Attachments to I-Recirculated-20, Cheryl Langley

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Date: July 21, 2014
Subject: Review of the TGPA/ZOU Draft Environmental Impact Report

I reviewed El Dorado County's (EDC) Targeted General Plan Amendments/Zoning Ordinance Update (TGPA/ZOU) draft Environment Impact Report (dEIR) and have the following comments.

(1) The basic approach of the dEIR is flawed.

Page 3.4-21 states: *"This DEIR analyzes whether these proposed changes…would not be reasonably foreseeable under the existing General Plan and Zoning Ordinance."*

AND

Page 3.4-25 states: *"Each of the impact discussions…first discloses the extent to which the current General Plan…has or is expected to have an impact on biological resources. The potential effects of the project on existing biological resources are then analyzed."*

AND

Page 3.4-25 states: **"***The 2004 Final EIR for the General Plan modified these considerations [CEQA thresholds of significance] to reflect the character of El Dorado County. The present DEIR will use the following considerations taken from the 2004 General Plan EIR to evaluate impacts…"*

Because the dEIR takes the 2004 General Plan as a "starting point" from which to evaluate the impacts of the newly proposed TGPA/ZOU policies, the result is an inappropriate assessment of new policy impacts. To be a legally appropriate document, the dEIR must compare the outcome of the proposed policies (the project) with ***existing*** physical conditions; that is, courts have required that the baseline of an EIR reflect physical conditions at the ***start of environmental review*** (*EPIC v. County of El Dorado [1982]*).[1] Using conditions that were present when the General Plan (a ten-year old document) was prepared and approved is inappropriate.

(2) Many of the mitigation programs described in the 2004 General Plan have not been implemented.

Page 3.4-5 states: **"***The County 2004 General Plan contains numerous goals and policies intended to conserve biological resources."*

Despite the fact that many of the mitigation measures (including *programs* intended to mitigate adverse effects of development) described in the 2004 General Plan have not been established, **the TGPA/ZOU dEIR is working under the assumption that these mitigations have been implemented and are efficacious**; this is erroneous. The dEIR should "start from scratch." It should clearly identify mitigation programs that are currently in use (and shown to be effective mitigation elements), and reestablish

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[1] **EPIC v County of El Dorado (1982) held:** *"The dispositive issue…is whether the requirements of CEQA are satisfied when the EIRs prepared for use in considering amendments to the county general plan compare the environmental impacts of the proposed amendments to the existing plan rather than to the existing environment. We hold that the EIRs must report on the impact of the proposed plans on the existing environment." Discussion available at: http://resources.ca.gov/ceqa/cases/1982/el_dorado_043082.html*

timelines for yet to be developed programs. Mitigation measures under development need to be well researched and—to the degree possible—their efficacy established through investigation into programs implemented elsewhere in the State, and/or evaluated and recommended by research institutions, including universities and State departments with expertise in the areas of concern. **The efficacy of established and proposed programs needs to be documented and presented in the dEIR.**

These programs/mitigation measures **must be in place** prior to allowing TGPA/ZOU development policies to move forward (e.g., increases in zoning densities, changes to allowable activities in Agricultural Districts, etc.)

Please provide information on the following programs/studies/ mitigation measures/strategies, databases, etc., in an appendix to the final EIR. Identify: 1) specifically how the programs, etc. function to mitigate the impacts they are designed to reduce; 2) the programs, etc. that have been established and implemented (include efficacy evaluations); 3) the programs, etc. that have not been developed, the progress made toward development, the anticipated completion date, and documentation upon which development will be based; 4) the programs, etc., that include monitoring and reporting components; 5) the timing/duration of monitoring and reporting components, if applicable; and 6) any penalties imposed (and/or project adjustments required) for noncompliance with mitigation responsibilities (short and long-term).

a. Integrated Natural Resources Management Plan (INRMP) (CO-M; page 3.4-13)
b. Important Biological Corridor (-IBC) Overlay (review and update; page 3.4-13)
c. Oak Tree Preservation Ordinance (page 3.4-11)
d. Biological Resources Study (CO-U, A; page 3.4-14)
e. Biological Resource Evaluation (if different than Biological Resources Study [d]) (page 3.4-28)
f. Important Habitat Mitigation Program (CO-U, B; page 3.4-14)
g. *County guidelines for off-site mitigation* of impacts to biological resources (page 3.4-14)
h. Erosion and Sediment Control Plan (page 3.4-23)
i. *Development standards* for hillside development (page 3.4-24)
j. *Conservation fund* to acquire and protect important habitat (CO-U; 3.4-13)
k. Ecological Preserve Fee Program (Policy 7.4.1.1; page 3.4-14)
l. Zoning Ordinance's in-lieu fee option (page 3.4-14)
m. Rare Plant Mitigation Program (page 3.4-15)
n. Riparian/wetland setbacks and "proposed code,"(page 3.4-6 & 3.4-28)
o. Conservation easements (page 3.4-6)
p. Natural Resource Protection Areas (page 3.4-6)
q. No-Net-Loss Policy (CO-U8; page 3.4-27)
r. Species, habitat, and natural community preservation/conservation strategies (page 3.4-6)
s. Natural Resources Management Plan Conservation Fund (If different than [j]) (page 3.4-12)
t. State Land Conservation Act Program; describe how EDC will "*provide for Open Space through local implementation*" of this program (page 3.4-13)
u. Habitat Protection Strategy (if different than [f]) (page 3.4-8)
v. Ecological Preserve overlay (page 3.4-5)
w. Database of important surface water features (page 3.4-6)
x. Important Biological Resources Map (page 3.4-7)
y. Biological Community Conservation Plans (page 3.4-7)

For each of the programs that have been implemented, please provide the following documentation in an appendix to the final EIR:

- Identify specific EDC development projects that have been required to implement mitigation programs, and identify which mitigation measures were implemented.
- Provide monitoring results from follow-up mitigation efficacy investigations, and name the specific development project(s) that were investigated.
- Identify the individual/agency/department/etc. responsible for evaluating the effectiveness of mitigation, and provide their credentials (relative to evaluating mitigation of environmental impacts).
- Provide documentation on specific (named) projects from which mitigation fees have been collected, identify the program under which they were collected, quantify the amounts collected, and what the fees were used for.

Please explain the following statements (A) and (B):

(A) "*Mitigation to ensure no net loss of important habitat would be developed, but there are no current assurances that implementation of such mitigation would be required by the County.*" (page 3.4-26)

(B) **"***There are no habitat conservation plans or natural community conservation plans in El Dorado County (U.S. Fish and Wildlife Service 2013; California Department of Fish and Wildlife 2013). Therefore,[there would be no] conflict with any such plan and there would be no impact.*" (page 3.6-9)

- Is it likely the "lack of mitigation enforcement" referenced in **(A)** would also apply to any or all of the proposed biological resources mitigation measures listed in **(2)** above? If so, under what circumstances?

- Does the statement *"[t]here are no habitat conservation plans…in El Dorado County"* **(B)** mean the conservation strategies and plans, conservation easements, etc., identified on page 3.4-6 are null and void?

(3) The mitigation proposals presented in the dEIR are "hollow."

While many of the mitigation proposals presented in the dEIR sound well established, closer inspection yields a different picture. <u>For example, tracing the thread of discussion on development of hillsides ≥30% yields the following information</u>.

Page 3.4-33: Mitigation Measure BIO-1a: Limit the relaxation of hillside development standards

Revise proposed Policy 7.1.2.1 and Section 17.30.060, subsections C and D, as follows.

Development or disturbance of slopes over 30% ***shall be restricted****. Standards for implementation of this policy, including but not limited to a* ***prohibition on development or disturbance where special-status species habitat*** *is present and exceptions for access,* ***reasonable use of the parcel****, and* ***agricultural uses*** *shall be incorporated into the Zoning Ordinance.*

Section 17.30.060, subsection C. Development Standards applicable to slopes 30 percent or greater.

*Development shall be **prohibited** where ground disturbance would adversely affect important habitat through conversion or fragmentation and shall comply with the provisions of General Plan Policy 7.4.1.6 regarding **avoidance** of **important habitats**. In order to demonstrate that adverse effects on important habitat will be avoided, **the development proponent** shall submit an independent **Biological Resources Study, to be prepared by a qualified biologist**, which examines the site for important habitat consistent with General Plan Implementation Measure **CO-U.***

Reviewer Comments on this portion of the mitigation proposal:

- Mitigation is described in broad terms, such as "*shall be restricted.*" This does nothing to identify how activities will actually *be* "restricted."
- "*Avoidance*" is not quantified or defined.
- "*Important habitats*" is not defined. (According to the 2004 General Plan, "important habitats" will not be defined until the INRMP is developed.)
- The term "*prohibited*"—in this context—is narrowly defined; special-status species is a high bar, and exceptions ("*reasonable use of parcel*," "*agricultural uses*," etc.) are included even in the presence of special-status species. (Who decides what "reasonable use" is?)
- The fact that the development proponent is responsible for hiring the biologist that performs the Biological Resources Study is problematic. The question of the potential "bias" of a report prepared by an individual hired by the developer to evaluate the developer's project will always loom large.
- Biological Resources Studies have not been performed, and the criteria for these studies have not been developed. Furthermore, it is not known *when* study criteria will be developed, or how effective the studies will be in evaluating project impacts. Because the studies will be performed by different biologists who are not required to consult with independent experts or with agencies with expertise in environmental issues (such as riparian/steam protection, wildlife requirements, etc.), the studies are likely to be inconsistent, and highly dependent upon the relative expertise of each biologist.

Again, following the thread to General Plan Policy 7.4.1.6. Page 144 of the 2004 General Plan states:

Policy 7.4.1.6 ***All development projects involving discretionary review shall be designed to avoid disturbance or fragmentation of important habitats to the extent reasonably feasible.** Where **avoidance** is not possible, the development shall be required to **fully mitigate** the effects of important habitat loss and fragmentation. Mitigation shall be defined in the **Integrated Natural Resources Management Plan (INRMP)** (see Policy 7.4.2.8 and Implementation Measure CO-M).*

*The County Agricultural Commission, Plant and Wildlife Technical Advisory Committee, representatives of the agricultural community, academia, and other stakeholders shall be involved and consulted in defining the **important habitats** of the County and in the **creation and implementation of the INRMP.***

Reviewer Comments on this portion of the mitigation proposal:

- "Avoidance" is once again not defined.
- "Important habitats" is not defined.

- The term “reasonably feasible” is a red flag for “wiggle room.” (Who determines what is “reasonably feasible”?) Without pre-determined mitigation standards, “reasonably feasible” is purely subjective.
- How do you “*fully mitigate*” something where “a*voidance is not possible*”? (How is this accomplished, and who determines how to accomplish mitigation?) “Full mitigation” would require that the site be left undisturbed.
- The Integrated Natural Resources Management Plan (INRMP) has not been established. According to the 2004 General Plan, it was to be developed within five years of General Plan approval (page 146, 2004 General Plan). Because the plan has not come to fruition, EDC’s mitigation program for “…*effective habitat preservation and management*” remains undefined.
- The Plant and Wildlife Technical Advisory Committee—to be established under the INRPM—is described as a Committee that “…***should** be formed of local experts, including agricultural, fire protection, and forestry representatives, who will consult with other experts with special expertise on various plant and wildlife issues, including representatives of regulatory agencies*.” What assurance is there that the Committee *will* be formed by local “experts,” or that members will consult with experts? Is it realistic to assume someone from fire protection (or agriculture or forestry, for that matter) has expertise in the area of wildlife issues?
- Policy 7.4.2.8 and CO-M refer to the non-existent INRMP.

<u>Again, following the thread to General Plan mitigation measure CO-U; page 144 of the 2004 General Plan states</u>:

> <u>MEASURE CO-U</u>
> *Mitigation under Policy 7.4.1.6 shall include providing **sufficient funding** to the County’s **conservation fund** to acquire and protect important habitat at a minimum 2:1 ratio. Impacts on important habitat and mitigation requirements shall be addressed in a **Biological Resources Study and an Important Habitat Mitigation Program (described below).***
>
> ***A. Biological Resources Study.** The County **shall adopt biological resource assessment standards** that apply to all discretionary projects that would result in disturbance of soil and native vegetation in areas that include **important habitat as defined in the INRMP.** The assessment of the project site must be in the form of an independent **Biological Resources Study,** and must be completed by a qualified biologist.*
>
> ***B. Important Habitat Mitigation Program.** The **Biological Resource Study** shall include an Important **Habitat Mitigation Program** that **identifies options that would avoid, minimize, or compensate for impacts on important habitats in compliance with the standards of the INRMP** and the General Plan.*

Reviewer Comments on this portion of the mitigation proposal:

- Because the INRMP, Biological Resources Study, and Important Habitat Mitigation Program have not been established, mitigation measure CO-U is a non-starter.

(4) Protections for Open Space are inadequate.

The exemptions and modifications to Open Space protections are numerous. Open space—the element that defines EDC’s rural character—is not protected under the proposed policies. “Rural character” is a finite resource; it is the unique feature that EDC has to offer both current and future residents, and visitors to the County. The 2004 General Plan identified this attribute as worthy of protection when it states that the goal of its policies is to, *"Maintain and protect the County's natural beauty and environmental quality, vegetation, air and water quality, natural landscape features, cultural resource values, and maintain the rural character and lifestyle…"* The policies proposed under this dEIR will erode Open Space protections, and change the character of EDC through the following proposals:

- exempt some development projects from the 30% open space requirement while allowing others to provide 15% in recreational/landscaped buffers and 15% in private yards;
- eliminate the provision that open space may be kept as *wildlife habitat*, instead providing that it may be maintained in a *natural condition*;
- allow development in specific areas (Community Regions and Rural Centers) and allow a lesser area of "*improved open space*;"
- provide open space off-site or by an in-lieu fee option (with actual off-site land acquisition, and acquisitions under fee program unidentified);
- provide "*exemptions and alternatives*" to open space to facilitate and encourage higher density housing developments;
- allow planned developments within Agricultural Districts to set aside open space for agricultural uses such as "*raising and grazing animals, orchards, vineyard, community gardens and crop lands*;" and
- include infrastructure, including roads, water, wastewater, drainage facilities and other utilities within Open Space Zones.

Please include in an appendix to the final EIR the following information:

- Why—given the obvious magnitude of the Open Space policy changes—the dEIR concludes that, "*…the TGPA and the related changes in the ZOU would not result in a significant environmental effect. This impact would be less than significant."*
- Explain how the in-lieu fee option works—if it has been used—and if it has been used, what funds have been collected and what they have been used for.
- Explain what is meant by "*eliminate the provision that open space **may** be kept as wildlife habitat, instead providing that it may be maintained in a natural condition."*
- Explain how *"natural condition"* differs from *"wildlife habitat"* in the context of this new policy.
- Describe what is meant by *"improved open space."*
- Identify where open space might be provided "off site." Identify where this has been done in the past (if it has), where the open space is, and identify and describe what policies protect it from future development.
- Explain why infrastructure and agricultural uses (orchards, etc.) will be classified as open space.

(5) Riparian/wetland setbacks for ministerial projects are too small; discretionary project setbacks remain undefined, with no minimums.

Page 3.4-28 states: ***"Ministerial development*** *would be required to be set back 25 feet from any intermittent stream, wetland or sensitive riparian habitat, or a distance of 50 feet from any perennial lake, river, or stream. All* ***discretionary development****… would require a* ***biological resource evaluation*** *to establish the area of avoidance and any buffers or setbacks required to reduce the impacts to a* ***less-than-significant level*** *(this would be in addition to any required CEQA analysis). Where* ***all impacts*** *are not reasonably avoided, the biological resource evaluation would be required to identify mitigation measures that* ***may*** *be employed to* ***reduce the significant effects****. The* ***proposed code*** *would also establish greater setbacks from specified major lakes, rivers, and creeks within the county."*

It is not clear from this description exactly what will be accomplished under the biological resource evaluation. The evaluation is described as a tool to identify setbacks that will reduce impacts to a "less-than-significant level," but where *all impacts* (***less*** than "less-than-significant"?) are not reasonably avoided, the evaluation would identify mitigation measures that "may" be employed to "reduce" significant effects. Then a "proposed code" is mentioned. So—what is the mitigation mechanism—the biological resource evaluation, or a yet-to-be-developed "code"?

The language in the dEIR does nothing to identify what **real** protection is being established for riparian/wetland habitat under discretionary projects. Where impacts "are not reasonably avoided," measures **may** be employed to reduce impacts, but clearly, these measures—as implied by the term "*may*"—need *not* be employed. Theoretically, EDC should have more flexibility to enforce setbacks under discretionary projects than under ministerial projects, and yet a standard has been set for ministerial projects (albeit inadequate to protect riparian/stream resources), but no setback has been established for discretionary projects.

Because the biological resource evaluation would be conducted by a biologist hired by the developer (with potentially as little expertise as is acquired with a BA degree in biology), it is doubtful the biologist would have the expertise necessary to effectively evaluate riparian/stream setback requirements. The biologist would need to consult with experts (research institutions, State agency personnel with field experience, etc.) to produce an effective evaluation. Consultation is crucial; effective buffers need to be based on science, not on the wishes of the developer.

Please provide in an appendix to the final EIR:

- **The scientific basis upon which riparian/stream setbacks were/will be developed (such as peer-reviewed research documents, studies from universities, reports from State agencies with expertise in riparian/stream protection).**
- **How/why the criteria for ministerial projects will differ from the setback for discretionary projects, given a hypothetically equivalent environment in each case.**
- **The criteria used to determine both the impacts/mitigations for discretionary development projects and the setback size(s) for discretionary projects.**
- **Information on the "biologist" that will perform the evaluations, including who will hire the biologist (the project developer, etc.) Include a discussion about whether an additional environmental review should be conducted post-project approval under contract with a research institution or State agency.**
- **A synopsis of what will be required in the biological resource evaluation, including whether the biologist will be required to consult with agencies with expertise in the field of riparian/stream protection, wildlife protection, etc., and be required to include information from such consultations in the report.**
- **Information on short- and long-term monitoring and reporting requirements for both ministerial and discretionary projects. (If they will be conducted, who will conduct them, and the qualifications of individuals conducting the monitoring.)**
- **Any penalties or corrective actions that will be required for violations to prescriptive mitigations, and the criteria upon which these actions will be based.**
- **Identify actions that will be taken to revise ordinances and policies if mitigation measures established in "code" are found not to be effective.**

(6) The "Environmental Setting"—beginning on page 3.4-15—is cursory at best and therefore understates the rich plant/animal communities present in EDC; some "special-status species" are not listed.

The description of EDC's plant/animal communities woefully understates the rich diversity present in the County. This "omission" could lull some reviewers into believing there is "really not much to lose," if we edge wildlife/wildlife habitat out as EDC "grows," and that the multiple environmental mitigation measures cited in the dEIR are more than adequate to protect the few biological resources mentioned. This, of course, would be a serious misperception; but it is one easily deduced from the limited representation of biota in this dEIR.

To complicate matters, the list of "special-status species" is incomplete. (It needs to be clarified—if it is indeed the case—that species to be protected via environmental mitigations include more than endangered, rare, or threatened species; included are *fully protected animals,*[2] *special animals,*[3] and nesting habitat for specific species, etc.) But because this list of "special-status species is incomplete, these animals (and nesting habitats) are probably not protected, and it is doubtful protections will be applied to ensure either their survival or the protection of their habitat if they are not recognized. For instance, Table 3.4-2 does not include some "special-status species" that the reviewer knows occur in EDC:

- The list does not include two *fully protected animals* that are EDC residents, the white-tailed kite (*Elanus leucurus*) and ring-tailed cat (genus *Bassariscus*).
- Nesting colony protection[4] for great blue heron (*Ardea Herodias*), and snowy egret (*Egretta thula*), white-tailed kite (*Elanus leucurus),* great gray owl (*Strix nebulosa*), Nuttall's woodpecker (*Picoides nuttalli*), and oak titmouse (*Baeolophus inornatus*) is not included.

(NOTE: This is by no means a complete list of animals/habitats that were overlooked; these are simply notes on what was easily recognized as omissions by a non-expert resident that has lived in EDC for a few years.) The fact that "fully protected" and "special animals" and their habitat requirements are not identified in the dEIR is an oversight that speaks volumes about the lack of analysis performed to establish these lists. Because this analysis has bearing on what is protected under mitigation activities, it needs to be amended/corrected by experts with appropriate credentials.

Section 15380 of the California Environmental Quality Act (CEQA) Guidelines clearly indicates that species of special concern (including "*fully protected*" and "*special animals*") should be included in the analysis of project impacts. Sections 15063 and 15065 are particularly relevant to species of special concern. (In assigning "impact significance" to populations of non-listed species, analysts consider factors such as population-level effects, proportion of the taxon's range affected by a project, regional effects, and impacts to habitat features.)[5]

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[2] California Department of Fish and Wildlife. 2014. *Fully Protected Animals*. Available at: https//dfg.ca.gov/wildlife/nongame/t_e_spp/fully_pro.html.
[3] Department of Fish and Game. 2011. *Special Animals*. Biogeographic Data Branch, California Natural Diversity Database. January, 2011.
[4] *Ibid*.
[5] California Department of Fish and Wildlife. 2014. *Fully Protected Animals*. Available at: https//dfg.ca.gov/wildlife/nongame/t_e_spp/fully_pro.html.

(7) Changes to agricultural zoning are not presented in an understandable manner; biological resources are not adequately protected under proposed policy changes.

The rationale behind the changes in zoning for Agricultural Districts—including changes to the roll-out zoning of Williamson Act lands—is not described in terms that enable the reviewer to understand what is accomplished as a result of these changes, or how the changes might impact the character of EDC and its natural environment. The discussions that *are* presented are disjointed, and make getting a grasp on the picture of the change—and its associated impact—impossible.

The discussion on impacts to wildlife habitat as a result of agricultural expansion is equally confusing:

Page 3.4-28 states: "*The 2004 General Plan EIR raised the concern that "[a]gricultural expansion has the potential for far greater impacts on the extent and connectivity of habitat than residential development, as a greater area of land in larger contiguous patches is generally more greatly disturbed."* ***However, land conversion data from the FMMP does not support this concern.*** *The conversion data for the three most recent reporting periods indicate that the amount of Other land converted to Agricultural was far outweighed by the amount of Agricultural land that converted to Other lands. The Other land category is not limited to wild land habitats as it also includes rural residential uses. Agricultural land that has been converted to Other land most probably became rural residential or other nonwild land land-use type. A certain amount of wild land habitat is being converted to agricultural use, but the amount is small, as shown in Table 3.4-4."*

Data from the Farmland Mapping and Monitoring Program (FMMP) neither support nor refute the concern that agricultural expansion has a greater potential to impact habitat connectivity than residential development. In fact—especially in light of the type of expansion proposed in Agricultural Districts under this dEIR—agricultural expansion will have a significant impact on wildlife habitat, especially because many of the mitigation measures that apply to residential development will not apply in Agricultural Districts (e.g., disturbance of natural areas, such as riparian/stream habitats, development on slopes ≥30%, on-site grading, Important Biological Corridor restrictions, etc.). That is not to say the impact on wildlife habitat will be *less* in areas of residential development than in Agricultural Districts, but in truth, this argument is specious; what is the value—and meaning—of such a discussion? Is it intended to persuade the reviewer that letting Agricultural Districts "off the hook" for impacts to wildlife and wildlife habitat is an acceptable trade-off for benefits that might be gained from agricultural expansion?

This discussion is particularly odd because close examination of the data source for Table 3.4-4 makes the reviewer wonder why the author of the table chose to present those specific data. The summary table from the Department of Conservation (DOC) shows that between 2008 – 2010 EDC's inventory of agricultural land declined by 1,742 acres, and "Other Land" (low-density residential) plus urban gained 1,513 and 75 acres, respectively, or 1,588 acres total from the ledger of agricultural land.[6] It is not clear why the (104 agricultural land/1,808 other land) data was used instead. In any case, it is not at all certain what this discussion (including the table) adds to the dEIR in terms of elucidating the relative impact of the expansion of agricultural land on wildlife and wildlife habitat.

If a discussion of relative impacts *is* to be had, it ought to include a discussion of the "addition" of 17,241 acres to Agricultural Districts, the expansion of new, allowable uses and activities in these Districts, and

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[6] California Department of Conservation. *California Farmland Conversion Report.* April, 2014. http://www.conservation.ca.gov/dlrp/fmmp/Documents/fmmp/pubs/2008-2010/fcr/FCR%200810%20complete.pdf

exemptions from environmental protections—but it does not. This makes the data presented in the table all the more confounding. It is "information" that serves only to add volume to the report, without adding meaning and clarity.

Please include in an appendix to the final EIR:

- A description of each of the current agricultural zones, what they will be changed to, and what this means in terms of how the land can or will be used in the future. Compare new uses to "old" uses.
- A description of why these changes are beneficial/necessary.
- Describe what it means, exactly, for Williamson Act lands to roll out into a new zoning classification as opposed to the past zoning roll-out designation for these lands (in terms of impact to agriculture, open space, wildlife habitat, etc.)
- Describe why Agricultural Districts are being allowed exemptions for disturbance of natural areas (riparian/stream habitats, etc.), development on slopes ≥30%, on-site grading, Important Biological Corridor restrictions, etc. Who benefits from these exemptions?
- Identify where the 17,241 acres "came from." That is, discuss what this land was zoned prior to its inclusion in Agricultural Districts, and how this change will impact EDC's biological resources and the viability of agriculture in EDC.

(8) Enforcement of Ordinances called into question.

A recent article in the Mountain Democrat (July 7, 2014; Chris Daley) cited a Grand Jury report that indicated the following:

> …several county departments and individuals failed to protect the public from threats to the environment and to the health of local residents. The report cites the departments of Transportation and Community Development as well as the District Attorney's Office at best for inattention and perhaps ineptitude or bowing to political pressure regarding the lack of enforcement of several county ordinances, particularly the "Grading, Erosion and Sediment Control Ordinance."

This is an obvious matter of concern; if ordinances are developed but not enforced, what assurance is there that mitigation measures developed to protect wildlife and wildlife habitat under this dEIR (or in the 2004 General Plan) will be enforced?

Please provide in an appendix to the final EIR:

- **The EDC department responsible for overseeing and enforcing the mitigations proposed in this dEIR.**
- **Describe the staffing levels and funding of departments responsible for mitigation oversight, and include an estimate of whether it is likely they can handle their respective workload(s).**
- **Describe whether EDC staff will be responsible for overseeing and reviewing projects post-implementation to make certain they are in compliance with ordinances (including mitigation measures), or if subsequent compliance "monitoring" will be reliant upon complaints from the public (residents).**
- **Describe who will handle public "complaints" regarding mitigation violations, and to what degree EDC staff is obligated to respond to complaints from the public.**

(9) This dEIR is difficult to review.

The dEIR is disorganized and difficult to review. It is full of confusing statements, any understanding of which is undermined by the imprecise use of language, the inclusion of undefined terms, and—in too many cases—contradictory statements. It also "asks" the reviewer to take leaps of faith, to rely on claims made in the dEIR; it does not provide information upon which to reasonably evaluate project impacts and impact mitigations.

For instance, meaningful review is complicated by the fact that the reviewer must make an attempt to estimate project impacts to biological resources when "the experts" make no attempt to do so, stating that *"[t]here is no specific development project being proposed at this time, and the number, size, and habitat value of sites to which the proposed amendments might be applied cannot be known because this will depend upon the future proposals of individual land owners"* and ***"**No specific level of future development was forecast during this analysis because there is no reasonable way to know how many of the uses allowable under the project may be approved in the future, and the locations of such uses cannot be known at this time*."(pages 3.4-29 & 30; 3.4-25)

To exacerbate difficulty of review, these nebulous accounts of development potential are often accompanied by statements of "significant and unavoidable" impacts. **Without concrete information on the magnitude of development, and the viability of mitigation programs, this "conclusion" is unsubstantiated.**

The reviewer is put in a similar situation (required to perform an evaluation in the absence of supporting information) when attempting to estimate the value of mitigations. In this instance, the reviewer is asked to put full faith in the efficacy of not yet developed mitigation programs. **What remains is not an impact analysis at all; it is a series of development proposals whose magnitude cannot be estimated, coupled with "mitigation measures" that—while presented as viable measures—have for the most part not been developed (and may never be developed).**

CEQA intends EIR documents to be easily understood by the public; that is what is prescribed. This document does not accomplish that goal.

California Department of Fish and Wildlife
California Natural Diversity Database (CNDDB)

SPECIAL ANIMALS LIST

March 2015

Recommended Citation:

California Department of Fish and Wildlife, Natural Diversity Database. March 2015. Special Animals List. Periodic publication. 51 pp.

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Special Animals

(899 taxa)
Last updated March 2015

"Special Animals" is a broad term used to refer to all the animal taxa tracked by the Department of Fish and Wildlife's California Natural Diversity Database (CNDDB), regardless of their legal or protection status. This list is also referred to as the list of "species at risk" or "special status species". The Department of Fish and Wildlife considers the taxa on this list to be those of greatest conservation need. The species on this list in 2005 were used in the development of California's Wildlife Action Plan (available at: http://www.dfg.ca.gov/SWAP/). The Special Animals list includes species, subspecies, or Evolutionarily Significant Units (ESU) where at least one of the following conditions applies:

- Officially listed or proposed for listing under the State and/or Federal Endangered Species Acts;

- Taxa considered by the Department to be a Species of Special Concern (SSC);

- Taxa which meet the criteria for listing, even if not currently included on any list, as described in Section 15380 of the California Environmental Quality Act Guidelines. (More information on CEQA is available at: http://resources.ca.gov/ceqa/guidelines

- Taxa that are biologically rare, very restricted in distribution, or declining throughout their range but not currently threatened with extirpation;

- Population(s) in California that may be peripheral to the major portion of a taxon's range but are threatened with extirpation in California;

- Taxa closely associated with a habitat that is declining in California at a significant rate (e.g. wetlands, riparian, vernal pools, old growth forests, desert aquatic systems, native grasslands, valley shrubland habitats, etc.);

- Taxa designated as a special status, sensitive, or declining species by other state or federal agencies, or a non-governmental organization (NGO) and determined by the CNDDB to be rare, restricted, declining, or threatened across their range in California.

Taxa marked with a "+" to the left of the scientific name are those for which there is location information in the CNDDB Geographic Information System (GIS), as of the date of this list.

Additional information on the CNDDB is available on the Department of Fish and Wildlife web site at: http://www.dfg.ca.gov/biogeodata/cnddb

Additional information on other Department resource management programs is available at: https://www.wildlife.ca.gov/Conservation

The Species Conservation & Recovery Program has additional information on wildlife habitat, threats, and survey guidelines at: http://www.dfg.ca.gov/wildlife/nongame

NatureServe Element Ranking

All Heritage Programs, such as the California Natural Diversity Database (CNDDB) use the same ranking methodology, originally developed by The Nature Conservancy and now maintained and recently revised by NatureServe. It includes a **Global rank** (G-rank), describing the rank for a given taxon over its entire distribution and a **State rank** (S-rank), describing the rank for the taxon over its state distribution. For subspecies and varieties, there is also a "T" rank describing the global rank for the infraspecific taxon. The next page of this document details the criteria used to assign element ranks, from G1 to G5 for the Global rank and from S1 to S5 for the State rank. Procedurally, state programs such as the CNDDB develop the State ranks. The Global ranks are determined collaboratively among the Heritage Programs for the states/provinces containing the species. NatureServe then checks for consistency and logical errors at the national level. Because the units of conservation may include non-taxonomic biological entities such as populations or ecological communities, NatureServe refers to the targets of biological conservation as elements rather than taxa.

An element rank is assigned using standard criteria and rank definitions. This standardization makes the ranks comparable between organisms and across political boundaries. NatureServe has developed a "rank calculator" to help increase repeatability and transparency of the ranking process. The three main categories that are taken into consideration when assigning an element rank are rarity, threats, and trends. Within these three categories, various factors are considered including:

- Range extent, area of occupancy, population size, total number of occurrences, environmental specificity and number of good occurrences (ranked A or B).

- Overall threat impact as well as intrinsic vulnerability (if threats are unknown).

- Long-term and short-term trends.

Detailed information on the newest element ranking methodology can be found here:
https://connect.natureserve.org/publications/StatusAssess_Methodology

With the above considerations in mind, refer below for the numerical definitions for G1-5 and S1-5. An element's ranking status may be adjusted up or down depending upon the considerations above.

Element Ranking

GLOBAL RANKING

The *global rank* (G-rank) is a reflection of the overall status of an element throughout its global range. **Both Global and State ranks represent a letter and number score that reflects a combination of Rarity, Threat, and Trend factors, with weighting being heavier on Rarity than the other two.**

SPECIES OR NATURAL COMMUNITY LEVEL

G1 = **Critically Imperiled**—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2 = **Imperiled**—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3 = **Vulnerable**—At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4 = **Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5 = **Secure**—Common; widespread and abundant.

SUBSPECIES LEVEL

Taxa which are subspecies or varieties receive a taxon rank (**T-rank)** attached to their G-rank. Where the G-rank reflects the condition of the entire species, the T-rank reflects the global situation of just the subspecies. For example: the Point Reyes mountain beaver, *Aplodontia rufa* ssp. *phaea* is ranked G5T2. The G-rank refers to the whole species range i.e., *Aplodontia rufa.* The T-rank refers only to the global condition of ssp. *phaea*.

STATE RANKING

The *state rank* (S-rank) is assigned much the same way as the global rank, but state ranks refer to the imperilment status only within California's state boundaries.

S1 = **Critically Imperiled**—Critically imperiled in the state because of extreme rarity (often 5 or fewer populations) or because of factor(s) such as very steep declines making it especially vulnerable to extirpation from the state.
S2 = **Imperiled**—Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state.
S3 = **Vulnerable**—Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation from the state.
S4 = **Apparently Secure**—Uncommon but not rare in the state; some cause for long-term concern due to declines or other factors.
S5 = **Secure**—Common, widespread, and abundant in the state.

Notes:

1.	Other considerations used when ranking a species or natural community include the pattern of distribution of the element on the landscape, fragmentation of the population/stands, and historical extent as compared to its modern range. It is important to take a **bird's eye or aerial view** when ranking sensitive elements rather than simply counting element occurrences.		3.	Other symbols: GH All sites are **historical**; the element has not been seen for at least 20 years, but suitable habitat still exists (SH = All California sites are historical). GX All sites are **extirpated**; this element is extinct in the wild (SX = All California sites are extirpated). GXC Extinct in the wild; exists in cultivation. G1Q The element is very rare, but there are **taxonomic questions** associated with it. T Rank applies to a subspecies or variety.
2.	Uncertainty about the rank of an element is expressed in two major ways: By expressing the ranks as a **range** of values: e.g., S2S3 means the rank is somewhere between S2 and S3. By adding a "?" to the rank: e.g., S2? This represents more certainty than S2S3, but less certainty than S2.			

Animal Element Occurrences and Mapping

What is an Element Occurrence?

An Element Occurrence (EO) is a location where the element has been documented to occur. It is a concept developed and applied within the NatureServe natural heritage network. **An EO is not a population**, but it may indicate that a population is present in that area; and a single population may be represented by more than one EO. An EO is based upon the source documents available to us at the time it was mapped. Both the mapped feature and the text portion of EO's are updated as new information becomes available.

Element Occurrence (EO) Definitions vary by taxa:

The EO definition refers to the types of information we map. For most animal taxa, the CNDDB is interested in information that indicates the presence of a resident population. However, for many migratory birds the CNDDB tracks detections of nest sites or behaviors indicating reproduction is occurring at the site. Details about avian detections are available in our Submitting Avian Detections document at: https://www.dfg.ca.gov/biogeodata/cnddb/submitting_data_to_cnddb.asp. For other taxa where we track only a certain part of their range or life history, the area or life stage is indicated on the list under the "Comment" column.

Mapping Conventions:

Our information is mapped to balance precision and uncertainty, based upon the source materials used to determine the location of the element occurrence (EO). Data with precise location information are mapped with 80m radius circles or specific polygons. Data with vague location information are mapped with non-specific circular features or non-specific polygons. Non-specific features indicate that the species was found somewhere within the mapped area, but the exact location was unknown. Generally, observations/collections within ¼ mile and/or within continuous habitat, are combined into a single element occurrence (EO).

Taxonomic References

Last updated March 2015

Taxonomic References and Sources of Additional Information:

The CNDDB follows current published taxonomy for animals as recognized by the scientific organizations listed below. The CNDDB reviews publications that propose new taxonomy and nomenclature for CNDDB-tracked species, and evaluates whether these proposals are recognized and accepted by the larger scientific community. The CNDDB makes every effort to use the best available science in the taxonomy we use, but different experts may recognize different names for some time after a taxonomic change is proposed. In these cases, the CNDDB will generally use the preexisting nomenclature until a change is formally recognized beyond the initial publication. In addition, the CNDDB recognizes some taxa identified by experts on the California fauna where these taxa may not be recognized by national biological societies. We generally follow the taxonomy used by NatureServe, with additional evaluation of taxonomy from the following sources:

For reptiles and amphibians:

The Center for North American Herpetology (http://www.cnah.org)
The Society for the Study of Amphibians and Reptiles (http://www.ssarherps.org)

For fish:

Moyle, P. B. 2002. Inland Fishes of California. University of California Press.

Nelson, J.S., E.J. Crossman, H. Espinosa-Perez, L.T. Findley, C.R. Gilbert, R.N. Lea, and J. D. Williams. 2004. Common and scientific names of fishes from the United States, Canada, and Mexico. American Fisheries Society, Special Publication 29, Bethesda, Maryland. 386 pp.

Jelks, H.L., S.J. Walsh, N.M. Burkhead, S. Contreras-Balderas, E. Díaz-Pardo, D.A. Hendrickson, J. Lyons, N.E. Mandrak, F. McCormick, J.S. Nelson, S.P. Platania, B.A. Porter, C.B. Renaud, J.J. Schmitter-Soto, E.B. Taylor, and M.L. Warren, Jr. 2008. Conservation status of imperiled North American freshwater and diadromous fishes. Fisheries 33(8):372-407.

For birds:

The checklist of the American Ornithologists' Union: http://checklist.aou.org/

For mammals:

The American Society of Mammalogists:
http://www.mammalsociety.org/publications/mammalian-species

Baker, R.J., L.C. Bradley, R.D. Bradley, J.W. Dragoo, M.D. Engstrom, R.S. Hoffman, C.A. Jones, F. Reid, D.W. Rice, & C. Jones. 2003. Revised Checklist of North American Mammals North of Mexico, 2003. Museum of Texas Tech University Occasional Papers 229:1-23. Available at: http://www.nsrl.ttu.edu/publications/opapers/ops/op229.pdf

Listing and Special Status Information

Last updated March, 2015

CALIFORNIA ENDANGERED SPECIES ACT (CESA) LISTING CODES: The listing status of each species is current as of the date of this list. The most current changes in listing status will be found in the "Endangered and Threatened Animals List," which the CNDDB updates and issues quarterly.

SE	State listed as Endangered
ST	State listed as Threatened
SCE	State candidate for listing as Endangered
SCT	State candidate for listing as Threatened
SCD	State candidate for delisting

FEDERAL ENDANGERED SPECIES ACT (ESA) LISTING CODES: The listing status is current as of the date of this list. The most current changes in listing status will be found in the "Endangered and Threatened Animals List," which the CNDDB updates and issues quarterly. Federal listing actions contained in the Federal Register are also available at: http://www.regulations.gov

FE	Federally listed as Endangered
FT	Federally listed as Threatened
FPE	Federally proposed for listing as Endangered
FPT	Federally proposed for listing as Threatened
FPD	Federally proposed for delisting
FC	Federal candidate species (former Category 1 candidates)

Section 4(c)(2)(A) of the Act requires the U.S. Fish and Wildlife Service to conduct a **review** of listed species at least once every **five** years. Five year reviews from the Pacific Southwest Region are available at: http://www.fws.gov/cno/es/recovery.html

OTHER STATUS CODES

The status of species on the Special Animals List according to other conservation organizations is provided. Taxa on these lists are reviewed for inclusion in the CNDDB Special Animals List, but are not automatically included. For example, taxa that are regionally rare within a portion of California may not be included, because they may be of lesser conservation concern across their full range in California.

American Fisheries Society (AFS): Designations for freshwater and diadromous species were taken from the paper:

Jelks, H.L., S.J. Walsh, N.M. Burkhead, S. Contreras-Balderas, E. Díaz-Pardo, D.A. Hendrickson, J. Lyons, N.E. Mandrak, F. McCormick, J.S. Nelson, S.P. Platania, B.A. Porter, C.B. Renaud, J.J. Schmitter-Soto, E.B. Taylor, and M.L. Warren, Jr. 2008. Conservation status of imperiled North American freshwater and diadromous fishes. Fisheries 33(8):372-407.

Available at: http://www.fs.fed.us/rm/pubs_other/rmrs_2008_jelks_h001.pdf

Designations for marine and estuarine species were taken from the paper:
Musick, J.A. et al. 2000. "Marine, Estuarine, and Diadromous Fish Stocks at Risk of Extinction in North America (Exclusive of Pacific Salmonids). Fisheries 25(11):6-30.
Available at: http://www.flmnh.ufl.edu/fish/sharks/sawfish/Reprint1390.pdf

BLM Sensitive: Bureau of Land Management (BLM) Manual §6840 states that "BLM sensitive species are: (1) species listed or proposed for listing under the Endangered Species Act (ESA), and (2) species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA, which are designated as Bureau sensitive by the State Director(s). All Federal candidate species, proposed species, and delisted species in the 5 years following delisting will be conserved as Bureau sensitive species." The California-BLM Sensitive Animals list is available at: http://www.blm.gov/ca/st/en/prog/wildlife.html

CDF Sensitive: California Department of Forestry and Fire Protection classifies "sensitive species" as those species that warrant special protection during timber operations. The list of "sensitive species" is given in §895.1 (Definitions) of the California Forest Practice Rules. The 2014 Forest Practice Rules are available at:
http://www.calfire.ca.gov/resource_mgt/resource_mgt_forestpractice.php.

CDFW Species of Special Concern (SSC): It is the goal and responsibility of the Department of Fish and Wildlife to maintain viable populations of all native species. To this end, the Department has designated certain vertebrate species as Species of Special Concern because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction. The goal of designating species as "Species of Special Concern" is to halt or reverse their decline by calling attention to their plight and addressing the issues of concern early enough to secure their long term viability. Not all "Species of Special Concern" have declined equally; some species may be just starting to decline, while others may have already reached the point where they meet the criteria for listing as a "Threatened" or "Endangered" species under the State and/or Federal Endangered Species Acts. More information is available at: https://www.dfg.ca.gov/wildlife/nongame/ssc/

CDFW Fully Protected: The classification of Fully Protected was the State's initial effort to identify and provide additional protection to those animals that were rare or faced possible extinction. Lists were created for fish, amphibians and reptiles, birds and mammals. Most of the species on these lists have subsequently been listed under the California and/or Federal Endangered Species Acts; the exceptions are white-tailed kite, golden eagle, trumpeter swan, northern elephant seal, and ring-tailed cat. The white-tailed kite and the golden eagle are tracked in the CNDDB; the trumpeter swan, northern elephant seal and ring-tailed cat are not. The Fish and Game Code sections dealing with Fully Protected species state that these species "...may not be taken or possessed at any time and no provision of this code or any other law shall be construed to authorize the issuance of permits or licenses to take any fully protected" species, although take may be authorized for necessary scientific research. This language arguably makes the "Fully Protected" designation the strongest and most restrictive regarding the "take" of these species. In 2003, the code sections dealing with Fully Protected species were amended to allow the Department to authorize take resulting from recovery activities for state-listed species. More information on Fully Protected species and the take provisions can be found in the Fish and Game Code, (birds at §3511, mammals at §4700, reptiles and amphibians at §5050, and fish at §5515). Additional information on Fully Protected fish can be found in the California Code of Regulations, Title 14, Division 1, Subdivision 1, Chapter 2, Article 4, §5.93. The category of Protected Amphibians and Reptiles in Title 14 has been repealed. The Fish and Game Code and Title 14 of the California Code of Regulations are available online.

IUCN - The International Union for Conservation of Nature (IUCN): The IUCN assesses, on a global scale, the conservation status of species, subspecies, varieties and even selected subpopulations in order to highlight taxa threatened with extinction, and therefore promote their conservation. Detailed information on the IUCN and the Red List is available at: http://www.iucnredlist.org

Marine Mammal Commission Marine Mammal Species of Special Concern: Section 202 of the Marine Mammal Protection Act directs the Marine Mammal Commission, in consultation with its Committee of Scientific Advisors, to make recommendations to the Department of Commerce, the Department of the Interior, and other federal agencies on research and management actions needed to conserve species of marine mammals. To meet this charge, the Commission devotes special attention to particular species and populations that are vulnerable to various types of human-related activities, impacts, and contaminants. Such species may include marine mammals listed as Endangered or Threatened under the Endangered Species Act or as depleted under the Marine Mammal Protection Act. In addition, the Commission often directs special attention to other species or populations of marine mammals not so listed whenever special conservation challenges arise that may affect them. More information on the Marine Mammal Protection Act and the Marine Mammal Species of Special Concern list is available at: http://www.mmc.gov/species/welcome.shtml.

North American Bird Conservation Initiative (NABCI): The North American Bird Conservation Initiative is a coalition of government agencies and private organizations that works to ensure the long-term health North America's native bird populations. They publish an annual State of the Birds report which includes a watch list of bird species in need of conservation help. Species on the list are assigned to either the Red Watch List for species with extremely high vulnerability, or Yellow Watch List for species that may be range restricted or may be more widespread but with declines and high threats. More information is available at: http://stateofthebirds.org.

National Marine Fisheries Service (NMFS) Species of Concern: The Office of Protected Resources (OPR) is a headquarters program office of NOAA's National Marine Fisheries Service (NOAA Fisheries Service, or NMFS), under the U.S. Department of Commerce, with responsibility for protecting marine mammals and endangered marine life. NOAA's Office of Protected Resources works to conserve, protect, and recover species under the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA). The category "Species of Concern" was established by the National Marine Fisheries Service (NMFS) effective 15 April 2004. Species of Concern are those species about which NOAA's National Marine Fisheries Service (NMFS) has some concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the Endangered Species Act (ESA). "Species of Concern" status does not carry any procedural or substantive protections under the ESA, but is meant to draw proactive attention and conservation action to these species. More information is available at: http://www.nmfs.noaa.gov/pr/species/concern.

U.S. Fish and Wildlife Service: Birds of Conservation Concern: The goal of the *Birds of Conservation Concern 2008* report is to accurately identify the migratory and non-migratory bird species (beyond those already designated as Federally Threatened or Endangered) that represent our highest conservation priorities and draw attention to species in need of conservation action. This report is available at: http://www.fws.gov/migratorybirds/currentbirdissues/management/BCC.html

U.S. Forest Service Sensitive: USDA Forest Service defines sensitive species as plant and animal species identified by a regional forester that are not listed or proposed for listing under the Federal Endangered Species Act for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density, or significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution. Regional Foresters shall identify sensitive species occurring within the region. California is the Pacific Southwest Region (Region 5). More information is available at: http://www.fs.usda.gov/main/r5/plants-animals
and at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5435266.xlsx

Western Bat Working Group (WBWG): The WBWG is comprised of agencies, organizations and individuals interested in bat research, management and conservation from the 13 western states and provinces. The goals are (1) to facilitate communication among interested parties and reduce risks of species decline or extinction; (2) to provide a mechanism by which current information on bat ecology, distribution and research techniques can be readily accessed; and (3) to develop a forum to discuss conservation strategies, provide technical assistance and encourage education programs. Species are ranked as High, Medium, or Low Priority in each of 10 regions in western North America. Because California includes multiple regions where a species may have different WBWG Priority ranks, the CNNDB includes categories for Medium-High, and Low-Medium Priority. The CNDDB tracks bat species that are at least Low-Medium Priority in California. More information is available at: http://www.wbwg.org.

Xerces Society Red List: The Xerces Society is an international non-profit organization dedicated to protecting biological diversity through invertebrate conservation. The Society advocates for invertebrates and their habitats by working with scientists, land managers, educators, and citizens on conservation and education projects. Their core programs focus on endangered species, native pollinators, and watershed health. More information on the Red List is available at: http://www.xerces.org.

Table of Special Status Code Abbreviations

Organization	Abbreviation
American Fisheries Society - Endangered	AFS_EN
American Fisheries Society - Threatened	AFS_TH
American Fisheries Society - Vulnerable	AFS_VU
Bureau of Land Management - Sensitive	BLM_S
Calif Dept of Forestry & Fire Protection - Sensitive	CDF_S
Calif Dept of Fish & Wildlife - Fully Protected	CDFW_FP
Calif Dept of Fish & Wildlife - Species of Special Concern	CDFW_SSC
Calif Dept of Fish & Wildlife - Watch List	CDFW_WL
IUCN - Critically Endangered	IUCN_CR
IUCN - Endangered	IUCN_EN
IUCN - Near Threatened	IUCN_NT
IUCN - Vulnerable	IUCN_VU
IUCN - Least Concern	IUCN_LC
IUCN - Data Deficient	IUCN_DD
IUCN - Conservation Dependent	IUCN_CD
Marine Mammal Commission - Species of Special Concern	MMC_SSC
National Marine Fisheries Service - Species of Concern	NMFS_SC
North American Bird Conservation Initiative- Red Watch List	NABCI_RWL
North American Bird Conservation Initiative- Yellow Watch List	NABCI_YWL
U. S. Forest Service - Sensitive	USFS_S
U. S. Fish & Wildlife Service Birds of Conservation Concern	USFWS_BCC
Western Bat Working Group - High Priority	WBWG_H
Western Bat Working Group - Medium-High Priority	WBWG_MH
Western Bat Working Group - Medium Priority	WBWG_M
Western Bat Working Group - Low-Medium Priority	WBWG_LM
Xerces Society - Critically Imperiled	XERCES_CI
Xerces Society - Imperiled	XERCES_IM
Xerces Society - Data Deficient	XERCES_DD
Xerces Society - Vulnerable	XERCES_VU

Special Animals List

The remainder of this document contains the CNDDB's Special Animals List current as of the date on the title page of this document. For additional information on how CNDDB determines what species to track please see the CNDDB webpage.

Invertebrates

Species	Comment	Rank	ESA	CESA	Other Status	Notes
PELECYPODA (clams and mussels)						
+*Anodonta californiensis* California floater		G3Q S2?	None	None	USFS:S	
Anodonta oregonensis Oregon floater		G5Q S2?	None	None		
+*Gonidea angulata* western ridged mussel		G3 S1S2	None	None		
+*Margaritifera falcata* western pearlshell		G4G5 S1S2	None	None		
+*Pisidium ultramontanum* montane peaclam		G1 S1	None	None	IUCN:VU USFS:S	
GASTROPODA (Snails, slugs and abalone)						
Algamorda newcombiana Newcomb's littorine snail		G1G2 S1S2	None	None		
+*Ammonitella yatesii* tight coin (=Yates' snail)		G1 S1	None	None	IUCN:VU	
+*Ancotrema voyanum* hooded lancetooth		G1G2 S1S2	None	None	BLM:S	
+*Assiminea infima* Badwater snail		G1 S1	None	None	IUCN:VU	
+*Binneya notabilis* Santa Barbara shelled slug		G1 S1	None	None	IUCN:DD	
+*Colligyrus convexus* canary duskysnail		G1G2 S1S2	None	None		
+*Eremarionta immaculata* white desertsnail		G1 S1	None	None	IUCN:VU	
Eremarionta millepalmarum Thousand Palms desertsnail		G1 S1	None	None	IUCN:VU	
+*Eremarionta morongoana* Morongo (=Colorado) desertsnail		G1G3 S1	None	None	IUCN:NT	
+*Eremarionta rowelli bakerensis* Baker's desertsnail		G3G4T1 S1	None	None	IUCN:DD	
+*Eremarionta rowelli mccoiana* California Mccoy snail		G3G4T1 S1	None	None	IUCN:DD	
+*Fluminicola seminalis* nugget pebblesnail		G2 S1S2	None	None	USFS:S	
+*Fontelicella sp.* Deep Springs fontelicella		G1 S1	None	None		
Glyptostoma gabrielense San Gabriel chestnut		G2 S2	None	None		
Haliotis corrugata pink abalone		G3? S2?	None	None	NMFS:SC	
+*Haliotis cracherodii* black abalone		G3 S1S2	Endangered	None	IUCN:CR	
Haliotis fulgens green abalone		G3G4 S2	None	None	NMFS:SC	
Haliotis kamtschatkana pinto abalone		G3G4 S2	None	None	IUCN:EN NMFS:SC	
Haliotis sorenseni white abalone		G1 S1	Endangered	None		
+*Haplotrema catalinense* Santa Catalina lancetooth		G1 S1	None	None		
+*Haplotrema duranti* ribbed lancetooth		G1G2 S1S2	None	None		
+*Helisoma newberryi* Great Basin rams-horn		G1Q S1	None	None	USFS:S	
+*Helminthoglypta allynsmithi* Merced Canyon shoulderband		G1 S1	None	None	IUCN:VU	
+*Helminthoglypta arrosa monticola* mountain shoulderband		G2G3T1 S1	None	None		

Invertebrates

Species	Comment	Rank	ESA	CESA	Other Status	Notes
GASTROPODA (Snails, slugs and abalone)						
+*Helminthoglypta arrosa pomoensis* Pomo bronze shoulderband		G2G3T1 S1	None	None	IUCN:DD	
+*Helminthoglypta ayresiana sanctaecrucis* Ayer's snail		G1G2T1T2 S1S2	None	None		
+*Helminthoglypta callistoderma* Kern shoulderband		G1 S1	None	None	IUCN:EN	
+*Helminthoglypta coelata* mesa shoulderband		G1 S1	None	None	IUCN:VU	
+*Helminthoglypta concolor* whitefir shoulderband		G1G2 S1S2	None	None		
Helminthoglypta fontiphila Soledad shoulderband		G1 S1	None	None		
+*Helminthoglypta hertleini* Oregon shoulderband		G1 S1	None	None	BLM:S	
+*Helminthoglypta milleri* peak shoulderband		G1 S1	None	None		
+*Helminthoglypta mohaveana* Victorville shoulderband		G1 S1	None	None	IUCN:NT	
+*Helminthoglypta nickliniana awania* Peninsula coast range shoulderband		G3T1 S1	None	None	IUCN:DD	
+*Helminthoglypta nickliniana bridgesi* Bridges' coast range shoulderband		G3T1 S1	None	None	IUCN:DD	
+*Helminthoglypta sequoicola consors* redwood shoulderband		G2T1 S1	None	None	IUCN:DD	
+*Helminthoglypta stiversiana williamsi* Williams' bronze shoulderband		G2G3T1 S1	None	None	IUCN:DD	
+*Helminthoglypta talmadgei* Trinity shoulderband		G2 S2	None	None	BLM:S	
+*Helminthoglypta taylori* westfork shoulderband		G1 S1	None	None		
Helminthoglypta traskii pacoimensis Pacoima shoulderband		G1G2T1 S1	None	None		
+*Helminthoglypta traskii traskii* Trask shoulderband		G1G2T1 S1	None	None		
Helminthoglypta uvasana Grapevine shoulderband		G1 S1	None	None		
Helminthoglypta vasquezi Vasquez shoulderband		G1 S1	None	None		
+*Helminthoglypta walkeriana* Morro shoulderband (=banded dune) snail		G1 S1	Endangered	None	IUCN:CR	
Herpeteros angelus Soledad desertsnail		G1 S1	None	None		
+*Hesperarion plumbeus* leaden slug		G1G3 S1S3	None	None		
+*Ipnobius robustus* robust tryonia		G1G2 S1	None	None		
+*Juga acutifilosa* topaz juga		G2 S2	None	None	USFS:S	
+*Juga chacei* Chace juga		G1 S1	None	None	USFS:S	
+*Juga occata* scalloped juga		G1 S1	None	None	USFS:S	
+*Juga orickensis* redwood juga		G2 S1S2	None	None		
Lanx alta highcap lanx		G2 S1S2	None	None		
Lanx klamathensis scale lanx		G1 S1	None	None		

Invertebrates

Species	Comment	Rank	ESA	CESA	Other Status	Notes
GASTROPODA (Snails, slugs and abalone)						
+*Lanx patelloides* kneecap lanx		G2 S2	None	None	USFS:S	
+*Megomphix californicus* Natural Bridge megomphix		G1G2 S1S2	None	None		
+*Micrarionta facta* Santa Barbara islandsnail		G1G2 S1S2	None	None	IUCN:VU	
+*Micrarionta feralis* San Nicolas islandsnail		G1 S1	None	None	IUCN:CR	
+*Micrarionta gabbi* San Clemente islandsnail		G1 S1	None	None	IUCN:VU	
+*Micrarionta opuntia* pricklypear islandsnail		G1 S1	None	None	IUCN:VU	
+*Monadenia callipeplus* downy sideband		G1G2 S1S2	None	None		
+*Monadenia chaceana* Siskiyou shoulderband		G2G3 S2	None	None	BLM:S	
+*Monadenia churchi* Klamath sideband		G2G3 S2	None	None		
+*Monadenia circumcarinata* keeled sideband		G1 S1	None	None	BLM:S IUCN:VU	
+*Monadenia cristulata* crested sideband		G1G2 S1S2	None	None		
+*Monadenia fidelis leonina* A terrestrial snail		G4G5T1T2 S1S2	None	None		
+*Monadenia fidelis pronotis* rocky coast Pacific sideband		G4G5T1 S1	None	None		
+*Monadenia infumata ochromphalus* yellow-based sideband		G2T1 S1	None	None		
+*Monadenia infumata setosa* Trinity bristle snail		G2T2 S2	None	Threatened	IUCN:VU	
Monadenia marmarotis marble sideband		G1 S1	None	None		
+*Monadenia mormonum buttoni* Button's Sierra sideband		G2T1 S1	None	None		
+*Monadenia mormonum hirsuta* hirsute Sierra sideband		G2T1 S1	None	None	BLM:S	
+*Monadenia troglodytes troglodytes* Shasta sideband		G1G2T1T2 S1S2	None	None	IUCN:DD USFS:S	
Monadenia troglodytes wintu Wintu sideband		G1G2T1T2 S1S2	None	None	IUCN:DD USFS:S	
+*Monadenia tuolumneana* Tuolumne sideband		G1 S1	None	None	BLM:S	
+*Monadenia yosemitensis* Yosemite Mariposa sideband		G1 S1	None	None		
+*Noyo intersessa* Ten Mile shoulderband		G2 S2	None	None		
+*Pomatiopsis binneyi* robust walker		G1 S1	None	None		
Pomatiopsis californica Pacific walker		G1 S1	None	None		
Pomatiopsis chacei marsh walker		G1 S1	None	None		
+*Pristiloma shepardae* Shepard's snail		G1 S1	None	None		
+*Pristinicola hemphilli* pristine pyrg		G3 S1	None	None	USFS:S	
Prophysaon coeruleum Blue-gray taildropper slug		G3G4 S1S2	None	None		Yes

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Species	Comment	Rank	ESA	CESA	Other Status	Notes
GASTROPODA (Snails, slugs and abalone)						
+*Punctum hannai* Trinity Spot		G1G2 S1S2	None	None		
+*Pyrgulopsis aardahli* Benton Valley (=Aahrdahl's) springsnail		G1 S1	None	None		
+*Pyrgulopsis archimedis* Archimedes pyrg		G1G2 S1S2	None	None		
+*Pyrgulopsis cinerana* Ash Valley pyrg		G1G2 S1S2	None	None		
+*Pyrgulopsis diablensis* Diablo Range pyrg		G1 S1	None	None	IUCN:VU	
+*Pyrgulopsis eremica* Smoke Creek pyrg		G2 S2	None	None		
+*Pyrgulopsis falciglans* Likely pyrg		G1 S1	None	None		
+*Pyrgulopsis gibba* Surprise Valley pyrg		G3 S1S2	None	None		
+*Pyrgulopsis greggi* Kern River pyrg		G1 S1	None	None	IUCN:VU	
+*Pyrgulopsis lasseni* Willow Creek pyrg		G1G2 S1S2	None	None	USFS:S	
+*Pyrgulopsis longae* Long Valley pyrg		G1 S1	None	None		
+*Pyrgulopsis owensensis* Owens Valley springsnail		G1G2 S1S2	None	None	USFS:S	
+*Pyrgulopsis perturbata* Fish Slough springsnail		G1 S1	None	None		
+*Pyrgulopsis rupinicola* Sucker Springs pyrg		G1 S1	None	None		
+*Pyrgulopsis taylori* San Luis Obispo pyrg		G1 S1	None	None		
+*Pyrgulopsis ventricosa* Clear Lake pyrg		G1 S1	None	None	IUCN:CR	
+*Pyrgulopsis wongi* Wong's springsnail		G2 S2	None	None	IUCN:LC USFS:S	
+*Radiocentrum avalonense* Catalina mountainsnail		G1 S1	None	None	IUCN:CR	
+*Rothelix warnerfontis* Warner Springs shoulderband		G1 S1	None	None	USFS:S	
+*Sterkia clementina* San Clemente Island blunt-top snail		G1 S1	None	None	IUCN:NT	
+*Trilobopsis roperi* Shasta chaparral		G1 S1	None	None	USFS:S	
Trilobopsis tehamana Tehama chaparral		G1 S1	None	None	BLM:S USFS:S	
+*Tryonia imitator* mimic tryonia (=California brackishwater snail)		G2 S2	None	None	IUCN:DD	
+*Tryonia margae* Grapevine Springs elongate tryonia		G1 S1	None	None		
+*Tryonia rowlandsi* Grapevine Springs squat tryonia		G1 S1	None	None		
+*Vespericola karokorum* Karok hesperian		G2 S2	None	None	IUCN:DD	
+*Vespericola marinensis* Marin hesperian		G2 S2	None	None		
+*Vespericola pressleyi* Big Bar hesperian		G1 S1	None	None	BLM:S USFS:S	
Vespericola scotti Benson Gulch hesperian		G1 S1	None	None		

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Species	Comment	Rank	ESA	CESA	Other Status	Notes
GASTROPODA (Snails, slugs and abalone)						
+*Vespericola shasta* Shasta hesperian		G1 S1	None	None	USFS:S	
+*Vespericola sierranus* Siskiyou hesperian		G2 S1S2	None	None		
+*Xerarionta intercisa* horseshoe snail		G1 S1	None	None	IUCN:VU	
+*Xerarionta redimita* wreathed cactussnail		G1G2 S1	None	None	IUCN:VU	
Xerarionta tryoni Bicolor cactussnail		G1 S1	None	None	IUCN:VU	
ARACHNIDA (Spiders and relatives)						
+*Aphrastochthonius grubbsi* Grubbs' Cave pseudoscorpion		G1G2 S1S2	None	None		
Aphrastochthonius similis Carlow's Cave pseudoscorpion		G1G2 S1S2	None	None		
Archeolarca aalbui Aalbu's Cave pseudoscorpion		G1G2 S1S2	None	None		
+*Banksula californica* Alabaster Cave harvestman		GH SH	None	None		
+*Banksula galilei* Galile's cave harvestman		G1 S1	None	None		
+*Banksula grubbsi* Grubbs' cave harvestman		G1 S1	None	None		
+*Banksula incredula* incredible harvestman		G1 S1	None	None		
+*Banksula martinorum* Martins' cave harvestman		G1 S1	None	None		
+*Banksula melones* Melones Cave harvestman		G1 S1	None	None	IUCN:VU	
+*Banksula rudolphi* Rudolph's cave harvestman		G1 S1	None	None		
+*Banksula tuolumne* Tuolumne cave harvestman		G1 S1	None	None		
+*Banksula tutankhamen* King Tut Cave harvestman		G1 S1	None	None		
+*Calicina arida* San Benito harvestman		G1 S1	None	None		
+*Calicina breva* Stanislaus harvestman		G1 S1	None	None		
+*Calicina cloughensis* Clough Cave harvestman		G1 S1	None	None		
+*Calicina conifera* Crane Flat harvestman		G1 S1	None	None		
+*Calicina diminua* Marin blind harvestman		G1 S1	None	None		
+*Calicina dimorphica* Watts Valley harvestman		G1 S1	None	None		
+*Calicina macula* marbled harvestman		G1 S1	None	None		
+*Calicina mesaensis* Table Mountain harvestman		G1 S1	None	None		
+*Calicina minor* Edgewood blind harvestman		G1 S1	None	None		
+*Calicina piedra* Piedra harvestman		G1 S1	None	None		
+*Calileptoneta briggsi* Briggs' leptonetid spider		G1 S1	None	None		
+*Calileptoneta oasa* Andreas Canyon leptonetid spider		G1 S1	None	None		

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Species	Comment	Rank	ESA	CESA	Other Status	Notes
ARACHNIDA (Spiders and relatives)						
+*Calileptoneta ubicki* Ubick's leptonetid spider		G1 S1	None	None		
+*Calileptoneta wapiti* Mendocino leptonetid spider		G1 S1	None	None		
+*Fissilicreagris imperialis* Empire Cave pseudoscorpion		G1 S1	None	None	IUCN:VU	
+*Hubbardia idria* Idria short-tailed whipscorpion		G1 S1	None	None		
+*Hubbardia secoensis* Arroyo Seco short-tailed whipscorpion		G1 S1	None	None		
+*Hubbardia shoshonensis* Shoshone Cave whip-scorpion		G1 S1	None	None	BLM:S	Yes
+*Larca laceyi* Lacey's Cave pseudoscorpion		G1G2 S1	None	None		
+*Meta dolloff* Dolloff Cave spider		G1 S1	None	None	IUCN:VU	
+*Microcina edgewoodensis* Edgewood Park micro-blind harvestman		G1 S1	None	None		
+*Microcina homi* Hom's micro-blind harvestman		G1 S1	None	None		
+*Microcina jungi* Jung's micro-blind harvestman		G1 S1	None	None		
+*Microcina leei* Lee's micro-blind harvestman		G1 S1	None	None		
+*Microcina lumi* Lum's micro-blind harvestman		G1 S1	None	None		
+*Microcina tiburona* Tiburon micro-blind harvestman		G1 S1	None	None		
+*Neochthonius imperialis* Empire Cave pseudoscorpion		G1 S1	None	None		
+*Pseudogarypus orpheus* Music Hall Cave pseudoscorpion		G1G2 S1	None	None		
+*Socalchemmis gertschi* Gertsch's socalchemmis spider		G1 S1	None	None		
+*Socalchemmis icenoglei* Icenogle's socalchemmis spider		G1 S1	None	None		
+*Socalchemmis monterey* Monterey socalchemmis spider		G1 S1	None	None		
+*Talanites moodyae* Moody's gnaphosid spider		G1G2 S1S2	None	None		
+*Talanites ubicki* Ubick's gnaphosid spider		G1 S1	None	None		
Telema sp. Santa Cruz telemid spider		G1G2 S1S2	None	None		
Texella deserticola Whitewater Canyon harvestman		G1 S1	None	None		
+*Texella kokoweef* Kokoweef Crystal Cave harvestman		G1 S1	None	None		
+*Texella shoshone* Shoshone Cave harvestman		G1 S1	None	None		
CRUSTACEA, Order Anostraca (fairy shrimp)						
+*Artemia monica* Mono Lake brine shrimp		G3 S3	None	None	IUCN:CD	
+*Branchinecta campestris* pocket pouch fairy shrimp		G2 S1	None	None		
+*Branchinecta conservatio* Conservancy fairy shrimp		G1 S1	Endangered	None	IUCN:EN	

Invertebrates

Species	Comment	Rank	ESA	CESA	Other Status	Notes
CRUSTACEA, Order Anostraca (fairy shrimp)						
+*Branchinecta longiantenna* longhorn fairy shrimp		G1 S1	Endangered	None	IUCN:EN	
+*Branchinecta lynchi* vernal pool fairy shrimp		G3 S2S3	Threatened	None	IUCN:VU	
+*Branchinecta mesovallensis* midvalley fairy shrimp		G2 S2	None	None		
+*Branchinecta sandiegonensis* San Diego fairy shrimp		G2 S2	Endangered	None	IUCN:EN	
+*Linderiella occidentalis* California linderiella		G2G3 S2S3	None	None	IUCN:NT	
+*Linderiella santarosae* Santa Rosa Plateau fairy shrimp		G1G2 S1	None	None		
+*Streptocephalus woottoni* Riverside fairy shrimp		G1G2 S1S2	Endangered	None	IUCN:EN	
CRUSTACEA, Order Notostraca (tadpole shrimp)						
+*Lepidurus packardi* vernal pool tadpole shrimp		G3 S2S3	Endangered	None	IUCN:EN	
CRUSTACEA, Order Anomopoda (water fleas)						
+*Dumontia oregonensis* hairy water flea		G1G3 S1	None	None		
CRUSTACEA, Order Isopoda (isopods)						
+*Bowmanasellus sequoiae* Sequoia cave isopod		G1 S1	None	None		
+*Caecidotea tomalensis* Tomales isopod		G2 S2	None	None		
+*Calasellus californicus* An isopod		G2 S2	None	None		
+*Calasellus longus* An isopod		G1 S1	None	None		
CRUSTACEA, Order Amphipoda (amphipods)						
+*Hyalella muerta* Texas Spring amphipod		G1 S1	None	None		Yes
+*Hyalella sandra* Death Valley amphipod		G1 S1	None	None		Yes
+*Stygobromus cherylae* Barr's amphipod		G1 S1	None	None		
Stygobromus cowani Cowan's amphipod		G1 S1	None	None		
Stygobromus gallawayae Gallaway's amphipod		G1 S1	None	None		
+*Stygobromus gradyi* Grady's Cave amphipod		G1 S1	None	None	IUCN:VU	
Stygobromus grahami Graham's Cave amphipod		G2 S2	None	None		
+*Stygobromus harai* Hara's Cave amphipod		G1G2 S1S2	None	None	IUCN:VU	
Stygobromus hyporheicus Hypoheic amphipod		G1 S1	None	None		
Stygobromus imperialis Empire Cave amphipod		G1 S1	None	None		
+*Stygobromus lacicolus* Lake Tahoe amphipod		G1 S1	None	None		
+*Stygobromus mackenziei* Mackenzie's Cave amphipod		G1 S1	None	None	IUCN:VU	
Stygobromus myersae Myer's amphipod		G1G2 S1S2	None	None		
Stygobromus mysticus Secret Cave amphipod		G1 S1	None	None		

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Species	Comment	Rank	ESA	CESA	Other Status	Notes
CRUSTACEA, Order Amphipoda (amphipods)						
Stygobromus rudolphi Rudolph's amphipod		G1 S1	None	None		
Stygobromus sheldoni Sheldon's amphipod		G1 S1	None	None		
Stygobromus sierrensis Sierra amphipod		G1 S1	None	None		
+*Stygobromus tahoensis* Lake Tahoe stygobromid		G1 S1	None	None		
Stygobromus trinus Trinity County amphipod		G1 S1	None	None		
+*Stygobromus wengerorum* Wengerors' Cave amphipod		G1 S1	None	None	IUCN:VU	
CRUSTACEA, Order Decapoda (crayfish & shrimp)						
+*Pacifastacus fortis* Shasta crayfish		G1 S1	Endangered	Endangered	IUCN:CR	
Pacifastacus leniusculus klamathensis Klamath crayfish		G5T5 S3	None	None		
+*Syncaris pacifica* California freshwater shrimp		G1 S1	Endangered	Endangered	IUCN:EN	
INSECTA, Order Odonata (dragonflies & damselflies)						
+*Ischnura gemina* San Francisco forktail damselfly		G2 S2	None	None	IUCN:VU	
INSECTA, Order Plecoptera (stoneflies)						
+*Capnia lacustra* Lake Tahoe benthic stonefly		G1 S1	None	None		
+*Cosumnoperla hypocrena* Cosumnes stripetail		G2 S2	None	None		
+*Megaleuctra sierra* Shirttail Creek stonefly		G2Q S1?	None	None		
INSECTA, Order Orthoptera (grasshoppers, katydids, and crickets)						
+*Aglaothorax longipennis* Santa Monica shieldback katydid		G1G2 S1S2	None	None	IUCN:CR	
+*Ammopelmatus kelsoensis* Kelso jerusalem cricket		G1G2 S1S2	None	None	IUCN:VU	
+*Ammopelmatus muwu* Point Conception jerusalem cricket		G1 S1	None	None	IUCN:VU	
+*Idiostatus kathleenae* Pinnacles shieldback katydid		G1G2 S1S2	None	None		
+*Idiostatus middlekauffi* Middlekauff's shieldback katydid		G1G2 S1	None	None	IUCN:CR	
Macrobaenetes algodonensis Algodones sand treader cricket		G1G2 S1S2	None	None		
+*Macrobaenetes kelsoensis* Kelso giant sand treader cricket		G2 S2	None	None	IUCN:VU	
+*Macrobaenetes valgum* Coachella giant sand treader cricket		G1G2 S1S2	None	None	IUCN:VU	
Pristoceuthophilus sp. Samwell Cave cricket		G1G3 S1S3	None	None	IUCN:VU	
+*Psychomastax deserticola* desert monkey grasshopper		G1G2 S1S2	None	None	IUCN:VU	
+*Stenopelmatus cahuilaensis* Coachella Valley jerusalem cricket		G1G2 S1S2	None	None	IUCN:VU	
+*Tetrix sierrana* Sierra pygmy grasshopper		G1G2 S1S2	None	None	IUCN:VU	
+*Trimerotropis infantilis* Zayante band-winged grasshopper		G1 S1	Endangered	None	IUCN:EN	
+*Trimerotropis occidentiloides* Santa Monica grasshopper		G1G2 S1S2	None	None	IUCN:EN	

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Species	Comment	Rank	ESA	CESA	Other Status	Notes
INSECTA, Order Orthoptera (grasshoppers, katydids, and crickets)						
+*Trimerotropis occulens* Lompoc grasshopper		G1G2 S1S2	None	None	IUCN:EN	
INSECTA, Order Heteroptera (true bugs)						
+*Ambrysus funebris* Nevares Spring naucorid bug		G1 S1	Candidate	None		
+*Belostoma saratogae* Saratoga Springs belostoman bug		G1 S1	None	None		
+*Oravelia pege* Dry Creek cliff strider bug		G1 S1	None	None		
+*Pelocoris shoshone* Amargosa naucorid bug		G1G3 S1S2	None	None		
+*Saldula usingeri* Wilbur Springs shorebug		G1 S1	None	None		
INSECTA, Order Neuroptera (lacewings)						
+*Oliarces clara* cheeseweed owlfly (cheeseweed moth lacewing)		G1G3 S2	None	None		
INSECTA, Order Coleoptera (beetles)						
+*Aegialia concinna* Ciervo aegilian scarab beetle		G1 S1	None	None	BLM:S IUCN:VU	
+*Agabus rumppi* Death Valley agabus diving beetle		G1G3 S1	None	None		
Agrilus harenus Harenus jewel beetle		G1G2 S1S2	None	None		
+*Anomala carlsoni* Carlson's dune beetle		G1 S1	None	None		
+*Anomala hardyorum* Hardy's dune beetle		G1 S1	None	None		
+*Anthicus antiochensis* Antioch Dunes anthicid beetle		G1 S1	None	None		
+*Anthicus sacramento* Sacramento anthicid beetle		G1 S1	None	None	IUCN:EN	
+*Atractelmis wawona* Wawona riffle beetle		G1G3 S1S2	None	None		
+*Chaetarthria leechi* Leech's chaetarthrian water scavenger beetle		G1? S1?	None	None		
+*Cicindela gabbii* western tidal-flat tiger beetle		G2G4 S1	None	None		
+*Cicindela hirticollis abrupta* Sacramento Valley tiger beetle		G5TH SH	None	None		
+*Cicindela hirticollis gravida* sandy beach tiger beetle		G5T2 S1	None	None		
+*Cicindela latesignata latesignata* western beach tiger beetle		G2G4T1T2 S1	None	None		
+*Cicindela ohlone* Ohlone tiger beetle		G1 S1	Endangered	None		
+*Cicindela senilis frosti* senile tiger beetle		G2G3T1T3 S1	None	None		
+*Cicindela tranquebarica ssp.* San Joaquin tiger beetle		G5T1 S1	None	None		
+*Cicindela tranquebarica viridissima* greenest tiger beetle		G5T1 S1	None	None		
+*Coelus globosus* globose dune beetle		G1G2 S1S2	None	None	IUCN:VU	
+*Coelus gracilis* San Joaquin dune beetle		G1 S1	None	None	BLM:S IUCN:VU	

Invertebrates

Species	Comment	Rank	ESA	CESA	Other Status	Notes
INSECTA, Order Coleoptera (beetles)						
Coenonycha clementina San Clemente Island coenonycha beetle		G1? S1?	None	None		
Cyclocephala wandae Wandae dune beetle		G1G2 S1S2	None	None		
Deltaspis ivae marsh-elder long-horned beetle		G1 S1	None	None		
+*Desmocerus californicus dimorphus* valley elderberry longhorn beetle		G3T2 S2	Threatened	None		
+*Dinacoma caseyi* Casey's June beetle		G1 S1	Endangered	None		
+*Dubiraphia brunnescens* brownish dubiraphian riffle beetle		G1 S1	None	None		
+*Dubiraphia giulianii* Giuliani's dubiraphian riffle beetle		G1G3 S1S3	None	None		
+*Elaphrus viridis* Delta green ground beetle		G1 S1	Threatened	None	IUCN:CR	
+*Glaresis arenata* Kelso Dunes scarab glaresis beetle		G2 S2	None	None		
+*Hydrochara rickseckeri* Ricksecker's water scavenger beetle		G2? S2?	None	None		
+*Hydroporus leechi* Leech's skyline diving beetle		G1? S1?	None	None		
+*Hydroporus simplex* simple hydroporus diving beetle		G1? S1?	None	None		
+*Hygrotus curvipes* curved-foot hygrotus diving beetle		G1 S1	None	None		
+*Hygrotus fontinalis* travertine band-thigh diving beetle		G1 S1	None	None		
Juniperella mirabilis juniper metallic wood-boring beetle		G1 S1	None	None		
+*Lepismadora algodones* Algodones sand jewel beetle		G1 S1	None	None		
+*Lichnanthe albipilosa* white sand bear scarab beetle		G1 S1	None	None		
+*Lichnanthe ursina* bumblebee scarab beetle		G2 S2	None	None		
+*Lytta hoppingi* Hopping's blister beetle		G1G2 S1S2	None	None		
Lytta insperata Mojave Desert blister beetle		G1G2 S1S2	None	None		
+*Lytta moesta* moestan blister beetle		G2 S2	None	None		
+*Lytta molesta* molestan blister beetle		G2 S2	None	None		
+*Lytta morrisoni* Morrison's blister beetle		G1G2 S1S2	None	None		
+*Microcylloepus formicoideus* Furnace Creek riffle beetle		G1 S1	None	None		
+*Miloderes nelsoni* Nelson's miloderes weevil		G2 S2	None	None		
+*Nebria darlingtoni* South Forks ground beetle		G1 S1	None	None		
+*Nebria gebleri siskiyouensis* Siskiyou ground beetle		G4G5T4 S1S2	None	None		
+*Nebria sahlbergii triad* Trinity Alps ground beetle		G1T1 S1	None	None		
Ochthebius crassalus wing shoulder minute moss beetle		G1G3 S1S3	None	None		

Invertebrates

Species	Comment	Rank	ESA	CESA	Other Status	Notes
INSECTA, Order Coleoptera (beetles)						
+*Ochthebius recticulus* Wilbur Springs minute moss beetle		G1 S1	None	None		
+*Onychobaris langei* Lange's El Segundo Dune weevil		G1 S1	None	None		
+*Optioservus canus* Pinnacles optioservus riffle beetle		G1 S1	None	None		
Paleoxenus dohrni Dohrn's elegant eucnemid beetle		G3? S3?	None	None		
+*Polyphylla anteronivea* Saline Valley snow-front June beetle		G1 S1	None	None		
+*Polyphylla barbata* Mount Hermon (=barbate) June beetle		G1 S1	Endangered	None		
+*Polyphylla erratica* Death Valley June beetle		G1 S1	None	None		
+*Polyphylla nubila* Atascadero June beetle		G1 S1	None	None		
Prasinalia imperialis Algodones white wax jewel beetle		G1G2 S1S2	None	None		
+*Pseudocotalpa andrewsi* Andrew's dune scarab beetle		G1 S1	None	None		
Scaphinotus behrensi Behrens' snail-eating beetle		G2G4 S2S4	None	None		
+*Trachykele hartmani* serpentine cypress wood-boring beetle		G1 S1	None	None		
Trichinorhipis knulli Knull's metallic wood-boring beetle		G1 S1	None	None		
+*Trigonoscuta brunnotesselata* brown tassel trigonoscuta weevil		G1G2 S1S2	None	None		
+*Trigonoscuta dorothea dorothea* Dorothy's El Segundo Dune weevil		G1T1 S1	None	None		
Trigonoscuta rothi algodones Algodones dune weevil		G1G2 S1S2	None	None		
Trigonoscuta rothi imperialis Imperial dune weevil		G1G2 S1S2	None	None		
Trigonoscuta rothi punctata Punctate dune weevil		G1G2 S1S2	None	None		
Trigonoscuta rothi rothi Roth's dune weevil		G1G2 S1S2	None	None		
+*Trigonoscuta sp.* Doyen's trigonoscuta dune weevil		G1Q S1	None	None		Yes
+*Trigonoscuta stantoni* Santa Cruz Island shore weevil		G1? S1?	None	None		
+*Vandykea tuberculata* serpentine cypress long-horned beetle		G1 S1	None	None		
INSECTA, Order Mecoptera (scorpionflies)						
+*Orobittacus obscurus* gold rush hanging scorpionfly		G1 S1	None	None		
INSECTA, Order Diptera (flies)						
+*Ablautus schlingeri* Oso Flaco robber fly		G1 S1	None	None		
Apiocera warneri Glamis sand fly		G1G2 S1S2	None	None		
+*Brennania belkini* Belkin's dune tabanid fly		G1G2 S1S2	None	None	IUCN:VU	
+*Efferia antiochi* Antioch efferian robberfly		G1G2 S1S2	None	None		

Invertebrates

Species	Comment	Rank	ESA	CESA	Other Status	Notes
INSECTA, Order Diptera (flies)						
Efferia macroxipha Glamis robberfly		G1G2 S1S2	None	None		
+*Metapogon hurdi* Hurd's metapogon robberfly		G1G3 S1S3	None	None		
+*Paracoenia calida* Wilbur Springs shore fly		G1 S1	None	None		
+*Rhaphiomidas terminatus abdominalis* Delhi Sands flower-loving fly		G1T1 S1	Endangered	None		
+*Rhaphiomidas terminatus terminatus* El Segundo flower-loving fly		G1T1 S1	None	None		
Rhaphiomidas trochilus Valley mydas fly		G1 S1	None	None		
INSECTA, Order Lepidoptera (butterflies & moths)						
+*Adela oplerella* Opler's longhorn moth		G2 S2	None	None		
+*Apodemia mormo langei* Lange's metalmark butterfly		G5T1 S1	Endangered	None	XERCES:CI	
+*Areniscythris brachypteris* Oso Flaco flightless moth		G1 S1	None	None		
Callophrys comstocki desert green hairstreak		G3G4 S1S2	None	None	XERCES:IM	
+*Callophrys mossii bayensis* San Bruno elfin butterfly		G4T1 S1	Endangered	None	XERCES:CI	
+*Callophrys mossii hidakupa* San Gabriel Mountains elfin butterfly		G4T1T2 S1S2	None	None	USFS:S	
+*Callophrys mossii marinensis* Marin elfin butterfly		G4T1 S1	None	None		
+*Callophrys thornei* Thorne's hairstreak		G1 S1	None	None	BLM:S	Yes
+*Carolella busckana* Busck's gallmoth		G1G3 SH	None	None		
+*Carterocephalus palaemon magnus* Sonoma arctic skipper		G5T5 S1	None	None		
Cercyonis pegala carsonensis Carson Valley wood nymph		G5T1T2 S1S2	None	None		
+*Chlosyne leanira elegans* Oso Flaco patch butterfly		G4G5T1T2 S1S2	None	None		
+*Coenonympha tullia yontockett* Yontocket satyr		G5T1T2 S1	None	None		
+*Danaus plexippus* monarch butterfly		G5 S3	None	None	USFS:S	
+*Euchloe hyantis andrewsi* Andrew's marble butterfly		G3G4T1 S1	None	None		
+*Eucosma hennei* Henne's eucosman moth		G1 S1	None	None		
+*Euphilotes battoides allyni* El Segundo blue butterfly		G5T1 S1	Endangered	None	XERCES:CI	
+*Euphilotes battoides comstocki* Comstock's blue butterfly		G5T2 S2	None	None		
Euphilotes baueri Bauer's dotted-blue		G2G4 S1S2	None	None	USFS:S XERCES:IM	
+*Euphilotes enoptes smithi* Smith's blue butterfly		G5T1T2 S1S2	Endangered	None	XERCES:CI	
Euphilotes mojave Mojave dotted-blue		G2G3 S1S2	None	None	XERCES:IM	
+*Euphydryas editha bayensis* Bay checkerspot butterfly		G5T1 S1	Threatened	None	XERCES:CI	
+*Euphydryas editha monoensis* Mono checkerspot butterfly		G5T2T3 S1S2	None	None	USFS:S	

Invertebrates

Species	Comment	Rank	ESA	CESA	Other Status	Notes
INSECTA, Order Lepidoptera (butterflies & moths)						
+*Euphydryas editha quino* quino checkerspot butterfly		G5T1T2 S1	Endangered	None	XERCES:CI	
Euphyes vestris harbisoni dun skipper		G5T1 S1?	None	None		
+*Euproserpinus euterpe* Kern primrose sphinx moth		G1 S1	Threatened	None	XERCES:CI	Yes
+*Glaucopsyche lygdamus palosverdesensis* Palos Verdes blue butterfly		G5T1 S1	Endangered	None	XERCES:CI	
+*Hesperia miriamae longaevicola* White Mountains skipper		G2G3T1 S1	None	None		
Hesperopsis gracielae Macneill's sootywing		G2G3 S1S2	None	None	XERCES:VU	
+*Lycaena hermes* Hermes copper butterfly		G1 S1	Candidate	None	IUCN:VU USFS:S	
Lycaena rubidus incana White Mountains copper		G5T1 S1	None	None		
+*Panoquina errans* wandering (=saltmarsh) skipper		G4G5 S2	None	None	IUCN:NT	
+*Philotiella speciosa bohartorum* Boharts' blue butterfly		G3G4T1 S1	None	None		
+*Plebejus icarioides albihalos* White Mountains icarioides blue butterfly		G5T2T3 S2?	None	None		
+*Plebejus icarioides missionensis* Mission blue butterfly		G5T1 S1	Endangered	None	XERCES:CI	
+*Plebejus icarioides moroensis* Morro Bay blue butterfly		G5T2 S2	None	None		
+*Plebejus icarioides parapheres* Point Reyes blue butterfly		G5T1T2 S1S2	None	None		
+*Plebejus idas lotis* lotis blue butterfly		G5TH SH	Endangered	None	XERCES:CI	
+*Plebejus saepiolus albomontanus* White Mountains saepiolus blue butterfly		G5T2 S1S2	None	None		
+*Plebejus saepiolus aureolus* San Gabriel Mountains blue butterfly		G5T1 S1	None	None	USFS:S	
+*Plebulina emigdionis* San Emigdio blue butterfly		G1G2 S1S2	None	None	USFS:S	
+*Polites mardon* mardon skipper		G2G3 S1	None	None	USFS:S XERCES:IM	
Polites sabuleti albamontana White Mountains sandhill skipper		G5T2 S2	None	None		
Pseudocopaeodes eunus eunus alkali skipper		G3G4T2 S2	None	None		
+*Pseudocopaeodes eunus obscurus* Carson wandering skipper		G3G4T1 S1	Endangered	None	XERCES:CI	
+*Pyrgus ruralis lagunae* Laguna Mountains skipper		G5T1 S1	Endangered	None	XERCES:CI	
+*Speyeria adiaste adiaste* unsilvered fritillary		G1G2T1 S1	None	None		
+*Speyeria callippe callippe* callippe silverspot butterfly		G5T1 S1	Endangered	None	XERCES:CI	
+*Speyeria egleis tehachapina* Tehachapi Mountain silverspot butterfly		G5T2 S2	None	None	USFS:S	
+*Speyeria nokomis carsonensis* Carson Valley silverspot		G3T1 S1	None	None		
+*Speyeria zerene behrensii* Behren's silverspot butterfly		G5T1 S1	Endangered	None	XERCES:CI	

Invertebrates

Species	Comment	Rank	ESA	CESA	Other Status	Notes
INSECTA, Order Lepidoptera (butterflies & moths)						
+*Speyeria zerene hippolyta* Oregon silverspot butterfly		G5T1 S1	Threatened	None	XERCES:CI	
+*Speyeria zerene myrtleae* Myrtle's silverspot butterfly		G5T1 S1	Endangered	None	XERCES:CI	Yes
+*Speyeria zerene sonomensis* Sonoma zerene fritillary		G5T1 S1	None	None		
INSECTA, Order Trichoptera (caddisflies)						
+*Cryptochia denningi* Denning's cryptic caddisfly		G1G2 S1S2	None	None		
+*Cryptochia excella* Kings Canyon cryptochian caddisfly		G1G2 S1S2	None	None		
+*Cryptochia shasta* confusion caddisfly		G1G2 S1S2	None	None		
+*Desmona bethula* amphibious caddisfly		G2G3 S2S3	None	None		
+*Diplectrona californica* California diplectronan caddisfly		G1G2 S1S2	None	None		
+*Ecclisomyia bilera* Kings Creek ecclysomyian caddisfly		G1G2 S1S2	None	None		
+*Farula praelonga* long-tailed caddisfly		G1G2 S1S2	None	None		
+*Goeracea oregona* Sagehen Creek goeracean caddisfly		G3 S1S2	None	None		
+*Lepidostoma ermanae* Cold Spring caddisfly		G1G2 S1S2	None	None		
+*Limnephilus atercus* Fort Dick limnephilus caddisfly		G3G4 S1	None	None		
+*Neothremma genella* golden-horned caddisfly		G1G2 S1S2	None	None		
Neothremma siskiyou Siskiyou caddisfly		G1G2 S1S2	None	None		
+*Parapsyche extensa* King's Creek parapsyche caddisfly		GH SH	None	None		
+*Rhyacophila lineata* Castle Crags rhyacophilan caddisfly		G1G3 S1S2	None	None		
+*Rhyacophila mosana* bilobed rhyacophilan caddisfly		G1G2Q S1S2	None	None		
+*Rhyacophila spinata* spiny rhyacophilan caddisfly		G1G2 S1S2	None	None		
INSECTA, Order Hymenoptera (ants, bees, & wasps)						
+*Andrena blennospermatis* Blennosperma vernal pool andrenid bee		G2 S2	None	None		
+*Andrena macswaini* An andrenid bee		G2 S2	None	None		
+*Andrena subapasta* an andrenid bee		G1G2 S1S2	None	None		
+*Argochrysis lassenae* Lassen cuckoo wasp		G1 S1	None	None		
+*Ashmeadiella chumashae* Channel Islands leaf-cutter bee		G2? S2?	None	None		
Bombus caliginosus a bumble bee		G4? S1S2	None	None	IUCN:VU	
Bombus crotchii a bumble bee		G3G4 S1S2	None	None		
Bombus franklini Franklin's bumble bee		G1 S1	None	None	IUCN:CR XERCES:CI	
Bombus morrisoni a bumble bee		G4G5 S1S2	None	None	IUCN:VU	

Invertebrates

Species	Comment	Rank	ESA	CESA	Other Status	Notes
INSECTA, Order Hymenoptera (ants, bees, & wasps)						
Bombus occidentalis western bumble bee		G2G3 S1	None	None	USFS:S XERCES:IM	
Bombus suckleyi a bumble bee		GH S1	None	None		
+*Ceratochrysis bradleyi* Bradley's cuckoo wasp		G1 S1	None	None		
+*Ceratochrysis gracilis* Piute Mountains cuckoo wasp		G1 S1	None	None		
+*Ceratochrysis longimala* Desert cuckoo wasp		G1 S1	None	None		
+*Ceratochrysis menkei* Menke's cuckoo wasp		G1 S1	None	None		
+*Chrysis tularensis* Tulare cuckoo wasp		G1G2 S1S2	None	None		
Cleptes humboldti Humboldt cuckoo wasp		G1G2 S1S2	None	None		
+*Dufourea stagei* Stage's dufourine bee		G1G2 S1?	None	None		
+*Eucerceris ruficeps* redheaded sphecid wasp		G1G3 S1S2	None	None		
Euparagia unidentata Algodones euparagia		G1G2 S1S2	None	None		
Habropoda pallida white faced bee		G1G2 S1S2	None	None		
+*Halictus harmonius* haromonius halictid bee		G1 S1	None	None	XERCES:CI	
+*Hedychridium argenteum* Riverside cuckoo wasp		G1? S1?	None	None		
+*Hedychridium milleri* Borax Lake cuckoo wasp		G1? S1?	None	None		
+*Lasioglossum channelense* Channel Island sweat bee		G1 S1	None	None		
+*Melitta californica* California mellitid bee		G4? S2?	None	None		
Microbembex elegans Algodones elegant sand wasp		G1G2 S1S2	None	None		
+*Minymischa ventura* Ventura cuckoo wasp		GU SU	None	None		
+*Myrmosula pacifica* Antioch multilid wasp		GH SH	None	None		
Neolarra alba white cuckoo bee		GH SH	None	None		
+*Paranomada californica* California cuckoo bee		G1 S1	None	None		
+*Parnopes borregoensis* Borrego parnopes cuckoo wasp		G1? S1?	None	None		
Perdita algodones Algodones perdita		G1G2 S1S2	None	None		
Perdita frontalis Imperial Perdita		G1G2 S1S2	None	None		
Perdita glamis Glamis perdita		G1G2 S1S2	None	None		
+*Perdita scitula antiochensis* Antioch andrenid bee		G1T1 S1	None	None		
+*Philanthus nasalis* Antioch specid wasp		G1 S1	None	None		
+*Protodufourea wasbaueri* Wasbauer's protodufourea bee		G1 S1	None	None	XERCES:DD	

Invertebrates

Species	Comment	Rank	ESA	CESA	Other Status	Notes
INSECTA, Order Hymenoptera (ants, bees, & wasps)						
+*Protodufourea zavortinki* Zavortink's protodufourea bee		G1 S1	None	None		
+*Rhopalolemma robertsi* Roberts' rhopalolemma bee		G1 S1	None	None		
Sedomaya glamisensis Glamis night tiphiid		G1G2 S1S2	None	None		
Sphaeropthalma ecarinata Glamis night mutillid		G1G2 S1S2	None	None		
+*Sphecodogastra antiochensis* Antioch Dunes halcitid bee		G1 S1	None	None	XERCES:CI	
Stictiella villegasi Algodones sand wasp		G1G2 S1S2	None	None		
+*Trachusa gummifera* San Francisco Bay Area leaf-cutter bee		G1 S1	None	None		

Fishes

Species	Comment	Rank	ESA	CESA	Other Status	Notes
PETROMYZONTIDAE (lampreys)						
+*Entosphenus hubbsi* Kern brook lamprey		G1G2 S1S2	None	None	AFS:TH CDFW:SSC IUCN:NT USFS:S	
Entosphenus lethophagus Pit-Klamath brook lamprey		G3G4 S3	None	None	AFS:VU	
Entosphenus similis Klamath River lamprey		G3G4Q S3S4	None	None	AFS:TH CDFW:SSC USFS:S	
+*Entosphenus tridentatus* Pacific lamprey		G4 S4	None	None	AFS:VU BLM:S USFS:S	
+*Entosphenus tridentatus ssp. 1* Goose Lake lamprey		G4T1 S1	None	None	AFS:VU CDFW:SSC USFS:S	
Lampetra ayresii river lamprey		G4 S4	None	None	AFS:VU CDFW:SSC	
ACIPENSERIDAE (sturgeon)						
+*Acipenser medirostris* green sturgeon	(southern DPS)	G3 S1S2	Threatened	None	AFS:VU CDFW:SSC IUCN:NT NMFS:SC	Yes
Acipenser transmontanus white sturgeon		G4 S2	None	None	AFS:EN IUCN:LC	
SALMONIDAE (trout & salmon)						
+*Oncorhynchus clarkii clarkii* coast cutthroat trout		G4T4 S3	None	None	AFS:VU CDFW:SSC USFS:S	
+*Oncorhynchus clarkii henshawi* Lahontan cutthroat trout		G4T3 S2	Threatened	None	AFS:TH	
+*Oncorhynchus clarkii seleniris* Paiute cutthroat trout		G4T1T2 S1S2	Threatened	None	AFS:EN	
+*Oncorhynchus gorbuscha* pink salmon		G5 S1	None	None	CDFW:SSC	
Oncorhynchus keta chum salmon		G5 S1	None	None	CDFW:SSC	
+*Oncorhynchus kisutch* coho salmon - southern Oregon / northern California ESU		G4T2Q S2?	Threatened	Threatened	AFS:TH CDFW:SSC	Yes
+*Oncorhynchus kisutch* coho salmon - central California coast ESU		G4 S2?	Endangered	Endangered	AFS:EN	Yes
+*Oncorhynchus mykiss aguabonita* Volcano Creek golden trout		G5T1 S1	None	None	AFS:TH CDFW:SSC USFS:S	
+*Oncorhynchus mykiss aquilarum* Eagle Lake rainbow trout		G5T1 S1	None	None	AFS:TH CDFW:SSC USFS:S	
Oncorhynchus mykiss gilberti Kern River rainbow trout		G5T1Q S1S2	None	None	AFS:TH CDFW:SSC USFS:S	
Oncorhynchus mykiss irideus steelhead - Klamath Mountains Province DPS		G5T3Q S2	None	None	CDFW:SSC USFS:S	Yes
+*Oncorhynchus mykiss irideus* steelhead - central California coast DPS		G5T2T3Q S2S3	Threatened	None	AFS:TH	Yes
+*Oncorhynchus mykiss irideus* steelhead - south/central California coast DPS		G5T2Q S2	Threatened	None	AFS:TH CDFW:SSC	Yes

Fishes

Species	Comment	Rank	ESA	CESA	Other Status	Notes
SALMONIDAE (trout & salmon)						
+*Oncorhynchus mykiss irideus* southern steelhead - southern California DPS		G5T1Q S1	Endangered	None	AFS:EN CDFW:SSC	Yes
+*Oncorhynchus mykiss irideus* steelhead - Central Valley DPS		G5T2Q S2	Threatened	None	AFS:TH	Yes
+*Oncorhynchus mykiss irideus* steelhead - northern California DPS		G5T2T3Q S2S3	Threatened	None	AFS:TH CDFW:SSC	Yes
+*Oncorhynchus mykiss irideus* summer-run steelhead trout		G5T4Q S2	None	None	CDFW:SSC	Yes
+*Oncorhynchus mykiss ssp. 1* Goose Lake redband trout		G5T2Q S1	None	None	AFS:VU CDFW:SSC USFS:S	
+*Oncorhynchus mykiss ssp. 2* McCloud River redband trout		G5T1T2Q S1S2	None	None	AFS:VU CDFW:SSC USFS:S	
Oncorhynchus mykiss ssp. 3 Warner Valley redband trout		G5T2Q S1?	None	None	AFS:VU USFS:S	
+*Oncorhynchus mykiss whitei* Little Kern golden trout		G5T2 S2	Threatened	None	AFS:EN	
+*Oncorhynchus tshawytscha* chinook salmon - spring-run Klamath-Trinity Rivers pop.		G5 S1S2	None	None	CDFW:SSC USFS:S	
+*Oncorhynchus tshawytscha* chinook salmon - Central Valley spring-run ESU		G5 S1	Threatened	Threatened	AFS:TH	Yes
+*Oncorhynchus tshawytscha* chinook salmon - Sacramento River winter-run ESU		G5 S1	Endangered	Endangered	AFS:EN	
Oncorhynchus tshawytscha chinook salmon - Central Valley fall / late fall-run ESU		G5 S2?	None	None	AFS:VU CDFW:SSC NMFS:SC USFS:S	Yes
+*Oncorhynchus tshawytscha* chinook salmon - California coastal ESU		G5 S1	Threatened	None	AFS:TH	Yes
Prosopium williamsoni mountain whitefish		G5 S3	None	None		
+*Salvelinus confluentus* bull trout		G4 SX	Threatened	Endangered	IUCN:VU	
OSMERIDAE (smelt)						
+*Hypomesus transpacificus* Delta smelt		G1 S1	Threatened	Endangered	AFS:TH IUCN:EN	
+*Spirinchus thaleichthys* longfin smelt		G5 S1	Candidate	Threatened	CDFW:SSC	Yes
+*Thaleichthys pacificus* eulachon	(southern DPS)	G5 S3	Threatened	None	CDFW:SSC	
CYPRINIDAE (minnows and carp)						
+*Gila coerulea* blue chub		G3G4 S2S3	None	None	CDFW:SSC	
+*Gila elegans* bonytail		G1 S1	Endangered	Endangered	AFS:EN IUCN:EN	
+*Gila orcuttii* arroyo chub		G2 S2	None	None	AFS:VU CDFW:SSC USFS:S	
+*Lavinia exilicauda chi* Clear Lake hitch		G4T1 S1	None	Threatened	AFS:VU CDFW:SSC USFS:S	
Lavinia exilicauda exilicauda Central Valley hitch		G4T2T4 S2S4	None	None		

Fishes

Species	Comment	Rank	ESA	CESA	Other Status	Notes
CYPRINIDAE (minnows and carp)						
Lavinia exilicauda harengus Pajaro/Salinas hitch		G4T2T4 S2S4	None	None		
+*Lavinia symmetricus mitrulus* Pit roach		G4T2 S2	None	None	AFS:VU CDFW:SSC	
+*Lavinia symmetricus navarroensis* Navarro roach		G4T1T2 S1S2	None	None	CDFW:SSC	
+*Lavinia symmetricus parvipinnis* Gualala roach		G4T1T2 S1S2	None	None	CDFW:SSC	
+*Lavinia symmetricus ssp. 1* San Joaquin roach		G4T3Q S3	None	None	CDFW:SSC	Yes
+*Lavinia symmetricus ssp. 2* Tomales roach		G4T2T3 S2S3	None	None	CDFW:SSC	
+*Lavinia symmetricus ssp. 3* Red Hills roach		G4T1 S1	None	None	AFS:VU BLM:S CDFW:SSC	
Lavinia symmetricus ssp. 4 Clear Lake - Russian River roach		G4T2T3 S2S3	None	None		
Lavinia symmetricus subditus Monterey roach		G4T2T3 S2S3	None	None	CDFW:SSC	
+*Mylopharodon conocephalus* hardhead		G3 S3	None	None	CDFW:SSC USFS:S	
+*Pogonichthys macrolepidotus* Sacramento splittail		G2 S2	None	None	AFS:VU CDFW:SSC IUCN:EN	
+*Ptychocheilus lucius* Colorado pikeminnow		G1 SX	Endangered	Endangered	CDFW:FP IUCN:VU	
+*Rhinichthys osculus ssp. 1* Amargosa Canyon speckled dace		G5T1Q S1	None	None	AFS:TH BLM:S CDFW:SSC	Yes
+*Rhinichthys osculus ssp. 2* Owens speckled dace		G5T1T2Q S1S2	None	None	AFS:TH CDFW:SSC	Yes
+*Rhinichthys osculus ssp. 3* Santa Ana speckled dace		G5T1 S1	None	None	AFS:TH CDFW:SSC USFS:S	
+*Rhinichthys osculus ssp. 5* Long Valley speckled dace		G5T1 S1	None	None	AFS:EN BLM:S	
+*Siphateles bicolor mohavensis* Mohave tui chub		G4T1 S1	Endangered	Endangered	AFS:EN CDFW:FP	
Siphateles bicolor pectinifer Lahontan Lake tui chub		G4T3 S1S2	None	None	CDFW:SSC	
+*Siphateles bicolor snyderi* Owens tui chub		G4T1 S1	Endangered	Endangered	AFS:EN	
+*Siphateles bicolor ssp. 1* Eagle Lake tui chub		G4T1T2 S1S2	None	None	CDFW:SSC	
+*Siphateles bicolor ssp. 2* High Rock Spring tui chub		G4TX SX	None	None	CDFW:SSC	
Siphateles bicolor ssp. 3 Pit River tui chub		G4T1T3 S1S3	None	None		
+*Siphateles bicolor thalassina* Goose Lake tui chub		G4T2T3 S2	None	None	AFS:TH CDFW:SSC	
+*Siphateles bicolor vaccaceps* Cow Head tui chub		G4T1 S1	None	None	AFS:EN CDFW:SSC	
CATOSTOMIDAE (suckers)						
+*Catostomus fumeiventris* Owens sucker		G3 S3	None	None	CDFW:SSC	
+*Catostomus latipinnis* flannelmouth sucker		G3G4 S1	None	None		

Fishes

Species	Comment	Rank	ESA	CESA	Other Status	Notes
CATOSTOMIDAE (suckers)						
+*Catostomus microps* Modoc sucker		G2 S2	Endangered	Endangered	AFS:EN CDFW:FP IUCN:EN	
+*Catostomus occidentalis lacusanserinus* Goose Lake sucker		G5T2Q S1	None	None	AFS:VU CDFW:SSC USFS:S	
Catostomus platyrhynchus mountain sucker		G5 S2S3	None	None	CDFW:SSC	
Catostomus rimiculus ssp. 1 Jenny Creek sucker		G5T2Q S1	None	None	AFS:VU	
+*Catostomus santaanae* Santa Ana sucker		G1 S1	Threatened	None	AFS:TH CDFW:SSC IUCN:VU	
+*Catostomus snyderi* Klamath largescale sucker		G3 S2	None	None	AFS:TH CDFW:SSC IUCN:NT	
+*Chasmistes brevirostris* shortnose sucker		G1 S1	Endangered	Endangered	AFS:EN CDFW:FP IUCN:EN	
+*Deltistes luxatus* Lost River sucker		G1 S1	Endangered	Endangered	AFS:EN CDFW:FP IUCN:EN	
+*Xyrauchen texanus* razorback sucker		G1 S1S2	Endangered	Endangered	AFS:EN CDFW:FP IUCN:EN	
CYPRINODONTIDAE (killifishes)						
+*Cyprinodon macularius* desert pupfish		G1 S1	Endangered	Endangered	AFS:EN IUCN:VU	
+*Cyprinodon nevadensis amargosae* Amargosa pupfish		G2T1T2 S1S2	None	None	AFS:VU BLM:S CDFW:SSC IUCN:VU	
+*Cyprinodon nevadensis nevadensis* Saratoga Springs pupfish		G2T1 S1	None	None	AFS:TH CDFW:SSC IUCN:VU	
+*Cyprinodon nevadensis shoshone* Shoshone pupfish		G2T1 S1	None	None	AFS:EN CDFW:SSC IUCN:VU	
+*Cyprinodon radiosus* Owens pupfish		G1 S1	Endangered	Endangered	AFS:EN CDFW:FP IUCN:EN	
+*Cyprinodon salinus milleri* Cottonball Marsh pupfish		G1T1Q S1	None	Threatened	AFS:TH IUCN:EN	
+*Cyprinodon salinus salinus* Salt Creek pupfish		G1T1 S1	None	None	AFS:VU CDFW:SSC IUCN:EN	
GASTEROSTEIDAE (sticklebacks)						
Gasterosteus aculeatus microcephalus resident threespine stickleback	(South of Pt. Conception only)	G5T2T3 S2S3	None	None		Yes
Gasterosteus aculeatus santaannae Santa Ana (=Shay Creek) threespine stickleback		G5T1Q S1	None	None	AFS:EN	Yes
+*Gasterosteus aculeatus williamsoni* unarmored threespine stickleback		G5T1 S1	Endangered	Endangered	AFS:EN CDFW:FP	Yes
POLYPRIONIDAE (wreckfishes)						
Stereolepis gigas giant sea bass		G3 S1S2	None	None	AFS:VU IUCN:CR	Yes

Fishes

Species	Comment	Rank	ESA	CESA	Other Status	Notes
CENTRARCHIDAE (sunfishes)						
+*Archoplites interruptus* Sacramento perch	(Within native range only)	G2G3 S1	None	None	AFS:TH CDFW:SSC	
EMBIOTOCIDAE (surfperches)						
Hysterocarpus traski lagunae Clear Lake tule perch		G5T2T3 S2S3	None	None		
+*Hysterocarpus traski pomo* Russian River tule perch		G5T4 S4	None	None	AFS:VU CDFW:SSC	
Hysterocarpus traski traski Sacramento-San Joaquin tule perch		G5T2T3 S2S3	None	None		
GOBIIDAE (gobies)						
+*Eucyclogobius newberryi* tidewater goby		G3 S2S3	Endangered	None	AFS:EN CDFW:SSC IUCN:VU	
COTTIDAE (sculpins)						
+*Cottus asperrimus* rough sculpin		G2 S2	None	Threatened	AFS:VU BLM:S CDFW:FP IUCN:VU	
Cottus gulosus riffle sculpin		G5 S3S4	None	None		
Cottus klamathensis klamathensis Upper Klamath marbled sculpin		G4T1T2 S1S2	None	None		
+*Cottus klamathensis macrops* bigeye marbled sculpin		G4T3 S3	None	None	AFS:VU CDFW:SSC	
Cottus klamathensis polyporus Lower Klamath marbled sculpin		G4T2T4 S2S4	None	None		
Cottus perplexus reticulate sculpin		G4 S2S3	None	None	CDFW:SSC	

Amphibians

Species	Comment	Rank	ESA	CESA	Other Status	Notes
AMBYSTOMATIDAE (mole salamanders)						
+*Ambystoma californiense* California tiger salamander		G2G3 S2S3	Threatened	Threatened	CDFW:SSC IUCN:VU	Yes
+*Ambystoma macrodactylum croceum* Santa Cruz long-toed salamander		G5T1T2 S1S2	Endangered	Endangered	CDFW:FP	
RHYACOTRITONIDAE (Olympic salamanders)						
+*Rhyacotriton variegatus* southern torrent salamander		G3G4 S2S3	None	None	CDFW:SSC IUCN:LC USFS:S	
SALAMANDRIDAE (newts)						
+*Taricha torosa* Coast Range newt	(Monterey Co. & south only)	G4 S4	None	None	CDFW:SSC	
PLETHODONTIDAE (lungless salamanders)						
+*Batrachoseps altasierrae* Greenhorn Mountains slender salamander		G4 S3S4	None	None	CDFW:SSC	
+*Batrachoseps bramei* Fairview slender salamander		G3 S3	None	None	USFS:S	
+*Batrachoseps campi* Inyo Mountains slender salamander		G2 S2	None	None	BLM:S CDFW:SSC IUCN:EN USFS:S	
Batrachoseps diabolicus Hell Hollow slender salamander		G2 S2	None	None	IUCN:DD	
+*Batrachoseps gabrieli* San Gabriel slender salamander		G2 S2	None	None	IUCN:DD USFS:S	
Batrachoseps gregarius gregarious slender salamander		G4 S4	None	None	IUCN:LC	
Batrachoseps incognitus San Simeon slender salamander		G2G3 S2S3	None	None	USFS:S	
Batrachoseps kawia Sequoia slender salamander		G1G2 S1S2	None	None	IUCN:DD	
Batrachoseps luciae Santa Lucia slender salamander		G2G3 S2S3	None	None	IUCN:LC	
+*Batrachoseps major aridus* desert slender salamander		G4T1 S1	Endangered	Endangered		
Batrachoseps minor lesser slender salamander		G1G2 S1S2	None	None	IUCN:DD USFS:S	
+*Batrachoseps pacificus* Channel Islands slender salamander		G3QT2 S2	None	None	IUCN:LC	
+*Batrachoseps regius* Kings River slender salamander		G1 S1	None	None	IUCN:VU USFS:S	
+*Batrachoseps relictus* relictual slender salamander		G1 S1	None	None	CDFW:SSC IUCN:DD USFS:S	Yes
+*Batrachoseps robustus* Kern Plateau salamander		G2 S2	None	None	IUCN:NT	
+*Batrachoseps simatus* Kern Canyon slender salamander		G2 S2	None	Threatened	IUCN:VU USFS:S	
+*Batrachoseps stebbinsi* Tehachapi slender salamander		G2 S2	None	Threatened	BLM:S IUCN:VU	
+*Ensatina eschscholtzii croceator* yellow-blotched salamander		G5T3 S3	None	None	BLM:S CDFW:SSC USFS:S	
+*Ensatina klauberi* large-blotched salamander		G2G3 S2S3	None	None	CDFW:SSC USFS:S	
+*Hydromantes brunus* limestone salamander		G1 S1	None	Threatened	BLM:S CDFW:FP IUCN:VU USFS:S	

Amphibians

Species	Comment	Rank	ESA	CESA	Other Status	Notes
PLETHODONTIDAE (lungless salamanders)						
+*Hydromantes platycephalus* Mount Lyell salamander		G4 S4	None	None	CDFW:SSC IUCN:LC	
+*Hydromantes shastae* Shasta salamander		G1G2 S1S2	None	Threatened	BLM:S IUCN:VU USFS:S	
+*Plethodon asupak* Scott Bar salamander		G1G2 S1S2	None	Threatened	IUCN:VU	Yes
+*Plethodon elongatus* Del Norte salamander		G4 S3	None	None	CDFW:SSC IUCN:NT	
+*Plethodon stormi* Siskiyou Mountains salamander		G2G3 S1S2	None	Threatened	IUCN:EN USFS:S	
ASCAPHIDAE (tailed frogs)						
+*Ascaphus truei* Pacific tailed frog		G4 S2S3	None	None	CDFW:SSC IUCN:LC	
SCAPHIOPODIDAE (spadefoot toads)						
+*Scaphiopus couchii* Couch's spadefoot		G5 S2S3	None	None	BLM:S CDFW:SSC IUCN:LC	
+*Spea hammondii* western spadefoot		G3 S3	None	None	BLM:S CDFW:SSC IUCN:NT	
BUFONIDAE (true toads)						
+*Anaxyrus californicus* arroyo toad		G2G3 S2S3	Endangered	None	CDFW:SSC IUCN:EN	Yes
+*Anaxyrus canorus* Yosemite toad		G2 S2	Threatened	None	CDFW:SSC IUCN:EN USFS:S	Yes
+*Anaxyrus exsul* black toad		G1 S1	None	Threatened	BLM:S CDFW:FP IUCN:VU USFS:S	Yes
+*Incilius alvarius* Sonoran desert toad		G5 SH	None	None	CDFW:SSC IUCN:LC	Yes
RANIDAE						
+*Lithobates pipiens* northern leopard frog	(Native populations only)	G5 S2	None	None	CDFW:SSC IUCN:LC	Yes
+*Lithobates yavapaiensis* lowland (=Yavapai, San Sebastian & San Felipe) leopard frog		G4 SX	None	None	BLM:S CDFW:SSC IUCN:LC	Yes
+*Rana aurora* northern red-legged frog		G4 S2?	None	None	CDFW:SSC USFS:S	Yes
+*Rana boylii* foothill yellow-legged frog		G3 S2S3	None	None	BLM:S CDFW:SSC IUCN:NT USFS:S	
+*Rana cascadae* Cascades frog		G3G4 S3	None	None	CDFW:SSC IUCN:NT USFS:S	
+*Rana draytonii* California red-legged frog		G2G3 S2S3	Threatened	None	CDFW:SSC IUCN:VU	Yes
+*Rana muscosa* southern mountain yellow-legged frog		G1 S1	Endangered	Endangered	CDFW:SSC IUCN:EN USFS:S	Yes
+*Rana pretiosa* Oregon spotted frog		G2 SH	Threatened	None	BLM:S CDFW:SSC IUCN:VU	

Amphibians

Species	Comment	Rank	ESA	CESA	Other Status	Notes
RANIDAE						
+*Rana sierrae* Sierra Nevada yellow-legged frog		G1 S1	Endangered	Threatened	CDFW:SSC IUCN:EN USFS:S	Yes

Reptiles

Species	Comment	Rank	ESA	CESA	Other Status	Notes
CHELONIIDAE (sea turtles)						
+*Chelonia mydas* green turtle		G3 S1	Threatened	None	IUCN:EN	
KINOSTERNIDAE (musk and mud turtles)						
+*Kinosternon sonoriense* Sonoran mud turtle		G4 SH	None	None	CDFW:SSC IUCN:VU	
EMYDIDAE (box and water turtles)						
+*Emys marmorata* western pond turtle		G3G4 S3	None	None	BLM:S CDFW:SSC IUCN:VU USFS:S	Yes
TESTUDINIDAE (land tortoises)						
+*Gopherus agassizii* desert tortoise		G3 S2	Threatened	Threatened	IUCN:VU	
GEKKONIDAE (geckos)						
+*Coleonyx switaki* barefoot gecko		G4 S1	None	Threatened	BLM:S IUCN:LC	
+*Coleonyx variegatus abbotti* San Diego banded gecko		G5T3T4 S1S2	None	None		
CROTAPHYTIDAE (collared & leopard lizards)						
+*Gambelia sila* blunt-nosed leopard lizard		G1 S1	Endangered	Endangered	CDFW:FP IUCN:EN	
PHRYNOSOMATIDAE (spiny lizards)						
+*Phrynosoma blainvillii* coast horned lizard		G3G4 S3S4	None	None	BLM:S CDFW:SSC IUCN:LC	
+*Phrynosoma mcallii* flat-tailed horned lizard		G3 S2	None	Candidate Endangered	BLM:S CDFW:SSC IUCN:NT	
+*Sceloporus graciosus graciosus* northern sagebrush lizard		G5T5 S3	None	None	BLM:S	
+*Uma inornata* Coachella Valley fringe-toed lizard		G1Q S1	Threatened	Endangered	IUCN:EN	
+*Uma notata* Colorado Desert fringe-toed lizard		G3 S2	None	None	BLM:S CDFW:SSC IUCN:NT	
+*Uma scoparia* Mojave fringe-toed lizard		G3G4 S3S4	None	None	BLM:S CDFW:SSC IUCN:LC	
XANTUSIIDAE (night lizards)						
+*Xantusia gracilis* sandstone night lizard		G1 S1	None	None	CDFW:SSC IUCN:VU	
+*Xantusia riversiana* island night lizard		G3 S3	Delisted	None	IUCN:LC	
Xantusia sierrae Sierra night lizard		G5T1 S1	None	None	CDFW:SSC USFS:S	
SCINCIDAE (skinks)						
+*Plestiodon skiltonianus interparietalis* Coronado Island skink		G5T2T3Q S1S2	None	None	BLM:S CDFW:SSC	
TEIIDAE (whiptails and relatives)						
+*Aspidoscelis hyperythra* orangethroat whiptail		G5 S2	None	None	CDFW:SSC IUCN:LC USFS:S	
+*Aspidoscelis tigris stejnegeri* coastal whiptail		G5T3T4 S2S3	None	None		

Reptiles

Species	Comment	Rank	ESA	CESA	Other Status	Notes
ANGUIDAE (alligator lizards)						
+*Elgaria panamintina* Panamint alligator lizard		G3 S3	None	None	BLM:S CDFW:SSC IUCN:VU USFS:S	
ANNIELLIDAE (Legless lizards)						
+*Anniella pulchra nigra* black legless lizard		G3G4T2T3Q S2	None	None	CDFW:SSC USFS:S	
+*Anniella pulchra pulchra* silvery legless lizard		G3G4T3T4Q S3	None	None	CDFW:SSC USFS:S	
HELODERMATIDAE (venomous lizards)						
+*Heloderma suspectum cinctum* banded gila monster		G4T4 S1	None	None	BLM:S CDFW:SSC IUCN:NT	Yes
BOIDAE (boas)						
+*Charina trivirgata* rosy boa		G4G5 S3S4	None	None	IUCN:LC USFS:S	Yes
+*Charina umbratica* southern rubber boa		G2G3 S2S3	None	Threatened	USFS:S	
COLUBRIDAE (egg-laying snakes)						
Bogertophis rosaliae Baja California rat snake		G4 S1	None	None	CDFW:SSC IUCN:LC	
+*Diadophis punctatus modestus* San Bernardino ringneck snake		G5T2T3Q S2?	None	None	USFS:S	
+*Diadophis punctatus similis* San Diego ringneck snake		G5T2T3 S2?	None	None	USFS:S	
+*Lampropeltis zonata (parvirubra)* California mountain kingsnake (San Bernardino population)		G4G5 S2?	None	None	BLM:S CDFW:SSC IUCN:LC USFS:S	
+*Lampropeltis zonata (pulchra)* California mountain kingsnake (San Diego population)		G4G5 S1S2	None	None	BLM:S CDFW:SSC IUCN:LC USFS:S	
+*Masticophis flagellum ruddocki* San Joaquin whipsnake		G5T2T3 S2?	None	None	CDFW:SSC	
+*Masticophis lateralis euryxanthus* Alameda whipsnake		G4T2 S2	Threatened	Threatened		
Pituophis catenifer pumilus Santa Cruz Island gopher snake		G5T1T2 S1?	None	None	CDFW:SSC	
+*Salvadora hexalepis virgultea* coast patch-nosed snake		G5T4 S2S3	None	None	CDFW:SSC	
NATRICIDAE (live-bearing snakes)						
+*Thamnophis gigas* giant garter snake		G2 S2	Threatened	Threatened	IUCN:VU	
+*Thamnophis hammondii* two-striped garter snake		G4 S3S4	None	None	BLM:S CDFW:SSC IUCN:LC USFS:S	
Thamnophis hammondii ssp. Santa Catalina garter snake		G4T1? S1	None	None		
+*Thamnophis sirtalis ssp.* south coast garter snake	(Coastal plain from Ventura Co. to San Diego Co., from sea level to about 850 m.)	G5T1T2 S1S2	None	None	CDFW:SSC	
+*Thamnophis sirtalis tetrataenia* San Francisco garter snake		G5T2Q S2	Endangered	Endangered	CDFW:FP	

Reptiles

Species	Comment	Rank	ESA	CESA	Other Status	Notes
VIPERIIDAE (vipers)						
+*Crotalus ruber* red-diamond rattlesnake		G4 S2?	None	None	CDFW:SSC USFS:S	

Birds

Species	Comment	Rank	ESA	CESA	Other Status	Notes
ANATIDAE (ducks, geese, and swans)						
Anser albifrons elgasi tule greater white-fronted goose	(Wintering)	G5T2 S2S3	None	None	CDFW:SSC	
Aythya americana redhead	(Nesting)	G5 S3S4	None	None	CDFW:SSC IUCN:LC	
Aythya valisineria canvasback	(Nesting)	G5 S2	None	None	IUCN:LC	
Branta bernicla brant	(Wintering & staging)	G5 S2?	None	None	CDFW:SSC IUCN:LC	
+*Branta hutchinsii leucopareia* cackling (=Aleutian Canada) goose	(Wintering)	G5T3 S2	Delisted	None		
Bucephala islandica Barrow's goldeneye	(Nesting)	G5 S1	None	None	CDFW:SSC IUCN:LC	
+*Dendrocygna bicolor* fulvous whistling-duck	(Nesting)	G5 S1	None	None	CDFW:SSC IUCN:LC	
+*Histrionicus histrionicus* harlequin duck	(Nesting)	G4 S2	None	None	CDFW:SSC IUCN:LC	
PHASIANIDAE (grouse and ptarmigan)						
+*Bonasa umbellus* ruffed grouse		G5 S3S4	None	None	CDFW:WL IUCN:LC	
+*Centrocercus urophasianus* greater sage-grouse	(Nesting & leks)	G3G4 S3	Proposed Threatened	None	BLM:S CDFW:SSC IUCN:NT USFS:S	Yes
+*Dendragapus fuliginosus howardi* Mount Pinos sooty grouse		G5T2T3 S2S3	None	None	CDFW:SSC	Yes
Tympanuchus phasianellus columbianus Columbian sharp-tailed grouse		G4T3 SX	None	None	CDFW:SSC	
ODONTOPHORIDAE (partridge and quail)						
Callipepla californica catalinensis Catalina California quail		G5T2 S2	None	None	CDFW:SSC	
GAVIIDAE (loons)						
Gavia immer common loon	(Nesting)	G5 S1	None	None	CDFW:SSC IUCN:LC	
DIOMEDEIDAE (albatross)						
Phoebastria albatrus short-tailed albatross		G1 S1	Endangered	None	CDFW:SSC IUCN:VU NABCI:RWL	
HYDROBATIDAE (storm petrels)						
+*Oceanodroma furcata* fork-tailed storm-petrel	(Nesting colony)	G5 S1	None	None	BLM:S CDFW:SSC IUCN:LC	
+*Oceanodroma homochroa* ashy storm-petrel	(Nesting colony)	G2 S2	None	None	BLM:S CDFW:SSC IUCN:EN NABCI:RWL USFWS:BCC	
+*Oceanodroma melania* black storm-petrel	(Nesting colony)	G3G4 S1	None	None	CDFW:SSC IUCN:LC NABCI:YWL	
PELECANIIDAE (pelicans)						
+*Pelecanus erythrorhynchos* American white pelican	(Nesting colony)	G4 S1	None	None	CDFW:SSC IUCN:LC	
+*Pelecanus occidentalis californicus* California brown pelican	(Nesting colony & communal roosts)	G4T3 S3	Delisted	Delisted	BLM:S CDFW:FP USFS:S	

Birds

Species	Comment	Rank	ESA	CESA	Other Status	Notes
PHALACROCORACIDAE (cormorants)						
+*Phalacrocorax auritus* double-crested cormorant	(Nesting colony)	G5 S4	None	None	CDFW:WL IUCN:LC	
ARDEIDAE (herons, egrets, and bitterns)						
+*Ardea alba* great egret	(Nesting colony)	G5 S4	None	None	CDF:S IUCN:LC	
+*Ardea herodias* great blue heron	(Nesting colony)	G5 S4	None	None	CDF:S IUCN:LC	
Botaurus lentiginosus American bittern		G4 S3S4	None	None	IUCN:LC	
+*Egretta thula* snowy egret	(Nesting colony)	G5 S4	None	None	IUCN:LC	
+*Ixobrychus exilis* least bittern	(Nesting)	G5 S2	None	None	CDFW:SSC IUCN:LC USFWS:BCC	
+*Nycticorax nycticorax* black-crowned night heron	(Nesting colony)	G5 S4	None	None	IUCN:LC	
THRESKIORNITHIDAE (ibises and spoonbills)						
+*Plegadis chihi* white-faced ibis	(Nesting colony)	G5 S3S4	None	None	CDFW:WL IUCN:LC	
CICONIIDAE (storks)						
Mycteria americana wood stork		G4 S2?	None	None	CDFW:SSC IUCN:LC	
CATHARTIDAE (New World vultures)						
+*Gymnogyps californianus* California condor		G1 S1	Endangered	Endangered	CDF:S CDFW:FP IUCN:CR NABCI:RWL	
ACCIPITRIDAE (hawks, kites, harriers, & eagles)						
+*Accipiter cooperii* Cooper's hawk	(Nesting)	G5 S4	None	None	CDFW:WL IUCN:LC	
+*Accipiter gentilis* northern goshawk	(Nesting)	G5 S3	None	None	BLM:S CDF:S CDFW:SSC IUCN:LC USFS:S	
+*Accipiter striatus* sharp-shinned hawk	(Nesting)	G5 S4	None	None	CDFW:WL	
+*Aquila chrysaetos* golden eagle	(Nesting & wintering)	G5 S3	None	None	BLM:S CDF:S CDFW:FP CDFW:WL IUCN:LC USFWS:BCC	
+*Buteo regalis* ferruginous hawk	(Wintering)	G4 S3S4	None	None	CDFW:WL IUCN:LC USFWS:BCC	
+*Buteo swainsoni* Swainson's hawk	(Nesting)	G5 S3	None	Threatened	BLM:S IUCN:LC USFWS:BCC	
+*Circus cyaneus* northern harrier	(Nesting)	G5 S3	None	None	CDFW:SSC IUCN:LC	
+*Elanus leucurus* white-tailed kite	(Nesting)	G5 S3S4	None	None	BLM:S CDFW:FP IUCN:LC	

Birds

Species	Comment	Rank	ESA	CESA	Other Status	Notes
ACCIPITRIDAE (hawks, kites, harriers, & eagles)						
+*Haliaeetus leucocephalus* bald eagle	(Nesting & wintering)	G5 S2	Delisted	Endangered	BLM:S CDF:S CDFW:FP IUCN:LC USFS:S USFWS:BCC	
+*Pandion haliaetus* osprey	(Nesting)	G5 S4	None	None	CDF:S CDFW:WL IUCN:LC	
Parabuteo unicinctus Harris' hawk	(Nesting)	G5 S1	None	None	CDFW:WL IUCN:LC	
FALCONIDAE (falcons)						
+*Falco columbarius* merlin	(Wintering)	G5 S3S4	None	None	CDFW:WL IUCN:LC	
+*Falco mexicanus* prairie falcon	(Nesting)	G5 S4	None	None	CDFW:WL IUCN:LC USFWS:BCC	
+*Falco peregrinus anatum* American peregrine falcon	(Nesting)	G4T4 S3S4	Delisted	Delisted	CDF:S CDFW:FP USFWS:BCC	
RALLIDAE (rails, coots, and gallinules)						
+*Coturnicops noveboracensis* yellow rail		G4 S1S2	None	None	CDFW:SSC IUCN:LC NABCI:RWL USFS:S USFWS:BCC	
+*Laterallus jamaicensis coturniculus* California black rail		G3G4T1 S1	None	Threatened	BLM:S CDFW:FP IUCN:NT NABCI:RWL USFWS:BCC	Yes
+*Rallus longirostris levipes* light-footed clapper rail		G5T1T2 S1	Endangered	Endangered	CDFW:FP NABCI:RWL	Yes
+*Rallus longirostris obsoletus* California clapper rail		G5T1 S1	Endangered	Endangered	CDFW:FP NABCI:RWL	Yes
+*Rallus longirostris yumanensis* Yuma clapper rail		G5T3 S1	Endangered	Threatened	CDFW:FP NABCI:RWL	Yes
GRUIDAE (cranes)						
Grus canadensis canadensis lesser sandhill crane	(Wintering)	G5T4 S3S4	None	None	CDFW:SSC	
+*Grus canadensis tabida* greater sandhill crane	(Nesting & wintering)	G5T4 S2	None	Threatened	BLM:S CDFW:FP USFS:S	
CHARADRIIDAE (plovers and relatives)						
+*Charadrius alexandrinus nivosus* western snowy plover	(Nesting)	G3T3 S2	Threatened	None	CDFW:SSC NABCI:RWL USFWS:BCC	Yes
+*Charadrius montanus* mountain plover	(Wintering)	G3 S2?	None	None	BLM:S CDFW:SSC IUCN:NT NABCI:RWL USFWS:BCC	Yes
HAEMATOPODIDAE (oystercatchers)						
Haematopus bachmani black oystercatcher	(Nesting)	G5 S4	None	None	IUCN:LC NABCI:YWL USFWS:BCC	

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Species	Comment	Rank	ESA	CESA	Other Status	Notes
SCOLOPACIDAE (sandpipers and relatives)						
Numenius americanus long-billed curlew	(Nesting)	G5 S2	None	None	CDFW:WL IUCN:LC NABCI:YWL USFWS:BCC	
LARIDAE (gulls and terns)						
+*Chlidonias niger* black tern	(Nesting colony)	G4 S2	None	None	CDFW:SSC IUCN:LC	
+*Gelochelidon nilotica* gull-billed tern	(Nesting colony)	G5 S1	None	None	CDFW:SSC IUCN:LC NABCI:YWL USFWS:BCC	Yes
+*Hydroprogne caspia* Caspian tern	(Nesting colony)	G5 S4	None	None	IUCN:LC USFWS:BCC	Yes
+*Larus californicus* California gull	(Nesting colony)	G5 S4	None	None	CDFW:WL IUCN:LC	
Leucophaeus atricilla laughing gull	(Nesting colony)	G5 S1	None	None	CDFW:WL IUCN:LC	
+*Rynchops niger* black skimmer	(Nesting colony)	G5 S2	None	None	CDFW:SSC IUCN:LC NABCI:YWL USFWS:BCC	
Sterna forsteri Forster's tern	(Nesting colony)	G5 S4	None	None	IUCN:LC	
+*Sternula antillarum browni* California least tern	(Nesting colony)	G4T2T3Q S2	Endangered	Endangered	CDFW:FP NABCI:RWL	Yes
Thalasseus elegans elegant tern	(Nesting colony)	G2 S1	None	None	CDFW:WL IUCN:NT	Yes
ALCIDAE (auklets, puffins, and relatives)						
+*Brachyramphus marmoratus* marbled murrelet	(Nesting)	G3G4 S1	Threatened	Endangered	CDF:S IUCN:EN NABCI:RWL	
+*Cerorhinca monocerata* rhinoceros auklet	(Nesting colony)	G5 S3	None	None	CDFW:WL IUCN:LC	
+*Fratercula cirrhata* tufted puffin	(Nesting colony)	G5 S1S2	None	None	CDFW:SSC IUCN:LC	
Ptychoramphus aleuticus Cassin's auklet	(Nesting colony)	G4 S2S4	None	None	CDFW:SSC IUCN:LC USFWS:BCC	
+*Synthliboramphus scrippsi* Scripps's murrelet	(Nesting colony)	G3 S2	Candidate	Threatened	BLM:S IUCN:VU NABCI:RWL USFWS:BCC	Yes
CUCULIDAE (cuckoos and relatives)						
+*Coccyzus americanus occidentalis* western yellow-billed cuckoo	(Nesting)	G5T3Q S1	Threatened	Endangered	BLM:S NABCI:RWL USFS:S USFWS:BCC	
STRIGIDAE (owls)						
+*Asio flammeus* short-eared owl	(Nesting)	G5 S3	None	None	CDFW:SSC IUCN:LC	
+*Asio otus* long-eared owl	(Nesting)	G5 S3?	None	None	CDFW:SSC IUCN:LC	
+*Athene cunicularia* burrowing owl	(Burrow sites & some wintering sites)	G4 S3	None	None	BLM:S CDFW:SSC IUCN:LC USFWS:BCC	Yes

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Species	Comment	Rank	ESA	CESA	Other Status	Notes
STRIGIDAE (owls)						
+*Micrathene whitneyi* elf owl	(Nesting)	G5 S1	None	Endangered	BLM:S IUCN:LC USFWS:BCC	
Otus flammeolus flammulated owl	(Nesting)	G4 S2S4	None	None	IUCN:LC NABCI:YWL USFWS:BCC	
+*Strix nebulosa* great gray owl	(Nesting)	G5 S1	None	Endangered	CDF:S IUCN:LC USFS:S	
Strix occidentalis caurina northern spotted owl		G3T3 S2S3	Threatened	Candidate Threatened	CDF:S CDFW:SSC IUCN:NT NABCI:YWL	Yes
Strix occidentalis occidentalis California spotted owl		G3T3 S3	None	None	BLM:S CDFW:SSC IUCN:NT USFS:S USFWS:BCC	Yes
APODIDAE (swifts)						
Chaetura vauxi Vaux's swift	(Nesting)	G5 S2S3	None	None	CDFW:SSC IUCN:LC	
+*Cypseloides niger* black swift	(Nesting)	G4 S2	None	None	CDFW:SSC IUCN:LC NABCI:YWL USFWS:BCC	
TROCHILIDAE (hummingbirds)						
+*Calypte costae* Costa's hummingbird	(Nesting)	G5 S4	None	None	IUCN:LC	
Selasphorus rufus rufous hummingbird	(Nesting)	G5 S1S2	None	None	IUCN:LC NABCI:YWL USFWS:BCC	
Selasphorus sasin Allen's hummingbird	(Nesting)	G5 S4	None	None	IUCN:LC NABCI:YWL USFWS:BCC	
PICIDAE (woodpeckers)						
+*Colaptes chrysoides* gilded flicker		G5 S1	None	Endangered	BLM:S IUCN:LC NABCI:YWL USFWS:BCC	
Melanerpes lewis Lewis' woodpecker	(Nesting)	G4 S4	None	None	IUCN:LC NABCI:YWL USFWS:BCC	
+*Melanerpes uropygialis* Gila woodpecker		G5 S1	None	Endangered	BLM:S IUCN:LC USFWS:BCC	
Picoides albolarvatus White-headed woodpecker	(Nesting)	G4 S4	None	None	IUCN:LC USFWS:BCC	
Picoides nuttallii Nuttall's woodpecker	(Nesting)	G4G5 S4S5	None	None	IUCN:LC USFWS:BCC	
+*Sphyrapicus ruber* red-breasted sapsucker	(Nesting)	G5 S4	None	None		
TYRANNIDAE (tyrant flycatchers)						
Contopus cooperi olive-sided flycatcher	(Nesting)	G4 S4	None	None	CDFW:SSC IUCN:NT NABCI:YWL USFWS:BCC	

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Species	Comment	Rank	ESA	CESA	Other Status	Notes
TYRANNIDAE (tyrant flycatchers)						
+*Empidonax traillii* willow flycatcher	(Nesting)	G5 S1S2	None	Endangered	IUCN:LC USFS:S USFWS:BCC	Yes
+*Empidonax traillii brewsteri* little willow flycatcher	(Nesting)	G5T3T4 S1S2	None	Endangered	USFWS:BCC	Yes
+*Empidonax traillii extimus* southwestern willow flycatcher	(Nesting)	G5T2 S1	Endangered	Endangered	NABCI:RWL	Yes
+*Myiarchus tyrannulus* brown-crested flycatcher	(Nesting)	G5 S3	None	None	CDFW:WL IUCN:LC	
+*Pyrocephalus rubinus* vermilion flycatcher	(Nesting)	G5 S2S3	None	None	CDFW:SSC IUCN:LC	
LANIIDAE (shrikes)						
+*Lanius ludovicianus* loggerhead shrike	(Nesting)	G4 S4	None	None	CDFW:SSC IUCN:LC USFWS:BCC	
Lanius ludovicianus anthonyi Island loggerhead shrike		G4T1 S1	None	None	CDFW:SSC NABCI:RWL	
+*Lanius ludovicianus mearnsi* San Clemente loggerhead shrike		G4T1Q S1	Endangered	None	CDFW:SSC NABCI:RWL	Yes
VIREONIDAE (vireos)						
+*Vireo bellii arizonae* Arizona bell's vireo	(Nesting)	G5T4 S1	None	Endangered	BLM:S IUCN:NT USFWS:BCC	Yes
+*Vireo bellii pusillus* least Bell's vireo	(Nesting)	G5T2 S2	Endangered	Endangered	IUCN:NT NABCI:YWL	Yes
Vireo huttoni unitti Catalina Hutton's vireo		G5T2? S2?	None	None	CDFW:SSC	
+*Vireo vicinior* gray vireo	(Nesting)	G4 S2	None	None	BLM:S CDFW:SSC IUCN:LC NABCI:YWL USFS:S USFWS:BCC	
CORVIDAE (jays, crows, and magpies)						
Aphelocoma californica cana Eagle Mountain scrub-jay		G5T1T2 S1S2	None	None	CDFW:WL	
Aphelocoma insularis Island scrub-jay		G1 S1	None	None	IUCN:NT NABCI:RWL USFWS:BCC	
Pica nuttalli yellow-billed magpie	(Nesting & communal roosts)	G3G4 S3S4	None	None	IUCN:LC NABCI:YWL USFWS:BCC	
ALAUDIDAE (larks)						
+*Eremophila alpestris actia* California horned lark		G5T3Q S3	None	None	CDFW:WL IUCN:LC	
HIRUNDINIDAE (swallows)						
+*Progne subis* purple martin	(Nesting)	G5 S3	None	None	CDFW:SSC IUCN:LC	
+*Riparia riparia* bank swallow	(Nesting)	G5 S2	None	Threatened	BLM:S IUCN:LC	
PARIDAE (titmice and relatives)						
+*Baeolophus inornatus* oak titmouse	(Nesting)	G4 S4	None	None	IUCN:LC NABCI:YWL USFWS:BCC	
Poecile atricapillus black-capped chickadee		G5 S3	None	None	CDFW:WL IUCN:LC	

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Species	Comment	Rank	ESA	CESA	Other Status	Notes
TROGLODYTIDAE (wrens)						
+*Campylorhynchus brunneicapillus sandiegensis* coastal cactus wren	(San Diego & Orange Counties only)	G5T3Q S3	None	None	CDFW:SSC USFS:S USFWS:BCC	Yes
Cistothorus palustris clarkae Clark's marsh wren		G5T2T3 S2S3	None	None	CDFW:SSC	
Thryomanes bewickii leucophrys San Clemente Bewick's wren		G5TX SX	None	None	CDFW:SSC	
SYLVIIDAE (gnatcatchers)						
+*Polioptila californica californica* coastal California gnatcatcher		G3T2 S2	Threatened	None	CDFW:SSC NABCI:YWL	Yes
+*Polioptila melanura* black-tailed gnatcatcher		G5 S3S4	None	None	IUCN:LC	
MIMIDAE (mockingbirds and thrashers)						
+*Toxostoma bendirei* Bendire's thrasher		G4G5 S3	None	None	BLM:S CDFW:SSC IUCN:VU NABCI:RWL USFWS:BCC	
+*Toxostoma crissale* Crissal thrasher		G5 S3	None	None	CDFW:SSC IUCN:LC	
+*Toxostoma lecontei* Le Conte's thrasher		G4 S3	None	None	CDFW:SSC IUCN:LC NABCI:RWL USFWS:BCC	Yes
PARULIDAE (wood-warblers)						
+*Geothlypis trichas sinuosa* saltmarsh common yellowthroat		G5T2 S2	None	None	CDFW:SSC USFWS:BCC	Yes
+*Icteria virens* yellow-breasted chat	(Nesting)	G5 S3	None	None	CDFW:SSC IUCN:LC	
+*Oreothlypis luciae* Lucy's warbler	(Nesting)	G5 S2S3	None	None	BLM:S CDFW:SSC IUCN:LC USFWS:BCC	
+*Oreothlypis virginiae* Virginia's warbler	(Nesting)	G5 S2S3	None	None	CDFW:WL IUCN:LC NABCI:YWL USFWS:BCC	
Setophaga occidentalis hermit warbler	(Nesting)	G4G5 S4	None	None	IUCN:LC	
+*Setophaga petechia* yellow warbler	(Nesting)	G5 S3S4	None	None	CDFW:SSC USFWS:BCC	Yes
+*Setophaga petechia sonorana* Sonoran yellow warbler	(Nesting)	G5T2T3 S2	None	None	CDFW:SSC USFWS:BCC	Yes
EMBERIZIDAE (sparrows, buntings, warblers, & relatives)						
+*Aimophila ruficeps canescens* southern California rufous-crowned sparrow		G5T3 S2S3	None	None	CDFW:WL	
Aimophila ruficeps obscura Santa Cruz Island rufous-crowned sparrow		G5T2T3 S2S3	None	None	CDFW:SSC	
+*Ammodramus savannarum* grasshopper sparrow	(Nesting)	G5 S2	None	None	CDFW:SSC IUCN:LC	
+*Artemisiospiza belli belli* Bell's sage sparrow		G5T2T4 S2?	None	None	CDFW:WL USFWS:BCC	Yes
+*Artemisiospiza belli clementeae* San Clemente sage sparrow		G5T1Q S1	Threatened	None	CDFW:SSC NABCI:YWL USFWS:BCC	Yes
+*Chondestes grammacus* lark sparrow	(Nesting)	G5 S4S5	None	None	IUCN:LC	

Birds

Species	Comment	Rank	ESA	CESA	Other Status	Notes
EMBERIZIDAE (sparrows, buntings, warblers, & relatives)						
+*Junco hyemalis caniceps* gray-headed junco	(Nesting)	G5T5 S1	None	None	CDFW:WL	
+*Melospiza melodia* song sparrow ("Modesto" population)		G5 S3?	None	None	CDFW:SSC	
+*Melospiza melodia graminea* Channel Island song sparrow		G5T1 S1	None	None	CDFW:SSC USFWS:BCC	Yes
+*Melospiza melodia maxillaris* Suisun song sparrow		G5T2 S2	None	None	CDFW:SSC USFWS:BCC	
+*Melospiza melodia pusillula* Alameda song sparrow		G5T2? S2?	None	None	CDFW:SSC USFWS:BCC	
+*Melospiza melodia samuelis* San Pablo song sparrow		G5T2? S2?	None	None	CDFW:SSC USFWS:BCC	
Melozone aberti Abert's towhee		G3G4 S2?	None	None	IUCN:LC	
+*Melozone crissalis eremophilus* Inyo California towhee		G4G5T1 S1	Threatened	Endangered	NABCI:RWL	Yes
Passerculus sandwichensis alaudinus Bryant's savannah sparrow		G5T2T3 S2S3	None	None	CDFW:SSC	
+*Passerculus sandwichensis beldingi* Belding's savannah sparrow		G5T3 S3	None	Endangered		
Passerculus sandwichensis rostratus large-billed savannah sparrow	(Wintering)	G5T2T3 S2?	None	None	CDFW:SSC	
Pipilo maculatus clementae San Clemente spotted towhee		G5T1 S1	None	None	CDFW:SSC USFWS:BCC	
+*Piranga flava* hepatic tanager	(Nesting)	G5 S1	None	None	CDFW:WL IUCN:LC	Yes
+*Piranga rubra* summer tanager	(Nesting)	G5 S2	None	None	CDFW:SSC IUCN:LC	Yes
Pooecetes gramineus affinis Oregon vesper sparrow	(Wintering)	G5T3? S3?	None	None	CDFW:SSC NABCI:RWL USFWS:BCC	
Spizella atrogularis black-chinned sparrow	(Nesting)	G5 S3	None	None	IUCN:LC NABCI:YWL USFWS:BCC	
+*Spizella breweri* Brewer's sparrow	(Nesting)	G5 S3	None	None	IUCN:LC USFWS:BCC	
Spizella passerina chipping sparrow	(Nesting)	G5 S3S4	None	None	IUCN:LC	
CARDINALIDAE (cardinals)						
+*Cardinalis cardinalis* northern cardinal		G5 S1	None	None	CDFW:WL IUCN:LC	
ICTERIDAE (blackbirds)						
Agelaius phoeniceus aciculatus Kern red-winged blackbird		G5T1T2 S1S2	None	None	CDFW:SSC	
+*Agelaius tricolor* tricolored blackbird	(Nesting colony)	G2G3 S1S2	None	Endangered	BLM:S CDFW:SSC IUCN:EN NABCI:RWL USFWS:BCC	Yes
+*Xanthocephalus xanthocephalus* yellow-headed blackbird	(Nesting)	G5 S3	None	None	CDFW:SSC IUCN:LC	
FRINGILLIDAE (finches and relatives)						
+*Spinus lawrencei* Lawrence's goldfinch	(Nesting)	G3G4 S3	None	None	IUCN:LC NABCI:YWL USFWS:BCC	

Mammals

Species	Comment	Rank	ESA	CESA	Other Status	Notes
TALPIDAE (moles)						
+*Scapanus latimanus insularis* Angel Island mole		G5T1 S1	None	None		
+*Scapanus latimanus parvus* Alameda Island mole		G5T1Q S1	None	None	CDFW:SSC	
SORICIDAE (shrews)						
+*Sorex lyelli* Mount Lyell shrew		G2G3 S2S3	None	None	CDFW:SSC IUCN:LC	
+*Sorex ornatus relictus* Buena Vista Lake ornate shrew		G5T1 S1	Endangered	None	CDFW:SSC	
Sorex ornatus salarius Monterey shrew		G5T1T2 S1S2	None	None	CDFW:SSC	
+*Sorex ornatus salicornicus* southern California saltmarsh shrew		G5T1? S1	None	None	CDFW:SSC	
+*Sorex ornatus sinuosus* Suisun shrew		G5T1T2Q S1S2	None	None	CDFW:SSC	
+*Sorex ornatus willetti* Santa Catalina shrew		G5T1 S1	None	None	CDFW:SSC	
+*Sorex vagrans halicoetes* salt-marsh wandering shrew		G5T1 S1	None	None	CDFW:SSC	
Sorex vagrans paludivagus Monterey vagrant shrew		G5T1 S1	None	None		
PHYLLOSTOMIDAE (leaf-nosed bats)						
+*Choeronycteris mexicana* Mexican long-tongued bat		G4 S1	None	None	CDFW:SSC IUCN:NT WBWG:H	
+*Leptonycteris yerbabuenae* lesser long-nosed bat		G4 S1	Endangered	None	IUCN:VU WBWG:H	Yes
+*Macrotus californicus* California leaf-nosed bat		G4 S3	None	None	BLM:S CDFW:SSC IUCN:LC WBWG:H	
VESPERTILIONIDAE (evening bats)						
+*Antrozous pallidus* pallid bat		G5 S3	None	None	BLM:S CDFW:SSC IUCN:LC USFS:S WBWG:H	
+*Corynorhinus townsendii* Townsend's big-eared bat		G3G4 S2	None	Candidate Threatened	BLM:S CDFW:SSC IUCN:LC USFS:S WBWG:H	
+*Euderma maculatum* spotted bat		G4 S3	None	None	BLM:S CDFW:SSC IUCN:LC WBWG:H	
+*Lasionycteris noctivagans* silver-haired bat		G5 S3S4	None	None	IUCN:LC WBWG:M	
+*Lasiurus blossevillii* western red bat		G5 S3	None	None	CDFW:SSC IUCN:LC WBWG:H	Yes
+*Lasiurus cinereus* hoary bat		G5 S4	None	None	IUCN:LC WBWG:M	
+*Lasiurus xanthinus* western yellow bat		G5 S3	None	None	CDFW:SSC IUCN:LC WBWG:H	Yes

Mammals

Species	Comment	Rank	ESA	CESA	Other Status	Notes
VESPERTILIONIDAE (evening bats)						
+*Myotis ciliolabrum* western small-footed myotis		G5 S3	None	None	BLM:S IUCN:LC WBWG:M	
+*Myotis evotis* long-eared myotis		G5 S3	None	None	BLM:S IUCN:LC WBWG:M	
Myotis lucifugus little brown bat	(San Bernardino Mts population)	G3 S2S3	None	None	IUCN:LC WBWG:M	
+*Myotis occultus* Arizona Myotis		G4 S1	None	None	CDFW:SSC IUCN:LC WBWG:M	
+*Myotis thysanodes* fringed myotis		G4 S3	None	None	BLM:S IUCN:LC USFS:S WBWG:H	
+*Myotis velifer* cave myotis		G5 S1	None	None	BLM:S CDFW:SSC IUCN:LC WBWG:M	
+*Myotis volans* long-legged myotis		G5 S3	None	None	IUCN:LC WBWG:H	
+*Myotis yumanensis* Yuma myotis		G5 S4	None	None	BLM:S IUCN:LC WBWG:LM	
MOLOSSIDAE (free-tailed bats)						
+*Eumops perotis californicus* western mastiff bat		G5T4 S3S4	None	None	BLM:S CDFW:SSC WBWG:H	
+*Nyctinomops femorosaccus* pocketed free-tailed bat		G4 S3	None	None	CDFW:SSC IUCN:LC WBWG:M	
+*Nyctinomops macrotis* big free-tailed bat		G5 S3	None	None	CDFW:SSC IUCN:LC WBWG:MH	
OCHOTONIDAE (pikas)						
+*Ochotona princeps schisticeps* gray-headed pika		G5T2T4 S2S4	None	None	IUCN:NT	Yes
LEPORIDAE (rabbits and hares)						
+*Brachylagus idahoensis* pygmy rabbit		G4 S3	None	None	BLM:S CDFW:SSC IUCN:LC USFS:S	
+*Lepus americanus klamathensis* Oregon snowshoe hare		G5T3T4Q S2?	None	None	CDFW:SSC	
+*Lepus americanus tahoensis* Sierra Nevada snowshoe hare		G5T3T4Q S2?	None	None	CDFW:SSC	
+*Lepus californicus bennettii* San Diego black-tailed jackrabbit		G5T3T4 S3S4	None	None	CDFW:SSC	
+*Lepus townsendii townsendii* western white-tailed jackrabbit		G5T5 S3?	None	None	CDFW:SSC	
+*Sylvilagus bachmani riparius* riparian brush rabbit		G5T1 S1	Endangered	Endangered		
APLODONTIDAE (mountain beavers)						
+*Aplodontia rufa californica* Sierra Nevada mountain beaver		G5T3T4 S2S3	None	None	CDFW:SSC IUCN:LC	Yes
+*Aplodontia rufa nigra* Point Arena mountain beaver		G5T1 S1	Endangered	None	CDFW:SSC IUCN:LC	Yes

Mammals

Species	Comment	Rank	ESA	CESA	Other Status	Notes
APLODONTIDAE (mountain beavers)						
+*Aplodontia rufa phaea* Point Reyes mountain beaver		G5T2 S2	None	None	CDFW:SSC IUCN:LC	Yes
SCIURIDAE (squirrels and relatives)						
+*Ammospermophilus nelsoni* Nelson's antelope squirrel		G2 S2	None	Threatened	BLM:S IUCN:EN	
Callospermophilus lateralis bernardinus San Bernardino golden-mantled ground squirrel		G5T1 S1	None	None		
+*Glaucomys sabrinus californicus* San Bernardino flying squirrel		G5T2T3 S2S3	None	None	CDFW:SSC USFS:S	
+*Neotamias panamintinus acrus* Kingston Mountain chipmunk		G4T1T2 S1S2	None	None		
+*Neotamias speciosus callipeplus* Mount Pinos chipmunk		G4T1T2 S1S2	None	None	USFS:S	
+*Neotamias speciosus speciosus* lodgepole chipmunk		G4T2T3 S2S3	None	None		
+*Xerospermophilus mohavensis* Mohave ground squirrel		G2G3 S2S3	None	Threatened	BLM:S IUCN:VU	
+*Xerospermophilus tereticaudus chlorus* Palm Springs round-tailed ground squirrel		G5T2Q S1S2	None	None	BLM:S CDFW:SSC	
GEOMYIDAE (pocket gophers)						
Thomomys bottae operarius Owens Lake pocket gopher		G5T1? S1?	None	None		
HETEROMYIDAE (kangaroo rats, pockets mice, & kangaroo mice)						
+*Chaetodipus californicus femoralis* Dulzura pocket mouse		G5T3 S3	None	None	CDFW:SSC	
+*Chaetodipus fallax fallax* northwestern San Diego pocket mouse		G5T3T4 S3S4	None	None	CDFW:SSC	Yes
+*Chaetodipus fallax pallidus* pallid San Diego pocket mouse		G5T34 S3S4	None	None	CDFW:SSC	Yes
+*Dipodomys californicus eximius* Marysville California kangaroo rat		G4T1 S1	None	None	CDFW:SSC	
+*Dipodomys heermanni berkeleyensis* Berkeley kangaroo rat		G3G4T1 S1	None	None		
+*Dipodomys heermanni dixoni* Merced kangaroo rat		G3G4T2T3 S2S3	None	None		
+*Dipodomys heermanni morroensis* Morro Bay kangaroo rat		G3G4TH SH	Endangered	Endangered	CDFW:FP	
+*Dipodomys ingens* giant kangaroo rat		G1G2 S1S2	Endangered	Endangered	IUCN:EN	
+*Dipodomys merriami collinus* Earthquake Merriam's kangaroo rat		G5T1T2 S1S2	None	None		
+*Dipodomys merriami parvus* San Bernardino kangaroo rat		G5T1 S1	Endangered	None	CDFW:SSC	
+*Dipodomys nitratoides brevinasus* short-nosed kangaroo rat		G3T1T2 S1S2	None	None	BLM:S CDFW:SSC IUCN:VU	
+*Dipodomys nitratoides exilis* Fresno kangaroo rat		G3TH SH	Endangered	Endangered	IUCN:VU	
+*Dipodomys nitratoides nitratoides* Tipton kangaroo rat		G3T1T2 S1S2	Endangered	Endangered	IUCN:VU	
+*Dipodomys panamintinus argusensis* Argus Mountains kangaroo rat		G5T1T3 S1S3	None	None		
+*Dipodomys panamintinus panamintinus* Panamint kangaroo rat		G5T3 S3	None	None		

Mammals

Species	Comment	Rank	ESA	CESA	Other Status	Notes
HETEROMYIDAE (kangaroo rats, pockets mice, & kangaroo mice)						
+*Dipodomys stephensi* Stephens' kangaroo rat		G2 S2	Endangered	Threatened	IUCN:EN	
+*Dipodomys venustus elephantinus* big-eared kangaroo rat		G4T2 S2	None	None	CDFW:SSC	
+*Dipodomys venustus venustus* Santa Cruz kangaroo rat		G4T1 S1	None	None		
+*Perognathus alticolus alticolus* white-eared pocket mouse		G1G2TH SH	None	None	BLM:S CDFW:SSC IUCN:EN USFS:S	Yes
+*Perognathus alticolus inexpectatus* Tehachapi pocket mouse		G1G2T1T2 S1S2	None	None	CDFW:SSC IUCN:EN USFS:S	Yes
+*Perognathus inornatus* San Joaquin Pocket Mouse		G2G3 S2S3	None	None	BLM:S	Yes
+*Perognathus inornatus psammophilus* Salinas pocket mouse		G4T2? S2?	None	None	CDFW:SSC	
+*Perognathus longimembris bangsi* Palm Springs pocket mouse		G5T2T3 S2S3	None	None	BLM:S CDFW:SSC	
+*Perognathus longimembris brevinasus* Los Angeles pocket mouse		G5T1T2 S1S2	None	None	CDFW:SSC	
+*Perognathus longimembris internationalis* Jacumba pocket mouse		G5T2T3 S1S2	None	None	CDFW:SSC	
+*Perognathus longimembris pacificus* Pacific pocket mouse		G5T1 S1	Endangered	None	CDFW:SSC	
Perognathus longimembris salinensis Saline Valley pocket mouse		G5T1 S1	None	None		
Perognathus longimembris tularensis Tulare pocket mouse		G5T1 S1	None	None		
+*Perognathus parvus xanthonotus* yellow-eared pocket mouse		G5T2T3 S1S2	None	None	BLM:S	
MURIDAE (mice, rats, and voles)						
+*Arborimus albipes* white-footed vole		G3G4 S2S3	None	None	CDFW:SSC IUCN:LC	
+*Arborimus pomo* Sonoma tree vole		G3 S3	None	None	CDFW:SSC IUCN:NT	
Microtus californicus halophilus Monterey vole		G5T1 S1	None	None		
+*Microtus californicus mohavensis* Mohave river vole		G5T1 S1	None	None	CDFW:SSC	
+*Microtus californicus sanpabloensis* San Pablo vole		G5T1T2 S1S2	None	None	CDFW:SSC	
+*Microtus californicus scirpensis* Amargosa vole		G5T1 S1	Endangered	Endangered		
+*Microtus californicus stephensi* south coast marsh vole		G5T1T2 S1S2	None	None	CDFW:SSC	
+*Microtus californicus vallicola* Owens Valley vole		G5T3 S3	None	None	BLM:S CDFW:SSC	
+*Neotoma albigula venusta* Colorado Valley woodrat		G5T3T4 S1S2	None	None		
+*Neotoma fuscipes annectens* San Francisco dusky-footed woodrat		G5T2T3 S2S3	None	None	CDFW:SSC	
+*Neotoma fuscipes riparia* riparian (=San Joaquin Valley) woodrat		G5T1Q S1	Endangered	None	CDFW:SSC	Yes
+*Neotoma lepida intermedia* San Diego desert woodrat		G5T3T4 S3S4	None	None	CDFW:SSC	

Mammals

Species	Comment	Rank	ESA	CESA	Other Status	Notes
MURIDAE (mice, rats, and voles)						
+*Neotoma macrotis luciana* Monterey dusky-footed woodrat		G5T3 S3	None	None	CDFW:SSC IUCN:DD	
+*Onychomys torridus ramona* southern grasshopper mouse		G5T3 S3	None	None	CDFW:SSC	
+*Onychomys torridus tularensis* Tulare grasshopper mouse		G5T1T2 S1S2	None	None	BLM:S CDFW:SSC	
+*Peromyscus maniculatus anacapae* Anacapa Island deer mouse		G5T1T2 S1S2	None	None	CDFW:SSC	
Peromyscus maniculatus clementis San Clemente deer mouse		G5T1T2 S1S2	None	None	CDFW:SSC	
+*Reithrodontomys megalotis distichlis* Salinas harvest mouse		G5T1 S1	None	None		
+*Reithrodontomys megalotis santacruzae* Santa Cruz harvest mouse		G5T1Q S1	None	None		Yes
+*Reithrodontomys raviventris* salt-marsh harvest mouse		G1G2 S1S2	Endangered	Endangered	CDFW:FP IUCN:EN	
+*Sigmodon arizonae plenus* Colorado River cotton rat		G5T2T3 SH	None	None	CDFW:SSC	
+*Sigmodon hispidus eremicus* Yuma hispid cotton rat		G5T2T3 S2S3	None	None	CDFW:SSC	
DIPODIDAE (jumping mice)						
+*Zapus trinotatus orarius* Point Reyes jumping mouse		G5T1T3Q S1S3	None	None	CDFW:SSC	
CANIDAE (foxes, wolves, and coyotes)						
+*Canis lupus* gray wolf		G4 S1	Endangered	Endangered	IUCN:LC	
Urocyon littoralis island fox	(Mapped by subspecies)	G1 S1	None	Threatened	IUCN:CR	Yes
+*Urocyon littoralis catalinae* Santa Catalina Island fox		G1T1 S1	Endangered	Threatened	IUCN:CR	Yes
+*Urocyon littoralis clementae* San Clemente Island fox		G1T1 S1	None	Threatened	IUCN:CR	Yes
+*Urocyon littoralis dickeyi* San Nicolas Island fox		G1T1 S1	None	Threatened	IUCN:CR	Yes
+*Urocyon littoralis littoralis* San Miguel Island fox		G1T1 S1	Endangered	Threatened	IUCN:CR	Yes
+*Urocyon littoralis santacruzae* Santa Cruz Island fox		G1T1 S1	Endangered	Threatened	IUCN:CR	Yes
+*Urocyon littoralis santarosae* Santa Rosa Island fox		G1T1 S1	Endangered	Threatened	IUCN:CR	Yes
+*Vulpes macrotis mutica* San Joaquin kit fox		G4T2 S2	Endangered	Threatened		
+*Vulpes vulpes necator* Sierra Nevada red fox		G5T1T2 S1	None	Threatened	USFS:S	
MUSTELIDAE (weasels and relatives)						
+*Enhydra lutris nereis* southern sea otter		G4T2 S2	Threatened	None	CDFW:FP IUCN:EN MMC:SSC	Yes
+*Gulo gulo* California wolverine		G4 S1	None	Threatened	CDFW:FP IUCN:NT USFS:S	
+*Lontra canadensis sonora* southwestern river otter		G5T1 S1	None	None	CDFW:SSC	Yes
+*Martes caurina* Pacific marten		G5 S3	None	None	IUCN:LC USFS:S	
+*Martes caurina humboldtensis* Humboldt marten		G5T1 S1	None	None	CDFW:SSC USFS:S	

Mammals

Species	Comment	Rank	ESA	CESA	Other Status	Notes
MUSTELIDAE (weasels and relatives)						
+*Martes caurina sierrae* Sierra marten		G5T3 S3	None	None	USFS:S	
+*Pekania pennanti* fisher - West Coast DPS		G5T2T3Q S2S3	Proposed Threatened	Candidate Threatened	BLM:S CDFW:SSC USFS:S	Yes
+*Taxidea taxus* American badger		G5 S3	None	None	CDFW:SSC IUCN:LC	
MEPHITIDAE (skunks)						
+*Spilogale gracilis amphiala* Channel Islands spotted skunk		G5T3 S3	None	None	CDFW:SSC	
FELIDAE (cats and relatives)						
Lynx rufus pallescens pallid bobcat		G5T3? S3?	None	None		
+*Puma concolor browni* Yuma mountain lion		G5T1T2Q S1	None	None	CDFW:SSC	
OTARIIDAE (sea lions and fur seals)						
+*Arctocephalus townsendi* Guadalupe fur-seal		G1 S1	Threatened	Threatened	CDFW:FP IUCN:NT	
+*Callorhinus ursinus* northern fur-seal		G3 S1	None	None	IUCN:VU	
+*Eumetopias jubatus* Steller (=northern) sea-lion		G3 S2	Delisted	None	IUCN:EN MMC:SSC	
BOVIDAE (sheep and relatives)						
+*Ovis canadensis nelsoni* desert bighorn sheep		G4T4 S3	None	None	BLM:S CDFW:FP USFS:S	Yes
+*Ovis canadensis nelsoni pop. 2* Peninsular bighorn sheep DPS		G4T3Q S1	Endangered	Threatened	CDFW:FP	Yes
+*Ovis canadensis sierrae* Sierra Nevada bighorn sheep		G4T1 S1	Endangered	Endangered	CDFW:FP	

End Notes

Invertebrates

GASTROPODA (Snails, slugs and abalone)

Prophysaon coeruleum

Blue-gray taildropper slug

1) May be a species complex.

ARACHNIDA (Spiders and relatives)

Hubbardia shoshonensis

Shoshone Cave whip-scorpion

1) BLM Sensitive Species list has this species as Trithyreus shoshonensis.

CRUSTACEA, Order Amphipoda (amphipods)

Hyalella muerta

Texas Spring amphipod

1) First North American hypogean hyalellid.

Hyalella sandra

Death Valley amphipod

1) Population in Texas Springs is an accidental introduction. Population in Nevares Springs may be a new species.

INSECTA, Order Coleoptera (beetles)

Trigonoscuta sp.

Doyen's trigonoscuta dune weevil

1) Sometimes referred to as "Trigonoscuta doyeni" which is an unpublished manuscript name.

INSECTA, Order Lepidoptera (butterflies & moths)

Callophrys thornei

Thorne's hairstreak

1) Formerly Mitoura thornei; changed to Callophrys thornei.

Euproserpinus euterpe

Kern primrose sphinx moth

1) Known from 2 sites at the south end of California's Central Valley. Until its rediscovery in Kern Co in 1974, this moth had been thought to be extinct. A 2nd population was recently found in SLO (Xerces Society 2005).

Speyeria zerene myrtleae

Myrtle's silverspot butterfly

1) The USFWS and others have not yet determined if the taxonomic expansion by Emmel and Emmel (1998) into S. z. myrtleae and S. z. puntareyes is warranted. The Speyereia zerene along coast of Marin and Sonoma Counties are Federally Endangered under the subspecies concept in the 1992 listing.

Fishes

ACIPENSERIDAE (sturgeon)

Acipenser medirostris

green sturgeon

1) Federal listing includes all spawning populations south of the Eel River.
2) The NMFS "Special Concern" designation refers to the northern DPS which includes spawning populations north of the Eel River (inclusive).

SALMONIDAE (trout & salmon)

Oncorhynchus kisutch

coho salmon - central California coast ESU

1) The federal listing is limited to naturally spawning populations in streams between Punta Gorda, Humboldt Co. and the San Lorenzo River, Santa Cruz Co.
2) The state listing is limited to Coho south of Punta Gorda, Humboldt Co.

coho salmon - southern Oregon / northern California ESU

1) Federal listing refers to populations between Cape Blanco, Oregon & Punta Gorda, Humboldt Co. California.
2) State listing refers to populations between the Oregon border & Punta Gorda, Humboldt Co. California.

Fishes

SALMONIDAE (trout & salmon)

Oncorhynchus mykiss irideus

southern steelhead - southern California DPS

1) The federal designation refers to fish in the coastal basins from the Santa Maria River (inclusive), south to the U.S. - Mexico Border.
2) The DFG "Species of Special Concern" designation refers to southern steelhead trout.

steelhead - central California coast DPS

1) Federal listing includes all runs in coastal basins from the Russian River in Sonoma County, south to Soquel Creek in Santa Cruz County, inclusive. It includes the San Francisco and San Pablo Bay basins, but excludes the Sacramento-San Joaquin River basins.

steelhead - Central Valley DPS

1) Federal listing includes all runs in the Sacramento & San Joaquin Rivers and their tributaries.

steelhead - Klamath Mountains Province DPS

1) This ESU includes all naturally spawned populations residing in streams between the Elk River in Oregon and the Klamath River in California, inclusive.
2) The SSC designation refers only to the California portion of the ESU and refers only to the summer-run.

steelhead - northern California DPS

1) The federal designation refers to naturally spawned populations residing below impassable barriers in coastal basins from Redwood Creek in Humboldt Co. to, and including, the Gualala River in Mendocino Co.
2) The DFG "Species of Special Concern" designation refers only to the summer-run.

steelhead - south/central California coast DPS

1) Federal listing includes all runs in coastal basins from the Pajaro River south to, but not including, the Santa Maria River.
2) The DFG "Species of Special Concern" designation refers to southern steelhead trout.

summer-run steelhead trout

1) Summer-run steelhead are part of both the Klamath Mountains Province DPS and the Northern California DPS.

Oncorhynchus tshawytscha

chinook salmon - California coastal ESU

1) Originally proposed as part of a larger Southern Oregon & California Coastal ESU. This new ESU was revised to include only naturally spawned coastal spring & fall-run chinook salmon between Redwood Creek in Humboldt Co & the Russian River in Sonoma Co.

chinook salmon - Central Valley fall / late fall-run ESU

1) The Central Valley fall/late fall-run ESU refers to populations spawning in the Sacramento & San Joaquin Rivers and their tributaries.
2) The DFG "Species of Special Concern" designation refers only to the fall-run.

chinook salmon - Central Valley spring-run ESU

1) Federal listing refers to the Central Valley Spring-run ESU. It includes populations spawning in the Sacramento River & its tributaries.

OSMERIDAE (smelt)

Spirinchus thaleichthys

longfin smelt

1) AFS Threatened designation take from: Musick, J.T. et al. 2000. "Marine, Estuarine, and Diadromous Fish Stocks at Risk of Extinction in North America (Exclusive of Pacific Salmonids). Fisheries 25(11):6-30.
2) Federal Candidate status is for the San Francisco Bay-Delta DPS of the longfin smelt.

CYPRINIDAE (minnows and carp)

Lavinia symmetricus ssp. 1

San Joaquin roach

1) Current taxonomy considers this taxon to be a population of Lavinia symmetricus symmetricus, the Sacramento-San Joaquin roach.

Rhinichthys osculus ssp. 1

Amargosa Canyon speckled dace

1) Current taxonomy considers this taxon to be a distinct population of Rhinichthys osculus nevadensis.

Rhinichthys osculus ssp. 2

Owens speckled dace

1) Current taxonomy includes the Benton Valley speckled dace (formerly ssp 4) with the Owens speckled dace.

Fishes

GASTEROSTEIDAE (sticklebacks)

Gasterosteus aculeatus microcephalus

resident threespine stickleback

1) The U.S. Forest Service "Sensitive" designation refers to the full species.

Gasterosteus aculeatus santaannae

Santa Ana (=Shay Creek) threespine stickleback

1) The U.S. Forest Service "Sensitive" designation refers to the full species.

Gasterosteus aculeatus williamsoni

unarmored threespine stickleback

1) The U.S. Forest Service "Sensitive" designation refer to the full species.

POLYPRIONIDAE (wreckfishes)

Stereolepis gigas

giant sea bass

1) AFS Vulnerable designation taken from: Musick, J.T. et al. 2000. "Marine, Estuarine, and Diadromous Fish Stocks at Risk of Extinction in North America (Exclusive of Pacific Salmonids). Fisheries 25(11):6-30.

Amphibians

AMBYSTOMATIDAE (mole salamanders)

Ambystoma californiense

California tiger salamander

1) Central Valley DPS federally listed as threatened. Santa Barbara & Sonoma counties DPS federally listed as endangered.

PLETHODONTIDAE (lungless salamanders)

Batrachoseps relictus

relictual slender salamander

1) Taxonomy follows Jockusch, Martinez-solano, Hansen, Wake (2012. Morphological and molecular diversification of slender salamanders (Caudata: Plethodontidae: Batrachoseps) in the southern Sierra Nevada of California with descriptions of two new species. Zootaxa 3190:130), which synonymized Batrachoseps Sp. 1, Breckenridge Mountain slender salamander, with B. relictus.

Plethodon asupak

Scott Bar salamander

1) Newly described species from what was part of the range of Plethodon stormi (Mead et al. 2005).
2) Since this newly described species was formerly considered to be a subpopulation of Plethodon stormi, and since Plethodon stormi is listed as Threatened under the California Endangered Species Act (CESA), Plethodon asupak retains the designation as a Threatened species under CESA (Calif. Regulatory Notice Register, No. 21-Z, p.916, 25 May 2007).

BUFONIDAE (true toads)

Anaxyrus californicus

arroyo toad

1) Formerly Bufo microscaphus californicus, now considered a full species.
2) At the time of listing, arroyo toad was known as Bufo microscaphus californicus, a subspecies of southwestern toad. In 2001 it was determined to be its own species, Bufo californicus. Since then, many species in the genus Bufo were changed to the genus Anaxyrus, and now arroyo toad is known as Anaxyrus californicus (Frost et al. 2006).

Anaxyrus canorus

Yosemite toad

1) Formerly Bufo canorus; Frost, Grant, Faivovich, Bain, Haas, Haddad, De Sá, Channing, Wilkinson, Donnellan, Raxworthy, Campbell, Blotto, Moler, Drewes, Nussbaum, Lynch, Green & Wheeler (2006. The Amphibian Tree of Life. Bulletin of the American Museum of Natural History 297: 1-370) placed this species in the genus Anaxyrus (Tschudi, 1845). The standard common name remains Yosemite toad.
2) The USFWS published a final rule on April 29, 2014, to list the Yosemite toad as Threatened. The effective date for this rule is June 30, 2014.

Anaxyrus exsul

black toad

1) Formerly Bufo exsul; Frost, Grant, Faivovich, Bain, Haas, Haddad, De Sá, Channing, Wilkinson, Donnellan, Raxworthy, Campbell, Blotto, Moler, Drewes, Nussbaum, Lynch, Green & Wheeler (2006. The Amphibian Tree of Life. Bulletin of the American Museum of Natural History 297: 1-370) placed this species in the genus Anaxyrus (Tschudi, 1845). The standard common name remains black toad.

Amphibians

BUFONIDAE (true toads)

Incilius alvarius

Sonoran desert toad

1) Formerly Bufo alvarius. Between 2006 & 2009 the scientific name has been changed to Cranopsis alvaria, to Ollotis alvaria, to Incilius alvarius, back to Ollotis alvarius and then back to Incilius alvarius. The common name has changed from Colorado River toad to Sonoran desert toad.

RANIDAE

Lithobates pipiens

northern leopard frog

1) Formerly Rana pipiens; Frost, Grant, Faivovich, Bain, Haas, Haddad, De Sá, Channing, Wilkinson, Donnellan, Raxworthy, Campbell, Blotto, Moler, Drewes, Nussbaum, Lynch, Green & Wheeler (2006. The Amphibian Tree of Life. Bulletin of the American Museum of Natural History 297: 1-370) placed this species in the genus Lithobates (Fitzinger, 1843). The standard common name remains northern leopard frog.

Lithobates yavapaiensis

lowland (=Yavapai, San Sebastian & San Felipe) leopard frog

1) Formerly Rana yavapaiensis; Frost, Grant, Faivovich, Bain, Haas, Haddad, De Sá, Channing, Wilkinson, Donnellan, Raxworthy, Campbell, Blotto, Moler, Drewes, Nussbaum, Lynch, Green & Wheeler (2006. The Amphibian Tree of Life. Bulletin of the American Museum of Natural History 297: 1-370) placed this species in the genus Lithobates (Fitzinger, 1843). The standard common name remains lowland leopard frog.

Rana aurora

northern red-legged frog

1) A recent mtDNA study consludes that Rana aurora aurora and Rana aurora draytonii should be recongnized as separate species with a narrow zone of overlap.

Rana draytonii

California red-legged frog

1) A recent mtDNA study concludes that Rana aurora aurora and Rana aurora draytonii should be recongnized as separate species with a narrow zone of overlap, and that the range of draytonii extends about 100 km further north in coastal California than previously thought.

Rana muscosa

southern mountain yellow-legged frog

1) Federal listing refers to populations in the San Gabriel, San Jacinto & San Bernardino Mountains (southern DPS).
2) Federal Proposed status refers to all populations that occur north of the Tehachapi Mountains in the Sierra Nevada (northern DPS). The USFWS published a final rule on April 29, 2014, to list the northern DPS of Rana mucosa as Endangered.This rule becomes effective June 30, 2014.
3) Rana muscosa has been split into Rana sierrae, the Sierra Nevada yellow-legged frog, found in the northern and central Sierra Nevada and Rana muscosa, the southern mountain yellow-legged frog, found in the southern Sierra Nevada and southern California.

Rana sierrae

Sierra Nevada yellow-legged frog

1) Formerly Rana muscosa. Rana muscosa has been split into Rana sierrae, the Sierra Nevada yellow-legged frog, found in the northern and central Sierra Nevada and Rana muscosa, the southern mountain yellow-legged frog, found in the southern Sierra Nevada and southern California.
2) Rana sierrae is a federally proposed endangered species (Apr 2013).
3) The USFWS published a final rule on April 29, 2014, to list the Sierra Nevada yellow-legged frog as Endangered.This rule becomes effective June 30, 2014.

Reptiles

EMYDIDAE (box and water turtles)

Emys marmorata

western pond turtle

1) The paper: Spinks, Phillip Q. & H. Bradley Shaffer. 2005. Range-wide molecular analysis of the western pond turtle (Emys marmorata): cryptic variation, isolation by distance, and their conservation implications. Molecular Ecology (2005) 14, 2047-2064. determined that the current subspecies split was not warranted. Therefore, we are now tracking the western pond turtle only at the full species level.
2) The paper: Spinks, Phillip Q., & H. Bradley Shaffer. 2009. Conflicting Mitochondrial and Nuclear Phylogenies for the Widely Disjunct Emys (Testudines: Emydidae) Species Complex, and What They Tell Us about Biogeography and Hybridization. Systematic Biology. 58(1): pp. 1-20 determined that the correct genus name is Emys.

Reptiles

HELODERMATIDAE (venomous lizards)

Heloderma suspectum cinctum

banded gila monster

1) The BLM "Sensitive Species" designation refers to the full species.

BOIDAE (boas)

Charina trivirgata

rosy boa

1) The Forest Service "Sensitive" designation refers only to the subspecies roseofusca.
2) The taxonomy of this species is in flux. The name Lichanura trivirgata is a synonym. Some sources list several subspecies while others don't recognize any subspecies.

Birds

PHASIANIDAE (grouse and ptarmigan)

Centrocercus urophasianus

greater sage-grouse

1) As of Oct 2013, the Bi-State DPS of greater sage-grouse (Mono Basin; Mono, Alpine, & Inyo Co.) have a federal status of Proposed Threatened; the remaining populations of the species are Candidate.

Dendragapus fuliginosus howardi

Mount Pinos sooty grouse

1) Formerly merged with D. obscurus as blue grouse, but separated on the basis of genetic evidence and differences in voice, behavior, & plumage.
2) The American Bird Conservancy "WatchList of Birds of Conservation Concern" designation refers to the full species.

RALLIDAE (rails, coots, and gallinules)

Laterallus jamaicensis coturniculus

California black rail

1) The American Bird Conservancy "WatchList of Birds of Conservation Concern" designation refers to the full species.
2) The IUCN designation of "Near Threatened" refers to the full species.

Rallus longirostris levipes

light-footed clapper rail

1) The American Bird Conservancy "WatchList of Birds of Conservation Concern" designation refers to the full species.

Rallus longirostris obsoletus

California clapper rail

1) The American Bird Conservancy "WatchList of Birds of Conservation Concern" designation refers to the full species.

Rallus longirostris yumanensis

Yuma clapper rail

1) The American Bird Conservancy "WatchList of Birds of Conservation Concern" designation refers to the full species.

CHARADRIIDAE (plovers and relatives)

Charadrius alexandrinus nivosus

western snowy plover

1) Federal listing applies only to the Pacific coastal population
2) DFG "Species of Special Concern" designation refers to both the coastal & interior populations.
3) USFWS - Birds of Conservation Concern designation refers to non-listed subspecies or populations of Threatened or Endangered species.

Charadrius montanus

mountain plover

1) The 5 Dec 2002 proposal to list the mountain plover as a threatened species was withdrawn by the FWS as of 12 May 2011.

LARIDAE (gulls and terns)

Gelochelidon nilotica

gull-billed tern

1) Taxonomy recently changed from Sterna nilotica

Birds

LARIDAE (gulls and terns)

Hydroprogne caspia

Caspian tern

1) Taxonomy recently changed from Sterna caspia

Sternula antillarum browni

California least tern

1) Taxonomy recently changed from Sterna antillarum browni.
2) The American Bird Conservancy "WatchList of Birds of Conservation Concern" designation refers to the full species.

Thalasseus elegans

elegant tern

1) Taxonomy recently changed from Sterna elegans

ALCIDAE (auklets, puffins, and relatives)

Synthliboramphus scrippsi

Scripps's murrelet

1) Formerly included in Xantus's murrelelt as Synthliboramphus hypoleucus scrippsi, now considered a full species

STRIGIDAE (owls)

Athene cunicularia

burrowing owl

1) A burrow site = an observation of one or more owls at a burrow or evidence of recent occupation such as whitewash and feathers. Winter observations at a burrow are mapped. Winter observations with or without a burrow in San Francisco, Ventura, Sonoma, Marin, Napa & Santa Cruz Counties are mapped.

Strix occidentalis caurina

northern spotted owl

1) There are no northern spotted owl EOs in the CNDDB. All northern spotted owl location information is maintained in a separate data layer. This layer is packaged with the CNDDB layer in BIOS. All RareFind subscribers have access to this information through BIOS (http:BIOS.dfg.ca.gov)
2) The American Bird Conservancy "WatchList of Birds of Conservation Concern" designation refers to the full species.

Strix occidentalis occidentalis

California spotted owl

1) The American Bird Conservancy "WatchList of Birds of Conservation Concern" designation refers to the full species.

TYRANNIDAE (tyrant flycatchers)

Empidonax traillii

willow flycatcher

1) State listing of the full species includes all subspecies
2) USFWS: Birds of Conservation Conern designation refers to non-listed subspecies or populations of Threatened or Endangered species.

Empidonax traillii brewsteri

little willow flycatcher

1) State listing of the full species includes all subspecies
2) The American Bird Conservancy "WatchList of Birds of Conservation Concern" designation refers to the full species.
3) USFWS - Birds of Conservation Concern designation refers to non-listed subspecies or populations for Threatened or Endangered species.

Empidonax traillii extimus

southwestern willow flycatcher

1) State listing of the full species includes all subspecies
2) The American Bird Conservancy "WatchList of Birds of Conservation Concern" designation refers to the full species.

Birds

LANIIDAE (shrikes)

Lanius ludovicianus mearnsi

San Clemente loggerhead shrike

1) Subspecific identity of shrikes currently on San Clemente is uncertain. Mundy et al. (1997a, b) provided evidence L. l. mearnsi is genetically distinct from L. l. gambeli and L. l. anthonyi, whereas Patten and Campbell (2000) concluded, based on morphology, that the birds now on San Clemente are intergrades between L. l. mearnsi and L. l. anthonyi.

VIREONIDAE (vireos)

Vireo bellii arizonae

Arizona bell's vireo

1) The American Bird Conservancy "WatchList of Birds of Conservation Concern" designation refers to the full species.
2) The IUCN designation of 'Near Threatened" refers to the full species.

Vireo bellii pusillus

least Bell's vireo

1) The American Bird Conservancy "WatchList of Birds of Conservation Concern" designation refers to the full species.
2) The IUCN designation of "Near Threatened" refers to the full species.

TROGLODYTIDAE (wrens)

Campylorhynchus brunneicapillus sandiegensis

coastal cactus wren

1) Nomenclature follows the draft DFG Bird Species of Special Concern report.

SYLVIIDAE (gnatcatchers)

Polioptila californica californica

coastal California gnatcatcher

1) AKA Alta California gnatcatcher
2) The American Bird Conservancy "WatchList of Birds of Conservation Concern" designation refers to the full species.

MIMIDAE (mockingbirds and thrashers)

Toxostoma lecontei

Le Conte's thrasher

1) The BLM "Sensitive Species" designation refers to the subspecies Toxostoma lecontei macmillanorum.
2) DFG "Species of Special Concern" designation refers only to the San Joaquin population, AKA T. l. macmillanorum.

PARULIDAE (wood-warblers)

Geothlypis trichas sinuosa

saltmarsh common yellowthroat

1) AKA San Francisco common yellowthroat

Setophaga petechia

yellow warbler

1) This element includes the subspecies S. p. morcormi & S. p. brewsteri, which are tracked under the full species, S. petechia due to difficulty distinguishing them. S. p. sonorana, which nests in California only along the Colorado River is tracked separately.

Setophaga petechia sonorana

Sonoran yellow warbler

1) Nests in California only along the Colorado River. Observations of yellow warblers from other regions are tracked as the full species, S. petechia.

EMBERIZIDAE (sparrows, buntings, warblers, & relatives)

Artemisiospiza belli belli

Bell's sage sparrow

1) The American Bird Conservancy "WatchList of Birds of Conservation Concern" designation refers to the full species.

Artemisiospiza belli clementeae

San Clemente sage sparrow

1) Subspecific validity uncertain. Recognized by AOU (1957), but not by Patten and Unitt (2002).
2) The American Bird Conservancy "WatchList of Birds of Conservation Concern" designation refers to the full species.

Birds

EMBERIZIDAE (sparrows, buntings, warblers, & relatives)

Melospiza melodia graminea

Channel Island song sparrow

1) Subspecific validity is uncertain. This subspecies when referred to as Santa Barbara song sparrow is extinct. However, the subspecies was merged by Patten (2001) with the San Miguel (M. m. micronyx), and San Clemente (M. m. clementae) song sparrows as the Channel Island song sparrow with the subspecific name M. m. graminea.

Melozone crissalis eremophilus

Inyo California towhee

1) Previously was in the genus Pipilo.

Piranga flava

hepatic tanager

1) According to The A.O.U. Check-list of North American Birds, Seventh Edition, this species is probably misplaced in the current phylogenetic listing but for which data indicating proper placement are not yet available.

Piranga rubra

summer tanager

1) According to The A.O.U. Check-list of North American Birds, Seventh Edition, this species is probably misplaced in the current phylogenetic listing but for which data indicating proper placement are not yet available.

ICTERIDAE (blackbirds)

Agelaius tricolor

tricolored blackbird

1) Emergency protection under CESA granted on December 3rd 2014 by the California Fish and Game Commission.

Mammals

PHYLLOSTOMIDAE (leaf-nosed bats)

Leptonycteris yerbabuenae

lesser long-nosed bat

1) Listed by the U.S. Fish & Wildlife Service as Leptonycteris curasoae yerbabuenae.

VESPERTILIONIDAE (evening bats)

Lasiurus blossevillii

western red bat

1) The DFG "Species of Special Concern" designation is based on the draft updated Mammalian Species of Special Concern report.

Lasiurus xanthinus

western yellow bat

1) The DFG "Species of Special Concern" designation is based on the draft updated Mammalian Species of Special Concern report.

OCHOTONIDAE (pikas)

Ochotona princeps schisticeps

gray-headed pika

1) All of the subspecies of pika in California have been synonymized under Ochotona princeps schisticeps.

APLODONTIDAE (mountain beavers)

Aplodontia rufa californica

Sierra Nevada mountain beaver

1) The IUCN "Least Concern" designation refers to the full species.

Aplodontia rufa nigra

Point Arena mountain beaver

1) The IUCN "Least Concern" designation refers to the full species.

Aplodontia rufa phaea

Point Reyes mountain beaver

1) The IUCN "Least Concern" designation refers to the full species.

Mammals

HETEROMYIDAE (kangaroo rats, pockets mice, & kangaroo mice)

Chaetodipus fallax fallax

northwestern San Diego pocket mouse

1) The DFG "Species of Special Concern" desgination refers to the full species.

Chaetodipus fallax pallidus

pallid San Diego pocket mouse

1) The DFG "Species of Special Concern" designation refers to the full species.

Perognathus alticolus alticolus

white-eared pocket mouse

1) The DFG "Species of Special Concern" and the BLM "Sensitive Species" designations refer to the full species.
2) The IUCN "Endangered" designation is at the species level.

Perognathus alticolus inexpectatus

Tehachapi pocket mouse

1) The DFG "Species of Special Concern" designation refers to the full species.
2) The IUCN "Endangered" designation is at the species level.

Perognathus inornatus

San Joaquin Pocket Mouse

1) This element includes the subspecies P. i. inornatus & P. i. neglectus, which are tracked under the full species, P. inornatus due to difficulty distinguishing them. P. i. inornatus generally occurs on the eastern side of San Joaquin Valley, while P. i. neglectus generally occurs on the western side. P. i. psammophilus, which occurs only in the Salinas Valley, is tracked separately.

MURIDAE (mice, rats, and voles)

Neotoma fuscipes riparia

riparian (=San Joaquin Valley) woodrat

1) This species is currently undergoing taxonomic revision

Reithrodontomys megalotis santacruzae

Santa Cruz harvest mouse

1) Synonomous with Reithrodontomys megalotus longicaudus, Santa Cruz Island Population.

CANIDAE (foxes, wolves, and coyotes)

Urocyon littoralis

island fox

1) State listing is at the full species level and includes all subspecies on all islands. Federal listing does not include San Nicolas & San Clemente island subspecies.

Urocyon littoralis catalinae

Santa Catalina Island fox

1) The IUCN "Critically Endangered" designation refers to the full species.

Urocyon littoralis clementae

San Clemente Island fox

1) The IUCN "Critically Endangered" designation refers to the full species.

Urocyon littoralis dickeyi

San Nicolas Island fox

1) The IUCN "Critically Endangered" designation refers to the full species.

Urocyon littoralis littoralis

San Miguel Island fox

1) The IUCN "Critically Endangered" designation refers to the full species.

Urocyon littoralis santacruzae

Santa Cruz Island fox

1) The IUCN "Critically Endangered" designation refers to the full species.

Mammals

CANIDAE (foxes, wolves, and coyotes)

Urocyon littoralis santarosae

Santa Rosa Island fox

1) The IUCN "Critically Endanagered" designation refers to the full species.

MUSTELIDAE (weasels and relatives)

Enhydra lutris nereis

southern sea otter

1) The IUCN "Endangered" designation refers to the full species.

Lontra canadensis sonora

southwestern river otter

1) SSC status refers only to the supspecies L. canadensis sonora, which is known in California only from the Colorado River.

Pekania pennanti

fisher - West Coast DPS

1) The subspecies M. p. pacifica is no longer considered a valid subspecies. The west coast population of the fisher is now considered to be a distinct population segment (DPS).
2) Federal candidate status refers to the distinct population segment (DPS) in Washington, Oregon & California.
3) The Fish and Game Commission Notice of Findings stated that the Pacific fisher was a candidate for listing as either an Endangered or Threatened species. At the 23 Jun 2010 meeting the FGC determined that the listing was not warranted. An 11 Mar 2013 Notice of Findings stated that pursuant to court order, the FGC set aside its 15 Sep 2010 findings rejecting the petition to list, and the Pacific fisher is a candidate species for the purposes of CESA.

BOVIDAE (sheep and relatives)

Ovis canadensis nelsoni

desert bighorn sheep

1) Desert bighorn sheep (O. c. nelsoni) in the Peninsular Ranges are tracked as a metapopulation of the subspecies, Peninsular bighorn sheep DPS (O. c. nelsoni pop. 2)

Ovis canadensis nelsoni pop. 2

Peninsular bighorn sheep DPS

1) The subspecies peninsular bighorn sheep (O. c. cremnobates) has been synonymized with O. c. nelsoni (Wehausen & Ramey 1993). Peninsular bighorn sheep are now considered to be a metapopulation and are recognized has a federal Distinct Population Segment (DPS).

ENVIRONMENTAL PLANNING AND INFORMATION COUNCIL OF WESTERN EL

DORADO COUNTY, INC., Plaintiff and Appellant,

v.

COUNTY OF EL DORADO, Board of Supervisors of the County of El Dorado, Planning

Commission of the County of El Dorado, Defendants and Respondents, Citizens For Sensible

Growth, Intervenor and Respondent, Camino Fruitridge Farmers Association, an

unincorporated association, et al., Intervenors and Respondents.

131 Cal.App.3d 350, 182 Cal.Rptr. 317

Civ. 19741.

Court of Appeal, Third District, California

April 30, 1982

As Modified on Denial of Rehearing May 28, 1982.

Hearing Denied June 30, 1982.

Environmental Planning and Information Council appealed from judgment entered by the Superior Court, El Dorado County, William E. Byrne, J., which upheld board of supervisors' adoption of amendment to general plan. The Court of Appeal, Reynoso, J., assigned, held that Environmental Quality Act generally and standards for preparation of environmental impact reports in particular compel agencies to assess environmental impacts of proposed general plan amendment by comparing the proposal with the actual conditions in the area.

Reversed and remanded with directions.

Puglia, P. J., dissented and filed opinion.

REYNOSO, Justice. [FN*]

FN* Assigned by the Chief Justice.

Environmental Planning and Information Council of Western El Dorado County, Inc., appeals from an adverse judgment on its petition for a writ of mandate and complaint for injunctive relief. Appellant had sought to set aside the El Dorado County Board of Supervisors' (Board) adoption of amendments to its general plan, arguing that the environmental impact reports (EIRs) prepared for use in considering such amendments were inadequate under the California Environmental Quality Act (CEQA). (Pub. Resources Code, s 21000 et seq.) The dispositive issue on this appeal is whether the requirements of CEQA are satisfied when the EIRs prepared for use in considering amendments to the county general plan compare the environmental impacts of the proposed amendments to the existing plan rather than to the existing environment. We hold that the EIRs must report on the impact of the proposed plans on the existing environment. Since we find that the EIRs in this case are inadequate for this purpose we reverse the judgment.

I.

In 1978, the Board adopted the "Greenstone" and "Camino-Fruitridge" area plans as amendments to the county's 1969 general plan and certified that the final EIRs for each of the two area plans had been prepared in compliance with CEQA.

Appellant petitioned the superior court for a writ of mandate to set aside the Board action on the ground, inter alia, that the two EIRs were inadequate.

The trial court agreed with appellant that the EIRs were inadequate, finding that they "should have included comments to the letters received from the general public" and "should have made findings regarding mitigation measures of the significant [environmental] effects." The court further held that the county "should have prepared supplemental EIRs to respond to the changes made in the plans by the Board of Supervisors." The court accordingly issued a writ of mandate.

The county responded to the writ of mandate by preparing supplemental EIRs for the Greenstone and Camino-Fruitridge area plans. On August 1, 1979, the Board held a public hearing to consider the plans in light of the revised EIRs. The Board again adopted the plans and certified that the revised EIRs complied with CEQA.

Appellant filed a supplementary petition for writ of mandate and complaint for injunctive relief contending that the supplemental EIRs were inadequate. The trial court held that the previous deficiencies were cured by the supplemental EIRs and denied the writ and request for an injunction. Appellant seeks reversal of the ensuing judgment.

II.

In interpreting the requirements of CEQA we begin, as we must, with the words of the statutes. The Legislature expressed its intent: "It is the intent of the Legislature that all agencies of the state government which regulate activities of private individuals, corporations, and public agencies which are found to affect the quality of the environment, shall regulate such activities so that major consideration is given to preventing environmental damage, while providing a decent home and satisfying living environment for every Californian." (Pub.Resources Code, s 21000, subd. (g), as amended by Stats.1979, ch. 947, p. 3270, s 4.) The policy of the state was to "ensure the long-term protection of the environment." In order to achieve the enumerated objectives of CEQA, the Legislature mandated preparation (in instances such as the case at bench) of EIRs to provide a detailed statement of "[t]he significant environmental effects of the proposed project" (Pub.Resources Code, s 21100, subd. (a), as amended by Stats.1976, ch. 1312, s 16) on the "physical conditions which exist within the area" (Pub.Resources Code, s 21060.5, defining "environment").

The purposes served by the EIR have been variously explained. The principal purpose, all writers seem to agree, is "to provide public agencies and the public in general with detailed information about the effect which a proposed project is likely to have on the environment; ..." (Pub.Res.Code, s 21061.) The court in Karlson v. City of Camarillo (1980) 100 Cal.App.3d 789, 804, 161 Cal.Rptr. 260, put it this way: "In reviewing an EIR a paramount consideration is the right of the public to be informed in such a way that it can intelligently weigh the environmental consequences of any contemplated action and have an appropriate voice in the formulation of any decision." But public decision makers, too, need the information. EIR's are "... to provide decisionmakers with information which enables them to make a decision which intelligently takes account of environmental consequences." (Cal.Admin.Code, tit. 14, s 15150 (hereafter Guidelines). The EIR serves both the public officials and the public: they are "to inform other governmental agencies, and the public generally, of the environmental impact of a proposed project ... and to demonstrate to an apprehensive citizenry that the agency has in fact analyzed and considered the ecological implications of its action." (No Oil, Inc. v. City of Los Angeles [1974] 13 Cal.3d 68, 86, 118 Cal.Rptr. 34, 529 P.2d 66.)

With the statutory and case law in mind we return to the original legal question: does CEQA generally, and the standards for preparation of EIRs in particular, compel agencies to assess environmental impacts of a proposed general plan amendment by comparing the proposal with the actual conditions in the area? To ask the question, after the above analysis, is to answer it.

CEQA nowhere calls for evaluation of the impacts of a proposed project on an existing general plan; it concerns itself with the impacts of the project on the environment, defined as the existing physical conditions in the affected area. The legislation evinces no interest in the effects of proposed general plan amendments on an existing general plan, but instead has clearly expressed concern with the effects of projects on the actual environment upon which the proposal will operate.

The courts, of course, have so recognized: "[W]e conclude that the Legislature intended the [C]EQA to be interpreted in such manner as to afford the fullest possible protection to the environment within the reasonable scope of the statutory language." (Friends of Mammoth v. Board of Supervisors [1972] 8 Cal.3d 247, 259, 104 Cal.Rptr. 761, 502 P.2d 1049.) "The highest priority must be given to environmental considerations in interpreting the statute." (Plan for Arcadia v. City Council of Arcadia [1974] 42 Cal.App.3d 712, 714, 726, 117 Cal.Rptr. 96.) "In determining environmental impact, agencies must consider the effect of the project on the environment." (Clinton Community Hospital Corp. v. Southern Maryland Medical Center [1974] 374 F.Supp. 450, 456-457.)

III

With the legal requirements of CEQA in mind we turn to a consideration of the adequacy of the particular EIRs involved in this appeal. Our role as a court in this inquiry is well-established. We do "not pass upon the correctness of the EIR's environmental conclusions, but only upon its sufficiency as an informative document. [Citations.]" (County of Inyo v.

City of Los Angeles [1977] 71 Cal.App.3d 185, 189, 139 Cal.Rptr. 396.) Judicial intervention is appropriate only where there has been an abuse of discretion, which will be established if the county has not proceeded in a manner required by law or where the county's decision is not supported by substantial evidence. (Pub.Res.Code, s 21168.5; No Oil, Inc. v. City of Los Angeles, supra, 13 Cal.3d at p. 74, 118 Cal.Rptr. 34, 529 P.2d 66.) Of course, if the EIRs in this case fail to report upon the potential environmental impacts of the Greenstone and Camino-Fruitridge area plans on the existing environment, then the county has not proceeded in a manner required by law.

A. The Greenstone EIR

A review of the Greenstone area plan EIR clearly shows that the thrust of the EIR is to compare the proposed plan with the existing general plan. The introductory "Project Environmental Summary" notes: "Based upon the supporting environmental and socio-economic information, the Plan significantly reduces the potential population capacity as compared to the existing plan capacity." (Greenstone Area Plan & EIR, p. v.) The Supplemental EIR includes the following:

"IRREVERSIBLE ENVIRONMENTAL CHANGES

"The Greenstone Plan and the modification provides for a total population projection of approximately 5800. Total housing units projected for the Greenstone area is approximately 1705. The anticipated buildout date is the year 2032 if maximum zoning classification is realized.

"The Greenstone Plan drastically reduces population holding capacity from 70,400 as per the existing General Plan to a population holding capacity of approximately 5800.

"Realization of the Greenstone Plan will generate and direct growth in certain areas. The Plan is committing specific lands to the irreversible environmental changes due to development."

The rest of the EIR continues in the same manner. The section on "Growth Inducting Impact" simply refers the reader to page 55 of the original Greenstone Plan and EIR which "adequately discuss[es] growth inducing impacts." In turn page 55 of the EIR reads as follows respecting that concern: "GROWTH INDUCTING IMPACT "Implementation of the proposed Area Plan and subsequent specific zoning will tend to direct growth into areas where the least environmental damage will occur. Growth inducement could result within the Plan Area upon completion of this project in that there are many buildable parcels which will continue to have that potential under this new plan. The overall Plan can be looked at as generating a net decrease in growth inducement with respect to the existing General Plan. The overall holding capacity of the proposed Plan will be reduced and, therefore, the extent of development will be likewise decreased."
We note further the portion of the Final EIR which deals with air quality.

The report reads: "The total population at saturation under the existing General Plan would be 70,402. Under the Proposed Plan, it would be 4,303.

This is a 94% reduction in density. This is approximately .75 persons per acre. [P] Staff does not feel that this will have an unfavorable effect on air quality."

B. The Camino-Fruitridge EIR
Like the Greenstone EIR, the Camino-Fruitridge EIR has as its thrust a comparison of the proposed area plan to the existing general plan. In adopting the plan the Board found:
"3. There may be cumulative impacts resulting from an increase in population within certain areas of the Plan which may not be capable of being wholly mitigated. In this regard there are nevertheless economic and social concerns which require that the project be approved; specifically, when balancing the benefits of this project which reduces total population potential in the area and provides for a reasonable but limited growth rate as desired by the majority of the community against potential unmitigated impacts which may result from the long-term cumulative effects of increased housing, this Board determines that it is in the best interest of the community to approve the project having mitigated the environmental damage to the greatest extent possible."
The entire thrust of the EIR may be summarized in the words of the Summary of Environmental Review: "The proposed plan establishes a population holding capacity of 22,440 while the existing plan provides a population holding capacity of

63,600. A substantial population reduction is then realized." Likewise, the Supplemental EIR notes that the proposed amendment reduces the population holding capacity of the general plan and concludes: "Intutively [sic] a population reduction of 65% would decrease any potential impacts by the same percentage."

C. Conclusion

These examples we have cited from the Greenstone and Camino-Fruitridge EIRs are not all-inclusive but are merely illustrative of the manner in which the EIRs were prepared. It is true that the reports do discuss certain physical impacts upon the existing environment, but such information must be painstakingly ferreted out of the reports. The comparisons, we have seen, are always between the existing general plan and the proposed amendments.

The deficiency of the EIRs is manifest when the existing environment is compared to the general plan. The existing general plan designates population capacities of over 63,000 for the Camino-Fruitridge area and over 70,000 for the Greenstone area. In contrast, the proposed amendments designate population capacities of 22,440 for the Camino- Fruitridge area, and 5,800 for the Greenstone areas, both substantial reductions. The comparisons, however, are illusory, for the current populations of those areas are approximately 3,800 for the Camino-Fruitridge area and 418 for the Greenstone area. The proposed plans actually call for substantial increases in population in each area rather than the illusory decreases from the general plan.

The comparisons utilized in the EIRs can only mislead the public as to the reality of the impacts and subvert full consideration of the actual environmental impacts which would result. There are no extensive, detailed evaluations of the impacts of the proposed plans on the environment in its current state. Accordingly, the EIRs fail as informative documents.

The judgment is reversed and the cause remanded to the trial court with directions to issue a writ of mandate in accordance with the views expressed herein.

CARR, J., concurs.

PUGLIA, Presiding Justice, dissenting.

I agree with the major premise of the court's opinion but not with its application to these facts. I concur with the majority's conclusion that an environmental impact report (EIR) as an informative document must include an appraisal of the impacts of the proposed plan upon present conditions in the plan area. I dissent because, contrary to the majority, my review of the two EIR's convinces me that each complies with that imperative.

The majority concludes that the "thrust" of the two EIR's is comparison of the proposed area plans with the theoretical conditions authorized by but unrealized under the existing plans. In support of this hypothesis, the majority extracts snippets from each EIR in which is stated the historically incontrovertible fact that the proposed plans contemplate a significant reduction in the population holding capacity of each area below that presently authorized by the existing plans. Abruptly dismissed as "information [which] must be painstakingly ferreted out of the reports" (maj. opn., p. 321) are the comprehensive treatments of plan impacts and mitigation measures relating to present conditions of soil, geology, hydrology, vegetation, wildlife, air quality, water quality, esthetics and historical and archaeological sites. The discussion of growth inducing impacts is specifically singled out and criticized by the majority for its reference to the substantial theoretical population reductions effected by the new as compared to the old plans. Brushed aside is the express acknowledgement that under the new plans actual growth "could result within the Plan Area[s] upon completion of [these] project[s] in that there are many buildable parcels which will continue to have that potential under [these] new plan[s]."

The majority's utter disregard of the very substantial portions of the two EIR's which deal with the present condition of the environment suggests that any reference to the existing area plans will render future EIR's vulnerable to rejection. However, an EIR must describe all reasonable alternatives to the project including the specific alternative of "no project" (County of Inyo v. City of Los Angeles [1977] 71 Cal.App.3d 185, 200, 203, 139 Cal.Rptr. 396). Although the "no project" alternative here is continuation of the existing area plans, it is the very mention of that alternative which inexplicably provides the occasion for the reversal of this judgment.

Since the board of supervisors was under no misapprehension as to the "thrust" of these two EIR's, I suspect the members will react with bewilderment and frustration to a reversal and remand premised on the "failure" of these EIR's to deal with present environmental conditions. Excerpts from the hearings before the board which culminated in approval of the new area plans demonstrate that their scope was accurately portrayed:

"LAURIE [county counsel]: Okay, and further, in recognizing that the [Greenstone area plan] does, in fact, result in a lesser density ... doesn't the Environmental Impact Report also recognize that there will be an increase in density over what there is, as of today?"
"RAPER [county planner]: Yes, sir. That is correct. The EIR indicates that the present population is approximately 560 persons, the estimated population is approximately 580. The mitigation measures that are contained in the Draft EIR, identify those construction activities that may occur and result in impact upon the plan area itself. That is why mitigation measures are incorporated within the Draft EIR itself.

"LAURIE: Is it then, safe to say, that on the one hand, the EIR does recognize that the project results in a lesser density, that it also, recognizes that there will be an increase in population over what there is today and offers mitigation measures for those impacts?

"RAPER: That's correct. If staff and Board took the position that the reduction in population was the main factor in this hearing, then it would be more appropriate to issue a negative declaration than to continue on with the EIR. And, to me, the staff and the Board recognized the activity and did prepare an EIR to recognize the development activities resulting for the plan area itself...." (Emphasis added.)
The following is extracted from the board hearing of the Camino-Fruitridge area plan:
"LAURIE: Mr. Raper, as in Greenstone, the EIR recognizes that this project results in a decreasing density from the present area plan, is that ....? "RAPER: That is correct. Again, by State law, we have to consider alternative projects and, again, if the project area plan was not adopted, or if no project was considered, the 1969 General Plan would be still effective.

"LAURIE: And, the EIR also recognizes, though, does it not, that under the plan, as proposed, there would be an increase in population over what is present today?

"RAPER: That's correct. That's why the mitigation measures and potential impacts are identified in the EIR.

"LAURIE: So those mitigation measures do pertain to the proposed increase in population over what exists today?

"RAPER: That's correct." (Emphasis in original.)
The trial court also had no difficulty identifying the scope and intent of these EIR's. In denying appellant's petition for writ of mandate, a finding was made that these EIR's "did review the potential impact of the proposed plans as they related to the conditions existing today." These EIR's constitute substantial evidence in support of that finding.

An EIR is but a means to achieve orderly, balanced and rational planning and development through informed public participation in the decisional process.

In its opinion the majority unfortunately subordinates *362 the function of an EIR as an informational document to a sterile formalism in which doctrinal purity assumes decisive importance.

I find no abuse of discretion in denial of the petition for writ of mandate.

I would affirm the judgment.

Hearing denied; RICHARDSON, J., dissenting, REYNOSO, J., did not participate.

CALIFORNIA FARMLAND CONVERSION REPORT 2008-2010

April 2014

Documenting changes in agricultural land use since 1984.

Edmund G. Brown Jr., Governor

John Laird, Secretary, Natural Resources Agency

Mark Nechodom, Director, Department of Conservation

California Department of Conservation
Division of Land Resource Protection (DLRP)

Our Mission:
The Department of Conservation balances today's needs with tomorrow's challenges and fosters intelligent, sustainable, and efficient use of California's energy, land, and mineral resources. DLRP's goal is to lead the change in the value proposition for the conservation of agricultural and open space land in California.

Farmland Mapping and Monitoring Program (FMMP)

The Program:

The Farmland Mapping and Monitoring Program provides consistent, timely, and accurate land use data for assessing present status, reviewing trends, and planning for the future of California's agricultural land resources.

For further information, please contact:

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Photo Credits

Front Cover: Oaks and vineyard along levee, Yolo County (Photo by Molly Penberth)
Figure 9: Vineyard Expansion in the Sierra Foothills (Photo by Troy Dick)
Figure 12: New Dairy Facilities in Kings County (Aerial image by the National Agriculture Imagery Program)

Back Cover: *Northern, central, and southern regional views of California's agricultural diversity*, top to bottom:
Whipple and Plank Ranch, Scott Valley, Siskiyou County (Photo by Larelle Burkham-Greydanus)
Galeazzi Farm walnut orchard, Lockeford, San Joaquin County (Photo by Molly Penberth)
The Flower Fields, Carlsbad, San Diego County (Photo by Molly Penberth)

The Whipple and Plank Ranch and Galeazzi Farm properties are protected in perpetuity by agricultural land conservation easements funded in part by the Department of Conservation's California Farmland Conservancy Program. Funding for these projects was derived from California Bond Propositions 40 and 84.

California Farmland Conversion Report
2008 – 2010

CALIFORNIA DEPARTMENT OF CONSERVATION

DIVISION OF LAND RESOURCE PROTECTION

FARMLAND MAPPING AND MONITORING PROGRAM

APRIL 2014

Acknowledgements

MANY INDIVIDUALS AND ORGANIZATIONS HAVE CONTRIBUTED TO THIS REPORT AND THE GIS DATA FROM WHICH IT WAS DERIVED.

Farmland Mapping and Monitoring Program Staff

Molly Penberth, Manager
Troy Dick
Karen FitzGerald*
Patrick Hennessy
Kerri Kisko
Michael Kisko
Amy Klug*
Judith Santillan*

*Until March 2012. Thanks also to all past FMMP staff members for their cumulative contributions.

Division of Land Resource Protection

John Lowrie, Assistant Director
David Thesell, Deputy Chief
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Principal Data Sources include digital soil survey data, produced by the U.S. Department of Agriculture-Natural Resources Conservation Service; with aerial imagery from the National Agriculture Imagery Program (NAIP), Google Maps, and Google Streetview.

Cultural base information for the Important Farmland Maps was derived from public domain data sets, based upon design of the U.S. Geological Survey, with updates generated by digitizing over current imagery.

Additional data on land management and land use conversion activity was made available from the U.S. Forest Service, California Department of Transportation, the California Energy Commission, and CalRecycle. GIS data posted at county and city websites proved valuable in many locations.

Map reviewer comments contributed substantially to improving the quality of the information. These reviewers include county and city planning offices, county agricultural commissioners, resource conservation districts, Natural Resources Conservation Service district conservationists, California Farm Bureau Federation, University of California Cooperative Extension, California Cattlemen's Association, local water and irrigation districts, public interest groups, and building industry representatives. Many of these groups also participated in development of the Farmland of Local Importance definitions for their respective counties.

NATURAL RESOURCES AGENCY EDMUND G. BROWN JR., GOVERNOR

DEPARTMENT OF CONSERVATION

Managing California's Working Lands

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April 2014

Dear Land Conservation Partner:

On behalf of the Department of Conservation (Department), I am pleased to present the California Farmland Conversion Report 2008-2010. This analysis of agricultural land use conversion trends, based on detailed geographic information system mapping, is the thirteenth biennial report of the Farmland Mapping and Monitoring Program (FMMP).

The FMMP was established in 1982 to document the location and extent of California's important farmlands, and to report on how they change over time. The Important Farmland Maps are used in the planning process to gauge the impact of planning decisions on agricultural land throughout the State. Population projections and today's environmental challenges make this information more important than ever.

Irrigated farmland in California decreased by more than 263 square miles (168,039 acres) between 2008 and 2010. The highest-quality agricultural soils, known as Prime Farmland, comprised 61 percent of the decrease (102,554 acres). Urban land increased by 44,504 acres, a 39 percent decrease relative to the 2006-2008 reporting period. This was the lowest urbanization rate recorded in the program's history, reflecting the impact of the recent economic recession. Long-term land idling was the largest factor contributing to irrigated land decreases, primarily in the southern San Joaquin Valley and in counties surrounding the San Joaquin-Sacramento Delta. The report contains county and regional summaries of the dynamics that occurred beyond the urban edge, providing context for larger planning issues.

Identifying strategic farmland resources is an important first step in maintaining California's agricultural vitality. The Department of Conservation thanks the agricultural organizations and local governments that work with us to produce these useful tools for conservation planning.

Sincerely,

Mark Nechodom
Director

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California Farmland Conversion Report 2008 – 2010

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Executive Summary, 2008-2010

URBANIZATION DECREASED SHARPLY, AND IRRIGATED FARMLAND LOSSES WERE LOWER THAN THE RECORD 2008 LEVELS. LAND IDLING IN THE SOUTHERN SAN JOAQUIN VALLEY WAS THE LARGEST CONTRIBUTOR TO FARMLAND CONVERSION.

Irrigated farmland in California decreased by nearly 263 square miles (168,039 acres) between 2008 and 2010 as documented by the Farmland Mapping and Monitoring Program (FMMP). The highest-quality agricultural soils, known as Prime Farmland, comprised 61 percent of the loss (102,554 acres). Urban development, which totaled 44,504 acres, decreased by 39 percent relative to the 2006-08 period. The 2010 urban land increase was the lowest recorded in the program's history, reflecting impacts of the recent recession.

The FMMP biennial mapping survey covers approximately 98 percent of the privately owned land in the state (49.1 million acres) in 49 counties. Land use information is gathered using aerial imagery and land management data, which is combined with soil quality data in a geographic information system (GIS) to produce maps and statistics. The earliest data for most counties is from 1984.

Urban Development

Of the nearly 70 square miles of new Urban and Built-up land in the state, 44 percent occurred in the Southern California region (19,702 acres). Five out of the top ten urbanizing counties were in Southern California. Riverside County accounted for 13 percent of the state total (5,874 acres). San Diego and Los Angeles each added more than 4,000 acres to their urban totals. The San Joaquin Valley comprised 34 percent of statewide urban increases (15,132 acres). The urban footprints of Kern, Kings, and Fresno counties each expanded by 3,000 acres or more. The San Francisco Bay and Sacramento Valley regions were in third and fourth ranks in terms of urbanization, at 3,735 and 2,973 acres, respectively.

Statewide, irrigated farmland was the source of 11,104 acres or 25 percent of all new urban land. Prime Farmland was impacted at more than twice the rate of lesser quality soils (7,807 acres and 3,297 acres, respectively). Another 30 percent of new urban land came from dryland farming and grazing uses, some of which may have been idled in anticipation of development. The remaining 45 percent was derived from natural vegetation or vacant lands.

2010 URBANIZATION: 44,504 ACRES

- *39 PERCENT LOWER THAN IN 2008*
- *25 PERCENT WAS FROM IRRIGATED FARMLAND AND 30 PERCENT FROM DRYLAND AGRICULTURE*
- *44 PERCENT WAS IN SOUTHERN CALIFORNIA, 34 PERCENT IN THE SAN JOAQUIN VALLEY*

Keeping with historic precedent, the San Joaquin Valley region had the largest proportion of direct irrigated land to urban land conversion (47 percent of its total urban increase). Kern and Tulare counties led in farmland urbanization, at more than 1,600 acres each. Direct irrigated farmland to urban conversions comprised 25 percent of total new urban for both the Sacramento Valley and San Joaquin Valley regions.

Housing and commercial development projects were significantly scaled back in size compared with prior mapping cycles. The largest single development statewide, at about 190 acres, was the Sun City Shadow Hills community in Indio (Riverside County). Community infrastructure such as water control, waste, and energy facilities also expanded. Examples included a single water treatment facility covering 400 acres near Lancaster (Los Angeles County), more than 3,500 acres of water recharge basins in the southern San Joaquin Valley, and a number of small scale renewable energy and landfill facilities in Southern California and the San Joaquin Valley. Federal prison construction in Fresno County added 135 acres to the urban totals.

Agricultural Trends

While urbanization is an important component of agricultural land conversion, economic and resource availability factors also lead to more intensive farming or cessation of land from irrigated uses. Conversion from grasslands to orchards, primarily almonds, was the most widespread form of intensification in 2010. New almonds, vineyards, and row crop plantings were centered in the Sierra foothills of the northern San Joaquin Valley, resulting in expansions of irrigated farmland exceeding 5,000 acres in each of the counties ranging from San Joaquin in the north to Fresno in the south. The Sacramento Valley region was more noted for conversions to high density olive orchards, while vineyards were the primary reason for central coast irrigated land expansions. Riverside County was the only county in the Southern California area with notable new irrigated land acreage, mostly in the form of nurseries and vineyards. Sixty-eight percent of the land brought into irrigated uses in 2010 did not meet Prime Farmland criteria.

Land was removed from irrigated categories—to uses aside from urban—at a rate 3 percent lower than the prior update (260,412 acres in 2008 and 252,473 acres in 2010). Land idling and reversion to dry farming were responsible for more than 84 percent of this type of conversion. The remaining 16 percent were conversions to Other Land, which includes miscellaneous uses such as wetland restoration, aggregate mining, abandoned development projects, and rural residences.

2010 IRRIGATED LAND TRENDS

- *LAND IDLING FOCUSED ON SOUTHERN SAN JOAQUIN VALLEY AND DELTA COUNTIES*
- *NEW IRRIGATED LANDS WERE MOST COMMON IN THE SIERRA FOOTHILLS OF THE NORTHERN SAN JOAQUIN VALLEY*
- *ALMONDS, VINEYARDS, OLIVES, AND ROW CROPS WERE THE PREDOMINANT NEW USES*

The southern San Joaquin Valley and counties in the Sacramento-San Joaquin Delta were most impacted by land idling. Five counties had 10,000 or more acres of this conversion type: Fresno, Kings, Kern, Sacramento, and San Joaquin. Fresno County's reclassification of more than 34,000 acres led all counties. Most of the conversions occurred on the west side of the San Joaquin Valley in association with ongoing drought and salinity related land retirement. Since 2006, water deliveries to federal and state water districts decreased to between 35 percent and 60 percent of their contracted allocations—including a 10 percent limit for federal contractors in calendar year 2009. In the Delta counties of Sacramento and San Joaquin, environmental restoration and anticipated urban development played a larger role in this conversion type. The cessation of irrigation resulted in land being reclassified to Grazing Land or Farmland of Local Importance, which could be reversed if environmental factors change. Another factor leading to conversions away from irrigated uses was dairy expansion. This occurred predominantly in Kings County, with more than 1,100 acres of new dairy facilities added to the county's Farmland of Local Importance total.

Conversion data from 26 years of Important Farmland mapping indicates that for every five acres leaving agricultural use, four convert to Urban Land and one converts to Other Land. This update cycle, conversions to Other Land declined by 2 percent relative to the 2008 period (from 39,959 acres to 39,208 acres). San Joaquin and Sacramento Valley counties accounted for 37 percent and 32 percent of the total, respectively. Large examples of this conversion type included wetland expansions in Fresno and Sutter counties (1,700 and 1,100 acres, respectively). Low density rural residential expansion, totaling just over 5,100 acres in the San Joaquin Valley, was significantly less than the 13,000 acre increase during the 2008 update.

Program Improvements and Challenges

Non-GIS users can now access Important Farmland data via the California Important Farmland Finder[1] (CIFF). The CIFF application was developed by the Department of Conservation's Enterprise Technology Services Division. It provides a number of location search options, as well as the ability to place points, digitize areas of interest, create buffers, and obtain Important Farmland acreages.

Despite the depth of the recent recession, planners at the state and local level have been actively working toward new energy, transportation, and water infrastructure to support the next generation of Californians. Interest in Important Farmland data increased as proposals for solar projects came forward. FMMP analysts responded to requests for evaluation of additional chemical, physical, or water-related data to determine potential productivity limitations at these locations. FMMP provided technical assistance to lead agencies and conducted evaluations of these proposals through the California Environmental Quality Act (CEQA) process on behalf of the Department.

Net Change

Statewide, irrigated farmland decreased by 168,039 acres in 2010, an amount 17 percent lower than the record decline reported in 2008 (203,011 acres). The San Joaquin Valley's nearly 85,000 acre irrigated land decrease accounted for just over 50 percent of the statewide total, while the Sacramento Valley region accounted for 20 percent of the total. Land idling was the single largest reason for land being removed from irrigated categories.

Additional factors contribute to irrigated farmland decreases, such as urbanization, ecological restoration, and gravel mining. While urbanization remained the dominant driver of farmland conversion in Southern California during the 2010 update, land idling and ecological restoration had greater impact on irrigated totals than urbanization in all other regions.

Countering the net loss of irrigated farmland in most counties, there were a few locations with net irrigated land increases in 2010. These were clustered in the eastern foothills of the northern San Joaquin Valley, with Merced County's 5,964 acre increase leading that of adjacent Stanislaus and Madera counties (3,455 acres and 1,181 acres, respectively). These increases were dominated by blocks of orchards or vineyards, the largest nearly four square miles in size. Coastal winegrowing counties and the new olive groves of Tehama County comprised the remaining counties with net positive irrigated totals.

2010 IRRIGATED LAND NET DECREASE: 168,039 ACRES

- *17 PERCENT LOWER THAN IN 2008*
- *50 PERCENT WAS IN THE SAN JOAQUIN VALLEY, 20 PERCENT IN THE SACRAMENTO VALLEY*
- *FRESNO COUNTY'S DECREASE WAS 19 PERCENT OF THE STATEWIDE TOTAL*

1984-2010 Net Land Use Change

During the 13 biennial reporting cycles since FMMP was established, nearly 1.4 million acres of agricultural land in California were converted to nonagricultural purposes. This represents an area larger in size than Merced County,

[1] http://maps.conservation.ca.gov/ciff/

or a rate of nearly one square mile every four days. Nearly 80 percent of this land was urbanized, and 19 percent became one of the miscellaneous land uses grouped into the Other Land category. New water bodies represent the remaining 1 percent of farmland conversion.

The largest losses in agricultural land have been from the Prime Farmland category (662,297 acres). The only agricultural category to increase over the 26 year period has been Unique Farmland (15,766 acres) due to expansion of high value crops—mostly orchards and vineyards—on hilly terrain.

1984-2010 TRENDS

- *1.4 MILLION ACRES HAVE BEEN REMOVED FROM FARMING USES*
- *79 PERCENT OF FARMLAND CONVERSIONS WERE TO URBAN LAND (1.1 MILLION NEW URBAN ACRES)*
- *47 PERCENT OF THE CONVERSIONS WERE FROM PRIME FARMLAND*

FMMP historic data also illustrates trends in agricultural and urban conversion since 1984. Urbanization declined in the periods of recession—the early-to-mid-1990's and the late 2000's. Irrigated farmland acreage decreased in almost every update cycle. Dryland farming and grazing have frequently moved in the opposite direction of irrigated land, as multi-year hydrologic and economic factors influence how much land growers put into production.

As 2012 mapping proceeds, the development of infrastructure to support the next generation of Californians is anticipated to impact its agricultural land resources. The Department of Conservation will continue to support informed planning decisions with timely and accurate agricultural land resource data, capturing these trends as they evolve.

Chapter 1: The Farmland Mapping and Monitoring Program

DOCUMENTING CHANGES IN AGRICULTURAL LAND USE SINCE 1984

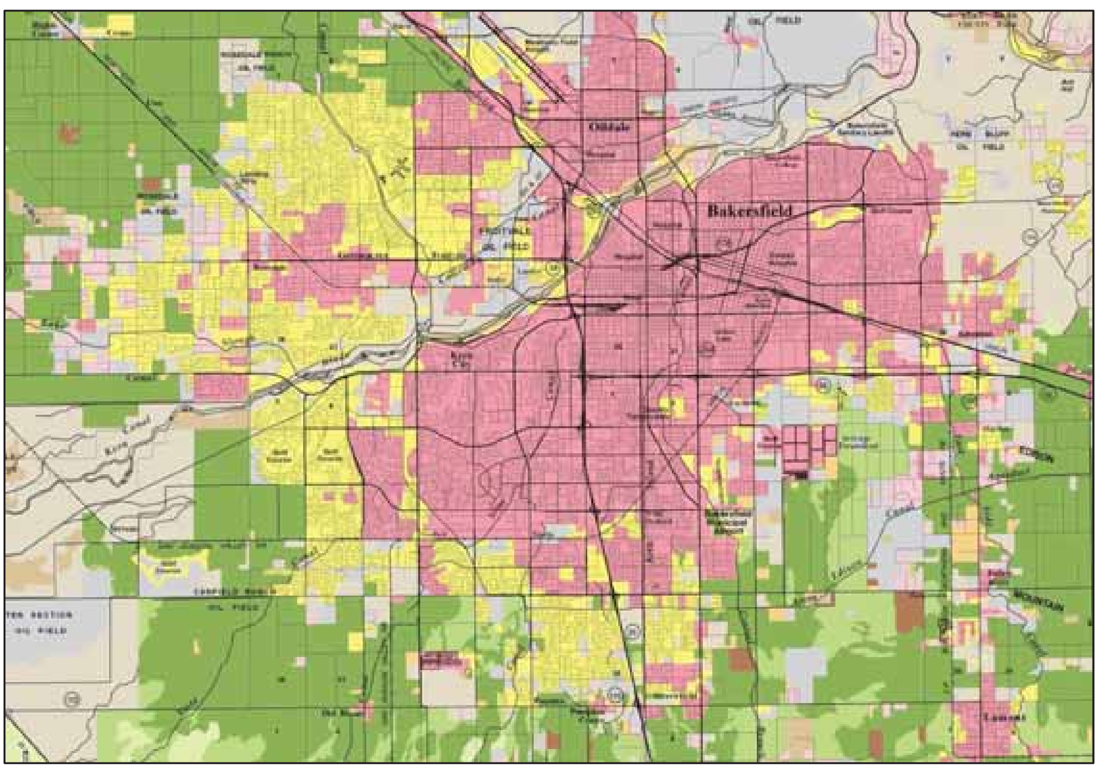
The goal of the Farmland Mapping and Monitoring Program (FMMP) is to provide consistent, timely, and accurate data to decision makers for use in assessing agricultural land resource status in California. The extent of urbanization since mapping was initiated is illustrated in yellow for the Bakersfield area of Kern County (Figure 1).

Approximately 98 percent of the privately owned land in the state (49.1 million acres) was mapped during the 2010 update cycle by FMMP. The survey area is shown on page 7 (Figure 2). Each map is updated every two years, providing an archive to track land use change over time.

Using a geographic information system (GIS), aerial imagery, comments from local agencies, and other information, FMMP combines soil quality data and current land use information to produce Important Farmland Maps. This program is mandated under Government Code Section 65570, and funded through the state's Soil Conservation Fund. This fund receives revenues from Land Conservation Act (commonly referred to as the Williamson Act) contract cancellation fees.

Advances in technology have supported significant FMMP data improvements over the years. Most recently, the California Important Farmland Finder allows users to locate their area of interest on mobile devices and desktops using many different search features. This allows use of the data in the field, complementing the Program's printed maps, PDF maps, statistics, field reports, and GIS data. The maps and data are used in environmental studies to assess the impacts of proposed development on agricultural and open space land. A number of jurisdictions base their agricultural land mitigation requirements on the amounts of Important Farmland affected by

FIGURE 1: URBANIZATION IN THE BAKERSFIELD AREA, KERN COUNTY, 1988-2010



development project conversions. FMMP data is also used in urbanization and environmental modeling, and comparative land cover studies.

In addition, only land that is classified in one of the four main agricultural categories on Important Farmland Maps is eligible for enrollment in Land Conservation Act Farmland Security Zone (FSZ) contracts. Under FSZ contracts, landowners receive substantial property tax benefits in exchange for their commitment to keep their land in agricultural use for 20-year periods.

This is the thirteenth Farmland Conversion Report produced by the FMMP, the current report covering the 2008 to 2010 period.

Important Farmland Map Categories

FMMP's study area coincides with boundaries of U.S. Department of Agriculture (USDA) modern soil surveys. Technical soil ratings and current land use information are combined to determine the appropriate map category. The minimum land use mapping unit for all categories is 10 acres unless otherwise noted. Soil units as small as one acre are maintained to most accurately represent the original USDA data.

Prime Farmland has the best combination of physical and chemical features able to sustain long-term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.

Farmland of Statewide Importance is similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.

Unique Farmland consists of lesser quality soils used for the production of the state's leading agricultural crops. This land is usually irrigated, but may include nonirrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the four years prior to the mapping date.

Farmland of Local Importance is land of importance to the local agricultural economy as determined by each county's board of supervisors and a local advisory committee. The definitions for this category are detailed in Appendix E of this report.

Grazing Land is land on which the existing vegetation is suited to the grazing of livestock. This category was developed in cooperation with the California Cattlemen's Association, University of California Cooperative Extension, and other groups interested in the extent of grazing activities.

Urban and Built-up Land is occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. Common examples include residential, industrial, commercial, institutional facilities, prisons, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, and water control structures.

Water is defined as perennial water bodies with an extent of at least 40 acres.

Other Land is land not included in any other mapping category. Common examples include low density rural developments, vegetative and riparian areas not suitable for livestock grazing, confined animal agriculture facilities, strip mines, borrow pits, and water bodies smaller than 40 acres. Vacant and nonagricultural land surrounded on all sides by urban development and greater than 40 acres is mapped as Other Land. More detailed data on these uses is available in counties containing the Rural Land Use Mapping categories.

Rural Land Use Mapping Categories

The Rural Land Mapping project provides more map and statistical detail than standard Important Farmland Map products by classifying Other Land into five subcategories, as described on page 7. This data is only available in the eight San Joaquin Valley counties and Mendocino County at this time; please see page 23 and the Appendix D tables.

Rural Residential Land includes residential areas of one to five structures per ten acres.

Semi-Agricultural and Rural Commercial includes farmsteads, small packing sheds, unpaved parking areas, composting facilities, firewood lots, and campgrounds.

Vacant or Disturbed Land consists of open field areas that do not qualify for an agricultural category, mineral and oil extraction areas, and rural freeway interchanges.

Confined Animal Agriculture includes aquaculture, dairies, feedlots, and poultry facilities.

Nonagricultural and Natural Vegetation covers heavily wooded, rocky or barren areas, riparian and wetland areas, grassland areas that do not qualify for Grazing Land due to their size or land management restrictions, small water bodies, and recreational water ski lakes. Constructed wetlands are also included in this category. The Rural Land classes are not designed for interpretation as habitat. Geographic data on the extent of habitat for various species may be available from other state and federal entities.

Optional Designation

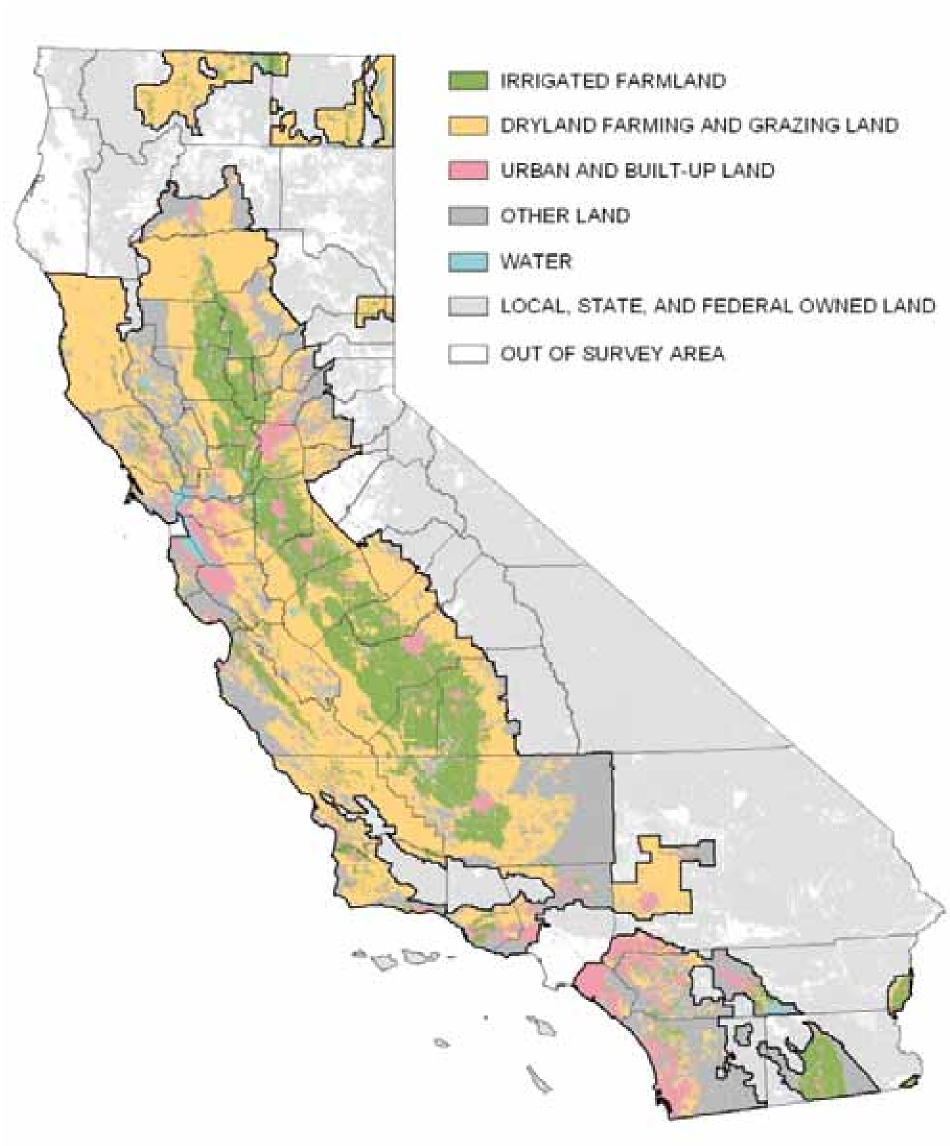
Land Committed to Nonagricultural Use is defined as existing farmland, grazing land, and vacant areas that have a permanent commitment for development. This optional designation allows local governments to provide detail on the nature of changes expected to occur in the future. It is available both statistically and as an overlay to the Important Farmland Map.

Survey Area Coverage

In Figure 2, the 'Irrigated Farmland' area includes the Prime Farmland, Farmland of Statewide Importance, and Unique Farmland categories. The 'Dryland Farming and Grazing Land' designation includes the Farmland of Local Importance and Grazing Land categories.

Locations shown as 'Out of Survey Area' may be added in the future, while those indicated as 'Local, State, and Federal Owned Land' are not planned for incorporation. Examples of government-owned land include National Parks and Forests and Bureau of Land Management property. Please note that small areas of public land are included within the Important Farmland survey area—generally appearing as 'Other Land' on the map.

FIGURE 2: 2010 IMPORTANT FARMLAND SURVEY AREA



Chapter 2: 2010 Improvements and Challenges

A WEB-BASED, SEARCHABLE PLATFORM AND INFRASTRUCTURE SITE ANALYSES HIGHLIGHT NEW TRENDS

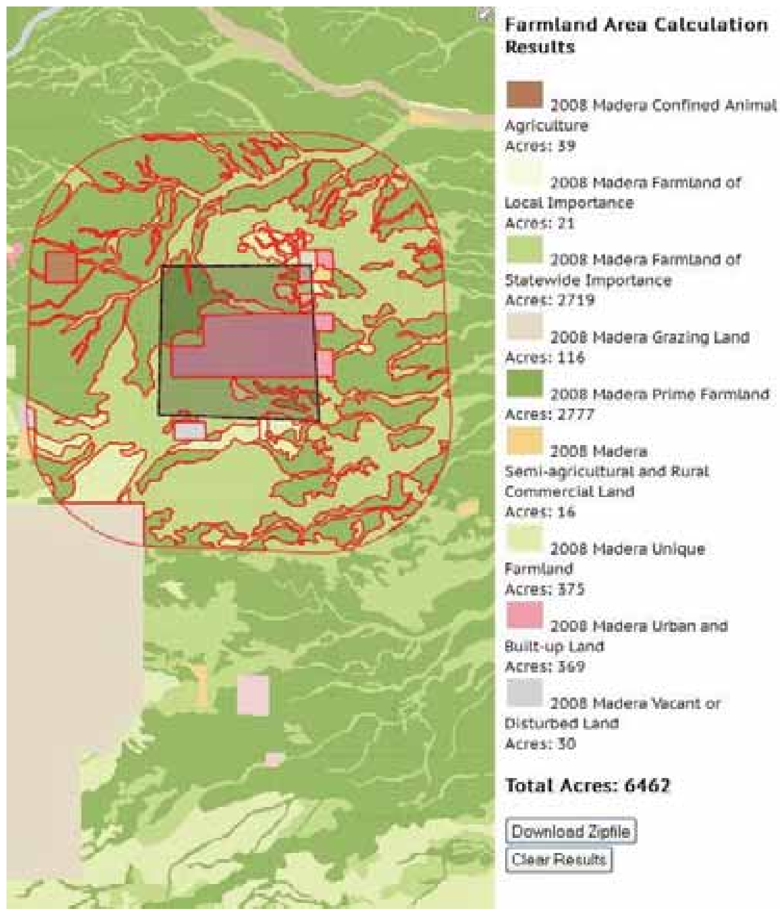
Each update cycle provides the opportunity to make improvements to the Important Farmland data, in order to achieve increased accuracy, process efficiency, or better reporting capabilities. The 2010 mapping cycle posed unique challenges because it coincided with the depth of California's recent recession. Departmental technology support enabled development of more easily accessible Important Farmland data, while FMMP staff focused on evaluating farmland in a larger perspective, in response to changing land use trends.

California Important Farmland Finder (CIFF)

http://maps.conservation.ca.gov/ciff/
The CIFF application was developed by the Department's Enterprise Technology Services Division, as a way to facilitate user access to FMMP data. Searches can be conducted by county, address, Zip Code, lat/long coordinates, or by using the geolocate function on mobile devices. Users may place points, digitize areas of interest, and obtain Important Farmland acreages.

A one mile buffer is available to determine Important Farmland status (Figure 3). This tool provides land sellers and agents the data they need to comply with right to farm real estate disclosure legislation.[2] Data can also be downloaded from CIFF in GIS format.

FIGURE 3: CALIFORNIA IMPORTANT FARMLAND FINDER EXAMPLE
BUFFERED POLYGON AND ACREAGE



Infrastructure for the Next Generation of Californians

Planners at the state and local level are actively working toward development of new energy, transportation, and water infrastructure to support the next generation of Californians. The largest impact of infrastructure projects during the 2010 update was associated with renewable energy generation. Electric utility companies in California are required to have 33 percent of their retail sales derived from renewable sources by 2020.[3] Agricultural land is attractive for siting photovoltaic solar facilities due to its level terrain, existing land disturbance, decreased likelihood of

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[2] AB 2881 (Wolk, Chapter 686, Statutes of 2009).
[3] Public Resources Code, starting with Section 25740.

hosting species of concern, and proximity to transmission lines or substations. The goals of maintaining a vibrant agricultural economy and resource base while meeting the renewable generation standard are of concern to many decision makers. Interest in Important Farmland data increased as proposals for solar projects came forward. FMMP analysts responded to requests for evaluation of additional chemical, physical, or water-related data to determine potential productivity limitations at these locations.

Additional projects expected to have a large footprint on agriculture in the next few years include California High Speed Rail and the Bay-Delta Conservation Plan. FMMP provided technical assistance to lead agencies and conducted evaluations of these proposals through the California Environmental Quality Act (CEQA) process on behalf of the Department.

Chapter 3: Understanding the Data

LOCATING AND INTERPRETING THE CALIFORNIA FARMLAND CONVERSION REPORT'S TABULAR DATA AND GRAPHICS.

Important Farmland information is developed on an individual county basis, taking two years to map the 49.1 million acre survey area. This report begins with each county's information, compiling it in various ways to produce the summary and analysis in Chapter 4.

Source Data: County Conversion Tables - Appendix A

These tables include acreage tallies and conversion statistics for individual counties. Figure 4 depicts how conversion tables are constructed.

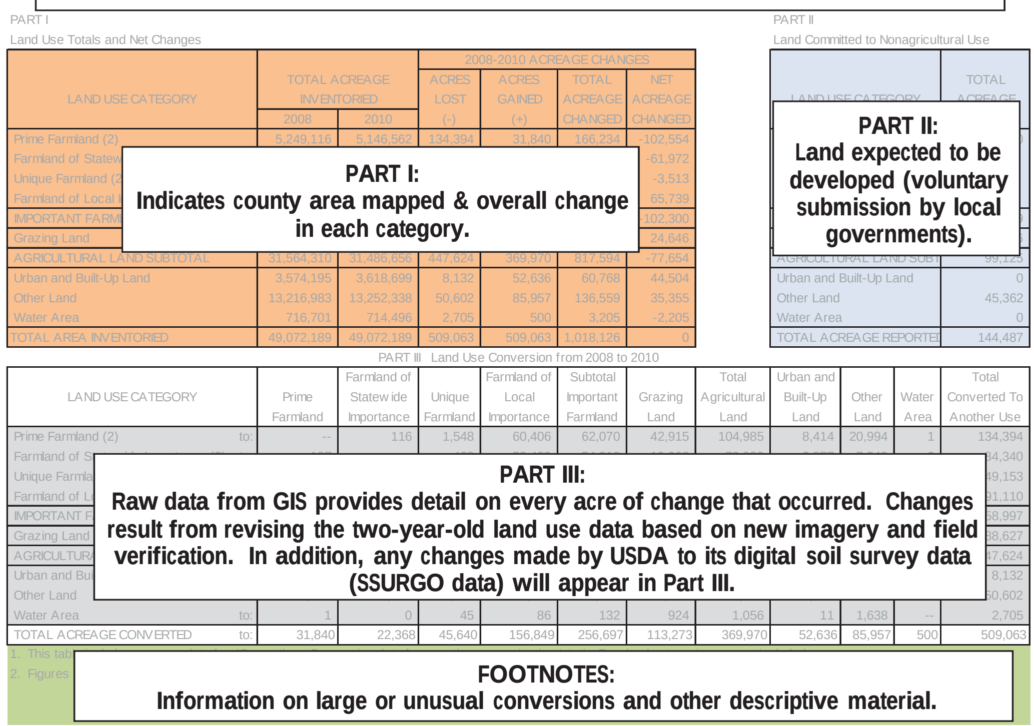
Statewide Conversion – Chapter 4, Table 3

This table summarizes material from all three sections of the Appendix A tables and has the same structure as the individual county tables.

2008 and 2010 County Acreage Tallies – Appendix B

Values for the individual years (Tables B-1 and B-2) are extracted from Part I of the tables in Appendix A. These tables also indicate the proportion of each county that lies within the FMMP survey area—mapping typically ends at the boundaries of National Forests, for example. Table B-3 shows this same information for 2010, grouped by region.

FIGURE 4: CONVERSION TABLE STRUCTURE
FOR COUNTY AND STATEWIDE DATA



County and Regional Conversion Summaries – Appendix C

The counties are grouped into geographic regions as seen in Figure 5. Much of the analysis in Chapter 4 is based on the data in Appendix C.

Table C-1	Classifies sources of new urban land for the period, by county and region.
Table C-2	Identifies conversions in or out of agriculture aside from urbanization, capturing the ebb and flow of agricultural land use change over time.
Table C-3	Documents net agricultural change from all factors, grouped by region and ranked by acreage.

Rural Land Use Mapping Tables – Appendix D

Contains data on changes associated with a more detailed subdivision of the Other Land category. Data is available for nine project counties at this time.

FIGURE 5: REGIONS USED FOR FMMP ANALYSIS

Simplifying Assumptions

In order to conduct comparative analysis, certain simplifying assumptions have been made. For example, Unique Farmland is considered to be an irrigated farmland category, even though a small percentage of land within the Unique Farmland category supports high value nonirrigated crops, such as some coastal vineyards. Conversely, Farmland of Local Importance is considered to be a nonirrigated category although it also supports some irrigated pasture on lower-quality soils.

Statistical Notes

As changes are made to the land use data, there are instances where residual pieces of land are left that are smaller than the 10- or 40-acre minimum land use mapping unit. In order to maintain map unit consistency, these small units are absorbed into the most appropriate adjacent land use type. This process may result in small shifts among categories that appear anomalous in the conversion statistics—such as urban to agriculture or Prime Farmland to Farmland of Statewide Importance.

Once land use and digital soil data are merged to create the Important Farmland data, units of less than 1.0 acre are reclassified into the next most appropriate category to optimize the data files. Tabular data is reported in whole numbers; small variations in category totals may result from rounding to whole numbers.

Particularly large or anomalous changes are footnoted at the bottom of each table. Additional detail is available in the field analyst report produced for each county.

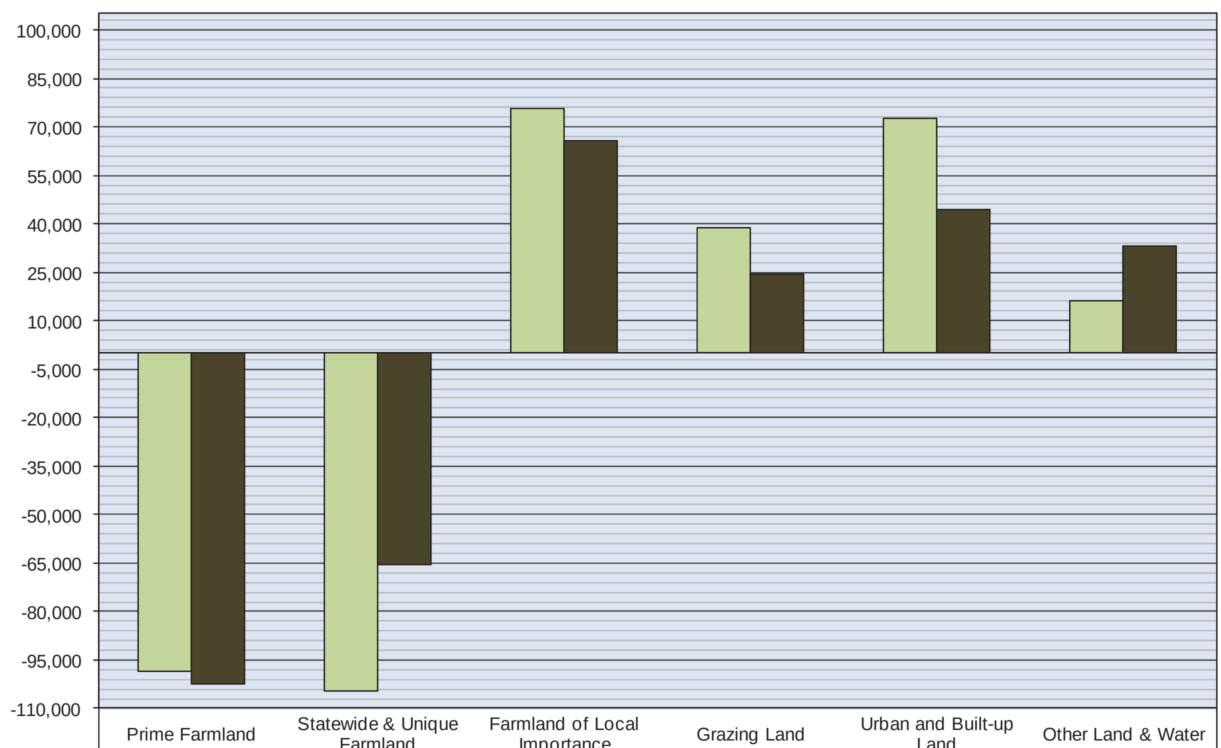
Chapter 4: Land Use Conversion, 2008-2010

URBANIZATION RATES DECREASED SHARPLY, AND IRRIGATED FARMLAND LOSSES DECREASED TO 2004-2006 LEVELS. LAND IDLING IN THE SOUTHERN SAN JOAQUIN VALLEY WAS THE LARGEST CONTRIBUTOR TO FARMLAND LOSS.

California's agricultural landscape continues to evolve in conjunction with economic and resource-related factors. Between 2008 and 2010, urban development impacted 44,504 acres, 39 percent fewer than the 72,548 acres urbanized between 2006 and 2008. Approximately 25 percent of urban conversions were derived from irrigated farmland, and 30 percent from dryland farming and grazing land. The statewide 2008-2010 conversion summary, Table 3, is located on page 15. Comparative changes in important farmland categories for the two most recent update cycles are shown in Figure 6 below.

A total of 168,039 acres were removed from irrigated land uses during the 2010 update; a 17 percent decrease compared with the 203,011 acre irrigated land loss posted in 2008. These totals include the impact of all factors—urbanization, land idling, habitat conversion, and low density rural development. As was the case during the 2006-08 mapping cycle, conversions from irrigated land to Grazing Land and Farmland of Local Importance exceeded urban land conversions. The location of idled lands likely indicates water availability issues in parts of the state, and is discussed later in this chapter.

FIGURE 6: STATEWIDE IMPORTANT FARMLAND CONVERSION SUMMARY (ACRES)



	Prime Farmland	Statewide & Unique Farmland	Farmland of Local Importance	Grazing Land	Urban and Built-up Land	Other Land & Water
2006-2008	-98,471	-104,540	75,622	38,836	72,548	16,005
2008-2010	-102,554	-65,485	65,739	24,646	44,504	33,150

Urbanization

2008-2010 Source Data: Appendix Table C-1

Southern California and San Joaquin Valley counties comprised the top ten urbanizing list during the 2010 Important Farmland update, as Riverside County continued to lead in overall urbanization (Table 1). Four other counties in the region remained in the top ranks: San Diego, Los Angeles, San Bernardino, and Orange. In total, Southern California accommodated 44 percent of the State's urbanization between 2008 and 2010. Five of the San Joaquin Valley counties completed 2010's top ten list. Bay Area, Foothill, and Sacramento Valley counties were absent from the top urbanizing list in 2010. Most counties had lower urbanization totals than during the prior update, many decreasing by significant amounts.

Although only two regions appeared in the top ten list, overall urbanization was slightly more dispersed during the 2010 update—while the top ten counties hosted 74 percent of statewide urban growth during 2008, the figure was 71 percent during the 2010 update.

TABLE 1: COUNTY URBANIZATION RANKS

Urbanization from All Categories

Top Ten Counties - net acres

2006-2008		2008-2010	
Riverside	15,139	Riverside	5,874
Kern	9,356	San Diego	4,646
San Bernardino	7,005	Los Angeles	4,024
San Diego	5,184	Kings	3,627
Orange	3,614	Kern	3,203
Los Angeles	2,881	Fresno	3,186
Placer	2,853	San Bernardino	2,180
San Joaquin	2,698	Tulare	1,997
Sacramento	2,391	San Joaquin	1,400
Contra Costa	2,371	Orange	1,249

Regional rankings were again dominated by Southern California and the San Joaquin Valley (Table 2). Although both regions showed a decline in urbanization relative to the 2006-08 period, Southern California's decrease was larger—dropping by 45 percent, compared to the 22 percent drop for the San Joaquin Valley. The Sierra Foothill region experienced the largest drop in urbanization, 92 percent, due to a near halt of development in Placer County. The increased rate of development in the North State region was primarily due to recreational facilities, including golf course resorts in Lake and Modoc counties.[4] The Central Coast region's growth rate was nearly identical in both updates.

TABLE 2: REGIONAL URBANIZATION RANKING

Urbanization From All Categories

net acres

2006-08		2008-10	
SOUTHERN CALIFORNIA	36,043	SOUTHERN CALIFORNIA	19,702
SAN JOAQUIN VALLEY	19,346	SAN JOAQUIN VALLEY	15,132
SAN FRANCISCO BAY	5,807	SAN FRANCISCO BAY	3,735
SACRAMENTO VALLEY	5,493	SACRAMENTO VALLEY	2,973
SIERRA FOOTHILL	3,906	CENTRAL COAST	1,419
CENTRAL COAST	1,479	NORTH STATE	1,224
NORTH STATE	474	SIERRA FOOTHILL	319

Housing and commercial developments were the most common new urban land uses. New planned developments consisted of single family homes along with schools, parks, and neighborhood commercial uses. The scale of projects was reduced compared to prior updates. While projects of 400 to 600 acres were common earlier in the decade, the largest 2010 example, 190 acres, occurred in

[4] Langtry Farms and Vineyard private golf course in Lake County, and an expansion of Likely Place RV and Golf Resort in Modoc County.

TABLE 3
CALIFORNIA FARMLAND CONVERSION SUMMARY
2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

Farmland Mapping and Monitoring Program

PART I
Land Use Totals and Net Changes

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED (1)		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	5,249,116	5,146,562	134,394	31,840	166,234	-102,554
Farmland of Statewide Importance	2,683,573	2,621,601	84,340	22,368	106,708	-61,972
Unique Farmland	1,335,387	1,331,874	49,153	45,640	94,793	-3,513
Farmland of Local Importance	3,120,278	3,186,017	91,110	156,849	247,959	65,739
IMPORTANT FARMLAND SUBTOTAL	12,388,354	12,286,054	358,997	256,697	615,694	-102,300
Grazing Land	19,175,956	19,200,602	88,627	113,273	201,900	24,646
AGRICULTURAL LAND SUBTOTAL	31,564,310	31,486,656	447,624	369,970	817,594	-77,654
Urban and Built-up Land	3,574,195	3,618,699	8,132	52,636	60,768	44,504
Other Land	13,216,983	13,252,338	50,602	85,957	136,559	35,355
Water Area (1)	716,701	714,496	2,705	500	3,205	-2,205
TOTAL AREA INVENTORIED	49,072,189	49,072,189	509,063	509,063	1,018,126	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	9,980
Farmland of Statewide Importance	1,922
Unique Farmland	3,064
Farmland of Local Importance	27,613
IMPORTANT FARMLAND SUBTOTAL	42,579
Grazing Land	56,546
AGRICULTURAL LAND SUBTOTAL	99,125
Urban and Built-up Land	0
Other Land	45,362
Water Area	0
TOTAL ACREAGE REPORTED	144,487

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	116	1,548	60,406	62,070	42,915	104,985	8,414	20,994	1	134,394
Farmland of Statewide Importance	to:	127	--	468	53,423	54,018	19,902	73,920	2,877	7,543	0	84,340
Unique Farmland	to:	551	204	--	16,262	17,017	20,357	37,374	1,109	10,670	0	49,153
Farmland of Local Importance	to:	17,072	12,112	15,393	--	44,577	19,983	64,560	8,593	17,946	11	91,110
IMPORTANT FARMLAND SUBTOTAL		17,750	12,432	17,409	130,091	177,682	103,157	280,839	20,993	57,153	12	358,997
Grazing Land	to:	7,277	6,188	22,825	22,660	58,950	--	58,950	6,917	22,735	25	88,627
AGRICULTURAL LAND SUBTOTAL		25,027	18,620	40,234	152,751	236,632	103,157	339,789	27,910	79,888	37	447,624
Urban and Built-up Land (2)	to:	607	292	397	669	1,965	1,594	3,559	--	4,431	142	8,132
Other Land	to:	6,205	3,456	4,964	3,343	17,968	7,598	25,566	24,715	--	321	50,602
Water Area (1)	to:	1	0	45	86	132	924	1,056	11	1,638	--	2,705
TOTAL ACREAGE CONVERTED	to:	31,840	22,368	45,640	156,849	256,697	113,273	369,970	52,636	85,957	500	509,063

(1) Conversion to other categories in San Luis Obispo and Santa Barbara counties due to upper reaches of Twitchell Reservoir being dry and used for other purposes in most years.
(2) Conversion from Urban and Built-up Land due to multiple factors, including cropping in former water retention basins, abandonment of urban uses for three or more update cycles, and the use of detailed digital imagery to delineate more distinct urban boundaries.

Indio, Riverside County.[5] Golf course construction was also significantly scaled back, with FMMP field analyst reports citing at most one or two facilities per county. The peak of golf course development occurred between 2000 and 2002, as large percentages of new urban land in Riverside and San Diego counties (25 percent and 14 percent, respectively) consisted of golf-related communities.[6]

> **LAND USE CONVERSION EXAMPLES**
>
> *EXAMPLES IN THIS REPORT DESCRIBE LARGE OR PARTICULARLY NOTABLE CHANGES, AND DO NOT FULLY ACCOUNT FOR THE EXTENT OF CHANGE IN EACH COUNTY MAP.*
>
> *PLEASE REFER TO FMMP FIELD ANALYST REPORTS ON THE PROGRAM WEB SITE FOR MORE DETAILED INFORMATION.*

Schools, parks, and shopping centers individually occupy relatively small footprints but occurred frequently and in many locations. The largest single school example was an 80 acre campus in San Bernardino County.[7] Distribution centers and industrial developments were much less frequent during the 2010 update. The most notable change was approximately 110 acres of airport-related construction in San Bernardino County.[8]

Infrastructure development was dominated by water control, waste, and energy services. Water treatment plants, storage ponds, groundwater recharge ponds, and evaporation basins were most commonly constructed in central and southern California. Such facilities totaled more than 2,000 acres in Kings County, more than 1,500 acres in Kern County, and 400 acres for a single water treatment facility near the city of Lancaster, Los Angeles County. Landfill and transfer yard expansions were few in number and size this update. Scattered, ten-acre expansions occurred around the state, and the largest single example, 50 acres, occurred in San Joaquin County.[9] Photovoltaic solar facilities of 50 acres or more occurred in Fresno and Riverside counties. At 170 acres, the largest solar project constructed was in Blythe, Riverside County. Additional solar facilities were breaking ground at the end of the 2010 update. These projects will be documented as conversions in the 2012 edition of the maps.

Urbanization's impact on irrigated farmland was significantly lower during the 2010 mapping cycle (Table 4 and Appendix Table C-1). Kern County hosted approximately 300 acres of new homes on former farmland in the Bakersfield area, while other jurisdictions converted between 10 and 50 acres each for residential and commercial purposes. New water control facilities occupied nearly 1,000 acres of irrigated land in Kern County, in the Calders Corner, Pumpkin Center, Strand Oil Field, and Rosamond areas.

TABLE 4: IRRIGATED FARMLAND TO URBAN RANKS

Irrigated Farmland to Urban

Top Ten Counties - net acres

2006-2008		2008-2010	
Kern	3,637	Kern	1,661
Riverside	3,267	Tulare	1,634
San Joaquin	2,006	Fresno	1,246
Tulare	1,526	Riverside	1,178
Fresno	1,409	Kings	1,004
San Bernardino	1,247	San Joaquin	824
Orange	1,131	San Bernardino	331
Stanislaus	639	Stanislaus	328
Imperial	633	Imperial	280
Sacramento	603	Ventura	267

In second ranking Tulare County, the Ridge Creek Dinuba Golf Course and Visalia Riverway Sports Park were notable additions to the urban footprint. Visalia, Tulare, and Porterville each added a mix of residential, commercial, and community facilities. Fresno County's

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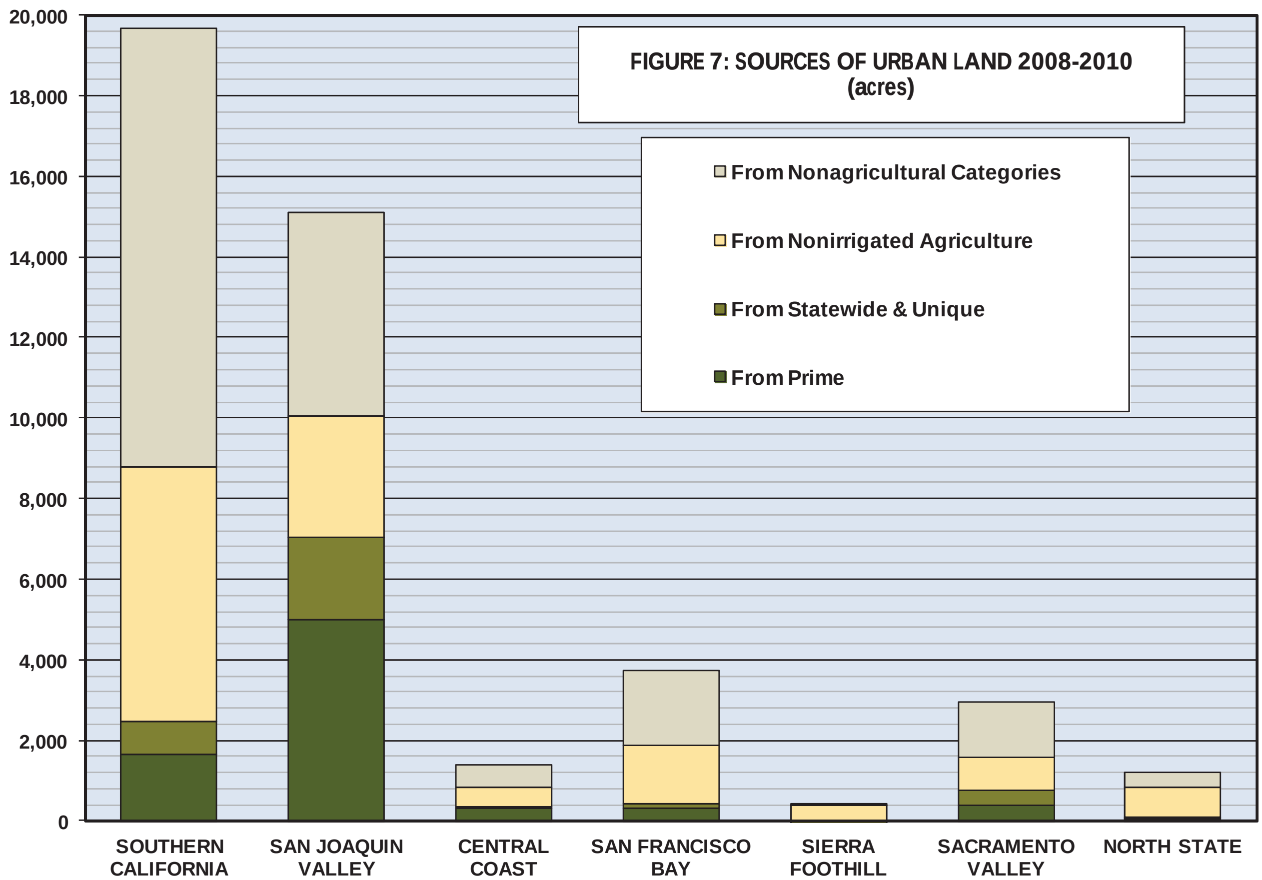
5 Sun City Shadow Hills Community.
6 California Farmland Conversion Report 2000-2002.
7 Oak Hills High School in Hesperia.
8 Two large structures at the Southern California Logistics Center, Victorville.
9 Austin Road Landfill in San Joaquin County.

notable conversions of irrigated farmland to urban uses included 135 acres at the Mendota Federal Correction Facility,[10] and nearly 300 acres each for new home development in the cities of Clovis and Fresno.

Tulare County was notable as having the highest proportion of urban development on Prime Farmland (72 percent) statewide, followed by Monterey County (69 percent).

All told, 33 percent of new urban land in the San Joaquin Valley came from Prime Farmland, and an additional 16 percent came from Farmland of Statewide Importance and Unique Farmland during the 2008-10 period. These statistics continue a trend in which Prime and irrigated farmland is being impacted at lower proportions compared to prior updates. As recently as 2002-04,[11] 48 percent of urbanization in the region was derived from Prime Farmland, and 13 percent came from Farmland of Statewide Importance and Unique Farmland. However, the proportion of new urban lands in the Valley located on idled farmland and grazing land has increased, from 18 percent during the 2008 cycle to 20 percent in the 2010 update. This may reflect a recession-induced lag time in the project development process.

Statewide, 25 percent of urbanization took place on irrigated farmland (18 percent Prime Farmland, 7 percent on lesser quality soils). Another 30 percent came from dryland farming and grazing uses, some of which may have been idled in anticipation of development. The relative location and type of land converted to urban uses is shown graphically in Figure 7.



[10] http://www.bop.gov/locations/institutions/men/index.jsp
[11] California Farmland Conversion Report 2002-2004.

Other Changes Affecting Agricultural Land

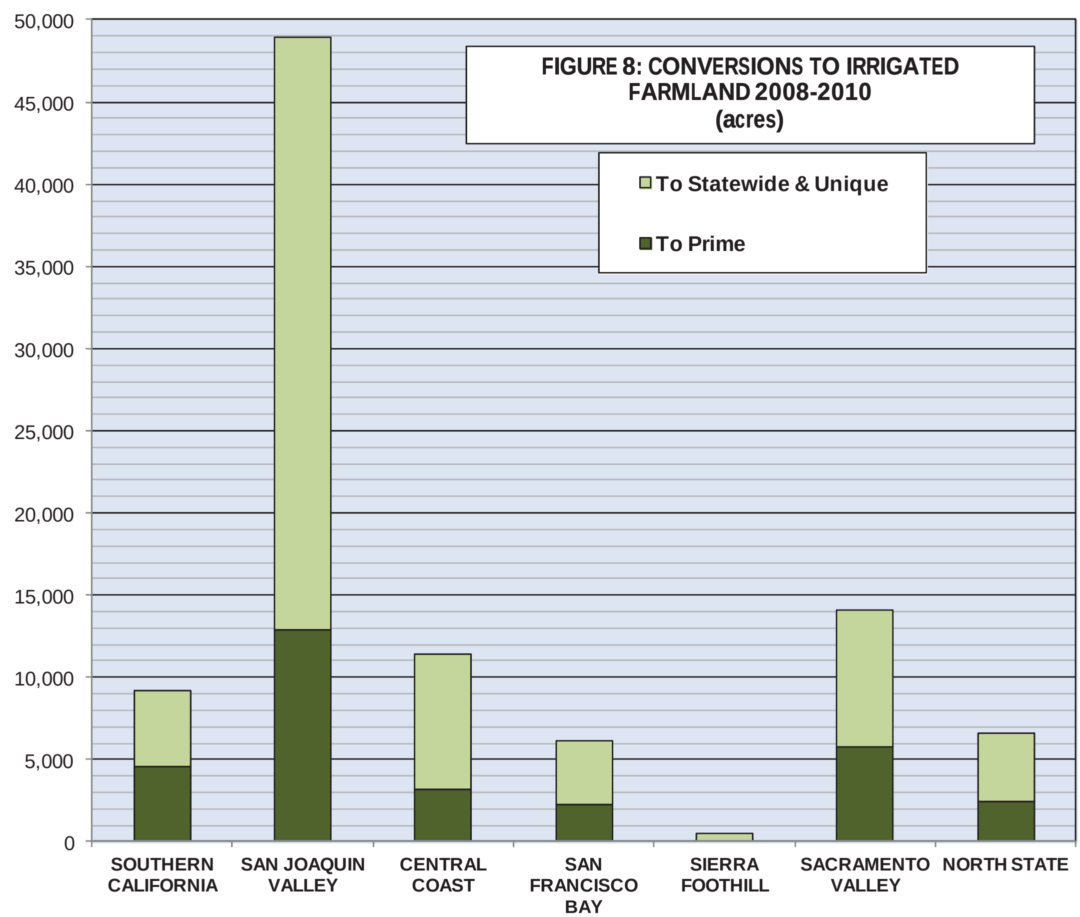
2008-2010 Source Data: Appendix Table C-2

A major goal of the Important Farmland mapping project is to track long-term trends in agricultural land resource use. The biennial reporting of these trends to the Legislature is statutorily mandated under Government Code Section 65570. While urbanization is an important component, economic and resource availability factors also lead to lands being more intensively farmed or being taken out of irrigated use. Appendix Table C-2 documents the extent to which these factors affected the data during the 2008-10 mapping cycle.

Land is converted to irrigated agricultural use when dry pastures or natural vegetation are converted, or when idled land is brought back into production. Conversions to irrigated categories totaled 99,834 acres between 2008 and 2010, an increase of 22 percent from the prior cycle. Nearly 68 percent of the land brought into agricultural use did not meet the criteria for Prime Farmland. Throughout the history of the Program, newly irrigated land has ranged between 65 percent and 70 percent non-Prime Farmland.

San Joaquin Valley counties accounted for 51 percent of the land brought into irrigated uses (Figure 8), while the Sacramento Valley and the Central Coast comprised 15 percent and 12 percent, respectively.

Five counties had irrigated land expansions in excess of 5,000 acres: Fresno, Madera, Merced, San Joaquin, and Stanislaus (Appendix Table C-2). Many of the additions were almond orchards along the Sierra Nevada foothills in the zone between San Joaquin and Madera counties. Almond acreage has continued to expand throughout the past decade due to strong market conditions. The California Almond Board reports a



statewide increase from 605,000 planted acres in the year 2000 to 805,000 acres in 2010.[12] County Agricultural Commissioner Reports document new almond plantings between 2008 and 2010 of 6,200 acres in Merced County and more than 16,000 acres in Stanislaus County.[13]

Other crops most commonly associated with irrigated land increases include high value vineyards, walnut orchards, and vegetable crops. Vegetable crop examples from Merced County[14] include expansions in tomatoes and sweet potatoes of nearly 3,000 acres each between 2008 and 2010. Cotton is another major crop that was not popular early in the decade due to pest-related and market issues, but statewide acreage has rebounded, including a Merced County increase of more than 4,200 acres between 2008 and 2010. Annually cropped lands that were idled due to pest or market-related issues may be brought back into production under improved circumstances. These changes would contribute to irrigated land acreage increases mapped during the FMMP biennial update.

FIGURE 9: VINEYARD EXPANSION IN THE SIERRA FOOTHILLS, STANISLAUS COUNTY

The largest irrigated land expansions in the Sacramento Valley occurred in Glenn and Tehama counties, at more than 3,400 acres each. FMMP has documented almond orchard expansion on the western side of the Sacramento Valley since the 2004 map update. During the 2010 update, olive orchards were the most notable new agricultural use. County crop reports document olive acreage increases of more than 64 percent in Glenn County and 28 percent in Tehama County between 2008 and 2010.[15] New high-density planting and mechanical harvesting systems allow orchards to reach full production in a shorter time frame while reducing labor costs. The largest olive processing facility in the United States was recently constructed in Glenn County,[16] which is likely to lead to additional orchard acreage as the market increases for the award-winning olive oil harvested from these trees.

The central coast counties of Monterey, San Luis Obispo, and Santa Barbara each had increases of more than 3,000 acres in their irrigated farmland footprint. Much of this growth was associated with vineyards and limited vegetable crop expansions. Southern California's irrigated farmland increases were largest in Riverside County, at just over 4,100 acres. Vineyard development and land devoted to nurseries were the primary increases. The Temecula, Hemet, San Jacinto, Perris, and La Quinta areas hosted most of these increases.

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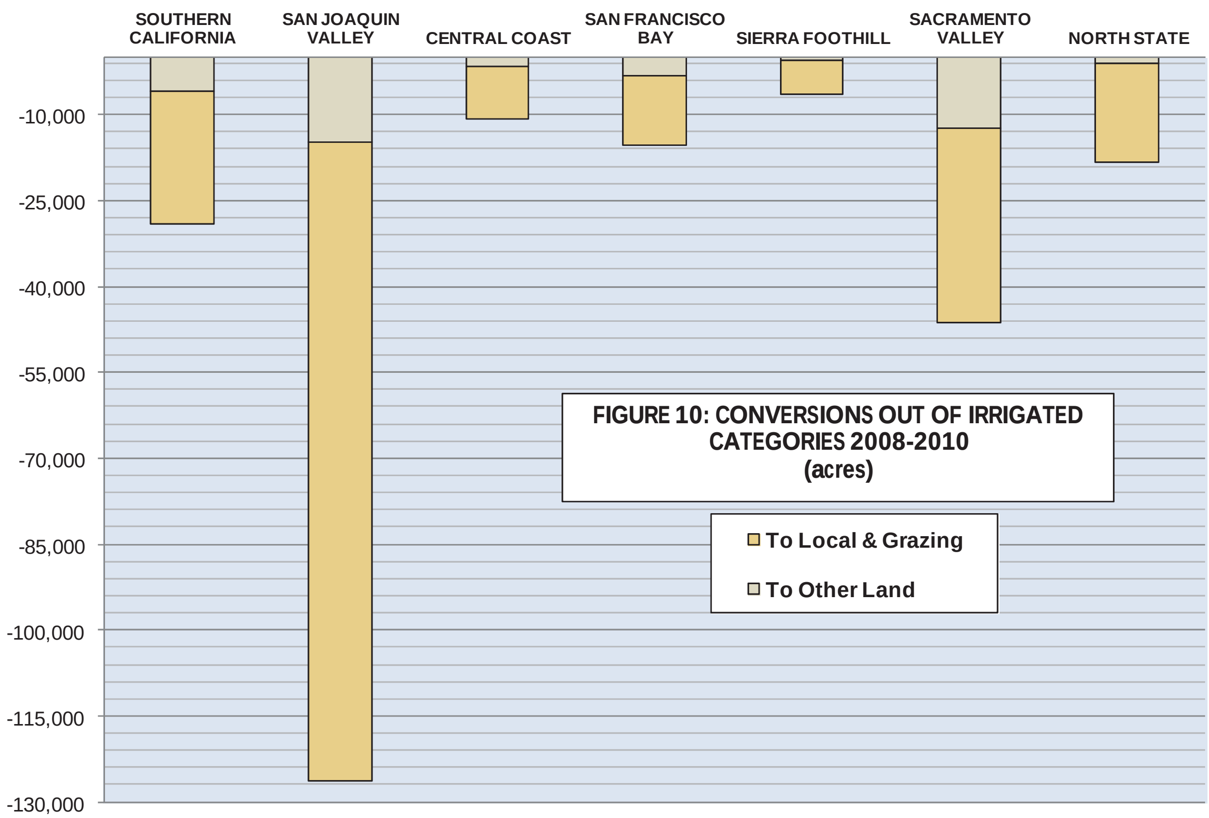
12 http://www.almondboard.com/AbouttheAlmondBoard/Documents/ALM110600_Almanac2011_LR.pdf
13 http://www.co.merced.ca.us/Archive.aspx?AMID=36 and http://www.stanag.org/crop-reports.shtm
14 http://www.co.merced.ca.us/Archive.aspx?AMID=36
15 http://westernfarmpress.com/orchard-crops/california-olive-oil-deemed-world-class-acreage-expands
16 http://www.oliveoiltimes.com/olive-oil-business/north-america/vossen-california-olive-oil-production-will-set-a-new-record/8434

Land is removed from irrigated categories through urbanization, conversion to Other Land, or reclassification to a dryland agriculture class (Grazing Land and Farmland of Local Importance). Urban reclassifications were discussed at the beginning of Chapter 4.

Reclassifications to Grazing Land or Farmland of Local Importance due to land idling or long-term dryland farming decreased by 3 percent compared with the 2008 mapping cycle (Figure 10). Reclassifications of this type stood at 220,453 acres in 2008 and 213,265 acres in 2010. During both mapping cycles, the San Joaquin Valley experienced the vast majority of the long-term land idling.

Five counties had 10,000 or more acres of this conversion type: Fresno, Kings, Kern, Sacramento and San Joaquin. Fresno County's reclassification of more than 34,000 acres led all counties, representing 16 percent of the statewide total for this conversion type. Most of the conversions that occurred on the west side of the San Joaquin Valley were associated with ongoing drought and salinity-related land retirement. Deliveries of irrigation water to federal water districts dropped from 100 percent in 2006 to less than 50 percent in each of the subsequent years—including a 10 percent allocation in calendar year 2009.[17] Similarly, State Water Project deliveries ranged between 35 percent and 60 percent between 2007 and 2010.[18]

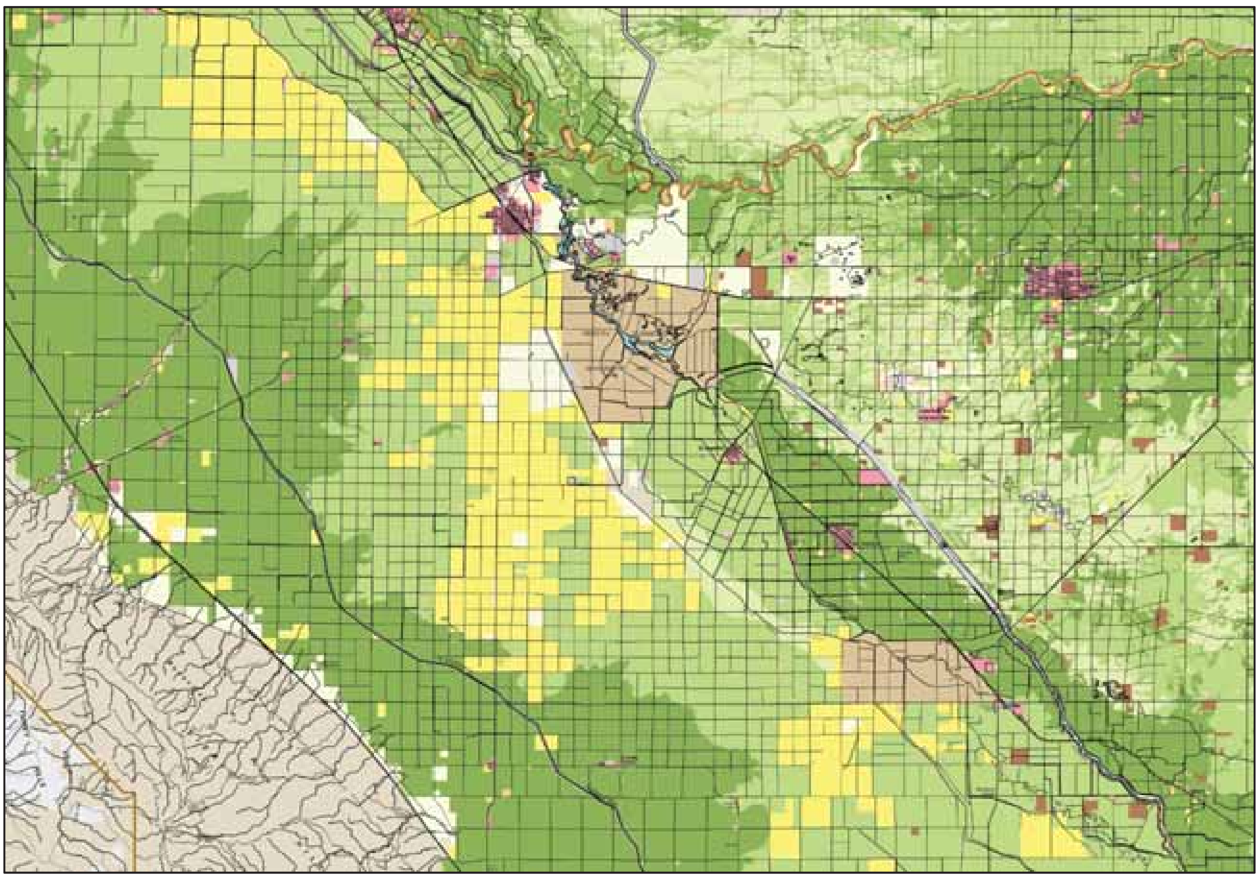


[17] http://www.usbr.gov/mp/cvo/vungvari/water_allocations_historical.pdf
[18] http://www.water.ca.gov/swpao/deliveries.cfm

The impact of land idling since FMMP mapping was initiated in the central and southern San Joaquin Valley is highlighted in Figure 11. Lands that were irrigated but are now classified as Grazing Land or Farmland of Local Importance are depicted in yellow. Much of this idled land lies within the Westlands Water District.

Water delivery uncertainties and other resource constraints raise the possibility of additional land retirement or conversion. As of the 2010 update, FMMP field analysts have flagged in excess of 102,000 acres in the southern San Joaquin Valley (Fresno, Kern, Kings, and Tulare counties) as being in dryland or fallow status for two update cycles. Should these conditions continue, this land will be removed from irrigated farmland categories during the 2012 map update.

FIGURE 11: LAND RECLASSIFIED FROM IRRIGATED TO DRYLAND FARMING CATEGORIES, WESTERN FRESNO COUNTY
CONVERSIONS TO DRYLAND USES SHOWN IN YELLOW



Sacramento and San Joaquin counties, which lie at the confluence of the rivers sharing their names, saw more than 11,000 acres and 14,000 acres, respectively, reclassified due to long-term idling or dryland farming during the 2010 update. Locations in San Joaquin County affected by larger conversions, of 500 acres or more each, occurred in the vicinity of Lathrop, Tracy, Vernalis, and Clifton Court Forebay. These conversions may represent potential urbanization or habitat restoration, depending on location. Large Sacramento County examples with a link to potential urbanization occurred in the North Natomas section of the city of Sacramento, and near the cities of Elk Grove and Galt. Habitat-related fallowing continued on

Sherman Island, site of flood control and mitigation efforts by the California Department of Water Resources.[19]

Elsewhere in the state, conversion to dryland farming categories was less extensive. Six widely dispersed counties had farmland downgrades in the 5,000 to 10,000 acre range: Imperial, Riverside, Tulare, Solano, Yolo, and Siskiyou. Factors leading to the cessation of irrigation vary based on the geography of the county. In Solano and Yolo counties, land fallowing in association with ecological restoration efforts was in evidence. Large examples occurred near the Cache Slough Restoration Project in Solano County,[20] and in the vicinity of the Davis wetlands and Liberty Island restoration projects in Yolo County.[21] In Siskiyou County, an ongoing water shortage restricts deliveries for agriculture and habitat in the Klamath Basin and Shasta Valley.[22] Tulare County's conversions reflect the same circumstances as other southern San Joaquin Valley counties. In Riverside County, land left fallow for three or more update cycles (and to a lesser degree nonirrigated grains) occurred adjacent to western Riverside cities, and sites in the Coachella and Palo Verde valleys. Imperial County's land idling was centered around the communities of Brawley, Calexico, and El Centro, as well as sites closer to the Salton Sea.

Reclassification of irrigated land to Other Land is less frequent but is typically more permanent in nature than land idling. This is because many of the new uses involve low density residential development, mining, ecological restoration, or similar changes.

Between 2008 and 2010, 39,208 acres statewide were reclassified from irrigated agriculture to Other Land. This was a 2 percent decrease from the prior update cycle. The San Joaquin and Sacramento Valley counties accounted for 37 percent and 32 percent of the total, respectively. The most active county for conversion to Other Land this update, at just over 4,200 acres, was Sutter. More than 1,100 acres of this change was due to flooding of former rice fields in the Butte Sink area and adjacent to the Cross Canal. Some of these parcels are associated with the Natomas Basin Conservancy mitigation land project.[23] An equally large change resulted from improvements to map alignment and detail along the Sacramento River. The new boundaries better reflect current conditions of the river channel and adjacent land than did the US Geological Survey base maps.

Six other counties had conversions to Other Land that exceeded 2,000 acres: Butte, Fresno, Kern, San Diego, San Joaquin, and Tulare. Notable changes in each county represent the spectrum of uses grouped into the miscellaneous Other Land category:

- Wetland restoration near the Gray Lodge and Llano Seco wildlife areas comprised nearly 25 percent of all conversions of this type in Butte County. In Fresno County, nearly 1,700 acres were converted from Farmland of Local Importance to Other Land in association with the Don Gragnani Wetland Reserve[24] project. This conversion constituted 80 percent of Fresno County's total acres converted to Other Land.

[19] http://www.water.ca.gov/floodmgmt/dsmo/ecb/maep/sherman.cfm and http://ccrm.berkeley.edu/resin/pdfs_and_other_docs/background-lit/hanson_5yr-plan.pdf
[20] http://www.water.ca.gov/deltainit/docs/6-16-08CacheSlough.pdf
[21] http://www.bizjournals.com/sacramento/news/2011/04/19/rocklin-firm-finishes-yolo-restoration.html and http://www.wildlandsinc.com/four-new-mitigation-and-conservation-banks-approved-in-california/
[22] http://www.fws.gov/refuge/tulelake/walkingwetlands.html
[23] http://www.natomasbasin.org/
[24] www.gragnanifarms.com/wetlands

- Development projects that were initiated and left in a disturbed condition were notable in Kern and Tulare counties. One such example is the Kern River Raceway,[25] a property larger than 100 acres that went into foreclosure in 2010. More recently, the project was sold and is now under construction. The land will be reclassified as Urban and Built-up during the 2012 update.
- Large rural estates encroaching into agricultural areas, evidenced by increased structural density, in parts of San Diego County resulted in conversions to Other Land.
- Aggregate mining at the Teichert Aggregates, Vernalis Plant[26] expanded by approximately 330 acres in San Joaquin County.

Counties with Rural Land Mapping Enhancements

2008-2010 Source Data: Appendix D

Approximately 27 percent of the Important Farmland survey area is classified as Other Land. While urbanization has historically been the driving force in agricultural land loss, FMMP's statistics indicate that for every five acres exiting crop or grazing uses, four convert to Urban Land and one converts to Other Land. Because the Other Land category encompasses a disparate group of land uses, and conversions to Other Land are most often geographically separated from urban centers, users requested more specific information about this conversion type. A 2002 pilot project created five subcategories for Other Land: Rural Residential, Semi-Agricultural and Rural Commercial, Confined Animal Agriculture, Vacant or Disturbed Land, and Nonagricultural Vegetation. The pilot effort expanded on a funds-available basis to include all eight San Joaquin Valley counties. Mendocino County was added to the FMMP survey area in 2006 upon the release of its USDA soil survey, and is also mapped using the more detailed classifications. Definitions for the Rural Land Mapping categories are shown on page 7. County-level data and summaries discussed here are located in Appendix D.

FIGURE 12: NEW DAIRY FACILITIES IN KINGS COUNTY

APPROXIMATELY 170 ACRES WERE ADDED TO THE FACILITY AT LEFT DURING THE 2010 MAP UPDATE

Between 2008 and 2010, expansion of Rural Land Mapping categories totaled 12,055 acres (Appendix Tables D-1 and D-2), significantly less than the acreage converted during the prior update (20,108 acres). A decrease in conversions to Rural Residential land was the largest contributor to the change, declining by more than 8,000 acres between the two update cycles. Fresno and San Joaquin counties led in this conversion type, at 1,885 and 1,244 acres, respectively. Nearly three quarters of the rural residential expansion in Fresno County occurred on nonirrigated land, primarily in the Sierra foothills. Conversely, in San Joaquin County, nearly two thirds of the conversion occurred on formerly irrigated farmland.

[25] http://www.bakersfieldcalifornian.com/sports/motorsports/x1526556968/New-raceway-blossoming
[26] http://www.aggman.com/granite-sets-its-sights-on-the-future/

Expansions of the Semi-agricultural and Rural Commercial category led on a percentage basis (3.4 percent), but owing to the smaller footprint of agricultural support uses, the increase totaled less than 1,400 acres. Changes of this type were widely distributed among the nine Rural Land Use counties, and Fresno County had the most conversion of this type at 445 acres.

Confined Animal Agriculture acreage expanded by 1,951 acres, a 2.2 percent increase. Kings County's increase of 1,140 acres dominated[27]—a number of dairies were added or expanded, four of them were 100 to 200 acres in size. Conversely, in San Joaquin County, a decrease of 150 acres occurred in the Confined Animal Agriculture category during the 2010 update. A series of small dairies around the county were demolished or converted to different uses as low milk prices and high management costs pressured the dairy industry[28] into consolidation in recent years. Conversions to Confined Animal Agriculture facilities have been decreasing since a high of 2,579 acres during the 2004-06 update.

Vacant or Disturbed Land can be a category of transition. More than 9,600 acres were reclassified into the Vacant class during the 2010 update. To a large degree, these were farmed lands that were disturbed in preparation for residential subdivisions or other developments but infrastructure was not completed due to the downturn in the real estate market. Another 7,100 acres converted from Vacant to Urban (54 percent), agricultural uses (37 percent), or another Rural Land Use category (9 percent). While FMMP analysts attempt to determine the use to which disturbed land will be put using planning and other data, it is not always possible to determine the future of a site in the span of a single FMMP update cycle. This is particularly true of disturbances resulting in new agricultural uses. The long-term biennial tracking of conversion provides a time series that ultimately captures what occurs to these transitional areas.

Nonagricultural Vegetation increased by a net 1,123 acres. The Fresno County wetland reserve conversion discussed on page 22 was the largest contributor to this increase. A number of counties that would impact this conversion type—particularly in the Sacramento Valley—are not currently available in the Rural Land data format.

Net Irrigated Farmland Change

2008-2010 Source Data: Appendix table C-3

Statewide, irrigated farmland decreased by a net 168,039 acres during the 2010 update (Appendix Table C-3). This figure is 17 percent lower than the 203,011 acre net loss during 2008, and is more reflective of the 157,000 acre decrease that was reported during the 2006 update. The San Joaquin Valley accounted for just over 50 percent of the net irrigated land decrease statewide in 2010. Land idling has been a major contributing factor to irrigated land decreases in recent updates, particularly in central and southern San Joaquin Valley counties. Net irrigated land decreases in the San Joaquin Valley totaled nearly 85,000 acres during the 2010 update, while the comparable figure was 130,000 acres for 2008 and 61,000 acres for 2006.

Concurrently, statewide urbanization declined during these update cycles, from 102,010 acres in 2006, to 72,548 acres in 2008, and 44,504 acres in the 2010 cycle. Irrigated land decreases due to land idling exceeded those due to urbanization during both the 2008 and 2010 updates.

[27] In Kings County, dairies are included in the County's Farmland of Local Importance category. Confined animal agriculture facilities that are not included in a county's locally-important category are classified as Other Land.

[28] http://articles.latimes.com/2013/mar/30/business/la-fi-california-dairies-20130330 and http://www.recordnet.com/apps/pbcs.dll/article?AID=/20090607/A_BIZ/906070305/-1/rss01

The Sacramento Valley region accounted for 20 percent of the statewide net irrigated land decreases, Southern California comprised 13 percent, and the North State region followed at 7 percent of the total. Land idling and ecological restoration had greater affects than urbanization in all but the Southern California region.

On a county basis, the predominance of land idling as a factor in conversion during the 2008 and 2010 updates is highlighted in Table 5. Southern San Joaquin Valley counties dominate the list, followed by counties that are either in proximity to the Sacramento-San Joaquin Delta (Sacramento, San Joaquin, Solano, and Yolo) or are high population growth inland counties (Riverside and San Bernardino). As discussed earlier in this report, a number of factors contribute to the changes seen in the Delta counties—ecological restoration, urbanization, gravel mining, and land idling. Imperial County had a relatively large number of land idling sites distributed throughout the Imperial and Palo Verde valleys.

TABLE 5: DECREASES OF IRRIGATED LAND RANKS

Net Losses of Irrigated Land

Top Ten Counties - net acres

2006-2008		2008-2010	
Fresno	-59,620	Fresno	-32,622
Kings	-24,527	Kern	-25,137
Kern	-22,959	Kings	-17,133
San Joaquin	-10,207	San Joaquin	-11,777
Tulare	-9,893	Sacramento	-11,483
Riverside	-8,648	Tulare	-8,801
Merced	-8,165	Solano	-5,835
Yolo	-7,340	Yolo	-5,612
Colusa	-4,976	Riverside	-5,609
San Bernardino	-4,637	Imperial	-5,333

TABLE 6: INCREASES OF IRRIGATED LAND RANKS

Net Increases of Irrigated Land

Top Ten Counties - net acres

2006-2008		2008-2010	
Stanislaus	7,007	Merced	5,964
Mendocino	868	Stanislaus	3,455
San Luis Obispo	585	Madera	1,181
Santa Barbara	377	San Luis Obispo	946
Mariposa	238	Tehama	721
Los Angeles	155	Monterey	476
El Dorado	52	Santa Barbara	402
		Mendocino	399
		San Mateo	52
		Mariposa	9

Countervailing the net loss of irrigated farmland in most counties, a few locations saw net increases in their farmland totals during the 2010 update (Table 6 and Appendix Table C-3). These were clustered in the northern San Joaquin Valley: Merced, Stanislaus, and Madera counties each had net increases exceeding 1,000 acres. Merced County's 5,964 acre irrigated land increase was characterized by large plantings of orchards, vineyards, and row crops in the lower foothills of the Sierra Nevada. A similar pattern occurred in Stanislaus County (net irrigated land increase of 3,455 acres), exemplified by a single orchard development of nearly four square miles north of the City of Oakdale. Coastal winegrowing counties (Mendocino, Monterey, San Luis Obispo, and Santa Barbara) comprised the remaining counties with net positive irrigated totals.

1984-2010 Net Land Use Change

During the 13 biennial reporting cycles since FMMP was established, nearly 1.4 million acres of agricultural land in California were converted to nonagricultural purposes (Table 7). This represents an area larger in size than Merced County, or a rate of nearly one square mile every four days.

In total, 79 percent of this land was urbanized, 19 percent became one of the miscellaneous land uses grouped into the Other Land category, and just over 1 percent represents new water bodies.[29]

The largest losses from agricultural land categories have been from Prime Farmland, Farmland of Statewide Importance, and Grazing Land (662,297, 348,077, and 361,879 acres, respectively). Urbanization at the periphery of cities in California's agricultural valleys led to the loss of Prime and Statewide Farmland, while grazing losses have been more prevalent in the coastal zone and interior Southern California. Unique Farmland registered a small net increase over the 26-year period (15,766 acres) due to expansion of high value crops—mostly orchards and vineyards—on hilly terrain.

The same data, shown graphically in Figure 13 (next page), illustrates trends in agricultural and urban conversion since 1984. Urbanization declined in the periods of recession—the early-to-mid-1990's and the late 2000's. Irrigated farmland acreage has decreased in almost every update cycle, most notably since the 2004. Dryland farming and grazing have frequently moved in the opposite direction of irrigated land, as multi-year hydrologic and economic factors influence how much land growers put into production.

TABLE 7
NET IMPORTANT FARMLAND CONVERSION 1984-2010 (1)

	Acres							
LAND USE CATEGORY	**1984-1990**	**1990-1994**	**1994-1998**	**1998-2002**	**2002-2006**	**2006-2010**	**Total Change**	**Average Annual Change**
Prime Farmland	-54,957	-84,267	-70,928	-91,298	-159,822	-201,025	-662,297	-25,473
Farmland of Statewide Importance	-13,242	-16,027	-47,566	-29,407	-97,783	-144,052	-348,077	-13,388
Unique Farmland	38,051	-23,141	26,093	32,804	-32,068	-25,973	15,766	606
Farmland of Local Importance	-105,739	-5,661	15,848	-76,738	37,841	141,361	6,912	266
Irrigated Farmland (2)	4,412	-9,368	-13,899	-8,101	-5,620	0	-32,576	-1,253
Nonirrigated Farmland (2)	229	-1,051	-3,928	-6,198	-1,615	0	-12,563	-483
Total Important Farmland	-131,246	-139,515	-94,380	-178,938	-259,067	-229,689	-1,032,835	-39,724
Grazing Land	-140,167	-43,557	-45,557	-108,151	-87,929	63,482	-361,879	-13,918
Total Agricultural Land (Important Farmland + Grazing Land)	-271,413	-183,072	-139,937	-287,089	-346,996	-166,207	-1,394,714	-53,643
Urban and Built-up Land	305,875	148,220	125,744	184,008	203,835	117,052	1,084,734	41,721
Other Land	-41,210	32,874	13,304	97,377	141,432	47,079	290,856	11,187
Water	6,748	1,978	889	5,704	2,303	2,076	19,698	758
	Acres (millions)							
Total Area Inventoried For Change (3)	40.3	42.2	44.1	45.9	46.1	49.1		

(1) Figures taken from the projectwide conversion summary in each of the California Farmland Conversion Reports, supplemented with data for the counties mapped on an 'interim' basis due to lack of modern soil surveys. Along with urbanization or changes in agricultural uses, the 'net land use change' data includes technical revisions made to the lists of Prime Farmland and Farmland of Statewide Importance by NRCS in various counties. Multiple update cycles have been grouped in this table for ease of reading.

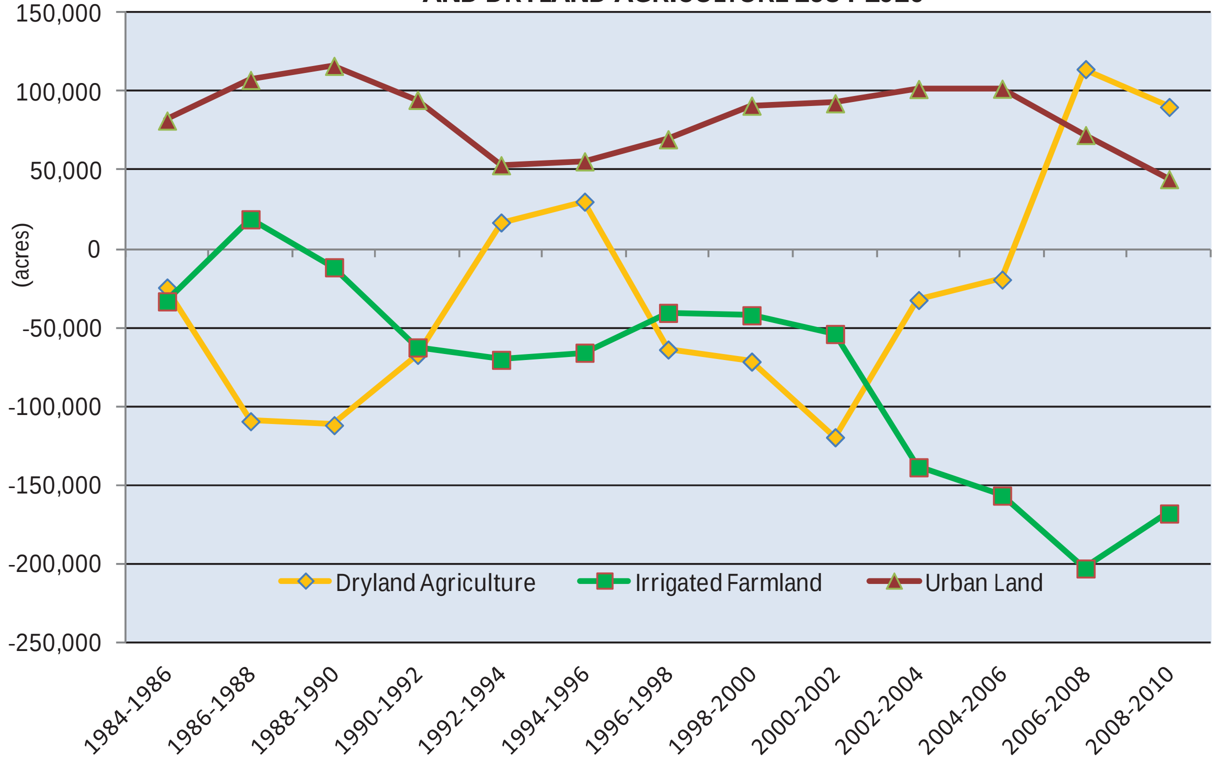
(2) Due to completion of NRCS soil surveys, the Interim mapping classes of Irrigated Farmland and Nonirrigated Farmland were no longer needed as of the 2004 data.

(3) Total Area Inventoried increased as NRCS completed modern soil surveys and FMMP initiated mapping. Areas added include: 1986--central Siskiyou, Butte, Colusa; 1988--Kern, Sacramento, eastern San Mateo, Sutter, Tulare, Yuba; 1990--San Joaquin; 1992--western Merced; 1996--Lake, Butte Valley/Tulelake (covers eastern Siskiyou & western Modoc); 2000--western Stanislaus, western Fresno; 2004--northeastern Stanislaus; 2006--Mendocino County; 2008--Carrizo Plain area (San Luis Obispo County) & Adin area (Modoc County). This represents an increase of 62 percent in the project area between 1984 and 2010.

[29] Water body increases included Diamond Valley Lake, Lake Sonoma, and Los Vaqueros Reservoir (Riverside, Sonoma, and Contra Costa counties, respectively) and flooding of San Joaquin Delta islands for habitat (Contra Costa and Solano counties).

As 2012 mapping proceeds, the development of infrastructure to support the next generation of Californians is anticipated to impact its agricultural land resources. The Department of Conservation will continue to support informed planning decisions with timely and accurate agricultural land resource data, capturing these trends as they evolve.

FIGURE 13: NET CHANGE IN URBAN LAND, IRRIGATED FARMLAND, AND DRYLAND AGRICULTURE 1984-2010



Appendix A
2008 – 2010
County Conversion Tables

TABLE A-1
ALAMEDA COUNTY
2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

Farmland Mapping and Monitoring Program

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED 2008	TOTAL ACREAGE INVENTORIED 2010	2008-10 ACREAGE CHANGES: ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	3,958	3,953	92	87	179	-5
Farmland of Statewide Importance	1,290	1,230	97	37	134	-60
Unique Farmland	2,441	2,383	122	64	186	-58
Farmland of Local Importance	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL	7,689	7,566	311	188	499	-123
Grazing Land	244,252	244,033	641	422	1,063	-219
AGRICULTURAL LAND SUBTOTAL	251,941	251,599	952	610	1,562	-342
Urban and Built-up Land	146,075	146,263	600	788	1,388	188
Other Land	73,522	73,595	481	554	1,035	73
Water Area	53,799	53,880	0	81	81	81
TOTAL AREA INVENTORIED	525,337	525,337	2,033	2,033	4,066	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	104
Farmland of Statewide Importance	77
Unique Farmland	66
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	247
Grazing Land	3,115
AGRICULTURAL LAND SUBTOTAL	3,362
Urban and Built-up Land	0
Other Land	1,116
Water Area	0
TOTAL ACREAGE REPORTED	4,478

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	0	0	0	0	37	37	25	30	0	92
Farmland of Statewide Importance	to:	0	--	1	0	1	47	48	35	14	0	97
Unique Farmland	to:	0	0	--	0	0	79	79	3	40	0	122
Farmland of Local Importance	to:	0	0	0	--	0	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL		0	0	1	0	1	163	164	63	84	0	311
Grazing Land	to:	49	12	22	0	83	--	83	422	136	0	641
AGRICULTURAL LAND SUBTOTAL		49	12	23	0	84	163	247	485	220	0	952
Urban and Built-up Land (1)	to:	7	6	26	0	39	146	185	--	334	81	600
Other Land	to:	31	19	15	0	65	113	178	303	--	0	481
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	87	37	64	0	188	422	610	788	554	81	2,033

(1) Conversion from Urban and Built-up Land primarily the result of the delineation of Lake Elizabeth in Fremont Central Park and the use of detailed digital imagery to delineate more distinct urban boundaries.

TABLE A-2
AMADOR COUNTY
2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	3,541	3,211	338	8	346	-330
Farmland of Statewide Importance	1,573	1,421	158	6	164	-152
Unique Farmland	3,678	3,335	359	16	375	-343
Farmland of Local Importance	1,485	1,864	75	454	529	379
IMPORTANT FARMLAND SUBTOTAL	10,277	9,831	930	484	1,414	-446
Grazing Land	188,115	188,433	414	732	1,146	318
AGRICULTURAL LAND SUBTOTAL	198,392	198,264	1,344	1,216	2,560	-128
Urban and Built-up Land	8,195	8,295	237	337	574	100
Other Land	88,463	88,491	368	396	764	28
Water Area	5,323	5,323	0	0	0	0
TOTAL AREA INVENTORIED	300,373	300,373	1,949	1,949	3,898	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	0
Grazing Land	0
AGRICULTURAL LAND SUBTOTAL	0
Urban and Built-up Land	0
Other Land	0
Water Area	0
TOTAL ACREAGE REPORTED	0

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	0	2	138	140	149	289	4	45	0	338
Farmland of Statewide Importance	to:	2	--	1	11	14	139	153	0	5	0	158
Unique Farmland	to:	3	2	--	27	32	260	292	0	67	0	359
Farmland of Local Importance	to:	0	1	6	--	7	68	75	0	0	0	75
IMPORTANT FARMLAND SUBTOTAL		5	3	9	176	193	616	809	4	117	0	930
Grazing Land	to:	2	3	7	272	284	--	284	23	107	0	414
AGRICULTURAL LAND SUBTOTAL		7	6	16	448	477	616	1,093	27	224	0	1,344
Urban and Built-up Land (1)	to:	0	0	0	3	3	62	65	--	172	0	237
Other Land	to:	1	0	0	3	4	54	58	310	--	0	368
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	8	6	16	454	484	732	1,216	337	396	0	1,949

(1) Conversion from Urban and Built-up Land primarily the result of the use of detailed digital imagery to delineate more distinct urban boundaries.

TABLE A-3
BUTTE COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	194,689	193,290	1,926	527	2,453	-1,399
Farmland of Statewide Importance	22,794	21,871	1,136	213	1,349	-923
Unique Farmland	23,078	22,190	1,143	255	1,398	-888
Farmland of Local Importance	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL	240,561	237,351	4,205	995	5,200	-3,210
Grazing Land	401,859	402,999	873	2,013	2,886	1,140
AGRICULTURAL LAND SUBTOTAL	642,420	640,350	5,078	3,008	8,086	-2,070
Urban and Built-up Land	45,350	45,914	204	768	972	564
Other Land	362,624	364,130	977	2,483	3,460	1,506
Water Area	22,858	22,858	0	0	0	0
TOTAL AREA INVENTORIED	1,073,252	1,073,252	6,259	6,259	12,518	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	0
Grazing Land	461
AGRICULTURAL LAND SUBTOTAL	461
Urban and Built-up Land	0
Other Land	0
Water Area	0
TOTAL ACREAGE REPORTED	461

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	1	4	0	5	787	792	163	971	0	1,926
Farmland of Statewide Importance	to:	2	--	0	0	2	785	787	28	321	0	1,136
Unique Farmland	to:	5	13	--	0	18	372	390	27	726	0	1,143
Farmland of Local Importance	to:	0	0	0	--	0	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL		7	14	4	0	25	1,944	1,969	218	2,018	0	4,205
Grazing Land	to:	170	165	127	0	462	--	462	103	308	0	873
AGRICULTURAL LAND SUBTOTAL		177	179	131	0	487	1,944	2,431	321	2,326	0	5,078
Urban and Built-up Land (1)	to:	27	10	1	0	38	9	47	--	157	0	204
Other Land	to:	323	24	123	0	470	60	530	447	--	0	977
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	527	213	255	0	995	2,013	3,008	768	2,483	0	6,259

(1) Conversion from Urban and Built-up Land primarily the result of removing the Koopers Industries wood treatment plant, Gridley Industrial Park site, and the historic communities of Feather Falls and Oroleve.

TABLE A-4
COLUSA COUNTY
2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

Farmland Mapping and Monitoring Program

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	197,497	196,320	1,537	360	1,897	-1,177
Farmland of Statewide Importance	2,012	2,046	14	48	62	34
Unique Farmland	121,186	120,316	1,435	565	2,000	-870
Farmland of Local Importance	235,023	236,013	729	1,719	2,448	990
IMPORTANT FARMLAND SUBTOTAL	555,718	554,695	3,715	2,692	6,407	-1,023
Grazing Land	9,111	9,161	49	99	148	50
AGRICULTURAL LAND SUBTOTAL	564,829	563,856	3,764	2,791	6,555	-973
Urban and Built-up Land	5,111	5,142	26	57	83	31
Other Land	168,542	169,484	406	1,348	1,754	942
Water Area	1,911	1,911	0	0	0	0
TOTAL AREA INVENTORIED	740,393	740,393	4,196	4,196	8,392	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	0
Grazing Land	0
AGRICULTURAL LAND SUBTOTAL	0
Urban and Built-up Land	0
Other Land	0
Water Area	0
TOTAL ACREAGE REPORTED	0

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)	to:	--	0	2	1,252	1,254	0	1,254	1	282	0	1,537
Farmland of Statewide Importance	to:	0	--	0	13	13	0	13	0	1	0	14
Unique Farmland	to:	1	0	--	391	392	97	489	5	941	0	1,435
Farmland of Local Importance	to:	260	48	259	--	567	1	568	37	124	0	729
IMPORTANT FARMLAND SUBTOTAL		261	48	261	1,656	2,226	98	2,324	43	1,348	0	3,715
Grazing Land	to:	0	0	42	6	48	--	48	1	0	0	49
AGRICULTURAL LAND SUBTOTAL		261	48	303	1,662	2,274	98	2,372	44	1,348	0	3,764
Urban and Built-up Land	to:	4	0	1	20	25	1	26	--	0	0	26
Other Land	to:	95	0	261	37	393	0	393	13	--	0	406
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	360	48	565	1,719	2,692	99	2,791	57	1,348	0	4,196

(1) Conversion to Farmland of Local Importance is primarily due to land left idle for three or more update cycles.

TABLE A-5
CONTRA COSTA COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	26,789	26,484	1,088	783	1,871	-305
Farmland of Statewide Importance	7,555	7,420	269	134	403	-135
Unique Farmland	3,125	3,205	142	222	364	80
Farmland of Local Importance	53,449	53,039	1,857	1,447	3,304	-410
IMPORTANT FARMLAND SUBTOTAL	90,918	90,148	3,356	2,586	5,942	-770
Grazing Land	168,904	168,646	563	305	868	-258
AGRICULTURAL LAND SUBTOTAL	259,822	258,794	3,919	2,891	6,810	-1,028
Urban and Built-up Land	151,336	151,965	651	1,280	1,931	629
Other Land	49,098	49,497	591	990	1,581	399
Water Area	53,764	53,764	0	0	0	0
TOTAL AREA INVENTORIED	514,020	514,020	5,161	5,161	10,322	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	465
Farmland of Statewide Importance	94
Unique Farmland	30
Farmland of Local Importance	894
IMPORTANT FARMLAND SUBTOTAL	1,483
Grazing Land	545
AGRICULTURAL LAND SUBTOTAL	2,028
Urban and Built-up Land	0
Other Land	784
Water Area	0
TOTAL ACREAGE REPORTED	2,812

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	0	29	713	742	22	764	93	231	0	1,088
Farmland of Statewide Importance	to:	4	--	1	186	191	10	201	38	30	0	269
Unique Farmland	to:	1	0	--	80	81	18	99	16	27	0	142
Farmland of Local Importance	to:	715	85	156	--	956	0	956	513	388	0	1,857
IMPORTANT FARMLAND SUBTOTAL		720	85	186	979	1,970	50	2,020	660	676	0	3,356
Grazing Land	to:	3	0	23	259	285	--	285	216	62	0	563
AGRICULTURAL LAND SUBTOTAL		723	85	209	1,238	2,255	50	2,305	876	738	0	3,919
Urban and Built-up Land (1)	to:	10	27	0	117	154	245	399	--	252	0	651
Other Land	to:	50	22	13	92	177	10	187	404	--	0	591
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	783	134	222	1,447	2,586	305	2,891	1,280	990	0	5,161

(1) Conversion from Urban and Built-up Land is primarily due to lack of sufficient infrastructure and the use of detailed digital imagery to delineate more distinct urban boundaries.

TABLE A-6

EL DORADO COUNTY

2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

Farmland Mapping and Monitoring Program

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	771	661	114	4	118	-110
Farmland of Statewide Importance	921	827	115	21	136	-94
Unique Farmland	3,766	3,206	620	60	680	-560
Farmland of Local Importance	59,648	59,565	733	650	1,383	-83
IMPORTANT FARMLAND SUBTOTAL	65,106	64,259	1,582	735	2,317	-847
Grazing Land	194,778	193,883	1,211	316	1,527	-895
AGRICULTURAL LAND SUBTOTAL	259,884	258,142	2,793	1,051	3,844	-1,742
Urban and Built-up Land	32,194	32,269	334	409	743	75
Other Land	237,507	239,020	551	2,064	2,615	1,513
Water Area	6,819	6,973	0	154	154	154
TOTAL AREA INVENTORIED	536,404	536,404	3,678	3,678	7,356	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	0
Grazing Land	0
AGRICULTURAL LAND SUBTOTAL	0
Urban and Built-up Land	0
Other Land	0
Water Area	0
TOTAL ACREAGE REPORTED	0

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	0	1	111	112	1	113	1	0	0	114
Farmland of Statewide Importance	to:	0	--	1	113	114	1	115	0	0	0	115
Unique Farmland	to:	1	0	--	381	382	163	545	5	70	0	620
Farmland of Local Importance	to:	3	21	19	--	43	14	57	38	638	0	733
IMPORTANT FARMLAND SUBTOTAL		4	21	21	605	651	179	830	44	708	0	1,582
Grazing Land (1)	to:	0	0	34	5	39	--	39	72	1,100	0	1,211
AGRICULTURAL LAND SUBTOTAL		4	21	55	610	690	179	869	116	1,808	0	2,793
Urban and Built-up Land (2)	to:	0	0	1	26	27	51	78	--	256	0	334
Other Land (3)	to:	0	0	4	14	18	86	104	293	--	154	551
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	4	21	60	650	735	316	1,051	409	2,064	154	3,678

(1) Conversion to Other Land primarily due to the use of high resolution imagery to delineate low density housing.
(2) Conversion from Urban and Built-up Land primarily the result of the use of detailed digital imagery to delineate more distinct urban boundaries
(2) Conversion to Water is due to the use of high resolution imagery to more accurately delineate the boundary of Jenkinson Lake.

TABLE A-7
FRESNO COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	693,174	685,411	11,052	3,289	14,341	-7,763
Farmland of Statewide Importance	439,020	415,689	24,776	1,445	26,221	-23,331
Unique Farmland	94,177	92,649	2,065	537	2,602	-1,528
Farmland of Local Importance	149,907	176,524	7,963	34,580	42,543	26,617
IMPORTANT FARMLAND SUBTOTAL	1,376,278	1,370,273	45,856	39,851	85,707	-6,005
Grazing Land	826,953	825,752	1,423	222	1,645	-1,201
AGRICULTURAL LAND SUBTOTAL	2,203,231	2,196,025	47,279	40,073	87,352	-7,206
Urban and Built-up Land	117,567	120,753	399	3,585	3,984	3,186
Other Land	111,702	115,722	2,208	6,228	8,436	4,020
Water Area	4,914	4,914	0	0	0	0
TOTAL AREA INVENTORIED	2,437,414	2,437,414	49,886	49,886	99,772	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	1,520
Farmland of Statewide Importance	411
Unique Farmland	242
Farmland of Local Importance	800
IMPORTANT FARMLAND SUBTOTAL	2,973
Grazing Land	2,511
AGRICULTURAL LAND SUBTOTAL	5,484
Urban and Built-up Land	0
Other Land	211
Water Area	0
TOTAL ACREAGE REPORTED	5,695

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)(3)	to:	--	16	21	8,946	8,983	45	9,028	820	1,204	0	11,052
Farmland of Statewide Importance (1)	to:	26	--	11	23,710	23,747	29	23,776	322	678	0	24,776
Unique Farmland (1)	to:	13	9	--	1,568	1,590	35	1,625	237	203	0	2,065
Farmland of Local Importance (2)(3)	to:	2,736	1,021	315	--	4,072	29	4,101	1,047	2,815	0	7,963
IMPORTANT FARMLAND SUBTOTAL		2,775	1,046	347	34,224	38,392	138	38,530	2,426	4,900	0	45,856
Grazing Land (3)	to:	100	14	34	112	260	--	260	18	1,145	0	1,423
AGRICULTURAL LAND SUBTOTAL		2,875	1,060	381	34,336	38,652	138	38,790	2,444	6,045	0	47,279
Urban and Built-up Land (4)	to:	77	44	12	83	216	0	216	--	183	0	399
Other Land	to:	337	341	144	161	983	84	1,067	1,141	--	0	2,208
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	3,289	1,445	537	34,580	39,851	222	40,073	3,585	6,228	0	49,886

(1) Conversion to Farmland of Local Importance is primarily due to land left idle or land used for dryland grain production for three or more update cycles.
(2) Conversion to irrigated farmland primarily due to the addition of irrigated row crops.
(3) Conversion to Other Land due to land left idle for three or more update cycles that has been graded for development, new agricultural processing facilities, and low density housing.
(4) Conversion from Urban and Built-up Land primarily the result of the use of detailed digital imagery to delineate more distinct urban boundaries.

TABLE A-08
GLENN COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	159,811	157,940	3,576	1,705	5,281	-1,871
Farmland of Statewide Importance	87,497	87,071	1,244	818	2,062	-426
Unique Farmland	17,306	17,300	1,007	1,001	2,008	-6
Farmland of Local Importance	83,544	85,836	3,446	5,738	9,184	2,292
IMPORTANT FARMLAND SUBTOTAL	348,158	348,147	9,273	9,262	18,535	-11
Grazing Land	227,391	226,837	1,587	1,033	2,620	-554
AGRICULTURAL LAND SUBTOTAL	575,549	574,984	10,860	10,295	21,155	-565
Urban and Built-up Land	6,372	6,420	123	171	294	48
Other Land	261,258	261,775	1,087	1,604	2,691	517
Water Area	5,950	5,950	0	0	0	0
TOTAL AREA INVENTORIED	849,129	849,129	12,070	12,070	24,140	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	686
Farmland of Statewide Importance	216
Unique Farmland	97
Farmland of Local Importance	1,001
IMPORTANT FARMLAND SUBTOTAL	2,000
Grazing Land	2
AGRICULTURAL LAND SUBTOTAL	2,002
Urban and Built-up Land	0
Other Land	682
Water Area	0
TOTAL ACREAGE REPORTED	2,684

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)(2)	to:	--	7	66	2,888	2,961	6	2,967	26	583	0	3,576
Farmland of Statewide Importance (2)	to:	8	--	8	1,056	1,072	3	1,075	15	154	0	1,244
Unique Farmland	to:	10	7	--	434	451	226	677	9	321	0	1,007
Farmland of Local Importance (3)	to:	1,427	689	336	--	2,452	583	3,035	38	373	0	3,446
IMPORTANT FARMLAND SUBTOTAL		1,445	703	410	4,378	6,936	818	7,754	88	1,431	0	9,273
Grazing Land	to:	2	1	499	924	1,426	--	1,426	6	155	0	1,587
AGRICULTURAL LAND SUBTOTAL		1,447	704	909	5,302	8,362	818	9,180	94	1,586	0	10,860
Urban and Built-up Land (4)	to:	58	14	3	30	105	0	105	--	18	0	123
Other Land	to:	200	100	89	406	795	215	1,010	77	--	0	1,087
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	1,705	818	1,001	5,738	9,262	1,033	10,295	171	1,604	0	12,070

(1) Conversion to Unique Farmland is due to the delineation of nonirrigated orchards near Orland.
(2) Conversion to Farmland of Local Importance is primarily due to land left idle or land used for dryland grain production for three or more update cycles and the delineation of habitat restoration areas along the Sacramento River.
(3) Conversion to Prime Farmland is due to new irrigated farmland, primarily in the Sacramento Valley area.
(4) Conversion from Urban and Built-up Land is primarily due to water holding ponds at the former Holly Sugar Plant in Hamilton City being filled in and planted with orchards.

TABLE A-9
IMPERIAL COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	195,588	194,137	1,865	414	2,279	-1,451
Farmland of Statewide Importance	311,047	307,221	4,579	753	5,332	-3,826
Unique Farmland	2,197	2,141	65	9	74	-56
Farmland of Local Importance	32,109	35,774	1,664	5,329	6,993	3,665
IMPORTANT FARMLAND SUBTOTAL	540,941	539,273	8,173	6,505	14,678	-1,668
Grazing Land	0	0	0	0	0	0
AGRICULTURAL LAND SUBTOTAL	540,941	539,273	8,173	6,505	14,678	-1,668
Urban and Built-up Land	27,709	28,485	83	859	942	776
Other Land	458,829	460,001	338	1,510	1,848	1,172
Water Area	1,029	749	293	13	306	-280
TOTAL AREA INVENTORIED	1,028,508	1,028,508	8,887	8,887	17,774	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	0
Grazing Land	0
AGRICULTURAL LAND SUBTOTAL	0
Urban and Built-up Land	0
Other Land	0
Water Area	0
TOTAL ACREAGE REPORTED	0

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)	to:	--	6	1	1,426	1,433	0	1,433	76	356	0	1,865
Farmland of Statewide Importance (1)	to:	2	--	0	3,870	3,872	0	3,872	212	495	0	4,579
Unique Farmland	to:	1	0	--	0	1	0	1	0	64	0	65
Farmland of Local Importance	to:	340	664	0	--	1,004	0	1,004	423	237	0	1,664
IMPORTANT FARMLAND SUBTOTAL		343	670	1	5,296	6,310	0	6,310	711	1,152	0	8,173
Grazing Land	to:	0	0	0	0	0	--	0	0	0	0	0
AGRICULTURAL LAND SUBTOTAL		343	670	1	5,296	6,310	0	6,310	711	1,152	0	8,173
Urban and Built-up Land (2)	to:	5	3	0	10	18	0	18	--	65	0	83
Other Land	to:	66	80	8	23	177	0	177	148	--	13	338
Water Area (3)	to:	0	0	0	0	0	0	0	0	293	--	293
TOTAL ACREAGE CONVERTED	to:	414	753	9	5,329	6,505	0	6,505	859	1,510	13	8,887

(1) Conversion to Farmland of Local Importance due to land fallowing for three or more update cycles.
(2) Conversion from Urban and Built-up Land is primarily due to reclassifying abandoned water control ponds near Brawley
(3) Decrease in Water area due to improvements made to the Salton Sea boundary.

TABLE A-10
KERN COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	626,217	608,789	19,583	2,155	21,738	-17,428
Farmland of Statewide Importance	216,347	213,465	3,957	1,075	5,032	-2,882
Unique Farmland	96,657	91,830	5,213	386	5,599	-4,827
Farmland of Local Importance	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL	939,221	914,084	28,753	3,616	32,369	-25,137
Grazing Land	1,807,069	1,827,391	4,113	24,435	28,548	20,322
AGRICULTURAL LAND SUBTOTAL	2,746,290	2,741,475	32,866	28,051	60,917	-4,815
Urban and Built-up Land	138,696	141,899	260	3,463	3,723	3,203
Other Land	2,329,396	2,330,998	2,709	4,311	7,020	1,602
Water Area	9,880	9,890	1	11	12	10
TOTAL AREA INVENTORIED	5,224,262	5,224,262	35,836	35,836	71,672	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	1,945
Farmland of Statewide Importance	59
Unique Farmland	3
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	2,007
Grazing Land	739
AGRICULTURAL LAND SUBTOTAL	2,746
Urban and Built-up Land	0
Other Land	542
Water Area	0
TOTAL ACREAGE REPORTED	3,288

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	3	11	0	14	15,696	15,710	1,441	2,431	1	19,583
Farmland of Statewide Importance	to:	0	--	12	0	12	3,456	3,468	133	356	0	3,957
Unique Farmland	to:	3	2	--	0	5	4,932	4,937	91	185	0	5,213
Farmland of Local Importance	to:	0	0	0	--	0	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL		3	5	23	0	31	24,084	24,115	1,665	2,972	1	28,753
Grazing Land	to:	1,323	677	303	0	2,303	--	2,303	686	1,114	10	4,113
AGRICULTURAL LAND SUBTOTAL		1,326	682	326	0	2,334	24,084	26,418	2,351	4,086	11	32,866
Urban and Built-up Land	to:	3	1	0	0	4	31	35	--	225	0	260
Other Land	to:	826	392	60	0	1,278	319	1,597	1,112	--	0	2,709
Water Area	to:	0	0	0	0	0	1	1	0	0	--	1
TOTAL ACREAGE CONVERTED	to:	2,155	1,075	386	0	3,616	24,435	28,051	3,463	4,311	11	35,836

(1) Conversion to Grazing Land due to land left idle or land used for dryland grain production for three or more update cycles.
(2) Conversion to Other Land due to land left idle for three or more update cycles that has been graded for development primarily in the Bakersfield area, the expansion of oil extraction in the Lost and Elk Hills areas, and the delineation of low density housing, farmsteads, and rural commercial.
(3) Conversion to Prime Farmland is due to new irrigated farmland, primarily row or field crops in the Antelope Plain area and orchards in the Maricopa Flat area.
(4) Conversion from Urban and Built-up Land is primarily due to lack of sufficient infrastructure and the use of detailed digital imagery to delineate more distinct urban boundaries.
(5) Approximately 1,500 acres of the conversion to Urban and Built-up Land is due to construction of water control facilities, for storage or drainage. FMMP maintains a separate data layer of water control facilities which is available for user adjustments.

TABLE A-11
KINGS COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	138,089	130,257	8,327	495	8,822	-7,832
Farmland of Statewide Importance	397,065	388,891	11,183	3,009	14,192	-8,174
Unique Farmland	22,928	21,801	1,792	665	2,457	-1,127
Farmland of Local Importance	10,022	11,138	156	1,272	1,428	1,116
IMPORTANT FARMLAND SUBTOTAL	568,104	552,087	21,458	5,441	26,899	-16,017
Grazing Land	257,746	271,831	4,610	18,695	23,305	14,085
AGRICULTURAL LAND SUBTOTAL	825,850	823,918	26,068	24,136	50,204	-1,932
Urban and Built-up Land	32,220	35,847	56	3,683	3,739	3,627
Other Land	32,654	30,959	2,445	750	3,195	-1,695
Water Area	62	62	0	0	0	0
TOTAL AREA INVENTORIED	890,786	890,786	28,569	28,569	57,138	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	25
Farmland of Statewide Importance	2
Unique Farmland	0
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	27
Grazing Land	0
AGRICULTURAL LAND SUBTOTAL	27
Urban and Built-up Land	0
Other Land	0
Water Area	0
TOTAL ACREAGE REPORTED	27

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land (4)	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)	to:	--	1	0	56	57	7,709	7,766	347	214	0	8,327
Farmland of Statewide Importance (1)	to:	1	--	15	709	725	9,484	10,209	711	263	0	11,183
Unique Farmland (1)	to:	3	31	--	240	274	1,477	1,751	2	39	0	1,792
Farmland of Local Importance	to:	21	40	19	--	80	1	81	22	53	0	156
IMPORTANT FARMLAND SUBTOTAL		25	72	34	1,005	1,136	18,671	19,807	1,082	569	0	21,458
Grazing Land (2)	to:	421	2,701	618	216	3,956	--	3,956	473	181	0	4,610
AGRICULTURAL LAND SUBTOTAL		446	2,773	652	1,221	5,092	18,671	23,763	1,555	750	0	26,068
Urban and Built-up Land (3)	to:	0	56	0	0	56	0	56	--	0	0	56
Other Land	to:	49	180	13	51	293	24	317	2,128	--	0	2,445
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	495	3,009	665	1,272	5,441	18,695	24,136	3,683	750	0	28,569

(1) Conversion to Grazing Land due to land left idle or land used for dryland grain production for three or more update cycles.
(2) Conversion to Farmland of Statewide Importance is due to newly irrigated farmland, primarily in the San Joaquin Valley and the Kettleman Plain.
(3) Conversion to Farmland of Statewide Importance is due to an area of irrigated farmland on a formerly vacant lot next to the water treatment plant in Hanford.
(4) Approximately 3,100 acres of the conversion to Urban and Built-up Land is due to construction of water control facilities, for storage or drainage. FMMP maintains a separate data layer of water control facilities which is available for user adjustments.

TABLE A-12
LAKE COUNTY
2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	13,636	11,603	2,194	161	2,355	-2,033
Farmland of Statewide Importance	1,099	847	264	12	276	-252
Unique Farmland	11,772	11,083	995	306	1,301	-689
Farmland of Local Importance	21,012	22,393	736	2,117	2,853	1,381
IMPORTANT FARMLAND SUBTOTAL	47,519	45,926	4,189	2,596	6,785	-1,593
Grazing Land	239,765	239,873	793	901	1,694	108
AGRICULTURAL LAND SUBTOTAL	287,284	285,799	4,982	3,497	8,479	-1,485
Urban and Built-up Land	15,126	15,688	79	641	720	562
Other Land	501,636	502,559	343	1,266	1,609	923
Water Area	46,793	46,793	0	0	0	0
TOTAL AREA INVENTORIED	850,839	850,839	5,404	5,404	10,808	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	0
Grazing Land	0
AGRICULTURAL LAND SUBTOTAL	0
Urban and Built-up Land	0
Other Land	0
Water Area	0
TOTAL ACREAGE REPORTED	0

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)	to:	--	0	22	1,768	1,790	8	1,798	45	351	0	2,194
Farmland of Statewide Importance	to:	1	--	0	246	247	1	248	0	16	0	264
Unique Farmland	to:	21	2	--	59	82	673	755	25	215	0	995
Farmland of Local Importance	to:	122	9	4	--	135	175	310	179	247	0	736
IMPORTANT FARMLAND SUBTOTAL		144	11	26	2,073	2,254	857	3,111	249	829	0	4,189
Grazing Land	to:	1	0	261	17	279	--	279	115	399	0	793
AGRICULTURAL LAND SUBTOTAL		145	11	287	2,090	2,533	857	3,390	364	1,228	0	4,982
Urban and Built-up Land	to:	2	0	1	15	18	23	41	--	38	0	79
Other Land	to:	14	1	18	12	45	21	66	277	--	0	343
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	161	12	306	2,117	2,596	901	3,497	641	1,266	0	5,404

(1) Conversion to Farmland of Local Importance is primarily due to land left idle for three or more update cycles.

TABLE A-13
LOS ANGELES COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	32,406	30,876	2,422	892	3,314	-1,530
Farmland of Statewide Importance	1,228	952	286	10	296	-276
Unique Farmland	1,177	1,129	101	53	154	-48
Farmland of Local Importance	7,193	6,855	412	74	486	-338
IMPORTANT FARMLAND SUBTOTAL	42,004	39,812	3,221	1,029	4,250	-2,192
Grazing Land	229,474	231,475	1,048	3,049	4,097	2,001
AGRICULTURAL LAND SUBTOTAL	271,478	271,287	4,269	4,078	8,347	-191
Urban and Built-up Land	170,864	174,888	270	4,294	4,564	4,024
Other Land	678,251	674,568	4,550	867	5,417	-3,683
Water Area	3,468	3,318	150	0	150	-150
TOTAL AREA INVENTORIED	1,124,061	1,124,061	9,239	9,239	18,478	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	44
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	44
Grazing Land	2,212
AGRICULTURAL LAND SUBTOTAL	2,256
Urban and Built-up Land	0
Other Land	7,492
Water Area	0
TOTAL ACREAGE REPORTED	9,748

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)	to:	--	1	16	52	69	2,141	2,210	46	166	0	2,422
Farmland of Statewide Importance	to:	0	--	0	0	0	277	277	0	9	0	286
Unique Farmland	to:	2	0	--	0	2	85	87	4	10	0	101
Farmland of Local Importance	to:	8	0	0	--	8	404	412	0	0	0	412
IMPORTANT FARMLAND SUBTOTAL		10	1	16	52	79	2,907	2,986	50	185	0	3,221
Grazing Land	to:	85	1	1	22	109	--	109	507	432	0	1,048
AGRICULTURAL LAND SUBTOTAL		95	2	17	74	188	2,907	3,095	557	617	0	4,269
Urban and Built-up Land	to:	27	0	24	0	51	119	170	--	100	0	270
Other Land	to:	770	8	12	0	790	23	813	3,737	--	0	4,550
Water Area (3)	to:	0	0	0	0	0	0	0	0	150	--	150
TOTAL ACREAGE CONVERTED	to:	892	10	53	74	1,029	3,049	4,078	4,294	867	0	9,239

(1) Conversion to Grazing Land primarily due to land left idle for three or more update cycles.
(2) Conversion from Urban and Built-up Land primarily the result of closing the Cascades Golf Course in Sylmar, the use of detailed digital imagery to delineate more distinct urban boundaries in the Santa Monica mountains, and to a mining operation near Palmdale.
(3) Conversion from Water due to the abandonment of Fairmont Reservoir because it was deemed seismically unsound and will not be refilled as a result of the 1971 Sylmar earthquake.

TABLE A-14
MADERA COUNTY
2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

Farmland Mapping and Monitoring Program

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	97,491	97,095	1,763	1,367	3,130	-396
Farmland of Statewide Importance	85,136	84,755	876	495	1,371	-381
Unique Farmland	163,973	165,931	1,605	3,563	5,168	1,958
Farmland of Local Importance	16,143	13,801	3,178	836	4,014	-2,342
IMPORTANT FARMLAND SUBTOTAL	362,743	361,582	7,422	6,261	13,683	-1,161
Grazing Land	399,501	400,604	3,111	4,214	7,325	1,103
AGRICULTURAL LAND SUBTOTAL	762,244	762,186	10,533	10,475	21,008	-58
Urban and Built-up Land	27,010	27,214	49	253	302	204
Other Land	65,734	65,588	1,071	925	1,996	-146
Water Area	6,055	6,055	0	0	0	0
TOTAL AREA INVENTORIED	861,043	861,043	11,653	11,653	23,306	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	106
Farmland of Statewide Importance	16
Unique Farmland	19
Farmland of Local Importance	504
IMPORTANT FARMLAND SUBTOTAL	645
Grazing Land	3,702
AGRICULTURAL LAND SUBTOTAL	4,347
Urban and Built-up Land	0
Other Land	472
Water Area	0
TOTAL ACREAGE REPORTED	4,819

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)	to:	--	7	6	1	14	1,388	1,402	58	303	0	1,763
Farmland of Statewide Importance	to:	9	--	3	0	12	736	748	41	87	0	876
Unique Farmland (1)	to:	16	2	--	34	52	1,179	1,231	15	359	0	1,605
Farmland of Local Importance (2)	to:	802	303	1,187	--	2,292	860	3,152	4	22	0	3,178
IMPORTANT FARMLAND SUBTOTAL		827	312	1,196	35	2,370	4,163	6,533	118	771	0	7,422
Grazing Land (2)	to:	367	13	1,765	763	2,908	--	2,908	54	149	0	3,111
AGRICULTURAL LAND SUBTOTAL		1,194	325	2,961	798	5,278	4,163	9,441	172	920	0	10,533
Urban and Built-up Land	to:	7	7	4	0	18	26	44	--	5	0	49
Other Land (2)	to:	166	163	598	38	965	25	990	81	--	0	1,071
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	1,367	495	3,563	836	6,261	4,214	10,475	253	925	0	11,653

(1) Conversion to Grazing Land primarily due to land left idle for three or more update cycles.
(2) Conversion to irrigated farmland categories is due to newly irrigated orchards and other crops. These conversions are primarily located near the intersection of Avenue 15 and Santa Fe Road.

TABLE A-15
MARIN COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	7	0	7	0	7	-7
Farmland of Statewide Importance	461	233	242	14	256	-228
Unique Farmland	299	287	48	36	84	-12
Farmland of Local Importance	65,154	63,297	2,493	636	3,129	-1,857
IMPORTANT FARMLAND SUBTOTAL	65,921	63,817	2,790	686	3,476	-2,104
Grazing Land	89,556	89,256	4,091	3,791	7,882	-300
AGRICULTURAL LAND SUBTOTAL	155,477	153,073	6,881	4,477	11,358	-2,404
Urban and Built-up Land	42,181	42,341	93	253	346	160
Other Land	136,185	138,429	4,195	6,439	10,634	2,244
Water Area	44,819	44,819	0	0	0	0
TOTAL AREA INVENTORIED	378,662	378,662	11,169	11,169	22,338	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	0
Grazing Land	0
AGRICULTURAL LAND SUBTOTAL	0
Urban and Built-up Land	0
Other Land	17
Water Area	0
TOTAL ACREAGE REPORTED	17

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	0	0	0	0	0	0	7	0	0	7
Farmland of Statewide Importance	to:	0	--	0	60	60	0	60	0	182	0	242
Unique Farmland	to:	0	0	--	17	17	20	37	2	9	0	48
Farmland of Local Importance (1)	to:	0	12	2	--	14	256	270	16	2,207	0	2,493
IMPORTANT FARMLAND SUBTOTAL		0	12	2	77	91	276	367	25	2,398	0	2,790
Grazing Land (1)	to:	0	1	33	95	129	--	129	12	3,950	0	4,091
AGRICULTURAL LAND SUBTOTAL		0	13	35	172	220	276	496	37	6,348	0	6,881
Urban and Built-up Land (2)	to:	0	0	0	2	2	0	2	--	91	0	93
Other Land (1)	to:	0	1	1	462	464	3,515	3,979	216	--	0	4,195
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	0	14	36	636	686	3,791	4,477	253	6,439	0	11,169

(1) Conversions between Grazing Land, Farmland of Local Importance, and Other Land due to the updating of grazing lease boundaries within the Point Reyes National Seashore and the Golden Gate National Recreation Area.
(2) Conversions to Other Land due to the use of high resolution imagery to delineate more distinct urban boundaries.

TABLE A-16

MARIPOSA COUNTY

2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	6	6	0	0	0	0
Farmland of Statewide Importance	41	49	0	8	8	8
Unique Farmland	284	285	9	10	19	1
Farmland of Local Importance	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL	331	340	9	18	27	9
Grazing Land	403,769	403,602	191	24	215	-167
AGRICULTURAL LAND SUBTOTAL	404,100	403,942	200	42	242	-158
Urban and Built-up Land	2,423	2,440	0	17	17	17
Other Land	75,874	76,015	38	179	217	141
Water Area	6,047	6,047	0	0	0	0
TOTAL AREA INVENTORIED	488,444	488,444	238	238	476	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	0
Grazing Land	1,331
AGRICULTURAL LAND SUBTOTAL	1,331
Urban and Built-up Land	0
Other Land	162
Water Area	0
TOTAL ACREAGE REPORTED	1,493

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	0	0	0	0	0	0	0	0	0	0
Farmland of Statewide Importance	to:	0	--	0	0	0	0	0	0	0	0	0
Unique Farmland	to:	0	0	--	0	0	9	9	0	0	0	9
Farmland of Local Importance	to:	0	0	0	--	0	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL		0	0	0	0	0	9	9	0	0	0	9
Grazing Land	to:	0	5	6	0	11	--	11	1	179	0	191
AGRICULTURAL LAND SUBTOTAL		0	5	6	0	11	9	20	1	179	0	200
Urban and Built-up Land	to:	0	0	0	0	0	0	0	--	0	0	0
Other Land	to:	0	3	4	0	7	15	22	16	--	0	38
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	0	8	10	0	18	24	42	17	179	0	238

TABLE A-17
MENDOCINO COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED 2008	TOTAL ACREAGE INVENTORIED 2010	2008-10 ACREAGE CHANGES: ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	21,107	21,346	175	414	589	239
Farmland of Statewide Importance	1,365	1,374	11	20	31	9
Unique Farmland	7,219	7,370	113	264	377	151
Farmland of Local Importance	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL	29,691	30,090	299	698	997	399
Grazing Land	1,927,016	1,925,803	1,597	384	1,981	-1,213
AGRICULTURAL LAND SUBTOTAL	1,956,707	1,955,893	1,896	1,082	2,978	-814
Urban and Built-up Land	19,194	19,455	13	274	287	261
Other Land	66,808	67,361	325	878	1,203	553
Water Area	2,135	2,135	0	0	0	0
TOTAL AREA INVENTORIED	2,044,844	2,044,844	2,234	2,234	4,468	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	0
Grazing Land	0
AGRICULTURAL LAND SUBTOTAL	0
Urban and Built-up Land	0
Other Land	0
Water Area	0
TOTAL ACREAGE REPORTED	0

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	1	3	0	4	61	65	19	91	0	175
Farmland of Statewide Importance	to:	0	--	3	0	3	4	7	3	1	0	11
Unique Farmland	to:	5	0	--	0	5	60	65	21	27	0	113
Farmland of Local Importance	to:	0	0	0	--	0	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL		5	1	6	0	12	125	137	43	119	0	299
Grazing Land	to:	391	17	247	0	655	--	655	186	756	0	1,597
AGRICULTURAL LAND SUBTOTAL		396	18	253	0	667	125	792	229	875	0	1,896
Urban and Built-up Land	to:	4	1	2	0	7	3	10	--	3	0	13
Other Land	to:	14	1	9	0	24	256	280	45	--	0	325
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	414	20	264	0	698	384	1,082	274	878	0	2,234

TABLE A-18
MERCED COUNTY
2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	270,641	271,100	2,082	2,541	4,623	459
Farmland of Statewide Importance	150,875	151,340	1,797	2,262	4,059	465
Unique Farmland	103,990	109,030	1,208	6,248	7,456	5,040
Farmland of Local Importance	67,985	65,057	6,733	3,805	10,538	-2,928
IMPORTANT FARMLAND SUBTOTAL	593,491	596,527	11,820	14,856	26,676	3,036
Grazing Land	567,392	562,461	5,330	399	5,729	-4,931
AGRICULTURAL LAND SUBTOTAL	1,160,883	1,158,988	17,150	15,255	32,405	-1,895
Urban and Built-up Land	37,419	38,376	160	1,117	1,277	957
Other Land	50,456	51,394	1,923	2,861	4,784	938
Water Area	16,859	16,859	0	0	0	0
TOTAL AREA INVENTORIED	1,265,617	1,265,617	19,233	19,233	38,466	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	31
Farmland of Statewide Importance	43
Unique Farmland	39
Farmland of Local Importance	516
IMPORTANT FARMLAND SUBTOTAL	629
Grazing Land	0
AGRICULTURAL LAND SUBTOTAL	629
Urban and Built-up Land	0
Other Land	65
Water Area	0
TOTAL ACREAGE REPORTED	694

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	4	17	778	799	97	896	228	958	0	2,082
Farmland of Statewide Importance (1)	to:	4	--	6	1,091	1,101	69	1,170	86	541	0	1,797
Unique Farmland	to:	8	7	--	578	593	109	702	42	464	0	1,208
Farmland of Local Importance (2)	to:	1,685	1,428	2,861	--	5,974	65	6,039	344	350	0	6,733
IMPORTANT FARMLAND SUBTOTAL		1,697	1,439	2,884	2,447	8,467	340	8,807	700	2,313	0	11,820
Grazing Land (3)(4)	to:	302	319	2,912	1,189	4,722	--	4,722	66	542	0	5,330
AGRICULTURAL LAND SUBTOTAL		1,999	1,758	5,796	3,636	13,189	340	13,529	766	2,855	0	17,150
Urban and Built-up Land (5)	to:	90	8	9	46	153	1	154	--	6	0	160
Other Land	to:	452	496	443	123	1,514	58	1,572	351	--	0	1,923
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	2,541	2,262	6,248	3,805	14,856	399	15,255	1,117	2,861	0	19,233

(1) Conversion to Farmland of Local Importance due to land fallowing for three or more update cycles.
(2) Conversion to irrigated farmland primarily due to the addition of irrigated row crops and vineyards.
(3) Conversion to Unique Farmland primarily due to the addition of irrigated row crops and vineyards.
(4) Conversion to Farmland of Local Importance is primarily due to the identification of nonirrigated grain areas throughout the county.
(5) Conversion from Urban and Built-Up Land was due to the addition of irrigated row crops and vineyards , primarily in the vicinity of Castle Airport, and due to conversion of water control facilities to cropland.

TABLE A-19
MODOC COUNTY
2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

Farmland Mapping and Monitoring Program

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	79,250	78,065	2,461	1,276	3,737	-1,185
Farmland of Statewide Importance	44,542	43,193	1,939	590	2,529	-1,349
Unique Farmland	13,971	14,556	352	937	1,289	585
Farmland of Local Importance	148,176	150,183	2,756	4,763	7,519	2,007
IMPORTANT FARMLAND SUBTOTAL	285,939	285,997	7,508	7,566	15,074	58
Grazing Land	814,860	814,097	1,917	1,154	3,071	-763
AGRICULTURAL LAND SUBTOTAL	1,100,799	1,100,094	9,425	8,720	18,145	-705
Urban and Built-up Land	3,430	3,652	4	226	230	222
Other Land	22,743	23,226	109	592	701	483
Water Area	57,265	57,265	0	0	0	0
TOTAL AREA INVENTORIED	1,184,237	1,184,237	9,538	9,538	19,076	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	16
Farmland of Statewide Importance	39
Unique Farmland	44
Farmland of Local Importance	1,393
IMPORTANT FARMLAND SUBTOTAL	1,492
Grazing Land	3,146
AGRICULTURAL LAND SUBTOTAL	4,638
Urban and Built-up Land	0
Other Land	209
Water Area	0
TOTAL ACREAGE REPORTED	4,847

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)	to:	--	10	2	2,018	2,030	366	2,396	1	64	0	2,461
Farmland of Statewide Importance (1)	to:	5	--	2	1,810	1,817	4	1,821	1	117	0	1,939
Unique Farmland	to:	5	1	--	220	226	105	331	0	21	0	352
Farmland of Local Importance	to:	678	563	485	--	1,726	669	2,395	201	160	0	2,756
IMPORTANT FARMLAND SUBTOTAL		688	574	489	4,048	5,799	1,144	6,943	203	362	0	7,508
Grazing Land	to:	561	2	415	706	1,684	--	1,684	4	229	0	1,917
AGRICULTURAL LAND SUBTOTAL		1,249	576	904	4,754	7,483	1,144	8,627	207	591	0	9,425
Urban and Built-up Land	to:	3	0	0	0	3	0	3	--	1	0	4
Other Land	to:	24	14	33	9	80	10	90	19	--	0	109
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	1,276	590	937	4,763	7,566	1,154	8,720	226	592	0	9,538

(1) Conversion to Farmland of Local Importance due to land fallowing for three or more update cycles.

TABLE A-20
MONTEREY COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	166,812	166,251	1,404	843	2,247	-561
Farmland of Statewide Importance	43,091	43,372	779	1,060	1,839	281
Unique Farmland	24,768	25,524	654	1,410	2,064	756
Farmland of Local Importance	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL	234,671	235,147	2,837	3,313	6,150	476
Grazing Land	1,066,494	1,065,698	2,942	2,146	5,088	-796
AGRICULTURAL LAND SUBTOTAL	1,301,165	1,300,845	5,779	5,459	11,238	-320
Urban and Built-up Land	56,534	56,779	311	556	867	245
Other Land	757,182	757,257	926	1,001	1,927	75
Water Area	6,246	6,246	0	0	0	0
TOTAL AREA INVENTORIED	2,121,127	2,121,127	7,016	7,016	14,032	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	635
Farmland of Statewide Importance	0
Unique Farmland	26
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	661
Grazing Land	67
AGRICULTURAL LAND SUBTOTAL	728
Urban and Built-up Land	0
Other Land	381
Water Area	0
TOTAL ACREAGE REPORTED	1,109

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	3	35	0	38	967	1,005	174	225	0	1,404
Farmland of Statewide Importance	to:	5	--	6	0	11	636	647	3	129	0	779
Unique Farmland	to:	32	47	--	0	79	421	500	7	147	0	654
Farmland of Local Importance	to:	0	0	0	--	0	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL		37	50	41	0	128	2,024	2,152	184	501	0	2,837
Grazing Land (1)	to:	649	908	1,115	0	2,672	--	2,672	38	232	0	2,942
AGRICULTURAL LAND SUBTOTAL		686	958	1,156	0	2,800	2,024	4,824	222	733	0	5,779
Urban and Built-up Land (2)	to:	6	9	0	0	15	28	43	--	268	0	311
Other Land	to:	151	93	254	0	498	94	592	334	--	0	926
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	843	1,060	1,410	0	3,313	2,146	5,459	556	1,001	0	7,016

(1) Conversion to irrigated farmland categories is due to newly irrigated farmland such as vineyards, lettuce, and strawberries primarily in the Salinas Valley and along its margins in foothill areas.
(2) Conversion from Urban and Built-Up Land was due to the removal of tanks at the Moss Landing Power Plant site, the lack of sufficient infrastructure, and the use of detailed digital imagery to delineate more distinct urban boundaries.

TABLE A-21
NAPA COUNTY
2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	31,742	31,621	369	248	617	-121
Farmland of Statewide Importance	9,798	9,711	218	131	349	-87
Unique Farmland	16,326	16,414	413	501	914	88
Farmland of Local Importance	18,490	18,464	442	416	858	-26
IMPORTANT FARMLAND SUBTOTAL	76,356	76,210	1,442	1,296	2,738	-146
Grazing Land	178,957	179,029	255	327	582	72
AGRICULTURAL LAND SUBTOTAL	255,313	255,239	1,697	1,623	3,320	-74
Urban and Built-up Land	23,328	23,557	80	309	389	229
Other Land	204,825	204,671	562	408	970	-154
Water Area	22,397	22,396	1	0	1	-1
TOTAL AREA INVENTORIED	505,863	505,863	2,340	2,340	4,680	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	46
Farmland of Statewide Importance	2
Unique Farmland	0
Farmland of Local Importance	1,425
IMPORTANT FARMLAND SUBTOTAL	1,473
Grazing Land	104
AGRICULTURAL LAND SUBTOTAL	1,577
Urban and Built-up Land	0
Other Land	128
Water Area	0
TOTAL ACREAGE REPORTED	1,705

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	1	6	220	227	5	232	21	116	0	369
Farmland of Statewide Importance	to:	0	--	2	140	142	2	144	20	54	0	218
Unique Farmland	to:	8	4	--	44	56	235	291	2	120	0	413
Farmland of Local Importance	to:	139	47	1	--	187	82	269	160	13	0	442
IMPORTANT FARMLAND SUBTOTAL		147	52	9	404	612	324	936	203	303	0	1,442
Grazing Land	to:	4	2	139	4	149	--	149	29	77	0	255
AGRICULTURAL LAND SUBTOTAL		151	54	148	408	761	324	1,085	232	380	0	1,697
Urban and Built-up Land	to:	36	11	2	2	51	1	52	--	28	0	80
Other Land	to:	61	66	350	6	483	2	485	77	--	0	562
Water Area	to:	0	0	1	0	1	0	1	0	0	--	1
TOTAL ACREAGE CONVERTED	to:	248	131	501	416	1,296	327	1,623	309	408	0	2,340

TABLE A-22
NEVADA COUNTY
2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	514	398	116	0	116	-116
Farmland of Statewide Importance	2,285	1,586	699	0	699	-699
Unique Farmland	500	480	23	3	26	-20
Farmland of Local Importance	22,664	23,470	42	848	890	806
IMPORTANT FARMLAND SUBTOTAL	25,963	25,934	880	851	1,731	-29
Grazing Land	116,866	116,808	78	20	98	-58
AGRICULTURAL LAND SUBTOTAL	142,829	142,742	958	871	1,829	-87
Urban and Built-up Land	17,506	17,541	0	35	35	35
Other Land	128,908	128,960	39	91	130	52
Water Area	2,145	2,145	0	0	0	0
TOTAL AREA INVENTORIED	291,388	291,388	997	997	1,994	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	5
Unique Farmland	0
Farmland of Local Importance	312
IMPORTANT FARMLAND SUBTOTAL	317
Grazing Land	342
AGRICULTURAL LAND SUBTOTAL	659
Urban and Built-up Land	0
Other Land	44
Water Area	0
TOTAL ACREAGE REPORTED	703

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	0	0	116	116	0	116	0	0	0	116
Farmland of Statewide Importance	to:	0	--	0	690	690	0	690	0	9	0	699
Unique Farmland	to:	0	0	--	0	0	1	1	0	22	0	23
Farmland of Local Importance	to:	0	0	0	--	0	15	15	0	27	0	42
IMPORTANT FARMLAND SUBTOTAL		0	0	0	806	806	16	822	0	58	0	880
Grazing Land	to:	0	0	2	42	44	--	44	1	33	0	78
AGRICULTURAL LAND SUBTOTAL		0	0	2	848	850	16	866	1	91	0	958
Urban and Built-up Land	to:	0	0	0	0	0	0	0	--	0	0	0
Other Land	to:	0	0	1	0	1	4	5	34	--	0	39
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	0	0	3	848	851	20	871	35	91	0	997

TABLE A-23
ORANGE COUNTY
2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	3,772	3,243	663	134	797	-529
Farmland of Statewide Importance	441	367	77	3	80	-74
Unique Farmland	4,209	3,654	650	95	745	-555
Farmland of Local Importance	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL	8,422	7,264	1,390	232	1,622	-1,158
Grazing Land	37,554	37,639	474	559	1,033	85
AGRICULTURAL LAND SUBTOTAL	45,976	44,903	1,864	791	2,655	-1,073
Urban and Built-up Land	287,923	289,172	75	1,324	1,399	1,249
Other Land	174,843	174,667	990	814	1,804	-176
Water Area	972	972	0	0	0	0
TOTAL AREA INVENTORIED	509,714	509,714	2,929	2,929	5,858	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	1,468
Farmland of Statewide Importance	161
Unique Farmland	1,398
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	3,027
Grazing Land	889
AGRICULTURAL LAND SUBTOTAL	3,916
Urban and Built-up Land	0
Other Land	2,450
Water Area	0
TOTAL ACREAGE REPORTED	6,366

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	0	2	0	2	265	267	121	275	0	663
Farmland of Statewide Importance	to:	1	--	3	0	4	36	40	15	22	0	77
Unique Farmland (1)	to:	118	1	--	0	119	235	354	87	209	0	650
Farmland of Local Importance	to:	0	0	0	--	0	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL		119	1	5	0	125	536	661	223	506	0	1,390
Grazing Land	to:	8	0	25	0	33	--	33	181	260	0	474
AGRICULTURAL LAND SUBTOTAL		127	1	30	0	158	536	694	404	766	0	1,864
Urban and Built-up Land	to:	5	0	13	0	18	9	27	--	48	0	75
Other Land	to:	2	2	52	0	56	14	70	920	--	0	990
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	134	3	95	0	232	559	791	1,324	814	0	2,929

(1) Conversion to Prime Farmland is primarily due to verifying agriculture in the ground on land previously mapped as a nursery. The area is located near Irvine Boulevard and Jeffrey Road.

TABLE A-24
PLACER COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	7,894	7,340	604	50	654	-554
Farmland of Statewide Importance	4,823	4,068	832	77	909	-755
Unique Farmland	20,195	18,060	2,374	239	2,613	-2,135
Farmland of Local Importance	101,011	103,273	1,461	3,723	5,184	2,262
IMPORTANT FARMLAND SUBTOTAL	133,923	132,741	5,271	4,089	9,360	-1,182
Grazing Land	24,448	24,193	1,478	1,223	2,701	-255
AGRICULTURAL LAND SUBTOTAL	158,371	156,934	6,749	5,312	12,061	-1,437
Urban and Built-up Land	58,622	58,714	786	878	1,664	92
Other Land	189,458	190,803	1,005	2,350	3,355	1,345
Water Area	5,011	5,011	0	0	0	0
TOTAL AREA INVENTORIED	411,462	411,462	8,540	8,540	17,080	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	2
Unique Farmland	0
Farmland of Local Importance	6
IMPORTANT FARMLAND SUBTOTAL	8
Grazing Land	1,722
AGRICULTURAL LAND SUBTOTAL	1,730
Urban and Built-up Land	0
Other Land	120
Water Area	0
TOTAL ACREAGE REPORTED	1,850

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	1	1	352	354	133	487	0	117	0	604
Farmland of Statewide Importance	to:	2	--	1	627	630	79	709	0	123	0	832
Unique Farmland (1)	to:	1	1	--	2,154	2,156	163	2,319	0	55	0	2,374
Farmland of Local Importance	to:	4	57	136	--	197	611	808	9	644	0	1,461
IMPORTANT FARMLAND SUBTOTAL		7	59	138	3,133	3,337	986	4,323	9	939	0	5,271
Grazing Land	to:	5	2	1	10	18	--	18	563	897	0	1,478
AGRICULTURAL LAND SUBTOTAL		12	61	139	3,143	3,355	986	4,341	572	1,836	0	6,749
Urban and Built-up Land (2)	to:	0	0	98	9	107	165	272	--	514	0	786
Other Land	to:	38	16	2	571	627	72	699	306	--	0	1,005
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	50	77	239	3,723	4,089	1,223	5,312	878	2,350	0	8,540

(1) Conversion to Farmland of Local Importance due to land fallowing for three or more update cycles.
(2) Conversion to Unique Farmland due to the addition of rice fields on former industrial ponds in the western part of the county. Conversion to Grazing and Other Land is primarily due to lack of sufficient infrastructure and the use of detailed digital imagery to delineate more distinct urban boundaries.

TABLE A-25
RIVERSIDE COUNTY
2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	122,935	119,635	5,655	2,355	8,010	-3,300
Farmland of Statewide Importance	44,653	44,086	1,463	896	2,359	-567
Unique Farmland	37,133	35,391	2,780	1,038	3,818	-1,742
Farmland of Local Importance	229,156	229,877	7,012	7,733	14,745	721
IMPORTANT FARMLAND SUBTOTAL	433,877	428,989	16,910	12,022	28,932	-4,888
Grazing Land	111,219	110,841	410	32	442	-378
AGRICULTURAL LAND SUBTOTAL	545,096	539,830	17,320	12,054	29,374	-5,266
Urban and Built-up Land	315,679	321,553	268	6,142	6,410	5,874
Other Land	1,021,336	1,020,717	3,118	2,499	5,617	-619
Water Area	62,350	62,361	0	11	11	11
TOTAL AREA INVENTORIED	1,944,461	1,944,461	20,706	20,706	41,412	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	375
Farmland of Statewide Importance	71
Unique Farmland	276
Farmland of Local Importance	12,217
IMPORTANT FARMLAND SUBTOTAL	12,939
Grazing Land	3,628
AGRICULTURAL LAND SUBTOTAL	16,567
Urban and Built-up Land	0
Other Land	17,691
Water Area	0
TOTAL ACREAGE REPORTED	34,258

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)(2)	to:	--	6	88	3,740	3,834	0	3,834	962	859	0	5,655
Farmland of Statewide Importance (2)	to:	4	--	32	1,225	1,261	0	1,261	92	110	0	1,463
Unique Farmland (2)	to:	5	3	--	2,376	2,384	0	2,384	155	241	0	2,780
Farmland of Local Importance (3)	to:	2,160	807	454	--	3,421	32	3,453	2,563	985	11	7,012
IMPORTANT FARMLAND SUBTOTAL		2,169	816	574	7,341	10,900	32	10,932	3,772	2,195	11	16,910
Grazing Land	to:	0	0	8	160	168	--	168	165	77	0	410
AGRICULTURAL LAND SUBTOTAL		2,169	816	582	7,501	11,068	32	11,100	3,937	2,272	11	17,320
Urban and Built-up Land (4)	to:	19	4	8	10	41	0	41	--	227	0	268
Other Land	to:	167	76	448	222	913	0	913	2,205	--	0	3,118
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	2,355	896	1,038	7,733	12,022	32	12,054	6,142	2,499	11	20,706

(1) Conversion to Unique Farmland due to the addition of potted plant nurseries throughout the county.
(2) Conversion to Farmland of Local Importance largely due to land idling for three or more update cycles.
(3) Conversion to Prime Farmland primarily due to the addition of irrigated row crops and vineyards.
(4) Conversion from Urban and Built-Up Land was due to deteriorating abandoned runways of what used to be Blythe Army Airfield located north of the current Blythe Airport.

TABLE A-26
SACRAMENTO COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	104,366	97,476	7,280	390	7,670	-6,890
Farmland of Statewide Importance	49,470	45,264	4,702	496	5,198	-4,206
Unique Farmland	15,463	15,076	532	145	677	-387
Farmland of Local Importance	43,819	53,928	1,340	11,449	12,789	10,109
IMPORTANT FARMLAND SUBTOTAL	213,118	211,744	13,854	12,480	26,334	-1,374
Grazing Land	156,144	155,822	844	522	1,366	-322
AGRICULTURAL LAND SUBTOTAL	369,262	367,566	14,698	13,002	27,700	-1,696
Urban and Built-up Land	177,915	178,784	0	869	869	869
Other Land	70,757	71,584	423	1,250	1,673	827
Water Area	18,147	18,147	0	0	0	0
TOTAL AREA INVENTORIED	636,081	636,081	15,121	15,121	30,242	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	217
IMPORTANT FARMLAND SUBTOTAL	217
Grazing Land	1,031
AGRICULTURAL LAND SUBTOTAL	1,248
Urban and Built-up Land	0
Other Land	124
Water Area	0
TOTAL ACREAGE REPORTED	1,372

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)	to:	--	5	11	6,807	6,823	8	6,831	71	378	0	7,280
Farmland of Statewide Importance (1)	to:	2	--	2	4,383	4,387	35	4,422	140	140	0	4,702
Unique Farmland	to:	3	2	--	171	176	267	443	13	76	0	532
Farmland of Local Importance	to:	327	421	34	--	782	182	964	174	202	0	1,340
IMPORTANT FARMLAND SUBTOTAL		332	428	47	11,361	12,168	492	12,660	398	796	0	13,854
Grazing Land	to:	12	16	67	46	141	--	141	249	454	0	844
AGRICULTURAL LAND SUBTOTAL		344	444	114	11,407	12,309	492	12,801	647	1,250	0	14,698
Urban and Built-up Land	to:	0	0	0	0	0	0	0	--	0	0	0
Other Land	to:	46	52	31	42	171	30	201	222	--	0	423
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	390	496	145	11,449	12,480	522	13,002	869	1,250	0	15,121

(1) Conversion to Farmland of Local Importance due to land fallowing for three or more update cycles.

TABLE A-27
SAN BENITO COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	28,701	27,425	2,106	830	2,936	-1,276
Farmland of Statewide Importance	6,587	6,475	700	588	1,288	-112
Unique Farmland	2,399	2,250	355	206	561	-149
Farmland of Local Importance	23,234	21,310	5,056	3,132	8,188	-1,924
IMPORTANT FARMLAND SUBTOTAL	60,921	57,460	8,217	4,756	12,973	-3,461
Grazing Land	612,455	614,821	3,116	5,482	8,598	2,366
AGRICULTURAL LAND SUBTOTAL	673,376	672,281	11,333	10,238	21,571	-1,095
Urban and Built-up Land	7,902	8,023	55	176	231	121
Other Land	206,968	207,937	326	1,295	1,621	969
Water Area	1,140	1,145	10	15	25	5
TOTAL AREA INVENTORIED	889,386	889,386	11,724	11,724	23,448	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	0
Grazing Land	0
AGRICULTURAL LAND SUBTOTAL	0
Urban and Built-up Land	0
Other Land	0
Water Area	0
TOTAL ACREAGE REPORTED	0

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	1	32	838	871	898	1,769	28	309	0	2,106
Farmland of Statewide Importance	to:	1	--	0	251	252	430	682	1	17	0	700
Unique Farmland	to:	9	0	--	35	44	275	319	1	35	0	355
Farmland of Local Importance (1)	to:	547	523	66	--	1,136	3,795	4,931	4	121	0	5,056
IMPORTANT FARMLAND SUBTOTAL		557	524	98	1,124	2,303	5,398	7,701	34	482	0	8,217
Grazing Land (2)	to:	214	50	94	1,892	2,250	--	2,250	46	805	15	3,116
AGRICULTURAL LAND SUBTOTAL		771	574	192	3,016	4,553	5,398	9,951	80	1,287	15	11,333
Urban and Built-up Land	to:	5	0	11	10	26	21	47	--	8	0	55
Other Land	to:	54	14	3	96	167	63	230	96	--	0	326
Water Area	to:	0	0	0	10	10	0	10	0	0	--	10
TOTAL ACREAGE CONVERTED	to:	830	588	206	3,132	4,756	5,482	10,238	176	1,295	15	11,724

(1) Conversion to Grazing Land is due to nonirrigated grain areas being left idle for four or more update cycles.
(2) Conversion to Farmland of Local Importance is primarily due to the identification of nonirrigated grain areas throughout the county.

TABLE A-28
SAN BERNARDINO COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	14,090	12,848	1,652	410	2,062	-1,242
Farmland of Statewide Importance	6,747	6,242	546	41	587	-505
Unique Farmland	2,661	2,511	263	113	376	-150
Farmland of Local Importance	1,828	1,160	668	0	668	-668
IMPORTANT FARMLAND SUBTOTAL	25,326	22,761	3,129	564	3,693	-2,565
Grazing Land	901,666	902,590	2,121	3,045	5,166	924
AGRICULTURAL LAND SUBTOTAL	926,992	925,351	5,250	3,609	8,859	-1,641
Urban and Built-up Land	275,695	277,875	473	2,653	3,126	2,180
Other Land	246,413	245,813	1,796	1,196	2,992	-600
Water Area	449	510	0	61	61	61
TOTAL AREA INVENTORIED	1,449,549	1,449,549	7,519	7,519	15,038	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	290
Farmland of Statewide Importance	0
Unique Farmland	26
Farmland of Local Importance	93
IMPORTANT FARMLAND SUBTOTAL	409
Grazing Land	12,731
AGRICULTURAL LAND SUBTOTAL	13,140
Urban and Built-up Land	0
Other Land	1,243
Water Area	0
TOTAL ACREAGE REPORTED	14,383

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)	to:	--	0	11	0	11	1,179	1,190	277	185	0	1,652
Farmland of Statewide Importance	to:	1	--	10	0	11	458	469	57	20	0	546
Unique Farmland	to:	1	1	--	0	2	240	242	20	1	0	263
Farmland of Local Importance	to:	81	27	0	--	108	543	651	17	0	0	668
IMPORTANT FARMLAND SUBTOTAL		83	28	21	0	132	2,420	2,552	371	206	0	3,129
Grazing Land	to:	160	10	50	0	220	--	220	1,128	773	0	2,121
AGRICULTURAL LAND SUBTOTAL		243	38	71	0	352	2,420	2,772	1,499	979	0	5,250
Urban and Built-up Land (2)	to:	5	0	18	0	23	172	195	--	217	61	473
Other Land	to:	162	3	24	0	189	453	642	1,154	--	0	1,796
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	410	41	113	0	564	3,045	3,609	2,653	1,196	61	7,519

(1) Conversion to Grazing Land primarily due to land left idle for three or more update cycles.
(2) Conversion from Urban and Built-up Land was due to the delineation of a water body in Prado Regional Park, and two potted plant nurseries in the Chino/Montclair area, a lack of sufficient infrastructure in some locations, and the use of detailed digital imagery to delineate more distinct urban boundaries.

TABLE A-29
SAN DIEGO COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	7,754	7,085	819	150	969	-669
Farmland of Statewide Importance	10,412	9,439	1,153	180	1,333	-973
Unique Farmland	51,975	48,359	4,110	494	4,604	-3,616
Farmland of Local Importance	153,186	154,038	3,039	3,891	6,930	852
IMPORTANT FARMLAND SUBTOTAL	223,327	218,921	9,121	4,715	13,836	-4,406
Grazing Land	126,871	126,496	475	100	575	-375
AGRICULTURAL LAND SUBTOTAL	350,198	345,417	9,596	4,815	14,411	-4,781
Urban and Built-up Land	350,500	355,146	65	4,711	4,776	4,646
Other Land	1,452,698	1,452,833	3,454	3,589	7,043	135
Water Area	13,298	13,298	0	0	0	0
TOTAL AREA INVENTORIED	2,166,694	2,166,694	13,115	13,115	26,230	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	89
Farmland of Statewide Importance	14
Unique Farmland	123
Farmland of Local Importance	1,951
IMPORTANT FARMLAND SUBTOTAL	2,177
Grazing Land	1,932
AGRICULTURAL LAND SUBTOTAL	4,109
Urban and Built-up Land	0
Other Land	3,381
Water Area	0
TOTAL ACREAGE REPORTED	7,490

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	3	10	609	622	0	622	70	127	0	819
Farmland of Statewide Importance	to:	2	--	22	759	783	0	783	65	305	0	1,153
Unique Farmland (1)(2)	to:	16	24	--	2,362	2,402	15	2,417	105	1,588	0	4,110
Farmland of Local Importance (3)	to:	86	93	274	--	453	26	479	1,191	1,369	0	3,039
IMPORTANT FARMLAND SUBTOTAL		104	120	306	3,730	4,260	41	4,301	1,431	3,389	0	9,121
Grazing Land	to:	0	0	6	36	42	--	42	272	161	0	475
AGRICULTURAL LAND SUBTOTAL		104	120	312	3,766	4,302	41	4,343	1,703	3,550	0	9,596
Urban and Built-up Land	to:	2	0	4	1	7	19	26	--	39	0	65
Other Land	to:	44	60	178	124	406	40	446	3,008	--	0	3,454
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	150	180	494	3,891	4,715	100	4,815	4,711	3,589	0	13,115

(1) Conversion to Farmland of Local Importance due to land fallowing for three or more update cycles.
(2) Conversion to Other Land due to land left idle for three or more update cycles, as well as areas of low density housing.
(3) Conversion to Other Land primarily due to delineation of low density housing in various areas of the county.

TABLE A-30
SAN JOAQUIN COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED 2008	TOTAL ACREAGE INVENTORIED 2010	2008-10 ACREAGE CHANGES: ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	396,984	385,337	12,570	923	13,493	-11,647
Farmland of Statewide Importance	86,297	83,307	3,202	212	3,414	-2,990
Unique Farmland	66,621	69,481	1,590	4,450	6,040	2,860
Farmland of Local Importance	65,788	76,869	3,644	14,725	18,369	11,081
IMPORTANT FARMLAND SUBTOTAL	615,690	614,994	21,006	20,310	41,316	-696
Grazing Land	142,460	139,235	3,341	116	3,457	-3,225
AGRICULTURAL LAND SUBTOTAL	758,150	754,229	24,347	20,426	44,773	-3,921
Urban and Built-up Land	90,529	91,929	127	1,527	1,654	1,400
Other Land	52,141	54,662	838	3,359	4,197	2,521
Water Area	11,773	11,773	0	0	0	0
TOTAL AREA INVENTORIED	912,593	912,593	25,312	25,312	50,624	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	404
Farmland of Statewide Importance	386
Unique Farmland	0
Farmland of Local Importance	3,018
IMPORTANT FARMLAND SUBTOTAL	3,808
Grazing Land	0
AGRICULTURAL LAND SUBTOTAL	3,808
Urban and Built-up Land	0
Other Land	485
Water Area	0
TOTAL ACREAGE REPORTED	4,293

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)(3)	to:	--	4	2	10,533	10,539	48	10,587	526	1,457	0	12,570
Farmland of Statewide Importance (1)	to:	4	--	3	2,158	2,165	0	2,165	339	698	0	3,202
Unique Farmland (1)	to:	33	0	--	1,322	1,355	14	1,369	16	205	0	1,590
Farmland of Local Importance (2)	to:	647	176	1,796	--	2,619	42	2,661	162	821	0	3,644
IMPORTANT FARMLAND SUBTOTAL		684	180	1,801	14,013	16,678	104	16,782	1,043	3,181	0	21,006
Grazing Land (2)	to:	88	12	2,598	480	3,178	--	3,178	21	142	0	3,341
AGRICULTURAL LAND SUBTOTAL		772	192	4,399	14,493	19,856	104	19,960	1,064	3,323	0	24,347
Urban and Built-up Land	to:	10	12	35	34	91	0	91	--	36	0	127
Other Land	to:	141	8	16	198	363	12	375	463	--	0	838
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	923	212	4,450	14,725	20,310	116	20,426	1,527	3,359	0	25,312

(1) Conversion to Farmland of Local Importance is primarily due to land left idle for three or more update cycles and the identification of nonirrigated grain areas throughout the county.
(2) Conversion to Unique Farmland is due to newly irrigated vineyards, orchards, and other crops; primarily in the eastern half of the County.
(3) Conversions to Other Land primarily due to delineation of low density housing, the addition of wetlands, aggregate mining, and land graded for development.

TABLE A-31
SAN LUIS OBISPO COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	41,569	41,319	1,129	879	2,008	-250
Farmland of Statewide Importance	21,109	21,132	685	708	1,393	23
Unique Farmland	38,777	39,950	894	2,067	2,961	1,173
Farmland of Local Importance	309,081	307,325	7,281	5,525	12,806	-1,756
IMPORTANT FARMLAND SUBTOTAL	410,536	409,726	9,989	9,179	19,168	-810
Grazing Land	1,183,042	1,181,015	7,549	5,522	13,071	-2,027
AGRICULTURAL LAND SUBTOTAL	1,593,578	1,590,741	17,538	14,701	32,239	-2,837
Urban and Built-up Land	44,392	45,017	582	1,207	1,789	625
Other Land	239,045	242,998	1,801	5,754	7,555	3,953
Water Area	10,521	8,780	1,741	0	1,741	-1,741
TOTAL AREA INVENTORIED	1,887,536	1,887,536	21,662	21,662	43,324	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	138
IMPORTANT FARMLAND SUBTOTAL	138
Grazing Land	219
AGRICULTURAL LAND SUBTOTAL	357
Urban and Built-up Land	0
Other Land	48
Water Area	0
TOTAL ACREAGE REPORTED	405

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	2	22	957	981	23	1,004	35	90	0	1,129
Farmland of Statewide Importance	to:	2	--	33	571	606	12	618	25	42	0	685
Unique Farmland	to:	10	11	--	134	155	626	781	9	104	0	894
Farmland of Local Importance (1)(4)	to:	762	649	486	--	1,897	2,990	4,887	392	2,002	0	7,281
IMPORTANT FARMLAND SUBTOTAL		774	662	541	1,662	3,639	3,651	7,290	461	2,238	0	9,989
Grazing Land (2)(3)	to:	16	10	1,293	3,583	4,902	--	4,902	181	2,466	0	7,549
AGRICULTURAL LAND SUBTOTAL		790	672	1,834	5,245	8,541	3,651	12,192	642	4,704	0	17,538
Urban and Built-up Land (5)	to:	19	5	4	86	114	115	229	--	353	0	582
Other Land (1)	to:	69	31	185	118	403	833	1,236	565	--	0	1,801
Water Area (6)	to:	1	0	44	76	121	923	1,044	0	697	--	1,741
TOTAL ACREAGE CONVERTED	to:	879	708	2,067	5,525	9,179	5,522	14,701	1,207	5,754	0	21,662

(1) Conversion to Other Land is primarily due to delineation of low-density housing, farmsteads, and rural commercial in various areas of the county.
(2) Conversion to Unique Farmland is due to newly irrigated vineyards, orchards, and other crops; primarily in the interior and coastal valleys.
(3) Conversion to Farmland of Local Importance is due to the identification of nonirrigated grain areas throughout the county.
(4) Conversion to Grazing Land is due to dry grain areas being left idle for four or more update cycles.
(5) Conversion from Urban and Built-up Land is due to the abandonment of urban uses for three or more update cycles and the use of detailed digital imagery to delineate more distinct urban boundaries.
(6) Conversion to other categories due to the observation that the upper reaches of Twitchell Reservoir are dry in most years and the land is used for other purposes.

TABLE A-32
SAN MATEO COUNTY
2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

Farmland Mapping and Monitoring Program

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	2,221	2,180	120	79	199	-41
Farmland of Statewide Importance	142	146	0	4	4	4
Unique Farmland	2,182	2,271	154	243	397	89
Farmland of Local Importance	937	695	419	177	596	-242
IMPORTANT FARMLAND SUBTOTAL	5,482	5,292	693	503	1,196	-190
Grazing Land	48,959	48,797	646	484	1,130	-162
AGRICULTURAL LAND SUBTOTAL	54,441	54,089	1,339	987	2,326	-352
Urban and Built-up Land	71,872	72,510	12	650	662	638
Other Land	161,405	161,119	770	484	1,254	-286
Water Area	65,734	65,734	0	0	0	0
TOTAL AREA INVENTORIED	353,452	353,452	2,121	2,121	4,242	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	0
Grazing Land	249
AGRICULTURAL LAND SUBTOTAL	249
Urban and Built-up Land	0
Other Land	307
Water Area	0
TOTAL ACREAGE REPORTED	556

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	0	21	0	21	79	100	2	18	0	120
Farmland of Statewide Importance	to:	0	--	0	0	0	0	0	0	0	0	0
Unique Farmland	to:	14	0	--	0	14	115	129	0	25	0	154
Farmland of Local Importance	to:	8	1	126	--	135	269	404	0	15	0	419
IMPORTANT FARMLAND SUBTOTAL		22	1	147	0	170	463	633	2	58	0	693
Grazing Land	to:	15	1	74	129	219	--	219	8	419	0	646
AGRICULTURAL LAND SUBTOTAL		37	2	221	129	389	463	852	10	477	0	1,339
Urban and Built-up Land	to:	2	0	3	0	5	0	5	--	7	0	12
Other Land	to:	40	2	19	48	109	21	130	640	--	0	770
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	79	4	243	177	503	484	987	650	484	0	2,121

TABLE A-33
SANTA BARBARA COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	67,170	66,568	1,311	709	2,020	-602
Farmland of Statewide Importance	12,298	12,475	339	516	855	177
Unique Farmland	34,779	35,606	1,101	1,928	3,029	827
Farmland of Local Importance	11,106	10,643	1,424	961	2,385	-463
IMPORTANT FARMLAND SUBTOTAL	125,353	125,292	4,175	4,114	8,289	-61
Grazing Land	581,985	581,642	3,097	2,754	5,851	-343
AGRICULTURAL LAND SUBTOTAL	707,338	706,934	7,272	6,868	14,140	-404
Urban and Built-up Land	62,334	62,762	57	485	542	428
Other Land	265,467	265,911	696	1,140	1,836	444
Water Area	4,191	3,723	468	0	468	-468
TOTAL AREA INVENTORIED	1,039,330	1,039,330	8,493	8,493	16,986	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	244
Farmland of Statewide Importance	2
Unique Farmland	219
Farmland of Local Importance	31
IMPORTANT FARMLAND SUBTOTAL	496
Grazing Land	213
AGRICULTURAL LAND SUBTOTAL	709
Urban and Built-up Land	0
Other Land	181
Water Area	0
TOTAL ACREAGE REPORTED	890

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	4	38	180	222	721	943	140	228	0	1,311
Farmland of Statewide Importance	to:	2	--	6	15	23	289	312	2	25	0	339
Unique Farmland	to:	13	4	--	90	107	761	868	29	204	0	1,101
Farmland of Local Importance	to:	198	71	94	--	363	938	1,301	25	98	0	1,424
IMPORTANT FARMLAND SUBTOTAL		213	79	138	285	715	2,709	3,424	196	555	0	4,175
Grazing Land (1)	to:	372	336	1,575	654	2,937	--	2,937	54	106	0	3,097
AGRICULTURAL LAND SUBTOTAL		585	415	1,713	939	3,652	2,709	6,361	250	661	0	7,272
Urban and Built-up Land	to:	11	4	19	2	36	10	46	--	11	0	57
Other Land	to:	113	97	196	20	426	35	461	235	--	0	696
Water Area (2)	to:	0	0	0	0	0	0	0	0	468	--	468
TOTAL ACREAGE CONVERTED	to:	709	516	1,928	961	4,114	2,754	6,868	485	1,140	0	8,493

(1) Conversion to Unique Farmland is due to newly irrigated vineyards and other crops.
(2) Conversion from Water due to the observation that the upper reaches of Twitchell Reservoir are dry in most years and the land is used for other purposes.

TABLE A-34
SANTA CLARA COUNTY
2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

Farmland Mapping and Monitoring Program

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	18,804	17,270	1,701	167	1,868	-1,534
Farmland of Statewide Importance	4,028	3,630	415	17	432	-398
Unique Farmland	2,489	2,523	279	313	592	34
Farmland of Local Importance	5,967	4,328	2,211	572	2,783	-1,639
IMPORTANT FARMLAND SUBTOTAL	31,288	27,751	4,606	1,069	5,675	-3,537
Grazing Land	390,091	392,777	792	3,478	4,270	2,686
AGRICULTURAL LAND SUBTOTAL	421,379	420,528	5,398	4,547	9,945	-851
Urban and Built-up Land	188,882	189,129	189	436	625	247
Other Land	216,504	217,108	460	1,064	1,524	604
Water Area	8,458	8,458	0	0	0	0
TOTAL AREA INVENTORIED	835,223	835,223	6,047	6,047	12,094	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	589
Farmland of Statewide Importance	0
Unique Farmland	70
Farmland of Local Importance	491
IMPORTANT FARMLAND SUBTOTAL	1,150
Grazing Land	1,619
AGRICULTURAL LAND SUBTOTAL	2,769
Urban and Built-up Land	0
Other Land	152
Water Area	0
TOTAL ACREAGE REPORTED	2,921

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)	to:	--	4	220	258	482	922	1,404	58	239	0	1,701
Farmland of Statewide Importance	to:	5	--	0	70	75	272	347	3	65	0	415
Unique Farmland (2)	to:	76	3	--	2	81	133	214	14	51	0	279
Farmland of Local Importance (3)	to:	7	3	16	--	26	1,907	1,933	79	199	0	2,211
IMPORTANT FARMLAND SUBTOTAL		88	10	236	330	664	3,234	3,898	154	554	0	4,606
Grazing Land	to:	42	0	9	212	263	--	263	110	419	0	792
AGRICULTURAL LAND SUBTOTAL		130	10	245	542	927	3,234	4,161	264	973	0	5,398
Urban and Built-up Land (4)	to:	13	6	5	3	27	71	98	--	91	0	189
Other Land	to:	24	1	63	27	115	173	288	172	--	0	460
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	167	17	313	572	1,069	3,478	4,547	436	1,064	0	6,047

(1) Conversion to Unique Farmland is primarily due to the incorporation of updated digital soil survey data (SSURGO) into the 2010 Important Farmland data. This reflects modifications made to soil mapping by the U.S. Department of Agriculture as opposed to land use conversions.
(2) Conversion to Prime Farmland is primarily due to the delineation of irrigated agriculture that had previously been mapped as potted plant nurseries.
(3) Conversion to Grazing Land is due to dry grain areas being left idle for four or more update cycles.
(4) Conversion from Urban and Built-up Land is primarily due to lack of sufficient infrastructure and the use of detailed digital imagery to delineate more distinct urban boundaries.

TABLE A-35

SANTA CRUZ COUNTY

2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

Farmland Mapping and Monitoring Program

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	14,357	13,817	604	64	668	-540
Farmland of Statewide Importance	2,706	2,449	272	15	287	-257
Unique Farmland	4,249	3,763	560	74	634	-486
Farmland of Local Importance	516	548	5	37	42	32
IMPORTANT FARMLAND SUBTOTAL	21,828	20,577	1,441	190	1,631	-1,251
Grazing Land	17,952	18,268	238	554	792	316
AGRICULTURAL LAND SUBTOTAL	39,780	38,845	1,679	744	2,423	-935
Urban and Built-up Land	32,013	32,750	47	784	831	737
Other Land	213,563	213,761	809	1,007	1,816	198
Water Area	357	357	0	0	0	0
TOTAL AREA INVENTORIED	285,713	285,713	2,535	2,535	5,070	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	0
Grazing Land	1
AGRICULTURAL LAND SUBTOTAL	1
Urban and Built-up Land	0
Other Land	24
Water Area	0
TOTAL ACREAGE REPORTED	25

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	4	16	0	20	152	172	53	379	0	604
Farmland of Statewide Importance	to:	3	--	2	0	5	170	175	15	82	0	272
Unique Farmland	to:	20	2	--	0	22	204	226	6	328	0	560
Farmland of Local Importance	to:	0	0	0	--	0	0	0	0	5	0	5
IMPORTANT FARMLAND SUBTOTAL		23	6	18	0	47	526	573	74	794	0	1,441
Grazing Land	to:	2	0	19	0	21	--	21	37	180	0	238
AGRICULTURAL LAND SUBTOTAL		25	6	37	0	68	526	594	111	974	0	1,679
Urban and Built-up Land	to:	7	0	1	0	8	6	14	--	33	0	47
Other Land	to:	32	9	36	37	114	22	136	673	--	0	809
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	64	15	74	37	190	554	744	784	1,007	0	2,535

TABLE A-36
SHASTA COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	12,289	11,082	1,454	247	1,701	-1,207
Farmland of Statewide Importance	3,287	2,928	392	33	425	-359
Unique Farmland	509	499	69	59	128	-10
Farmland of Local Importance	6,104	5,207	1,229	332	1,561	-897
IMPORTANT FARMLAND SUBTOTAL	22,189	19,716	3,144	671	3,815	-2,473
Grazing Land	412,731	414,052	1,034	2,355	3,389	1,321
AGRICULTURAL LAND SUBTOTAL	434,920	433,768	4,178	3,026	7,204	-1,152
Urban and Built-up Land	36,640	36,930	199	489	688	290
Other Land	543,773	544,632	494	1,353	1,847	859
Water Area	5,875	5,878	0	3	3	3
TOTAL AREA INVENTORIED	1,021,208	1,021,208	4,871	4,871	9,742	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	0
Grazing Land	858
AGRICULTURAL LAND SUBTOTAL	858
Urban and Built-up Land	0
Other Land	2,214
Water Area	0
TOTAL ACREAGE REPORTED	3,072

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland	to:	--	1	14	110	125	894	1,019	21	414	0	1,454
Farmland of Statewide Importance	to:	1	--	1	1	3	309	312	1	79	0	392
Unique Farmland	to:	1	0	--	1	2	57	59	0	10	0	69
Farmland of Local Importance (1)	to:	3	0	1	--	4	1,056	1,060	7	162	0	1,229
IMPORTANT FARMLAND SUBTOTAL		5	1	16	112	134	2,316	2,450	29	665	0	3,144
Grazing Land	to:	196	15	36	166	413	--	413	68	553	0	1,034
AGRICULTURAL LAND SUBTOTAL		201	16	52	278	547	2,316	2,863	97	1,218	0	4,178
Urban and Built-up Land (2)	to:	2	8	0	34	44	20	64	--	135	0	199
Other Land	to:	44	9	7	20	80	19	99	392	--	3	494
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	247	33	59	332	671	2,355	3,026	489	1,353	3	4,871

(1) Conversion to Grazing Land largely due to irrigated pasture on unique soils or nonirrigated grain fields left fallow for three or more update cycles.
(2) Conversion from Urban and Built-up Land is primarily due to lack of sufficient infrastructure and the use of detailed digital imagery to delineate more distinct urban boundaries.

TABLE A-37
SIERRA VALLEY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	8,724	6,599	2,199	74	2,273	-2,125
Farmland of Statewide Importance	7,474	6,244	1,485	255	1,740	-1,230
Unique Farmland	3,793	3,169	714	90	804	-624
Farmland of Local Importance	89,302	92,964	581	4,243	4,824	3,662
IMPORTANT FARMLAND SUBTOTAL	109,293	108,976	4,979	4,662	9,641	-317
Grazing Land	79,500	79,576	188	264	452	76
AGRICULTURAL LAND SUBTOTAL	188,793	188,552	5,167	4,926	10,093	-241
Urban and Built-up Land	999	1,009	0	10	10	10
Other Land	7,903	8,164	9	270	279	261
Water Area	75	45	30	0	30	-30
TOTAL AREA INVENTORIED	197,770	197,770	5,206	5,206	10,412	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	57
IMPORTANT FARMLAND SUBTOTAL	57
Grazing Land	2,709
AGRICULTURAL LAND SUBTOTAL	2,766
Urban and Built-up Land	0
Other Land	153
Water Area	0
TOTAL ACREAGE REPORTED	2,919

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)	to:	--	0	1	2,147	2,148	32	2,180	4	15	0	2,199
Farmland of Statewide Importance (1)	to:	1	--	1	1,448	1,450	32	1,482	0	3	0	1,485
Unique Farmland	to:	0	1	--	600	601	101	702	0	12	0	714
Farmland of Local Importance	to:	67	254	88	--	409	95	504	4	73	0	581
IMPORTANT FARMLAND SUBTOTAL		68	255	90	4,195	4,608	260	4,868	8	103	0	4,979
Grazing Land	to:	4	0	0	45	49	--	49	2	137	0	188
AGRICULTURAL LAND SUBTOTAL		72	255	90	4,240	4,657	260	4,917	10	240	0	5,167
Urban and Built-up Land	to:	0	0	0	0	0	0	0	--	0	0	0
Other Land	to:	2	0	0	3	5	4	9	0	--	0	9
Water Area	to:	0	0	0	0	0	0	0	0	30	--	30
TOTAL ACREAGE CONVERTED	to:	74	255	90	4,243	4,662	264	4,926	10	270	0	5,206

(1) Conversion to Farmland of Local Importance is primarily due to land left idle for three or more update cycles.

TABLE A-38
SISKIYOU COUNTY
2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

Farmland Mapping and Monitoring Program

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	77,208	74,245	3,490	527	4,017	-2,963
Farmland of Statewide Importance	27,678	26,729	1,210	261	1,471	-949
Unique Farmland	33,008	33,584	901	1,477	2,378	576
Farmland of Local Importance	616,670	624,522	3,689	11,541	15,230	7,852
IMPORTANT FARMLAND SUBTOTAL	754,564	759,080	9,290	13,806	23,096	4,516
Grazing Land	393,893	387,886	6,354	347	6,701	-6,007
AGRICULTURAL LAND SUBTOTAL	1,148,457	1,146,966	15,644	14,153	29,797	-1,491
Urban and Built-up Land	15,605	15,774	210	379	589	169
Other Land	98,831	100,153	242	1,564	1,806	1,322
Water Area	18,399	18,399	0	0	0	0
TOTAL AREA INVENTORIED	1,281,292	1,281,292	16,096	16,096	32,192	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	9
IMPORTANT FARMLAND SUBTOTAL	9
Grazing Land	19
AGRICULTURAL LAND SUBTOTAL	28
Urban and Built-up Land	0
Other Land	21
Water Area	0
TOTAL ACREAGE REPORTED	49

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)	to:	--	1	0	3,452	3,453	16	3,469	3	18	0	3,490
Farmland of Statewide Importance (1)	to:	0	--	1	1,202	1,203	1	1,204	0	6	0	1,210
Unique Farmland	to:	4	0	--	852	856	23	879	1	21	0	901
Farmland of Local Importance (2)	to:	475	259	1,419	--	2,153	187	2,340	223	1,126	0	3,689
IMPORTANT FARMLAND SUBTOTAL		479	260	1,420	5,506	7,665	227	7,892	227	1,171	0	9,290
Grazing Land (4)	to:	26	1	48	5,871	5,946	--	5,946	53	355	0	6,354
AGRICULTURAL LAND SUBTOTAL		505	261	1,468	11,377	13,611	227	13,838	280	1,526	0	15,644
Urban and Built-up Land (5)	to:	0	0	6	91	97	75	172	--	38	0	210
Other Land	to:	22	0	3	73	98	45	143	99	--	0	242
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	527	261	1,477	11,541	13,806	347	14,153	379	1,564	0	16,096

(1) Conversion to Farmland of Local Importance is primarily due to land left idle for three or more update cycles.
(2) Conversion to irrigated farmland categories is due to new alfalfa and irrigated hay in Butte Valley and Shasta Valley.
(3) Conversion to Other Land primarily due to delineation of low density housing in various areas of the county.
(4) Conversions between Farmland of Local Importance and Grazing Land due to use of updated data on public lands and Williamson Act contracts to delineate areas qualifying for Farmland of Local Importance.
(5) Conversion from Urban and Built-up Land is primarily due to lack of sufficient infrastructure and the use of detailed digital imagery to delineate more distinct urban boundaries.

TABLE A-39
SOLANO COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	135,735	131,820	4,498	583	5,081	-3,915
Farmland of Statewide Importance	7,038	6,369	873	204	1,077	-669
Unique Farmland	10,526	9,275	1,540	289	1,829	-1,251
Farmland of Local Importance	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL	153,299	147,464	6,911	1,076	7,987	-5,835
Grazing Land	204,519	209,195	1,511	6,187	7,698	4,676
AGRICULTURAL LAND SUBTOTAL	357,818	356,659	8,422	7,263	15,685	-1,159
Urban and Built-up Land	59,157	59,591	194	628	822	434
Other Land	112,087	112,661	420	994	1,414	574
Water Area	53,311	53,462	0	151	151	151
TOTAL AREA INVENTORIED	582,373	582,373	9,036	9,036	18,072	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	2
Farmland of Statewide Importance	0
Unique Farmland	2
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	4
Grazing Land	3,557
AGRICULTURAL LAND SUBTOTAL	3,561
Urban and Built-up Land	0
Other Land	773
Water Area	0
TOTAL ACREAGE REPORTED	4,334

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)	to:	--	2	2	0	4	3,753	3,757	156	585	0	4,498
Farmland of Statewide Importance	to:	2	--	1	0	3	817	820	24	29	0	873
Unique Farmland (1)	to:	3	1	--	0	4	1,455	1,459	6	75	0	1,540
Farmland of Local Importance	to:	0	0	0	--	0	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL		5	3	3	0	11	6,025	6,036	186	689	0	6,911
Grazing Land	to:	469	197	283	0	949	--	949	305	257	0	1,511
AGRICULTURAL LAND SUBTOTAL		474	200	286	0	960	6,025	6,985	491	946	0	8,422
Urban and Built-up Land (2)	to:	31	0	0	0	31	115	146	--	48	0	194
Other Land (3)	to:	78	4	3	0	85	47	132	137	--	151	420
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	583	204	289	0	1,076	6,187	7,263	628	994	151	9,036

(1) Conversion to Grazing Land primarily due to land left idle for three or more update cycles, primarily southeast of Vacaville.
(2) Conversion from Urban and Built-up Land is primarily due to lack of sufficient infrastructure and the use of detailed digital imagery to delineate more distinct urban boundaries.
(3) Conversion to Water due to the flooding of the southern portion of the Liberty Farms area for the Cache Slough Area Restoration Project.

TABLE A-40
SONOMA COUNTY
2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	30,814	29,939	1,282	407	1,689	-875
Farmland of Statewide Importance	17,252	17,192	654	594	1,248	-60
Unique Farmland	32,106	32,924	562	1,380	1,942	818
Farmland of Local Importance	80,045	80,195	1,814	1,964	3,778	150
IMPORTANT FARMLAND SUBTOTAL	160,217	160,250	4,312	4,345	8,657	33
Grazing Land	419,004	417,773	1,604	373	1,977	-1,231
AGRICULTURAL LAND SUBTOTAL	579,221	578,023	5,916	4,718	10,634	-1,198
Urban and Built-up Land	74,741	75,214	241	714	955	473
Other Land	354,589	355,314	906	1,631	2,537	725
Water Area	17,533	17,533	0	0	0	0
TOTAL AREA INVENTORIED	1,026,084	1,026,084	7,063	7,063	14,126	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	9
Farmland of Local Importance	238
IMPORTANT FARMLAND SUBTOTAL	247
Grazing Land	874
AGRICULTURAL LAND SUBTOTAL	1,121
Urban and Built-up Land	0
Other Land	449
Water Area	0
TOTAL ACREAGE REPORTED	1,570

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)	to:	--	0	49	1,027	1,076	53	1,129	20	133	0	1,282
Farmland of Statewide Importance	to:	5	--	6	490	501	50	551	9	94	0	654
Unique Farmland	to:	7	7	--	147	161	205	366	16	180	0	562
Farmland of Local Importance	to:	235	315	341	--	891	48	939	225	650	0	1,814
IMPORTANT FARMLAND SUBTOTAL		247	322	396	1,664	2,629	356	2,985	270	1,057	0	4,312
Grazing Land	to:	32	142	719	267	1,160	--	1,160	70	374	0	1,604
AGRICULTURAL LAND SUBTOTAL		279	464	1,115	1,931	3,789	356	4,145	340	1,431	0	5,916
Urban and Built-up Land (2)	to:	5	13	7	6	31	10	41	--	200	0	241
Other Land	to:	123	117	258	27	525	7	532	374	--	0	906
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	407	594	1,380	1,964	4,345	373	4,718	714	1,631	0	7,063

(1) Conversion to Farmland of Local Importance is primarily due to land left idle for three or more update cycles.
(2) Conversion from Urban and Built-up Land is primarily due to lack of sufficient infrastructure at the former Santa Rosa Air Center and the use of detailed digital imagery to delineate more distinct urban boundaries.

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

TABLE A-41
STANISLAUS COUNTY
2008-2010 Land Use Conversion

Farmland Mapping and Monitoring Program

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	256,166	253,435	3,809	1,078	4,887	-2,731
Farmland of Statewide Importance	31,448	31,474	453	479	932	26
Unique Farmland	81,367	87,527	2,100	8,260	10,360	6,160
Farmland of Local Importance	31,160	31,366	4,744	4,950	9,694	206
IMPORTANT FARMLAND SUBTOTAL	400,141	403,802	11,106	14,767	25,873	3,661
Grazing Land	434,137	429,544	7,480	2,887	10,367	-4,593
AGRICULTURAL LAND SUBTOTAL	834,278	833,346	18,586	17,654	36,240	-932
Urban and Built-up Land	63,971	64,529	119	677	796	558
Other Land	64,456	64,831	1,351	1,726	3,077	375
Water Area	7,466	7,465	1	0	1	-1
TOTAL AREA INVENTORIED	970,171	970,171	20,057	20,057	40,114	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	130
Farmland of Statewide Importance	33
Unique Farmland	233
Farmland of Local Importance	27
IMPORTANT FARMLAND SUBTOTAL	423
Grazing Land	156
AGRICULTURAL LAND SUBTOTAL	579
Urban and Built-up Land	0
Other Land	528
Water Area	0
TOTAL ACREAGE REPORTED	1,107

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)(2)	to:	--	3	51	569	623	1,854	2,477	360	972	0	3,809
Farmland of Statewide Importance	to:	4	--	10	130	144	154	298	9	146	0	453
Unique Farmland (3)	to:	9	0	--	1,670	1,679	210	1,889	25	186	0	2,100
Farmland of Local Importance (4)	to:	181	152	3,939	--	4,272	339	4,611	2	131	0	4,744
IMPORTANT FARMLAND SUBTOTAL		194	155	4,000	2,369	6,718	2,557	9,275	396	1,435	0	11,106
Grazing Land (4)(5)	to:	433	230	3,991	2,512	7,166	--	7,166	58	256	0	7,480
AGRICULTURAL LAND SUBTOTAL		627	385	7,991	4,881	13,884	2,557	16,441	454	1,691	0	18,586
Urban and Built-up Land	to:	37	2	27	1	67	17	84	--	35	0	119
Other Land	to:	414	92	242	68	816	313	1,129	222	--	0	1,351
Water Area	to:	0	0	0	0	0	0	0	1	0	--	1
TOTAL ACREAGE CONVERTED	to:	1,078	479	8,260	4,950	14,767	2,887	17,654	677	1,726	0	20,057

(1) Conversion to Unique Farmland is due to the identification of a nonirrigated orchard and potted plant nurseries on land previously mapped as irrigated farmland.
(2) Conversion to Grazing Land is due to land left idle for three or more update cycles, primarily within the San Joaquin Valley.
(3) Conversion to Farmland of Local Importance is primarily due to the identification of nonirrigated grain and irrigated pasture on poor soils.
(4) Conversion to Unique Farmland is due to newly irrigated orchards, field crops, vineyards, and other crops within the San Joaquin Valley and the eastern foothills.
(5) Conversion to Farmland of Local Importance is primarily due to the identification of nonirrigated grain along the eastern edge of the San Joaquin Valley.

TABLE A-42

SUTTER COUNTY

2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	165,315	162,673	3,266	624	3,890	-2,642
Farmland of Statewide Importance	106,597	105,395	1,709	507	2,216	-1,202
Unique Farmland	19,156	17,752	1,720	316	2,036	-1,404
Farmland of Local Importance	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL	291,068	285,820	6,695	1,447	8,142	-5,248
Grazing Land	52,571	53,538	1,426	2,393	3,819	967
AGRICULTURAL LAND SUBTOTAL	343,639	339,358	8,121	3,840	11,961	-4,281
Urban and Built-up Land	13,230	13,560	25	355	380	330
Other Land	30,562	34,513	670	4,621	5,291	3,951
Water Area	1,883	1,883	0	0	0	0
TOTAL AREA INVENTORIED	389,314	389,314	8,816	8,816	17,632	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	93
Unique Farmland	0
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	93
Grazing Land	68
AGRICULTURAL LAND SUBTOTAL	161
Urban and Built-up Land	0
Other Land	20
Water Area	0
TOTAL ACREAGE REPORTED	181

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)(2)	to:	--	0	1	0	1	1,096	1,097	59	2,110	0	3,266
Farmland of Statewide Importance (1)	to:	1	--	0	0	1	1,008	1,009	78	622	0	1,709
Unique Farmland (2)	to:	3	0	--	0	3	183	186	1	1,533	0	1,720
Farmland of Local Importance	to:	0	0	0	--	0	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL		4	0	1	0	5	2,287	2,292	138	4,265	0	6,695
Grazing Land	to:	476	310	263	0	1,049	--	1,049	30	347	0	1,426
AGRICULTURAL LAND SUBTOTAL		480	310	264	0	1,054	2,287	3,341	168	4,612	0	8,121
Urban and Built-up Land	to:	6	10	0	0	16	0	16	--	9	0	25
Other Land	to:	138	187	52	0	377	106	483	187	--	0	670
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	624	507	316	0	1,447	2,393	3,840	355	4,621	0	8,816

(1) Conversion to Grazing Land primarily due to land left idle for three or more update cycles.
(2) Conversions to Other Land primarily due to boundary improvements along the Sacramento River and wetland areas in the Butte Sink, Natomas Basin, and Butte Slough.

TABLE A-43
TEHAMA COUNTY
2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

Farmland Mapping and Monitoring Program

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	63,038	62,175	1,981	1,118	3,099	-863
Farmland of Statewide Importance	17,231	17,304	499	572	1,071	73
Unique Farmland	18,054	19,565	244	1,755	1,999	1,511
Farmland of Local Importance	132,608	132,548	2,442	2,382	4,824	-60
IMPORTANT FARMLAND SUBTOTAL	230,931	231,592	5,166	5,827	10,993	661
Grazing Land	1,549,800	1,547,951	2,417	568	2,985	-1,849
AGRICULTURAL LAND SUBTOTAL	1,780,731	1,779,543	7,583	6,395	13,978	-1,188
Urban and Built-up Land	13,633	13,805	48	220	268	172
Other Land	38,948	39,964	273	1,289	1,562	1,016
Water Area	6,182	6,182	0	0	0	0
TOTAL AREA INVENTORIED	1,839,494	1,839,494	7,904	7,904	15,808	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	91
Farmland of Statewide Importance	2
Unique Farmland	2
Farmland of Local Importance	916
IMPORTANT FARMLAND SUBTOTAL	1,011
Grazing Land	1,885
AGRICULTURAL LAND SUBTOTAL	2,896
Urban and Built-up Land	0
Other Land	611
Water Area	0
TOTAL ACREAGE REPORTED	3,507

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)	to:	--	3	15	1,748	1,766	5	1,771	25	185	0	1,981
Farmland of Statewide Importance	to:	6	--	0	431	437	0	437	25	37	0	499
Unique Farmland	to:	6	3	--	6	15	107	122	1	121	0	244
Farmland of Local Importance (2)	to:	1,005	551	51	--	1,607	403	2,010	39	393	0	2,442
IMPORTANT FARMLAND SUBTOTAL		1,017	557	66	2,185	3,825	515	4,340	90	736	0	5,166
Grazing Land (3)	to:	11	1	1,600	172	1,784	--	1,784	83	550	0	2,417
AGRICULTURAL LAND SUBTOTAL		1,028	558	1,666	2,357	5,609	515	6,124	173	1,286	0	7,583
Urban and Built-up Land	to:	13	1	0	9	23	22	45	--	3	0	48
Other Land	to:	77	13	89	16	195	31	226	47	--	0	273
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	1,118	572	1,755	2,382	5,827	568	6,395	220	1,289	0	7,904

(1) Conversion to Farmland of Local Importance is primarily due to land left idle for three or more update cycles.
(2) Conversion to Prime Farmland primarily due to the addition of irrigated row crops and irrigated pasture.
(3) Conversion to Unique Farmland primarily due to the addition of irrigated row crops in various locations of the county.

TABLE A-44

TULARE COUNTY

2008-2010 Land Use Conversion

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

Farmland Mapping and Monitoring Program

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	375,119	370,249	6,071	1,201	7,272	-4,870
Farmland of Statewide Importance	327,204	323,599	6,606	3,001	9,607	-3,605
Unique Farmland	11,919	11,593	545	219	764	-326
Farmland of Local Importance	150,193	154,550	4,280	8,637	12,917	4,357
IMPORTANT FARMLAND SUBTOTAL	864,435	859,991	17,502	13,058	30,560	-4,444
Grazing Land	439,851	440,042	246	437	683	191
AGRICULTURAL LAND SUBTOTAL	1,304,286	1,300,033	17,748	13,495	31,243	-4,253
Urban and Built-up Land	57,947	59,944	93	2,090	2,183	1,997
Other Land	218,980	221,236	1,144	3,400	4,544	2,256
Water Area	4,656	4,656	0	0	0	0
TOTAL AREA INVENTORIED	1,585,869	1,585,869	18,985	18,985	37,970	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	159
Farmland of Statewide Importance	29
Unique Farmland	1
Farmland of Local Importance	304
IMPORTANT FARMLAND SUBTOTAL	493
Grazing Land	97
AGRICULTURAL LAND SUBTOTAL	590
Urban and Built-up Land	0
Other Land	157
Water Area	0
TOTAL ACREAGE REPORTED	747

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)(2)	to:	--	4	19	3,146	3,169	4	3,173	1,450	1,448	0	6,071
Farmland of Statewide Importance (1)(2)	to:	4	--	14	5,217	5,235	0	5,235	196	1,175	0	6,606
Unique Farmland	to:	7	1	--	166	174	236	410	7	128	0	545
Farmland of Local Importance (3)	to:	836	2,479	46	--	3,361	129	3,490	325	465	0	4,280
IMPORTANT FARMLAND SUBTOTAL		847	2,484	79	8,529	11,939	369	12,308	1,978	3,216	0	17,502
Grazing Land	to:	0	0	90	29	119	--	119	2	125	0	246
AGRICULTURAL LAND SUBTOTAL		847	2,484	169	8,558	12,058	369	12,427	1,980	3,341	0	17,748
Urban and Built-up Land (4)	to:	12	7	0	15	34	0	34	--	59	0	93
Other Land	to:	342	510	50	64	966	68	1,034	110	--	0	1,144
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	1,201	3,001	219	8,637	13,058	437	13,495	2,090	3,400	0	18,985

(1) Conversions to Farmland of Local Importance due to land left idle for three or more update cycles and the expansion of Confined Livestock facilities.
(2) Conversions to Other Land primarily due to the addition of wetlands near Angiola, low-density housing and land graded for development.
(3) Conversion to irrigated farmland categories largely due to the addition of irrigated crops and orchards, scattered throughout the county.
(4) Conversion from Urban and Built-up Land is primarily due to lack of sufficient infrastructure and the use of detailed digital imagery to delineate more distinct urban boundaries.

TABLE A-45
VENTURA COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	43,791	42,420	1,787	416	2,203	-1,371
Farmland of Statewide Importance	33,841	33,482	702	343	1,045	-359
Unique Farmland	28,643	28,793	1,535	1,685	3,220	150
Farmland of Local Importance	16,218	14,988	2,260	1,030	3,290	-1,230
IMPORTANT FARMLAND SUBTOTAL	122,493	119,683	6,284	3,474	9,758	-2,810
Grazing Land	195,674	197,278	743	2,347	3,090	1,604
AGRICULTURAL LAND SUBTOTAL	318,167	316,961	7,027	5,821	12,848	-1,206
Urban and Built-up Land	104,280	105,233	108	1,061	1,169	953
Other Land	129,563	129,816	1,242	1,495	2,737	253
Water Area	3,939	3,939	0	0	0	0
TOTAL AREA INVENTORIED	555,949	555,949	8,377	8,377	16,754	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	284
Farmland of Statewide Importance	165
Unique Farmland	118
Farmland of Local Importance	732
IMPORTANT FARMLAND SUBTOTAL	1,299
Grazing Land	3,694
AGRICULTURAL LAND SUBTOTAL	4,993
Urban and Built-up Land	0
Other Land	1,375
Water Area	0
TOTAL ACREAGE REPORTED	6,368

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)	to:	--	3	583	695	1,281	9	1,290	207	290	0	1,787
Farmland of Statewide Importance (1)	to:	1	--	242	244	487	10	497	117	88	0	702
Unique Farmland (2)	to:	36	7	--	20	63	1,027	1,090	30	415	0	1,535
Farmland of Local Importance (2)	to:	172	163	183	--	518	1,272	1,790	108	362	0	2,260
IMPORTANT FARMLAND SUBTOTAL		209	173	1,008	959	2,349	2,318	4,667	462	1,155	0	6,284
Grazing Land	to:	6	4	287	42	339	--	339	83	321	0	743
AGRICULTURAL LAND SUBTOTAL		215	177	1,295	1,001	2,688	2,318	5,006	545	1,476	0	7,027
Urban and Built-up Land	to:	20	23	44	2	89	0	89	--	19	0	108
Other Land	to:	181	143	346	27	697	29	726	516	--	0	1,242
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	416	343	1,685	1,030	3,474	2,347	5,821	1,061	1,495	0	8,377

(1) Conversion to Unique Farmland is due to the identification of potted plant nurseries on land previously mapped as irrigated farmland.
(2) Conversion to Grazing Land is primarily due to irrigated crops or nonirrigated grain fields left fallow for three or more update cycles.

TABLE A-46
YOLO COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED		2008-10 ACREAGE CHANGES			
	2008	2010	ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	255,193	252,083	3,661	551	4,212	-3,110
Farmland of Statewide Importance	16,793	16,412	568	187	755	-381
Unique Farmland	45,750	43,629	3,071	950	4,021	-2,121
Farmland of Local Importance	60,345	62,410	3,096	5,161	8,257	2,065
IMPORTANT FARMLAND SUBTOTAL	378,081	374,534	10,396	6,849	17,245	-3,547
Grazing Land	157,963	160,450	2,337	4,824	7,161	2,487
AGRICULTURAL LAND SUBTOTAL	536,044	534,984	12,733	11,673	24,406	-1,060
Urban and Built-up Land	30,225	30,537	20	332	352	312
Other Land	79,370	80,128	693	1,451	2,144	758
Water Area	7,814	7,804	10	0	10	-10
TOTAL AREA INVENTORIED	653,453	653,453	13,456	13,456	26,912	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	232
Farmland of Statewide Importance	0
Unique Farmland	21
Farmland of Local Importance	323
IMPORTANT FARMLAND SUBTOTAL	576
Grazing Land	118
AGRICULTURAL LAND SUBTOTAL	694
Urban and Built-up Land	0
Other Land	550
Water Area	0
TOTAL ACREAGE REPORTED	1,244

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)(2)	to:	--	2	93	2,755	2,850	4	2,854	148	659	0	3,661
Farmland of Statewide Importance	to:	2	--	6	496	504	2	506	10	52	0	568
Unique Farmland (3)	to:	9	3	--	81	93	2,815	2,908	4	159	0	3,071
Farmland of Local Importance (3)	to:	335	180	193	--	708	1,897	2,605	22	469	0	3,096
IMPORTANT FARMLAND SUBTOTAL		346	185	292	3,332	4,155	4,718	8,873	184	1,339	0	10,396
Grazing Land (2)	to:	1	1	496	1,722	2,220	--	2,220	5	112	0	2,337
AGRICULTURAL LAND SUBTOTAL		347	186	788	5,054	6,375	4,718	11,093	189	1,451	0	12,733
Urban and Built-up Land	to:	13	0	5	2	20	0	20	--	0	0	20
Other Land	to:	191	1	157	105	454	106	560	133	--	0	693
Water Area	to:	0	0	0	0	0	0	0	10	0	--	10
TOTAL ACREAGE CONVERTED	to:	551	187	950	5,161	6,849	4,824	11,673	332	1,451	0	13,456

(1) Conversion to Unique Farmland due to the identification of nonirrigated orchards previously mapped as irrigated farmland.
(2) Conversion to Farmland of Local Importance due to the cropping of nonirrigated grains for three or more update cycles.
(3) Conversion to Grazing Land largely due to irrigated crops or nonirrigated grain fields left fallow for three or more update cycles.

TABLE A-47
YUBA COUNTY
2008-2010 Land Use Conversion

PART I
County Summary and Change by Land Use Category

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED 2008	TOTAL ACREAGE INVENTORIED 2010	2008-10 ACREAGE CHANGES: ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland	41,371	39,485	2,191	305	2,496	-1,886
Farmland of Statewide Importance	10,975	10,829	164	18	182	-146
Unique Farmland	32,606	32,224	1,026	644	1,670	-382
Farmland of Local Importance	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL	84,952	82,538	3,381	967	4,348	-2,414
Grazing Land	141,639	141,509	1,869	1,739	3,608	-130
AGRICULTURAL LAND SUBTOTAL	226,591	224,047	5,250	2,706	7,956	-2,544
Urban and Built-up Land	13,669	14,026	107	464	571	357
Other Land	165,126	167,313	430	2,617	3,047	2,187
Water Area	6,629	6,629	0	0	0	0
TOTAL AREA INVENTORIED	412,015	412,015	5,787	5,787	11,574	0

PART II
Land Committed to Nonagricultural Use

LAND USE CATEGORY	TOTAL ACREAGE 2010
Prime Farmland	0
Farmland of Statewide Importance	0
Unique Farmland	0
Farmland of Local Importance	0
IMPORTANT FARMLAND SUBTOTAL	0
Grazing Land	0
AGRICULTURAL LAND SUBTOTAL	0
Urban and Built-up Land	0
Other Land	0
Water Area	0
TOTAL ACREAGE REPORTED	0

PART III Land Use Conversion from 2008 to 2010

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (1)	to:	--	2	2	0	4	1,282	1,286	22	883	0	2,191
Farmland of Statewide Importance	to:	2	--	0	0	2	55	57	6	101	0	164
Unique Farmland	to:	9	2	--	0	11	334	345	50	631	0	1,026
Farmland of Local Importance	to:	0	0	0	--	0	0	0	0	0	0	0
IMPORTANT FARMLAND SUBTOTAL		11	4	2	0	17	1,671	1,688	78	1,615	0	3,381
Grazing Land	to:	259	9	588	0	856	--	856	110	903	0	1,869
AGRICULTURAL LAND SUBTOTAL		270	13	590	0	873	1,671	2,544	188	2,518	0	5,250
Urban and Built-up Land (2)	to:	4	0	3	0	7	1	8	--	99	0	107
Other Land	to:	31	5	51	0	87	67	154	276	--	0	430
Water Area	to:	0	0	0	0	0	0	0	0	0	--	0
TOTAL ACREAGE CONVERTED	to:	305	18	644	0	967	1,739	2,706	464	2,617	0	5,787

(1) Conversion to Grazing Land primarily due to land left idle for three or more update cycles.
(2) Conversion from Urban and Built-up Land primarily the result of areas on Beale AFB noted for a lack of structures for six update cycles.

Appendix B
2008 and 2010
County Acreage Tallies

TABLE B-1
IMPORTANT FARMLAND ACREAGE SUMMARY 2008

COUNTY	IMPORTANT FARMLAND				IMPORTANT FARMLAND SUBTOTAL	GRAZING LAND	AGRICULTURAL LAND SUBTOTAL	URBAN & BUILT-UP LAND	OTHER LAND	WATER AREA	COUNTY AREA INVENTORIED (4)	PERCENT MAPPED (1)	COUNTY AREA NOT INVENTORIED	TOTAL COUNTY AREA (2)(4)
	PRIME	STATEWIDE	UNIQUE	LOCAL										
Alameda	3,958	1,290	2,441	0	7,689	244,252	251,941	146,075	73,522	53,799	525,337	100%	0	525,338
Amador	3,541	1,573	3,678	1,485	10,277	188,115	198,392	8,195	88,463	5,323	300,373	77%	87,452	387,825
Butte	194,689	22,794	23,078	0	240,561	401,859	642,420	45,350	362,624	22,858	1,073,252	100%	0	1,073,253
Colusa	197,497	2,012	121,186	235,023	555,718	9,111	564,829	5,111	168,542	1,911	740,393	100%	0	740,393
Contra Costa	26,789	7,555	3,125	53,449	90,918	168,904	259,822	151,336	49,098	53,764	514,020	100%	0	514,020
El Dorado	771	921	3,766	59,648	65,106	194,778	259,884	32,194	237,507	6,819	536,404	47%	608,519	1,144,923
Fresno	693,174	439,020	94,177	149,907	1,376,278	826,953	2,203,231	117,567	111,702	4,914	2,437,414	63%	1,408,897	3,846,311
Glenn	159,811	87,497	17,306	83,544	348,158	227,391	575,549	6,372	261,258	5,950	849,129	100%	0	849,128
Imperial	195,588	311,047	2,197	32,109	540,941	0	540,941	27,709	458,829	1,029	1,028,508	36%	1,839,918	2,868,426
Kern	626,217	216,347	96,657	0	939,221	1,807,069	2,746,290	138,696	2,329,396	9,880	5,224,262	100%	0	5,224,262
Kings	138,089	397,065	22,928	10,022	568,104	257,746	825,850	32,220	32,654	62	890,786	100%	0	890,785
Lake	13,636	1,099	11,772	21,012	47,519	239,765	287,284	15,126	501,636	46,793	850,839	100%	0	850,841
Los Angeles	32,406	1,228	1,177	7,193	42,004	229,474	271,478	170,864	678,251	3,468	1,124,061	43%	1,488,613	2,612,674
Madera	97,491	85,136	163,973	16,143	362,743	399,501	762,244	27,010	65,734	6,055	861,043	63%	516,492	1,377,535
Marin	7	461	299	65,154	65,921	89,556	155,477	42,181	136,185	44,819	378,662	100%	0	378,661
Mariposa	6	41	284	0	331	403,769	404,100	2,423	75,874	6,047	488,444	52%	447,153	935,597
Mendocino	21,107	1,365	7,219	0	29,691	1,927,016	1,956,707	19,194	66,808	2,135	2,044,844	91%	203,248	2,248,093
Merced	270,641	150,875	103,990	67,985	593,491	567,392	1,160,883	37,419	50,456	16,859	1,265,617	100%	0	1,265,618
Modoc	79,250	44,542	13,971	148,176	285,939	814,860	1,100,799	3,430	22,743	57,265	1,184,237	44%	1,505,444	2,689,681
Monterey	166,812	43,091	24,768	0	234,671	1,066,494	1,301,165	56,534	757,182	6,246	2,121,127	100%	0	2,121,127
Napa	31,742	9,798	16,326	18,490	76,356	178,957	255,313	23,328	204,825	22,397	505,863	100%	0	505,859
Nevada	514	2,285	500	22,664	25,963	116,866	142,829	17,506	128,908	2,145	291,388	47%	332,448	623,836
Orange	3,772	441	4,209	0	8,422	37,554	45,976	287,923	174,843	972	509,714	100%	0	509,712
Placer	7,894	4,823	20,195	101,011	133,923	24,448	158,371	58,622	189,458	5,011	411,462	43%	548,558	960,020
Riverside	122,935	44,653	37,133	229,156	433,877	111,219	545,096	315,679	1,021,336	62,350	1,944,461	42%	2,728,440	4,672,901
Sacramento	104,366	49,470	15,463	43,819	213,118	156,144	369,262	177,915	70,757	18,147	636,081	100%	0	636,083
San Benito	28,701	6,587	2,399	23,234	60,921	612,455	673,376	7,902	206,968	1,140	889,386	100%	0	889,388
San Bernardino	14,090	6,747	2,661	1,828	25,326	901,666	926,992	275,695	246,413	449	1,449,549	11%	11,418,240	12,867,789
San Diego	7,754	10,412	51,975	153,186	223,327	126,871	350,198	350,500	1,452,698	13,298	2,166,694	80%	545,506	2,712,200
San Joaquin	396,984	86,297	66,621	65,788	615,690	142,460	758,150	90,529	52,141	11,773	912,593	100%	0	912,600
San Luis Obispo	41,569	21,109	38,777	309,081	410,536	1,183,042	1,593,578	44,392	239,045	10,521	1,887,536	89%	236,671	2,124,207
San Mateo	2,221	142	2,182	937	5,482	48,959	54,441	71,872	161,405	65,734	353,452	100%	0	353,450
Santa Barbara	67,170	12,298	34,779	11,106	125,353	581,985	707,338	62,334	265,467	4,191	1,039,330	59%	718,869	1,758,199
Santa Clara	18,804	4,028	2,489	5,967	31,288	390,091	421,379	188,882	216,504	8,458	835,223	100%	0	835,225
Santa Cruz	14,357	2,706	4,249	516	21,828	17,952	39,780	32,013	213,563	357	285,713	100%	0	285,709
Shasta	12,289	3,287	509	6,104	22,189	412,731	434,920	36,640	543,773	5,875	1,021,208	41%	1,443,965	2,465,173
Sierra Valley (3)	8,724	7,474	3,793	89,302	109,293	79,500	188,793	999	7,903	75	197,770	4%	5,111,596	5,309,366
Siskiyou	77,208	27,678	33,008	616,670	754,564	393,893	1,148,457	15,605	98,831	18,399	1,281,292	32%	2,780,933	4,062,225
Solano	135,735	7,038	10,526	0	153,299	204,519	357,818	59,157	112,087	53,311	582,373	100%	0	582,371
Sonoma	30,814	17,252	32,106	80,045	160,217	419,004	579,221	74,741	354,589	17,533	1,026,084	100%	0	1,026,085
Stanislaus	256,166	31,448	81,367	31,160	400,141	434,137	834,278	63,971	64,456	7,466	970,171	100%	0	970,169
Sutter	165,315	106,597	19,156	0	291,068	52,571	343,639	13,230	30,562	1,883	389,314	100%	0	389,313
Tehama	63,038	17,231	18,054	132,608	230,931	1,549,800	1,780,731	13,633	38,948	6,182	1,839,494	97%	53,406	1,892,900
Tulare	375,119	327,204	11,919	150,193	864,435	439,851	1,304,286	57,947	218,980	4,656	1,585,869	51%	1,513,407	3,099,276
Ventura	43,791	33,841	28,643	16,218	122,493	195,674	318,167	104,280	129,563	3,939	555,949	47%	631,902	1,187,851
Yolo	255,193	16,793	45,750	60,345	378,081	157,963	536,044	30,225	79,370	7,814	653,453	100%	0	653,452
Yuba	41,371	10,975	32,606	0	84,952	141,639	226,591	13,669	165,126	6,629	412,015	100%	0	412,014
TOTAL (4)	5,249,116	2,683,573	1,335,387	3,120,278	12,388,354	19,175,956	31,564,310	3,574,195	13,216,983	716,701	49,072,189		36,169,677	85,241,864

(1) Counties that are not completely inventoried typically contain large public land holdings, such as National Forests, that are not covered by modern soil surveys.
(2) Total County Area figures are calculated from a statewide GIS county boundary file available through the California Spatial Information Library.
(3) Lassen, Plumas, and Sierra counties are included within the tri-county area referred to as "Sierra Valley" in the USDA-NRCS soil survey for that region.
(4) Category and Area Inventoried totals may differ slightly from statewide conversion table due to rounding. Similarly, minor discrepancies occur between the FMMP inventoried area and the statewide GIS data set acreage due to rounding.

TABLE B-2
IMPORTANT FARMLAND ACREAGE SUMMARY 2010

California Department of Conservation
Division of Land Resource Protection

FARMLAND MAPPING AND MONITORING PROGRAM

COUNTY	IMPORTANT FARMLAND				IMPORTANT FARMLAND SUBTOTAL	GRAZING LAND	AGRICULTURAL LAND SUBTOTAL	URBAN & BUILT-UP LAND	OTHER LAND	WATER AREA	COUNTY AREA INVENTORIED (4)	PERCENT MAPPED (1)	COUNTY AREA NOT INVENTORIED	TOTAL COUNTY AREA (2)(4)
	PRIME	STATEWIDE	UNIQUE	LOCAL										
Alameda	3,953	1,230	2,383	0	7,566	244,033	251,599	146,263	73,595	53,880	525,337	100%	0	525,338
Amador	3,211	1,421	3,335	1,864	9,831	188,433	198,264	8,295	88,491	5,323	300,373	77%	87,452	387,825
Butte	193,290	21,871	22,190	0	237,351	402,999	640,350	45,914	364,130	22,858	1,073,252	100%	0	1,073,253
Colusa	196,320	2,046	120,316	236,013	554,695	9,161	563,856	5,142	169,484	1,911	740,393	100%	0	740,393
Contra Costa	26,484	7,420	3,205	53,039	90,148	168,646	258,794	151,965	49,497	53,764	514,020	100%	0	514,020
El Dorado	661	827	3,206	59,565	64,259	193,883	258,142	32,269	239,020	6,973	536,404	47%	608,519	1,144,923
Fresno	685,411	415,689	92,649	176,524	1,370,273	825,752	2,196,025	120,753	115,722	4,914	2,437,414	63%	1,408,897	3,846,311
Glenn	157,940	87,071	17,300	85,836	348,147	226,837	574,984	6,420	261,775	5,950	849,129	100%	0	849,128
Imperial	194,137	307,221	2,141	35,774	539,273	0	539,273	28,485	460,001	749	1,028,508	36%	1,839,918	2,868,426
Kern	608,789	213,465	91,830	0	914,084	1,827,391	2,741,475	141,899	2,330,998	9,890	5,224,262	100%	0	5,224,262
Kings	130,257	388,891	21,801	11,138	552,087	271,831	823,918	35,847	30,959	62	890,786	100%	0	890,785
Lake	11,603	847	11,083	22,393	45,926	239,873	285,799	15,688	502,559	46,793	850,839	100%	0	850,841
Los Angeles	30,876	952	1,129	6,855	39,812	231,475	271,287	174,888	674,568	3,318	1,124,061	43%	1,488,613	2,612,674
Madera	97,095	84,755	165,931	13,801	361,582	400,604	762,186	27,214	65,588	6,055	861,043	63%	516,492	1,377,535
Marin	0	233	287	63,297	63,817	89,256	153,073	42,341	138,429	44,819	378,662	100%	0	378,661
Mariposa	6	49	285	0	340	403,602	403,942	2,440	76,015	6,047	488,444	52%	447,153	935,597
Mendocino	21,346	1,374	7,370	0	30,090	1,925,803	1,955,893	19,455	67,361	2,135	2,044,844	91%	203,249	2,248,093
Merced	271,100	151,340	109,030	65,057	596,527	562,461	1,158,988	38,376	51,394	16,859	1,265,617	100%	0	1,265,618
Modoc	78,065	43,193	14,556	150,183	285,997	814,097	1,100,094	3,652	23,226	57,265	1,184,237	44%	1,505,444	2,689,681
Monterey	166,251	43,372	25,524	0	235,147	1,065,698	1,300,845	56,779	757,257	6,246	2,121,127	100%	0	2,121,127
Napa	31,621	9,711	16,414	18,464	76,210	179,029	255,239	23,557	204,671	22,396	505,863	100%	0	505,859
Nevada	398	1,586	480	23,470	25,934	116,808	142,742	17,541	128,960	2,145	291,388	47%	332,448	623,836
Orange	3,243	367	3,654	0	7,264	37,639	44,903	289,172	174,667	972	509,714	100%	0	509,712
Placer	7,340	4,068	18,060	103,273	132,741	24,193	156,934	58,714	190,803	5,011	411,462	43%	548,558	960,020
Riverside	119,635	44,086	35,391	229,877	428,989	110,841	539,830	321,553	1,020,717	62,361	1,944,461	42%	2,728,440	4,672,901
Sacramento	97,476	45,264	15,076	53,928	211,744	155,822	367,566	178,784	71,584	18,147	636,081	100%	0	636,083
San Benito	27,425	6,475	2,250	21,310	57,460	614,821	672,281	8,023	207,937	1,145	889,386	100%	0	889,388
San Bernardino	12,848	6,242	2,511	1,160	22,761	902,590	925,351	277,875	245,813	510	1,449,549	11%	11,418,240	12,867,789
San Diego	7,085	9,439	48,359	154,038	218,921	126,496	345,417	355,146	1,452,833	13,298	2,166,694	80%	545,506	2,712,200
San Joaquin	385,337	83,307	69,481	76,869	614,994	139,235	754,229	91,929	54,662	11,773	912,593	100%	0	912,600
San Luis Obispo	41,319	21,132	39,950	307,325	409,726	1,181,015	1,590,741	45,017	242,998	8,780	1,887,536	89%	236,671	2,124,207
San Mateo	2,180	146	2,271	695	5,292	48,797	54,089	72,510	161,119	65,734	353,452	100%	0	353,450
Santa Barbara	66,568	12,475	35,606	10,643	125,292	581,642	706,934	62,762	265,911	3,723	1,039,330	59%	718,869	1,758,199
Santa Clara	17,270	3,630	2,523	4,328	27,751	392,777	420,528	189,129	217,108	8,458	835,223	100%	0	835,225
Santa Cruz	13,817	2,449	3,763	548	20,577	18,268	38,845	32,750	213,761	357	285,713	100%	0	285,709
Shasta	11,082	2,928	499	5,207	19,716	414,052	433,768	36,930	544,632	5,878	1,021,208	41%	1,443,965	2,465,173
Sierra Valley (3)	6,599	6,244	3,169	92,964	108,976	79,576	188,552	1,009	8,164	45	197,770	4%	5,111,596	5,309,366
Siskiyou	74,245	26,729	33,584	624,522	759,080	387,886	1,146,966	15,774	100,153	18,399	1,281,292	32%	2,780,933	4,062,225
Solano	131,820	6,369	9,275	0	147,464	209,195	356,659	59,591	112,661	53,462	582,373	100%	0	582,371
Sonoma	29,939	17,192	32,924	80,195	160,250	417,773	578,023	75,214	355,314	17,533	1,026,084	100%	0	1,026,085
Stanislaus	253,435	31,474	87,527	31,366	403,802	429,544	833,346	64,529	64,831	7,465	970,171	100%	0	970,169
Sutter	162,673	105,395	17,752	0	285,820	53,538	339,358	13,560	34,513	1,883	389,314	100%	0	389,313
Tehama	62,175	17,304	19,565	132,548	231,592	1,547,951	1,779,543	13,805	39,964	6,182	1,839,494	97%	53,406	1,892,900
Tulare	370,249	323,599	11,593	154,550	859,991	440,042	1,300,033	59,944	221,236	4,656	1,585,869	51%	1,513,407	3,099,276
Ventura	42,420	33,482	28,793	14,988	119,683	197,278	316,961	105,233	129,816	3,939	555,949	47%	631,902	1,187,851
Yolo	252,083	16,412	43,629	62,410	374,534	160,450	534,984	30,537	80,128	7,804	653,453	100%	0	653,452
Yuba	39,485	10,829	32,224	0	82,538	141,509	224,047	14,026	167,313	6,629	412,015	100%	0	412,014
TOTAL (4)	5,146,562	2,621,601	1,331,874	3,186,017	12,286,054	19,200,602	31,486,656	3,618,699	13,252,338	714,496	49,072,189		36,169,678	85,241,864

(1) Counties that are not completely inventoried typically contain large public land holdings, such as National Forests, that are not covered by modern soil surveys.
(2) Total County Area figures are calculated from a statewide GIS county boundary file available through the California Spatial Information Library.
(3) Lassen, Plumas, and Sierra counties are included within the tri-county area referred to as "Sierra Valley" in the USDA-NRCS soil survey for that region.
(4) Category and Area Inventoried totals may differ slightly from statewide conversion table due to rounding. Similarly, minor discrepancies occur between the FMMP inventoried area and the statewide GIS data set acreage due to rounding.

TABLE B-3

IMPORTANT FARMLAND ACREAGE SUMMARY, BY REGION, 2010

COUNTY	IRRIGATED FARMLAND			NONIRRIGATED			URBAN &				TOTAL
	PRIME	STATEWIDE	UNIQUE	LOCAL	GRAZING LAND	FARMLAND SUBTOTAL	BUILT-UP LAND	OTHER LAND	WATER	COUNTY AREA MAPPED (1)	COUNTY AREA (1)
SOUTHERN CALIFORNIA											
Imperial	**194,137**	**307,221**	**2,141**	**35,774**	**0**	**539,273**	**28,485**	**460,001**	**749**	**1,028,508**	**2,868,426**
Los Angeles	**30,876**	**952**	**1,129**	**6,855**	**231,475**	**271,287**	**174,888**	**674,568**	**3,318**	**1,124,061**	**2,612,674**
Orange	**3,243**	**367**	**3,654**	**0**	**37,639**	**44,903**	**289,172**	**174,667**	**972**	**509,714**	**509,712**
Riverside	**119,635**	**44,086**	**35,391**	**229,877**	**110,841**	**539,830**	**321,553**	**1,020,717**	**62,361**	**1,944,461**	**4,672,901**
San Bernardino	**12,848**	**6,242**	**2,511**	**1,160**	**902,590**	**925,351**	**277,875**	**245,813**	**510**	**1,449,549**	**12,867,789**
San Diego	**7,085**	**9,439**	**48,359**	**154,038**	**126,496**	**345,417**	**355,146**	**1,452,833**	**13,298**	**2,166,694**	**2,712,200**
Ventura	**42,420**	**33,482**	**28,793**	**14,988**	**197,278**	**316,961**	**105,233**	**129,816**	**3,939**	**555,949**	**1,187,851**
Subtotals	**410,244**	**401,789**	**121,978**	**442,692**	**1,606,319**	**2,983,022**	**1,552,352**	**4,158,415**	**85,147**	**8,778,936**	**27,431,553**
SAN JOAQUIN VALLEY											
Fresno	**685,411**	**415,689**	**92,649**	**176,524**	**825,752**	**2,196,025**	**120,753**	**115,722**	**4,914**	**2,437,414**	**3,846,311**
Kern	**608,789**	**213,465**	**91,830**	**0**	**1,827,391**	**2,741,475**	**141,899**	**2,330,998**	**9,890**	**5,224,262**	**5,224,262**
Kings	**130,257**	**388,891**	**21,801**	**11,138**	**271,831**	**823,918**	**35,847**	**30,959**	**62**	**890,786**	**890,785**
Madera	**97,095**	**84,755**	**165,931**	**13,801**	**400,604**	**762,186**	**27,214**	**65,588**	**6,055**	**861,043**	**1,377,535**
Merced	**271,100**	**151,340**	**109,030**	**65,057**	**562,461**	**1,158,988**	**38,376**	**51,394**	**16,859**	**1,265,617**	**1,265,618**
San Joaquin	**385,337**	**83,307**	**69,481**	**76,869**	**139,235**	**754,229**	**91,929**	**54,662**	**11,773**	**912,593**	**912,600**
Stanislaus	**253,435**	**31,474**	**87,527**	**31,366**	**429,544**	**833,346**	**64,529**	**64,831**	**7,465**	**970,171**	**970,169**
Tulare	**370,249**	**323,599**	**11,593**	**154,550**	**440,042**	**1,300,033**	**59,944**	**221,236**	**4,656**	**1,585,869**	**3,099,276**
Subtotals	**2,801,673**	**1,692,520**	**649,842**	**529,305**	**4,896,860**	**10,570,200**	**580,491**	**2,935,390**	**61,674**	**14,147,755**	**17,586,556**
CENTRAL COAST											
Monterey	**166,251**	**43,372**	**25,524**	**0**	**1,065,698**	**1,300,845**	**56,779**	**757,257**	**6,246**	**2,121,127**	**2,121,127**
San Benito	**27,425**	**6,475**	**2,250**	**21,310**	**614,821**	**672,281**	**8,023**	**207,937**	**1,145**	**889,386**	**889,388**
San Luis Obispo	**41,319**	**21,132**	**39,950**	**307,325**	**1,181,015**	**1,590,741**	**45,017**	**242,998**	**8,780**	**1,887,536**	**2,124,207**
Santa Barbara	**66,568**	**12,475**	**35,606**	**10,643**	**581,642**	**706,934**	**62,762**	**265,911**	**3,723**	**1,039,330**	**1,758,199**
Subtotals	**301,563**	**83,454**	**103,330**	**339,278**	**3,443,176**	**4,270,801**	**172,581**	**1,474,103**	**19,894**	**5,937,379**	**6,892,921**
SAN FRANCISCO BAY											
Alameda	**3,953**	**1,230**	**2,383**	**0**	**244,033**	**251,599**	**146,263**	**73,595**	**53,880**	**525,337**	**525,338**
Contra Costa	**26,484**	**7,420**	**3,205**	**53,039**	**168,646**	**258,794**	**151,965**	**49,497**	**53,764**	**514,020**	**514,020**
Marin	**0**	**233**	**287**	**63,297**	**89,256**	**153,073**	**42,341**	**138,429**	**44,819**	**378,662**	**378,661**
Napa	**31,621**	**9,711**	**16,414**	**18,464**	**179,029**	**255,239**	**23,557**	**204,671**	**22,396**	**505,863**	**505,859**
San Mateo	**2,180**	**146**	**2,271**	**695**	**48,797**	**54,089**	**72,510**	**161,119**	**65,734**	**353,452**	**353,450**
Santa Clara	**17,270**	**3,630**	**2,523**	**4,328**	**392,777**	**420,528**	**189,129**	**217,108**	**8,458**	**835,223**	**835,225**
Santa Cruz	**13,817**	**2,449**	**3,763**	**548**	**18,268**	**38,845**	**32,750**	**213,761**	**357**	**285,713**	**285,709**
Solano	**131,820**	**6,369**	**9,275**	**0**	**209,195**	**356,659**	**59,591**	**112,661**	**53,462**	**582,373**	**582,371**
Sonoma	**29,939**	**17,192**	**32,924**	**80,195**	**417,773**	**578,023**	**75,214**	**355,314**	**17,533**	**1,026,084**	**1,026,085**
Subtotals	**257,084**	**48,380**	**73,045**	**220,566**	**1,767,774**	**2,366,849**	**793,320**	**1,526,155**	**320,403**	**5,006,727**	**5,006,718**
SIERRA FOOTHILL											
Amador	**3,211**	**1,421**	**3,335**	**1,864**	**188,433**	**198,264**	**8,295**	**88,491**	**5,323**	**300,373**	**387,825**
El Dorado	**661**	**827**	**3,206**	**59,565**	**193,883**	**258,142**	**32,269**	**239,020**	**6,973**	**536,404**	**1,144,923**
Mariposa	**6**	**49**	**285**	**0**	**403,602**	**403,942**	**2,440**	**76,015**	**6,047**	**488,444**	**935,597**
Nevada	**398**	**1,586**	**480**	**23,470**	**116,808**	**142,742**	**17,541**	**128,960**	**2,145**	**291,388**	**623,836**
Placer	**7,340**	**4,068**	**18,060**	**103,273**	**24,193**	**156,934**	**58,714**	**190,803**	**5,011**	**411,462**	**960,020**
Subtotals	**11,616**	**7,951**	**25,366**	**188,172**	**926,919**	**1,160,024**	**119,259**	**723,289**	**25,499**	**2,028,071**	**4,052,201**
SACRAMENTO VALLEY											
Butte	**193,290**	**21,871**	**22,190**	**0**	**402,999**	**640,350**	**45,914**	**364,130**	**22,858**	**1,073,252**	**1,073,253**
Colusa	**196,320**	**2,046**	**120,316**	**236,013**	**9,161**	**563,856**	**5,142**	**169,484**	**1,911**	**740,393**	**740,393**
Glenn	**157,940**	**87,071**	**17,300**	**85,836**	**226,837**	**574,984**	**6,420**	**261,775**	**5,950**	**849,129**	**849,128**
Sacramento	**97,476**	**45,264**	**15,076**	**53,928**	**155,822**	**367,566**	**178,784**	**71,584**	**18,147**	**636,081**	**636,083**
Shasta	**11,082**	**2,928**	**499**	**5,207**	**414,052**	**433,768**	**36,930**	**544,632**	**5,878**	**1,021,208**	**2,465,173**
Sutter	**162,673**	**105,395**	**17,752**	**0**	**53,538**	**339,358**	**13,560**	**34,513**	**1,883**	**389,314**	**389,313**
Tehama	**62,175**	**17,304**	**19,565**	**132,548**	**1,547,951**	**1,779,543**	**13,805**	**39,964**	**6,182**	**1,839,494**	**1,892,900**
Yolo	**252,083**	**16,412**	**43,629**	**62,410**	**160,450**	**534,984**	**30,537**	**80,128**	**7,804**	**653,453**	**653,452**
Yuba	**39,485**	**10,829**	**32,224**	**0**	**141,509**	**224,047**	**14,026**	**167,313**	**6,629**	**412,015**	**412,014**
Subtotals	**1,172,524**	**309,120**	**288,551**	**575,942**	**3,112,319**	**5,458,456**	**345,118**	**1,733,523**	**77,242**	**7,614,339**	**9,111,709**
NORTH STATE (northwest & northeast)											
Lake	**11,603**	**847**	**11,083**	**22,393**	**239,873**	**285,799**	**15,688**	**502,559**	**46,793**	**850,839**	**850,841**
Mendocino	**21,346**	**1,374**	**7,370**	**0**	**1,925,803**	**1,955,893**	**19,455**	**67,361**	**2,135**	**2,044,844**	**2,248,093**
Modoc	**78,065**	**43,193**	**14,556**	**150,183**	**814,097**	**1,100,094**	**3,652**	**23,226**	**57,265**	**1,184,237**	**2,689,681**
Sierra Valley (3)	**6,599**	**6,244**	**3,169**	**92,964**	**79,576**	**188,552**	**1,009**	**8,164**	**45**	**197,770**	**5,309,366**
Siskiyou	**74,245**	**26,729**	**33,584**	**624,522**	**387,886**	**1,146,966**	**15,774**	**100,153**	**18,399**	**1,281,292**	**4,062,225**
Subtotals	**191,858**	**78,387**	**69,762**	**890,062**	**3,447,235**	**4,677,304**	**55,578**	**701,463**	**124,637**	**5,558,982**	**15,160,206**
GRAND TOTALS (2)	**5,146,562**	**2,621,601**	**1,331,874**	**3,186,017**	**19,200,602**	**31,486,656**	**3,618,699**	**13,252,338**	**714,496**	**49,072,189**	**85,241,864**

(1) Total County Area figures are calculated from a statewide GIS county boundary file available through the California Spatial Information Library.

(2) Category and Area Inventoried totals may differ slightly from statewide conversion table due to rounding.

(3) Lassen, Plumas, and Sierra counties are included within the tri-county area referred to as "Sierra Valley" in the USDA-NRCS soil survey for that region.

Appendix C
County and Regional Conversion Summaries

Table C-1

SOURCES OF URBAN LAND 2008-2010

and

LAND COMMITTED TO NONAGRICULTURAL USE

COUNTY	*Shifts to Urban and Built-Up Land from (1):*					Land Committed to Nonagricultural Use (2)	
	Prime	Statewide & Unique	Other Land & Water	Grazing & Local	Total	Prime	Total
SOUTHERN CALIFORNIA							
Imperial	71	209	83	413	776	0	0
Los Angeles	19	-20	3,637	388	4,024	44	9,748
Orange	116	89	872	172	1,249	1,468	6,366
Riverside	943	235	1,978	2,718	5,874	375	34,258
San Bernardino	272	59	876	973	2,180	290	14,383
San Diego	68	166	2,969	1,443	4,646	89	7,490
Ventura	187	80	497	189	953	284	6,368
Subtotals	1,676	818	10,912	6,296	19,702	2,550	78,613
SAN JOAQUIN VALLEY							
Fresno	743	503	958	982	3,186	1,520	5,695
Kern	1,438	223	887	655	3,203	1,945	3,288
Kings	347	657	2,128	495	3,627	25	27
Madera	51	45	76	32	204	106	4,819
Merced	138	111	345	363	957	31	694
San Joaquin	516	308	427	149	1,400	404	4,293
Stanislaus	323	5	188	42	558	130	1,107
Tulare	1,438	196	51	312	1,997	159	747
Subtotals	4,994	2,048	5,060	3,030	15,132	4,320	20,670
CENTRAL COAST							
Monterey	168	1	66	10	245	635	1,109
San Benito	23	-9	88	19	121	0	0
San Luis Obispo	16	25	212	372	625	0	405
Santa Barbara	129	8	224	67	428	244	890
Subtotals	336	25	590	468	1,419	879	2,404
SAN FRANCISCO BAY							
Alameda	18	6	-112	276	188	104	4,478
Contra Costa	83	27	152	367	629	465	2,812
Marin	7	2	125	26	160	0	17
Napa	-15	9	49	186	229	46	1,705
San Mateo	0	-3	633	8	638	0	556
Santa Clara	45	6	81	115	247	589	2,921
Santa Cruz	46	20	640	31	737	0	25
Solano	125	30	89	190	434	2	4,334
Sonoma	15	5	174	279	473	0	1,570
Subtotals	324	102	1,831	1,478	3,735	1,206	18,418
SIERRA FOOTHILL							
Amador	4	0	138	-42	100	0	0
El Dorado	1	4	37	33	75	0	0
Mariposa	0	0	16	1	17	0	1,493
Nevada	0	0	34	1	35	0	703
Placer (3)	0	-98	-208	398	92	0	1,850
Subtotals	5	-94	17	391	319	0	4,046
SACRAMENTO VALLEY							
Butte	136	44	290	94	564	0	461
Colusa	-3	4	13	17	31	0	0
Glenn	-32	7	59	14	48	686	2,684
Sacramento	71	153	222	423	869	0	1,372
Shasta	19	-7	257	21	290	0	3,072
Sutter	53	69	178	30	330	0	181
Tehama	12	25	44	91	172	91	3,507
Yolo	135	9	143	25	312	232	1,244
Yuba	18	53	177	109	357	0	0
Subtotals	409	357	1,383	824	2,973	1,009	12,521
NORTH STATE (northwest & northeast)							
Lake	43	24	239	256	562	0	0
Mendocino	15	21	42	183	261	0	0
Modoc	-2	1	18	205	222	16	4,847
Sierra Valley	4	0	0	6	10	0	2,919
Siskiyou	3	-5	61	110	169	0	49
Subtotals	63	41	360	760	1,224	16	7,815
GRAND TOTALS	7,807	3,297	20,153	13,247	44,504	9,980	144,487

(1) New Urban Land acreages are net figures.

(2) Land Committed to Nonagricultural Use data is voluntarily submitted by city and county planning departments.

(3) Conversion out of Urban and Built-up Land due to cropping in former water retention basins and insufficient infrastructure to qualify as Urban.

Table C-2

IRRIGATED FARMLAND CHANGES 2008-2010 (1)

ASIDE FROM URBANIZATION

COUNTY	*Land converted to Irrigated Agriculture:* Grazing, Local, Other Land & Urban to Prime	Grazing, Local, Other Land & Urban to Statewide & Unique	Total	*Land removed from Irrigated Agriculture:* Prime, Statewide & Unique to Other	Prime, Statewide & Unique to Local & Grazing	Total
SOUTHERN CALIFORNIA						
Imperial	411	755	1,166	915	5,296	6,211
Los Angeles	890	46	936	185	2,555	2,740
Orange	15	92	107	506	536	1,042
Riverside	2,346	1,805	4,151	1,210	7,341	8,551
San Bernardino	408	132	540	206	1,877	2,083
San Diego	132	615	747	2,020	3,745	5,765
Ventura	379	1,193	1,572	793	2,005	2,798
Subtotals	4,581	4,638	9,219	5,835	23,355	29,190
SAN JOAQUIN VALLEY						
Fresno	3,250	1,925	5,175	2,085	34,333	36,418
Kern	2,152	1,433	3,585	2,973	24,084	27,057
Kings	491	3,627	4,118	516	19,675	20,191
Madera	1,342	4,040	5,382	749	3,338	4,087
Merced	2,529	8,476	11,005	1,963	2,722	4,685
San Joaquin	886	4,653	5,539	2,360	14,075	16,435
Stanislaus	1,065	8,675	9,740	1,304	4,587	5,891
Tulare	1,190	3,182	4,372	2,751	8,769	11,520
Subtotals	12,905	36,011	48,916	14,701	111,583	126,284
CENTRAL COAST						
Monterey	806	2,379	3,185	501	2,024	2,525
San Benito	820	761	1,581	361	2,727	3,088
San Luis Obispo	867	2,707	3,574	236	2,323	2,559
Santa Barbara	694	2,392	3,086	457	2,056	2,513
Subtotals	3,187	8,239	11,426	1,555	9,130	10,685
SAN FRANCISCO BAY						
Alameda	87	100	187	84	163	247
Contra Costa	778	326	1,104	288	1,029	1,317
Marin	0	50	50	191	97	288
Napa	240	619	859	290	646	936
San Mateo	65	226	291	43	194	237
Santa Clara	86	103	189	355	1,657	2,012
Santa Cruz	41	65	106	789	526	1,315
Solano	578	487	1,065	689	6,025	6,714
Sonoma	395	1,912	2,307	407	1,972	2,379
Subtotals	2,270	3,888	6,158	3,136	12,309	15,445
SIERRA FOOTHILL						
Amador	3	17	20	117	724	841
El Dorado	3	79	82	70	770	840
Mariposa	0	18	18	0	9	9
Nevada	0	3	3	31	807	838
Placer	47	312	359	295	3,508	3,803
Subtotals	53	429	482	513	5,818	6,331
SACRAMENTO VALLEY						
Butte	520	450	970	2,018	1,944	3,962
Colusa	359	611	970	1,224	1,753	2,977
Glenn	1,687	1,731	3,418	1,058	4,613	5,671
Sacramento	385	621	1,006	594	11,671	12,265
Shasta	245	76	321	503	1,372	1,875
Sutter	620	822	1,442	4,265	2,287	6,552
Tehama	1,106	2,306	3,412	343	2,297	2,640
Yolo	540	1,033	1,573	870	6,153	7,023
Yuba	294	656	950	1,615	1,671	3,286
Subtotals	5,756	8,306	14,062	12,490	33,761	46,251
NORTH STATE (northwest & northeast)						
Lake	139	294	433	582	2,755	3,337
Mendocino	409	277	686	119	125	244
Modoc	1,266	1,512	2,778	202	4,523	4,725
Sierra Valley	73	342	415	30	4,360	4,390
Siskiyou	523	1,736	2,259	45	5,546	5,591
Subtotals	2,410	4,161	6,571	978	17,309	18,287
GRAND TOTALS	31,162	65,672	96,834	39,208	213,265	252,473

(1) Agricultural change data compiled from Part III of individual county tables. Figures do not include shifts among irrigated categories (soil unit revisions); shifts involving Water are grouped with Other Land.

Table C-3

NET CHANGE IN IRRIGATED LAND 2008-2010

From all Factors (1)

Grouped by Region	
SOUTHERN CALIFORNIA	
Imperial	-5,333
Los Angeles	-1,854
Orange	-1,158
Riverside	-5,609
San Bernardino	-1,897
San Diego	-5,258
Ventura	-1,580
Subtotal	-22,689
SAN JOAQUIN VALLEY	
Fresno	-32,622
Kern	-25,137
Kings	-17,133
Madera	1,181
Merced	5,964
San Joaquin	-11,777
Stanislaus	3,455
Tulare	-8,801
Subtotal	-84,870
CENTRAL COAST	
Monterey	476
San Benito	-1,537
San Luis Obispo	946
Santa Barbara	402
Subtotal	287
SAN FRANCISCO BAY	
Alameda	-123
Contra Costa	-360
Marin	-247
Napa	-120
San Mateo	52
Santa Clara	-1,898
Santa Cruz	-1,283
Solano	-5,835
Sonoma	-117
Subtotal	-9,931
SIERRA FOOTHILL	
Amador	-825
El Dorado	-764
Mariposa	9
Nevada	-835
Placer	-3,444
Subtotal	-5,859
SACRAMENTO VALLEY	
Butte	-3,210
Colusa	-2,013
Glenn	-2,303
Sacramento	-11,483
Shasta	-1,576
Sutter	-5,248
Tehama	721
Yolo	-5,612
Yuba	-2,414
Subtotal	-33,138
NORTH STATE (northwest & northeast)	
Lake	-2,974
Mendocino	399
Modoc	-1,949
Sierra Valley	-3,979
Siskiyou	-3,336
Subtotal	-11,839
GRAND TOTAL	**-168,039**

Rank by County 2008-2010	
Merced	5,964
Stanislaus	3,455
Madera	1,181
San Luis Obispo	946
Tehama	721
Monterey	476
Santa Barbara	402
Mendocino	399
San Mateo	52
Mariposa	9
Sonoma	-117
Napa	-120
Alameda	-123
Marin	-247
Contra Costa	-360
El Dorado	-764
Amador	-825
Nevada	-835
Orange	-1,158
Santa Cruz	-1,283
San Benito	-1,537
Shasta	-1,576
Ventura	-1,580
Los Angeles	-1,854
San Bernardino	-1,897
Santa Clara	-1,898
Modoc	-1,949
Colusa	-2,013
Glenn	-2,303
Yuba	-2,414
Lake	-2,974
Butte	-3,210
Siskiyou	-3,336
Placer	-3,444
Sierra Valley	-3,979
Sutter	-5,248
San Diego	-5,258
Imperial	-5,333
Riverside	-5,609
Yolo	-5,612
Solano	-5,835
Tulare	-8,801
Sacramento	-11,483
San Joaquin	-11,777
Kings	-17,133
Kern	-25,137
Fresno	-32,622

(1) Data compiled from Part I of individual county tables. Net change includes the impact of urbanization, conversion to Other Land, removal from irrigated use due to idling, as well as conversions into irrigated use. The net figure also includes any soil unit reclassifications or other revisions within irrigated categories.

Appendix D
Rural Land Use Mapping Tables

TABLE D-1

RURAL LAND USE CONVERSION SUMMARY

2008-2010, FOR ALL AVAILABLE COUNTIES

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection **Farmland Mapping and Monitoring Program**

PART I

Rural Land Use Summary

LAND USE CATEGORY	ACREAGE INVENTORIED		ACREAGE CHANGED (2)	PERCENT CHANGE
	2008	2010		
Rural Residential	180,627	185,742	5,115	2.8%
Semi-agricultural and Rural Commercial	39,598	40,958	1,360	3.4%
Confined Animal Agriculture	88,669	90,620	1,951	2.2%
Vacant or Disturbed Land	347,498	350,004	2,506	0.7%
Nonagricultural and Natural Vegetation	2,387,127	2,388,250	1,123	0.0%
TOTAL AREA INVENTORIED (1)	3,043,519	3,055,574	12,055	0.4%

PART II

Conversions to Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Rural Residential Land	Semi-agricultural and Rural	Confined Animal Agriculture	Vacant or Disturbed Land	Nonagricultural and Natural Vegetation
Prime Farmland	to:	2,126	1,003	877	4,917	642
Farmland of Statewide Importance	to:	989	496	1,576	1,203	927
Unique Farmland	to:	444	165	548	694	242
IRRIGATED FARMLAND SUBTOTAL	to:	3,559	1,664	3,001	6,814	1,811
Farmland of Local Importance	to:	1,356	348	172	728	1,931
Grazing Land	to:	2,154	462	291	749	984
AGRICULTURAL LAND TOTAL	to:	7,069	2,474	3,464	8,291	4,726
Urban and Built-up Land (3)	to:	114	145	21	206	84
Other Rural Land Uses (4)	to:	836	577	186	1,120	325
TOTAL LAND CONVERTED TO RURAL USES		8,019	3,196	3,671	9,617	5,135

PART III

Conversions From Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Urban and Built-up Land	Irrigated Farmland	Farmland of Local Importance and Grazing	Other Rural Land Uses (4)
Rural Residential Land	to:	1,115	946	450	393
Semi-agricultural and Rural Commercial	to:	382	672	187	595
Confined Animal Agriculture	to:	70	945	322	383
Vacant or Disturbed Land	to:	3,829	2,156	465	661
Nonagricultural and Natural Vegetation	to:	323	2,099	578	1,012
TOTAL LAND CONVERTED FROM RURAL USES		5,719	6,818	2,002	3,044

(1) As of 2010, rural Land data is available in the counties of Fresno, Kern, Kings, Madera, Mendocino, Merced, San Joaquin, Stanislaus, and Tulare. These counties encompass 33 percent of the Important Farmland survey area.
(2) Total Area Inventoried for Rural Land categories is equal to that of Other Land plus the acreage of Confined Animal Agriculture. In some counties, Confined Animal Agriculture facilities are included within the county's Farmland of Local Importance definition--see Appendix E for defintions.
(3) Conversions out of Urban Land primarily due to the use of detailed digital imagery to delineate more distinct urban boundaries.
(4) These statistics represent shifts from one Rural Land Use category to another.

Table D-2

RURAL LAND MAPPING CHANGES 2008-2010

NET ACRES - FOR ALL AVAILABLE COUNTIES (1)

COUNTY	*Farm and Grazing Land converted to Rural Residential: (2)*			*Farm and Grazing Land converted to other Rural Land categories: (2)*				
	Irrigated Farmland	Grazing and Local	Total	To Semi-agricultural and Rural Commercial	To Confined Animal Agriculture	To Vacant or Disturbed	To Nonagricultural or Natural Vegetation	Total
SAN JOAQUIN VALLEY								
Fresno (3)	519	1,366	1,885	445	66	852	1,785	3,148
Kern	137	154	291	240	-3	2,542	-581	2,198
Kings	148	10	158	176	1,140	66	31	1,413
Madera	23	19	42	68	20	-118	-82	-112
Merced	8	207	215	17	259	273	519	1,068
San Joaquin	794	450	1,244	267	-151	911	406	1,433
Stanislaus	253	68	321	235	101	206	-301	241
Tulare	654	290	944	103	755	905	357	2,120
Subtotals	2,536	2,564	5,100	1,551	2,187	5,637	2,134	11,509
ADDITIONAL RURAL LAND COUNTIES								
Mendocino	77	496	573	64	10	33	-85	22
Subtotals	77	496	573	64	10	33	-85	22
GRAND TOTALS	2,613	3,060	5,673	1,615	2,197	5,670	2,049	11,531

(1) As of 2010, Rural Land data is available in the counties of Fresno, Kern, Kings, Madera, Mendocino, Merced, San Joaquin, Stanislaus, and Tulare. These counties encompass 33 percent of the Important Farmland survey area.

(2) Negative numbers represent net increase of farm or grazing land relative to the Rural Land category.

(3) Conversion to Nonagricultural Vegetation is primarily due to the Don Gragnani Wetland Reserve Project on the USGS San Joaquin quad.

TABLE D-3

FRESNO COUNTY

2008-2010 Rural Land Use Data

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection **Farmland Mapping and Monitoring Program**

PART I

Rural Land Use Summary

LAND USE CATEGORY	ACREAGE INVENTORIED		ACREAGE	PERCENT
	2008	2010	CHANGED	CHANGE
Rural Residential Land	40,905	42,468	1,563	3.8%
Semi-agricultural and Rural Commercial	6,721	7,283	562	8.4%
Confined Animal Agriculture	12,401	12,473	72	0.6%
Vacant or Disturbed Land	30,611	30,836	225	0.7%
Nonagricultural and Natural Vegetation	33,465	35,135	1,670	5.0%
TOTAL AREA INVENTORIED (1)	124,103	128,195	4,092	3.3%

PART II

Conversions to Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Rural Residential Land	Semi-agricultural and Rural Commerical	Confined Animal Agriculture	Vacant or Disturbed Land	Nonagricultural and Natural Vegetation
Prime Farmland	to:	457	349	70	352	46
Farmland of Statewide Importance	to:	175	72	123	335	96
Unique Farmland	to:	90	28	34	60	25
IRRIGATED FARMLAND SUBTOTAL	to:	722	449	227	747	167
Farmland of Local Importance (2)	to:	430	150	29	439	1,776
Grazing Land (3)	to:	1,045	85	0	12	3
AGRICULTURAL LAND TOTAL	to:	2,197	684	256	1,198	1,946
Urban and Built-up Land	to:	19	117	18	35	12
Other Rural Land Uses (4)	to:	94	81	9	108	2
TOTAL LAND CONVERTED TO RURAL USES		2,310	882	283	1,341	1,960

PART III

Conversions From Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Urban and Built-up Land	Irrigated Farmland	Farmland of Local Importance and Grazing	Other Rural Land Uses (4)
Rural Residential Land	to:	362	203	109	73
Semi-agricultural and Rural Commercial	to:	55	208	31	26
Confined Animal Agriculture	to:	1	135	55	20
Vacant or Disturbed Land	to:	721	278	68	49
Nonagricultural and Natural Vegetation	to:	3	133	28	126
TOTAL LAND CONVERTED FROM RURAL USES		1,142	957	291	294

(1) Total Area Inventoried for Rural Land categories in Fresno County is equal to that of Other Land plus that of Confined Animal Agriculture. Confined animal agriculture facilities are a component of the county's Farmland of Local Importance definition.
(2) Conversion to Nonagricultural Vegetation primarily due to development of the Don Gragnani Wetland Reserve Project.
(3) Conversion to Rural Residential Land due to low development home development throughout the county.
(4) These statistics represent shifts from one Rural Land Use category to another.

TABLE D-4

KERN COUNTY

2008-2010 Rural Land Use Data

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection **Farmland Mapping and Monitoring Program**

PART I

Rural Land Use Summary

LAND USE CATEGORY	ACREAGE INVENTORIED		ACREAGE	PERCENT
	2008	2010	CHANGED	CHANGE
Rural Residential Land	38,410	38,703	293	0.8%
Semi-agricultural and Rural Commercial	11,633	11,629	-4	0.0%
Confined Animal Agriculture	7,553	7,549	-4	-0.1%
Vacant or Disturbed Land	244,661	247,072	2,411	1.0%
Nonagricultural and Natural Vegetation	2,027,139	2,026,045	-1,094	-0.1%
TOTAL AREA INVENTORIED (1)	2,329,396	2,330,998	1,602	0.1%

PART II

Conversions to Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Rural Residential Land	Semi-agricultural and Rural Commerical	Confined Animal Agriculture	Vacant or Disturbed Land	Nonagricultural and Natural Vegetation
Prime Farmland	to:	125	103	0	2,184	19
Farmland of Statewide Importance	to:	21	151	0	160	24
Unique Farmland	to:	2	20	0	55	108
IRRIGATED FARMLAND SUBTOTAL	to:	148	274	0	2,399	151
Farmland of Local Importance	to:	0	0	0	0	0
Grazing Land	to:	176	70	0	520	348
AGRICULTURAL LAND TOTAL	to:	324	344	0	2,919	499
Urban and Built-up Land	to:	45	3	0	122	55
Other Rural Land Uses (2)	to:	340	166	0	528	83
TOTAL LAND CONVERTED TO RURAL USES		709	513	0	3,569	637

PART III

Conversions From Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Urban and Built-up Land	Irrigated Farmland	Farmland of Local Importance and Grazing	Other Rural Land Uses (2)
Rural Residential Land	to:	296	11	22	87
Semi-agricultural and Rural Commercial	to:	173	51	53	240
Confined Animal Agriculture	to:	0	2	1	1
Vacant or Disturbed Land	to:	501	218	159	280
Nonagricultural and Natural Vegetation	to:	142	996	84	509
TOTAL LAND CONVERTED FROM RURAL USES		1,112	1,278	319	1,117

(1) Total Area Inventoried for Rural Land Use categories is equal to that of Other Land in the Important Farmland Map for Kern County.
(2) These statistics represent shifts from one Rural Land Use category to another.
(3) Conversion to Vacant and Disturbed Land due to land left idle for three or more update cycles that has been graded for development primarily in the Bakersfield area, the expansion of oil extraction in the Lost Hills area, and the delineation of low density housing, farmsteads, and rural commercial.

KERN COUNTY

TABLE D-5

KINGS COUNTY

2008-2010 Rural Land Use Data

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection **Farmland Mapping and Monitoring Program**

PART I

Rural Land Use Summary

LAND USE CATEGORY	ACREAGE INVENTORIED		ACREAGE CHANGED	PERCENT CHANGE
	2008	2010		
Rural Residential Land	3,861	3,930	69	1.8%
Semi-agricultural and Rural Commercial	2,551	2,726	175	6.9%
Confined Animal Agriculture	10,022	11,138	1,116	11.1%
Vacant or Disturbed Land	20,383	18,403	-1,980	-9.7%
Nonagricultural and Natural Vegetation	5,859	5,900	41	0.7%
TOTAL AREA INVENTORIED (1)	42,676	42,097	-579	-1.4%

PART II

Conversions to Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Rural Residential Land	Semi-agricultural and Rural Commerical	Confined Animal Agriculture	Vacant or Disturbed Land	Nonagricultural and Natural Vegetation
Prime Farmland	to:	83	34	56	64	33
Farmland of Statewide Importance	to:	128	89	709	33	13
Unique Farmland	to:	9	19	240	5	6
IRRIGATED FARMLAND SUBTOTAL	to:	220	142	1,005	102	52
Farmland of Local Importance	to:	0	0	0	0	0
Grazing Land	to:	13	69	216	99	0
AGRICULTURAL LAND TOTAL	to:	233	211	1,221	201	52
Urban and Built-up Land	to:	0	0	0	0	0
Other Rural Land Uses (2)	to:	29	39	51	59	80
TOTAL LAND CONVERTED TO RURAL USES		262	250	1,272	260	132

PART III

Conversions From Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Urban and Built-up Land	Irrigated Farmland	Farmland of Local Importance and Grazing	Other Rural Land Uses (2)
Rural Residential Land	to:	42	72	3	76
Semi-agricultural and Rural Commercial	to:	23	35	0	17
Confined Animal Agriculture	to:	22	80	1	53
Vacant or Disturbed Land	to:	2,015	117	18	90
Nonagricultural and Natural Vegetation	to:	48	18	3	22
TOTAL LAND CONVERTED FROM RURAL USES		2,150	322	25	258

(1) Total Area Inventoried for Rural Land categories in Kings County is equal to that of Other Land plus the acreage of Confined Animal Agriculture.
Confined animal agriculture facilities are a component of the county's Farmland of Local Importance definition.
(2) These statistics represent shifts from one Rural Land Use category to another.

TABLE D-6

MADERA COUNTY

2008-2010 Rural Land Use Data

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

Farmland Mapping and Monitoring Program

PART I

Rural Land Use Summary

LAND USE CATEGORY	ACREAGE INVENTORIED		ACREAGE CHANGED	PERCENT CHANGE
	2008	2010		
Rural Residential Land	28,381	28,426	45	0.2%
Semi-agricultural and Rural Commercial	1,820	1,887	67	3.7%
Confined Animal Agriculture	4,071	4,108	37	0.9%
Vacant or Disturbed Land	10,472	10,280	-192	-1.8%
Nonagricultural and Natural Vegetation	20,990	20,887	-103	-0.5%
TOTAL AREA INVENTORIED (1)	65,734	65,588	-146	-0.2%

PART II

Conversions to Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Rural Residential Land	Semi-agricultural and Rural Commerical	Confined Animal Agriculture	Vacant or Disturbed Land	Nonagricultural and Natural Vegetation
Prime Farmland	to:	68	42	37	132	24
Farmland of Statewide Importance	to:	13	1	16	48	9
Unique Farmland	to:	47	27	27	243	15
IRRIGATED FARMLAND SUBTOTAL	to:	128	70	80	423	48
Farmland of Local Importance	to:	16	0	1	5	0
Grazing Land	to:	25	84	18	17	5
AGRICULTURAL LAND TOTAL	to:	169	154	99	445	53
Urban and Built-up Land	to:	5	0	0	0	0
Other Rural Land Uses (2)	to:	36	0	17	6	0
TOTAL LAND CONVERTED TO RURAL USES		210	154	116	451	53

PART III

Conversions From Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Urban and Built-up Land	Irrigated Farmland	Farmland of Local Importance and Grazing	Other Rural Land Uses (2)
Rural Residential Land	to:	38	105	22	0
Semi-agricultural and Rural Commercial	to:	0	86	0	1
Confined Animal Agriculture	to:	0	79	0	0
Vacant or Disturbed Land	to:	41	522	41	39
Nonagricultural and Natural Vegetation	to:	2	135	0	19
TOTAL LAND CONVERTED FROM RURAL USES		81	927	63	59

(1) Total Area Inventoried for Rural Land Use categories is equal to that of Other Land in the Important Farmland Map for Madera County.
(2) These statistics represent shifts from one Rural Land Use category to another.

TABLE D-7

MENDOCINO COUNTY

2008-2010 Rural Land Use Data

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection **Farmland Mapping and Monitoring Program**

PART I

Rural Land Use Summary

LAND USE CATEGORY	ACREAGE INVENTORIED		ACREAGE CHANGED	PERCENT CHANGE
	2008	2010		
Rural Residential Land	19,985	20,501	516	2.6%
Semi-agricultural and Rural Commercial	1,049	1,117	68	6.5%
Confined Animal Agriculture	70	80	10	14.3%
Vacant or Disturbed Land	977	1,009	32	3.3%
Nonagricultural and Natural Vegetation	44,727	44,654	-73	-0.2%
TOTAL AREA INVENTORIED (1)	66,808	67,361	553	0.8%

PART II

Conversions to Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Rural Residential Land	Semi-agricultural and Rural Commerical	Confined Animal Agriculture	Vacant or Disturbed Land	Nonagricultural and Natural Vegetation
Prime Farmland	to:	63	10	0	0	18
Farmland of Statewide Importance	to:	1	0	0	0	0
Unique Farmland	to:	26	0	0	0	1
IRRIGATED FARMLAND SUBTOTAL	to:	90	10	0	0	19
Farmland of Local Importance	to:	0	0	0	0	0
Grazing Land	to:	632	64	10	33	17
AGRICULTURAL LAND TOTAL	to:	722	74	10	33	36
Urban and Built-up Land	to:	1	0	0	0	2
Other Rural Land Uses (2)	to:	4	4	0	0	35
TOTAL LAND CONVERTED TO RURAL USES		727	78	10	33	73

PART III

Conversions From Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Urban and Built-up Land	Irrigated Farmland	Farmland of Local Importance and Grazing	Other Rural Land Uses (2)
Rural Residential Land	to:	27	13	136	35
Semi-agricultural and Rural Commercial	to:	0	7	3	0
Confined Animal Agriculture	to:	0	0	0	0
Vacant or Disturbed Land	to:	1	0	0	0
Nonagricultural and Natural Vegetation	to:	17	4	117	8
TOTAL LAND CONVERTED FROM RURAL USES		45	24	256	43

(1) Total Area Inventoried for Rural Land Use categories is equal to that of Other Land in the Important Farmland Map for Mendocino County.
(2) These statistics represent shifts from one Rural Land Use category to another.

TABLE D-8

MERCED COUNTY

2008-2010 Rural Land Use Data

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection **Farmland Mapping and Monitoring Program**

PART I

Rural Land Use Summary

LAND USE CATEGORY	ACREAGE INVENTORIED 2008	ACREAGE INVENTORIED 2010	ACREAGE CHANGED	PERCENT CHANGE
Rural Residential Land	5,310	5,418	108	2.0%
Semi-agricultural and Rural Commercial	3,605	3,666	61	1.7%
Confined Animal Agriculture	14,188	14,339	151	1.1%
Vacant or Disturbed Land	15,008	15,234	226	1.5%
Nonagricultural and Natural Vegetation	12,345	12,737	392	3.2%
TOTAL AREA INVENTORIED (1)	50,456	51,394	938	1.9%

PART II

Conversions to Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Rural Residential Land	Semi-agricultural and Rural Commerical	Confined Animal Agriculture	Vacant or Disturbed Land	Nonagricultural and Natural Vegetation
Prime Farmland	to:	142	92	254	424	46
Farmland of Statewide Importance	to:	65	51	276	80	69
Unique Farmland	to:	7	21	185	213	38
IRRIGATED FARMLAND SUBTOTAL	to:	214	164	715	717	153
Farmland of Local Importance	to:	168	8	44	79	51
Grazing Land	to:	86	8	22	4	422
AGRICULTURAL LAND TOTAL	to:	468	180	781	800	626
Urban and Built-up Land	to:	0	1	3	0	2
Other Rural Land Uses (2)	to:	39	81	38	166	11
TOTAL LAND CONVERTED TO RURAL USES		507	262	822	966	639

PART III

Conversions From Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Urban and Built-up Land	Irrigated Farmland	Farmland of Local Importance and Grazing	Other Rural Land Uses (2)
Rural Residential Land	to:	102	206	47	44
Semi-agricultural and Rural Commercial	to:	14	161	2	24
Confined Animal Agriculture	to:	4	439	83	145
Vacant or Disturbed Land	to:	153	510	17	60
Nonagricultural and Natural Vegetation	to:	78	75	32	62
TOTAL LAND CONVERTED FROM RURAL USES		351	1,391	181	335

(1) Total Area Inventoried for Rural Land Use categories is equal to that of Other Land in the Important Farmland Map for Merced County.
(2) These statistics represent shifts from one Rural Land Use category to another.

TABLE D-7

MENDOCINO COUNTY

2008-2010 Rural Land Use Data

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection **Farmland Mapping and Monitoring Program**

PART I

Rural Land Use Summary

LAND USE CATEGORY	ACREAGE INVENTORIED		ACREAGE CHANGED	PERCENT CHANGE
	2008	2010		
Rural Residential Land	19,985	20,501	516	2.6%
Semi-agricultural and Rural Commercial	1,049	1,117	68	6.5%
Confined Animal Agriculture	70	80	10	14.3%
Vacant or Disturbed Land	977	1,009	32	3.3%
Nonagricultural and Natural Vegetation	44,727	44,654	-73	-0.2%
TOTAL AREA INVENTORIED (1)	66,808	67,361	553	0.8%

PART II

Conversions to Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Rural Residential Land	Semi-agricultural and Rural Commerical	Confined Animal Agriculture	Vacant or Disturbed Land	Nonagricultural and Natural Vegetation
Prime Farmland	to:	63	10	0	0	18
Farmland of Statewide Importance	to:	1	0	0	0	0
Unique Farmland	to:	26	0	0	0	1
IRRIGATED FARMLAND SUBTOTAL	to:	90	10	0	0	19
Farmland of Local Importance	to:	0	0	0	0	0
Grazing Land	to:	632	64	10	33	17
AGRICULTURAL LAND TOTAL	to:	722	74	10	33	36
Urban and Built-up Land	to:	1	0	0	0	2
Other Rural Land Uses (2)	to:	4	4	0	0	35
TOTAL LAND CONVERTED TO RURAL USES		727	78	10	33	73

PART III

Conversions From Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Urban and Built-up Land	Irrigated Farmland	Farmland of Local Importance and Grazing	Other Rural Land Uses (2)
Rural Residential Land	to:	27	13	136	35
Semi-agricultural and Rural Commercial	to:	0	7	3	0
Confined Animal Agriculture	to:	0	0	0	0
Vacant or Disturbed Land	to:	1	0	0	0
Nonagricultural and Natural Vegetation	to:	17	4	117	8
TOTAL LAND CONVERTED FROM RURAL USES		45	24	256	43

(1) Total Area Inventoried for Rural Land Use categories is equal to that of Other Land in the Important Farmland Map for Mendocino County.
(2) These statistics represent shifts from one Rural Land Use category to another.

TABLE D-8

MERCED COUNTY

2008-2010 Rural Land Use Data

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection **Farmland Mapping and Monitoring Program**

PART I

Rural Land Use Summary

LAND USE CATEGORY	ACREAGE INVENTORIED		ACREAGE CHANGED	PERCENT CHANGE
	2008	2010		
Rural Residential Land	5,310	5,418	108	2.0%
Semi-agricultural and Rural Commercial	3,605	3,666	61	1.7%
Confined Animal Agriculture	14,188	14,339	151	1.1%
Vacant or Disturbed Land	15,008	15,234	226	1.5%
Nonagricultural and Natural Vegetation	12,345	12,737	392	3.2%
TOTAL AREA INVENTORIED (1)	50,456	51,394	938	1.9%

PART II

Conversions to Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Rural Residential Land	Semi-agricultural and Rural Commerical	Confined Animal Agriculture	Vacant or Disturbed Land	Nonagricultural and Natural Vegetation
Prime Farmland	to:	142	92	254	424	46
Farmland of Statewide Importance	to:	65	51	276	80	69
Unique Farmland	to:	7	21	185	213	38
IRRIGATED FARMLAND SUBTOTAL	to:	214	164	715	717	153
Farmland of Local Importance	to:	168	8	44	79	51
Grazing Land	to:	86	8	22	4	422
AGRICULTURAL LAND TOTAL	to:	468	180	781	800	626
Urban and Built-up Land	to:	0	1	3	0	2
Other Rural Land Uses (2)	to:	39	81	38	166	11
TOTAL LAND CONVERTED TO RURAL USES		507	262	822	966	639

PART III

Conversions From Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Urban and Built-up Land	Irrigated Farmland	Farmland of Local Importance and Grazing	Other Rural Land Uses (2)
Rural Residential Land	to:	102	206	47	44
Semi-agricultural and Rural Commercial	to:	14	161	2	24
Confined Animal Agriculture	to:	4	439	83	145
Vacant or Disturbed Land	to:	153	510	17	60
Nonagricultural and Natural Vegetation	to:	78	75	32	62
TOTAL LAND CONVERTED FROM RURAL USES		351	1,391	181	335

(1) Total Area Inventoried for Rural Land Use categories is equal to that of Other Land in the Important Farmland Map for Merced County.
(2) These statistics represent shifts from one Rural Land Use category to another.

TABLE D-9

SAN JOAQUIN COUNTY

2008-2010 Rural Land Use Data

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection **Farmland Mapping and Monitoring Program**

PART I

Rural Land Use Summary

LAND USE CATEGORY	ACREAGE INVENTORIED		ACREAGE CHANGED	PERCENT CHANGE
	2008	2010		
Rural Residential Land	14,583	15,767	1,184	8.1%
Semi-agricultural and Rural Commercial	4,048	4,161	113	2.8%
Confined Animal Agriculture	5,552	5,247	-305	-5.5%
Vacant or Disturbed Land	10,371	11,134	763	7.4%
Nonagricultural and Natural Vegetation	23,139	23,600	461	2.0%
TOTAL AREA INVENTORIED (1)	57,693	59,909	2,216	3.8%

PART II

Conversions to Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Rural Residential Land	Semi-agricultural and Rural Commerical	Confined Animal Agriculture	Vacant or Disturbed Land	Nonagricultural and Natural Vegetation
Prime Farmland	to:	464	126	37	523	344
Farmland of Statewide Importance	to:	226	49	16	401	22
Unique Farmland	to:	127	36	23	41	1
IRRIGATED FARMLAND SUBTOTAL	to:	817	211	76	965	367
Farmland of Local Importance	to:	411	125	18	95	42
Grazing Land	to:	79	23	5	26	14
AGRICULTURAL LAND TOTAL	to:	1,307	359	99	1,086	423
Urban and Built-up Land	to:	18	0	0	14	4
Other Rural Land Uses (2)	to:	144	84	28	18	68
TOTAL LAND CONVERTED TO RURAL USES		1,469	443	127	1,118	495

PART III

Conversions From Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Urban and Built-up Land	Irrigated Farmland	Farmland of Local Importance and Grazing	Other Rural Land Uses (2)
Rural Residential Land	to:	202	23	40	20
Semi-agricultural and Rural Commercial	to:	98	32	60	140
Confined Animal Agriculture	to:	34	72	178	148
Vacant or Disturbed Land	to:	156	93	82	24
Nonagricultural and Natural Vegetation	to:	7	17	0	10
TOTAL LAND CONVERTED FROM RURAL USES		497	237	360	342

(1) Total Area Inventoried for Rural Land categories in San Joaquin County is equal to that of Other Land plus the acerage of Confined Animal Agriculture. Confined animal agriculture facilities are a component of the county's Farmland of Local Importance definition.
(2) These statistics represent shifts from one Rural Land Use category to another.

TABLE D-10

STANISLAUS COUNTY

2008-2010 Rural Land Use Data

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection **Farmland Mapping and Monitoring Program**

PART I

Rural Land Use Summary

LAND USE CATEGORY	ACREAGE INVENTORIED		ACREAGE	PERCENT
	2008	2010	CHANGED	CHANGE
Rural Residential Land	9,516	9,819	303	3.2%
Semi-agricultural and Rural Commercial	2,568	2,866	298	11.6%
Confined Animal Agriculture	11,595	11,721	126	1.1%
Vacant or Disturbed Land	5,477	5,540	63	1.2%
Nonagricultural and Natural Vegetation	35,300	34,885	-415	-1.2%
TOTAL AREA INVENTORIED (1)	64,456	64,831	375	0.6%

PART II

Conversions to Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Rural Residential Land	Semi-agricultural and Rural Commerical	Confined Animal Agriculture	Vacant or Disturbed Land	Nonagricultural and Natural Vegetation
Prime Farmland	to:	264	168	99	358	83
Farmland of Statewide Importance	to:	23	19	38	55	11
Unique Farmland	to:	75	12	39	36	24
IRRIGATED FARMLAND SUBTOTAL	to:	362	199	176	449	118
Farmland of Local Importance	to:	50	30	24	26	1
Grazing Land	to:	35	59	11	32	119
AGRICULTURAL LAND TOTAL	to:	447	288	211	507	238
Urban and Built-up Land	to:	26	3	0	0	6
Other Rural Land Uses (2)	to:	17	87	37	97	34
TOTAL LAND CONVERTED TO RURAL USES		490	378	248	604	278

PART III

Conversions From Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Urban and Built-up Land	Irrigated Farmland	Farmland of Local Importance and Grazing	Other Rural Land Uses (2)
Rural Residential Land	to:	32	109	17	29
Semi-agricultural and Rural Commercial	to:	3	45	8	24
Confined Animal Agriculture	to:	0	106	4	12
Vacant or Disturbed Land	to:	171	236	65	69
Nonagricultural and Natural Vegetation	to:	16	252	287	138
TOTAL LAND CONVERTED FROM RURAL USES		222	748	381	272

(1) Total Area Inventoried for Rural Land Use categories is equal to that of Other Land in the Important Farmland Map for Stanislaus County.
(2) These statistics represent shifts from one Rural Land Use category to another.

TABLE D-11

TULARE COUNTY

2008-2010 Rural Land Use Data

CALIFORNIA DEPARTMENT OF CONSERVATION
Division of Land Resource Protection **Farmland Mapping and Monitoring Program**

PART I

Rural Land Use Summary

LAND USE CATEGORY	ACREAGE INVENTORIED		ACREAGE	PERCENT
	2008	2010	CHANGED	CHANGE
Rural Residential Land	19,676	20,710	1,034	5.3%
Semi-agricultural and Rural Commercial	5,603	5,623	20	0.4%
Confined Animal Agriculture	23,217	23,965	748	3.2%
Vacant or Disturbed Land	9,538	10,496	958	10.0%
Nonagricultural and Natural Vegetation	184,163	184,407	244	0.1%
TOTAL AREA INVENTORIED (1)	242,197	245,201	3,004	1.2%

PART II

Conversions to Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Rural Residential Land	Semi-agricultural and Rural Commerical	Confined Animal Agriculture	Vacant or Disturbed Land	Nonagricultural and Natural Vegetation
Prime Farmland	to:	460	79	324	880	29
Farmland of Statewide Importance	to:	337	64	398	91	683
Unique Farmland	to:	61	2	0	41	24
IRRIGATED FARMLAND SUBTOTAL	to:	858	145	722	1,012	736
Farmland of Local Importance	to:	281	35	56	84	61
Grazing Land	to:	63	0	9	6	56
AGRICULTURAL LAND TOTAL	to:	1,202	180	787	1,102	853
Urban and Built-up Land	to:	0	21	0	35	3
Other Rural Land Uses (2)	to:	133	35	6	138	12
TOTAL LAND CONVERTED TO RURAL USES		1,335	236	793	1,275	868

PART III

Conversions From Rural Land Uses, 2008 to 2010

LAND USE CATEGORY		Urban and Built-up Land	Irrigated Farmland	Farmland of Local Importance and Grazing	Other Rural Land Uses (2)
Rural Residential Land	to:	14	204	54	29
Semi-agricultural and Rural Commercial	to:	16	47	30	123
Confined Animal Agriculture	to:	9	32	0	4
Vacant or Disturbed Land	to:	70	182	15	50
Nonagricultural and Natural Vegetation	to:	10	469	27	118
TOTAL LAND CONVERTED FROM RURAL USES		119	934	126	324

(1) Total Area Inventoried for Rural Land Use categories in Tulare County is equal to that of Other Land plus that of Confined Animal Agriculture. The confined animal agriculture facilities are a component of the county's Farmland of Local Importance definition.

(2) These statistics represent shifts from one Rural Land Use category to another.

Appendix E
Farmland of Local Importance Definitions

Farmland of Local Importance

Background

Farmland of Local Importance is land of importance to the local economy, as defined by each county's local advisory committee and adopted by its Board of Supervisors. Farmland of Local Importance is either currently producing, or has the capability of production, but does not meet the criteria of Prime Farmland, Farmland of Statewide Importance, or Unique Farmland. Authority to adopt or to recommend changes to the category of Farmland of Local Importance rests with the Board of Supervisors in each county.

ALAMEDA

The Board of Supervisors determined that there will be no Farmland of Local Importance for Alameda County.

AMADOR

Land that is currently in agricultural production and that is providing an economic return equal to that from the prime soil types.

BUTTE

The Board of Supervisors determined that there will be no Farmland of Local Importance for Butte County.

COLUSA

The following lands are to be included in the Farmland of Local Importance category: All farmable lands within Colusa County that do not meet the definitions of Prime, Statewide, or Unique, but are currently irrigated pasture or nonirrigated crops; or nonirrigated land with soils qualifying for Prime Farmland or Farmland of Statewide Importance; or lands that would have Prime or Statewide designation and have been improved for irrigation but are now idle; or lands with a General Plan Land Use designation for agricultural purposes; and lands that are legislated to be used only for agricultural (farmland) purposes.

CONTRA COSTA

The lands within the Tassajara area, extending eastward to the county boundary and bordered on the north by the Black Hills, the Deer, Lone Tree and Briones Valleys, the Antioch area, and the Delta. These lands are typically used for livestock grazing. They are capable of producing dryland grain on a two year summer fallow or longer rotation with volunteer hay and pasture. The farmlands in this category are included in the U.S. Natural Resources Conservation Service's Land Capability Classes I, II, III, and IV, and lack some irrigation water.

EL DORADO

Lands that do not qualify for the Prime, Statewide, or Unique designation but are considered Existing Agricultural Lands, or Potential Agricultural Lands, in the Agricultural Land Element of the County General Plan. Timberlands are excluded.

FRESNO

All farmable lands within Fresno County that do not meet the definitions of Prime, Statewide, or Unique. This includes land that is or has been used for irrigated pasture, dryland farming, confined livestock and dairy, poultry facilities, aquaculture and grazing land.

GLENN

Local Importance (L): All lands not qualifying for Prime, Statewide, or Unique that are cropped on a continuing or cyclic basis (irrigation is not a consideration). All cropable land within Glenn County water district boundaries not qualifying for Prime, Statewide, or Unique.

Local Potential (LP): All lands having Prime and Statewide soil mapping units which are not irrigated, regardless of cropping history or irrigation water availability.

IMPERIAL
Unirrigated and uncultivated lands with Prime and Statewide soils.

KERN
The Board of Supervisors determined that there will be no Farmland of Local Importance for Kern County.

KINGS
Land that supports the following commercial agricultural activities: dairies, confined livestock, and poultry operations.

LAKE
Lands which do not qualify as Prime Farmland or Farmland of Statewide Importance or Unique Farmland, but are currently irrigated pasture or nonirrigated crops; and unirrigated land with soils qualifying for Prime Farmland or Farmland of Statewide Importance. Areas of unirrigated Prime and Statewide Importance soils overlying ground water basins may have more potential for agricultural use.

LOS ANGELES
Producing lands that would meet the standard criteria for Prime or Statewide but are not irrigated.

MADERA
Lands that are presently under cultivation for small grain crops, but are not irrigated. Also lands that are currently irrigated pasture, but have the potential to be cultivated for row/field crop use.

MARIN
Land which is not irrigated, but is cultivated; or has the potential for cultivation.

MARIPOSA
The Board of Supervisors determined that there will be no Farmland of Local Importance for Mariposa County.

MENDOCINO
The Board of Supervisors determined that there will be no Farmland of Local Importance for Mendocino County.

MERCED
Farmlands that have physical characteristics that would qualify for Prime or Statewide except for the lack of irrigation water. Also, farmlands that produce crops that are not listed under Unique but are important to the economy of the county or city.

MODOC
Irrigated and dry cropland classified as Class III and Class IV irrigated land if water is or becomes available.

MONTEREY

The Board of Supervisors determined that there will be no Farmland of Local Importance for Monterey County.

NAPA

These farmlands include areas of soils that meet all the characteristics of Prime Farmland or of additional Farmland of Statewide Importance with the exception of irrigation. These farmlands include dryland grains, haylands, and dryland pasture.

NEVADA

Farmlands that have physical characteristics that would qualify for Prime or Statewide except for the lack of irrigation water. Farmlands that produce crops that are not listed under Unique Lands but are important to the economy of the county are: Christmas trees, Sudan grass, Meadow hay, chestnuts, poultry houses and feedlots, improved dryland pasture (not rangeland), and irrigated pasture (it is under Statewide or Prime if soils are listed as such, otherwise as Local).

Also, lands that are legislated to be used only for agricultural (farmland) purposes, such as Williamson Act land in western Nevada County.

ORANGE

The Board of Supervisors determined that there will be no Farmland of Local Importance for Orange County.

PLACER

Farmlands not covered by the categories of Prime, Statewide, or Unique. They include lands zoned for agriculture by County Ordinance and the California Land Conservation Act as well as dry farmed lands, irrigated pasture lands, and other agricultural lands of significant economic importance to the County and include lands that have a potential for irrigation from Placer County water supplies.

RIVERSIDE

Soils that would be classified as Prime and Statewide but lack available irrigation water. Lands planted to dryland crops of barley, oats, and wheat.

Lands producing major crops for Riverside County but that are not listed as Unique crops. These crops are identified as returning one million or more dollars on the 1980 Riverside County Agriculture Crop Report. Crops identified are permanent pasture (irrigated), summer squash, okra, eggplant, radishes, and watermelons.

Dairylands, including corrals, pasture, milking facilities, hay and manure storage areas if accompanied with permanent pasture or hayland of 10 acres or more.

Lands identified by city or county ordinance as Agricultural Zones or Contracts, which includes Riverside City "Proposition R" lands. Lands planted to jojoba which are under cultivation and are of producing age.

SACRAMENTO

Lands which do not qualify as Prime, Statewide, or Unique designation but are currently irrigated crops or pasture or nonirrigated crops; lands that would be Prime or Statewide designation and have been improved for irrigation but are now idle; and lands which currently support confined livestock, poultry operations, and aquaculture.

SAN BENITO
Land cultivated as dry cropland. Usual crops are wheat, barley, oats, safflower, and grain hay. Also, orchards affected by boron within the area specified in County Resolution Number 84-3.

SAN BERNARDINO
Farmlands which include areas of soils that meet all the characteristics of Prime, Statewide, or Unique and which are not irrigated.

Farmlands not covered by above categories but are of high economic importance to the community. These farmlands include dryland grains of wheat, barley, oats, and dryland pasture.

SAN DIEGO
Land that meets all the characteristics of Prime and Statewide, with the exception of irrigation.

Farmlands not covered by the above categories but are of significant economic importance to the county. They have a history of good production for locally adapted crops. The soils are grouped in types that are suited for truck crops (such as tomatoes, strawberries, cucumbers, potatoes, celery, squash, romaine lettuce, and cauliflower) and soils suited for orchard crops (avocados and citrus).

SAN JOAQUIN
All farmable land within San Joaquin County not meeting the definitions of "Prime Farmland," "Farmland of Statewide Importance," and "Unique Farmland." This includes land that is or has been used for irrigated pasture, dryland farming, confined livestock or dairy facilities, aquaculture, poultry facilities, and dry grazing. It also includes soils previously designated by soil characteristics as "Prime Farmland," "Farmland of Statewide Importance," and "Unique Farmland" that has since become idle.

SAN LUIS OBISPO
Local Importance (L): areas of soils that meet all the characteristics of Prime or Statewide, with the exception of irrigation. Additional farmlands include dryland field crops of wheat, barley, oats, and safflower.

Local Potential (LP): lands having the potential for farmland, which have Prime or Statewide characteristics and are not cultivated.

SAN MATEO
Lands other than Prime, Statewide, or Unique that produce the following crops: oats, Christmas trees, pumpkins, dryland pasture, other grains, and haylands. These lands are not irrigated.

SANTA BARBARA
All dryland farming areas and permanent pasture (if the soils were not eligible for either Prime or Statewide). Dryland farming includes various cereal grains (predominantly wheat, barley, and oats), sudan, and many varieties of beans. (Although beans can be high value crops the production areas are usually rotated with grain, hence the decision to include them under Local rather than Unique. Also, bean crop yields are highly influenced by climate, so there can be a wide variance in cash value.)

SANTA CLARA
Small orchards and vineyards primarily in the foothill areas. Also land cultivated as dry cropland for grains and hay.

SANTA CRUZ
Soils used for Christmas tree farms and nurseries, and that do not meet the definition for Prime, Statewide, or Unique.

SHASTA
Dryland grain producing lands. Also included are farmlands that are presently irrigated but do not meet the soil characteristics of Prime or Statewide. The majority of these farmlands are located within the Anderson Cottonwood Irrigation District. These soils include Newton gravelly loam (8 to 15 percent slopes), Moda loam, seeped (0 to 3 percent slopes), Moda loam, shallow (0 to 5 percent slopes), and Hillgate loam.

SIERRA VALLEY
Plumas County: Lands designated as "agricultural preserve" in the 1984 Plumas County General Plan and rangelands with a carrying capacity of 8 acres/animal month, as well as irrigable lands.

Lassen and Sierra counties: Farmlands that include areas of soils that meet all the characteristics of Prime or Statewide and which are not irrigated. Also, all dry land wheat, barley, oats, hayland, and pasture.

SISKIYOU
Farmlands that include dryland or sub-irrigated hay and grain and improved pasture forage species; these dry farmed lands commonly have inclusions of uncultivated shallow, rocky, or steep soils; farmlands presently irrigated but which do not meet the soil characteristics of Prime Farmland or Farmland of Statewide Importance; areas currently shown as Prime Agricultural Land in the Siskiyou County General Plan; areas under contract as Agricultural Preserves in Siskiyou County (currently mapped only for the Scott-Shasta-Butte Valley and Tule Lake soil survey areas); other agricultural land of significant importance to the county (currently mapped only for the Scott-Shasta-Butte Valley and Tule Lake soil survey areas); areas previously designated by soil characteristics as Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance that have since become idle; lands enrolled in the U.S. Department of Agriculture's Conservation Reserve Program.

SOLANO
The Board of Supervisors determined that there will be no Farmland of Local Importance for Solano County.

SONOMA
The hayland producing areas of the Santa Rosa Plains, Petaluma Valley, and Tubbs Island Naval Reservation. Additional areas also include those lands which are classified as having the capability for producing locally important crops such as grapes, corn, etc., but may not be planted at the present time.

Examples of these areas include the coastal lands from Fort Ross to Stewarts Point, areas surrounding Bloomfield, Two Rock, Chileno Valley, and areas of Sonoma Valley in the vicinity of Big Bend, Vineburg, and Schellville.

STANISLAUS
Farmlands growing dryland pasture, dryland small grains, and irrigated pasture.

SUTTER
The Board of Supervisors determined that there will be no Farmland of Local Importance for Sutter County.

TEHAMA
All lands which are not included in Prime, Statewide, or Unique and are cropped continuously or on a cyclic

basis (irrigation is not a factor). Also, all lands included in the L category which have soil mapping units listed for Prime or Statewide and which are not irrigated.

TULARE
Lands that produce dryland grains (barley and wheat); lands that have physical characteristics that would qualify for "Prime" or "Statewide Important" farmlands except for the lack of irrigation water; and lands that currently support confined livestock, poultry, and/or aquaculture operations.

VENTURA
Soils that are listed as Prime or Statewide that are not irrigated, and soils growing dryland crops--beans, grain, dryland walnuts, or dryland apricots.

YOLO
Local Importance (L): cultivated farmland having soils which meet the criteria for Prime or Statewide, except that the land is not presently irrigated, and other nonirrigated farmland.

Local Potential (LP): Prime or Statewide soils which are presently not irrigated or cultivated.

YUBA
The Board of Supervisors determined that there will be no Farmland of Local Importance for Yuba County.

The Department of Conservation makes no warranties as to the suitability of this product for any particular purpose.

Northern, central, and southern regional views of California's agricultural diversity.

Fully Protected Animals

The classification of Fully Protected was the State's initial effort in the 1960's to identify and provide additional protection to those animals that were rare or faced possible extinction. Lists were created for fish, mammals. amphibians and reptiles, birds and mammals. Please note that most fully protected species have also been listed as threatened or endangered species under the more recent endangered species laws and regulations.

Fully Protected species may not be taken or possessed at any time and no licenses or permits may be issued for their take except for collecting these species for necessary scientific research and relocation of the bird species for the protection of livestock.

The following common and scientific names are those given in the Fish and Game Code Sections 3511, 4700, 5050 and 5515. However, some of these names are no longer consistent with current scientific nomenclature.

Jump to section: Fish | Amphibians | Reptiles | Birds | Mammals

Fishes	
Colorado River squawfish (=Colorado pikeminnow)	Ptychocheilus lucius
thicktail chub	Gila crassicauda
Mohave chub (=Mohave tui chub)	Gila mohavensis
Lost River sucker	Catostomus luxatus (=Deltistes luxatus)
Modoc sucker	Catostomus microps
shortnose sucker	Chasmistes brevirostris
humpback sucker (=razorback sucker)	Xyrauchen texanus
Owens River pupfish (=Owens pupfish)	Cyprinoden radiosus
unarmored threespine stickleback	Gasterosteus aculeatus williamsoni
rough sculpin	Cottus asperrimus
Amphibians	
Santa Cruz long-toed salamander	Ambystoma macrodactylum croceum
limestone salamander	Hydromantes brunus
black toad	Bufo exsul
Reptiles	
blunt-nosed leopard lizard	Gambelia sila (=Gambelia silus)
San Francisco garter snake	Thamnophis sirtalis tetrataenia

Birds	
American peregrine falcon	Falco peregrinus anatum
brown pelican (=California brown pelican)	Pelecanus occidentalis (=P. o. occidentalis)
California black rail	Laterallus jamaicensis coturniculus
California clapper rail	Rallus longirostris obsoletus
California condor	Gymnogyps califonianus
California least tern	Sterna albifrons browni (=Sterna antillarum browni)
golden eagle	Aquila chrysaetos
greater sandhill crane	Grus candadensis tabida
light-footed clapper rail	Rallus longirostris levipes
southern bald eagle (=bald eagle)	Haliaeetus leucocephalus leucocephalus (=Haliaeetus leucocephalus)
trumpeter swan	Cygnus buccinator
white-tailed kite	Elanus leucurus
Yuma clapper rail	Rallus longirostris yumanensis

Mammals	
Morro Bay kangaroo rat	Dipodomys heermanni morroensis
bighorn sheep	Ovis canadensis - except Nelson bighorn sheep (ssp. Ovis canadensis nelsoni) in the area described in subdivision (b) of Section 4902 (Fish and Game Code)
northern elephant seal	Mirounga angustirostris
Guadalupe fur seal	Arctocephalus townsendi
ring-tailed cat	Genus Bassariscus (=Bassariscus astutus)
Pacific right whale	Eubalanea sieboldi (=Balaena glacialis)
salt-marsh harvest mouse	Reithrodontomys raviventris
southern sea otter	Enhydra lutris nereis
wolverine	Gulo luscus (=Gulo gulo)

Setback Recommendations to Conserve Riparian Areas and Streams in Western Placer County

Prepared for:

Placer County Planning Department

Prepared by

Jones & Stokes in cooperation with **PRBO Conservation Science**

February 2005

Setback Recommendations to Conserve Riparian Areas and Streams in Western Placer County

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Contents

Tables

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Acronyms and Abbreviations

NCCP	Placer County Natural Communities Conservation Plan
HCP	Habitat Conservation Plan
RSPZs	Riparian and Stream Protection Zones
DFG	California Department of Fish and Game
USFWS	U.S. Fish and Wildlife Service
NOAA Fisheries	National Oceanic and Atmospheric Administration National Marine Fisheries Service
CEQA	California Environmental Quality Act
In	Inches
km	kilometers
Mi	mile
m	meters
Ft	Feet
PCWA	Placer County Water Authority
SOCs	synthetic organic compounds
DO	dissolved oxygen
CAFOs	concentrated animal feeding operations
N2	atmospheric nitrogen
NH4+	ammonia
NO2-	nitrite
NO3-	nitrate
O2	oxygen
SOCs	Synthetic organic compounds
PCBs	polychlorinated biphenyls

DDT	dichlorodiphenyltrichloroethane
Delta	San Joaquin Delta
C	Celsius
F	Farenheit
mg/l	milligrams per liter
M/sec	meter per second
Ft/sec	feet per second
SRA	Shaded riverine aquatic

Chapter 1
Introduction

Riparian areas provide important ecological functions (Table 1-1). They occupy the land between stream channel banks and adjacent uplands, and generally correspond to stream floodplains. These areas are transitional between terrestrial and aquatic ecosystems, and they contain gradients in hydrology, soils, ecological processes and biota (Brinson et al. 2002). Consequently, they perform ecological functions that are distinct from other components of the landscape. For example, riparian areas convey floodwaters and are important sites of denitrification, which returns nitrogen to the atmosphere. In western Placer County, they also provide essential habitat areas for a high diversity of aquatic and terrestrial wildlife species (Zeiner et al. 1988, 1990a,b; Moyle et al. 1996), including numerous threatened, endangered, and other special-status species that have been proposed for coverage under the Placer County Natural Community Conservation Plan (NCCP) and Habitat Conservation Plan (HCP) for the Phase I Planning Area (Jones & Stokes 2004a).

Because these areas provide such important ecological functions (including fish and wildlife habitat), a number of measures have been proposed to conserve riparian areas and aquatic ecosystems; these measures include establishing zones with land use restrictions (i.e., setbacks) around streams and riparian areas. Setbacks from streams and riparian areas have been widely recognized as necessary conservation measures. For example, the *Placer Legacy Open Space and Agricultural Conservation Program Implementation Report* (Placer County Planning Department 2000), which provided direction for development of a Placer County NCCP/HCP, identified Riparian and Stream Protection Zones (RSPZs) as an important component of the NCCP/HCP. Non-development setbacks encompassing and adjacent to riparian zones and streams are routinely recommended by local, state, and federal agencies including the Placer County Planning Department, the California Department of Fish and Game (DFG), the U.S. Fish and Wildlife Service (USFWS), and the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries). These agencies have identified a need in western Placer County (and elsewhere in the Sacramento Valley) to develop a strong scientific foundation for recommending stream and riparian setbacks that include buffers to reduce effects from adjacent land uses.

The current study was designed to support efforts by the Placer County Planning Department to develop this scientific foundation for the establishment of stream and riparian setbacks. Its purpose was to review existing literature and make specific recommendations for riparian setbacks—particularly the width of such setbacks—that can be used in the California Environmental Quality Act (CEQA) or NCCP/HCP processes.

This report summarizes the results of the review. Each chapter addresses a set of related ecological functions performed by riparian areas and streams, as listed below.

- Hydrologic and geomorphic functions (e.g., groundwater recharge, sediment transport).
- Biogeochemical functions (e.g., nutrient cycling, degradation of contaminants).
- Provision of salmonid habitat.
- Provision of riparian plant habitat.
- Provision of wildlife habitat.

Each chapter describes the pertinent functions mechanistically, reviews the effects of human alterations on the functions, assesses the relationships between setback width and human activities, and concludes with recommendations for setback widths. The recommendations are intended to provide for long-term conservation of the relevant function by protecting the riparian area as well as a defined buffer that will reduce the effects of adjacent land uses on riparian and aquatic systems. In these recommendations, and throughout the report, all distances refer to only one side of streams.

The report concludes with an overall setback recommendation that includes setback widths and guidance regarding uses of setback land that may be compatible with resource conservation.

Table 1-1. Ecological Functions of Riparian Ecosystems[a]

Hydrologic and Geomorphic Functions
Recharge of groundwater
Storage of surface water
Conveyance of floodwaters and other overland flows
Transport of sediment
Storage of sediment
Biogeochemical Functions
Production of biomass (i.e., primary production)
Storage of carbon in vegetation and soil
Cycling of phosphorus
Cycling of nitrogen
Cycling of micronutrients
Adsorbtion, storage, and transformation of non-nutrient metals (e.g., mercury)
Adsorbtion, storage, and degradation of pesticides and hydrocarbons
Habitat Functions
Sustenance of characteristic plant associations
Sustenance of aquatic animal habitats
Sustenance of terrestrial animal habitats

[a] Based on lists of functions in Keddy 2000 and Brinson et al. 2002.

Chapter 2

Hydrologic and Geomorphic Functions

Overview

Hydrologic and geomorphic functions involve the transport and storage of water and sediment. Streams—comprising stream channels and floodplains—are integral to the provision of those functions. Riparian vegetation occupies floodplains; for the purposes of this report, riparian areas may be considered synonymous with floodplains. Sediment and water are transported to streams from throughout the watershed; upon reaching the stream, sediment and water move down the stream and occasionally outwards onto the floodplain. In response to these inputs of water and sediment, the form of stream channels and floodplains changes. These dynamic changes can in turn affect most ecological functions provided by riparian areas and aquatic ecosystems. This chapter describes these processes and the effects on them caused by human activities. The chapter concludes with an assessment of the relationship of setback width and human effects, and offers the project team's recommendation for setback widths to conserve hydrologic and geomorphic functions.

Effects of Human Alterations on Movement of Water and Sediment to Riparian Areas and Streams

Watershed Hydrology

In the absence of human alterations (e.g., interbasin water transfers), streamflows originate from the precipitation falling throughout a stream's watershed. Rainfall is the predominant form of precipitation in most of western Placer County. Before reaching a stream, precipitation may infiltrate to become groundwater or return to the atmosphere through evapotranspiration. Human alterations affect the proportion of precipitation following each of these pathways, and thus the quantity and timing of streamflows, which in turn influences geomorphic functions in the stream corridor.

Evapotranspiration

Evapotranspiration is the loss of water to the atmosphere due to the diffusion of water vapor from the interior of plant leaves (transpiration) and from soil and other surfaces (evaporation). It can dominate a watershed's water balance and can influence soil moisture content, groundwater recharge, and streamflow.

Air temperature and humidity determine the potential rate of evapotranspiration, whereas water availability determines its actual rate. Under cool or moist conditions, water availability does not limit evapotranspiration; actual and potential evapotranspiration are equal. Under drier and warmer conditions, as surfaces and soils dry, plants reduce their use of water by a combination of closing their leaf pores (i.e., stomata), changing leaf angles, losing leaves, becoming dormant, or dying (Barbour et al. 1998). Thus, under dry and warm conditions, actual evapotranspiration is limited by water availability.

Not all water is available for evapotranspiration. Only water stored at the earth's surface (i.e., surface water and water intercepted by surfaces) or in soils is available for evapotranspiration. Therefore, the timing of precipitation and the time water resides in a watershed strongly influence actual evapotranspiration.

Western Placer County has a Mediterranean-type climate, characterized by concentration of rainfall during the coldest months of the year. Consequently, only water stored in soils, streams, and other water bodies is available for evapotranspiration during summer months when the potential evapotranspiration is greatest. During these months, vegetation can remove a substantial fraction of the water within riparian areas and streams. For example, in July in the Sacramento Valley, potential evapotranspiration is about 0.8 centimeters (cm) (0.3 inches [in]) per unit area each day (California Department of Water Resources 2004). This corresponds to about 18 acre-feet of water being transpired by 1.6 kilometers (km) (1 mile [mi]) of a riparian corridor 30 meters (m) (98 feet [ft]) wide on each side of a stream.

Human alterations can increase or reduce evapotranspiration. Importing water from other watersheds or withdrawing groundwater from below the rooting zone to irrigate agricultural lands and landscaping can increase evapotranspiration by increasing the availability of water. Removing vegetation or increasing runoff can reduce evapotranspiration. Alterations that remove vegetation include both the temporary removal of biomass (e.g., timber harvesting, woodcutting) and the permanent conversion of natural vegetation to developed land uses with impervious surfaces (e.g., roofs, paved roads). Alterations affecting runoff are described in the next section.

Runoff

There are three basic types of runoff.

- Overland flow.
- Subsurface flow.
- Saturated overland flow.

Each of these runoff types can occur individually or in some combination in the same locale. Despite involving belowground flow, subsurface and saturated overland flow are considered components of runoff because they are closely linked to overland flow.

Overland flow occurs when the rate of rainfall or snowmelt exceeds the rate of water movement into the soil (i.e., infiltration rate). The infiltration rate is affected by soil structure and moisture content (infiltration diminishes as water saturates a soil). Areas with natural vegetative cover and leaf litter usually have high infiltration rates. These features protect the surface soil pore spaces from being plugged by fine soil particles as a consequence of raindrop splash.

Overland flows may subsequently enter the soil as rainfall diminishes in intensity or ceases, or they may reach a stream channel before entering the soil. Slope and vegetation affect the speed of overland flow, and thus the portion that discharges directly into stream channels.

Subsurface flow is a storm-generated pulse of groundwater. Once in the soil, water moves in response to differences in hydraulic head (i.e., the potential for flow resulting from a difference in hydrostatic pressure at different elevations). Before a storm, where the water table slopes toward a stream, water moves down and into the stream channel as baseflow. During a storm, as rainwater infiltrates the soil, the water table can rise more rapidly near the stream than it does further upslope. This can happen when the soil near the stream has greater moisture content and a shorter distance to the water table than does soil upslope. As the water table becomes locally steeper, this newly arrived groundwater moves relatively rapidly towards the stream channel, mixes with baseflow, and increases groundwater discharge to the channel.

Saturated overland flow is a combination of direct precipitation and subsurface flows. Where the water table reaches or emerges from the surface, soils are saturated. Consequently, all rain falling on these soils, as well as emerging groundwater, flows downslope as overland runoff.

Human alterations increase runoff by reducing the soil's infiltration capacity (i.e., maximum rate of infiltration). Conversion of natural vegetation to developed land cover causes the greatest reduction in infiltration. However, agricultural lands also exhibit reduced infiltration capacity compared to natural vegetation. Heavy machinery, livestock, and even humans can compact soils, reducing infiltration. Moreover, removal of vegetation can expose the soil surface to the impacts of raindrops, reducing soil pore spaces and infiltration. In western Placer County, these alterations have affected extensive portions of the landscape. For example, along the major streams of western Placer County, approximately a quarter of the land < 20 m (66 ft) from the centerline of a stream, is in developed or agricultural land-cover (Jones & Stokes 2004a, 2004b).

Groundwater

Gravity causes water to move downward through soil until it reaches an area already saturated with water. The top of this saturated zone defines the groundwater table. However, the movement of groundwater may be quite complex. The permeability of sediments and rock strongly influences the rate of groundwater movement. Water moves easily through larger pores and more slowly through smaller pores. In addition, layers of sediment or rock with low permeability (i.e., confining beds) may severely restrict groundwater movement. Thus, where the permeability of sediments and rock varies considerably, complex patterns of groundwater movement may occur. Riparian areas typically have considerable variability in the permeability of their sediments.

Human alterations can affect groundwater through several different mechanisms. First, activities that affect runoff or evapotranspiration affect the proportion of precipitation that becomes groundwater. Second, because streamflows can be an important source of groundwater, alterations that reduce streamflows can also reduce inputs to groundwater. Third, alterations that affect the quantity of groundwater (i.e., groundwater withdrawals) can change the elevation of the groundwater table. Drainage ditches and tiles also lower the water table's elevation.

Erosion

Gravity, wind, and water transport soil to riparian areas and streams. Soil is dislodged when the force of wind, water, or gravity exceeds the forces holding soil in place. Several factors affect the balance of these forces: the soil's physical properties; vegetation structure; topography; and the quantity, concentration, and speed of runoff. Soil characteristics, such as lithology (i.e., rock or mineral content), cohesion, and granulometry (i.e., grain size association), influence the erodibility of soils. Vegetation reduces erosion by binding soil particles and by slowing wind and water (Brinson et al. 2002); accordingly, greater cover of vegetation reduces the potential for erosion. Because both velocity and shear stress increase with slope, the potential for erosion increases with the angle and length of upland slopes. Also, as more runoff is generated and concentrated (i.e., greater runoff depth), the force exerted by flowing water on the soil surface—and hence erosion— increases.

Gravity can also induce the slow downhill movement of soil and rock (i.e., soil creep) and mass failures such as debris flows. In steep terrain, mass failures can transport enormous quantities of sediment into riparian areas and stream channels. Mass failures are often triggered by intense rainstorms falling on saturated soils (Swanston 1991). Under such conditions, soil is particularly heavy due to the added water, and subsurface flows can reduce the forces that offset gravity. Although western Placer County generally has gently sloping topography, that is not conducive to mass failures, slopes can be steep along stream channels, particularly near the area's eastern boundary in the Sierran foothills.

The magnitude and distribution of erosion in watersheds affect the yield of sediment to the stream corridor. Soil erosion can occur gradually over a long period or it can be cyclic or episodic, accelerating during certain seasons or during certain rainstorm events (Grove and Rackham 2001). Erosion does not proceed at a uniform rate, because rainstorms are episodic events of varied intensity and because the forces binding soils continually change with temperature, moisture content, and vegetation structure.

Human activities strongly alter patterns of erosion and thus the quantity of sediment entering riparian areas and streams. In the Sacramento Valley and adjacent foothills, human-induced fine sediment loading is primarily due to changes in land use that both alter the vegetative cover and increase runoff. The three main land uses generating sediment in the region are agriculture, in-channel mining, and construction activities. The effects of silvicultural activities, though discussed in this section, are concentrated at higher elevations in the central and eastern portions of the county.

Agriculture generally exposes friable topsoils to raindrop erosion, which has the potential to generate large amounts of sediment (Waters 1995). In the Sacramento Valley and adjacent foothills, additional land is still being converted from natural vegetation to agriculture. Much of this new agricultural land is of marginal quality and on relatively steep slopes, and is consequently likely to generate more sediment than agricultural land with gentler slopes (Charbonneau and Kondolf 1993).

Gravel mining can increase fine sediments in streams and streambeds. Gravel mines are often in the active floodplain or even the stream channel itself, and because processing of aggregate occurs on site, this activity can add fine sediment directly to the stream and streambed. Gravel mining is on-going in the historic floodplains of at least two streams in western Placer County (EDAW 2004; Jones & Stokes 1999).

Forestry practices, including clear-cutting, skidding, yarding, site preparation, and road construction and maintenance, can substantially increase sediment input to streams. Poorly designed logging roads and skid trails are persistent sources of sediment. Open slopes with soils exposed by yarding activities, scarification, or by associated mass failures or fires erode easily (Chamberlain et al. 1991).

Residential development, industrial construction, streets and utilities, and other urban infrastructure elements can increase sediment movement to streams

(Waters 1995). Excavation for infrastructure construction and maintenance is a primary source of sediment transported to streams. Development on steep hillsides further increases erosion and transport of sediment (Renard et al. 1997).

In addition to these effects of general types of land use activities, roads, graded and recontoured land, and the routing of stormwater drainage can all spatially concentrate runoff, and hence increase both surficial erosion and the likelihood of mass failures.

Effects of Human Alterations on Water and Sediment Movement along Streams

Flow Regime

Streamflows originate in runoff and groundwater entering the stream channel. As this water moves along the stream it may follow several different pathways. Some water will evaporate from the surface of the flow. Some will enter the sediments underlying the channel and floodplain, where it will intermix with groundwater in a zone (i.e., the hyporheic zone) that can extend from several to more than a hundred meters from the channel (Brunke and Gonser 1997). (This hyporheic zone is habitat for invertebrates and microbes that have important roles in nutrient cycling and the degradation of pollutants.) Stream water entering the hyporheic zone may reenter the channel downstream; alternatively, in reaches where the water table is lower than the stream channel, the water entering the hyporheic zone may continue to flow away from the stream toward the water table. During high streamflows, the channel may not be able to convey the entire flow, and streamflows spill over the channel banks onto the floodplain, and may or may not reenter the channel downstream.

Streamflows are typically highly variable across days, seasons, and years. Most aspects of a stream's flow regime (i.e., the pattern of streamflow), including magnitude, frequency, timing, and duration, have consequences for sediment transport and channel form, and indirectly or directly affect organisms. For example, low flows can reduce the area of aquatic habitats. High flows can wash away eggs or, through sediment movement, can sustain or degrade habitats. Rapid declines in flow can strand fish.

Together with the pattern of water inputs from the watershed, channel form and vegetative structure determine a stream's flow regime. The slope, area, form, and roughness (i.e., irregularity of the surface) of the channel and floodplain surface determine the depth and velocity of streamflows, as well as their magnitude and duration.

As a stream's discharge (i.e., the volume of water discharged per unit time) increases, either flow velocity, flow area, or both must increase. Similarly, as water flows along a stream, the depth, velocity, and cross-sectional area of the flow change to maintain a constant discharge. This occurs because as more water enters than exits a section of channel, the volume of water in that section increases, changing the width and depth of the flowing water until the discharge entering the segment equals the exiting discharge. As width and depth change flow velocity changes.

Flow velocity is a product of slope (which causes water to accelerate as it moves downhill) and the surface over which the water flows (the character of which can impede or facilitate the water's passage through friction or the lack of it). At a given slope, water velocity decreases as the roughness of the inundated surface increases. Vegetation, coarse sediment, and larger obstacles all increase roughness. For example, the encroachment of woody plants into a stream channel reduces the velocity of water, and consequently the channel's capacity to convey floodwaters before inundating the floodplain; for this reason, woody plants are removed from many stream banks to maintain floodwater conveyance.

Flow regime is changed to some degree by all human activities that alter the quantity or timing of water inputs to streams or the movement of flows along streams. Surface water diversions, groundwater withdrawals, and inter-basin water transfers change the quantity of water entering streams. When these waters are used for irrigation during California's summer dry season (and subsequently drain back to streams), they change the seasonality as well as the levels of flows. Conversions of land cover throughout the watershed affect the rate at which water enters streams. As described in *Watershed Hydrology* above, replacement of natural vegetation with agricultural or developed lands increases runoff. This increased runoff results in higher peak streamflows because, after rainstorms, runoff enters streams much more rapidly than does groundwater. Decreased infiltration is also associated with increased runoff; such decreased inputs to groundwater can reduce low flows, and can even convert a perennial flow regime to a seasonal or intermittent one. These changes are most dramatic along urban streams where much of the watershed consists of developed lands with a high proportion of impervious surfaces (Hollis 1975; Macrae 1996; Booth and Jackson 1997; Paul and Meyer 2001).

Interbasin water transfers are a particularly significant human alteration of flow regimes in western Placer County (Jones & Stokes 2004b). Water is diverted from the Bear River's watershed into Coon Creek, Doty Ravine and Auburn Ravine. Water is also diverted from the American River's watershed into Auburn Ravine. Because large quantities of water (about 20,000 acre-feet) are transferred by the Placer County Water Authority (PCWA) from the American River watershed to the City of Roseville, it is likely that interbasin transfers augment flows in the Dry Creek watershed as well (ECORP 2003).

Modifications of channels and floodplains also alter flow regime. Vegetation removal that is conducted to clear channels or that results from grazing, logging, or conversion to agricultural and developed lands can reduce roughness, thereby increasing flow velocities. Physical alterations to the channel and floodplain (e.g., channelization, levees, berms) also changes flow regimes. For example, the straightening and deepening of the channel to improve conveyance (channelization) speeds velocities and increases peak flows downstream. Dams and reservoirs can affect all aspects of flow regimes, and in some instances replace the previous flow regime with a new regime determined by the schedule of releases from a reservoir. Common downstream effects of reservoirs include a reduction in overall flows, reduced peak flows, and rapid changes in discharge (Stanford et al. 1996; Brinson et al. 2002). Along some Sacramento Valley streams, reservoir releases in conjunction with drainage from irrigated lands have increased summer flows, converting seasonal flow regimes to perennial ones.

Sediment Transport

Sediment transport is directly related to stream power. A stream's power is a product of its discharge, the specific weight of water (which is essentially a constant), and slope. Stream power represents the quantity of work that a streamflow can perform (i.e., the rate of potential energy expenditure per unit length). Most of this energy is dissipated overcoming friction at the channel and floodplain surface, but a small portion moves sediment.

The portion of stream power that moves sediment depends on several stream attributes. The movement of sediment downstream only occurs when the force exerted by water along the surface of the channel (shear stress) exceeds the forces holding sediment in place. The magnitude of shear stress and the forces that offset it are affected by the following factors.

- Flow depth and velocity.
- Channel morphology.
- Sediment size.
- Adhesion of particles.
- Binding of particles by roots.

Sediment transport is increased by conditions that concentrate the force of flowing water (e.g., confining flow to a narrower channel) or reduce the resistance of particles to their displacement (e.g., loss of vegetation and hence of roots).

Sediment transport in any given stream is greatest during peak flows. Not only does shear stress increase with flow depth and velocity, but the relationship between shear stress and sediment transport is non-linear (Gordon et al. 1992). In other words, the increased force exerted by peak flows results in a disproportionate increase in the capacity to transport sediment.

Human alterations affect sediment transport by changing flow regime or sediment inputs to streams, and by blocking the continuity of sediment delivery along a stream. Human effects on flow regime and sediment inputs have already been described in the flow regime and erosion sections of this chapter. The movement of sediment along a stream may be blocked by dams or reduced by pits from gravel mining. Dams block the downstream movement of coarser sediment from the upper portions of watersheds of most rivers and streams in the Sacramento Valley. In-stream gravel mining produces pits that trap incoming sediment (Mount 1995).

Effects of Human Alterations on Channel and Floodplain Form

The form of stream channels and their floodplains affects the important stream and riparian functions listed below.

- Transport and storage of sediment.
- Conveyance of floodwaters.
- Provision of floodplain habitats.
- Provision of aquatic habitats.

For example, the shape and gradient of channels affects the location of areas of sediment deposition and removal. Similarly, fish spawning and rearing habitats are affected by the interplay of channel geometry with flow depth, velocity, and the scour and deposition of sediments.

The form of a stream's channel and floodplain is a product of water and sediment inputs from the watershed, geologic constraints, channel or floodplain vegetation, and historic events. Consequently, changes in sediment inputs, flow regime, or vegetation cause changes in channel and floodplain form. These geomorphic responses can be complex because of interactions among these important factors. Flow regime, sediment transport, and vegetation influence each other; changes in channel and floodplain form likewise affect the growth of plants and the movement of water and sediment. Consequently, changes in a watershed may cause channels and floodplains to undergo complex patterns of change across decades.

Channel Morphology

In the absence of human alterations, the form of stream channels is not static, unless constrained by geology. Channel and floodplain morphology changes slowly in response to long-term changes in climate; it can also change rapidly in response to periodic intense storms or to massive inputs of sediments from slope failures.

Human alterations often cause changes in flow regime and sediment input that lead to unstable channels with rapidly changing forms. Unstable channels result from rates of erosion and sedimentation that are much more rapid than in comparable, but relatively unaltered, streams (Doyle et al. 2000). This instability can affect riparian and stream biogeochemical and habitat functions (Paul and Meyer 2001; Brinson et al. 2002).

Channel instability has both horizontal (channel bed) and vertical (channel banks) components. A longitudinal section of streambed is stable when the size and quantity of sediment entering the section equals the size and quantity of sediment carried downstream. If the capacity of flows to transport sediment changes (e.g., change in peak flows) without a corresponding change in sediment inputs, or vice versa, then net erosion or deposition will occur and the channel may become unstable. The rising (i.e., aggradation) or lowering (i.e., incision or degradation) of channel beds generally alters flows of groundwater and surface water through riparian areas by changing the elevation or slope of the water table, and by changing the discharge necessary for overbank flows.

The stability of channel banks is affected not only by the shear stress of flowing water, but also by the force of gravity pulling bank sediments downward, which can lead to mass failure of sections of bank (i.e., bank failure). The binding of sediment particles by plant roots can substantially reduce bank erosion. A tree's roots typically extend up to twice the radial distance of the tree's crown; thus, in western Placer County, trees up to 20 m [66 ft] from the channel may contribute to bank stability. Therefore, bank retreat (i.e., net linear recession of the bank) is increased not only by changes in flow regime that increase shear stresses, but also by removal of vegetation along the banks (Lawler et al. 1997).

Human alterations affect channel stability through changes of flow regime, sediment transport, or channel vegetation, or by placing structures along or in the channel. Human activities altering flow regime, erosion, and sediment transport are described in the respective sections of this chapter. Their net affect on channel form is to alter the balance between erosion and deposition along the stream channel, causing a corresponding change in channel form.

Channel bank vegetation is directly altered by grazing, channel maintenance, wood cutting and timber harvesting, land-cover conversion, and even by the trampling associated with intensive recreational use. All these activities may lead to bank retreat. With the exception of timber harvesting, these activities occur locally along western Placer County's streams (Placer County 2002; Appendix A)

Channel vegetation is also altered by activities that change flow regime, water table elevation, or channel stability. If changes to flow regime or water table elevation reduce water availability during the growing season, vegetation will be altered and will probably exhibit reduced roughness or a lower density of roots to bind bank sediments. Conversely, reduced flows may allow riparian vegetation to establish on lower-elevation surfaces within the channel, where establishment and survival were previously not possible because of scouring or prolonged submergence (Pelzman 1973). The latter scenario has occurred along a number of Sacramento Valley streams below dams (Pelzman 1973; CALFED 2000b). This encroachment of vegetation on the channel stabilizes channel sediments.

The changes in erosion, runoff, and peak flows associated with conversion of natural vegetation to developed land cover generally cause channel instability (Paul and Meyer 2001). Though channels may transiently aggrade with sediment eroded from construction sites, the higher flow peak flows associated with runoff from developed lands are capable of eroding and transporting more sediment (Wolman 1964). This tends to cause channel incision, bank retreat, or both, and a resulting increase in the channel's cross-sectional area. The slope and meanders of stream channels also may change (Riley 1998). Other changes in vegetation or land cover may cause effects comparable to those from conversion to developed lands. Incision is widespread along western Placer County's streams, and has reduced the area of floodplain inundated by floodflows, and thus detrimentally affected most riparian functions (Placer County 2002; EDAW 2004; Jones & Stokes 2004c).

All structures constructed in the channel or active floodplain to some degree alter flows and sediment erosion and deposition, and thus have consequences for channel form. The most substantial effects result from bank protection, berms and levees, and dams. Bank protection (e.g., stone revetment, riprap) is installed for the purpose of reducing lateral movement of the channel. Berms and levees restrict floodwaters to a small portion of the floodplain, and thus may create deeper and faster peak flows capable of eroding and transporting more sediment, which in turn may expand channel cross-sectional area. Berms and bank protection exist occur along western Placer County's streams, particularly at lower elevations. Other structures include numerous road crossings and about thirty dams (County of Placer 2002; DWR 2002; Bailey Environmental 2003; Foothill Associates 2004; Jones & Stokes 2004b)

The construction of dams to form reservoirs contributes to accelerated channel erosion below the dams and to changes in the particle size on the riverbed (Kondolf 1997). Water released from dams is relatively free of sediment, particularly coarse sediment (i.e., larger than 2 mm in diameter). The relatively sediment-free flow results in net erosion of channel bed and banks, often leading to channel incision. Without the input of coarse sediment from upstream, the area of gravel beds in the channel is reduced, and the remaining gravel is often of larger sizes that are not mobilized by flows released from the dam (i.e., armoring of the channel). Dams also reduce peak flows, resulting in a reduction of channel size and accumulation of finer sediment along and within the river channel (Kondolf 1997). Flashboard dams, however, may have lesser effects if removed during peak flows. Most dams in western Placer County are flashboards dams, and many are removed during peak flows (DWR 2002; Placer County 2002; Bailey Environmental 2003)

Stream channel shape is directly altered by channelization and in-channel gravel mining. As mentioned earlier in this chapter, channelization converts streams into deeper, straighter, and often wider shapes to improve conveyance of floodwaters. It increases peak flows and can promote channel instability, which may lead to lowering of the water table (Gordon et al. 1992). In-channel gravel mining removes material from the channel bed and thus lowers its elevation (Bravard et al. 1997).

Floodplain Morphology

The active floodplain is the geomorphic surface adjacent to the stream channel that is typically inundated on a regular basis (i.e., a recurrence interval of about 2–10 years or less). It is the most extensive low depositional surface, typically covered with fine overbank deposits, although gravel bar deposits may occur along some streams. The floodplain surface often contains abandoned channels or secondary channels (i.e., chutes).

The stream migrates laterally across the floodplain as the outside of the meander bend erodes and the point bar builds with coarse-textured sediment. This naturally occurring process maintains the cross section needed to convey water and sediment from the watershed.

Floodplains are built by two stream processes: lateral and vertical accretion. Lateral accretion results from differential erosion and deposition along the channel. In unconstrained rivers, bank retreat is concentrated on the outside (concave side) of bends in the channel (i.e., meanders), forming cut banks; deposition occurs on the inside (convex side) of bends, forming point bars. This difference in erosion and deposition along channel bends causes channels to migrate across the floodplain. Other floodplain features also arise through channel migration. Where bends become cut off at their base (because erosion joins their upstream and downstream ends), oxbow lakes are formed. Where higher flows cross over point bars, chutes may form. Channel shifts to old or new courses (i.e., channel avulsion) can occur during floodflows, and may cut off meander bends and change the channel's form.

Vertical accretion is the deposition of sediment on flooded surfaces. It occurs when flows exceed the channel's conveyance capacity, inundate the floodplain, and deposit sediment. Though most floodplain sediment is deposited through lateral accretion (Leopold et al. 1964), overbank flows and the associated vertical accretion have a significant effect on aquatic and floodplain habitats that are described in subsequent chapters of this report.

Lateral and vertical accretion are affected by human alterations that modify flow regime, sediment supply, and channel stability or that construct structures within the floodplain. Human alterations affecting flow regime, sediment transport, and channel form alter the rate of channel movement and the frequency of overbank flows. These alterations, including the effects of dams, have been described in the preceding sections of this chapter. All structures within the channel or floodplain alter flows and accretion to some degree. However, the most substantial alterations are bank protection, which is installed specifically to reduce lateral channel migration, and berms and levees, which restrict floodwaters, and thus vertical accretion, to a small portion of the floodplain.

Relationships Between Human Effects and Riparian Setback Width

Riparian setbacks can reduce the effects of human alterations on water and sediment inputs to streams; if they extend beyond the active floodplain, setbacks can also reduce direct effects on flow regime, sediment transport, and channel and floodplain morphology. However, many effects of human alterations on hydrologic and geomorphic functions would be relatively unaltered by setbacks.

There has been considerable research on the effects of natural riparian vegetation or managed buffers on the movement of runoff and suspended sediment. (This literature has been reviewed by Castelle et al. 1992; Wenger 1999; Brinson et al. 2002; Lowrance et al. 2002; Correll 2003). This research indicates that setbacks have three beneficial effects: slightly reducing the area of sediment sources in a watershed, increasing the distance of runoff and erosion sources from streams, and interposing a zone of vegetation with high roughness and high infiltration capacity between streams and sources of runoff and erosion. The roughness of both natural and managed vegetation can slow runoff and cause the deposition of sediment before it reaches the stream. This deposition of sediment increases with vegetation width; at any given width, deposition is greatest when flows are evenly distributed (not locally concentrated) and when vegetation and topography are uniform (Herrone and Hairsine 1998; Wenger 1999; Brinson et al. 2002).

Numerous studies document the effectiveness of managed or natural vegetation in removing suspended sediment, particularly sands and silts, from runoff before it reaches stream channels (Castelle et al. 1992; Wenger 1999; Brinson et al. 2002; Lowrance et al. 2002). (Because clay particles are very small [less than 2 μm], they remain suspended even in still water for hours, and thus are much more likely to remain in runoff.) If this sediment is deposited on the active floodplain, it may be only temporarily stored there before entering the stream channel. However, if sediment is removed from runoff before it reaches the floodplain, it is much less likely to be remobilized into the stream channel. Setbacks may also reduce the likelihood of mass failures on adjacent slopes by including susceptible terrain inside the buffer, where human alterations are less likely to cause mass failures (Rhodes 1994; Tang and Montgomery 2004).

There is considerable variation among the results of studies assessing the relationship between the width of buffers and sediment removal from runoff. A number of studies document narrow buffers (less than 10 m [33 ft]) removing substantial amounts of sediment from runoff (Castelle et al. 1992; Wenger 1999; Lee et al. 2000; Hook 2003). However, many of these have been short-term studies or studies of managed buffers that were conducted under a narrow range of conditions. Short-term studies probably underestimate the distance sediment is able to be moved across buffers because erosion is a highly variable process, largely associated with intense storms and other unusual events (Grove and Rackham 2001). Similarly, small-scale studies of managed buffers probably underestimate the quantity of sediment that is able to cross unmanaged buffers because natural topography and vegetation are quite varied, and can concentrate flow, have less roughness than managed vegetation, or provide additional sources of runoff or sediment at some locations. These findings are supported by other studies that have indicated wider buffers (20–60 m [66–197 ft]) are necessary to remove most sediments (Cooper and Gilliam 1987; Castelle et al. 1992; Davies and Nelson 1994; Wenger 1999). These include longer-term studies that have shown most sediment moving considerable distances into riparian areas (Cooper et al. 1987), and studies that document effects of excessive sedimentation on aquatic organisms in streams bordered by wide buffers (Megahan 1987 *in* Rhodes 1994).

Setbacks of sufficient width to include the entire active floodplain prevent structures and developed land uses from impeding overbank flooding and channel migration. Setbacks including the entire active floodplain also reduce direct effects of human activities on bank stability.

Recommended Setback Width to Conserve Hydrologic and Geomorphic Functions

For the purpose of long-term conservation of hydrologic and geomorphic functions, the project team recommends that riparian setbacks include the entire active floodplain, regardless of the current extent of riparian vegetation on that surface, and that an additional 30 m (98 ft) buffer be included within the setback. This width should be sufficient to substantially slow or infiltrate much of the runoff from adjacent uplands, and to remove excessive sediment from that runoff prior to its entering the active floodplain.

It is important to note that setbacks do not ameliorate many effects of human alterations on hydrologic and geomorphic functions. Some effects are offset only if the activities causing them are excluded from the setback. Examples of these activities include riparian vegetation removal, grazing, and channel modifications. Other alterations are only partially offset, such as the effects of developed or agricultural land cover on runoff and groundwater. Finally, other effects are not addressed by riparian setbacks. These include the effects of surface water diversions, groundwater withdrawals, and dams. Therefore, to conserve hydrologic and geomorphic functions, other measures are necessary in addition to setbacks.

Chapter 3
Biogeochemical Functions

Introduction

Biogeochemical functions cycle elements among compounds and locations by biological and geological mechanisms. For example, in the carbon cycle, photosynthesizing plants remove carbon from the atmosphere; through respiration, plants, animals, and microbes return carbon to the atmosphere. A substantial quantity of carbon is stored in these organisms and in the organic matter derived from them. Nutrient cycles are essential to ecosystem functions; moreover, such cycles facilitate the transformation and degradation of contaminants entering these ecosystems.

All terrestrial habitats provide some biogeochemical functions. However, riparian areas are particularly important for nutrient and other element cycles because they are ecotones (transitional zones) between terrestrial, fluvial, and groundwater systems. Consequently, riparian areas have substantial effects on water quality because they help to regulate the transfer of sediment and water, and because they facilitate chemical transformations of contaminants (Naiman and Decamps 1997; Brinson et al. 2002).

This chapter reviews the transport, storage, and transformation of nutrients, metals, and synthetic organic compounds (SOCs; e.g., most pesticides) in riparian areas, and the consequences of human alterations for these ecosystem processes. The chapter concludes with a summary of the relationships between riparian setback widths and human influences on biogeochemical processes.

Effects of Human Alterations on Biogeochemical Functions

Macronutrients

Agricultural and developed lands are major sources of nitrogen and phosphorus entering streams and rivers (Jackson et al. 2001). In aquatic ecosystems, over-enrichment with phosphorus and nitrogen (i.e., eutrophication) causes a wide range of problems, including degradation of water quality for human uses (e.g., irrigation, drinking, recreation), toxic algal blooms, loss of biodiversity, and fish kills (Richter et al. 1997; Jackson et al. 2001). These detrimental effects are largely due to greatly increased growth of microbes, algae, and plants, accompanied by the decomposition of their biomass and the resulting depletion of dissolved oxygen (DO). DO is frequently the key substance in determining the extent and composition of life in water bodies (Manahan 1994). For instance, it was found to be one of the best environmental predictors of invertebrate community composition in flow-through constructed wetlands (Spieles and Mitsch 2000). Salmonids are particularly sensitive to low DO concentrations (Bjornn and Reiser 1991).

The cycles of phosphorus and nitrogen involve different mechanisms, and riparian areas affect these cycles differently. Accordingly, these cycles and the effects of human alteration are described in separate sections below.

Phosphorus

Ultimately, all phosphorus originates from the weathering of rock; it should be noted that different rock types may have substantially varied phosphate contents (Wetzel 2001). However, because it is a macronutrient, phosphorus concentrates in organisms; consequently, organic matter, fertilizer applications, wastes from concentrated animal feeding operations (CAFOs), and sewage are all important sources of the phosphorus entering streams (Jackson et al. 2001).

The availability of soluble phosphorus (i.e., phosphorus in a molecule dissolved in water) is strongly affected by pH (Wetzel 2001). Soluble phosphorus is most available at a pH of 6–7; consequently, it is most readily leached from soils of that pH range. At lower pH values, phosphorus combines readily with aluminum, iron, and manganese. At higher pH values, greater amounts of phosphate combine with calcium as calcium phosphates and apatites (i.e., minerals in which calcium and phosphorus combine with other elements). These reactions (that predominate above and below the pH 6–7 range) result in the formation of insoluble complexes and the adherence of phosphorus to the surfaces of clay particles.

In most environments (including waters with pH values of 6–7), insoluble forms of phosphorus predominate because they readily form and persist longer than soluble forms, which are rapidly taken up by microorganisms and plants or are sorbed to soil particles (Marschner 1995; Wetzel 2001). (Sorption includes absorption, adsorption, and physical interspersion or association.) Consequently, runoff is the primary means by which phosphorus enters waters, because most phosphorus is transported to streams adhered to soil particles or associated with particles of organic matter (Wenger 1999; Jackson et al. 2001; Wetzel 2001). Insoluble and sediment-bound forms of phosphorus may subsequently become soluble in streams.

Though phosphorus is readily bound to particles of clay and organic matter, soils cannot retain unlimited quantities of phosphorus. Therefore, high inputs of phosphorus could saturate binding sites in riparian soils. This saturation was suggested by the results of several studies (reviewed in Wenger 1999) where the percent of phosphorus inputs removed by newly established buffers declined over time.

Human alteration of ecosystems can affect the transport and storage of phosphorus in riparian areas through the effects of adjacent land uses, conversion of riparian areas to agricultural or developed land cover, hydrologic and geomorphic alterations, and alterations of riparian vegetation and soils. In addition to increasing phosphorus inputs, adjacent land uses can increase or concentrate overland flows, or even route them past riparian areas. For example, the Roseville Wastewater Treatment Plant adds effluent containing substantial quantities of phosphorus to Dry Creek (ECORP 2003), and this effluent enters the stream without ever passing through the soils of a riparian area. Such alterations limit opportunities for phosphorus to sorb to particles of clay and organic matter in the soil. Similarly, drainage tiles and ditches also reduce phosphorus retention by moving flows rapidly through riparian areas. Conversion of riparian areas to agricultural or developed land uses reduces the size of riparian areas, and thus reduces the residence time of flows and the capacity of the riparian area for retaining phosphorus. Direct alterations that reduce hydraulic roughness of the vegetation or soil infiltration (e.g., grazing, timber harvest) could reduce sediment deposition and the residence time of flows in the riparian area, which could in turn reduce phosphorus retention.

Nitrogen

Nitrogen cycling involves fixation of atmospheric nitrogen (N_2) into organic molecules, and the return of nitrogen to the atmosphere through denitrification (Jackson et al. 2001; Wetzel 2001). Microorganisms perform both these transformations. Nitrogen is also fixed by the high temperatures and pressures of internal combustion engines and, to a lesser extent, by lightning. The nitrogen fixed into organic molecules is stored in living organisms and the organic materials derived from them. It is a constituent of amino acids and nucleic acids, and is also a component of the animal waste products urea and uric acid, as well as other organic molecules. During decomposition, nitrogen is released to the environment in the small inorganic molecules ammonia (NH_4^+), nitrite (NO_2^-) and nitrate (NO_3^-). These molecules and small organic molecules (e.g., amino acids) are highly soluble, readily taken up by microbes and plants, and through denitrification are transformed to N_2 and returned to the atmosphere.

Agricultural and developed lands are major sources of the nitrogen entering streams (Jackson et al. 2001). Fertilizer applications and wastes from CAFOs are the primary sources on agricultural lands. On developed lands, nitrogen sources include septic systems, pet wastes, fertilizers applied to lawns and other landscaping, sewage systems, and some industrial sources. Erosion is also an important source of nitrogen from both agricultural and developed lands.

Unlike phosphorus, nitrogen is quite soluble and readily moves into shallow groundwater (Lowrance et al. 1984; Schnoor 1996); in many areas most nitrogen enters streams via subsurface flows (Fennessey and Cronk 1997). Denitrification is the major pathway for removal of nitrogen as this subsurface water crosses riparian areas. Plant uptake also removes nitrogen from groundwater and stores it in plant tissue (Marschner 1995; Fennessey and Cronk 1997). However, unless they are removed from riparian areas or deeply buried, plant tissues will decompose after death, releasing this stored nitrogen.

Most denitrification occurs in saturated soils (Fennessey and Cronk 1997; Jackson et al. 2001; Wetzel 2001). There, low oxygen (O_2) concentrations create a demand for NO_3^- as an electron acceptor. During aerobic respiration (the primary source of energy for the metabolic activities of animals, plants, and many microbes), oxygen is required as the terminal electron acceptor. Where limited oxygen availability hinders aerobic respiration (e.g.,, under anaerobic conditions), organisms can still derive energy from metabolic pathways that rely on other molecules as electron acceptors. In the case of denitrifying bacteria, energy is derived from organic compounds using NO_3^- instead of oxygen as the terminal electron acceptor.

Factors affecting removal of nitrates by riparian areas include the portion of flows crossing the riparian area as runoff, the rate of denitrification, and the time required for subsurface flows to cross the riparian area (Fennessey and Cronk 1997). Because surface flows cross riparian areas rapidly, little or no nitrate is removed from runoff. From subsurface flows, the amount of nitrate removed is a product of the rate of denitrification and time in the riparian area.

Rates of denitrification are governed by the following conditions.

- Nitrate concentration.
- Quantity of organic carbon.
- Degree of soil saturation.
- Activity of denitrifying bacteria.
- Temperature.
- pH.

Denitrification primarily removes nitrogen that enters riparian areas as nitrate, and low concentrations of nitrate, relative to other forms of nitrogen (e.g., organic nitrogen), can limit the rate of denitrification. For example, in one study, 76% of the nitrogen entering a riparian area was in nitrate, but only 18% of the nitrogen leaving that riparian area was in the form of nitrate (Fennessey and Cronk 1997). Compared to nitrate, a much larger fraction of nitrogen in organic compounds passes through riparian areas.

Organic matter is the substrate from which denitrifying bacteria obtain energy; consequently, the lack of a carbon source can limit denitrification. Exudates from plant roots, and the roots themselves, provide an important carbon source for soil microorganisms (Marschner 1995; Gurwick et al. 2004).

Saturated soils have higher denitrification rates than unsaturated soils because they have less oxygen availability than dry or unsaturated soils. Denitrification is a mechanism for extracting energy from organic molecules; in aerobic environments, many denitrifying bacteria will perform aerobic metabolism instead of denitrification, or will compete for carbon sources with microbes performing aerobic respiration. Aerobic respiration does not involve nitrate, and thus the rate of N_2 production decreases (Fennessey and Cronk 1997; Wetzel 2001).

The ability of denitrifying bacteria to perform denitrification depends on their abundance and the quantity of nitrate to which they have recently been exposed, which together determine the overall denitrifying activity of the microbes; temperature (which affects the rate of all reactions); and pH (Fennessey and Cronk 1997; Wetzel 2001).

The residence time of surface and subsurface water in a riparian area is as important as the rate of denitrification. Many factors affect the residence time of water in riparian areas; these include width of the riparian area, slope gradient, surface roughness, hydraulic head (i.e., the force moving water through the riparian area), and soil hydrologic connectivity (i.e., permeability) (Gordon et al. 1992; Brunke and Gonser 1997; Spruill 2000). Depending on the characteristics of the given riparian area, residence times can range from hours to months or even years. Within individual riparian areas, residence time also can vary considerably due to local concentration of flow before it enters the riparian area, heterogeneity in hydrology and topography, and the characteristic heterogeneity of the texture (and hence permeability) of riparian soils (Brunke and Gonser 1997; Fennessey and Cronk 1997).

Riparian areas typically support favorable conditions for denitrification (Fennessey and Cronk 1997; Naiman and Decamps 1997; Brinson et al. 2002). The rooting zone of riparian soils is typically saturated, and plant roots provide an organic carbon source. In addition, riparian soils support high levels of microbial activity (Fennessey and Cronk 1997; Naiman and Decamps 1997; Tufekcioglu et al. 2001; Brinson et al. 2002). Therefore, a substantial portion of the nitrates contained in subsurface flows are denitrified if they pass through the rooting zone (Pinay and Fabre 1993; Fennessey and Cronk 1997; Lee et al. 2000; Spruill 2000; Sabater et al. 2003; McKergow et al. 2004; Zegre et al. 2004).

However, not all water entering streams passes through riparian soils within the plant rooting zone, where conditions for denitrification are most favorable. For example, overland flows and deep groundwater do not pass through this zone; consequently, the riparian area may remove little nitrogen from these waters (Fennessey and Cronk 1997; Wenger 1999; Spruill 2000; Simpkins et al. 2002).

Human alterations affect the ability of riparian areas to remove nitrogen through the effects of adjacent land uses, conversion of riparian areas to agricultural and developed land cover, hydrologic and geomorphic alterations, and direct removal of riparian vegetation. Adjacent land uses can increase overland flows and nitrogen inputs, and can concentrate flows or route them past riparian areas. Increased overland flows and concentration of flows before they enter riparian areas reduces the time water spends there, and reduces their opportunity to remove nitrogen. Conversion of portions of riparian areas to developed or agricultural uses reduces the time water spends within the riparian area and hence the quantity of nitrogen removed. Artificial drainage (e.g., tile drains) also reduces the residence time of water. Flow diversions, groundwater withdrawals, and channel incision that lowers the water table below the rooting zone of riparian vegetation reduce the ability of riparian soils to remove nitrogen and the ability of plants to take up nitrogen. Riparian management that reduces infiltration, vegetation density, or the cover of woody plants can also reduce nitrogen removals by reducing flows through the plant rooting zone or by altering the density and depth of plant roots.

In western Placer County, incision of stream channels is widespread (Appendix A; Placer County 2002; ECORP 2003; EDAW 2004; Jones & Stokes 2004c), and riparian vegetation has often been reduced to a narrow discontinuous band (Appendix A; Placer County 2002). Consequently, human alterations have reduced the denitrifying capacity of these riparian areas.

Heavy Metals

Heavy metals include zinc, copper, cadmium, lead, nickel, iron, silver, chromium, and mercury. Due to their potential toxicity at low concentrations to organisms at all trophic levels, heavy metal contaminants, particularly mercury, have been identified as a problem in the Sacramento River Basin (including the Bear River in Placer County) and downstream in the Bay-Delta (CALFED 2000a). Downstream of Placer County in the Sacramento–San Joaquin Bay-Delta, relatively high (and potentially harmful) concentrations of copper, nickel, zinc, and mercury have been observed in water and in some cases in organisms (Cain and Louma 1999; Hornberger et al. 1999; CALFED 2000a). These metals can cause gill, kidney, liver, and nerve damage in fish and other aquatic organisms (Luoma et al. 1990; Schnoor 1996; Morel et al. 1998; CALFED 2000a). Because of differences in its cycling in the environment, as well as heightened concerns regarding bioaccumulation, mercury is discussed separately from the other heavy metals in this chapter.

Mercury

Mercury contamination is widespread in sediments and waters of the Sacramento Valley, including western Placer County, and downstream in the Sacramento–San Joaquin Bay-Delta. Although atmospheric deposition and inputs from developed land uses occur, mercury contamination is in large part a legacy of the

California gold mining era, when mercury was used in the gold refining process (Domagalski 1998).

The fate of mercury in the environment depends on its chemical form and the local environmental conditions (Beckvar et al. 1996). Elemental mercury, inorganic mercury, and methylmercury are the three most important forms of mercury in natural aquatic environments. Most mercury is released into the environment as inorganic mercury, which is primarily bound to sediment particles and organic substances; in this form, it may not be available for direct uptake by aquatic organisms. However, methylmercury, an extremely harmful form of mercury, is readily taken up by aquatic plants, fish, and wildlife; it has been demonstrated to bioaccumulate and transfer through the food web (Beckvar et al. 1996).

Methylmercury is formed by sulfate-reducing bacteria (Wetzel 2001). The methylation of mercury is influenced by the availability of inorganic mercury, oxygen concentration, pH, oxidation-reduction potential, presence of sulfate and sulfide, type and concentrations of complexing inorganic and organic agents, salinity, and organic carbon (Blum and Batrha 1980; Jackson 1989; Parks et al. 1989; Winfrey and Rudd 1990; Beckvar et al. 1996; Gill et al. 2002). These conditions and the biological productivity of methylating microbes are also affected by seasonal changes in temperature, nutrient supply, oxygen supply, and hydrodynamics (changes in suspended sediment concentrations and flow rates).

Methylmercury has been demonstrated to accumulate in plant and animal tissues and to transfer through the food web as contaminated food sources are consumed (Beckvar et al. 1996). Methylmercury and other associated forms of bioavailable mercury damage nervous and other tissues and cause mutations, leading to cancers and reduced survival of embryos (Birge et al. 1979; Sharp and Neff 1980; Gentile et al. 1983; Thain 1984; Morel et al. 1998; CALFED 2000a).

Sediment is the primary source of mercury entering aquatic environments in the Sacramento Valley (Beckvar et al. 1996). Correlating mercury concentrations in sediment with concentrations in biota is difficult, however, particularly for higher-trophic-level species. High concentrations of organic substances and reduced sulfur that complex with free inorganic mercury ions in sediment can reduce the availability of mercury to biota (Luoma 1977; Rubinstein et al. 1983). Many investigators report no correlation between sediment and tissue concentrations of mercury for higher-trophic-level species (Nishimura and Kumagi 1983; Jackson 1988; Rada et al. 1989b; Lindqvist 1991; Dukerschein et al. 1992). This difficulty in correlating mercury in sediment with mercury in organisms reflects the complexity of variables that affect both the methylation of mercury in surface sediments and its transfer between trophic levels (Beckvar et al. 1996).

The movement, transformation, and storage of mercury within riparian areas are particularly complex processes; the human effects on these processes are also complex. Consequently, the effects of riparian setbacks on methylmercury production are likely to vary among sites. Wide setbacks (e.g., more than 30 m

[98 ft]) would reduce inputs of mercury-laden sediments from adjacent uplands, and would reduce disturbance and remobilization of mercury-laden sediments in riparian areas. However, the saturated soils and high organic carbon content of many riparian soils provide favorable conditions for methylation of mercury; in western Placer County, such soils also likely contain some mining sediments with elevated concentrations of mercury. Therefore, riparian setbacks may reduce additional inputs of mercury to riparian areas and streams, but probably will not diminish the role of riparian areas as a source of methylmercury.

Other Heavy Metals

Heavy metals enter streams from natural and human sources. Natural sources are the dissolution of rocks and minerals in sediments. Human sources include brake pad debris (Woodward-Clyde Consultants 1994), roofing materials (U.S. Environmental Protection Agency 1978) and other urban and industrial inputs, agricultural chemicals (e.g., copper-based herbicides), historical mine tailings, and acidic mine drainage (CALFED 2000a; Paul and Meyer 2001).

Unlike SOCs, heavy metals are elements that cannot be degraded; unlike nitrate, relatively little metal is transformed into other chemical forms that volatilize into the atmosphere. Therefore, heavy metals removed from flows are merely stored in riparian areas. This storage may be transient, as when metals in overland flows rapidly cross the riparian area, or may be for prolonged periods of time, as when metals sorb to buried sediments in riparian areas.

In riparian areas and adjacent streams, metal ions may be dissolved in water (either hydrated or complexed with other ions), precipitated (i.e., in an insoluble complex), sorbed to sediment or suspended particles, or taken up by plants or microbes. With the exception of uptake by organisms, these states are reversible, and metals exist in equilibrium between them. (The concentration of metal in each state depends on its rate of conversion to other states, relative to the reverse transformation.) This equilibrium, and the concentration of metals in water, is strongly influenced by DO concentration, pH, and the abundance of organic matter (Wetzel 2001; Schnoor 1996). In anaerobic environments, metals tend to precipitate in complexes with sulfides that are generated by microbes under these conditions. Under aerobic conditions, at near neutral (i.e., pH 7) and high pH (i.e., pH greater than 7), metals tend to form precipitates (i.e., insoluble forms) with hydroxyl ions (OH^-). Therefore, solubility of metals is much greater in aerobic, acidic waters (i.e., pH less than 7). Because organic matter contains many components that complex with metals, increased concentrations of organic matter in soils and in suspended sediments reduces metal solubility.

The high biomass and organic matter content of many riparian soils contributes to the removal of metals from subsurface flows. (Riparian plants also take up metals, but they require only minute quantities of a few heavy metals as nutrients, and the root endodermis functions as a barrier that blocks most additional uptake [Marschner 1995]). Thus, riparian areas store metals that would otherwise enter streams. However, soils cannot retain unlimited quantities of heavy metals, and high inputs of metals could saturate binding sites in riparian soils. The clay and organic matter content, and pH, of riparian soils will substantially influence the quantity of metals they can retain.

The association of metals with the surfaces of sediments and suspended particles is particularly important for their transport and storage in riparian areas. Surfaces of particles, such as clays, are typically charged or polar, and these particles interact with a coating of ions and molecules removed from and reentering the surrounding water. In most environments, heavy metals tend to form surface complexes with particles, and this tendency has been described as “metals scavenging” by particles (Schnoor 1996).

Because of the insoluble precipitates and complexes with particles formed by metals, eroding sediments are the major delivery mechanism for metals into riparian areas. The high surface roughness and soil permeability of many riparian areas causes deposition of metal-containing sediments that would otherwise enter streams. However, this storage is not necessarily permanent. Metals may be subsequently leached from these transported sediments, and the sediments themselves may be subsequently eroded or moved by floodwaters. Riparian soils cannot retain an unlimited quantity of heavy metals (similar to soil limitations regarding phosphorus retention), and high inputs may saturate the available binding sites.

Human alterations can affect the transport and storage of heavy metals in riparian areas through the effects of adjacent land uses, conversion of riparian areas, direct hydrologic and geomorphic alterations, and direct alterations of riparian vegetation. In addition to increasing metal inputs, human alterations of adjacent lands (e.g., acid mine drainage) can increase the acidity of waters and the leaching of metals from riparian sediments. Adjacent land uses can also increase or concentrate overland flows, or even route them past riparian areas. These alterations limit opportunities for heavy metals to sorb to particles of clay and organic matter in the soil. Similarly, drainage tiles and ditches reduce metal retention by moving flows rapidly through riparian areas. Conversion of riparian areas to agricultural or developed land uses reduces the size of riparian areas, and consequently reduces the residence time of flows and the capacity of the riparian area for retaining heavy metals. Direct alterations that reduce hydraulic roughness of the vegetation or soil infiltration could reduce sediment deposition and the residence time of flows in the riparian area, also reducing metal retention.

Synthetic Organic Compounds

SOCs include most pesticides and herbicides and a wide variety of chemicals used in industry. Many of these artificial compounds persist in the environment for prolonged periods (in some cases for decades), and some (e.g., polychlorinated biphenyls [PCBs]) bioaccumulate in animal tissues (Schnoor 1996). (Use of some of the most persistent molecules has been banned, but the compounds have remained in the environment.)

Pesticides (including diazinon, carbofuran, and chlorpyrifos), herbicides, solvents, and other SOCs are frequently washed into the Sacramento Valley's river systems during irrigation, by winter storms, and through urban runoff (Kuivila and Foe 1995; MacCoy et al. 1995; Domagalski 1996). These compounds can have direct and indirect harmful effects on soils and aquatic organisms including microorganisms, invertebrates, and vertebrates (CALFED 2000a). For example, diazinon, an organophosphate insecticide used for many agricultural applications, and until recently for urban applications as well, is highly toxic to birds, terrestrial insects, aquatic invertebrates, soil microbes, and fish (Ingham and Coleman 1984; Stone and Gradoni 1985; Mackenzie and Winston 1989; Robertson and Mazzella 1989; Turner 2002). Application of this insecticide coincides with the rainy season in California, resulting in runoff discharges into streams and rivers. Consequently, in tributaries of the Sacramento River (including the Bear River in Placer County), peak values of diazinon can exceed state or federal water quality standards by an order of magnitude or more (Turner 2002).

The SOCs in streams and rivers may come from point and nonpoint sources, release of materials stored in sediments, illegal dumping, and accidental spills. Applications of pesticides and herbicides to plants and soils in agricultural and developed lands are particularly important sources of SOCs. When applied by field equipment, aerial drift may distribute them for several meters beyond the site of application (de Snoo and de Wit 1998); when these compounds are applied by airplanes, drift may extend much further (tens to hundreds of meters).

In the environment, SOCs can volatilize (i.e., disperse into the atmosphere), dissolve in and be transported by water, adsorb to soil, bioaccumulate in animals, and degrade. The fate of these compounds is determined by their chemical properties, especially their size and solubility in water. Synthetic organic compounds vary widely in size and polarity. Many SOCs contain highly polar alcohol, organic acid, and ionic groups that increase their polarity, and increase their solubility in water. However, other SOCs are essentially non-polar; these are generally insoluble. For example, the solubility in water of PCBs and dichlorodiphenyltrichloroethane (DDT) is low (approximately 10^{-2} $\mu moleL^{-1}$); that of chlorpyrifos is higher (about 1 $\mu moleL^{-1}$); whereas the solubility of industrial solvents such as toluene and tetrachloroethylene is very high (>10^{3} $\mu moleL^{-1}$).

The smallest SOCs (e.g., organic solvents) are those most prone to volatilize. However, larger molecules that are relatively insoluble in water also volatilize at moderate rates (Schnoor 1996).

SOCs also sorb to particles of soil and organic matter. This sorption occurs through electrostatic attractions, ionic bonding, or physical intermingling (e.g., the dissolution of a non-polar molecule among particles of organic matter). However, stronger and less reversible chemical bonds also may form. The tendency of an SOC to sorb to sediment is negatively related to its solubility in water (i.e., molecules with lower solubility in water have greater propensity to sorb to sediment). The sorbed molecules of SOCs attach primarily to clays and particles of organic matter, and the sorption of SOCs increases substantially with the concentration of organic matter in the sediment (Schnoor 1996; Neitsch et al. 2002).

The accumulation of SOCs in organisms (i.e., bioaccumulation) represents the net balance resulting from uptake across gill and skin, ingestion from food, metabolic degradation, and excretion. The SOCs most prone to bioaccumulate are the relatively non-polar, hydrophobic molecules (e.g., DDT, PCBs, chlordane) that tend to sorb into membranes and fatty tissues (Schnoor 1996). Typically, these are the same molecules that tend to sorb to sediment.

SOCs can be degraded (changed into other molecules) through the absorption of light energy (photodegradation), by reacting with water or chemicals in water or soil (chemical degradation), or by microorganisms (biodegradation). With the exception of photodegradation, these processes occur most rapidly in soil (Brinson et al. 2002; Neitsch et al. 2002). Biodegradation occurs because microorganisms use SOCs as food sources; they obtain energy stored in the chemical bonds of SOCs through a series of oxidation-reduction reactions, ultimately breaking the SOCs down to carbon dioxide and water. Microbes also mediate other transformations of SOCs (Schnoor 1996). Rates of degradation of SOCs vary over a wide range (Schnoor 1996). Chemical degradation of molecules dissolved in water can reduce the concentration of some SOCs by half within minutes, while other SOCs require years before concentrations are halved. Photodegradation can break down more than 99% of dissolved Carbaryl in a month, but does not eliminate 1% of DDT in a year. For any given SOC, biodegradation rates vary with the environmental conditions listed below.

- Temperature.
- Concentration of oxygen.
- Nutrient availability.
- Microbial population density or biomass concentration.
- Acclimation of the microbial flora to the SOC.

All these factors affect the activity of microbes that perform biodegradation. Riparian areas are considered to support high rates of biodegradation because they typically contain a range of oxygen and nutrient availability, and they support dense, active populations of microorganisms (Fennessey and Cronk 1997; Naiman and Decamps 1997; Tufekcioglu et al. 2001; Brinson et al. 2002).

Overall, the degradation of SOCs in riparian areas depends not only on degradation rates but also on the infiltration of water and associated SOCs into the soil and the time required for water to cross the riparian area. Because overland flow (i.e., runoff) crosses riparian areas rapidly, little or no degradation or storage occurs (Neitsch et al. 2002; Popov and Cornish 2004). Factors affecting the passage of subsurface flows through a riparian area include its width, hydraulic head, and hydrologic conductivity (Fetter 1994; Brunke and Gonser 1997).

The degradation and storage of SOCs in riparian areas is entirely dependent on human alterations because they are the sole source of SOCs. In addition to generating inputs, human alterations also affect the degradation and storage of SOCs in riparian areas by converting these areas to other land-cover types; reducing infiltration of water in riparian areas and adjacent uplands; and lowering groundwater levels through groundwater withdrawals, flow diversions, and stream channel incision. All these alterations reduce the quantity of SOCs passing through riparian soils and the time they remain there. Alterations that concentrate overland flows, or that reduce the hydraulic roughness of riparian vegetation, can also reduce the deposition of SOCs associated with suspended sediment. In western Placer County, incision of stream channels and loss of riparian vegetation have reduced the ability of riparian areas to degrade SOCs.

Relationships Between Effects and Setback Width

A substantial quantity of research has been conducted worldwide on the biogeochemical functions of riparian areas, the effects of human alterations on those functions, and the benefits of managed buffers between streams and areas of timber harvest, agricultural activities, and development (Correll 2003). This research strongly supports the conservation and management of riparian areas and adjacent uplands for water quality benefits, and it has identified the factors affecting riparian functions. Accordingly, this research provides justification for riparian setbacks and some information to guide their planning and design. Nonetheless, current understanding is not sufficient to reliably determine the exact effects that different width buffers will have on biogeochemical functions (and stream water quality). Several computer models have recently been developed that could be used to evaluate the consequences of different width setbacks (Lowrance et al. 2000; Dallo et al. 2001; Zhongwie and Wong 2004). However, these models have several deficiencies: they have not been tested under a range of conditions; they have several unresolved issues regarding their accuracy; and they are currently costly to apply (Inamdar 2004).

The most important factors affecting biogeochemical functions in riparian areas are listed below.

- Loadings from adjacent uplands.
- Partitioning of runoff between overland and subsurface flow.
- Distribution (i.e., spatial concentration) of overland flow.
- Depth of shallow groundwater.
- Time that water resides in the riparian area or buffer (i.e., residence time).
- Quantity of sediment eroded and transported to riparian areas.
- Redistribution of deposited sediment by subsequent floodwaters.

The width of riparian setbacks can affect several of these factors, and can consequently affect the biogeochemical functions of riparian areas. First, the width of a setback determines the distance between stream waters and sources of macronutrients, metals, and SOCs. A wide riparian zone increases infiltration (and subsurface flows), rates of sediment deposition, and the time required for materials to reach a stream. Thus, greater setback widths tend to increase the storage and removal of materials en route to streams. Second, the area of sources for macronutrients, metals, and SOCs is reduced by wider setbacks because more land is retained in natural vegetation. Third, if a riparian setback extends beyond the stream's active floodplain, then sediments and associated contaminants will be stored, at least in part, outside the active floodplain, where they are less likely to be carried into streams by floodwaters.

Researchers have documented substantial reductions in stream loadings of macronutrients, metals, and SOCs due to riparian areas or buffers ranging in width from several to more than a hundred meters. (Castelle et al. 1992; Fennessey and Cronk 1997; Wenger 1999; Brinson et al. 2002.) Reductions resulting from a very narrow riparian area (e.g., 6 m [20 ft]) in one study may be comparable to reductions in a much wider riparian area (e.g., 30 m [98 ft]) in another study. This variability reflects both differences in site attributes that affect movement, transformation, and storage of these materials, as well as variability in the methods of researchers.

Overall, the most significant factors causing variation in the biogeochemical functions of riparian areas are hydrologic conditions (e.g., the depth of subsurface flows); climate and vegetation attributes seem to cause lesser effects (Fennessey and Cronk 1997; Simpkins et al. 2002; Sabater et al. 2003). Nonetheless, California's Mediterranean climate may reduce a setback's effectiveness relative to a setback of similar width in other climates. In northern California, because rainfall is concentrated during the winter months and evapotranspiration is low at that time, rain frequently falls on saturated soils, and overland flows are consequently greater than they might be under a different climatic regime.

Variation in the results of relevant research is often due to differences in the types of sites and the range of conditions included in the study. For example, many studies are conducted in small-scale plots with simulated rainstorms. The results of such short-term studies under a narrow range of conditions often indicate greater effectiveness of narrow buffers or setbacks than do the results of longer-term, larger-scale studies (Castelle et al. 1992; Davies and Nelson 1994; Fennessey and Cronk 1997; Wenger 1999; Lee et al. 2000; McKergow et al. 2004; Zegre et al. 2004). Similarly, actively managed buffers, such as tilled and planted borders of agricultural fields, are generally more effective at narrower widths than are unmanaged setbacks; appropriately, many of the recommendations for narrower setbacks are intended for actively managed areas (Lowrance et al. 2002).

Recommended Setback Width to Conserve Biogeochemical Functions

For the purpose of long-term conservation of biogeochemical functions, the project team recommends that riparian setbacks include the entire active floodplain, regardless of the current extent of riparian vegetation on that surface, and that an additional 30-m (98-ft) buffer be included in the setback.

For effective long-term conservation of riparian functions, setback widths should be sufficient to retain macronutrients, metals, and SOCs from the concentrated flows and infrequent events (e.g., intense rain on saturated soils) that transport a substantial portion of the sediment and materials to riparian areas. This criterion requires a setback of moderate width. Consequently, for the purpose of long-term conservation, though widths from several to more than a hundred meters have been recommended, setbacks of 20–30 m (66–98 ft) have been recommended most frequently (Castelle et al. 1992; Johnson and Ryba 1992; McCauley and Single 1995; Fennessey and Cronk 1997; Herrone and Hairsine 1998; Wenger 1999; Lowrance et al. 2002; Environmental Law Institute 2003; Lee et al. 2004).

It is important to note that setbacks do not ameliorate many effects of human alterations on biogeochemical functions. Not all inputs (of macronutrients, metals, SOCs, and other contaminants) to streams will pass through riparian soils (e.g., deeper groundwater flows, stormwater, and agricultural drainage that crosses in pipes or ditches). Moreover, riparian setbacks will not retain all inputs of fertilizers, heavy metals, pesticides, and other contaminants that pass through them. In addition, high levels of inputs may cause the effectiveness of setbacks to may diminish over time. Therefore, other measures that address the upland sources of macronutrients, metals, SOCs, and other contaminants are necessary.

Chapter 4
Salmonid Habitat Functions

Overview

Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*O. mykiss irideus*) are anadromous fishes that spend a major portion of their lives in the Pacific Ocean. Maturing adult steelhead and Chinook salmon migrate from the ocean to spawn in Central Valley rivers and creeks, including those of western Placer County. After rearing in these rivers, the juveniles migrate back to the Pacific Ocean.

Salmonids occupy the freshwater systems from the Sacramento–San Joaquin Delta (Delta) to stream headwaters, depending on the streams' accessibility to migrating fish and the availability of spawning and rearing habitat within them. Not only are salmonid habitat functions valued directly, but they also provide an indicator of human effects on other components of these aquatic ecosystems. This chapter describes salmonid habitat functions and how human alterations affect those functions. It concludes with a summary of the relationships between riparian setback width and human effects, and offers the project team's recommendation for setback widths to conserve salmonid habitat functions.

Effects of Human Alterations on Migration

Shallow water depth, high water velocity, and physical barriers may impede salmonid passage through spawning streams. Human alterations affect each of these potential impediments to migration.

Water Depth

In general, water depth greater than 0.3 m (1 ft) is needed to allow passage of adult and juvenile Chinook salmon and steelhead (California Department of Fish and Game 2001; National Marine Fisheries Service 2001). However, this minimum depth may be a somewhat conservative estimate, because Chinook salmon and steelhead can pass through short sections of water that are less than 0.3 m (1 ft) deep (Thompson 1972 *in* Bjornn and Reiser 1991).

Low streamflows and shallow water depths may delay or block migrating salmonids' access to upstream spawning habitats, expose adult fish to water temperatures detrimental to individual survival, and reduce the fecundity of females (i.e., egg viability). Delayed passage of adults may also delay spawning and extend incubation of eggs and rearing of juveniles into months when warmer water temperatures predominate. The result may be reduced egg and juvenile survival and reduced productivity in that year (i.e., year class production).

Low streamflows can also affect juvenile migration. Like the requirements for adult salmonid passage, water depth greater than 0.3 m (1 ft) is necessary for passage of juvenile Chinook salmon and steelhead (California Department of Fish and Game 2001; National Marine Fisheries Service 2001). Delayed or blocked passage of juveniles may prevent access to downstream rearing habitat and increase their exposure to warm water temperatures, entrainment in diversions, and predation. The resulting decrease in survival and growth rates reduces year class production and potentially reduces adult abundance in subsequent years.

Relatively shallow flow in combination with physical barriers and high water temperatures can cause fish to fatigue as they migrate upstream; these cumulative effects may lower the survival and reproductive success of individual fish (Gallagher 1999). For these reasons, long stretches of river with maximum depths near 0.3 m (1 ft) may be barriers to migration. Other factors interacting with the effects of depth include cover and suitable resting areas (e.g., deep pools).

Flow rates may affect travel time for juvenile salmonids. Travel time for juvenile Chinook salmon and steelhead generally decreases with increasing flow and water velocities. Faster travel times may reduce exposure to predation and facilitate movement of smolts to the ocean (Berggren and Filardo 1993).

Vertical Drops

In addition to adequate depth and velocity, vertical drops should not exceed the leaping abilities of Chinook salmon and steelhead. The ability to jump vertical drops is greatly affected by staging pool depth, jump angle, and the horizontal distance of the leap (Powers and Orsborn 1985; Reiser and Peacock 1985). The ratio of staging pool depth to barrier height should be at least 1.5 (Stuart 1962; U.S. Forest Service 1977; Robison et al. 1999). Although the conservative vertical limit for adult fish is 1.4 m (4.5 ft) for steelhead and 0.9 m (3 ft) for Chinook salmon, passage is best facilitated by drops of 0.3 m (1 ft) or less. For juvenile salmonids, downstream migration is facilitated by drops of 0.15 m (0.5 ft) or less (National Marine Fisheries Service 2001).

Water Temperature

Warm temperatures and low DO concentrations may impede salmonid migration. Temperatures warmer than 13º Celsius (C) (55ºFarenheit [F]) have caused mortality of female adult Chinook salmon prior to spawning, and migration was blocked when water temperature reached 21ºC (69.8ºF) in the Delta (Andrew and Green 1960 *in* Raleigh et al. 1986; Hallock 1970 *in* McCullough 1999). In the Columbia River, a temperature of 21ºC (69.8ºF) was lethal to steelhead acclimated to a river temperature of 19ºC (66.2ºF). The response to warm temperatures may be complicated by low DO concentrations. In the Delta, adult Chinook salmon avoided temperatures warmer than 19ºC (66ºF) when DO was less than 5 milligrams per liter (mg/l) (Alabaster and Hallock 1988, 1970 *in* McCullough 1999).

Discussion of Effects

Construction of dams and other barriers, such as temporary diversion structures, are the most significant human alterations affecting migration and causing the loss of salmonid habitats (Yoshiyama et al. 2001). These barriers prevent Chinook salmon and steelhead migration to the higher foothill reaches of many streams in the Sacramento Valley. The alteration of flows, temperatures, and water quality below major reservoirs may also interfere with salmonid migration.

In western Placer County, dams are considerable impediments to fish passage. There are approximately thirty dams on western Placer County's streams (DWR 2002; Placer County 2002; Bailey Environmental 2003). While some of these allow fish passage under many flow conditions, others (e.g., Cottonwood Dam on Miners Ravine) are more substantial barriers.

Water control structures, road crossings, and culverts constrain flows and can create high water velocities. Culverts are characteristically uniform and designed to optimize flow efficiency, often resulting in high velocities. The velocity a fish can overcome in moving through a culvert depends on its length; as culvert length increases, flow velocities must decrease to permit fish passage. In general, water velocity should be less than 1 meter per second (m/sec) (3 feet per second [ft/sec]) for any culvert more than 30 m (98 ft) long and less than 1.5 m/sec (5 ft/sec) for culverts less than 30 m (98 ft) long (California Department of Fish and Game 2001). In western Placer County, roads cross streams at dozens of locations, and the culverts under a number of these roads are partial barriers, particularly at low flows (DWR 2002; Placer County 2002; Bailey Environmental 2003).

Surface water diversions and management of water releases from reservoirs can affect migration and increase mortality of juvenile salmonids by creating warm water temperatures. Diversions also can cause direct effects such as migration delay, injury, and mortality resulting from entrainment, impingement, and predation (National Marine Fisheries Service 1994). Entrainment occurs when fish move with the diverted flow into a canal or turbine; in most cases, entrained organisms do not survive. Impingement occurs when individual fish come in contact with a screen, a trashrack, or debris at the intake. Contact causes bruising, loss of scales, and other injuries. Fish mortality can result if impingement is prolonged, repeated, or occurs at high velocities. In addition, intakes increase predation by stressing or disorienting prey fish and by providing habitat for fish and bird predators (National Marine Fisheries Service 1994).

The proportion of a population that can become entrained or impinged in diversions depends on the location, timing, duration, and volume (relative to total flow) of the diversion relative to the distribution, abundance, and behavior of each species' life stage. Diversions in the Sacramento River Basin affect juvenile Chinook salmon and steelhead (U.S. Fish and Wildlife Service 1995). In addition to the possibility of entrainment at unscreened diversions, juvenile salmonids can be impinged against screens by fast-moving water, or they can pass through screens that are not designed to screen out salmonid fry and other small fish. Western Placer County's dams are associated with water diversions. Most of these diversions are unscreened, and thus entrainment can occur.

Effects of Human Alterations on Spawning Habitat

Salmonids lay their eggs in streambed gravels. The fish create depressions in the gravel, deposit and fertilize their eggs, and then bury the eggs with gravel. The resulting gravel nest is called a redd. The quality of spawning habitat is influenced by water temperature and depth, flow velocity, and substrate.

Water Temperature

Chinook salmon eggs and larvae require temperatures between 4ºC and 12ºC (39.2ºF and 53.6ºF) for maximum survival (Myrick and Cech 2001). Survival of eggs was less than 50% when temperature is warmer than 16ºC (60.8ºF) (Alderice and Velsen 1978). Optimal water temperatures for steelhead spawning and incubation are similar to those of Chinook salmon; they fall between 3.9ºC and 11.1ºC (39ºF and 52ºF) (Myrick and Cech 2001). Steelhead eggs subjected to temperatures warmer than 15ºC (59ºF) are prone to increased mortality.

Water Depth and Velocity

Water depth and flow velocity are factors that influence spawning habitat selection for Chinook salmon and steelhead. Minimum water depths at redd areas vary with fish size and water velocity, because these variables affect the depth necessary for successful digging; the water should be sufficiently deep to cover the fish (Healey 1991). In general, suitable spawning gravels are covered by flows at least 0.25 m (0.8 ft) deep and with velocities between 0.25 m and 1.2

m/sec (0.8 and 3.8 ft/sec) (Bjornn and Reiser 1991; Railegh et al. 1986). Reduced flows during incubation periods may cause mortality through desiccation of redds, or through reduced water circulation resulting in low DO, accumulation of metabolic waste, and increased incidence of disease.

Substrate

Although the suitability of gravel substrates for spawning depends largely on the species and individual fish size, a number of studies have determined substrate sizes that represent the most suitable conditions. Generally, Chinook salmon require substrates of approximately 0.3–15 cm (0.1–5.9 inches), whereas steelhead prefer substrates no larger than 10 centimeters (4 inches) (Bjornn and Reiser 1991).

The eggs depend on water flow through spawning gravels to supply oxygen for the developing embryos. Oxygen is supplied by the water flowing through the area of the gravel bed with the eggs (i.e., the redd). Flow rates and the concentration of oxygen in the flowing water effectively determine the DO available to eggs and fry in the redd.

The velocity of the water and the permeability of the surrounding gravels together determine the rate at which water flows through a redd. Gravel beds consisting of smaller-sized particles have lower permeability (greater resistance) to water flow than do gravel beds consisting of larger-sized particles. Therefore, the velocity of water through a redd slows as particle size decreases.

Discussion of Effects

Throughout the Central Valley, including Placer County, human alterations (i.e., changes in sediment supply and transport) have substantially reduced the extent of suitable spawning gravel for salmonids (Jones & Stokes 2004c). Along most Central Valley rivers and streams, sediment supply and transport have been altered by hydraulic mining, levees, land use changes, gravel mining, dam construction, and water diversions (CALFED 2000b). Currently, managed forest lands, roads, construction, and developed and agricultural lands contribute substantially more sediment than do areas of natural vegetation (Charbonneau and Kondolf 1993). In the lower portions of watersheds, most of this sediment is of fine materials (less than 2 mm [0.08 in] in diameter). On most rivers and streams, dams block the transport of coarser materials from the upper portions of watersheds, while gravel mining has removed coarse materials from downstream floodplains and channels. As a consequence of these changes, spawning habitats for Chinook salmon and steelhead have been reduced.

The addition of fine sediments into streams and streambeds can decrease the quality and quantity of spawning habitat by reducing the permeability of spawning gravels and thus reducing the flow of water and oxygen to eggs, which leads to direct mortality of eggs and fry, physiological stress, and impediments to the movement of fry from the redd (Gibbons and Salo 1973; Tappel and Bjornn 1983, Sigler et al. 1984; Raleigh et al. 1986; Lloyd et al. 1987; Reynolds et al. 1989; Waters 1995; Ligon et al. 2003). In western Placer County, gravel beds currently have high concentrations of fine sediments that reduce suitability for spawning (Jones & Stokes 2004b).

Spawning habitats are also affected by human alterations of riparian vegetation. The loss of riparian vegetation has contributed to increased water temperatures and reduced quality of spawning habitat along many Central Valley rivers and streams, including those in western Placer County (CALFED 2000b; Jones & Stokes 2004b). Reduced flows may allow riparian vegetation to establish on river bars and channels where establishment and survival were not previously possible because of scouring or prolonged submergence under unregulated flow regimes (Pelzman 1973). This encroachment of vegetation stabilizes sediments and confines the channel, contributing to a reduction in salmonid spawning habitat.

Effects of Human Alterations on Rearing Habitat

Multiple environmental conditions, food resources, and interactions among individuals, predators, and competitors all influence rearing habitat quantity and quality and the productivity of streams (Bjornn and Reiser 1991). Water temperature and velocity, cover, and inundation of floodplains are particularly important factors influencing salmonid rearing habitats.

Water Temperature

Water temperature has a strong affect on juvenile salmonids, and rearing success deteriorates at water temperatures above 20ºC (68ºF) (Raleigh et al. 1984; Myrick and Cech 2001). Myrick and Cech (2001) observed maximum juvenile growth rates at water temperatures between 17ºC and 20ºC (62.6ºF and 68ºF) and at 19ºC (66.2ºF), for steelhead and Chinook salmon, respectively. Rich (1987) found that juvenile Chinook salmon from the Nimbus State Fish Hatchery died before the end of the experiment when reared at 24ºC (75.2ºF). Steelhead juveniles can be expected to show significant mortality at temperatures exceeding 25ºC (77ºF) (Raleigh et al. 1984; Myrick and Cech 2001).

Water Velocity

Water velocity is of particular importance in determining where juvenile salmonids occur, because it determines the energetic requirements of fish for maintaining position and the amount of food delivered to a particular location. Juvenile salmonids tend to select positions that maximize access to food and minimize energy expenditures, but these positions can be altered by interaction with other fish and the presence of cover (Shirvell 1990). The water velocity preferred by salmonids varies with size of the fish; larger fish occupy areas of higher velocity and greater depth than small fish, potentially gaining access to abundant food and avoiding predatory birds (Bjornn and Reiser 1991; Jackson 1992). Griffith (1972 *in* Raleigh et al. 1984) found water velocities of 0.10–0.22 m/second (sec) (0.32–0.72 ft/sec) to be associated with occurrence of rainbow trout. Sheppard and Johnson (1985) found similar results for juvenile steelhead; they measured velocities of 0.12–0.24 m/sec (0.40–0.80 ft/sec). Bovee (1978 *in* California Department of Fish and Game 1991) reported water velocities of 0.18–0.37 m/sec (0.6–1.2 ft/sec) as the preferred range for juvenile rainbow trout and steelhead.

Cover

Instream cover (e.g., undercut banks, downed trees, other woody debris) is important for juvenile rearing. The addition of cover increases spatial complexity and may reduce predation of juvenile fish. The abundance of food, suitable physical conditions, and the presence of competitors and predators determine cover value. Fine-textured instream woody material provides the hydraulic diversity necessary for selection of suitable velocities, access to drifting food, and escape refugia from predatory fish. An area of cover less than 15% of the total habitat area is likely inadequate for juvenile salmonids (Raleigh et al. 1984).

Shaded riverine aquatic (SRA) cover is important to juvenile Chinook salmon and steelhead because it provides high-value resting and feeding areas and protection from predators. Riparian vegetation not only provides woody debris for instream cover, but also filters sediments, inputs organic matter, modifies channel pattern and geometry, creates SRA cover, and provides habitat for aquatic invertebrates eaten by salmonids. For these reasons, stream sections shaded by riparian vegetation (in contrast to sections characterized by denuded banks) provide important rearing and resting areas for adult Chinook salmon and steelhead migrating upstream (Raleigh et al. 1984, 1986; Slaney and Zaldokas 1997; Haberstock 1999; CALFED 2000b). Woody material is important not only because it provides instream cover, but also because it affects geomorphology and facilitates the creation of pools for holding juvenile salmon during high flow events (Larson 1999; Macklin and Plumb 1999). Shade reduces daily temperature variability and maximum temperature, maintains DO, and may help maintain base flows during dry seasons (Slaney and Zaldokas 1997; Whitting 1998; Haberstock 1999; CALFED 2000).

Floodplain Habitat

Seasonally inundated floodplains, though they provide habitat for both native and nonnative fish species, are particularly important to native species (Moyle et al.

2000). Many native fish species, including salmonids, are dependent on or benefit from inundated floodplains. Floodplains function as nursery areas, refuges from low water temperatures in early spring and winter, and refuges from high water velocities during high flow periods (Turner et al. 1994). Inundated floodplains also provide high food abundance, a range of water temperature conditions, and increased water clarity that may increase growth and survival rates (Sommer et al. 2001a, 2001b). Inundated floodplains of the Sacramento River and its tributaries may also provide high-quality organic nutrients to the Bay-Delta, benefiting estuarine species.

Discussion of Effects

Human alterations have affected rearing habitat by reducing water quality, removing riparian vegetation, hydraulically isolating floodplains, and altering flows. The introduction of nonnative predatory fish species has also detrimentally affected juvenile rearing. These alterations have all contributed to the loss of rearing habitat in western Placer County.

Adjacent agricultural and developed land uses are sources of contaminants and sediment (e.g., macronutrients, pesticides, and heavy metals) that reduce water quality. These effects on water quality are described in the chapter dealing with biogeochemical functions.

In addition to physically affecting salmonids, contaminants and sediments can cause changes in macroinvertebrate communities. These changes in turn can affect food available to foraging fish (Waters 1995). Such changes may have occurred in the streams of western Placer County, because in all six streams for which data are available, macroinvertebrate communities are dominated by species moderately to highly tolerant of pollution (Bailey 2003).

Researchers have found that elevated concentrations of suspended sediment can cause direct mortality of fry, fingerlings, and juvenile salmonids (Sigler et al. 1984; Lloyd et al. 1987; Reynolds et al. 1989). Sublethal effects include avoidance of sediment-laden areas, reduced feeding and growth, respiratory impairment, reduced tolerance to disease and toxicants, and physiological stress (Waters 1995).

The loss of riparian vegetation and SRA cover results from conversion of riparian areas to other land uses, adjacent gravel mining, placement of bank protection (e.g., riprap), grazing, and other direct removals (e.g., due to levee maintenance). It also is a consequence of hydrologic and geomorphic alterations, such as flow reductions and incision. Because riparian vegetation affects not only stream water temperature, but also cover, food resources, habitat complexity, and geomorphic processes (e.g., pool formation, bank stability), its loss substantially degrades rearing habitat. In western Placer County, conversion to developed or agricultural land-cover has removed extensive areas of riparian vegetation (Jones & Stokes 2004a, 2004b), and remaining vegetation is often in narrow bands with a discontinuous cover of trees (Appendix A).

Water diversions cause broad effects on stream ecosystems that can reduce the quality of rearing habitat. Water diversions affect fish, aquatic organisms, sediments, salinity, streamflows, habitat, foodweb productivity, and species abundance and distribution (National Marine Fisheries Service 1994). Some diversions have screens that exclude larger organisms such as most adult fish, but eggs, larvae, invertebrates, plankton, organic debris, and dissolved nutrients are important components of the lower trophic levels that may be lost to diversions. Reductions at the lower trophic levels can result in reduced food supplies and have secondary impacts on all higher trophic levels, affecting the overall foodweb. In western Placer County, there are over two dozen water diversions, and most of these are unscreened (DWR 2002; Placer County 2002; Bailey Environmental 2003; Jones & Stokes 2004b).

Human alterations affecting hydrologic and geomorphic processes can reduce rearing habitat on floodplains. (The effects of human alterations on hydrologic and geomorphic processes are described in detail in the chapter on hydrologic and geomorphic functions.) These alterations include water diversions, groundwater withdrawals, dams, levees, bank protection, and changes in land cover. Due to human alterations, in western Placer County, stream channel incision has reduced the area of rearing habitat on floodplains.

In addition to inundating floodplains, streamflow has several effects on the rearing capacity of streams. Predation may increase during low flows, particularly during downstream migration of juveniles. Higher flows result in faster outmigration, reduced water clarity, and cooler water temperature, all contributing to reduced predation (U.S. Fish and Wildlife Service 1996). Both flow and depth affect travel time for juvenile salmonids. Faster travel time may reduce exposure to predation and facilitate movement of smolts to the ocean (Berggren and Filardo 1993).

Flow alterations have a major effect on the water temperatures of Sacramento Valley streams. For rivers and larger streams, reservoir operations (i.e., the timing, temperature, and magnitude of reservoir releases, as well as total reservoir storage) are among the most important influences on water temperatures. Agricultural and municipal diversions reduce river flow and potentially increase temperatures during summer months (Myers et al. 1998; Myrick and Cech 2001), and the elevated temperatures of irrigation return flows can also affect instream water temperatures (U.S. Fish and Wildlife Service 1995). Water temperatures that are marginal or unsuitable for rearing of juvenile salmonids frequently occur along most streams in western Placer County (Bailey 2003; Jones & Stokes 2004b).

Streamflow also affects the concentration, and consequently the detrimental effects, of contaminants. For example, experimental studies indicated that contaminants in agricultural return flow from the west side of the San Joaquin Valley had no detrimental effects on the growth and survival of juvenile Chinook salmon when the return flows were diluted by 50% or more with San Joaquin River water (Saiki et al. 1992).

High pesticide concentrations may affect aquatic invertebrates (Brown et al. 2000). Adult and larval aquatic macroinvertebrates are a major food source for juvenile Chinook salmon, and a loss of invertebrate production could have an effect on juvenile salmonid production (Brown and May 2000); however, the extent of this effect has not been quantified.

Rapid fluctuations in flows can cause the stranding of juvenile and adult anadromous fish and the dewatering of redds. Fish can become stranded in borrow areas, the floodplain, shallow nearshore areas, side channels, and deep areas in the active stream channel when water levels change quickly.

Although adult fish do become stranded, juvenile fish are more vulnerable to stranding. Fry are poor swimmers and tend to stay in shallower water along the edges of streams and rivers or in side channels (Phinney 1974; Woodin 1984; Hunter 1992). Juvenile fish are not as able to follow receding waters back to the river (U.S. Fish and Wildlife Service 1995b). Also, redd dewatering can occur when flows decline while eggs are incubating.

Factors such as the total drop in stage, the lowest water level attained, the frequency of flow reductions, and the rate of change in flow affect fish stranding rates. In an episode of flow reduction, the greater the total drop in stage, and the lower the lowest flow attained, the more likely it is that side channels and shallow ponds in the floodplain will be isolated from flow and that gravel bars where redds may be located could be exposed (Hunter 1992). Frequent flow fluctuations result in cumulative stranding (U.S. Fish and Wildlife Service 1995; Bauersfeld 1978), and the faster the rate of change in flow, the more likely fish are to become stranded. Olsen (1990) found that ramping rates of less than 2.5 cm per hour (1 inch per hour) were needed to protect steelhead fry on the Sultan River in Washington State.

Relationships Between Setback Width and Effects of Human Alterations

The width of riparian setbacks directly affects the integrity of geomorphic processes that sustain salmonid habitats, the area of floodplain rearing habitat, and the extent of riparian vegetation providing SRA cover and inputs to the aquatic ecosystem. Setback width also influences inputs of sediment and contaminants from adjacent uplands; these inputs are described in other chapters (Chapters 2, 3, and 5) of this report.

Structures, developed land uses, and most agricultural land uses within the active floodplain detrimentally affect salmonid habitat functions. Thus, to conserve salmonid habitat functions, setback widths should be sufficient to include the active floodplain and to buffer the active floodplain from detrimental effects that may result from adjacent land uses.

All riparian vegetation within the active floodplain contributes inputs to the aquatic ecosystem. These inputs are greatest from vegetation immediately adjacent to the stream channel, and shade is only provided by vegetation within a distance determined by stream orientation, tree height, and topography. In some cases (e.g., topographically confined or incised reaches), the vegetation affecting streams is outside the active floodplain. One tree height (i.e., potential maximum tree height on that site) has often been used as an approximation of the width of the zone alongside streams that provides effective shading and inputs (e.g., large woody debris) to the channel (Rhodes et al. 1994), although vegetation further from streams can still, in the proper circumstances, provide some shade. This distance (i.e., potential maximum tree height) is roughly 20 m (66 ft) to as much as 30 m (98 ft) in western Placer County, based on the observed and potential heights of mature Fremont's cottonwoods, valley oaks, and other tree species (Hickman 1993; Stuart and Sawyer 2001).

Recommended Setback Width to Conserve Salmonid Habitat Functions

For the purpose of long-term conservation of salmonid habitat functions, the project team recommends that riparian setbacks include the entire active floodplain, regardless of the current extent of riparian vegetation on that surface, and that an additional 30 m (98 ft) buffer be included within the setback. Conversion of the active floodplain to developed or agricultural land uses would substantially affect the hydrologic and geomorphic processes that sustain salmonid habitat functions. Land adjacent to the active floodplain also may affect shade, inputs of woody debris, and water quality; consequently, the 30 m (98 ft) buffer would reduce the effects of adjacent land uses.

It is important to recognize that riparian setbacks are not sufficient to ensure conservation of salmonid habitat functions. Many effects on salmonid habitat functions result from human alterations that are unrelated to setback width, but that are rather associated with flow alterations, water quality, vegetation management, and land uses within the watershed. Therefore, conservation of salmonid habitat functions requires the implementation of a coordinated set of measures involving land use, flow management, and vegetation management in these watersheds and within these defined setbacks.

Chapter 5
Plant Habitat Functions

Introduction

More than 15 native tree and shrub species occur in the riparian forests, woodlands, and scrublands of the Sacramento Valley and adjacent foothills (Conard et al. 1980). These species are all deciduous, and all require high or very high levels of water availability. They differ in their dispersal mechanisms, seed size, shade tolerance, size, growth rates, and longevity (Table 5-1). These attributes, in concert with site conditions and flow and disturbance regimes, determine the species composition and structure of riparian vegetation.

In the Sacramento Valley, early successional vegetation typically is dominated by Fremont's cottonwood (*Populus fremonti*) and willow species (*Salix* spp.). Both taxa produce large numbers of widely dispersed seeds and are rapidly growing, shade intolerant, and relatively short-lived (Sudworth 1908; Strahan 1984; Burns and Honkala 1990). Shrubby thickets of these species can reach heights of 3–12 m (10–40 ft) over a period of 10–20 years. Other species, such as Oregon ash (*Fraxinus latifolia*) and valley oak (*Quercus lobata*), establish either concurrently with or subsequent to the willows and cottonwood and grow more slowly, but they are more tolerant of shade and are longer lived (Burns and Honkala 1990; Tu 2000). In the absence of frequent disturbance, individuals of these species enter the canopy, particularly after 50 years since stand initiation, as mortality of willows and cottonwoods create openings in the forest canopy. Conversely, frequent disturbance prevents the transition to mature mixed riparian or valley oak forests. Currently, in western Placer County, oak species are abundant in the riparian vegetation, white alder (*Alnus rhombifolia*) is widespread, and cottonwoods and willows are less abundant than along many other Central Valley rivers and streams (Appendix A; Placer County 2002).

Human alterations of riparian areas change site conditions, including flow and disturbance regimes, and consequently affect the dispersal, establishment, growth, reproduction, and mortality of riparian species. These changes alter the species composition and structure of riparian vegetation, thereby modifying habitat for aquatic fish and terrestrial wildlife habitat, as well as biogeochemical functions.

Effects of Human Alterations on Life Cycle of Riparian Species

Effects on Dispersal

Air, water and animals disperse riparian plant species. However, flow regime strongly affects the dispersal of all plant species. Surfaces that remain submerged throughout the period of seed release are largely inaccessible to most dispersing seed, and surfaces that remain above water during this period are inaccessible to water-dispersed seed. Seeds are commonly dispersed through the air or by floating on water; large numbers of seeds wash onto shorelines and bars as water levels recede. The river stage during the dispersal period must be at a level high enough to distribute seeds to a surface where scouring by subsequent flows does not occur, and low enough to prevent desiccation of seedlings once the river stage recedes.

Accordingly, hydrologic or geomorphic alterations affect the dispersal of riparian plant species. Levees and berms isolate surfaces from stream flows and preclude the deposition of water-dispersed seed. Flow alterations modify the river's stage, raising or lowering the elevation at which seeds are deposited. Similarly, incision of the stream channel lowers the river's stage, and thus lowers the elevation at which seeds are deposited. Such incision is widespread in western Placer County (Appendix A; Placer County 2002; ECORP 2003; EDAW 2004; Jones & Stokes 2004 c).

Similarly, conversion of active floodplain to agricultural or developed land uses can isolate seed sources and potentially create barriers to flows or animal movements and thus to seed dispersal. However, the extent of these effects is not well known.

Effects on Establishment

Establishment of riparian plants requires suitable conditions for germination and subsequent growth. Hydrology and hydraulics, soil properties, competing vegetation, disease-causing organisms, herbivorous animals, and vegetation management by humans all affect the transition from seed to established plant.

For successful recruitment, cottonwood and willows are particularly dependent on specific hydrologic events before, during, and immediately following their seed release periods. These shade-intolerant species have very small and short-lived seeds (Table 5-1); accordingly, they require establishment sites that are largely free of competition from existing vegetation. The erosion and deposition of sediment along stream channels and on floodplains creates such surfaces. A moist substrate must be maintained for approximately a week following seed dispersal to allow seeds to germinate (Scott et al. 1999, 2000). Following germination, the river stage must decline gradually to enable seedling

Table 5-1. Selected Attributes of Sacramento Valley and Foothill Riparian Tree Species

Species	Seed Size[a]	Seedling Shade Tolerance[b]	Height[c]	Longevity[d] (years)
Box-elder *Acer negundo*	0.1 g (0.001 oz.)	Tolerant	15-25 m (49-82 ft)	50-100
White Alder *Alnus rhombifolia*	0.001 g (0.0001 oz.)	Intolerant	15-25 m (49-82 ft)	50-100
Oregon ash *Fraxinus latifolia*	0.1 g (0.001 oz.)	Tolerant	10-25 m (33-82 ft)	150-250
Walnut *Juglans hindsii*	10.0 g (0.1oz.)	Intermediate	10-20 m (33-66 ft)	50-150
Sycamore *Platanus racemosa*	0.01 g (0.0001 oz.)	Intolerant	10-30 m (33-98 ft)	150-200
Fremont's cottonwood *Populus fremontii*	0.001 g (0.0001 oz.)	Intolerant	15-30 m (49-98 ft)	50-100
Valley oak *Quercus lobata*	1.0 g (0.1 oz.)	Intermediate	10-35 m (33-115 ft)	300-400
Interior Live-oak *Quercus wislizenii*	1.0 g (0.1 oz.)	Intermediate	5-20 m (16-66 ft)	100-200
Goodding's black willow *Salix gooddingii*	0.0001 g (0.00001 oz.)	Intolerant	10-30 m (33-98 ft)	50-100
Narrow-leaved willow *Salix exigua*	0.0001 g (0.00001 oz.)	Intolerant	5 m (16 ft)	20-30
Red willow *Salix laevigata*	0.0001 g (0.00001 oz.)	Intolerant	10-15 m (33-49 ft)	40-60
Arroyo willow *Salix lasiolepis*	0.0001 g (0.00001 oz.)	Intolerant	5-10 m (16-33 ft)	30-50
Shining willow *Salix lucida*	0.0001 g (0.00001 oz.)	Intolerant	5-10 m (16-33 ft)	30-50

[a] = Based on information in Schopmeyer 1974, and rounded to nearest order of magnitude
[b] = Based on information in Sudworth 1908, Burns and Honkala 1990
[c] = Based on information in Hickman 1993, Stuart and Sawyer 2001
[d] = Based on information in Burns and Honkala 1990, Sudworth 1908 and J. Hunter unpublished data
g = grams
oz = ounces
m = meters
ft = feet

establishment. If the river stage declines too quickly, seedlings are prone to mortality by desiccation. To supply seedlings with adequate water as their roots elongate toward the water table, the decline in river stage should not exceed 2.5-3.8 cm (1–1.5 inches) per day (Mahoney and Rood 1998; Shafroth et al. 1998; Scott et al. 1999, 2000).

After germination, seedlings grow on surfaces ranging from immediately below peak-flow to immediately above low-flow elevations. Most seedlings do not survive their first year on these surfaces. Because high levels of soil moisture within several feet of the surface are required for these seedlings to survive through the first summer, seedlings may desiccate on higher elevation surfaces. Moreover, prolonged inundation during the growing season can kill seedlings (Sprenger et al. 2001). Under unaltered conditions, high summer flows typically do not occur; however, where streams are downstream of dams or are used to convey irrigation waters, high summer flows may frequently occur. Finally, flows during the following winter and spring may inundate all surfaces supporting seedlings; seedlings may be scoured from those surfaces inundated with sufficient depth and velocity of water to mobilize the surface (Friedman and Auble 1999). Such scouring is most likely on lower-elevation surfaces.

Historically, flows suitable for cottonwood and willow establishment did not occur in most years. Historical records and tree-aging studies have shown that in numerous riverine environments in the western United States, the combination of factors leading to a large-scale establishment event typically occurs once every 5–10 years (Stromberg et al. 1991; Scott et al. 1997; Mahoney and Rood 1998). Scott et al. (1997) determined that establishment of cottonwoods on the upper Missouri River in an area with little channel movement was most likely on surfaces inundated by floods with a recurrence interval of more than 9 years. Hughes (1994) concluded that long-term cottonwood establishment was associated with even longer flood return intervals (30–50 years) along some non-meandering rivers.

Because other species of riparian trees and shrubs are characterized by larger seed sizes and greater shade tolerance than willows and cottonwoods (Table 5-1), the establishment of such species is less dependent on stream flows. All riparian plants are affected by water availability and competition from existing vegetation, and are consequently affected to some degree by hydrology and the creation of new surfaces by the erosion and deposition of sediment. Some species, such as Oregon ash and valley oak, are able to establish in the shade of other plants; others, such as elderberry and valley oak, can survive drier conditions than can cottonwoods and willows. Thus, in the absence of suitable conditions for willow and cottonwood establishment, other riparian species establish, but the resulting stands differ from cottonwood and willow–dominated stands in species composition, structure, and wildlife habitat value.

Vegetation management activities also affect the establishment of all riparian species. Such activities entail removal of vegetation by means of grazing, herbicide application, and mechanical operations for rangeland and agricultural management; firewood cutting; and levee, floodway, road, and right-of-way maintenance. (Silviculture is not a widespread practice in the Sacramento Valley and foothill riparian areas.) While vegetation removal kills seedlings, it also removes established plants, creating greater opportunities for establishment in subsequent years.

Vegetation management activities occur in western Placer County and may be detrimentally affecting the regeneration of riparian vegetation. Despite stands having a sparse layer of trees and a narrow width, small saplings (i.e., < 2 m [6.6 ft]), particularly those of cottonwoods or willows, often are rare or absent (Appendix A; Placer County 2002). However, hydrologic alterations also may account for these conditions.

Effects on Growth and Reproduction

Growth and reproduction of riparian plants are affected by changes in resource availability and interactions with other species. The effects of human alterations on reproduction have not been documented, except to the extent that reproduction is dependent on growth, and effects on growth have been documented. Human alterations affect the growth of riparian species through surface water diversions and groundwater removals, nutrient inputs, the introduction of nonnative species, and inundation of riparian habitats by dams and reservoirs.

Beyond providing suitable conditions for establishment, flows must be sufficient to maintain existing riparian vegetation year-round. Cottonwoods and willows, in particular, are very susceptible to drought-induced stress. In California, the lack of summer moisture limits these and other riparian tree species to areas with readily available shallow groundwater. Accordingly, groundwater and flows following seedling establishment must be sufficient to maintain the elevation of the riparian groundwater zone or capillary fringe within 10–20 feet of the surface (Jones & Stokes 2000a). Diversions of surface water and groundwater removals that cause groundwater levels to fall could reduce growth and contribute to mortality (Stromberg and Patten 1992). Human alterations increase nutrient inputs to riparian areas thorough atmospheric deposition of nitrogen; additionally, irrigation and stormwater runoff conveys fertilizers from agricultural and developed lands into riparian areas and stream channels. Though the addition of nutrients tends to increase plant growth and biomass, it also affects the cycling of other elements and does not benefit all species equally (Vitousek et al. 1997). Typically, a few species are able to acquire most of the added nutrients, and consequently to outcompete species they would otherwise have been unable to displace. In grasslands, shrublands, and wetlands, nutrient additions have been found to reduce plant species diversity (Vitousek et al. 1997; Keddy 2000). Effects on woody riparian vegetation are undocumented, but are likely to be similar to those reported for other vegetation types.

A number of nonnative species have been introduced and become abundant in the riparian areas of the Sacramento Valley and adjacent foothills (Hunter et al. 2003). These nonnative species create new competitive interactions, and they alter growth by changing resource availability for native species. For example, several introduced species, including black locust (*Robinia pseudoacacia*) and red sesbania (*Sesbania punicea*), fix nitrogen from the atmosphere into biologically available forms via symbioses with soil microorganisms (Hunter 2000; Hunter and Platenkamp 2003). These introduced species may increase nutrient availability for other species. In contrast, tamarisk (*Tamarix* spp.) may reduce water availability for other species (Sala et al. 1996). Several invasive nonnatives, including red sesbania, Himalayan blackberry (*Rubus discolor*), giant reed (*Arundo donax*), and perennial pepperweed (*Lepidium latifolium*), form dense, monotypic stands that preclude the establishment of native species (Bossard et al. 2000).

In western Placer County, many of these invasives are widespread and abundant. For example, Himalayan blackberry is the most abundant species in the shrub layer along western Placer County's streams, and red sesbania grows widely along Dry Creek (Appendix A; ECORP 2003). This non-native vegetation has displaced native species and altered several riparian functions (e.g., conveyance of floodwaters, nitrogen cycling and wildlife habitat).

Effects on Mortality

The mortality resulting from disturbance is integral to the dynamics of riparian vegetation; it affects the proportions of different successional stages and vegetation types within riparian corridors (Stromberg et al. 1991; Malanson 1993; Johnson 1994; Freidman and Auble 1999; Taylor et al. 1999). Along Sacramento Valley and foothill rivers and streams, trees are killed by a number of mechanisms including scour, undercutting by channel migration, uprooting and inundation by flood flows, drought, fire, windthrow, and the removal of vegetation for agricultural or flood control purposes. These disturbances clear spaces for the establishment of early successional vegetation, such as willow thickets and forests dominated by young Fremont's cottonwoods. They also can remove forest vegetation before growth and succession has resulted in the complex canopy structures of mature forests and later successional stages, such as mixed riparian forests and stands of valley oaks. Thus, disturbance regimes determine the proportions of early and late successional vegetation within riparian landscapes.

To maintain both early successional vegetation and mature forests within a riparian landscape, the rate of disturbance must be sufficient to create space for the establishment of new patches of riparian forest, yet not so frequent that it prevents any forest from reaching maturity. Of course, disturbances are not randomly distributed spatially or by type (Conard et al. 1980; Hunter and Parker 1993; Malanson 1993; Freidman and Auble 1999). Disturbance by scour, channel migration, flood flows, and inundation are more frequent and intense at lower elevations (i.e., nearer the stream channel) than at higher elevations (Conard et al. 1980; Malanson 1993; Mitsch and Gosselink 1993; Freidman and Auble 1999; Keddy 2000). In contrast, along Central Valley riparian systems, disturbance by drought and fire is more frequent and intense at higher elevations further from the channel. Thus, across a single cross-section of a riparian corridor, clear gradients exist in disturbance frequency and magnitude. These disturbance gradients, together with interspecific differences in physiological tolerances and establishment requirements, lead to the well-documented zonation of riparian vegetation (Conard et al. 1980; Warner and Hendrix 1985; Mitsch and Gosselink 1993). Accordingly, the persistence of substantial areas of both early successional and mature vegetation within riparian areas is not dependent upon a specific overall average rate of disturbance; rather, it requires only zones of higher and lower rates of disturbance. The combination of flood flows, an actively meandering river channel, and a range of elevations provide such zonation.

Human alterations not only change mortality rates by directly removing vegetation but also by altering hydrology and geomorphic processes. Dams, levees, and surface water diversions isolate riparian areas from the stream channel and floodflows, and thus from associated disturbances. Similarly, bank protection and channelization reduce mortality that can result from channel migration. In addition, groundwater removals can reduce water availability and exacerbate drought-induced mortality of riparian plants.

In western Placer County, substantial areas of riparian vegetation have been converted to developed and agricultural land-cover (Jones & Stokes 2004a, 2004b). For example, along the major streams of western Placer County, approximately a quarter of the land < 20 m (66 ft) from the centerline of a stream, is in developed or agricultural land-cover (Jones & Stokes 2004a, 2004b). The remaining riparian vegetation frequently consists of a narrow band (< 20 m [66 ft]) with a discontinuous layer of trees (Appendix A).

Relationships Between Effects and Setback Width

Human alterations primarily affect riparian plant habitats by vegetation management (e.g., grazing, removal of vegetation to increase conveyance of floodwaters) or by altering hydrology and geomorphic processes. Vegetation management is not necessarily related to setback width, but alterations of hydrologic and geomorphic processes are related to setback width. Infrastructure and other developed land uses within the active floodplain, as well as associated levees, berms, and bank protection, affect hydrology and geomorphic processes; such uses consequently alter the structure and species composition of riparian vegetation. Thus, riparian setbacks narrower than the active floodplain facilitate much more extensive alteration of riparian vegetation than setbacks that extend beyond the active floodplain.

Recommended Setback Width to Conserve Plant Habitat Functions

For the purpose of long-term conservation of plant habitat functions, the project team recommends that riparian setbacks include the entire active floodplain, regardless of the current extent of riparian vegetation on that surface. The distribution of riparian vegetation is not static within the active floodplain, and the diversity of vegetative structure and species composition is strongly related to the hydrologic and geomorphic processes within the active floodplain. Therefore, conversion of any portion of the active floodplain to developed or agricultural land-cover types would not only affect hydrologic and geomorphic functions but would affect plant habitat functions as well.

It is important to note that many human effects on riparian plant habitat functions are not necessarily reduced by establishing setbacks. These effects include the consequences of hydrologic and geomorphic alterations and of vegetation management. Additional measures are necessary to address these effects.

Chapter 6
Terrestrial Animal Habitat Functions

Introduction

The contribution of riparian habitats to biodiversity greatly exceeds the proportional extent of landscape areas they occupy. Scientific documentation of the importance of these habitats for plants and animals has been published in studies conducted across the continent (Sands 1977, Warner and Hendrix 1984, Naiman et al. 1993, 2000; Crow et al. 2000; Brinson et al. 2002).

In western Placer County, Valley Foothill Riparian Woodlands (riparian woodlands) (Mayer and Laudenslayer 1988) and their associated upland habitats provide food, water; cover and migration and dispersal corridors for a higher diversity of wildlife species than any other habitat. Riparian woodlands may support up to 193 vertebrate species, including 133 breeding species and 60 visitors, in western Placer County (Jones & Stokes 2004a). Some animals reside primarily in riparian woodlands year-round, while others occupy these habitats as part of their breeding home range or territories. Many species visit riparian woodlands seasonally or for short periods (e.g., migrating birds).

A number of special-status animals are known to be associated with riparian woodlands in western Placer County: valley elderberry longhorn beetle, foothill yellow-legged frog, western pond turtle, giant garter snake, double-crested cormorant, great egret (rookery), great blue heron (rookery), black-crowned night-heron (rookery), bald eagle, Swainson's hawk, osprey, white-tailed kite, Cooper's hawk, yellow-billed cuckoo (one historical record), long-eared owl, willow flycatcher, purple martin, yellow warbler, yellow-breasted chat, Modesto song sparrow, river otter, ringtail, and an unknown number of bat species (e.g., Townsend's big-eared bat, long-eared myotis, long-legged myotis, and Yuma myotis).

Riparian-associated species vary considerably in their area requirements; many special-status and declining species have large home ranges, and thus require wide riparian areas to maintain viable populations. The habitat and area requirements of riparian-associated birds, mammals, reptiles, and amphibians in western Placer County are summarized in Table 6-1. This list includes only species that depend on riparian woodlands for successful reproduction and survival. Plant and animal population size is often the best predictor of future extinctions or local extirpations; accordingly, habitat patches should be large enough to maintain viable populations of the most area-sensitive species, including special-status and economically important species (Environmental Law Institute 2003).

The primary goal of this chapter is to examine the possible relationships between terrestrial vertebrate diversity (i.e., species' occurrence and abundance) and the extent, width, and condition of riparian woodlands in western Placer County and nearby foothill counties. For each vertebrate group discussed below, the project team evaluated riparian and upland habitat requirements, patch size requirements (area and width), and effects of human activities on those vertebrate groups. The chapter concludes with a summary of the relationships between the width of riparian setbacks and the effects on wildlife habitat due to human alterations, and setback recommendations for conservation of wildlife habitat functions.

Birds

Habitat Relationships

Riparian habitats have been identified as the most important habitat for landbirds in California (Manley and Davidson 1993, Riparian Habitat Joint Venture 2004). Birds of numerous species are abundant in riparian woodlands of western Placer County. Up to 70 species breed in these habitats; an additional 55 species use them for shelter, foraging, or as migratory stopover areas (Jones & Stokes 2004a). Several riparian-associated birds may be covered under the HCP/NCCP for the Phase I Planning Area: Swainson's hawk, yellow-billed cuckoo (one historical record), yellow warbler, yellow-breasted chat, and Modesto song sparrow. Two potentially covered species (bald eagle and bank swallow) may use these habitats for foraging, shelter, or cover but do not breed there (Jones & Stokes 2004a).

Many species of riparian-associated birds are known to breed in western Placer County. These include Cooper's hawk, red-shouldered hawk, Swainson's hawk, black-chinned hummingbird, downy woodpecker, western wood-pewee, Pacific-slope flycatcher, warbling vireo, tree swallow, house wren, yellow warbler (no recent breeding records), yellow-breasted chat, common yellowthroat, Modesto song sparrow, black-headed grosbeak, blue grosbeak, and American goldfinch (Table 6-1).

Riparian Habitat Requirements

Riparian-associated bird species occupy a wide variety of ecological niches; accordingly, they require a complex vegetative structure for breeding, foraging, and shelter/cover (Riparian Habitat Joint Venture 2004). Riparian woodlands provide many niches for breeding birds because they typically support diverse plant communities, are varied in their vertical and horizontal structures, and

			Riparian		Upland	
Species	Home Range Size	Territory Size	Habitat Use	Habitat Requirements	Habitat Use	Habitat Requirements
Pacific treefrog* *Hyla regilla*	Most move < 10 m; capable of moving up to 400 m (Schaub and Larsen 1978)	Circles with radii of 50 cm (Whitney 1980)	Breeding, cover, foraging	Breeds in water; takes cover under logs and vegetation. Uses all riparian stages and temporary water sources (Zeiner et al. 1988)	Cover, foraging	Requires upland sites for cover during nonbreeding season, takes cover in moist niches under logs and vegetation (Zeiner et al. 1988)
Common garter snake* *Thammophis sirtalis*	Probable overlap between pairs during the spring-fall activity period (Zeiner et al. 1988)	Not thought to be territorial; they often remain aggregated from fall until spring (Zeiner et al. 1988)	Cover, foraging, breeding	Permanent and semi-permanent water bodies. Seeks cover in holes and small mammal burrows, often basks on flat rocks and rotting logs near cover (Zeiner et al. 1988)	Cover, foraging, but only in cold northern climates	May migrate to inland localities during winter in cold northern climates (Zeiner et al. 1988)
Western terrestrial garter snake* *Thamnophis elegans*	Probable overlap between pairs during the summer activity period (Zeiner et al. 1988)	Not thought to be territorial (Zeiner et al. 1988)	Cover, foraging, breeding	Permanent and semi-permanent water bodies. Seeks cover in holes and small mammal burrows, often basks on flat rocks and rotting logs near cover (Zeiner et al. 1988)	Cover, foraging	In mild climates, mammal burrows and surface objects (rocks and rotting logs) serve as winter refuges (Zeiner et al. 1988)
Giant garter snake* *Thamnophis couchi gigas*	Probable overlap between pairs during summer activity period; may migrate between wetland habitats and upland sites that provide winter hibernacula (Zeiner et al. 1988)	Not thought to be territorial (Zeiner et al. 1988)	Cover, foraging, breeding	Highly aquatic; seeks cover in holes and small mammal burrows, crevices, and surface objects. Often basks in streamside vegetation. Rocks and rotting logs serve as winter refuges	Cover, foraging	In mild climates, mammal burrows and surface objects (rocks and rotting logs) serve as winter refuges (Zeiner et al. 1988)
Cooper's hawk *Accipiter cooperii*	*Michigan* – four home ranges averaged 311 ha, range 96–401 ha; 17 others averaged 207 ha, range 18–531 ha *Wyoming* – One home range of 205 ha (Craighead and Craighead 1956).	Males defend ~100 m around potential nest sites prior to pair formation (Brown and Amadon 1968). *Oregon* – nests were 3.2–4.2 km apart (Jackman and Scott 1975). Elsewhere, nests were 1.6–2.4 km apart (Meng 1951, Brown and Amadon 1968). *California* – In oak stands, mean distance between nests was 2.6 km (Zeiner et al. 1990a)	Breeding, foraging, perching	Needs dense stands of live oak, riparian deciduous, coniferous, or other forest habitats near water; nests in crotches 3–23 m high (Zeiner et al. 1990a)	Breeding, foraging, perching	Hunts in patchy wooded areas and edges; needs snags or dense tree stands for perching and waiting for prey (Beebe 1974). Dense stands with moderate crown-depths used for nesting (Zeiner et al. 1990a)

Species	Home Range Size	Territory Size	Riparian		Upland	
			Habitat Use	Habitat Requirements	Habitat Use	Habitat Requirements
Red-shouldered hawk* *Buteo lineatus*	*Michigan* – averaged 63 ha, range 19–384 ha (Craighead and Craighead 1956)	Same as home range	Breeding, perching, foraging	Extensive stands of forest with tall trees and variable amounts of understory required for breeding (Crocoll 1994)	Cover, foraging	Does not require upland sites, but will use them for foraging and roosting; mostly forages in oak woodlands and adjacent annual grasslands (Zeiner et al. 1990a)
Swainson's hawk+ *Buteo swainsoni*	*Wyoming* – five pairs averaged 2.5 km^2 (Craighead and Craighead 1956) *California* – 12 pairs, 2,760–2,553 ha (Estep 1989); 5 pairs ranged 4,038–2,663 ha (Babcock 1995) *Washington* – eight pairs, 621–214 ha (Fitzner 1978); five pairs, 886–243 ha (Bechard 1982) *Colorado* – eight pairs, 2,429–1,050 ha (Andersen 1995) Nest sites in riparian forest close to alfalfa or recently harvested row crops corresponded to smaller home ranges (Estep 1989)	No specific information on territory size (England et al. 1997); three territories were found within a 1.1-km length of riparian forest in the Central Valley (Bloom 1980)	Breeding and perching	Requires large trees to support nests, but will nest in open habitats with scattered trees and small groves near water (Bloom 1980); nests 1.3–30 m above ground (Zeiner et al. 1990a)	Breeding, foraging, perching	Not an obligate riparian species; needs proximity to good foraging habitat such as grassland, pasture, or grainfields; primarily needs large trees for nesting (Woodbridge 1998; Zeiner et al. 1990a); may nest in open grassland or cropland habitats with scattered trees (England et al. 1997)
Yellow-billed cuckoo+ *Coccyzus americanus*	Large home ranges averaging 17 ha (Laymon and Halterman 1987)	10 ha is an appropriate minimum patch size (Halterman pers. comm.)	Nesting, foraging, perching	Optimal stands defined as more than 80 ha in extent and more than 600 m wide, marginal stands as 20–40 ha and 100–200 m wide, and unsuitable stands as less than 15 ha and less than 100 m wide (Laymon and Halterman 1989)	Foraging	May forage in uplands adjacent to riparian woodlands, especially early successional stands of cottonwoods and willows (Laymon and Halterman 1989). 10 ha is an appropriate minimum patch size for this species (Halterman pers. comm.)

			Riparian		Upland	
Species	Home Range Size	Territory Size	Habitat Use	Habitat Requirements	Habitat Use	Habitat Requirements
Black-chinned hummingbird+ *Archilochus alexandri*	No data	*S. California* – male breeding territory averaged 0.1 ha (Stiles 1973); 41–130 nests per 40 ha (Pitelka 1951) *Arizona* – eight nests per 40 ha in oak woodland; 21 per 40 ha in oak juniper woodland (Balda 1970)	Nesting, foraging, perching	Sparse to open riparian woodland preferred for breeding; uses trees and shrubs for cover; places open cup nest in understory (0.9–9.1 m above ground) near water source (Grinnell and Miller 1944; Zeiner et al. 1990a)	Occasional breeding, mostly foraging	Woodland and scrub habitats adjacent to riparian areas used for feeding during breeding season. Occasionally nests in orchards (Zeiner et al. 1990a)
Downy woodpecker* *Picoides pubescens*	Territory and home range are the same (Zeiner et al. 1990a)	*Ontario* – two breeding territories of 2.0 and 3.2 ha (Lawrence 1967)	Breeding, foraging, cover	Associated with riparian deciduous softwoods; uses tree and shrub foliage for cover; requires abundant snags and tree/shrub, tree/herbaceous, and shrub/herbaceous ecotones (Zeiner et al. 1990a). Excavates nest cavity in snag (preferably aspen) or dead branch 1.3–15 m high (Bent 1939; Lawrence 1967)	Foraging, cover	Frequents hardwoods, conifer habitats, and orchards adjacent to riparian areas (Zeiner et al. 1990a)
Western wood-pewee+ *Contopus sordidulus*	No information found, but probably equal to territory. Density estimates range from 1–10 pairs per 40 ha in Colorado aspen-conifer habitat (Beaver and Baldwin 1975) to 18–33 pairs per 40 ha in Sacramento Valley riparian habitats (Gaines 1974)	*Colorado* – territory averaged 1.2–1.6 ha over 3 yrs (Eckhardt 1976). Territory size probably varies widely depending on habitat and foraging conditions (Zeiner et al. 1990a)	Breeding, perching, foraging	Uses trees of almost any size, especially with dead lower branches, for nesting, singing, and foraging perches. Places open cup nest 4–25 m above ground. Nests in woodlands edging riparian areas and in valley foothill riparian habitats (Zeiner et al. 1990a)	Breeding, roosting, foraging	Nests in open woodlands with sparse to moderate canopy, most commonly in ponderosa pine, montane hardwood-conifer, mixed conifer, Jeffrey pine, lodgepole pine, eastside pine, red fir, and aspen (Grinnell and Miller 1944; Garrett and Dunn 1981; Zeiner et al. 1990a)

			Riparian		Upland	
Species	Home Range Size	Territory Size	Habitat Use	Habitat Requirements	Habitat Use	Habitat Requirements
Willow flycatcher+ *Empidonax traillii*	In breeding season, probably equal to territory. *Washington* – 9.2 pairs per 40 ha in scrub habitat (King 1955) *Michigan* – 60.7 individuals per 40 ha in scrub habitat (Berger 1957)	*California* - six paired males ranged 0.09–0.38 ha and averaged 0.18 ha in Fresno County (KRCD 1985); 22 territories ranged 0.06–0.89 ha and averaged 0.34 ha in Sierra County (Sanders and Flett 1989); monogamous males averaged 0.6 ha (SD = 0.35, n = 24, range 0.1–1.3) and polygynous males averaged 1.1 ha (SD = 0.68, n = 24, range 0.2–2.8) at the South Fork Kern River (Whitfield and Strong 1995; Whitfield and Enos 1996; Whitfield et al. 1997). *Arizona* – range 0.06–1.5 ha (Sogge et al. 1997). *Michigan* – avg. size was 0.7 ha (Walkinshaw 1966)	Nesting, foraging, perching	Broad river valleys or moist mountain meadows where lush thickets of dense willows, alders, and cottonwoods edge on wet meadows, ponds, or backwaters (Zeiner et al. 1990a; Serena 1982; Harris et al. 1988; Whitfield et al. 1997; Sanders and Flett 1989). In mountain meadows prefers willow thickets interspersed with open space; in lowland riverine habitats prefers contiguous willow thickets (Harris 1991). Does not occur in areas of dense tree cover (King 1955; Walkinshaw 1966)	Migration	May migrate into higher elevations after breeding and during fall migration (Grinnell and Miller 1944). No specific data un upland habitat use
Pacific-slope flycatcher+ *Empidonax difficilis*	*Colorado* – 5–28 individuals/40 ha in conifer forest (Beaver and Baldwin 1975) *California* – 11 males/40 ha in broadleaf evergreen forest in Alameda County (Cogswell 1973), 35 males/40 ha in buckeye/California bay mixed forest in Marin County (Stewart 1973)	No data	Breeding, foraging, perching	Breeds in shady alder and willow thickets and similar riparian growth in oak woodlands, redwood, and ponderosa pine forests (Zeiner et al. 1990a)	Foraging, perching, migration	Frequents shaded woodlands and forests with dense canopy adjacent to riparian habitat during breeding season. Occurs in more open habitats in migration (Zeiner et al. 1990a)

Species	Home Range Size	Territory Size	Riparian Habitat Use	Riparian Habitat Requirements	Upland Habitat Use	Upland Habitat Requirements
Warbling vireo+ *Vireo gilvus*	*Idaho* – one pair had a 37-m radius around the nest (Rust 1920); five pairs/40 ha in a cut-over Douglas-fir forest (Johnston 1949) *Arizona* – 42 pairs/40 ha in fir-pine-aspen forest (Haldeman et al. 1973) *California* – 40 pairs/40 ha in an oak/bay mixed forest (Stewart 1973); 21 pairs/40 ha in a lodgepole-aspen forest (Winkler and Dana 1977); eight pairs/40 ha in a broadleaf evergreen forest (Cogswell 1973)	*California* – nine pairs in coastal riparian forest averaged 1.45 ha; 19 territories in eastern California averaged 1.2 ha (Gardali and Ballard 2000) *Arizona* – 2 pairs were both 1.2 ha (Barlow 1977). *Illinois* – One pair was ~1.2 ha (Gardali 2003). *Ontario* – Three pairs ~1.2-1.5 ha (Gardali 2003). *Alberta* – Two pairs were both 1.5 ha (Gardali 2003)	Breeding, foraging, perching	Nests in mature mixed deciduous woodlands along riparian corridors (Gardali 1998). Likes edges and openings, large trees, and semi-open canopy (James 1971; MacKenzie et al. 1982; Marzluff and Lyon 1983; Verner and Boss 1980) According to Grinnell and Miller (1944), may be more attracted to riparian trees than to moisture	Occasional breeding, perching, and migration	Commonly uses deciduous trees, shrubs and conifers for cover. Occasionally breeds in conifer habitats and forest interiors near edges and openings (Zeiner et al. 1990a; Gardali 1998). Also occurs in desert riparian, orchards, vineyards, and urban habitats during migration (Zeiner et al. 1990a; Gardali 1998)
Tree swallow+ *Tachycineta bicolor*	Kuerzi (1941) stated home range is "large"	*California* – 4–18 pairs/40 ha in riparian habitat (N = 3) and 2–10 pairs/40 ha in mixed conifer forest (N = 4) in the Sierra Nevada (Raphael and White 1978)	Breeding, foraging, cover	Requires trees and snags with cavities in forest and riparian woodland for nesting and cover (Zeiner et al. 1990a)	Breeding, foraging, perching, migration	Will nest in lodgepole pine belts. Common to occasional transient throughout the state in virtually all non-desert habitats (Zeiner et al. 1990a)
House wren* *Troglodytes aedon*	No data	*Oregon* – 14 breeding territories averaged 0.9 ha, range 0.5–1.8 ha (Kroodsma 1973) *Ohio* – 178 breeding territories averaged 0.4 ha, range 0.03–1.5 ha (Kendeigh 1941b)	Breeding, foraging, cover	Brushy understory beneath oaks and other riparian deciduous trees. Requires cavities in trees and snags with thickets nearby for foraging (Zeiner et al. 1990a)	Dispersal	Moves upslope after breeding in the Cascades and Sierra Nevada (Zeiner et al. 1990a)

			Riparian		Upland	
Species	Home Range Size	Territory Size	Habitat Use	Habitat Requirements	Habitat Use	Habitat Requirements
Yellow warbler+ *Dendroica petechia*	*New York* – less than 0.2 ha (Ficken and Ficken 1966) *Iowa* – 0.16 ha (Kendeigh 1941a)	*California* – 0.40–.74/ha (mean 1.64 SE + 0.12) in early successional habitats of eastern Sierra Nevada (PRBO unpublished data) *Iowa* – 0.16/ha in prairie community *Minnesota* – range 0.03–1.62 ha (Beer et al. 1956) *Michigan* – polygynous male territories (0.78 ha) significantly larger than those of monogamous males (0.21 ± 0.05 ha) (DellaSala 1986) Territory size variable depending on availability of foraging area (Kendeigh 1941)	Breeding, foraging, perching	Nests in early successional riparian habitat or remnant or regenerating canopy with good shrub cover. Prefers deciduous trees such as willows, alders, sycamore, maples, and cottonwoods; in the eastern Sierra breeds locally in wild rose and more xeric plant species and habitats (Heath 1998)	Breeding, foraging, perching	Breeds in montane shrubs in open conifer forests (Gaines 1977). In migration, visits woodland, forest, and shrub habitats (Zeiner et al. 1990a). Kendeigh observed individuals regularly moving up to 488 m to a willow-marsh edge to feed. (Zeiner et al. 1990a). *D.p. brewsteri* was found to breed in locations away from water in the Modoc Bioregion (Grinnell et al. 1930).
Common yellowthroat *, + *Geothlypis trichas*	*Michigan* – 1.4 ha for polygynous male; 10 pairs ranged 0.3–0.7 ha in marsh and riparian habitats (Stewart 1953) *New York* – seven pairs spaced uniformly over 2.0–2.4 ha in a brush field (Kendeigh 1945)	*California* – 1.04 territories/ha in Marin County (Evens et al. 1997); spacing of 0.2–2.0 ha reported by Foster (1977) in the SF Bay *Michigan* – 0.3–0.7 ha (Stewart 1953) *New York* – spacing of 2.0–2.4 ha	Breeding, foraging, perching	Needs tall, emergent herbaceous wetlands and low, dense vegetation near water (Timossi 1990; Zeiner et al. 1990)	Occasional breeding, migration	Occasionally breeds in dense shrubs and annual/perennial grasslands (Garrett and Dunn 1981; Zeiner et al. 1990). Brushy habitats used in migration (Zeiner et al. 1990a)

			Riparian		Upland	
Species	Home Range Size	Territory Size	Habitat Use	Habitat Requirements	Habitat Use	Habitat Requirements
Yellow-breasted chat + *Icteria virens*	*California* – 10pairs/40 ha reported in the Sacramento Valley (Gaines 1974)	*Indiana* – avg. 1.24 ha (range 1.12–1.58 ha). Males that arrived early established large territories that shrunk as more males arrived; males expanded their territories if neighboring territories were abandoned (Thompson and Nolan 1973)	Breeding, foraging, perching	Requires dense riparian thickets of willows, vine tangles, and dense brush associated with streams, swampy ground, and borders of small ponds (Small 1994). Uses taller trees as song perches (Dunn and Garrett 1997). Nest substrate in California consists of blackberry, wild rose, and pipevine (Ricketts and Kus 2000; Burnett and DeStaebler 2002)	Dispersal	May wander upslope post-breeding (Gaines 1977)
Song sparrow * *Melospiza melodia*	*New York* – 0.6 ha (Butts 1927) *Kansas* – 3.6 ha winter home range; 29 home ranges averaged ~2.8 ha (Fitch 1958) *British Columbia* – averaged 0.05 ha in an island population (Tompa 1962)	*California* Modoc Bioregion: 1.94 territories/ha (n=14) (King and King 2000). Sierra Bioregion: 0.2–1.2 territories per creek km (Heath and Ballard 1999) Bay/Delta Bioregion: 4.4–8.1 territories/ha (Gardali et al. 1998) *British Columbia* – 1.7–5.6 pairs/ha (Rogers et al. 1997)	Breeding, foraging, perching	Breeds in early successional riparian habitat, emergent wetlands, and coastal scrub (Burridge 1995; Roberson and Tenney 1993). Requires water, dense vegetation, light, and exposed ground for foraging (Marshall 1948) Abundance is negatively correlated with tree cover and closed canopy cover ($p<0.05$) (Holmes et al. 1999)	Breeding, foraging, perching	Regularly breeds in coastal scrub habitat, which provides enough water in the form of fog (Humple and Geupel 2004). In winter may be found far from water, in open habitats with thickets of shrubs or tall herbs. Usually avoids densely wooded habitats, except along forest edges (Zeiner et al. 1990a)
Black-headed grosbeak+ *Pheucticus melanocephalus*	*California* – 31–66 singing males/40 ha (Gaines 1974)	*New Mexico* – 0.79 ha (n=28, range=0.43-1.63ha) (Hill 1988; Hill 1995) *Utah* – 2.7 ha (n=12, range=1.9–3.0 ha) (Ritchisson 1983) No information available for California	Breeding, foraging, perching	Requires vegetation density and vertical complexity (Hill 1988); trees and shrubs as low as 1 m to support nests (Zeiner et al. 1990a); favors cottonwood/ willow associations (Grinnell and Miller 1944) with a primary and secondary canopy, variety in shrub height, and patches of herbaceous cover (Gaines 1977)	Occasional nesting, foraging, perching	Sometimes nests in open woodlands, orchards, or edges of dense woodlands (Zeiner et al. 1990a, Lynes 1998)

			Riparian		Upland	
Species	Home Range Size	Territory Size	Habitat Use	Habitat Requirements	Habitat Use	Habitat Requirements
Blue grosbeak+ *Guiraca caerulea*	No data	*South Carolina* – 5.2–6.12 ha (Odum and Kuensler 1955) *Georgia* – 1.2 ha in tung-oil groves (White 1998)	Breeding, foraging, perching	Prefers riparian edges, forest/field edges, or forest/gravel-bar interfaces (Gaines 1974) with herbaceous annuals and young, shrubby willows/cottonwoods (Grinnell and Miller 1944). Prefers upright growing herbs for nest placement, and tall shrubs and trees for singing perches and shade for nest sites (White 1998)	Foraging, dispersal, migration	Forages in openings, grasslands, and croplands adjacent to riparian areas. Not limited to riparian habitats post breeding or in migration (Zeiner et al. 1990a)
American goldfinch* *Carduelis tristis*	*Michigan* – nesters fed up to 274 m from nest (Nickell 1951) and at least 0.8 km from nest (Coutlee 1967); 53–205 pairs/40 ha (Berger 1957) *California* – 10–33 males/40 ha (Gaines 1974)	*Michigan* – males defended 30 m around nest and built nests at least 35 m apart (Coutlee 1967) *Wisconsin* – 9.1–27 m around nest in marshland (Stokes 1950)	Breeding, foraging, perching	Nests in riparian deciduous woodland near feeding areas in brushy or herbaceous habitats (Coutlee 1967). Must be near water and may require trees for roosting (Zeiner et al. 1990a). Uses willow, cottonwood, or other riparian deciduous tree as nesting substrate (Grinnell and Miller 1944)	Breeding, foraging, perching	Will move upslope after breeding (Zeiner et al. 1990a). May nest in oaks, orchards, other upland shrubs, or thistles (Grinnell and Miller 1944)
Ornate shrew* *Sorex ornatus*	Occurrence and abundance of shrews varied significantly between sites and years but the size of the landscape or the study site had no effect on their abundance; peak densities usually occurred during the spring (Laakkonen et al. 2001).	No data found.	Breeding, foraging, cover	Optimum habitats are foothill and montane riparian (Zeiner et al. 1990b). The amount of urban edge had no significant effect on the captures of shrews but increased edge allows invasion of the Argentine ants, which had a highly significant negative impact on shrew abundance (Laakkonen et al. 2001)	Breeding, foraging, cover	Occurs in a variety of woodland, scrub, and grassland habitats and occupies dry, upland sites more commonly than most other shrews (Zeiner et al. 1990b)

			Riparian		Upland	
Species	Home Range Size	Territory Size	Habitat Use	Habitat Requirements	Habitat Use	Habitat Requirements
Yuma myotis *Myotis yumanensis*	Radio telemetry studies showed that direct line distances between capture sites and first day roosts averaged 2,007 m, and 1,130 m for roost sites on consecutive days (Evelyn et al. 2004)	Territoriality has not been reported; probably not territorial at foraging or roosting sites; roosts in large groups numbering from about 200 to thousands of individuals (Zeiner et al. 1990b)	Breeding, foraging, cover	Usually forages over water, and seems to be more closely associated with water than any other North American bat species (Barbour and Davis 1969). Riparian habitats offer optimal habitats for this species since they provide suitable roosting and breeding habitat a nearby source of water for foraging (Zeiner et al. 1990b). Large maternity colonies may be found in buildings, caves, under bridges (Zeiner et al. 1990b), and in large trees (Evelyn et al. 2004). Prefers to roost in large trees (mean diameter 115 cm) that provide suitable cracks, crevices, and cavities; roost sites are usually near water (mean 133 m from water) (Evelyn et al. 2004)	Breeding, foraging, cover	Found in a wide variety of habitats from the coast to mid-elevations, and preferred habitats include open forests and woodlands near sources of water for foraging (Zeiner et al. 1990b).
Beaver* *Castor canadensis*	*Canada*—colonies had home range of 0.8 km radius from lodge, or about 201 ha (Aleksiuk 1968) *California*—colony home range was about 15 ha (Light 1969)	*Canada*--territory boundaries maintained by scent mounds, averaged 0.4 km radius, or about 50 ha (Aleksiuk 1968); colonies closer together formed more scent mounds than did more isolated colonies (Butler and Butler 1979)	Breeding, foraging, cover	In winter forages almost entirely on the bark and cambium of riparian trees including aspen, willow, alder, and cottonwood; forages mostly on streambanks, felling trees and harvesting branches for winter food. Builds lodges out of branches and mud, usually on streamside banks or on islands. Takes cover in lodge or by diving in water; makes dams to form deeper ponds for foraging and taking cover (Zeiner et al. 1990b)	Foraging	Forages us to 200 m from water; cuts a variety of trees but tends to take smaller trees far from water (Jenkins 1980)

			Riparian		Upland	
Species	Home Range Size	Territory Size	Habitat Use	Habitat Requirements	Habitat Use	Habitat Requirements
Ringtail* *Bassariscus astutus*	No information available	*California* – estimated to vary from 44–515 ha (Grinnell et al. 1937) *Texas* – average size estimated at 20–43 ha (Toweill and Teer 1981)	Breeding, foraging, cover	Breeds and takes cover in hollow logs, trees, and cavities in talus and other rocky areas, usually near water (Zeiner et al. 1990b). Primarily carnivorous; prefers rodents and rabbits. Also consumes birds and eggs, reptiles, invertebrates, fruits, nuts, and some carrion (Trapp 1978)	Foraging	Forages primarily in riverine and riparian areas, but may also use nearby uplands if suitable prey is available (Zeiner et al. 1990b)
Raccoon* *Procyon lotor*	*Michigan*—home ranges of males averaged 204 ha and varied from 18 to 814 ha (Stuewer 1943) *North Dakota*—home ranges of males varied from 396 ha to 1,468 ha, and females varied from 532 to 743 ha for females (Fritzell 1977)	Radiotelemetry studies suggest that males may be territorial, but females probably are not; no information on territory size available (Zeiner et al. 1990b)	Breeding, foraging, cover	Found in greatest abundance in low and mid-elevation riparian habitats; takes cover and breeds in tree cavities, snags, and downed logs. Usually forages for both animal and plant material in shallow water (Zeiner et al. 1990b)	Breeding, foraging, cover	Frequents a high diversity of habitats including upland areas such as forested, shrub, and herbaceous areas; may use rocky areas for dens or cover; a source of water is required for foraging and washing (Zeiner et al. 1990b)
River otter* *Lutra canadensis*	Home ranges may extend an average of 24 km along rivers and streams (Haley 1975); travel distance is highly variable and depends on food supplies and habitat quality; may travel 80 to 96 km along streams during a year (Liers 1951)	Males known to establish scent posts using urine, feces, and musk but no information on territory size available ((Zeiner et al. 1990b)	Breeding, foraging, cover	Uncommon residents of riparian habitats and associated streams and rivers; takes cover and nests in burrows and cavities in river banks; also uses hollow logs, stumps, snags, abandoned beaver lodges, and natural cavities in riparian habitats (Zeiner et al. 1990b)	Foraging	Seldom moves away from water but may pursue prey short distances from water courses into upland habitats (Sheldon and Toll 1964)

* Resident (at least partially) in riparian habitats of western Placer County.

+ Neotropical migrant species that breed in riparian habitats of western Placer County or in nearby counties.

provide a source of surface water (MacArthur 1964; James 1971; Rice et al. 1983, 1984; Brinson et al. 2002). Many riparian areas offer a range of successional habitats due to the dynamic nature of their hydrology. Riparian woodlands are also critical to a diversity of migratory birds (e.g., raptors, flycatchers, vireos, warblers, tanagers, sparrows, and grosbeaks) that depend on trees and shrubs near streams for shelter/cover and for the rich food supplies (e.g., insects, seeds, and fruits) associated with these areas (Jones & Stokes 2004a). Moreover, riparian areas can also provide perching, nesting, and foraging habitat, as well as water, for bird species that primarily nest in upland areas (Heath and Ballard 2003).

Because habitat heterogeneity promotes animal diversity, the highest bird abundance and species richness are usually found in riparian woodlands with a variety of different successional stages (i.e., young and old trees) and a lush understory of shrubs and/or herbaceous plants. Many breeding bird species prefer specific successional stages of riparian woodlands. For example, song sparrows, blue grosbeaks, yellow-breasted chats, yellow warblers, and common yellowthroats are often most abundant in early successional habitats (e.g., stands approximately 2 to 4 m [6.5 to 13 ft] tall) with dense vegetation near the ground. Other species, such as Cooper's hawks, red-shouldered hawks, yellow-billed cuckoos, tree swallows, and black-headed grosbeaks, prefer late-successional stands with taller trees and snags (e.g., more than 10 m [33 ft] tall) that are required for nesting substrates and/or song or foraging perches. Some bird species (most woodpeckers, owls, and some swallows and flycatchers) require large snags for nesting (Zeiner et al. 1990a; Riparian Habitat Joint Venture 2004).

Riparian areas also provide essential habitat for migratory birds and wintering species. For example, willow flycatchers (state listed as endangered) require these habitats during spring and fall migration, but they do not remain to nest in western Placer County (Table 6-1). Many other species of Neotropical birds such as vireos, warblers, thrushes, and grosbeaks also depend on riparian habitats for cover and foraging during migration (Riparian Habitat Joint Venture 2004).

Upland Habitat Requirements

Upland habitats provide migratory stopover grounds, foraging habitat, and dispersal corridors for non-breeding adults and juveniles of many riparian-associated species. For this reason, the adjacent land cover is a strong determinant of the species composition of a specific habitat area (Appendices A and B). Yellow-billed cuckoos, yellow warblers, common yellowthroats, and song sparrows are among the many riparian-associated species that may forage in upland habitats adjacent to riparian nesting sites (Zeiner et al. 1990a). Upland areas serve both as refugia during floods and as supplemental or primary foraging areas at other times of year. Riparian areas also can support primarily upland nesting bird species for perching, nesting, foraging, and water (Heath and Ballard 2003). Uplands can also be important for juvenile dispersal. For example, in coastal California, juvenile Swainson's thrushes use uplands regularly during the post-fledgling period (PRBO unpublished data). Swainson's hawk is an example of a species that frequently nests in riparian woodlands in the Central Valley but forages in upland habitats consisting of large, flat, open, undeveloped landscapes with suitable grassland or agricultural foraging habitat. Swainson's hawks usually nest in large native trees such as valley oaks, cottonwoods, and willows, although nonnative trees, such as eucalyptus, are also used (England et al. 1997). Other primarily riparian-associated birds that often forage in adjacent, upland habitats include Cooper's hawks, red-shouldered hawks, tree swallows, blue grosbeaks, and American goldfinches (Table 6-1).

Patch Size and Riparian Width Requirements

Numerous studies in North America have demonstrated that breeding bird species richness and abundance are positively correlated with riparian width and patch size—at least for riparian-associated and forest interior species. The following studies from California, other states, and Canada provide examples of the relationships between riparian width and patch size and bird species richness and abundance.

California

- In the California Central Valley, riparian bird species richness increased with the width of the riparian zone (Stralberg et al. 2004 [Appendix B of this report]). Species richness was positively associated with riparian width along mainstem rivers, but not along smaller, tributary streams, with a significant increase in species richness occurring beyond 100 m (Appendix B).
- Also in the Central Valley, the occurrence of three riparian-associated species (i.e., black-headed grosbeak, common yellowthroat, and yellow warbler) also was positively associated with riparian zone width (Appendix B). Black-headed grosbeak presence was positively associated with riparian width at mainstem, but not tributary sites, while the reverse was true for the yellow warbler and common yellowthroat. For all three species, significant increases in abundance occurred when the riparian zone was greater than 100 m in width (Appendix B).
- In the San Francisco Bay Area, bird species richness and density decreased as the number of artificial structures (i.e., bridges) increased and as the volume of native vegetation decreased due to urbanization (Rottenborn 1999).
- In coastal Marin County, the abundance of warbling vireos, Swainson's thrushes, and common yellowthroats increased with the width of the riparian corridor. There was no association between riparian width and bird species diversity or richness (Holmes et al. 1999).
- In the eastern Sierra, bird species diversity was positively correlated with riparian width and tree species diversity (Heath and Ballard 2003).

- In California, Song Sparrows and Spotted Towhees have been observed in strips as narrow as 1 m, and other species have been observed in strips 10 m wide (Soulé 1988, PRBO unpubl. data).

Other States

- Along Oregon's headwater streams, riparian buffers are likely to provide the most benefit to riparian- and forest-associated birds if they are more than 40 m (131 ft) wide (Hagar 1999).
- In eastern Oregon, total abundance of riparian birds was greater in continuous shrub associations than in discontinuous shrub associations (Sanders and Edge 1998).
- In Texas, bird abundance was positively correlated to forest width, and streamside forests more than 50 m (164 ft) wide supported the greatest number of total species; area-sensitive bird species increased in abundance in these forests as widths increased from 25 to 100 m (82 to 328 ft); and narrow riparian strips were usually inhabited only by species associated with early successional vegetation and habitat edges (Dickson et al. 1995).
- In South Carolina, species richness of all birds (including Neotropical migrant birds) increased with the width of riparian stands. Narrow riparian strips (less than 50 m [164 ft] wide) supported an abundant and diverse avifauna, but conservation of wide strips (more than 500 m [1,640 ft] wide) was required to support the complete avian community characteristic of that region (Kilgo et al. 1998).
- In Iowa, bird species richness increased with the width of wooded riparian habitats (from 10 to 200 m [33 to 656 ft]), and area-sensitive species were only present on the widest plots (Stauffer and Best 1980).
- In Pennsylvania, most area-sensitive bird species did not occur in riparian zones less than 25 m (82 ft) wide. However, the presence of very narrow (e.g., 2 m [7 ft]) bands of woody vegetation along streams was found to be important for some bird species in disturbed areas (Croonquist and Brooks 1993).
- In Maryland and Delaware, the species richness of area-sensitive riparian birds increased in width zones between 25 m (82 ft) and 100 m (328 ft), and several Neotropical migrant species were only found in riparian forests more than 100 m (328 ft) wide (Keller et al. 1993).

Canada

- In Alberta, forest-dependent bird species declined as buffer width narrowed from 200 m (656 ft) to less than 100 m (328 ft) (Hannon et al. 2002).
- In Quebec, riparian strips less than 40 m (131 ft) wide had the highest mean bird densities (Darveau et al. 1995).

- In Newfoundland, total numbers of interior forest birds may increase in wider buffers, but these species were rare even in the widest strips sampled (40–50 m [131–164 ft]) (Whitaker and Montevecchi 1999).

Overall, the species richness (i.e., total number of species) and abundance (i.e., number of individuals within a species) of riparian-associated species are highest in wide and continuous riparian corridors; this pattern is especially true for area-sensitive species. The effect of riparian width depends on each species' needs, the riparian habitat type and its historic conditions, and attributes of the surrounding landscape. Fragmentation of riparian woodlands could be especially detrimental to nonmigratory species such as song sparrows and spotted towhees that generally do not disperse over large distances. Even thin strips of connecting habitat, while usually not suitable for nesting, can benefit sedentary species that will not disperse through open habitats (e.g., grasslands or barren areas) (Croonquist and Brooks 1993).

Patch size requirements for each species depend on territory and home range sizes and relative sensitivity to fragmentation (Tewksbury et al. 1998; Riparian Habitat Joint Venture 2004). In planning the conservation of an assemblage of species, those species with greatest sensitivity to habitat fragmentation should be used to set patch size requirements (Tewksbury et al. 1998). In western Placer County, some of the most area-sensitive bird species are raptors (home ranges often larger than 100 ha [247 ac]), yellow-billed cuckoos (home ranges larger than 10 ha [25 ac]), downy woodpeckers, and yellow-breasted chats (home ranges greater than 1 ha [2.5 ac]). These species require relatively large areas of riparian habitat to breed and forage successfully (Table 6-1).

Yellow-billed cuckoo is an example of a species that requires large tracts of late-successional riparian forest for breeding habitat. This species was a rare historical visitor to western Placer County, but it has not been recorded there in many decades (Jones & Stokes 2004a). However, yellow-billed cuckoos are regular breeders in wide riparian forests along the Sutter Bypass, about 12 km (7.5 mi) from the Placer and Sutter county line. Using radio-telemetry, Laymon and Halterman (1987) determined that yellow-billed cuckoos have large home ranges, averaging 17 ha (42 ac). Optimal stands were defined as more than 80 ha (198 ac) in extent and wider than 600 m (1,970 ft), marginal stands as 20–40 ha (49–99 ac) in extent and 100–200 m (328–656 ft) wide, and unsuitable stands as less than 15 ha (37 ac) in extent and less than 100 m (328 ft) wide Laymon and Halterman (1989).

Effects of Human Alterations on Riparian Birds

Habitat Loss and Degradation

In the western United States, approximately 95% of riparian habitats have been lost or degraded due to human activities during the past 100 years (Smith 1977, Ohmart 1994). These habitats represent less than 1% of most western landscapes, yet they provide breeding habitat for more than 50% of bird species in this region (Ohmart and Anderson 1982; Rice et al. 1983; Ohmart 1994; Tewksbury et al. 2002). Throughout the Central Valley and Sierra Nevada foothills, riparian habitats have been reduced to a small fraction of their original extent (Hunter et al. 1997, Riparian Habitat Joint Venture 2004), and those habitats that remain have been fragmented and degraded by a variety of human activities. The primary factors include historical gold mining; heavy livestock use of some riparian corridors; vegetation removal on the floodplain; introduction and spread of noxious weeds; road and home development; alterations in the hydrologic regime caused by hydroelectric and water storage reservoirs; gravel mining; and groundwater extraction (Kondolf et al. 1996).

In western Placer County, riparian woodlands occur as well-developed and continuous stands along depositional reaches of Coon Creek and portions of the Bear River and the American River. Along most other creeks, however, this habitat occurs as narrow and generally discontinuous bands of trees (Appendix A). Riparian woodlands rarely occur on intermittent streams and almost never on ephemeral streams that only flow during storm events. Riparian vegetation occupies about 2,456 ha (6,069 ac), or roughly 2% of the land area, in western Placer County (Jones & Stokes 2004a). Accordingly, it is clear that available riparian habitat has been greatly reduced and fragmented, causing a decline in locally nesting populations and an increased potential for local extirpation.

Riparian areas in western Placer County are increasingly surrounded by urban, rural-residential, and agricultural development. Increased noise levels associated with human activity can cause nest abandonment, flushing from the nest, and consequent nest failure (Delaney et al. 1999). Agricultural activities such as mowing, disking, grazing, pesticide use, and artificial flooding can also reduce the habitat quality if they encroach into riparian woodlands (Ohmart 1994). Fragmentation and degradation resulting from urban, residential, and agricultural land uses has probably reduced the wildlife habitat functions of most riparian areas in western Placer County (Appendix A; Jones & Stokes 2004a, 2004b). Urban development can also result in increased mammalian and avian predator populations and greater exposure to predation pressures, as discussed below.

The species richness and densities of certain riparian-associated birds have been demonstrated to decrease with increasing urban development in the surrounding landscape (Rottenborn 1999; Miller et al., 2003). In the uplands of Placer County’s foothill oak woodland zone, several riparian-associated bird species (including black-headed grosbeak) were found at lower relative abundance in fragmented compared to unfragmented oak woodland landscapes (Stralberg and Williams 2002).

Livestock Grazing

Livestock grazing in riparian areas is particularly widespread in the western U.S., especially in dry areas where cattle are attracted to riparian zones for water, shade, and shelter (Bryant 1979). Many native bird species have experienced population declines in grazed or heavily settled riparian areas (Tewksbury et al. 2002). Cattle browse and trample riparian vegetation, compact the soil, promote stream bank erosion and loss of water quality, and they attract brown-headed cowbirds (see below). Intensive grazing often increases the fragmentation and degradation riparian habitats, and this leads to a reduction of bird species richness and abundance. During the breeding season, grazing can be particularly detrimental to bird species that nest on or near the ground because cattle disturb understory vegetation and may directly trample nests and/or fledglings (Bock et al. 1993).

Brown-Headed Cowbird Brood Parasitism

The brown-headed cowbird is a native North American species that expanded its range into California in the early 1900s (Grinnell and Miller 1944). Brown-headed cowbirds parasitize the nests of other native songbirds and reduce their reproductive success (Rothstein 1975, Beedy and Granholm 1985, Zeiner et al. 1990a, Gaines 1992, Lowther 1993). Cowbird parasitism contributes to lowered productivity in host species through direct destruction of host eggs and competition between cowbird and host chicks. Brown-headed cowbirds usually parasitize songbird nests that are situated near forest edges (Rothstein et al. 1984, Gates and Evans 1998). However, more recent studies suggest proximity to (within 3.2 km [2 mi]) and occurrence of host species is much more important than the presence of habitat edges, especially in western riparian habitats (Tewkbury et al.1999).

Cattle grazing and other livestock operations attract brown-headed cowbirds. Human habitation, agriculture, and livestock facilities adjacent to riparian zones provide brown-headed cowbirds with ample foraging habitat close to songbird breeding grounds (Tewksbury et al. 1998, Riparian Habitat Joint Venture 2004). In riparian woodlands of western Placer County, brown-headed cowbirds are most common in disturbed areas and in early successional stands, especially where livestock are present nearby (Appendix A). Radio telemetry studies have demonstrated that brown-headed cowbirds may move more than 6.7 km (4.2 mi) between foraging and breeding areas (Rothstein et al. 1984). Daily commute distances of 14 k or more have been reported cowbird abundance has also been shown to decline with increasing distance from human food sources over distances as short as 2 to 4 km (1.2 to 2.5 mi) (Curson et al. 2000).

Predation

The number of young fledged is probably the most important factor influencing the occurrence and persistence of many songbird species. For most species, nest success rates of 20% or less indicate unsustainable or *sink* populations (Donovan et al. 1995).

Proximity to urban and agricultural areas typically leads to higher densities of predators subsidized by human activity, such as raccoons, skunks, feral and domestic cats, jays, crows, and magpies, all of which are well-documented avian nest predators (Zeiner et al. 1990a). Nest predation rates are higher in narrow riparian buffer strips than in intact riparian forests (Vander Haegen and Degraff 1996 but see Haff 2003). Nest predation is higher in smaller woodlots and woodlots near suburban areas than in woodlots in rural areas, and survivorship of most bird species is higher in large forested habitats (larger than 35 ha [86 ac]) than in smaller habitat areas (Doherty and Grubb 2002). Open-cup nests more than 2 m (7 ft) above ground are most vulnerable to predation (Wilcove 1985). A dense and diverse herbaceous or shrub understory provides both nesting sites and protection from predators; this vegetative layer is especially important for species such as spotted towhees, song sparrows, and common yellowthroats that nest on or near the ground (Riparian Habitat Joint Venture 2004).

In general, “soft” edges (e.g., wetland or herbaceous cover grading to shrubs or scrubby willow grading to riparian woodland) are preferable to “hard” edges (e.g., abrupt changes in vegetation type such as agricultural or urban development adjacent to stream corridors), because predation levels along hard edges are higher (Suarez et al. 1997). Manicured parks, rural homes, dairies, and urban areas adjacent to riparian habitat can attract predators and be detrimental to riparian bird populations (Miller et al. 2003). Feeding of wildlife, either inadvertently or intentionally, encourages and elevates populations of nest predators such as domestic and feral cats that are estimated to kill many millions of songbirds annually (Stallcup 1991) and have a major impact on local bird populations (Churcher and Lawton 1987, Coleman et al. 1997).

Introduction of Non-native Species

Introduction of Himalayan blackberry in riparian corridors has reduced the extent of native herbaceous and shrub vegetation in riparian woodlands of western Placer County (Appendix A). This species is the dominant understory plant along many riparian corridors. Although it is not native, Himalayan blackberry is used for nesting, food, and cover by many birds (e.g., California quail, song sparrows, spotted towhees, California towhees, common yellowthroats, and tricolored blackbirds) (Jones & Stokes 2004a), and it may have beneficial effects on some species. Other nonnative plants, such as yellow star-thistle, acacia, black locust, and eucalyptus (blue gum), can outcompete native trees and understory plants that are favored by most bird species (Jones & Stokes 2004a).

Introduced birds such as European starlings, house sparrows, and wild turkeys are widespread in riparian areas of western Placer County. Starling populations are thought to be increasing in the Sierra Nevada foothills (Purcell et al. 2002) and occur throughout the oak woodland landscape in Placer County (Stralberg and Williams 2002). Starlings and house sparrows often outcompete native cavity nesters for nest sites, and turkeys consume foods that might otherwise be used by California quail and other native species (Zeiner et al. 1990a; Purcell et al. 2002).

Black rats and Norway rats occur in riparian woodlands of western Placer County; they are common along urbanized streams that are dominated by Himalayan blackberry thickets (Appendix A). Introduced rats may have detrimental effects on nesting songbirds because they prey on eggs and young, and because they often carry and transmit diseases (Zeiner et al. 1990b).

Mammals

Habitat Relationships

Numerous mammal species are abundant in the riparian woodlands of western Placer County. Up to 41 species breed in these habitats; two other species use them for shelter or foraging. No mammal species are proposed for coverage under the HCP/NCCP for the Phase I Planning Area (Jones & Stokes 2004a).

Mammal species that are often associated with riparian woodlands of western Placer County include vagrant shrew, ornate shrew, Trowbridge's shrew, broad-footed mole, Yuma myotis, California myotis, western pipistrelle, big brown bat, hoary bat, Townsend's big-eared bat, and pallid bat, brush rabbit, black-tailed jackrabbit, western gray squirrel, beaver, western harvest mouse, brush mouse, deer mouse, dusky-footed woodrat, California vole, muskrat, western jumping mouse, porcupine, coyote, gray fox, long-tailed weasel, mink, ringtail, raccoon, American badger, western spotted skunk, striped skunk, river otter, mountain lion (visitor), bobcat (visitor), mule deer, and wild pig (introduced). All these species also occur in a variety of upland habitats in western Placer County (Jones & Stokes 2004a).

Riparian Habitat Requirements

Mammals use riparian woodlands for all scales of movement—as part of their territories or home ranges; as dispersal corridors; or for short-distance movements between breeding, resting, and foraging areas. Conservation biologists often recommend preserving riparian areas for mammals with large home ranges in part because such areas can also function as corridors for dispersal of species with smaller home ranges in fragmented landscapes (Brinson et al. 2002). However, if a riparian woodland does not meet a species' habitat requirements, it may not be used for dispersal and hence will not provide a suitable corridor connecting habitat patches for many large mammals (Noss et al. 1996; Rosenberg et al. 1997; Brinson et al. 2002).

Like territories and home ranges, dispersal capabilities differ among vertebrate groups and species. Large mammals move over large distances, while most species of small mammals (except bats) are relatively sedentary and make only short-distance movements.

Some mammals, such as the ornate shrew, Yuma myotis, beaver, ringtail, raccoon, and river otter are strongly associated with riparian corridors in western Placer County (Table 6-1). Riparian woodlands are also important for migratory mule deer that forage, breed, and take cover there. A source of surface water (e.g., creek or river) is especially important to deer (Zeiner et al. 1990b).

Upland Habitat Requirements

As is true of many bird species, many riparian-associated mammals also frequent nearby upland habitats; most use these areas for breeding, foraging, and cover (Table 6-1). Thus, the adjacent land cover is a strong determinant of the species composition of a specific habitat area. In general, riparian areas that are adjacent to agricultural or urban development have fewer native mammals and an increased density of introduced species such as house mouse, Norway rat, and black rat (Jones & Stokes 2004a).

Patch Size and Riparian Width Requirements

Darveau et al. (2001) found that some large mammal species using riparian strips in Quebec seemed to prefer narrower riparian buffers, while other small mammals preferred wider strips.

Thin (e.g., 20 m [66 ft] wide) strips that connect larger patches can be used as refugia by small and larger mammals. However, narrow strips do not provide sufficient habitat to support mammal species with large territories and home ranges, because such strips exhibit high edge-to-interior ratios (Darveau et al. 2001). Riparian strips at least 100 m (328 ft) wide have been recommended to maintain riparian-associated small mammals, because the presence of these species has been observed to change little with increased width (Hannon et al. 2002).

In western Placer County, most small mammals (e.g., shrews, rabbits, ground squirrels, tree squirrels, mice, woodrats) have relatively small territories and home ranges (less than 1 ha [2.5 ac]) (Zeiner et al. 1990b). However, a few species of larger mammals (coyotes, gray foxes, mountain lions, bobcats, mule deer) occupy large areas, and their home ranges may cover many square kilometers, encompassing riparian woodlands and adjacent oak woodlands, annual grasslands, foothill chaparral, and other upland habitats. For this reason, the extent and quality of upland habitats surrounding riparian habitats is especially important in maintaining breeding populations of these species.

Effects of Human Alterations on Riparian Mammals

Habitat Loss and Degradation

The effects of human-induced habitat loss and degradation on riparian mammals are similar to those described above for riparian-associated birds.

Livestock Grazing

Intensive grazing often increases the fragmentation and degradation riparian habitats, and this leads to a reduction of mammal species richness and abundance. Livestock grazing in streams and their associated riparian corridors affect small mammal populations through direct disturbance and alteration of habitat conditions such as loss of cover and reduced food materials (Ehrhart and Hansen 1997).

Predation

Predation resulting from fragmentation (edge and patch effects) causes effects similar to those described above for birds.

Introduction of Nonnative Species

Nonnative mammals (e.g., house mouse, black rat, Norway rat, Virginia opossum) occur in riparian woodlands in western Placer County (Jones & Stokes 2004a), and they often outcompete native small mammals for food, breeding sites, and cover. In general, riparian woodlands that are situated near urbanized or agricultural areas support the highest densities of these species. Feral cats are widespread in riparian woodlands of western Placer County (Jones & Stokes 2004a, Appendix A), and they prey extensively on small native mammals (Zeiner et al. 1990b). Nonnative plants such as Himalayan blackberry provide habitat for black rats and Norway rats that that may compete with or prey upon small mammals in riparian woodlands.

Reptiles and Amphibians

Habitat Relationships

Up to 18 species of reptiles and four amphibians breed in riparian woodlands of western Placer County. Three other amphibian species (California newt, Pacific treefrog, and foothill yellow-legged frog) visit these habitats during some portions of their life cycles. Two riparian-associated reptiles (western pond turtle and giant garter snake) and one amphibian (foothill yellow-legged frog) may be covered under the HCP/NCCP for the Phase I Planning Area.

Amphibian species that occur in riparian woodlands of western Placer County include: ensatina, California slender salamander, Pacific treefrog, foothill yellow-legged frog, and western toad. Reptiles that may occur in these habitats include racer, common garter snake, western terrestrial garter snake, western aquatic garter snake, common kingsnake, night snake, ringneck snake, California whipsnake, gopher snake, western rattlesnake, western and Gilbert's skinks, southern alligator lizard, and western fence lizard (Jones & Stokes 2004a).

Riparian Habitat Requirements

Most amphibians and some reptiles are closely associated with riparian areas and their associated water bodies. Few terrestrial vertebrates are as dependent on water as are amphibians, since these species require surface water to complete their life cycles. Frogs, toads, and salamanders occur in riparian areas year-round, and intact riparian areas, upland habitats, and aquatic breeding habitats are essential for their survival (Brinson et al. 2002). Reptiles use riparian corridors for cover, shade, and a source of water. Microhabitats in riparian areas are important in meeting the habitat requirements of amphibians and reptiles, and dense, shaded forest canopies and leaf litter are positively correlated with the abundance of these species in narrow riparian corridors (Rudolf and Dickson 1990).

Upland Habitat Requirements

Similar to birds and mammals discussed above, many riparian-associated amphibians and reptiles frequent nearby upland habitats, and can use these areas for breeding, foraging, and cover (Table 6-1). Accordingly, the adjacent land cover is a strong determinant of the species composition of a specific habitat area. Upland habitats can serve as important refugia for reptile and amphibian species during times of flooding. Aquatic turtles will use upland habitats, including forests and flooded agricultural areas, during the warm months (Bodie and Semlitsch 2000). Several species of lizards associated with the vegetative cover and organic material of riparian forests bask and forage in uplands (Brinson et al. 2002). Many snake species hunt in upland habitats, but they rest in cooler microclimates under dense riparian forests (Zeiner et al. 1988).

Patch Size and Riparian Width Requirements

Most reptiles and amphibians in western Placer County have relatively small home ranges and territories (less than 1 ha [2.5 ac]) (Table 6-1). For example, Pacific treefrogs often move only about 10 m (33 ft), and western skinks have average home ranges of only about 0.09 ha (0.22 ac) (Zeiner et al. 1988). In contrast, western pond turtles breed along slow-moving, permanent streams, and they deposit eggs in nests in sandy soils up to 100 m (328 ft) from the streams (Zeiner et al. 1988). Similarly, giant garter snakes may migrate long distances (more than 100 m [328 ft]) from wetland habitats to upland sites that serve as winter hibernacula (Zeiner et al. 1988). Semlitsch and Bodie (2003) recommended a three-tiered approach to conserving habitat for riparian-associated amphibians and reptiles: aquatic buffer (30–60 m [98–197 ft]), core habitat (142–289 m [466–948 ft] including aquatic buffer), and terrestrial buffer (additional 50 m [164 ft] beyond the core habitat to account for the needs of most reptile and amphibian species).

Effects of Human Alterations on Riparian Reptiles and Amphibians

Changes in Flows

Flow diversions or increased streamflows in summer due to water supply and/or releases of treated sewage water could possibly affect amphibians by stranding of tadpoles, washing away or desiccating egg masses, or increasing predation. These effects have been documented for salmonids and foothill yellow-legged frogs (Bauersfeld 1978; National Marine Fisheries Service 1994; U.S. Fish and Wildlife Service 1995, 1996; Kupferberg 1996a; Lind et al. 1996). Water diversions for agriculture also have the potential to entrain tadpoles and other amphibian larvae into irrigation ditches, causing direct mortality. In general, flow and depth affect habitat suitability for riparian-associated amphibians, and reduced flows may confine larvae in remaining pools where they are more susceptible to predation (Hayes and Jennings 1986, 1988).

Habitat Loss and Degradation

In general, the effects of anthropogenic habitat loss and degradation on riparian reptiles and amphibians are similar to those described above for riparian-associated birds. However, inputs of fine sediment from adjacent land uses may also detrimentally alter the aquatic habitats of amphibians (Ashton et al. 2003).

Livestock Grazing

Livestock grazing in riparian corridors affects reptile populations through direct disturbance and alteration of habitat conditions. However, these effects may not result in differences in reptile and amphibian species richness or abundance between grazed and ungrazed sites (Homyack and Giuliano 2002).

Predation

Predation as a result of fragmentation (edge and patch effects) probably is greater in agricultural and urbanized areas than in riparian forests surrounded by oak woodlands or other upland habitats. The introduced bullfrog is a major predator of adult and larval amphibians (see discussion below).

Introduction of Nonnative Species

Bullfrogs are the only introduced, nonnative amphibian species in western Placer County. They were observed on about 25% of the riparian plots that were surveyed in the course of this study (Appendix A). Bullfrogs frequently prey on the larvae and adults of native amphibians, and they compete with native amphibians for space and food (Zeiner et al. 1988). Bullfrogs may be responsible for the elimination of California red-legged frogs and foothill yellow-legged frogs from the floor of the Central Valley and much of the Sierra Nevada foothills (Moyle 1973; Kupferberg 1996b). There are no introduced reptiles in western Placer County (Jones & Stokes 2004a).

Relationships Between Setback Width and Effects of Human Alterations

Some effects of human-induced alterations (e.g., abrupt flow changes) do not vary with riparian width, and their effects on terrestrial vertebrates are not well understood. However, many other relationships between riparian area width and animal diversity have been well documented. The effects that are most strongly related to setback width and the total area of riparian plots are direct habitat losses and fragmentation of riparian corridors. Many riparian species require a minimum area of contiguous habitat that must contain specific habitat attributes (e.g., interior forest microclimate, upland refugia, large trees, snags). In order to conserve wildlife habitat functions, the width of riparian areas must be sufficient to contain these habitat attributes for area-sensitive species.

Habitat requirements vary considerably among various riparian-associated vertebrate taxa. However, the following general conclusions can be made regarding the relationship of habitat values to width and size of riparian areas in western Placer County.

- Large (more than 10 ha [25 ac]) and wide (more than 500 m [1,640 ft]) riparian corridors provide the highest habitat values for riparian-dependent wildlife with large home ranges and territories.
- Moderately large (5–10 ha [12–25 ac]) and wide (more than 100 m [328 ft]) corridors provide sufficient habitat values to support most native species that are strongly associated with these habitats.

- Small (less than 5 ha [12 ac]) and narrow (less than 30 m [98 ft]) riparian corridors provide habitat values for many species, but most area-sensitive species will probably not be present.
- Highly fragmented and narrow riparian corridors (< 5 m [16 ft]) provide habitat for only a few generalist species, but they may still provide some values for cover and as movement corridors in urbanized and agricultural areas.

Recommendations for Setbacks to Conserve Terrestrial Animal Functions

In view of the foregoing, the project team recommends the following management strategies to conserve wildlife habitat functions.

- Low order streams (i.e., first and second order stream segments), which typically have narrow riparian corridors, should be managed to maintain and enhance riparian corridors at least 30 m wide. Where only very narrow (e.g., < 5 m [16 ft] wide) riparian corridors are feasible, these narrow areas should still be conserved because they may function as dispersal corridors.
- Higher order stream segments (i.e., third order and higher), which often have broader riparian corridors, should be managed to maintain and enhance riparian corridors at least 100 m (294 ft) on both sides of the channel (Semlitsch and Bodie 2003, Appendix B). Riparian woodlands should be restored and enhanced within this zone. Restoration and enhancement measures should include:
    - Re-creation of regular disturbance events (e.g., high water) on the floodplain will enhance vegetation and breeding bird populations in most systems (Riparian Habitat Joint Venture 2004).
    - Management activities such as mowing, grazing and burning within riparian zones should be limited to the non-breeding season to minimize impacts on nesting birds (Riparian Habitat Joint Venture 2004).
    - Other recommendations listed in (Riparian Habitat Joint Venture 2004).
- Where feasible, contiguous areas larger than 5 ha (12 ac) should be maintained, enhanced and linked to provide habitat refuge areas for area-sensitive species. These areas should be connected by riparian corridors more than 30 m (98 ft) wide on both sides of the channel wherever possible, in order to provide movement and dispersal corridors for wildlife.
- Where large, wide riparian corridors are not feasible in urbanized and/or agricultural settings, a minimum riparian buffer width of 10 m (33 ft) should be maintained to provide movement corridors for generalist species (Riparian Habitat Joint Venture 2004).

- Riparian woodland edges should be minimized (e.g., patches rather than linear strips) and buffered by shrubs and forbs (to reduce predation pressure on open-cup nesting species (RHJV 2004, Small et al. 1999).
- Streams should be prioritized for preservation and/or enhancement based on the information summarized herein. Some streams currently have higher wildlife value than others (e.g., Coon Creek) and should be the conservation priority.
- Non-native plants and animals, especially nest predators (e.g. rats, raccoons, domestic and feral cats), should be reduced and controlled on riparian-adjacent properties (Riparian Habitat Joint Venture 2004).
- The preservation, restoration and linkage of large parcels of undeveloped and uncultivated lands adjacent to riparian areas will provide significant benefits to riparian songbird species. Thus, large contiguous areas of riparian vegetation surrounded by "natural" uplands should be conserved to the greatest extent possible.
- Potential effects of adjacent land uses on riparian areas should be thoroughly evaluated during regional land use planning, and during the environmental review and permitting processes for specific projects, and these effects should be avoided to the maximum extent practicable.

It is important to recognize that riparian setbacks are not sufficient to ensure habitat functions for all wildlife species. Many factors affecting wildlife habitats are unrelated, or only indirectly related, to setbacks; such factors include the condition of the riparian vegetation and the abundance of nonnative plants and animals. Landscape factors can have significant effects on riparian areas (Allan 2004, Appendices A and B of this report). For example, adjacent land uses, such as intensive grazing, human habitation, golf courses, and agriculture, can significantly subsidize predator populations that can then turn to the riparian zone for sustenance (Riparian Habitat Joint Venture 2004).

Currently, most riparian areas in western Placer County have been affected by human alterations. Even where moderately wide sections (i.e., more than 100 m [328 ft]) of riparian vegetation remain, wildlife habitat functions and species richness and abundance may be reduced compared to large and wide riparian corridors that are surrounded by native vegetation (Appendices A and B). Therefore, conservation of wildlife habitat functions in western Placer County's riparian areas will require the implementation of measures involving the management of adjacent land uses as well as streams and riparian vegetation within defined setbacks.

Chapter 7

Overall Recommendations for Riparian Setbacks

Riparian setbacks should be adequate to provide long-term conservation of riparian and stream functions in western Placer County. However, while width criteria for setbacks are particularly important, other criteria should address the compatibility of existing and future land uses within these setbacks with the conservation of riparian and stream functions. Setbacks are essential for the conservation of riparian and stream functions, but they are not in themselves sufficient to ensure successful conservation of these functions. For this reason, additional measures also will be necessary to conserve these functions.

Conclusions Regarding Riparian and Stream Functions

Based on the review and analysis of riparian and stream functions, the effects of human alterations on such functions, and the relationships between these effects and setback widths, the project team identified the following 10 conclusions that are particularly relevant for setback criteria.

- Stream channels move within their active floodplains.
- Changes in runoff and erosion from uplands affect hydrologic and biogeochemical functions of streams.
- Patterns of groundwater flow affect biogeochemical functions (e.g., nitrate and phosphorus removal, degradation of SOCs); these patterns can be complex in both active and historic floodplains.
- Erosion of sediment is a major pathway by which contaminants enter streams.
- Sediments stored on active floodplains may remain there temporarily until floodwaters carry them into stream channels.
- Periodic floodplain inundation is important for salmonid and riparian plant habitat functions.
- Riparian vegetation is dynamic: it is frequently removed by disturbances, grows rapidly, and is sensitive to water availability.

- All riparian and stream functions are affected by artificial structures, impervious surfaces, ground disturbance, and removal of natural vegetation within stream channels or active floodplains.
- Riparian-associated wildlife species differ in the specific habitat attributes they require in riparian systems. Consequently, structurally diverse vegetation, as well as the full range of naturally occurring physical conditions and disturbance regimes, are necessary to provide suitable riparian habitat for the entire community of associated wildlife species.
- Many riparian-associated wildlife species use, and often require, both riparian and adjacent upland habitats for reproduction, cover, and/or foraging.

Rationale for Including Active Floodplains in Setbacks

These conclusions regarding riparian and stream functions, considered collectively, indicate that most human uses of the active floodplain are not compatible with conservation of riparian functions, because the stream and its floodplain represent an integrated system that, when intact, produces riparian functions. Accordingly, development and encroachment setbacks should include the entire active floodplain of a creek or river. (The active floodplain is the geomorphic surface adjacent to the stream channel that is typically inundated every 2-10 years or less.)

These conclusions also indicate that active floodplain boundaries are more stable and measurable than stream banks or the boundaries of riparian vegetation that are dynamic and change with time. Therefore, the boundary of the active floodplain, which can be readily delineated, is a preferable basis for determining setback widths than are the edges of stream banks, stream centerlines (or thalwegs), or any boundaries based exclusively on channel widths or vegetation.

Rationale for Including Lands Adjacent to Active Floodplains in Setbacks

The conclusions regarding riparian and stream functions indicate that lands adjacent to active floodplains provide physical and habitat functions, and they help to buffer streams from excessive inputs of sediment and contaminants. In general, conservation of most terrestrial wildlife functions depends on the inclusion of land beyond the active floodplain to provide adjacent upland habitats that benefit many riparian-associated wildlife species, and to buffer riparian habitats from the effects of adjacent land uses.

In western Placer County, riparian vegetation currently provides wildlife habitat outside the active floodplains of rivers and creeks. Such vegetation can occur on historic floodplains that have become isolated from streams due to changes in flows and channel form. Construction of levees or berms also causes isolation of riparian vegetation. Some of this adjacent vegetation would be within setbacks that include land outside the active floodplain. Adjacent lands would also buffer riparian and stream ecosystems from inputs of sediments and contaminants through infiltration of runoff and retention of sediment. Along the smallest channels, whose floodplains are very narrow (or essentially absent), this additional buffer is necessary to prevent inputs from entering the stream channel directly.

There is no single, abrupt, well-documented threshold width setback that would provide maximum benefits for all riparian functions. Rather, because riparian functions have different mechanistic bases, they are affected by different site attributes, and the relationship between setback widths and reduction of human effects differs among riparian functions. These relationships are described in detail in Chapters 2-6.

Nevertheless, several defensible arguments can be constructed regarding the appropriate width for a buffer to include within riparian setbacks. First, most riparian functions would be affected if setbacks included a buffer of less than 20 m (66 ft) beyond the active floodplain; consequently, narrower widths are not adequate for long-term conservation of riparian functions. This conclusion is based largely on our review of the scientific literature (summarized in Chapters 2-6). In addition, in western Placer County, stream incision and a discontinuous cover of woody plants reduces the benefits of narrow buffers. Recent incision now restricts the active floodplain to a narrow band along many of the higher order stream segments in western Placer County (Jones & Stokes 2004c, Placer County Planning Department 2002). Thus, a narrow setback would not include large areas of riparian vegetation on the historical floodplain. Also, the riparian vegetation of western Placer County has a lower and more discontinuous cover of trees and shrubs than do many of the sites where research has been conducted (Appendix A). For many functions (e.g., cover for terrestrial wildlife), this variability in vegetation extent and structure reduces the effectiveness of narrow setbacks.

Second, while there is evidence that even buffers wider than 30 m (98 ft) are not sufficient to eliminate detrimental effects altogether, the benefits provided by additional width beyond 30 m (98 ft) are either small or represent diminishing returns for most functions. For example, in western Placer County, riparian (and most upland) trees reach only 20-30 m (66-98 ft) in height. Thus, at distances > 30 m (98 ft) trees provide very little woody debris to stream ecosystems, and cast little shade on streams.

Third, unlike most other functions, the conservation of wildlife habitat functions for some area-sensitive species requires buffer areas substantially wider than 30 m (98 ft) beyond the active floodplain. This is illustrated by the summary in Table 6-1 of the habitat requirements and area requirements of riparian-associated wildlife in western Placer County. Significantly, wildlife habitat functions also differ from most other functions because the setbacks necessary to conserve them do not necessarily have to be applied along the entire stream network in order to be beneficial. Most wildlife habitat functions probably could be conserved in western Placer County by means of extensive sites with wider setbacks (> 100 m [328 ft]) connected by stream corridors with narrower setbacks (e.g., 30 m [98 ft]).

Recommendations for Riparian Setback Widths in Western Placer County

The project team's overall recommendations for riparian setbacks are presented below.

- Apply to first and second order stream segments a minimum riparian setback that includes the entire active floodplain plus a buffer of 30 m (98 ft) of adjacent land (on each side of the active floodplain), or the distance to the nearest ridgeline or watershed boundary, whichever is less. (First order stream segments are upstream segments that have no tributaries, and second order segments are formed by the junction of first order segments.) Though the purpose of this setback would be to conserve stream and riparian functions; it would not be sufficient for the conservation of many wildlife species with large area requirements.
- Along higher order stream segments (i.e., third order and greater), and along lower order segments at selected sites (e.g., those in or adjacent to conservation lands), apply a setback of at least 100 m (328 ft), and preferably 150 m (656 ft), from the active floodplain for the purpose of conserving and enhancing stream and riparian ecosystem functions including most wildlife habitat functions. Along these larger stream segments, floodplains and riparian areas are more extensive, continuous, and structurally diverse than for lower order stream segments (e.g., first and second order). These areas constitute corridors connecting a watershed's lower order stream segments, and, at a watershed scale, the riparian areas of these higher order segments contain particularly important habitats for most riparian-associated species. The conservation of wildlife habitat functions within these areas may be necessary for the persistence of their populations within western Placer County. For this reason, a wider setback, sufficient for the retention of wildlife habitat functions, is recommended along these stream segments.

The team estimates that these recommendations would result in a total setback width ranging from slightly more than 30 m (98 ft) on most first- and second-order stream segments to over 150-200 m (492-656 ft) on higher-order streams near Placer County's western boundary. (Widths > 150 m (656 ft) would be associated with the 150 m setback suggested for higher order stream segments in the overall recommendation above.) This estimate is based on a preliminary examination of riparian vegetation as shown on aerial photographs and of mapped alluvial soils; such soils indicate the extent of the historic floodplain, which in many cases is wider than the current active floodplain. The project team did not measure active floodplains in the field. However, widespread incision limits active floodplains to a fraction of the historical floodplain of along several of the larger streams (Jones & Stokes 2004c, Placer County Planning Department 2002).

By basing these recommendations, in part, on the width of active floodplains, the project team has created a variable, site-specific setback width that accounts for stream size. The width of the active floodplain provides a clear, functional basis for a variable width criterion that accomplishes the same purpose more directly than criteria based on stream order, slope, and other attributes of streams and their settings.

Management Recommendations for Riparian Setbacks

Within these setbacks, most developed land uses would be incompatible with the conservation of stream and riparian functions. Within the active floodplain, developed land uses should be restricted to unavoidable crossings by roads and other infrastructure, because any structures or alterations of topography, vegetation or the soil surface are likely to affect both stream and riparian functions, and could result in substantial effects both on-site and downstream.

Within the portion of a setback that is outside of the active floodplain, some uses could be compatible with conservation of riparian functions, particularly along first- and second-order streams where conservation of salmonid and wildlife habitat are not necessarily the primary objectives. Along first- and perhaps second-order streams, compatible agricultural uses include filter strips and riparian buffers managed according to standards established by the National Resources Conservation Service. Such practices would improve the buffers' effectiveness for conserving some functions; additionally, there are programs that subsidize the establishment and maintenance of such practices. Along first- and perhaps second-order streams, compatible developed land uses could include public open space, landscaping, and low-density residential development, provided that no impervious surfaces, infrastructure, or irrigation are placed within the setback.

Within the wider setbacks for wildlife conservation, some additional development > 30 m (98 ft) from the active floodplain could be incorporated at sites with limited conservation value. Though development within these setbacks generally is not compatible with the conservation of wildlife habitats, extensive areas of developed and agricultural lands already exist along streams in western Placer County. Thus, effective conservation of some sites may be very problematic, and it may be more appropriate to mitigate offsite for the loss of habitat caused by development of these sites, than to preclude this development (and thus potentially cause the loss of habitats elsewhere). Such mitigation could contribute to the conservation of more extensive areas along relatively unaltered stream reaches.

In the absence of additional site-specific information, effects on riparian wildlife habitats due to adjacent development could be considered to diminish with distance from the active floodplain or existing riparian area. Effects would be greatest due to development of immediately adjacent land and would drop to minimal levels at 100-200 m (328-656 ft) away. There are several reasons for considering effects to be related to distance. First, the magnitude of effects on the processes sustaining riparian habitats diminishes with distance. Second, most riparian-associated wildlife species also use upland habitats and the area of adjacent uplands is greater when development is more distant. Third, harm and harassment due to pets and people probably diminishes with distance. Fourth, roads and structures are less likely to affect animal movements along the riparian corridor if at a greater distance from it. These and other relevant mechanisms are described in detail in Chapters 2-6 of this report.

Currently, agricultural and developed land uses exist within the recommended setbacks, and they preclude the effectiveness of the recommended setbacks in these areas. For example, along the major streams of western Placer County, approximately a quarter of the land < 20 m (66 ft) from the centerline of a stream, already is in developed or agricultural land-cover (Jones & Stokes 2004a, 2004b). For some functions (e.g., biogeochemical and hydrologic functions), this limitation cannot be offset by establishing wider setbacks in other areas (Weller et al. 1998).

In addition, there are other, more fundamental limitations on the effectiveness of setbacks for conserving riparian and stream functions. Examples of these limitations include the effects of dams and flow diversions, currently abundant nonnative species, mercury from the Gold Rush era already in riparian and stream sediments, and runoff that bypasses riparian areas by passing through the stormwater system directly into streams. Also, conversion of large portions of a watershed or region to developed and agricultural land uses is associated with broad negative effects on riparian and stream ecosystems (Findlay and Houlahan 1996, Roth et al 1996, Booth and Jackson 1997, Magee et al. 1999, Doyle et al. 2000, Paul and Meyer 2001, Allan 2004, Hatt et al. 2004, Pellet et al. 2004, Wissmar et al 2004, and Appendices A and B of this report).

Addressing these and other effects on riparian and stream functions will require additional conservation measures. These additional measures include measures for the:

- design and operation of stormwater and water supply systems to minimize impacts on hydrologic and geomorphic functions;
- implementation of construction and agricultural Best Management Practices (i.e., BMPs) to prevent excessive erosion and high inputs of fine sediments to floodplains and streams.

- maintenance and enhancement of riparian vegetation and it's habitat values (as described in Chapter 6); and
- preservation of extensive areas of natural vegetation, particularly in and adjacent to riparian corridors.

The implementation of such measures would both complement, and greatly enhance, the benefits provided by riparian setbacks for the conservation of stream and riparian functions.

Chapter 8
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Appendix A

Relationships Among Animal Species and Site Attributes in Riparian Ecosystems of the Sacramento Valley, California

Relationships Among Animal Species and Site Attributes in Riparian Ecosystems of the Sacramento Valley, California

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Summary

This report summarizes the relationships between riparian site attributes and biodiversity in the data sets collected in Tasks 2.8 (Evaluation of Habitat Assessment) and 2.10 (Validate RAP and Habitat Assessment) for the Placer County Riparian Ecosystem Assessment. More specifically, for one-hectare (2.5 acres) plots located in riparian corridors of the Sacramento Valley and adjacent foothills, we describe the relationships between species richness (i.e., number of species) of selected taxonomic groups (i.e., birds, mammals, reptiles, amphibians, butterflies, dragonflies, and damselflies) and measured vegetation and land cover attributes. The primary goals for collecting and analyzing these data were to support the development of a functional assessment model (FAM) for riparian habitats in Placer County, and to provide setback guidance for riparian corridors in western Placer County. The key results of the study were:

- vertebrate data from multiple site surveys provide a much stronger basis for assessing a riparian site than do data from a single site visit;
- non-destructive area searches for mammals, amphibians, and reptiles were not effective rapid assessment survey techniques, even with the placement of cover boards to provide artificial shelter for these species;
- for the 50 riparian sites surveyed, species richness was not strongly correlated among the different taxonomic groups, nor was the width or structure of the riparian vegetation strongly correlated with richness for any taxonomic group; however
- land cover in the vicinity (i.e., within 250 meters to 5 kilometers) of plots was related to the species richness of several taxonomic groups we examined, and in some cases, these relationships were strong.

These results have implications for the development of a riparian FAM and for guidance regarding riparian setbacks. However, they should be interpreted with caution since they were based on a small sample size (e.g., only 12 plots were visited for multiple surveys), a large geographic area was covered, and only presence data were collected for species in each taxonomic group. (In addition, several published studies are not consistent with some of our conclusions.) Assessment of overall riparian habitat functions should not be based on a single taxonomic group because none indicates the overall habitat functions provided by a site and responses vary within each taxonomic group. Also, assessments of habitat values should consider, attributes of surrounding land cover, in addition to attributes of the riparian vegetation itself. Similarly, the basis for setback widths should consider the upland habitat requirements of riparian species and the effects of adjacent upland land uses on riparian habitat, as these factors have

significant relationships with species richness of riparian-associated species for at least several taxonomic groups (e.g., birds, dragonflies, and butterflies). Separate technical reports will propose a draft FAM and will provide guidance regarding riparian setbacks. The implications of this study will be considered more fully in these reports.

Relationships Among Animal Species and Site Attributes in Riparian Ecosystems of the Sacramento Valley, California

Introduction

This report summarizes the results of Tasks 2.8 (Evaluation of Habitat Assessment) and 2.10 (Validate RAP and Habitat Assessment) of the Riparian Ecosystem Assessment that Jones & Stokes is conducting for the Placer County Planning Department, with assistance from the Point Reyes Bird Observatory (PRBO). These tasks were intended to support development of assessment techniques, preparation of a functional assessment model (FAM) and summarizing setback guidance for the riparian corridors of western Placer County. These tasks involved collection of data on species presence and site attributes at a random sample of riparian sites in Placer County and throughout the Sacramento Valley. Task 2.8 consisted of a field and geographic information systems (GIS) assessment of 47 sites. Task 2.10 consisted of additional, more intensive, data collection (including multiple surveys) at 12 of these sites.

Our analyses of these data focused on the relationships typically serving as the basis for setbacks and indicator-based assessments. Some FAMs base their measures of terrestrial habitat functions on the presence of selected taxa (e.g., bird species) that are presumed to indicate habitat suitability for other taxonomic groups. However, most FAMs are based on a combination of site attributes that are predicted to influence habitat area or quality for most species. The widths of riparian setbacks that are intended to conserve habitat functions are based on the relationships between species presence and the area of habitat types and the potential influence of adjacent land uses. Therefore, we examined criteria for assessments and setbacks by comparing the relationships among the species richness of taxonomic groups and their relationships to measured site attributes. Our general hypotheses were:

1. The number of riparian–associated bird species (riparian bird species richness) is positively associated with the species richness of other vertebrates and of invertebrates (i.e., bird species richness is a valid indicator of overall biodiversity);

For all taxonomic groups:

2. Species richness increases with the width of riparian vegetation;

3. Species richness increases with the cover of woody plants (i.e., trees and shrubs) in the riparian vegetation;
4. Species richness increases with the total area of riparian vegetation in a plot and its surrounding landscape;
5. Species richness increases with the proportion of surrounding land area in natural vegetation; and
6. Species richness is negatively associated with the proportion of developed and agricultural land uses in the surrounding landscape.

For our analysis of birds and butterflies, we included only riparian-associated species, which are presumably more responsive to riparian site attributes than other species that may use a range of habitat types, including riparian. We considered riparian-associated birds and butterflies to be those species that in the Sacramento Valley and adjacent foothills are primarily associated with riparian vegetation (Tables 1 and 2). These lists were determined prior to field work on the basis of relevant literature (Pool and Gill 1990–2003) and our professional judgments; the draft bird list also was revised in response to comments by PRBO ornithologists.

Methods

In addition to the following summary, our sample design and data collection methods were described (in more detail) in the sample design memo and field protocols provided to the Placer County Planning Department in 2003 (Appendix A).

Sample Design

Study site locations (plots) were a stratified random sample of existing PRBO point count survey sites along tributary streams in the Sacramento Valley where information regarding riparian corridor width was available and site access was know to be possible. Additional plots in Placer County were also included in cases where permission to enter private lands had been granted. Although not along a tributary stream, PRBO sites along the Cosumnes River were included in the list of potential plots because this area was considered reasonably similar to many of the included tributary streams in its riparian attributes. This set of potential plots was stratified on the basis of riparian corridor width. Data from PRBO records, digital aerial photographs, and a draft land cover map of Placer County were used to assign each plot to a width category. These categories were: 0–20 meters (m), >20–40 m, >40–60 m, >60–100 m, and >100–200 m. From each width category, ten plots were randomly selected, each at least 500 m from all other selected plots.

Sample size was limited by access to suitable survey sites and the available budget. On this basis, we estimated the maximum sample size would be 50 plots.

The power associated with this sample was sufficient to identify correlations between variables (power > 0.8 for even small values of *r*); however, it was of more marginal size for the application of multivariate analyses, such as multiple regression analyses. Statistical power is the ability of a statistical test to the identify relationships and differences that exist (i.e., it is the ability to reject the null hypothesis of no difference or association when it is incorrect).

From those plots located on Placer County, public or Nature Conservancy properties, 12 were randomly selected as more intensive data collection plots, each at least 5 kilometers (km) apart. At these plots, in addition to the data collection taking place at other plots, the following surveys were performed: small mammal trapping; placement of cover boards that might be used as artificial shelters for amphibians and reptiles; and multiple surveys for butterflies and vertebrate groups. These data collection plots were included in the study, despite their cost, to allow the value of this additional data to be evaluated. However, for these additional data, the small sample size substantially limits the analyses that can be applied, the power of these analyses, and thus the conclusions that can be drawn from the data. For example, the power associated with data from these 12 plots was only sufficient for the identification of strong correlations (i.e., *r* values > 0.7), and important combinations of site attributes had few or no replicates.

During our study, access or scheduling difficulties prevented most data collection at three plots, and seven plots were not surveyed for odonates. Thus, sample sizes were reduced to $n = 47$ and to $n = 43$ for odonates.

Field Data Collection

A 1-ha plot (100 m by 100 m) was located along the bank of the stream channel at all of the study sites. These plots contained riparian vegetation, and most also contained other natural, or agricultural or developed land-cover. For each plot, information on site attributes was recorded and area searches were conducted for vertebrate and invertebrate species.

The site attributes recorded in the field included: onsite infrastructure, disturbance, vegetation, surrounding land use, and evidence of overbank flows (Appendix A). Presence of infrastructure (roads, bridges, levees, or bank protection) and evidence of disturbance (grazing, trash dumping, cutting of trees and shrubs, etc.) were recorded for the riparian and non-riparian portions of the plot and for lands within 250 m of the plot. (The riparian portion of the plot was defined as the zone covered by riparian trees and shrubs.) For the riparian vegetation within the plot, we recorded its width along the stream (at the plot's edges and center), cover of the tree, shrub and herb layers, and the cover of each woody species, as well as snag density, and predominant tree size class. We also recorded the length and continuity of riparian vegetation along the stream corridor, and estimated the percent of adjacent land (within 250 m) that was in natural vegetation, agricultural, and developed land cover types.

Standardized, time-constrained area searches (Ralph et al. 1993) were conducted separately for vertebrate and invertebrate species (see Appendix A for protocols). For vertebrates, searches of the entire plot were conducted for one hour (between 6 and 11 a.m.) on one day between mid-May and mid-June, 2003. However, at 12 intensive data collection plots we conducted area searches four times at approximately one-week intervals from mid-May to July 1. During the area searches, we recorded all species observed, and species for which scat or tracks were observed, and noted whether the species was observed in the riparian or non-riparian portions of the plot. Woody debris and rocks were not disturbed to avoid degrading habitat. For birds, we also recorded total numbers of individuals and observed behaviors (e.g., territorial displays, carrying food or nesting material, or observation of nests). Observed behaviors (and presence of nests or fledglings) were used to identify potential residents, and the number of potential resident species among riparian-associated birds was included in the analysis. Point counts (Point Reyes Bird Observatory 2003) also were conducted at plots in Placer County because no PRBO point count data existed for those locations.

Each plot was also surveyed twice for butterfly species, once during May 15–30 and again during June 2–14, 2003 and most plots (43 of 47) were surveyed once for odonates (i.e., dragonflies and damselflies) during August 19-29, 2003. These searches were conducted between 9 a.m. and 4 p.m. because of the daily flight activity patterns of these animals. As with the vertebrate area searches, the odonate and first butterfly surveys at each site were one hour long and each observed species was recorded. For butterflies, the number of observed individuals also was recorded. Based on the results of the first butterfly survey and to reduce costs, the second survey at each site was shortened to 50 minutes. (This caused no complications for the testing of our hypotheses because each site received equal survey effort.)

Small mammal live-trapping was also conducted at the 12 intensive data collection sites. Along the length of the plot’s streambank side, 15 Sherman live traps were evenly spaced. An additional 15 traps were placed along a second line 10 m away and parallel to the first trap line. Each trap was baited with peanut butter and rolled oats, and a wad of cotton was placed at the back of each trap for bedding. These traps were set within 2 hours of sunset and checked within 3 hours of sunrise on three consecutive nights between June 10 and July 3, 2003.

At the 12 intensive data collection sites, cover boards also were placed within plots (Fellers and Drost 1994). These cover boards were approximately 0.9-m by 0.6 m pieces of 1.9 centimeters (cm) thick plywood. Along the length of the plot’s streambank side, 10 cover boards were evenly spaced. An additional 10 boards were placed along a second line 10 m away and parallel to the first. These boards were lifted during each area search to determine the presence of amphibians and reptiles.

Geographic Information Systems Data Collection

In addition to site attributes recorded in the field, GIS data layers were used to estimate the area of four land cover types within 250 m, 1 km, and 5 km of each plot center including: riparian vegetation, natural vegetation (including riparian), developed, and agricultural land cover types. For this analysis, we used the best available data for each plot's location in the Sacramento Valley. These land cover data were from the California Department of Fish and Game's Wetland and Riparian GIS Mapping Layers (Ducks Unlimited 1997), Sacramento River riparian vegetation (California Sate University Chico 1998), U.S. Forest Service existing vegetation (U.S. Forest Service 1999–2000), California Department of Water Resources' land use layer (California Department of Water Resources various years), and the Draft Land Cover Map of Western Placer County (Jones & Stokes 2004). The process by which a single coverage was produced from these data sources involved converting each data source from its vector format to a 31 m grid. For tabulating the area of riparian vegetation within 250 m, 1 km and 5 km, cells attributed as riparian in any of the data layers were counted as riparian. Surrounding land use information was calculated from the California Department of Water Resources land use layer. This layer was a composite of counties that were photographed and mapped in different years. The land use categories in this layer were aggregated into three broad categories: natural vegetation, and agricultural and developed lands.

Data Analysis

Our data analysis consisted of summarizing the data sets and testing our six general research hypotheses. In evaluating these hypotheses, we used scatter plots, correlation coefficients, and simple or multiple stepwise regression models (Sokal and Rolf 1994). All statistical analyses were performed with the S-Plus statistical software package (MathSoft, Inc. 1999).

We evaluated our hypotheses with respect to eight species groups: 1) All bird species; 2) Riparian-associated bird species; 3) All mammals; 4) Small mammals; 5) All amphibians and reptiles; 6) All butterflies; 7) Riparian-associated butterflies; and 8) all odonates. For all of these groups (except small mammals), species richness (i.e., number of species) was used as the measure of the habitat provided for that group at an individual site. In other words, species richness was analyzed with respect to the amount, quality and diversity of habitat. Density of trapped individuals was the metric used for small mammals.

Our conclusions were based on the results of these analyses, consideration of the data's limitations (due to methodology and sample size) and a review of applicable scientific literature.

Table 1. Riparian-Associated Birds of Western Placer County

Common Name	Scientific Name
Cooper's Hawk	*Accipiter cooperii*
Red-shouldered Hawk	*Buteo lineatus*
Swainson's Hawk	*Buteo swainsoni*
Black-chinned Hummingbird	*Archilochus alexandri*
Downy Woodpecker	*Picoides pubescens*
Western Wood Pewee	*Contopus sordidulus*
Willow Flycatcher	*Empidonax traillii*
Pacific-slope Flycatcher	*Empidonax difficilis*
Warbling Vireo	*Vireo gilvus*
Tree Swallow	*Tachycineta bicolor*
House Wren	*Troglodytes aedon*
Yellow Warbler	*Dendroica petechia*
Common Yellowthroat	*Geothlypis trichas*
Yellow-breasted Chat	*Icteria virens*
Song Sparrow	*Melospiza melodia*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Blue Grosbeak	*Guiraca caerulea*
American Goldfinch	*Carduelis tristis*

Table 2. Riparian-Associated Butterfly Species

Common Name	Scientific Name
Sara Orange-tip	*Anthocaris sara*
Pipevine Swallowtail	*Battus philenor*
Lorquin's Admiral	*Limentis lorquini*
Mourning Cloak	*Nymphalis antiopa*
Two-tailed Swallowtail	*Papilio multicaudatus*
Western Tiger	*Papilio rutulus*
Umber Skipper	*Paratrytone melane*
Green-veined White	*Pieris napi*
Satyr Comma	*Polygonia satyrus*
Sylvan Hairstreak	*Satyrium sylvinus*
Red Admiral	*Vanessa atalanta*
California Dogface	*Zerene eurydice*

Prior to calculating correlation coefficients or constructing regression models, variables were transformed to improve normality and homogeneity of variances. Percents were arcsine transformed, areas and widths were log transformed, and count data were square root transformed (Sokal and Rolf 1994; Zar 1999). Correlation coefficients were used to evaluate the magnitude and significance of relationships between pairs of variables. (Magnitude is the degree that two variables co-vary, while significance indicates that the correspondence is unlikely to have occurred by chance.) We used these coefficients to evaluate relationships among plot attributes, the different species groups, and between species groups and plot attributes.

Regression models were also used to evaluate the strengths of relationships between plot attributes and the measured species richness of taxonomic groups. A least-squares regression model is the equation for the straight line that best "fits" the data. This is the line that comes as close to passing through the data points as is possible. Unlike correlation coefficients, regression models can be used to quantify the degree to which combinations of readily observed plot attributes could be considered predictors of species richness. The interpretation of each regression model was based on its R^2 value and the partitioning of the sum of squares among variables (i.e., the sum of the squared deviations from the mean). In developing a regression model for each species group, species richness was the dependent variable and 1–4 plot attributes were the independent variables considered. Only variables significantly correlated with a group's species richness ($\alpha = 0.05$) were considered for initial inclusion in a model. When two or three variables representing an adjacent land cover type (e.g., percent natural vegetation within 250 m and within 1 km) were correlated with a species group, only the variable with the highest correlation was included. This was done to avoid including strongly correlated independent variables that could complicate interpretation of the results. Stepwise multiple regression analysis was used to define the final regression model if two or more variables were included in the initial model.

In interpreting the statistical significance of relationships, we adjusted the threshold for significance to account for making multiple statistical comparisons to evaluate one research hypothesis. Traditionally, a P value < 0.05 is used to indicate statistical significance. However, as more statistical tests are performed the odds of encountering a low P value due to chance increase. Therefore, we adjusted the P value considered significant through a Bonferroni correction (Sokal and Rolf 1994) so that the probability of erroneously considering a result significant (i.e., when the pattern was due to random variation in the absence of an actual relationship) was < 0.05 for the entire set of statistical tests addressing one of our general research hypotheses. Each of our hypotheses was addressed by 8–24 statistical comparisons, therefore, P values of 0.0063–0.0021, respectively, were considered the thresholds for significant relationships. Since Bonferroni adjustments are sometimes criticized as being overly strict, especially when the consequences of false negatives (β error) are worse that the consequences of false positives (α error), P values above these thresholds but < 0.01 were considered suggestive of possible relationships among the variables.

Although more than one dependent variable (i.e., richness based on one or four site surveys) was analyzed for several of the species groups, not every variable was used to evaluate any one of our research hypotheses. Because few mammal, amphibian or reptile species were detected over the course of a single area search, we only used richness based on four visits for these species groups.

Results

Most of the plots were situated in moderately to substantially altered riparian corridors, including Placer County plots (Table 3, Appendix B). At only 2 of the 47 plots (4%) was riparian vegetation > 100 m wide. Only 6 of the 47 plots (13%) were completely surrounded by natural vegetation and did not contain any infrastructure. In contrast, for 16 plots (34%) agricultural or developed land accounted for over half the adjacent land cover within 250 m, and 44% contained a road or other infrastructure (Table 3). On average, agricultural or developed lands accounted for 43% of the lands within 1 km of the plots (Table 4).

The riparian vegetation within most survey plots also was somewhat altered in its composition and structure. In general, the tree layer was discontinuous and averaged only 46% cover, and the shrub layer also had a comparable cover (Table 4). Willows and Fremont's cottonwood accounted for just 16% of tree cover, and oak species (primarily interior live oak and valley oak) accounted for 26%. Non-native species occupied little of this tree layer (5%), but Northern California black walnut, a species absent from this region 150 years ago, accounted for an additional 4% of total tree cover. In the shrub layer, the non-native Himalayan blackberry accounted for over half of all shrub cover.

Table 3. Presence of Infrastructure and Evidence of Disturbance in Plots[1]

Attribute	Total *N = 47*	Placer County Plots *N = 23*	Plots Outside Placer Co. *N = 24*
Presence of Bank Protection	4	5	4
Levee or Berm	15	4	25
Road in Plot	46	50	42
Stream Incision	61	55	67
Evidence of Overbank Flow	57	41	71
Evidence of Grazing	21	17	25
Evidence of Tree Cutting	0	0	0
Evidence of Brush Clearing	4	4	4
Evidence of Dumping	21	22	21
Evidence of Other Disturbance	13	17	8

Note:
[1] Values in table are percents.

Table 4. Summary of Plot Vegetation and Surrounding Land Cover[1,2]

Attribute	Total Mean (Range)	Placer County Mean (Range)	Outside Placer County Mean (Range)
Riparian Width (meters [m])[3]	37 (2–200)	25 (2–80)	49 (10–200)
Tree Cover (%)	46 (3–95)	48 (3–95)	44 (10–80)
Shrub Cover (%)	41 (1–90)	38 (1–80)	44 (2–90)
Herb Cover (%)	76 (10–100)	84 (10–98)	69 (10–100)
Riparian Vegetation 250 m (hectares [ha])	5 (0–13)	4 (0–9)	6 (0–13)
Riparian Vegetation 1 kilometers (km) (ha)	36 (0–147)	26 (0–74)	45 (0–147)
Riparian Vegetation 5 km (ha)	365 (33–1,001)	261 (132–554)	465 (33–1,001)
Natural Vegetation 250 m (%)	66 (0–100)	69 (0–100)	64 (18–100)
Natural Vegetation 1 km (%)	58 (6–100)	59 (6–23)	56 (10–100)
Natural Vegetation 5 km (%)	60 (8–100)	63 (25–91)	57 (8–100)
Agricultural Land Cover 250 m (%)	20 (0–81)	10 (0–68)	28 (0–81)
Agricultural Land Cover 1 km (%)	29 (0–87)	18 (0–62)	39 (0–87)
Agricultural Land Cover 5 km (%)	26 (0–88)	15 (0–49)	37 (0–88)
Developed Land Cover 250 m (%)	14 (0–100)	20 (0–100)	8 (0–81)
Developed Land Cover 1 km (%)	14 (0–49)	23 (0–94)	5 (0–26)
Developed Land Cover 5 km (%)	14 (0–73)	22 (0–73)	5 (0–26)

Notes:

1 *N* = 47.

2 Riparian width, and tree, shrub and herb covers are ground-based measurements and land-cover variables are geographic information systems (GIS)–based.

3 SD = standard deviation.

4 Sample was stratified by anticipated riparian width, thus these width statistics are not representative of riparian vegetation width in the Sacramento Valley (e.g., the Valley's mean width is narrower).

The six relatively unaltered plots (i.e., no infrastructure in plot and no agricultural or developed land within 250 m) varied widely in their vegetation structure and species composition. The width of their riparian vegetation ranged from 8 m to 200 m. In the tree layer, the cover of oak species ranged from 0 to 78% and the cover of willows and cottonwood from 0 to 30%. The shrub layer varied from over 80% Himalayan blackberry (*Rubus discolor*) to a sparse cover (5%) of shrubs and tree saplings. With the exception of tree cover, these relatively unaltered plots bracketed the range of conditions observed in other plots that were more altered. None of the unaltered plots had low tree covers (range 40-80%); in contrast, 49% of other plots had tree covers below 40%.

There were relatively few strong relationships among site attributes (Table 5); however, suggestive positive relationships existed among riparian vegetation width with tree and shrub cover. Otherwise, most negative relationships were between variables that are inversely related by definition (e.g., land cover proportion) and most positive relationships were between variables that represented the same land cover category at different scales (e.g., developed land within 250 m, 1 km and 5 km).

Data collected at the 12 intensive data collection sites varied in their value for assessing riparian habitats. At these sties, almost no amphibians or reptiles were found beneath the cover boards. The results of the small mammal trapping varied substantially among sites (Table 6, Appendix B), and they did not correspond closely to the results of surveys for other taxonomic groups. However, conducting area searches for vertebrates on multiple dates resulted in more complete species lists (i.e., greater species richness) compared to lists based on a single area search, and species richness estimates based on multiple surveys had stronger relationships to site attributes than single survey estimates (Tables 7 and 8, Figure 1).

Three of the relatively unaltered plots were intensive data collection sites, and at these plots, results were similar to those at more altered sites, with the exception of small mammal density and the number of potential nesting bird species. The total number of small mammals trapped at the unaltered sites averaged 32 ± 4 (mean ± standard error) versus 3 ± 1 at the more altered plots. The number of potential nesting bird species at the unaltered sites averaged 3.3 ± 0.3 versus 1.1 ± 0.4 at the other plots (Table 6).

Table 5. Correlations Among Plot Attributes[1,2]

	Riparian Width	Tree Cover	Shrub Cover	Riparian (250 m)	Riparian (1 km)	Riparian (5 km)	Natural (250 m)	Natural (1 km)	Natural (5 km)	Agricultural (250 m)	Agricultural (1 km)	Agricultural (5 km)	Developed (250 m)	Developed (1 km)	Developed (5 km)
Riparian Width	1.00	**0.48**	**0.44**	0.30	-0.01	-0.04	0.04	**0.43**	0.01	0.13	-0.28	-0.17	-0.14	-0.16	0.19
Tree Cover	–	1.00	**0.44**	0.03	0.03	-0.04	-0.07	-0.06	-0.05	0.05	-0.01	-0.06	0.05	0.13	0.18
Shrub Cover	–	–	1.00	-0.18	-0.12	-0.04	-0.13	-0.01	0.16	-0.07	-0.08	-0.02	0.26	0.17	-0.10
Riparian (250 m)	–	–	–	1.00	**0.91**	**0.63**	-0.21	-0.21	-0.04	0.24	0.28	0.15	0.01	-0.03	-0.08
Riparian (1 km)	–	–	–	–	1.00	**0.73**	-0.29	-0.26	-0.06	0.28	0.27	0.13	0.06	0.04	-0.05
Riparian (5 km)	–	–	–	–	–	1.00	-0.29	-0.27	-0.03	0.28	0.20	0.02	0.07	0.13	0.04
Natural (250 m)	–	–	–	–	–	–	1.00	**0.84**	**0.59**	**-0.55**	**-0.44**	**-0.37**	**-0.59**	**-0.49**	-0.20
Natural (1 km)	–	–	–	–	–	–	–	1.00	**0.74**	**-0.53**	**-0.65**	**-0.55**	**-0.44**	**-0.42**	-0.11
Natural (5 km)	–	–	–	–	–	–	–	–	1.00	**-0.48**	**-0.54**	**-0.61**	-0.21	-0.23	-0.30
Agricultural (250 m)	–	–	–	–	–	–	–	–	–	1.00	**0.83**	**0.68**	**-0.34**	**-0.35**	-0.30
Agricultural (1 km)	–	–	–	–	–	–	–	–	–	–	1.00	**0.88**	-0.28	**-0.40**	**-0.49**
Agricultural (5 km)	–	–	–	–	–	–	–	–	–	–	–	1.00	-0.22	**-0.38**	**-0.57**
Developed (250 m)	–	–	–	–	–	–	–	–	–	–	–	–	1.00	**0.89**	**0.49**
Developed (1 km)	–	–	–	–	–	–	–	–	–	–	–	–	–	1.00	**0.71**
Developed (5 km)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.00

Notes:

m = meters, km = kilometers

1 $n = 47$

2 Numbers in table are correlation coefficients (r) between the site attributes, and those with a p value <0.01 are in bold; P values are based on the r value and number of observations (n), and in this analysis values <0.01 are considered to indicate suggestive relationships among variables. Variables were transformed as described in methods prior to calculation of correlation coefficients.

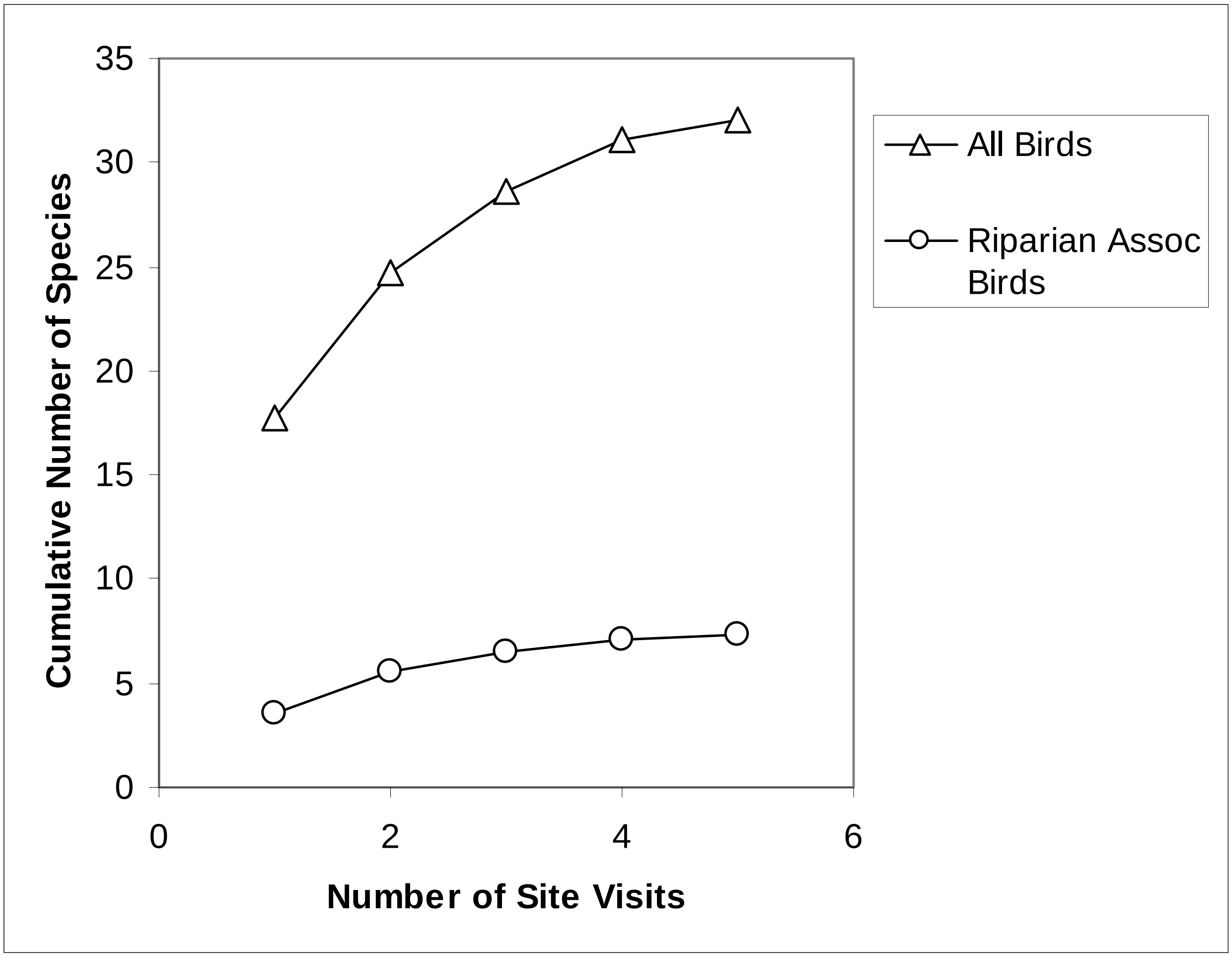


Figure 1. Cumulative Number of Bird Species Observed During Area Searches

Table 6. Summary of Species Observations[1,2]

Species Group	*N*	Mean	SD	Range
Butterfly Spp (2 Surveys)	47	8.6	2.6	4–14
Riparian-Associated Butterfly Spp (2 Surveys)	47	2.4	1.2	0–5
Odonate Spp (1 Survey)	43	7.8	2.3	3–12
Bird Spp (1 Survey)	47	16.3	4.3	6–29
Riparian-Associated Bird Spp (1 Survey)	47	4.3	2.0	0–8
Riparian Associated Bird Spp (4 Surveys)	12	7.4	2.0	4–14
Small Mammal Density (3 nights trapping)[3]	10	12	15	0–39
Mammal Spp (1 Survey)	47	1.5	1.3	0–4
Mammal Spp (4 Surveys)	12	2.3	1.2	1–4
Amphibian and Reptile Spp (1 Survey)	47	0.8	1.0	0–3
Amphibian and Reptile Spp (4 Surveys)	12	2.7	1.1	1–4

Notes:

[1] Numbers in table are numbers of species observed per plot, except for small mammal density, which is number of individuals per plot.

[2] Abbreviations: N = number of plots, SD = standard deviation, Spp = species.

[3] Number of individuals per unit area (not number of species).

With the exception of relationships between surrounding land cover types and vertebrate species richness, our results did not strongly support our initial research hypotheses. In most cases, the species richness of riparian-associated birds was not strongly related to the species richness of other animal groups, though two relationships were significant (Table 7, Figure 2). There was a significant relationship between riparian-associated birds and mammal species (4 surveys, $df = 10$, $r = 0.71$, $p < 0.05$ and < 0.01 without Bonferroni adjustment). There were also significant relationships between potentially resident riparian-associated birds and amphibians and reptiles (based on 4 surveys, $df = 10$, $r = 0.76$, $p < 0.01$, without Bonferroni adjustment $p < 0.005$).

Species richness did not increase significantly with the width of riparian vegetation for any animal group. Correlation coefficients between species groups and riparian width generally were all below 0.40 (Table 8). Results for riparian-associated birds (based on 1 survey) suggested a positive relationship with riparian width ($df = 45$, $r = 0.35$, $p < 0.07$ and < 0.009 without Bonferroni adjustment; Table 8, Figure 3). This could be considered evidence of a significant relationship. However, for the multiple survey plots, there was not a relationship between the number of riparian-associated bird species and riparian width ($df = 10$, $r = 0.16$, $p > 0.25$ without Bonferroni adjustment; Figure 3). Similarly, the species richness of other animal groups had no significant or suggestive positive relationships with riparian width. Riparian width was initially included in four regression models (Table 9), although, in one case (riparian-associated birds based on 1 survey), width was not included in the final model.

In general, species richness of the animal groups had no significant or suggestive relationships with the area of riparian vegetation, and only weak relationships with tree or shrub cover (Table 8). However, riparian-associated birds,, based on 1 survey, had a highly significant relationship with tree cover ($df = 45$, $r = 0.49$, $p < 0.004$ and $p < 0.0005$ without Bonferroni adjustment; Figure 3). The species richness of other animal groups did not have significant or suggestive relationships with riparian woody plant cover.

For the plots receiving multiple surveys, significant correlations existed between vertebrate species richness and surrounding land cover. For these data, nearly half the correlation coefficients were between 0.50 and 0.87, and 14 of these were significant or suggestive (Table 8).

The species richness of riparian-associated birds was significantly related to the extent of surrounding natural and agricultural lands. Riparian-associated birds (based on 4 surveys) had suggestive relationships with percent of surrounding land in natural vegetation within 250 m, 1 km and 5 km ($r = 0.67$–0.73, $p < 0.22$-0.09 and $p < 0.009$–0.004 without Bonferroni adjustment). If the count of riparian-associated bird species at each plot were restricted to just potential nesting species, the relationships to adjacent land cover were stronger. For this set of observed riparian-associated bird species, correlations with agricultural and natural land cover within 250 m had coefficients of -0.84 and 0.82, respectively, indicating strong relationships with surrounding land cover (p values < 0.01-0.02 and < 0.0005 without Bonferroni adjustment). This group also had suggestive relationships to natural and agricultural land cover at other scales (Table 8). Furthermore, no breeding or nesting behaviors were observed for riparian-associated birds at the sites with higher portions of the surrounding area in agricultural land at 250 m (Figure 4).

Similarly, in the multiple survey data sets, the species richness of amphibians, reptiles and mammals was related to surrounding land-cover within 250 m to 5 km. Species richness of amphibians and reptiles had a significant relationship with the portion of the surrounding area in agricultural land for the areas within 1 km and 5 km ($r = -0.78$ and -0.85, respectively, $p < 0.04$ and 0.01, respectively, and p values < 0.002 and < 0.0005 without Bonferroni adjustment). Similarly, species richness of mammals had a significant negative correlation with developed land cover within 250 m and 1 km ($r = -0.82$ and -0.87, respectively, $p < 0.02$ and 0.01, and p values < 0.001 and 0.0005 without Bonferroni adjustment), and suggestive correlations to natural land cover (Table 8).

Although some of the relationships between vertebrate species richness and surrounding land cover were considered just suggestive in the context of this analysis's numerous hypothesis tests, each of these relationships accounted for a moderate portion of the variability among the multiple survey plots in the species richness of a vertebrate group.

Combinations of variables did not produce substantially stronger models for predicting species richness than did single variables. For the individual

Table 7. Correlations Among Species Groups[1,2]

	All Bird Spp	R-A Bird Spp (1 Survey)	R-A Bird Spp (4 Surveys)	R-A, PN Bird Spp (4 Surveys)	Mammal Spp (1 Survey)	Mammal Spp (4 Surveys)	Small Mammal Density	Amphibian & Reptile Spp (1 Survey)	Amphibian & Reptile Spp (4 Surveys)	All Butterfly Spp	R-A Butterfly Spp	Odonate Spp
All Bird Spp (*n* = 47)	1.00	–	–	–	–	–	–	–	–	–	–	–
R-A Bird Spp 1 survey (*n* = 47)	**0.75**[3]	1.00	–	–	–	–	–	–	–	–	–	–
R-A Bird Spp 4 Surveys (*n* = 12)	**0.50**	**0.78**[3]	1.00	–	–	–	–	–	–	–	–	–
R-A, PN Bird Spp 4 Surveys (*n* = 12)	0.53	0.20	0.54	1.00	–	–	–	–	–	–	–	–
Mammal Spp 1 survey (*n* = 47)	0.18	0.06	0.12	0.16	1.00	–	–	–	–	–	–	–
Mammal Spp 4 surveys (*n* = 12)	0.11	0.43	**0.71**[3]	0.32	0.42	1.00	–	–	–	–	–	–
Small Mammal Density (*n* = 10)	0.12	-0.12	0.00	0.58	0.16	0.25	1.00	–	–	–	–	–
Amphibian & Reptile Spp 1 Survey (*n* = 47)	0.32	0.18	0.28	**0.87**[3]	0.29	0.31	-0.13	1.00	–	–	–	–
Amphibian & Reptile Spp 4 Surveys (*n* = 12)	0.20	0.06	0.29	**0.76**[3]	-0.04	-0.13	0.59	**0.62**	1.00	–	–	–
All Butterfly Spp 2 Surveys (*n* = 47)	0.10	0.14	-0.08	-0.06	-0.09	-0.09	-0.26	0.13	-0.02	1.00	–	–
R-A Butterfly Spp 2 Surveys (*n* = 47)	0.14	0.33	-0.30	-0.23	-0.10	-0.15	-0.07	-0.01	0.43	**0.57**	1.00	-
Odonate Spp 1 Survey (*n* = 43)	0.19	-0.01	**0.58**	0.52	-0.24	0.09	-0.07	0.23	0.45	0.04	-0.13	1.00

Notes:

1 Numbers in table are correlation coefficients (*r*) between the number of species observed and the value of a site attribute, and those with a *p* value <0.01 are in bold; *P* values are based on the *r* value and number of observations (*n*), and in this analysis values <0.01 are considered to indicate suggestive or significant relationships among variables. Variables were transformed as described in methods prior to calculation of correlation coefficients.

2 Abbreviations are: R-A = riparian-associated, PN = potentially nesting, and Spp = Species.

3 Correlation significant at $\propto = 0.05$ with Bonferroni adjustment.

Table 8. Correlations of Species Observations with Plot Attributes[1]

Species Group[2]	Riparian Width	Tree Cover	Shrub Cover	Riparian (250 m)	Riparian (1 km)	Riparian (5 km)	Natural (250 m)	Natural (1 km)	Natural (5 km)	Agricultural (250 m)	Agricultural (1 km)	Agricultural (5 km)	Developed (250 m)	Developed (1 km)	Developed (5 km)
All Bird Spp (*n* = 47)	0.18	0.27	0.12	-0.05	-0.08	-0.03	0.18	0.15	0.05	-0.03	-0.16	-0.18	-0.22	-0.07	0.13
R-A Bird Spp 1 survey (*n* = 47)	**0.35**	**0.49**[3]	0.18	0.07	0.07	0.16	0.21	0.20	0.20	0.03	-0.10	-0.14	-0.28	-0.16	-0.04
R-A Bird Spp 4 Surveys (*n* = 12)	0.16	0.33	0.04	-0.15	-0.33	-0.40	**0.67**	**0.70**	**0.73**	-0.38	-0.31	-0.23	-0.43	-0.61	-0.50
R-A, PN Bird Spp 4 Surveys (*n* = 12)	-0.01	-0.07	0.34	-0.45	-0.46	-0.52	**0.82**[3]	**0.73**	0.52	**-0.84**[3]	**-0.70**	**-0.67**	-0.15	-0.29	-0.05
Mammal Spp 1 survey (*n* = 47)	0.14	-0.17	0.06	0.32	**0.36**	0.21	0.01	-0.11	-0.10	0.19	0.28	0.27	-0.19	-0.20	-0.21
Mammal Spp 4 surveys (*n* = 12)	0.32	0.33	0.20	-0.12	-0.18	-0.36	**0.70**	**0.76**	0.42	0.05	-0.01	0.12	**-0.82**[3]	**-0.87**[3]	-0.47
Trapped Mammal Density (*n* = 10)	0.39	0.02	0.50	-0.31	-0.37	-0.42	0.62	0.67	0.29	-0.40	-0.47	-0.29	-0.29	-0.30	-0.03
Amphibian & Reptile Spp 1 Survey (*n* = 47)	-0.24	-0.19	-0.17	0.27	0.25	0.30	0.21	0.22	0.28	-0.04	-0.14	-0.25	-0.20	-0.12	-0.04
Amphibian & Reptile Spp 4 Surveys (*n* = 12)	-0.18	-0.19	0.62	-0.44	-0.45	-0.34	0.02	0.35	0.46	-0.46	**-0.78**[3]	**-0.85**[3]	0.37	0.31	0.38
All Butterfly Spp 2 surveys (*n* = 47)	**-0.39**	0.07	-0.11	0.16	0.16	0.05	0.33	0.20	0.25	-0.18	-0.15	-0.29	-0.22	-0.10	0.07
R-A Butterfly Spp 2 surveys (*n* = 47)	0.05	0.30	0.23	0.15	0.18	0.07	0.10	0.13	0.27	-0.06	-0.10	-0.17	-0.08	-0.04	-0.06
Odonate Spp 1 survey (*n* = 43)	-0.24	-0.11	-0.08	-0.19	-0.27	-0.25	0.03	0.04	-0.02	0.11	0.13	0.06	-0.15	-0.26	-0.15

Notes:

1 Numbers in table are correlation coefficients (r) between the number of species observed and the value of a site attribute, and those with a p value <0.01 are in bold; P values are based on the r value and number of observations (n), and in this analysis values <0.01 are considered to indicate suggestive or significant relationships among variables. Variables were transformed as described in methods prior to calculation of correlation coefficients.

2 Abbreviations are: R-A = riparian-associated, PN = potentially nesting, and Spp = Species.

3 Correlation significant at ∝ = 0.05 with Bonferroni adjustment.

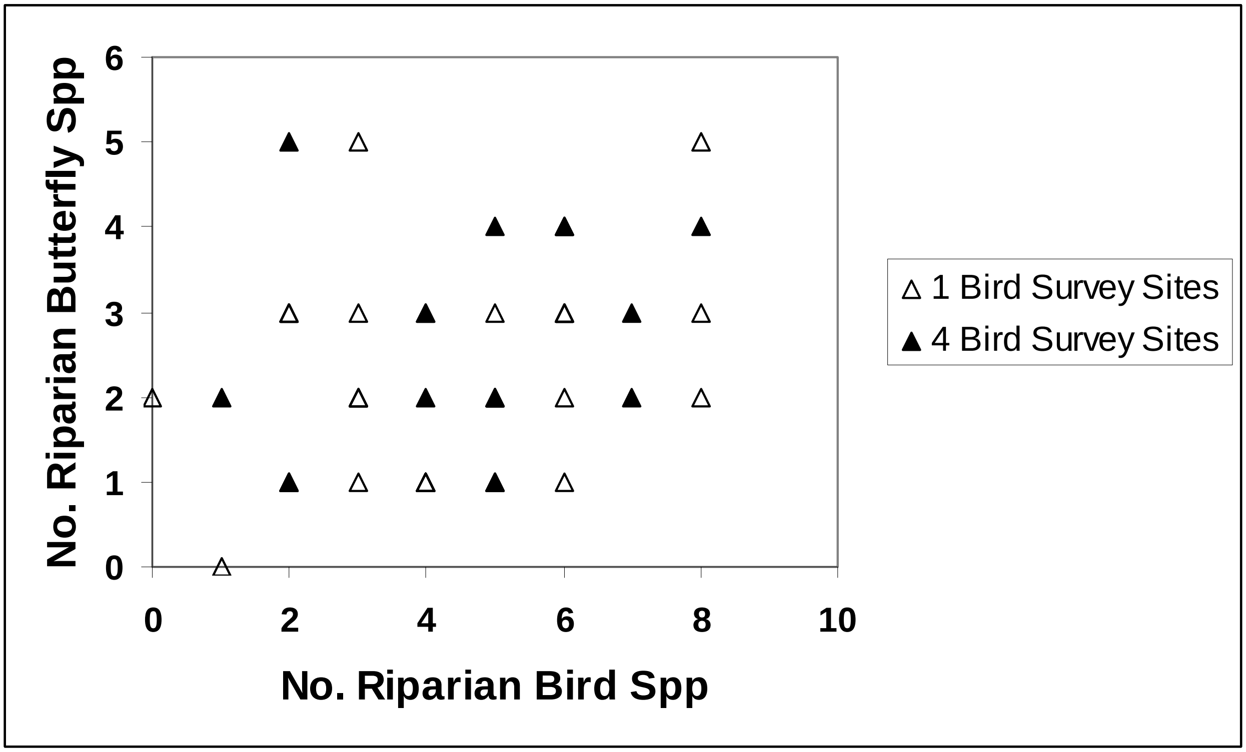
Table 9. Contribution of Variables to Multiple Regression Models for Relationship of Species Groups to Site Attributes[1]

Species Group[2]	R^2	Total SS	Sum of Squares (SS) Associated with Variables												
			Riparian Width	Tree Cover	Shrub Cover	Riparian (1 km)	Riparian (5 km)	Natural (250 m)	Natural (1 km)	Natural (5 km)	Agricultural (250 m)	Agricultural (1 km)	Agricultural (5 km)	Developed (250 m)	Developed (1 km)
All Bird Spp (*n* = 47, p = 0.0426)	0.09	13.59 (100%)	–	1.20 (9%)	–	–	–	–	–	–	–	–	–	–	–
R-A Bird Spp 1 Survey (*n* = 47, p = 0.0003)	0.31	11.63 (100%)	0 (0%)	2.89 (25%)	–	–	–	–	–	–	–	–	–	0.71 (6%)	–
R-A Bird Spp 4 Survey (*n* = 12, p = 0.0115)	0.63	1.53 (100%)	–	–	–	–	–	–	–	0.67 (44%)	–	–	–	–	0.29 (19%)
R-A, PN Bird Spp (*n* = 12, p < 0.0001)	0.90	3.41 (100%)	–	–	–	–	0 (0%)	2.63 (77%)	–	–	0.44 (13%)	–	–	–	–
Mammal Spp 1 Survey (*n* = 47, p = 0.0132)	0.13	9.99 (100%)	–	–	–	1.29 (13%)	–	–	–	–	–	0 (0%)	–	–	–
Mammal Spp 4 Survey (*n* = 12, p = .0175)	0.45	1.37 (100%)	–	–	–	–	–	–	0 (0%)	–	–	–	–	–	0.61 (45%)
Sm. Mammal Density (*n* = 10, p = 0.0641)	0.37	40.16 (100%)	–	–	–	–	–	–	14.68 (37%)	–	–	–	–	–	–
A & R Spp 1 Survey (n = 47, p = 0.0505)	0.13	7.74 (100%)	0.62 (8%)	–	–	–	0 (0%)	–	–	0.36 (5%)	0 (0%)	–	–	–	–
A & R Spp 4 Survey (*n* = 12, p = 0.0017)	0.64	1.01 (100%)	–	–	0 (0%)	–	–	–	–	–	–	–	0.65 (64%)	–	–
All Butterfly Spp (*n* = 47, p = 0.0006)	0.29	8.75 (100%)	1.43 (16%)	–	–	–	–	1.08 (12%)	–	–	–	–	0 (0%)	–	–
R-A Butterfly Spp (*n* = 47, p = 0.0453)	0.09	6.49 (100%)	–	–	–	–	–	–	–	0.56 (9%)	–	–	–	–	–
Odonate Spp (*n* = 43, p = 0.0405)	0.19	7.47 (100%)	0.44 (6%)	–	–	0.44 (6%)	–	–	–	–	–	–	–	–	0.54 (7%)

Notes:

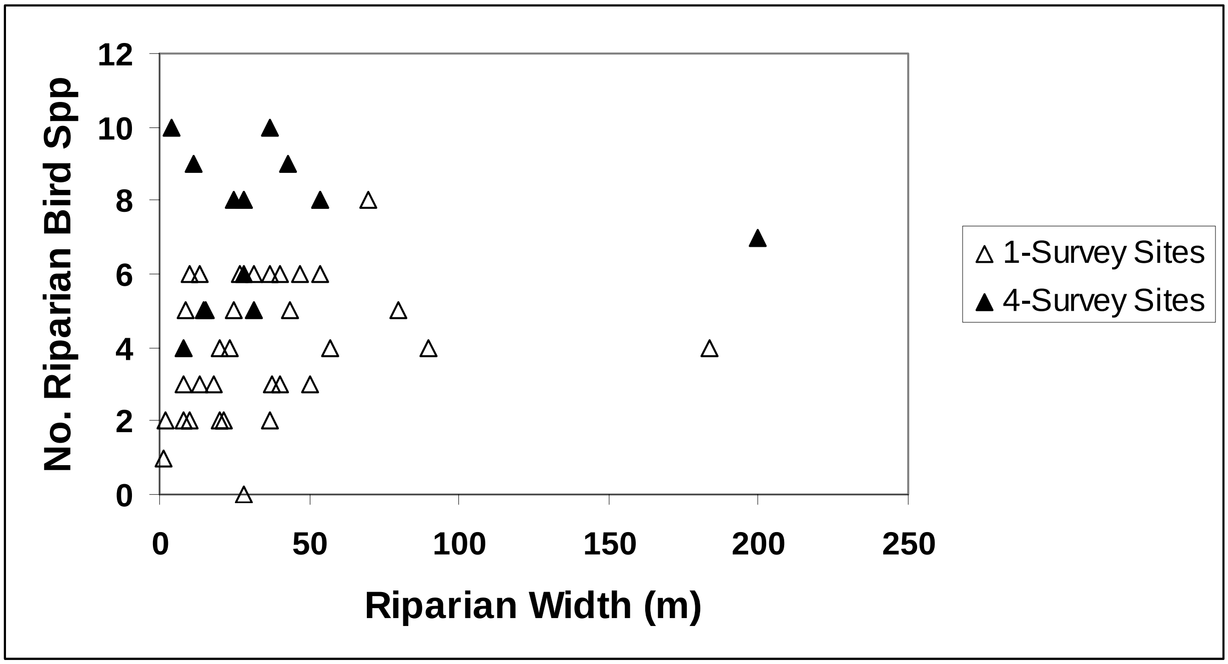
[1] Variables were transformed as described in methods prior to calculation of regression models.

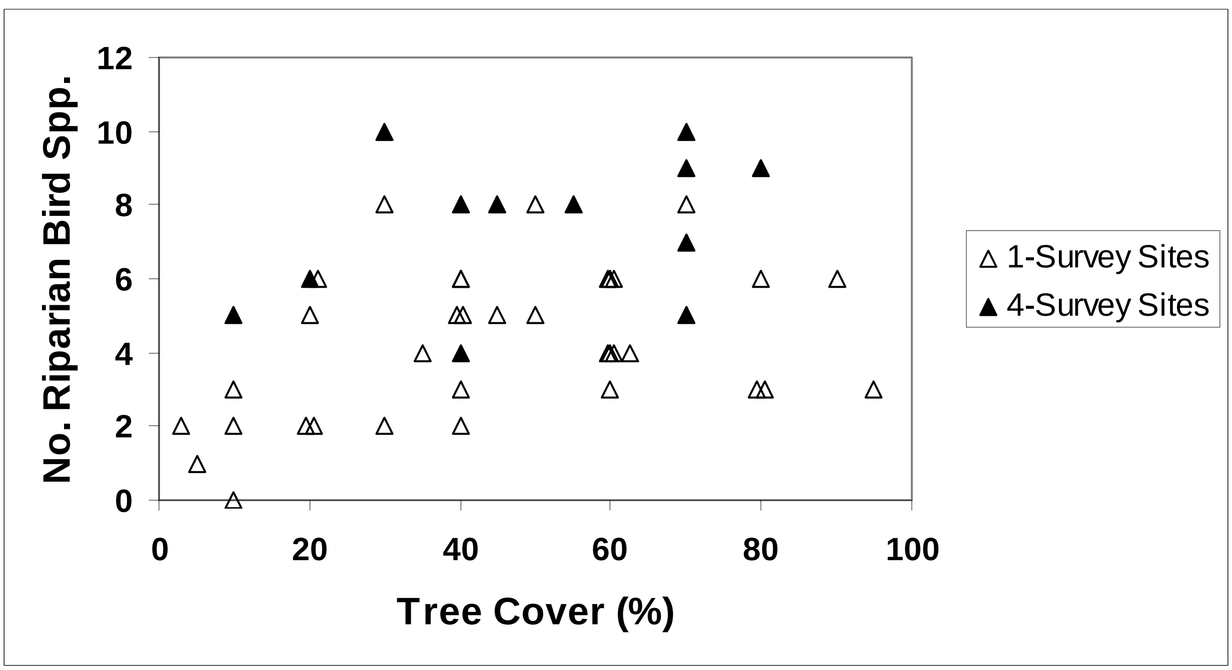
[2] Abbreviations are: R-A = riparian-associated, PN = potentially nesting, A & R = Amphibian and Reptile, and Spp = Species.



Note:
[1] *n* = 47

Figure 2. Correspondence of Species Richness among Riparian-Associated Birds and Riparian-Associated Butterflies[1]





Note:
[1] *n* = 47

Figure 3. Relationship of Species Richness of Riparian-Associated Birds and Selected Site Attributes[1]

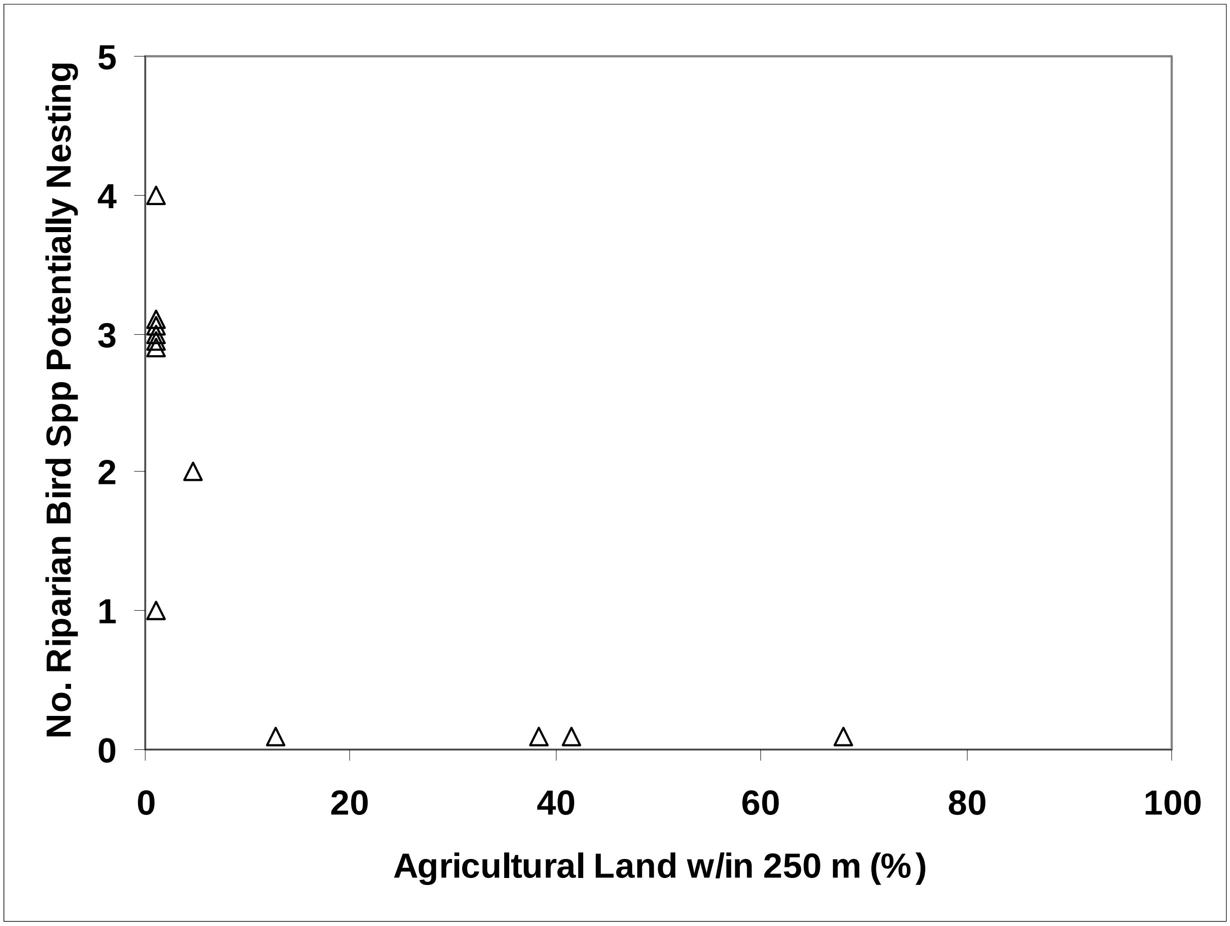


Figure 4. Relationship Between Number of Riparian-Associated Bird Species Potentially Nesting at a Site and Adjacent Agricultural Land

taxonomic groups, simple linear and stepwise multiple regression produced models with p values between < 0.0001 and 0.064 (Table 9). For all vertebrate species, the models consisted of one or two variables and almost all independent variables represented surrounding land cover. Only three of these models had R^2 values > 0.5: riparian-associated birds (4-surveys), riparian-associated birds potentially nesting (4 surveys) and amphibians and reptiles (4 surveys). The amphibian and reptile model was based only on the percent of area within 5 km that was in agricultural land. The model for potential nesting riparian-associated birds was based on two land cover variables, but just one of these (natural vegetation within 250 m) accounted for 86 % of the variability explained by the model. For riparian-associated birds (all observed during 4 surveys regardless of behavior), the regression model based on two variables was substantially stronger than for any one variable ($R^2 = 0.63$).

Discussion

The results of this study must be interpreted cautiously due to limitations of the study's overall sample size, attributes of available sites and chosen methodologies. Nonetheless, the results have implications for assessment methodologies, development of a FAM, and for riparian setbacks. These implications are discussed in the following sections.

Implications for Biological Site Surveys to Assess Riparian Biodiversity

These results indicated that data from multiple site surveys for vertebrates provide a much stronger basis for assessing a riparian area than data from a single site visit. Not only did data from four site surveys document more species than a single survey of those sites, but the results of single and multiple surveys were not highly correlated with each other. Overall, multiple site surveys provide a much more consistent basis for evaluating the habitat value of riparian sites.

These results also indicate that non-destructive area searches for mammals, amphibians, and reptiles were not an effective survey technique, even with the placement of cover boards. Overall, few species were observed during these area searches, usually less than one amphibian or reptile species during a single survey. Though few amphibian or reptile species may have been present, the results still demonstrate that a single non-destructive area search is not an effective means of inventorying the mammal, amphibian, and reptile species using a site. In most plots surveyed multiple times, additional species were observed, indicating that during a single survey most species using a site were not detected. No amphibian or reptiles species was observed beneath any of the 240 cover boards set out and checked 4–6 times during this study. However, cover boards may be more effective is used during late winter-early spring rainy season, when conditions beneath them would be more favorable for amphibians and reptiles, and possibly if constructed using thicker materials that provided better insulation from higher temperatures.

Implications for a FAM

Overall, our results indicate that, for the smaller streams and rivers of the Sacramento Valley, developing a single model that *precisely* quantifies *overall* habitat functions on the basis of readily measured site attributes is not possible, particularly on the basis of available information. However, the results do show that some readily measured site attributes are related to the species richness of particular taxonomic groups. For particular species, guilds, or taxonomic groups, this indicates that useful assessment criteria based on readily measured site attributes could be developed as shown in the examples in Table 10.

In this study, the species richness of different groups (particularly between vertebrates and invertebrates) was not related, and species groups often differed in their relationships to plot attributes. In general, species differ in their biology and thus their habitat requirements, particularly across major taxonomic groups such as vascular plants, butterflies and mammals. Therefore, numerous specific site attributes such as disturbance history, vegetation structure, and presence of host plants, refugia, or rock outcrops affect these species groups differently, and many of these attributes are themselves only loosely related to the landscape variables that are most useful for a cost-effective FAM (e.g., surrounding land use, area and width of riparian vegetation). Thus, models, or assessment criteria, that focus on individual species or guilds will likely provide more useful assessments of a site's habitat value than a model that attempts to quantify habitat value for all species combined (Stein et al. 2000; Smith 2000; Bryce et al. 2002).

In this study, the vertebrate groups had relationships to site attributes, and thus for particular vertebrate taxonomic groups, guilds or species effective assessment criteria based on readily measured site attributes probably could be developed through additional studies. In data from multiple site visits, which were most effective at documenting species' presence, relationships between species richness and surrounding land use were important.

Unfortunately, due to their sample size and the types of data collected, these data sets have substantial limitations. They consist of only twelve plots, and they contain few or no replicates of some important types of sites (e.g., wide riparian corridors in urban areas). They also were scattered over a wide and heterogeneous geographic area. Furthermore, they contain little information on abundance and no information on rates of growth, survival or reproduction. Thus, while these data indicate the importance of surrounding land uses, and other readily measured site attributes, additional studies with larger sample sizes, and collecting other types of ecological data (e.g., density, survival or reproduction), are necessary for defining assessment criteria that precisely quantify habitat values under different combinations of site attributes. We consider such studies important next steps for the conservation planning process.

Table 10. Evaluation of Habitat Functions by Representative Functional Assessment Methods

Assessment	Terrestrial Habitat Functions	Variables used to Assess Habitat Function	Tested[1]
Spatial Wetland Assessment for Management and Planning, SWAMP (Sutter 2001)	Terrestrial wildlife habitat	Area of interior habitat Heterogeneity of vegetation Presence of surface water	No
Assessment of riverine wetlands in Washington State (Hruby et al. 1999)	Bird, Mammal, Amphibian Habitat	Density and condition of snags Presence of special features Evidence of disturbance on adjacent land Interspersion of vegetation types	No
Hydrogeomorphic assessment (HGM) of riverine floodplains in the Northern Rocky Mountains (Hauer et al. 2002)	Characteristic vertebrate habitats	Cover in herb and shrub layers and of native species Tree density Inundation frequency Connectivity of vegetation types	No
Suggested revisions to BLM's Proper Functioning Condition assessment procedure (Stevens et al. 2002)	Fish and wildlife habitat	Canopy connectivity Vegetation patch density Fluvial landform diversity	No
Southern California Riparian Model (Stein et al. 2000)[2]	Condition units[2]	Cover of native plants Percent invasive species Vegetation structural diversity Riparian vegetation continuity Adjacent land cover	No
Bird Integrity Index (Bryce et al. 2002)	Overall riparian integrity including overall habitat integrity	Number or proportion of bird species (or of individuals) in selected guilds	Yes
Tidal freshwater wetlands along Hudson River (Findley et al. 2002)	Breeding Bird, Muskrat and Waterfowl Habitat[3]	Cover or stem density of plant species Soil texture	No[3]
Wetland Assessment, WEA, for San Francisco Bay Region (Breaux and Martindale 2003)	Wildlife Utilization Rating	Guidelines for professional judgment	No
San Diego Creek Assessment (Smith 2000)	Riparian habitat integrity	Native riparian vegetation area Riparian corridor continuity Adjacent land use/land cover	No
Indicator Value Assessment, IVA (Hruby et al. 1995)	General waterfowl, General wildlife	Numerous (>60 indicators)	No
Wetland Habitat Assessment Technique, HAT (Cable et al. 1989)	Habitat quality	Bird species presence Wetland area	No

Notes:

1 Tested by comparison to direct measurements of species presence, abundance or demography. For assessments that used direct measures of animal species group (e.g., birds) presence to assess overall site condition or habitat quality, testing requires comparison to direct measurements of other animal groups.

2 Habitat function incorporated into overall rating (i.e., condition units), and only habitat variables are listed in this table.

3 This study also included fish and aquatic invertebrate habitat functions that were tested by comparison to direct measurements.

As one of these next steps, PRBO's point count dataset provides an excellent opportunity to evaluate relationships between the abundance (i.e., number of individuals) of riparian-associated bird species and riparian width and surrounding land cover. Point count surveys are designed to record the relative abundance of individual species, and PRBO has conducted these surveys for over a thousand locations over multiple years. Their analysis would require the calculation of GIS-based landscape metrics (comparable to the surrounding land cover variables used in this study) and an aerial photo-based interpretation of riparian width. Nonetheless, the analysis of existing PRBO point count data would be a cost-effective means to rigorously analyze relationships between the abundance of species and riparian width and surrounding land cover.

Because of the differences among species groups, and the limitations of current knowledge, a FAM for western Placer County that calculates a single score for a riparian area's habitat functions should be considered only a very general indicator of the overall provision of habitat functions. Such a score should be based on a limited number of variables, preferably just one or two variables that are broadly related to most habitat values and the processes sustaining them (e.g., proportion of surroundings in natural vegetation, hydraulic connectivity). This would limit inaccuracies caused by the operations and coefficients selected to combine variables, and would maintain a mechanistic basis for the assessment.

Implications for Riparian Setbacks

Though width of riparian vegetation was not strongly related to species richness, as measured by these measures, this result should not be interpreted as evidence that the width of a riparian setback is not an important consideration for habitat conservation. This study's sample size, particularly for the multiple survey sites, was small and spread over a large geographic area. Thus, it is likely that only effects of larger magnitude would have been identified and locally important effects would not have been detected without a larger sample size. Width may be important for some species, but these species might be few in number or absent from our data sets. Because all but a few plots represented landscapes substantially altered by human use, most species sensitive to these alterations (including a reduction in riparian width) may no longer be present at any of the study sites. For example, Western Yellow-billed Cuckoo is such a species (Greco et al. 2002) and was not detected at any of the 47 plots during our surveys.

Riparian setbacks would include both riparian and other natural vegetation, and their width would be directly related to the extent of adjacent natural, agricultural and developed land cover; and the proportions of surrounding land-cover types were related to species richness in this study's results. Furthermore, other studies, have shown relationships between the width of riparian vegetation and the presence of riparian-associated animals (Greco et al. 2002).

This study's results indicated that there are important relationships between adjacent land use within 250 m–5 km and the biodiversity of riparian corridors in the Sacramento Valley. These relationships are consistent with studies of riparian habitat elsewhere (Findlay and Houlahan 1996; Forman and Alexander 1998; Bryce et al. 2002; Miller et al. 2003; Semlitsch and Bodie 2003) and with our understanding of factors known to affect riparian species in the Sacramento Valley, such as the availability of upland habitats also used by many of these species. Thus, riparian setbacks should consider both the condition and management of riparian vegetation and the buffer between this vegetation and adjacent developed and agricultural lands. Also, the results suggest that riparian setbacks may not be able to prevent all adverse effects of surrounding land uses on riparian biodiversity, and thus that other conservation measures may be necessary as well. These conservations measures will be discussed in the report providing guidance for riparian setbacks.

However, the results of this study are not by themselves a sufficient basis for recommending setback or buffer widths. For this reason, our report providing guidance for riparian setbacks (Task 5 of the Riparian Ecosystem Assessment), will consider these results together with other available data, and a review of the scientific literature regarding the use of adjacent land by riparian species and the influences of adjacent land uses on those species.

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Appendix A
RAP Forms

Protocol for Description of Riparian Ecosystem Assessment Plots

INTRODUCTION

These protocols provide a guide to assist the survey team in obtaining the required information as efficiently as possible. Minor modifications to these protocols may be necessary depending on access constraints and time available to complete the surveys. All RAP surveys will be done at riparian sites that PRBO has surveyed previously and at Placer County riparian sites where permission is granted from the landowners. Assume that all land is private and do not trespass if you are uncertain about the land ownership. Also, avoid stopping in front of residences and generally be discrete about displaying maps, cameras, and clipboards. Be careful about pulling off roads and do not violate any traffic laws to sample a riparian plot or observe a species. Always leave gates exactly as you found them. Also, for Placer County sites, it is important that all requirements specified by the landowner are followed. These requirements are attached to the directions, map, and photograph for each plot in Placer County.

PREFIELD TASKS

Prior to performing the field surveys, please review the following materials that will be provided in the field packets:

- Road maps and maps of the individual streams showing roads and access points so that survey routes can be planned and surveyed efficiently;
- PRBO field notes giving directions to individual sites, vegetation descriptions, and bird species lists for survey plots;
- Aerial photographs of individual creeks and rivers (as available).

Plan your route to the riparian sites and consult the field checklist to ensure that you have gathered all the necessary equipment to complete the site description and any other RAP survey work you will be conducting (an equipment and contact list is included as Attachment 1).

LOCATING THE PLOT

Proceed to the pre-determined coordinates for the plot center point. Centered on this point, the plot edge ds 100 m along the stream bank edge of the riparian zone (50 m up and 50 m down stream), and then extends 100 m inland (away from the stream bank). In most cases, the actual center of the located plot will differ from the pre-determined coordinates used to locate the plot. Therefore, once the plot boundaries have been determined, the actual coordinates for the plot center point are determined and recorded on the data form (see below).

RIPARIAN RAP DATA FORM

The intent of the RAP data form is to facilitate the collection of field data at selected plots rapidly and accurately. At each plot record the required data in each of the following data fields:

Location

- Provide the River/Creek name and number the plot (e.g., Deer Creek #1).
- Provide the survey date(s) and names of surveyors.
- Use the GPS unit to determine coordinates for the center point of each plot; and record the lat/long on the form. (Elevation will be determined from USGS topographic map and recorded on the form afterwards.)

- Take photographs facing North, East, South, and West, and of a representative view of the riparian corridor. Record their numbers on the form.

Environmental Description

This provides a brief description of the general slope exposure and steepness of the riparian plot that is sampled. If slope varies within the plot, record the slope across the plot as a whole (i.e., from the stream-side to the inland side of the plot).

ADJACENT LAND USES AND IMPACTS

Developed Non-industrial Land Uses **-** Record the extent of adjacent residential and suburban development with 250 m of the center of the survey plot both by noting the percentage of area covered by these land uses and recording the number of development units (du) observed, including barns and other out buildings.

Agricultural Land Uses – Record agricultural development within 250 m of the center of the plot both by recording the percentage of area covered by agricultural land uses, and by noting the general agricultural type(s) observed.

Industrial Land Uses – Record industrial development within 250 m of the center of the plot both by recording the percentage of area covered by industrial land uses and by noting the general type of industrial uses observed.

Impact Types – In the table provided, for both the riparian and non-riparian portions of the plot, record the presence of the following impacts: brush removal, tree cutting, roadedness, grazing, and trash dumping. The adjacent area extends 250 m from the center of the plot. If the adjacent area is not in natural vegetation, do not record brush cutting, tree cutting, or trash dumping as occurring in the adjacent area. In documenting roadedness, all roads, including dirt and gravel, and other impervious or heavily compacted surfaces are included in this type of impact. For the other category, specify the impact type.

Channel Condition – Indicate whether bank protection has been used in the channel adjacent to the plot, and whether the channel shows evidence of incision. Note whether levees are present at or near the site that may confine the extent of potential riparian habitat areas, and indicate whether there is evidence of overland flow on the plot. Also, indicate the distance to the nearest road (paved, gravel or dirt).

ADDITIONAL COMMENTS

Add any additional comments on site access or interpretation, including management of creeks (e.g., recent revegetation or clearing, channelization, herbicide use, etc.). Also, if aerial photos are available and vegetation has changed since the photograph was taken, this should be noted. Add these additional comments, as necessary, at the bottom of the form.

VEGETATION DESCRIPTION

- In the box provided, enter the Habitat Type(s) using the appropriate Placer County WHR codes (Attachment 2).
- Estimated width of the riparian vegetation. Estimate the width of the riparian stand using a range finder at the center and both ends of each plot and record these widths on the data form.
- Record the surrounding habitat types using the Placer County WHR codes.
- Estimate the total size of the stand from aerial photos and ground inspection, and record its approximate length and continuity, as indicated on the form.
- Record estimates of total absolute cover (expressed as a percentage) of the tree, shrub, and herbaceous layers, and estimate the total extent of unvegetated ground (i.e., bare ground).

- Estimate the total snag density as high (> 20 per hectare), moderate (10-19 ha^{-1}), low (< 10 ha^{-1}), or absent.
- Check the appropriate habitat stage category for that represents the size of the trees dominating the tree layer.
- In the table provided, based on a visual estimate, record the scientific name and check the appropriate category for absolute cover for each woody species in the tree layer (> 3 m), and in the shrub layer (0.5-3 m).

POST-FIELD CHECKLIST

- Check over the field data forms and make sure everything is completed and clear.
- Surveyors should review each other's completed forms for completeness and accuracy in the field.
- From topographic maps, add plot elevations to the RAP data form.
- Photocopy all your field forms. File the copes in the file cabinet in Ted's office and the originals in the Placer Legacy office.
- Download the digital photographs into the P drive folder and rename with the site, point number and orientation (e.g., Thomes 7-1 N, Thomes 7-1 E etc.).
- Download the site coordinates from the GPS into the P drive folder.
- Cross off, date, and initial your completed site on the master list to ensure that field work is not repeated.
- Report progress to the project manager and obtain additional survey packages.

RIPARIAN ECOSYSTEM ASSESSMENT SURVEY PLOTS
RAPID BIOLOGICAL ASSESSMENT FIELD FORM
(J&S--Revised May 7, 2003)

LOCATION

RIVER/CREEK NAME ____ Plot #____________

Surveyors ____**Date** ___________________

Photo #s: ____

GPS Coordinates: Lat. ____°_____'_______" **Long.** _____°_____'_______" **Elevation** (ft/m) ________________
(WGS 84)

ENVIRONMENTAL DESCRIPTION

General Slope Exposure: ___________

General Slope Steepness: 0 degrees_____ 1-5 degrees _____ 5-25 degrees _____ > 25 degrees

ADJACENT LAND USES AND IMPACTS:

Developed Non-industrial Land Uses ___% of adjacent area**;**
Number of development units per acre: < 1du/ha ___1-2 du/ha _____ > 2 du/ha
Agricultural Land Uses: ___% of adjacent area; Types**:** _____**Orchard** _____ **Vineyard** _____ **Row Crops** ____ **Grain** ___ **Pasture** ___ **Other**
Industrial Land Uses: ___% of adjacent area; Types: **___Gravel Mining ____Other**

Comments ____

Impact Types in Riparian Plot and Adjacent Areas (within 250 m)

IMPACT TYPE	Riparian portion of plot	Non-riparian part of plot	Adjacent Area
Brush removal[1]			
Tree-cutting[1]			
Roadedness[2]			
Grazing[1,3]			
Trash dumping[1]			
Other – specify			

[1] – For adjacent areas not in natural vegetation, do not consider this impact type to be present.
[2] – As roads, include dirt, gravel and paved roads, and other paved surfaces.
[3] – Evidence of grazing includes cows, cow excrement, and tracks.

Bank Protection (e.g. riprap): __% of plot length Channel Incised? Yes No (circle one)

Levee (circle one): [None along stream] [In plot] [Between plot & channel] [Plot between channel & levee]

Evidence of overland flow within plot? Yes No (circle one)

Nearest road : In Plot: Yes No (circle one) If No Road in Plot: Nearest road within ___meters of plot center point.

ADDITIONAL COMMENTS

____

____

____

____

____

VEGETATION DESCRIPTION

Habitat Type (CWHR)	Stand Width (Plot Edge)	Stand Width (Plot Center)	Stand Width (Plot Edge)	Surrounding Habitat Types

Estimated size of total stand: ___< 0.5 ha ___ >0.5-1 ha ___>1-5 ha ___>5-10 ha ___ >10-25 ha ____ >25 ha

Stand Length and Continuity: > 1 km, continuous_____ > 1 km, not continuous _____ 0.5-1 km, continuous _____ 0.5-1 km , not continuous _____ < 0.5 km, continuous ______ <0.5 km, not continuous _____

Total Cover (absolute): Tree Layer: __% Shrub Layer: ___% Herbaceous Layer: __% Bare:___%

Snag Density: High (> 20/ha)_____ **Moderate** (< 20 to 10/ha) _____ **Low** (< 10/ha) _____ **Absent ______**

Predominant Tree Size Class (refer to WHR Habitat Stages for visual examples of each)

Size Class (circle one)	**1**	**2**	**3**	**4**	**5**	**6**
Stage	Seedling	Sapling	Pole	Small	Medium-Large	Multi-storied
DBH	< 1"	1"-6"	6"-11"	11"-24"	>24"	Size 5 over 4 or 3

Woody Plant Absolute Cover in Riparian Portion of Plots

(Check 1 category for each species present)

Species	0-1 %	>1-5 %	>5-25%	>25-50%	>50-75%	>75-95%	>95%
Tree layer (> 3 m)							
Shrub layer (< 3 m)							

Attachment 1. Riparian Assessment Field Equipment

Equipment List

Road maps, area maps, and aerial photographs (as available).
Compass
Clipboard
Rangefinder
Thermometer
Digital Camera
GPS
Cell phone
Fine Sharpies, pencils
J&S equipment bag
Cover boards (if 1st visit to a site where amphibian & reptile data will be collected)

Data Forms

Plot Description Fomr RAP Data Form and Attachments 1, 2, 3
PRBO Area Search Form
Amphibian and Reptile Search Form
Mammal Area Search Form
PRBO Pont Count Form
Small Mammal Trapping data Collection Form
Continuation Pages

Reference Package
RAP Protocols (Plot Description, Area Search and Small Mammal trapping)
Attachment 1. Field Equipment
Attachment 2. CWHR Land Cover and Habitat Types and Codes
Attachment 3. Key to Woody Plants of Central Valley Riparian Zones
Attachment 4. Beaufort Wind Scale
Road map(s)
USGS Quad map

Contacts List

Becky N.	916.752.0973
Ted	530.274.7232
Eric	530.292.0100
Brad	916.752.0923
Margaret	916.752.0941
Kate	916.752.0930
John S.	916.752.0899
Bud	916.752.0938
Jen H.	916.752.0985
Doug	916.835.3197

Placer Wildlife Habitat Relationship Classification
Placer Legacy Phase 1 Area - Land Cover & Habitat Types
2-20-03

Aquatic – Open Water
WL Lacustrine (Lakes/Reservoirs) (generally these features are greater than 1 acre in size)
WR Riverine (Rivers and Creeks) (only mapped if large enough to be mapped accurately on the photographs)

Barren
BR Barren (Cliffs, rock outcrops)
BD Disturbed Lands (Landfills, Graded lands-Non agricultural)

Herbaceous
HA Annual Grassland
HP Pasture - Irrigated
HW Fresh Emergent Wetland
VP Vernal Pool (individual vernal pool >0.5 acre in size) (only mapped if not included in previous mapping and not within a complex)
VC Vernal Pool Complex
- VCh—(High) vernal pool density >7%
- VCm—(Medium) vernal pool density 4-7%
- VCl—(Low) vernal pool density <3%

HS Seasonal Wetland

Shrub
SC Foothill Chaparral

Forested
FR Riparian
FH Foothill Hardwood - includes where signatures are distinguishable:
- FHV Valley Oak Woodland
- FHB Blue Oak Woodland
- FHL Interior Live Oak Woodland

FS Oak Woodland-Savanna (low density oak woodland/savanna mix where density is <= 5 'large' trees per acre)
FOP Oak-Foothill Pine
FP Ponderosa Pine
FE Eucalyptus

Agricultural
AR Rice
AC Row Crops
AA Alfalfa
AP Pasture
AV Vineyards
AO Orchards
AU Unidentified Croplands (including plowed, idle)

Urban

US Urban/Suburban (>1 unit / acre)

UR Rural-residential (0.1 – 1.0 unit / acre) (less than 70% canopy cover of large trees)

URF Rural-residential Forested (0.1-1.0 unit/acre plus 70-90% canopy cover of large trees)

UP Urban Parks (includes isolated city parks: playgrounds, grass fields, etc)

UG Golf Courses

UT Urban riparian (includes internal riparian areas such as greenbelts, most often surrounded by residential/urban development)

UF Urban woodland (includes city parks with predominate woodland type vegetation and windbreaks with mostly non-native trees)

UW Urban wetland (includes vernal pools, seasonal wetlands, and emergent marshes surrounded by urban uses)

Small-Patch Ecosystems

XW Springs and Seeps

XP Stock Ponds (less than 1 acre)

XL Landscape and Golf Course Ponds (less than 1 acre)

Special Geologic Formations and Soils

XG Gabbrodiorite Soils

XS Serpentine Soils

MR Mehrten Formation Soils

BIRD AREA SEARCH PROTOCOL

INTRODUCTION

These protocols provide a guide to assist the survey team in obtaining the required information as efficiently as possible. Minor modifications to these protocols may be necessary depending on access constraints and time available to complete the surveys. All RAP surveys will be done at riparian sites that PRBO has surveyed previously and at Placer County riparian sites where permission is granted from the landowners. Assume that all land is private and do not trespass if you are uncertain about the land ownership. Also, avoid stopping in front of residences and generally be discrete about displaying maps, cameras, and clipboards. Be careful about pulling off roads and do not violate any traffic laws to sample a riparian plot or observe a species. Always leave gates exactly as you found them. Also, for Placer County sites, it is important that all requirements specified by the landowner are followed. These requirements are attached to the directions, map, and photograph for each plot in Placer County.

PREFIELD TASKS

Prior to performing the field surveys, please review the following materials that will be provided in the field packets:

- Road maps and maps of the individual streams showing roads and access points so that survey routes can be planned and surveyed efficiently;
- PRBO field notes giving directions to individual sites, vegetation descriptions, and bird species lists for survey plots;
- Aerial photographs of individual creeks and rivers (as available).

Plan your route to the riparian sites and consult the field checklist to ensure that you have gathered all the necessary equipment to complete the RAP survey work you will be conducting (an equipment and contact list is included as Attachment 1).

LOCATING THE PLOT

Proceed to the coordinates for the center point of the 100 m by 100 m plot. Centered on this point, the plot edge is 100 m along the stream bank edge of the riparian zone (50 m up and 50 m down stream), and then extends 100 m inland (away from the stream bank).

CONDUCTING THE AREA SEARCH

The area search involves conducting a census of the entire1 ha plot (100 m X 100 m) and recording all bird species detected there. Please use the PRBO area search form to record data. Each area search plot is covered in approximately 1 hour to provide comparable search time at each plot. Typically, at least 3 plots should be covered in a single morning.

Begin the area search by filling out the observer and census information at the top of the PRBO AREA SEARCH FORM. Complete the weather information, and record the air temperature, % cloud cover (% of sky covered in clouds), and approximate wind speed using the attached Beaufort wind scale.

During the census, carefully record the name of each species seen, heard, or for which tracks or scat was observed. Please use the species' common name (not 4-letter codes) to avoid later confusion. For each individual of each species, record a single letter (S=song, V=visual, C=call), in the order of priority explained in the code key. You should change the data (i.e. from a call to a song) if a higher priority observation later occurs for that individual. Also, record breeding and nesting behavior. Recording other special behaviors (such as food carries, flocking, displaying), is strongly recommended but not required; there are respective columns on the form for these observations, following breeding bird atlas methodology. Other species observed off the plot or flying over may be recorded under Notes and Flyovers or on a separate sheet of paper.

In recording species on the data form, note whether the species was observed in the riparian or non-riparian portions of the plot.

POST-FIELD CHECKLIST

- Check over the field data forms and make sure everything is completed and clear.
- Surveyors should review each other's completed forms for completeness and accuracy in the field.
- Photocopy all your field forms. File the copes in the file cabinet in Ted's office and the originals in the Placer Legacy office.
- Cross off, date, and initial your completed site on the master list to ensure that field work is not repeated.
- Report progress to the project manager and obtain additional survey packages.

Beaufort Wind Scale

Used to guage wind speed using observations of the winds effects on trees and other objects. Often used in monitoring projects because it doesn't require fancy equipment.

Format: Beaufort Number * Wind Speed in Miles/hour(Km/hour) *** Description**

0 *** <1 (<1.6)*****Calm:** Still: Smoke will rise vertically.

1***1-3(1.6-4.8)*** **Light Air:** Rising smoke drifts, weather vane is inactive.

2***4-7(6.4-11.3)*****Light Breeze:** Leaves rustle, can feel wind on your face, weather vane is inactive.

3***8-12(12.9-19.3)*****Gentle Breeze:** Leaves and twigs move around. Light weight flags extend.

4***13-18 (20.9-29.0)*****Moderate Breeze:** Moves thin branches, raises dust and paper.

5***19-24 (30.6-38.6)*****Fresh Breeze:** Moves trees sway.

6***25-31(40.2-50.0) *****Strong Breeze:** Large tree branches move, open wires (such as telegraph wires) begin to "whistle", umbrellas are difficult to keep under control.

7***32-38 (51.5-61.2)*****Moderate Gale:** Large trees begin to sway, noticeably difficult to walk.

8***39-46(62.8-74.0)*****Fresh Gale:** Twigs and small branches are broken from trees, walking into the wind is very difficult.

9***47-54(75.6-86.9)*****Strong Gale:** Slight damage occurs to buildings, shingles are blown off of roofs.

10***55-63 (88.5-101.4)*****Whole Gale:** Large trees are uprooted, building damage is considerable.

11***64-72 (103.0-115.9)*****Storm:** Extensive widespread damage. These typically occur only at sea, and rarely inland.

12***>73 (>115.9)*****Hurricane:** Extreme destruction.

NOTE: The Beaufort number is also referred to as a "Force" number, for example,
"Force 10 Gale".

* To calculate knots, divide miles/hour by 1.15.

PRBO AREA SEARCH FORM

Observer Information	Census Information	
Observers	River/Creek	Plot #
Date	Location (County)	

__________°F or °C (circle one) Temperature   _________% Cloud Cover   _________ mph , knots, or kmph (circle one) Wind Speed

Number of Observers: ______ **Start Time:** _______________ **End Time:** _____________

Species	**Tally of Individuals** (<u>S</u>ong, <u>V</u>isual, <u>C</u>all, one letter per individual)	**Total**	**Behavior** (check if applicable)*								
			Forage.	Flock	Copul.	Displ.	Pair	carry Mater.	carry Food	Nest	Fledge.

*Forag. = foraging, Copl. = copulation, Displ. = courtship or territorial display, Food carry includes fecal sack, Fledg. = fledgling.

Notes and flyovers:____

____

____

____

____

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Be sure you have the following:

- binoculars
- watch which indicates seconds
- at least 2 pens
- field notebook
- sufficient blank data forms
- clipboard
- rubber bands (for holding forms on clipboard)

Depending on the route, census type, and your experience level, you may also need:

- directions and maps
- GPS unit & extra batteries
- cell phone or radio
- range finder
- field guide
- water and snacks

Counts begin approximately 15 minutes after local sunrise and should be completed within 3-4 hours, generally by 10AM.

We recommend 2-3 visits per season (e.g., twice in May and once in June). Visits should be at least 10-15 days apart. Timing of the field season will vary by location, but should cover the local breeding season with as little overlap with migration or dispersal as possible.

When possible, the order in which points are surveyed should vary between visits. Ideally, observers should also vary among visits.

Do not conduct surveys during weather conditions that likely reduce detectability (e.g., high winds or rain). If conditions change for the worse while doing a count, remaining points can be completed <7 days from the first day, but this should be avoided as much as possible.

Approach the point with as little disturbance to the birds as possible, and begin your count as soon as you are oriented and are confident you can estimate distances accurately (less than 1 minute).

PRBO point counts are 5 minutes duration at each point. Record the time the survey begins at each point using the 24-hour clock. If something interferes with your ability to detect birds during the 5-minute count, stop the count until the disturbance has passed and start over. Cross out the interrupted data and note what happened on your form.

Every species detected at a point is recorded, regardless of how far from the observer. Use the standardized banding lab 4-letter abbreviation for species codes (http://www.pwrc.usgs.gov/bbl/manual/bandsize.htm) and follow the naming conventions maintained by the American Ornithologists Union (http://www.aou.org/aou/birdlist.html). For unknown species, record "XXXX." For unknown members of various families, use "XX" plus two letters to signify the family – "XXHU" for unidentified hummingbird, for example. You can follow birds after the completion of a point in order to verify identification. If no birds are detected at a point, write "No birds detected" on your form. We recommend keeping a list of all species detected between points (i.e., not during the 5 minute counts) on the back of your form.

For each individual detected we record the distance to the detection and the behavior that alerted us to the individuals' presence. Also, for each species we record any indications of breeding status. Make every effort to avoid double counting individuals detected at a single point. However, if an individual is known or thought to have been counted at a previous point, make a note of it, but record its presence at the current point anyway. No attracting devices, recordings, or "pishing" should be used.

Distance: All point counts involve recording distance to detections at some level of resolution. Depending on project, we use either 50m fixed-radius counts, or Variable Circular Plots (VCP), in which the distance to each detection is recorded to the nearest 10m (though this distance may vary by project and habitat type – consult project leader). Both methods also specify whether or not detections were beyond 100m.

Note: Fifty m radius counts may not provide sufficient data for calculating population density or trends for some species or habitats where the use of VCP's may improve estimates. We recommend the use of range finders and extensive training for either method, but especially for VCP. VCP data should always be taken in a way that is transferable to 50m format.

The distance recorded is the distance from the point to the first location an individual was observed, regardless of its behavior. If the bird subsequently moves, *do not change the original distance recorded*. If a bird is flying (but not "flying over" – see below), or perched high in a tree, the distance recorded is to the point at which a plumb line would hit the ground if hung from the point at which the bird was first observed. This distance should be measured as

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though a tape were laid across the ground, that is, including any intervening topographic features.

A bird flushed from within 10m of the point when you arrive should be included in the count. Birds that are flushed from farther away should be noted on the back of the form if they are species that didn't occur during the count.

We record the behavioral cue that alerted us to the presence of the individual - generally "S" for song, "V" for visual, or "C" for call ("D" for drumming woodpecker, "H" for humming hummingbird). If a bird sings after it has been detected via a different cue, this is indicated in the data, but the initial detection cue is preserved. Circle the original detection cue ("V" or "C") to note that a bird was singing subsequent to its initial detection, but otherwise, no changes in behavior are noted. Juvenile birds are recorded as "J"s regardless of their behavior, and are not included in most analyses.

Birds that are flying over but not using the habitat on the study area are recorded in the fly-over column. Birds flying below canopy level, flying from one perch to another, or actively foraging on or above the study area are recorded as described in the previous paragraphs.

Breeding status: We record any potential indications of breeding if noted for species at each point as follows:

- CO – copulation
- DI – territorial display.
- DD – distraction display
- FC – food carry
- FL – fledglings
- FS – fecal sac carry
- MC – material carry
- NF – nest found
- PA – pair

Riparian Ecosystem Assessment Mammal Area Search Protocol

INTRODUCTION

These protocols provide a guide to assist the survey team in obtaining the required information as efficiently as possible. Minor modifications to these protocols may be necessary depending on access constraints and time available to complete the surveys. All RAP surveys will be done at riparian sites that PRBO has surveyed previously and at Placer County riparian sites where permission is granted from the landowners. Assume that all land is private and do not trespass if you are uncertain about the land ownership. Also, avoid stopping in front of residences and generally be discrete about displaying maps, cameras, and clipboards. Be careful about pulling off roads and do not violate any traffic laws to sample a riparian plot or observe a species. Always leave gates exactly as you found them. Also, for Placer County sites, it is important that all requirements specified by the landowner are followed. These requirements are attached to the directions, map, and photograph for each plot in Placer County.

PREFIELD TASKS

Prior to performing the field surveys, please review the following materials that will be provided in the field packets:

- Road maps and maps of the individual streams showing roads and access points so that survey routes can be planned and surveyed efficiently;
- PRBO field notes giving directions to individual sites, vegetation descriptions, and bird species lists for survey plots;
- Aerial photographs of individual creeks and rivers (as available).

Plan your route to the riparian sites and consult the field checklist to ensure that you have gathered all the necessary equipment to complete the RAP survey work you will be conducting (an equipment and contact list is included as Attachment 1).

LOCATING THE PLOT

Proceed to the coordinates for the center point of the 100 m by 100 m plot. Centered on this point, the plot edge is 100 m along the stream bank edge of the riparian zone (50 m up and 50 m down stream), and then extends 100 m inland (away from the stream bank).

SEARCHING FOR MAMMALS

Area searches are conducted for approximately 1 hour to ensure comparable search effort on each plot. Begin the area search by entering the observer, date, time and site information at the top of the *Mammal Area Search* form. During the census, carefully record the name of each species seen or heard. Please use the species' common name (not 4-letter codes) to avoid later confusion. The area search involves walking throughout the entire (100 m by 100 m) plot.

POST-FIELD CHECKLIST

- Check over the field data forms and make sure everything is completed and clear.
- Surveyors should review each other's completed forms for completeness and accuracy in the field.

- Photocopy all your field forms. File the copes in the file cabinet in Ted's office and the originals in the Placer Legacy office.
- Cross off, date, and initial your completed site on the master list to ensure that field work is not repeated.
- Report progress to the project manager and obtain additional survey packages.

Mammal Area Search Form

Site: ______________________________________ **Plot**: ______________

Date: ______________ **Start Time**: _______ **Stop Time**: _____

Observer: ________________________________

Temperature: ________ **Cloud Cover**: _________

Species	Visual Observation	Vocalization	Scat	Tracks	Prey Remains	Notes

Additional Comments:

Riparian Ecosystem Assessment Amphibian & Reptile Search Protocol

INTRODUCTION

These protocols provide a guide to assist the survey team in obtaining the required information as efficiently as possible. Minor modifications to these protocols may be necessary depending on access constraints and time available to complete the surveys. All RAP surveys will be done at riparian sites that PRBO has surveyed previously and at Placer County riparian sites where permission is granted from the landowners. Assume that all land is private and do not trespass if you are uncertain about the land ownership. Also, avoid stopping in front of residences and generally be discrete about displaying maps, cameras, and clipboards. Be careful about pulling off roads and do not violate any traffic laws to sample a riparian plot or observe a species. Always leave gates exactly as you found them. Also, for Placer County sites, it is important that all requirements specified by the landowner are followed. These requirements are attached to the directions, map, and photograph for each plot in Placer County.

PREFIELD TASKS

Prior to performing the field surveys, please review the following materials that will be provided in the field packets:

- Road maps and maps of the individual streams showing roads and access points so that survey routes can be planned and surveyed efficiently;
- PRBO field notes giving directions to individual sites, vegetation descriptions, and bird species lists for survey plots;
- Aerial photographs of individual creeks and rivers (as available).

Plan your route to the riparian sites and consult the field checklist to ensure that you have gathered all the necessary equipment to complete the RAP survey work you will be conducting (an equipment and contact list is included as Attachment 1).

Where data on amphibians and reptiles will be collected, cover boards will be placed out during the first visit to the site, and will be checked during the next visit (at least a week later).

LOCATING COVER BOARDS WITHIN THE PLOT

Proceed to the coordinates for the center point of the 100 m by 100 m plot. Centered on this point, the plot edge is 100 m along the stream bank edge of the riparian zone (50 m up and 50 m down stream), and then extends 100 m inland (away from the stream bank). Locate the first 100 m line of cover boards along the length of the stream bank side of the plot. Place 10 cover boards, evenly spaced apart, along this first line. Place an additional 10 cover boards along a second 100 m line 10 m in from the stream bank side of the plot and parallel to the first line of cover boards.

SEARCHING FOR AMPHIBIANS AND REPTILES

Area searches are conducted for approximately 1 hour to ensure comparable search effort on each plot. (If area searches deviate from the 1 hour duration, note this in the “Additional Comments” section of the data form.) Begin the area search by entering the observer, date, time and site information at the top of the *Amphibian and Reptile Data Collection* form. During the census, carefully record the name of each species seen or heard. Please use the species' common name (not 4-letter codes) to avoid later confusion. The area search involves walking throughout the entire (100 m by 100 m) plot and also checking under all cover boards. In checking cover boards, quickly lift each cover board and identify species present. Only handle amphibians and reptiles if you have a DFG permit and you cannot identify them. Most species should be identifiable without handling them. After it has been checked, replace each board in its original position. Please collect all cover boards and remove any flagging after the final plot survey.

POST-FIELD CHECKLIST

- Check over the field data forms and make sure everything is completed and clear.
- Surveyors should review each other's completed forms for completeness and accuracy in the field.
- Photocopy all your field forms. File the copes in the file cabinet in Ted's office and the originals in the Placer Legacy office.
- Cross off, date, and initial your completed site on the master list to ensure that field work is not repeated.
- Report progress to the project manager and obtain additional survey packages.

Amphibian and Reptile Data Collection Form

Site: ______________________________________ **Plot**: ______________

Date: ______________ **Start Time**: _______ **Stop Time**: _____

Observer: _________________________

Temperature: ________ **Cloud Cover**: _________

Species	Visual Observation	Vocalization	Under Cover	Notes

Additional Comments:

Riparian Ecosystem Assessment Butterfly Search Protocol

INTRODUCTION

These protocols provide a guide to assist the survey team in obtaining the required information as efficiently as possible. Minor modifications to these protocols may be necessary depending on access constraints and time available to complete the surveys. All RAP surveys will be done at riparian sites that PRBO has surveyed previously and at Placer County riparian sites where permission is granted from the landowners. Assume that all land is private and do not trespass if you are uncertain about the land ownership. Also, avoid stopping in front of residences and generally be discrete about displaying maps, cameras, and clipboards. Be careful about pulling off roads and do not violate any traffic laws to sample a riparian plot or observe a species. Always leave gates exactly as you found them. Also, for Placer County sites, it is important that all requirements specified by the landowner are followed. These requirements are attached to the directions, map, and photograph for each plot in Placer County.

PREFIELD TASKS

Prior to performing the field surveys, please review the following materials that will be provided in the field packets:

- Road maps and maps of the individual streams showing roads and access points so that survey routes can be planned and surveyed efficiently;
- PRBO field notes giving directions to individual sites, vegetation descriptions, and bird species lists for survey plots;
- Aerial photographs of individual creeks and rivers (as available).

Plan your route to the riparian sites and consult the field checklist to ensure that you have gathered all the necessary equipment to complete the RAP survey work you will be conducting (an equipment and contact list is included as Attachment 1).

Where data on amphibians and reptiles will be collected, cover boards will be placed out during the first visit to the site, and will be checked during the next visit (at least a week later).

SEARCHING FOR BUTERFLIES

All butterfly area searches must take place between 9 AM and 4 PM because of the daily flight patterns of butterflies. Area searches are conducted for approximately 1 hour to ensure comparable search effort on each plot. (If area searches deviate from the 1 hour duration, note why in the “Additional Comments” section of the data form.) Begin the area search by entering the observer and site information at the top of the *Butterfly Area Search* form. The area search involves walking throughout the entire (100 m by 100 m) plot. During the census, carefully record the name of each species seen. Please use the species’ scientific name (not 4-letter codes) to avoid later confusion. Indicate the relative abundance of each species in the *General Abundance* column of the data form using the following scale: Rare (1 individual), Uncommon (2-5 individuals), Common (5-10 individuals), Abundant (> 10 individuals).

POST-FIELD CHECKLIST

- Check over the field data forms and make sure everything is completed and clear.

- Surveyors should review each other’s completed forms for completeness and accuracy in the field.
- Photocopy all your field forms. File the copes in the file cabinet in Ted’s office and the originals in the Placer Legacy office.
- Cross off, date, and initial your completed site on the master list to ensure that field work is not repeated.
- Report progress to the project manager and obtain additional survey packages.

Area Search for Butterfly Species

Site: ______________________________________ **Plot**: ______________

Date: ______________ **Start Time**: ______ **Stop Time**: ____

Observer: _________________________

Notes on Weather: ____

____

Species	In Riparian	Out of Riparian	General Abundance	Notes

Additional Comments:

Riparian Ecosystem Assessment Small Mammal Trapping Protocol

INTRODUCTION

These protocols provide a guide to assist the survey team in obtaining the required information as efficiently as possible. Minor modifications to these protocols may be necessary depending on access constraints and time available to complete the surveys. All RAP surveys will be done at riparian sites that PRBO has surveyed previously and at Placer County riparian sites where permission is granted from the landowners. Assume that all land is private and do not trespass if you are uncertain about the land ownership. Also, avoid stopping in front of residences and generally be discrete about displaying maps, cameras, and clipboards. Be careful about pulling off roads and do not violate any traffic laws to sample a riparian plot or observe a species. Always leave gates exactly as you found them. Also, for Placer County sites, it is important that all requirements specified by the landowner are followed. These requirements are attached to the directions, map, and photograph for each plot in Placer County.

PREFIELD TASKS

Prior to performing the field surveys, please review the following materials that will be provided in the field packets:

- Road maps and maps of the individual streams showing roads and access points so that survey routes can be planned and surveyed efficiently;
- PRBO field notes giving directions to individual sites, vegetation descriptions, and bird species lists for survey plots;
- Aerial photographs of individual creeks and rivers (as available).

Plan your route to the riparian sites and consult the field checklist to ensure that you have gathered all the necessary equipment to complete the RAP survey work you will be conducting (an equipment and contact list is included as Attachment 1).

LOCATING TRAPS WITHIN THE PLOT

Proceed to the coordinates for the center point of the 100 m by 100 m plot. Centered on this point, the plot edge is 100 m along the stream bank edge of the riparian zone (50 m up and 50 m down stream), and then extends 100 m inland (away from the stream bank). Locate the first 100 m line of traps along the length of the stream bank side of the plot. Place 15 traps, evenly spaced apart, along this first line. Place an additional 15 traps along a second 100 m line 10 m in from the stream bank side of the plot and parallel to the first line of traps.

CONDUCTING THE SMALL MAMMAL TRAPPING

Trapping will be conducted for three consecutive nights at each plot All traps will be set within 2 hours of sunset and checked within 3 hours after sunrise the following morning. Each trap will be baited with peanut butter and rolled oats, and a wad of cotton was placed at the back of each trap for bedding.

Each animal captured will be identified to species, and its age, sex, reproductive condition, and general health will be evaluated and noted. The time, location of capture, and general weather and habitat conditions also will be recorded. Photographs will be taken of each study plot and each new species captured. All data will be recorded on standardized Jones & Stokes field forms

(Attached). Each captured animal will be marked with a permanent nontoxic felt pen so it could be identified as a recapture if trapped on subsequent trap-nights. All animals will be released at the site of capture.

All Jones & Stokes biologists conducting the small mammal surveys will wear appropriate protective clothing and respirators during the handling of the animals to avoid potential exposure to Hantivirus. Standard precautionary measures identified in Mills et al. (1995) *Guidelines for Working with Rodents Potentially Infected with Hantivirus* will be observed during this work.

Once tapping has been completed all traps and flagging will be removed from the site.

POST-FIELD CHECKLIST

- Check over the field data forms and make sure everything is completed and clear.
- Surveyors should review each other's completed forms for completeness and accuracy in the field.
- Photocopy all your field forms. File the copes in the file cabinet in Ted's office and the originals in the Placer Legacy office.
- Cross off, date, and initial your completed site on the master list to ensure that field work is not repeated.
- Report progress to the project manager and obtain additional survey packages.

Project: Placer Riparian Ecosystem Assessment

Site:_______________ **Plot:** ___________

Date:_____/_____/03 **Start Survey Time:**___________ **End Survey Time:**___________

Team Members: ____

____

Weather: Temp:______F; **Wind:** _______mph from_______; **Clouds:** __________; **Precip:**________

Other Site Conditions: ____

____

Photos: ____

Trap Survey Results

Time	Site	Location	Cl	Species	Sex	Age	Condition	Recapture?	Marked?	

Trap check-off

Trap #	Trap Line		
	1	2	3
1			
2			
3			
4			
5			
6			
7			
7			
8			
10			
11			
12			
13			
14			
15			
Enter species code for each capture.			
If trap is empty, put "x" in box			

Notes:

Project Manager sign-off:

Draft 19 May, 2003

A KEY TO THE WOODY PLANTS OF RIPARIAN ZONES IN CALIFORNIA"S CENTRAL VALLEY

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1. Plant a large (up to several m high), densely clumped grass, with thick (> 2 cm) woody stems … *Arundo donax* (Giant reed)
1. Plant not a grass … 2
    2. Leaves compound (the thin flat portion of the leaf discontinuous) … 3
        3. Leaves opposite (> 1 leaf attached to stem in same plane) … 4
            4. Leaflets palmately arranged (radiating from a central point), flowers > 1 cm long, fruit with a husk that separates from the large (> 3 cm in diameter) round seed … *Aesculus californica* (California buckeye)
            4. Leaflets pinnately arranged (feather-like, arranged like ribs off a backbone), flowers < 1 cm long and fruits either flat and winged or small (<5 mm across) round and fleshy … 5
                5. Fruits dry and winged (with a thin flat extension), flowers inconspicuous, pith (in center of stem) not particularly large … 6
                    6. Fruit two-parted, each part with a wing; Leaves with 3-7 leaflets; Leaflet margins coarsely toothed … *Acer negundo* (box elder)
                    6. Fruit one-parted with one wing; Leaves with 5-7 leaflets; Leaflet margins smooth or with fine (small) teeth … *Fraxinus latifolia* (Oregon ash)
                5. Fruits fleshy without a wing, pith conspicuously large and spongy, flowers small and white (or cream) but showy in a dense inflorescence (cluster) … 7
                    7. Flowers in a broad flat clusters, Fruits black (sometimes white) with a white waxy coating that causes them to appear blue … *Sambucus mexicana* (Blue elderberry)
                    7. Flowers in rounded to cylindrical clusters, Fruits red, or black, without a waxy covering … *Sambucus racemosa* (Red elderberry)
        3. Leaves alternate (just 1 leaf attached to stem at any perpendicular plane) … 8
            8. Plant a legume (Our woody species in the Central Valley have pea-like flowers in drooping clusters, fruit a dry pod with multiple seeds) … 9
                9. A tree with white flowers, spines at the base of leaves, and a flat pod … *Robinia pseudoacacia* (black locust)
                9. A shrub or small tree with red flowers, no spines, and a pod with four "wings" … *Sesbania punecia*
            8. Plant not a legume … 10
                10. Plant w/ prickles … 11
                    11. Fruits dry, enclosed in a fruit-like fleshy to leathery sac (a rose hip); Leaflets pinnately arranged (feather-like, arranged like ribs off a backbone) … *Rosa californica* (California rose)
                    11. Fruits fleshy, blackberry-like; Leaflets palmately arranged (radiating from a central point) … 12
                        12. Leaves white on underside; Prickles broad-based; Stems often stout and ribbed (ridged); Leaflets 3-5; Flowers/fruits > 10 in each inflorescence (cluster) … *Rubus procerus* (Himilayan blackberry)
                        12. Leaves light green on underside; Prickles slender; Stems round; Leaflets 3; Flowers/fruits 2-15 in an inflorescence … *Rubus ursinus* (California blackberry)
                10. Plant w/o prickles … 13
                    13. Leaflets with a round gland (a thickened dot) near the base, fruit flat, dry with a wing … Ailanthus (Tree-of-Heaven)
                    13. Leaflets without a basal gland, fruit round, fleshy or leathery and without a wing … 14
                        14. Plant a vine or shrub; Leaflets 3-5; Leaflet margins lobed, coarsely toothed or smooth; Fruits small (< 1 cm) … *Toxicodendron diversilobum* (Poison oak)
                        14. Plant a tree, Leaflets 11-19; Leaflet margins sharply toothed but not lobed; Fruits large (> 2.5 cm across) … *Juglans californica* var. *hindsii* (Northern California black walnut)

2. Leaves simple (the thin flat portion of the leaf continuous)
   15. Plant a willow: Fruit a capsule with seeds embedded in cottony fluff; Leaves alternate, deciduous and narrow (ranging from linear (almost not taper) to lance-shaped); Buds covered by a single scale; Bark bitter tasting and astringent with an aspirin-like flavor … 16
      16. Scale covering bud in axil of leaf (where leaf meets stem) has free and overlapping margins (you can see this by pressing down on the tip of the bud and rocking it from side to side); Axillary bud small (< 3 mm), conical and pointed … 17
         17. Leaf dull green on both sides; stipules (a pair of small leafy or dry and papery bracts where the leaf joins the stem) absent; Twigs of the current year tend to be yellow to olive, Plant a tree to 30 m high … *Salix gooddingii* (Gooding's black willow)
         17. Leaf glossy green above and glaucous (waxy white) below; stipules generally present; Current year twigs typically red to yellowish brown; Plant a tree to 14 m … *Salix laevigata* (Red willow)
      16. Scale covering bud in axil has margins fused together so that the scale forms a cap; Axillary bud small to large, with a rounded tip and shape elliptic to conical … 18
         18. Leaves narrow (linear and generally < 1 cm wide) with upper and lower surfaces similar, both covered (thickly or thinly) in silky hairs; Plant a clonal, multi-stemmed shrub to 6 m … *Salix exigua* (Sandbar or Narrow leaf willow)
         18. Leaves broader (elliptic to lance-shaped and generally > 1 cm wide) with upper surfaces shiny green and lower surfaces pale green or glaucous (waxy white), hairs generally restricted to young leaves; Plant a shrub or small tree to 18 m … 19
            19. Petiole (stalk of leaf) with glands at base of blade (these glands appear as small warty, irregular protrusions); Leaves 5-17 cm long, lance-shaped and gradually tapering towards the tip with concave sides (long acuminate)… *Salix lucida* var. *lasiandra*, (Shining willow)
            19. Petiole without glands; Leaves 3-12 cm long, narrowly lance-shaped to elliptic, tapers to tip with convex sides … *Salix lasiolepi*s, (Arroyo willow)
   15. Plant not a willow and the complete set of attributes not as above; Fremont's cottonwood is in the willow family and shares some of the traits described above except that its leaves are broad and triangular to heart-shaped and its buds have > 1 scale; For other species: Fruit not a capsule and seeds not embedded in cottony fluff; Leaves alternate or opposite, deciduous or evergreen and narrow or broad; Buds covered by more than one scale; Bark taste varied but without an aspirin-like flavor;
      20. Plant an oak: Fruit an acorn; Buds clustered near the branch tips; Plant a tree … 21
         21. Leaves with bristles *Quercus wislizenii* (Interior live oak) – However, at higher elevations, if underside of leaf has a pale bluish cast and it covered in powdery dust, the plant could be could be *Quercus chrysolepis* (Canyon live oak)
         21. Leaves w/o bristles … 22
            22. Leaves deeply lobed (often > ½ distance to midrib); Acorn 3-5 cm long; Leaves upper surface with a greenish cast … *Quercus lobata* (Valley oak)
            22. Leaves shallowly lobed (< ½ distance to midrib) or wavy margined; Acorn 2-3.5 cm long; Leaves upper surface often with a bluish cast … *Quercus douglasii* (Blue oak)
      20. Plant not an oak: Fruit not an acorn; Buds generally not clustered near branch tips; Plant a tree, shrub or vine … 23
         23. Plant a woody vine … 24
            24. Plant evergreen, lacking tendrils … *Hedera helix* (Ivy)
            24. Plant deciduous and with tendrils opposite leaves … *Vitis californica* (California wild grape)
         23. Plant a shrub or tree … 25
            25. Plant evergreen … 26
               26. Plant a shrub, often sticky; Flowers in dense clusters (surrounded by bracts so that they almost appear to be a single flower) developing into dry fruits with a tuft of bristles (pappus) at the top … 27
                  27. Leaves up to 15 cm long, narrow with a gradual taper, widest near middle; Leaf stalks (petioles) winged (i.e., having a thin, flat extension running along them) … *Baccharis salicifolia* (mule fat)

27. Leaves up to 5 cm long, broad and strongly tapering to base, often widest above middle; Leaf stalks very short … *Baccharis pilularis* (coyote brush)
26. Plant a shrub or tree, not sticky; Flowers not as above, clearly on separate stalks (pedicels), and fruits fleshy … 28
28. Leaf margin entire (smooth); Fruits 1-3 cm long, green or black when mature … 29
29. Leaves alternate, green on both sides, aromatic … *Umbellularia californica* (California bay laurel)
29. Leaves opposite, green above, silvery below, not particularly aromatic … *Olea europea* (olive)
28. Leaf margin toothed; Fruits about 0.6 cm long, red when mature … *Heteromeles arbutifolia* (toyon)
25. Plant deciduous … 30
30. Leaves opposite or whorled … 31
31. Leaf margins jagged (toothed); Fruit 2-parted, each part with a wing (a thin flat extension), and not splitting open, seeds not hairy … *Acer saccharinum* (Silver maple)
31. Leaf margins smooth; Fruit lacking a wing, seeds with or without a fringe of hairs …
32. Fruits arranged in a dense ball at or near tips of branches, and each fruit composed of two hard, dry pieces; Seeds without a fringe of hairs; Plant a shrub or small tree; Leaves with a dry scale (interpetiolar stipule) between adjacent leaf bases … *Cephalanthus occidentalis* (Button-willow)
32. Fruit a long woody pod; Seeds with fringes of hairs at their ends; Plant a tree; Leaves without scales (stipules) at the base of their stalks … *Catalpa* species (common name also Catalpa)
30. Leaves alternate … 33
33. Leaves small (< 3mm), triangular and close against the stem; Petioles (leaf stalks) absent … *Tamarix parviflora* (Smallflower tamarisk)
33. Leaves larger (> 1 cm), shapes various but not triangular, and spreading away from stem; Petioles present … 34
34. Leaves lobed … 35
35. Leaves 2-5 cm wide and hairless, base of leaf stalk does not completely enclose bud; Plant a shrub … *Ribes aureum* (Golden currant)
35. Leaves 10-20 cm wide and pubescent, base of leaf stalk either encircles stem or completely encloses bud; Plant a large shrub to large tree … 36
36. Leaves and stems exude milky sap when broken; Fruit fleshy; Bark relatively smooth and not flaking … *Ficus carica* (Fig)
36. Leaves and stem do not exude milky sap when broken; Fruit hard and dry with a tuft of hairs, arranged in dense round heads; Bark flakes in thin sheets to reveal smooth pale surface … *Platanus racemosa* (Western sycamore)
34. Leaves toothed but not lobed; Bark varied but not as above; Fruits various but not as above ... 37
37. Leaves triangular to heart-shaped; Petiole (leaf stalk) flattened near leaf blade; Fruit a capsule opening to release small seeds in cottony fluff; Plant a large tree to 30 m … *Populus fremontii* (Fremont's cottonwood)
37. Leaves elliptic to lance-shaped; petiole more or less round, not conspicuously flattened; Fruit not a capsule and seeds not embedded in cottony fluff; Plant a small to large tree … 38
38. Plant with two types of shoots – long and short shoots, the short shoots with closely spaced leaves and also bearing the flowers and fruits; Leaves with lateral veins that fork and bend before reaching the leaf margin (the edge of the leaf) … *Prunus* species (the stone fruits including cherries and almond)

38. Plant with one type of shoot, though these may vary in orientation and spacing of leaves; Leaves with straight lateral veins only some of which fork before reaching the leaf margin … 39
    39. Fruits produced on woody scales arranged in a cone-like structure; Buds on a small stalk, not offset from leaf stalk … *Alnus rhombifolia* (White alder)
    39. Fruits not produced in a cone-like structure; Buds not stalked, offset from leaf stalk … *Ulmus* species (Elm species)

Appendix B
Summary of Species Observations

Table B-1. Frequency of Observed Odonate Species

Common Name	Scientific Name	Total (%) *N = 43*	Placer County Plots (%) *N = 20*	Other Plots (%) *N = 23*
Damselflies	**Zygoptera**			
American Rubyspot	*Hetaerina americana*	47	50	43
Spotted Spreadwing	*Lestes congener*	2	0	4
California Spreadwing	*Archilestes californica*	7	0	13
California Dancer	*Argia agrioides*	19	20	17
Emma's Dancer	*Argia emma*	28	25	30
Sooty Dancer	*Argia lugens*	14	5	22
Aztec Dancer	*Argia nahuana*	2	0	4
Vivid Dancer	*Argia vivida*	40	45	35
Unknown sp. teneral dancer	*Argia* sp.	5	10	0
Boreal Bluet	*Enallagma boreale*	5	5	4
Familiar Bluet	*Enallagma civile*	44	40	48
Unknown sp. female bluet	*Enallagma* sp.	5	5	4
Pacific Forktail	*Ischnura cervula*	42	35	48
Western Forktail	*Ischnura perparva*	5	10	0
Desert Firetail	*Telebasis salva*	2	5	0
Dragonflies	**Anisoptera**			
Blue-eyed Darner	*Aeshna multicolor*	65	75	57
Common Green Darner	*Anax junius*	93	90	96
Pale-faced Clubskimmer	*Brechmorhoga mendax*	42	50	35
Western Pondhawk	*Erythemis collocata*	26	20	30
Eight-spotted Skimmer	*Libellula forensis*	0	0	0
Widow Skimmer	*Libellula luctuosa*	9	10	9
Common Whitetail	*Plathemis lydia*	7	10	4
Twelve-spotted Skimmer	*Libellula pulchella*	9	5	13
Flame Skimmer	*Libellula saturata*	21	0	39
Blue Dasher	*Pachydiplax longipennis*	30	35	26
Red Rock Skimmer	*Paltothemis lineatipes*	5	0	9
Wandering Glider	*Pantala flavescens*	44	40	48
Spot-winged Glider	*Pantala hymenaea*	26	25	26
Variegated Meadowhawk	*Sympetrum corruptum*	51	40	61
Striped Meadowhawk	*Sympetrum pallipes*	5	0	9
Black Saddlebags	*Tramea lacerata*	84	85	83

Table B-2. Observed Butterfly Species

Common Name	Scientific Name	Total (%) *N = 43*	Placer County Plots (%) *N = 23*	Other Plots (%) *N = 24*
California Sister	*Adelpha bredowii*	11	13	8
Sara Orange-tip	*Anthocharis sara*	6	9	4
Field Skipper	*Atlopedes campestris*	23	35	13
Pipevine Swallowtail	*Battus philenor*	72	70	75
Persius Duskywing	*Erynnis persius*	2	0	4
Northern Checkerspot	*Charidryas palla*	4	4	4
California Ringlet	*Coenonympha tullia*	45	70	21
Orange Sulphur	*Colias eurytheme*	77	74	79
Monarch	*Danaus plexipus*	0	0	0
Propertius Duskywing	*Erynnis propertius*	6	4	8
Mournful Duskywing	*Erynnis tristis*	2	4	0
Common Checkerspot	*Euphydryas chalcedona*	4	0	8
Eastern Tailed Blue	*Everes comyntas*	51	57	46
Gorgon Copper	*Gaeides gorgon*	2	0	4
Fiery Skipper	*Hylephila phyleus*	6	13	0
Buckeye	*Junonia coenia*	96	96	96
Lorquin's Admiral	*Limentis lorquini*	15	30	0
Purplish Copper	*Lycaena helloides*	4	9	0
Mourning Cloak	*Nymphalis antiopa*	11	17	4
The Farmer	*Ochlodes agricola*	4	9	0
Pale Swallowtail	*Papilio eurymedon*	2	4	0
Western Tiger	*Papilio rutulus*	70	78	63
Anise Swallowtail	*Paplio zelicaon*	13	17	8
Umber Skipper	*Paratrytone melane*	13	22	4
Common sSoty-wing	*Pholisora catullus*	2	0	4
Mylitta Crescent	*Phyciodes mylitta*	34	52	17
Cabbage Butterfly	*Pieris rapae*	89	91	88
Acmon Blue	*Plebejus acmon*	30	17	42
Sandhill Skipper	*Polites sabuleti*	2	4	0
Satyr Comma	*Polygonia satyrus*	4	0	8
Checkered White	*Pontia protodice*	2	4	0
Common Checkered	*Pyrgus communis*	4	0	8
California Hairstreak	*Satyrium californicum*	17	17	17
Hedge-row Hairstreak	*Satyrium saepium*	0	0	0
Sylvan Hairstreak	*Satyrium sylvinus*	11	9	13
Common Hairstreak	*Strymon melinus*	28	48	8
West Coast Lady	*Vanessa annabella*	4	0	8
Red Admiral	*Vanessa atalanta*	34	43	25
Painted Lady	*Vanessa cardui*	55	61	50
American Lady	*Vanessa virginiensis*	6	13	0

Table B-3. Amphibian and Reptile Species Observed During One Survey of Plots

Common Name	Scientific Name	Total (%) *N = 47*	Placer County Plots (%) *N = 23*	Other Plots (%) *N = 24*
Pacific Treefrog	*Pseudacris regilla*	2	4	0
Foothill Yellow-legged Frog	*Rana boylii*	0	0	0
Bullfrog	*Rana catesbeiana*	32	26	38
Western Pond Turtle	*Emys marmorata*	0	0	0
Western Fence Lizard	*Sceloporus occidentalis*	28	26	29
Western Skink	*Eumeces skiltonianus*	0	0	0
Aligator Lizard	*Elgaria* sp.	13	4	21
Gopher Snake	*Pituophis catenifer*	2	0	4
Garter Snake	*Thamnophis* sp.	2	0	4
Western Rattlesnake	*Crotalis viridis*	6	4	8

Table B-4. Amphibian and Reptile Species Observed During Four Surveys of Plots

Common Name	Scientific Name	Total (%) *N = 12*	Placer County Plots (%) *N = 8*	Other Plots (%) *N = 4*
Pacific Treefrog	*Pseudacris regilla*	8	0	25
Foothill Yellow-legged Frog	*Rana boylii*	8	13	0
Bullfrog	*Rana catesbeiana*	42	38	50
Western Pond Turtle	*Emys marmorata*	8	0	25
Western Fence Lizard	*Sceloporus occidentalis*	83	88	75
Western Skink	*Eumeces skiltonianus*	0	0	0
Aligator Lizard	*Elgaria* sp.	33	50	0
Gopher Snake	*Pituophis catenifer*	8	13	0
Garter Snake	*Thamnophis* sp.	0	0	0
Western Rattlesnake	*Crotalis viridis*	8	0	25

Table B-5. Mammal Species Observed During One Survey of Plots

Common Name	Scientific Name	Total (%) *N = 47*	Placer County Plots (%) *N = 23*	Other Plots (%) *N = 24*
Virginian Opossum	*Didelphis virginiana*	2	0	4
Desert Cottontail	*Sylivlagus audubonii*	4	4	4
Black-tailed Jackrabbit	*Lepus californicus*	11	13	8
Western Gray Squirrel	*Sciurus griseus*	19	22	17
Botta's Pocket Gopher	*Thomomys bottae*	9	4	13
American Beaver	*Castor canadensis*	6	0	12.5
Coyote	*Canis latrans*	6	9	4
Racoon	*Procyon lotor*	40	35	46
Northern River Otter	*Lontra canadensis*	2	0	4
Bobcat	*Lynx rufus*	9	9	8
Mule Deer	*Odocoileus hemionus*	34	26	42

Table B-6. Mammal Species Observed During Four Surveys of Plots

Common Name	Scientific Name	Total (%) *N = 12*	Placer County Plots (%) *N = 8*	Other Plots (%) *N = 4*
Virginian Opossum	*Didelphis virginiana*	8	13	0
Desert Cottontail	*Sylivlagus audubonii*	8	0	25
Black-tailed Jackrabbit	*Lepus californicus*	17	13	25
Western Gray Squirrel	*Sciurus griseus*	33	38	25
Botta's Pocket Gopher	*Thomomys bottae*	8	0	25
Deer Mouse	*Peromyscus maniculatus*	8	0	25
California Meadow Mouse	*Microtus californicus*	17	13	25
Feral Dog	*Canis familiaris*	8	0	25
Coyote	*Canis latrans*	17	25	0
Gray Fox	*Urocyon cinereoargenteus*	8	0	25
Raccoon	*Procyon lotor*	75	75	75
Feral Cat	*Felis catus*	17	25	0
Bobcat	*Lynx rufus*	17	13	25
Mule Deer	*Odocoileus hemionus*	67	63	75
Muskrat	*Ondatra zibethicus*	8	0	25

Table B-7. Mean Abundance of Small Mammals Trapped at Plots[1]

Common Name	Scientific Name	Total *N = 10*	Placer County Plots *N = 6*	Other Plots *N = 4*
Opossum	*Didelphis virginiana*	0.1 ± 0.1	0.2 ± 0.2	–
Brush Mouse	*Peromyscus boylii*	3.5 ± 2.3	–	8.8 ± 5.1
Deer Mouse	*Peromyscus maniculatus*	5.1 ± 1.8	2.0 ± 1.6	9.8 ± 2.5
California Meadow Mouse	*Microtus californicus*	3.2 ± 2.5	1.2 ± 0.7	6.3 ± 6.3
House Mouse	*Mus musculus*	1.3 ± 0.9	0.8 ± 0.8	2.0 ± 2.0
Black Rat	*Rattus rattus*	0.6 ± 0.2	0.7 ± 0.3	0.5 ± 0.3

[1] Values are means ± 1 standard error.

Table B-8. Bird Species Observed During One Survey of Plots

Common Name	Scientific Name	Summer Resident	Migrant	Total (%) *N = 47*	Placer County Plots (%) *N = 23*	Other Plots (%) *N = 24*
Pied-billed Grebe	*Podilymbus podiceps*	X		2	4	0
Great Blue Heron	*Ardea herodias*	X		2	4	0
Green Heron	*Butorides virescens*	X		2	0	4
Wood Duck	*Aix sponsa*	X		2	4	0
Mallard	*Anas platyrhynchos*	X		11	17	4
Cinnamon Teal	*Anas cyanoptera*	X		2	4	0
Common Merganser	*Mergus merganser*	X		0	0	0
Turkey Vulture	*Cathartes aura*	X		4	4	4
White-tailed Kite	*Elanus leucurus*	X		2	0	4
Cooper's Hawk	*Accipiter cooperii*	X		2	4	0
Red-shouldered Hawk	*Buteo lineatus*	X		11	13	8
Swainson's Hawk	*Buteo swainsoni*	X		2	4	0
Red-tailed Hawk	*Buteo jamaicensis*	X		6	0	13
American Kestrel	*Falco sparverius*	X		0	0	0
Ring-necked Pheasant	*Phasianus colchicus*	X		2	4	0
Wild Turkey	*Meleagris gallopavo*	X		4	9	0
California Quail	*Callipepla californica*	X		17	13	21
Common Moorhen	*Gallinula chloropus*	X		2	4	0
American Coot	*Fulica americana*	X		2	4	0
Killdeer	*Charadrius vociferus*	X		9	4	13
Spotted Sandpiper	*Tringa macularia*	X		0	0	0
Mourning Dove	*Zenaida macroura*	X		28	26	29
Barn Owl	*Tyto alba*	X		0	0	0

Common Name	Scientific Name	Summer Resident	Migrant	Total (%) *N = 47*	Placer County Plots (%) *N = 23*	Other Plots (%) *N = 24*
Great Horned Owl	*Bubo virginianus*	X		0	0	0
Black-chinned Hummingbird	*Archilochus alexandri*	X		17	17	17
Anna's Hummingbird	*Calypte anna*	X		32	30	33
Belted Kingfisher	*Megaceryle alcyon*	X		11	9	13
Acorn Woodpecker	*Melanerpes formicivorus*	X		30	48	13
Nuttall's Woodpecker	*Picoides nuttallii*	X		60	52	67
Downy Woodpecker	*Picoides pubescens*	X		40	39	42
Hairy Woodpecker	*Picoides villosus*	X		2	0	4
Northern Flicker	*Colaptes auratus*	X		11	4	17
Western Wood-Pewee	*Contopus sordidulus*	X		32	26	38
Willow Flycatcher	*Empidonax traillii*		X	13	22	4
Dusky Flycatcher	*Empidonax oberholseri*		X	2	4	0
Pacific-slope Flycatcher	*Empidonax difficilis*	X		19	22	17
Black Phoebe	*Sayornis nigricans*	X		51	61	42
Ash-throated Flycatcher	*Myiarchus cinerascens*	X		68	70	67
Western Kingbird	*Tyrannus verticalis*	X		30	26	33
Hutton's Vireo	*Vireo huttoni*	X		9	13	4
Warbling Vireo	*Vireo gilvus*	?		28	30	25
Western Scrub-Jay	*Aphelocoma californica*	X		57	65	50
Yellow-billed Magpie	*Pica nuttalli*	X		19	26	13
American Crow	*Corvus brachyrhynchos*	X		2	4	0
Common Raven	*Corvus corax*	X		0	0	0
Tree Swallow	*Tachycineta bicolor*	X		38	26	50
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	X		15	4	25
Cliff Swallow	*Hirundo pyrrhonota*	X		4	0	8

Common Name	Scientific Name	Summer Resident	Migrant	Total (%) *N = 47*	Placer County Plots (%) *N = 23*	Other Plots (%) *N = 24*
Barn Swallow	*Hirundo rustica*	X		2	4	0
Oak Titmouse	*Parus inornatus*	X		53	61	46
Bushtit	*Psaltriparus minimus*	X		57	61	54
White-breasted Nuthatch	*Sitta carolinensis*	X		51	65	38
Bewick's Wren	*Thryomanes bewickii*	X		40	26	54
House Wren	*Troglodytes aedon*	X		55	74	38
Western Bluebird	*Sialia mexicana*	X		9	4	13
Swainson's Thrush	*Catharus ustulatus*		X	9	0	17
American Robin	*Turdus migratorius*	X		30	30	29
Wrentit	*Chamaea fasciata*	X		15	26	4
Northern Mockingbird	*Mimus polyglottos*	X		13	17	8
European Starling	*Sturnus vulgaris*	X		40	48	33
Cedar Waxwing	*Bombycilla cedrorum*		X	2	0	4
Phainopepla	*Phainopepla nitens*	X		0	0	0
Orange-crowned Warbler	*Vermivora celata*	X		19	22	17
Nashville Warbler	*Vermivora ruficapilla*		X	2	0	4
Yellow Warbler	*Dendroica petechia*		X	21	13	29
Common Yellowthroat	*Geothlypis trichas*	X		11	9	13
Wilson's Warbler	*Wilsonia pusilla*	?		30	17	42
Yellow-breasted Chat	*Icteria virens*	X		30	22	38
Western Tanager	*Piranga ludoviciana*		X	26	22	29
Black-headed Grosbeak	*Pheucticus melanocephalus*	X		45	35	54
Blue Grosbeak	*Guiraca caerulea*	X		4	0	8
Lazuli Bunting	*Passerina amoena*	X		19	22	17
Spotted Towhee	*Pipilo maculatus*	X		28	30	25

Common Name	Scientific Name	Summer Resident	Migrant	Total (%) *N = 47*	Placer County Plots (%) *N = 23*	Other Plots (%) *N = 24*
California Towhee	*Pipilo crissalis*	X		19	9	29
Lark Sparrow	*Chondestes grammacus*	X		2	0	4
Savannah Sparrow	*Passerculus sandwichensis*	X		2	0	4
Song Sparrow	*Melospiza melodia*	X		26	26	25
Red-winged Blackbird	*Agelaius phoeniceus*	X		13	17	8
Western Meadowlark	*Sturnella neglecta*	X		13	13	13
Brewer's Blackbird	*Euphagus cyanocephalus*	X		11	0	21
Brown-headed Cowbird	*Molothrus ater*	X		51	30	71
Bullock's Oriole	*Icterus bullockii*	X		32	13	50
House Finch	*Carpodacus mexicanus*	X		49	43	54
Lesser Goldfinch	*Carduelis psaltria*	X		45	57	33
American Goldfinch	*Carduelis tristis*	X		45	48	42
House Sparrow	*Passer domesticus*	X		9	9	8

Table B-9. Bird Species Observed During Four Site Visits

Common Name	Scientific Name	Summer Resident	Migrant	Total (%) *N = 12*	Placer County Plots (%) *N = 8*	Other Plots (%) *N = 4*
Pied-billed Grebe	*Podilymbus podiceps*	X		0	0	0
Great Blue Heron	*Ardea herodias*	X		0	0	0
Green Heron	*Butorides virescens*	X		8	13	0
Wood Duck	*Aix sponsa*	X		17	25	0
Mallard	*Anas platyrhynchos*	X		25	38	0
Cinnamon Teal	*Anas cyanoptera*	X		0	0	0
Common Merganser	*Mergus merganser*	X		8	0	25
Turkey Vulture	*Cathartes aura*	X		17	13	25
White-tailed Kite	*Elanus leucurus*	X		8	0	25
Cooper's Hawk	*Accipiter cooperii*	X		8	13	0
Red-shouldered Hawk	*Buteo lineatus*	X		42	63	0
Swainson's Hawk	*Buteo swainsoni*	X		8	0	25
Red-tailed Hawk	*Buteo jamaicensis*	X		25	13	50
American Kestrel	*Falco sparverius*	X		8	13	0
Ring-necked Pheasant	*Phasianus colchicus*	X		8	13	0
Wild Turkey	*Meleagris gallopavo*	X		0	0	0
California Quail	*Callipepla californica*	X		42	25	75
Common Moorhen	*Gallinula chloropus*	X		0	0	0
American Coot	*Fulica americana*	X		0	0	0
Killdeer	*Charadrius vociferus*	X		17	13	25
Spotted Sandpiper	*Tringa macularia*	X		8	0	25
Mourning Dove	*Zenaida macroura*	X		58	38	100
Barn Owl	*Tyto alba*	X		0	0	0

Common Name	Scientific Name	Summer Resident	Migrant	Total (%) *N = 12*	Placer County Plots (%) *N = 8*	Other Plots (%) *N = 4*
Great Horned Owl	*Bubo virginianus*	X		8	13	0
Black-chinned Hummingbird	*Archilochus alexandri*	X		58	50	75
Anna's Hummingbird	*Calypte anna*	X		67	88	25
Belted Kingfisher	*Megaceryle alcyon*	X		42	38	50
Acorn Woodpecker	*Melanerpes formicivorus*	X		83	88	75
Nuttall's Woodpecker	*Picoides nuttallii*	X		92	88	100
Downy Woodpecker	*Picoides pubescens*	X		75	88	50
Hairy Woodpecker	*Picoides villosus*	X		0	0	0
Northern Flicker	*Colaptes auratus*	X		17	25	0
Western Wood-Pewee	*Contopus sordidulus*	X		58	50	75
Willow Flycatcher	*Empidonax traillii*		X	33	38	25
Dusky Flycatcher	*Empidonax oberholseri*		X	8	13	0
Pacific-slope Flycatcher	*Empidonax difficilis*	X		33	50	0
Black Phoebe	*Sayornis nigricans*	X		92	88	100
Ash-throated Flycatcher	*Myiarchus cinerascens*	X		100	100	100
Western Kingbird	*Tyrannus verticalis*	X		33	13	75
Hutton's Vireo	*Vireo huttoni*	X		17	25	0
Warbling Vireo	*Vireo gilvus*	?		33	38	25
Western Scrub-Jay	*Aphelocoma californica*	X		75	75	75
Yellow-billed Magpie	*Pica nuttalli*	X		25	25	25
American Crow	*Corvus brachyrhynchos*	X		17	25	0
Common Raven	*Corvus corax*	X		8	0	25
Tree Swallow	*Tachycineta bicolor*	X		58	38	100
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	X		50	50	50
Cliff Swallow	*Hirundo pyrrhonota*	X		17	25	0

Common Name	Scientific Name	Summer Resident	Migrant	Total (%) *N = 12*	Placer County Plots (%) *N = 8*	Other Plots (%) *N = 4*
Barn Swallow	*Hirundo rustica*	X		0	0	0
Oak Titmouse	*Parus inornatus*	X		92	100	75
Bushtit	*Psaltriparus minimus*	X		100	100	100
White-breasted Nuthatch	*Sitta carolinensis*	X		92	100	75
Bewick's Wren	*Thryomanes bewickii*	X		83	88	75
House Wren	*Troglodytes aedon*	X		92	88	100
Western Bluebird	*Sialia mexicana*	X		17	13	25
Swainson's Thrush	*Catharus ustulatus*		X	8	0	25
American Robin	*Turdus migratorius*	X		67	75	50
Wrentit	*Chamaea fasciata*	X		33	38	25
Northern Mockingbird	*Mimus polyglottos*	X		25	13	50
European Starling	*Sturnus vulgaris*	X		92	100	75
Cedar Waxwing	*Bombycilla cedrorum*		X	8	13	0
Phainopepla	*Phainopepla nitens*	X		17	13	25
Orange-crowned Warbler	*Vermivora celata*	X		42	50	25
Nashville Warbler	*Vermivora ruficapilla*		X	8	0	25
Yellow Warbler	*Dendroica petechia*		X	25	25	25
Common Yellowthroat	*Geothlypis trichas*	X		17	0	50
Wilson's Warbler	*Wilsonia pusilla*	?		58	50	75
Yellow-breasted Chat	*Icteria virens*	X		42	38	50
Western Tanager	*Piranga ludoviciana*		X	58	50	75
Black-headed Grosbeak	*Pheucticus melanocephalus*	X		83	88	75
Blue Grosbeak	*Guiraca caerulea*	X		0	0	0
Lazuli Bunting	*Passerina amoena*	X		25	25	25
Spotted Towhee	*Pipilo maculatus*	X		67	63	75

Common Name	Scientific Name	Summer Resident	Migrant	Total (%) *N = 12*	Placer County Plots (%) *N = 8*	Other Plots (%) *N = 4*
California Towhee	*Pipilo crissalis*	X		25	25	25
Lark Sparrow	*Chondestes grammacus*	X		0	0	0
Savannah Sparrow	*Passerculus sandwichensis*	X		0	0	0
Song Sparrow	*Melospiza melodia*	X		42	38	50
Red-winged Blackbird	*Agelaius phoeniceus*	X		0	0	0
Western Meadowlark	*Sturnella neglecta*	X		0	0	0
Brewer's Blackbird	*Euphagus cyanocephalus*	X		8	0	25
Brown-headed Cowbird	*Molothrus ater*	X		75	63	100
Bullock's Oriole	*Icterus bullockii*	X		58	50	75
House Finch	*Carpodacus mexicanus*	X		83	75	100
Lesser Goldfinch	*Carduelis psaltria*	X		92	100	75
American Goldfinch	*Carduelis tristis*	X		75	88	50
House Sparrow	*Passer domesticus*	X		25	25	25

Appendix B

Central Valley Songbird Responses to Riparian Width and Other Site- and Landscape-Scale Habitat Characteristics

Appendix B

Central Valley Songbird Responses to Riparian Width and Other Site- and Landscape-Scale Habitat Characteristics

Introduction

To address Placer County's interest in developing riparian setback guidelines for conservation purposes, we analyzed six years of riparian bird count data with respect to width of the riparian zone. Using a subset of PRBO bird survey sites, supplemented by new sites in Placer County, Jones & Stokes (2004) detected a positive relationship between riparian bird species richness and riparian zone width. Thus we wanted to investigate whether additional relationships could be detected using our comprehensive Central Valley riparian point count dataset. In our analysis, we also examined local vegetation and GIS-generated habitat types and surrounding landscape characteristics. Our primary goal was to characterize songbird relationships with riparian zone width, and to identify appropriate widths for riparian buffer zones (development setbacks), given a range of habitat and landscape characteristics.

Methods

Data used for analysis were obtained from bird point count surveys (Ralph et al. 1993) conducted between 1998 and 2003. Sites included long-term monitoring sites along the Sacramento, Cosumnes and San Joaquin Rivers, as well as sites that were surveyed for shorter periods of time, primarily for inventory purposes (Figure B-1). We used a total of 596 riparian point count stations along 117 streamside transects (Table B-1). Within each transect, points were spaced at least 200 meters apart, and the first point count survey station was selected using a random starting point. Point counts were conducted for five minutes, with 1-3 visits per season. (See http://www.prbo.org/tools/pc/pcprot.doc for detailed methods.)

For each of the 596 survey points, we calculated riparian species richness (as defined in Jones & Stokes 2004) as a cumulative value across all surveys. We also obtained a mean abundance across all surveys for each of these riparian-associated species, as well as presence/absence. A variable representing the number of surveys upon which the species richness and presence/absence values were based was retained in all models, to account for the fact that species richness increases with the number of surveys.

Using standard GIS data layers, point count stations were classified into two general categories, tributary or mainstem, as well as identified by drainage basin (DWR CalWater 2.2), elevation, and dominant vegetation cover type (WHR category based on best available GIS data layer) (Tables B-2 to B-5).

For each point we also calculated surrounding landscape characteristics within a 1-km radius, as well as the dominant surrounding land use—urban, agricultural, or "natural" (everything else). Land use and vegetation types were aggregated into more meaningful categories for analysis (Table B-5). We used three different GIS layers for these calculations:

1. Land use (DWR multi-year composite) (Figure B-2)
2. Vegetation (CDFG/DU 1993 wetlands where available; USFS existing vegetation multi-year composite elsewhere) (Figure B-3)
3. Riparian vegetation (union of available datasets: Chico State Sacramento River, San Joaquin River, CDFG/DU wetlands, DWR land use, Placer County vegetation)

Vegetation data were collected for each point count location using a modified relevé protocol (Ralph et al. 1993, Ralph et al. 1995) within a 50-m radius (see http://www.prbo.org/tools/pc/relevepr.html for detailed methods). A subset of variables representing major structural characteristics was used for this analysis (Table B-5). To reduce the number of variables considered, and because riparian zone width was of primary interest in our analysis, floristic composition variables were not analyzed.

Regression models were developed for riparian-associated bird species richness (as defined by Jones & Stokes 2004), as well as presence/absence of each of these species. We used multiple linear regression for species richness, and logistic regression (Hosmer and Lemeshow 1989) for each individual species' occurrence. Three classes of regression models were developed and compared with respect to the relative importance of riparian width as a predictor of bird species richness / occurrence. The dependent variables for each of these model classes were:

- Riparian width category only
- Riparian width category + potentially significant vegetation and landscape variables (from Pearson correlation analysis, $\alpha = 0.10$)
- Riparian width category + basin, vegetation type (WHR) and stream type

Models were first constructed using a numerical riparian width value (1 = 0-50 m, 2 = 50-100 m, 3 = >100 m), treated as a continuous variable, to test for linear relationships between riparian width and bird species richness and individual species' probability of occurrence. To evaluate differences between each of our three width categories (<50 m, 50-100 m, >100 m), we reran the models treating

Transect Code	Transect Name	County	Basin Name	Number of Points	Number of Visits	Number of Years
ANRP	Anderson River Park	Shasta	Redding	3	1	1
BACR	Battle Creek Parking	Tehama	Redding	15	6	3
BASL	Babel Slough	Yolo	Sacramento Delta	6	1	1
BEHI	Beehive	Glenn	Colusa Basin	6	4	2
BISO	Bloody Island South	Tehama	Redding	4	2	1
BIVI	Bianchi Vineyards	Fresno	South Valley Floor	3	1	1
BRSP	Bidwell-Sacramento River Park	Butte	Tehama	15	4	2
BUCR	Butte Creek	Shasta	Colusa Basin	4	1	1
BUPA	Bussett Park	Kings	South Valley Floor	1	1	1
BUSI	Butte Sink	Shasta	Colusa Basin	2	1	1
CAPA	Camp Pashayan	Fresno	South Valley Floor	2	2	1
CARO	Carpenter Road	Stanislaus	San Joaquin Valley Floor	2	2	1
CCRD	Coal Canyon Road		Colusa Basin	1	1	1
CHCA	Chowchilla Canal	Madera	San Joaquin Valley Floor	10	2	1
CMAT	Cal Mat Cement	Kings	South Valley Floor	9	2	1
CMIN	Calveras Material, Inc.	Merced	San Joaquin Valley Floor	6	2	1
CMSP	Caswell Memorial State Park	San Joaquin	San Joaquin Valley Floor	15	2	1
CNWR	Colusa National Wildlife Refuge	Colusa	Colusa Basin	1	1	1
CODO	Codora	Glenn	Colusa Basin	6	21	7
COLU	Colusa	Colusa	Colusa Basin	7	5	2
COTT	Cottonwood Creek	Shasta	Redding	4	1	1
DCER	Deer Creek at Elliot Road	Sacramento	North Valley Floor	1	1	1

Transect Code	Transect Name	County	Basin Name	Number of Points	Number of Visits	Number of Years
DECR	Deer Creek	Tehama	Tehama	23	6	3
DNWR	Delevan National Wildlife Refuge	Colusa	Colusa Basin	1	1	1
DUFE	Durham Ferry	San Joaquin	San Joaquin Delta	11	2	1
DWRE	Dept. Water Resources	Sacramento	North Valley Floor / San Joaquin Delta	9	23	8
DYCR	Dye Creek	Tehama	Tehama	15	7	3
EFYE	Effie Yeaw County Park	Sacramento	Valley-American	5	2	1
ELAV	Elkhorn Avenue	Kings	South Valley Floor	3	1	1
ELKH	Elkhorn Regional Park	Yolo	Valley Putah-Cache	3	1	1
ENCI	Encinal	Sutter / Yolo	Marysville	3	1	1
ERRO	Evans Reimer Road	Butte	Marysville	1	1	1
FGLS	Fish and Game Llano Seco		Colusa Basin	1	1	1
FIRE	Firebaugh	Madera	San Joaquin Valley Floor	2	2	1
FLYN	Flynn	Tehama	Tehama	14	24	8
FMRO	Four Mile Road		Colusa Basin	1	1	1
FOCO	Four Corners	Merced	San Joaquin Valley Floor	3	2	1
GJHA	Grayson	Stanislaus	San Joaquin Valley Floor	6	2	1
GRAY	Green Field	Stanislaus	Delta-Mendota Canal	5	2	1
GRKL	Grimes to Knights Landing	Colusa / Sutter / Yolo	Colusa Basin / Valley-American	4	1	1
GRLO	Gray Lodge	Butte	Colusa Basin	2	1	1
GVGA	Great Valley Grasslands A	Merced	San Joaquin Valley Floor	3	2	1
GVGB	Great Valley Grasslands B	Merced	Delta-Mendota Canal	3	2	1

Transect Code	Transect Name	County	Basin Name	Number of Points	Number of Visits	Number of Years
HALE	Haleakala	Tehama	Tehama	6	23	8
HAPA	Halgaman Park	Stanislaus	San Joaquin Valley Floor	1	1	1
HAYE	Hayes Avenue	Kings	South Valley Floor	5	1	1
HBRA	Honolulu Bar Recreation Area	Stanislaus	San Joaquin Valley Floor	1	2	1
HOSL	Howard Slough (F&G)		Colusa Basin	3	1	1
HW41	Highway 41	Fresno	South Valley Floor	3	1	1
JACI	Jacinto	Glenn	Colusa Basin	9	3	2
JFBR	Jelly's Ferry Bridge	Tehama	Redding	2	2	1
KAIS	Kaiser	Glenn	Tehama	8	9	3
KCCD	Kings County Conservation District	Kings	South Valley Floor	1	2	1
KOSL	Kopta Slough	Tehama	Tehama	6	17	6
LABA	La Baranca	Tehama	Tehama	15	23	8
LASL	Laird's Slough	Stanislaus	Delta-Mendota Canal	6	2	1
LBCR	Little Butte Creek	Butte	Colusa Basin	1	2	2
LIAV	Lincoln Avenue	Kings	South Valley Floor	1	1	1
LKRP	Layton-Kingston Regional Park	Fresno	South Valley Floor	2	1	1
LLSE	Llano Seco	Butte	Colusa Basin	5	5	3
LODI		Sacramento	North Valley Floor	3	1	1
LOLA	Lost Lake Park	Fresno	San Joaquin Valley Floor	13	2	1
LWWT	Livingston Waste Water Treatment	Merced	San Joaquin Valley Floor	1	1	1
MARO	Maple Road	Fresno	South Valley Floor	1	1	1
MEND	Mendota	Fresno	Delta-Mendota Canal / San Joaquin	4	2	1

Transect Code	Transect Name	County	Basin Name	Number of Points	Number of Visits	Number of Years
			Valley Floor			
MHRA	McHenry Recreation Area	San Joaquin	San Joaquin Valley Floor	4	2	1
MICR	Mill Creek	Tehama	Tehama	17	8	4
MOKE		Sacramento	North Valley Floor	1	1	1
MOON	Mooney	Tehama	Tehama	9	2	1
MORI	Mokelumne River	San Joaquin	North Valley Floor	6	1	1
MRBR	Meiss Road Bridge	Sacramento	North Valley Floor	1	1	1
MSRA	McConnel State Recreation Area	Merced	San Joaquin Valley Floor	5	2	1
OABR	Oakdale Avenue Bridge	Merced	San Joaquin Valley Floor	1	2	1
OBRA	Orange Blossom Recreation Area	Stanislaus	San Joaquin Valley Floor	2	2	1
OFBN	Ord Ferry Bridge North	Glenn	Colusa Basin	4	2	1
OLMI	Old Mill	Shasta	Redding	8	3	1
OSFA		Shasta	Redding	2	1	1
OWAR	Oroville Wildlife Area	Butte / Tehama	Marysville	10	2	2
PACR	Paine's Creek	Tehama	Redding	9	2	1
PAIS	Packer Island	Tehama	Colusa Basin	6	6	2
PARO	Parallel Road	San Joaquin	San Joaquin Valley Floor	3	2	1
PICR	Pine Creek	Butte	Tehama	7	11	4
PRAR	Project Area	Shasta	Redding	13	11	4
PRIN	Princeton	Colusa	Colusa Basin	7	3	2
PUCR	Putah Creek	Tehama	Valley Putah-Cache	3	1	1
PURO	Putnam Road	Colusa	Colusa Basin	2	1	1

Transect Code	Transect Name	County	Basin Name	Number of Points	Number of Visits	Number of Years
QSTR	Q Street	Fresno	Delta-Mendota Canal	1	2	1
RAMI	Ramirez	Fresno	Delta-Mendota Canal	1	1	1
RANK	Rank Island	Fresno	San Joaquin Valley Floor	3	1	1
REBA	Reading Bar	Shasta	Redding	4	11	4
REIS		Shasta	Redding	4	1	1
RIVI	River Vista	Tehama	Tehama	1	25	9
RSPO	Ripon Sewage Ponds	San Joaquin	San Joaquin Valley Floor	6	2	1
RYAN	Ryan	Tehama	Tehama	4	24	8
SACC	Sacramento River	Shasta	Redding	7	9	3
SFBR	Sante Fe Bridge	Stanislaus	San Joaquin Valley Floor	1	1	1
SHFA	Shiloh Fishing Access	Stanislaus	San Joaquin Valley Floor	1	1	1
SHGA	Shooting Gallery	Shasta	Redding	5	12	4
SRCL	Sacramento Refuge Car Loop		Colusa Basin	1	1	1
SRSL	Santa Rita Slough	Merced	Delta-Mendota Canal	1	2	1
STCR	Stony Creek	Glenn	Colusa Basin	6	23	8
STIL	Stillwater Creek	Shasta	Redding	1	1	1
SUNO	Sul Norte	Glenn	Colusa Basin	10	24	8
TAFO	Tall Forest	Sacramento	San Joaquin Delta	13	25	9
TAMO	Table Mountain	Tehama	Redding	7	1	1
THCR	Thomes Creek	Shasta / Tehama	Tehama	11	1	1
THOM	Thomas	Glenn	Colusa Basin	5	6	3
TLSR	Turlock Lake State Rec Area	Stanislaus	San Joaquin Valley Floor	4	2	1

Transect Code	Transect Name	County	Basin Name	Number of Points	Number of Visits	Number of Years
TURL	Turlock Road	Merced	San Joaquin Valley Floor	1	2	1
VALE	Valensin	Sacramento	North Valley Floor	5	20	7
VORA	Valley Oak Recreation Area	Stanislaus	San Joaquin Valley Floor	2	2	1
WELE	Wendell's Levee	Sacramento	San Joaquin Delta	3	25	9
WERO	Wendell's Road	Sacramento	North Valley Floor / San Joaquin Delta	3	23	9
WILA	Wilson's Landing	Butte	Tehama	3	1	1
WISL	Willow Slough	Sacramento	San Joaquin Delta	9	24	9
WIUN	Willow Unit	Fresno	San Joaquin Valley Floor	2	2	1
WOBR	Woodson Bridge State Park	Tehama	Tehama	13	5	3

Table B-2. Summary of Point Count Types -- Stream Type by Hydrologic Unit / Basin

Hydrologic Unit Name	Mainstem	Tributary	Total
Colusa Basin / Marysville	89	13	102
North Valley Floor / San Joaquin Delta	58	7	65
Redding	27	61	88
San Joaquin Valley Floor / Delta-Mendota Canal	117	2	119
South Valley Floor	31	0	31
Tehama	95	72	167
Valley-American / Valley Putah-Cache / Sacramento Delta	15	3	18
Total	432	158	590

Table B-3. Summary of Point Count Types -- Land Use Type by Hydrologic Unit / Basin

Hydrologic Unit Name	Agricultural	Natural	Urban	Total
Colusa Basin / Marysville	57	44	1	102
North Valley Floor / San Joaquin Delta	19	45	3	65
Redding	6	75	7	88
San Joaquin Valley Floor / Delta-Mendota Canal	77	39	3	119
South Valley Floor	20	11	0	31
Tehama	118	49	0	167
Valley-American / Valley Putah-Cache / Sacramento Delta	13	0	5	18
Total	310	263	19	590

Table B-4. Summary of Point Count Types -- WHR Habitat Type by Hydrologic Unit / Basin

Hydrologic Unit Name	AGR	AGS	BOW	CHP
Colusa Basin / Marysville	22	7	0	1
North Valley Floor / San Joaquin Delta	3	14	0	0
Redding	3	10	11	0
San Joaquin Valley Floor / Delta-Mendota Canal	14	18	1	0
South Valley Floor	2	8	0	1
Tehama	34	27	0	0
Valley-American / Valley Putah-Cache / Sacramento Delta	7	3	0	1
Total	85	87	12	3

Hydrologic Unit Name	FEW	URB	VOW	VRI	Total
Colusa Basin / Marysville	3	1	0	67	102
North Valley Floor / San Joaquin Delta	22	3	0	23	65
Redding	6	1	5	52	88
San Joaquin Valley Floor / Delta-Mendota Canal	9	3	0	75	119
South Valley Floor	1	2	0	17	31
Tehama	1	1	3	101	167
Valley-American / Valley Putah-Cache / Sacramento Delta	0	2	0	5	18
Total	42	13	8	340	590

Notes:

AGR = Agriculture

AGS = Annual Grassland

BOW = Blue Oak Woodland

CHP = Chaparral Scrub

FEW = Fresh Emergent Wetland

URB = Urban

VOW = Valley Oak Woodland

VRI = Valley / Foothill Riparian

Table B-5. Definition of Independent Variables Used in Regression Analysis

Variable name	Definition
Riparian width (field-collected)	
width2	riparian width category: 1 is 0-50 m, 2 is 50-100 m, 3 is >100 m)
Geography / habitat variables	
elevation	elevation (m)
huname / huname2	basin name (see Tables 2-4)
whr_new	WHR habitat type (see Table 4)
strm_type	stream type (mainstem or tributary)
Landscape-level vegetation variables	
rip_cov	proportion of riparian cover within a 1 km radius
agric_veg	proportion of agricultural vegetation within a 1 km radius
herb_veg	proportion of grassland vegetation within a 1 km radius
shrub_veg	proportion of shrub vegetation within a 1 km radius
wtlnd_veg	proportion of wetland vegetation within a 1 km radius
forest_veg	proportion of forest vegetation within a 1 km radius
Lanscape-level landuse variables	
agric_use	proportion of agricultural landuse within a 1 km radius
natur_use	proportion of natural landuse within a 1 km radius
urban_use	proportion of urban landuse within a 1 km radius
Site-level (field-collected) vegetation variables	
canopycov	canopy cover
treecov_new	absolute percent cover of the tree layer (>5 m in height); may contain vegetation that is not strictly a tree, such as vines hanging from trees, so long as its within the height range
shrubcov_new	absolute percent cover of the shrub layer (0.5-5 m in height); may contain non-woody plants within the height range
herbcov_new	absolute percent cover of the hebraceous layer (<0.5 m in height); may contain small shrubs and other woody plants less than .5 meters high
hitreeht	*average* height of the upper bounds of the tree layer
hishrubht	*average* height of the upper bounds of the shrub layer
maxtrdbh	maximum diameter at breast height to the nearest 0.1 centimeters, for the tree layer

width as a categorical variable and tested for equality of means within each width category.

This process was repeated for just the subset of point counts representing tributary streams, as well as for the subsets of data representing each dominant land use type within 1 km (agriculture, natural or urban).

Because we were interested in the effect of riparian width, with and without controlling for environmental conditions, we compared the model coefficient for riparian width across the three model classes. We recognized that riparian width could be affected by surrounding landscape characteristics, which may in turn affect local vegetation characteristics. Thus the apparent effect of riparian width could increase or decrease when controlling for other variables that are more strongly associated with a given bird metric. Our approach was intended to identify additional environmental variables associated with the bird metrics in question, and perhaps help explain the importance of riparian width. But we also wished to detect the responses to riparian width that may be obscured by other variables in a more complex model.

Results

Without controlling for any other environmental variables, riparian width was a significant positive predictor of riparian-associated bird species richness, as well as the presence of Black-headed Grosbeak (BHGR) and Common Yellowthroat (COYE) (Table B-6). Blue Grosbeak (BLGR) presence was negatively associated with riparian width. Controlling for the effect of geography (basin, elevation) and habitat type (WHR type and stream type), all of these species except COYE had a reduced, but still significant response to riparian width category, as did species richness. Only BHGR was positively associated with riparian width, and BLGR was negatively associated with riparian width, after also controlling for vegetation and surrounding land use characteristics (Table B-6).

Species richness and BHGR presence were positively associated with riparian width at mainstem, but not tributary sites, while the reverse was true for Yellow Warbler (YWAR) and COYE (Table B-7). For the Song Sparrow (SOSP), there was a significant positive relationship with riparian width at tributary sites, but a negative relationship at mainstem sites (Table B-7). BLGR presence was negatively associated with riparian width only at mainstem sites (Table B-7).

Comparing dominant surrounding land use categories (agricultural or natural), the relative importance of riparian width varied across species. For species richness, the effect was greater in natural than agricultural landscapes (Table B-8). For BHGR and BLGR probability of occurrence, the positive/negative effect of riparian width was greatest in natural landscapes. Warbling Vireo (WAVI) displayed a negative association with riparian width only in natural landscapes, while COYE and SOSP showed significant associations with riparian width only within agricultural landscapes (Table B-8).

Controlling for riparian width and site vegetation, we found a positive association between species richness and the proportion of riparian and wetland vegetation within a 1 km radius (Table B-10). With respect to individual species, we found that (Table B-10):

- YWAR was negatively associated with surrounding agricultural proportion within 1 km;
- BHGR and YWAR were negatively associated with surrounding grassland proportion;
- BLGR was positively associated with surrounding grassland proportion;
- SOSP and YBCH were positively associated with the proportion of surrounding natural land uses;
- YBCH was negatively associated with surrounding wetland proportion; and
- WIFL was positively associated with the proportion of surrounding forest.

Although we found a positive, linear effect of riparian width on species richness, tests for equality of means revealed a significant difference between widths greater than 100 m and those less than 100 m, but could not discriminate between widths less than 100 m (i.e., <50 m vs. 50-100 m) (Table B-6, Figure B-4). The same was true for YWAR and COYE probability of occurrence (Table B-7). However, for BHGR probability of occurrence, there was a threshold at 50 m, with a significant difference between width categories 1 (<50 m) and 2 (50-100 m), as well as between category 3 (>100 m) and category 1 (<50 m).

Summary and Recommendations

Our results indicated that, in California's Central Valley, the number of riparian songbird species was significantly lower where the riparian woodland zone was less than 100 m in width, at least along mainstem river corridors. Four species were also less likely to occur in riparian areas less than 100 m wide: the Black-headed Grosbeak, Common Yellowthroat, Yellow Warbler (a California Bird Species of Special Concern), and Song Sparrow. For the latter three species, this positive response to riparian width was only detected along tributary creeks, while for the Black-headed Grosbeak, it was only along mainstem rivers.

In addition, we found a strong influence of surrounding land use (within a 1-km radius) on which and how many riparian songbird species occurred at a site. The number of species increased with the amount of riparian and wetland habitat found within a 1-km radius. With respect to species composition, we found that the Yellow Warbler was negatively associated with the amount of agricultural land use within 1 km, and that the Song Sparrow and Yellow-breasted Chat were positively associated with the amount of “natural” (i.e., non-agricultural and non-urban) land use. Because few of our study sites were in urban areas, we were not able to evaluate the effect of urban development directly.

Table B-6. Comparison of Riparian Width Effect -- Univariate Models vs. Basin/Habitat Models vs. Vegetation/Landscape Models

		Univariate Model						Basin/Habitat Model						Veg/Landscape Model					
Bird Metric	Total Detections	Coeff	SE	Width test (1)	R2	P-value	n	Coeff	SE	Width test (1)	R2	P-value	n	Coeff	SE	Width test (1)	R2	P-value	n
Species Richness	N/A	0.40	0.08 ***	3>1*	0.67	<0.001	590	0.17	0.00 *	3>1*	0.72	0.01	590	0.13	0.09		0.71	0.15	556
BHGR presence	1499	0.70	0.12 ***	2>1*, 3>1**	0.24	<0.001	590	0.45	0.13 ***	2>1**, 3>1***	0.34	<0.001	587	0.37	0.14 *	2>1*, 3>1**	0.36	<0.001	560
BLGR presence	133	-0.60	0.17 ***		0.14	0.23	590	-0.59	0.19 **	3<1**	0.23	0.05	547	-0.37	0.19 *	3<1*	0.17	0.54	560
COYE presence	603	0.28	0.16 *	3>1*	0.04	<0.001	590	0.24	0.19		0.39	0.01	550	0.15	0.18		0.35	0.00	579
SOSP presence	957	-0.07	0.11		0.00	0.50	590	0.04	0.16 *		0.33	0.06	403	-0.22	0.12 *	3<1*	0.08	0.05	578
SWHA presence	15	0.11	0.60		0.17	0.33	590												
WIFL presence	43	0.07	0.22		0.08	0.42	590							-0.09	0.23		0.09		560
WAVI presence	124	-0.04	0.19		0.23	0.02	590	-0.21	0.22		0.31	0.67	548	-0.03	0.20		0.28	0.27	560
YBCH presence	227	0.08	0.15		0.04	0.14	590	-0.02	0.19		0.21	0.36	415	-0.13	0.17		0.24	0.54	560
YWAR presence	212	0.21	0.16		0.13	0.00	590	0.10	0.19		0.27	0.02	532	-0.04	0.20		0.24	0.27	558

* = P<0.10
** = P<0.01
*** = P<0.001

(1) 1 = 0-50 m
2 = 50-100 m
3 = > 100 m

Table B-7. Effect of Riparian Width -- Comparison Between Tributary and Mainstem Streams

		Univariate Model							Basin/Habitat Model					
Bird Metric		Coeff	SE		P-value	Width test	R2	n	Coeff	SE	P-value	Width test	R2	n
Species Richness	Mainstem	0.47	0.09	***		3>1***	0.71	432	0.14	0.09		3>1*	0.77	432
	Tributaries	0.23	0.15		0.13		0.50	158	0.16	0.15	0.28		0.59	158
BHGR presence	Mainstem	0.88	0.15	***		2>1*, 3>1***	0.12	432	0.56	0.18 **		2>1*, 3>1**	0.42	425
	Tributaries	-0.44	0.33		0.02		0.03	158	0.25	0.22	0.05		0.26	154
BLGR presence	Mainstem	-0.69	0.21	***		3<1***	0.18	432	-0.64	0.24 **		3<1**	0.28	376
	Tributaries	-0.44	0.33		0.27		0.03	158	-0.23	0.35	0.51		0.12	136
COYE presence	Mainstem	0.12	0.20		0.01		0.35	432	-0.17	0.25			0.41	385
	Tributaries	0.64	0.33	*		3>1*	0.21	158	0.98	0.39 *	0.01	3>1*	0.34	130
SOSP presence	Mainstem	-0.57	0.14	***		3<2*, 3<1***	0.06	432	-0.05	0.18			0.35	321
	Tributaries	0.84	0.32	**	0.00	3<1*	0.13	158	0.25	0.55	0.13		0.43	75
WAVI presence	Mainstem	0.16	0.24				0.28	432	0.12	0.29			0.35	388
	Tributaries	-0.63	0.37	*	0.16	3<2**	0.06	158	-0.60	0.42	0.32		0.15	115
YBCH presence	Mainstem	0.27	0.27				0.07	432	-0.38	0.32			0.15	258
	Tributaries	0.20	0.21		0.12		0.06	158	0.17	0.27	0.24		0.30	143
YWAR presence	Mainstem	-0.01	0.30				0.19	432	0.07	0.24			0.25	371
	Tributaries	0.68	0.29	*	0.01	3>1*	0.11	158	0.23	0.37	0.37		0.39	140

*	=	P<0.10
**	=	P<0.01
***	=	P<0.001
(1) 1	=	0-50 m; 2 = 50-100 m; 3 = > 100 m

Table B-8. Riparian Width Effect -- Comparison between Predominantly Agricultural and Predominantly Natural Surrounding Land Uses

Bird Metric		Univariate Model Coeff	SE		Width tests (1)	R^2	n
Species Richness	Natural	0.50	0.10	***	3>1***, 3>2*	0.72	263
	Agricultural	0.31	0.12	**	3>1**	0.64	310
Black-headed Grosbeak presence	Natural	0.92	0.19	***	3>1***, 3>2*	0.22	263
	Agricultural	0.55	0.16	***	3>1**	0.28	310
Blue Grosbeak presence	Natural	-0.77	0.28	**	3<1**	0.21	263
	Agricultural	-0.48	0.22	*	3<1*	0.09	310
Common Yellowthroat presence	Natural	0.19	0.33			0.48	263
	Agricultural	0.38	0.19	*	3>1*	0.24	310
Song Sparrow presence	Natural	-0.02	0.19			0.16	263
	Agricultural	-0.52	0.17	**	3<2*, 3<1**	0.04	310
Warbling Vireo presence	Natural	-0.20	0.26			0.20	263
	Agricultural	0.08	0.31			0.33	310
Yellow-breated Chat presence	Natural	0.01	0.18			0.00	263
	Agricultural	0.16	0.34			0.23	310
Yellow Warbler presence	Natural	0.14	0.23			0.15	263
	Agricultural	0.15	0.27			0.15	310

Notes:

* = P<0.10
** = P<0.01
*** = P<0.001

(1)
1 = 0-50 m
2 = 50-100 m
3 = > 100 m

Table B-9. Significant Variables in Basin/Habitat Models

Bird Metric	n	R2 / Pseudo R2	Number of visits	Riparian width	Basin (1)	WHR Type (2)	Tributary	Elevation
Species Richness	590	0.72	+++		3(+++), 4(---), 6(+++), 7(--)	5(+++), 8(+++)	-	---
Black-headed Grosbeak presence	587	0.34	+++	+++	2(---), 4(---), 5(---), 7(-)		---	
Blue Grosbeak presence	547	0.23	+++	--	2(++), 5(+), 6(+)			
Common Yellowthroat presence	550	0.39	+++		3(+), 6(+)	6(+)		---
Song Sparrow presence	403	0.33	+++		2(+++), 3(+++), 4(+++), 5(+++)	3(-), 7(-), 8(---)		
Warbling Vireo presence	548	0.31	+++		6(+), 7(+)	3(++), 4(+), 8(+)	-	
Yellow-Breasted Chat presence	415	0.21	+++		2(--), 6(-)	2(+)	+	
Yellow Warbler presence	532	0.27	+++		6(-)	5(+++)		+

Notes:

+/- : P<0.10; ++/-- : P<0.01; +++/--- : P<0.001

(1) 1 = Colusa Basin / Marysville, 2 = North Valley Floor / San Joaquin Delta, 3 = Redding, 4 = San Joaquin Valley Floor / Delta-Mendota Canal, 5 = South Valley Floor, 6 = Tehama, 7 = Valley-American / Valley Putah-Cache / Sacramento Delta

(2) 1 = Agriculture (AGR), 2 = Annual Grassland (AGS), 3 = Blue Oak Woodland (BOW), 4 = Chaparral (CHP), 5 = Fresh Emergent Wetland (FEW), 6 = Urban (URB), 7 = Valley Oak Woodland (VOW), 8 = Valley/Foothill Riparian

Table B-10. Significant Independent Variables in Vegetation/Landscape Models

Bird Metric	n	R2 / Pseudo R2	Number of visits	Riparian width	Vegetation variables (2)	Landscape variables (2)
Species Richness	550	0.71	+++		maxtrdbh (+++), shrubcov_new (+++), herbcov_new (--)	rip_cov (+++), wtlnd_veg (+++)
Black-headed Grosbeak presence	560	0.36	+++	++	rip_cov (+++)	herb_veg (---)
Blue Grosbeak presence	560	0.17	+++	-	rip_cov (-)	herb_veg (+)
Common Yellowthroat presence	587	0.35	+++		shrubcov_new (+++)	
Song Sparrow presence	578	0.08	+++	-	treecov_new (-)	natur_use (+)
Swainson's Hawk presence	-					
Willow Flycather presence	560	0.09	++			forest_veg (+++)
Warbling Vireo presence	560	0.28	+++			shrub_veg (-), forest_veg (+), agric_use (-)
Yellow-breasted Chat presence	560	0.24	+++			shrub_veg (++), wtlnd_veg (---), natur_use (+++)
Yellow Warbler presence	558	0.25	+++		herbcov_new (-)	herb_veg (--), agric_use (---)

+/- = P<0.10
++/-- = P<0.01
+++/--- = P<0.001

(1) 1 = 0-50 m
2 = 50-100 m
3 = > 100 m

(2) See Table 5 for definitions of vegetation and landscape variables.

These findings suggest that, in order to maintain current populations of riparian-associated bird species, riparian woodlands and other natural vegetation should be maintained within at least 100 m on either side of all streams. To restore populations of species that are in decline (e.g., Yellow Warbler) or locally extirpated (e.g., Song Sparrow), the condition of riparian woodlands should be actively enhanced and restored within this zone. The Riparian Bird Conservation Plan (RHJV 2004) lists several recommendations for enhancing riparian habitat for birds and wildlife, which include managing for a diverse understory, increasing the diversity of woody plants, control of invasive plant and animals, and timing of management activities, such as mowing and grazing, to avoid the breeding season. To conserve greater riparian bird diversity, riparian setbacks and activity restrictions should be implemented not only in rural residential and urban areas, but also in agricultural zones.

It is also important to recognize the importance of landscape context in determining habitat suitability for riparian songbirds. The preservation, restoration and linkage of large parcels of undeveloped and uncultivated lands will provide significant benefits to riparian songbird species. Conservation priorities should be large contiguous areas of riparian vegetation surrounded by "natural" uplands to the greatest extent possible. Restoration priorities should be stream segments with large areas of nearby existing riparian habitat.

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Figure B-1. Study Sites

Figure B-2. Central Valley Vegetation

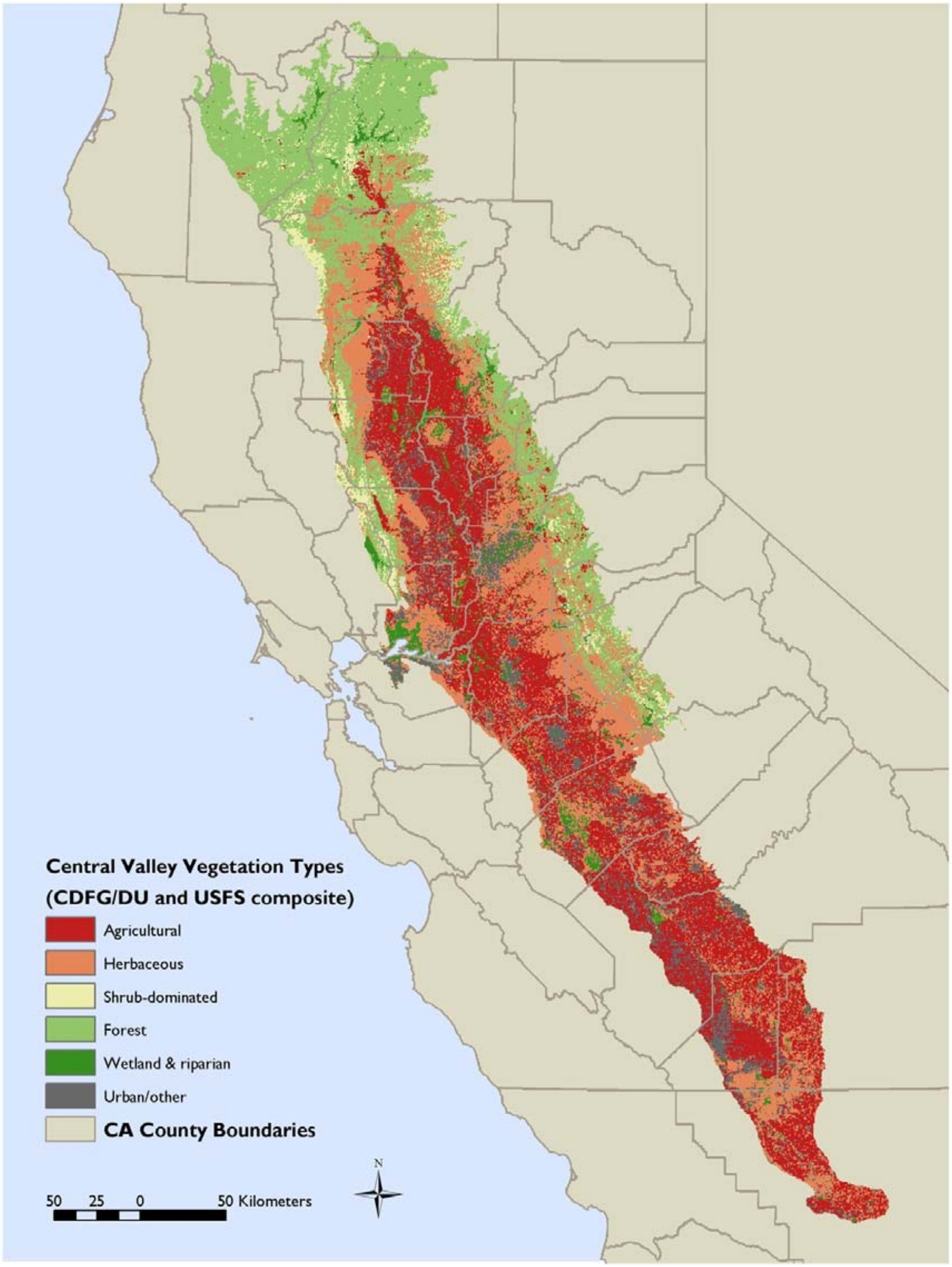


Figure B-3. Central Valley Land Use

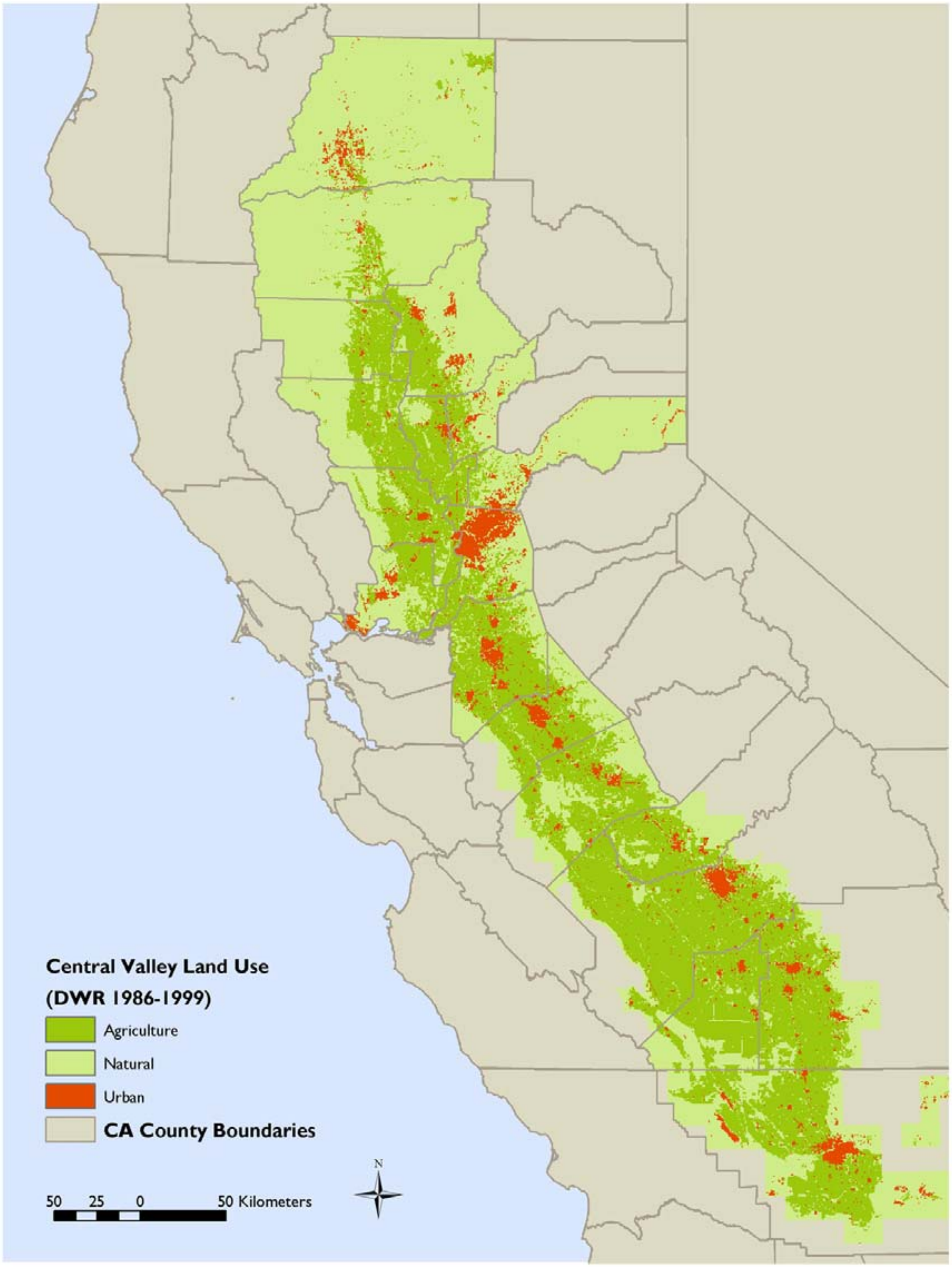
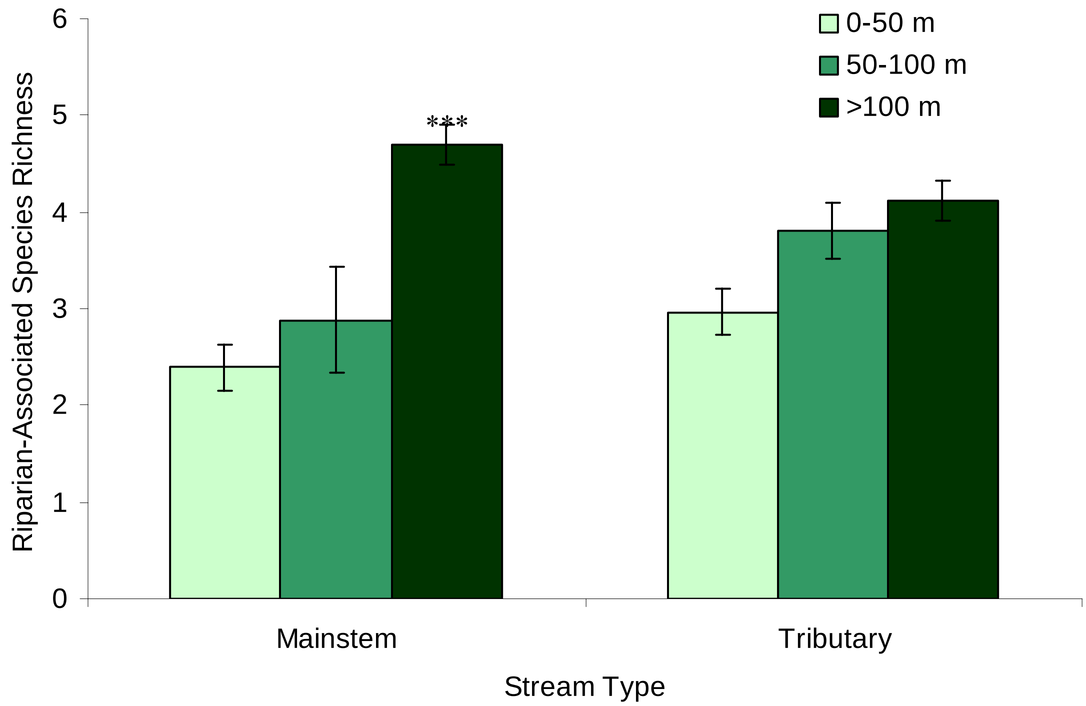


Figure B-4. Mean riparian-associated bird species richness by riparian width category (0-50 m, 50-100 m, >100m) and stream type (mainstem, tributary and wetland). Error bars represent standard errors. Significantly different means are denoted by asterisks (*** = < 0.001)



El Dorado Irrigation District

SB 610 Water Supply Assessment for the Village of Marble Valley Specific Plan

SB 610 Water Supply Assessment
Prepared for the
Village of Marble Valley Specific Plan

Final

August 2013

Prepared by:

Tully & Young
Comprehensive Water Planning

Prepared for:

El Dorado Irrigation District

Approved by Eldorado Irrigation District Board of Directors
on August 26, 2013 as action item #8

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Table of Contents

SECTION 1 – PROJECT INTRODUCTION

1.1 INTRODUCTION

In December 2012, the El Dorado Irrigation District (EID) received a letter from the El Dorado County Planning Department (County) requesting the completion of a Water Supply Assessment (WSA) for the Village of Marble Valley Specific Plan (hereafter referred to as the "Proposed Project"). As the proposed water supply purveyor for the Proposed Project, EID has prepared this WSA to assess the availability and sufficiency of EID's water supplies to meet the Proposed Project's estimated water demands. This document provides the necessary information to comply with the assessment of sufficiency as required by statute.

Statutory Background

Enacted in 2001, Senate Bill 610 added section 21151.9 to the Public Resources Code requiring that any proposed "project," as defined in section 10912 of the Water Code, comply with Water Code section 10910, et seq. Commonly referred to as a "SB 610 Water Supply Assessment," Water Code section 10910 outlines the necessary information and analysis that must be included in an environmental analysis of the project (e.g. CEQA compliance) to ensure that proposed land developments have a sufficient water supply to meet existing and planned water demands over a 20-year projection.

Proposed "projects" requiring the preparation of a SB 610 water supply assessment include, among others, residential developments of more than 500 dwelling units, shopping centers or business establishments employing more than 1,000 persons or having more than 500,000 square feet of floor space, commercial office buildings employing more than 1,000 persons or having more than 250,000 square feet of floor space and projects that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project.[1]

The Proposed Project requires a WSA because it contemplates more than 500 new dwelling units as detailed in Section 1.2.

Document Organization

This WSA supports the Proposed Project's environmental review process and analyzes the sufficiency of water supplies to meet projected water demands of the Proposed Project through the required planning horizon. The WSA is organized according to the following sections:

- **Section 1: Project Introduction**. This section provides an overview of WSA requirements, and a detailed description of the Proposed Project, especially the land-use elements that will require water service.

[1] Water Code § 10912, subdivision (a).

- **Section 2: Proposed Project Estimated Water Demands**. This section describes the methodology used to estimate water demands of the Proposed Project and details the estimated water demands at build-out of the Proposed Project.

- **Section 3: Other Estimated Water Demands**. This section details the other water demands currently served by EID and anticipated to be served based on information in the El Dorado County's (County) General Plan as well as known and potential planned modifications since the County's adoption of the General Plan.

- **Section 4: Water Supply Characterization**. This section characterizes the EID water supply portfolio that will serve the Proposed Project along with other current and future water demands. Water rights, along with water service contracts and agreements are characterized for normal, single dry, and multiple dry year conditions.

- **Section 5: Sufficiency Analysis**. This section assesses whether sufficient water will be available to meet the Proposed Project water demands, while recognizing existing and other potential planned water demands within the EID service area. To provide the necessary conclusions required by statute, the analysis integrates the demand detailed in Section 2 and Section 3 with the characterization of EID's water supply portfolio detailed in Section 4.

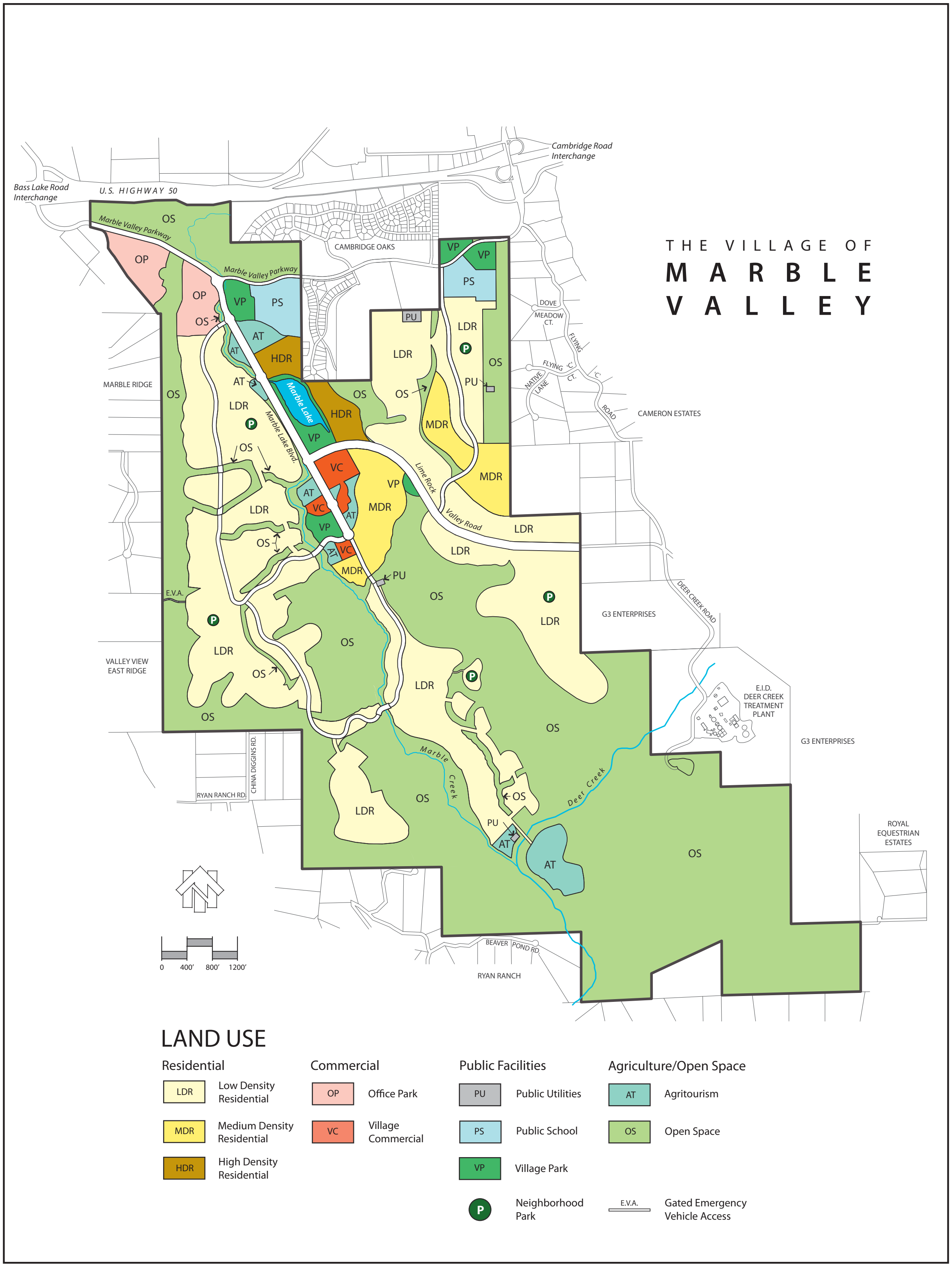
1.2 PROPOSED PROJECT DESCRIPTION

The Proposed Project is a planned development between Bass Lake and Cambridge Roads, south of Highway 50 encompassing approximately 2,340 acres in the unincorporated community of El Dorado Hills (see **Figure 1-1**).

The Proposed Project includes 3,236 residences, commercial space, village and neighborhood parks, agricultural uses, two schools, and open space. Proposed residential dwelling units include 193 custom lots on approximately 1 acre, 125 custom homes on approximately 1/2 acre-lots, 982 production lots with densities of 3 to 4 dwelling units per acre (designated "medium density-low"), 663 production lots with densities of 4 to 5 dwelling units per acre (designated "medium density-high"), 981 lots with densities of 7 to 12 dwelling units per acre (designated "Condo/Duplex"), and 292 high-density units (designated "multi-family"). Parks are spread throughout the project and include private parks in the gated areas, joint use parks along side the schools, village parks for non gated areas, a large park around the lake, and a historic park. The project includes about 475,000 square feet of commercial, retail, office, and other non-residential space residing on about 58 acres on the project site. Both a K5 and K8 school are planned for about 35 acres. About 55 acres of vineyards are to be planted on site both in designated lots and in some medians for aesthetics.

Table 1-1 summarizes the proposed land use acreages.

Figure 1-1 – Proposed Project Location and Land Uses



1.2.2 Projected Land Uses

Table 1-1 – Summary of Proposed Build-Out Land Uses and Acreages[2]

Land Use	Description	Acres	Units
1 Acre Custom Homes	1 DU/Ac	198	193
1/2 Acre Custom Homes	2 DU/Ac	62	125
3-4 per Acre Production Homes	3-4 DU/Ac	277	982
4-5 per Acre Production Homes	4-5 DU/Ac	148	663
Condominiums/Town Homes	5-12 DU/Ac	85	772
High Density Residential	12-24 DU/Ac	28	501
Office Park/Commercial	--	60	--
Schools	--	35	--
Parks	--	47	--
Open Space	--	1,282	--
ROW and Landscaping	--	73	--
Vineyards	--	55	--
	Total	**2,350**	**3,236**

1.3 Proposed Project Phasing

Table 1-2 describes the Proposed Project's four construction phases. Each phase represents a portion of the development, focusing on particular land-use classifications. Before constructing homes, commercial space, or other parts of the development, the proponents will begin site grading and project-wide infrastructure development. Some infrastructure and site grading will continue throughout all phases of the Proposed Project, as necessary. These activities include installing facilities for potable water, recycled water (as appropriate for the Proposed Project), sewer, electric, telecommunications, gas, stormwater, and roads. During these activities, a small water demand will exist – referred to in this WSA as "construction water." This demand is included in the yearly water demands presented in Section 2.

The initial phase will result in approximately one quarter of the Proposed Project demanding water service by 2020, with the three subsequent phases each adding an additional quarter as they are completed. All construction is planned to be completed by 2035, within the 20-year planning horizon of this WSA.

[2] Specific Plan Land Use Summary was provided by El Dorado County of Development Services Department.

Table 1-2 – Proposed Project Schedule

Land Use	Phase 1 By 2020	Phase 2 2021-2025	Phase 3 2026-2030	Phase 4 2031-2035	Total
1 Acre Custom Homes	25	20	100	48	193
1/2 Acre Custom Homes	25	25	--	75	125
3-4 per Acre Production Homes	215	378	--	389	982
4-5 per Acre Production Homes	--	--	663	--	663
Condominiums/Town Homes	75	522	175	--	772
High Density Residential	209	50	228	14	501
Total	549	995	1,166	526	**3,236**

SECTION 2 – PROPOSED PROJECT ESTIMATED WATER DEMANDS

2.1 INTRODUCTION

This section describes the methodology, provides the supporting evidence, and presents the estimated water demands for the Proposed Project. For the purpose of estimating water demand, the Proposed Project is planned to develop according to the phasing in **Table 1-2**.

2.2 DETERMINING UNIT WATER DEMAND FACTORS

As detailed in Section 1, the Proposed Project has specific residential and non-residential land-uses with defined residential lot-sizes, types of commercial uses and other characteristics. As these attributes vary among the types of proposed land-uses, so too will the water needs. To understand the water needs of the entire Proposed Project, unique demand factors that correspond with each unique land use are necessary. This subsection presents the methodology for determining the baseline unit water use demand factors that become the basis of the Proposed Project water demand estimates. Two distinct groups of demand factors are presented: (1) residential, and (2) non-residential.

2.3 PRIMARY SOURCE OF BASELINE WATER USE DATA

Because the Proposed Project is very similar in nature to particular elements built as part of the Serrano and El Dorado Hills developments over the past few decades, recent water use data for comparable products in these neighborhoods provides a reliable foundation for EID to establish new project-specific water demands. Through comparison of Proposed Project land-use elements to existing land uses, EID determined appropriate existing, established neighborhoods and commercial facilities that best aligned with each unique residential and non-residential project element. For each comparable neighborhood, EID gathered and assessed total annual water use for the years 2008 through 2012. This selected period of water use best represents 1) the highest build-out percentage within each selected area (including established back-yard landscapes), and 2) varied water use over a range of climatic conditions reflecting various rainfall amounts and timing. Average annual uses were derived from the data and are discussed under the respective land-use categories.

2.4 BASELINE RESIDENTIAL WATER USE DEMAND FACTORS

The Proposed Project anticipates specific residential products that fall within general lot-size designations. The size of the lot will have the largest impact on the annual per-lot demand for water. Indoor demands remain relatively consistent regardless of lot size, with the exception of apartments, which tend to have fewer people living in each unit and thus a slightly lower indoor use.

For purposes of this WSA, the per-lot demand for residential lots will be described as "the acre-feet of water use annually per dwelling unit" – or simply put, acre-feet/dwelling unit (af/du). This value will reflect indoor and outdoor uses expected for a typical dwelling unit for each of the following classifications:[3]

- 1-acre custom lots
- ½-acre custom lots
- 8,000 to 10,000 square-foot production lots
- 5,000 to 7,000 square-foot production lots
- Condominiums/townhouses
- Multi-family housing with community facilities including pool and/or clubhouse

The method and basis for determining the baseline unit water demand factor for each of these classifications is detailed in the following subsections.

1-Acre Custom Home Lots

Water demand factors for the proposed large lots are based on recent water use data records for residential lots in the Serrano development – specifically existing residential lots located on Greenview Drive, Errante Drive, and others. The proposed lots in this category average at about 1 acre. However, not all land on these lots will be landscaped. For instance, a lot may include hillside and/or areas of oak woodland that must be protected, resulting in a diminished area for the home's footprint, outdoor hardscapes and landscaping. Generally, the house itself is large, with extensive outdoor features including pools, hardscapes, water features, and significant landscaping with well-maintained turf areas.

Based on available historic meter data for similar developments served by EID, the baseline unit water demand factor for this land-use category is approximately 1.16 af/du.

½-Acre Custom Home Lots

Water demand factors for the proposed large lots are based on recent water use data records for residential lots in the Serrano development – specifically existing residential lots located on Renaissance Way and Renaissance Place. The proposed lots in this category average at about 1/2-acre though have a project minimum of 15,000 square feet. Landscaping on the lot may be based on a predetermined landscaping package for a production home. Generally, the house itself is large, with extensive outdoor features including pools, hardscapes, water features, and significant landscaping with well-maintained turf areas.

Based on available historic meter data for similar developments served by EID, the baseline unit water demand factor for this land-use category is approximately 0.87 af/du.

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[3] These classifications reflect EID's defined water demand factor categories as EID believes they best relate to the Proposed Project's land-use classifications as shown in the Table 1-1.

8,000 to 10,000 Square-foot Production Lots

The proposed project will include a large number of lots reserved for production homes on lots typically described as "large" for a residential community. For these lots, ranging up to ¼-acre or more, water demands will be based on recent water use data records for similar lots in the Serrano development – specifically Village D2 and portions of Village E, which includes numerous similar-sized lots. In contrast to the smaller lot production homes described in the next classification, these lots will retain adequate area on the lot for well-maintained turf and other landscaping. As much as one-half, but not less than about one-quarter, of the lot may still remain for landscaping, after accounting for the home's footprint and hardscape areas – equating to a few thousand to several thousand square-feet. Though less landscaped area than the custom home lots, the landscaped area will drive water use on these lots.

Based on the available historic meter data for similar developments served by EID, the baseline unit water demand factor for this land-use category is 0.55 af/du.

5,000 to 7,000 Square-foot Production Lots

The Proposed Project includes numerous proposed lots with average of 4 to 5 dwelling units per acre. As a result of the limited outdoor area, many of these lots are limited to front-yard landscaping with well-maintained turf, and back yards often only including hardscapes, pools or other amenities, and lower water using landscapes. Unit water demands are based on recent water use data records for similar lots in the Serrano development – specifically Village D1A, portions of Village E and Euer Ranch, which include numerous similar-sized lots.

Based on the available historic meter data for similar developments served by EID, the baseline unit water demand factor for this land-use category is 0.50 af/du.

Condominiums/Townhouses

The Proposed Project includes numerous proposed lots characterized as being condominiums or townhomes (7 to 12 units per acre). These proposed lots are anticipated to be similar to projects in the El Dorado Hills area, most notable the Regalo Project in Serrano. The Proposed Project includes large attached housing units, with large individual landscape yards and common areas.

Based on the available historic meter data for similar developments served by EID, the baseline unit water demand factor for this land-use category is 0.40 af/du.

Multi-Family Housing

The Proposed Project includes numerous multi-family housing elements characterized as multi-family housing. These lots will include community landscaping, multi-story housing structures, community pools and other amenities. These projects are anticipated to be similar to the existing indoor and outdoor demands of the Sterling Apartment and Vineyard Apartment properties currently served by EID. Although both of these properties differ in their layouts and landscape types and coverage, both use approximately the same quantity of water on a per-dwelling unit basis.

Based on the available historic meter data for similar developments served by EID, the baseline unit water demand factor for this land-use category is 0.16 af/du – inclusive of both indoor and outdoor demands.

Residential Indoor Water Use

Based on EID meter data for the past several years, indoor water use for typical single-family homes averages about 0.18 af/du.[4]. The value drops for apartments as a result of less people on average living in each apartment unit.[5] This value can be used to derive separation of residential demands that could be served with non-potable supplies, such as recycled water from the Deer Creek and/or El Dorado Hills wastewater treatment facilities (see Section 2.7.2).

2.5 MODIFYING BASELINE VALUES

All of the above-developed water demand factors for the residential classifications are based on similar existing developments in the El Dorado Hills area. However, since construction of the existing houses, a few changes have occurred that will reduce the Proposed Project's water demands from the baseline unit water demands derived from existing meter data. These include:

- CAL Green Code
- California Model Water Efficient Landscape Ordinance

CAL Green Code

In January 2010, the California Building Standards Commission adopted the statewide mandatory Green Building Standards Code (CAL Green Code) that requires the installation of water-efficient indoor infrastructure for all new projects beginning January 1, 2011. CAL Green Code was incorporated as Part 11 into Title 24 of the California Code of Regulations.[6] The CAL Green Code applies to the planning, design, operation, construction, use and occupancy of every newly constructed building or structure. All proposed land uses must satisfy the indoor water use infrastructure standards necessary to meet the CAL Green Code. The CAL Green Code requires residential and nonresidential water efficiency and conservation measures for new buildings and structures that will reduce the overall potable water use inside the building by 20 percent. The 20 percent water savings can be achieved in one of the following ways: (1) installation of plumbing fixtures and fittings that meet the 20 percent reduced flow rate specified in the CAL Green Code, or (2) by demonstrating a 20 percent reduction in water use from the building

[4] This value is a subset of the total usage estimated for a dwelling unit under each land-use category. Data from 2012 Water Resources and Service Reliability Report, EID, August 13, 2012, Appendix Table A, p.42
[5] El Dorado County indicates the average household size is 2.63 persons per occupied unit. (El Dorado County General Plan, 2008 Housing Element, August 2008 (Amended April 2009), p. 4-7).
[6] The CAL Green Code is Part 11 in Title 24.

"water use baseline."[7] The Proposed Project will satisfy one of these two requirements through the use of appliances and fixtures such as high-efficiency toilets, faucet aerators, on-demand water heaters, as well as Energy Star and California Energy Commission-approved appliances.

California Model Water Efficient Landscape Ordinance

In 2006, the Water Conservation in Landscaping Act was enacted, which required the Department of Water Resources to update the Model Water Efficient Landscape Ordinance (MWELO).[8] In fall of 2009, the Office of Administrative Law (OAL) approved the updated MWELO, which required that a retail water supplier adopt the provisions of the MWELO by January 1, 2010 or enact its own provisions equal to or more restrictive than the MWELO provisions.

The provisions of the MWELO are applicable to new construction with a landscape area greater than 2,500 square feet.[9] The MWELO provides a methodology to calculate total water use based upon a given plant factor and irrigation efficiency. Finally, MWELO requires the landscape design plan to delineate hydrozones (based upon plant factors) and then assign a unique valve for each hydrozone (low, medium, high water use).[10] The design of landscape irrigation systems is anticipated to better match the needs of grouped plant-types and thus result in more efficient outdoor irrigation.

Applying Conservation to Baseline Demand Factors

Collectively, these and other factors will put downward pressure on the baseline residential unit water demand factors – potentially dropping each unit demand by up to 10 percent for the larger lots. **Table 2-1** provides a summary of the baseline demand factor for each residential land-use category, the anticipated savings from the conservation mandates, and the resulting unit demand factor used to estimate the Proposed Project's water use.

[7] See CAL Green Code.
[8] Gov. Code §§ 65591-65599
[9] CCR Tit. 23, Div. 2, Ch. 27, Sec. 490.1.
[10] CCR Tit. 23, Div. 2, Ch. 27, Secs. 492.3(a)(2)(A) and 492.7(a)(2).

Table 2-1 – Summary of Residential Baseline and Proposed Project Demand Factors

EID Water Demand Category (Relates to Table 1-1 Land Use)	Density Range	Current Factor (af/du)	Conservation Applied	Factor Used (af/du)
1 Acre Custom Homes	1 DU/Ac	1.16	10%	1.04
1/2 Acre Custom Homes	2 DU/Ac	0.87	8%	0.80
8,000-10,000 sf Lots	3 - 4 DU/Ac	0.55	5%	0.52
5,000-7,000 sf Lots	4 - 5 DU/Ac	0.50	5%	0.48
Condominiums/Town Homes	7 - 12 DU/Ac	0.40	4%	0.38
Multi-Family Housing[1]	15 - 24 DU/Ac	0.16	2%	0.16

1. The Multi-family Housing values remain constant due to rounding. The "current factor" was determined to be 0.165 af/du.

2.6 Baseline Non-Residential Water Use Demand Factors

Similar to the residential water demand factors, non-residential factors are based upon recent water use trends for similar types of land classifications.

For purposes of this WSA, the per-lot demand for non-residential lots is described as "the acre-feet of water use annually per acre of land" – or simply put, acre-feet/acre (af/ac). This value reflects indoor and outdoor water needs expected for a typical non-residential use for each of the following classifications:

- Office Park/Village Commercial
- Public and Neighborhood Parks
- Schools
- Other miscellaneous uses, including street medians, recreational lake, vineyards, and environmental mitigation

The method and basis for determining the baseline unit water demand factor for each of these classifications is detailed in the following subsections.

Office Park/Village Commercial

The proposed office park/village commercial facilities are anticipated to be "office space" as well as "retail and entertainment" in nature. Analysis of recent meter data for both the La Borgata retail facility on El Dorado Hills Boulevard and the Village Green office/public facility at the corner of Silva Valley and Serrano Parkways indicates that water use on a per-acre basis is nearly consistent, with the retail space using about 2.15 af/ac and the office facility using 1.95 af/ac. Although the Village Green indoor facilities have lower use, the area has more turf landscaped area (not including Village Green park), which matches, on a gross acre-by-acre comparison with the higher indoor retail demands and limited landscaping of the restaurants at La Borgata.

Based on the available historic meter data for similar facilities served by EID, the unit water demand factor is 2.0 af/ac.

Public and Neighborhood Parks

The Proposed Project includes five neighborhood parks, two village joint-use parks, and two special use parks. Neighborhood parks will include expansive turf areas, playfields, and other park amenities. Village joint-use parks will be adjacent to the school facilities and consist of similar features as the neighborhood parks. The special use parks, that surround the lake and historical site, differ from the other parks and are analyzed on a net landscaped acreage to match the water use estimates. Based upon recent water meter data for similar park facilities in the El Dorado Hills area – namely Bella Terra Park, Allan Lindsey Park, and the Village A, C, L3, and L4 parks – a representative water demand factor was identified. A "smart meter" controls the irrigation system at each existing park. These devices adjust water use to actual climate data, including precipitation events. Thus, the recent meter data is very indicative of expected demands for the new parks, which will also be outfitted with similar technology.

Based on the available historic meter data for similar facilities served by EID, the unit water demand factor is 2.77 af/ac.

Schools

The Proposed Project includes two schools: a Kindergarten through 5th grade, and a Kindergarten through 8th grade. The schools will use adjacent village parks for school-related recreational activities, and will include turf playfields. As an example, the water use at Oak Meadows Elementary on Silva Valley Parkway provides a useful representation of the expectations for the two proposed school facilities. Oak Meadows, operational by 2004, has an average water use of 1.70 af/ac – representing a use of about 0.019 af/student. For comparison, other schools in the area were analyzed and had very comparable per-student water use rates for similar facilities. But, the range in school use varied from as much as 2.5 af/ac to 0.8 af/ac – depending on factors like total school footprint, number of students and amenities. The average among seven schools analyzed was 1.43 af/ac. For purposes of this WSA, the average value would be an appropriate estimation for the future school sites.

Based on the available historic meter data for similar facilities served by EID, the unit water demand factor will use a baseline value of approximately 1.43 af/ac.

Other Miscellaneous Uses

The Proposed Project has additional miscellaneous uses including landscaped street medians, environmental mitigation requirements, a recreational lake, vineyards, gate houses at entrances to private streets, sewer lift stations, and construction water. These uses have minimal impacts to the overall per-project total water use due to their limited size and water needs, and some are temporary in nature.

Landscape Street Medians and Community Entrances

The Proposed Project includes proposed landscaping along street corridors and at entrances to particular residential areas, as is common in El Dorado Hills. Since comparable data is not available due to the variety of landscapes used in existing street medians around El Dorado Hills, unit water demands for this category is derived from the MWELO (see prior discussion under "residential land-uses"). To provide flexibility to the Proposed Project to landscape as needed, the entire width of the landscaped area was assumed to demand the maximum use allowed by MWELO.[11] This maximum is determined as 70 percent of the reference evapotranspiration for the area. Using available maps from the California Department of Water Resources, the reference evapotranspiration for the Proposed Project area is approximately 57 inches per year.[12] The resulting demand factor is 3.3 af/ac.

Oak Woodlands Management

As of the preparation of this WSA, the mitigation requirements for impacts to oak woodlands resulting from the Proposed Project are as detailed in the County's Policy 7.4.4.4.[13] For purposes of estimating the water demands of this Proposed Project element, the WSA assumes mitigation will include establishing new trees, likely with associated irrigation water to assure seedlings are established. As defined in the County's Oak Woodland Management Plan Monitoring Program:

> *"Replacement of removed tree canopy . . . is subject to intensive to moderate management and 10 to 15 years of monitoring, respectively. The survival rate shall be 90 percent as specified in the approved monitoring plan for the project, prepared by a qualified professional. Acorns may be used instead of saplings or one gallon trees."*
>
> *"Management intensity assumes that 10 years after planting 1 year old saplings that trees that have been nurtured with high management intensity will be on average 2 inches DBH with 90 percent survival; moderate management intensity will result in trees that are on average 1.5 inches DBH with 85 percent survival."*

More precisely, an intensive management program is required to obtain 90 percent survival. The management includes10 years of monitoring for one-gallon/one year old saplings and 15 years of

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[11] Although this may be higher than seen by EID for current street medians and community entrances, this conservative assumption allows the Proposed Project with flexibility to landscape these areas up to the full demands of MWELO.

[12] Reference Evapotranspiration is obtained from the map available at http://wwwcimis.water.ca.gov/cimis/cimiSatEtoZones.jsp

[13] The County Board of Supervisors has an Oak Woodland Management Plan (OWMP) codified as Chapter 17.73 of the County Code (Ord. 4771. May 6, 2008.). The primary purpose of this plan is to implement the Option B provisions of Policy 7.4.4.4. On September 24, 2012, the Board of Supervisors directed the Development Services Department to prepare a General Plan amendment to amend Policies 7.4.2.8, 7.4.2.9, 7.4.4.4, 7.4.4.5, 7.4.5.1, and 7.4.5.2 and their related implementation measures to clarify and refine the County's policies regarding oak tree protection and habitat preservation. (This excerpt was copied from the following El Dorado County web site: http://www.edcgov.us/Government/Planning/General_Plan_Oak_Woodlands.aspx on May 4, 2013.)

monitoring if acorns are planted. Any trees/acorns that do not survive within the monitoring periods are to be replaced within that time, so that 90 percent survival is achieved at the end of the monitoring period.

Because establishment of new trees is highly dependent on site conditions (soil depth and composition, depth to water table, slope, aspect, existing vegetation), planting conditions (water year, starting from acorns or saplings, weed mats, mulch, density of plantings and other adjacent veg, etc.), establishment and maintenance practices (manual or installed irrigation systems, and irrigation intervals), and the required success criteria (target % survival), the estimated water demands are difficult to predict.[14] However, in order to be reasonably conservative, this WSA assumes that each acre of habitat mitigation will require 1 acre-foot per acre of annual irrigation for a period of 15 years.[15] For instance, if the Proposed Project must mitigate with 10 acres of woodland, the demand would be 10 acre-feet annually. All oak woodland will be established prior to build-out and require no on-going irrigation.

Recreational Lake

The recreational lake is expected to need augmentation water to maintain desired lake elevations. Currently, the lake fills from adjacent groundwater seepage and stormwater runoff. Based on characterizations of this seepage from Proposed Project representatives, the water elevation often lowers during the summer and fall as surface evaporation outpaces seepage. To maintain water level elevations in the 10-acre lake, and estimated 6 to 10 acre-feet per surface acre of the lake will be assumed. For the entire lake, this equates to between 60 and 100 acre-feet. For purposes of the WSA, an assumed annual demand of 85 acre-feet will be used.

Vineyards

The Proposed Project will include approximately 55 acres of vineyards spread throughout the project. These vineyards serve as both an aesthetic feature and a business function – actively producing wine grapes. The majority of the planting is located on lots spread between differing housing types. Vineyards are also used in medians and other ornamental type plantings where appropriate. The use of vineyards in this fashion results in lower water use than fully landscaped medians. The vineyard water use estimates is based on a collection of documents from the University of California – Cooperative Extension combined with input for a local producer and winemaker. Reviewing water use data from *Wine Grape Cost and Return Studies, El Dorado and Amador Counties*, as well as other areas with similar climates and elevations, water demand range from 5 to 12 inches per year for established vines. In the interest of being conservative,

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[14] A qualified professional will likely develop the project specific oak management plan. More detailed water use will be available in this plan. Review of information from oak mitigation projects in the area revealed a range of planting types, irrigation methods, and management time frames. Overall, irrigation demands were all low as would be expected for a native species.

[15] A conservative water demand number and a long management window were assumed to provide the Proposed Project applicants flexibility in meeting the oak woodland mitigation requirements.

the 12-inch annual value is used.[16] To account for any additional water demands while establishing the vines, this WSA assumes that twice the water will be needed in the first few years following planting. As shown in **Table 2-3**, the initial demand upon planning (included for the first 5-year increment for each vineyard planning phase) is 2 acre-feet/acre. This value drops to 1 acre-foot/acre for the remainder of the analysis period for a particular planting phase.

Gate Houses at Private Entrances

No usable comparison exists in the EID water use history to represent the demand of a gate house. A gate house consists of a small building with a single bathroom. The average country club employee per shift uses 50 Liters per day, or just over 13.2 gallons.[17] Assuming two employees per shift and 3 shifts per day, the resulting water use comes out to about 0.09 acre-feet per year. To be conservative, the demand used is rounded up to 0.1 acre-feet per year.

Sewer Lift Stations

Lift station demand comes in form of maintenance of the stations. Operational flushing at these lift stations is the primary water use. Based on EID records for such operations, each lift station is assumed to demand 2.5 acre-feet of water annually.

Construction Water

As stated in Section 1, early phases of the Proposed Project will include site grading and infrastructure installation. These and other construction elements will require dust suppression and other incidental water uses. These are estimated to be nominal, and do not continue beyond the construction phases of the Proposed Project. For purposes of identifying incremental water demands, construction water is assumed within this WSA to be 11 acre-feet per year (this is well over 3.5 million gallons – or nearly 900 fill-ups of a 4,000 gallon water truck annually).

Modifications to Reflect Additional Water Use Reductions

Similar to the residential demand factors, the above-developed water demand factors for the non-residential classifications are based on similar existing developments in the El Dorado Hills area. Considerations to reduce these baseline values for conservation factors, however, are not required, since demand factors for many of the landscaped features, such as parks, will not change from the existing values – with the exception of commercial land-uses. The landscape-dominant demand factors are affected primarily by climatic conditions that drive plant evapotranspiration. In other words, an acre of turf at a park will still use the same amount of water in the new parks as the existing parks. Commercial land-uses, however, are adjusted downward slightly to reflect the CAL Green Code and likely modifications to landscape designs (compared to existing establishments) to limit outdoor water use. Schools are kept consistent

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[16] *The water demand is one dimensional and total demand is dependent on area. For the purposes of this WSA, acres are used for the second dimension. Therefore, one acre-foot of water is multiplied by each acre of vineyard. The result is 1 acre-foot/acre which is used in this documents calculations*

[17] Tchobanoglous, George, and Edward Schroeder. *Water Quality*. Menlo Park: Addison Wesley Longman, 1987

with the existing demand factor, since the data is based on the average of several schools and the exact configuration and number of students at the proposed schools is not fully defined. **Table 2-2** summarizes the non-residential demand factors used in this WSA.

Table 2-2 – Summary of Non-Residential Demand Factors

Land Use	Current Factor (af/ac)	Conservation % Applied	Factor Used (af/ac)
Office Park/Commercial	2.00	3%	1.94
Parks	2.77	0%	2.77
Schools	1.43	0%	1.43
ROW Landscaping	3.30	0%	3.30
Open Space	0.00	0%	0.00

2.7 Proposed Project Water Demand Projection

Combining the Proposed Project's land-use details and phasing as summarized in **Table 1-1** and **Table 1-2** with the demand factors presented in **Table 2-1** and **Table 2-2**, the water demands for the project from initiation to build-out are estimated. At completion, the Proposed Project is estimated to need 1,927 acre-feet of water annually (prior to considerations of non-revenue water, described in the next subsection) as shown in **Table 2-3**.

2.7.1 Non-Revenue Water Demands

The demand factors presented earlier in this section represent the demand for water at the customer's meter for each category. To fully represent the demand on EID's water resources, non-revenue water also needs to be included. Non-revenue water represents all of the water necessary to deliver to the customer accounts and reflects distribution system leaks, water demands from potentially un-metered uses such as fire protection, hydrant flushing, and unauthorized connections, and inescapable inaccuracies in meter readings.[18] In most instances, the predominant source of non-revenue water is from system leaks – the loss from fittings and connections from EID's water sources through treatment plants, tanks, pumping plants, major delivery system back-bone pipelines, and community distribution systems. Because a significant portion of the delivery system used to bring water to the Proposed Project already exists, the benefits of new piping within the Proposed Project has limited effect on the overall percentage of non-revenue water necessary to operate the system.

[18] The American Water Works Association and the California Urban Water Conservation Council recognize the inherent non-revenue water that is either lost or mis-accounted in urban treated water distribution systems and suggest purveyors strive for a value of 10% of all delivered water. Obtaining this value is dependent on numerous factors including the age and extent of distribution system infrastructure, meter rehabilitation programs, and how a purveyor accounts for actions such as fire flows and hydrant flushing.

Although EID has an established program for identifying and accounting for most unbilled and other system losses, there are still pipeline leaks, unmetered uses, unauthorized connections, meter inaccuracies, and other losses that are difficult to specifically quantify. Consistent with the District's methodology for calculating future water meter availability, as defined in the *2012 Water Resources and Service Reliability Report,* non-revenue water is projected at a fixed rate of 13 percent. Non-revenue demand is estimated to add 250 acre-feet per year at build-out to the Proposed Project's land-use demands, bringing the estimated build-out water demand attributed to the Proposed Project to 2,177 acre-feet annually (see **Table 2-3**).

2.7.2 Recycled Water Demand

A portion of the Proposed Project's demands (see Figure 1-1) could be met with recycled water provided by EID (see Section 4.3). As previously noted, other than the high-density multi-family units, residential potable demands require about 0.18 acre-feet annually per household. The remaining portion of the unit demand factor for each type of residential lot could be met with recycled water (see **Table 2.1** for unit demand factors). For the high-density residential units, the potable water requirement is lower due to fewer customers per unit on average when compared to other housing types. Using these unit water demand assumptions, coupled with the number of residential units, the Proposed Project could meet approximately 937 acre-feet of the 1,510 acre-feet of residential water demand with recycled water – prior to consideration of non-revenue water demands.

Non-residential components of the Proposed Project could also be met with recycled water, especially the parks, vineyards and lake supplementation. Removing the small potable demands for parks and the limited commercial properties, the Proposed Project could meet 355 acre-feet of the 417 acre-feet of total non-residential demand with recycled water – prior to the consideration of non-revenue water demands. Combined, recycled water could serve approximately 1,292 acre-feet of the Proposed Project's demand (see **Table 2-4**).

Table 2-4 – Estimated Demand Met with Recycled Water

	Demand (af/yr)		
	Residential	Non-Res	Total
Potable	572	62	635
Recycled	937	355	1,292
Total Demand	**1,510**	**417**	**1,927**

Table 2-3 – Estimated Proposed Project Water Demands from Start-up to Build-out

	Unit Count or Acreage						Demand Factor (af/du or af/ac)						Demand (af/yr)					
Category	Current	2015	2020	2025	2030	2035	Current	2015	2020	2025	2030	2035	Current	2015	2020	2025	2030	2035
Residential																		
1 Acre Custom Homes	0	0	25	45	145	193	1.16	1.04	1.04	1.04	1.04	1.04	0	0	26	47	152	202
1/2 Acre Custom Homes	0	0	25	50	50	125	0.87	0.80	0.80	0.80	0.80	0.80	0	0	20	40	40	100
8,000-10,000 sf Lots	0	0	215	593	593	982	0.55	0.53	0.53	0.53	0.53	0.53	0	0	113	312	312	517
5,000-7,000 sf Lots	0	0	0	0	663	663	0.50	0.48	0.48	0.48	0.48	0.48	0	0	0	0	315	315
Condominiums/Town Homes	0	0	75	597	772	772	0.40	0.38	0.38	0.38	0.38	0.38	0	0	29	228	295	295
Multi-Family Housing	0	0	209	259	487	501	0.16	0.16	0.16	0.16	0.16	0.16	0	0	34	42	79	81
												Subtotal	0	0	222	669	1,192	1,510
Commercial																		
Office Park/Commercial	0	0	0	12	27	58	2.00	1.94	1.94	1.94	1.94	1.94	0	0	0	22	52	112
Schools	0	0	0	0	19	35	1.43	1.43	1.43	1.43	1.43	1.43	0	0	0	0	28	50
Gate House	0	0	1	1	1	1	0.10	0.10	0.10	0.10	0.10	0.10	0	0	0	0	0	0
												Subtotal	0	0	0	23	80	162
Public																		
Parks	0	5	13	14	22	22	2.77	2.77	2.77	2.77	2.77	2.77	0	14	37	40	60	60
Open Space	0	1,282	1,282	1,282	1,282	1,282	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0
Lake	0	0	1	1	1	1	85.00	85.00	85.00	85.00	85.00	85.00	0	0	85	85	85	85
Vineyards Phase 1	0	0	18	18	18	18	0.00	0.00	2.00	1.00	1.00	1.00	0	0	35	18	18	18
Vineyards Phase 2	0	0	0	13	13	13	0.00	0.00	0.00	2.00	1.00	1.00	0	0	0	26	13	13
Vineyards Phase 3	0	0	0	0	10	10	0.00	0.00	0.00	0.00	2.00	1.00	0	0	0	0	20	10
Vineyards Phase 4	0	0	0	0	0	14	0.00	0.00	0.00	0.00	0.00	2.00	0	0	0	0	0	28
Lift Stations	0	0	2	2	2	2	2.50	2.50	2.50	2.50	2.50	2.50	0	0	5	5	5	5
												Subtotal	0	14	162	173	201	219
Other																		
ROW & landscape lots	0	0	6	11	11	11	3.30	3.30	3.30	3.30	3.30	3.30	0	0	18	36	36	36
Mitigation Demands	0	100	225	225	125	0	1.00	1.00	1.00	1.00	1.00	1.00	0	100	225	225	125	0
Construction Water	0	2	2	2	2	0	5.50	5.50	5.50	5.50	5.50	5.50	0	11	11	11	11	0
												Subtotal	0	111	254	272	172	36
												Total Water Demand	**0**	**125**	**638**	**1,137**	**1,646**	**1,927**
												Non-Revenue Demand at 13%	0	16	83	148	214	250
												Total Proposed Project Demand	**0**	**141**	**721**	**1,285**	**1,860**	**2,177**

SECTION 3 – OTHER ESTIMATED WATER DEMANDS

3.1 INTRODUCTION

As stated in this excerpt from Water Code Section 10910(b)(3): *"[T]he water supply assessment for the project shall include a discussion with regard to whether the public water system's total projected water supplies available…will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses…"* This section details EID's other "existing and planned future uses." For purposes of this WSA, existing and planned future uses are subdivided into the following:

- **Other Currently Proposed Projects** – in addition to the Proposed Project, El Dorado County (County) is the Lead Agency (pursuant to CEQA) for four additional proposed development projects. As Lead Agency, the County has requested separate WSAs from EID for each of these other projects. Because detailed land-use information is available for three of the four projects and separate WSAs are being developed for these three in parallel to this WSA, each of these three projects have unique water demand estimates that are included in this WSA.[19]

- **All Other Existing and Planned Future Uses –** in addition to the Proposed Project and the Other Currently Proposed Projects, existing customers and anticipated growth in the County must be quantified. The subdivisions of this category are:

    - **Current Customers and Uses** – using 2012 as a baseline condition, this category reflects the current range of EID's potable and recycled water customers. Because these customers and uses already exist, keeping them separate from planned future uses allows an analysis to reflect anticipated reductions in use over time as EID continues to implement its urban water conservation programs targeted at many of the existing customers.[20]

    - **Adjusted General Plan Update Land Use Growth** – in addition to the identified development projects currently undergoing County CEQA review, the County's 2004 General Plan Update (GPU) anticipates continued urban growth throughout the EID service area. This growth is accounted for in the EID 2013 *Integrated*

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[19] EID understands the fourth project, San Stino, to be undergoing changes to its land-use plans at the time of drafting this WSA. Lacking the details needed to determine water demands similar to the other WSAs currently being completed, the San Stino project is reflected in the next subgroup of demands (see Section 3.3).

[20] New customers added to EID's system will have lower demand factors, as discussed in Section 2, and will be less likely to implement additional conservation or see much reduction when changes are made. For instance, many existing customers may still have 3 gallon per flush toilets or even 1.6 gallon per flush toilets, which when replaced, will likely only use 1.28 gallons. New houses will be constructed, per the CAL Green Code, with 1.28 gallon per flush toilets. EID has had conservation and incentives programs for more than 20 years.

Water Resources Master Plan (2013 IWRMP) and serves as the primary water demand driver into the future. Adjustments to anticipated GPU growth to reflect the "Other Currently Proposed Projects" and other proposed land-use changes, however, must be made. The adjustments discussed under this category include: (1) potential changes in the 2004 General Plan land use designations as identified in Facility Improvement Letters received and analyzed by EID; and (2) the removal of the Proposed Project and other proposed project uses being developed under concurrent WSAs.

  - **Other Authorized Uses** – EID does not anticipate increases above 2012 levels in other authorized potable water uses such as fire flows, meter testing, water quality flushing, and ditch system operations. Demands for this category of water use is removed from the general plan growth and included separately.

- **Non-Revenue Water** – As discussed in Section 2.7.1, an additional demand is seen by EID to treat and deliver water to all customers. Referred to as non-revenue water, this water demand represents a 13 percent increase added to estimated customer demands. This value represents a long-term average experienced by EID.

3.2 OTHER CURRENTLY PROPOSED PROJECTS

As mentioned in the previous section, El Dorado County is the Lead CEQA Agency for four additional proposed development projects and has requested EID to prepare WSA's for each development concurrent with this Proposed Project WSA. EID is currently drafting three of these four WSAs.[21] The estimate of water demand for each WSA follows the same methods used in Section 2 of this WSA, with specific unit demand factors applied to each unique land use element. The other projects are:

- Central El Dorado Hills – located along El Dorado Hills Blvd north of Hwy 50, this projects is a planned infill mixed development with primarily residential units and some commercial space.
- Lime Rock Valley Specific Plan – located adjacent to the Village of Marble Valley, this development is a planned residential community with a variety of lot sizes and housing types.
- Dixon Ranch Residential Project – located northeast of the Proposed Project, this development is a planned residential community with a range of lot sizes and housing types, including a number of "age-restricted" units, accompanied by a community club house, parks, ponds, and trails.

[21] EID understands that the San Stino development project is undergoing changes to the land-use plans previously submitted to the County. Therefore, EID has not begun the WSA for that project.

Based on the detailed analysis completed in the other WSAs, these "Other Currently Proposed Projects" represent approximately 1,330 acre-feet per year of new demand by 2035. **Table 3-1**, presented later in this section, summarizes the estimated water demands as determined and detailed in the concurrent WSAs for each unique project. The values shown are the estimated customer and use demands and do not include the additional water associated with non-revenue percentages attributable to the treatment and distribution for each project (see Section 3.5).

3.3 ALL OTHER EXISTING AND PLANNED FUTURE USES

In simple terms, this category of use would typically reflect all the other water demands anticipated by EID that are in addition to the Proposed Project. However, because of the unique circumstance that other WSAs are concurrently being drafted by EID, this category must be adjusted to remove those other well-defined water demands. Furthermore, because other potential changes to the 2004 GPU have been brought to EID's attention, and EID anticipates changes to current customer uses, a more detailed assessment of future demands is warranted. This subsection describes:

- Current Customers and Uses
- Adjusted GPU Land Use Growth
- Other Authorized Uses

3.3.1 Current Customers and Uses

Current customers and uses in the contiguous EID service area provide a baseline from which to assess additional demand from the Proposed Project and other potential planned uses. For purposes of the WSA, the deliveries to current customers in 2012 were used to define this baseline. Based on the 2012 EID *Water Diversion Report*, EID diverted 36,580 acre-feet into its potable water system. In addition to the potable water, EID served 2,404 acre-feet of recycled water to meet customer demands.[22] Combined, the current water demand is represented as 38,984 acre-feet. This value includes the non-revenue water (see Section 2.7.1), including system losses, necessary to deliver these supplies from their respective treatment plants to the customer meter. This value also includes 1,269 acre-feet sold to the City of Placerville.[23]

Since the WSA uses 2012 as a baseline, the "current" demand varies from that used in the recently adopted 2013 IWRMP, which used the year 2008 for its baseline.[24] Given on-going conservation efforts, adoption of new rate structures, and other drivers, EID has seen an overall decrease in the annual customer use since the IWRMP selected its baseline. Therefore the 2012

[22] See EID 2013 Water Resources and Reliability Report (Table 14)
[23] See EID Consumption Report: Reporting Year 2012 (Table on p. 7)
[24] The IWRMP, adopted by the EID Board in March 2013, began several years ago and at the time used 2008 as a baseline. Since that time, EID's annual diversions have dropped from a high in 2008 of about 45,000 acre-feet to 35,678, 33,453, and 36,580 in 2010, 2011, and 2012, respectively. Combined with recycled water deliveries, the 2012 demand is lower than that used for the 2013 IWRMP, but greater than 2010 and 2011.

baseline used for this WSA is more representative of the baseline use expected into the future from these existing customers and uses.

A slight adjustment to this baseline is necessary, however, to project it into the future. Although this demand will remain relatively constant since it does not add any new uses (additional uses are discussed in the next subsections), a slight decrease is assumed that reflects on-going implementation of conservation and installation of new water-using fixtures by existing customers. EID's continued leadership in conservation will enable existing customers to retrofit toilets, receive appliance rebates for new household items such as dishwashers, water heaters and clothes washers, and implement irrigation efficiency improvements through various incentives. Additional reductions in existing customer demands will also occur simply as a result of the natural replacement of old fixtures and appliances with lower water-use devices. For purposes of the WSA, EID estimates the reduction in current customer demand will be approximately 2% by 2020 and an additional 1% by 2035. This is consistent with EID's expectations necessary to meet its per-capita water use targets as detailed in the 2010 Urban Water Management Plan.[25]

3.3.2 Adjusted GPU Land Use Growth

In the 2004 GPU, the County made growth projections using land-use zoning throughout the County. Within the contiguous EID water service area, the GPU land-use zoning correlates to EID defined unit water demand factors. During preparation of the recently adopted 2013 IWRMP, EID used GIS-based land-use designations, combined with the water demand factors, to develop estimated growth in water demand. Absent any changes to the 2004 GPU land-use designations, the 2013 IWRMP demand projections would provide a valid representation of future water needs. However, because several proposed changes to the GPU land-use designations have been submitted – both through the County's formal process, such as is the situation with the Proposed Project and Other Planned Projects, and through an EID process explained below – the 2013 IWRMP demand projections require refinement. The steps to adjust these demands included:

- Removal of Proposed Project and Other Planned Projects water demands
- Modifying land-use zoning based on Facility Improvement Letters
- Determining Growth to Year 2035

Once these steps were completed, the analysis reassessed the water demand using the water demand factors applied in the 2013 IWRMP.

Step 1: Removal of Proposed Project and Other Planned Project Water Demands

The first step in adjusting the water demands was to remove the detailed water demands estimated in this WSA for the Proposed Project and for the Other Planned Projects (see

[25] See Section 3 of the 2010 UWMP available here:
http://www.eid.org/modules/showdocument.aspx?documentid=338

Section 2 and Section 3.2). This step involved removing the specific acreage and water demand factors from the 2013 IWRMP analysis. The 2004 GPU included land-use zoning for the lands underlying the Proposed Project as well as the Other Planned Projects. In the 2013 IWRMP, water demands were estimated using the existing zoning. Removing these land uses eliminates the potential to double-count the associated acreage when assessing the remaining GPU expected growth.

Step 2: Modifying Land-use Zoning based on FILs
When investigating water service from EID for development projects (e.g. lot splits, land use changes, and new service to existing parcels), existing landowners submit a Facilities Improvement Letter (FIL). This document allows EID to assess whether infrastructure or supplies are available to serve the proposed project. In some instances, the FILs include proposed land-use zoning changes not previously incorporated into EID water demand projections. By using GIS to map the locations of the FILs requesting a change in land-use zoning, EID was able to identify where changes to the 2013 IWRMP demand estimates would occur. About 25 specific FILs were identified as having land-use designation changes. These identified parcels were removed from the prior analysis to eliminate potential double counting of demands.

In a separate analysis, the water demand for this subset of parcels was recalculated using the appropriate water demand factor for the new proposed land-use classification (e.g. water needs for these parcels may have previously been calculated based on very-low density housing, but is requesting a change to higher density housing). Through the analysis, an increased demand of approximately 3,000 acre-feet over the 2013 IWRMP projections was identified.

Step 3: Determining Growth to 2035
The GPU identifies anticipated build-out conditions for the County and, as a subset, for the EID contiguous water service area. Since this WSA assesses water demands in 5-year increments only to 2035 – well short of the anticipated timing of the County's build-out – the amount of build-out growth occurring by 2035 must be determined. This was done for both the parcels identified with new land-use zoning through the FIL analysis, and for the remaining parcels with original GPU land-use designations.

Because there is little detail about planned development rates for the FIL-related parcels, this WSA assumed that these parcels would have full water demand usage by 2035.[26] This is a conservative estimate, since some of these lands may not develop by 2035 or may never

[26] This assumption also considers that a landowner would likely only submit a FIL to EID if they are seriously contemplating the development activity. Thus, there is a higher likelihood that these parcels will develop at a faster rate than other generally anticipated growth for the remaining parcels in the GPU.

develop. Thus, the estimated increase in demand of approximately 3,000 acre-feet was assumed to occur by 2035 with the 2013 IWRMP growth rate applied.

For the remaining parcels, growth rates used to determine the degree of development were based on EID's 2013 IWRMP. In the 2013 IWRMP, growth rates for the El Dorado Hills, and Western/Eastern water service areas were identified for specific year-ranges.[27] This WSA uses those growth rates for the remaining parcels. Using the 2013 IWRMP growth rates, the analysis determined build-out for the El Dorado and Western/Eastern service areas occurs after 2035.

During this adjustment, special attention was provided to the City of Placerville. The City purchases potable water from EID for distribution to its residents. The 2013 IWRMP projected future water demands for the City based on the City's existing General Plan. This WSA assumes the same rate of growth and build-out demand as the 2013 IWRMP for the City.

Upon completion of these steps, the adjusted demand for the GPU land uses was determined. **Table 3-1** summarizes the anticipated increase in water demand during each 5-year increment as a result of these adjustments to the GPU land-uses.

3.3.3 Other Authorized Uses

In addition to the sale of water to metered customers, EID has a set of water demands it refers to as "Other Authorized Uses." This designation is for the following existing uses:

- Knolls Reservoir Assessment District
- Private Fire Services
- Temporary Water Use Permit
- Bulk Water Stations - Permanent
- Bulk Water Stations - Temporary
- Lift Stations
- Collection System Flushing
- Spills, Overflows, and Flushing
- Clear Creek Aesthetics Flow Maintenance District

Of these, the Clear Creek aesthetic flows comprise over 80 percent of the annual authorized uses. Lift stations and temporary use permits comprise another 10 percent. The current demand of approximately 2,200 acre-feet is already reflected in the "Current Customers and Uses." EID anticipates no growth in these authorized water uses, with the total demand to remain constant at 2,200 acre-feet through 2035.

[27] EID Integrated Water Resources Master Plan, adopted March 2013 (Table 9-2).

3.4 NON-REVENUE WATER DEMANDS

The subtotal values in **Table 3-1** represent the demand for water at the customer's meter for each category. To fully represent the demand placed on EID's water resources, non-revenue water also needs to be included. Non-revenue water represents all of the water necessary to deliver to the meter and reflects distribution system leaks, water demands from potentially un-metered uses of fire protection, fire hydrant flushing, and unauthorized connections, and inescapable inaccuracies in meter readings.[28] In most instances, the predominant source of non-revenue water is from system losses – the loss from fittings and connections from the District's water sources through treatment plants, tanks, pumping plants, major delivery system back-bone pipelines, and community distribution systems.

Although the District has an established program for identifying and accounting for most unbilled and other system losses, there are still pipeline leaks, unmetered uses, unauthorized connections, meter inaccuracies, and other losses that are difficult to specifically quantify. Consistent with the District's methodology for calculating future water meter availability, as defined in the *2012 Water Resources and Service Reliability Report,* non-revenue water is projected at a fixed rate of 13 percent.

As shown in **Table 3-1**, non-revenue demand for Existing and Planned Future Uses is estimated to be about 7,500 acre-feet per year by 2035.

3.5 ESTIMATED EXISTING AND PLANNED FUTURE USES

Combining the estimated water demand for Other Currently Planned Projects (see Section 3.2 with the All Other Existing and Planned Future Uses demand (Current Customers and Uses plus the Adjusted GPU Land Use values), the total estimated demand during each 5-year increment to 2035 is derived (see subtotal water demand in **Table 3-1)**.

[28] See footnote 14

Table 3-1 – All Other Existing and Planned Future Uses

Category	Estimated Demand (af/yr)					
	Current	2015	2020	2025	2030	2035
Other Currently Proposed Projects	0	163	696	1,052	1,272	1,332
Current Customers and Uses [1]	38,984	34,154	33,809	33,694	33,579	33,464
Adjusted GPU Land Use [2]	0	514	2,853	7,975	14,718	22,830
Subtotal Water Demand	**38,984**	**34,831**	**37,359**	**42,721**	**49,570**	**57,627**
	Current	2015	2020	2025	2030	2035
Non-Revenue Water at 13%	--	4,528	4,857	5,554	6,444	7,491
Total Water Demand	**38,984**	**39,359**	**42,216**	**48,275**	**56,014**	**65,117**

1. The "Current Customers and Uses" demand value includes the "Other Authorized Uses." The Value is greater under the "Current" condition because "Non-Revenue Water" is included in the current year. All other years will have "non-revenue water" added on a separate line. A 3% conservation decrease occurs by 2035.
2. "Adjusted GPU Land Use" reflects changes to the 2004 GPU as determined by FILs submitted to EID. This value also does NOT include the other proposed projects currently undergoing County CEQA review.

3.6 Total Estimated Demand

The other existing and planned future water demands described in this section represent the total demands anticipated *in addition to* the water demands of the Proposed Project. Combining the estimated Proposed Project water demands of 2,177 acre-feet annually (see **Table 2-3**) with the estimated Existing and Planned Future water demands of approximately 65,000 acre-feet annually (see **Table 3-1**), a total estimated demand for EID water supplies by 2035 is determined. Estimated existing and planned future water demands, inclusive of non-revenue water needs, for each 5-year increment to 2035 are presented in **Table 3-2**. The estimated demand for EID Water supplies is 67,295 acre-feet annually.

Table 3-2 – Total Estimated Water Demands

Category	Estimated Demand (af/yr)					
	Current	2015	2020	2025	2030	2035
Proposed Project	0	141	721	1,285	1,860	2,177
Existing and Planned Future Uses	38,984	39,359	42,216	48,275	56,014	65,117
Total Water Demand	**38,984**	**39,500**	**42,937**	**49,560**	**57,874**	**67,295**

Of note is that the estimated water demand for 2035 presented in **Table 3-2** fits within the range of total demands presented in Table 9-1 of the 2013 IWRMP (estimated to be between 61,262 acre-feet and 77,315 acre-feet). The primary differences is that the 2013 IWRMP used 2008 as a baseline demand, which is substantially higher than EID has seen in the last several years. This WSA uses 2012 as a baseline. The 2008 value was approximately 45,000 acre-feet, while the 2012 value is 38,984 – or about 39,000 acre-feet. This represents a difference of about 6,000 acre-feet. Starting from a different baseline quantity and year, and then applying the 2013 IWRMP growth rates, results in a different estimated total demand when reaching 2035.

SECTION 4 – WATER SUPPLY CHARACTERIZATION

4.1 INTRODUCTION

This section explains the intended water supply that EID will use to serve the Proposed Project.[29] EID will meet the Proposed Project's water demands by utilizing water assets derived from its existing sources as well as through future asset acquisition efforts with El Dorado County Water Agency. This section details the Proposed Project's available water supplies and entitlements as well as its planned water supplies and entitlements in both normal water years and dry water years. The Proposed Project exists completely in El Dorado Irrigation District's contiguous water service area (see **Figure 4-1**) and may be served with both treated water and recycled water.[30]

El Dorado Irrigation District maintains two primary interconnected water systems in its contiguous service area: the El Dorado Hills system and the Western/Eastern system, along with a separate recycled water system. The El Dorado Hills water system obtains its primary supplies under rights and entitlements from Folsom Reservoir. The Western/Eastern system derives its supplies from sources under rights and entitlements emanating from further up the American River watershed and the Cosumnes River watershed. The recycled water system serves treated wastewater from the El Dorado Hills wastewater treatment plant and the Deer Creek wastewater treatment plant.

The water assets can be further categorized by the service area they primarily serve and the treatment plant they flow through. Water derived from Folsom Reservoir is delivered to the El Dorado Hills water treatment plant and serves the El Dorado Hills area. Water derived from upstream American River watershed diversions and storage reservoirs generally use the Reservoir 1 Water Treatment Plant while the Cosumnes River diversions use Reservoir A Water Treatment Plant to serve the Western/Eastern area. Water assets from these upstream diversions can be delivered by gravity feed to the El Dorado Hills area, but assets from Folsom Reservoir are not delivered outside the El Dorado Hills area due to infrastructure limitations. The following subsections describe these water supplies and delivery mechanics in more detail.

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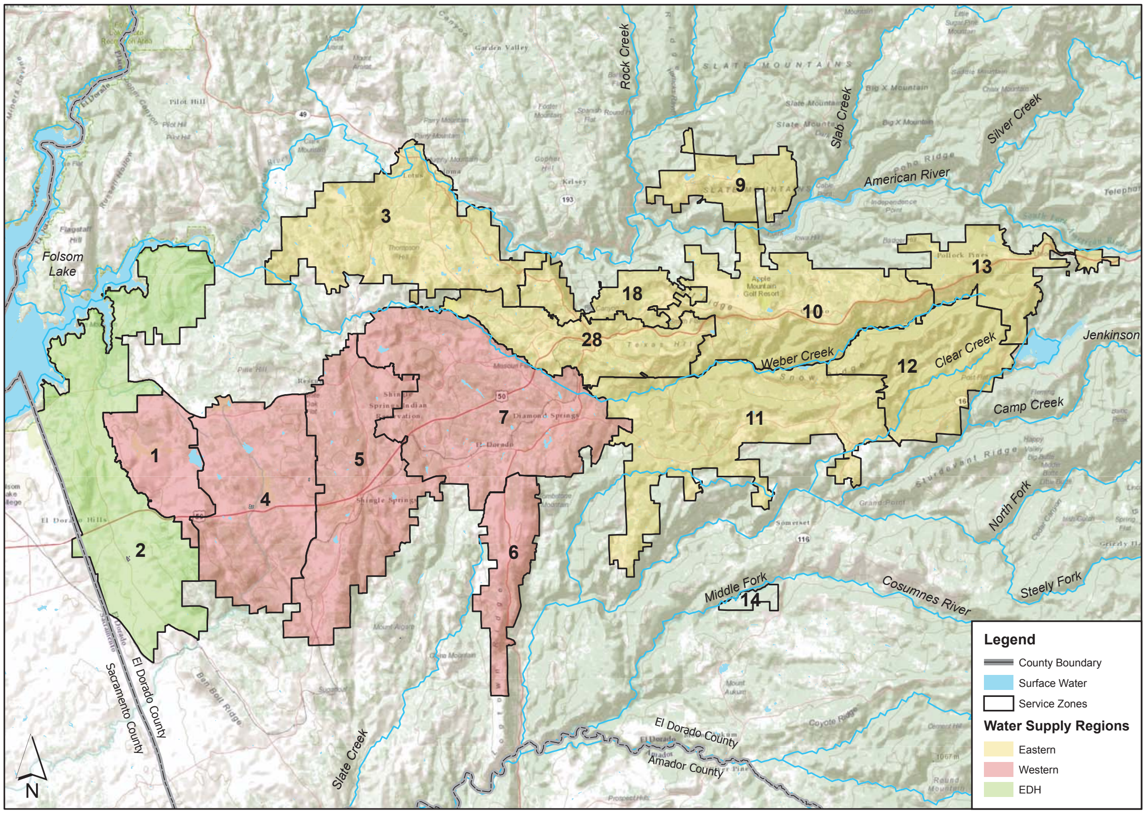
[29] CWC § 10910(d)(1) requires that "The assessment… include an identification of any existing water supply entitlements, water rights, or water service contracts relevant to the identified water supply for the proposed project, and a description of the quantities of water received in prior years by the public water system…under existing water supply entitlements, water rights, or water service contracts. (2) An identification of existing water supply entitlements, water rights, or water service contracts held by the public water system…shall be demonstrated by providing information related to all of the following: (A) Written contracts or other proof of entitlement to an identified water supply. (B) Copies of a capital outlay program for financing the delivery of a water supply that has been adopted by the public water system. (C) Federal, state, and local permits for construction of necessary infrastructure associated with delivering the water supply. (D) Any necessary regulatory approvals that are required in order to be able to convey or deliver the water supply."

[30] EID also has surface water assets that it serves to two non-contiguous areas as well as raw water assets that are used for agricultural purposes. These water assets are irrelevant to the Proposed Project contemplated in this Water Supply Assessment and are, therefore, not analyzed.

Figure 4-1 – El Dorado Irrigation District Service Area
(from Figure 8-7, Integrated Water Resources Master Plan, EID, March 2013)



4.2 Treated Water Supplies

EID's treated water supplies identified for the Proposed Project are derived from a number of water rights and entitlements as detailed in **Table 4-1**. The maximum available water assets column in **Table 4-1** does not account for other hydrological, technical, regulatory, and contractual limitations that apply to the water assets for normal year and dry year deliveries. These issues are addressed in the other two columns in the table. EID's water assets available for the Proposed Project include water rights and entitlements that EID currently has in its possession and planned water rights and entitlements that it will control in the future.

4.2.1 Water Rights and Entitlements Description

Generally, EID's water assets are derived from pre-1914 appropriative water rights, licensed and permitted appropriative water rights, Central Valley Project (CVP) contracts, Warren Act contracts (that allow non-federal water assets to be wheeled through the federal storage and conveyance facilities), and recycled water generated from the effluent treated at the District's two wastewater treatment plants. The District's counsel has recently confirmed all of these water rights and entitlements. Pertinent information regarding these water assets is included in **Appendix A** of this document as required by Water Code section 10910(d).

Water for the Proposed Project will be derived from both Folsom Reservoir and upstream American River and Cosumnes River diversions. As shown in **Table 4-1**, the primary water assets for diversion at Folsom Reservoir are: CVP Contract 14-06-200-1375A-LTR1, and License 2184 and several pre-1914 water rights incorporated into Warren Act contract 06-WC-20-3315. EID is seeking to finalize its Warren Act contract for diversions of Permit 21112 at Folsom Reservoir. EID also has additional water assets under the El Dorado – SMUD Cooperation Agreement and a Central Valley Project water entitlement derived from El Dorado County Water Agency's Fazio water supply. These water assets will be described in **Section 4.2.2**.

Table 4-1 – Water Rights, Entitlements, and Supply Availability

Water Right or Entitlement	Maximum Water Assets Available (Ac-ft)	Normal Year Planned Supply Availability (Ac-ft)	Dry-Year Planned Supply Availability (Ac-ft)
License 2184 and pre-1914 ditch rights including Warren Act Contract 06-WC-20-3315	4,560	4,560	3,000
Licenses 11835 and 11836	33,400	23,000	20,920[A]
CVP Contract 14-06-200-1375A-LTR1	7,550	7,550	5,660
Pre-1914 American River diversion and storage rights	15,080	15,080	15,080
Permit 21112	17,000	17,000	17,000
Subtotal Existing	**77,590**	**67,190**	**61,660**
Central Valley Project Fazio water entitlement (PL 101-514 (1990) Fazio) [D]	7,500	7,500	5,625
Applications 5645X12, 5644X02 and partial assignment of Applications 5645, 5644 with El Dorado-SMUD Cooperation Agreement [E]	40,000[B]	30,000	5,000[C]
Subtotal Planned	**47,500**	**37,500**	**10,625**
Recycled Water	5,600	5,600	5,600
Total	**130,690**	**110,290**	**77,885**

[A] This is the modeled safe-yield of this water right during a single dry-year. For planning purposes, the second and third dry years of a three-year dry period are assumed to be 17,000 acre-feet, and 15,500 acre-feet, respectfully
[B] Section 5.1.1 of the El-Dorado SMUD Cooperation Agreement indicates that 40,000 acre-feet of SMUD water will be available after 2025. For conservative Normal Year planning purposes, the District uses 30,000 acre-feet of available supply.
[C] Available supply is 15,000 acre-feet in a single dry year but in preparing for multiple dry years EID anticipates using only 5,000 acre-feet per year for a three year period.
[D] Available starting in 2015
[E] Available starting in 2025

License 2184 and Pre-1914 Water Rights

Water rights associated with Weber Dam, Weber Creek (Farmer's Free Ditch), Slab Creek (Summerfield Ditch), and Hangtown Creek (Gold Hill Ditch) are available to be diverted at Folsom Reservoir under a long-term Warren Act Contract, with approximately 4,560 acre-feet available each year from these sources. A Warren Act Contract allows the use of federal facilities to take non-CVP water such as these supplies. The 40-year contract commenced on March 1, 2011 and has a maximum net contract amount of 4,560 acre-feet per year. The contract total also assumes a 15% conveyance loss between the former points of diversion and Folsom Reservoir, which can be adjusted at a later date by mutual agreement without amending the contract. The annual water diversion season is limited to April through November 15 and the water must be used for municipal and industrial purposes in the El Dorado Hills and Cameron Park areas.

Licenses 11835 and 11836

Licenses 11835 and 11836 allow for 33,400 acre-feet of diversion in EID's upstream system in the Cosumnes River watershed. These diversions are stored in Jenkinson Lake, the largest storage reservoir in EID, formed by two earth and rock dams across Sly Park Creek near Pollock Pines with a maximum capacity of 41,033 acre-feet. The dam was constructed as a portion of the United States Bureau of Reclamation (USBR) CVP in 1955. With the transfer of ownership from the USBR of the Sly Park dam and associated lands and facilities in 2003, EID not only operates and maintains the Jenkinson Lake and Sly Park Dam facilities, including recreational aspects, but also holds the water rights. The average annual use from this facility is approximately 23,000 acre-feet, though EID's annual water right is for 33,400 acre-feet of total beneficial use. This water supply is used entirely within EID's contiguous service area. Under average flow conditions, Jenkinson Lake is operated to maintain 14,000 to 18,000 acre-feet of carryover storage each year. The outlet works at Sly Park Dam have a maximum capacity of 125 cfs. Water is released to the Reservoir A Water Treatment Plant for subsequent treatment, transmission, and distribution.

Jenkinson Lake contributes approximately 20,920 acre-feet per year to EID's system firm yield. Over the past five years, EID's annual diversions from Jenkinson Lake have averaged approximately 22,600 acre-feet per year. EID's maximum and minimum diversions from this particular water source during this five-year period were 25,745 and 20,800 acre-feet per year, respectively.

USBR CVP Contract 14-06-200-1375A-LTR1

Surface water from Folsom Reservoir is provided to the El Dorado Hills area. By contract with the USBR for Folsom Reservoir water, EID is entitled to 7,550 acre-feet per year. The contract includes provisions for use in a particular area that generally encompasses the El Dorado Hills and Cameron Park areas. Folsom Reservoir is operated by the USBR as part of the CVP, a multipurpose project that provides flood control, hydroelectricity, drinking water, and water for irrigation.

The El Dorado Hills County Water District entered into a USBR Contract in 1964 for water supply from Folsom Reservoir. The contract had a not-to-exceed limit of 37,600 acre-feet per year. When EID annexed the El Dorado Hills County Water District in 1973, the contract was assigned to EID, and subsequently, in 1979, an amendatory contract replaced the original 1964 contract and reduced the maximum annual supply quantity of Folsom Reservoir water to 6,500 acre-feet per year. In 1983, the USBR increased the maximum annual supply quantity from 6,500 to 7,500 acre-feet per year. EID also annexed and succeeded to a USBR Contract for 50 acre-feet per year to supply the Lakehills area in El Dorado Hills. In 2006, these two contracts were consolidated into a single 40-year USBR Contract with a maximum quantity of 7,550 acre-feet per year.

Pre-1914 South Fork American River and Project 184

EID acquired Project 184 from Pacific Gas and Electric (PG&E) in 1999. Project 184 includes reservoirs and associated dams, 22 miles of canals, a 21 Mw powerhouse, and other ancillary facilities. Prior to the transfer of ownership and water rights, EID held a contract to purchase water from PG&E and its predecessor, Western States Gas and Electric Co. The original water rights claims date back to 1856, with additional claims being filed in the 1860s and 1870s. The water rights for diversions from Echo Lake were established in 1880 in a California Supreme Court decision. Then, in 1918, the California Railroad Commission (predecessor to the California Public Utilities Commission) recognized the use of water from the El Dorado Canal for irrigation and domestic purposes.

The sources of this water supply include natural flows in the South Fork American River and its tributaries, and stored water in Silver, Aloha, Echo, and Caples Lakes. The supply is diverted from the South Fork American River at Kyburz and is conveyed via the El Dorado Canal to the El Dorado Forebay. Some additional water is obtained by diversions into the El Dorado Canal from streams tributary to the South Fork American River. EID takes consumptive use of the water supply at the Main Ditch Intake, located at the El Dorado Forebay. This particular supply contributes 15,080 acre-feet per year to EID's system firm yield.

Water diversions of up to 156 cfs can be made from the South Fork American River at the diversion dam. In addition to these direct diversion rights, EID also has pre-1914 diversion and storage rights associated with portions of the waters stored in Silver Lake, Caples Lake, and Lake Aloha and all of the waters stored in Echo Lake.

El Dorado Forebay is filled by the surface water supply from the Project 184 facilities upstream in the South Fork American River basin and at Echo Lake. EID has a consumptive water entitlement of 15,080 acre-feet per year delivery at the Forebay. The entitlement is a pre-1914 water right, and diversions are made in compliance with the 40-year Federal Energy Regulatory Commission Project 184 operating license issued to EID in October 2006. Because the full entitlement can be provided in all years including the most severe historic single dry year of 1977, this source of water is considered assured, and not subject to shortage from hydrologic droughts.

Permit 21112 and Warren Act Contract

The State Water Resources Control Board (SWRCB) issued EID a water right permit in 2001 for an additional 17,000 acre-feet per year of water supply associated with Project 184 facilities and power operations to be taken at Folsom Reservoir. This water supply was authorized under Permit 21112 for diversion and consumptive use anywhere within EID's contiguous service area. There are no cutback provisions on this supply.

The El Dorado County Water Agency (EDCWA) and EID applied to the SWRCB to obtain water rights for consumptive use of waters previously stored and released for power generation from Caples, Silver, and Aloha Lakes, as well as certain direct diversions from the South Fork American River, all of which have been used by Project 184 for hydroelectric power generation or instream flows. The EDCWA later assigned all of its rights under this application to EID. The SWRCB granted the right to appropriate 17,000 acre-feet per year of water. Permit 21112 allows EID to make direct diversions from the South Fork American River at Folsom Reservoir; to store in Caples, Silver, and Aloha Lakes; and to redivert the water released from storage. The sole approved point of take for consumptive purposes is Folsom Reservoir.

A diversion from Folsom Reservoir requires acquiescence from the USBR and issuance of a Warren Act Contract. EID has diverted water under this right under a temporary urgency basis and the Warren Act Contract is pending.

Recycled Water Supplies

EID produces recycled water at both the El Dorado Hills and Deer Creek wastewater treatment plants which is then used by EID's customers for irrigation of residential landscape and commercial landscape. The availability of recycled water is currently limited to the El Dorado Hills and Cameron Park areas. EID anticipates a 2035 recycled water supply totaling 5,600 acre-feet per year (see Section 4.3 for further details).

4.2.2 Planned Water Supplies

EID has plans to acquire and use two additional water supplies from EDCWA for use within its service area to make available for the Proposed Project – water under the El Dorado-SMUD Cooperation Agreement and water under EDCWA's Fazio CVP supply. This section describes these supplies.

El Dorado-SMUD Cooperation Agreement

As shown in **Table 4-1**, the additional supplies include a grouping of water right applications and assignment of existing water right applications totaling approximately 40,000 acre-feet of water. This supply is being developed by the El Dorado Water and Power Authority (EDWPA). EDWPA is a Joint Powers Authority consisting of El Dorado County, El Dorado County Water Agency and El Dorado Irrigation District (collectively, El Dorado Parties). EDWPA was formed to pursue additional water supplies for the western slope of El Dorado County as determined by the El Dorado County General Plan. This need is identified in the El Dorado County Water Agency Water Resources Development and Management Plan (Water Plan).[31] The Water Plan is

[31] http://www.edcgov.us/water/final_water_resources_plan.html

designed to coordinate water resource planning activities within El Dorado County and identifies water supply needs for the western slope of El Dorado County of approximately 34,000 acre-feet per year (AFA) at the 2025 demand level.

In 2005, the El Dorado Parties signed the "El Dorado – SMUD Cooperation Agreement" (included with **Appendix A**), which would help meet the Water Plan's identified water supply needs. This Agreement requires SMUD to make annual deliveries of up to 30,000 acre-feet of water through 2025 and 40,000 acre-feet thereafter from SMUD's Upper American River Project (UARP) to the El Dorado Parties. In 2008, EDWPA petitioned the SWRCB for partial assignment of two applications for diversion and storage to obtain water supplies necessary to trigger SMUD's obligations. A Draft Environmental Impact Report has been prepared in support of the water rights application and was circulated in July 2010. EDWPA is currently in the protest settlement phase and the CEQA process is anticipated to be completed in 2014 with award of water rights shortly thereafter.

The El Dorado-SMUD Cooperation Agreement also obliges SMUD to provide carryover storage and delivery to EID of up to 15,000 acre-feet of drought protection water supplies to be obtained by EDWPA. Based on demand projections, EID anticipates that only 30,000 acre-feet of the 40,000 acre-feet identified in the water right applications and the El Dorado – SMUD Cooperative Agreement will be available to EID in normal years. Moreover, EID has planned that a mere 5,000 acre-feet of the water supply will be available for EID's uses in each dry year. This number is derived from Appendix H of the El Dorado – SMUD Cooperation Agreement describing deliveries available from carryover storage. Both of these conservative assumptions are shown in **Table 4-1**. EID has planned this supply to be available starting in 2025.

Fazio CVP Supply

EID is also in the final stages of securing 7,500 acre-feet of CVP water supplies in conjunction with EDCWA. In 1990, Congress directed the Secretary of the Interior, through the USBR, to enter into a new CVP Municipal and Industrial (M&I) water service contract with EDCWA for up to 15,000 acre-feet of water annually (Section 206 of P.L. 101-514). The CVP water service contract requires requisite compliance by EDCWA and the USBR with CEQA, NEPA, and ESA statutes.

In 2009, a draft EIS/EIR was released for public review and comment for the CVP M&I water rights contract. In 2010, USBR advised EDCWA that it would take another 5 years before the CVP-Operations Criteria and Plan (OCAP) related litigation would allow the EIS to move forward. As a result, EDCWA made the decision to detach the EIR from the EIS – essentially separating the CEQA and NEPA processes. EDCWA certified the Final EIR and approved the project in January 2011. EDCWA then prepared and submitted to USBR a draft Biological Assessment (BA) in September 2011 and a draft Final EIS in October 2011. USBR submitted the draft Final EIS to NOAA Fisheries in December 2011. Final EIS completion and contract execution is pending completion of ESA consultation with NOAA Fisheries.

The CVP contract seeks to acquire 15,000 acre-feet of CVP project water, of which at least 7,500 acre-feet would be made available to EID by subcontracts with EDCWA.[32] Diversions by EID would occur at its existing intake in Folsom Reservoir, conveyed to the El Dorado Hills Water Treatment Plant, and delivered to a specific place of use location in El Dorado Hills and Cameron Park areas as shown in Figure ES-2 of EDCWA's EIR.

The contract negotiations and environmental compliance efforts are ongoing. These actions allow EID to use this water supply in this WSA as a planned supply that will be available to EID in the future to serve the Proposed Project. The approval of the contract terms as well as finalization of the environmental documents will allow EID to apply the water supplies under this contract entitlement to municipal and industrial beneficial uses. EID has planned this water supply to be available starting in 2015.

4.2.3 Normal Year Water Supply Availability

As shown in **Table 4-1**, EID's total water entitlements under its existing and planned supplies does not equate to the amount of water available in normal years in the future. The normal year water supplies will be described in this section.

Excluding recycled supplies, EID's secured water rights and entitlements available for the Proposed Project total 67,190 acre-feet. As shown in the sufficiency analysis in Section 5, this amount is insufficient to serve EID's future demand incorporating the Proposed Project and all planned future projects. Accordingly, this section assesses both EID's secured supplies and additional planned supplies. EID's water supplies associated with the entire secured and planned water assets totals 110,290 acre-feet per year.

The 67,190 acre-feet of secured supplies include appropriative water right license 2184 and pre-1914 appropriative water rights associated with Slab Creek, Hangtown Creek and Weber Creek. As described above, these rights are collectively combined for conveyance purposes in a Warren Act Contract, No. 06-WC-20-3315, that allows for storage in and diversion from Folsom Reservoir. The total volume is 4,560, net of a negotiated 15% conveyance loss under the terms of the Warren Act contract. For purposes of serving the Proposed Project, EID assumes full diversion at 4,560 in normal years under these water assets.

Appropriative water right licenses 11835 and 11836 are also secured supplies. These supplies can be diverted from several creeks in the Cosumnes River watershed (Camp, Hazel, and Sly

[32] Central Valley Project Water Supply Contracts Under Public Law 101-514 (Section 206): Proposed Contract Between the U.S. Bureau of Reclamation and the El Dorado County Water Agency, and Proposed Subcontracts Between the El Dorado County Water Agency and the El Dorado Irrigation District, and Between the El Dorado County Water Agency and the Georgetown Divide Public Utility District Final Environmental Impact Report at ES-1, January 2011.

Park) and are typically stored in Jenkinson Lake. The maximum rate of diversion is 500 cfs for a total possible diversion volume of 33,400. However, due to limitations in storage availability in Jenkinson Lake assessed through OASIS hydrologic modeling, the maximum available normal year supply for the Proposed Project is 23,000 acre-feet.[33] Although EID has diverted as much as 25,745 acre-feet from this reservoir, EID does not anticipate using more than 23,000 acre-feet under this right for its normal year diversions in the future.

Central Valley Project Contract 14-06-200-1375A-LTR1 is a secured supply available for immediate use for the Proposed Project. This CVP contract entitlement requires the USBR to deliver up to 7,550 acre-feet of water from its SWRCB water right permits on the American River to EID.

As described in Section 4.2.1, EID also has a number of pre-1914 appropriative water rights on the American River with storage components in Silver Lake, Lake Aloha, Caples Lake, and Echo Lake. For purposes of this document, these are collectively called the pre-1914 American River water rights.[34] The total volume of water available under the pre-1914 American River water rights is 15,080 acre-feet in normal years.

Appropriative water right permit 21112 is a secured supply for purposes of this WSA. Permit 21112 allows EID to divert up to 17,000 acre-feet of water per year from Folsom Reservoir to be used in EID's service area. EID has diverted water under this permit as part of a temporary urgency in 2008. EID must finalize its Warren Act Contract to divert this water at Folsom Reservoir. However, based upon the availability of the supply in Permit 21112, the ability to store the water in Caples, Silver, and Aloha lakes, and the pending conveyance agreement with USBR, the normal-year availability of this supply is 17,000 acre-feet.[35]

As described in Section 4.2.2, EID's planned water supplies include the CVP Fazio supply of 7,500 acre-feet as authorized under federal law. Once secured, EID should receive normal-year deliveries of the full entitlement just as USBR promises to other CVP M&I contract holders on the American River system. There is no reason to believe that this contract entitlement will be different than other CVP contract entitlements on the American River system.

Last, as described in Section 4.2.2, EID's planned water supplies derived from the EDWPA appropriative water right applications filings and assignments, as well as the El Dorado – SMUD Cooperation Agreement, indicate that EID should receive normal-year water deliveries of 30,000 acre-feet per year starting in 2025 and then as much as 40,000 acre-feet of deliveries thereafter.

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[33] 2013 Water Resources Report

[34] California Water Code section 10910(d)(2)(A) requires "proof of entitlement" of each individual water right that is combined into this pre-1914 American River water rights grouping. These documents are contained in **Appendix A** of this Water Supply Assessment.

[35] EID Urban Water Management Plan 2010 Update, July 2011 at page 4-7 of 22. Follow-up discussion with EID Counsel on water availability on April 23, 2013.

Based on demand projections, the District uses 30,000 acre-feet of normal-year deliveries under these collective applications and the El Dorado-SMUD Cooperation Agreement.

4.2.4 Dry-Year Water Supply Availability

As shown in **Table 4-1**, EID anticipates less water being available in dry years than is otherwise available in normal years as described in Section 4.2.3. Dry-year supplies include supply reductions attributable to hydrologic droughts and regulatory curtailments. The dry-year water supplies are described in this section.

EID's entire normal-year secured and planned water assets total 110,290 acre-feet per year. In dry years, EID's total water assets equal 77,885 acre-feet. Of this total supply, 61,660 acre-feet are secured water assets and 16,225 acre-feet are planned water assets.

As described in Section 4.2.3, the secured water assets include License 2184 and the additional pre-1914 appropriative rights that are included in Warren Act contract 06-WC-20-3315, Licenses 11835 and 11836, CVP Contract 14-06-200-1375A-LTR1, the pre-1914 American River water rights grouping, and Permit 21112. All of these water rights are subject to different regulatory and hydrological restrictions that could result, in some instances, in reduction of the water supplies available under the right or entitlement in dry years.

The water rights contained in the Warren Act Contract 06-WC-20-3315 have some level of regulatory restrictions and hydrological uncertainty. EID's 2010 UWMP indicates that the estimated dry-year yield associated with this water asset is 3,000 acre-feet per year based upon regional hydrologic conditions.[36] Accordingly, based upon the presumed hydrologic conditions, the dry-year reliability for this supply in three consecutive dry years is 3,000 acre-feet per year.

Licenses 11835 and 11836 have a full diversion entitlement of 33,400 acre-feet per year. Of that amount, carryover storage in Jenkinson Lake and diminished inflow reduce that entitlement to a normal-year supply of 23,000 acre-feet per year. In dry years, this amount is further reduced based upon hydrologic conditions as well as carryover storage needs for future years from Jenkinson Lake. Accordingly, based upon the OASIS hydrologic modeling report, EID reduces this supply's availability to 20,920 acre-feet in a single dry year. Thus, 20,920 acre-feet per year is used in this WSA as the dry-year safe yield number for a single dry year. To be conservative, EID plans for this supply to be further reduced during year two and again in year three of and three consecutive dry years. This WSA uses 17,000 acre-feet and 15,500 acre-feet as the available supply in year two and year three of a multi-year drought, respectfully.

CVP Contract 14-06-200-1375A-LTR1 has a normal-year entitlement of 7,500 acre-feet per year. The USBR, however, assesses the dry-year supply availability of its CVP M&I contracts

[36] EID Urban Water Management Plan 2010 Update, July 2011 at page 4-6 of 22. Follow-up discussion with EID Counsel on water availability on April 23, 2013.

through the CVP M&I Shortage Policy. Based on inflow and storage criteria developed at the joint operations center, USBR can reduce contract water supplies under the CVP M&I Shortage Policy by up to 25% of historic use with various adjustments made for population, use of non-CVP water and extraordinary conservation actions.[37] With these adjustments in mind, USBR calculates the reduced CVP M&I delivery essentially based upon the average of the three previous normal years of use under the CVP contract. Under the strictest interpretation of this policy, if the water under the CVP contract was not used, then the dry year water is not available. But, USBR has considered that use of non-CVP supplies in lieu of CVP water use may be used to calculate use under this shortage policy. For purposes of this analysis, however, we have determined that based upon normal growth in demand in EID's service area, EID's customers would utilize the entire contract entitlement in normal years in the future. As such, EID calculates its dry-year reduction for this Proposed Project based upon three years of full use of its contract allocation. Accordingly, the dry year supply under this water contract entitlement is 5,660 acre-feet per year.

EID's pre-1914 American River water rights-grouping has a normal-year reliability of 15,080 acre-feet per year. Based upon the early priority date of these water assets and the storage capability within EID's system associated with these water assets, they are not reduced at all in a single dry year or three consecutive dry years.

Permit 21112 is another secure dry-year water asset. EID's 2010 UWMP states "there are no cutback provisions on this supply."[38] As such, the dry year reliability of Permit 21112 is 17,000 acre-feet per year.

As described in Section 4.2.2, EID's planned supplies include the CVP Fazio supply, and the several rights and contract that make up the UARP SMUD water. All of these assets combined have a three consecutive dry year supply reliability of 10,625 acre-feet per year.

The CVP Fazio supply is another CVP M&I contract supply that is subject to the same Municipal and Industrial shortage provisions described above for EID's other CVP contract entitlement. EID's expected portion of the Fazio supply has a normal-year contract allocation of 7,500 acre-feet per year. Assuming under the rules described above that EID is able to use its entire contract entitlement in the future, a 25% reduction from the contract entitlement reduces the delivery by 1,875 acre-feet per year. As such, the single dry year reliability and three consecutive dry year reliability under this contract is 5,625 acre-feet per year.

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[37] Reclamation has the authority to reduce the supply volumes even further under extreme conditions – Health and Safety criteria – but this sort of supply reduction would only occur in extreme drought and would be offset by reductions in demand in EID's service area, as needed, to maintain basic Health and Safety conditions. The District's drought contingency plans address these situations.

[38] This assertion was confirmed in a telephone conversation with the District's Counsel on April 23, 2013.

Last, the UARP SMUD water that is derived from the numerous water right applications and assignments as well as the El Dorado-SMUD Cooperative Agreement indicates that the water available under these components in dry years could be severely curtailed. Appendix H of the Agreement states that annual deliveries can be superseded and deliveries from carryover drought storage can be reduced to as little as 5,000 acre-feet in a declared Critically Dry year if SMUD reservoir storage drops below 100,000 acre-feet (approximately 25%). Out of an abundance of caution, EID anticipates only 5,000 acre-feet of carryover drought-supply water would be available each year over the course of a three-year drought.

4.3 Recycled Water Supplies

EID uses recycled water to meet some current non-potable demands within its service area. EID may expand its development and use of recycled water in the future to meet a portion of the non-potable demands associated with the Proposed Project and other anticipated new demands. EID's current recycled water use is about 2,200 acre-feet per year. This use will expand incrementally over time. By 2035, EID anticipates a supply of 5,600 acre-feet of recycled water per year within its service area.[39]

EID's recycled water system consists of supply from the El Dorado Hills wastewater treatment plant and the Deer Creek wastewater treatment plant. These treatment plants have an interconnected network of transmission and distribution pipelines, pump stations, storage tanks, pressure reducing stations, and appurtenant facilities located within the communities of El Dorado Hills and Cameron Park.[40] EID mandates the use of recycled water through Board Policy 7010, wherever economically and physically feasible as determined by the Board, for non-domestic purposes.[41] At this time, non-domestic use includes commercial landscape irrigation, residential or multi-family dual-plumbed landscape irrigation, construction water, and recreational impoundments.

Recycled water availability is an outcome of increased municipal and domestic demand and wastewater production as a byproduct of this demand. In other words, annual recycled water production capabilities are based on the total wastewater flows to the treatment plants. With the population and industrial demands growing in this region, as described in Section 3, the availability of recycled water will increase. EID is taking a conservative view of the growth in recycled water based upon its current production levels, estimated regional population growth, facility expansion identified in its 2013 IWRMP and WWFMP, treated water discharge requirements, and its ability to capture and store recycled water supplies in the future. The total recycled water available for use in 2035 is estimated to be 5,600 acre-feet per year.[42]

[39] EID Integrated Water Resources Master Plan, March 31, 2013
[40] EID Urban Water Management Plan 2010 Update, July 2011 at page 4-10 of 22.
[41] EID Urban Water Management Plan 2010 Update, July 2011 at page 4-6 of 22.
[42] EID Integrated Water Resources Master Plan, March 31, 2013 at page 221.

Accordingly, Table 4-2 shows the incremental recycled water assets that would be available over time for the District's non-potable water uses.

Table 4-2 – Timing of Recycled Water and Quantities

Year	Recycled Water Supply (acre-feet)
Current	2,200
2015	2,400
2020	2,600
2025	3,100
2030	4,200
2035	5,600

4.4 Facility Costs and Financing

EID's recently completed 2013 IWRMP and WWFMP identify and allocate the future costs of capital expansion and replacement needs, and addresses financing mechanisms for EID's water assets. These costs and financing mechanisms are hereby incorporated by reference.

The District establishes and periodically updates its Facility Capacity Charges (FCCs) to recover the cost of those portions of existing District facilities that will be used by future customers and to fund needed expansion, or additional capacity, of District facilities to serve new users. The District periodically reviews its FCCs to ensure they accurately reflect the costs of providing service to new customers. Currently the District is updating the FCCs to incorporate projects identified in the adopted 2013 IWRMP. The FCC update is currently under review by the Board and a developer committee, and the District anticipates adoption of the updated FCCs in August 2013.

4.5 Regulatory Approvals and Permits

As described in Section 4.2.2, EID has water assets that require further regulatory approvals, permit compliance, and contract approvals. Each water asset has its own set of regulatory requirements that are assessed in this section.

Appropriative water right Permit 21112 issued by the SWRCB has not been perfected. In order to perfect an appropriative water right, EID must put all of the water assets under that permit to beneficial use. Upon putting the water to beneficial uses and meeting all of the other conditions in the water right permit, EID will be eligible to obtain a water right license for this appropriative water right. Attaining a water right license further fortifies the legitimacy of the water right for EID's continual use in the future. There is no indication that EID will have difficulty in obtaining a water right license for Permit 21112.

Permit 21112 also requires a Warren Act Contract to be negotiated and approved by the USBR. The Warren Act Contract will allow EID to divert water from Folsom Reservoir for delivery to the El Dorado Hills Water Treatment Plant. Although the District may choose to divert some of the water upstream of Folsom Reservoir through other SWRCB regulatory processes, a Warren Act Contract is essential for any diversions emanating from Folsom Reservoir. EID is currently in negotiations with USBR to obtain a long-term contract. While those negotiations continue, short-term Warren Act Contracts are also obtainable, if needed. There are no foreseeable reasons that these negotiations will not succeed. Both EID's Board of Directors and USBR officials will need to execute the contract once the terms have been drafted, and EID will need to obtain judgment in a judicial action to validate the contract.

The Fazio water supply also has additional regulatory approvals and permits pending. This CVP contract entitlement is authorized by Public Law 101-514. The 15,000 acre-feet of water supply is contemplated to be split equally between Georgetown Divide Public Utilities District and EID. As described in Section 4.2.2, EDCWA is negotiating with USBR on behalf of EID to secure the CVP contract entitlement authorized by this federal statute and finalize the EIS. Accordingly, EID will continue to work with EDCWA and USBR to finalize acquisition of this water supply. Upon completion of the EIS, the EDCWA's designee and USBR officials will need to execute the CVP water supply contract, and EDCWA may need to obtain judgment in a judicial action validating the contract.

The pending water right applications and application assignments before the SWRCB as well as the El Dorado – SMUD Cooperation Agreement constitute the last water supply that is pending further regulatory approvals. As described in Section 4.2.2, EDWPA is awaiting approvals from SWRCB for these water assets. Upon SWRCB approval, EID will obtain 30,000 acre-feet of water under the El Dorado – SMUD Cooperation Agreement.

The SWRCB water right process requires the SWRCB to conduct an internal project review of the applicable technical and hydrological information as well as consider the broader effects on other legal users of water throughout the watershed before issuing a permit. This regulatory process may eventually necessitate a SWRCB hearing where testimony from proponents and opponents of the water right permit is heard and weighed by the SWRCB Board Members before issuing the conditioned permits. Once permits have been issued, then the District must comply with the permit terms and perfect application of the water supplies to beneficial use in order to acquire water right licenses associated with the appropriative water rights.

The El Dorado – SMUD Cooperation Agreement is an agreement among the various parties to cooperate in facilitating the storage and delivery of these water assets to the identified purveyors. As such, through the processing of the water right applications and the furtherance of compliance with the terms of those agreements, the water assets considered there are likely to be available to

EID. The regulatory approvals and permits needed to finalize EID's control over these water assets are moving forward.

4.6 Supply Summary

EID has two broad categories of water assets that are available for the Proposed Project – the secured water assets and planned water assets. Collectively, these supplies total 110,290 acre-feet in normal water years and 77,885 acre-feet in a single dry water year. In year two and year three of a multi-year drought, supplies are further reduced to 73,965 acre-feet and 72,465 acre-feet, respectfully.

As described above, the secured water assets include appropriative water right License 2184 and the accompanying pre-1914 appropriative water rights held under Warren Act Contract 06-WC-20-3315, appropriative water right Licenses 11835 and 11836, CVP Contract 14-060200-1375A-LTR1, the pre-1914 American River storage and diversion appropriative water rights, and Permit 21112. The normal year water supplies available to EID under the secured assets total 67,190 acre-feet per year. In dry years, the water supplies available to EID under the secured assets totals 61,660 acre-feet per year.

The planned water assets, although partially secured, are not yet fully available for EID's use to serve the Proposed Project contemplated in this WSA. As described above, these assets are sufficiently secure to be considered planned supplies for the Proposed Project in 2035. In normal years, the water supplies under these assets total 37,500 acre-feet. In dry years, the water supplies under these assets total 10,625 acre-feet.

Finally, the recycled water assets in both normal and dry years, derived from planned growth and continual indoor water usage regardless of year type, total 5,600 acre-feet in 2035.

SECTION 5 – SUFFICIENCY ANALYSIS

5.1 INTRODUCTION

The analysis detailed in this section provides a basis for determining whether sufficient water supplies exist to meet the estimated water demand of the Proposed Project.[43]

This section includes:

- Analysis of sufficiency, considering variations in supply and demand characteristics under normal, single-dry and multi-dry hydrologic conditions,
- Analysis conclusions

5.2 SUFFICIENCY ANALYSIS

The sufficiency analysis integrates the water demands detailed in Section 2 and Section 3 with the water supplies characterized in Section 4. The results are presented in **Table 5-1** beginning with "current" conditions (recognized as 2012) and continuing with 5-year increments from 2015 through 2035. While the analysis at various intervals before build-out is important, the most critical projection for the sufficiency analysis occurs in 2035. This analysis assumes that the Proposed Project, along with the other projects simultaneously undergoing a WSA analysis (see Section 3.3), are fully constructed by 2035, and other anticipated growth continues as described in Section 3.4.

Table 5-1 incorporates the Proposed Project water demand projection in **Table 2-3**, assuming the Proposed Project develops as detailed in Section 1, and the estimated water demands for all other existing and planned future uses through 2035 as detailed in **Table 3-2**. **Table 5-1** also presents the available water supplies for the contiguous EID service area during normal, single-dry and multiple-dry years, as detailed in Section 4. The water demands and available supplies in a single dry-year and multiple dry-year condition are discussed in the following subsections.

[43] CWC § 10910 (c)(4) provides that "If the city or county is required to comply with this part pursuant to subdivision (b), the water supply assessment for the project shall include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during normal, single dry, and multiple dry water years during a 20-year projection, will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses."

Table 5-1 – Comparable Analysis of Supply and Demand

Year	Project Water Demand (af/yr)	All Other EID Water Demands (af/yr)	Total Water Demands (af/yr)	Non-Revenue Water @ 13%	Demands with Loss	EID Water Supplies							Projected Surplus/ (Shortfall) (af/yr)
						Surface Water					Recycled Water (af/yr)	Total Available Water Supply (af/yr)	
						Hydrologic Year Type		EDH Service Area (af/yr)	West/East Service Area (af/yr)	Total (af/yr)			
Current	0	38,984	38,984	N/A	38,984	**Normal**		29,110	38,080	67,190	2,200	69,390	30,406
	0	40,933	40,933	N/A	40,933	**Single Dry**		25,660	36,000	61,660		63,860	22,927
	0	40,933	40,933	N/A	40,933	**Multiple Dry**	Year 1	25,660	36,000	61,660		63,860	22,927
	0	38,068	38,068	N/A	38,068		Year 2	25,660	32,080	57,740		59,940	21,872
	0	34,793	34,793	N/A	34,793		Year 3	25,660	30,580	56,240		58,440	23,647
2015	125	34,831	34,956	4,544	39,500	**Normal**		36,610	38,080	74,690	2,400	77,090	37,590
	131	36,573	36,704	4,771	41,475	**Single Dry**		31,285	36,000	67,285		69,685	28,210
	131	36,573	36,704	4,771	41,475	**Multiple Dry**	Year 1	31,285	36,000	67,285		69,685	28,210
	122	34,012	34,134	4,437	38,572		Year 2	31,285	32,080	63,365		65,765	27,193
	111	31,087	31,198	4,056	35,254		Year 3	31,285	30,580	61,865		64,265	29,011
2020	638	37,359	37,997	4,940	42,937	**Normal**		36,610	38,080	74,690	2,600	77,290	34,353
	670	39,227	39,897	5,187	45,084	**Single Dry**		31,285	36,000	67,285		69,885	24,801
	670	39,227	39,897	5,187	45,084	**Multiple Dry**	Year 1	31,285	36,000	67,285		69,885	24,801
	623	36,481	37,104	4,824	41,928		Year 2	31,285	32,080	63,365		65,965	24,037
	569	33,343	33,912	4,409	38,321		Year 3	31,285	30,580	61,865		64,465	26,144
2025	1,137	42,721	43,859	5,702	49,561	**Normal**		19,610	85,080	104,690	3,200	107,890	58,329
	1,194	44,858	46,052	5,987	52,039	**Single Dry**		14,285	58,000	72,285		75,485	23,446
	1,194	44,858	46,052	5,987	52,039	**Multiple Dry**	Year 1	14,285	58,000	72,285		75,485	23,446
	1,111	41,718	42,828	5,568	48,396		Year 2	14,285	54,080	68,365		71,565	23,169
	1,015	38,129	39,144	5,089	44,233		Year 3	14,285	52,580	66,865		70,065	25,832
2030	1,646	49,570	51,216	6,658	57,874	**Normal**		19,610	85,080	104,690	4,100	108,790	50,916
	1,728	52,048	53,777	6,991	60,768	**Single Dry**		14,285	58,000	72,285		76,385	15,617
	1,728	52,048	53,777	6,991	60,768	**Multiple Dry**	Year 1	14,285	58,000	72,285		76,385	15,617
	1,607	48,405	50,012	6,502	56,514		Year 2	14,285	54,080	68,365		72,465	15,951
	1,469	44,241	45,710	5,942	51,652		Year 3	14,285	52,580	66,865		70,965	19,313
2035	1,927	57,627	59,554	7,742	67,295	**Normal**		19,610	85,080	104,690	5,600	110,290	42,995
	2,023	60,508	62,531	8,129	70,660	**Single Dry**		14,285	58,000	72,285		77,885	7,225
	2,023	60,508	62,531	8,129	70,660	**Multiple Dry**	Year 1	14,285	58,000	72,285		77,885	7,225
	1,881	56,273	58,154	7,560	65,714		Year 2	14,285	54,080	68,365		73,965	8,251
	1,720	51,432	53,152	6,910	60,061		Year 3	14,285	52,580	66,865		72,465	12,404

5.2.1 Single Dry Year Supply and Demand Conditions

Under this condition, EID would anticipate a variance from the normal-year analysis, including: (1) shortage in full availability of supplies as detailed in **Section 4**, and (2) an increase in water demand. The increase in demand is based on the following:

- Landscape irrigation demands will increase to reflect the generalized earlier start of the landscape irrigation season due to limited rainfall in the single driest year. Since this increase only applies to the outdoor portion of a customer's demand, an adjustment factor of 5 percent is applied to the total normal-year water demand values.
- Historically, during single dry year circumstances, EID does not implement its shortage contingency plan,[44] since the extent of the dry conditions into future years is unknown. EID follows adopted policies and its 2008 *Drought Preparedness Plan* when implementing any voluntary or mandatory demand reduction measures.

As a result of these factors, the Proposed Project water demand and those of the other existing and planned uses is expected to increase in a single dry year above the demand expected under normal hydrologic circumstances. Additionally, as detailed in Section 4, EID anticipates a decrease in available water supplies. These changes are shown in **Table 5-1**.

5.2.2 Multi-Dry Year Supply and Demand Conditions

When a single dry year expands into a series of dry years, water supply and demand conditions will continue to evolve. Under such a multi-dry year, EID would anticipate many similar conditions that were assumed for the single-dry year, including: (1) shortage in full availability of supplies as detailed in Section 4, and (2) increases in projected demands. However, when entering the second and third year of a sequence of dry-years, EID would implement necessary policies to manage limited water supplies.[45] Demands over a series of three dry years are adjusted as follows:

- Year 1 – the first year mimics a "single-dry year" condition, where demands increase approximately 5 percent and EID shortage policies are not yet invoked (see Section 5.2.1).
- Year 2 – The demands again mimic a "single-dry year" and would be expected to increase by 5 percent above normal year conditions. However, when recognizing a second dry-year, EID would invoke the first stage of the Drought Preparedness Plan. This stage states: "*The objective of Stage 1 is to initiate public awareness of predicted water shortage conditions, and encourage voluntary water conservation to decrease*

[44] See EID Board Policy AR 5011-Water Supply Management Conditions (available at http://www.eid.org/modules/showdocument.aspx?documentid=2687).
[45] See EID Board Policy AR 5011-Water Supply Management Conditions (available at http://www.eid.org/modules/showdocument.aspx?documentid=2687).

normal demand up to 15%."[46] As part of this stage, EID implements drought water rates among other specified activities to encourage conservation. For purposes of this WSA, the demand reduction achieved under Stage 1 is estimated to be 7 percent of the already higher single dry-year demand.

- Year 3 – Upon entering the third dry year, EID would invoke the second stage of the Drought Preparedness Plan. This stage states: "*The objective of Stage 2 is to increase public understanding of worsening water supply conditions, encourage voluntary water conservation measures, and then if necessary, enforce mandatory conservation measures in order to decrease normal demand up to 30%.*"[47] Under this Stage, EID increases efforts to reduce demand. For purposes of this WSA, the savings achieved under Stage 2 is estimated to be 15 percent of the already higher single dry-year demand.

As a result of these factors, the Proposed Project water demand and those of the Other Existing and Planned Uses is expected to increase in the first year of a multi dry-year condition above that estimated during normal hydrologic circumstances. In subsequent years, the demand will drop as elements of EID's Drought Preparedness Plan are implemented. These changes are shown in **Table 5-1**.

5.2.3 Analysis

As shown in **Table 5-1**, the demand and supply are compared under each hydrologic condition for each 5-year increment out to 2035. The resulting "supply surplus" or "supply shortfall" is shown in the final column. Based on the analyses, EID anticipates it will have sufficient water under all hydrologic conditions in each of the 5-year increments through 2035. Notably, the "surplus" supply is lowest during the second year of a multi-dry year condition, since this is the circumstance where demand is only slightly constrained, while supplies are the most constrained. Yet, even under such circumstances, sufficient water should be available.

5.3 Sufficiency Analysis Conclusions

As detailed in **Section 2**, this WSA estimates water demands for the Proposed Project of 2,177 acre-feet per year at build-out (including non-revenue water demands). The annual water demand estimate for all existing and planned projects in the contiguous EID service area, as detailed in **Section 3**, is approximately 67,300 acre-feet per year by 2035. After accounting for these demand projections for the next twenty years, EID should have sufficient water to meet the demands of the Proposed Project and its other service area demands for at least the next 20 years.

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[46] See EID Board Policy AR 5011.2-Water supply slightly restricted Drought Stage 1 – Voluntary reductions in use (available at http://www.eid.org/modules/showdocument.aspx?documentid=2687).
[47] See EID Board Policy AR 5011.3-Water supply slightly restricted Drought Stage 2 – Voluntary and mandatory reductions (available at http://www.eid.org/modules/showdocument.aspx?documentid=2687).

The conclusion that EID should have sufficient water available to meet the needs of the Proposed Project, in addition to the other demands in its service area through 2035, rests on the following set of assumptions:

- EID, EDCWA, and EDWPA successfully execute the contracts and obtain the water right permit approvals for currently unsecured water supplies discussed in Section 4. Absent these steps, the water supplies currently held by EID and recognized to be diverted under existing contracts and agreements would be insufficient in 2035 to meet the Proposed Project demands along with all other existing and planned future uses.
- EID will commit to implement Facility Capacity Charges in an amount sufficient to assure the financing is available as appropriate to construct the necessary infrastructure as detailed in the March 2013 EID *Integrated Water Resources Master Plan*.
- Demand in single-dry years includes an additional 5 percent of demand over the normal year demand during the same time period. This conservative assumption accounts for the likelihood that EID customers will irrigate earlier in the season to account for dry spring conditions. This hypothetical demand augmentation may or may not manifest in dry years, but this conservative assumption further tests the sufficiency of water supplies during dry conditions.
- The estimated demands include 13 percent to account for non-revenue water losses (e.g. distribution system losses).

The finding of this WSA is that EID should have sufficient water to meet the demands of Proposed Project and its other service area demands for the next 20 years.

California poised to tighten watering restrictions

BY MATT WEISER - MWEISER@SACBEE.COM
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WATER & DROUGHT

California poised to tighten watering restrictions

If water officials have their way, it soon will be illegal for many Californians to water their yard more than two days a week. The unprecedented proposal, along with other water conservation tactics, will be debated at a meeting Tuesday in Sacramento. It marks the latest response to the continuing drought.

A PRIMER ON CALIFORNIA WATER RIGHTS

Prepared by
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The following is a "primer" on basic California water rights. It is by no means comprehensive, and is intended only as an introduction to California's system of surface and groundwater rights. Specific situations must be analyzed with reference to the operative facts.

Surface Water Rights

California has a unique system of surface water rights that combines a traditional riparian system with the appropriative system found elsewhere in the West. The result is a confused approach to water rights that often leads to more questions that certainty.

For purposes of California law, surface water includes underflow of streams, underground streams, and any other subsurface flow that is identified with a defined bed, bank or channel. Therefore, wells extracting water near a surface water supply may, in fact, be pumping "surface water" for purposes of a water rights analysis.

On many other streams in California, the surface water rights are a tangle of various categories of rights that are virtually impossible to distinguish from one another. Often, historical practice is far more relevant in determining how water is actually allocated than are the underlying water rights. Nevertheless, that historical practice is founded on basic water rights law, which recognizes four basic types of surface water rights.

<u>Riparian Rights</u>. The riparian right is a natural appurtenance to land abutting a watercourse. However, the fact that a parcel of land presently abuts the watercourse does not mean that the entire parcel possesses riparian water rights. California adheres to the "source of title" rule. Under this rule, riparian land is the smallest parcel abutting the stream which has continuously been held under single ownership in the chain of title. In other words, if a 20 acre parcel originally abutting a river is split into a 15 acre portion separated from the river, and a 5 acre parcel is still touching the river, the 15 acre parcel will forever have lost its riparian character. Even if the 15 acre parcel is later purchased by the owner of the 5 acre parcel, the 15 acre parcel will not be restored to its former riparian character. (It is possible to reserve riparian rights to a severed parcel if the reservation is explicit in the deed creating the division, but this infrequently occurs).

Riparian rights can be explicitly severed from otherwise riparian land. Thus, the verification of riparian rights requires a careful examination of the chain of title back to the original paten t, together with a detailed examination of each deed in the chain to determine if riparian rights were reserved to an otherwise severed parcel, or conveyed from an otherwise riparian parcel.

The riparian right is a right to the natural flow of a watercourse. Therefore, there can be no riparian right to store water. Generally, "storage" means the impoundment of water for more than 30 days; riparian water which is "stored" for less than 30 days is usually deemed to have merely been "regulated" within the permissible scope of the underlying riparian right.

Riparian rights are generally senior to pre-1914 and post-1914 appropriative water rights (see below), and are not lost by non-use. However, recent California court decisions suggest that unexercised riparian rights can be subordinated to longstanding downstream appropriative rights in order to avoid unfair disruption of water allocation schemes upon which water users have come to rely. As a result, an unexercised riparian right may be junior to other rights; in a case where a stream is fully appropriated, a junior right may be tantamount to no right at all, and the holder of an unexercised riparian right might find himself or herself with little or no recourse as against his or her neighbors. In addition, the right of a riparian to object to conflicting uses can be lost by prescription (see below).

Riparian right holders generally do not have priorities with respect to other riparians. Instead, each has a "correlative right" to the use of a reasonable share of the total riparian water available in the watercourse, to the extent the riparian can place that water to beneficial use on the riparian's land[1]. As a result, quantification of the riparian right is almost impossible unless there has been a stream-wide adjudication.

Pre-1914 Appropriative Rights. Appropriative water can generally be defined as water that is diverted for use on non-riparian land. Prior to 1914, there was no comprehensive permit system available to establish appropriative water rights in California, and the establishment of such a right required simply posting and recording a notice of intended diversion and the construction and use of actual diversion facilities. The measure of the right was the nature and scope of the use of the water diverted.

Pre-1914 appropriative rights are relatively common. However, they are also fairly difficult to establish, and require evidence of original use prior to 1914 and continued use thereafter. Recorded notices of diversion can sometimes be obtained through county recorder's offices; som

[1] In 1928, the California Constitution was amended making the exercise of all water rights (both surface and groundwater) subject to a paramount limitation of reasonable and beneficial use (see below). This amendment did not affect priorities as among different users and classes of users, but simply put a cap on the right of any user to that amount of water which can be applied to reasonable, beneficial use.

e pre-1914 diverters also file notices or reports of appropriation with the State Water Resources Control Board (the "SWRCB").

The appropriative right is lost by non-use for the prescriptive period, and therefore the continuity of use is as important as the origin of the right. Even if the existence of the right is established, the priority of the right is often difficult to determine unless all rights along the watercourse have been adjudicated. Nevertheless, in the realm of appropriative rights, California adheres to the "first in time, first in right" rule, and a true pre-1914 right will have priority over a post-1914 right.

<u>Post-1914 Appropriative Rights</u>. In 1914, a comprehensive permit system was established in California and all new appropriative uses (both for diversion and storage) subsequent to that year require application to what is now the SWRCB. A "post-1914" appropriative water right will be granted by the SWRCB only after a public process in which the applicant is required to demonstrate the availability of unappropriated water and the ability to place that water to beneficial use. The SWRCB can verify the issuance and priority of any post-1914 water right. However, since even post-1914 rights may be lost by non-use, the continuing vitality of those rights still requires confirmation that the rights have been continually exercised without lengthy interruption (except, of course, for lack of water).

<u>Prescriptive Rights</u>. This final category of surface water rights is obtained by open, notorious, continuous and adverse use for the prescriptive period (in California, five years). Since the use must be adverse, a use which harms one water user may not harm another (for example an upstream water user). The prescriptive right is therefore less of a "water right" than it is the right to prevent another from objecting to one's own water use. One cannot prescript upstream. Since the adverse use must be continuous for the prescriptive period, one year of surplus water can cut off the prescriptive period and will require the would-be prescriptor to begin the prescriptive period again. Furthermore, in one case, the courts have held that since prescription does not run against the State, the SWRCB is not bound to recognize a prescriptive right and that the State may (i) require a prescriptor to apply for an appropriative permit and to comply with all conditions imposed thereon by the SWRCB, and (ii) enjoin the prescriptive use of water by a prescriptor who refuses to do so. As a result, a prescriptive right is also difficult to establish, unless it has been adjudicated; a SWRCB adjudication or court proceeding is necessary to confirm the existence and scope of a prescriptive right.

Groundwater Rights

At present, California groundwater law is found almost entirely in reported court decisions. Unlike the law governing rights to surface water and true underground streams (which is large ly statutory), there is no comprehensive, statewide regulatory scheme governing the extraction or use of groundwater. Therefore, a great many aspects of groundwater law remain unclear or subject to interpretation.

The recent drought resulted in unprecedented groundwater pumping due to surface water shortages. It is therefore predictable that a great many groundwater cases have been (or will be) commenced, potentially resulting in a number of significant appellate decisions in the next few years. It is also quite possible that legislative changes in groundwater law will occur in the foreseeable future. California is one of the few states in the West without a comprehensive statutory framework for groundwater regulation, and there have been a number of recent efforts in the Legislature to enact sweeping groundwater legislation. Although those efforts have been unsuccessful, the recent enactment of AB 3030 (permitting local agencies to develop and implement groundwater management plans) indicates the continued interest in regulating groundwater through legislation.

There has also been a recent effort by California counties to regulate groundwater by virtue of their general municipal police powers. While counties have generally not attempted to regulate groundwater extraction, except with respect to well drilling standards and health and safety concerns, demands of groundwater during the recent drought inspired counties to become more proactive in the groundwater arena. A California court has recently held that groundwater regulation is within a county's police powers and is not otherwise preempted by general State law. As a result of this case, many counties are considering adopting sweeping groundwater ordinances. In particular, counties are concerned with potential mining of groundwater resources for use outside the county. The extent to which counties can regulate groundwater is still an open question.

Prior to 1903, California courts generally applied the English common law rule that a landowner owns beneath the surface of his or her property to "the depths of the earth and up to the heavens." This rule was known as the "absolute ownership" rule because it resulted in a landowner having the right to use as much groundwater as s/he could physically extract from beneath his or her property. There was no limitation on this right.

However, in a landmark case decided in 1903, the California Supreme Court determined that the absolute ownership rule had no place in the arid climate of California. In the wake of the rejection of the rule, the courts established three categories of groundwater rights with respect to native percolating groundwaters (i.e., those not resulting from importation and/or artificial recharge and which are not surface water for purposes of regulation).

Overlying Rights. The courts have consistently upheld the right of a landowner whose land was overlying a groundwater basin to extract and use that groundwater on the overlying land, but have restricted that right to an amount which is reasonable in light of the competing demands of other overlying users. Each such landowner is called an "overlying user"; the right that each such user has is an "overlying right." Since an overlying user's right is limited in relation to other overlying users, this right is sometimes called a correlative right. The quantification of each overlying user's correlative right depends entirely on the facts and circumstances as they exist in the basin. However, the overlying user's correlative right is generally to a reasonable share of the groundwater in the common groundwater basin for use on such landowner's land that overlies the basin.

As among overlying users, it is generally irrelevant who first developed the groundwater. Each overlying user has a right in the common supply, and the exercise of that right entitles each to make a reasonable use of the water for the benefit and enjoyment of his or her overlying land. The correlative right belongs to all overlying landowners in common, and each may use only a reasonable share when the water is insufficient to meet the needs of all.

The overlying right may be used for any reasonable, beneficial use. However, water devoted to public uses (for example, water acquired by municipalities and public utilities for distribution to the public) is not an overlying use. Consequently, at least in theory, the rights of a party extracting groundwater for a public use are no greater, as against other parties, than would be the case if the water was taken out of land that party did not own. However, as a practical matter, overlyers can find it difficult to stop truly public uses of groundwater, even if those uses are based on junior rights (see below).

Appropriative Rights. Any party who does not own land overlying the basin, who owns overlying land but uses the water on nonoverlying land, or who sells the water to the public generally is an "appropriator" and not an overlying user. The courts generally acknowledge the right of an appropriator to take the available surplus from a groundwater basin and apply it to beneficial use inside or outside the basin. For this purpose, "surplus" means available water (that is, water the use of which will not create an overdraft condition) not needed to provide for the needs of all overlying users. (Overdraft is discussed more fully below.) There is no restriction as to where the water may be used, and no requirement that the appropriator be a landowner. The water may generally be used for private or public uses without restriction, subject to the requirement that the use of the water must be reasonable and beneficial.

Among appropriators, the priority of each appropriator's right is determined by the relative timing of the commencement of use, i.e., first in time is first in right.

Prescriptive Rights. There is some question in California as to whether prescriptive rights to groundwater can be asserted. At least one case suggests that the doctrine of prescription (or at least the doctrine of "mutual prescription" pursuant to which all users of a basin prescript as against each other) no longer has a place in California. However, the better view seems to be that prescription can occur relative to groundwater, just as it can with respect to surface water.

Prescriptive rights do not begin to accrue until a condition of overdraft begins. Therefore, it is first necessary to determine when a condition of surplus ends and overdraft begins.

The definition of overdraft was articulated by the California Supreme Court in 1975. There, the court held that overdraft begins when extractions exceed the safe yield of a basin plus any temporary surplus. Safe yield is defined as the maximum quantity of water which can be withdrawn annually from a groundwater supply under a given set of conditions without causing a gradual lowering of the groundwater levels resulting, in turn, in the eventual depletion of the supply. "Temporary surplus" is the amount of water which can be pumped from a basin to provide storage space for surface water which would be wasted during wet years if it could not be stored in the basin.

Once a groundwater basin reaches a condition of overdraft, no new appropriative uses may be lawfully made. If overlying users (who, as discussed below, have priority over appropriative users) begin to consume a greater share of the safe yield, the existing appropriators must cease pumping in reverse order of their priority as against other appropriators. Typically, however, appropriators continue extraction activities unless and until demand is made and/or suit is brought. If an appropriator continues pumping from an overdrafted basin for the prescriptive period (which, as in other contexts, is five years) after the other users from the basin have notice of the over draft condition (through decline of groundwater levels or otherwise), then that appropriator may obtain a prescriptive right good as against any other private (i.e., overlying) user.[2]

If the groundwater basin comes out of an overdraft condition, i.e., there is a surplus, during the five year period, the "continuous adverse use" requirement is not satisfied. In that situation, the five year period begins anew once overdraft conditions return. Prescription generally may not occur as against public entities and public utilities.

As against other prescriptive users, the first in time probably is first in right. It has been held, however, that if multiple prescriptors continue their prescriptive uses for an extended period of time, the concept of "mutual prescription" may apply. Under the mutual prescription doctrine, all such prescriptive users would bear proportionate reductions caused by water shortages, rather than on the basis of temporal priority. However, as noted above, questions exist about the continued viability of the mutual prescription doctrine.

As with prescriptive surface water rights, an adjudication or court proceeding is necessary to confirm the existence and scope of prescriptive rights.

<u>Overlying User v. Appropriator</u>. As long as surplus water is available from the basin, both overlying users and appropriators may pump without restriction, provided the water is applied to reasonable and beneficial uses. Therefore, if the groundwater basin can supply the needs of all overlying users and appropriators without creating a condition of overdraft, all may continue to extract water. If there is a condition of overdraft, the overlying user will generally prevail in a dispute over priority of rights as against an appropriator (<u>even</u> <u>if</u> the appropriator is a public entity). This is because the appropriative right is only in the surplus; if there is no surplus, there is no possibility of an appropriative right (although a prescriptive right may develop or exist). Therefore, it is unlikely an appropriator could prevail as against individual overlying users in a dispute over the right to pump native groundwater.

Notwithstanding the priority of overlying users as against appropriators, it does not necessarily follow that overlying users may <u>prevent</u> extractions by an appropriator depending upon the timing of an action against the appropriator and the appropriator's use of the water. Where the appropriated water has been put to public use, an injunction prohibiting further appropriation may not necessarily be issued. One court has stated that "where the interests of the public are involved and the court can arrive in terms of money at the loss . . . an absolute injunction should not be

[2] Some Southern California counties are subject to the additional requirement that notice of extraction in excess of 25 acre-feet per year be filed. If the required notice is not filed in any one year, the prescriptive period starts over.

granted, but an injunction conditional merely upon the failure of the defendant to make good the damage which results from its work. Such an action, if successful, should be regarded in its nature as the reverse of an action in condemnation." Also, an absolute injunction will not be granted where other forms of relief are available and would be adequate.

<u>Overlying User v. Prescriptive User</u>. Prescriptive use establishes a prescriptive right good against the overlying users as to whom the prescription has been effected. The priority between such users depends on the amount used by the overlying users during the prescriptive period. If the overlying users continue to pump at the same or increasing levels during the prescriptive period, then neither the prescriptive user nor the overlying user has priority over the other. Rather, the prescriptive user will obtain in effect a parity, according to the following formula announced by the California Supreme Court:

> The effect of the prescriptive right would be to give to the party acquiring it and take away from the private defendant against whom it was acquired either (i) enough water to make the ratio of the prescriptive right to the remaining rights of the private defendant as favorable to the former in time of subsequent shortage as it was throughout the prescriptive period . . . or (ii) the amount of the prescriptive taking, whichever is less . . .

If an overlying user's use declines during the prescriptive period, the overlying user will lose his or her right (as against a prescriptive user) to the extent of that reduction. Ironically, those who are not exercising their overlying use rights at all may fare quite well in the face of prescriptive uses; based on comments by some courts, it appears prescriptive rights do not impair an overlyer's right to groundwater for new overlying uses for which the need had not yet come into existence during the prescriptive period.

When prescriptive rights have vested and an overlying user continues to pump during the prescriptive period, the overlyer's right to continue pumping will usually be protected. In that case, a court would more likely order a proportionate reduction in pumping by both parties.

<u>Appropriator v. Prescriptive User</u>. Technically, this condition does not often exist, since one cannot be an appropriator unless there is surplus, and one cannot acquire a prescriptive right unless there is overdraft. Nevertheless, a prescriptive user is simply an appropriator whose use has continued for a sufficient period of time in the face of an overdraft condition. If both become prescriptive users, and one is a public entity, the public entity will likely prevail because it can pr

escript against the other user, while the private user cannot prescript against the public entity. However, even though a public entity cannot lose its rights by prescription, it is subject to limitations in prescription by the exercise of self help by an overlying user.

Groundwater Resulting From Imported Water. The preceding discussion relates to native groundwater, i.e., percolating groundwater which occurs naturally and is not imported. Imported water is water derived from outside the watershed which is purposefully recharged into the groundwater basin, essentially creating an "account" for the recharger. Imported water does not include the return flow from extracted native groundwater since that water does not add to the overall groundwater supply but instead decreases the amount of extraction from the basin. Assuming no prescriptive rights have attached to imported water used to recharge a basin, the imported water belongs solely to the importer, who may extract it (even if the basin is in overdraft) and use or export it without liability to other basin users.

Common Groundwater Practices. While the legal principles summarized above are those that govern groundwater throughout the State it is important to understand that those principles are often ignored--or at least discounted--in practice. Groundwater is frequently pumped by one landowner and sold or given to another, and groundwater has often been exported from one overdrafted basin to another (especially during the recent drought). Probably more than any other body of natural resource law, groundwater law is often honored more in the breach than in the compliance. Historical practices therefore frequently overrun technicalities, and courts often attempt to honor past practices by finding (sometimes tortured) ways to make the law "fit" the circumstances. Thus, the failure to use groundwater in accordance with the principles summarized above does not necessarily mean that a water user is violating the law or is without rights to the groundwater in question.

Adjudicated Water Rights

Many "water rights" in California are not quantified, but are simply claimed and/or exercised without objection by other parties. However, when competing demands for a common water supply--whether surface water, groundwater or both--become too great, formal adjudications are sometimes commenced by one or more of the competing claimants. Both the SWRCB and the courts can conduct adjudications under appropriate circumstances, which typically result in an enforceable order allocating the water (and the water rights) in the adjudicated stream system, groundwater basin or combined water source. Adjudications typically take years (or even decades) to complete because of the often complex legal and factual issues involved.

Frequently, the result of an adjudication is an equitable apportionment of water that does not "track" with a technical application of water law principles. For example, in a recently completed adjudication in the Mojave Basin, the court noted that strict adherence to priority of rights and correlative rights among water users of equal status created uncertainty and potential economic consequences. Therefore, the court applied a "physical solution" requiring all users of the common water source to share equitably both in the water and in the reduction in use necessary to reduce extractions to safe yield. As is commonly the case in judicial adjudications, the court also retained continuing jurisdiction over the implementation of the adjudication order, making the court an ongoing "player" in the administration of the basin.

Such physical solutions may produce the most appropriate allocation of the water resource, but they also create a number of issues. The adjudication order effectively supersedes water rights law, and any interested party must become familiar with the order's impacts on existing and future involvement with impacted water users. Depending on the adjudication order, a watermaster may be in place with jurisdiction over the affected water, and special procedures may be imposed on parties dealing with the water and water rights involved. Even more vexing is the relatively common situation in which the adjudication order effectively severs the water rights from the land, making them freely transferable separate from the land on which those rights originally arose. Adjudicated water rights therefore can fall into a category distinct from more traditional water rights.

Beneficial Use and the Public Trust Doctrine

Regardless of the nature of the water right in question, two very important principles will always apply. First, under the California Constitution, water must be put to reasonable and beneficial use. No water right grants any party the right to waste or make unreasonable use of water, and any water right can be curtailed or revoked if it is determined that the holder of that right has engaged in a wasteful or unreasonable use of water.

Second, no water user in the State "owns" any water. Instead, a water right grants the holder thereof only the right <u>to</u> <u>use</u> water (called a "usufructuary right"). The owner of "legal title" to all water is the State in its capacity as a trustee for the benefit of the public. The so-called "public trust doctrine" requires the State, as a trustee, to manage its public trust resources (including water) so as to derive the maximum benefit for its citizenry. The benefits to be considered and balanced include economic, recreational, aesthetic and environmental; if at any time the trustee determines that a use of water other than the then current use would better serve the public trust, the State has the power <u>and</u> <u>the</u> <u>obligation</u> to reallocate that water in accordance with the public's interest. Even if the water at issue has been put to beneficial use (and relied upon) for decades, it can be taken from one user in favor of another need or use. The public trust doctrine therefore means that <u>no</u> water rights in California are truly "vested" in the traditional sense of property rights.

Water Contracts, Districts and Mutual Water Companies

At least in theory, all water used in California is developed and diverted based on one or more of the basic rights described above. However, it is common for the water rights relied upon by a water user to be held by another party, as in the case of water users receiving water from a district or mutual water company. In fact, most water users in California probably do not hold the water rights underlying much of their water supply. Nevertheless, those water users have a right to receive water separate and distinct from the water rights which support the diversion of the water in question.

Some water suppliers hold the rights to the water they deliver, while many others must acquire water from the ultimate water rights holder and themselves own nothing more than a contract right. For example, many older districts were formed in order to acquire water rights, and the districts themselves therefore hold the water rights which produce the water they distribute. Conversely, the United States is the record holder of the water rights used to operate the Central Valley Project; districts receiving CVP water supplies simply contract with the United States and distribute their contract supplies to their water users.[3]

In many (but not all) districts which provide agricultural water supplies, the right of a landowner to receive a share of the district's water supply is a matter of statute which accrues automatically by virtue of land ownership. No additional documentation is required. In other situations, a formal contractual relationship between the district and the water user is established, and the contract (rather than a statute) establishes the scope of the water user's right to receive a portion of the district's water supply. Districts currently have broad discretion relative to the use and transferability by water users of water they distribute; however, there are ongoing legislative efforts to grant water users more freedom to transfer district water allocated to them without the consent of the district, effectively transforming district water allocations into the personal property of each water user.

In the case of mutual water companies, the right to receive water from the company follows stock ownership. Mutual water company stock can be either appurtenant to the land in the co

[3]Most CVP water users believe themselves to actually be the beneficial owners of the water rights underlying CVP operations, and that the United States is merely a trustee for those rights holding bare legal title. That important distinction is beyond the scope of these materials.

mpany's service are or completely separate therefrom. Generally, the stock of mutual water com
panies formed within the past 25 years is appurtenant to the lands served and passes with convey
ances of that land (although separate assignments of stock should still be prepared). For many ol
der mutual water companies, the stock (and thus the right to receive water) is completely separat
e from the land served, and separate stock assignments are required to transfer the right to receiv
e water evidenced by shares. As with districts, mutual water companies currently can control tra
nsfers of water allocated to shareholders, but could have that authority significantly curtailed by l
egislation granting water users rights to transfer water allocations over the objection of water sup
pliers.

Dam emissions rise

Low water levels at Folsom Lake are causing an increase in air pollution from the spillway project. **Page B8**

Opinion

MARCOS BRETON

mbreton@sacbee.com

Hansen's got guts to defy KJ

Steve Hansen is showing some real daring in standing up to Mayor Kevin Johnson – the kind of political guts we don't often see in Sacramento.

KJ is easily the most popular politician in town. He is riding high after saving the Kings, cultivating a national profile and going after what he's always wanted: more hiring power, firing power and veto power for the mayor's office.

Influential people helped KJ put a strong-mayor proposal on the November ballot, and it appeared there

Friends mourn animal rescuer

THEY TIE HEALTH DECLINE TO RECENT DOG NEGLECT CASE

By Cynthia Hubert
chubert@sacbee.com

For decades, it was just Elaine Greenberg and her rescue dogs.

On her farm off a country road outside Davis, Greenberg took in dogs that had been burned and beaten, injured in dog fights, destined for death row. She fed, sheltered and trained them, paid for their veterinary care and found many of them new homes through her nonprofit group, Second Chance Rottweiler Rescue.

But something happened to Greenberg in the final

Second Chance Rottweiler Rescue

Elaine Greenberg, 74, a longtime dog rescuer, was found dead in her Davis-area home over the weekend.

months of her life that left her unable to care for her animals and herself, friends and acquaintances said. Earlier this month, authorities converged on her home and found a horrifying scene, with dead and malnourished animals living in squalor. They seized 11 surviving dogs, placed Greenberg on a "mental health hold" for a few hours and began investigating her for neglect.

Two weeks later, sheriff's deputies found Greenberg's dead body in her home. She was 74 years old.

The chain of events shocked longtime friends who knew Greenberg as an intensely private, somewhat cantankerous former biochemist who during the past two decades dedicated her life to saving dogs that otherwise likely would have been killed at animal shelters.

"She took dogs that no one else would take, and she gave them meticulous care, and she saved hun-

RESCUER | Page B2

Water is way below allotments

TOTAL OF 'JUNIOR RIGHTS' IS 5 TIMES THE SUPPLY

By Matt Weiser
mweiser@sacbee.com

The state of California has handed out five times more water rights than nature can deliver, a new study by University of California researchers shows.

California's total freshwater runoff in an average year is about 70 million acre-feet, according to the study. But the state has handed out junior water rights totaling 370 million acre-feet. One acre-foot is enough to meet the needs of two average households for a year.

The rivers under the most strain, the research indicates, are virtually all that drain into the Central Valley, including the Sacramento, Feather, Yuba, American, Mokelumne, Stanislaus, Tuolumne, Merced, Kings and San Joaquin rivers. Others near the top include the Salinas, Santa Clara,

WATER | Page B3

FROM THE COVER

Water

FROM PAGE B1

Santa Ana and Santa Ynez rivers.

"It seems clear that in a lot of these cases, we've promised a lot more water than what's available," said Ted Grantham, the study's lead author, who conducted the research as part of postdoctoral studies at UC Davis. "There's never going to be enough water to meet all of these demands."

The study confirms prior estimates of the disparity but goes further by describing the degree of over-allocation in individual watersheds across California. It also reveals that the problem may be much larger since the researchers looked at only a subset of California water rights – those allocated after 1914 and considered "junior" rights.

California's system of water rights, overseen by the State Water Resources Control Board, is the primary means by which the state distributes natural runoff to provide water for cities, farms and industry. In most cases, a property owner or government agency applies to the state for a water right or permit. If granted, it allows them to divert a certain amount of water directly from a river or stream.

Such rights, for example, account for all the water stored behind dams in the state, which is the primary source of drinking water for many Californians and irrigation water for crops.

The study was published in the current issue of the journal Environmental Research Letters. It was conducted by analyzing more than 12,000 water rights issued after 1914, the year California adopted its system of water diversion rules. Only those rights had sufficient data available for analysis, Grantham said.

"It seems clear that in a lot of these cases, we've promised a lot more water than what's available. There's never going to be enough water to meet all of these demands."

TED GRANTHAM, *study's lead author*

The researchers then used streamflow data collected by the U.S. Geological Survey to establish baseline natural runoff volumes for about 4,500 sub-watersheds across the state. These data were compared to the water rights. In many cases, the results showed that diverters are allowed to withdraw far more water than the stream can produce in an average weather year.

"In so doing, they give these rights-holders a false sense of water security," said Joshua Viers, a co-author of the study and an engineering professor at UC Merced. "It's an entitlement that may never be filled. That is unfortunate, because we continue to allocate water rights to this day."

In dry years like this one, the disparity grows worse, because there is less snowmelt to feed streams. The consequences can be dire: This summer, the state water board imposed curtailments on about 10,000 water rights, requiring diversions to be halted completely because there isn't enough water to go around.

Craig Wilson, Delta water master for the state board, has a different view of the situation. He said the excess allocation of water is "overblown" because many water-rights holders actually divert less water than their permits allow. And very often, much of that diverted water returns to the same stream as runoff from farm fields, where it can be used again by someone downstream.

"It's very true, the board has issued water rights for more water than is available," said Wilson, who oversees water rights in the Sacramento-San Joaquin Delta. "I don't think it's nearly as big an issue as some people believe."

But Grantham said it is difficult to know for sure, because the state has no idea how much water is being diverted at any moment. Diverters are not required to report their water use in real time. Instead, they report water usage annually, and these reports are not verified for accuracy.

"Particularly in times of drought, I think there is just so much uncertainty in how these water rights are being exercised that it's practically impossible to try and manage these systems," said Grantham, who now works for the U.S. Geological Survey in Colorado.

It has long been assumed that correcting the excess allocation would be complicated because there are so many water rights, each with unique historical and legal complications. But Grantham said the study revealed that might not be so, because 80 percent of the water volume is held by 1 percent of the water rights, and mostly by government agencies.

"We don't really need to deal with thousands and thousands of water-rights holders," he said. "We might just need to deal with a couple hundred that hold 90 percent of the water."

Call The Bee's Matt Weiser at (916) 321-1264. Follow him on Twitter @matt_weiser.

Attachment to I-Recirculated-24, Kathy Prevost

291116

261017

COMMENT LETTER FOR PROPOSED REZONING OF EID BASS LAKE APN 115-400-12

Bald Eagle, December 2012
2180 Summer Drive
Basil Court and Summer Drive – WoodRidge
El Dorado Hills, CA

EL DORADO COUNTY
RECEIVED
JUL 22 2014
LONG RANGE PLANNING

261017

July 21, 2014

El Dorado County Development Agency
Long Range Planning
2850 Fairlane Drive, Bldg. C
Placerville, CA 95667

Attn: Shawna Purvines, Senior Planner

RE: LUPPU Proposed Rezoning of APN 115-400-12, 3240 Bass Lake Road
From RF – Adopted Plan to RFH – High Use Recreation
El Dorado Irrigation District (EID) property containing Bass Lake

EID owned APN 115-400-12 is proposed to be rezoned under the El Dorado County Land Use Policy Programmatic Update (LUPPU – now LRP) from its current status as Recreational Facilities (RF) – Recreation with a land use of Adopted Plan (AP) to Recreational Facilities high - intensity (RFH) – Recreation, High Usage zoning which would allow the property to be used for recreational activities with high concentrations of people, such as sports fields, sports complexes, recreational parks and amusement parks. See attached map. **(Attachment 1)**

We believe this proposed zoning change would be in direct contravention to the El Dorado Hills Specific Plan (EDHSP), which specifically designates the EID Bass Lake parcel as permanently dedicated to open space and low impact recreation. Additionally, this property is in a Rural Region where Recreational Facilities low-intensity (RFL) zoning would be allowed but not RFH according to the El Dorado County TGPA/ZOU Draft EIR Project Description.

According to Chapter 17.25 – Special Purpose Zones 17.25.010, C 1. "Recreational Facilities, Low-Intensity (RFL) is applied to regulate and promote dispersed recreational and tourist accommodating uses and activities primarily in Rural Regions or Rural Centers of the County where such uses are compatible with adjacent or nearby rural residential, agricultural or resource development. Uses include but are not limited to camping, picnicking, equestrian staging and river put-in take-out."

Designated Village "R" in the EDHSP the lake and surrounding 157 acres of the EID Bass Lake reservoir and water treatment facility were once used as a low impact recreation area for fishing and boating while under private ownership. At one time called the American Reservoir, the lake has been in use since the 1850's. EID has owned this property since 1969 and it is no longer available for public use.

The US Fish and Wildlife Service National Wetlands Inventory considers this area as wetlands with historic wetlands on the site. It is also part of the Carson Creek watershed with the north branch of Carson Creek draining the lake. The area supports a wide variety of wildlife including but not limited to Bald Eagles who have inhabited the site for well over 40 years and American White Pelicans who visit all year round.

Following are the reasons we believe it would be a mistake to rezone this valuable environmental and historical resource which should be preserved for future generations and will one day be the only open space between Cameron Park and El Dorado Hills.

1. El Dorado Hills Specific Plan and Environmental Impact Report

   A. *"Should conflicts arise between the provisions of the planned development overlay zone standards and those standards and policies of the Specific Plan, the latter shall prevail. All subsequent subdivision and development, all public works projects, and all zoning regulations must be consistent with the Specific Plan."*
   EDHSP December 23, 1987 Section 1. Introduction 1.1.1 Implementation of Policies
   (Attachment 2)

   California Government Code section 65455 states that, "No public works project may be approved, no tentative map or parcel map for which a tentative map was not required may be approved, and ***no zoning ordinance may be adopted or amended within an area covered by a specific plan unless it is consistent with the adopted specific plan."***

   B. *"Village "R" constitutes 157 acres of El Dorado Irrigations District's (EID) Bass Lake water reservoir and water treatment facility. Once used as a recreation area, the lake and surroundings properties are no longer available for public use".*

   "In spite of its restricted access, Bass Lake does offer a visual water amenity to the North Uplands Golf Course Neighborhood and to travelers using Bass Lake Road. The lake and surrounding properties also constitute an additional area of permanent open space which, if feasible, should be returned to public recreational use in the future. No development is proposed for Village "R"."
   EDHSP Draft EIR Area Place Designations Map Figure 4-1 refers to Village "R" as open space conservation.
   EDHSP Draft EIR October 1987 - Area Plan Designations Map Figure 4-1
   EDHSP Residential Land Use Element, Section 2, Village R, page 35
   EDHSP Draft EIR, October 1987-Open Space Map Figure 2.10/Proposed Zoning Map 1a Figure 4-3
   (Attachments 3-6)

   C. *"Natural Open space, as designated in the Specific Plan, will be preserved in perpetuity in an essentially unaltered condition. No development will occur within these areas except for maintenance, fire protection, trails and permitted uses. Use*

will be restricted to such activities as jogging, hiking, and horseback riding, where the impact will be minimal."
EDHSP Design Guidelines, Appendix B, Section 5.0 Open Space, Parks and Recreation, Trails and Paths, 5.2, Natural Open Space, page B-12 **(Attachment 7)**

D. *"The north branch of Carson Creek that drains Bass Lake has considerably less riparian dependent vegetation that the main branch."*
EDHSP Draft EIR, October 1987/Chapter 12, Vegetation, Wildlife and Aquatic Resources, page 12-8 **(Attachment 8)**

E. *"Village "J" is bounded on the northeast by the exterior of the Specific Plan area and on the south by Country Club Drive. It includes the Bass Lake Road and the Bass Lake water reservoir which is designated as open space."*
EDHSP, Section 2. Residential Land Use Element, page 33 **(Attachment 9)**

F. *"Bass Lake – (approximately 154 acres) A large year round lake at the east edge of the Plan Area has special value as wildlife habitat."*
EDHSP Draft EIR, October 1987, page 12-11/Chapter 12, Vegetation, Wildlife and Aquatic **(Attachment 10)**

2. 2004 General Plan Conservation and Open Space Element

A. *Preservation of Open Space*
"Goal 7.6 Open Space Conservation
Conserve open space land for the continuation of the County's rural character, commercial agriculture, forestry and other productive uses, the enjoyment of scenic beauty and recreation, the protection of natural resources, for protection from natural hazards, and for wildlife habitat."

a. *Policy 7.6.1*
"Conserving natural resource areas required for the conservation of plant and animal life including habitat for fish and wildlife species; areas required for ecologic and other scientific study purposes; rivers, streams, banks of rivers and streams and watershed lands;"
El Dorado County General Plan – Conservation and Open Space Element July 2004 Page 157 **(Attachment 11)**

3. General Plan Plan Use Designation and Zone Consistency/Draft TGPA/ZOU EIR

A. *El Dorado County Impact Analysis Biological Resources El Dorado County TGPA/ZOU Draft Program EIRSCH# 20120520743.4-24March 2014ICF 00103.12*
λ Section 17.25.010 and 17.25.020
"Recreational Facilities, Low-intensity [RFL] and Recreational Facilities, High-intensity [RFH]) RFL zoning would be allowable in Rural Regions and Rural

Centers; RFH zoning would be "primarily located in Community Regions and Rural Centers.""

B. *"Table 2.2 El Dorado County Project Description Draft EIR attached shows RFH in OS Open Space only when located within a Community Region and the Bass Lake parcel is outside the Community Region."*
See attached map and table. **(Attachment 12)**

4. Environmental Background

A. *The EID Bass Lake property is listed in the US Fish and Wildlife Service National Wetlands Inventory. There are two historic wetlands on the East side of the lake. This area is deemed to be Waters of the United States.*
See attached map and the decoding documentation for the map.
(Attachment 13)

B. *In a letter dated, June 12, 2003 from Larry L. Eng, PHD, Deputy Regional Manager, the Department of Fish and Game, to Mr. Gary Hyden, EDC Park Department, regarding the May 16, 2003 Notice of Preparation of an EIR for the proposed 41 acre Bass Lake Regional Park property which is adjacent to the EID Bass Lake property, the following comments were made.*

a. *"Bass Lake and the surrounding shoreline, including lands within the proposed park site, are valuable habitat areas for resident and migratory bird. At least one bald eagle (haliaeetus leucocephalus) has been a frequently observed winter visitor there in recent years, and has often been observed along the shoreline near or inside of the boundaries of the proposed park. Also, Bass Lake is a valuable feeding and resting area for wintering waterfowl, including ring-necked ducks, etc."*

b. *"Development of ball fields, a golf course, nature interpretation facilities, a community center, pathways, and other facilities, as well as the human use, can be expected to greatly reduce resident and migratory bird use of the area.*

c. *Besides the direct permanent removal of habitat from project construction, many of the bird species are very sensitive to human disturbances which can be expected from operation of the park. For example, the development and use of a perimeter trail has the potential to significantly affect foraging areas for birds, such as the bald eagle, great egret, and many species of water fowl."*
(Attachment 14) Complete Letter attached.

C. *Bass Lake Road Realignment Draft EIR, 1992, Appendix B, NOP Comments (now called Silver Springs Parkway) has two comment letters regarding the Bald Eagles at Bass Lake.*

a. From D. Bruce Swinehart, Jr., Biology Professor, American River College to Kris Payne, EDC DOT, stating "I have been aware of the wintering eagles at Bass Lake for the last forty years." "I take my ornithology field classes to Bass Lake at least twice a year to see the eagles, waterfowl and other birds." "I hope your county will realize the tremendous resource a place like Bass Lake is."
(Attachment 15) Letter dated 12/27/1991.

b. *From Roger E. Johnson, resident of the area to Kris Payne, EDC DOT, stating "My family and I have enjoyed watching the bald eagles at Bass Lake for the past four winters since moving to Rescue."*
(Attachment 16) Letter dated December 30, 1991

D. *SMUD stated the California Natural Diversity Data Base reported eagles have wintered at Bass Lake for over forty years in 2002-2003. Residential development was identified as a major concern to wintering Eagles at Bass Lake.*

E. *The Aububon Society states during their December 2012 bird count finding waterfowl species including Mallard, American Widgeon, Ring Necked Duck, Bufflehead, Canada Goose, and Greater Whitefronted Goose. Other species seen were Turkey Vultures, Wild Turkey, Great Blue Heron, Great Egret, Double-crested Cormorant, Killdeer, and Lark Sparrow. They also reported eagles at Bass Lake in their December 2011 bird count.*

F. *Over the years, the residents of the Bass Lake Area have seen Bald Eagles, Ospreys and several different kinds of hawks as well as American White Pelicans who have been arriving for at least ten years. American White Pelicans are experiencing a declining habitat and are protected by the Migratory Bird Treaty Act of 1918. It has the California Department of Fish and Game protective status and the California Species of Special Concern (CSC).*
(Attachment 17) Picture attached.

A pair of swans remained at Bass Lake over the Summer of 2013 and returned in the Fall. Recently a Golden Eagle was spotted around the EID Bass Lake property sitting on a pole and a Bald Eagle was seen by a nearby Serrano resident. A photo of a Bald Eagle was taken by Joe D'Amico at 2180 Summer Drive (WoodRidge) near the intersection of Basil Court and Summer Drive, December 2012 . The bird had been recently eating a fish in the tree.
(Attachment 18) A copy of this photo is attached and a document Environmental Impacts, Eagles/Pelicans at EID Bass Lake, Bass Lake Wetlands and Historic Wetlands

G. *This is a valuable historical site having served the residents of the Bass Lake area with water and the town of Clarksville when it was the Bass Lake predecessor*

American Reservoir as early as the 1850's. The attached map is a General Land Office Plat of the Township.
(Attachment 19) Historic Map Attached

In conclusion, we understand from an email from Shawna Purvines (email of September 24, 2013 to Ellen Van Dyke attached), the EDC Long Range Planning staff felt this property should be rezoned because when the EDC Parks and Trails Master Plan was approved it included a previous master plan for the proposed Bass Lake Regional Park (BLRP) including the EID property APN 115-400-12. The proposed BLRP, APN 115-400-02 has a proposed LUPPU zoning of RE-5 and was identified to potentially include intensive uses and amenities such as a community center, ball fields, etc. It is also in a Rural Region and parts of it adjoin Green Springs Ranch. **(Attachment 20 with map of park)**

An Environmental Impact Report was never completed for the proposed BLRP property and previously quoted information in this letter from the Department of Fish and Game to EDC is listed under Number 4, Environmental Background, B, and states there would have been potentially significant environmental impacts if the project had moved forward as proposed.

Additionally, the 2012 EDC Parks and Trails Master Plan states the proposed BLRP plans need "to be revisited taking into consideration new residential developments, local parks and road projects in the area." "More passive uses such as trails and nature may have greater value as the El Dorado Hills and Cameron Park communities are becoming more densely developed." "These types of uses would also have fewer environmental impacts and cost less to develop and maintain." (RP4) **(Attachment 21)**

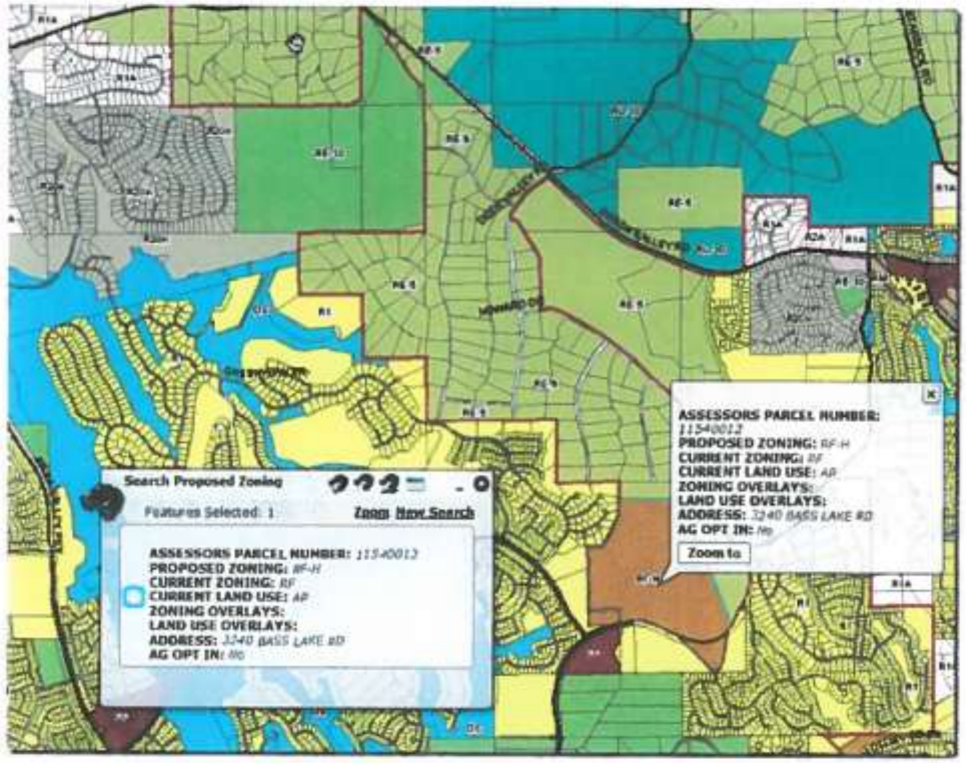
Page 57 of the EDC Parks Master Plan states "The master plan will need to be revisited before improvements for this site are implemented to reflect changes in community needs and recreation trends."

Bass Lake and the surrounding wetlands are much enjoyed by the residents of our area and it is a visual water amenity for us which supports a varied wildlife community as well. The EID Bass Lake property is a significant environmental and historical asset for the Bass Lake and El Dorado Hills area and should be protected with a parcel zoning of Recreational Facilities –Low Intensity (RFL) and an open space (conservation) land usage as shown in the EDHSP. I believe the facts stated in this letter support this conclusion.

Sincerely,
Kathleen M Prevost

Kathleen M. Prevost
1080 Jasmine Circle
El Dorado Hills, CA 95762
530 672-6836

Attachment 1. Bass Lake EID Property Proposed LUPPU (note RF-Recreational Facilities to RFH--High Intensity Facilities proposed zoning).



BASS LAKE EID
PROPERTY

Attachment 2. EDH Specific Plan (EDHSP), December 23, 1987.

EDHSP DECEMBER 23 1987
ATTACHMENT 2 261017

SECTION 1.
INTRODUCTION

1.1 Purpose and Content of the Specific Plan

The purpose of the El Dorado Hills Specific Plan is to provide for the orderly and systematic development of the Plan Area in a manner consistent with the policies of El Dorado County and with the characteristics of the land. This purpose will be achieved by establishing a master plan for the development of approximately 4,000 acres of property that will contain an orderly, comprehensive program of development controls and implementation measures.

1.1.1 Implementation of Policies

The El Dorado Hills Specific Plan is designed to be consistent with, and represent a refinement and expansion of, the broader policies set forth in the El Dorado County Long Range Plan and the El Dorado Hills/Salmon Falls Area Plan. It provides a transition between those policies and the implementation regulations contained in both the zoning and subdivision ordinances. The plan's policies and standards will be implemented through land use entitlements granted subsequent to adoption of the Specific Plan, including zoning consistent with the Specific Plan. In addition, the use of the County's planned development overlay zoning designation will further ensure that development within the Specific Plan area occurs pursuant to the policies and standards of the Specific Plan. Should conflicts arise between the provisions of the planned development overlay zone standards and those standards and policies of the Specific Plan, the latter shall prevail. Similarly, the standards and policies of the planned development district shall prevail over conflicting provisions which may be applicable in the underlying zoning district. All subsequent subdivision and development, all public works projects, and all zoning regulations must be consistent with the Specific Plan.

1.1.2 Control of the Quality of Future Development

Goals and policies are established within the text of this Specific Plan in order to guide future development. In addition, Design Guidelines and conceptual Master Covenants, Conditions, and Restrictions (CC&Rs) will serve to provide more definitive controls for development. The Design Guidelines are included in the Specific Plan as Appendix B.

A Development Agreement will ensure compliance with the Design Guidelines, Master CC&Rs, Specific Plan, and applicable County ordinances and regulations.

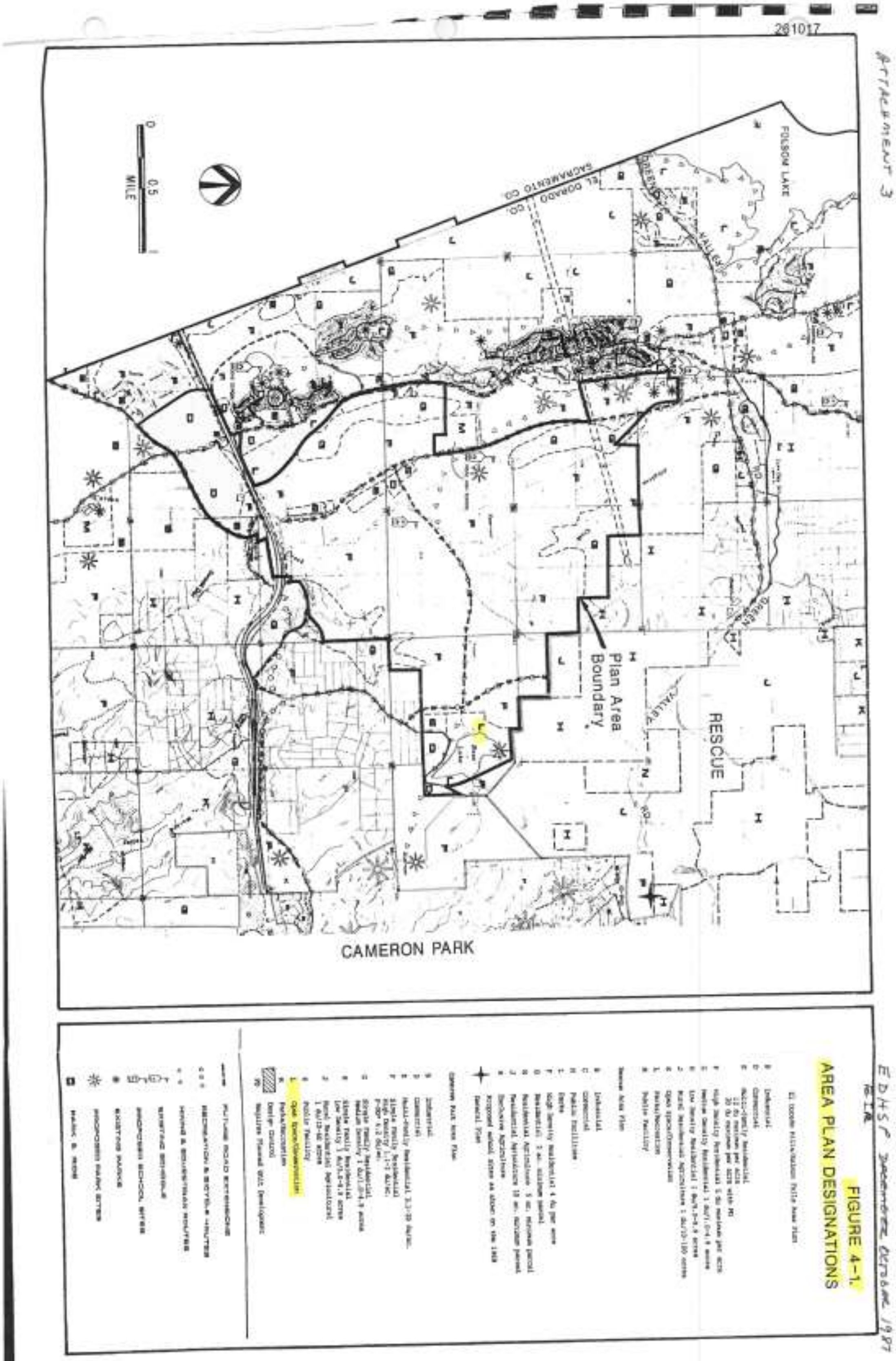
1.1.3 Implementation Measures

The Specific Plan sets forth implementation measures to ensure the ultimate fulfillment of the plan concepts. These measures include:

- Goals and Policies
- Master Covenants, Conditions, and Restrictions
- Design Guidelines
- Funding Mechanisms to Provide for Specific Public Improvements
- Development Agreements

Each of these measures is applied individually or in concert with other measures to implement the intent of the Specific Plan. The application of these measures is described in Section 9, "Implementation."

Attachment 3. EDH Specific Plan (EDHSP): Area Plan Designations, October, 1987



Attachment 4. EDHSP: Residential Land Uses, December 23, 1987.

ATTACHMENT 4

EDHSP SECTION 2
RESIDENTIAL LAND USES
DECEMBER 23, 1987

261017

VILLAGE "M"

Village "M" constitutes a variation from the mix of housing types found elsewhere in the Specific Plan. This is due to the sensitive character of the village in terms of dense tree cover, wildlife habitat, and rolling-to-steep topography. As a result, this village is reserved for the largest lots within the Specific Plan area, Ranch Estates (RE) of 4-7 acres in size. These rural lots also act as a buffer between the edge of the Plan Area and the large rural lots to the north and the agricultural preserve to the east. The rural character of Village "M" will be maintained by the use of a standard rural road system of aggregate or chip seal surface. Water and sewer lines will be located within the public right-of-way. Road connections to the north are not expected to permit incompatible traffic volumes that would impact the rural setting and natural amenities of the village. Village "M," although large in acreage, is appropriate for approximately 37 dwelling units.

VILLAGE "R"

Village "R" constitutes 157 acres of the El Dorado Irrigation District's (EID) Bass Lake water reservoir and water treatment facility. Once used as a recreation area, the lake and surrounding properties are no longer available for public use. The lake is now a potable water storage area for use by EID as a source of gravity-fed domestic water for the El Dorado Hills area. A treatment plant and caretaker's residence are also situated in Village "R."

In spite of its restricted access, Bass Lake does offer a visual water amenity to the North Uplands Golf Course Neighborhood and to travelers using Bass Lake Road. The lake and surrounding properties also constitute an additional area of permanent open space which, if feasible, should be returned to public recreational use in the future. No development is proposed for Village "R."

2.5.2 Development Neighborhood #2

The South Uplands Golf Course Neighborhood constitutes an area lying between the North Uplands Golf Course Neighborhood and Highway 50 in the southeastern portion of the Specific Plan area. It is a large area of gentle slopes and less tree cover than exists in the North Uplands Golf Course Neighborhood. This setting leaves less area for preservation as natural open space. However, additional water amenities are provided to increase the riparian habitat and the visual character of this neighborhood. Envisioned as a second golf course community, this neighborhood would also permit construction of an 18-hole golf course through the valleys and drainage course. Overall densities in this neighborhood are slightly higher due to the difference in topography and the need to maximize effective open space.

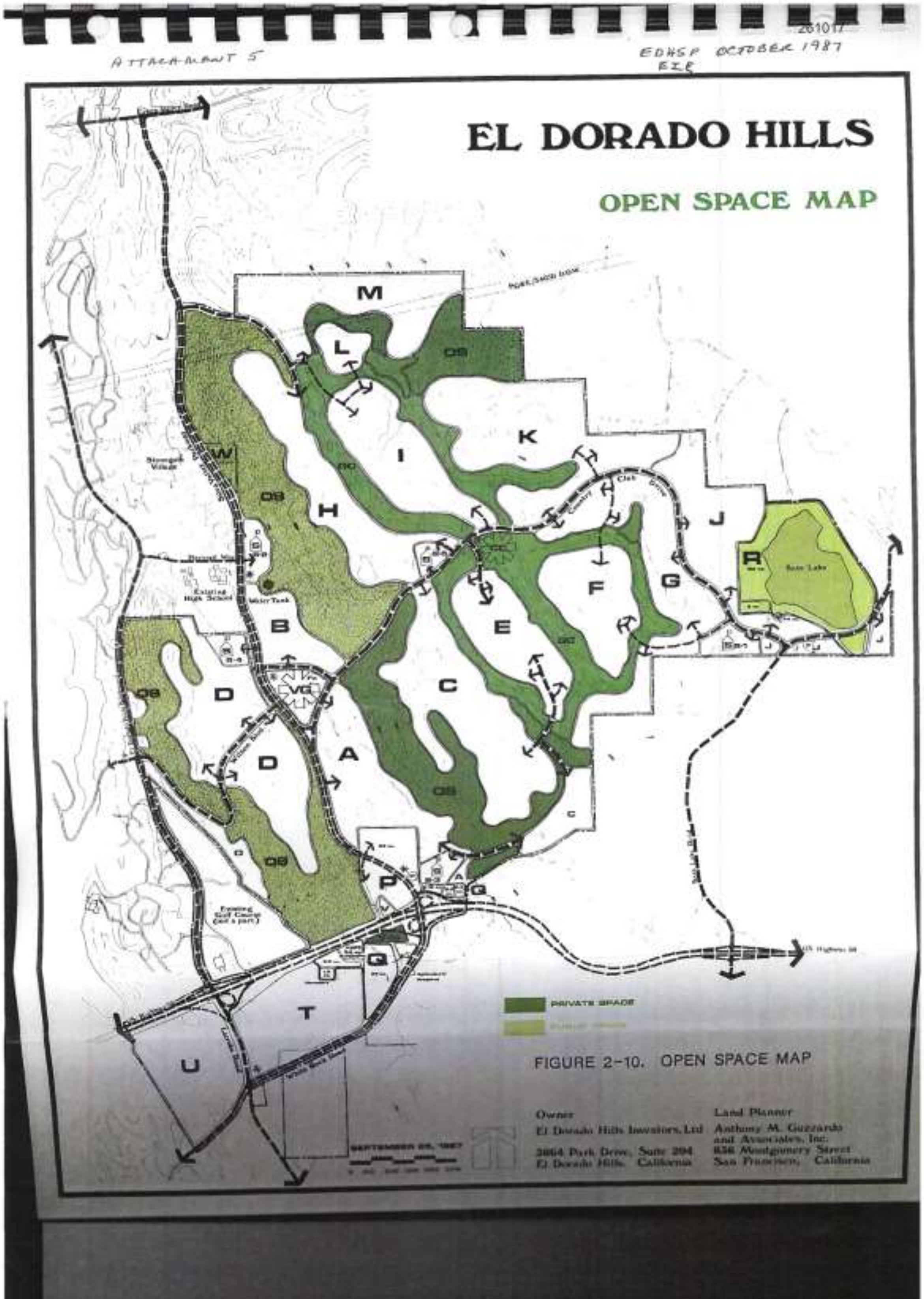
In addition to the golf course, a country club and related facilities also may be provided south of Country Club Drive, although its location will depend on the final design and plans for golf course development. The South Uplands Golf Course Neighborhood contains four separate villages oriented to the golf course and natural open space areas. Consistent with the Specific Plan, certain housing types are also allocated in this neighborhood based on natural land constraints and proximity to existing or planned amenities.

The villages within the South Uplands Golf Course Neighborhood include the following:

VILLAGE "C"

Village "C" is defined by the contiguous natural open space areas to the west and south and the proposed golf course to the east. This village also lies along a north-south ridgeline of gentle to moderate slopes that contain very few trees but excellent views of the Sacramento Valley. View Lots (VL) are designated along the west side of the ridge, with larger Estate Homes (EH) anticipated in the interior of the village and on the east ridgeside. Fairway Estates (FE) are suitable uses fronting the golf course at the east side of the village. An area of Ranch Estate

Attachment 5. EDHSP / EIR: Open Space Map, October, 1987



Attachment 6. EDHSP / EIR: Proposed Zoning Map, October, 1987.

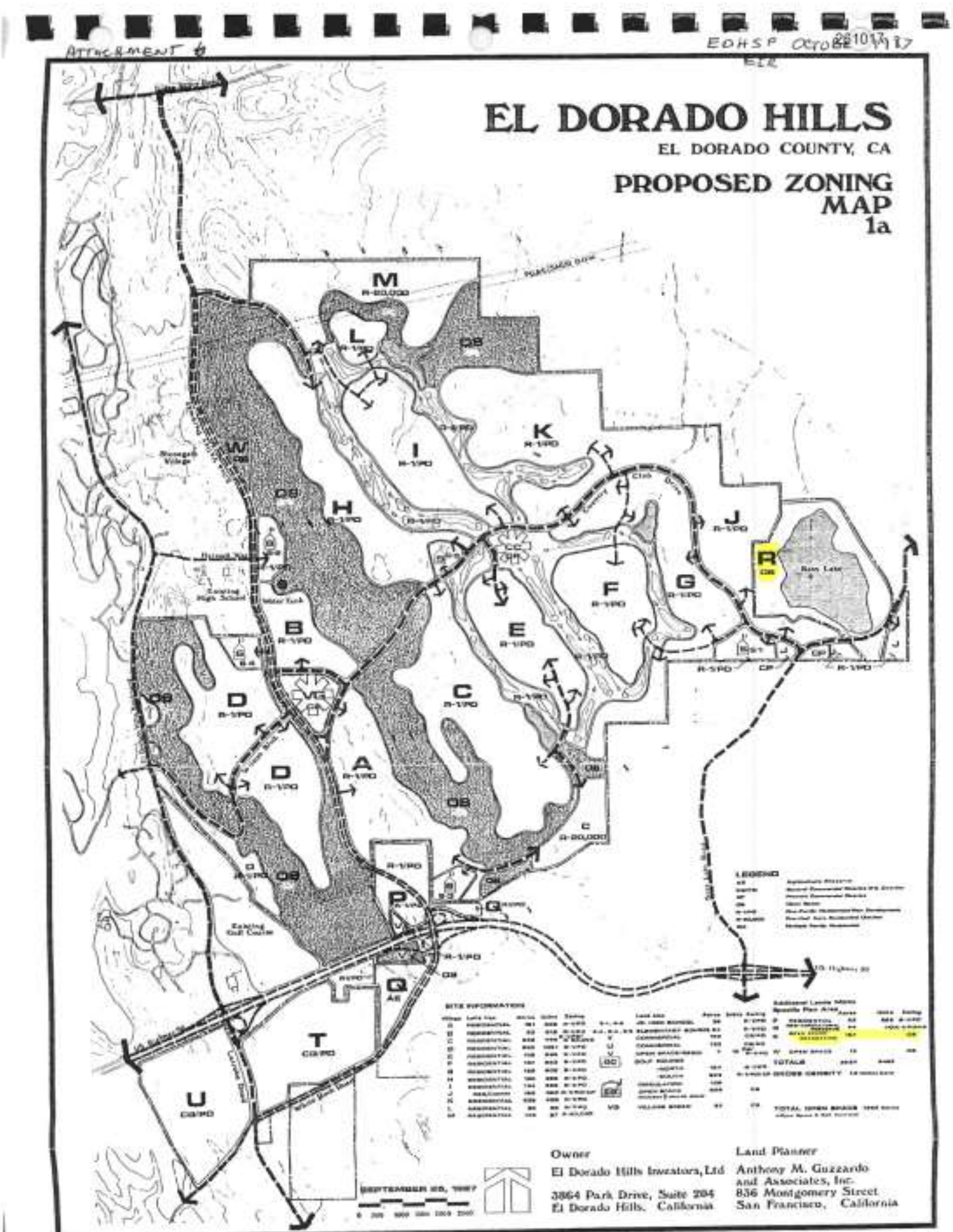


FIGURE 4-3.
PROPOSED ZONING MAP

Attachment 7. EDHSP: Design Guidelines, Section 5.0, Appendix B.

ATTACHMENT 7

EDHSP DESIGN GUIDE LINES SECTION 5.0 APPENDIX B

c. All exterior lighting fixtures shall be efficient in terms of design and energy use. Low- and high-pressure sodium (LPS and HPS) lamps are recommended in public areas but prohibited on structures.

d. Lighting fixtures within the Village Green/Community Center shall be designed to deflect light and glare away from the viewsheds of adjacent residences, parks, and open space. Fixture placements are to be approved by the ACC. Cutoff-type fixtures are recommended to minimize light spillage and glare.

e. All electrical, telephone, and other cable services shall be installed underground. Transformers, terminal boxes, meter cabinets, pedestals, concealed ducts, and other facilities necessary and appurtenant to underground facilities, street lighting, and the irrigation system may be placed above ground when necessary. Public utilities may be provided in private streets with recorded easements to ensure access as required for their maintenance.

Section 5.0 Open Space, Parks and Recreation, Trails and Paths

Integral to the concept of the El Dorado Hills Specific Plan is the mixture of open space, residential areas, commercial sites, and circulation. The success of this integration depends primarily on the manner in which the boundaries between these various land uses meet and interconnect. This section establishes guidelines to facilitate these interconnections and especially to protect the natural open space from impacts from adjacent uses.

5.1 Open Space

Five basic types of open space are provided in the Plan Area: natural open space, golf course, residential open space, parkland and school playfields, and drainageways.

5.2 Natural Open Space

a. Natural open space, as designated in the Specific Plan, will be preserved in perpetuity in an essentially unaltered condition.

b. No development will occur within these areas except for maintenance, fire protection, trails, and permitted uses.

c. Use will be restricted to such activities as jogging, hiking, and horseback riding, where the impact on the natural environment will be minimal.

5.3 Golf Course

a. With the exception of the clubhouse, pro shop facilities, and commercial uses, all of the area designated as the golf course will be landscaped and developed exclusively for golf and country club-related facilities.

b. Swales and drainageways will be landscaped, where possible, using native planting to enhance the natural habitat.

5.4 Residential Open Space

a. Open space easement dedications on individual residential parcels may be required in order to reduce fence visibility, reduce open space intrusion, buffer open space from development, and reduce tree loss.

b. Such easements may be required to prevent development of other than accessory structures and landscaping.

c. General public access rights will not be permitted within these easements.

Attachment 8. EDHSP: Draft EDHSP / EIR Chapter 12. Vegetation, Wildlife and Aquatics, October, 1987.

ATTACHMENT 8

DRAFT EDHSP EIR CHAPTER 12
VEGETATION, 261017 WILDLIFE
AND AQUATICS,
OCTOBER 1987

canopies dominated by interior live oak, blue oak, and buckeye. Occasional valley oak, cottonwood, California grape, and willow are scattered, but rare, along these creeks. Two small sites along Allegheny Creek have notable stands of cottonwood/willow/Himalaya-berry vegetation (Figure 12-1). The presence of the two stands of riparian-dependent vegetation and the occasional valley oaks, cottonwoods, and willows along the rest of the creek, indicates that Allegheny Creek may be capable of supporting more extensive riparian-dependent vegetation.

Carson Creek supports an intermediate type of creekside vegetation with the riparian dependent cottonwood, willow, and buttonbush species mixing with interior live oak, blue oak, and buckeye. The canopy is nearly closed and riparian-dependent species contribute about 40 percent of total cover. Because water is present most or all of the year, riparian herbs such as beardgrass, deer grass, and spike rush are also present. The channel is very rocky with numerous large boulders and bedrock outcrops. These features reduce accessibility to livestock and may account for the increased amount of riparian-dependent vegetation.

The north branch of Carson Creek that drains Bass Lake has considerably less riparian-dependent vegetation than the main branch. Willows and buttonbush are only occasionally present with interior live oak and buckeye the most common species along the creek edges; reaches with annual grasslands and no woody vegetation are common. Compared with the main branch, this branch has less water and is more accessible to livestock because the large bedrock exposures and boulders are absent. These characteristics may help to explain the lower amounts of riparian-dependent vegetation.

The creekside habitat with the most highly developed stand of riparian-dependent vegetation is west of the Plan Area along the small unnamed creek flowing through the existing golf course. This creek has a small watershed and no surface flow was observed above the golf course. The creek's vegetation consists of a 40- to 50-foot tall canopy of young cottonwoods, a dense mid-story layer of various willow species and alders, and a dense impenetrable understory of Himalaya berry, wild grape, and poison oak. Golf course irrigation probably augments natural creek discharge. This feature, and the absence of livestock grazing, probably account for the well-developed young stand of riparian vegetation. Presumably, this riparian-dependent vegetation was not present before the golf course increased creek discharge and the livestock grazing was terminated.

<u>Wildlife</u>

Allegheny Creek has few of the wildlife values usually associated with creekside habitats because of the effects of livestock grazing and past mining activities and because of its intermittent water flow. In general, the corridor along

Attachment 9. EDHSP: Section D. Residential Land Use.

ATTACHMENT 9

EDHSP SECTION – RESIDENTIAL USE 281017

VILLAGE "I"

Village "I" is encircled by the proposed golf course and may include a country club and related facilities. It is an area characterized by lower elevations and gentle slopes, and is located in the center of the development neighborhood. As a result, the outer boundaries of Village "I" are appropriate for Attached Golf Townhomes (AGT) and Fairway Estates (FE). The interior portions of the village, with more level topography, are appropriate locations for Single Family Detached (SFD) homes.

This village is also planned to include a neighborhood park, the location of which will be determined with the filing of a tentative subdivision map for this village. Village "I" would accommodate approximately 699 dwelling units.

VILLAGE "K"

Village "K" is defined by the northeast boundaries of the Specific Plan area, the golf course on the west, and the main east-west arterial (Country Club Drive) to the south. The village contains significant tree cover and includes a knoll which offers panoramic views of the Sacramento Valley, Folsom Lake, and the Sierra Nevada. Subdivision design and placement of structures will be subject to design review to preserve as many of the existing live oaks within this village as possible.

The eastern edge of Village "K" abuts the existing rural parcels of Green Springs Estates, and therefore the lower density Ranch Estate (RE) lots act as a transition between those existing rural lots outside of the Plan Area and the Estate Home (EH) lots located toward the interior of the village. Westerly facing slopes fronting on the golf course are appropriate locations for the lower density View Estates (VE). Single Family Detached (SFD) residences are proposed along Country Club Drive and along the golf course frontage where the topography would not accommodate attached dwelling units. This development pattern would permit Village "K" to accommodate approximately 458 dwelling units.

VILLAGE "J"

Village "J" is bounded on the northeast by the exterior of the Specific Plan area and on the south by Country Club Drive. It includes Bass Lake Road and the Bass Lake water reservoir, which is designated as open space.

This village is not adjacent to a golf course or Specific Plan open space areas and contains level to gently rolling topography. The latter characteristic lends itself to Single Family Detached (SFD) uses, except at the edges adjacent to rural parcels or Bass Lake where larger Ranch Estate (RE) lots are provided. Specifically, parcels that abut the Plan Area boundary are to be 4-acre minimum. These designations are appropriate as a buffer to the open space of Bass Lake and the rural parcels lying adjacent to, but outside of, the Specific Plan area to the east.

Village "J" also includes 45 acres of neighborhood commercial sites on the west and east sides of Bass Lake Road. These uses are intended to serve the daily shopping needs of future residents in the vicinity. Village "J" would accommodate approximately 342 dwelling units.

VILLAGE "L"

Village "L" represents the smallest village in the Specific Plan area, constituting an island of development surrounded by natural open space or a golf course. With its heavy tree cover and location on a prominent knoll, the site is established as a separate, unique village, and the larger Estate Home (EH) lots are appropriate. A low-lying area east of the village is designated for a future water retention pond to accommodate drainage in the area. This lake also provides an accessible water amenity within the North Uplands Golf Course Neighborhood. Village L is appropriate for only 56 dwelling units.

Attachment 10. EDHSP: Draft EIR Chapter 12/Page 11. Vegetation, Wildlife and Aquatics, October, 1987.

ATTACHMENT 10

EDHSP DRAFT EIR
OCTOBER 1987
CHAPTER 12, PAGE 12-11
VEGETATION, WILDLIFE
AND AQUATIC

261017

Wildlife - Stockponds

Stockponds in the Plan Area are similarly degraded by livestock grazing. These turbid ponds may provide resting and foraging grounds for mallards and great blue herons and are also a source of water for mule deer and other mammals and birds. The wildlife value of the stockponds is substantially reduced because they lack riparian or emergent vegetation.

Bass Lake (approximately 154 acres)

A large year-round lake at the east edge of the Plan Area has special value as wildlife habitat.

Vegetation

Vegetation at Bass Lake consists of a few scattered cottonwoods and willow trees and herbaceous species listed previously for the freshwater marshes and seep habitats.

Wildlife

Because of its fluctuating water levels, Bass Lake does not support any important stands of emergent or riparian vegetation, but it does provide foraging and resting grounds for a variety of waterfowl. Common mergansers, ruddy ducks, buffleheads, and American wigeons use Bass Lake in the winter. Great blue herons, great egrets, and killdeer forage along the muddy margins of the lake, and black phoebes, tree and violet-green swallows flycatch for insects above the lake's waters. Bass Lake is also a source of water for mammals like raccoons, striped skunks, and mule deer.

Serpentine Chaparral (approximately 39 acres)

A small area with serpentine substrates and derived soils is present along the east edge of the Plan Area east and adjacent to Bass Lake. Serpentine substrates are common east and north of the Plan Area (Rogers 1974).

Soils derived from serpentines are nutritionally poor and present a stressful habitat for plant growth due to the presence of toxic metals and thin soils. As a result, the vegetation differs in structure and composition from surrounding non-serpentine substrates.

Serpentine is famous in California because many special-status plant species are restricted to the substrate. In El Dorado County eight special-status species are associated with serpentine and the related gabbro substrates (Wilson 1986, Smith and York 1984). None of these species occur in the Plan Area on

Attachment 11. El Dorado County General Plan: Preservation of Open Space. July, 2004.

ATTACHMENT 11

EDC GENERAL PLAN
2610122004

PRESERVATION OF OPEN SPACE

GOAL 7.6: OPEN SPACE CONSERVATION

Conserve open space land for the continuation of the County's rural character, commercial agriculture, forestry and other productive uses, the enjoyment of scenic beauty and recreation, the protection of natural resources, for protection from natural hazards, and for wildlife habitat.

OBJECTIVE 7.6.1: IMPORTANCE OF OPEN SPACE

Consideration of open space as an important factor in the County's quality of life.

Policy 7.6.1.1 The General Plan land use map shall include an Open Space land use designation. The purpose of this designation is to implement the goals and objectives of the Land Use and the Conservation and Open Space Elements by serving one or more of the purposes stated below. In addition, the designations on the land use map for Rural Residential and Natural Resource areas are also intended to implement said goals and objectives. Primary purposes of open space include:

A. Conserving natural resource areas required for the conservation of plant and animal life including habitat for fish and wildlife species; areas required for ecologic and other scientific study purposes; rivers, streams, banks of rivers and streams and watershed lands;

B. Conserving natural resource lands for the managed production of resources including forest products, rangeland, agricultural lands important to the production of food and fiber; and areas containing important mineral deposits;

C. Maintaining areas of importance for outdoor recreation including areas of outstanding scenic, historic and cultural value; areas particularly suited for park and recreation purposes including those providing access to lake shores, beaches and rivers and streams; and areas which serve as links between major recreation and open space reservations including utility easements, banks of rivers and streams, trails and scenic highway corridors;

D. Delineating open space for public health and safety including, but not limited to, areas which require special management or regulation because of hazardous or special conditions such as earthquake fault zones, unstable soil areas, flood plains, watersheds, areas presenting high fire risks, areas required for the protection of water quality and water reservoirs, and areas required for the protection and enhancement of air quality; and

E. Providing for open spaces to create buffers which may be landscaped to minimize the adverse impact of one land use on another.

Attachment 12. El Dorado County General Plan Land Use Designations and Zone Consistency Matrix July 20, 2014.

ATTACHMENT 12

El Dorado County | Project Description

Table 2-2. General Plan Land Use Designation and Zone Consistency Matrix

Zones	Land Use Designations											
	MFR	HDR	MDR	LDR	RR	AL	NR	C	R&D	I	OS	TR
RM	•							•[1]				
R1		•	▲									
R20K		•										
R1A		•	•									
R2A			•									
R3A			•									
RE (5-10)			•	•	•[2]							
CPO								•				
CL								•				
CH								•				
CC								•				
CR								•				
CG								•				
I										•		
R&D									•			
LA (10-160)				•[4]	•	•	•				•[3]	
PA (10-160)				•[4, 8]	•	•	•				•[3]	
RL (10-160)				•[4]	•	•	•				•[3]	
AG (40-160)				★	•	•	•				•[3]	★
FR					•	•	•					
TPZ				•	•	•	•					
RFL	•	•	•	•	•		•				•	•
RFH	•	•						•			•[3]	•
TC	•	•	•	•	•	•	•	•	•	•	•	•
OS	•	•	•	•	•	•	•				•	•

NOTES:

Land Use Designations

C = Commercial
R&D = Research & Development
HDR = High-Density Residential
I = Industrial
LDR = Low-Density Residential
MDR = Medium-Density Residential
MFR = Multifamily Residential
NR = Natural Resource
OS = Open Space
RR = Rural Residential
AL = Agricultural Lands
TR = Tourist Recreational

Footnote (5) on the next page: "*When inside a Community Region*".

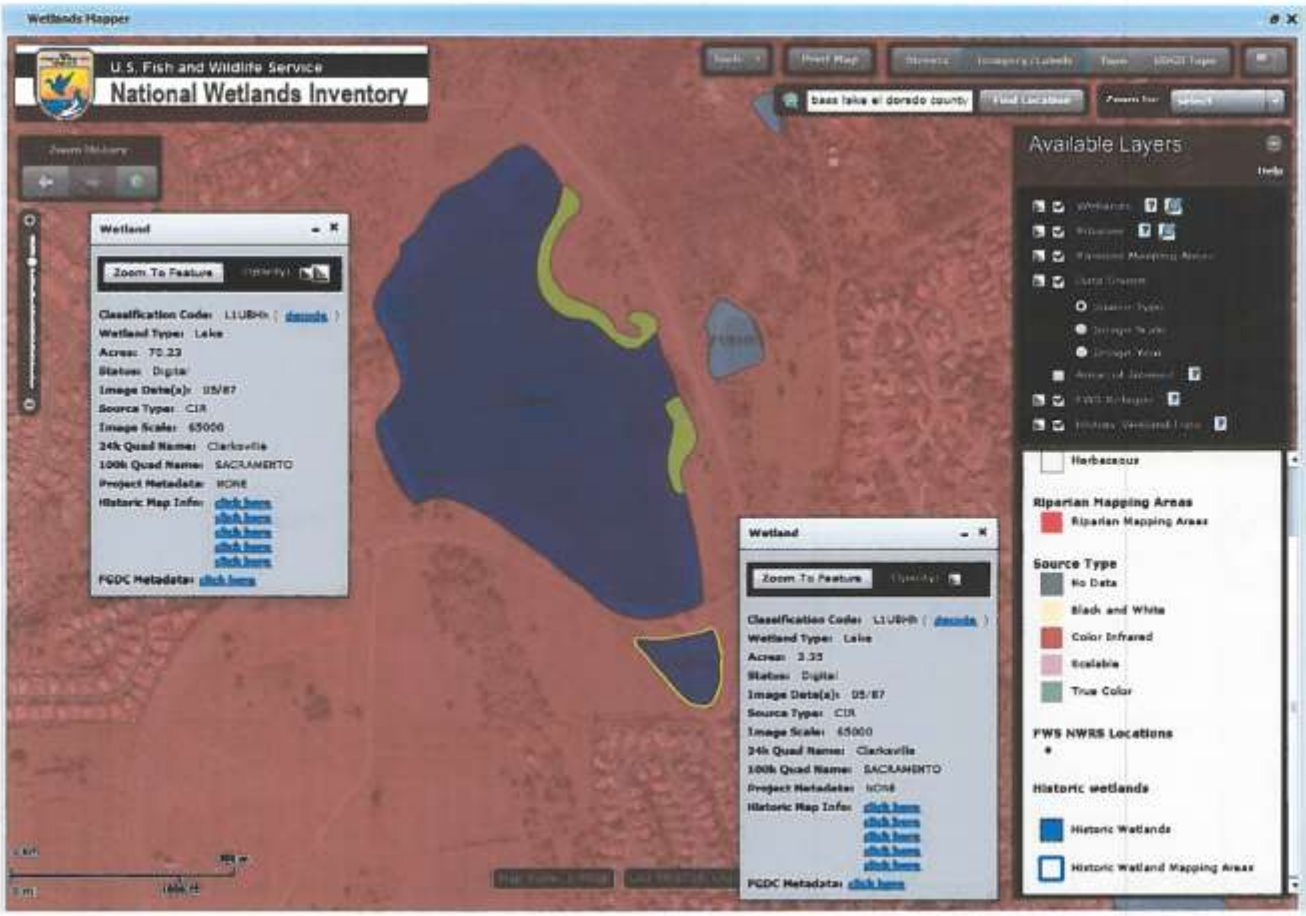
261017

PROJECT DESCRIPTION
DRAFT EIR 1

7/20/2014 7:50 A

Attachment 13-1. U.S. Fish & Wildlife Service, National Wetlands Inventory, Bass Lake, El Dorado County. July 19, 2014.

ATTACHMENT 13-1



261017

Attachment 13-2. U.S. Fish & Wildlife Service, National Wetlands Inventory, Bass Lake Descriptors. July 19, 2014.

ATTACHMENT 13-2

261017

137.227.242.85/Data/interpreters/wetlands.aspx

Latest Headlines Basil - Sonoma ... AP KathleenNewell... MicroFarm Work... Sign in to Yahoo Gm

National Wetlands Inventory

Branch of Resource and Mapping Support

Enter Classification code: (Example: **L1UB1Hx**)

For geographically specific information* (optional), please enter a State code: (Example: **TX** for Texas)

DECODE

Description for code **PEMFh** :

P System **PALUSTRINE**: The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, emergents, mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean derived salts is below 0.5 ppt. Wetlands lacking such vegetation are also included if they exhibit all of the following characteristics: 1. are less than 8 hectares (20 acres); 2. do not have an active wave-formed or bedrock shoreline feature; 3. have at low water a depth less than 2 meters (6.6 feet) in the deepest part of the basin; 4. have a salinity due to ocean-derived salts of less than 0.5 ppt.

Subsystem :

EM Class **EMERGENT**: Characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants.

Subclass :

Modifier(s):

F WATER REGIME **Semipermanently Flooded**: Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land's surface.

h SPECIAL MODIFIER **Diked/Impounded**: These wetlands have been created or modified by a man-made barrier or dam which obstructs the inflow or outflow of water. The descriptors 'diked' and 'impounded' have been combined into a single modifier since the observed effect on wetlands is similar. They have been combined here due to image interpretation limitations. For clarification of the extent of impoundment see discussion of Lacustrine System limits.

ca Plant Specie(s):

Scientific Name	Common Name	Indicator	Reference Info.

ca Soil(s):

Series	Subgroup	Soils Fields Ind.	Drainage Class	Flood Frequency	Flood Duration	Flood Latest	HWT Depth	HWT Latest	LRR	Soil-5 Code

Attachment 13-3. U.S. Fish & Wildlife Service, National Wetlands Inventory, Bass Lake Descriptors. July 19, 2014.

ATTACHMENT 13-3

261017

Enter Classification code: (Example: **L1UB1Hx**)

For geographically specific information* (optional), please enter a State code: (Example: **TX** for Texas)

DECODE

Description for code **L1UBHh** :

L System **LACUSTRINE**: The Lacustrine System includes wetlands and deepwater habitats with all of the following characteristics: 1. situated in a topographic depression or a dammed river channel; 2. lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30% areal coverage; 3. total area exceeds 8 hectares (20 acres).

1 Subsystem **LIMNETIC**: Extends outward from Littoral boundary and includes all deep-water habitats within the Lacustrine System.

UB Class **UNCONSOLIDATED BOTTOM**: Includes all wetlands and deepwater habitats with at least 25% cover of particles smaller than stones (less than 6-7 cm), and a vegetative cover less than 30%.

Subclass :

Modifier(s):

H WATER REGIME **Permanently Flooded**: Water covers the land surface throughout the year in all years.

h SPECIAL MODIFIER **Diked/Impounded:** These wetlands have been created or modified by a man-made barrier or dam which obstructs the inflow or outflow of water. The descriptors 'diked' and 'impounded' have been combined into a single modifier since the observed effect on wetlands is similar. They have been combined here due to image interpretation limitations. For clarification of the extent of impoundment see discussion of Lacustrine System limits.

ca Plant Specie(s):

Scientific Name	Common Name	Indicator	Reference Info.

ca Soil(s):

Series	Subgroup	Soils Fields Ind.	Drainage Class	Flood Frequency	Flood Duration	Flood Latest	HWT Depth	HWT Latest	LRR	Soil-5 Code

Attachment 14-1. California Department of Fish & Game, Review of Draft Environmental Impact Report (DEIR). June 12, 2003.

ATTACHMENT 14-1

261017

REVISED 6/16/03

STATE OF CALIFORNIA - THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME
SACRAMENTO VALLEY AND CENTRAL SIERRA REGION
1701 NIMBUS ROAD, SUITE A
RANCHO CORDOVA, CALIFORNIA 95670
Telephone (916) 358-2900

GRAY DAVIS, Governor

Flex your Power

June 12, 2003

Mr. Gary Hyden
El Dorado County
2000 Fairlane Court
Placerville, CA 95667

Dear Mr. Hyden:

The Department of Fish and Game (DFG) has reviewed the May 16, 2003 Notice of Preparation (NOP) of a draft Environmental Impact Report (DEIR) for the Bass Lake Regional Park (SCH 2003052077). Project plans for the 41-acre park site include development of a golf course, baseball diamond, soccer field, and other facilities. The project site is immediately adjacent to Bass Lake, near Bass Lake Road and south of Green Valley Road, in western El Dorado County.

Bass Lake and the surrounding shoreline, including lands within the proposed park site, are valuable habitat areas for resident and migratory bird. At least one bald eagle (*Haliaeetus leucocephalus*) has been a frequently observed winter visitor there in recent years, and has often been observed along the shoreline near or inside of the boundaries of the proposed park. Also, Bass Lake is a valuable feeding and resting area for wintering waterfowl, including ring-necked duck (*Athya collaris*), mallard (*Anas platyrhynchos*) northern shoveler (*Anas clypeata*) and other species. Other aquatic bird species present at Bass Lake include western grebe (*Aechmophorus occidentalis*) and great egret (*Ardea herodias*). Bird species found in grassland areas near Bass Lake include lark sparrow (*Chondestes grammacus*), western meadowlark (*Stenella neglecta*), and western kingbird (*Tyrannus verticalis*). All of the aforementioned bird species have been documented on or adjacent to Bass Lake by Mr. Frank Gray, Biologist of my staff.

Development of ball fields, a golf course, nature interpretation facilities, a community center, pathways, and other facilities, as well as the associated human use, can be expected to greatly reduce resident and migratory bird use of the area. Besides the direct permanent removal of habitat from project construction, many of the bird species are very sensitive to human disturbances which can be expected from operation of the park. For example, the development and use of a perimeter trail

Attachment 14-2. California Department of Fish & Game, Review of Draft Environmental Impact Report (DEIR). June 12, 2003.

14-2

261017

(NOP Item #16, Figure 2) has the potential to significantly affect foraging areas for birds, such as the bald eagle, great egret, and many species of waterfowl.

The DFG has documented many fish species in Bass Lake. Species include largemouth bass (*Micropterus salmoides*), redear sunfish (*Lepomis microlophus*), channel catfish (*Ictalurus punctatus*), and other species. There is potential for runoff from parking areas and construction sites that contain substances deleterious to aquatic life. The risk for this runoff entering Bass Lake and its effect on fish and other aquatic life should be analyzed in the DEIR. Also, bulrushes, cattails, and submerged portions trees are important habitat and escape cover for these and other fish species and should be retained.

In addition to addressing these issues, the DEIR should address the following:

1. Baseline Habitat Species Inventory/Habitat Mapping – A comprehensive inventory of all bird, mammals and other animals, and plant species known or likely to occur at the 41-acre project site and at Bass Lake should be provided. Full species lists should be included in the Appendices of the DEIR. Habitat types of the subject areas should also be identified and mapped in the DEIR. This should include the acreage and location of the existing pond and associated wetlands on the 41 acre property. All grasslands on the 41-acre site should also be mapped and described, as well as the specific location, area, species composition, and other information of existing large willow trees and other plants bordering that part of Bass Lake nearest to the 41-acre property.

Surveys should be conducted at the time of year when rare, threatened, or endangered species are both evident and identifiable. Field surveys should be scheduled to coincide with the appropriate breeding or other life history stage of animals and when they are likely to be evident. Also, surveys should coincide with peak flowering periods and/or during periods of phenological development that are necessary to identify a plant species of concern. Maps and other relevant information regarding rare or listed species may be obtained from the DFG Natural Diversity database for a nominal fee by calling (916) 324-3812.

2. Project Impacts - Analyze and discuss project impacts on the DEIR and all reasonably foreseeable direct, indirect and cumulative project-related impacts on the 41 acre project site and nearby areas, including Bass Lake. Project impacts to native plants should be included in the analysis. A list of all individual trees to be removed should be provided, or the acreage of trees and shrubs to be removed if such removal involves clumps of small trees. The project should be designed so that impacts to these resources are avoided. The DEIR should address the project's impact on species identified as rare, threatened, or endangered.

Attachment 14-3. California Department of Fish & Game, Review of Draft Environmental Impact Report (DEIR). June 12, 2003.

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Any activity should be addressed that may result in loss of habitat, decreased reproductive success, or other negative effects on population levels of rare, threatened, or endangered species. Mitigation should be provided which reduces project impacts to a level less than significant, if it is not possible to avoid impacts.

3. Fragmentation – The DEIR should evaluate the project's contribution to habitat fragmentation, population isolation, and decreased habitat connectivity for all plant and animal populations, including state and federal listed species and species of concern.

4. Mitigation/Monitoring - Identify and discuss feasible mitigation measures. This should include a mitigation plan for removal of trees associated with the project, including but not limited to oak trees, foothill pines, willows, and other species. Mitigation should be provided for unavoidable impacts based upon the concept of no-net-loss of habitat values or acreage. A monitoring program should be implemented for all mitigation activities, as consistent with CEQA Guidelines Section 15097. This program should be described in the DEIR.

A timetable for achieving the mitigation should be provided. Priority should be given to mitigation measures designed to avoid project- related impacts, followed by mitigation measures that will substantially lessen such impacts. Specifically, identify mitigation measures that minimize and fully mitigate all project impacts to state and federal listed species. Specific project level analysis should identify both on-site mitigation achieved through project design, take avoidance measures, and any potential off-site mitigation strategies.

5. Consistency - Evaluate the project's consistency with the applicable local and regional land use plans such as General Plans, Watershed Plans, Habitat Conservation Plans and U.S. Fish and Wildlife Service Biological Opinions.

6. Project Alternatives - discuss and include alternatives in development design for the project that will avoid or substantially lessen project-related impacts on biological resources. Alternative designs should include avoidance of all significant habitats and listed species and species of concern and include design concepts that address habitat connectivity, fragmentation and population isolation.

It is likely that a Fish and Game Code 1601 or 1603 agreement will be required for various elements of park construction. This is particularly true with respect to modifications of the shoreline of the existing large pond on the project site. In general, an agreement is applicable whenever a proposed project involves work undertaken in or near a river, stream, or lake that flows at least intermittently through a bed or channel,

Attachment 14-4. California Department of Fish & Game, Review of Draft Environmental Impact Report (DEIR). June 12, 2003.

14-4

261017

including ephemeral streams and water courses. Impacts triggering regulation by the DFG under these provisions of the Fish and Game Code typically result from activities that:

- Divert, obstruct, or change the natural flow or the bed, channel or bank of a river, stream, or lake;
- Use material from a streambed; or
- Result in the disposal or deposition of debris, waste, or other material where it may pass into a river, stream, or lake.

In the event implementation of the proposed project involves such activities, and those activities will result in reasonably foreseeable substantial adverse effects on fish or wildlife, a Lake or Streambed Alteration Agreement (LSAA) will be required by the DFG. The DEIR should analyze whether the potentially feasible mitigation measures set forth below will avoid or substantially reduce impacts requiring a LSAA from the DFG.

1. Protection and maintenance of the riparian, wetland, stream or lake systems to ensure a "no-net-loss" of habitat value and acreage. Plant removal should not exceed the minimum necessary to complete operations.

2. Provisions for the protection of fish and wildlife resources at risk that consider various life stages, maintain migration and dispersal corridors, and protect essential breeding (i.e. spawning, nesting) habitats.

3. Delineation of buffers along streams and wetlands to provide adequate protection of the aquatic resource. No grading or construction activities should be allowed within these buffers.

4. Placements of construction materials, spoil, or fill, so that they cannot be washed into Bass Lake or other waters of the State.

5. Prevention of downstream sedimentation and pollution. Provisions may include but not be limited to oil/grit separators, detention ponds, buffering filter strips, silt barriers, etc., to prevent downstream sedimentation and pollution.

Restoration plans must include performance standards such as the types of vegetation to be used, the timing of implementations, and contingency plans if the replanting is not successful. Restoration plans of disturbed areas should use native plants.

Attachment 14-5. California Department of Fish & Game, Review of Draft Environmental Impact Report (DEIR). June 12, 2003.

14-5

261017

Finally, in the event implementation of the proposed project will involve activities and impacts requiring a LSAA, please contact the Sacramento Valley-Central Sierra Region for a notification packet and fee schedule.

This project will have an impact to fish and/or wildlife habitat. Assessment of fees under Public Resources Code Section 21089 and as defined by Fish and Game Code Section 711.4 is needed. Fees are payable by the project applicant upon filing of the Notice of Determination by the lead agency

Pursuant to Public Resources Code Sections 21092 and 21092.2, the DFG requests written notification of proposed actions and pending decisions regarding this project. Written notifications should be directed to this office.

Thank you for the opportunity to review this project. If the DFG can be of further assistance, please contact Mr. Frank Gray at (916) 358-2883 or Ms. Terry Roscoe, Habitat Conservation Planning Supervisor, at (916) 358-2382.

Sincerely,

For

Larry L. Eng, Ph.D.
Deputy Regional Manager

FG:js

cc: Mr. Phil Dunn
C/o EDAW
2022 J Street
Sacramento, CA 95814

Mr. Peter Epanchin
U.S. Fish and Wildlife Service
Forest Foothill Branch
2800 Cottage Way, Room W-2605
Sacramento, CA 95825

Alice Q. Howard
Conservation Chair, Maidu Chapter
Sierra Club
1487 Crooked Mile Ct.
Placerville, CA 95667

Attachment 14-6. California Department of Fish & Game, Review of Draft Environmental Impact Report (DEIR). June 12, 2003.

14-6

261017

cc: Ms. Mary Bisharat
Conservation Chair
Sacramento Audubon Society
2110 Boyer Drive
Carmichael, CA 95608

Mr. Dave Witter
Director of Water Policy Coordination
El Dorado Irrigation District
2890 Mosquito Road
Placerville, CA 95667

Ms. Terry Roscoe
Mr. Jason Holley
Mr. Stafford Lehr
Department of Fish and Game
Sacramento Valley - Central Sierra Region
1701 Nimbus Road, Suite A
Rancho Cordova, CA 95670

Attachment 14-7. California Department of Fish & Game, Draft Approved Environmental Impact Report (DEIR). June 10, 2003.

14-7

261017

Gray/pg

Draft Approved by

T. Roscoe 6/10/03

S. Wick 6/10/03 out

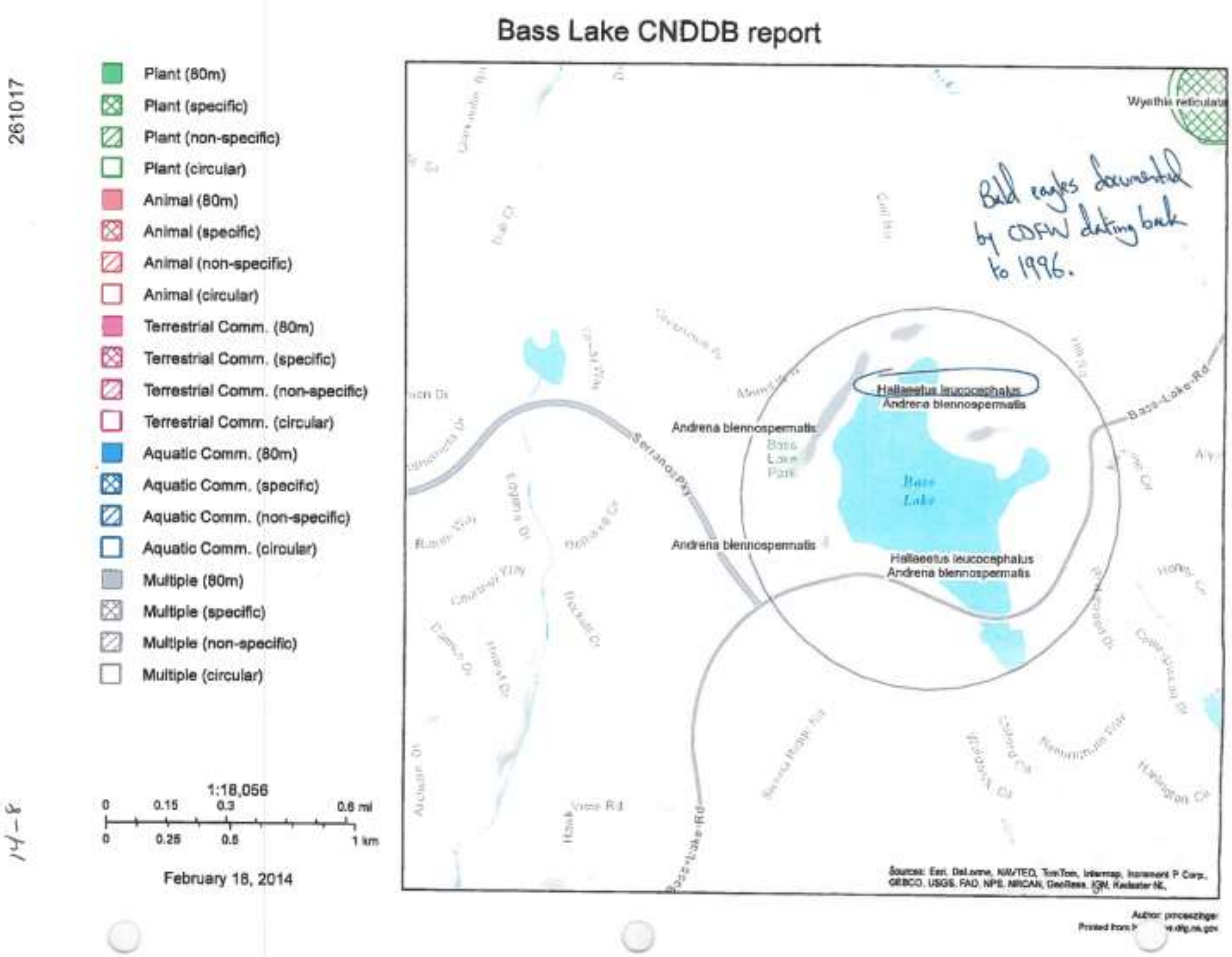
File: ES Chron, RF
a: gray 2003/Hyden/BassLake RegParkNOP0503/pg

Surname	6-10-03	6/12/03			

Attachment 14-8a. Bald Eagle *(Haliaeetus leucocephalus) F*

Haliaeetus leucocephalus

Attachment 14-8b. Bald Eagle *(Haliaeetus leucocephalus)* documented by CDFW dating back to 1996



Attachment 15. Draft EIR, Bass Lake Road Realignment. Letter about bald eagle habitat and preservation from Dr. D. Bruce Swinehart, Biologist. February, 1992. (Now called Silver Springs Parkway)

ATTACHMENT 15

DRAFT EIR - BASS LAKE ROAD
REALIGNMENT
FEBRUARY 1992
(NOW CALLED SILVER SPRINGS PARKWA

2610017

American River College
4700 College Oak Dr.
Sacramento, CA. 95841

12. 27 1991

El Dorado County of Transportation
2441 Headington Rd.
Placerville, CA. 95667
Attn: Mr. Kris Payne

Dear Sir,

It has come to my attention that a development is planned near Bass Lake in your county. I also understand that it was not clear whether there are wintering Bald Eagles at that Lake.

I have been a professor at American River College for forty-three years and teach natural history, conservation and ornithology. I am also a past president of the Sacramento Audubon Society.

I have been aware of the wintering eagles at Bass lake for the last 40 years. I even use a picture of a bald eagle taken there in some of my lectures. I take my ornithology field classes to Bass Lake at least twice each year to see the eagles, waterfowl and other birds.

Any development in the area must recognize the presence of these birds or the Endangered Species Act will be violated. I hope your county will realize the tremendous resource a place like Bass Lake is. I implore the planning and administration units of El Dorado County to make wise and far-reaching decisions that will ensure the atmosphere of your county that people enjoy and appreciate will be preserved.

If I can help with any further information about the area in question, please let me know. If further evidence of the eagles' presence is needed, I can put you in contact with many individuals and organizations familiar with the lake.

Very truly yours,

DBSwinehart Jr

D. Bruce Swinehart, Jr.
Biology Professor

cc. Eldorado County Planning Comission
Sacramento Audubon Society

home # 487-2525

Attachment 16-1. Draft EIR, Bass Lake Road Realignment. Letter regarding bald eagle habitat and preservation, Rescue citizens. February, 1992. (Now called Silver Springs Parkway)

ATTACHMENT 16-1

DRAFT EIR BASS LAKE ROAD
REALIGNMENT
FEBRUARY 1992
NOW CALLED SILVER SPRINGS PARKWAY

December 30, 1991

Mr. Kim Payne
El Dorado County D.O.T.
2441 Headington Road
Placerville, CA 95667

RECEIVED
DEC 30 1991
EL DORADO CO.
DEPT. OF TRANSPORTATION

Dear Mr. Payne:

Re: Bass Lake Road Realignment N.O.P.

I have reviewed the Notice of Preparation for the Bass Lake Road realignment and would like to offer some comments that should be addressed in the EIR.

1 Air Quality – there should be a discussion of the potential for creating serpentine dust which can be carcinogenic and any additional mitigation, including avoidance of serpentine outcrops to eliminate the potential for serpentine dust.

2. Noise – timing of construction should occur to avoid any negative effects on the bald eagles that winter at Bass Lake.

3 Biological Resources – the EIR should thoroughly discuss the potential direct and indirect and cummulative impact to bald eagles that winter at Bass Lake each year. My family and I have enjoyed watching the bald eagles at Bass Lake for the past four winters since moving to Rescue. We have corresponded with Dr Bruce Swinehart at American River College in Sacramento and have found that Dr. Swinehart has personally observed the six bald eagles at Bass Lake

Attachment 16-2. Draft EIR, Bass Lake Road Realignment. Letter regarding bald eagle habitat and preservation, Rescue citizens. February, 1992. (Now called Silver Springs Parkway)

ATTACHMENT 16-2

261017

Mr. Kris Payne
December 31, 1991
Page 2

with the sloughs for the past 46 years. Because the bald eagle is a state listed endangered species, any potential loss of habitat is a significant impact that should be thoroughly addressed in the EIR.

Direct impacts such as noise and construction activity during the winter should be avoided. Indirect impacts of increased traffic on the realigned road should be evaluated. Cummulative impacts of increase development in the vicinity of Bass Lake ~~[illegible]~~ in response to the realigned road should also be addressed.

A study to evaluate the significance of the potential loss of Bass Lake for bald eagle wintering habitat should be undertaken by El Dorado County D.O.T in addition to the other project proponents proposing projects in the Bass Lake area. The California Department of Fish and Game and the U.S Fish and Wildlife Service should be consulted to determine the appropriate design of such a study.

Please call me at work 653-6325 or home 677-1491 if you would like to discuss these comments further.

Sincerely,
[signature]

Roger E Johnson
2703 Melodye Lane
Rescue, CA 95672

Attachment 17. A flock of American White Pelicans on Bass Lake, 7/23/2014

ATTACHMENT 17

The American White Pelican has soared in flocks of up to fifty birds high over Bass Lake and El Dorado Hills in slow graceful aerial dances. One of the largest North American birds, the American White Pelican is majestic in the air. The birds soar with incredible steadiness on broad, white-and-black wings. The black tips of the wings are observable only in flight.

Attachment 18-1. Environmental Impacts on Eagles/Pelicans at EID Bass Lake, Bass Lake Wetlands and Historic Wetlands, 7/23/2014

ATTACHMENT 18-1

261017

Environmental Impacts
Eagles/Pelicans at EID Bass Lake
Bass Lake Wetlands and Historic Wetlands

From SMUD:
The CNDDB (California Natural Diversity Data Base) reports that eagles have wintered at Bass Lake in western El Dorado County (T. 10 N., R. 9 E., S. 31, NE Qtr.; elevation 1,250 ft.) for over 40 years. Bass Lake is about 1.5 miles south of the UARP transmission line.
Residential development has been identified as a major concern to wintering eagles at Bass Lake. Here's the document:

http://hydrorelicensing.smud.org/docs/spr/6.1%20%20Bald%20Eagle%20and%20Osprey%20Study%20-%20PG020606.pdf

From Bass Lake Regional Park:
This above information was also reported by the California Dept. of Fish and Game when they commented on the EIR for the proposed Bass Lake Regional Park in 2002 - 2003. Since this was 10 years ago, the eagles would be in residence approximately 50 years at this time.

Bass Lake – From the Audubon Society:
Bass Lake is used to store water for the El Dorado Irrigation District. It is located on Bass Lake Rd. between Highway 50 and Green Valley Rd. Access to the lake is restricted but birds can be seen from roadside turnouts with binoculars or a spotting scope. Winter finds many waterfowl species here including Mallard, American Widgeon, Ring-necked Duck, Bufflehead, Canada Goose, and Greater White-fronted Goose. Other species seen here are Turkey Vulture, Wild Turkey, Great Blue Heron, Great Egret, Double-crested Cormorant, Killdeer, and Lark Sparrow.

In 2012 the Audubon Society reported that in 2011, eagles were spotted at Bass Lake when they did their December count.

Residents Observations:
Other birds noted at Bass Lake by local residents are several different kinds of hawks, American White Pelicans (for 10 years/see more information about them below) and a pair of swans who remained over the summer of 2013.

Recently a Golden Eagle was spotted around the EID Bass Lake property sitting on a pole and a Bald Eagle was seen by a nearby Serrano resident.

Attachment 18-2. Environmental Impacts on Eagles/Pelicans at EID Bass Lake, Bass Lake Wetlands and Historic Wetlands, 7/23/2014

ATTACHMENT-18-2

261017

American White Pelicans

This species is protected by the Migratory Bird Treaty Act of 1918. It has the California Department of Fish and Game protective status California species of special concern (CSC). On a global scale however, the species is common enough to qualify as a Species of Least Concern according to the IUCN.[1]

Habitat loss is the largest known cause of nesting failure, with flooding and drought being recurrent problems. Human-related losses include entanglement in fishing gear, boating disturbance and poaching as well as additional habitat degradation.[9]

There was a pronounced decline in American White Pelican numbers in the mid-20th century, attributable to the excessive spraying of DDT, endrin and other organochlorides in agriculture as well as widespread draining and pollution of wetlands. But populations have recovered well after stricter environmental protection laws came into effect, and are stable or slightly increasing today. By the 1980s, more than 100,000 adult American White Pelicans were estimated to exist in the wild, with 33,000 nests altogether in the 50 colonies in Canada, and 18,500 nests in the 14–17 United States colonies. Shoreline erosion at breeding colonies remains a problem in some cases, as are the occasional mass poisonings when pesticides are used near breeding or wintering sites.

Bass Lake Wetlands/Historic Wetlands

The USGS National Wetlands Inventory map for the US Department of Fish and Wildlife Service has classified Bass Lake as a wetland and there are two historic wetlands on the east side of the lake. The link to this information is below.

http://mail.aol.com/38203-112/aol-6/en-us/mail/get-attachment.aspx?uid=29739912&folder=NewMail&partId=3&saveAs=basslake.png

Attachment 18-3. Swans at Bass Lake

18-3

261017

Swans at Bass Lake

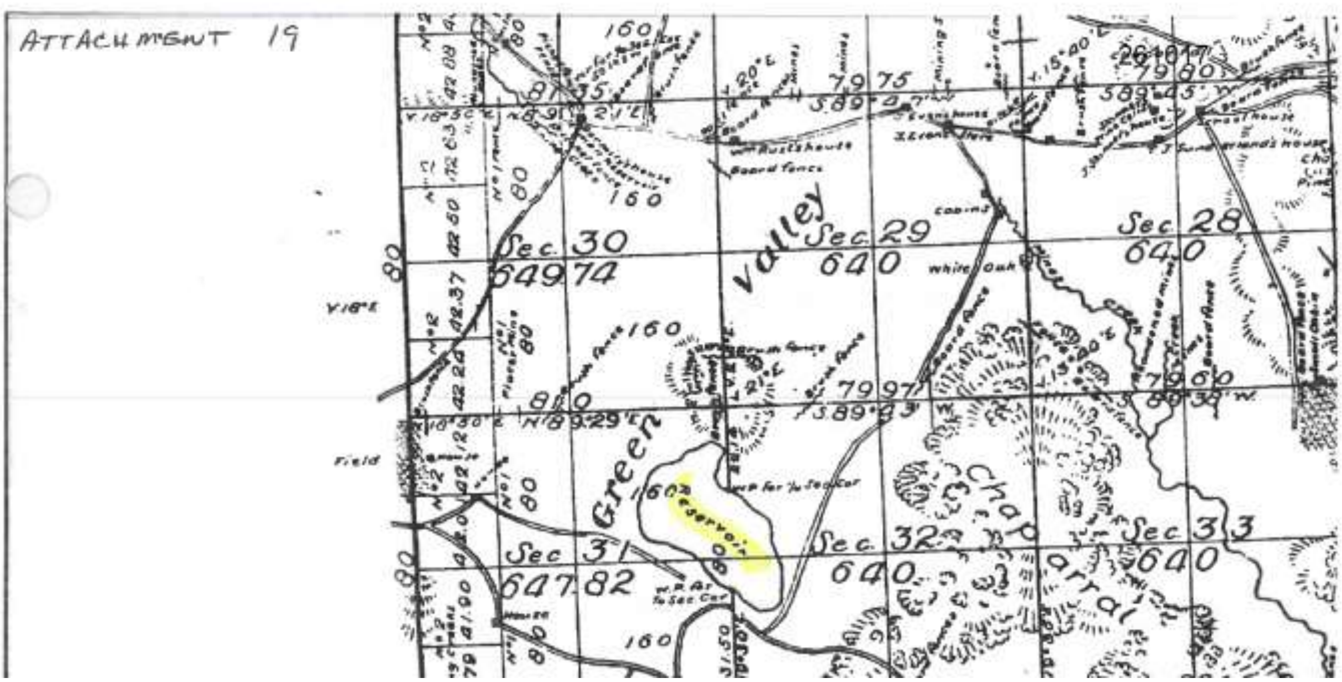
Attachment 18-4. Bald Eagle at corner of Basil Court and Summer Drive, Woodridge Area of El Dorado Hills, adjacent to Bass Lake. Summer of 2012. Taken by Joe D'Amico. (Eagle had been eating a fish.)

get-attachment.asp... EG Image, 3648 × 2736 pixels) - Scaled (32%) ...://mail.aol.com/38664-816/aol-6/en-us/mail/get-attachment.aspx?uid=31...

ATTACH... MENT 18-4

BASIC AND SUMMER DRIVE
BALD EAGLE
DECEMBER 2012
TAKEN BY JOE D'AMICO
(HAD BEEN EATING A FISH)

Attachment 19. Original Sections in Green Valley surrounding Bass Lake (named on map as Reservoir)



Attachment 20-1. Shawna Purvines Email to Ellen VanDyke Identifying the Bass Lake parcel as zoned as RF (Recreational Facilities) and intended to be rezoned as RFH (High intensive use), September 24, 2013

SHAWNA PURVINES
SEPTEMBER 24, 2013
EMAIL TO ELLEN VANDYKE

ATTACHMENT 20-1
261017

Subject: Re: Bass Lake parcel 115-400-12

The Assessor Parcel Number (APN) 115-400-12 you have listed below is currently General Planned for Recreation within the El Dorado Hills Specific Plan (AP) and zoned Recreational Facilities (RF). Countywide, all currently zoned Recreational Facility (RF) parcels are being proposed for a rezone to either Recreational Facilities High (RFH) or Recreational Facilities low (RFL) consistent with General Plan objectives and based on current site location, uses or future planned site uses.

The El Dorado County Parks and Trails Master Plan was approved by the Board of Supervisors on March 27, 2012. This plan integrated a previous master plan developed for the Bass Lake Regional Park including APN 115-400-12. The Bass Lake Hills Regional Park was identified to potentially include intensive uses and amenities such as a community center, group picnic areas, basketball courts, a baseball field, toddler play area, playground, soccer field, dog park, disc golf, outdoor classroom, nature interpretive area, and parking.

Therefore, this site is proposed to be rezoned to Recreational Facilities High (RFH) consistent with the Board adopted Parks and Trails Master Plan.

Parcels within other Specific Plans may be proposed for revisions depending on the individual Specific Plan policies and requirements.

Shawna

Attachment 20-2. Bass Lake parcel as zoned as RF (Recreational Facilities) and intended to be rezoned as RFH (High intensive use)

ATTACHMENT 20-2

Attachment 21. 2012 El Dorado County Parks Master Plan Final Approval: Exerpts regarding Bass Lake Regional Park. Plan is Ten Years Old and Should be Revisited. 2012

ATTACHMENT 21

261017

2012 El Dorado County Parks Master Plan Final Approved

Bass Lake Regional Park

RP4. Bass Lake Regional Park

The County undertook a comprehensive planning effort in 2001 to 2003 to develop plans for the Bass Lake Regional Park. The proposed improvements include multiple lighted sports fields, picnic areas, a dog park, play areas, a community center, habitat areas, interpretive features, an outdoor classroom, and trails. During the EIR Notice of Preparation public scoping meeting in 2003 the community expressed concerns about the potential for the park as designed to adversely impact the neighbors and existing natural resource. A phased approach to the project was proposed, but has not moved forward due to budget and staffing issues. The concept plan is now 10 years old, and needs to be revisited taking into consideration new residential developments, local parks, and road projects in the area. On a regional basis, there continues to be a need for both soccer and baseball fields but the relative value of the other proposed improvements should be reexamined to reflect anticipated demographics and recreation preferences. More passive uses such as trails and nature areas may have greater value as the El Dorado Hills and Cameron Park communities are becoming more densely developed. These types of uses would also have fewer environmental impacts and cost less to develop and maintain. As a phased approach, the plan should scale back development of the active use facilities to focus on those for which there is the greatest demand. These are also more likely to be facilities that are revenue generating and may be suitable for a public/private development and operation agreement. (p117)

From pg 57:

Bass Lake Park comprises 40 acres of undeveloped county park land located between the communities of Cameron Park and El Dorado Hills. A master plan was developed for the land in 2001 to 2003 that include potential amenities such as a community center, group picnic areas, basketball courts, a baseball field, toddler play area, playground, soccer field, dog park, disc golf, outdoor classroom, nature interpretive area, and parking. However, the environmental review process for this project was not completed and the project has been on hold since 2003. The master plan will need to be revisited before improvements for this site are implemented to reflect changes in community needs and recreation trends.

Frm pg 117:

More passive uses such as trails and nature areas may have greater value as the El Dorado Hills and Cameron Park communities are becoming more densely developed. These types of uses would also have fewer environmental impacts and cost less to develop and maintain. As a phased approach, the plan should scale back development of the active use facilities to focus on those for which there is the greatest demand. These are also more likely to be facilities that are revenue generating and may be suitable for a public/private development and operation agreement.

Final Attachment 22. Water fowl swooping low over Bass Lake. 2013.