

## **Appendix E. Biological Resources**

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- E1. U.S. Fish and Wildlife Service Species Letter**
- E2. California Natural Diversity Database and California Native Plant Society Inventory Search Results**
- E3. 2016 Biological Field Reconnaissance Survey Reports**
- E4. 2013-2014 Giant Garter Snake Water Habitat Surveys**



## **E1. U.S. Fish and Wildlife Service Species Letter**







# United States Department of the Interior



## FISH AND WILDLIFE SERVICE

Sacramento Fish and Wildlife Office

FEDERAL BUILDING, 2800 COTTAGE WAY, ROOM W-2605

SACRAMENTO, CA 95825

PHONE: (916)414-6600 FAX: (916)414-6713

Consultation Code: 08ESMF00-2017-SLI-0770

January 09, 2017

Event Code: 08ESMF00-2017-E-01661

Project Name: Lower Elkhorn Basin Levee Setback- 3 mile buffer

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

### To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, under the jurisdiction of the U.S. Fish and Wildlife Service (Service) that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Please follow the link below to see if your proposed project has the potential to affect other species or their habitats under the jurisdiction of the National Marine Fisheries Service:

[http://www.nwr.noaa.gov/protected\\_species/species\\_list/species\\_lists.html](http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html)

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2)

of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2) (c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan ([http://www.fws.gov/windenergy/eagle\\_guidance.html](http://www.fws.gov/windenergy/eagle_guidance.html)). Additionally, wind energy projects should follow the wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>; <http://www.towerkill.com>; and <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment



United States Department of Interior  
Fish and Wildlife Service

Project name: Lower Elkhorn Basin Levee Setback- 3 mile buffer

## Official Species List

### Provided by:

Sacramento Fish and Wildlife Office  
FEDERAL BUILDING  
2800 COTTAGE WAY, ROOM W-2605  
SACRAMENTO, CA 95825  
(916) 414-6600

### Expect additional Species list documents from the following office(s):

San Francisco Bay-Delta Fish and Wildlife  
650 CAPITOL MALL  
SUITE 8-300  
SACRAMENTO, CA 95814  
(916) 930-5603  
[http://kim\\_squires@fws.gov](mailto:kim_squires@fws.gov)

**Consultation Code:** 08ESMF00-2017-SLI-0770

**Event Code:** 08ESMF00-2017-E-01661

**Project Type:** STREAM / WATERBODY / CANALS / LEVEES / DIKES

**Project Name:** Lower Elkhorn Basin Levee Setback- 3 mile buffer

**Project Description:** Flood management and species habitat enhancement

**Please Note:** The FWS office may have modified the Project Name and/or Project Description, so it may be different from what was submitted in your previous request. If the Consultation Code matches, the FWS considers this to be the same project. Contact the office in the 'Provided by' section of your previous Official Species list if you have any questions or concerns.

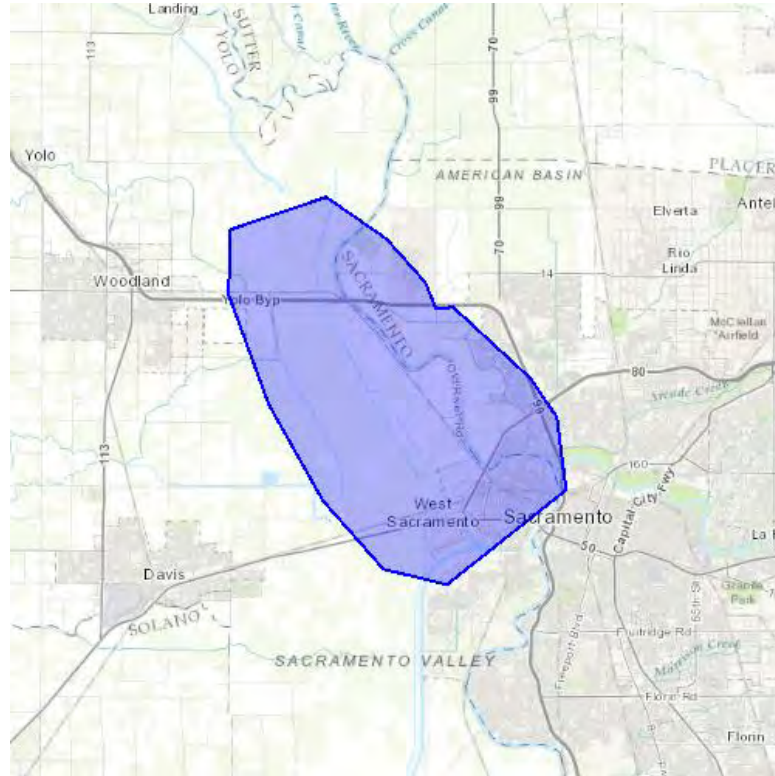
<http://ecos.fws.gov/ipac>, 01/09/2017 12:44 PM



United States Department of Interior  
Fish and Wildlife Service

Project name: Lower Elkhorn Basin Levee Setback- 3 mile buffer

**Project Location Map:**



**Project Coordinates:** MULTIPOLYGON (((-121.6399383544922 38.71980474264239, -121.6945266723633 38.7050706325604, -121.69555664062501 38.675861332951186, -121.6725540161133 38.626526838378076, -121.64096832275392 38.58386804217583, -121.60629272460938 38.552729904424844, -121.56990051269533 38.5462858464921, -121.5022659301758 38.58816189871531, -121.50741577148439 38.62116234642254, -121.52183532714845 38.638327308061875, -121.56681060791017 38.67023248314003, -121.57608032226564 38.66969637912233, -121.58294677734376 38.681757748501546, -121.60457611083986 38.70078377577087, -121.6399383544922 38.71980474264239)))

**Project Counties:** Sacramento, CA | Yolo, CA

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United States Department of Interior  
Fish and Wildlife Service

Project name: Lower Elkhorn Basin Levee Setback- 3 mile buffer

## Endangered Species Act Species List

There are a total of 13 threatened or endangered species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

Amphibians	Status	Has Critical Habitat	Condition(s)
California red-legged frog ( <i>Rana draytonii</i> ) Population: Wherever found	Threatened	Final designated	
California tiger Salamander ( <i>Ambystoma californiense</i> ) Population: U.S.A. (Central CA DPS)	Threatened	Final designated	
<b>Birds</b>			
Least Bell's vireo ( <i>Vireo bellii pusillus</i> ) Population: Wherever found	Endangered	Final designated	
western snowy plover ( <i>Charadrius nivosus ssp. nivosus</i> ) Population: Pacific Coast population DPS- U.S.A. (CA, OR, WA), Mexico (within 50 miles of Pacific coast)	Threatened	Final designated	
Yellow-Billed Cuckoo ( <i>Coccyzus americanus</i> ) Population: Western U.S. DPS	Threatened	Proposed	
<b>Crustaceans</b>			

<http://ecos.fws.gov/ipac>, 01/09/2017 12:44 PM



United States Department of Interior  
Fish and Wildlife Service

Project name: Lower Elkhorn Basin Levee Setback- 3 mile buffer

Conservancy fairy shrimp ( <i>Branchinecta conservatio</i> ) Population: Wherever found	Endangered	Final designated	
Vernal Pool fairy shrimp ( <i>Branchinecta lynchi</i> ) Population: Wherever found	Threatened	Final designated	
Vernal Pool tadpole shrimp ( <i>Lepidurus packardi</i> ) Population: Wherever found	Endangered	Final designated	
<b>Fishes</b>			
Delta smelt ( <i>Hypomesus transpacificus</i> ) Population: Wherever found	Threatened	Final designated	
steelhead ( <i>Oncorhynchus (=salmo) mykiss</i> ) Population: Northern California DPS	Threatened	Final designated	
<b>Flowering Plants</b>			
Palmate-Bracted bird's beak ( <i>Cordylanthus palmatus</i> ) Population: Wherever found	Endangered		
<b>Insects</b>			
Valley Elderberry Longhorn beetle ( <i>Desmocerus californicus dimorphus</i> ) Population: Wherever found	Threatened	Final designated	
<b>Reptiles</b>			
Giant Garter snake ( <i>Thamnophis gigas</i> ) Population: Wherever found	Threatened		

<http://ecos.fws.gov/ipac>, 01/09/2017 12:44 PM



United States Department of Interior  
Fish and Wildlife Service

Project name: Lower Elkhorn Basin Levee Setback- 3 mile buffer

## Critical habitats that lie within your project area

The following critical habitats lie fully or partially within your project area.

Fishes	Critical Habitat Type
Delta smelt ( <i>Hypomesus transpacificus</i> ) Population: Wherever found	Final designated
steelhead ( <i>Oncorhynchus (=salmo) mykiss</i> ) Population: Northern California DPS	Final designated

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# IPaC Trust Resources Report

Generated November 23, 2016 12:18 PM MST, IPaC v3.0.10

This report is for informational purposes only and should not be used for planning or analyzing project level impacts. For project reviews that require U.S. Fish & Wildlife Service review or concurrence, please return to the IPaC website and request an official species list from the Regulatory Documents page.



IPaC - Information for Planning and Conservation (<https://ecos.fws.gov/ipac/>): A project planning tool to help streamline the U.S. Fish & Wildlife Service environmental review process.



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# IPaC Trust Resources Report

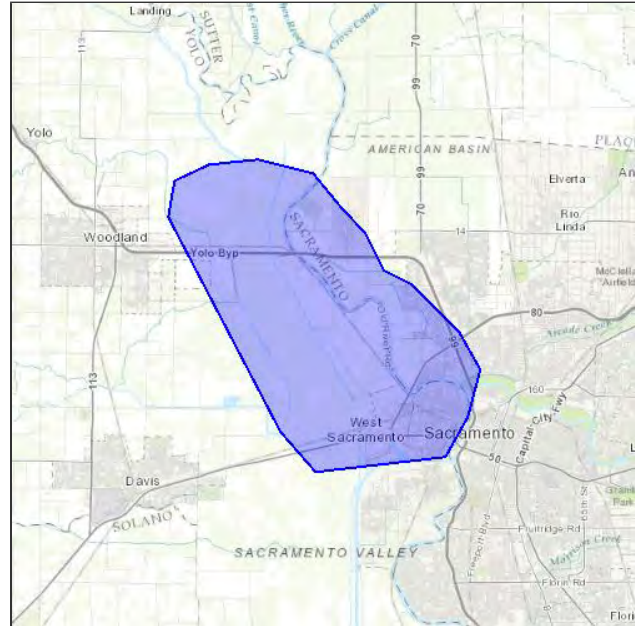


LOCATION

Sacramento and Yolo counties,  
California

IPAC LINK

<https://ecos.fws.gov/ipac/project/3UL2R-KAFF5-BNBH3-32IHJ-NWXV5E>



## U.S. Fish & Wildlife Service Contact Information

Trust resources in this location are managed by:

**San Francisco Bay-delta Fish And Wildlife**

650 Capitol Mall  
Suite 8-300  
Sacramento, CA 95814  
(916) 930-5603

**Sacramento Fish And Wildlife Office**

Federal Building  
2800 Cottage Way, Room W-2605  
Sacramento, CA 95825-1846  
(916) 414-6600

## Endangered Species

Proposed, candidate, threatened, and endangered species are managed by the [Endangered Species Program](#) of the U.S. Fish & Wildlife Service.

**This USFWS trust resource report is for informational purposes only and should not be used for planning or analyzing project level impacts.**

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list from the Regulatory Documents section.

[Section 7](#) of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency.

**A letter from the local office and a species list which fulfills this requirement can only be obtained by requesting an official species list either from the Regulatory Documents section in IPaC or from the local field office directly.**

The list of species below are those that may occur or could potentially be affected by activities in this location:

### Amphibians

**California Red-legged Frog** *Rana draytonii* Threatened

MANAGED BY

Sacramento Fish And Wildlife Office  
San Francisco Bay-delta Fish And Wildlife

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?sPCODE=D02D](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=D02D)

**California Tiger Salamander** *Ambystoma californiense* Threatened

MANAGED BY

Sacramento Fish And Wildlife Office  
San Francisco Bay-delta Fish And Wildlife

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?sPCODE=D01T](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=D01T)

## Birds

**Least Bell's Vireo** *Vireo bellii pusillus* Endangered

MANAGED BY

Sacramento Fish And Wildlife Office  
San Francisco Bay-delta Fish And Wildlife

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?scode=B067](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?scode=B067)

**Western Snowy Plover** *Charadrius alexandrinus nivosus* Threatened

MANAGED BY

Sacramento Fish And Wildlife Office  
San Francisco Bay-delta Fish And Wildlife

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?scode=B07C](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?scode=B07C)

**Yellow-billed Cuckoo** *Coccyzus americanus* Threatened

MANAGED BY

Sacramento Fish And Wildlife Office  
San Francisco Bay-delta Fish And Wildlife

CRITICAL HABITAT

There is **proposed** critical habitat designated for this species.

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?scode=B06R](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?scode=B06R)

## Crustaceans

### **Conservancy Fairy Shrimp** *Branchinecta conservatio* Endangered

MANAGED BY

Sacramento Fish And Wildlife Office  
San Francisco Bay-delta Fish And Wildlife

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?spcode=K03D](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=K03D)

### **Vernal Pool Fairy Shrimp** *Branchinecta lynchi* Threatened

MANAGED BY

Sacramento Fish And Wildlife Office  
San Francisco Bay-delta Fish And Wildlife

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?spcode=K03G](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=K03G)

### **Vernal Pool Tadpole Shrimp** *Lepidurus packardii* Endangered

MANAGED BY

Sacramento Fish And Wildlife Office  
San Francisco Bay-delta Fish And Wildlife

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?spcode=K048](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=K048)

## Fishes

### **Delta Smelt** *Hypomesus transpacificus* Threatened

MANAGED BY

Sacramento Fish And Wildlife Office  
San Francisco Bay-delta Fish And Wildlife

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?spcode=E070](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=E070)

### **Steelhead** *Oncorhynchus (=Salmo) mykiss* Threatened

MANAGED BY

Sacramento Fish And Wildlife Office  
San Francisco Bay-delta Fish And Wildlife

CRITICAL HABITAT

**No critical habitat** has been designated for this species.

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?spcode=E08D](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=E08D)

## Flowering Plants

**Palmate-bracted Bird's Beak** *Cordylanthus palmatus* Endangered

MANAGED BY

Sacramento Fish And Wildlife Office  
San Francisco Bay-delta Fish And Wildlife

CRITICAL HABITAT

**No critical habitat** has been designated for this species.

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?spcode=Q1UT](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=Q1UT)

## Insects

**Delta Green Ground Beetle** *Elaphrus viridis* Threatened

MANAGED BY

San Francisco Bay-delta Fish And Wildlife

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?spcode=I01G](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=I01G)

**Valley Elderberry Longhorn Beetle** *Desmocerus californicus dimorphus* Threatened

MANAGED BY

Sacramento Fish And Wildlife Office  
San Francisco Bay-delta Fish And Wildlife

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?spcode=I01L](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=I01L)

## Reptiles

**Giant Garter Snake** *Thamnophis gigas* Threatened

MANAGED BY

Sacramento Fish And Wildlife Office  
San Francisco Bay-delta Fish And Wildlife

CRITICAL HABITAT

**No critical habitat** has been designated for this species.

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?spcode=C057](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=C057)

## Critical Habitats

This location overlaps all or part of the critical habitat for the following species:

**Chinook Salmon** *Oncorhynchus (=Salmo) tshawytscha*

Final designated critical habitat

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?spcode=E06D#crithab](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=E06D#crithab)

**Delta Smelt** *Hypomesus transpacificus*

Final designated critical habitat

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?sPCODE=E070#crithab](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=E070#crithab)

**Steelhead** *Oncorhynchus (=Salmo) mykiss*

Final designated critical habitat

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?sPCODE=E08D#crithab](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=E08D#crithab)

## Migratory Birds

Birds are protected by the [Migratory Bird Treaty Act](#) and the [Bald and Golden Eagle Protection Act](#).

Any activity that results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish & Wildlife Service.<sup>[1]</sup> There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

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1. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

Additional information can be found using the following links:

- Birds of Conservation Concern  
<http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>
- Conservation measures for birds  
<http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Year-round bird occurrence data  
<http://www.birdscanada.org/birdmon/default/datasummaries.jsp>

The following species of migratory birds could potentially be affected by activities in this location:

**Bald Eagle** *Haliaeetus leucocephalus*

Bird of conservation concern

Season: Year-round

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?sPCODE=B008](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=B008)

**Burrowing Owl** *Athene cunicularia*

Bird of conservation concern

Season: Year-round

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?sPCODE=B0NC](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=B0NC)

**Fox Sparrow** *Passerella iliaca*

Bird of conservation concern

Season: Wintering

**Least Bittern** *Ixobrychus exilis*

Season: Breeding

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?sPCODE=B092](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=B092)



<b>Lesser Yellowlegs</b> <i>Tringa flavipes</i>	Bird of conservation concern
Season: Wintering <a href="http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0MD">http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0MD</a>	
<b>Lewis's Woodpecker</b> <i>Melanerpes lewis</i>	Bird of conservation concern
Season: Wintering <a href="http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HQ">http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HQ</a>	
<b>Loggerhead Shrike</b> <i>Lanius ludovicianus</i>	Bird of conservation concern
Season: Year-round <a href="http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FY">http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FY</a>	
<b>Long-billed Curlew</b> <i>Numenius americanus</i>	Bird of conservation concern
Season: Wintering <a href="http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B06S">http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B06S</a>	
<b>Marbled Godwit</b> <i>Limosa fedoa</i>	Bird of conservation concern
Season: Wintering <a href="http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0JL">http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0JL</a>	
<b>Mountain Plover</b> <i>Charadrius montanus</i>	Bird of conservation concern
Season: Wintering <a href="http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B078">http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B078</a>	
<b>Nuttall's Woodpecker</b> <i>Picoides nuttallii</i>	Bird of conservation concern
Season: Year-round <a href="http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HT">http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HT</a>	
<b>Oak Titmouse</b> <i>Baeolophus inornatus</i>	Bird of conservation concern
Season: Year-round <a href="http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0MJ">http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0MJ</a>	
<b>Peregrine Falcon</b> <i>Falco peregrinus</i>	Bird of conservation concern
Season: Wintering <a href="http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FU">http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FU</a>	
<b>Short-eared Owl</b> <i>Asio flammeus</i>	Bird of conservation concern
Season: Wintering <a href="http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HD">http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HD</a>	
<b>Swainson's Hawk</b> <i>Buteo swainsoni</i>	Bird of conservation concern
Season: Breeding <a href="http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B070">http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B070</a>	
<b>Tricolored Blackbird</b> <i>Agelaius tricolor</i>	Bird of conservation concern
Season: Year-round <a href="http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B06P">http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B06P</a>	
<b>Western Grebe</b> <i>aechmophorus occidentalis</i>	Bird of conservation concern
Season: Year-round <a href="http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0EA">http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0EA</a>	

**Williamson's Sapsucker** *Sphyrapicus thyroideus*

Season: Year-round

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?sPCODE=B0FX](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=B0FX)

Bird of conservation concern

**Yellow-billed Magpie** *Pica nuttalli*

Season: Year-round

[http://ecos.fws.gov/tess\\_public/profile/speciesProfile.action?sPCODE=B0N8](http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=B0N8)

Bird of conservation concern

# Wildlife refuges and fish hatcheries

**There are no refuges or fish hatcheries in this location**

# Wetlands in the National Wetlands Inventory

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

## DATA LIMITATIONS

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

## DATA EXCLUSIONS

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

## DATA PRECAUTIONS

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

This location overlaps all or part of the following wetlands:

## Freshwater Emergent Wetland

[PEM/ABHx](#)

[PEMA](#)

[PEMAh](#)

[PEMC](#)

[PEMCh](#)

[PEMCx](#)

[PEMF](#)  
[PEMFx](#)  
[PEMH](#)  
[PEMHx](#)  
[PEMJh](#)  
[PEMKFx](#)  
[PEMKx](#)  
[PEMR](#)  
[PEMS](#)  
[PEMT](#)

## Freshwater Forested/shrub Wetland

[PFOA](#)  
[PFOAx](#)  
[PFOC](#)  
[PFOCH](#)  
[PFOCx](#)  
[PSSA](#)  
[PSSC](#)  
[PSSCH](#)  
[PSSCx](#)  
[PSSR](#)

## Freshwater Pond

[PABFx](#)  
[PABH](#)  
[PABHx](#)  
[PUBF](#)  
[PUBH](#)  
[PUBHh](#)  
[PUBHx](#)  
[PUBK](#)  
[PUBKx](#)  
[PUBT](#)

## Lake

[L1UBHx](#)

[L2USAx](#)

Other

[PUSA](#)

[PUSAh](#)

[PUSC](#)

Riverine

[R1UBVx](#)

[R2UBFx](#)

[R2UBH](#)

[R2UBHx](#)

[R2UBKHx](#)

[R2USC](#)

[R4USFx](#)

A full description for each wetland code can be found at the National Wetlands Inventory website: <http://107.20.228.18/decoders/wetlands.aspx>

## **E2. California Natural Diversity Database and California Native Plant Society Inventory Search Results**





Query Summary:

Quad IS (Clarksburg (3812145) OR Davis (3812156) OR Florin (3812144) OR Grays Bend (3812166) OR Rio Linda (3812164) OR Sacramento East (3812154) OR Sacramento West (3812155) OR Saxon (3812146) OR Taylor Monument (3812165))

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CNDDDB Element Query Results

Scientific Name	Common Name	Taxonomic Group	Element Code	Total Occs	Returned Occs	Federal Status	State Status	Global Rank	State Rank	CA Rare Plant Rank	Other Status	Habitats
Accipiter cooperii	Cooper's hawk	Birds	ABNKC12040	107	3	None	None	G5	S4	null	CDFW_WL-Watch List, IUCN_LC-Least Concern	Cismontane woodland, Riparian forest, Riparian woodland, Upper montane coniferous forest
Agelaius tricolor	tricolored blackbird	Birds	ABPBXB0020	859	23	None	Candidate Threatened	G2G3	S1S2	null	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_EN-Endangered, NABCI_RWL-Red Watch List, USFWS_BCC-Birds of Conservation Concern	Freshwater marsh, Marsh & swamp, Swamp, Wetland
Ammodramus savannarum	grasshopper sparrow	Birds	ABPBXA0020	20	2	None	None	G5	S3	null	CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern	Valley & foothill grassland
Antrozous pallidus	pallid bat	Mammals	AMACC10010	406	1	None	None	G5	S3	null	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern, USFS_S-Sensitive, WBWG_H-High Priority	Chaparral, Coastal scrub, Desert wash, Great Basin grassland, Great Basin scrub, Mojavean desert scrub, Riparian woodland, Sonoran desert scrub, Upper montane coniferous forest, Valley & foothill grassland
Archoplites interruptus	Sacramento perch	Fish	AFCQB07010	5	1	None	None	G2G3	S1	null	AFS_TH-Threatened, CDFW_SSC-Species of Special Concern	Aquatic, Sacramento/San Joaquin flowing waters, Sacramento/San Joaquin standing waters
Ardea alba	great egret	Birds	ABNGA04040	37	6	None	None	G5	S4	null	CDF_S-Sensitive, IUCN_LC-Least Concern	Brackish marsh, Estuary, Freshwater marsh, Marsh & swamp, Riparian forest, Wetland
Ardea herodias	great blue heron	Birds	ABNGA04010	137	7	None	None	G5	S4	null	CDF_S-Sensitive, IUCN_LC-Least Concern	Brackish marsh, Estuary, Freshwater marsh, Marsh & swamp, Riparian forest, Wetland
Astragalus tener var. ferrisiae	Ferris' milk-vetch	Dicots	PDFAB0F8R3	18	4	None	None	G2T1	S1	1B.1	BLM_S-Sensitive	Meadow & seep, Valley & foothill grassland, Wetland
<p>Lower Elkhorn Basin Levee Setback Project ADEIS/ADEIR  USACE and DWR</p>												

GEI Consultants, Inc.

Astragalus tener var. tener	alkali milk-vetch	Dicots	PDFAB0F8R1	65	10	None	None	G2T2	S2	1B.2	null	grassland, Vernal pool, Wetland
Athene cunicularia	burrowing owl	Birds	ABNSB10010	1914	87	None	None	G4	S3	null	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern, USFWS_BCC-Birds of Conservation Concern	Coastal prairie, Coastal scrub, Great Basin grassland, Great Basin scrub, Mojavean desert scrub, Sonoran desert scrub, Valley & foothill grassland
Atriplex cordulata var. cordulata	heartscale	Dicots	PDCHE040B0	66	1	None	None	G3T2	S2	1B.2	BLM_S-Sensitive	Chenopod scrub, Meadow & seep, Valley & foothill grassland
Atriplex depressa	brittlescale	Dicots	PDCHE042L0	61	5	None	None	G2	S2	1B.2	null	Alkali playa, Chenopod scrub, Meadow & seep, Valley & foothill grassland, Vernal pool, Wetland
Bombus crotchii	Crotch bumble bee	Insects	IIHYM24480	233	1	None	None	G3G4	S1S2	null	null	null
Bombus occidentalis	western bumble bee	Insects	IIHYM24250	282	1	None	None	G2G3	S1	null	USFS_S-Sensitive, XERCES_IM-Imperiled	null
Branchinecta conservatio	Conservancy fairy shrimp	Crustaceans	ICBRA03010	43	1	Endangered	None	G2	S2	null	IUCN_EN-Endangered	Valley & foothill grassland, Vernal pool, Wetland
Branchinecta lynchi	vernal pool fairy shrimp	Crustaceans	ICBRA03030	751	39	Threatened	None	G3	S3	null	IUCN_VU-Vulnerable	Valley & foothill grassland, Vernal pool, Wetland
Branchinecta mesovallensis	midvalley fairy shrimp	Crustaceans	ICBRA03150	126	8	None	None	G2	S2S3	null	null	Vernal pool, Wetland
Buteo regalis	ferruginous hawk	Birds	ABNKC19120	107	2	None	None	G4	S3S4	null	CDFW_WL-Watch List, IUCN_LC-Least Concern, USFWS_BCC-Birds of Conservation Concern	Great Basin grassland, Great Basin scrub, Pinon & juniper woodlands, Valley & foothill grassland
Buteo swainsoni	Swainson's hawk	Birds	ABNKC19070	2409	308	None	Threatened	G5	S3	null	BLM_S-Sensitive, IUCN_LC-Least Concern, USFWS_BCC-Birds of Conservation Concern	Great Basin grassland, Riparian forest, Riparian woodland, Valley & foothill grassland
Carex comosa	bristly sedge	Monocots	PMCYP032Y0	29	1	None	None	G5	S2	2B.1	null	Coastal prairie, Freshwater marsh, Marsh & swamp, Valley & foothill grassland, Wetland
Charadrius alexandrinus nivosus	western snowy plover	Birds	ABNNB03031	124	2	Threatened	None	G3T3	S2S3	null	CDFW_SSC-Species of Special Concern, NABCI_RWL-Red Watch List, USFWS_BCC-Birds of Conservation Concern	Great Basin standing waters, Sand shore, Wetland
											BLM_S-Sensitive, CDFW_SSC-Species of Special Concern	

Charadrius montanus	mountain plover	Birds	ABNNB03100	88	4	None	None	G3	S2S3	null	IUCN_NT-Near Threatened, NABCI_RWL-Red Watch List, USFWS_BCC-Birds of Conservation Concern	Chenopod scrub, Valley & foothill grassland
Chloropyron palmatum	palmate-bracted salty bird's-beak	Dicots	PDSCR0J0J0	26	3	Endangered	Endangered	G1	S1	1B.1	SB_RSABG-Rancho Santa Ana Botanic Garden	Chenopod scrub, Meadow & seep, Valley & foothill grassland, Wetland
Cicindela hirticollis abrupta	Sacramento Valley tiger beetle	Insects	IICOL02106	6	2	None	None	G5TH	SH	null	null	Sand shore
Coccyzus americanus occidentalis	western yellow-billed cuckoo	Birds	ABNRB02022	155	2	Threatened	Endangered	G5T2T3	S1	null	BLM_S-Sensitive, NABCI_RWL-Red Watch List, USFS_S-Sensitive, USFWS_BCC-Birds of Conservation Concern	Riparian forest
Cuscuta obtusiflora var. glandulosa	Peruvian dodder	Dicots	PDCUS01111	6	1	None	None	G5T4T5	SH	2B.2	null	Marsh & swamp, Wetland
Desmocerus californicus dimorphus	valley elderberry longhorn beetle	Insects	IICOL48011	271	24	Threatened	None	G3T2	S2	null	null	Riparian scrub
Downingia pusilla	dwarf downingia	Dicots	PDCAM060C0	126	6	None	None	GU	S2	2B.2	null	Valley & foothill grassland, Vernal pool, Wetland
Egretta thula	snowy egret	Birds	ABNGA06030	16	1	None	None	G5	S4	null	IUCN_LC-Least Concern	Marsh & swamp, Meadow & seep, Riparian forest, Riparian woodland, Wetland
Elanus leucurus	white-tailed kite	Birds	ABNKC06010	162	17	None	None	G5	S3S4	null	BLM_S-Sensitive, CDFW_FP-Fully Protected, IUCN_LC-Least Concern	Cismontane woodland, Marsh & swamp, Riparian woodland, Valley & foothill grassland, Wetland
Elderberry Savanna	Elderberry Savanna	Riparian	CTT63440CA	4	3	None	None	G2	S2.1	null	null	Riparian scrub
Emys marmorata	western pond turtle	Reptiles	ARAAD02030	1187	7	None	None	G3G4	S3	null	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_VU-Vulnerable, USFS_S-Sensitive	Aquatic, Artificial flowing waters, Klamath/North coast flowing waters, Klamath/North coast standing waters, Marsh & swamp, Sacramento/San Joaquin flowing waters, Sacramento/San Joaquin standing waters, South coast flowing waters, South coast standing waters, Wetland
Eryngium jepsonii	Jepson's coyote-thistle	Dicots	PDAP10Z130	19	2	None	None	G2	S2	1B.2	null	Valley & foothill grassland, Vernal pool
Extriplex joaquinana	San Joaquin spearscale	Dicots	PDCHE041F3	109	8	None	None	G2	S2	1B.2	BLM_S-Sensitive, SB_RSABG-Rancho Santa Ana Botanic Garden	Alkali playa, Chenopod scrub, Meadow & seep, Valley & foothill grassland
Falco	Lower Elkhorn Basin	Levee Setback Project ADEIS/ADEIR									CDFW_WL-Watch List	Estuary, Great Basin grassland,

columbarius	merlin	Birds	ABNKD06030	35	6	None	None	G5	S3S4	null	IUCN_LC- Least Concern	Valley & foothill grassland
Fritillaria agrestis	stinkbells	Monocots	PMLIL0V010	32	2	None	None	G3	S3	4.2	null	Chaparral, Cismontane woodland, Ultramafic, Valley & foothill grassland
Gratiola heterosepala	Boggs Lake hedge-hyssop	Dicots	PDSCR0R060	94	1	None	Endangered	G2	S2	1B.2	BLM_S- Sensitive	Freshwater marsh, Marsh & swamp, Vernal pool, Wetland
Great Valley Cottonwood Riparian Forest	Great Valley Cottonwood Riparian Forest	Riparian	CTT61410CA	56	1	None	None	G2	S2.1	null	null	Riparian forest
Hibiscus lasiocarpus var. occidentalis	woolly rose- mallow	Dicots	PDMAL0H0R3	173	10	None	None	G5T2	S2	1B.2	SB_RSABG- Rancho Santa Ana Botanic Garden	Freshwater marsh, Marsh & swamp, Wetland
Juglans hindsii	Northern California black walnut	Dicots	PDJUG02040	5	1	None	None	G1	S1	1B.1	SB_USDA-US Dept of Agriculture	Riparian forest, Riparian woodland
Lasionycteris noctivagans	silver-haired bat	Mammals	AMACC02010	138	1	None	None	G5	S3S4	null	IUCN_LC- Least Concern, WBWG_M- Medium Priority	Lower montane coniferous forest, Oldgrowth, Riparian forest
Lasiurus cinereus	hoary bat	Mammals	AMACC05030	235	2	None	None	G5	S4	null	IUCN_LC- Least Concern, WBWG_M- Medium Priority	Broadleaved upland forest, Cismontane woodland, Lower montane coniferous forest, North coast coniferous forest
Legenere limosa	legenere	Dicots	PDCAM0C010	78	7	None	None	G2	S2	1B.1	BLM_S- Sensitive	Vernal pool, Wetland
Lepidium latipes var. heckardii	Heckard's pepper-grass	Dicots	PDBRA1M0K1	14	7	None	None	G4T1	S1	1B.2	null	Valley & foothill grassland, Vernal pool
Lepidurus packardii	vernal pool tadpole shrimp	Crustaceans	ICBRA10010	320	26	Endangered	None	G4	S3S4	null	IUCN_EN- Endangered	Valley & foothill grassland, Vernal pool, Wetland
Lilaeopsis masonii	Mason's lilaeopsis	Dicots	PDAPI19030	197	1	None	Rare	G2	S2	1B.1	null	Freshwater marsh, Marsh & swamp, Riparian scrub, Wetland
Linderiella occidentalis	California linderiella	Crustaceans	ICBRA06010	430	40	None	None	G2G3	S2S3	null	IUCN_NT- Near Threatened	Vernal pool
Melospiza melodia	song sparrow ("Modesto" population)	Birds	ABPBXA3010	92	10	None	None	G5	S3?	null	CDFW_SSC- Species of Special Concern	null
Myrmosula pacifica	Antioch multilid wasp	Insects	IIHYM15010	3	1	None	None	GH	SH	null	null	Interior dunes
Navarretia leucocephala ssp. bakeri	Baker's navarretia	Dicots	PDPLM0C0E1	58	2	None	None	G4T2	S2	1B.1	BLM_S- Sensitive	Cismontane woodland, Lower montane coniferous forest, Meadow & seep, Valley & foothill grassland, Vernal pool, Wetland
Neostapfia colusana	Colusa grass	Monocots	PMPOA4C010	62	3	Threatened	Endangered	G1	S1	1B.1	null	Vernal pool, Wetland
Northern Claypan Vernal Pool	Northern Claypan Vernal Pool	Herbaceous	CTT44120CA	21	1	None	None	G1	S1.1	null	null	Vernal pool, Wetland
Northern Hardpan Vernal Pool	Northern Hardpan Vernal Pool	Herbaceous	CTT44110CA	126	8	None	None	G3	S3.1	null	null	Vernal pool, Wetland
Nycticorax nycticorax	black-crowned night heron	Birds	ABNGA11010	26	4	None	None	G5	S4	null	IUCN_LC- Least Concern	Marsh & swamp, Riparian forest, Riparian woodland, Wetland

Oncorhynchus mykiss irideus	steelhead - Central Valley DPS	Fish	AFCHA0209K	31	5	Threatened	None	G5T2Q	S2	null	AFS_TH- Threatened	Aquatic, Sacramento/San Joaquin flowing waters
Oncorhynchus tshawytscha	chinook salmon - Central Valley spring-run ESU	Fish	AFCHA0205A	13	1	Threatened	Threatened	G5	S1	null	AFS_TH- Threatened	Aquatic, Sacramento/San Joaquin flowing waters
Oncorhynchus tshawytscha	chinook salmon - Sacramento River winter-run ESU	Fish	AFCHA0205B	2	1	Endangered	Endangered	G5	S1	null	AFS_EN- Endangered	Aquatic, Sacramento/San Joaquin flowing waters
Phalacrocorax auritus	double-crested cormorant	Birds	ABNFD01020	38	3	None	None	G5	S4	null	CDFW_WL- Watch List, IUCN_LC- Least Concern	Riparian forest, Riparian scrub, Riparian woodland
Plagiobothrys hystriculus	bearded popcomflower	Dicots	PDBOR0V0H0	14	1	None	None	G2	S2	1B.1	null	Valley & foothill grassland, Vernal pool, Wetland
Plegadis chihi	white-faced ibis	Birds	ABNGE02020	20	1	None	None	G5	S3S4	null	CDFW_WL- Watch List, IUCN_LC- Least Concern	Marsh & swamp, Wetland
Pogonichthys macrolepidotus	Sacramento splittail	Fish	AFCJB34020	15	1	None	None	GNR	S3	null	AFS_VU- Vulnerable, CDFW_SSC- Species of Special Concern, IUCN_EN- Endangered	Aquatic, Estuary, Freshwater marsh, Sacramento/San Joaquin flowing waters
Progne subis	purple martin	Birds	ABPAU01010	68	10	None	None	G5	S3	null	CDFW_SSC- Species of Special Concern, IUCN_LC- Least Concern	Broadleaved upland forest, Lower montane coniferous forest
Puccinellia simplex	California alkali grass	Monocots	PMPOA53110	71	8	None	None	G3	S2	1B.2	null	Chenopod scrub, Meadow & seep, Valley & foothill grassland, Vernal pool
Riparia riparia	bank swallow	Birds	ABPAU08010	297	1	None	Threatened	G5	S2	null	BLM_S- Sensitive, IUCN_LC- Least Concern	Riparian scrub, Riparian woodland
Sagittaria sanfordii	Sanford's arrowhead	Monocots	PMALI040Q0	93	23	None	None	G3	S3	1B.2	BLM_S- Sensitive	Marsh & swamp, Wetland
Spirinchus thaleichthys	longfin smelt	Fish	AFCHB03010	45	1	Candidate	Threatened	G5	S1	null	CDFW_SSC- Species of Special Concern	Aquatic, Estuary
Symphotrichum lentum	Suisun Marsh aster	Dicots	PDASTE8470	173	1	None	None	G2	S2	1B.2	SB_RSABG- Rancho Santa Ana Botanic Garden, SB_USDA-US Dept of Agriculture	Brackish marsh, Freshwater marsh, Marsh & swamp, Wetland
												Alkali marsh, Alkali playa, Alpine, Alpine dwarf scrub, Bog & fen, Brackish marsh, Broadleaved upland forest, Chaparral, Chenopod scrub, Cismontane woodland, Closed-cone coniferous forest, Coastal bluff scrub, Coastal dunes, Coastal prairie, Coastal scrub,

Taxidea taxus	American badger	Mammals	AMAJF04010	517	3	None	None	G5	S3	null	CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern	Desert dunes, Desert wash, Freshwater marsh, Great Basin grassland, Great Basin scrub, Interior dunes, lone formation, Joshua tree woodland, Limestone, Lower montane coniferous forest, Marsh & swamp, Meadow & seep, Mojavean desert scrub, Montane dwarf scrub, North coast coniferous forest, Oldgrowth, Pavement plain, Redwood, Riparian forest, Riparian scrub, Riparian woodland, Salt marsh, Sonoran desert scrub, Sonoran thorn woodland, Ultramafic, Upper montane coniferous forest, Upper Sonoran scrub, Valley & foothill grassland
Thamnophis gigas	giant gartersnake	Reptiles	ARADB36150	347	87	Threatened	Threatened	G2	S2	null	IUCN_VU-Vulnerable	Marsh & swamp, Riparian scrub, Wetland
Trifolium hydrophilum	saline clover	Dicots	PDFAB400R5	49	7	None	None	G2	S2	1B.2	null	Marsh & swamp, Valley & foothill grassland, Vernal pool, Wetland
Tuctoria mucronata	Crampton's tuctoria or Solano grass	Monocots	PMPOA6N020	4	2	Endangered	Endangered	G1	S1	1B.1	SB_RSABG-Rancho Santa Ana Botanic Garden	Valley & foothill grassland, Vernal pool, Wetland
Vireo bellii pusillus	least Bell's vireo	Birds	ABPBW01114	472	2	Endangered	Endangered	G5T2	S2	null	IUCN_NT-Near Threatened, NABCI_YWL-Yellow Watch List	Riparian forest, Riparian scrub, Riparian woodland
Xanthocephalus xanthocephalus	yellow-headed blackbird	Birds	ABPBXB3010	12	1	None	None	G5	S3	null	CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern	Marsh & swamp, Wetland

### Plant List

29 matches found. Click on scientific name for details

Search Criteria

Found in 9 Quads around 38121E5

Scientific Name	Common Name	Family	Lifeform	Rare Plant Rank	State Rank	Global Rank
<a href="#">Astragalus pauperculus</a>	depauperate milk-vetch	Fabaceae	annual herb	4.3	S4	G4
<a href="#">Astragalus tener var. ferrisiae</a>	Ferris' milk-vetch	Fabaceae	annual herb	1B.1	S1	G2T1
<a href="#">Astragalus tener var. tener</a>	alkali milk-vetch	Fabaceae	annual herb	1B.2	S2	G2T2
<a href="#">Atriplex cordulata var. cordulata</a>	heartscale	Chenopodiaceae	annual herb	1B.2	S2	G3T2
<a href="#">Atriplex depressa</a>	brittlescale	Chenopodiaceae	annual herb	1B.2	S2	G2
<a href="#">Carex comosa</a>	bristly sedge	Cyperaceae	perennial rhizomatous herb	2B.1	S2	G5
<a href="#">Centromadia parryi ssp. rudis</a>	Parry's rough tarplant	Asteraceae	annual herb	4.2	S3	G3T3
<a href="#">Chloropyron palmatum</a>	palmate-bracted bird's-beak	Orobanchaceae	annual herb (hemiparasitic)	1B.1	S1	G1
<a href="#">Cuscuta obtusiflora var. glandulosa</a>	Peruvian dodder	Convolvulaceae	annual vine (parasitic)	2B.2	SH	G5T4T5
<a href="#">Downingia pusilla</a>	dwarf downingia	Campanulaceae	annual herb	2B.2	S2	GU
<a href="#">Eryngium jepsonii</a>	Jepson's coyote thistle	Apiaceae	perennial herb	1B.2	S2	G2
<a href="#">Extriplex joaquinana</a>	San Joaquin spearscale	Chenopodiaceae	annual herb	1B.2	S2	G2
<a href="#">Fritillaria agrestis</a>	stinkbells	Liliaceae	perennial bulbiferous herb	4.2	S3	G3
<a href="#">Gratiola heterosepala</a>	Boggs Lake hedge-hyssop	Plantaginaceae	annual herb	1B.2	S2	G2
<a href="#">Hesperevax caulescens</a>	hogwallow starfish	Asteraceae	annual herb	4.2	S3	G3
<a href="#">Hibiscus lasiocarpus var. occidentalis</a>	woolly rose-mallow	Malvaceae	perennial rhizomatous herb	1B.2	S2	G5T2
<a href="#">Juglans hindsii</a>	Northern California black walnut	Juglandaceae	perennial deciduous tree	1B.1	S1	G1
<a href="#">Legenere limosa</a>	legenere	Campanulaceae	annual herb	1B.1	S2	G2
<a href="#">Lepidium latipes var. heckardii</a>	Heckard's pepper-grass	Brassicaceae	annual herb	1B.2	S1	G4T1
<a href="#">Lilaeopsis masonii</a>	Mason's lilaeopsis	Apiaceae	perennial rhizomatous herb	1B.1	S2	G2
<a href="#">Myosurus minimus ssp. apus</a>	little mousetail	Ranunculaceae	annual herb	3.1	S2	G5T2Q
<a href="#">Navarretia leucocephala ssp. bakeri</a>	Baker's navarretia	Polemoniaceae	annual herb	1B.1	S2	G4T2
<a href="#">Neostapfia colusana</a>	Colusa grass	Poaceae	annual herb	1B.1	S1	G1
<a href="#">Plagiobothrys hystriculus</a>	bearded popcornflower	Boraginaceae	annual herb	1B.1	S2	G2
<a href="#">Puccinellia simplex</a>	California alkali grass	Poaceae	annual herb	1B.2	S2	G3
<a href="#">Sagittaria sanfordii</a>	Sanford's arrowhead	Alismataceae	perennial rhizomatous herb	1B.2	S3	G3

<a href="#"><u>Symphotrichum lentum</u></a>	Suisun Marsh aster	Asteraceae	perennial rhizomatous herb	1B.2	S2	G2
<a href="#"><u>Trifolium hydrophilum</u></a>	saline clover	Fabaceae	annual herb	1B.2	S2	G2
<a href="#"><u>Tuctoria mucronata</u></a>	Crampton's tuctoria or Solano grass	Poaceae	annual herb	1B.1	S1	G1

Suggested Citation

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## **E3. 2016 Biological Field Reconnaissance Survey Reports**



## **SURVEY METHODS**

On March 8, 2016, DWR Biologists conducted field reconnaissance surveys along the levee crown road for the north and south levees of the Sacramento Bypass and the east levee of the Yolo Bypass from the Sacramento Bypass northward to I5. Surveys were conducted in winter before leaves appeared on deciduous trees in order to better observe existing nest sites. These surveys recorded sensitive environmental and biological resources and evaluated the potential interactions on the resources from subsurface investigation activities. Field studies did not include protocol-level surveys for special status species. Sensitive resource locations were added to high-resolution (1"=1000') color aerial project route maps. The resulting data was digitized into ArcMap 10.2.2 shapefiles for spatial determination of potential impacts to sensitive natural resources.

## **SURVEY RESULTS**

The Project Area includes the Sacramento Bypass from the Sacramento River to the Yolo Bypass and the Lower Elkhorn section of the Yolo Bypass from the Sacramento Bypass north to I5. The Project Area is located in Yolo County to the west of Sacramento.

The Levee Segments are:

- Sacramento Bypass
- Lower Elkhorn: RD 0785 Unit 2, RD 0827 Unit 2

The Project Area is composed primarily of actively farmed agricultural land. All geotechnical borings would be confined to these agricultural lands and would not include any in-water work. As such, the area in which geotechnical work would occur is significantly disturbed, and is frequently subject to additional disturbance by heavy farm equipment. The following sections document potential special status species that have the potential to occur in or around the project area. Standard avoidance and minimization measures are also included in these sections; however, the likelihood of any impacts to these species without implementing these measures is low.

## **SENSITIVE BIOLOGICAL RESOURCES**

### ***Special Status Reptile Species: Giant Garter Snake (State Threatened, Federal Threatened)***

Potential giant garter snake (GGS) habitat was identified during the biological reconnaissance-level surveys in the channels along the waterside slopes of the north and south levees of Sacramento Bypass, Tule canal along the Lower Elkhorn levee, the drainage canal along the cross levee between RD 785 and RD 827(drainage canal), and a larger channel running north-south thru the nearby agricultural field.

However, the drainage canal, and the larger canal are low quality habitat; therefore, GGS are unlikely to be found in these areas.

Rice is a major crop grown in the Yolo Bypass from County Road 22 in the north and down 4 miles. According to the CNDDDB, GGS were observed within the rice fields and interconnected canals from 2009-2012. There is no rice in the Lower Elkhorn Basin. GGS were observed in the Tule Canal along a one mile stretch of the Lower Elkhorn levee between RD 785 and RD 827 in 1990. Due to the connectivity of the channel to known GGS sightings, GGS avoidance measures should be used for activities closer than 200 feet from a waterbody. The geotech boring project will take place farther than 200 feet from any GGS habitat except for possibly at the very northern extent of this project area.

If activities are moved closer than 200 feet to Tule Canal the following mitigation measures should be followed.

During the GGS active season, as defined by USFWS (May 1 to October 1), snakes may bask in areas such as roadways up to 800 feet from their aquatic habitat. There could be a risk that project activities could harm a basking GGS. Service -approved biological monitors will be required for work conducted in areas containing GGS habitat, such as marshes, sloughs, ponds, small lakes, low-gradient streams, other waterways, agricultural wetlands like irrigation and drainage canals or rice fields, and their adjacent uplands for a distance of 200 feet.

### ***Special Status Invertebrate Species: Valley Elderberry Longhorn Beetle (Federal Threatened)***

The valley elderberry longhorn beetle (VELB) is closely associated with its host plant, the blue elderberry *Sambucus nigra ssp. Cerulean* (formerly *S. Mexicana*). Elderberry shrubs that have a stem diameter of 1 inch or greater at ground level are considered VELB habitat by USFWS. The VELB has an active season from March 15 through June 15, when the adult beetle emerges, breeds, and lays eggs. During this active season, VELB may be more susceptible to disturbance. Elderberry shrubs within 100 feet of the boring locations require a USFWS-approved biological monitor. During the inactive period, elderberry shrubs can be approached within 20 feet with a biological monitor present.

The survey was conducted in the winter and no elderberry bushes were observed; however, the boring locations are not within 100 feet of any vegetation that could potentially be an elderberry bush. No mitigation measures are necessary.

### ***Special Status Birds Species: Migratory Birds***

Nearly all migratory birds are protected under the Migratory Bird Treaty Act (MBTA) of 1918. The MBTA prohibits the taking or possessing active nests or nesting birds, and prohibits any activity causing nesting birds to abandon their nests during the breeding season. This act is enforced by USFWS.

Many species are also protected under additional laws and regulations, such as the Endangered Species Act (ESA) of 1973, as amended and Executive Order 13186, California Endangered Species Act (CESA). ESA is enforced by USFWS, while CESA is enforced by the California Department of Fish and Wildlife (CDFW).

Project activities can still be scheduled to occur during the breeding season, defined by USFWS as February 1 to August 31 for raptors and March 1 to August 31 for other species. Under these laws, any activity during the breeding season that directly and adversely impacts nesting birds, either through habitat removal or increased disturbance, is prohibited.

Potential Swainson's hawk nesting habitat is found along the Sacramento Bypass, Lower Elkhorn levee, Hwy 124 canal and the mitigation area. All of these areas except for the mitigation area (to which does not currently have access) were checked carefully for the presence of nests and raptors. Two raptor nests were seen along the south levee of the Sacramento Bypass along with four smaller nests. Two raptor nests were spotted on Hwy 124 along the canal that runs from the levee to Old River Road. Two raptor nests were also seen along the Lower Elkhorn levee from Hwy 124 northward to I5. Several smaller nests were also observed in this area. The stands along these levee stretches have several large trees but have been reduced to a narrow band of usually one tree width which is not ideal raptor nesting habitat. The trees lining the nearby Sacramento River and in the mitigation site provide more suitable habitat for nesting sites.

Two pairs of kites and two pairs of harrier hawks were observed in the Sacramento Bypass indicating that this area may be used more for foraging than for nest habitat. Several young red-tailed hawks and 2 unidentified hawks were seen in the immediate area. One pair of harrier hawks was displaying aerial courtship behavior.

Two pairs of cormorants were spotted in the canal along the northern levee of Sacramento Bypass. A heron rookery of at least 50 Black-crowned Night Herons was found along the Lower Elkhorn levee about 2000 feet north from where Hwy 124 turns to the east.

Birds nesting along these levees may not be disturbed by vehicular traffic but may be agitated by foot traffic. Unless the young have fledged by the time drilling starts, a ¼ mile buffer (see map) around the area will be needed to avoid any potential adverse impacts.

### **Special Status Birds Species: Yellow-billed cuckoo (Federal Candidate)**

No habitat for the yellow-billed cuckoo (YBCU) (*Coccyzus americanus*) was identified during the biological surveys. The closest proposed critical habitat is about 23 miles to the north.

The YBCU is known to occupy its California breeding sites between June to mid-September. From mid-August to early September, individual YBCU begin their migration south to South America. Avoidance measures will not be required due to the brevity and relatively low disturbance level of the exploration activities.

### **Water Quality - Clean Water Act Section 303(d)**

The U.S. Environmental Protection Agency's Clean Water Act, Section 303(d) lists the Feather and Bear Rivers in California as "impaired waterways". For impaired water bodies that contain federally-listed fish species, extra conservation measures may be required by the National Marine Fisheries Service and/or USFWS whenever project activities have the potential for impact. The Tule Canal is not listed as an impaired waterway.

### **Riparian Vegetation**

Riparian vegetation is protected by CDFW. Any removal of riparian vegetation requires a Lake and Streambed Alteration Agreement (CDFW Code, 1600 et seq.). Riparian vegetation is present along all the Sacramento Bypass and Lower Elkhorn levee, as well as along the agricultural canal running beside Hwy 124. However, the project activities will be conducted in agricultural fields and will not impact the riparian vegetation.

## RECORD OF FIELD ACTIVITY

**Date:** 04/6/16

**Person(s) present:** Shelly Amrhein, Gabrielle Bohrer and Kristin Ford

**Time:** 9:00 am - 2:00 pm

**Location:** Sacramento Bypass and Yolo Bypass along Lower Elkhorn Basin

**Purpose:** The purpose of the visit was to document the presence or absence of existing stick nests and of nesting birds or special status species in the proposed project area. The project area includes the Sacramento Bypass from the Sacramento River to the Yolo Bypass and the Lower Elkhorn section of the Yolo Bypass from the Sacramento Bypass north to I5. The project area is located in Yolo County to the west of Sacramento. The proposed project includes a setback levee in the Yolo Bypass along Lower Elkhorn Basin, aligned north to south. It would begin just south of I-5 and would be set back approximately 2,000 feet east of the existing levee in the northern and middle portions of the basin, continuing south approximately 4.2 miles. From there, the levee setback would expand to 3,400 feet in the southern portion of the basin, spanning 1.3 miles, ending at the new Sacramento Bypass levee. The Sacramento Bypass would be expanded by constructing a new setback levee 1,500 feet north of the existing levee and would be approximately 1.3 miles long.

**Activities:** The survey began at approximately 9:30 am on 4/6/16. The weather conditions were sunny with scattered clouds. The temperature was approximately 65° F with light winds approximately 5 MPH. Land use of the surrounding area is primarily agricultural.

The site was surveyed from end to end traversing the levee crown roads to locate active or inactive nests on both the left and right banks. The surrounding canopy and understory was scanned using 10x42 hand-held binoculars. The banks on both the water and land side of the levees were also surveyed for the presence or absence of special status species.

**Species Observed:** The project area is primarily agricultural with rudral vegetation. Mixed riparian vegetation is also present with scattered Himalayan blackberry (*Rubus armeniacus*), California wild rose (*Rosa californica*), valley oak (*Quercus lobata*) Fremont cottonwood (*Populus fremontii*), box elder (*Acer negundo*) and various willow and herbaceous species.

Birds observed on or adjacent to the site during the survey included: California quail (*Callipepla californica*), dark-eyed junco (*Junco hyemalis*), killdeer (*Charadrius vociferous*), California towhee (*Melospiza crissalis*), Anna's hummingbird (*Calypte anna*), white-crowned sparrow (*Zonotrichia leucophrys*), tree swallow (*Tachycineta bicolor*), song sparrow (*Melospiza melodia*), Turkey vulture (*Cathartes aura*), house finch, (*Carpodacus mexicanus*), bushtit (*Psaltiriparus minimus*), black phoebe (*Sayornis nigricans*), mourning dove (*Zenaida macroura*), Western kingbird (*Tyrannus verticalis*), Red-winged blackbird (*Agelaius phoeniceus*), Western scrub-jay (*Aphelocoma californica*), Eurasian collared-dove (*Streptopelia decaocto*), Great blue heron (*Ardea herodias*), Great egret (*Ardea alba*), American robin (*Turdus migratorius*), European starling (*Sturnus vulgaris*), Great horned owl (*Bubo virginianus*), Red-tailed hawk (*Buteo jamaicensis*), and Swainson's Hawk (*Buteo swainsoni*)

Several Jackrabbits (*Lepus californicus*), Western pond turtle (*Actinemys marmorata*) and western fence lizard (*Sceloporus occidentalis*) were also observed on or adjacent to the site.

**Evaluation:** Existing stick nest locations (map) were surveyed; an active red-tailed hawk and great horned owl nest were identified. No elderberry shrubs were identified; however a more focused survey for elderberry shrubs will be conducted to rule out impacts to VELB. Marginal suitable habitat for giant garter snake was observed in the channel adjacent to site; Western pond turtles were also observed in this channel. An egret rookery was found approximately three quarters of a mile from the project area on the Sacramento River.





## RECORD OF FIELD ACTIVITIES

**Dates:** 8/17/16, 8/26/16, 9/01/16 & 9/09/16

**Person(s) present:** Gabrielle Bohrer, Stephanie Chun, Erica Hironaka and Heather White

**Time:** 9:00 am - 4:00 pm

**Location:** Sacramento Bypass and Yolo Bypass along Lower Elkhorn Basin

**Purpose:** The purpose of the visits was to document and assess habitat suitability for giant garter snake (GGS) in the proposed project area. The project area includes the Sacramento Bypass from the Sacramento River to the Yolo Bypass and the Lower Elkhorn section of the Yolo Bypass from the Sacramento Bypass north to I5. The project area is located in Yolo County to the west of Sacramento. The proposed project includes a setback levee in the Yolo Bypass along Lower Elkhorn Basin, aligned north to south. It would begin just south of I-5 and would be set back approximately 2,000 feet east of the existing levee in the northern and middle portions of the basin, continuing south approximately 4.2 miles. From there, the levee setback would expand to 3,400 feet in the southern portion of the basin, spanning 1.3 miles, ending at the new Sacramento Bypass levee. The Sacramento Bypass would be expanded by constructing a new setback levee 1,500 feet north of the existing levee and would be approximately 1.3 miles long.

**Protocol:** DWR's Flood Maintenance Office's GGS Habitat Suitability Protocol (GGS Protocol 2014) was used to determine habitat suitability for GGS. The GGS Protocol was developed based on U.S. Fish and Wildlife Service's 1999 Draft Recovery Plan for the GGS, Appendix D (U.S. Fish and Wildlife Service, 1999) and through consultation with Eric Hansen and his survey protocol. (Hansen, E.C. 2013). Surveys are conducted by driving along the levee crown road looking out to 200 feet from the levee toe (landside and waterside). If a water feature is identified within 200 feet of the levee toe, the surveyor completes a FMO 2014 GGS Water Habitat Survey Datasheet. For this survey water features that are beyond the levee and within the project footprint were also surveyed and assessed. Each datasheet is given a score for GGS habitat suitability (suitable, marginal or unsuitable).

**Activities:** The survey began at approximately 9:00 am and concluded around 4:00pm each day. The weather conditions were sunny with scattered clouds. The temperature was approximately 90<sup>0</sup>-95<sup>0</sup> F with light winds approximately 3-5 MPH. Land use of the surrounding area is primarily agricultural. Water features within the project footprint were surveyed and assessed from end to end traversing the levee crown roads and adjacent roads. Photos were taken of each water feature.

**Evaluation:** All of the water features were scored as suitable, marginal or unsuitable habitat for GGS. See attached Yolo Bypass Elkhorn Basin Levee Setback Project GGS Survey Map for results.

**Reference:**

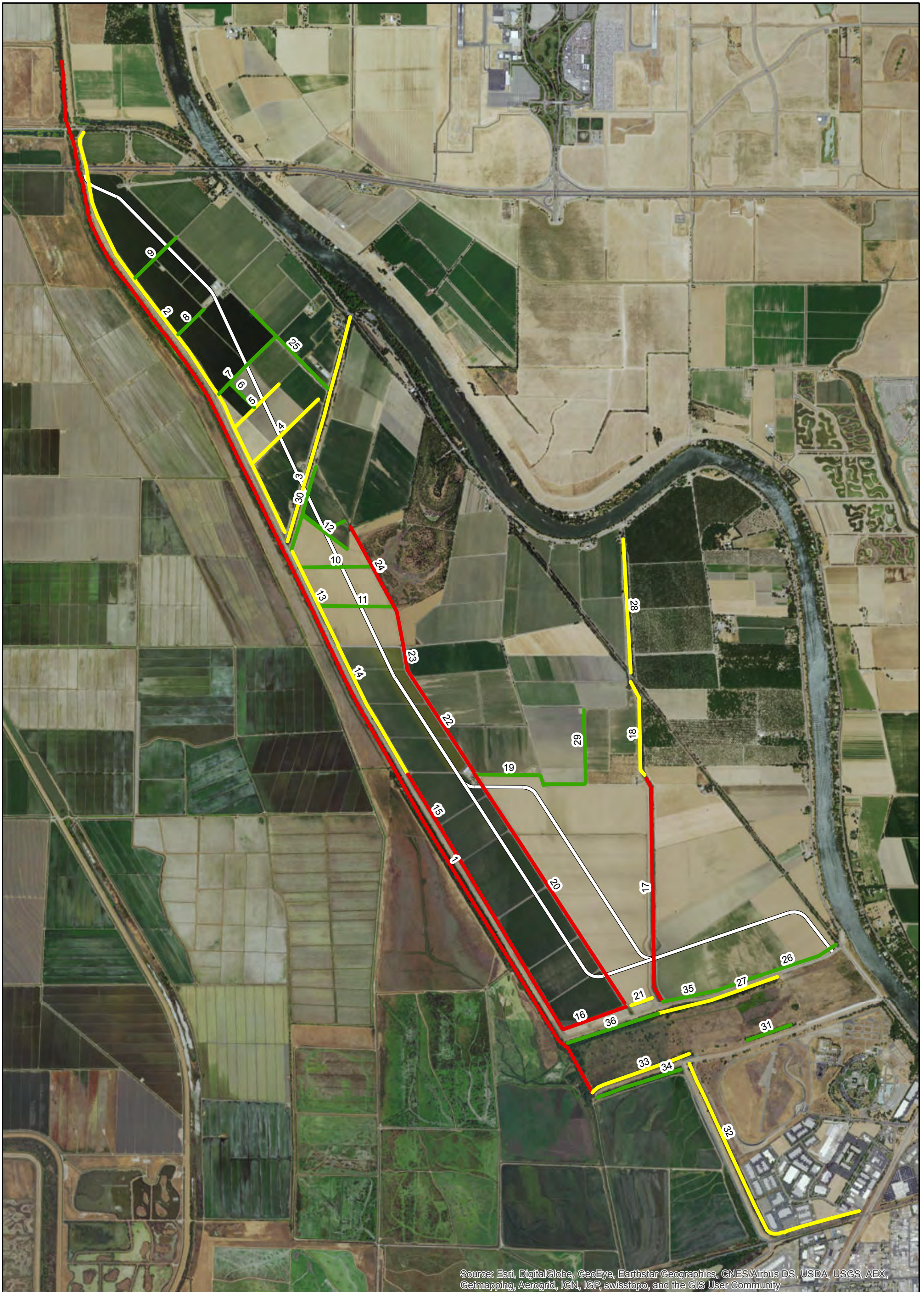
GGS Protocol 2014. Department of Water Resources, Flood Maintenance Office 2014 Levee Survey Plan for Sutter Yard. June 4, 2014.

Hansen, E.C. 2013. Biggs-West Gridley Water District Gray Lodge Wildlife Area Water Supply Project Giant Garter Snake (*Thamnopsis gigas*) Habitat and Impact Assessment. Prepared for Provost and Pritchard Consulting Group. March 27, 2013. Unpublished. 82 pp. + appendices.

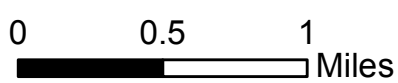
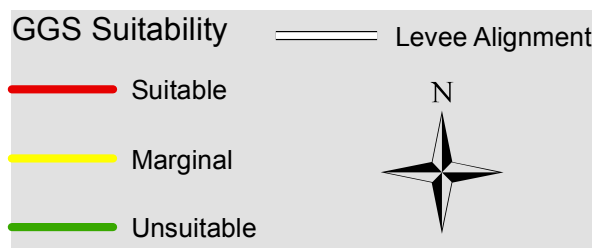
U.S. Fish and Wildlife Service. 1999. Draft Recovery Plan for the Giant Garter Snake (*Thamnopsis gigas*). U.S. Fish and Wildlife Service, Portland, Oregon. ix+ 192 pp.







Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Yolo Bypass Elkhorn Basin  
Levee Setback Project

GGS Survey  
GEI Consultants, Inc.





## **E.4 2013-2014 Giant Garter Snake Water Habitat Surveys**



# Blank Habitat Survey Datasheets





**FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets**

Date: \_\_\_\_\_ Staff Name(s): \_\_\_\_\_ Levee Unit: \_\_\_\_\_ Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  ||  or  ⊥  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: \_\_\_\_\_ File Name: \_\_\_\_\_ Point Name: \_\_\_\_\_

<b>HABITAT ATTRIBUTE</b>		<b>(SCORE)</b>	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+ ( )	
2	Flowing water over sand, gravel, rock or cement substrate	- ( )	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+ ( )	
	b) April through October (i.e. irrigation for crops)	+ ( )	
	c) all year (i.e. perennial marsh or channel)	+ ( )	
4	Site subject to severe seasonal flooding (i.e. within bypass)	- ( )	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+ ( )	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+ ( )	
Subtotal:			
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]			
7	Banks:		
	a) Banks are sunny	+ ( ) %	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	- ( ) %	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ ( ) %	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	- ( )	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ ( ) %	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+ ( )	
Subtotal:			
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ ( )	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+ ( )	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- ( )	
Subtotal:			
<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+ ( )	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	- ( )	
15	Rice fields (fallow or flooded)	+ ( )	
16	Upland habitat other than levee for winter refugia (above high water mark)	+ ( )	
17	Row crop, orchard, pasture, or other agricultural	- ( )	
18	Urban or developed public area	- ( )	
Subtotal:			
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ ( )	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ ( )	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- ( )	
Subtotal:			
<b>TOTAL SCORE:</b>			
22	Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes <input type="checkbox"/> no	
23	Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Photo #'s:			
Reviewer(s):			Date:

**Comments**

Water: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Basking/Refugia: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Predator/Prey: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Adjacent land use: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Disturbance: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

# FMO 2013-14 Giant Garter Snake Water Habitat Survey Photo Log

## Instructions for Photos:

Take photos of each and every water feature within 200 feet of the levee toe from several angles.  
Take photos of predators and prey if present, and aquatic or emergent plants if unable to identify.

**Levee Name:** \_\_\_\_\_ **Camera Name:** \_\_\_\_\_ **GPS File Name:** \_\_\_\_\_

Levee Mile #: _____	Landside <input type="checkbox"/> Waterside <input type="checkbox"/>	Photo #: _____	Direction Photo Taken: N / S / E / W
GPS Point Name: _____ Description: _____			

Levee Mile #: _____	Landside <input type="checkbox"/> Waterside <input type="checkbox"/>	Photo #: _____	Direction Photo Taken: N / S / E / W
GPS Point Name: _____ Description: _____			

Levee Mile #: _____	Landside <input type="checkbox"/> Waterside <input type="checkbox"/>	Photo #: _____	Direction Photo Taken: N / S / E / W
GPS Point Name: _____ Description: _____			

Levee Mile #: _____	Landside <input type="checkbox"/> Waterside <input type="checkbox"/>	Photo #: _____	Direction Photo Taken: N / S / E / W
GPS Point Name: _____ Description: _____			

Levee Mile #: _____	Landside <input type="checkbox"/> Waterside <input type="checkbox"/>	Photo #: _____	Direction Photo Taken: N / S / E / W
GPS Point Name: _____ Description: _____			

Levee Mile #: _____	Landside <input type="checkbox"/> Waterside <input type="checkbox"/>	Photo #: _____	Direction Photo Taken: N / S / E / W
GPS Point Name: _____ Description: _____			

Levee Mile #: _____	Landside <input type="checkbox"/> Waterside <input type="checkbox"/>	Photo #: _____	Direction Photo Taken: N / S / E / W
GPS Point Name: _____ Description: _____			

FMO 2013-14 Giant Garter Snake Water Habitat Survey Photo Log (cont.)

Levee Name: \_\_\_\_\_ (cont.) Camera Name: \_\_\_\_\_ GPS File Name: \_\_\_\_\_

Levee Mile #: \_\_\_\_\_ Landside  Waterside  Photo #: \_\_\_\_\_ Direction Photo Taken: N / S / E / W  
GPS Point Name: \_\_\_\_\_ Description: \_\_\_\_\_  
\_\_\_\_\_

Levee Mile #: \_\_\_\_\_ Landside  Waterside  Photo #: \_\_\_\_\_ Direction Photo Taken: N / S / E / W  
GPS Point Name: \_\_\_\_\_ Description: \_\_\_\_\_  
\_\_\_\_\_

Levee Mile #: \_\_\_\_\_ Landside  Waterside  Photo #: \_\_\_\_\_ Direction Photo Taken: N / S / E / W  
GPS Point Name: \_\_\_\_\_ Description: \_\_\_\_\_  
\_\_\_\_\_

Levee Mile #: \_\_\_\_\_ Landside  Waterside  Photo #: \_\_\_\_\_ Direction Photo Taken: N / S / E / W  
GPS Point Name: \_\_\_\_\_ Description: \_\_\_\_\_  
\_\_\_\_\_

Levee Mile #: \_\_\_\_\_ Landside  Waterside  Photo #: \_\_\_\_\_ Direction Photo Taken: N / S / E / W  
GPS Point Name: \_\_\_\_\_ Description: \_\_\_\_\_  
\_\_\_\_\_

Levee Mile #: \_\_\_\_\_ Landside  Waterside  Photo #: \_\_\_\_\_ Direction Photo Taken: N / S / E / W  
GPS Point Name: \_\_\_\_\_ Description: \_\_\_\_\_  
\_\_\_\_\_

Levee Mile #: \_\_\_\_\_ Landside  Waterside  Photo #: \_\_\_\_\_ Direction Photo Taken: N / S / E / W  
GPS Point Name: \_\_\_\_\_ Description: \_\_\_\_\_  
\_\_\_\_\_

Levee Mile #: \_\_\_\_\_ Landside  Waterside  Photo #: \_\_\_\_\_ Direction Photo Taken: N / S / E / W  
GPS Point Name: \_\_\_\_\_ Description: \_\_\_\_\_  
\_\_\_\_\_

# Instructions for Completing the

## FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

\*PLEASE NOTE: CHANGES HAVE BEEN MADE SINCE the April 7, 2014 version  
USED FOR THE SACRAMENTO YARD 2014 SURVEYS\*

### General Instructions

- Fill out a Giant Garter Snake Water Habitat Survey Datasheet when a water feature is within 200 feet of the toe of the surveyed levee.
- Fill out the Giant Garter Snake Water Habitat Survey Datasheets completely.
- Familiarize yourself with the datasheet, these instructions, and ask questions prior to conducting surveys in the field.
- Familiarize yourself with determining distances, especially 200 feet, before conducting the surveys.
- Review and test yourself with percent cover plot tests before conducting surveys to gain a better understanding of cover percentages in the field.
- The datasheet is divided into different habitat attribute factors of a water feature. These are Water, Basking/Refugia, Predator/Prey, Adjacent Land Use, and Levee for scoring purposes. The levee section nearest to the water feature is also being evaluated. This is for getting a score specific to the levee itself, which is the footprint of the rodent damage repair activities.
- Note that the scoring values throughout the datasheet are 0, 1, 2, or 3. The scoring is conducted by evaluating the water feature on its attributes, therefore, if that the attribute is present, absent, or to a certain degree then, the appropriate score is given to represent that attribute on the datasheet. The scoring criteria on the datasheet and are as follows:
  - [0 = absent, 1 = present] for questions 1, 2, 3, 4, 8b, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21
  - [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0] for question 5
  - [no breaks = 2; <= 200' = 1; >200' = 0] for question 6
  - % = [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%] for questions 7a, 7b, 8a, and 9.
- Use the comment sheet to add any comments about the water feature to add detail that may be needed later, or if there are any questionable circumstances that need to be explained.
- After collection, survey data will be reviewed for accuracy, errors, and revised as necessary.
- Each FMO 2014 GGS Water Habitat Survey datasheet is given a score for GGS habitat suitability of that particular water feature. The scores are added or subtracted on either being a positive (+) or negative (-) habitat attributes for GGS. This score is translated into one of three habitat categories (suitable, marginal, or unsuitable). It is assumed that a water feature within 200 feet of the levee toe determines if that levee reach may or may not provide potential habitat for GGS; therefore; the levee itself can be assessed if it provides or does not provide potential GGS habitat. The results of the GGS surveys for each levee unit will be summarized on a Survey Summary Table and a map. See the Department of Water Resources, Flood Maintenance Office 2014 Levee Survey Plan for details on evaluating the results and a general overview of these surveys.
- Note changes from version April 7, 2014: The June's version questions 19, 20, and 21 are from April's questions 10c, 11c, and 21 respectively. The following April questions were collapsed and numbers were changed: 10 a/b (June question 9), 11 a/b (June question 10), and 18/19 (June question 17).

## **Question Specific Instructions**

### **Datasheet ID**

Assign each individual datasheet with a Datasheet ID. Label with a “W” for waterside or “L” for landside and then the number of the datasheet, for example “W1” for the first datasheet for a water feature on the waterside of the levee being surveyed. Therefore the fifth datasheet on the landside will be labeled, “L5”.

### **Levee Unit**

This is the name or code of the levee being surveyed.

### **Levee Mile #**

Note the closest levee mile to the water feature, or the levee miles that the water feature is at along the levee (i.e. 0.1 – 2).

## **Water**

1. Still or slow-flowing water over silt substrate.  
Adjacent bank on water side is soil, silt, or mud. Flows less than or equal to 3 mph. Water is often dark or murky rather than clear, i.e. marshes, sloughs, or irrigation canals. Scoring options for this question are 0 if absent OR 1 if present. + (0 / 1).
2. Flowing water over sand, gravel, rock or cement substrate.  
Does the channel or bank on water side have impermeable substrate like gravel, rock or cement? Slopes may have cinders or fine concrete riprap placed for erosion control. Typically has flows more than 3 mph. Water is often clear, like in flowing streams or rivers where silt or sediment will not persist, low turbidity. Scoring options for this question are 0 if absent OR 1 if present. - (0 / 1)
3. Water availability.  
Factors in this category are based upon the persistence of all water within 200 feet of observed habitat. Scoring options for these questions are 0 if absent OR 1 if present. + (0 / 1).
  - a) winter runoff or sporadic availability (i.e. for only 2 weeks at a time)  
Is water available in canals, ditches or wetlands only after rains or from winter runoff?
  - b) April through October only (e.g. rice irrigation, crops)  
Is water available in canals and ditches only when growing crops in the adjacent fields?
  - c) all year or permanent water (e.g. perennial marsh or channel).
4. Site subject to severe seasonal flooding (i.e. within bypass).  
Is water feature and immediate surrounding area subjected to prolonged inundation by seasonal floodwaters, persistent tidal flows, within bypass, or within the levee sections that flood periodically?  
Scoring options for this question are 0 if absent OR 1 if present. - (0 / 1)
5. Connectivity to known populations of GGS: (Determine in office)  
The closer the habitat or population of GGS, the higher the score. Take good pictures in the field, but also look on Google Earth to determine if connectivity exists and to measure the distance. Ranked by distance using current California Natural Diversity Database(CNDDDB) occurrence records. Scoring options for this question are if connectivity is within 1 mile then score is 3; within 5 miles then score is 2; within 10 miles then score is 1. + (0/1/2/3)
6. Connectivity to suitable habitat via channels: (Determine in office, but also provide helpful comments if there is a noticeable connectivity or lack of in the field.)  
This is ranked by continuity to water features that have CNDDDB occurrence records. Scoring options for this question are if there are no breaks in continuity the score is 2; if there are breaks in connectivity less than or equal to 200 feet the score is 1, if there are breaks greater than 200 feet in distance the score is 0. + (0/1/2)

## **Basking / Refugia (Active Season)**

### 7. Banks

These questions are looking at the percent of area on the immediate banks of the water feature that a GGS could use to bask in the sun. These questions are addressing the banks together cumulatively, not individually. Therefore questions 7a and 7b should ideally add up to 100 percent together.

#### a) Banks are sunny

What percentage of the bank receives direct sunlight? Can GGS access sun for basking? Consider where sun will be throughout the day. Scoring options for this question are based on the percent sunny banks; if none (0%) then the score is 0; if low (9-24%) then the score is 1; if moderate (25-74%) then the score is 2; if high (75-100%) then the score is 3. + (0/1/2/3) %.

#### b) Banks shaded by overstory vegetation:

What percentage of the banks are shaded by overstory vegetation or canopy cover blocking sunlight from reaching the ground surface? Consider where the sun will be throughout the day. Scoring options for this question are based on the percent of the banks being shaded by overstory vegetation; if the shade is from another source, i.e. steep bank, make comments and score the same. If there is no shade, none (0%) then the score is 0; if low (9-24%) then the score is 1; if moderate (25-74%) then the score is 2; if high (75-100%) then the score is 3. + (0/1/2/3) %

### 8. Vegetation in the aquatic habitat.

These questions evaluate the type and percent of vegetation within the water feature.

#### a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose).

Does the water feature have aquatic vegetation or emergent vegetation (wetland vegetation), be sure to look at the banks along the inside of the water feature (i.e. canals and ditches), that may provide cover for GGS? Scoring options for this question are based on the percent of aquatic or emergent vegetation within the water feature. If there is none (0%) then the score is 0; low (9-24%) then the score is 1; moderate (25-74%) then the score is 2; high (75-100%) then the score is 3. + (0/1/2/3) %

#### b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal plants)

Is there terrestrial or upland vegetation within the water feature or aquatic habitat (i.e. canal, ditch, pond, or channel)? Usually associated within ditches that are used seasonally or temporarily. Scoring options for this question are based on the percent of terrestrial or upland vegetation within the water feature. Scoring options for this question are 0 if absent OR 1 if present. + (0 / 1).

### 9. Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap).

Are there places above ground where a GGS can take temporary refuge to get away from the sun or predators (not be exposed in the open)? This could be vegetation that provides cover for the GGS while still allowing for sunlight to penetrate such as tall grasses, low shrubs, willows, or Himalayan blackberry. Debris such as downed logs, brush piles, wood piles, or ditch/canal clean out vegetation piles where GGS can take temporary refuge in. Rip rap or large rock with enough interstitial space that may be used by GGS for cover. Scoring options for this question are based on the percent of refugia within 200 feet of the water feature. If there is none (0%) then the score is 0; low (9-24%) then the score is 1; moderate (25-74%) then the score is 2; high (75-100%) then the score is 3. + (0/1/2/3)

### 10. Subsurface retreats within 200 feet from the water feature (i.e. burrows, cracks, crevices).

Are there animals burrows, cracks, crevices, or other types of holes in the ground that may provide cover/refugia for GGS within 200 feet of the water feature? Scoring options for this question are 0 if absent OR 1 if present. + (0 / 1).

## **Predator / Prey**

For the Predator/Prey section, numbers 11 - 13, for now, we will assume that if the water body being surveyed has year round water and is directly connected to a body of water that has water year round, that large predatory fish and prey fish and amphibians are present.

### 11. Prey fish present:

Are small fish such as mosquitofish, carp, or blackfish present? Watch the water surface for movement, if there is movement, then it can be assumed that prey fish are present in the water feature. Assume presence if the aquatic feature has permanent water or is connected to a permanent water source. Scoring options for this question are 0 if absent OR 1 if present. + (0 / 1).

### 12. Prey amphibians present:

Assume amphibian prey such as tadpoles and chorus frogs are present if the aquatic feature has permanent water or is near a permanent water feature. Seasonal water sources may also provide enough water for presence of amphibians. Note: toads do not constitute preferred prey for GGS and are not included. Scoring options for this question are 0 if absent OR 1 if present. + (0 / 1).

### 13. Introduced gamefish present:

Assume predatory gamefish (e.g. black bass, striped bass, channel catfish) are present if the aquatic feature has permanent water and is connected to a permanent water feature. Scoring options for this question are 0 if absent OR 1 if present. - (0 / 1).

## **ADJACENT LAND USE**

This section will evaluate the immediate surrounding land uses around the water feature being evaluated.

### 14. Natural marsh, wetland, mitigation bank, or manmade pond.

Are there natural or manmade wetland(s) or pond(s) adjacent.

#### a) Functions ecologically as a wetland

Is there a natural or manmade water feature nearby that functions ecologically as a wetland (from the perspective of a GGS)? Scoring options for this question are 0 if absent (no) OR 1 if present (yes). + (0 / 1).

#### b) Functions for recreational use (i.e. fishing, boating, water skiing).

Is there a manmade water feature nearby that was created for recreational purposes, or a natural wetland that is used mostly for recreational purposes such as fishing, boating, or water skiing. Scoring options for this question are 0 if absent (no) OR 1 if present (yes). - (0 / 1).

### 15. Rice fields (fallow/dry or flooded)

Is there a rice field(s) nearby? Due to the timing of the survey or the current drought conditions rice fields may be dry or fallow. Since GGS presence is associated with rice growing regions, by scoring dry rice fields as a positive still gives insight to the surrounding activities that may affect GGS presence related to the levee section. Scoring options for this question are 0 if absent (no) OR 1 if present (yes). + (0 / 1).

### 16. Upland habitat other than the levee for winter refugia (above the high water mark-flood waters).

Is there upland habitat above the high water mark for the GGS to use as winter refugia within 500 feet of the water feature? Scoring options for this question are 0 if absent (no) OR 1 if present (yes). + (0 / 1).

### 17. Row crops, orchard, pasture, or other agricultural.

Row crops are usually annually disturbed furrowed fields with shallow ditches that are dug/created annually and have no to little vegetation on the edges. Wheat fields (esp. winter wheat) look a lot like rice fields early in the growing season. Wheat fields are highly disturbed fields with annual disturbed ditches that usually have no vegetation for GGS usage. Orchards represent a 100% canopy cover with ditches usually cleaned out. Pasture lands usually provide no cover and no wetland features available for GGS to use. These types of agriculture are negative attributes for GGS habitat suitability. Any other type of



agriculture beyond rice is grouped into this category. Scoring options for this question are 0 if absent (no) OR 1 if present (yes). - (0 / 1)

18. Urban or developed public area.

This includes parking lots and paved roads.

Scoring options for this question are 0 if absent (no) OR 1 if present (yes). - (0 / 1).

### **Levee (footprint of rodent damage repair activities)**

For this section consider only the levee slopes noted in the **Levee Mile #** above, when answering.

19. Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap).

Are there places above ground where a GGS can take temporary refuge to get away from the sun or predators? This includes vegetation that provides cover for the GGS while still allowing for sunlight to penetrate such as tall grasses, low shrubs, willows, or Himalayan blackberry. Debris such as downed logs, brush piles, wood piles, or ditch/canal clean out vegetation piles where GGS can take temporary refuge in. Rip rap or large rock with enough interstitial space that may be used by GGS for cover. Note: similar to #9 above, except consider only the levee slopes. Scoring options for this question are 0 if absent (no) OR 1 if present (yes). + (0 / 1).

20. Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)

Do the levee slopes have subsurface retreats such as animal burrows, cracks or crevices that are available for a GGS to use above the high water mark. Note: similar to #10 above, except consider only the levee slopes. Scoring options for this question are 0 if absent (no) OR 1 if present (yes). + (0 / 1).

21. Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing).

Is the levee prism subjected to prolonged or regular disturbance by human recreational activities (e.g. fishing, boating, dog walking, hunting). Activities are considered regular if they occur more than 50% of the time between March and November. Scoring options for this question are 0 if absent (no) OR 1 if present (yes). - (0 / 1).

### **Yes/No**

The section collects basic yes/no data about the levee itself.

22. Does the levee provide the ONLY over-wintering refugia above the high water mark within 500' (feet)?

This is 500 feet from the levee itself, not the water feature. Consider the levee reach noted in the **Levee Mile #** above, when answering.

23. Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?

Consider the levee reach noted in the **Levee Mile #** above, when answering. Do not spend the time to count rodent holes, just if there are noticeable rodent holes or cracks that would be grouted in this section of the levee.



# Completed Habitat Survey Datasheets












Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

*\* Revisit 30 15 // to levee*



-  Strip Map
-  CNDDB GGS
-  1mibuffer
-  Levee Lines
-  canal\_lines



Yolo Bypass Levee Setback Project

GGS Survey  
Field Work Map



# FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID: 1

Date: 8-17-16 Staff Name(s): G. Bohner S. Chun <sup>entire no drain</sup> Levee Unit: 22-19 Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 229157 File Name: 1/0/05+back II 08172016 Point Name: GG8101

HABITAT ATTRIBUTE	(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]		
1 Still or slow-flowing water over silt or mud substrate	+(1)	
2 Flowing water over sand, gravel, rock or cement substrate	-(0)	
3 Water availability:		
a) winter runoff or sporadic availability (i.e. ephemeral)	+(1)	
b) April through October (i.e. irrigation for crops)	+(1)	
c) all year (i.e. perennial marsh or channel)	+(1)	
4 Site subject to severe seasonal flooding (i.e. within bypass)	-(1)	
5 Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+(3)	
6 Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+(2)	
Subtotal:	8	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]		
7 Banks:		
a) Banks are sunny <u>10% - 30%</u>	+(2) %	
b) Banks shaded by overstory vegetation (i.e. trees, riparian)	-(2) %	
8 Vegetation in the aquatic habitat:		
a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+(2) %	
b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	-(0)	
9 Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+(3) %	
10 Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+(1)	
Subtotal:	6	
<b>Predator/Prey</b> [0 = absent, 1 = present]		
11 Prey fish present (i.e. small carp, mosquitofish, blackfish)	+(1)	
12 Prey amphibians present (i.e. chorus frog, small bull frog)	+(1)	
13 Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	-(1)	
Subtotal:	1	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]		
14 Natural marsh, wetland, mitigation bank, or manmade pond		
a) functions ecologically as a wetland	+(0)	
b) functions for recreational use (i.e. fishing, boating, water skiing)	-(0)	
15 Rice fields (fallow or flooded)	+(1)	
16 Upland habitat other than levee for winter refugia (above high water mark)	+(0)	
17 Row crop, orchard, pasture, or other agricultural	-(1)	
18 Urban or developed public area	-(0)	
Subtotal:	0	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]		
19 Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+(1)	
20 Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+(1)	
21 Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	-(0)	
Subtotal:	2	
<b>TOTAL SCORE:</b>		<b>17</b>
22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes	<input type="checkbox"/> no
23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input checked="" type="checkbox"/> yes	<input type="checkbox"/> no
Photo #'s: <u>1943-1945</u> <u>1955-1957</u> <u>2003-05</u> <u>2010-2012</u>	Reviewer(s): <u>taken @ GGS pt 111 from GGS12</u>	
Date: _____		

↑ additional photos taken from GGS104 looking at waterside





**FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets**

Date: 8-17-16 Staff Name(s): G. Bohn Schum Levee Unit: 22-34 Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: 15 (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 229157 File Name: YoloSetbackII 08172016 Point Name: 668102

HABITAT ATTRIBUTE		(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+ (0)	
2	Flowing water over sand, gravel, rock or cement substrate	- (0)	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+ (1)	
	b) April through October (i.e. irrigation for crops)	+ (1)	
	c) all year (i.e. perennial marsh or channel)	+ (0)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	- (0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+ (3)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+ (0)	
Subtotal:		5	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1 = 9-24%; 2 = 25-74%; 3 = 75-100%]			
7	Banks:		
	a) Banks are sunny	+ (3) %	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	- (0) %	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ (2) %	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	- (1)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ (2) %	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+ (1)	
Subtotal:		5	
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ (0)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+ (0)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- (0)	
Subtotal:		0	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+ (1)	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	- (0)	
15	Rice fields (fallow or flooded)	+ (1)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+ (0)	
17	Row crop, orchard, pasture, or other agricultural	- (1)	
18	Urban or developed public area	- (0)	
Subtotal:		1	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ (1)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ (1)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- (0)	
Subtotal:		2	
<b>TOTAL SCORE:</b>		13	

22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?  yes  no  
 23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?  yes  no

Photo #'s: 1946-1948 [ 1949-1951 | 1952-1954 ] Date: \_\_\_\_\_  
 Reviewer(s): \_\_\_\_\_

(additional photos from other pts along canal)



# FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID: 3

Date: 8-26-16 Staff Name(s): G. Palmer Schen Levee Unit: 7-? Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee? sidelane  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 229157 File Name: paloset\acdm\107262016 Point Name: G6S107

HABITAT ATTRIBUTE	(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]		
1 Still or slow-flowing water over silt or mud substrate	+ (1)	
2 Flowing water over sand, gravel, rock or cement substrate	- (0)	
3 Water availability:		
a) winter runoff or sporadic availability (i.e. ephemeral)	+ (1)	
b) April through October (i.e. irrigation for crops)	+ (1)	
c) all year (i.e. perennial marsh or channel)	+ (1)	
4 Site subject to severe seasonal flooding (i.e. within bypass)	- (0)	
5 Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+ (1)	
6 Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+ (0)	
Subtotal:	5	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]		
7 Banks:		
a) Banks are sunny	+ (2) %	
b) Banks shaded by overstory vegetation (i.e. trees, riparian)	- (2) %	
8 Vegetation in the aquatic habitat:		
a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ (2) %	
b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	- (0)	
9 Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ (2) %	
10 Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+ (1)	
Subtotal:	5	
<b>Predator/Prey</b> [0 = absent, 1 = present]		
11 Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ (1)	
12 Prey amphibians present (i.e. chorus frog, small bull frog)	+ (1)	
13 Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- (1)	
Subtotal:	1	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]		
14 Natural marsh, wetland, mitigation bank, or manmade pond		
a) functions ecologically as a wetland	+ (1)	
b) functions for recreational use (i.e. fishing, boating, water skiing)	- (0)	
15 Rice fields (fallow or flooded)	+ (1)	
16 Upland habitat other than levee for winter refugia (above high water mark)	+ (6)	
17 Row crop, orchard, pasture, or other agricultural	- (1)	
18 Urban or developed public area	- (0)	
Subtotal:	1	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]		
19 Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ (1)	
20 Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ (1)	
21 Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- (1)	
Subtotal:	1	
<b>TOTAL SCORE:</b>		13

22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?  yes  no  
 23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?  yes  no  
 Photo #'s: 1979-1981 1982-1985 1987  
 Reviewer(s): \_\_\_\_\_ Date: \_\_\_\_\_



**FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets**

Datasheet ID: 4

Date: 8-26-16 Staff Name(s): G. Richter S. Chen Levee Unit: 36 Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 229157 File Name: ycosstheadm1082616 Point Name: 665106

<b>HABITAT ATTRIBUTE</b>		<b>(SCORE)</b>	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+ (0)	
2	Flowing water over sand, gravel, rock or cement substrate	- (0)	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+ (1)	
	b) April through October (i.e. irrigation for crops)	+ (1)	
	c) all year (i.e. perennial marsh or channel)	+ (0)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	- (0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+ (3)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+ (0)	
	Subtotal:	<u>5</u>	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]			
7	Banks:		
	a) Banks are sunny	+ (1) %	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	- (0) %	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ (1) %	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	- (1)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ (2) %	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+ (1)	
	Subtotal:	<u>4</u>	
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ (0)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+ (0)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- (0)	
	Subtotal:	<u>0</u>	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+ (4)	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	- (0)	
15	Rice fields (fallow or flooded)	+ (1)	across the reach
16	Upland habitat other than levee for winter refugia (above high water mark)	+ (0)	
17	Row crop, orchard, pasture, or other agricultural	- (1)	
18	Urban or developed public area	- (1)	
	Subtotal:	<u>1</u>	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ (1)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ (1)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- (0)	
	Subtotal:	<u>2</u>	
<b>TOTAL SCORE:</b>		<u>12</u>	
22	Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes <input type="checkbox"/> no	
23	Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Photo #'s: <u>1975-1978</u>			
Reviewer(s): _____		Date: _____	



# FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID: 5

Date: 7-26-16 Staff Name(s): G. Bohner S-chen Levee Unit: 35 Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: 1.25  
 GPS Name: 229157 File Name: yolooselbcdmIF08262016 Point Name: 665105

HABITAT ATTRIBUTE	(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]		
1 Still or slow-flowing water over silt or mud substrate	+(0)	
2 Flowing water over sand, gravel, rock or cement substrate	-(0)	
3 Water availability:		
a) winter runoff or sporadic availability (i.e. ephemeral)	+(1)	
b) April through October (i.e. irrigation for crops)	+(1)	
c) all year (i.e. perennial marsh or channel)	+(0)	
4 Site subject to severe seasonal flooding (i.e. within bypass)	-(0)	
5 Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+(3)	
6 Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+(0)	
Subtotal:	<u>5</u>	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]		
7 Banks:		
a) Banks are sunny	+(2) %	
b) Banks shaded by overstory vegetation (i.e. trees, riparian)	-(0) %	
8 Vegetation in the aquatic habitat:		
a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+(1) %	
b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	-(1)	
9 Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+(2) %	
10 Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+(1)	
Subtotal:	<u>3</u>	
<b>Predator/Prey</b> [0 = absent, 1 = present]		
11 Prey fish present (i.e. small carp, mosquitofish, blackfish)	+(0)	
12 Prey amphibians present (i.e. chorus frog, small bull frog)	+(0)	
13 Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	-(0)	
Subtotal:	<u>0</u>	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]		
14 Natural marsh, wetland, mitigation bank, or manmade pond		
a) functions ecologically as a wetland	+(1)	
b) functions for recreational use (i.e. fishing, boating, water skiing)	-(0)	
15 Rice fields (fallow or flooded)	+(1)	
16 Upland habitat other than levee for winter refugia (above high water mark)	+(0)	
17 Row crop, orchard, pasture, or other agricultural	-(1)	
18 Urban or developed public area	-(0)	
Subtotal:	<u>1</u>	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]		
19 Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+(1)	<u>NA</u>
20 Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+(1)	<u>NA</u>
21 Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	-(0)	<u>NA</u>
Subtotal:	<u>2</u>	<u>0</u>
<b>TOTAL SCORE:</b>		
	<u>18</u>	
22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes	<input type="checkbox"/> no
23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes	<input type="checkbox"/> no
Photo #'s: <u>1972-1974</u>		
Reviewer(s):		Date:



# FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID: 6

Date: 8-26-16 Staff Name(s): G. Baker & S. Chun Levee Unit: 30 Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 229157 File Name: VolusiaCoAH#08172016 Point Name: 66S108

HABITAT ATTRIBUTE	(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]		
1 Still or slow-flowing water over silt or mud substrate	+ (0)	
2 Flowing water over sand, gravel, rock or cement substrate	- (0)	
3 Water availability:		
a) winter runoff or sporadic availability (i.e. ephemeral)	+ (1)	
b) April through October (i.e. irrigation for crops)	+ (1)	
c) all year (i.e. perennial marsh or channel)	+ (0)	
4 Site subject to severe seasonal flooding (i.e. within bypass)	- (0)	
5 Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+ (1)	
6 Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+ (0)	
Subtotal:	3	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]		
7 Banks:		
a) Banks are sunny	+ (3) %	
b) Banks shaded by overstory vegetation (i.e. trees, riparian)	- (0) %	
8 Vegetation in the aquatic habitat:		
a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ (0) %	
b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	- (1)	
9 Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ (0) %	
10 Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+ (0)	
Subtotal:	2	
<b>Predator/Prey</b> [0 = absent, 1 = present]		
11 Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ (0)	
12 Prey amphibians present (i.e. chorus frog, small bull frog)	+ (0)	
13 Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- (0)	
Subtotal:	0	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]		
14 Natural marsh, wetland, mitigation bank, or manmade pond		
a) functions ecologically as a wetland	+ (0)	
b) functions for recreational use (i.e. fishing, boating, water skiing)	- (0)	
15 Rice fields (fallow or flooded)	+ (0)	
16 Upland habitat other than levee for winter refugia (above high water mark)	+ (0)	
17 Row crop, orchard, pasture, or other agricultural	- (1)	
18 Urban or developed public area	- (0)	
Subtotal:	-1	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]		
19 Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ (0)	
20 Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ (0)	
21 Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- (0)	
Subtotal:	0	
<b>TOTAL SCORE:</b>		<b>4</b>
22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes	<input type="checkbox"/> no
23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes	<input type="checkbox"/> no
Photo #'s: <u>1988-1990</u>		
Reviewer(s):		Date:



# FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID:

7

Date: 8-17-16 Staff Name(s): G. B. and S. Chun Levee Unit: 31 Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 229157 File Name: YolosabedchIT08172016 Point Name: GG8104

**HABITAT ATTRIBUTE**

(SCORE)

Review

**Water**

[0 = absent, 1 = present]

1	Still or slow-flowing water over silt or mud substrate	+ (0)	
2	Flowing water over sand, gravel, rock or cement substrate	- (0)	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+ (1)	
	b) April through October (i.e. irrigation for crops)	+ (1)	
	c) all year (i.e. perennial marsh or channel)	+ (0)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	- (0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+ (3)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+ (0)	
Subtotal:		5	

**Basking/Refugia (Active Season)**

% = [0 = 0%; 1 = 9-24%; 2 = 25-74%; 3 = 75-100%]

7	Banks:		
	a) Banks are sunny	+ (0) %	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	- (3) %	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ (1) %	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	- (1)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ (1) %	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+ (1)	
Subtotal:		- 1	

**Predator/Prey**

[0 = absent, 1 = present]

11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ (0)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+ (0)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- (0)	
Subtotal:		0	

**Adjacent Land Use**

[0 = absent, 1 = present]

14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+ (0)	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	- (3)	
15	Rice fields (fallow or flooded)	+ (1)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+ (0)	
17	Row crop, orchard, pasture, or other agricultural	- (1)	
18	Urban or developed public area	- (0)	
Subtotal:		0	

**Levee (footprint of rodent damage repair activities)**

[0 = absent, 1 = present]

19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ (1)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ (1)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- (0)	
Subtotal:		2	

**TOTAL SCORE:**

6

22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?  yes  no

23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?  yes  no

Photo #'s: 1952-1954

Reviewer(s):

Date:



FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID: 8

Date: 8-17-16 Staff Name(s): G. Schie Schen Levee Unit: 29 Levee Mile(s):  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 229157 File Name: yalosalbachm108172016 Point Name: 668103

HABITAT ATTRIBUTE		(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+ (0)	
2	Flowing water over sand, gravel, rock or cement substrate	- (0)	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+ (1)	
	b) April through October (i.e. irrigation for crops)	+ (1)	
	c) all year (i.e. perennial marsh or channel)	+ (0)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	- (0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+ (3)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+ (0)	
Subtotal:		5	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]			
7	Banks:		
	a) Banks are sunny	+ (2) %	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	- (0) %	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ (0) %	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	- (1)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ (1) %	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+ (1)	
Subtotal:		3	
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ (0)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+ (0)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- (0)	
Subtotal:		0	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+ (0)	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	- (0)	
15	Rice fields (fallow or flooded)	+ (0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+ (0)	
17	Row crop, orchard, pasture, or other agricultural	- (1)	
18	Urban or developed public area	- (0)	
Subtotal:		-1	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ (1)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ (1)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- (0)	
Subtotal:		2	
<b>TOTAL SCORE:</b>		9	
22	Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input checked="" type="checkbox"/> yes <input type="checkbox"/> no	
23	Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Photo #'s: 1949-1951			
Reviewer(s):			Date:

dry  
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 counter



FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID: 9

Date: 8-17-16 Staff Name(s): G. Bohler S. Chun Levee Unit: 25 Levee Mile(s):  
 Survey on: Waterside  or Landside  Distance from levee toe: 30 (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length:  
 GPS Name: 229157 File Name: Yd05elbecVIT08172016 Point Name: EGS 102 1

**HABITAT ATTRIBUTE**

(SCORE)

Review

**Water**

[0 = absent, 1 = present]

- 1 Still or slow-flowing water over silt or mud substrate + (0)
- 2 Flowing water over sand, gravel, rock or cement substrate - (0)
- 3 Water availability:
  - a) winter runoff or sporadic availability (i.e. ephemeral) + (1)
  - b) April through October (i.e. irrigation for crops) + (1)
  - c) all year (i.e. perennial marsh or channel) + (0)
- 4 Site subject to severe seasonal flooding (i.e. within bypass) - (0)
- 5 Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0] + (3)
- 6 Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0] + (0)

Subtotal: 5

**Basking/Refugia (Active Season)**

% = [0 = 0%; 1 = 9-24%; 2 = 25-74%; 3 = 75-100%]

- 7 Banks:
  - a) Banks are sunny + (2) %
  - b) Banks shaded by overstory vegetation (i.e. trees, riparian) - (0) %
- 8 Vegetation in the aquatic habitat:
  - a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose) + (0) %
  - b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present] - (1)
- 9 Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap) + (1) %
- 10 Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present] + (1)

Subtotal: 3

**Predator/Prey**

[0 = absent, 1 = present]

- 11 Prey fish present (i.e. small carp, mosquitofish, blackfish) + (0)
- 12 Prey amphibians present (i.e. chorus frog, small bull frog) + (0)
- 13 Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source) - (0)

Subtotal: 0

**Adjacent Land Use**

[0 = absent, 1 = present]

- 14 Natural marsh, wetland, mitigation bank, or manmade pond
  - a) functions ecologically as a wetland + (0)
  - b) functions for recreational use (i.e. fishing, boating, water skiing) - (0)
- 15 Rice fields (fallow or flooded) + (0)
- 16 Upland habitat other than levee for winter refugia (above high water mark) + (0)
- 17 Row crop, orchard, pasture, or other agricultural - (1)
- 18 Urban or developed public area - (0)

Subtotal: 7

**Levee (footprint of rodent damage repair activities)**

[0 = absent, 1 = present]

- 19 Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap) + (1)
- 20 Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?) + (1)
- 21 Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing) - (0)

Subtotal: 2

**TOTAL SCORE:**

9

- 22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?  yes  no
- 23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?  yes  no

Photo #'s: 1946-48

Reviewer(s):

Date:

no levee

Label completed dry



# FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID: 10

Date: 9-1-16 Staff Name(s): G. Bohrer S. Chun Levee Unit: 37 Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 229157 File Name: 4060262016 Point Name: 66S110

<b>HABITAT ATTRIBUTE</b>		(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+ (0)	
2	Flowing water over sand, gravel, rock or cement substrate	- (0)	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+ (1)	
	b) April through October (i.e. irrigation for crops)	+ (1)	
	c) all year (i.e. perennial marsh or channel)	+ (0)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	- (0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+ (3)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+ (0)	
Subtotal:		<u>5</u>	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]			
7	Banks:		
	a) Banks are sunny	+ (3) %	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	- (0) %	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ (1) %	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	- (1)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ (1) %	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+ (1)	
Subtotal:		<u>5</u>	
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ (0)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+ (0)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- (0)	
Subtotal:		<u>0</u>	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+ (1)	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	- (1)	
15	Rice fields (fallow or flooded)	+ (0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+ (0)	
17	Row crop, orchard, pasture, or other agricultural	- (1)	
18	Urban or developed public area	- (0)	
Subtotal:		<u>- 1</u>	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ (1)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ (1)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- (1)	
Subtotal:		<u>1</u>	
<b>TOTAL SCORE:</b>		<u>9</u>	
22	Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes <input type="checkbox"/> no	
23	Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Photo #'s: <u>1993-96</u>			
Reviewer(s): _____			Date: _____

Check  
spots

dry  
field  
verify  
could be  
unusable



FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID: 11

Date: 9-1-16 Staff Name(s): G. Bohm, S. Chan Levee Unit: 38 Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 229157 File Name: 10105041020108262016 Point Name: GGS111

HABITAT ATTRIBUTE		(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+ (0)	
2	Flowing water over sand, gravel, rock or cement substrate	- (0)	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+ (1)	
	b) April through October (i.e. irrigation for crops)	+ (1)	
	c) all year (i.e. perennial marsh or channel)	+ (0)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	- (0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+ (3)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+ (0)	
	Subtotal:	5	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]			
7	Banks:		
	a) Banks are sunny	+ (1) %	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	- (0) %	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ (0) %	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	- (1)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ (1) %	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+ (1)	
	Subtotal:	2	
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ (0)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+ (0)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- (0)	
	Subtotal:	0	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+ (1)	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	- (1)	
15	Rice fields (fallow or flooded)	+ (0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+ (0)	
17	Row crop, orchard, pasture, or other agricultural	- (1)	
18	Urban or developed public area	- (0)	
	Subtotal:	- 1	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ (1)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ (1)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- (1)	
	Subtotal:	1	
<b>TOTAL SCORE:</b>		7	
22	Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes <input type="checkbox"/> no	
23	Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Photo #'s:	<u>1999-2002</u>		
Reviewer(s):		Date:	



Comments

Water: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Basking/Refugia: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Predator/Prey: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Adjacent land use: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Disturbance: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Side Ag canal

Datasheet ID: 12

FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Date: 9/1 Staff Name(s): Heather White/Erica H. ronald Levee Unit: 887 Levee Mile(s):  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: \_\_\_\_\_ File Name: \_\_\_\_\_ Point Name: \_\_\_\_\_

HABITAT ATTRIBUTE		(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+(0)	
2	Flowing water over sand, gravel, rock or cement substrate	-(1)	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+(0)	
	b) April through October (i.e. irrigation for crops)	+(1)	
	c) all year (i.e. perennial marsh or channel)	+(0)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	-(0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+(2)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+(0)	
Subtotal:		2	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]			
7	Banks:		
	a) Banks are sunny	+(2)%	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	-(1)%	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+(1)%	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	-(1)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+(3)%	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+(1)	
Subtotal:		4	
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+(0)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+(0)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	-(0)	
Subtotal:		0	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+(0)	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	-(0)	
15	Rice fields (fallow or flooded)	+(0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+(0)	
17	Row crop, orchard, pasture, or other agricultural	-(1)	
18	Urban or developed public area	-(0)	
Subtotal:		1	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+(1)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+(1)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	-(0)	
Subtotal:		2	
<b>TOTAL SCORE:</b>		7	
22	Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes <input type="checkbox"/> no	
23	Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Photo #'s: 3145 3146			
Reviewer(s):			Date:

**Comments**

Water: 1 end of canal is full of sand; the other end has emergent wetland veg.

Basking/Refugia:

Predator/Prey: Raptors in area.

Adjacent land use: tomatoes on one side; levee of toe road on other side

Disturbance: Ag.



# FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID:

13

Date: 9-1-16 Staff Name(s): G. Bohrer, S. Chun Levee Unit: 8-10.5 Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 229157 File Name: yolo set back II 08262016 Point Name: 06S 110

<b>HABITAT ATTRIBUTE</b>		(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+ ( 1 )	
2	Flowing water over sand, gravel, rock or cement substrate	- ( 0 )	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+ ( 1 )	
	b) April through October (i.e. irrigation for crops)	+ ( 1 )	
	c) all year (i.e. perennial marsh or channel)	+ ( 0 )	
4	Site subject to severe seasonal flooding (i.e. within bypass)	- ( 0 )	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+ ( 3 )	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+ ( 0 )	
Subtotal:		6	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]			
7	Banks:		
	a) Banks are sunny	+ ( 3 ) %	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	- ( 0 ) %	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ ( 3 ) %	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	- ( 1 )	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ ( 2 ) %	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+ ( 1 )	
Subtotal:		8	
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ ( 0 )	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+ ( 0 )	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- ( 0 )	
Subtotal:		0	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+ ( 1 )	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	- ( 1 )	
15	Rice fields (fallow or flooded)	+ ( 0 )	
16	Upland habitat other than levee for winter refugia (above high water mark)	+ ( 0 )	
17	Row crop, orchard, pasture, or other agricultural	- ( 1 )	
18	Urban or developed public area	- ( 0 )	
Subtotal:		- 1	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ ( 1 )	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ ( 1 )	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- ( 1 )	
Subtotal:		1	
<b>TOTAL SCORE:</b>		14	
22	Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes <input type="checkbox"/> no	
23	Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Photo #'s: <u>1993-97</u>			
Reviewer(s): _____		Date: _____	

could?

**Comments**

Water: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Basking/Refugia: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Predator/Prey: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Adjacent land use: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Disturbance: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



# FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID: 14

Date: 9-1-16 Staff Name(s): G. Bohner & S. Chen Levee Unit: 10.5-13.7<sup>s</sup> Levee Mile(s): 14  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 229157 File Name: yolosel\bohn\105172016 Point Name: 665112

**HABITAT ATTRIBUTE**

(SCORE) Review

Water [0 = absent, 1 = present]

1	Still or slow-flowing water over silt or mud substrate	+ (0)	
2	Flowing water over sand, gravel, rock or cement substrate	- (0)	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+ (1)	
	b) April through October (i.e. irrigation for crops)	+ (1)	
	c) all year (i.e. perennial marsh or channel)	+ (0)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	- (0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+ (3)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+ (0)	
Subtotal:		5	

Basking/Refugia (Active Season) %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]

7	Banks:		
	a) Banks are sunny	+ (2) %	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	- (1) %	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ (2) %	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	- (1)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ (2) %	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+ (1)	
Subtotal:		5	

Predator/Prey [0 = absent, 1 = present]

11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ (0)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+ (0)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- (0)	
Subtotal:		0	

Adjacent Land Use [0 = absent, 1 = present]

14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+ (1)	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	- (0)	
15	Rice fields (fallow or flooded)	+ (0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+ (0)	
17	Row crop, orchard, pasture, or other agricultural	- (1)	
18	Urban or developed public area	- (0)	
Subtotal:		0	

Levee (footprint of rodent damage repair activities) [0 = absent, 1 = present]

19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ (1)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ (1)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- (0)	
Subtotal:		2	

**TOTAL SCORE:**

12

22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?  yes  no  
 23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?  yes  no

Photo #'s: 2006 2007-09 Reviewer(s): \_\_\_\_\_ Date: \_\_\_\_\_

2  
 10.5  
 10.5

**Comments**

Water: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Basking/Refugia: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Predator/Prey: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Adjacent land use: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Disturbance: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_





FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Date: 9-1-16 Staff Name(s): G. Bohner S. Chun Levee Unit: 1305-19 Levee Mile(s):  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 20957 File Name: photos\bochner\110917\2016 Point Name: GGS114

**HABITAT ATTRIBUTE**

(SCORE)

Review

**Water**

[0 = absent, 1 = present]

- 1 Still or slow-flowing water over silt or mud substrate + (1)
- 2 Flowing water over sand, gravel, rock or cement substrate - (0)
- 3 Water availability:
  - a) winter runoff or sporadic availability (i.e. ephemeral) + (1)
  - b) April through October (i.e. irrigation for crops) + (1)
  - c) all year (i.e. perennial marsh or channel) + (0)
- 4 Site subject to severe seasonal flooding (i.e. within bypass) - (0)
- 5 Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0] + (3)
- 6 Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0] + (0)

Subtotal: 6

**Basking/Refugia (Active Season)**

% = [0 = 0%; 1 = 9-24%; 2 = 25-74%; 3 = 75-100%]

- 7 Banks:
  - a) Banks are sunny + (2) %
  - b) Banks shaded by overstory vegetation (i.e. trees, riparian) - (1) %
- 8 Vegetation in the aquatic habitat:
  - a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose) + (3) %
  - b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present] - (0)
- 9 Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap) + (2) %
- 10 Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present] + (1)

Subtotal: 7

**Predator/Prey**

[0 = absent, 1 = present]

- 11 Prey fish present (i.e. small carp, mosquitofish, blackfish) + (1)
- 12 Prey amphibians present (i.e. chorus frog, small bull frog) + (1)
- 13 Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source) - (0)

Subtotal: 2

**Adjacent Land Use**

[0 = absent, 1 = present]

- 14 Natural marsh, wetland, mitigation bank, or manmade pond
  - a) functions ecologically as a wetland + (1)
  - b) functions for recreational use (i.e. fishing, boating, water skiing) - (0)
- 15 Rice fields (fallow or flooded) + (0)
- 16 Upland habitat other than levee for winter refugia (above high water mark) + (0)
- 17 Row crop, orchard, pasture, or other agricultural - (1)
- 18 Urban or developed public area - (0)

Subtotal: 0

**Levee (footprint of rodent damage repair activities)**

[0 = absent, 1 = present]

- 19 Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap) + (1)
- 20 Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?) + (1)
- 21 Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing) - (0)

Subtotal: 2

**TOTAL SCORE: 17**

22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?  yes  no

23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?  yes  no

Photo #'s: 2015-17

Reviewer(s):

Date:



**Comments**

Water: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Basking/Refugia: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Predator/Prey: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Adjacent land use: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Disturbance: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Marginal

Datasheet ID: 16

FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Date: 8/26 Staff Name(s): H. White & Hironaka Levee Unit: 20-21 Levee Mile(s):  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 229158 File Name: Yologgs 0826 10 Point Name: GGS 15

**HABITAT ATTRIBUTE**

**Water** [0 = absent, 1 = present] (SCORE) Review

- 1 Still or slow-flowing water over silt or mud substrate + (1)
- 2 Flowing water over sand, gravel, rock or cement substrate - (0)
- 3 Water availability:
  - a) winter runoff or sporadic availability (i.e. ephemeral) + (1)
  - b) April through October (i.e. irrigation for crops) + (1)
  - c) all year (i.e. perennial marsh or channel) + (1)
- 4 Site subject to severe seasonal flooding (i.e. within bypass) - (0)
- 5 Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0] + (2)
- 6 Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0] + (2)

Subtotal: 8

**Basking/Refugia (Active Season)**

%= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]

- 7 Banks:
  - a) Banks are sunny + (1) %
  - b) Banks shaded by overstory vegetation (i.e. trees, riparian) - (2) %
- 8 Vegetation in the aquatic habitat:
  - a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose) + (3) %
  - b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present] - (0)
- 9 Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap) + (3) %
- 10 Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present] + (0)

Subtotal: 5

**Predator/Prey**

[0 = absent, 1 = present]

- 11 Prey fish present (i.e. small carp, mosquitofish, blackfish) + (1)
- 12 Prey amphibians present (i.e. chorus frog, small bull frog) + (1)
- 13 Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source) - (1)

Subtotal: 1

**Adjacent Land Use**

[0 = absent, 1 = present]

- 14 Natural marsh, wetland, mitigation bank, or manmade pond
  - a) functions ecologically as a wetland + (0)
  - b) functions for recreational use (i.e. fishing, boating, water skiing) - (0)
- 15 Rice fields (fallow or flooded) + (0)
- 16 Upland habitat other than levee for winter refugia (above high water mark) + (0)
- 17 Row crop, orchard, pasture, or other agricultural - (1)
- 18 Urban or developed public area - (0)

Subtotal: -1

**Levee (footprint of rodent damage repair activities)**

[0 = absent, 1 = present]

- 19 Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap) + (N/A)
- 20 Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?) + (N/A)
- 21 Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing) - (N/A)

Subtotal: N/A

**TOTAL SCORE: 13**

- 22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?  yes  no
- 23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?  yes  no

Photo #'s: 3083 — 3085  
 Reviewer(s): \_\_\_\_\_ Date: \_\_\_\_\_

Redundant

Comments

Water: Still ag ditch with duckweed ~~and~~ aquatic fern.  
Open water.

Basking/Refugia: Blackberry thick on south bank. North bank  
has tules, blackberries and poison oak. Oak trees, box elders,  
tree of heaven, and willows scattered on banks

Predator/Prey:

Adjacent land use: ~~Past~~ roamed hay

Disturbance: Ag machinery



Suitable

code 1616

Datasheet ID:

17

FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Date: 8/26 Staff Name(s): H White, E Honaka Levee Unit: 50 Levee Mile(s):  
 Survey on: Waterside  or Landside  Distance from levee toe: 100 (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length:  
 GPS Name: 229158 File Name: Y000665082616 Point Name: 66510

**HABITAT ATTRIBUTE**

(SCORE)

Review

**Water**

[0 = absent, 1 = present]

- 1 Still or slow-flowing water over silt or mud substrate + (1)
- 2 Flowing water over sand, gravel, rock or cement substrate - (0)
- 3 Water availability:
  - a) winter runoff or sporadic availability (i.e. ephemeral) + (1)
  - b) April through October (i.e. irrigation for crops) + (1)
  - c) all year (i.e. perennial marsh or channel) + (1)
- 4 Site subject to severe seasonal flooding (i.e. within bypass) - (0)
- 5 Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0] + (2)
- 6 Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0] + (2)

Subtotal: 8

**Basking/Refugia (Active Season)**

% = [0 = 0%; 1 = 9-24%; 2 = 25-74%; 3 = 75-100%]

- 7 Banks:
  - a) Banks are sunny + (2) %
  - b) Banks shaded by overstory vegetation (i.e. trees, riparian) - (1) %
- 8 Vegetation in the aquatic habitat:
  - a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose) + (3) %
  - b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present] - (0)
- 9 Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap) + (3) %
- 10 Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present] + (1)

Subtotal: 8

**Predator/Prey**

[0 = absent, 1 = present]

- 11 Prey fish present (i.e. small carp, mosquitofish, blackfish) + (1)
- 12 Prey amphibians present (i.e. chorus frog, small bull frog) + (1)
- 13 Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source) - (1)

Subtotal: 1

**Adjacent Land Use**

[0 = absent, 1 = present]

- 14 Natural marsh, wetland, mitigation bank, or manmade pond
  - a) functions ecologically as a wetland + (0)
  - b) functions for recreational use (i.e. fishing, boating, water skiing) - (0)
- 15 Rice fields (fallow or flooded) + (0)
- 16 Upland habitat other than levee for winter refugia (above high water mark) + (0)
- 17 Row crop, orchard, pasture, or other agricultural - (1)
- 18 Urban or developed public area - (0)

Subtotal: -1

**Levee (footprint of rodent damage repair activities)**

[0 = absent, 1 = present]

- 19 Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap) + (N/A)
- 20 Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?) + (N/A)
- 21 Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing) - (N/A)

Subtotal: N/A

**TOTAL SCORE:**

16

22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?  yes  no

23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?  yes  no

Photo #'s: ~~3075~~ 3075 3076

Reviewer(s):

Date:

**Comments**

Water: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Basking/Refugia: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Predator/Prey: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Adjacent land use: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Disturbance: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



Marginal

Datasheet ID: 18

FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Date: 8/26/16 Staff Name(s): Heather White & Erica Hironaka Levee Unit: 51 Levee Mile(s):  
 Survey on: Waterside  or Landside  Distance from levee toe: 10 (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length:  
 GPS Name: 229158 File Name: Yolo ggs 08 26 16 Point Name: GGS11

HABITAT ATTRIBUTE		(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+(1)	
2	Flowing water over sand, gravel, rock or cement substrate	-(0)	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+(1)	
	b) April through October (i.e. irrigation for crops)	+(1)	
	c) all year (i.e. perennial marsh or channel)	+(1)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	-(0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+(2)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+(2)	
Subtotal:		8	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]			
7	Banks:		
	a) Banks are sunny	+(1)%	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	-(3)%	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+(3)%	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	-(1)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+(3)%	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+(1)	
Subtotal:		4	
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+(1)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+(1)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	-(1)	
Subtotal:		1	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+(0)	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	-(0)	
15	Rice fields (fallow or flooded)	+(0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+(0)	
17	Row crop, orchard, pasture, or other agricultural	-(1)	
18	Urban or developed public area	-(0)	
Subtotal:		1	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+( )	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+( )	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	-( )	
Subtotal:		NA	
<b>TOTAL SCORE:</b>		12	
22	Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes <input type="checkbox"/> no	
23	Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Photo #'s: IMG-3061 to IMG 3071			
Reviewer(s): 3068		Date:	
3067			
3063			
3062			

**Comments**

Water: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Basking/Refugia: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Predator/Prey: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Adjacent land use: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Disturbance: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



# FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID: 19A

Date: 7/1 Staff Name(s): Heather White / Erica Thronaka Levee Unit: 46 & 47 Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: \_\_\_\_\_ File Name: \_\_\_\_\_ Point Name: GGS 17

No levee, only berm next to canal

HABITAT ATTRIBUTE	(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]		
1 Still or slow-flowing water over silt or mud substrate	+ (0)	
2 Flowing water over sand, gravel, rock or cement substrate	- (0)	
3 Water availability:		
a) winter runoff or sporadic availability (i.e. ephemeral)	+ (0)	
b) April through October (i.e. irrigation for crops)	+ (1)	
c) all year (i.e. perennial marsh or channel)	+ (0)	
4 Site subject to severe seasonal flooding (i.e. within bypass)	- (0)	
5 Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+ (2)	
6 Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+ (0)	
Subtotal:	3	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]		
7 Banks:		
a) Banks are sunny	+ (2) %	
b) Banks shaded by overstory vegetation (i.e. trees, riparian)	- (0) %	
8 Vegetation in the aquatic habitat:		
a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ (3) %	
b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	- (1)	
9 Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ (2) %	
10 Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+ (1)	
Subtotal:	6	
<b>Predator/Prey</b> [0 = absent, 1 = present]		
11 Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ (0)	
12 Prey amphibians present (i.e. chorus frog, small bull frog)	+ (0)	
13 Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- (0)	
Subtotal:	0	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]		
14 Natural marsh, wetland, mitigation bank, or manmade pond		
a) functions ecologically as a wetland	+ (0)	
b) functions for recreational use (i.e. fishing, boating, water skiing)	- (0)	
15 Rice fields (fallow or flooded)	+ (0)	
16 Upland habitat other than levee for winter refugia (above high water mark)	+ (0)	
17 Row crop, orchard, pasture, or other agricultural	- (1)	
18 Urban or developed public area	- (0)	
Subtotal:	-1	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]		
19 Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ (0)	
20 Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ (0)	
21 Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- (0)	
Subtotal:	0	
<b>TOTAL SCORE:</b>		8

22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?  yes  no  
 23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?  yes  no

Photo #'s: 3130 3131 \_\_\_\_\_  
 Reviewer(s): \_\_\_\_\_ Date: \_\_\_\_\_

Comments

Water: No water present. Dry ag. canal.

Basking/Refugia: lots of ground squirrels on both sides of road. Road on either side of canal for basking.

Predator/Prey: Ø

Adjacent land use: Row crops & Hay field  
↑ tomato                      ↓ Recently harvested.

Disturbance: Ag.

Not suitable habitat by our estimation, even though it scores as marginal.



FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID: 196

Date: 9/1 Staff Name(s): Heather White/Janca Thronke Levee Unit: 46 & 47 Levee Mile(s):  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: \_\_\_\_\_ File Name: \_\_\_\_\_ Point Name: GGS 18

next to levee

HABITAT ATTRIBUTE		(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+ (0)	
2	Flowing water over sand, gravel, rock or cement substrate	- (0)	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+ (0)	
	b) April through October (i.e. irrigation for crops)	+ (1)	
	c) all year (i.e. perennial marsh or channel)	+ (0)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	- (0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+ (2)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+ (0)	
	Subtotal:	3	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]			
7	Banks:		
	a) Banks are sunny	+ (3) %	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	- (0) %	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ (0) %	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	- (0)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ (2) %	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+ (1)	
	Subtotal:	6	
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ (0)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+ (0)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- (0)	
	Subtotal:	0	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+ (0)	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	- (0)	
15	Rice fields (fallow or flooded)	+ (0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+ (0)	
17	Row crop, orchard, pasture, or other agricultural	- (1)	
18	Urban or developed public area	- (0)	
	Subtotal:	-1	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ (0)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ (0)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- (0)	
	Subtotal:	0	
<b>TOTAL SCORE:</b>		8	

22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?  yes  no  
 23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?  yes  no

Photo #'s: 3132 3133 3135  
 Reviewer(s): \_\_\_\_\_ Date: \_\_\_\_\_

Comments

Water: No water present

Basking/Refugia: Could use basking/surface refugia from adjacent ag canals ~~with~~

Predator/Prey: Many raptors sighted

Adjacent land use: tomatoe and fallow fields

Disturbance: Ag disturbance is high. Likely to be filled over at end of season

Not suitable habitat based on visual estimates but still scores as marginal



Suitable

Datasheet ID: 20

FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Date: 8/26 Staff Name(s): H White, E Hirayaka Levee Unit: 6, 41-45 Levee Mile(s):  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 229158 File Name: Yolo GGS 082616 Point Name: GGS 14

**HABITAT ATTRIBUTE**

		(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+(1)	
2	Flowing water over sand, gravel, rock or cement substrate	-(0)	
3	Water availability:		
a)	winter runoff or sporadic availability (i.e. ephemeral)	+(1)	
b)	April through October (i.e. irrigation for crops)	+(1)	
c)	all year (i.e. perennial marsh or channel)	+(1)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	-(0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+(2)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+(1)	
Subtotal:		7	

<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]			
7	Banks:		
a)	Banks are sunny	+(3) %	
b)	Banks shaded by overstory vegetation (i.e. trees, riparian)	-(0) %	
8	Vegetation in the aquatic habitat:		
a)	Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+(3) %	
b)	Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	-(0)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+(3) %	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+(1)	
Subtotal:		10	

<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+(1)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+(1)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	-(1)	
Subtotal:		1	

<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
a)	functions ecologically as a wetland	+(0)	
b)	functions for recreational use (i.e. fishing, boating, water skiing)	-(0)	
15	Rice fields (fallow or flooded)	+(1)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+(1)	
17	Row crop, orchard, pasture, or other agricultural	-(1)	
18	Urban or developed public area	-(0)	
Subtotal:		1	

<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+(N/A)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+(N/A)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	-(N/A)	
Subtotal:		N/A	

**TOTAL SCORE: 19**

22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?  yes  no  
 23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?  yes  no

Photo #'s: 3081 3082  
 Reviewer(s): Date:

NA

Comments

Water: Still open water. Culverts placed throughout length of canal

willows Basking/Refugia: Low lying to 6 veg on canal bank. Walnut trees + small interspersed throughout in singular or small clumps. Tule, blackberry, cattails, rose on banks.

Predator/Prey: Saw large fish jump predator?

Adjacent land use: rice, tomato, <sup>and</sup> hay crops

Disturbance: farming trucks/vehicles.



Marginal

Datasheet ID: 21

FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Date: 8/26 Staff Name(s): H. White, E. Hronata Levee Unit: 21 Levee Mile(s):  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 229158 File Name: YOLO665082616 Point Name: GGS13

HABITAT ATTRIBUTE		(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+(1)	
2	Flowing water over sand, gravel, rock or cement substrate	-(0)	
3	Water availability:		
a)	winter runoff or sporadic availability (i.e. ephemeral)	+(1)	
b)	April through October (i.e. irrigation for crops)	+(1)	
c)	all year (i.e. perennial marsh or channel)	+(1)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	-(0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+(2)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+(0)	
Subtotal:		6	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]			
7	Banks:		
a)	Banks are sunny	+(1)%	
b)	Banks shaded by overstory vegetation (i.e. trees, riparian)	-(2)%	
8	Vegetation in the aquatic habitat:		
a)	Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+(1)%	
b)	Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	-(0)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+(1)%	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+(1)	
Subtotal:		2	
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+(1)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+(1)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	-(0)	
Subtotal:		2	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
a)	functions ecologically as a wetland	+(0)	
b)	functions for recreational use (i.e. fishing, boating, water skiing)	-(0)	
15	Rice fields (fallow or flooded)	+(0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+(1)	
17	Row crop, orchard, pasture, or other agricultural	-(1)	
18	Urban or developed public area	-(0)	
Subtotal:		0	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+(1)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+(NA)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	-(NA)	
Subtotal:		1	
<b>TOTAL SCORE:</b>		10	
22	Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes <input type="checkbox"/> no	
23	Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Photo #'s:	3077 → 3080		
Reviewer(s):			Date:

**Comments**

Water: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Basking/Refugia: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Predator/Prey: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Adjacent land use: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Disturbance: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



# FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID: 22

Date: \_\_\_\_\_ Staff Name(s): H. White & E. Honaka Levee Unit: 53 Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: \_\_\_\_\_ File Name: \_\_\_\_\_ Point Name: 66519

No levee

**HABITAT ATTRIBUTE**

**(SCORE)**

Review

**Water**

[0 = absent, 1 = present]

1	Still or slow-flowing water over silt or mud substrate	+ (1)	
2	Flowing water over sand, gravel, rock or cement substrate	- (0)	
3	Water availability:		
a)	winter runoff or sporadic availability (i.e. ephemeral)	+ (1)	
b)	April through October (i.e. irrigation for crops)	+ (1)	
c)	all year (i.e. perennial marsh or channel)	+ (1)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	- (0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+ (2)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+ (2)	
Subtotal:		8	

**Basking/Refugia (Active Season)**

% = [0 = 0%; 1 = 9-24%; 2 = 25-74%; 3 = 75-100%]

7	Banks:		
a)	Banks are sunny	+ (3) %	
b)	Banks shaded by overstory vegetation (i.e. trees, riparian)	- (1) %	
8	Vegetation in the aquatic habitat:		
a)	Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ (2) %	
b)	Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	- (1)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ (3) %	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+ (1)	
Subtotal:		7	

**Predator/Prey**

[0 = absent, 1 = present]

11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ (1)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+ (1)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- (0)	
Subtotal:		2	

**Adjacent Land Use**

[0 = absent, 1 = present]

14	Natural marsh, wetland, mitigation bank, or manmade pond		
a)	functions ecologically as a wetland	+ (0)	
b)	functions for recreational use (i.e. fishing, boating, water skiing)	- (0)	
15	Rice fields (fallow or flooded)	+ (0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+ (1)	
17	Row crop, orchard, pasture, or other agricultural	- (1)	
18	Urban or developed public area	- (0)	
Subtotal:		0	

**Levee (footprint of rodent damage repair activities)**

[0 = absent, 1 = present]

19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ (0)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ (0)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- (0)	
Subtotal:		0	

**TOTAL SCORE:**

17

22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?  yes  no  
 23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?  yes  no

Photo #'s: \_\_\_\_\_  
 Reviewer(s): \_\_\_\_\_ Date: \_\_\_\_\_

Comments

Water: Present

Basking/Refugia: Some sections have lots of sun; others quite shady. Road works as upland refugia during flooding.

Predator/Prey: Raptors in area

Adjacent land use: Tomatoes on one side; Road & hay field on other side.

Disturbance: Ag., gravel road



# FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID: 23

Date: \_\_\_\_\_ Staff Name(s): \_\_\_\_\_ Levee Unit: 54 Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: \_\_\_\_\_ File Name: \_\_\_\_\_ Point Name: GGS 20

**HABITAT ATTRIBUTE**

**(SCORE)** Review

**Water**

[0 = absent, 1 = present]

1	Still or slow-flowing water over silt or mud substrate	+(0)	
2	Flowing water over sand, gravel, rock or cement substrate	-(0)	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+(1)	
	b) April through October (i.e. irrigation for crops)	+(1)	
	c) all year (i.e. perennial marsh or channel)	+(0)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	-(0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+(2)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+(2)	
Subtotal:		6	

**Basking/Refugia (Active Season)**

% = [0 = 0%; 1 = 9-24%; 2 = 25-74%; 3 = 75-100%]

7	Banks:		
	a) Banks are sunny	+(1)%	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	-(3)%	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+(2)%	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	-(0)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+(2)%	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+(1)	
Subtotal:		3	

**Predator/Prey**

[0 = absent, 1 = present]

11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+(0)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+(0)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	-(0)	
Subtotal:		0	

**Adjacent Land Use**

[0 = absent, 1 = present]

14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+(0)	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	-(0)	
15	Rice fields (fallow or flooded)	+(0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+(1)	
17	Row crop, orchard, pasture, or other agricultural	-(1)	
18	Urban or developed public area	-(0)	
Subtotal:		0	

**Levee (footprint of rodent damage repair activities)**

[0 = absent, 1 = present]

19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+(0)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+(0)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	-(0)	
Subtotal:		0	

**TOTAL SCORE:**

9

22	Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes	<input type="checkbox"/> no
23	Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes	<input type="checkbox"/> no

Photo #'s: \_\_\_\_\_  
 Reviewer(s): \_\_\_\_\_ Date: \_\_\_\_\_

Comments

Water:  $\phi$  water present; grasses growing in canal; bottom. #10

Basking/Refugia: More than 200 ft from nearest levee. Willows, bullrush & tules along bank for refugia. Also tall trees on banks of canal. Upland refugia on other side of road adjacent to canal.

Predator/Prey: Raptors sighted near canal

Adjacent land use: Tomatoes and fallow field

Disturbance: Ag machinery



# FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID: 24

Date: 9/1 Staff Name(s): Heather White / Ehiro Matsuda Levee Unit: SS Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: \_\_\_\_\_ File Name: \_\_\_\_\_ Point Name: GGS 21

<u>HABITAT ATTRIBUTE</u>	(SCORE)	Review
<b>Water</b> <span style="float: right;">[0 = absent, 1 = present]</span>		
1 Still or slow-flowing water over silt or mud substrate	+ (1)	
2 Flowing water over sand, gravel, rock or cement substrate	- (0)	
3 Water availability:		
a) winter runoff or sporadic availability (i.e. ephemeral)	+ (1)	
b) April through October (i.e. irrigation for crops)	+ (1)	
c) all year (i.e. perennial marsh or channel)	+ (1)	
4 Site subject to severe seasonal flooding (i.e. within bypass)	- (0)	
5 Connectivity to known populations of GGS <span style="float: right;">[within 1 mile = 3; 5 mi = 2; 10 mi = 1; &gt;10 = 0]</span>	+ (2)	
6 Connectivity to suitable habitat via channels <span style="float: right;">[no breaks = 2; &lt;= 200' = 1; &gt;200' = 0]</span>	+ (2)	
Subtotal:	8	
<b>Basking/Refugia (Active Season)</b> <span style="float: right;">% = [0 = 0%; 1 = 9-24%; 2 = 25-74%; 3 = 75-100%]</span>		
7 Banks:		
a) Banks are sunny	+ (3) %	
b) Banks shaded by overstory vegetation (i.e. trees, riparian)	- (1) %	
8 Vegetation in the aquatic habitat:		
a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ (3) %	
b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) <span style="float: right;">[0 = absent, 1 = present]</span>	- (0)	
9 Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ (3) %	
10 Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) <span style="float: right;">[0 = absent, 1 = present]</span>	+ (1)	
Subtotal:	9	
<b>Predator/Prey</b> <span style="float: right;">[0 = absent, 1 = present]</span>		
11 Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ (1)	
12 Prey amphibians present (i.e. chorus frog, small bull frog)	+ (1)	
13 Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- (1)	
Subtotal:	1	
<b>Adjacent Land Use</b> <span style="float: right;">[0 = absent, 1 = present]</span>		
14 Natural marsh, wetland, mitigation bank, or manmade pond		
a) functions ecologically as a wetland	+ (1)	
b) functions for recreational use (i.e. fishing, boating, water skiing)	- (0)	
15 Rice fields (fallow or flooded)	+ (0)	
16 Upland habitat other than levee for winter refugia (above high water mark)	+ (1)	
17 Row crop, orchard, pasture, or other agricultural	- (1)	
18 Urban or developed public area	- (0)	
Subtotal:	1	
<b>Levee (footprint of rodent damage repair activities)</b> <span style="float: right;">[0 = absent, 1 = present]</span>		
19 Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ (0)	
20 Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ (0)	
21 Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- (0)	
Subtotal:	0	
<b>TOTAL SCORE:</b>		19
22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes	<input type="checkbox"/> no
23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes	<input type="checkbox"/> no
Photo #'s: <u>3140</u> <u>3191</u> <u>3142</u>		
Reviewer(s): _____		Date: _____

**Comments**

Water: Water present. Seems to provide water to adjacent mitigation bank

Basking/Refugia: Blackberry, tules, bullrush and other lowlying veg on bank. in canal bed is lowlying veg and tules.

Predator/Prey: White face ibis, ~~and~~ great egret, and snowy egrets present. Bullfrogs also present

Adjacent land use: Tomato <sup>unknown</sup> row crop (grain/nut), and mitigation bank adjacent.

Disturbance: Occasional ag disturbance.



46-47

Datasheet ID: 25

FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Date: 8/26/16 Staff Name(s): G. Bona S. Chun Levee Unit: 80 Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 229157 File Name: 1010setbackto817006 Point Name: 66S109

HABITAT ATTRIBUTE		(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+ (0)	
2	Flowing water over sand, gravel, rock or cement substrate	- (0)	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+ (1)	
	b) April through October (i.e. irrigation for crops)	+ (1)	
	c) all year (i.e. perennial marsh or channel)	+ (0)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	- (0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+ (1)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+ (0)	
Subtotal:		3	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]			
7	Banks:		
	a) Banks are sunny	+ (1) %	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	- (2) %	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ (1) %	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	- (1)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ (6) %	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+ (0)	
Subtotal:		1	
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ (0)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+ (0)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- (0)	
Subtotal:			
<b>Adjacent Land Use</b> [0 = absent, 1 = present]		0	
14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+ (0)	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	- (0)	
15	Rice fields (fallow or flooded)	+ (0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+ (0)	
17	Row crop, orchard, pasture, or other agricultural	- (1)	
18	Urban or developed public area	- (0)	
Subtotal:		- 1	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ (1)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ (1)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- (0)	
Subtotal:		2	
<b>TOTAL SCORE:</b>		5	
22	Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes <input type="checkbox"/> no	
23	Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Photo #'s:	<u>1991-1992</u>		
Reviewer(s):		Date:	

**Comments**

Water: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Basking/Refugia: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Predator/Prey: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Adjacent land use: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Disturbance: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_





**Comments**

Water: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Basking/Refugia: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Predator/Prey: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Adjacent land use: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Disturbance: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID: 27

Date: 8/17/16 Staff Name(s): G. Bonner, H. White, E. Hivonaka, S. Chun Levee Unit: 2-4 Levee Mile(s):  
 Survey on: Waterside  or Landside  Distance from levee toe: 18 (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 225691 File Name: Volosetback 08172016 Point Name: GGS2

HABITAT ATTRIBUTE		(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+(1)	
2	Flowing water over sand, gravel, rock or cement substrate	-(0)	
3	Water availability:		
a)	winter runoff or sporadic availability (i.e. ephemeral)	+(1)	
b)	April through October (i.e. irrigation for crops)	+(1)	
c)	all year (i.e. perennial marsh or channel)	+(1)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	-(1)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+(3)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+(2)	
Subtotal:		8	
<b>Basking/Refugia (Active Season)</b> 0-8% % = [0 = 0%; 1 = 9-24%; 2 = 25-74%; 3 = 75-100%]			
7	Banks:		
a)	Banks are sunny	+(1) %	
b)	Banks shaded by overstory vegetation (i.e. trees, riparian)	-(3) %	
8	Vegetation in the aquatic habitat:		
a)	Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+(1) %	
b)	Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	-(0)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+(1) %	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+(1)	
Subtotal:		1	
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+(1)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+(1)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	-(1)	
Subtotal:		1	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
a)	functions ecologically as a wetland	+(1)	
b)	functions for recreational use (i.e. fishing, boating, water skiing)	-(0)	
15	Rice fields (fallow or flooded)	+(0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+(0)	
17	Row crop, orchard, pasture, or other agricultural	-(1)	
18	Urban or developed public area	-(0)	
Subtotal:		0	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+(1)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+(1)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	-(1)	
Subtotal:		1	
<b>TOTAL SCORE:</b>		10	
22	Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes <input type="checkbox"/> no	
23	Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Photo #'s: 1940-1942			
Reviewer(s):			Date:

not included in score. redundant in 9+10 for all data sheets

**Comments**

Water: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Basking/Refugia: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Predator/Prey: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Adjacent land use: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Disturbance: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



Marginal

Datasheet ID: 28

FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Date: 6/26/16 Staff Name(s): Heather White + Erica Hironaka Levee Unit: 52 Levee Mile(s):  
 Survey on: Waterside  or Landside  Distance from levee toe: 10 (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length:  
 GPS Name: 229158 File Name: ydoggs 082616 Point Name: GGS12

HABITAT ATTRIBUTE		(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+(1)	
2	Flowing water over sand, gravel, rock or cement substrate	-(0)	
3	Water availability:		
a)	winter runoff or sporadic availability (i.e. ephemeral)	+(1)	
b)	April through October (i.e. irrigation for crops)	+(1)	
c)	all year (i.e. perennial marsh or channel)	+(1)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	-(0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+(2)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+(2)	
Subtotal:		8	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]			
7	Banks:		
a)	Banks are sunny	+(0)%	
b)	Banks shaded by overstory vegetation (i.e. trees, riparian)	-(3)%	
8	Vegetation in the aquatic habitat:		
a)	Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+(3)%	
b)	Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	-(1)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+(3)%	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+(1)	
Subtotal:		3	
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+(0)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+(1)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	-(0)	
Subtotal:		1	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
a)	functions ecologically as a wetland	+(0)	
b)	functions for recreational use (i.e. fishing, boating, water skiing)	-(0)	
15	Rice fields (fallow or flooded)	+(0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+(0)	
17	Row crop, orchard, pasture, or other agricultural	-(1)	
18	Urban or developed public area	-(0)	
Subtotal:		-1	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+(N/A)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+(N/A)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	-(N/A)	
Subtotal:		N/A	
<b>TOTAL SCORE:</b>		11	
22	Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes <input type="checkbox"/> no	
23	Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Photo #'s:	3072 3073 3074		
Reviewer(s):		Date:	

NA

Comments

Water: Very shallow water connected to ~~canal~~<sup>ag</sup> canal south of railroad track. ~~Channel~~ Channel narrows at this location. Mainly choked up with emergent veg (tules & cattails). Area in middle (near orchard) where channel vegetation is clearer and channel widened.

Basking/Refugia: Mainly star thistle and thistle sp. covering banks adjacent to water source

Predator/Prey: Water so shallow/narrow that unlikely will have game fish or prey species.

Adjacent land use: row crop and orchards

Disturbance: only ag disturbance



FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID:

29

Date: 9/1 Staff Name(s): Heather White Erica Hironaka Levee Unit: 52 Levee Mile(s):  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: \_\_\_\_\_ File Name: YSB0901 Point Name: GGS 16

HABITAT ATTRIBUTE		(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+(0)	
2	Flowing water over sand, gravel, rock or cement substrate	-(0)	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+(0)	
	b) April through October (i.e. irrigation for crops)	+(1)	
	c) all year (i.e. perennial marsh or channel)	+(0)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	-(0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+(2)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+(0)	
Subtotal:		3	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]			
7	Banks:		
	a) Banks are sunny	+(3) %	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	-(0) %	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+(0) %	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	-(2)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+(2) %	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+(2)	
Subtotal:		5	
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+(0)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+(0)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	-(0)	
Subtotal:		0	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+(0)	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	-(0)	
15	Rice fields (fallow or flooded)	+(0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+(0)	
17	Row crop, orchard, pasture, or other agricultural	-(1)	
18	Urban or developed public area	-(0)	
Subtotal:		1	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+(0)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+(0)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	-(0)	
Subtotal:		0	
<b>TOTAL SCORE:</b>		7	
22	Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes <input type="checkbox"/> no	
23	Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Photo #'s: 3127 + 3129			
Reviewer(s):			Date:

**Comments**

Water: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Basking/Refugia: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Predator/Prey: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Adjacent land use: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Disturbance: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



Side is ditch

Datasheet ID:  
30

FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Date: 9/1 Staff Name(s): Heather White/Enia Hirouaka Levee Unit: \_\_\_\_\_ Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: \_\_\_\_\_ File Name: \_\_\_\_\_ Point Name: GGS22

HABITAT ATTRIBUTE		(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+ (0)	
2	Flowing water over sand, gravel, rock or cement substrate	- (0)	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+ (0)	
	b) April through October (i.e. irrigation for crops)	+ (1)	
	c) all year (i.e. perennial marsh or channel)	+ (0)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	- (0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+ (2)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+ (0)	
	Subtotal:	3	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]			
7	Banks:		
	a) Banks are sunny	+ (3) %	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	- (0) %	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ (0) %	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	- (0)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ (2) %	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+ (1)	
	Subtotal:	6	
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ (0)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+ (0)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- (0)	
	Subtotal:	0	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+ (0)	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	- (0)	
15	Rice fields (fallow or flooded)	+ (0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+ (1)	
17	Row crop, orchard, pasture, or other agricultural	- (1)	
18	Urban or developed public area	- (0)	
	Subtotal:	0	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ (0)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ (0)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- (0)	
	Subtotal:	0	
<b>TOTAL SCORE:</b>		9	
22	Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes <input type="checkbox"/> no	
23	Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Photo #'s: 3143 3144			
Reviewer(s):			Date:

Comments

Water:  $\emptyset$  water. Clearing day. The ditch seems recently created.

Basking/Refugia: Refugia is adjacent levee.

Predator/Prey: Raptors nearby.

Adjacent land use: Tomatoes and empty field.

Disturbance: Ag disturbance

Does not seem to be adequate GGS habitat.  
Potential GGS aquatic resource is separated/isolated from this dry feature by a large levee.



Unsuitable

Datasheet ID:

31

FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Date: 8/17 Staff Name(s): Erika H. + Heather W. Levee Unit: \_\_\_\_\_ Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: 40 (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 225691 File Name: YoloSetbackGGS08172016 Point Name: GGS 3

HABITAT ATTRIBUTE		(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+ (0)	
2	Flowing water over sand, gravel, rock or cement substrate	- (0)	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+ (1)	
	b) April through October (i.e. irrigation for crops)	+ (0)	
	c) all year (i.e. perennial marsh or channel)	+ (0)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	- (1)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+ (2)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+ (0)	
Subtotal:		2	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]			
7	Banks:		
	a) Banks are sunny	+ (0) %	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	- (3) %	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ (0) %	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	- (1)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ (2) %	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+ (1)	
Subtotal:		-1	
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ (0)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+ (1)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- (0)	
Subtotal:		1	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+ (0)	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	- (0)	
15	Rice fields (fallow or flooded)	+ (0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+ (0)	
17	Row crop, orchard, pasture, or other agricultural	- (0)	
18	Urban or developed public area	- (1)	
Subtotal:		-1	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ (N/A)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ (N/A)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- (N/A)	
Subtotal:		N/A	
<b>TOTAL SCORE:</b>		7	
22	Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes <input type="checkbox"/> no	
23	Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Photo #'s: <u>3012</u> <u>3013</u>			
Reviewer(s): _____		Date: _____	



Marg.

FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID: 32

Date: 8/17/16 Staff Name(s): Krnica H + Heather W, Levee Unit: \_\_\_\_\_ Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: \_\_\_\_\_ (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 225691 File Name: y010 setback ops 0817 2016 Point Name: GGS 4

HABITAT ATTRIBUTE		(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+(1)	
2	Flowing water over sand, gravel, rock or cement substrate	-(0)	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+(1)	
	b) April through October (i.e. irrigation for crops)	+(1)	
	c) all year (i.e. perennial marsh or channel)	+(1)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	-(0)	?
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+(2)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+( )	?
Subtotal:		4	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1 = 9-24%; 2 = 25-74%; 3 = 75-100%]			
7	Banks:		
	a) Banks are sunny	+(2) %	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	-(2) %	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+(2) %	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	-(0)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+(3) %	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+(1)	
Subtotal:		6	
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+(1)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+(1)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	-(1)	
Subtotal:		1	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+(0)	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	-(0)	
15	Rice fields (fallow or flooded)	+(0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+(1)	
17	Row crop, orchard, pasture, or other agricultural	-(1)	
18	Urban or developed public area	-(1)	
Subtotal:		-2	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+(1)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+(1)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	-(0)	
Subtotal:		2	
<b>TOTAL SCORE:</b>		14	
22	Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes <input type="checkbox"/> no	
23	Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Photo #'s: 13014			
Reviewer(s):			Date:



Marginal

FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID: 33

Date: 8/17/16 Staff Name(s): Erica H + Heather W Levee Unit: \_\_\_\_\_ Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: 10 (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 225691 File Name: yolo setback ggs 08/17/2016 Point Name: GGS 5

**HABITAT ATTRIBUTE** (SCORE) Review

**Water** [0 = absent, 1 = present]

1	Still or slow-flowing water over silt or mud substrate	+(1)	
2	Flowing water over sand, gravel, rock or cement substrate	-(0)	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+(1)	
	b) April through October (i.e. irrigation for crops)	+(1)	
	c) all year (i.e. perennial marsh or channel)	+(1)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	-(1)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+(2)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+(2)	
Subtotal:		7	

**Basking/Refugia (Active Season)** %= [0 = 0%; 1 = 9-24%; 2 = 25-74%; 3 = 75-100%]

7	Banks:		
	a) Banks are sunny	+(2)%	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	-(2)%	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+(3)%	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	-(0)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+(2)%	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+(1)	
Subtotal:		6	

**Predator/Prey** [0 = absent, 1 = present]

11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+(1)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+(1)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	-(1)	
Subtotal:		1	

**Adjacent Land Use** [0 = absent, 1 = present]

14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+(0)	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	-(0)	
15	Rice fields (fallow or flooded)	+(0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+(1)	
17	Row crop, orchard, pasture, or other agricultural	-(1)	
18	Urban or developed public area	-(1)	
Subtotal:		-1	

**Levee (footprint of rodent damage repair activities)** [0 = absent, 1 = present]

19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+(1)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+(1)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	-(0)	
Subtotal:		2	

**TOTAL SCORE: 15**

22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?  yes  no  
 23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?  yes  no

Photo #'s: 3015 3016  
 Reviewer(s): \_\_\_\_\_ Date: \_\_\_\_\_



Unsuitable

Datasheet ID:  
34

FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Date: 8/17/16 Staff Name(s): Enza H + Heather W. Levee Unit: \_\_\_\_\_ Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: 20 (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: 225691 File Name: yolo set back eggs 08172016 Point Name: GGS 6

HABITAT ATTRIBUTE		(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]			
1	Still or slow-flowing water over silt or mud substrate	+(0)	
2	Flowing water over sand, gravel, rock or cement substrate	-(0)	
3	Water availability:		
	a) winter runoff or sporadic availability (i.e. ephemeral)	+(1)	
	b) April through October (i.e. irrigation for crops)	+(5)	
	c) all year (i.e. perennial marsh or channel)	+(0)	
4	Site subject to severe seasonal flooding (i.e. within bypass)	-(0)	
5	Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+(2)	
6	Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+(0)	
Subtotal:		3	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]			
7	Banks:		
	a) Banks are sunny	+(1)%	
	b) Banks shaded by overstory vegetation (i.e. trees, riparian)	-(3)%	
8	Vegetation in the aquatic habitat:		
	a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+(0)%	
	b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	-(1)	
9	Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+(2)%	
10	Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+(1)	
Subtotal:		0	
<b>Predator/Prey</b> [0 = absent, 1 = present]			
11	Prey fish present (i.e. small carp, mosquitofish, blackfish)	+(0)	
12	Prey amphibians present (i.e. chorus frog, small bull frog)	+(1)	
13	Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	-(0)	
Subtotal:		1	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]			
14	Natural marsh, wetland, mitigation bank, or manmade pond		
	a) functions ecologically as a wetland	+(6)	
	b) functions for recreational use (i.e. fishing, boating, water skiing)	-(0)	
15	Rice fields (fallow or flooded)	+(0)	
16	Upland habitat other than levee for winter refugia (above high water mark)	+(0)	
17	Row crop, orchard, pasture, or other agricultural	-(1)	
18	Urban or developed public area	-(0)	
Subtotal:		-1	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]			
19	Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+(1)	
20	Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+(1)	
21	Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	-(6)	
Subtotal:		2	
<b>TOTAL SCORE:</b>		5	
22	Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes <input type="checkbox"/> no	
23	Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes <input type="checkbox"/> no	
Photo #'s: 3017 3018 3019			
Reviewer(s):			Date:

Redundant



Unsuitable

Datasheet ID:

35

FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Date: 8/17/16 Staff Name(s): H. White, E. Hironaka Levee Unit: Levee Mile(s):
Survey on: Waterside [ ] or Landside [x] Distance from levee toe: 20 (feet) Is water feature [x] or [ ] to the levee?
Aquatic Habitat Type: IrrDitch [ ] ConcCanal [ ] AgCanal [ ] Channel [ ] Stream [ ] Marsh [ ] Pond [ ] Rice Field [ ]
Waterbody: Width: 0-10' [ ] 10'-20' [ ] 20'-40' [ ] >40' [ ] Depth: 0-1' [ ] 1'-3' [ ] >3' [ ] Length:
GPS Name: 225691 File Name: Yolo setback ggs 08/17/2016 Point Name: GGS7

HABITAT ATTRIBUTE

(SCORE)

Review

Water

[0 = absent, 1 = present]

- 1 Still or slow-flowing water over silt or mud substrate + (0)
2 Flowing water over sand, gravel, rock or cement substrate - (0)
3 Water availability:
a) winter runoff or sporadic availability (i.e. ephemeral) + (1)
b) April through October (i.e. irrigation for crops) + (0)
c) all year (i.e. perennial marsh or channel) + (0)
4 Site subject to severe seasonal flooding (i.e. within bypass) - (0)
5 Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0] + (2)
6 Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0] + (0)

Subtotal:

3

Basking/Refugia (Active Season)

% = [0 = 0%; 1 = 9-24%; 2 = 25-74%; 3 = 75-100%]

- 7 Banks:
a) Banks are sunny + (0) %
b) Banks shaded by overstory vegetation (i.e. trees, riparian) - (2) %
8 Vegetation in the aquatic habitat:
a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose) + (2) %
b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present] - (1)
9 Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap) + (3) %
10 Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present] + (1)

Subtotal:

3

Predator/Prey

[0 = absent, 1 = present]

- 11 Prey fish present (i.e. small carp, mosquitofish, blackfish) + (0)
12 Prey amphibians present (i.e. chorus frog, small bull frog) + (0)
13 Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source) - (0)

Subtotal:

0

Adjacent Land Use

[0 = absent, 1 = present]

- 14 Natural marsh, wetland, mitigation bank, or manmade pond
a) functions ecologically as a wetland + (0)
b) functions for recreational use (i.e. fishing, boating, water skiing) - (0)
15 Rice fields (fallow or flooded) + (0)
16 Upland habitat other than levee for winter refugia (above high water mark) + (0)
17 Row crop, orchard, pasture, or other agricultural - (1)
18 Urban or developed public area - (0)

Subtotal:

-1

Levee (footprint of rodent damage repair activities)

[0 = absent, 1 = present]

- 19 Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap) + (1)
20 Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?) + (1)
21 Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing) - (0)

Subtotal:

2

TOTAL SCORE:

7

22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'? [ ] yes [ ] no

23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee? [ ] yes [ ] no

Photo #'s: 3020 3021

Reviewer(s):

Date:

Connected to GGS1



# FMO 2013-14 Giant Garter Snake Water Habitat Survey Datasheets

Datasheet ID:  
**36**

Date: 9/9 Staff Name(s): H White, Schun Levee Unit: 39-40 Levee Mile(s): \_\_\_\_\_  
 Survey on: Waterside  or Landside  Distance from levee toe: 30 (feet) Is water feature  or  to the levee?  
 Aquatic Habitat Type: IrrDitch  ConcCanal  AgCanal  Channel  Stream  Marsh  Pond  Rice Field   
 Waterbody: Width: 0-10'  10'-20'  20'-40'  >40'  Depth: 0-1'  1'-3'  >3'  Length: \_\_\_\_\_  
 GPS Name: \_\_\_\_\_ File Name: \_\_\_\_\_ Point Name: \_\_\_\_\_

HABITAT ATTRIBUTE	(SCORE)	Review
<b>Water</b> [0 = absent, 1 = present]		
1 Still or slow-flowing water over silt or mud substrate	+ (1)	
2 Flowing water over sand, gravel, rock or cement substrate	- (0)	
3 Water availability:		
a) winter runoff or sporadic availability (i.e. ephemeral)	+ (1)	
b) April through October (i.e. irrigation for crops)	+ (1)	
c) all year (i.e. perennial marsh or channel)	+ (1)	
4 Site subject to severe seasonal flooding (i.e. within bypass)	- (1)	
5 Connectivity to known populations of GGS [within 1 mile = 3; 5 mi = 2; 10 mi = 1; >10 = 0]	+ (3)	
6 Connectivity to suitable habitat via channels [no breaks = 2; <= 200' = 1; >200' = 0]	+ (2)	
Subtotal:	5	
<b>Basking/Refugia (Active Season)</b> %= [0 = 0%; 1= 9-24%; 2= 25-74%; 3= 75-100%]		
7 Banks:		
a) Banks are sunny	+ (0) %	
b) Banks shaded by overstory vegetation (i.e. trees, riparian)	- (3) %	
8 Vegetation in the aquatic habitat:		
a) Aquatic or emergent vegetation present (i.e. cattails, bulrush, tule, primrose)	+ (0) %	
b) Terrestrial vegetation present in aquatic habitat (i.e. non-native ruderal) [0 = absent, 1 = present]	- (0)	
9 Surface refugia within 200' from water feature (i.e. grasses, low shrubs, woody debris, riprap)	+ (2) %	
10 Subsurface retreats within 200' from water (i.e. burrows, cracks, crevices) [0 = absent, 1 = present]	+ (1)	
Subtotal:	0	
<b>Predator/Prey</b> [0 = absent, 1 = present]		
11 Prey fish present (i.e. small carp, mosquitofish, blackfish)	+ (1)	
12 Prey amphibians present (i.e. chorus frog, small bull frog)	+ (1)	
13 Introduced gamefish present (i.e. striped bass, catfish, associated with permanent water source)	- (1)	
Subtotal:	1	
<b>Adjacent Land Use</b> [0 = absent, 1 = present]		
14 Natural marsh, wetland, mitigation bank, or manmade pond		
a) functions ecologically as a wetland	+ (1)	
b) functions for recreational use (i.e. fishing, boating, water skiing)	- (0)	
15 Rice fields (fallow or flooded)	+ (0)	
16 Upland habitat other than levee for winter refugia (above high water mark)	+ (0)	
17 Row crop, orchard, pasture, or other agricultural	- (1)	
18 Urban or developed public area	- (0)	
Subtotal:	0	
<b>Levee (footprint of rodent damage repair activities)</b> [0 = absent, 1 = present]		
19 Surface refugia on levee slopes for daytime cover? (i.e. grasses, low shrubs, riprap)	+ (1)	
20 Subsurface retreats on levee slopes for over-wintering (burrows/cracks/crevices above high water mark?)	+ (1)	
21 Disturbance on levee due to recreational activities? (i.e. walking dogs, hunting, fishing)	- (1)	
Subtotal:	1	
<b>TOTAL SCORE:</b>		4
22 Does the levee provide the ONLY over-wintering refugia above the high water mark within 500'?	<input type="checkbox"/> yes	<input type="checkbox"/> no
23 Are there noticeable ground squirrel burrows or other holes/cracks in this section of levee?	<input type="checkbox"/> yes	<input type="checkbox"/> no
Photo #'s: <u>2021-2025</u>		
Reviewer(s): _____		Date: _____





## **Appendix F. Native American Correspondence**

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**F1. Native American Correspondence  
(U.S. Army Corps of Engineers)**







DEPARTMENT OF THE ARMY  
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT  
1325 J STREET  
SACRAMENTO CA 95814-2922

Environmental Resources Branch

SEP 02 2016

Ms. Julianne Polanco  
State Historic Preservation Officer  
Office of Historic Preservation  
1725 23<sup>rd</sup> Street, Suite 100  
Sacramento, CA 95896

Dear Ms. Polanco:

The U.S. Army Corps of Engineers, Sacramento District (Corps) is writing you to relay the project description and initiate consultation on the Area of Potential Effects (APE) for the Lower Elkhorn Basin Levee Setback Project, Yolo County, California (Project). The local proponent, the California Department of Water Resources (DWR), has requested permission from the Corps under Section 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 408) and Section 404 of the Clean Water Act of 1977 (33 U.S.C. § 1344). Both of these permissions are Federal undertakings which require compliance with Section 106 of the National Historic Preservation Act (54 U.S.C. § 306108). The APEs for both permit actions are the same, so the Corps compliance process will deal with both permit actions simultaneously; any reference to the Project APE should be interpreted as including both elements.

DWR proposes to improve flood management facilities in the Lower Elkhorn Basin and Sacramento Bypass areas of the flood system in Yolo County, just north of the existing Sacramento Bypass and Weir. The Project consists primarily of partial or complete removal of an "L"-shaped section of the existing Lower Elkhorn Basin East Levee from Interstate 5 to the Sacramento Bypass and the Sacramento Bypass North Levee from the Weir to its intersection with the Lower Elkhorn Basin East Levee; and construction of a new "L"-shaped setback levee northeast of the existing levee segments mentioned above. In sum, Project components include the following:

- Existing levee removal; to entail levee breaching, degrading, complete removal, and/ or partial removal
- Setback levee construction; to entail site grading, installation of cut-off walls up to 85 feet deep, and/or construction of seepage berms laterally along the landside (east side) of setback levee up to 300 feet in width
- Utility removal and/or relocation
- Vegetation removal and clearing
- Grading existing roads and hauling the debris off-site for disposal
- Grading and use of staging areas (locations to be determined)
- Acquisition of fill material for levee construction
- Grading and use of borrow sites
- Installation of relief wells and associated conduit connections
- Intermittent inundation during Project operation of the area between the existing levees and new setback levees

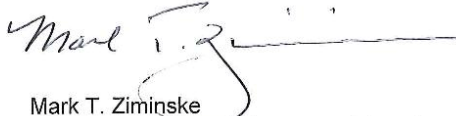
Widening of the Sacramento Bypass is also a recommended feature of the American River Common Features General Reevaluation Report (GRR), for which a general reevaluation was completed in 2016, although it is not yet congressionally authorized. The proposed Project is not intended to duplicate this recommended feature, rather it offers our partner, DWR, an alternative means to construct this key feature should the American River Common Features GRR not be authorized prior to possible permission under Section 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 408).

All construction activities described above will take place within the proposed APE (Enclosure), although the exact levee alignments and other locations of project activities have not been determined within that space. The APE encompasses approximately 2,003 acres (Grays Bend, CA USGS 7.5" Topographic Quadrangle, Unsectioned lands in T 9 N, R 3 E and T 10 N, R 3 E; Taylor Monument, CA USGS 7.5" Topographic Quadrangle, Unsectioned lands in T 9 N, R 3 E; Sacramento West, CA USGS 7.5" Topographic Quadrangle, Unsectioned lands in T 9 N, R 3 E and T 9 N, R 4 E). Should the location of any Project activities change to include areas outside this initial delineation of the APE, the Corps will notify all parties and continue consultation accordingly.

Inventory efforts are expected to include consultation with interested tribes, pedestrian surface survey, subsurface investigations through trenching or other means due to the potential for buried sites within the alluvial sediments of the Sacramento River floodplain. The results of the inventory efforts will be presented in a forthcoming technical report.

At this time, we are seeking your comments on the Project APE designation. Comments and questions may be sent to Attn: Ms. Geneva Kraus, U.S. Army Corps of Engineers, CESP-K-PD-RC, 1325 J Street, Sacramento, CA 95814. Ms. Kraus can also be reached at (916) 557-7447 or by email at [Geneva.Kraus@usace.army.mil](mailto:Geneva.Kraus@usace.army.mil).

Sincerely,



Mark T. Ziminske  
Chief, Environmental Resources Branch

Enclosure



DEPARTMENT OF THE ARMY  
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT  
1325 J STREET  
SACRAMENTO CA 95814-2922

Environmental Resources Branch

SEP 02 2016

Charlie Wright  
Chairperson  
Cortina Band of Indians  
P.O. Box 1630  
Williams, CA 95987

Dear Mr. Wright:

The U.S. Army Corps of Engineers, Sacramento District (Corps) is writing you to relay the project description and initiate consultation on the Area of Potential Effects (APE) for the Lower Elkhorn Basin Levee Setback Project, Yolo County, California (Project). The local proponent, the California Department of Water Resources (DWR), has requested permission from the Corps under Section 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 408) and Section 404 of the Clean Water Act of 1977 (33 U.S.C. § 1344). Both of these permissions are Federal undertakings which require compliance with Section 106 of the National Historic Preservation Act (54 U.S.C. § 306108). The APEs for both permit actions are the same, so the Corps compliance process will deal with both permit actions simultaneously; any reference to the Project APE should be interpreted as including both elements. Additional state requirements, such as those under the California Environmental Quality Act and Assembly Bill 52, are the responsibility of DWR, from whom you will receive further documentation.

DWR proposes to improve flood management facilities in the Lower Elkhorn Basin and Sacramento Bypass areas of the flood system in Yolo County, just north of the existing Sacramento Bypass and Weir. The Project consists primarily of partial or complete removal of an "L"-shaped section of the existing Lower Elkhorn Basin East Levee from Interstate 5 to the Sacramento Bypass and the Sacramento Bypass North Levee from the Weir to its intersection with the Lower Elkhorn Basin East Levee; and construction of a new "L"-shaped setback levee northeast of the existing levees mentioned above. In sum, Project components include the following:

- Existing levee removal; to entail levee breaching, degrading, complete removal, and/ or partial removal
- Setback levee construction; to entail site grading, installation of cut-off walls up to 85 feet deep, and/or construction of seepage berms laterally along the landside (east side) of setback levee up to 300 feet in width
- Utility removal and/or relocation
- Vegetation removal and clearing
- Grading existing roads and hauling the debris off-site for disposal
- Grading and use of staging areas (locations to be determined)
- Acquisition of fill material for levee construction
- Grading and use of borrow sites
- Installation of relief wells and associated conduit connections
- Intermittent inundation during Project operation of the area between the existing levees and new setback levees



Widening of the Sacramento Bypass is also a recommended feature of the American River Common Features General Reevaluation Report (GRR), for which a general reevaluation was completed in 2016, although it is not yet congressionally authorized. The proposed Project is not intended to duplicate this recommended feature, rather it offers our partner, DWR, an alternative means to construct this key feature should the American River Common Features GRR not be authorized prior to possible permission under Section 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 408).

All construction activities described above will take place within the proposed APE (Enclosure), although the exact levee alignments and other locations of project activities have not been cemented. The APE encompasses approximately 2,003 acres (Grays Bend, CA USGS 7.5" Series Topographic Quadrangle, Unsectioned lands in T 9 N, R 3 E and T 10 N, R 3 E; Taylor Monument, CA USGS 7.5" Series Topographic Quadrangle, Unsectioned lands in T 9 N, R 3 E; Sacramento West, CA USGS 7.5" Series Topographic Quadrangle, Unsectioned lands in T 9 N, R 3 E and T 9 N, R 4 E). Should the location of any Project activities change to include areas outside this initial delineation of the APE, the Corps will notify all parties and continue consultation accordingly.

Inventory efforts are expected to include pedestrian surface survey as well as subsurface investigations through trenching due to the potential for buried sites within the alluvial sediments of the Sacramento River floodplain. Proposed trenches will be located throughout the APE to best identify the presence or absence of subsurface archaeological deposits. A plan for carrying out this geoarchaeological work will be forthcoming and transmitted to you for review and comment.

At this time, we request that you please notify us if you are aware of any cultural resources or properties in the area that we should take into consideration during this permit action. We would like to work with you to identify any concerns you have about the project. If you know the locations of archaeological sites or traditional cultural properties in or near the APE, we request that you share that information with us within 30 days. In addition, we are seeking your comments on the Project APE designation. Comments and questions may be sent to Attn: Ms. Geneva Kraus, U.S. Army Corps of Engineers, CESPK-PD-RC, 1325 J Street, Sacramento, CA 95814. Ms. Kraus can also be reached at (916) 557-7447 or by email at [Geneva.Kraus@usace.army.mil](mailto:Geneva.Kraus@usace.army.mil).

Sincerely,



Mark T. Ziminske  
Chief, Environmental Resources Branch

Enclosure



DEPARTMENT OF THE ARMY  
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT  
1325 J STREET  
SACRAMENTO CA 95814-2922

Environmental Resources Branch

SEP 02 2016

Gene Whitehouse  
Chairperson  
United Auburn Indian Community of the Auburn Rancheria  
10720 Indian Hill Road  
Auburn, CA 95603

Dear Mr. Whitehouse:

The U.S. Army Corps of Engineers, Sacramento District (Corps) is writing you to relay the project description and initiate consultation on the Area of Potential Effects (APE) for the Lower Elkhorn Basin Levee Setback Project, Yolo County, California (Project). The local proponent, the California Department of Water Resources (DWR), has requested permission from the Corps under Section 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 408) and Section 404 of the Clean Water Act of 1977 (33 U.S.C. § 1344). Both of these permissions are Federal undertakings which require compliance with Section 106 of the National Historic Preservation Act (54 U.S.C. § 306108). The APEs for both permit actions are the same, so the Corps compliance process will deal with both permit actions simultaneously; any reference to the Project APE should be interpreted as including both elements. Additional state requirements, such as those under the California Environmental Quality Act and Assembly Bill 52, are the responsibility of DWR, from whom you will receive further documentation.

DWR proposes to improve flood management facilities in the Lower Elkhorn Basin and Sacramento Bypass areas of the flood system in Yolo County, just north of the existing Sacramento Bypass and Weir. The Project consists primarily of partial or complete removal of an "L"-shaped section of the existing Lower Elkhorn Basin East Levee from Interstate 5 to the Sacramento Bypass and the Sacramento Bypass North Levee from the Weir to its intersection with the Lower Elkhorn Basin East Levee; and construction of a new "L"-shaped setback levee northeast of the existing levees mentioned above. In sum, Project components include the following:

- Existing levee removal; to entail levee breaching, degrading, complete removal, and/ or partial removal
- Setback levee construction; to entail site grading, installation of cut-off walls up to 85 feet deep, and/or construction of seepage berms laterally along the landside (east side) of setback levee up to 300 feet in width Utility removal and/or relocation
- Vegetation removal and clearing
- Grading existing roads and hauling the debris off-site for disposal
- Grading and use of staging areas (locations to be determined)
- Acquisition of fill material for levee construction
- Grading and use of borrow sites
- Installation of relief wells and associated conduit connections
- Intermittent inundation during Project operation of the area between the existing levees and new setback levees

Widening of the Sacramento Bypass is also a recommended feature of the American River Common Features General Reevaluation Report (GRR), for which a general reevaluation was completed in 2016, although it is not yet congressionally authorized. The proposed Project is not intended to duplicate this recommended feature, rather it offers our partner, DWR, an alternative means to construct this key feature should the American River Common Features GRR not be authorized prior to possible permission under Section 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 408).

All construction activities described above will take place within the proposed APE (Enclosure), although the exact levee alignments and other locations of project activities have not been cemented. The APE encompasses approximately 2,003 acres (Grays Bend, CA USGS 7.5" Series Topographic Quadrangle, Unsectioned lands in T 9 N, R 3 E and T 10 N, R 3 E; Taylor Monument, CA USGS 7.5" Series Topographic Quadrangle, Unsectioned lands in T 9 N, R 3 E; Sacramento West, CA USGS 7.5" Series Topographic Quadrangle, Unsectioned lands in T 9 N, R 3 E and T 9 N, R 4 E). Should the location of any Project activities change to include areas outside this initial delineation of the APE, the Corps will notify all parties and continue consultation accordingly.

Inventory efforts are expected to include pedestrian surface survey as well as subsurface investigations through trenching due to the potential for buried sites within the alluvial sediments of the Sacramento River floodplain. Proposed trenches will be located throughout the APE to best identify the presence or absence of subsurface archaeological deposits. A plan for carrying out this geoarchaeological work will be forthcoming and transmitted to you for review and comment.

A copy of this letter furnished with enclosures will be sent to Mr. Marcos Guerrero, Tribal Preservation Committee, and Mr. Matthew Moore, Tribal Historic Preservation Officer, both of United Auburn Indian Community of the Auburn Rancheria, 10720 Indian Hill Road, Auburn, CA 95603.

At this time, we request that you please notify us if you are aware of any cultural resources or properties in the area that we should take into consideration during this permit action. We would like to work with you to identify any concerns you have about the project. If you know the locations of archaeological sites or traditional cultural properties in or near the APE, we request that you share that information with us within 30 days. In addition, we are seeking your comments on the Project APE designation. Comments and questions may be sent to Attn: Ms. Geneva Kraus, U.S. Army Corps of Engineers, CESP-K-PD-RC, 1325 J Street, Sacramento, CA 95814. Ms. Kraus can also be reached at (916) 557-7447 or by email at [Geneva.Kraus@usace.army.mil](mailto:Geneva.Kraus@usace.army.mil).

Sincerely,



Mark T. Ziminske  
Chief, Environmental Resources Branch

Enclosure





DEPARTMENT OF THE ARMY  
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT  
1325 J STREET  
SACRAMENTO CA 95814-2922

Environmental Resources Branch

Leland Kinter  
Chairperson  
Yocha Dehe Wintun Nation  
P.O. Box 18  
Brooks, CA 95606

SEP 02 2016

Dear Mr. Kinter:

The U.S. Army Corps of Engineers, Sacramento District (Corps) is writing you to relay the project description and initiate consultation on the Area of Potential Effects (APE) for the Lower Elkhorn Basin Levee Setback Project, Yolo County, California (Project). The local proponent, the California Department of Water Resources (DWR), has requested permission from the Corps under Section 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 408) and Section 404 of the Clean Water Act of 1977 (33 U.S.C. § 1344). Both of these permissions are Federal undertakings which require compliance with Section 106 of the National Historic Preservation Act (54 U.S.C. § 306108). The APEs for both permit actions are the same, so the Corps compliance process will deal with both permit actions simultaneously; any reference to the Project APE should be interpreted as including both elements. Additional state requirements, such as those under the California Environmental Quality Act and Assembly Bill 52, are the responsibility of DWR, from whom you will receive further documentation.

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- Utility removal and/or relocation
- Vegetation removal and clearing
- Grading existing roads and hauling the debris off-site for disposal
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A copy of this letter furnished with enclosures will be sent to Mr. James Sarmento, Tribal Historic Preservation Officer, Yocha Dehe Wintun Nation, P.O. Box 18, Brooks, CA 95606.

At this time, we request that you please notify us if you are aware of any cultural resources or properties in the area that we should take into consideration during this permit action. We would like to work with you to identify any concerns you have about the project. If you know the locations of archaeological sites or traditional cultural properties in or near the APE, we request that you share that information with us within 30 days. In addition, we are seeking your comments on the Project APE designation. Comments and questions may be sent to Attn: Ms. Geneva Kraus, U.S. Army Corps of Engineers, CESPK-PD-RC, 1325 J Street, Sacramento, CA 95814. Ms. Kraus can also be reached at (916) 557-7447 or by email at [Geneva.Kraus@usace.army.mil](mailto:Geneva.Kraus@usace.army.mil).

Sincerely,



Mark T. Ziminske  
Chief, Environmental Resources Branch

Enclosure

**Dunn, Hannah**

---

**From:** Scott, Barry  
**Sent:** Tuesday, January 17, 2017 11:10 AM  
**To:** Dunn, Hannah  
**Subject:** FW: USACE Lower Elkhorn Public Scoping Meeting Invite

-----Original Message-----

**From:** Amrhein, Rochelle@DWR [mailto:Rochelle.Amrhein@water.ca.gov]  
**Sent:** Wednesday, September 14, 2016 9:16 AM  
**To:** Brock, Lori@DWR <Lori.Brock@water.ca.gov>; Agustinez, Anecita S.@DWR <Anecita.Agustinez@water.ca.gov>; Scott, Barry <bscott@geiconsultants.com>  
**Cc:** Nelson, Tim@DWR <Tim.Nelson@water.ca.gov>; Briggs, Kelly@DWR <Kelly.Briggs@water.ca.gov>  
**Subject:** FW: USACE Lower Elkhorn Public Scoping Meeting Invite

UAIC is interested in meeting with us and with the Corps. They have proposed meeting on September 27, 29, or 30th.

Marcos sent the request to Monica Nolte; so, I will follow up with her (and Jackie).

Shelly

-----Original Message-----

**From:** Simmons, Zachary M SPK [mailto:Zachary.M.Simmons@usace.army.mil]  
**Sent:** Wednesday, September 14, 2016 7:58 AM  
**To:** Kraus, Geneva SPK  
**Cc:** Griffin, S. Joe SPK; Bowers, Lee Ann SPK; Nolte, Monica L.@DWR; Amrhein, Rochelle@DWR  
**Subject:** FW: USACE Lower Elkhorn Public Scoping Meeting Invite

Hi Geneva,

I just received this response from Marcos Guerrero at UAIC. I am available the 27th and 29th. Would you like to coordinate a meeting or should I do it?

I don't know if Monica is the correct cultural resources contact at DWR for the Lower Elkhorn project.

Zach

-----Original Message-----

**From:** Marcos Guerrero [mailto:mguerrero@auburnrancheria.com]  
**Sent:** Wednesday, September 14, 2016 7:45 AM  
**To:** Simmons, Zachary M SPK <Zachary.M.Simmons@usace.army.mil>  
**Cc:** Nolte, Monica L.@DWR (Monica.Nolte@water.ca.gov) <Monica.Nolte@water.ca.gov>; Melodi McAdams <mmcadams@auburnrancheria.com>; Matthew Moore <mmoore@auburnrancheria.com>  
**Subject:** [EXTERNAL] FW: USACE Lower Elkhorn Public Scoping Meeting Invite

Hello Mr. Simmons/Ms. Nolte,  
Thank you for your invitation to the public meeting. The UAIC is interested in meeting with USACE and DWR regarding this project.

If any cultural resources records searches or studies have been completed to date can you please send those over.

We are available September 27, 29 and 30th. Please suggest a time, if either of you are available.

Thanks,  
mg

-----Original Message-----

From: Kraus, Geneva SPK [mailto:Geneva.Kraus@usace.army.mil]  
Sent: Monday, September 12, 2016 12:26 PM  
To: Marcos Guerrero  
Cc: Griffin, S. Joe SPK; Matthew Moore; Lee, Kevin C SPK  
Subject: USACE Lower Elkhorn Public Scoping Meeting Invite

Good Afternoon Mr. Guerrero,

I would like to invite you, and any other interested members of United Auburn Indian Community, to attend the upcoming public scoping meeting for the Lower Elkhorn 408 project. The details below are taken directly from the public notice.

"The U.S. Army Corps of Engineers Sacramento District has posted Public Notice SPK-2016-00457 to Blockedwww.spk.usace.army.mil/Media/RegulatoryPublicNotices.aspx

A public scoping meeting will be held for the proposed Lower Elkhorn Basin Levee Setback Project, Yolo County, California. The purpose of the meeting is to present information to the public and to receive comments from the public on the project and the scope of the environmental analysis.

West Sacramento - Thursday, September 15, 2016, 4:00 to 7:00 p.m., West Sacramento Civic Center, 1110 West Capitol Avenue, West Sacramento, CA 95691

Written comments and suggestions concerning the scope and content of the environmental information must be submitted by October 7, 2016, to Mr. Tyler Stalker, email at spk-pao@usace.army.mil; or surface mail at U.S. Army Corps of Engineers, Sacramento District, Attn: Public Affairs Office (CESPK-PAO), 1325 J Street, Sacramento, CA 95814-2922. Requests to be placed on the electronic or surface mail notification lists should also be sent to this address.

For additional information you may contact Mr. Zachary Simmons at our California South Regulatory Branch, 1325 J Street, Room 1350, Sacramento, California 95814-2922, email Zachary.M.Simmons@usace.army.mil, or telephone 916-557-6746."

If you have any questions about the meeting later this week please feel free to contact me. Additionally, if there are sensitive tribal concerns you prefer to voice in a more private setting, I would like extend to you the option to have a tribal scoping meeting as a follow-on to the public meeting. If this is something you would like to pursue please let me know as soon as possible. I have also attached for your reference the Notice of Intent for the project published recently in the Federal Register.

Thank you,  
Geneva Kraus  
Archaeologist (Student Trainee)  
U.S. Army Corps of Engineers, Sacramento District  
1325 J Street  
Sacramento, CA 95814  
(916) 557-7447





MIWOK United Auburn Indian Community  
 MAIDU of the Auburn Rancheria

Gene Whitehouse  
 Chairman

John L. Williams  
 Vice Chairman

Danny Rey  
 Secretary

Jason Camp  
 Treasurer

Calvin Moman  
 Council Member

September 14, 2016

Geneva Kraus  
 United States Army Corps of Engineers  
 1325 J Street  
 Sacramento, CA 95814-2922

Subject: Environmental Resources Branch Lower Elkhorn Basin Levee Setback Project, Yolo County, California

Dear Geneva Kraus,

Thank you for requesting information regarding the above referenced project. The United Auburn Indian Community (UAIC) of the Auburn Rancheria is comprised of Miwok and Southern Maidu (Nisenan) people whose tribal lands are within Placer County and whose service area includes El Dorado, Nevada, Placer, Sacramento, Sutter, and Yuba counties. The UAIC is concerned about development within its aboriginal territory that has potential to impact the lifeways, cultural sites, and landscapes that may be of sacred or ceremonial significance. We appreciate the opportunity to comment on this and other projects in your jurisdiction. The UAIC would like to consult on this project.

In order to ascertain whether the project could affect cultural resources that may be of importance to the UAIC, we would like to receive copies of any archaeological reports that are completed for the project. We also request copies of future environmental documents for the proposed project so that we have the opportunity to comment on potential impacts and proposed mitigation measures related to cultural resources. The UAIC would also like the opportunity to have our tribal monitors accompany you during the field survey. The information gathered will provide us with a better understanding of the project and cultural resources on site and is invaluable for consultation purposes.

The UAIC's preservation committee has identified cultural resources in and around your project area, and would like to recommend that a tribal monitor be present during any ground disturbing activities. Thank you again for taking these matters into consideration, and for involving the UAIC early in the planning process. We look forward to reviewing the documents requested above and consulting on your project. Please contact Marcos Guerrero, Cultural Resources Manager, at (530) 883-2364 or by email at [mguerrero@auburnrancheria.com](mailto:mguerrero@auburnrancheria.com) if you have any questions.

Sincerely,

Gene Whitehouse,  
 Chairman

CC: Marcos Guerrero, CRM

Tribal Office 10720 Indian Hill Road Auburn, CA 95603 (530) 883-2390 FAX (530) 883-2380





MIWOK  
MAIDU United Auburn Indian Community  
of the Auburn Rancheria

Tribal Office  
10720 Indian Hill Road  
Auburn, CA 95603

Geneva Kraus,  
United States Army Corps of Engineers  
1325 J Street  
Sacramento, CA 95814-2922

*JK*



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**Dunn, Hannah**

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**From:** Kraus, Geneva SPK <Geneva.Kraus@usace.army.mil>  
**Sent:** Wednesday, October 12, 2016 3:05 PM  
**To:** Marcos Guerrero; Matthew Moore  
**Cc:** Amrhein, Rochelle@DWR; Griffin, S. Joe SPK; Rinck, Jane L SPK; Lee, Kevin C SPK; Scott, Barry  
**Subject:** USACE - Tribal Consultation for the Lower Elkhorn Basin Levee Setback Project 408 permit  
**Attachments:** APE\_Location\_Map.pdf; APE\_map\_aerial.pdf

Good Afternoon Mr. Guerrero,

I received your letter yesterday regarding the Lower Elkhorn Basin Levee Setback Project. I look forward to working with United Auburn throughout the tribal consultation process for the project on the Corps side. You outlined several requests in your letter, to which I hope I can provide some answers and suggestions below.

You have requested archaeological and environmental reports in your letter. Both DWR and the Corps will be generating cultural resources documents throughout the project and contacting you separately, although the documents pertain to the same project; DWR will be sending documents related to state requirements, while the Corps will be covering the federal Section 106 compliance process. I believe you will have already received the plan for the proposed geoaerchaeological investigations from DWR by this time. Additional reports will be made available to you as cultural resources work continues. As far as future environmental documents, I will provide the Corps' lead on the NEPA side of the project with your contact information so that UAIC will receive NEPA notifications and/or documents as they are made available for public review.

DWR will be the lead on coordinating cultural resources fieldwork, so further questions about engaging tribal monitors would be best be addressed by their personnel. Given that we have a meeting with Corps, DWR, and UAIC personnel planned for next week, this would be an ideal agenda item for you to bring to the table.

Finally, you mention in your letter that UAIC's preservation committee has identified cultural resources in and around the project area. The meeting next week would be an excellent venue in which to begin to address your concerns about cultural resources relative to the locations of proposed project activities. I have attached maps of the Area of Potential Affects (APE) for your reference. We would appreciate it if you could share with the project team the location and nature of the cultural resources you refer to in your letter. The earlier we are aware of UAIC's concerns the better we can work together to resolve them.

Please feel free to call or email if you have any questions or concerns that you would like to address prior to the meeting next week.

Thank you,  
Geneva Kraus  
Archaeologist (Student Trainee)  
U.S. Army Corps of Engineers, Sacramento District  
1325 J Street  
Sacramento, CA 95814  
(916) 557-7447  
Geneva.Kraus@usace.army.mil

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**F2. Native American Correspondence  
(California Department of Water Resources)**





**NATIVE AMERICAN HERITAGE COMMISSION**

1550 Harbor Blvd., Suite 100  
West Sacramento, CA 95691  
(916) 373-8710  
Fax (916) 373-9471



May 20, 2016

Monica Nottle  
Department of Water Resources

Sent by Email: Monica.Nottle@water.ca.gov  
Number of Pages: 2

**RE: Elk Slough to Sacramento Bypass Widening Feasibility Study, Yolo County**

Dear Ms. Nottle:

A record search of the Native American Heritage Commission (NAHC) *Sacred Lands File* was completed for the area of potential project effect (APE) referenced above with negative results. However, the APE is located within an area of high sensitivity therefore I recommend completing an additional record search through the California Historical Resources Information System (CHRIS). Please note that the absence of specific site information in the *Sacred Lands File* does not indicate the absence of Native American cultural resources in any APE.

I suggest you contact all of those listed on the attached Native American Contact List, if they cannot supply information, they might recommend others with specific knowledge. The list should provide a starting place to locate areas of potential adverse impact within the APE. By contacting all those on the list, your organization will be better able to respond to claims of failure to consult. If a response has not been received within two weeks of notification, the NAHC requests that you follow-up with a telephone call to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from any of these individuals or groups, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact via email: [sharaya.souza@nahc.ca.gov](mailto:sharaya.souza@nahc.ca.gov).

Sincerely,

A handwritten signature in blue ink, appearing to read 'Sharaya Souza'.

Sharaya Souza  
Staff Services Analyst

**Native American Contacts  
Yolo County  
May 19, 2016**

Cortina Band of Indians  
Charlie Wright, Chairperson  
P.O. Box 1630 Wintun / Patwin  
Williams, CA 95987  
(530) 473-3274 Office  
(530) 473-3301 Fax

United Auburn Indian Community of the Auburn Rancheria  
Gene Whitehouse, Chairperson  
10720 Indian Hill Road Maidu  
Auburn, CA 95603 Miwok  
(530) 883-2390 Office  
  
(530) 883-2380 Fax

Yocha Dehe Wintun Nation  
Leland Kinter, Chairperson  
P.O. Box 18 Wintun (Patwin)  
Brooks, CA 95606  
lkinter@yochadehe-nsn.gov  
(530) 796-3400  
(530) 796-2143 Fax

**This list is current only as of the date of this document and is based on the information available to the Commission on the date it was produced.**

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resource Section 5097.98 of the Public Resources Code

This list is only applicable for contacting local Native Americans with regard to cultural resources assessment for the proposed Elk Slough to Sacramento Bypass Widening Feasibility Study, Yolo County.

**DEPARTMENT OF WATER RESOURCES**DIVISION OF FLOOD MANAGEMENT  
P.O. BOX 219000  
SACRAMENTO, CA 95821-9000

September 23, 2016

Honorable Gene Whitehouse, Chairman  
United Auburn Indian Community of the Auburn Rancheria  
10720 Indian Hill Road  
Auburn, CA 95603Subject: Division of Flood Management – Lower Elkhorn Basin Levee Setback:  
Geoarchaeology Investigation Plan

Dear Honorable Gene Whitehouse,

The California Department of Water Resources (DWR) is planning to improve flood facilities in the Lower Elkhorn Basin and Sacramento Bypass areas of the flood system. DWR proposes to construct a levee setback as part of this improvement effort as well as remove all or portions of the existing Yolo Bypass East Levee south of Interstate 5 and the Sacramento Bypass North Levee. Portions of the local reclamation district cross levees, which bisect the basin, would also be removed. DWR is proposing to use borrow for the planned setback levee from segments of the existing levee that would be removed, and from the agricultural lands between the existing levees and proposed future levee. The project area is within Yolo County and is shown on Attachment 1.

DWR first notified you of this project by letter dated May 20, 2016, and provided your tribe with the opportunity to provide information. On August 31, 2016, DWR sent you a second letter describing cultural resources investigations (records search and surveys to support geotechnical investigations) that had been conducted up to that date. The letter also indicated that a geoarchaeology sensitivity assessment and proposed work plan was being prepared. The purpose of this letter is to provide you with the *Geoarchaeology Sensitivity Assessment and Work Plan for the Lower Elkhorn Basin Levee Setback Project, Yolo County, California* prepared by GEI Consultants.

The purpose of the sensitivity assessment is to determine the likelihood of the presence of buried archaeological resources in the various parts of the project area using existing information. This assessment is a "desktop" analysis of known soil types and ages, depositional context, and known archaeological site locations and was used to formulate the proposed geoarchaeological work plan. The work plan consists of a proposed geoarchaeological testing program and identifies proposed methods and locations for testing. The proposed geoarchaeological testing includes excavation of 34 – 42 trenches in an effort to locate buried archaeological sites and buried soils that may be sensitive for the presence of archaeological sites. This testing is part of the resource identification process, and will not include data recovery or mitigation.

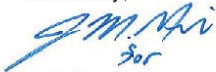
The sensitivity assessment and the geoarchaeological testing will be conducted by a qualified professional geoarchaeologist (an individual who meets the Secretary of the Interior's Professional Qualifications Standards for archaeology and who also has education and experience in soils and geology). The geoarchaeological program is just one element of DWR's efforts to identify important cultural resources and will be integrated into the overall effort to inventory all types of cultural resources in the proposed project area. The exact schedule for geoarchaeological investigations has not been determined, but based on consideration of agricultural constraints and potential weather conditions, investigations would likely begin in middle October 2016.



Lower Elkhorn Basin Levee Setback Letter  
September 23, 2016  
Page 2 of 2

DWR is sending this letter to solicit your comments, questions or interest in the proposed geoarchaeological trenching at the project site. We respectfully request that you provide your comments, questions or other interest in the proposed investigation within 14 days of the date of this letter. Correspondence may be sent to Shelly Amrhein at [Rochelle.Amrhein@water.ca.gov](mailto:Rochelle.Amrhein@water.ca.gov) or you may call Ms. Amrhein directly at 916-574-1415. Please also feel free to contact Anecita Agustinez at 916-653-8726 or by email at [Anecita.Agustinez@water.ca.gov](mailto:Anecita.Agustinez@water.ca.gov). DWR is committed to working together with your tribe consistent with its Tribal Engagement Policy, the California Natural Resources Agency's Tribal Engagement Policy, Governor Brown's Executive Order B-10-11 and California Environmental Quality Act requirements.

Sincerely,



Eric Koch  
Acting Chief  
Division of Flood Management

cc: Shelly Amrhein, DWR  
Anecita Agustinez, DWR  
Geneva Kraus, U.S. Army Corps of Engineers  
Tribal Administrator

Enclosures: Map

*Geoarchaeological Sensitivity Assessment and Work Plan for the Lower Elkhorn Basin Levee Setback Project, Yolo County, California*

**DEPARTMENT OF WATER RESOURCES**DIVISION OF FLOOD MANAGEMENT  
P.O. BOX 219000  
SACRAMENTO, CA 95821-9000

September 23, 2016

Honorable Leland Kinter, Chairman  
Yocha Dehe Wintun Nation  
P.O. Box 18  
Brooks, CA 95606-0018Subject: Division of Flood Management – Lower Elkhorn Basin Levee Setback;  
Geoarchaeology Investigation Plan

Dear Honorable Leland Kinter,

The California Department of Water Resources (DWR) is planning to improve flood facilities in the Lower Elkhorn Basin and Sacramento Bypass areas of the flood system. DWR proposes to construct a levee setback as part of this improvement effort as well as remove all or portions of the existing Yolo Bypass East Levee south of Interstate 5 and the Sacramento Bypass North Levee. Portions of the local reclamation district cross levees, which bisect the basin, would also be removed. DWR is proposing to use borrow for the planned setback levee from segments of the existing levee that would be removed, and from the agricultural lands between the existing levees and proposed future levee. The project area is within Yolo County and is shown on Attachment 1.

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Lower Elkhorn Basin Levee Setback Letter  
September 23, 2016  
Page 2 of 2

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Sincerely,

A handwritten signature in blue ink, appearing to read "Eric Koch" with "for" written below it.

Eric Koch  
Acting Chief  
Division of Flood Management

cc: Shelly Amrhein, DWR  
Anecita Agustinez, DWR  
Geneva Kraus, U.S. Army Corps of Engineers  
Tribal Administrator

Enclosures: Map

*Geoarchaeological Sensitivity Assessment and Work Plan for the Lower Elkhorn Basin Levee Setback Project, Yolo County, California*

## DEPARTMENT OF WATER RESOURCES

DIVISION OF FLOOD MANAGEMENT  
P.O. BOX 279000  
SACRAMENTO, CA 95821-9000



September 23, 2016

Honorable Rhonda Morningstar Pope, Chairperson  
Buena Vista Rancheria of Me-Wuk Indians  
1418 20th Street, Suite 200  
Sacramento, CA 95811

Subject: Division of Flood Management – Lower Elkhorn Basin Levee Setback;  
Geoarchaeology Investigation Plan

Dear Honorable Rhonda Morningstar Pope,

The California Department of Water Resources (DWR) is planning to improve flood facilities in the Lower Elkhorn Basin and Sacramento Bypass areas of the flood system. DWR proposes to construct a levee setback as part of this improvement effort as well as remove all or portions of the existing Yolo Bypass East Levee south of Interstate 5 and the Sacramento Bypass North Levee. Portions of the local reclamation district cross levees, which bisect the basin, would also be removed. DWR is proposing to use borrow for the planned setback levee from segments of the existing levee that would be removed, and from the agricultural lands between the existing levees and proposed future levee. The project area is within Yolo County and is shown on Attachment 1.

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Eric Koch  
Acting Chief  
Division of Flood Management

cc: Shelly Amrhein, DWR  
Anecita Agustinez, DWR  
Geneva Kraus, U.S. Army Corps of Engineers  
Ms. Denean Swenson, Tribal Administrator

Enclosures: Map

*Geoarchaeological Sensitivity Assessment and Work Plan for the Lower Elkhorn Basin Levee Setback Project, Yolo County, California*

**DEPARTMENT OF WATER RESOURCES**DIVISION OF FLOOD MANAGEMENT  
P.O. BOX 219000  
SACRAMENTO, CA 95821-9000

September 23, 2016

Honorable Dr. Crystal Martinez, Chairperson  
Ione Band of Miwok Indians  
P.O. Box 699  
Plymouth, CA 95669Subject: Division of Flood Management – Lower Elkhorn Basin Levee Setback;  
Geoarchaeology Investigation Plan

Dear Honorable Dr. Crystal Martinez,

The California Department of Water Resources (DWR) is planning to improve flood facilities in the Lower Elkhorn Basin and Sacramento Bypass areas of the flood system. DWR proposes to construct a levee setback as part of this improvement effort as well as remove all or portions of the existing Yolo Bypass East Levee south of Interstate 5 and the Sacramento Bypass North Levee. Portions of the local reclamation district cross levees, which bisect the basin, would also be removed. DWR is proposing to use borrow for the planned setback levee from segments of the existing levee that would be removed, and from the agricultural lands between the existing levees and proposed future levee. The project area is within Yolo County and is shown on Attachment 1.

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Lower Elkhorn Basin Levee Setback Letter  
September 23, 2016  
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Sincerely,



Eric Koch  
Acting Chief  
Division of Flood Management

cc: Shelly Amrhein, DWR  
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Geneva Kraus, U.S. Army Corps of Engineers  
Tribal Administrator

Enclosures: Map  
*Geoarchaeological Sensitivity Assessment and Work Plan for the Lower Elkhorn Basin Levee Setback Project, Yolo County, California*

**DEPARTMENT OF WATER RESOURCES**

DIVISION OF FLOOD MANAGEMENT  
P.O. BOX 219000  
SACRAMENTO, CA 95821-9000



September 23, 2016

Honorable Nicholas Fonseca, Chairman  
Shingle Springs Band of Miwok Indians  
P.O. Box 1340  
Shingle Springs, CA 95682-1340

Subject: Division of Flood Management – Lower Elkhorn Basin Levee Setback;  
Geoarchaeology Investigation Plan

Dear Honorable Nicholas Fonseca,

The California Department of Water Resources (DWR) is planning to improve flood facilities in the Lower Elkhorn Basin and Sacramento Bypass areas of the flood system. DWR proposes to construct a levee setback as part of this improvement effort as well as remove all or portions of the existing Yolo Bypass East Levee south of Interstate 5 and the Sacramento Bypass North Levee. Portions of the local reclamation district cross levees, which bisect the basin, would also be removed. DWR is proposing to use borrow for the planned setback levee from segments of the existing levee that would be removed, and from the agricultural lands between the existing levees and proposed future levee. The project area is within Yolo County and is shown on Attachment 1.

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Lower Elkhorn Basin Levee Setback Letter  
September 23, 2016  
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Sincerely,



Eric Koch  
Acting Chief  
Division of Flood Management

cc: Shelly Amrhein, DWR  
Anecita Agustinez, DWR  
Geneva Kraus, U.S. Army Corps of Engineers  
Ernest Vargas, Tribal Administrator

Enclosures: Map

*Geoarchaeological Sensitivity Assessment and Work Plan for the Lower Elkhorn Basin Levee Setback Project, Yolo County, California*

**DEPARTMENT OF WATER RESOURCES**DIVISION OF FLOOD MANAGEMENT  
P.O. BOX 219000  
SACRAMENTO, CA 95821-9000

September 23, 2016

Honorable Raymond Hitchcock, Chairman  
Wilton Rancheria  
9728 Kent Street  
Elk Grove, CA 95624Subject: Division of Flood Management – Lower Elkhorn Basin Levee Setback;  
Geoarchaeology Investigation Plan

Dear Honorable Raymond Hitchcock,

The California Department of Water Resources (DWR) is planning to improve flood facilities in the Lower Elkhorn Basin and Sacramento Bypass areas of the flood system. DWR proposes to construct a levee setback as part of this improvement effort as well as remove all or portions of the existing Yolo Bypass East Levee south of Interstate 5 and the Sacramento Bypass North Levee. Portions of the local reclamation district cross levees, which bisect the basin, would also be removed. DWR is proposing to use borrow for the planned setback levee from segments of the existing levee that would be removed, and from the agricultural lands between the existing levees and proposed future levee. The project area is within Yolo County and is shown on Attachment 1.

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Lower Elkhorn Basin Levee Setback Letter  
September 23, 2016  
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Eric Koch  
Acting Chief  
Division of Flood Management

cc: Shelly Amrhein, DWR  
Anecita Agustinez, DWR  
Geneva Kraus, U.S. Army Corps of Engineers  
Tribal Administrator

Enclosures: Map

*Geoarchaeological Sensitivity Assessment and Work Plan for the Lower Elkhorn Basin Levee Setback Project, Yolo County, California*

**DEPARTMENT OF WATER RESOURCES**DIVISION OF FLOOD MANAGEMENT  
P.O. BOX 219000  
SACRAMENTO, CA 95821-9000

September 23, 2016

Honorable Don Ryberg, Chairman  
Tsi-Akim Maidu  
P.O. Box 510  
Browns Valley, CA 95918-0510Subject: Division of Flood Management – Lower Elkhorn Basin Levee Setback;  
Geoarchaeology Investigation Plan

Dear Honorable Don Ryberg,

The California Department of Water Resources (DWR) is planning to improve flood facilities in the Lower Elkhorn Basin and Sacramento Bypass areas of the flood system. DWR proposes to construct a levee setback as part of this improvement effort as well as remove all or portions of the existing Yolo Bypass East Levee south of Interstate 5 and the Sacramento Bypass North Levee. Portions of the local reclamation district cross levees, which bisect the basin, would also be removed. DWR is proposing to use borrow for the planned setback levee from segments of the existing levee that would be removed, and from the agricultural lands between the existing levees and proposed future levee. The project area is within Yolo County and is shown on Attachment 1.

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Lower Elkhorn Basin Levee Setback Letter  
September 23, 2016  
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Eric Koch  
Acting Chief  
Division of Flood Management

cc: Shelly Amrhein, DWR  
Anecita Agustinez, DWR  
Geneva Kraus, U.S. Army Corps of Engineers  
Tribal Administrator

Enclosures: Map

*Geoarchaeological Sensitivity Assessment and Work Plan for the Lower Elkhorn Basin Levee Setback Project, Yolo County, California*

**DEPARTMENT OF WATER RESOURCES**DIVISION OF FLOOD MANAGEMENT  
P.O. BOX 219000  
SACRAMENTO, CA 95821-9000

September 23, 2016

Honorable Cosme Valdez, Chairman  
Nashville Eldorado Miwok  
P.O. Box 580986  
Elk Grove, CA 95758

Subject: Division of Flood Management – Lower Elkhorn Basin Levee Setback;  
Geoarchaeology Investigation Plan

Dear Honorable Cosme Valdez,

The California Department of Water Resources (DWR) is planning to improve flood facilities in the Lower Elkhorn Basin and Sacramento Bypass areas of the flood system. DWR proposes to construct a levee setback as part of this improvement effort as well as remove all or portions of the existing Yolo Bypass East Levee south of Interstate 5 and the Sacramento Bypass North Levee. Portions of the local reclamation district cross levees, which bisect the basin, would also be removed. DWR is proposing to use borrow for the planned setback levee from segments of the existing levee that would be removed, and from the agricultural lands between the existing levees and proposed future levee. The project area is within Yolo County and is shown on Attachment 1.

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Eric Koch  
Acting Chief  
Division of Flood Management

cc: Shelly Amrhein, DWR  
Anecita Agustinez, DWR  
Geneva Kraus, U.S. Army Corps of Engineers  
Tribal Administrator

Enclosures: Map

*Geoarchaeological Sensitivity Assessment and Work Plan for the Lower Elkhorn  
Basin Levee Setback Project, Yolo County, California*

**DEPARTMENT OF WATER RESOURCES**DIVISION OF FLOOD MANAGEMENT  
P.O. BOX 219000  
SACRAMENTO, CA 95821-9000

September 23, 2016

Honorable Charlie Wright, Chairman  
Cortina Band of Indians  
P.O. Box 1630  
Williams, CA 95987Subject: Division of Flood Management – Lower Elkhorn Basin Levee Setback:  
Geoarchaeology Investigation Plan

Dear Honorable Charlie Wright,

The California Department of Water Resources (DWR) is planning to improve flood facilities in the Lower Elkhorn Basin and Sacramento Bypass areas of the flood system. DWR proposes to construct a levee setback as part of this improvement effort as well as remove all or portions of the existing Yolo Bypass East Levee south of Interstate 5 and the Sacramento Bypass North Levee. Portions of the local reclamation district cross levees, which bisect the basin, would also be removed. DWR is proposing to use borrow for the planned setback levee from segments of the existing levee that would be removed, and from the agricultural lands between the existing levees and proposed future levee. The project area is within Yolo County and is shown on Attachment 1.

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Lower Elkhorn Basin Levee Setback Letter  
September 23, 2016  
Page 2 of 2

DWR is sending this letter to solicit your comments, questions or interest in the proposed geoarchaeological trenching at the project site. We respectfully request that you provide your comments, questions or other interest in the proposed investigation within 14 days of the date of this letter. Correspondence may be sent to Shelly Amrhein at [Rochelle.Amrhein@water.ca.gov](mailto:Rochelle.Amrhein@water.ca.gov) or you may call Ms. Amrhein directly at 916-574-1415. Please also feel free to contact Anecita Agustinez at 916-653-8726 or by email at [Anecita.Agustinez@water.ca.gov](mailto:Anecita.Agustinez@water.ca.gov). DWR is committed to working together with your tribe consistent with its Tribal Engagement Policy, the California Natural Resources Agency's Tribal Engagement Policy, Governor Brown's Executive Order B-10-11 and California Environmental Quality Act requirements.

Sincerely,



Eric Koch  
Acting Chief  
Division of Flood Management

cc: Shelly Amrhein, DWR  
Anecita Agustinez, DWR  
Geneva Kraus, U.S. Army Corps of Engineers  
Tribal Administrator

Enclosures: Map

*Geoarchaeological Sensitivity Assessment and Work Plan for the Lower Elkhorn Basin Levee Setback Project, Yolo County, California*

**DEPARTMENT OF WATER RESOURCES**DIVISION OF FLOOD MANAGEMENT  
P.O. BOX 219000  
SACRAMENTO, CA 95821-9000

September 23, 2016

Mr. Matthew Moore, Tribal Historic Preservation Officer  
United Auburn Indian Community of the Auburn Rancheria  
10720 Indian Hill Road  
Auburn, CA 95603

Subject: Division of Flood Management – Lower Elkhorn Basin Levee Setback;  
Geoarchaeology Investigation Plan

Dear Mr. Matthew Moore,

The California Department of Water Resources (DWR) is planning to improve flood facilities in the Lower Elkhorn Basin and Sacramento Bypass areas of the flood system. DWR proposes to construct a levee setback as part of this improvement effort as well as remove all or portions of the existing Yolo Bypass East Levee south of Interstate 5 and the Sacramento Bypass North Levee. Portions of the local reclamation district cross levees, which bisect the basin, would also be removed. DWR is proposing to use borrow for the planned setback levee from segments of the existing levee that would be removed, and from the agricultural lands between the existing levees and proposed future levee. The project area is within Yolo County and is shown on Attachment 1.

DWR first notified you of this project by letter dated May 20, 2016, and provided your tribe with the opportunity to provide information. On August 31, 2016, DWR sent you a second letter describing cultural resources investigations (records search and surveys to support geotechnical investigations) that had been conducted up to that date. The letter also indicated that a geoarchaeology sensitivity assessment and proposed work plan was being prepared. The purpose of this letter is to provide you with the *Geoarchaeology Sensitivity Assessment and Work Plan for the Lower Elkhorn Basin Levee Setback Project, Yolo County, California* prepared by GEI Consultants.

The purpose of the sensitivity assessment is to determine the likelihood of the presence of buried archaeological resources in the various parts of the project area using existing information. This assessment is a "desktop" analysis of known soil types and ages, depositional context, and known archaeological site locations and was used to formulate the proposed geoarchaeological work plan. The work plan consists of a proposed geoarchaeological testing program and identifies proposed methods and locations for testing. The proposed geoarchaeological testing includes excavation of 34 – 42 trenches in an effort to locate buried archaeological sites and buried soils that may be sensitive for the presence of archaeological sites. This testing is part of the resource identification process, and will not include data recovery or mitigation.

The sensitivity assessment and the geoarchaeological testing will be conducted by a qualified professional geoarchaeologist (an individual who meets the Secretary of the Interior's Professional Qualifications Standards for archaeology and who also has education and experience in soils and geology). The geoarchaeological program is just one element of DWR's efforts to identify important cultural resources and will be integrated into the overall effort to inventory all types of cultural resources in the proposed project area. The exact schedule for geoarchaeological investigations has not been determined, but based on consideration of agricultural constraints and potential weather conditions, investigations would likely begin in middle October 2016.

DWR is sending this letter to solicit your comments, questions or interest in the proposed geoarchaeological trenching at the project site. We respectfully request that you provide your comments, questions or other interest in the proposed investigation within 14 days of the date of this letter. Correspondence may be sent to Shelly Amrhein at [Rochelle.Amrhein@water.ca.gov](mailto:Rochelle.Amrhein@water.ca.gov) or you may call Ms. Amrhein directly at 916-574-1415. Please also feel free to contact Anecita Agustinez at 916-653-8726 or by email at [Anecita.Agustinez@water.ca.gov](mailto:Anecita.Agustinez@water.ca.gov). DWR is committed to working together with your tribe consistent with its Tribal Engagement Policy, the California Natural Resources Agency's Tribal Engagement Policy, Governor Brown's Executive Order B-10-11 and California Environmental Quality Act requirements.

Sincerely,



for

Eric Koch  
Acting Chief  
Division of Flood Management

cc: Shelly Amrhein, DWR  
Anecita Agustinez, DWR  
Geneva Kraus, U.S. Army Corps of Engineers

Enclosures: Map

*Geoarchaeological Sensitivity Assessment and Work Plan for the Lower Elkhorn Basin Levee Setback Project, Yolo County, California*

**DEPARTMENT OF WATER RESOURCES**DIVISION OF FLOOD MANAGEMENT  
P.O. BOX 279000  
SACRAMENTO, CA 95821-9000

September 23, 2016

Mr. Marcos Guerrero, Cultural Resources Manager  
United Auburn Indian Community of the Auburn Rancheria  
10721 Indian Hill Road  
Auburn, CA 95604

Subject: Division of Flood Management – Lower Elkhorn Basin Levee Setback;  
Geoarchaeology Investigation Plan

Dear Mr. Marcos Guerrero,

The California Department of Water Resources (DWR) is planning to improve flood facilities in the Lower Elkhorn Basin and Sacramento Bypass areas of the flood system. DWR proposes to construct a levee setback as part of this improvement effort as well as remove all or portions of the existing Yolo Bypass East Levee south of Interstate 5 and the Sacramento Bypass North Levee. Portions of the local reclamation district cross levees, which bisect the basin, would also be removed. DWR is proposing to use borrow for the planned setback levee from segments of the existing levee that would be removed, and from the agricultural lands between the existing levees and proposed future levee. The project area is within Yolo County and is shown on Attachment 1.

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Sincerely,



Eric Koch  
Acting Chief  
Division of Flood Management

cc: Shelly Amrhein, DWR  
Anecita Agustinez, DWR  
Geneva Kraus, U.S. Army Corps of Engineers

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*Geoarchaeological Sensitivity Assessment and Work Plan for the Lower Elkhorn Basin Levee Setback Project, Yolo County, California*

**DEPARTMENT OF WATER RESOURCES**DIVISION OF FLOOD MANAGEMENT  
P.O. BOX 219000  
SACRAMENTO, CA 95821-9000

September 23, 2016

Mr. Steven Hutchason, Executive Director  
Environmental Resources Department  
Wilton Rancheria  
9728 Kent Street  
Elk Grove, CA 95624Subject: Division of Flood Management – Lower Elkhorn Basin Levee Setback;  
Geoarchaeology Investigation Plan

Dear Mr. Steven Hutchason,

The California Department of Water Resources (DWR) is planning to improve flood facilities in the Lower Elkhorn Basin and Sacramento Bypass areas of the flood system. DWR proposes to construct a levee setback as part of this improvement effort as well as remove all or portions of the existing Yolo Bypass East Levee south of Interstate 5 and the Sacramento Bypass North Levee. Portions of the local reclamation district cross levees, which bisect the basin, would also be removed. DWR is proposing to use borrow for the planned setback levee from segments of the existing levee that would be removed, and from the agricultural lands between the existing levees and proposed future levee. The project area is within Yolo County and is shown on Attachment 1.

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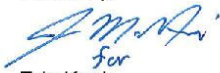
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Lower Elkhorn Basin Levee Setback Letter  
September 23, 2016  
Page 2 of 2

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Sincerely,



Eric Koch  
Acting Chief  
Division of Flood Management

cc: Shelly Amrhein, DWR  
Anecita Agustinez, DWR  
Geneva Kraus, U.S. Army Corps of Engineers

Enclosures: Map

*Geoarchaeological Sensitivity Assessment and Work Plan for the Lower Elkhorn Basin Levee Setback Project, Yolo County, California*

1

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**Dunn, Hannah**

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**From:** Scott, Barry  
**Sent:** Wednesday, December 28, 2016 7:21 AM  
**To:** Scott, Barry  
**Subject:** RE: Lower Elkhorn Basin Levee Setback Project

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**From:** Kara Perry [<mailto:KPerry@ssband.org>]  
**Sent:** Friday, November 04, 2016 2:42 PM  
**To:** Nelson, Tim@DWR; [valdezcome@comcast.net](mailto:valdezcome@comcast.net)  
**Cc:** Amrhein, Rochelle@DWR; Agustinez, Anecita S.@DWR  
**Subject:** RE: Lower Elkhorn Basin Levee Setback Project

Good Afternoon Tim,

The Shingle Springs Band Of Miwok Indians would like to be involved in the consultation process for this project as well as being able to have a tribal representative on-site during ground disturbing activities.

Thank you  
Kara Perry



**Kara Perry**  
Cultural Outreach Coordinator  
Cultural Resources Department  
  
Phone: (530) 488-4049  
Mobile: (530) 363-5123  
Fax: (530) 558-2034  
Email: [kperry@ssband.org](mailto:kperry@ssband.org)

Shingle Springs Band of Miwok Indians | P.O. Box 1340, Shingle Springs, CA 95682 |  
[www.shinglespringsrancheria.com](http://www.shinglespringsrancheria.com)

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SSBMI Disclaimer: This email (RE: Lower Elkhorn Basin Levee Setback Project) is from Shingle Springs Band of Miwok Indians: Cultural Resources Department and is intended for [Tim.Nelson@water.ca.gov](mailto:Tim.Nelson@water.ca.gov); [valdezcome@comcast.net](mailto:valdezcome@comcast.net). Any attachments thereto may contain private, confidential, and privileged material. Any review, copying, or distribution of this email (or any attachments thereto) by parties other than the Shingle Springs Band of Miwok Indians (and its affiliated departments or programs) or the intended recipient(s) is strictly prohibited. If you properly received this e-mail as an employee of the Shingle Springs Band of Miwok Indians, outside legal counsel or retained expert, you should maintain its contents in confidence in order to preserve the attorney-client or work product privilege that may be available to protect confidentiality.

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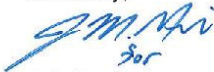
**From:** Nelson, Tim@DWR [<mailto:Tim.Nelson@water.ca.gov>]  
**Sent:** Wednesday, October 26, 2016 11:08 AM  
**To:** Kara Perry; [valdezcome@comcast.net](mailto:valdezcome@comcast.net)



Lower Elkhorn Basin Levee Setback Letter  
September 23, 2016  
Page 2 of 2

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Sincerely,



Eric Koch  
Acting Chief  
Division of Flood Management

cc: Shelly Amrhein, DWR  
Anecita Agustinez, DWR  
Geneva Kraus, U.S. Army Corps of Engineers  
Tribal Administrator

Enclosures: Map

*Geoarchaeological Sensitivity Assessment and Work Plan for the Lower Elkhorn Basin Levee Setback Project, Yolo County, California*

**Cc:** Amrhein, Rochelle@DWR; Agustinez, Anecita [S.@DWR](mailto:S.@DWR)  
**Subject:** Lower Elkhorn Basin Levee Setback Project

The first email bounced back the initial emails. So, we try again.  
Thanks  
Tim

-----  
Hello Tribal Representatives,

You are receiving this email, because your tribe has potential cultural sites in the Lower Elkhorn Basin Levee Setback Project area. A letter was sent to your tribe on Aug. 31, 2016 offering an opportunity to consult on this project. DWR has heard nothing back, and we are giving another chance to respond for consultation. Currently, we are consulting with other tribes, and DWR wanted to confirm your participation. Now is this time to be heard as ground breaking will start soon.

Please respond whether your tribe is interested, deferring to other tribes, or have no interest in the project.  
Thanks for your time.

Tim Nelson, P.E.  
Dept. of Water Resources  
NCRO- Tribal Liaison  
3500 Industrial Blvd, Suite 100  
West Sacramento, CA 95691  
Office - (916) 376-1926  
Fax - (916) 376-9676  
Email - [Tim.Nelson@water.ca.gov](mailto:Tim.Nelson@water.ca.gov)

## NATIVE AMERICAN HERITAGE COMMISSION

1550 Harbor Blvd., Suite 100  
West Sacramento, CA 95691  
Phone (916) 373-3710  
Fax (916) 373-5471  
Email: [nahc@nahc.ca.gov](mailto:nahc@nahc.ca.gov)  
Website: <http://www.nahc.ca.gov>  
Twitter: @CA\_NAHC



September 12, 2016

Shelly Amrhein  
California Department of Water Resources  
3464 El Camino Ave, Suite 150  
Sacramento, CA 95821

RE: SCH#2016092015, Lower Elkhorn Basin Levee Setback, Yolo County

Dear Ms. Amrhein:

The Native American Heritage Commission has received the Notice of Preparation (NOP) for the project referenced above. The California Environmental Quality Act (CEQA) (Pub. Resources Code § 21000 et seq.), specifically Public Resources Code section 21084.1, states that a project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment. (Pub. Resources Code § 21084.1; Cal. Code Regs., tit. 14, § 15064.5 (b) (CEQA Guidelines Section 15064.5 (b)). If there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, an environmental impact report (EIR) shall be prepared. (Pub. Resources Code § 21080 (d); Cal. Code Regs., tit. 14, § 15064 subd.(a)(1) (CEQA Guidelines § 15064 (a)(1)). In order to determine whether a project will cause a substantial adverse change in the significance of a historical resource, a lead agency will need to determine whether there are historical resources with the area of project effect (APE).

**CEQA was amended significantly in 2014.** Assembly Bill 52 (Gatto, Chapter 532, Statutes of 2014) (AB 52) amended CEQA to create a separate category of cultural resources, "tribal cultural resources" (Pub. Resources Code § 21074) and provides that a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment. (Pub. Resources Code § 21084.2). Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource. (Pub. Resources Code § 21084.3 (a)). **AB 52 applies to any project for which a notice of preparation or a notice of negative declaration or mitigated negative declaration is filed on or after July 1, 2015.** If your project involves the adoption of or amendment to a general plan or a specific plan, or the designation or proposed designation of open space, on or after March 1, 2005, it may also be subject to Senate Bill 18 (Burton, Chapter 905, Statutes of 2004) (SB 18). **Both SB 18 and AB 52 have tribal consultation requirements.** If your project is also subject to the federal National Environmental Policy Act (42 U.S.C. § 4321 et seq.) (NEPA), the tribal consultation requirements of Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 300101, 36 C.F.R. § 800 et seq.) may also apply.

The NAHC recommends consultation with California Native American tribes that are traditionally and culturally affiliated with the geographic area of your proposed project as early as possible in order to avoid inadvertent discoveries of Native American human remains and best protect tribal cultural resources. Below is a brief summary of portions of AB 52 and SB 18 as well as the NAHC's recommendations for conducting cultural resources assessments. **Consult your legal counsel about compliance with AB 52 and SB 18 as well as compliance with any other applicable laws.**

AB 52

AB 52 has added to CEQA the additional requirements listed below, along with many other requirements:

1. Fourteen Day Period to Provide Notice of Completion of an Application/Decision to Undertake a Project: Within fourteen (14) days of determining that an application for a project is complete or of a decision by a public agency to undertake a project, a lead agency shall provide formal notification to a designated contact of, or tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice, to be accomplished by at least one written notice that includes:
  - a. A brief description of the project.
  - b. The lead agency contact information.
  - c. Notification that the California Native American tribe has 30 days to request consultation. (Pub. Resources Code § 21080.3.1 (d)).
  - d. A "California Native American tribe" is defined as a Native American tribe located in California that is on the contact list maintained by the NAHC for the purposes of Chapter 905 of Statutes of 2004 (SB 18). (Pub. Resources Code § 21073).
2. Begin Consultation Within 30 Days of Receiving a Tribe's Request for Consultation and Before Releasing a Negative Declaration, Mitigated Negative Declaration, or Environmental Impact Report: A lead agency shall begin the consultation process within 30 days of receiving a request for consultation from a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project. (Pub. Resources Code § 21080.3.1, subs. (d) and (e)) and prior to the release of a negative declaration, mitigated negative declaration or environmental impact report. (Pub. Resources Code § 21080.3.1(b)).
  - a. For purposes of AB 52, "consultation shall have the same meaning as provided in Gov. Code § 65352.4 (SB 18). (Pub. Resources Code § 21080.3.1 (b)).
3. Mandatory Topics of Consultation If Requested by a Tribe: The following topics of consultation, if a tribe requests to discuss them, are mandatory topics of consultation:
  - a. Alternatives to the project.
  - b. Recommended mitigation measures.
  - c. Significant effects. (Pub. Resources Code § 21080.3.2 (a)).
4. Discretionary Topics of Consultation: The following topics are discretionary topics of consultation:
  - a. Type of environmental review necessary.
  - b. Significance of the tribal cultural resources.
  - c. Significance of the project's impacts on tribal cultural resources.
  - d. If necessary, project alternatives or appropriate measures for preservation or mitigation that the tribe may recommend to the lead agency. (Pub. Resources Code § 21080.3.2 (a)).
5. Confidentiality of Information Submitted by a Tribe During the Environmental Review Process: With some exceptions, any information, including but not limited to, the location, description, and use of tribal cultural resources submitted by a California Native American tribe during the environmental review process shall not be included in the environmental document or otherwise disclosed by the lead agency or any other public agency to the public, consistent with Government Code sections 6254 (r) and 6254.10. Any information submitted by a California Native American tribe during the consultation or environmental review process shall be published in a confidential appendix to the environmental document unless the tribe that provided the information consents, in writing, to the disclosure of some or all of the information to the public. (Pub. Resources Code § 21082.3 (c)(1)).
6. Discussion of Impacts to Tribal Cultural Resources in the Environmental Document: If a project may have a significant impact on a tribal cultural resource, the lead agency's environmental document shall discuss both of the following:
  - a. Whether the proposed project has a significant impact on an identified tribal cultural resource.
  - b. Whether feasible alternatives or mitigation measures, including those measures that may be agreed to pursuant to Public Resources Code section 21082.3, subdivision (a), avoid or substantially lessen the impact on the identified tribal cultural resource. (Pub. Resources Code § 21082.3 (b)).
7. Conclusion of Consultation: Consultation with a tribe shall be considered concluded when either of the following occurs:
  - a. The parties agree to measures to mitigate or avoid a significant effect, if a significant effect exists, on a tribal cultural resource; or



- b. A party, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached. (Pub. Resources Code § 21080.3.2 (b)).
8. Recommending Mitigation Measures Agreed Upon in Consultation in the Environmental Document: Any mitigation measures agreed upon in the consultation conducted pursuant to Public Resources Code section 21080.3.2 shall be recommended for inclusion in the environmental document and in an adopted mitigation monitoring and reporting program, if determined to avoid or lessen the impact pursuant to Public Resources Code section 21082.3, subdivision (b), paragraph 2, and shall be fully enforceable. (Pub. Resources Code § 21082.3 (a)).
  9. Required Consideration of Feasible Mitigation: If mitigation measures recommended by the staff of the lead agency as a result of the consultation process are not included in the environmental document or if there are no agreed upon mitigation measures at the conclusion of consultation, or if consultation does not occur, and if substantial evidence demonstrates that a project will cause a significant effect to a tribal cultural resource, the lead agency shall consider feasible mitigation pursuant to Public Resources Code section 21084.3 (b). (Pub. Resources Code § 21082.3 (e)).
  10. Examples of Mitigation Measures That, If Feasible, May Be Considered to Avoid or Minimize Significant Adverse Impacts to Tribal Cultural Resources:
    - a. Avoidance and preservation of the resources in place, including, but not limited to:
      - i. Planning and construction to avoid the resources and protect the cultural and natural context.
      - ii. Planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.
    - b. Treating the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:
      - i. Protecting the cultural character and integrity of the resource.
      - ii. Protecting the traditional use of the resource.
      - iii. Protecting the confidentiality of the resource.
    - c. Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places.
    - d. Protecting the resource. (Pub. Resource Code § 21084.3 (b)).
    - e. Please note that a federally recognized California Native American tribe or a nonfederally recognized California Native American tribe that is on the contact list maintained by the NAHC to protect a California prehistoric, archaeological, cultural, spiritual, or ceremonial place may acquire and hold conservation easements if the conservation easement is voluntarily conveyed. (Civ. Code § 815.3 (c)).
    - f. Please note that it is the policy of the state that Native American remains and associated grave artifacts shall be repatriated. (Pub. Resources Code § 5097.991).
  11. Prerequisites for Certifying an Environmental Impact Report or Adopting a Mitigated Negative Declaration or Negative Declaration with a Significant Impact on an Identified Tribal Cultural Resource: An environmental impact report may not be certified, nor may a mitigated negative declaration or a negative declaration be adopted unless one of the following occurs:
    - a. The consultation process between the tribes and the lead agency has occurred as provided in Public Resources Code sections 21080.3.1 and 21080.3.2 and concluded pursuant to Public Resources Code section 21080.3.2.
    - b. The tribe that requested consultation failed to provide comments to the lead agency or otherwise failed to engage in the consultation process.
    - c. The lead agency provided notice of the project to the tribe in compliance with Public Resources Code section 21080.3.1 (d) and the tribe failed to request consultation within 30 days. (Pub. Resources Code § 21082.3 (d)).

The NAHC's PowerPoint presentation titled, "Tribal Consultation Under AB 52: Requirements and Best Practices" may be found online at: [http://nahc.ca.gov/wp-content/uploads/2015/10/AB52TribalConsultation\\_CalEPAPDF.pdf](http://nahc.ca.gov/wp-content/uploads/2015/10/AB52TribalConsultation_CalEPAPDF.pdf)

**SB 18**

SB 18 applies to local governments and requires local governments to contact, provide notice to, refer plans to, and consult with tribes prior to the adoption or amendment of a general plan or a specific plan, or the designation of

open space. (Gov. Code § 65352.3). Local governments should consult the Governor's Office of Planning and Research's "Tribal Consultation Guidelines," which can be found online at: [https://www.opr.ca.gov/docs/09\\_14\\_05\\_Updated\\_Guidelines\\_922.pdf](https://www.opr.ca.gov/docs/09_14_05_Updated_Guidelines_922.pdf)

Some of SB 18's provisions include:

1. **Tribal Consultation:** If a local government considers a proposal to adopt or amend a general plan or a specific plan, or to designate open space it is required to contact the appropriate tribes identified by the NAHC by requesting a "Tribal Consultation List." If a tribe, once contacted, requests consultation the local government must consult with the tribe on the plan proposal. **A tribe has 90 days from the date of receipt of notification to request consultation unless a shorter timeframe has been agreed to by the tribe.** (Gov. Code § 65352.3 (a)(2)).
2. **No Statutory Time Limit on SB 18 Tribal Consultation.** There is no statutory time limit on SB 18 tribal consultation.
3. **Confidentiality:** Consistent with the guidelines developed and adopted by the Office of Planning and Research pursuant to Gov. Code section 65040.2, the city or county shall protect the confidentiality of the information concerning the specific identity, location, character, and use of places, features and objects described in Public Resources Code sections 5097.9 and 5097.993 that are within the city's or county's jurisdiction. (Gov. Code § 65352.3 (b)).
4. **Conclusion of SB 18 Tribal Consultation:** Consultation should be concluded at the point in which:
  - a. The parties to the consultation come to a mutual agreement concerning the appropriate measures for preservation or mitigation; or
  - b. Either the local government or the tribe, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached concerning the appropriate measures of preservation or mitigation. (Tribal Consultation Guidelines, Governor's Office of Planning and Research (2005) at p. 18).

Agencies should be aware that neither AB 52 nor SB 18 precludes agencies from initiating tribal consultation with tribes that are traditionally and culturally affiliated with their jurisdictions before the timeframes provided in AB 52 and SB 18. For that reason, we urge you to continue to request Native American Tribal Contact Lists and "Sacred Lands File" searches from the NAHC. The request forms can be found online at: <http://nahc.ca.gov/resources/forms/>

#### NAHC Recommendations for Cultural Resources Assessments

To adequately assess the existence and significance of tribal cultural resources and plan for avoidance, preservation in place, or barring both, mitigation of project-related impacts to tribal cultural resources, the NAHC recommends the following actions:

1. Contact the appropriate regional California Historical Research Information System (CHRIS) Center ([http://ohp.parks.ca.gov/?page\\_id=1068](http://ohp.parks.ca.gov/?page_id=1068)) for an archaeological records search. The records search will determine:
  - a. If part or all of the APE has been previously surveyed for cultural resources.
  - b. If any known cultural resources have been already been recorded on or adjacent to the APE.
  - c. If the probability is low, moderate, or high that cultural resources are located in the APE.
  - d. If a survey is required to determine whether previously unrecorded cultural resources are present.
2. If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.
  - a. The final report containing site forms, site significance, and mitigation measures should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum and not be made available for public disclosure.
  - b. The final written report should be submitted within 3 months after work has been completed to the appropriate regional CHRIS center.
3. Contact the NAHC for:

- a. A Sacred Lands File search. Remember that tribes do not always record their sacred sites in the Sacred Lands File, nor are they required to do so. A Sacred Lands File search is not a substitute for consultation with tribes that are traditionally and culturally affiliated with the geographic area of the project's APE.
  - b. A Native American Tribal Consultation List of appropriate tribes for consultation concerning the project site and to assist in planning for avoidance, preservation in place, or, failing both, mitigation measures.
4. Remember that the lack of surface evidence of archaeological resources (including tribal cultural resources) does not preclude their subsurface existence.
  - a. Lead agencies should include in their mitigation and monitoring reporting program plan provisions for the identification and evaluation of inadvertently discovered archaeological resources per Cal. Code Regs., tit. 14, section 15064.5(f) (CEQA Guidelines section 15064.5(f)). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American with knowledge of cultural resources should monitor all ground-disturbing activities.
  - b. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the disposition of recovered cultural items that are not burial associated in consultation with culturally affiliated Native Americans.
  - c. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the treatment and disposition of inadvertently discovered Native American human remains. Health and Safety Code section 7050.5, Public Resources Code section 5097.98, and Cal. Code Regs., tit. 14, section 15064.5, subdivisions (d) and (e) (CEQA Guidelines section 15064.5, subds. (d) and (e)) address the processes to be followed in the event of an inadvertent discovery of any Native American human remains and associated grave goods in a location other than a dedicated cemetery.

If you have any questions, please contact me at my email address: [sharaya.souza@nahc.ca.gov](mailto:sharaya.souza@nahc.ca.gov).

Sincerely,



Sharaya Souza  
Staff Services Analyst  
cc: State Clearinghouse





MIWOK United Auburn Indian Community  
 MAIDU of the Auburn Rancheria

Gene Whitehouse  
 Chairman

John L. Williams  
 Vice Chairman

Danny Rey  
 Secretary

Jason Camp  
 Treasurer

Calvin Moman  
 Council Member

November 10, 2016

Shelly Amrhein  
 Department of Water Resources  
 Division of Flood Management  
 3464 El Camino Avenue, Suite 150  
 Sacramento, CA 95821

RE: Lower Elkhorn Levee Setback, UAIC Project Number: THPC-PRJ-2016-067

Dear Shelly Amrhein,

The United Auburn Indian Community (UAIC) has consulted with your department regarding the proposed project, the Lower Elkhorn Levee Setback Project. Thank you for requesting information regarding the proposed project. In response to your request, we conducted a complete records search of the cultural resource records and survey reports contained in our Tribal Historic Resources Information System that are within a 1/2 mile radius of the proposed project area. Our review of this information indicates that the search area contains recorded prehistoric-period cultural resources.

Enclosed is some additional information about the Tribal Historic Resources Information System and UAIC's Environmental Review, Assessment, and Compliance Program. Thank you for using our services. A billing statement and invoice is enclosed. Please remit payment in the form of a check made payable to the United Auburn Indian Community and mailed to the attention of the Finance & Accounting Department at 10720 Indian Hill Road in Auburn, California 95603. Payment is due within 30 days. We will be happy to discuss the results of the records search with you in greater detail once payment is received. Similarly, once payment is received, we will be happy to provide you with an environmentally sensitive area (ESA) map and GIS SHP file that depicts the boundaries of known cultural resources and areas that are sensitive for cultural resources.

The United Auburn Indian Community comprises Miwok and Southern Maidu (Nisenan) people whose ancestral territory includes the proposed project area. UAIC actively monitors development within its ancestral territory that could impact lifeways, cultural sites, and landscapes that are sacred or have ceremonial significance. We appreciate the documentation you submitted along with your request for information. We ask that you send us copies of any archaeological reports or cultural resource assessments that are completed for the project so that we can continue to monitor the project's potential impact on cultural resources that are important to UAIC.

We also ask that UAIC tribal representatives be allowed to observe and participate in all cultural resource surveys, including initial pedestrian surveys for the project. If tribal cultural resources

Tribal Office 10720 Indian Hill Road Auburn, CA 95603 (530) 883-2390 FAX (530) 883-2380



are identified within the project area, it is UAIC's policy that tribal monitors must be present for all ground disturbing activities. Finally, please be advised that UAIC's strong preference is to preserve tribal cultural resources in place and avoid them whenever possible. Subsurface testing and data recovery in areas with known or suspected tribal cultural resources must not occur without first consulting with UAIC and receiving UAIC's written consent.

If you have any questions about the results of the records search or UAIC's Environmental Review, Assessment, and Compliance Program, please contact Marcos Guerrero, UAIC's Cultural Resources Manager. He can be reached by phone at (530) 883-2364 or by email at [mguerrero@auburnrancheria.com](mailto:mguerrero@auburnrancheria.com).

Sincerely,



Matt Moore  
UAIC Tribal Historic Preservation Officer

Enclosures

- 1: UAIC Environmental Review, Assessment and Compliance Program
- 2: Invoice

Tribal Office 10720 Indian Hill Road Auburn, CA 95603 (530) 883-2390 FAX (530) 883-2380

**Appendix G. Lower Elkhorn Basin  
Levee Setback Project  
Hydraulic Impact Analysis (Draft)**

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# **Appendix G**

## **Lower Elkhorn Basin Levee Setback Project Hydraulic Impact Analysis (Draft)**

Prepared by:

California Department of Water Resources

Division of Flood Management

May 2017





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# 1. Introduction

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The purpose of this hydraulic impact analysis is to identify potential impacts related to increased flood risk from the proposed Lower Elkhorn Basin Levee Setback (LEBLS) project. For this analysis, the differences in stages at various locations within the Sacramento River Flood Control System were used to quantify impacts for selected hydrologic events (i.e., approximate 100- and 200-year flood events). Four scenarios described in Section 3, “Hydraulic Modeling Methods,” were modeled to represent the following different conditions for all action alternatives:

- Existing Conditions (existing conditions without LEBLS project)
- Existing With-Project (existing conditions with LEBLS project)
- Future Without-Project (future conditions without LEBLS project)
- Future With-Project (future conditions with LEBLS project)



## 2. Hydrologic Methods

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### 2.1 Products and Tools

The Central Valley Hydrology Study (CVHS) products and tools were applied to develop the model hydrology. The CVHS was a joint project conducted by the U. S. Army Corps of Engineers (USACE) and California Department of Water Resources (DWR) to support future planning and implementation efforts to reduce flood risk in the Central Valley. The CVHS developed products and tools that can be applied for developing design storm hydrographs, water surface elevations (WSEs), and supporting risk analysis studies. This includes use of four specified historic flow patterns and the various scaled versions of that dataset.

CVHS tools were used to perform reservoir simulations, including reservoir operating rules and starting conditions, using the USACE Hydrologic Engineering Center (HEC) ResSIM software. The Task Order 34 Sacramento River Routing HEC-RAS model for the Sacramento River system (TO 34 SRR model) was used for hydraulic routing of the flows downstream as described in Section 3, “Hydraulic Modeling Methods.”

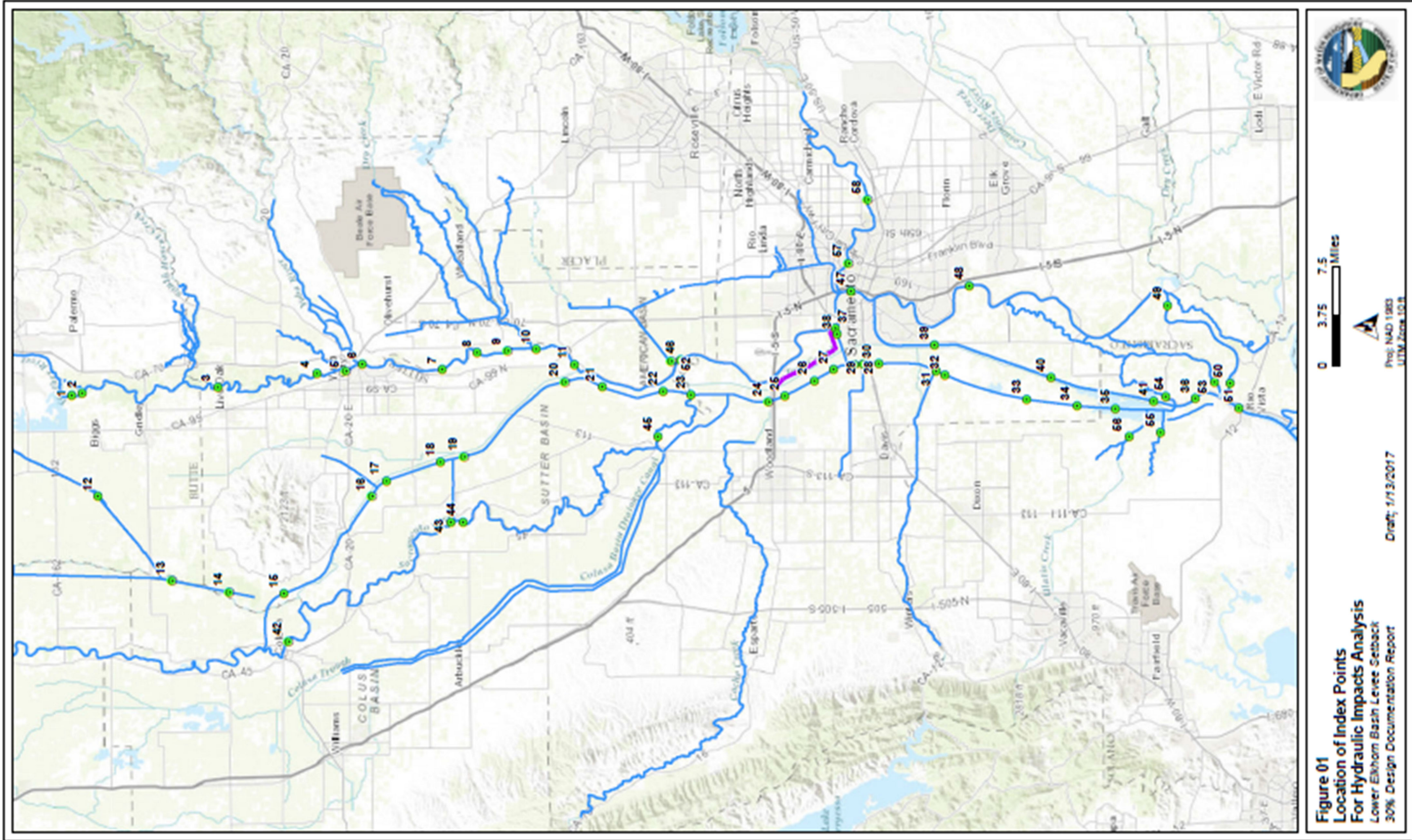
### 2.2 Reservoir Simulation

The Sacramento River HEC-ResSim system model, originally developed for CVHS by DWR and USACE, was updated for this analysis. Specifically, the forecast-based operation at Folsom Reservoir, which incorporates the new spillway, was configured into the model. The reservoir operation baseline condition and all with-project conditions are the same, so one model was developed. The selected events (as described below) were simulated using the updated reservoir operations model.

### 2.3 Event Selection

Specific scaled historic hydrologic events were used to identify potential impacts by comparing the without- and with-project conditions. The scaled event selection is based on the process used for the Sacramento River Basin-Wide Feasibility Study (BWFS) to support the Central Valley Flood Protection Plan (CVFPP) 2017 Update. During the process, DWR ran the full set of CVFPP Baseline HEC-RAS models. The full set of models include varying scales of historic flood events: 1956, 1965, 1986, and 1997. The simulated models were run without levee breaches while allowing overtopping. In-channel regulated flow-frequency curves were computed throughout the Sacramento River system for 15 index points on the main river stems and bypasses (Figure 1). Combined regulated flow-frequency curves were computed from the four storm events. Since the 1997 storm was found to be the dominant event among the four observed, the 1997 scaled event that produced similar peak flows as the combined regulated flow-frequency curve was chosen to represent the 100- and 200-year recurrence interval flows. The median representation of the Yolo Bypass system hydrology used two scaled historic events, 1997 x 95% and 1997 x 110%, which approximately correspond to the 100- and 200-year recurrence-interval flows, respectively.

Figure 1. Location of Index Points





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# **3. Hydraulic Modeling Methods**

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## **3.1 Topography and Datums**

Topographic data were obtained from two sources: (1) Central Valley Floodplain Evaluation and Delineation (CVFED) LiDAR 2007 data developed by DWR, and (2) design-level topographic surveys and survey control reports. The vertical project datum is North American Vertical Datum, 1988 (NAVD 88) and the horizontal datum is the North American Datum, 1983 (NAD 83).

## **3.2 Model Selection**

Hydraulic modeling was used to route the flows downstream through the river basin to compare without- and with-project peak stages. The TO 34 SRR model was used and enhanced from the TO 25 CVFED model by extending the river reaches to upstream forecast points, gages, and flood control reservoirs.

## **3.3 Calibration and Validation**

The TO 25 CVFED model, from which the TO 34 SRR model was enhanced, was calibrated for the 1997 and 2006 flood events and reviewed and accepted by USACE, Sacramento District as part of the CVFED program. The TO 34 SRR model was validated by comparing the 1997 and 2006 events with recorded gage data and high water marks.

## **3.4 Downstream Boundary Condition**

Downstream boundary conditions at the Sacramento River, Threemile Slough, and Georgiana Slough are represented by observed stage hydrographs during the 1997 storm event, which were obtained from USACE.

## **3.5 Modeling Scenarios**

### **3.5.1 Existing Conditions Scenario**

The Existing Conditions scenario includes the existing conditions as of September 2016 plus the authorized and funded projects (Early Implementation Project [EIP] funded by Propositions 1E and 84 and represented in the 2017 CVFPP Update system analysis). The Existing Conditions scenario also represents the No Project Alternative under the California Environmental Quality Act and the No Action Alternative under the National Environmental Policy Act (NEPA). The projects include the Folsom Joint Federal Project improvements and new dam operation guidelines as well as several levee improvement and setback projects throughout the basin that have been completed or are under construction. These detailed projects are listed below.

- Hamilton City Flood Damage Reduction and Ecosystem Restoration Project Phase 1: This USACE project is located on the west levee of the Sacramento River at Hamilton City. The project is a 6.8-mile setback levee to provide flood risk reduction to the community and agricultural areas. The



setback and levee raise has been applied to the Existing Condition geometry from Sacramento River Mile (RM) 200.782 to RM 198.262.

- Feather River Levee Improvement Project: Feather River East Levee was setback from RM 104.85 to RM 97.50.
- Star Bend Levee Setback Project: Feather River West Levee was setback at RM 98.6 for 0.75 Mile.
- Bear River Levee Setback Project: Bear River North Levee was setback from RM 3.4 to RM 1.43.
- Natomas Levee Improvement Program (NLIP).
- Sacramento River East Levee Project: The Sacramento River East Levee was raised from RM 78.933 to RM 67.132.
- Natomas Cross Canal South Levee: This levee was raised from RM 5.162 to RM 0.154.
- Pleasant Grove Canal South Levee: This levee was raised from RM 0.55 to RM 0.
- Southport Levee Improvement Project: Sacramento River West Levee was setback from RM 56.8 to RM 52.6.
- American River Common Features Project 1996/1999 sites.
- Folsom Dam Joint Federal Project: Includes water control manual update considering Folsom Dam raise and forecast-based operations as of December 2016.
- Marysville Ring Levee.
- Sutter Basin Project – Feather River West Levee Project.

EIP projects are included in the Existing Conditions since, although a few of the projects are undergoing a phased implementation and have not been fully constructed, these projects are upstream of the project site and/or have no contribution to any hydraulic impacts resulting from the LEBLS project.

### **3.5.2 Existing With-Project Scenario**

The Existing With-Project scenario is the same as Existing Conditions with the addition of each of the four LEBLS project action alternatives to determine the effects of each action alternative. LEBLS project features are detailed in Chapter 3, “Alternatives.”

### **3.5.3 Future Without-Project Scenario**

The Future Without-Project scenario is the same as Existing Conditions with the addition of the features in the USACE American River Common Features General Reevaluation Report (ARCF GRR) recommended plan. Those features include widening the Sacramento Bypass by approximately 1,500 feet and extending the Sacramento Weir by the same length. The Sacramento Bypass setback levee alignment is consistent with the LEBLS project alignment except for the tie-in connection with the existing Sacramento Bypass Levee (instead of at the extended weir). This scenario is provided for informational purposes but is not used to compare impacts of the alternatives.

### **3.5.4 Future With-Project Scenario**

The Future With-Project scenario is the same as the Existing With-Project scenario with the addition of the LEBLS project and the Sacramento Weir and Bypass expansions (consistent with the ARCF GRR and Future Without-Project scenario). This scenario is also the cumulative effects scenario.

# 4. Hydraulic Modeling Results

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Hydraulic model results for the four scenarios are shown in Tables 1 through 4.

**Table 1. Peak Water Surface Elevations for Model Scenarios – Alternative 2**

No.	Indicator Location	Existing Stage (feet)		FWOP Stage (feet)		EWP Stage (feet)		FWP Stage (feet)		EWP (Alternative 2) vs. Existing Conditions Change in Stage (feet)		FWOP vs. Existing Conditions Change in Stage (feet)		FWP (Alternative 2 and cumulative) vs. Existing Conditions Change in Stage (feet)	
		100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year
		1	Feather River Upstream of Cherokee Canal Diversion	126.60	127.05	126.60	127.05	126.60	127.05	126.60	127.05	0	0	0	0
2	Feather River Downstream of Cherokee Canal Diversion	121.56	122.05	121.56	122.05	121.56	122.05	121.56	122.05	0	0	0	0	0	0
3	Feather River Downstream of Honcut Creek Confluence	84.88	85.11	84.88	85.11	84.88	85.11	84.88	85.11	0	0	0	0	0	0
4	Feather River Upstream of Jack Slough Confluence	77.56	77.99	77.56	77.99	77.56	77.99	77.56	77.99	0	0	0	0	0	0
5	Feather River Upstream of Yuba River Confluence	75.14	75.76	75.14	75.76	75.14	75.76	75.14	75.76	0	0	0	0	0	0
6	Feather River Downstream of Yuba River Confluence	73.95	74.65	73.95	74.65	73.95	74.65	73.95	74.65	0	0	0	0	0	0
7	Feather River at Boyd's Landing	64.81	65.62	64.80	65.61	64.81	65.62	64.80	65.61	0	0	-0.01	-0.01	-0.01	-0.01
8	Feather River Upstream of Mainstem Setback	62.04	62.85	62.03	62.85	62.03	62.85	62.03	62.84	-0.01	0	-0.01	0	-0.01	-0.01
9	Feather River Upstream of Bear River Confluence	57.62	58.37	57.61	58.36	57.61	58.36	57.60	58.36	-0.01	-0.01	-0.01	-0.01	-0.02	-0.01
10	Feather River Downstream of Bear River Confluence	56.07	56.85	56.06	56.84	56.06	56.83	56.05	56.83	-0.01	-0.02	-0.01	-0.01	-0.02	-0.02
11	Feather River Upstream of Sutter Bypass Confluence	51.61	52.69	51.58	52.65	51.58	52.65	51.56	52.63	-0.03	-0.04	-0.03	-0.04	-0.05	-0.06
12	Cherokee Canal Downstream of Cherokee Bypass	87.38	87.80	87.38	87.80	87.38	87.80	87.38	87.80	0	0	0	0	0	0
13	Butte Sink Downstream of Cherokee Canal	69.83	70.52	69.83	70.52	69.83	70.52	69.83	70.52	0	0	0	0	0	0
14	Butte Sink Upstream of Sutter Bypass	66.83	67.98	66.83	67.98	66.83	67.98	66.83	67.98	0	0	0	0	0	0
15	Sutter Bypass Downstream of Butte Sink	65.87	66.95	65.87	66.95	65.87	66.95	65.87	66.94	0	0	0	0	0	-0.01
16	Sutter Bypass Upstream of Wadsworth Canal Confluence	55.75	57.10	55.73	57.08	55.73	57.08	55.73	57.08	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
17	Sutter Bypass Downstream of Wadsworth Canal Confluence	54.65	56.01	54.63	55.99	54.63	55.99	54.62	55.98	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03
18	Sutter Bypass Upstream of Tisdale Bypass Confluence	52.35	53.68	52.32	53.65	52.32	53.65	52.31	53.64	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04
19	Sutter Bypass Downstream of Tisdale Bypass Confluence	51.85	53.16	51.82	53.14	51.82	53.13	51.80	53.12	-0.03	-0.03	-0.03	-0.02	-0.05	-0.04
20	Sutter Bypass Upstream of Feather River Confluence	49.47	50.66	49.43	50.62	49.43	50.61	49.41	50.59	-0.04	-0.05	-0.04	-0.04	-0.06	-0.07
21	Sutter Bypass Downstream of Feather River Confluence	46.73	47.87	46.66	47.80	46.66	47.79	46.62	47.75	-0.07	-0.08	-0.07	-0.07	-0.11	-0.12
22	Sutter Bypass Upstream of Fremont Weir	43.21	44.21	43.08	44.09	43.07	44.07	43.00	44.00	-0.14	-0.14	-0.13	-0.12	-0.21	-0.21
23	Yolo Bypass Downstream of Fremont Weir	41.13	42.08	41.02	41.96	40.95	41.88	40.89	41.83	-0.18	-0.2	-0.11	-0.12	-0.24	-0.25
24	Yolo Bypass Upstream of I-5	35.43	36.44	35.30	36.33	34.72	35.78	34.71	35.79	-0.71	-0.66	-0.13	-0.11	-0.72	-0.65
25	Yolo Bypass Downstream of I-5	33.67	34.65	33.55	34.55	33.01	34.02	33.04	34.06	-0.66	-0.63	-0.12	-0.1	-0.63	-0.59
26	Yolo Bypass Upstream of Sacramento Bypass-1	32.08	33.10	31.96	33.01	31.69	32.73	31.75	32.82	-0.39	-0.37	-0.12	-0.09	-0.33	-0.28
27	Yolo Bypass Upstream of Sacramento Bypass-2	31.25	32.27	31.13	32.18	31.01	32.06	31.10	32.17	-0.24	-0.21	-0.12	-0.09	-0.15	-0.1
28	Yolo Bypass Downstream of Sacramento Bypass	30.66	31.68	30.84	31.89	30.76	31.81	30.85	31.92	0.1	0.13	0.18	0.21	0.19	0.24
29	Yolo Bypass Upstream of I-80	30.48	31.49	30.65	31.69	30.57	31.62	30.67	31.73	0.09	0.13	0.17	0.2	0.19	0.24
30	Yolo Bypass Near West Sacramento	29.71	30.63	29.87	30.82	29.80	30.75	29.88	30.84	0.09	0.12	0.16	0.19	0.17	0.21
31	Yolo Bypass Downstream of Putah Creek	27.53	28.42	27.69	28.59	27.62	28.53	27.70	28.62	0.09	0.11	0.16	0.17	0.17	0.2
32	Yolo Bypass at Lisbon	27.31	28.20	27.47	28.38	27.40	28.31	27.48	28.40	0.09	0.11	0.16	0.18	0.17	0.2
33	Yolo Bypass Downstream of Lisbon	24.51	25.43	24.66	25.60	24.60	25.53	24.68	25.62	0.09	0.1	0.15	0.17	0.17	0.19
34	Yolo Bypass Upstream of Reclamation District 2068	21.80	22.85	21.97	23.03	21.90	22.96	21.99	23.05	0.1	0.11	0.17	0.18	0.19	0.2
35	Yolo Bypass Upstream of Cache Slough	20.08	21.09	20.24	21.25	20.17	21.19	20.25	21.27	0.09	0.1	0.16	0.16	0.17	0.18
36	Cache Slough Upstream of Steamboat Slough	14.05	15.11	14.13	15.21	14.10	15.18	14.15	15.23	0.05	0.07	0.08	0.1	0.1	0.12
37	Sacramento Bypass at Sacramento Weir-1	32.93	34.08	31.89	32.98	31.58	32.65	31.76	32.86	-1.35	-1.43	-1.04	-1.1	-1.17	-1.22
38	Sacramento Bypass at Sacramento Weir-2	32.44	33.57	31.58	32.67	31.30	32.37	31.45	32.54	-1.14	-1.2	-0.86	-0.9	-0.99	-1.03
39	Deep Water Ship Channel - Downstream of Tie-in	17.03	18.09	17.13	18.22	17.09	18.18	17.14	18.24	0.06	0.09	0.1	0.13	0.11	0.15



**Table 1. Peak Water Surface Elevations for Model Scenarios – Alternative 2**

No.	Indicator Location	Existing Stage (feet)		FWOP Stage (feet)		EWP Stage (feet)		FWP Stage (feet)		EWP (Alternative 2) vs. Existing Conditions Change in Stage (feet)		FWOP vs. Existing Conditions Change in Stage (feet)		FWP (Alternative 2 and cumulative) vs. Existing Conditions Change in Stage (feet)	
		100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year
		40	Deep Water Ship Channel - Midway	17.02	18.09	17.12	18.21	17.08	18.18	17.13	18.24	0.06	0.09	0.1	0.12
41	Deep Water Ship Channel - Towards the End	17.01	18.08	17.10	18.21	17.07	18.17	17.12	18.24	0.06	0.09	0.09	0.13	0.11	0.16
42	Sacramento River Downstream of Colusa	67.00	67.59	66.99	67.59	66.99	67.59	66.99	67.59	-0.01	0	-0.01	0	-0.01	0
43	Sacramento River Upstream of Tisdale Bypass	53.19	55.64	53.17	55.64	53.16	55.64	53.15	55.64	-0.03	0	-0.02	0	-0.04	0
44	Sacramento River Downstream of Tisdale Bypass	52.86	55.01	52.84	55.01	52.83	55.01	52.82	55.01	-0.03	0	-0.02	0	-0.04	0
45	Sacramento River Downstream of Knights Landing	42.57	43.51	42.47	43.41	42.41	43.35	42.36	43.30	-0.16	-0.16	-0.1	-0.1	-0.21	-0.21
46	Sacramento River at Verona	41.72	42.71	41.40	42.38	41.51	42.48	41.33	42.29	-0.21	-0.23	-0.32	-0.33	-0.39	-0.42
47	Sacramento River at I Street	34.22	35.44	32.41	33.55	33.41	34.57	32.31	33.46	-0.81	-0.87	-1.81	-1.89	-1.91	-1.98
48	Sacramento River at Freeport	27.90	28.93	26.53	27.41	27.25	28.23	26.48	27.34	-0.65	-0.7	-1.37	-1.52	-1.42	-1.59
49	Sacramento River Downstream of Georgiana Slough	17.17	17.71	16.61	17.08	16.90	17.44	16.59	17.06	-0.27	-0.27	-0.56	-0.63	-0.58	-0.65
50	Sacramento River Upstream of Cache Slough	12.63	13.28	12.61	13.27	12.62	13.29	12.61	13.28	-0.01	0.01	-0.02	-0.01	-0.02	0
51	Sacramento River at Rio Vista	12.23	12.88	12.25	12.90	12.25	12.90	12.25	12.91	0.02	0.02	0.02	0.02	0.02	0.03
52	Natomas Cross Canal	41.82	42.80	41.52	42.48	41.62	42.58	41.45	42.40	-0.2	-0.22	-0.3	-0.32	-0.37	-0.4
53	Steamboat Slough Upstream Sacramento River	12.73	13.40	12.68	13.37	12.71	13.40	12.69	13.38	-0.02	0	-0.05	-0.03	-0.04	-0.02
54	Miner Slough Upstream Cache Slough	16.89	17.95	16.98	18.07	16.94	18.03	16.99	18.10	0.05	0.08	0.09	0.12	0.1	0.15
55	Lindsey Slough Upstream Yolo Bypass	17.45	18.44	17.56	18.56	17.51	18.52	17.58	18.58	0.06	0.08	0.11	0.12	0.13	0.14
56	Cache Slough Upstream Yolo Bypass	18.34	19.30	18.47	19.43	18.42	19.38	18.49	19.45	0.08	0.08	0.13	0.13	0.15	0.15
57	American River Upstream of SR 160 Bridge	37.28	38.71	35.99	37.40	36.69	38.09	35.92	37.34	-0.59	-0.62	-1.29	-1.31	-1.36	-1.37
58	American River Upstream of Fair Oaks	51.33	53.54	51.24	53.41	51.27	53.48	51.24	53.41	-0.06	-0.06	-0.09	-0.13	-0.09	-0.13

Notes: FWOP = Future Without-Project; EWP = Existing With-Project; FWP = Future With-Project  
 Source: Data compiled by California Department of Water Resources in 2017

**Table 2. Peak Water Surface Elevations for Model Scenarios – Alternative 3**

No.	Indicator Location	Existing (No Action Alternative) Stage (feet)		FWOP Stage (feet)		EWP Stage (feet)		FWP Stage (feet)		EWP (Alternative 3) vs. Existing Conditions Change in Stage (feet)		FWOP vs. Existing Conditions Change in Stage (feet)		FWP (Alternative 3 and Cumulative) vs. Existing Conditions Change in Stage (feet)	
		100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year
1	Feather River Upstream of Cherokee Canal Diversion	126.60	127.05	126.60	127.05	126.6	127.05	126.60	127.05	0	0	0	0	0	0
2	Feather River Downstream of Cherokee Canal Diversion	121.56	122.05	121.56	122.05	121.56	122.05	121.56	122.05	0	0	0	0	0	0
3	Feather River Downstream of Honcut Creek Confluence	84.88	85.11	84.88	85.11	84.87	85.1	84.87	85.10	-0.01	-0.01	0	0	-0.01	-0.01
4	Feather River Upstream of Jack Slough Confluence	77.56	77.99	77.56	77.99	77.57	77.99	77.57	77.99	0.01	0	0	0	0.01	0
5	Feather River Upstream of Yuba River Confluence	75.14	75.76	75.14	75.76	75.15	75.77	75.15	75.77	0.01	0.01	0	0	0.01	0.01
6	Feather River Downstream of Yuba River Confluence	73.95	74.65	73.95	74.65	73.95	74.66	73.95	74.66	0	0.01	0	0	0	0.01
7	Feather River at Boyd's Landing	64.81	65.62	64.80	65.61	64.84	65.65	64.84	65.65	0.03	0.03	-0.01	-0.01	0.03	0.03
8	Feather River Upstream of Mainstem Setback	62.04	62.85	62.03	62.85	62.09	62.9	62.09	62.90	0.05	0.05	-0.01	0	0.05	0.05
9	Feather River Upstream of Bear River Confluence	57.62	58.37	57.61	58.36	57.71	58.46	57.70	58.45	0.09	0.09	-0.01	-0.01	0.08	0.08
10	Feather River Downstream of Bear River Confluence	56.07	56.85	56.06	56.84	56.06	56.84	56.05	56.83	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02
11	Feather River Upstream of Sutter Bypass Confluence	51.61	52.69	51.58	52.65	51.58	52.65	51.56	52.63	-0.03	-0.04	-0.03	-0.04	-0.05	-0.06
12	Cherokee Canal Downstream of Cherokee Bypass	87.38	87.80	87.38	87.80	87.38	87.8	87.38	87.80	0	0	0	0	0	0
13	Butte Sink Downstream of Cherokee Canal	69.83	70.52	69.83	70.52	69.83	70.52	69.83	70.52	0	0	0	0	0	0
14	Butte Sink Upstream of Sutter Bypass	66.83	67.98	66.83	67.98	66.83	67.98	66.83	67.98	0	0	0	0	0	0
15	Sutter Bypass Downstream of Butte Sink	65.87	66.95	65.87	66.95	65.87	66.95	65.87	66.94	0	0	0	0	0	-0.01
16	Sutter Bypass Upstream of Wadsworth Canal Confluence	55.75	57.10	55.73	57.08	55.73	57.08	55.73	57.07	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03
17	Sutter Bypass Downstream of Wadsworth Canal Confluence	54.65	56.01	54.63	55.99	54.63	55.99	54.62	55.98	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03
18	Sutter Bypass Upstream of Tisdale Bypass Confluence	52.35	53.68	52.32	53.65	52.32	53.65	52.31	53.64	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04
19	Sutter Bypass Downstream of Tisdale Bypass Confluence	51.85	53.16	51.82	53.14	51.82	53.13	51.80	53.12	-0.03	-0.03	-0.03	-0.02	-0.05	-0.04
20	Sutter Bypass Upstream of Feather River Confluence	49.47	50.66	49.43	50.62	49.43	50.61	49.40	50.59	-0.04	-0.05	-0.04	-0.04	-0.07	-0.07
21	Sutter Bypass Downstream of Feather River Confluence	46.73	47.87	46.66	47.80	46.66	47.79	46.62	47.75	-0.07	-0.08	-0.07	-0.07	-0.11	-0.12
22	Sutter Bypass Upstream of Fremont Weir	43.21	44.21	43.08	44.09	43.07	44.06	42.99	43.99	-0.14	-0.15	-0.13	-0.12	-0.22	-0.22
23	Yolo Bypass Downstream of Fremont Weir	41.13	42.08	41.02	41.96	40.93	41.87	40.87	41.81	-0.2	-0.21	-0.11	-0.12	-0.26	-0.27
24	Yolo Bypass Upstream of I-5	35.43	36.44	35.30	36.33	34.62	35.69	34.62	35.69	-0.81	-0.75	-0.13	-0.11	-0.81	-0.75
25	Yolo Bypass Downstream of I-5	33.67	34.65	33.55	34.55	32.87	33.88	32.90	33.93	-0.8	-0.77	-0.12	-0.1	-0.77	-0.72
26	Yolo Bypass Upstream of Sacramento Bypass-1	32.08	33.10	31.96	33.01	31.6	32.65	31.67	32.74	-0.48	-0.45	-0.12	-0.09	-0.41	-0.36
27	Yolo Bypass Upstream of Sacramento Bypass-2	31.25	32.27	31.13	32.18	30.97	32.03	31.07	32.14	-0.28	-0.24	-0.12	-0.09	-0.18	-0.13
28	Yolo Bypass Downstream of Sacramento Bypass	30.66	31.68	30.84	31.89	30.76	31.81	30.86	31.93	0.1	0.13	0.18	0.21	0.2	0.25
29	Yolo Bypass Upstream of I-80	30.48	31.49	30.65	31.69	30.57	31.62	30.67	31.74	0.09	0.13	0.17	0.2	0.19	0.25
30	Yolo Bypass Near West Sacramento	29.71	30.63	29.87	30.82	29.8	30.75	29.89	30.85	0.09	0.12	0.16	0.19	0.18	0.22
31	Yolo Bypass Downstream of Putah Creek	27.53	28.42	27.69	28.59	27.62	28.53	27.71	28.63	0.09	0.11	0.16	0.17	0.18	0.21
32	Yolo Bypass at Lisbon	27.31	28.20	27.47	28.38	27.4	28.31	27.49	28.41	0.09	0.11	0.16	0.18	0.18	0.21
33	Yolo Bypass Downstream of Lisbon	24.51	25.43	24.66	25.60	24.6	25.53	24.68	25.63	0.09	0.1	0.15	0.17	0.17	0.2
34	Yolo Bypass Upstream of Reclamation District 2068	21.80	22.85	21.97	23.03	21.9	22.96	22.00	23.06	0.1	0.11	0.17	0.18	0.2	0.21
35	Yolo Bypass Upstream of Cache Slough	20.08	21.09	20.24	21.25	20.17	21.19	20.26	21.28	0.09	0.1	0.16	0.16	0.18	0.19
36	Cache Slough Upstream of Steamboat Slough	14.05	15.11	14.13	15.21	14.1	15.18	14.15	15.23	0.05	0.07	0.08	0.1	0.1	0.12
37	Sacramento Bypass at Sacramento Weir-1	32.93	34.08	31.89	32.98	31.37	32.41	31.67	32.77	-1.56	-1.67	-1.04	-1.1	-1.26	-1.31
38	Sacramento Bypass at Sacramento Weir-2	32.44	33.57	31.58	32.67	31.2	32.27	31.35	32.44	-1.24	-1.3	-0.86	-0.9	-1.09	-1.13
39	Deep Water Ship Channel - Downstream of Tie-in	17.03	18.09	17.13	18.22	17.09	18.18	17.14	18.25	0.06	0.09	0.1	0.13	0.11	0.16

**Table 2. Peak Water Surface Elevations for Model Scenarios – Alternative 3**

No.	Indicator Location	Existing (No Action Alternative) Stage (feet)		FWOP Stage (feet)		EWP Stage (feet)		FWP Stage (feet)		EWP (Alternative 3) vs. Existing Conditions Change in Stage (feet)		FWOP vs. Existing Conditions Change in Stage (feet)		FWP (Alternative 3 and Cumulative) vs. Existing Conditions Change in Stage (feet)	
		100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year
40	Deep Water Ship Channel - Midway	17.02	18.09	17.12	18.21	17.08	18.18	17.14	18.24	0.06	0.09	0.1	0.12	0.12	0.15
41	Deep Water Ship Channel - Towards the End	17.01	18.08	17.10	18.21	17.07	18.17	17.12	18.24	0.06	0.09	0.09	0.13	0.11	0.16
42	Sacramento River Downstream of Colusa	67.00	67.59	66.99	67.59	66.99	67.59	66.99	67.59	-0.01	0	-0.01	0	-0.01	0
43	Sacramento River Upstream of Tisdale Bypass	53.19	55.64	53.17	55.64	53.16	55.64	53.15	55.64	-0.03	0	-0.02	0	-0.04	0
44	Sacramento River Downstream of Tisdale Bypass	52.86	55.01	52.84	55.01	52.83	55.01	52.82	55.01	-0.03	0	-0.02	0	-0.04	0
45	Sacramento River Downstream of Knights Landing	42.57	43.51	42.47	43.41	42.4	43.34	42.34	43.29	-0.17	-0.17	-0.1	-0.1	-0.23	-0.22
46	Sacramento River at Verona	41.72	42.71	41.40	42.38	41.51	42.48	41.31	42.28	-0.21	-0.23	-0.32	-0.33	-0.41	-0.43
47	Sacramento River at I Street	34.22	35.44	32.41	33.55	33.46	34.61	32.25	33.40	-0.76	-0.83	-1.81	-1.89	-1.97	-2.04
48	Sacramento River at Freeport	27.90	28.93	26.53	27.41	27.29	28.27	26.44	27.29	-0.61	-0.66	-1.37	-1.52	-1.46	-1.64
49	Sacramento River Downstream of Georgiana Slough	17.17	17.71	16.61	17.08	16.92	17.45	16.58	17.04	-0.25	-0.26	-0.56	-0.63	-0.59	-0.67
50	Sacramento River Upstream of Cache Slough	12.63	13.28	12.61	13.27	12.63	13.29	12.61	13.28	0	0.01	-0.02	-0.01	-0.02	0
51	Sacramento River at Rio Vista	12.23	12.88	12.25	12.90	12.25	12.91	12.26	12.92	0.02	0.03	0.02	0.02	0.03	0.04
52	Natomas Cross Canal	41.82	42.80	41.52	42.48	41.62	42.58	41.43	42.39	-0.2	-0.22	-0.3	-0.32	-0.39	-0.41
53	Steamboat Slough Upstream Sacramento River	12.73	13.40	12.68	13.37	12.72	13.4	12.69	13.38	-0.01	0	-0.05	-0.03	-0.04	-0.02
54	Miner Slough Upstream Cache Slough	16.89	17.95	16.98	18.07	16.94	18.04	17.00	18.10	0.05	0.09	0.09	0.12	0.11	0.15
55	Lindsey Slough Upstream Yolo Bypass	17.45	18.44	17.56	18.56	17.51	18.52	17.58	18.59	0.06	0.08	0.11	0.12	0.13	0.15
56	Cache Slough Upstream Yolo Bypass	18.34	19.30	18.47	19.43	18.42	19.38	18.49	19.45	0.08	0.08	0.13	0.13	0.15	0.15
57	American River Upstream of SR 160 Bridge	37.28	38.71	35.99	37.40	36.72	38.11	35.87	37.29	-0.56	-0.6	-1.29	-1.31	-1.41	-1.42
58	American River Upstream of Fair Oaks	51.33	53.54	51.24	53.41	51.28	53.48	51.24	53.41	-0.05	-0.06	-0.09	-0.13	-0.09	-0.13

Notes: FWOP = Future Without-Project; EWP = Existing With-Project; FWP = Future With-Project  
 Source: Data compiled by California Department of Water Resources in 2017

**Table 3. Peak Water Surface Elevations for Model Scenarios – Alternative 4**

No.	Indicator Location	Existing (No Action Alternative) Stage (feet)		FWOP Stage (feet)		EWP Stage (feet)		FWP Stage (feet)		EWP (Alternative 4) vs. Existing Conditions Change in Stage (feet)		FWOP vs. Existing Conditions Change in Stage (feet)		FWP (Alternative 4 and Cumulative) vs. Existing Conditions Change in Stage (feet)	
		100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year
1	Feather River Upstream of Cherokee Canal Diversion	126.60	127.05	126.60	127.05	126.6	127.05	126.60	127.05	0	0	0	0	0	0
2	Feather River Downstream of Cherokee Canal Diversion	121.56	122.05	121.56	122.05	121.56	122.05	121.56	122.05	0	0	0	0	0	0
3	Feather River Downstream of Honcut Creek Confluence	84.88	85.11	84.88	85.11	84.87	85.1	84.87	85.10	-0.01	-0.01	0	0	-0.01	-0.01
4	Feather River Upstream of Jack Slough Confluence	77.56	77.99	77.56	77.99	77.57	77.99	77.57	77.99	0.01	0	0	0	0.01	0
5	Feather River Upstream of Yuba River Confluence	75.14	75.76	75.14	75.76	75.15	75.77	75.15	75.77	0.01	0.01	0	0	0.01	0.01
6	Feather River Downstream of Yuba River Confluence	73.95	74.65	73.95	74.65	73.95	74.66	73.95	74.66	0	0.01	0	0	0	0.01
7	Feather River at Boyd's Landing	64.81	65.62	64.80	65.61	64.84	65.65	64.84	65.65	0.03	0.03	-0.01	-0.01	0.03	0.03
8	Feather River Upstream of Mainstem Setback	62.04	62.85	62.03	62.85	62.09	62.9	62.09	62.90	0.05	0.05	-0.01	0	0.05	0.05
9	Feather River Upstream of Bear River Confluence	57.62	58.37	57.61	58.36	57.71	58.46	57.71	58.46	0.09	0.09	-0.01	-0.01	0.09	0.09
10	Feather River Downstream of Bear River Confluence	56.07	56.85	56.06	56.84	56.06	56.85	56.06	56.84	-0.01	0	-0.01	-0.01	-0.01	-0.01
11	Feather River Upstream of Sutter Bypass Confluence	51.61	52.69	51.58	52.65	51.59	52.67	51.57	52.65	-0.02	-0.02	-0.03	-0.04	-0.04	-0.04
12	Cherokee Canal Downstream of Cherokee Bypass	87.38	87.80	87.38	87.80	87.38	87.8	87.38	87.80	0	0	0	0	0	0
13	Butte Sink Downstream of Cherokee Canal	69.83	70.52	69.83	70.52	69.83	70.52	69.83	70.52	0	0	0	0	0	0
14	Butte Sink Upstream of Sutter Bypass	66.83	67.98	66.83	67.98	66.83	67.98	66.83	67.98	0	0	0	0	0	0
15	Sutter Bypass Downstream of Butte Sink	65.87	66.95	65.87	66.95	65.87	66.95	65.87	66.95	0	0	0	0	0	0
16	Sutter Bypass Upstream of Wadsworth Canal Confluence	55.75	57.10	55.73	57.08	55.74	57.09	55.73	57.08	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02
17	Sutter Bypass Downstream of Wadsworth Canal Confluence	54.65	56.01	54.63	55.99	54.64	56	54.63	55.99	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02
18	Sutter Bypass Upstream of Tisdale Bypass Confluence	52.35	53.68	52.32	53.65	52.34	53.66	52.32	53.65	-0.01	-0.02	-0.03	-0.03	-0.03	-0.03
19	Sutter Bypass Downstream of Tisdale Bypass Confluence	51.85	53.16	51.82	53.14	51.83	53.15	51.82	53.13	-0.02	-0.01	-0.03	-0.02	-0.03	-0.03
20	Sutter Bypass Upstream of Feather River Confluence	49.47	50.66	49.43	50.62	49.45	50.63	49.43	50.61	-0.02	-0.03	-0.04	-0.04	-0.04	-0.05
21	Sutter Bypass Downstream of Feather River Confluence	46.73	47.87	46.66	47.80	46.69	47.82	46.65	47.79	-0.04	-0.05	-0.07	-0.07	-0.08	-0.08
22	Sutter Bypass Upstream of Fremont Weir	43.21	44.21	43.08	44.09	43.13	44.13	43.06	44.07	-0.08	-0.08	-0.13	-0.12	-0.15	-0.14
23	Yolo Bypass Downstream of Fremont Weir	41.13	42.08	41.02	41.96	41.04	41.97	40.98	41.92	-0.09	-0.11	-0.11	-0.12	-0.15	-0.16
24	Yolo Bypass Upstream of I-5	35.43	36.44	35.30	36.33	35.14	36.16	35.12	36.16	-0.29	-0.28	-0.13	-0.11	-0.31	-0.28
25	Yolo Bypass Downstream of I-5	33.67	34.65	33.55	34.55	33.28	34.26	33.30	34.29	-0.39	-0.39	-0.12	-0.1	-0.37	-0.36
26	Yolo Bypass Upstream of Sacramento Bypass-1	32.08	33.10	31.96	33.01	31.59	32.62	31.65	32.71	-0.49	-0.48	-0.12	-0.09	-0.43	-0.39
27	Yolo Bypass Upstream of Sacramento Bypass-2	31.25	32.27	31.13	32.18	30.96	32	31.05	32.11	-0.29	-0.27	-0.12	-0.09	-0.2	-0.16
28	Yolo Bypass Downstream of Sacramento Bypass	30.66	31.68	30.84	31.89	30.75	31.79	30.84	31.89	0.09	0.11	0.18	0.21	0.18	0.21
29	Yolo Bypass Upstream of I-80	30.48	31.49	30.65	31.69	30.56	31.59	30.65	31.70	0.08	0.1	0.17	0.2	0.17	0.21
30	Yolo Bypass Near West Sacramento	29.71	30.63	29.87	30.82	29.79	30.73	29.87	30.82	0.08	0.1	0.16	0.19	0.16	0.19
31	Yolo Bypass Downstream of Putah Creek	27.53	28.42	27.69	28.59	27.61	28.51	27.69	28.60	0.08	0.09	0.16	0.17	0.16	0.18
32	Yolo Bypass at Lisbon	27.31	28.20	27.47	28.38	27.39	28.29	27.47	28.38	0.08	0.09	0.16	0.18	0.16	0.18
33	Yolo Bypass Downstream of Lisbon	24.51	25.43	24.66	25.60	24.59	25.51	24.66	25.60	0.08	0.08	0.15	0.17	0.15	0.17
34	Yolo Bypass Upstream of Reclamation District 2068	21.80	22.85	21.97	23.03	21.89	22.94	21.97	23.03	0.09	0.09	0.17	0.18	0.17	0.18
35	Yolo Bypass Upstream of Cache Slough	20.08	21.09	20.24	21.25	20.16	21.17	20.24	21.25	0.08	0.08	0.16	0.16	0.16	0.16
36	Cache Slough Upstream of Steamboat Slough	14.05	15.11	14.13	15.21	14.09	15.16	14.14	15.21	0.04	0.05	0.08	0.1	0.09	0.1
37	Sacramento Bypass at Sacramento Weir-1	32.93	34.08	31.89	32.98	31.37	32.4	31.91	33.01	-1.56	-1.68	-1.04	-1.1	-1.02	-1.07
38	Sacramento Bypass at Sacramento Weir-2	32.44	33.57	31.58	32.67	31.19	32.25	31.61	32.71	-1.25	-1.32	-0.86	-0.9	-0.83	-0.86
39	Deep Water Ship Channel - Downstream of Tie-in	17.03	18.09	17.13	18.22	17.08	18.16	17.13	18.22	0.05	0.07	0.1	0.13	0.1	0.13



**Table 3. Peak Water Surface Elevations for Model Scenarios – Alternative 4**

No.	Indicator Location	Existing (No Action Alternative) Stage (feet)		FWOP Stage (feet)		EWP Stage (feet)		FWP Stage (feet)		EWP (Alternative 4) vs. Existing Conditions Change in Stage (feet)		FWOP vs. Existing Conditions Change in Stage (feet)		FWP (Alternative 4 and Cumulative) vs. Existing Conditions Change in Stage (feet)	
		100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year
40	Deep Water Ship Channel - Midway	17.02	18.09	17.12	18.21	17.07	18.16	17.12	18.22	0.05	0.07	0.1	0.12	0.1	0.13
41	Deep Water Ship Channel - Towards the End	17.01	18.08	17.10	18.21	17.06	18.15	17.11	18.22	0.05	0.07	0.09	0.13	0.1	0.14
42	Sacramento River Downstream of Colusa	67.00	67.59	66.99	67.59	67	67.59	66.99	67.59	0	0	-0.01	0	-0.01	0
43	Sacramento River Upstream of Tisdale Bypass	53.19	55.64	53.17	55.64	53.18	55.64	53.17	55.64	-0.01	0	-0.02	0	-0.02	0
44	Sacramento River Downstream of Tisdale Bypass	52.86	55.01	52.84	55.01	52.85	55.01	52.83	55.01	-0.01	0	-0.02	0	-0.03	0
45	Sacramento River Downstream of Knights Landing	42.57	43.51	42.47	43.41	42.49	43.42	42.43	43.38	-0.08	-0.09	-0.1	-0.1	-0.14	-0.13
46	Sacramento River at Verona	41.72	42.71	41.40	42.38	41.57	42.54	41.39	42.36	-0.15	-0.17	-0.32	-0.33	-0.33	-0.35
47	Sacramento River at I Street	34.22	35.44	32.41	33.55	33.47	34.62	32.42	33.57	-0.75	-0.82	-1.81	-1.89	-1.8	-1.87
48	Sacramento River at Freeport	27.90	28.93	26.53	27.41	27.3	28.28	26.53	27.42	-0.6	-0.65	-1.37	-1.52	-1.37	-1.51
49	Sacramento River Downstream of Georgiana Slough	17.17	17.71	16.61	17.08	16.92	17.45	16.61	17.09	-0.25	-0.26	-0.56	-0.63	-0.56	-0.62
50	Sacramento River Upstream of Cache Slough	12.63	13.28	12.61	13.27	12.62	13.28	12.61	13.27	-0.01	0	-0.02	-0.01	-0.02	-0.01
51	Sacramento River at Rio Vista	12.23	12.88	12.25	12.90	12.24	12.9	12.25	12.91	0.01	0.02	0.02	0.02	0.02	0.03
52	Natomas Cross Canal	41.82	42.80	41.52	42.48	41.68	42.64	41.5	42.47	-0.14	-0.16	-0.3	-0.32	-0.32	-0.33
53	Steamboat Slough Upstream Sacramento River	12.73	13.40	12.68	13.37	12.71	13.39	12.69	13.37	-0.02	-0.01	-0.05	-0.03	-0.04	-0.03
54	Miner Slough Upstream Cache Slough	16.89	17.95	16.98	18.07	16.93	18.02	16.98	18.08	0.04	0.07	0.09	0.12	0.09	0.13
55	Lindsey Slough Upstream Yolo Bypass	17.45	18.44	17.56	18.56	17.5	18.5	17.56	18.56	0.05	0.06	0.11	0.12	0.11	0.12
56	Cache Slough Upstream Yolo Bypass	18.34	19.30	18.47	19.43	18.41	19.37	18.47	19.43	0.07	0.07	0.13	0.13	0.13	0.13
57	American River Upstream of SR 160 Bridge	37.28	38.71	35.99	37.40	36.72	38.12	35.99	37.40	-0.56	-0.59	-1.29	-1.31	-1.29	-1.31
58	American River Upstream of Fair Oaks	51.33	53.54	51.24	53.41	51.28	53.48	51.24	53.41	-0.05	-0.06	-0.09	-0.13	-0.09	-0.13

Notes: FWOP = Future Without-Project; EWP = Existing With-Project; FWP = Future With-Project  
 Source: Data compiled by California Department of Water Resources in 2017

**Table 4. Peak Water Surface Elevations for Model Scenarios – Alternative 5**

No.	Indicator Location	Existing (No Action Alternative) Stage (feet)		FWOP Stage (feet)		EWP Stage (feet)		FWP Stage (feet)		EWP (Alternative 5) vs. Existing Conditions Change in Stage (feet)		FWOP vs. Existing Conditions Change in Stage (feet)		FWP (Alternative 5 and Cumulative) vs. Existing Conditions Change in Stage (feet)	
		100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year
1	Feather River Upstream of Cherokee Canal Diversion	126.60	127.05	126.60	127.05	126.6	127.05	126.60	127.05	0	0	0	0	0	0
2	Feather River Downstream of Cherokee Canal Diversion	121.56	122.05	121.56	122.05	121.56	122.05	121.56	122.05	0	0	0	0	0	0
3	Feather River Downstream of Honcut Creek Confluence	84.88	85.11	84.88	85.11	84.87	85.1	84.87	85.10	-0.01	-0.01	0	0	-0.01	-0.01
4	Feather River Upstream of Jack Slough Confluence	77.56	77.99	77.56	77.99	77.57	77.99	77.57	77.99	0.01	0	0	0	0.01	0
5	Feather River Upstream of Yuba River Confluence	75.14	75.76	75.14	75.76	75.15	75.77	75.15	75.77	0.01	0.01	0	0	0.01	0.01
6	Feather River Downstream of Yuba River Confluence	73.95	74.65	73.95	74.65	73.95	74.66	73.95	74.66	0	0.01	0	0	0	0.01
7	Feather River at Boyd's Landing	64.81	65.62	64.80	65.61	64.84	65.65	64.84	65.65	0.03	0.03	-0.01	-0.01	0.03	0.03
8	Feather River Upstream of Mainstem Setback	62.04	62.85	62.03	62.85	62.09	62.9	62.09	62.90	0.05	0.05	-0.01	0	0.05	0.05
9	Feather River Upstream of Bear River Confluence	57.62	58.37	57.61	58.36	57.71	58.46	57.71	58.46	0.09	0.09	-0.01	-0.01	0.09	0.09
10	Feather River Downstream of Bear River Confluence	56.07	56.85	56.06	56.84	56.06	56.85	56.06	56.84	-0.01	0	-0.01	-0.01	-0.01	-0.01
11	Feather River Upstream of Sutter Bypass Confluence	51.61	52.69	51.58	52.65	51.59	52.67	51.57	52.65	-0.02	-0.02	-0.03	-0.04	-0.04	-0.04
12	Cherokee Canal Downstream of Cherokee Bypass	87.38	87.80	87.38	87.80	87.38	87.8	87.38	87.80	0	0	0	0	0	0
13	Butte Sink Downstream of Cherokee Canal	69.83	70.52	69.83	70.52	69.83	70.52	69.83	70.52	0	0	0	0	0	0
14	Butte Sink Upstream of Sutter Bypass	66.83	67.98	66.83	67.98	66.83	67.98	66.83	67.98	0	0	0	0	0	0
15	Sutter Bypass Downstream of Butte Sink	65.87	66.95	65.87	66.95	65.87	66.95	65.87	66.95	0	0	0	0	0	0
16	Sutter Bypass Upstream of Wadsworth Canal Confluence	55.75	57.10	55.73	57.08	55.74	57.09	55.73	57.08	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02
17	Sutter Bypass Downstream of Wadsworth Canal Confluence	54.65	56.01	54.63	55.99	54.64	56	54.63	55.99	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02
18	Sutter Bypass Upstream of Tisdale Bypass Confluence	52.35	53.68	52.32	53.65	52.34	53.67	52.32	53.65	-0.01	-0.01	-0.03	-0.03	-0.03	-0.03
19	Sutter Bypass Downstream of Tisdale Bypass Confluence	51.85	53.16	51.82	53.14	51.83	53.15	51.82	53.13	-0.02	-0.01	-0.03	-0.02	-0.03	-0.03
20	Sutter Bypass Upstream of Feather River Confluence	49.47	50.66	49.43	50.62	49.45	50.64	49.43	50.62	-0.02	-0.02	-0.04	-0.04	-0.04	-0.04
21	Sutter Bypass Downstream of Feather River Confluence	46.73	47.87	46.66	47.80	46.7	47.83	46.66	47.79	-0.03	-0.04	-0.07	-0.07	-0.07	-0.08
22	Sutter Bypass Upstream of Fremont Weir	43.21	44.21	43.08	44.09	43.14	44.14	43.07	44.07	-0.07	-0.07	-0.13	-0.12	-0.14	-0.14
23	Yolo Bypass Downstream of Fremont Weir	41.13	42.08	41.02	41.96	41.05	41.99	40.99	41.93	-0.08	-0.09	-0.11	-0.12	-0.14	-0.15
24	Yolo Bypass Upstream of I-5	35.43	36.44	35.30	36.33	35.18	36.2	35.17	36.20	-0.25	-0.24	-0.13	-0.11	-0.26	-0.24
25	Yolo Bypass Downstream of I-5	33.67	34.65	33.55	34.55	33.34	34.32	33.36	34.35	-0.33	-0.33	-0.12	-0.1	-0.31	-0.3
26	Yolo Bypass Upstream of Sacramento Bypass-1	32.08	33.10	31.96	33.01	31.68	32.71	31.74	32.80	-0.4	-0.39	-0.12	-0.09	-0.34	-0.3
27	Yolo Bypass Upstream of Sacramento Bypass-2	31.25	32.27	31.13	32.18	30.99	32.03	31.08	32.14	-0.26	-0.24	-0.12	-0.09	-0.17	-0.13
28	Yolo Bypass Downstream of Sacramento Bypass	30.66	31.68	30.84	31.89	30.74	31.78	30.84	31.89	0.08	0.1	0.18	0.21	0.18	0.21
29	Yolo Bypass Upstream of I-80	30.48	31.49	30.65	31.69	30.56	31.59	30.65	31.70	0.08	0.1	0.17	0.2	0.17	0.21
30	Yolo Bypass Near West Sacramento	29.71	30.63	29.87	30.82	29.78	30.72	29.87	30.82	0.07	0.09	0.16	0.19	0.16	0.19
31	Yolo Bypass Downstream of Putah Creek	27.53	28.42	27.69	28.59	27.61	28.5	27.69	28.59	0.08	0.08	0.16	0.17	0.16	0.17
32	Yolo Bypass at Lisbon	27.31	28.20	27.47	28.38	27.39	28.29	27.47	28.38	0.08	0.09	0.16	0.18	0.16	0.18
33	Yolo Bypass Downstream of Lisbon	24.51	25.43	24.66	25.60	24.58	25.51	24.66	25.60	0.07	0.08	0.15	0.17	0.15	0.17
34	Yolo Bypass Upstream of Reclamation District 2068	21.80	22.85	21.97	23.03	21.88	22.94	21.97	23.03	0.08	0.09	0.17	0.18	0.17	0.18
35	Yolo Bypass Upstream of Cache Slough	20.08	21.09	20.24	21.25	20.16	21.17	20.24	21.25	0.08	0.08	0.16	0.16	0.16	0.16
36	Cache Slough Upstream of Steamboat Slough	14.05	15.11	14.13	15.21	14.09	15.16	14.13	15.21	0.04	0.05	0.08	0.1	0.08	0.1
37	Sacramento Bypass at Sacramento Weir-1	32.93	34.08	31.89	32.98	31.48	32.52	31.95	33.05	-1.45	-1.56	-1.04	-1.1	-0.98	-1.03
38	Sacramento Bypass at Sacramento Weir-2	32.44	33.57	31.58	32.67	31.31	32.38	31.65	32.75	-1.13	-1.19	-0.86	-0.9	-0.79	-0.82
39	Deep Water Ship Channel - Downstream of Tie-in	17.03	18.09	17.13	18.22	17.07	18.16	17.13	18.22	0.04	0.07	0.1	0.13	0.1	0.13

**Table 4. Peak Water Surface Elevations for Model Scenarios – Alternative 5**

No.	Indicator Location	Existing (No Action Alternative) Stage (feet)		FWOP Stage (feet)		EWP Stage (feet)		FWP Stage (feet)		EWP (Alternative 5) vs. Existing Conditions Change in Stage (feet)		FWOP vs. Existing Conditions Change in Stage (feet)		FWP (Alternative 5 and Cumulative) vs. Existing Conditions Change in Stage (feet)	
		100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year	100-year	200-year
40	Deep Water Ship Channel - Midway	17.02	18.09	17.12	18.21	17.07	18.15	17.12	18.22	0.05	0.06	0.1	0.12	0.1	0.13
41	Deep Water Ship Channel - Towards the End	17.01	18.08	17.10	18.21	17.05	18.15	17.10	18.21	0.04	0.07	0.09	0.13	0.09	0.13
42	Sacramento River Downstream of Colusa	67.00	67.59	66.99	67.59	67	67.59	66.99	67.59	0	0	-0.01	0	-0.01	0
43	Sacramento River Upstream of Tisdale Bypass	53.19	55.64	53.17	55.64	53.18	55.64	53.17	55.64	-0.01	0	-0.02	0	-0.02	0
44	Sacramento River Downstream of Tisdale Bypass	52.86	55.01	52.84	55.01	52.85	55.01	52.83	55.01	-0.01	0	-0.02	0	-0.03	0
45	Sacramento River Downstream of Knights Landing	42.57	43.51	42.47	43.41	42.5	43.43	42.44	43.39	-0.07	-0.08	-0.1	-0.1	-0.13	-0.12
46	Sacramento River at Verona	41.72	42.71	41.40	42.38	41.58	42.56	41.39	42.37	-0.14	-0.15	-0.32	-0.33	-0.33	-0.34
47	Sacramento River at I Street	34.22	35.44	32.41	33.55	33.52	34.67	32.45	33.59	-0.7	-0.77	-1.81	-1.89	-1.77	-1.85
48	Sacramento River at Freeport	27.90	28.93	26.53	27.41	27.34	28.32	26.55	27.44	-0.56	-0.61	-1.37	-1.52	-1.35	-1.49
49	Sacramento River Downstream of Georgiana Slough	17.17	17.71	16.61	17.08	16.93	17.47	16.62	17.09	-0.24	-0.24	-0.56	-0.63	-0.55	-0.62
50	Sacramento River Upstream of Cache Slough	12.63	13.28	12.61	13.27	12.62	13.28	12.61	13.27	-0.01	0	-0.02	-0.01	-0.02	-0.01
51	Sacramento River at Rio Vista	12.23	12.88	12.25	12.90	12.24	12.9	12.25	12.91	0.01	0.02	0.02	0.02	0.02	0.03
52	Natomas Cross Canal	41.82	42.80	41.52	42.48	41.69	42.65	41.51	42.48	-0.13	-0.15	-0.3	-0.32	-0.31	-0.32
53	Steamboat Slough Upstream Sacramento River	12.73	13.40	12.68	13.37	12.71	13.39	12.69	13.37	-0.02	-0.01	-0.05	-0.03	-0.04	-0.03
54	Miner Slough Upstream Cache Slough	16.89	17.95	16.98	18.07	16.93	18.01	16.98	18.08	0.04	0.06	0.09	0.12	0.09	0.13
55	Lindsey Slough Upstream Yolo Bypass	17.45	18.44	17.56	18.56	17.5	18.5	17.56	18.56	0.05	0.06	0.11	0.12	0.11	0.12
56	Cache Slough Upstream Yolo Bypass	18.34	19.30	18.47	19.43	18.4	19.36	18.47	19.43	0.06	0.06	0.13	0.13	0.13	0.13
57	American River Upstream of SR 160 Bridge	37.28	38.71	35.99	37.40	36.76	38.15	36.01	37.42	-0.52	-0.56	-1.29	-1.31	-1.27	-1.29
58	American River Upstream of Fair Oaks	51.33	53.54	51.24	53.41	51.28	53.48	51.24	53.42	-0.05	-0.06	-0.09	-0.13	-0.09	-0.12

Notes: FWOP = Future Without-Project; EWP = Existing With-Project; FWP = Future With-Project  
 Source: Data compiled by California Department of Water Resources in 2017

# 5. Wind Setup and Wave Run-up

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This analysis was performed to assess the potential increase in stage along the levees due to wind setup and wave run-up. The procedures follow the USACE Sutter Basin Feasibility Study (Sutter Study; USACE 2011) along with three main guidance documents: *Coastal Engineering Manual* (EM), 1110-2-1100 (USACE 2008); *Hydrologic Engineering Requirements for Reservoirs*, EM 1110-2-1420 (USACE 1997); and *Shore Protection Manual* (SPM) (USACE 1984). The Sutter Report follows these three documents overall, but uses revised Hurdle and Stive (1989) wave forecasting equations to estimate significant wave height, peak wave period, and limiting duration required for estimating wave run-up.

## 5.1 Inputs

This analysis was based on initial estimates of annual maximum hourly wind speed (maximum probable) at eight orbital directions taken directly from the Sutter Report. The fetch length for this analysis was estimated based on a fetch normal to the levee, +45° (counterclockwise) off the normal, and -45° (clockwise) off the normal. Three analysis sites (LEBL1, LEBL2, LEBL3) were considered to maximize fetch length or wind speed so that maximum run-up values could be estimated for the setback levee. The site that provided maximum combined wind setup and wave run-up was selected for analysis.

Estimated 200-year WSEs from the hydraulic analysis were used to compute fetch depth. The terrain and bathymetry data required to estimate flow depth were obtained from the CVFED Program. Fetch depths were estimated as the average hydraulic depths (the ratio of cross-sectional area and top width) calculated along the fetch radials.

## 5.2 Results

The preliminary wind setup and wave run-up analysis results for the three sites are displayed in Table 5. The run-up estimates are based on a waterside levee slope of 4:1 (horizontal:vertical). Among the sites considered, an overall maximum run-up of 9.08 feet and maximum wind setup of 1.25 feet was estimated at Site LEBL3 (Table 5). Also, the total water level (TWL) for the maximum probable wind speed is shown in Table 5.



**Table 5. Wind Wave Analysis Results for the Maximum Probable Wind Speed and 1997 x 110% River Stage**

Site <sup>1</sup>	Wind Stress <sup>2</sup> UA (mph)	Fetch Length <sup>3</sup> F (miles)	Depth <sup>4</sup> d (feet)	Wave Height H <sub>s</sub> (feet)	Wave Period T <sub>p</sub> (second)	Wave Run-up Ru2% (feet)	Wind Setup S <sub>wind</sub> (feet)	Total Water Level TWL (feet, NAVD88)
LEBL1 (RM 49.288)	105.8 (65.0)	3.040 (Northwest)	14.96 (33.84)	5.06	3.82	7.01	0.61	41.46
LEBL2 (RM 46.973)	82.5 (56.5)	7.855 (South)	15.12 (32.67)	4.74	4.07	7.24	1.18	41.09
LEBL3 (RM 44.729)	105.8 (65)	6.444 (Northwest)	15.52 (31.88)	5.85	4.60	9.08	1.25	42.21

Notes:

<sup>1</sup> River Mile (RM) based on TO 34 CVFED model for YOLO R06 Reach

<sup>2</sup> 1-hour most probable wind stress (UA, maximum of the annual maximum 1-hour wind stress values) and corresponding 1-hour wind speed, in parentheses

<sup>3</sup> Fetch length measured along a direction that produces the maximum run-up. Direction shown in parentheses. Average fetch depth (d). River stage (static water level) in NAVD88 at the site location shown in parentheses.

Source: Data compiled by California Department of Water Resources in 2017

# 6. Impact Analysis

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## 6.1 Study Area and Index Points

The study area includes channel reaches downstream and upstream of the project site that would be influenced by changes in flows and corresponding WSEs. This study area was defined by comparing the Existing Conditions and Existing With-Project results. The selected event model runs resulted in hydraulic changes from approximately the Sutter Bypass confluence with the Feather River to the Sacramento River at Rio Vista, including flows in the lower Sutter Bypass, Yolo Bypass, Sacramento Bypass, and Deepwater Ship Channel. The index points were selected to evaluate the hydraulic impacts throughout the study area (see Figure 1).

## 6.2 Peak Stage Increases

The comparison of results between Existing Conditions and the Existing With-Project scenario, as shown in Tables 1 through 4, reflects the reduced WSEs along the Yolo Bypass immediately upstream of the Sacramento Bypass confluence and increase in WSEs immediately downstream of the Sacramento Bypass confluence under all alternatives. The stage reduction along the Yolo Bypass between the Fremont Weir and the confluence with the Sacramento Bypass is due to the LEBLS project under the Existing With-Project scenario. More water is drawn out of the Sacramento River to the Sacramento Bypass, which increases WSEs along the Yolo Bypass downstream of the Sacramento Bypass confluence by a smaller amount than the larger WSEs decreases in the Sacramento River near Sacramento. The increase in WSEs in the Yolo Bypass gradually dissipates moving downstream towards the Sacramento-San Joaquin Delta (Delta). For Alternative 2, the maximum increase in WSE of 0.10 foot appears at the Yolo Bypass, immediately downstream of the Sacramento Bypass confluence for the 100-year flood event. At Rio Vista, the increase is reduced to 0.02 foot (see Table 1). The maximum stage reduction on the Sacramento River at the I Street Bridge due to the LEBLS project is 0.81 foot for the 100-year flood event.

The comparison of results between Existing Conditions and the Future With-Project scenario (cumulative scenario), reflects the same pattern as described in the previous scenario but with different magnitudes. WSEs are reduced along Yolo Bypass between the Fremont Weir and the confluence with the Sacramento Bypass due to the combined effects of the ARCF GRR that expands the Sacramento Weir/Bypass, and the LEBLS project. More water is drawn out of the Sacramento River through the Sacramento Weir to the Bypass which increases WSEs along the Yolo Bypass downstream of the Sacramento Bypass confluence. The increase in WSEs gradually dissipates moving downstream towards the Delta. Under Alternative 2, the maximum increase in WSE of 0.19 foot appears at the Yolo Bypass immediately downstream of the Sacramento Bypass confluence for the 100-year flood event. On the Sacramento River at Rio Vista, the WSE increase is reduced to 0.02 foot as shown in Table 3. Under Alternative 2, the maximum decrease in WSE of 1.91 feet occurs on the Sacramento River at the I Street Bridge due to the combined effects of the ARCF GRR Sacramento Weir/Bypass expansion and the LEBLS project.

Comparisons under the 200-year event display a similar pattern of changes to that of the 100-year event, but with slightly greater magnitudes. These differences are shown in Tables 1 through 4 for Alternatives 2 through 5, respectively.

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## 8. Acronyms

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ARCF	American River Common Features
BWFS	Sacramento River Basin-Wide Feasibility Study
CVFED	Central Valley Floodplain Evaluation and Delineation
CVFPP	Central Valley Flood Protection Plan
CVHS	Central Valley Hydrology Study
DWR	California Department of Water Resources
EIP	Early Implementation Program
EWP	Existing With-Project Scenario
FWOP	Future Without-Project Scenario
FWP	Future With-Project Scenario
GRR	General Reevaluation Report
HEC	U. S. Army Corps of Engineers Hydrologic Engineering Center
LEBL	Lower Elkhorn Basin Levee
LEBLS	Lower Elkhorn Basin Levee Setback
LiDAR	Light Detection and Ranging
NAD	North American Datum
NAVD	North American Vertical Datum
RM	River Mile
SPM	Shore Protection Manual
TO	Task Order
TWL	Total Water Level
WSE	Water Surface Elevation

**Appendix H. Lower Elkhorn Basin  
Levee Setback Project  
Agricultural Economics Modeling Report**

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# **Appendix H**

## **Lower Elkhorn Basin Levee Setback Project Agricultural Economics Modeling Report**

Prepared by:

California Department of Water Resources

Division of Flood Management

September 5, 2018

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# Chapter 1. Introduction

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This agricultural economic impact analysis evaluates the primary and secondary annual agricultural economic impacts resulting from changes in agricultural land use (crops) caused by proposed levee setbacks along the Yolo and Sacramento Bypasses (north levee) in the Lower Elkhorn Basin (Lower Basin). Some crops currently protected by the existing Yolo Bypass levee would be located inside the Yolo Bypass and subject to more frequent flooding because of the levee setback. It is anticipated that these crops would be converted to a different crop compatible with more frequent flooding. The remaining crops behind the levee setback would have improved flood protection. Finally, some crops would be displaced by the proposed levee setback footprint and within the Sacramento Bypass expansion area which will be converted to native vegetation. Other impacts (benefits) associated with the levee setbacks, such as improved flood protection in urban areas downstream of the Lower Basin, are qualitatively described.



# Chapter 2. Study Region and Analysis Period

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## 2.1 Study Region

The study region is Yolo County. The Lower Basin is upstream of the Sacramento metropolitan area and is surrounded by leveed portions of the Sacramento River to the east, Yolo Bypass to the west, and the Sacramento Bypass to the south. Interstate 5 is the northern boundary. The Lower Basin comprises about 6,018 acres, of which about 4,881 acres (81%) were in agricultural production in 2016. The Elkhorn Upper Basin (Upper Basin) is north of Interstate 5 between the Yolo Bypass and the Sacramento River. Figure 1 shows the study region.

Cross levees subdivide the Lower Basin into 3 separate reclamation districts (RD 827, RD 785, and RD 537) each requiring its own pump station for dewatering following flood events. RD 1600 is in the Upper Basin. These reclamation districts are shown in Figure 2.

## 2.2 Analysis Period

Project construction is scheduled to begin in 2020; therefore, the 50-year economic analysis period will be 2020-2070.

# Chapter 3. Agricultural Impacts

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The impact analysis includes primary and secondary economic impacts:

## 3.1 Primary Economic Impacts

Primary (or direct) economic impacts are the changes in the value of goods and services and/or the reduction in costs, damage, or losses to those directly affected by the project (i.e., primarily the growers in the Lower Basin). Primary annual economic impacts include:

- Total crop revenue. Total crop revenue is the total value of crop production and is a function of crop types, acres, yields, and commodity prices received.
- Operating costs. Crop variable production costs excluding land and overhead costs.
- Expected annual flood damage. Crops located on the landside of the existing and proposed levee setbacks are subject to expected annual damage (EAD) which is a function of hydrologic, hydraulic, geotechnical, and economic considerations.
- Expected annual flood losses. Crops that will be located on the water side of the proposed Yolo Basin levee setback will be subject to more frequent flooding within the Yolo Bypass which may delay planting and therefore reduce yields and crop revenue. These flood losses are a function of crop type, crop planting windows, and last date wet assumptions (compared to crop planting windows) within the Yolo Bypass.
- Net crop revenue. Net crop revenue is total crop revenue minus the operating costs and flood damage/losses described above.
- Employment. Number of full-time jobs associated with crop production.

Primary economic impacts are evaluated using a spreadsheet analysis with these inputs:

- Crop types and acreage. For years prior to 2016, crop types and acreages were identified using California Department of Water Resources (DWR) Yolo County 2008 and 2014 land use surveys (summer conditions). Cropping patterns for 2015 were based upon grower input. Cropping patterns for 2016 were based upon observed changes since 2014. Future year (2020) without- and with-project crop types and acres were developed with grower input.
- Crop yields. Crop yields between 2010 and 2015 were identified using Yolo County Agricultural Crop Reports.
- Crop prices. Crop prices received by the growers between 2010 and 2015 were identified using Yolo County Agricultural Crop Reports.
- Crop operating costs. Crop variable production costs were identified using various UC Davis Cooperative Extension Sample Production Costs studies (i.e., crop budgets).

- Employment. Crop machine and non-machine labor hour information were obtained from various UC Cooperative Extension crop budgets. Total crop hours were converted to full-time equivalents.
- Crop expected annual flood damage. Annual crop flood damage/acre estimates were originally developed for the Sacramento and San Joaquin Rivers Comprehensive Study (2001) and updated for the 2012 and 2017 Central Valley Flood Protection Plans (CVFPP) flood risk analyses. These are described in the DWR *Handbook for Assessing Value* (HAV).
- Crop expected annual flood losses. Crop planting windows due to flood-related delayed planting are based on published information (crop budgets and Howitt, et al).
- Levee failure probabilities. Levee failure probabilities without- and with-project are based on HEC-Flood Damage Analysis (FDA) expected annual exceedance probability (AEP) results from the 2017 CVFPP flood risk analysis.

## 3.2 Secondary Economic Impacts

Secondary “ripple” economic impacts are the changes in values that accrue to persons other than those primarily affected by the project (the direct impacts to the growers). Secondary economic impacts include:

- Indirect effects. Indirect effects are the interindustry linkages resulting from a firm (i) purchasing inputs to produce its products (backward linking effects) and (ii) then shipping its products to markets or to other firms for further processing (forward linking effects). Examples of interindustry effects in an agricultural economy include the purchases of farm products (e.g., seed and fertilizer) required to grow the crops and expenditures by mills to process the farm products for final consumption.
- Induced effects. Induced effects occur when employees and business proprietors spend their income (e.g., wages and profits) in other businesses in the region (e.g., going out to a restaurant).
- Total effects. Total effects are the sum of the direct, indirect, and induced effects.

An input-output (I/O) analysis is used to evaluate secondary economic impacts and IMPLAN is a recognized model for conducting these analyses. For the Lower Basin analysis a subscription was purchased for on-line access to a Yolo County 2015 IMPLAN model. For each of the effects described above (except indirect forward linking effects), IMPLAN estimates output, value added, and employment effects. Output is the total gross revenue for products produced which includes intermediary products used in production (e.g., fertilizer). Value added is the difference between the value of goods produced and the cost of materials and supplies used in producing them. Value added consists of employee compensation, proprietor income, and taxes on production and imports. Because it excludes intermediate products used in production, value added is a preferred metric compared to output. Employment includes the number of full-time, seasonal, and part-time employees.

### 3.3 Data Sources

The data sources underlying the estimation of the primary and secondary impacts described above are very diverse and are derived from local, state, and/or national sources. For example:

- Historical crop acreages were derived from DWR Yolo County land use surveys over several years. However, the 2020 crop projections were estimated after discussions with growers in the study area. Growers were asked about crop yield, price, and employment information, but they recommended using Yolo County crop reports and UC Cooperative Extension crop budgets.
- The Yolo County crop reports annually collect acreage and prices received information from countywide growers and other local sources.
- The UC Cooperative Extension crop budgets are for regions within the State (e.g. Sacramento Valley) or individual counties, depending upon the crop. These crop budgets are based on hypothetical farm operations, production practices, overhead, employment, etc., and calculations relevant for the crop and region are developed for specified base years. Most crop budgets used for this analysis are for the Sacramento Valley for different base years.
- The crop expected annual flood damage/acre estimates described in HAV are based (in part) on information from crop budgets within the entire Central Valley for specified crops. Monthly flood frequency information was developed by the US Army Corps of Engineers Sacramento District.
- IMPLAN's data sets are constructed annually from national, state, and county sources. For example, for employment data, the Bureau of Labor Statistics Quarterly Census of Employment and Wages (CEW) data provide county-level industry structure for the IMPLAN database. However, because much farm employment is self-employment, CEW data has limited farm coverage.

Because of the different impacts evaluated in this analysis, all of the above data sources have been used. However, it is recognized that there will be inconsistencies in these data sources when applied to a specific study area such as the Lower Basin and where significant potential inconsistencies are expected to occur they are identified in the analysis. Two of these potential inconsistencies include employment and property tax impacts described below.



# Chapter 4. Without-Project Conditions

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The identification of without-project conditions is critical for the agricultural (or any other) impact analysis because these are the baseline for identifying changes associated with the project (with-project conditions). Without-project conditions include existing and future without-project conditions:

## 4.1 Existing Conditions

For an agricultural impact analysis the focus is upon changes in land use, i.e. cropping patterns. Using DWR Yolo County land use surveys, Lower Basin cropping patterns were identified for 2008 and 2014. Cropping patterns for 2015 were based upon discussions with local growers. Cropping patterns for 2016 were based upon observed changes since 2014. These cropping patterns are for summer growing conditions when the land use surveys were conducted. However, because of crop rotational requirements, cropping patterns in the winter can be different. Table 1 shows the Lower Basin without-project summer land use for 2014, 2015, and 2016.<sup>1</sup> There are about 6,018 acres in the Lower Basin, of which about 4,881 acres (81%) were in crop production in 2016.

## 4.2 Future Conditions

Because project construction is scheduled for 2020, a likely without-project “future year” cropping pattern for 2020 was developed with grower input. Study staff met with growers to (a) confirm the accuracy of the historical cropping patterns and make changes where necessary and (b) discuss on a crop-by-crop basis where growers expected changes to occur from 2016 to 2020 based on expected future market and other conditions. Table 1 also shows the projected 2020 Lower Basin summer cropping pattern and Table 2 shows projected Lower Basin winter land use for 2020. The 2020 cropping pattern will be the baseline used for comparison with the with-project conditions described below. Figure 3 shows changes in summer cropping patterns from 2014 through 2016 as well as projected changes to 2020. Between 2014 and 2020 there are expected increases of deciduous crops (primarily walnuts) and truck crops (primarily processing tomatoes) with expected decreases in grain and hay crops.

## 4.3 With-Project Conditions

The proposed project will (a) set back the Yolo Bypass levee along the western boundary of the Lower Basin, generally following the alignment of County Road 124 and (b) set back the north levee along the Sacramento Bypass, the southern boundary of the Lower Basin. In addition to the No Project Alternative (Alternative 1), there are four alternative levee setback alignments shown in Figures 4-7. Alternative 2 is the preferred alternative. Whichever levee setback alignment is selected, there will be some crop acres currently protected by the existing Yolo Bypass levee that will be (a) on the water side of the new levee setback and subject to flooding within the Yolo Bypass; (b) on the land (and therefore protected) side of the new levee setback; and (c) removed from production if they are located within the

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<sup>1</sup> GIS land use estimates were recently updated for 2014-2020 but not 2008. This resulted in a difference in total land use for 2008 (5,874 acres) vs. the updated land use for later years (6,018 acres). To avoid this inconsistency the 2008 land use will be dropped from the analysis; however, this information is only used for historical purposes and does not affect the analysis.

new levee footprint and the Sacramento Bypass expansion area. Table 3 summarizes the acreage expected to be on the water side, land side, and included in the new levee setback footprint for the five alternatives and the Sacramento Bypass expansion area. Project areas for Alternative 2 (preferred alternative) were recently updated to reflect a smaller footprint for that alternative and a minor change to the study area boundary (i.e., inclusion of existing levee footprint area). These changes were not done for Alternatives 3-5; thus, there are differences in the total project area and Sacramento Bypass expansion area for those alternatives compared to Alternative 2. Table 4 shows the Alternative 2 2020 land use for the water side, land side, levee footprint, and Sacramento Bypass expansion area before crop substitution on the water side, based on projected 2020 conditions. Table 5 shows the same information except with the crop substitution (expected to be rice as described below) on the water side.

# Chapter 5. Primary Agricultural Impacts

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As the result of setting back the Yolo Bypass levee and Sacramento Bypass north levee, primary (direct) agricultural impacts will likely occur because of these changes from 2020 without- to with-project conditions:

## 5.1 Conversion of land side to water side crops

Some crops currently protected by the existing Yolo Bypass levee will be on the water side of the new levee setback. Crops currently (2016) on the proposed water side of the setback levee (primarily to the west of County Road 124) include sunflowers in the northern portion, safflower in the central portion, and walnuts in the southern portion along the Sacramento Bypass. However, by 2020 the sunflowers are expected to be replaced with processing tomatoes. A new levee setback will likely result in changes in crops compatible with flooding within the Yolo Bypass, including potential delayed planting (compared to the crop's planting window) because of flooding (i.e. last day wet) which could reduce crop yields. Based on grower input, it is assumed that the substitute crop will be rice which has been grown on the water side of the existing Lower Basin Yolo Basin levee for several years. However, other crops may be possible depending upon market conditions, water availability, and restored ground elevations on the water side of the levee setback after construction is completed. Rice has a planting window of April 14 through May 20 (sometimes into June) but its yield could be reduced by as much as 100% if planting is delayed beyond May 15<sup>th</sup> due to flooding in the Yolo Bypass (Howitt, et al; 2013). In this report, an assumed 10% reduction in average annual yield due to late rice planting is being used. However, a sensitivity analysis was conducted to show the effects of 0, 10, 20, 30, 40, and 50% average annual rice yield reductions due to late plantings.

## 5.2 Improved flood protection for land side crops

The remaining crops on the land side of the new levee setback should receive improved flood protection and thus lower expected annual damage (EAD). To estimate EAD, crop annual flood damage/acre estimates originally developed for the Sacramento and San Joaquin Rivers Comprehensive Study (2001) and updated for the 2012 and 2017 Central Valley Flood Protection Plans' flood risk analyses were applied to without- and with-project crop acres on the land side of the existing and proposed levee setbacks for all alternatives. These estimates take into account monthly cultivation costs, harvest costs, gross income, and monthly flooding probabilities. However, unlike for a structure, the crop annual flood damage/acre estimates assume a crop is damaged as soon as it gets wet; thus, they are not a function of depth but rather wetted area. These damage estimates also take into account the duration of flooding: short-term (less than 5 days of inundation) and long-term (5 days or greater inundation). Duration of flooding is important for permanent crops (such as walnuts) with potential re-establishment costs. For this analysis the average of short- and long-term annual crop flood damage/acre estimates was used.

The annual crop flood damage estimates must be adjusted for the expected annual frequency of flooding. The 2012 and 2017 CVFPP flood risk analyses developed HEC-FDA models for 100+ impact areas in the Central Valley including Elkhorn (SAC35), which includes the Upper and Lower Basins. In addition to expected annual damage (EAD), a key output of the HEC-FDA models is expected annual

exceedance probability (AEP), or the expected annual chance of flooding in an area taking into account hydrologic and hydraulic (H&H) and geotechnical information as well as the uncertainty for each of those parameters. To assess EAD and AEP, index points are assigned to river reaches bordering an impact area. These index points are meant to be representative of the H&H and geotechnical characteristics along the entire river reach. For Elkhorn (SAC35), index points were assigned in the Upper Basin along the Sacramento River (SAC35a) and along the Yolo Bypass (SAC35) in the Lower Basin (Figure 8). Thus, levee failure probabilities can be compared along both waterways for the Lower Basin assuming (a) that the AEP values for the Upper Basin along the Sacramento River are also representative for the Lower Basin and (b) the AEP values for the Yolo Bypass levee are also representative of those values for the Sacramento Bypass north levee. For the SAC35a index point along the Sacramento River, the 2017 CVFPP 2013 Baseline AEP is 0.014 or about a 1.4% annual chance of flooding (or about a 71 year level of protection). For the SAC35 index point along the Yolo Bypass, the 2013 Baseline AEP is 0.027, or about a 2.7% annual chance of flooding (or 37 year level of protection). Thus, the levee along the Yolo Bypass is the weak link and an improvement to at least 1.4% annual chance of flooding could be expected with the levee setback, constrained by the existing levee protection along the Sacramento River which would then become the weak link.

### **5.3 Loss of crops because of levee setback footprints and Sacramento Bypass expansion area**

Some crops will be displaced by the new levee setback footprints and Sacramento Bypass expansion area which will be converted to native vegetation. Of the 535 total acres affected by the Alternative 2 levee footprints and Sacramento Bypass expansion area, 442 acres would be removed from agricultural production.

### **5.4 Primary economic impact analysis input values**

Table 4 shows the estimated Alternative 2 2020 summer land use before the substitution of rice in the water side portion of the Lower Basin. Table 5 shows the same information except rice has been substituted for the other crops in the water side portion. Table 6 shows the assumed Lower Basin yields and prices (averages of 2013-2015 values obtained from Yolo County crop reports), operating costs obtained from various UC Cooperative Extension crop budgets, and labor hours which were also obtained from those crop budgets. All dollar values are expressed in 2016 dollars based on USDA (National Agricultural Statistics Service) prices received and paid indexes. Table 7 shows annual crop flood damage/acre estimates obtained from the DWR HAV that were used for the 2017 CVFPP flood risk analysis. Table 8 shows the expected annual damage calculation for Alternative 1 No Project Conditions and Table 9 shows the expected annual damage calculation for Alternative 2.

# Chapter 6. Secondary Agricultural Impacts

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Secondary economic impacts are the changes in values that accrue to persons other than those primarily affected by the project (the direct impacts to the growers). Secondary economic impacts include the indirect (except forward linking effects), induced, and total effects described above and these were estimated using a Yolo County 2015 IMPLAN model. To “run” the model requires results from the primary (direct) economic impact analysis, either total crop revenue (output) or value added impacts for each alternative. Based on those direct impacts, IMPLAN estimates the annual indirect, induced, and total impacts for output, value added, and employment. Included in the value added impacts are changes in federal, state, and local taxes. Local taxes include changes in county production-related sales taxes and property taxes which would be of interest to Yolo County. Changes in property taxes were also estimated outside of IMPLAN using specific project information regarding loss of crop acreages and assessed values resulting from the levee footprints and changes in crop types and values on the water side of the new levee setback, including the conversion of 193 crop acres to native vegetation in the Sacramento Bypass expansion area.



# Chapter 7. Primary Agricultural Impact Results

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Primary (direct) annual economic impact results are shown in Tables 10-13 for each alternative based on projected 2020 without- and with-project land use conditions. Each table shows total crop revenue, operating costs (excluding land and overhead costs), expected annual flood damage, expected annual flood losses, net crop revenue, and employment for without- and with-project conditions. The with-project conditions include land and water side conditions. Changes between the without- and with-project conditions are the annual impacts. For the with-project land use on the water side of the levee setback it is assumed that rice would be the crop replacing 2020 without-project crops. Crops located within the Sacramento Bypass expansion area will be converted to native vegetation (193 acres for Alternative 2). Reductions in expected annual damage reflect the benefits of improved flood protection resulting from the new levee setbacks (as described below).

Table 14 summarizes the primary (direct) annual economic impacts for all alternatives. For example, for Alternative 2, the annual total crop revenue impact is -\$1,124,934, which is the difference between the without-and with-project conditions shown in Table 10. Subtracted from this are the changes in operating annual costs, expected annual land side flood damages, and expected annual losses caused by delayed planting on the water side (which is a positive number because these costs did not occur in the without-project condition). Flood damages and flood losses are treated the same as operational expenses to grow the crops. After deducting all changes in operational costs from changes in total annual crop revenues, the change (i.e. impact) in annual net crop revenue is derived. The annual net crop revenue impacts range from about \$458,279 (Alternative 5) to about \$324,721 (Alternative 2). However, the levee footprint for Alternative 2 has recently been re-evaluated resulting in a smaller total footprint (249 total acres vs 492 total acres previously estimated). This re-evaluation has not been done for Alternatives 3-5.

For Alternative 2, the preferred alternative, the annual net revenue impact is about -\$324,721. Of this amount, about -\$379,426 is attributable to crop loss due to the new levee footprints and Sacramento Bypass expansion. This reduction is offset by the improved land side flood damage reduction benefits (\$94,925) resulting in a net reduction of about -\$284,501 attributable to the levee foot prints and Sacramento Bypass expansion area. The remainder (-\$40,220) is attributable to the change in water side crops to rice including yield reductions.

Table 15 shows the results of the Alternative 2 rice average annual yield reduction sensitivity analysis due to delayed planting in the Yolo Bypass. Rice net revenue within the Yolo Bypass is estimated without and with assumed average annual yield reductions of 0, 10, 20, 30, 40, and 50%, with differences added to the average annual net impacts. Changes in the Alternative 2 average annual impact range from -\$307,497 with a 0% average annual rice yield reduction to -\$393,615 with a 50% average annual rice yield reduction. A 10% reduction was assumed for all alternatives as described above.

For comparison, the total gross value of Yolo County 2015 agricultural production was about \$661.8 million (including about \$30 million in animal production such as cattle and calves). The total crop

revenue impact for Alternative 2 is about -\$1.1 million (Table 10), or about 0.2% of the total 2015 county agricultural production.

The present value of these annual net revenue impacts is shown in Table 16. Present value was computed over a 50-year analysis period (2020-2070) using discount rates of 3% and 6% for a sensitivity analysis. However, the 3% discount rate is the recommended rate consistent with current California Water Commission use for the Water Supply Implementation Program. For Alternative 2, the present value with a 3% discount rate is about \$8.4 million. Table 14 also summarizes the primary annual employment impacts for each alternative. These were estimated using labor hours/acre estimates from UC Extension crop budgets for the various crops. These are expressed as the number of full-time jobs although it is recognized that agricultural employment is likely to include both full-time and part-time employees. The impacts range from -1.6 (Alternative 5) to -7.0 (Alternative 3), with -3.6 for Alternative 2.

# Chapter 8. Secondary Agricultural Impact Results

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The results of the IMPLAN secondary (I/O) impact analysis are shown in Tables 17-20 for each alternative. These tables show the direct, indirect, induced, and total effects for employment, value added, and output, of which value added is the preferred metric. To “run” the IMPLAN model, the total annual crop revenue (i.e., output) impact from each alternative (Table 14) was input into the model. For Alternative 2 (Table 17), the annual direct output effect is about -\$1.1 million with a total output effect (including direct, indirect, and induced effects) of about -\$1.8 million, or a multiplier of about 1.6. The associated direct value added effect is about -\$607 thousand and the total value added effect (including direct, indirect, and induced effects) is about -\$1.0 million, or a multiplier of about 1.7.

A comparison of the annual primary and secondary impacts estimated by the LEBLS spreadsheet and IMPLAN analyses is shown in Table 21 for Alternative 2. For primary (direct) impacts, the LEBLS analysis estimates total crop revenue (output) impacts based on DWR county land use information, Yolo County crop reports, and UC Cooperative Extension crop budgets. The LEBLS analysis then estimates changes in operating costs (excluding land and overhead costs) and the two flood-related impacts--expected annual damage and expected annual losses. Net crop revenue is estimated by deducting the operating and flood-related costs. The LEBLS total crop revenue (output) impact is input into IMPLAN to “run” the analysis. IMPLAN then computes value added and output impacts. Value added includes employee compensation, proprietor income, and production-related taxes; thus, it is a larger value than net crop revenue. However, the IMPLAN value added does not include the two flood-related costs (expected annual damage and expected annual flood losses). IMPLAN computes the direct, indirect, induced, and total effects.

Included in the value added effects are annual county taxes on production and imports, including sales taxes and property taxes (Table 22). For Alternative 2 the total annual (direct, indirect, and induced) production-related tax effect is about -\$2,872. Of this amount, about -\$2,181 are property tax losses which are estimated within IMPLAN using national, state, and local financial accounts and relationships which are not based upon actual acreage changes within the project area.

For a comparison, property tax changes were also estimated outside of IMPLAN using project-specific information, including:

- Footprint and Sacramento Bypass expansion acres removed from agricultural production.
- Footprint acres’ and Sacramento Bypass expansion area average crop assessed value (\$4,644/acre) based on information provided by Yolo County.
- Change in cropping patterns and acreages on water side of proposed levee setback.
- Land side field crop market value of \$12,000/acre based on crop budget information and assumed assessed value of \$6,000/acre.

- Water side rice market value of \$10,000/acre based on crop budget information and assumed assessed value of \$6,000/acre.
- Property tax rate of 1.0%.

Estimated property tax impacts based on project information are shown in Table 23 for Alternative 2. The estimated total annual property tax impact for this alternative is about \$27,341, most of which is associated with foregone revenues from the crops displaced by the levee footprint (\$11,568) and Sacramento Bypass expansion (\$8,963), plus the difference in taxes due to change in land use on water side (\$6,809). Table 24 summarizes the estimated annual property tax impacts for all of the alternatives based on project information.

IMPLAN also estimates direct, indirect, induced and total employment effects which include full-time, seasonal, and part-time employees. The IMPLAN employment impacts were higher than those computed using the LEBLS analysis. For example, for Alternative 2, the LEBLS analysis estimated direct employment effect of -3.6 (Table 10) whereas IMPLAN estimates a direct effect of -14.6 employees (Table 17). This difference is probably due to several factors, including (a) the LEBLS analysis estimates full-time employees vs. the IMPLAN full-time, seasonal, and part-time employees; and (b) the LEBLS analysis uses UC Crop Extension crop budget labor hour information and the IMPLAN analysis uses limited county crop employment relationships information.

# Chapter 9. Other Impacts

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Other impacts potentially associated with the proposed levee setback include:

## 9.1 Construction

The proposed project would require substantial construction and labor expenses over several months, starting in 2020. Expenditures on construction goods, materials, equipment and labor that occur within the Yolo County study region (primary impacts) would generate additional economic benefits as spending ripples through the local economy via inter-industry industry linkages and additional household spending by employees and proprietors (secondary impacts). The key is identifying how much of these construction purchases originate in the study region and how many employees reside there compared to commuting to the work site from outside the study region. Purchases of construction materials and employees living outside of the study region could result in “leakages” to other areas such as Sacramento and surrounding cities which would benefit those other areas but not Yolo County.

IMPLAN can estimate secondary impacts resulting from construction expenditures. For example, the estimated cost of constructing Alternatives 2 and 3 (both the same length) is about \$147 million (the direct output effect). Using IMPLAN, the total output direct, indirect, and induced effects is about \$196 million (Table 25). The corresponding direct and total value-added effects are about \$80 and \$109 million, respectively; and, the corresponding direct and total employment effects are about 441 and 790, respectively. Table 26 shows the same information for the shorter Alternatives 3 and 4. However, these estimates assume that all construction expenditures would occur within Yolo County, which is unlikely. At this time it is not known how much of the construction expenditures would occur within Yolo County. But, for example, if it is assumed that 50% of the expenditures would occur within Yolo County, then all of the above effects would be reduced by about 50%.

## 9.2 Consolidated number of reclamation districts

Cross levees currently subdivide the Lower Basin into 3 separate reclamation districts (RD 827, RD 785, and RD 537) each requiring its own pump station for dewatering following flood events (Figure 2). The longer alternatives (Alternatives 2 and 3) would remove these cross levees and consolidate the 3 reclamation districts (and possibly include RD 1600 located in the Upper Basin) into one reclamation district. Consolidation of the reclamation districts should reduce the administrative costs of providing flood protection in the Lower Basin. For the shorter alternatives (Alternatives 4 and 5), consolidation of reclamation districts may still occur, especially if the shorter alternatives are extended to one of the longer alternatives in the future.

## 9.3 Reduced long-term operation, maintenance, repair, rehabilitation, and replacement (OMRR&R) costs

Long-term OMRR&R costs should be reduced with a new levee compared to the existing Yolo Bypass levee, with greater cost reductions for the longer alternatives (Alternatives 2 and 3) compared to the shorter alternatives (Alternatives 4 and 5). Dewatering pumping costs should also be reduced because each of the reclamation districts has its own pump station, so 3 pump stations can be replaced with 1



new pump station at the southern end of the Lower Basin as a result of reclamation district consolidation. Figure 9 shows the existing RD 537 pump station.

## 9.4 Improved flood protection in the Lower Basin

The above analysis included reductions in crop EAD on the land side of the proposed levee setback because of improved levee protection provided by the new levee setback. In addition, there are about 30 residential single-family residences, one restaurant/bar, and numerous agricultural sheds and related structures that would also benefit from improved flood protection which has not been quantified for this analysis. However, 2 options are available to estimate reductions in flood damage (EAD) for these structures if future analysis is desired:

- HEC-FDA. A HEC-FDA model (SAC35) was developed for the Elkhorn impact area for the 2012 and 2017 CVFPP flood damage analyses. The structural inventory (based on 2010 parcel information) for this model would include residential and commercial structures (but not agricultural structures such as sheds) in the Lower Basin and in the Upper Basin. In addition, the 2017 CVFPP HEC-FDA models have been configured to reflect systemwide H&H and geotechnical assumptions pertinent to that analysis which may not be applicable for this analysis (for example, assumptions of baseline 200-year level of protection for urban areas based on appropriate H&H and geotechnical inputs). Thus, the 2017 CVFPP HEC-FDA (SAC35) model cannot be used without significant changes.
- FRAM. DWR has a Flood Rapid Assessment Model (FRAM) to conduct more simplified, spreadsheet analyses of flood damage reduction benefits (i.e., changes in EAD) in rural areas. FRAM could be used to estimate flood damage reduction benefits for these residential and commercial structures by exporting them from the HEC-FDA (SAC35) inventory (which includes information such as square footage, number of stories, age of structure, ground elevation, and depreciated replacement value) based on a GIS analysis. They could then be included in a FRAM model along with assumptions about potential levee failure probabilities (from SAC35) and assumed flood depths without-and with-project. The above land side crop flood damage analysis used spreadsheet methods and data (such as the crop damage/acre estimates and levee failure probabilities) similar to a FRAM analysis.

## 9.5 Improved flood protection outside the Lower Basin

Widening of the Yolo Bypass accomplished with a Lower Basin levee setback should reduce stages in the Sacramento River which should result in downstream flood reduction benefits, especially for West Sacramento and other cities in the Sacramento metropolitan region. Although these benefits can be quantified using HEC-FDA, any quantification must be done in the context of projects planned or under construction to provide legislatively mandated 200-year level of protection for urban area by 2025 (Senate Bill 5; 2007). For example, the West Sacramento Levee Improvement Program (WSLIP) is well underway that will provide 200-year level of protection. Because the WSLIP would be included in the HEC-FDA without-project baseline conditions, benefits that might otherwise be attributable to the Lower Basin levee setback (with-project condition) would be reduced. Thus, HEC-FDA has not been used to quantify these benefits. However, stage reductions on the Sacramento River as a result of the Lower Basin levee setback have been computed which can be used as an indicator of system resiliency reinforcing flood damage reduction benefits expected to result from implementation of the WSLIP. For example, Sacramento River stage reductions at I Street and further downstream at Freeport are expected to be about -0.87 and -0.69 feet, respectively, for 200-year conditions. Yolo Bypass stage reductions for

200-year conditions upstream and downstream of I-5 near Woodland are expected to be about -0.66 and -0.64 feet, respectively. The Lower Basin levee setback will widen the Sacramento Bypass which will result in more flows in the Yolo Bypass, but stage increases in the Yolo Bypass near West Sacramento are expected to be only about 0.11 feet for 200-year conditions.

## **9.6 Improved roads and traffic flow patterns**

County Road 124 extends from north to south in the western portion of the Lower Basin (Figure 2). Although currently paved, it needs serious repairs and in the central portion of the Lower basin it is located on top of the Yolo Bypass levee. The longer alternatives (Alternatives 2 and 3) would straighten and repave County Road 124 for its entire length in the Lower Basin and locate it along the land side of the levee setback. A gravel road would be located on top of the levee setback for maintenance purposes. The shorter alternatives (Alternatives 4 and 5) would also improve County Road 124 but for shorter lengths.

## **9.7 Remediated Bryte landfill**

The non-operational Bryte land fill (about 5 acres) is located in the southwest corner of the Lower Basin (Figure 2) and is currently maintained by a private landowner. The landfill will be relocated within the southern end of the levee setback and the Sacramento Area Flood Control Agency and the new consolidated reclamation district will assume maintenance responsibilities.

## **9.8 Future recreation and ecosystem restoration opportunities**

Although not identified as project objectives at this time, a levee setback should provide future recreation and ecosystem restoration opportunities on the water side of the levee setback.

# Chapter 10. Conclusions

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This agricultural economic impact analysis evaluates the primary and secondary annual agricultural economic impacts resulting from changes in agricultural land use (crops) caused by proposed levee setbacks along the Yolo Bypass and Sacramento Bypass (north levee) in the Lower Basin. Some crops currently protected by the existing Yolo Bypass levee would be located inside the Yolo Bypass and subject to more frequent flooding because of the levee setback. It is anticipated that these crops would be converted to a different crop (rice) compatible with more frequent flooding. Existing crops within the Sacramento Bypass would be converted to native habitat (about 193 acres for Alternative 2). The remaining crops behind both levee setbacks would have improved flood protection. Finally, some crops would be displaced by the proposed levee setback footprints (about 249 total acres for Alternative 2). Thus, for Alternative 2, a total of 442 crop acres would be removed from production.

The primary (direct) average annual total crop revenue impacts range from about -\$1.1 million (Alternatives 2 and 5) to about -\$2.0 million (Alternative 3) in 2016 dollars. The associated primary (direct) average annual net crop revenue impacts range from about -\$479.8 thousand (Alternative 3) to about -\$324.7 thousand (Alternative 2). Alternative 2 is the preferred alternative and its lower average annual net crop revenue impact reflects a more refined analysis of the levee footprint resulting in a smaller footprint and associated impacts than estimated in the DEIR/DEIS (-\$464.1 thousand). This more refined analysis of levee footprints was not done for Alternatives 3-5.

The range of net crop revenue impacts includes an assumed average annual yield reduction of 10% for the rice that is expected to be planted within the Yolo Bypass and therefore subject to more frequent flooding. For Alternative 2, a sensitivity analysis was done to evaluate a range of average annual rice yield reductions—0, 10, 20, 30, 40, and 50%. The resulting range of average annual net crop revenue impacts for Alternative 2 is about -\$307.5 thousand (0% average annual rice yield reduction) to -\$393.6 thousand (50% average annual rice yield reduction). With the 10% average annual rice yield reduction the average annual net crop revenue impact is about -\$324.7 thousand. For Alternative 2, the present value of the average annual net crop revenue impact over a 50-year analysis period (2020-2070) with a 3% discount rate is about -\$8.4 million.

For comparison, the total gross value of Yolo County 2015 agricultural production was about \$661.8 million. The average annual total crop revenue impact for Alternative 2 is about \$1.1 million, or about 0.2% of the total 2015 county agricultural production, which does not appear to be a significant annual impact from a countywide perspective.

Secondary “ripple” economic impacts were also estimated. These are the changes in values that accrue to persons other than those primarily affected by the project (i.e., the growers), including indirect (interindustry linkages), induced (household spending), and total (direct, indirect, and induced) effects which were estimated using a Yolo County 2015 IMPLAN model. Based on the average annual total crop revenue (output) impacts described above, IMPLAN estimates the annual indirect, induced, and total impacts for output (gross revenue), value added (the difference between the value of goods produced and the cost of materials and supplies used in producing them), and employment. For Alternative 2, the annual total output impact (direct, indirect, and induced) is about -\$1.8 million. However, value added is the preferred metric because it excludes the costs of intermediary products used

in production but it includes employee compensation, proprietor income, and taxes on production and imports. For Alternative 2, the total (direct, indirect, and induced) annual value-added effect is about -\$1.0 million.

Included in the value-added impacts are changes in local taxes such as county production-related sales taxes and property taxes. The total (direct, indirect, and induced) production-related annual tax effect is about -\$2.9 thousand, including about -\$2.2 thousand in property taxes. However, changes in property taxes were also estimated outside of IMPLAN using specific project information regarding loss of crop acreages resulting from the levee footprints, Sacramento Bypass expansion, and changes in crop types and assessed values on the water side of the new Yolo Bypass levee setback. Using this method, the estimated annual property tax impact is about -\$27.3 thousand for Alternative 2.

Other impacts (benefits) associated with the levee setback were qualitatively described, including impacts resulting from construction expenditures within the county, consolidated number of reclamation districts, reduced long-term OMRR&R costs, improved non-agricultural flood protection inside and outside the Lower Basin, improved roads and traffic flow patterns within the Lower Basin, remediated operation of the Bryte landfill, and potential for recreation and ecosystem restoration opportunities at the project site.

# Chapter 11. Sources

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California Department of Water Resources:

- County Land Use Surveys (<http://www.water.ca.gov/landwateruse/lusrvymain.cfm>)
- *Handbook for Assessing Value of State Flood Management Investments* (HAV)(June 2014)
- 2017 CVFPP HEC-FDA model for Elkhorn Basin (SAC35)
- Lower Elkhorn Basin Levee Setback Project Stage Summaries (GEI; 01/23/2017)

Howitt, Richard, et al; Agricultural and Economic Impacts of Yolo Bypass Fish Habitat Proposals, April 2013.

IMPLAN 2015 Yolo County online software, Huntersville, NC.

UC Cooperative Extension Sample Production Costs (crop budgets):

- Sunflowers for Seed (Sacramento Valley; 2011)
- Safflower (Sacramento County; 1989)
- Small Grain Silage (San Joaquin Valley south; 2013)
- Alfalfa Hay (Sacramento Valley and Northern San Joaquin Valley flood irrigation; 2015)
- Rice (Sacramento Valley medium grain; June 2016)
- Processing Tomatoes (Sacramento Valley and Northern Delta furrow irrigated; 2014)
- English Walnuts (Sacramento Valley micro sprinkler irrigated; 2015)

Yolo County

- Agricultural Crop Reports (2012-2015)
- LEBLS Alt2LU footprint-parcels-06-20-17.xlsx



**Table 1. Lower Basin Summer Without-Project Land Use**

DWR Land Use Classification	2014	2015	2016	2020 Projected
<b>Field</b>				
Safflower	516	690	690	690
Corn	302			
Sudan	21	21	21	21
Beans (dry)	26	26	113	26
Miscellaneous				
Sunflowers	109	411	411	72
<i>Subtotal</i>	<i>974</i>	<i>1,149</i>	<i>1,235</i>	<i>810</i>
<b>Grain and Hay</b>				
Grain and hay	1,372	272	272	272
<b>Wheat</b>				
<i>Subtotal</i>	<i>1,372</i>	<i>272</i>	<i>272</i>	<i>272</i>
<b>Pasture</b>				
Alfalfa/alfalfa mixtures	753	753	753	753
<b>Rice</b>				
Rice				
Wild rice				
<i>Subtotal</i>				
<b>Truck and Nursery/Berry</b>				
Beans (green)	128			
Melons/squash/cucumbers	51	51	51	51
Onions/garlic	48	48	48	48
Tomatoes (processing)	669	1,228	1,141	1,480
Mixed (4 or more)	15	15	15	15
Miscellaneous	50	34	34	34
<i>Subtotal</i>	<i>991</i>	<i>1,377</i>	<i>1,290</i>	<i>1,629</i>
<b>Deciduous Fruits/Nuts</b>				
Miscellaneous	2	2	2	2
Walnuts	789	1,328	1,328	1,415
<i>Subtotal</i>	<i>791</i>	<i>1,330</i>	<i>1,330</i>	<i>1,417</i>
<b>Idle</b>				
Land not cropped but cropped in past 3 years	2	2	2	2
New lands being prepared for crop production				
<i>Subtotal</i>	<i>2</i>	<i>2</i>	<i>2</i>	<i>2</i>
<b>Semi agricultural</b>				
Farmsteads (with residence)	54	54	56	54
Farmsteads (w/o residence)	22	22	20	22

**Table 1. Lower Basin Summer Without-Project Land Use**

DWR Land Use Classification	2014	2015	2016	2020 Projected
Miscellaneous	226	226	226	226
<i>Subtotal</i>	<i>301</i>	<i>301</i>	<i>301</i>	<i>301</i>
<b>Urban</b>				
Lawn area (irrigated)	1	1	1	1
Single family residence	1	1	1	1
Railroad right of way	15	15	15	15
Paved area	40	40	40	40
<i>Subtotal</i>	<i>57</i>	<i>57</i>	<i>57</i>	<i>57</i>
<b>Native/Riparian Vegetation</b>				
Native vegetation	382	382	382	382
Riparian vegetation	232	232	232	232
Marsh lands/tules/sedges	10	10	10	10
Trees/shrubs/other	98	98	98	98
<b>Permanent duck marsh</b>				
<i>Subtotal</i>	<i>722</i>	<i>722</i>	<i>722</i>	<i>722</i>
Water Surface	55	46	46	46
Total Basin Land Use	6,018	6,018	6,018	6,018

Note:

<sup>1</sup> Land use for 2014-2020 was updated based on latest GIS analysis of project study area which included levee footprint of existing levee.

**Table 2. Lower Basin 2020 Winter Without-Project Land Use**

DWR Land Use Classification	2020 Projected
<b>Field</b>	
Safflower	
Corn	
Sudan	21
Beans (dry)	26
Miscellaneous	
Sunflowers	73
<i>Subtotal</i>	<i>120</i>
<b>Grain and Hay</b>	
Grain and hay	272
Wheat	690
<i>Subtotal</i>	<i>962</i>
<b>Pasture</b>	
Alfalfa/alfalfa mixtures	753

**Table 2. Lower Basin 2020 Winter Without-Project Land Use**

DWR Land Use Classification	2020 Projected
<b>Rice</b>	
Rice	
Wild rice	
<i>Subtotal</i>	
<b>Truck and Nursery/Berry</b>	
Beans (green)	
Melons/squash/cucumbers	51
Onions/garlic	48
Tomatoes (processing)	
Mixed (4 or more)	15
Miscellaneous	34
<i>Subtotal</i>	149
<b>Deciduous Fruits/Nuts</b>	
Miscellaneous	0
Walnuts	1,415
<i>Subtotal</i>	1,415
<b>Idle</b>	
Land not cropped but cropped in past 3 years	1,484
New lands being prepared for crop production	
<i>Subtotal</i>	1,482
<b>Semi agricultural</b>	
Farmsteads (with residence)	54
Farmsteads (w/o residence)	22
Miscellaneous	226
<i>Subtotal</i>	301
<b>Urban</b>	
Lawn area (irrigated)	1
Single family residence	1
Railroad right of way	15
Paved area	40
<i>Subtotal</i>	57
<b>Native/Riparian Vegetation</b>	
Native vegetation	382
Riparian vegetation	232
Marsh lands/tules/sedges	10
Trees/shrubs/other	98

**Table 2. Lower Basin 2020 Winter Without-Project Land Use**

DWR Land Use Classification	2020 Projected
Permanent duck marsh	
<i>Subtotal</i>	722
<b>Water Surface</b>	55
<b>Total Basin Land Use</b>	<b>6,018</b>

**Table 3. With-Project Alternatives Acreage Summary**

Project Area	Alternatives				
	1 (No Project)	2	3 <sup>1</sup>	4 <sup>1</sup>	5 <sup>1</sup>
Water Side	0	853	1,313	892	621
Land Side	6,018	4,630	4,072	4,686	4,953
Levee Footprint	0	271	489	296	299
Sacramento Bypass Expansion	0	264	---	---	---
<b>Total</b>	<b>6,018</b>	<b>6,018</b>	<b>5,874</b>	<b>5,874</b>	<b>5,874</b>

Note:

<sup>1</sup> Project boundaries and levee footprints were not updated using GIS for Alternatives 3-5. The water side acres include 222 acres for the Sacramento Bypass expansion.

**Table 4. Alternative 2 2020 Summer Land Use (Before Water Side Crop Substitution)<sup>1</sup>**

DWR Land Use Classification	Water Side	Land Side	Levee Footprint	Sacramento Bypass Expansion	Total
<b>Field</b>					
Safflower <sup>2</sup>	420	116	110	44	690
Sudan		21			21
Beans (dry)		26			26
Sunflowers		72			72
<i>Subtotal</i>	<i>420</i>	<i>236</i>	<i>110</i>	<i>44</i>	<i>810</i>
<b>Grain and Hay</b>					
Grain and hay	29	243			272
Wheat (winter only)		116			116
<i>Subtotal</i>	<i>29</i>	<i>243</i>			<i>263</i>
<b>Pasture</b>					
Alfalfa/alfalfa mixtures	43	693	18		753
<b>Rice</b>					
Rice					
Wild rice					

**Table 4. Alternative 2 2020 Summer Land Use (Before Water Side Crop Substitution)<sup>1</sup>**

DWR Land Use Classification	Water Side	Land Side	Levee Footprint	Sacramento Bypass Expansion	Total
<i>Subtotal</i>					
<b>Truck and Nursery/Berry</b>					
Melons/squash/cucumbers	10	34	8		51
Onions/garlic		48			48
Tomatoes (processing)	179	1,199	81	21	1,480
Mixed (4 or more)		15			15
Miscellaneous		34			34
<i>Subtotal</i>	<i>189</i>	<i>1,331</i>	<i>88</i>	<i>21</i>	<i>1,629</i>
<b>Deciduous Fruits/Nuts</b>					
Miscellaneous		2			2
Walnuts		1,254	33	128	1,415
<i>Subtotal</i>		<i>1,255</i>	<i>33</i>	<i>128</i>	<i>1,417</i>
<b>Idle</b>					
Land not cropped but cropped in past 3 years		2			2
<b>Semi agricultural</b>					
Farmsteads (with residence)	1	53			54
Farmsteads (w/o residence)	1	18	2		22
Miscellaneous	22	191	8	5	226
<i>Subtotal</i>	<i>24</i>	<i>263</i>	<i>10</i>	<i>5</i>	<i>301</i>
<b>Urban</b>					
Lawn area (irrigated)		1			1
Single family residence		1			1
Railroad right of way		15			15
Paved area	4	28	1	5	40
<i>Subtotal</i>	<i>4</i>	<i>46</i>	<i>1</i>	<i>5</i>	<i>57</i>
<b>Native/Riparian Vegetation</b>					
Native vegetation	130	192	8	52	382
Riparian vegetation		230		1	232
Marsh lands/tules/sedges	1	8		1	10
Trees/shrubs/other		97		1	98
Permanent duck marsh					
<i>Subtotal</i>	<i>131</i>	<i>527</i>	<i>9</i>	<i>55</i>	<i>722</i>
<b>Water Surface</b>	<b>12</b>	<b>34</b>	<b>2</b>	<b>6</b>	<b>55</b>
<b>Total Basin Land Use</b>	<b>853</b>	<b>4,630</b>	<b>271</b>	<b>264</b>	<b>6,018</b>

Notes:

<sup>1</sup> Based on projected 2020 land use conditions.

<sup>2</sup> Replaced by wheat in winter.



**Table 5. Alternative 2 2020 Summer Land Use (After Water Side Crop Substitution)<sup>1</sup>**

DWR Land Use Classification	Water Side	Land Side	Levee Footprint	Sacramento Bypass Expansion	Total
<b>Field</b>					
Safflower <sup>2</sup>		116	110	44	270
Sudan		21			21
Beans (dry)		26			26
Miscellaneous					
Sunflowers		72			72
<i>Subtotal</i>		236	110	44	390
<b>Grain and Hay</b>					
Grain and hay		243			243
Wheat (winter only)		116			116
<i>Subtotal</i>		243			243
<b>Pasture</b>					
Alfalfa/alfalfa mixtures		693	18		710
<b>Rice</b>					
Rice	681				681
Wild rice					
<i>Subtotal</i>	681				681
<b>Truck and Nursery/Berry</b>					
Melons/squash/cucumbers		34	8		42
Onions/garlic		48			48
Tomatoes (processing)		1,199	81	21	1,301
Mixed (4 or more)		15			15
Miscellaneous		34			34
<i>Subtotal</i>		1,331	88		1,440
<b>Deciduous Fruits/Nuts</b>					
Miscellaneous		2			2
Walnuts		1,254	33	128	1,415
<i>Subtotal</i>		1,255	33	128	1,417
<b>Idle</b>					
Land not cropped but cropped in past 3 years		2			2
<b>Semi agricultural</b>					
Farmsteads (with residence)	1	53	0		54
Farmsteads (w/o residence)	1	18	2		22
Miscellaneous	22	191	8	5	226
<i>Subtotal</i>	24	263	10	5	301

**Table 5. Alternative 2 2020 Summer Land Use (After Water Side Crop Substitution)<sup>1</sup>**

DWR Land Use Classification	Water Side	Land Side	Levee Footprint	Sacramento Bypass Expansion	Total
<b>Urban</b>					
Lawn area (irrigated)		1			1
Single family residence		1			1
Railroad right of way	4	15			20
Paved area		28		5	34
<i>Subtotal</i>	<i>4</i>	<i>46</i>	<i>1</i>	<i>5</i>	<i>57</i>
<b>Native/Riparian Vegetation</b>					
Native vegetation	130	192	8	52	382
Riparian vegetation		230		1	232
Marsh lands/tules/sedges	1	8		1	10
Trees/shrubs/other		97		1	98
Permanent duck marsh					
<i>Subtotal</i>	<i>131</i>	<i>527</i>	<i>8</i>	<i>55</i>	<i>722</i>
<b>Water Surface</b>	<b>12</b>	<b>34</b>	<b>2</b>	<b>6</b>	<b>55</b>
<b>Total Basin Land Use</b>	<b>853</b>	<b>4,630</b>	<b>271</b>	<b>264</b>	<b>6,018</b>

Notes:

<sup>1</sup> Based on projected 2020 land use conditions

<sup>2</sup> Replaced by wheat in winter.

**Table 6. Lower Basin Yields, Prices Received, Operating Costs, and Labor Hours**

DWR Land Use Classification	Yields <sup>1</sup> (tons/acre)	Prices <sup>1,2</sup> (\$/ton)	Operating Costs <sup>2,3</sup> (\$/acre)	Labor Hours <sup>4</sup> (hours/acre)
<b>Field</b>				
Safflower	1.12	\$444	\$102	2.5
Sudan	NA	NA	NA	NA
Beans (dry)	NA	NA	NA	NA
Sunflowers	NA	\$1,308 <sup>5</sup>	\$483	4.86
<b>Grain and Hay</b>				
Grain and hay	2.79	\$146	\$497	1.51
Wheat	2.54	\$185	\$497 <sup>6</sup>	1.51
<b>Pasture</b>				
Alfalfa/alfalfa mixtures	6.01	\$155	\$611	14.84
<b>Rice</b>				
Rice	4.21	\$348	\$1,210	4.52
<b>Truck and Nursery/Berry</b>				

**Table 6. Lower Basin Yields, Prices Received, Operating Costs, and Labor Hours**

DWR Land Use Classification	Yields <sup>1</sup> (tons/acre)	Prices <sup>1,2</sup> (\$/ton)	Operating Costs <sup>2,3</sup> (\$/acre)	Labor Hours <sup>4</sup> (hours/acre)
<b>Melons/squash/cucumbers</b>				
Onions/garlic	NA	NA	NA	NA
Tomatoes (processing)	45.59	\$69	\$2,827	22.38
Mixed (4 or more)	NA	NA	NA	NA
Miscellaneous	NA	NA	NA	NA
<b>Deciduous Fruits/Nuts</b>				
Miscellaneous	NA	NA	NA	NA
Walnuts	1.42	\$2,911	\$2,214	7.06

Notes:

<sup>1</sup> 2013-2015 averages (Source: Yolo County crop reports)

<sup>2</sup> Prices and operating costs updated to 2016 dollars using USDA prices received and paid indexes.

<sup>3</sup> Operating costs exclude land and overhead costs. (Source: UC Cooperative Extension crop budgets).

<sup>4</sup> Machine and non-machine hours (Source: UC Cooperative Extension crop budgets).

<sup>5</sup> Sunflower prices are revenue\$/acre.

<sup>6</sup> Not found in crop budgets but assumed to be the same as wheat.

NA—prices/ yields not found in Yolo County crop reports. For now these crops are excluded from the analysis but this should not significantly affect the results since these crops are on land side. Analysis can be updated if information is obtained from growers or other sources.

**Table 7. Lower Basin Annual Crop Flood Damage/Acre Estimates<sup>1</sup>**

DWR Land Use Classification	2020 Without Project Acres	Short-Term Damage/ Acre (\$2014) <sup>2</sup>	Long-Term Damage/ Acre (\$2014) <sup>3</sup>	Average Damage/ Acre (\$2014)	Average Damage/ Acre (\$2016) <sup>4</sup>
<b>Field</b>					
Safflower	690	\$337	\$373	\$355	\$365
Sudan	21				
Beans (dry)	26	\$342	\$363	\$353	\$362
Sunflowers	72				
<i>Weighted Average</i>					\$365
<b>Grain and Hay</b>					
Grain and hay	272	489	508	499	512
<b>Pasture</b>					
Alfalfa/alfalfa mixtures	753	\$547	\$1,057	\$802	\$824
<b>Truck and Nursery/Berry</b>					
Melons/squash/cucumbers	51	\$652	\$652	\$652	\$670
Onions/garlic	48				
Tomatoes (processing)	1,480	\$947	\$947	\$947	\$973
Mixed (4 or more)	15				
Miscellaneous	34				
<i>Weighted Average</i>					\$963

**Table 7. Lower Basin Annual Crop Flood Damage/Acre Estimates<sup>1</sup>**

DWR Land Use Classification	2020 Without Project Acres	Short-Term Damage/ Acre (\$2014) <sup>2</sup>	Long-Term Damage/ Acre (\$2014) <sup>3</sup>	Average Damage/ Acre (\$2014)	Average Damage/ Acre (\$2016) <sup>4</sup>
<b>Deciduous Fruits/Nuts</b>					
Miscellaneous	2				
Walnuts	1,415	\$739	\$4,120	\$2,430	\$2,497
<b>Idle<sup>5</sup></b>	2	\$291	\$291	\$291	\$299
<b>Semi agricultura<sup>5</sup></b>	296	\$291	\$291	\$291	\$299

Notes:

- <sup>1</sup> These estimates take into account monthly cultivation costs, harvests costs, gross income, and monthly flooding probabilities, Source: DWR *Handbook for Assessing Value*; Table 3-5 (Sacramento Valley) (6/2014)
- <sup>2</sup> Short-term is less than 5 days inundation.
- <sup>3</sup> Long-term is 5 days or greater inundation.
- <sup>4</sup> Prices adjusted using Gross Domestic Product Implicit Price Deflator (<https://fred.stlouisfed.org/series/GDPDEF>).
- <sup>5</sup> Clean-up costs only.

**Table 8. Alternative 1 No Project Expected Annual Flood Damage**

DWR Land Use Classification	Acres	Average Damage/ Acre (\$2016) <sup>1</sup>	Total Damage
<b>Field</b>			
Safflower	690	\$365	\$251,836
Sudan	21	<b>\$365</b>	\$7,832
Beans (dry)	26	\$362	\$9,373
Sunflowers	72	<b>\$365</b>	\$26,392
<i>Subtotal</i>	<i>810</i>		<i>\$295,432</i>
<b>Grain and Hay</b>			
Grain and hay	272	\$512	\$139,286
<b>Pasture</b>			
Alfalfa/alfalfa mixtures	753	\$824	\$620,925
<b>Truck and Nursery/Berry</b>			
Melons/squash/cucumbers	51	\$670	\$34,485
Onions/garlic	48	<b>\$963</b>	\$46,279
Tomatoes (processing)	1,480	\$973	\$1,440,484
Mixed (4 or more)	15	<b>\$963</b>	\$14,727
Miscellaneous	34	<b>\$963</b>	\$32,843
<i>Subtotal</i>	<i>1,629</i>		<i>\$1,568,818</i>
<b>Deciduous Fruits/Nuts</b>			
Miscellaneous	2	\$2,497	\$4,470
Walnuts	1,415	\$2,497	\$3,533,557

**Table 8. Alternative 1 No Project Expected Annual Flood Damage**

DWR Land Use Classification	Acres	Average Damage/ Acre (\$2016) <sup>1</sup>	Total Damage
<i>Subtotal</i>	1,417		\$3,538,027
<b>Idle</b>	2	\$299	\$739
<b>Semiagricultural</b>	301	\$299	\$90,063
<b>Total</b>	5,859		\$6,253,291
<b>Annual Exceedence Probability (AEP)<sup>2</sup></b>			0.027
<b>Expected Annual Damage</b>			\$168,839

Notes:

<sup>1</sup> From Table 7. Bold values are crop type weighted averages (e.g., \$365 for field crops).<sup>2</sup> 2017 CVFPP Update HEC-FDA AEP value for SAC 35 (Elkhorn) Yolo Bypass index point.**Table 9. Alternative 2 With- Project (Land Side) Expected Annual Flood Damage**

DWR Land Use Classification	Acres	Average Damage/ Acre (\$2016) <sup>1</sup>	Total Damage
<b>Field</b>			
Safflower	116	\$365	\$42,451
Sudan	21	<b>\$365</b>	\$7,833
Beans (dry)	26	\$362	\$9,374
Sunflowers	72	<b>\$365</b>	\$26,392
<i>Subtotal</i>	236		\$86,050
<b>Grain and Hay</b>			
Grain and hay	243	\$512	\$124,299
<b>Pasture</b>			
Alfalfa/alfalfa mixtures	693	\$824	\$570,958
<b>Truck and Nursery/Berry</b>			
Melons/squash/cucumbers	34	\$670	\$22,847
Onions/garlic	48	<b>\$963</b>	\$46,275
Tomatoes (processing)	1,199	\$973	\$1,167,325
Mixed (4 or more)	15	<b>\$963</b>	\$14,731
Miscellaneous	34	<b>\$963</b>	\$32,841
<i>Subtotal</i>	1,331		\$1,284,018
<b>Deciduous Fruits/Nuts</b>			
Miscellaneous	2	\$2,497	\$4,482
Walnuts	1,254	\$2,497	\$3,130,509
<i>Subtotal</i>	1,255		\$3,134,991
<b>Idle</b>	2	\$299	\$740



**Table 9. Alternative 2 With- Project (Land Side) Expected Annual Flood Damage**

DWR Land Use Classification	Acres	Average Damage/ Acre (\$2016) <sup>1</sup>	Total Damage
Semiagricultural	263	\$299	\$78,512
<b>Total</b>	<b>4,139</b>		<b>\$5,279,569</b>
<b>Annual Exceedence Probability (AEP)<sup>2</sup></b>			<b>0.014</b>
<b>Expected Annual Damage With- Project (Alternative 2)</b>			<b>\$73,914</b>

Notes:

<sup>1</sup> From Table 7. Bold values are crop type weighted averages (e.g., \$365 for field crops).<sup>2</sup> 2017 CVFPP Update HEC-FDA AEP value for SAC 35a (Elkhorn) Sacramento River index point.**Table 10. Alternative 2 Primary Annual Economic Impacts (\$2016)**

Primary Economic Impacts	Without New Levee Setback		With New Levee Setback		Annual Impacts <sup>2</sup>
	Land Side	Land Side	Water Side	Total <sup>1</sup>	
<b>Total Crop Revenue<sup>3</sup></b>	\$11,464,183	\$9,342,986	\$996,263	\$10,339,249	-\$1,124,934
<b>- Operating Costs<sup>4</sup></b>	\$8,361,006	\$6,814,465	\$824,028	\$7,638,493	-\$722,512
<b>- Expected Annual Damage<sup>5</sup></b>	\$168,839	\$73,914	\$0	\$73,914	-\$94,925
<b>- Expected Annual Losses<sup>6</sup></b>	\$0	\$0	\$17,223	\$17,223	\$17,223
<b>Net Crop Revenue</b>	<b>\$2,934,139</b>	<b>\$2,454,607</b>	<b>\$155,011</b>	<b>\$2,609,618</b>	<b>-\$324,721</b>
<b>Employment<sup>7</sup></b>	27.8	33.7	1.5	24.2	-3.6

Notes:

<sup>1</sup> Adjusted for acreage loss caused by change in levee footprint and Sacramento Bypass expansion.<sup>2</sup> Changes in direct annual economic effects between without- and with- project conditions.<sup>3</sup> Function of crop types, acres, yields, and prices received.<sup>4</sup> Crop production costs excluding land, and overhead costs.<sup>5</sup> Expected annual damage caused by levee failure.<sup>6</sup> Expected annual losses caused by delayed planting date in Yolo Bypass.<sup>7</sup> Number of full-time jobs.**Table 11. Alternative 3 Primary Annual Economic Impacts (\$2016)**

Primary Economic Impacts	Without New Levee Setback		With New Levee Setback		Annual Impacts <sup>2</sup>
	Land Side	Land Side	Water Side	Total <sup>1</sup>	
<b>Total Crop Revenue<sup>3</sup></b>	\$11,464,183	\$8,035,285	\$1,394,800	\$9,430,086	-\$2,034,163
<b>- Operating Costs<sup>4</sup></b>	\$8,361,006	\$5,730,989	\$1,153,666	\$6,884,655	-\$1,476,351
<b>- Expected Annual Damage<sup>5</sup></b>	\$168,839	\$66,692	\$0	\$66,692	-\$102,147
<b>- Expected Annual Losses<sup>6</sup></b>	\$0	\$0	\$24,113	\$24,113	\$24,113
<b>Net Crop Revenue</b>	<b>\$2,934,336</b>	<b>\$2,237,540</b>	<b>\$217,021</b>	<b>\$2,454,560</b>	<b>-\$479,779</b>
<b>Employment<sup>7</sup></b>	27.8	18.7	2.1	20.8	-7.0

Notes:

**Table 11. Alternative 3 Primary Annual Economic Impacts (\$2016)**

Primary Economic Impacts	Without New Levee Setback		With New Levee Setback		Annual Impacts <sup>2</sup>
	Land Side	Land Side	Water Side	Total <sup>1</sup>	
<sup>1</sup> Adjusted for acreage loss caused by change in levee footprint and Sacramento Bypass expansion.					
<sup>2</sup> Changes in direct annual economic effects between without- and with- project conditions.					
<sup>3</sup> Function of crop types, acres, yields, and prices received.					
<sup>4</sup> Crop production costs excluding land, and overhead costs.					
<sup>5</sup> Expected annual damage caused by levee failure.					
<sup>6</sup> Expected annual losses caused by delayed planting date in Yolo Bypass.					
<sup>7</sup> Number of full-time jobs.					

**Table 12. Alternative 4 Primary Annual Economic Impacts (\$2016)**

Primary Economic Impacts	Without New Levee Setback		With New Levee Setback		Annual Impacts <sup>2</sup>
	Land Side	Land Side	Water Side	Total <sup>1</sup>	
<b>Total Crop Revenue<sup>3</sup></b>	\$11,464,183	\$9,099,248	\$832,105	\$9,931,352	-\$1,532,831
<b>- Operating Costs<sup>4</sup></b>	\$8,361,005	\$6,698,284	\$688,250	\$7,386,534	-\$974,471
<b>- Expected Annual Damage<sup>5</sup></b>	\$168,839	\$72,851	\$0	\$72,851	-\$95,988
<b>- Expected Annual Losses<sup>6</sup></b>	\$0	\$0	\$14,386	\$14,386	\$14,386
<b>Net Crop Revenue</b>	<b>\$2,934,337</b>	<b>\$2,328,112</b>	<b>\$129,470</b>	<b>\$2,457,582</b>	<b>-\$476,757</b>
<b>Employment<sup>7</sup></b>	27.8	22.8	1.2	24.0	-3.8

Notes:

- <sup>1</sup> Adjusted for acreage loss caused by change in levee footprint and Sacramento Bypass expansion.
- <sup>2</sup> Changes in direct annual economic effects between without- and with- project conditions.
- <sup>3</sup> Function of crop types, acres, yields, and prices received.
- <sup>4</sup> Crop production costs excluding land, and overhead costs.
- <sup>5</sup> Expected annual damage caused by levee failure.
- <sup>6</sup> Expected annual losses caused by delayed planting date in Yolo Bypass.
- <sup>7</sup> Number of full-time jobs.

**Table 13. Alternative 5 Primary Annual Economic Impacts (\$2016)**

Primary Economic Impacts	Without New Levee Setback		With New Levee Setback		Annual Impacts <sup>2</sup>
	Land Side	Land Side	Water Side	Total <sup>1</sup>	
<b>Total Crop Revenue<sup>3</sup></b>	\$11,464,183	\$9,893,173	\$466,397	\$10,359,570	-\$1,104,614
<b>- Operating Costs<sup>4</sup></b>	\$8,361,005	\$7,413,250	\$385,765	\$7,799,016	-\$561,990
<b>- Expected Annual Damage<sup>5</sup></b>	\$168,839	\$76,433	\$0	\$76,433	-\$92,406
<b>- Expected Annual Losses<sup>6</sup></b>	\$0	\$0	\$8,063	\$8,063	\$8,063
<b>Net Crop Revenue</b>	<b>\$2,934,337</b>	<b>\$2,403,490</b>	<b>\$72,568</b>	<b>\$2,476,058</b>	<b>-\$458,281</b>
<b>Employment<sup>7</sup></b>	27.8	25.5	0.7	26.2	-1.6

Notes:

- <sup>1</sup> Adjusted for acreage loss caused by change in levee footprint and Sacramento Bypass expansion.
- <sup>2</sup> Changes in direct annual economic effects between without- and with- project conditions.
- <sup>3</sup> Function of crop types, acres, yields, and prices received.

**Table 13. Alternative 5 Primary Annual Economic Impacts (\$2016)**

Primary Economic Impacts	Without New Levee Setback		With New Levee Setback		Annual Impacts <sup>2</sup>
	Land Side	Land Side	Water Side	Total <sup>1</sup>	
<sup>4</sup> Crop production costs excluding land, and overhead costs.					
<sup>5</sup> Expected annual damage caused by levee failure.					
<sup>6</sup> Expected annual losses caused by delayed planting date in Yolo Bypass.					
<sup>7</sup> Number of full-time jobs.					

**Table 14. Primary Annual Impact Assessment Results Summary (2020 Conditions; \$2016)**

Primary Economic Impacts <sup>1,2</sup>	Alternatives			
	2	3	4	5
<b>Total Annual Crop Revenue<sup>3</sup></b>	-\$1,124,934	-\$2,034,163	-\$1,532,831	-\$1,104,614
<b>- Operating Annual Costs<sup>4</sup></b>	-\$722,512	-\$1,476,351	-\$974,471	-\$561,990
<b>- Expected Annual Damage<sup>5</sup></b>	-\$94,925	-\$102,147	-\$95,988	-\$92,406
<b>- Expected Annual Losses<sup>6</sup></b>	\$17,223	\$24,113	\$14,386	\$8,063
<b>Net Annual Crop Revenue</b>	-\$324,721	-\$479,779	-\$476,757	-\$458,281
<b>Employment<sup>7</sup></b>	-3.6	-7.0	-3.8	-1.6

Notes:

- <sup>1</sup> Adjusted for acreage loss caused by change in levee footprint and Sacramento Bypass expansion.
- <sup>2</sup> Changes in direct annual economic effects between without- and with- project conditions.
- <sup>3</sup> Function of crop types, acres, yields, and prices received.
- <sup>4</sup> Crop production costs excluding land, and overhead costs.
- <sup>5</sup> Expected annual damage caused by levee failure.
- <sup>6</sup> Expected annual losses caused by delayed planting date in Yolo Bypass.
- <sup>7</sup> Number of full-time jobs.

**Table 15. Alternative 2 Average Annual Rice Yield Reduction Sensitivity Analysis (\$2016)**

Rice Average Annual Yield Reduction Assumptions <sup>1</sup>	Rice Net Revenue Without Delay <sup>2</sup>	Rice Net Revenue With Delay	Difference	Alternative 2 Average Annual Impacts
0%	\$172,235	\$172,235	\$0	-\$307,497
10%	\$172,235	\$155,011	-\$17,223	-\$324,721
20%	\$172,235	\$137,788	-\$34,447	-\$341,944
30%	\$172,235	\$120,564	-\$51,670	-\$359,168
40%	\$172,235	\$103,341	-\$68,894	-\$376,391
50%	\$172,235	\$86,117	-\$86,117	-\$393,615

Notes:

- <sup>1</sup> Average annual rice yield reductions caused by late planting in Yolo Bypass due to prolonged inundation.
- <sup>2</sup> Net revenue of rice planted in the Yolo Bypass.

**Table 16. Present Worth Analysis (\$2016)<sup>1</sup>**

Alternatives	Discount Rate	
	3% <sup>2</sup>	6%
2	-\$8,354,943	-\$5,118,176
3	-\$12,344,472	-\$7,562,131
4	-\$12,266,819	-\$7,514,562
5	-\$11,791,411	-\$7,223,330

Notes:

1 50-year analysis period (2020-2070).

2 Recommended discount rate based on California Water Commission use for Water Supply Implementation Program.

**Table 17. Alternative 2 IMPLAN Secondary Annual Impacts (2020 Conditions; \$2016)**

Impact Type	Employment	Value Added <sup>4</sup>	Output <sup>5</sup>
Direct Effect <sup>1</sup>	-14.6	-\$607,054	-\$1,124,934
Indirect Effects <sup>2</sup>	-3.6	-\$259,814	-\$391,415
Induced effects <sup>3</sup>	-2.1	-\$172,124	-\$282,062
<b>Total Effects</b>	<b>-20.3</b>	<b>-\$1,038,992</b>	<b>-\$1,798,41</b>

Notes:

1 The initial production changes (output) made by the growers as a result of this Lower Basin alternative.

2 The impact of growers buying goods and services from other businesses.

3 The impact of growers and workers re-spending their income in the economy.

4 The difference between total output (total crop revenue) and the cost of intermediate inputs.

5 The change in total crop revenue (output) associated with this Lower Basin alternative (Table 8).

[Note: This is the value that "runs" the I/O analysis.]

**Table 18. Alternative 3 IMPLAN Secondary Annual Impacts (2020 Conditions; \$2016)**

Impact Type	Employment	Value Added <sup>4</sup>	Output <sup>5</sup>
Direct Effect <sup>1</sup>	-19.5	-\$810,764	-\$2,034,163
Indirect Effects <sup>2</sup>	-6.6	-\$469,810	-\$707,776
Induced effects <sup>3</sup>	-3.0	-\$247,385	-\$405,407
<b>Total Effects</b>	<b>-29.0</b>	<b>-\$1,527,959</b>	<b>-\$3,147,346</b>

Notes:

1 The initial production changes made by the growers as a result of this Lower Basin alternative.

2 The impact of growers buying goods and services from other businesses.

3 The impact of growers and workers re-spending their income in the economy.

4 The difference between total output (total crop revenue) and the cost of intermediate inputs.

5 The change in total crop revenue (output) associated with this Lower Basin alternative (Table 9).

[Note: This is the value that "runs" the I/O analysis.]

**Table 19. Alternative 4 IMPLAN Secondary Annual Impacts (2020 Conditions; \$2016)**

Impact Type	Employment	Value Added <sup>4</sup>	Output <sup>5</sup>
<b>Direct Effect<sup>1</sup></b>	-8.9	-\$368,287	-\$1,532,831
<b>Indirect Effects<sup>2</sup></b>	-5.0	-\$354,022	-\$533,340
<b>Induced effects<sup>3</sup></b>	-1.6	-\$132,412	-\$217,707
<b>Total Effects</b>	-15.4	-\$854,721	-\$2,283,178

Notes:

<sup>1</sup> The initial production changes made by the growers as a result of this Lower Basin alternative.

<sup>2</sup> The impact of growers buying goods and services from other businesses.

<sup>3</sup> The impact of growers and workers re-spending their income in the economy.

<sup>4</sup> The difference between total output (total crop revenue) and the cost of intermediate inputs.

<sup>5</sup> The change in total crop revenue (output) associated with this Lower Basin alternative (Table 10).

[Note: This is the value that “runs” the I/O analysis.]

**Table 20. Alternative 5 IMPLAN Secondary Annual Impacts (2020 Conditions; \$2016)**

Impact Type	Employment	Value Added <sup>4</sup>	Output <sup>5</sup>
<b>Direct Effect<sup>1</sup></b>	-8.9	-\$368,287	-\$1,104,614
<b>Indirect Effects<sup>2</sup></b>	-3.6	-\$255,121	-\$384,344
<b>Induced effects<sup>3</sup></b>	-1.4	-\$118,318	-\$193,900
<b>Total Effects</b>	-13.9	-\$741,726	-\$1,682,858

Notes:

<sup>1</sup> The initial production changes made by the growers as a result of this Lower Basin alternative.

<sup>2</sup> The impact of growers buying goods and services from other businesses.

<sup>3</sup> The impact of growers and workers re-spending their income in the economy.

<sup>4</sup> The difference between total output (total crop revenue) and the cost of intermediate inputs.

<sup>5</sup> The change in total crop revenue (output) associated with this Lower Basin alternative (Table 11).

[Note: This is the value that “runs” the I/O analysis.]



**Table 21. Comparison of LEBLS and IMPLAN Annual Primary and Secondary Impact Results for Alternative 2 (\$2016)**

Impact Type	Primary (Direct)		Secondary			Multiplier <sup>2</sup>
	LEBLS	IMPLAN	IMPLAN Indirect Effects	IMPLAN Induced Effects	IMPLAN Total Effects <sup>1</sup>	
<b>Total Crop Revenue (Output)</b>	-\$1,124,934	-\$1,124,934	-\$391,415	-\$282,062	-\$1,798,411	1.6
<b>-Operating Costs<sup>3</sup></b>	-\$722,512	-----	-----	-----	-----	
<b>-Expected Annual Damage</b>	-\$94,925	-----	-----	-----	-----	
<b>-Expected Annual Losses</b>	\$17,223	-----	-----	-----	-----	
<b>Value Added<sup>4</sup></b>	-----	-\$607,054	-\$259,814	-\$172,124	-\$1,038,992	1.7
<b>Net Crop Revenue</b>	-\$324,721	-----	-----	-----	-----	

Notes:

<sup>1</sup> Sum of IMPLAN primary (direct), indirect, and induced effects.

<sup>2</sup> IMPLAN total effects compared to IMPLAN primary (direct) effects.

<sup>3</sup> Excludes land and overhead costs.

<sup>4</sup> Includes employee compensation, proprietor income, and production-related taxes.

**Table 22. IMPLAN Total Annual County Production and Import Taxes Effects<sup>1</sup> (\$2016)**

Alternatives	Sales Tax	Property Tax	Other Taxes, Fines, Fees	Total
2	-\$146	-\$2,181	-\$545	-\$2,872
3	-\$239	-\$3,561	-\$889	-\$4,689
4	-\$158	-\$2,359	-\$589	-\$3,106
5	-\$123	-\$1,838	-\$458	-\$2,419

Notes:

<sup>1</sup> Includes direct, indirect, and induced effects.

**Table 23. Alternative 2 Annual County Property Tax Impacts<sup>1</sup> (\$2016)**

Affected Areas	Acres	Assessed Value/Acre <sup>6</sup>	Total Assessed Value	Tax Rate	Annual Taxes
Footprint	249	\$4,644	\$1,156,829	1.0%	\$11,568
Water Side					
Without Project <sup>2</sup>	681	\$6,000	\$4,085,648	1.0%	\$40,856
With Project <sup>3</sup>	681	\$5,000	\$3,404,707	1.0%	\$34,047
Difference					\$6,809
Sacramento Bypass Expansion <sup>4</sup>	193	\$4,644	\$896,790	1.0%	\$8,963
<b>Total<sup>5</sup></b>					<b>\$27,341</b>

## Notes:

<sup>1</sup> Computed with project information and not using IMPLAN.

<sup>2</sup> Primarily field crops. (Source: LEBLS team)

<sup>3</sup> Replacement crop of rice. (Source: UC Cooperative Extension rice budget (Sacramento Valley).

<sup>4</sup> Crop acres planted in Sacramento Bypass expansion. Sum of taxes within footprint and Sacramento Bypass expansion plus the difference in taxes due to change in land use on water side. Footprint and Sacramento Bypass expansion average assessed values based on Yolo County parcel information. Approximate assessment values used on water side due to lack of comparable rice property tax information within the Yolo Bypass.

**Table 24. Summary of Annual Property Tax Impacts<sup>1</sup> (\$2016)**

Alternatives	Levee Footprint	Water Side <sup>2</sup>	Sacramento Bypass Expansion	Total
2	-\$11,568	-\$6,809	-\$8,963	-\$27,341
3	-\$20,005	-\$9,533	-\$8,963	-\$38,502
4	-\$11,977	-\$5,687	-\$8,963	-\$26,627
5	-\$11,694	-\$3,188	-\$8,963	-\$23,844

## Notes:

<sup>1</sup> Computed with project information and not using IMPLAN

<sup>2</sup> Includes reduction in taxes due to switch to rice.

**Table 25. Alternatives 2 and 3 IMPLAN Secondary Construction Impacts (\$2016)**

Impact Type	Employment	Value Added <sup>4</sup>	Output
Direct Effect <sup>1</sup>	441.2	\$79,672,511	\$145,556,115
Indirect Effects <sup>2</sup>	172.9	\$14,253,477	\$26,297,099
Induced effects <sup>3</sup>	175.6	\$14,587,963	\$23,010,637
Total Effects	789.8	\$108,513,950	\$195,772,851

## Notes:

<sup>1</sup> The construction expenditure (output) associated with these Lower Basin alternatives (both about 7 miles in length). [Note: This is the value that "runs" the I/O analysis.]

<sup>2</sup> The impact of contractors buying goods and services from other businesses.

<sup>3</sup> The impact of project managers and workers re-spending their income in the economy.

<sup>4</sup> The difference between total output (total construction expenditures) and the cost of intermediate inputs.

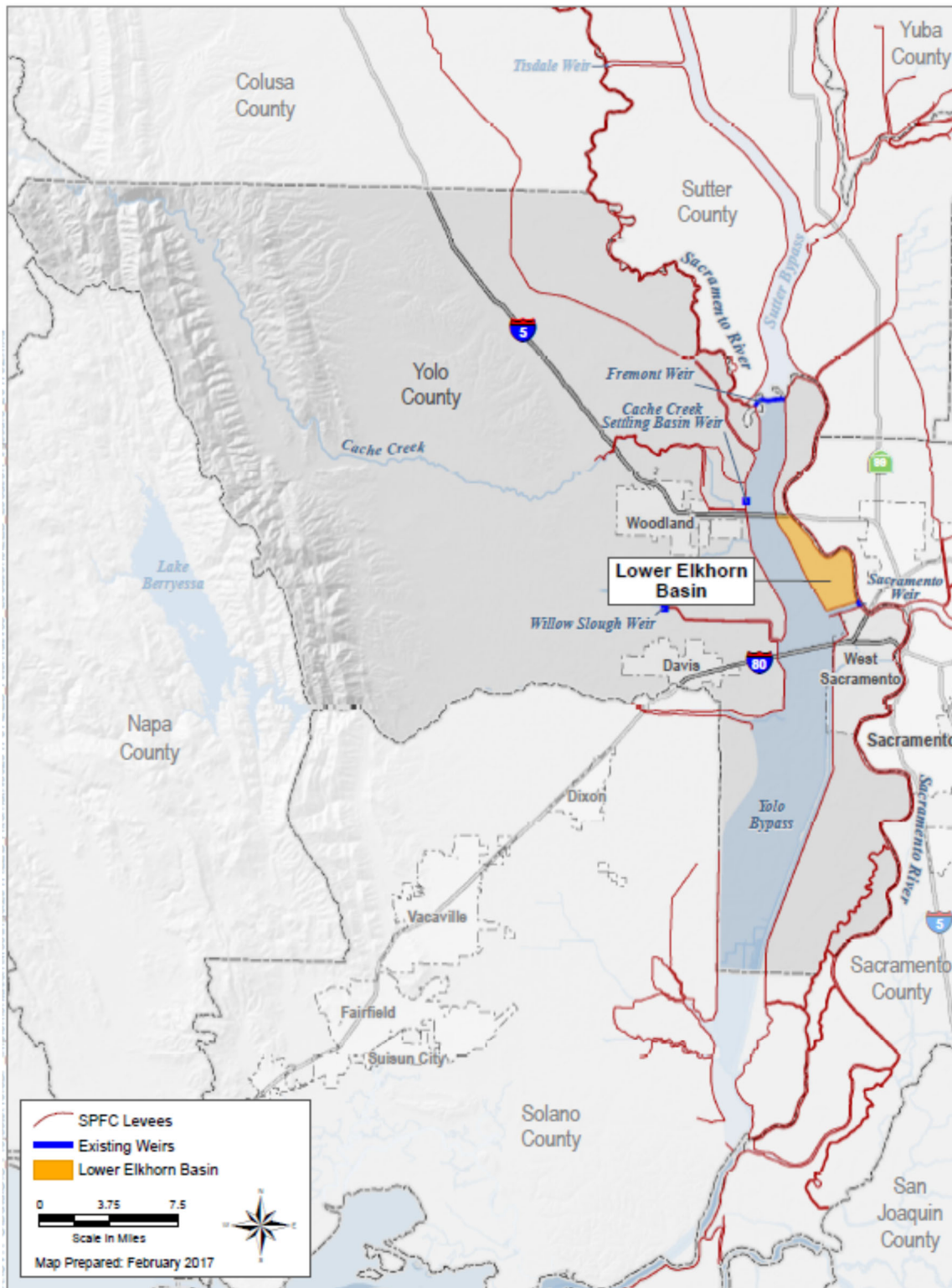
**Table 26. Alternatives 4 and 5 IMPLAN Secondary Construction Impacts (\$2016)**

<b>Impact Type</b>	<b>Employment</b>	<b>Value Added<sup>4</sup></b>	<b>Output</b>
<b>Direct Effect<sup>1</sup></b>	315.2	\$56,908,936	\$103,968,654
<b>Indirect Effects<sup>2</sup></b>	123.5	\$10,181,065	\$18,783,642
<b>Induced effects<sup>3</sup></b>	125.4	\$10,419,973	\$17,985,455
<b>Total Effects</b>	564.1	\$77,509,965	\$139,837,750

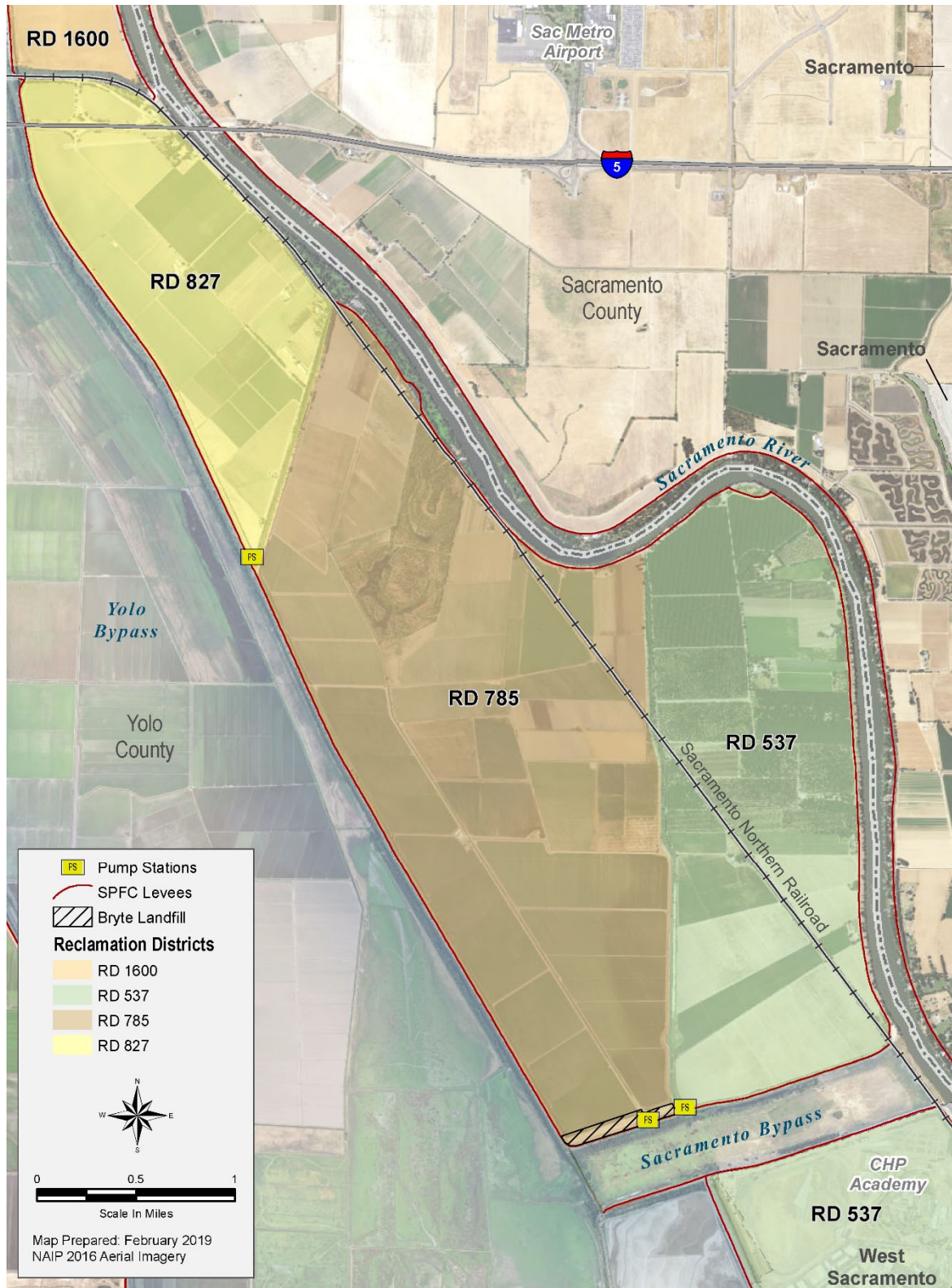
Notes:

- <sup>1</sup> The construction expenditure (output) associated with these Lower Basin alternatives (both about 5 miles in length). [Note: This is the value that “runs” the I/O analysis.]
- <sup>2</sup> The impact of contractors buying goods and services from other businesses.
- <sup>3</sup> The impact of project managers and workers re-spending their income in the economy.
- <sup>4</sup> The difference between total output (total construction expenditures) and the cost of intermediate inputs.

**Figure 1. Study Region**

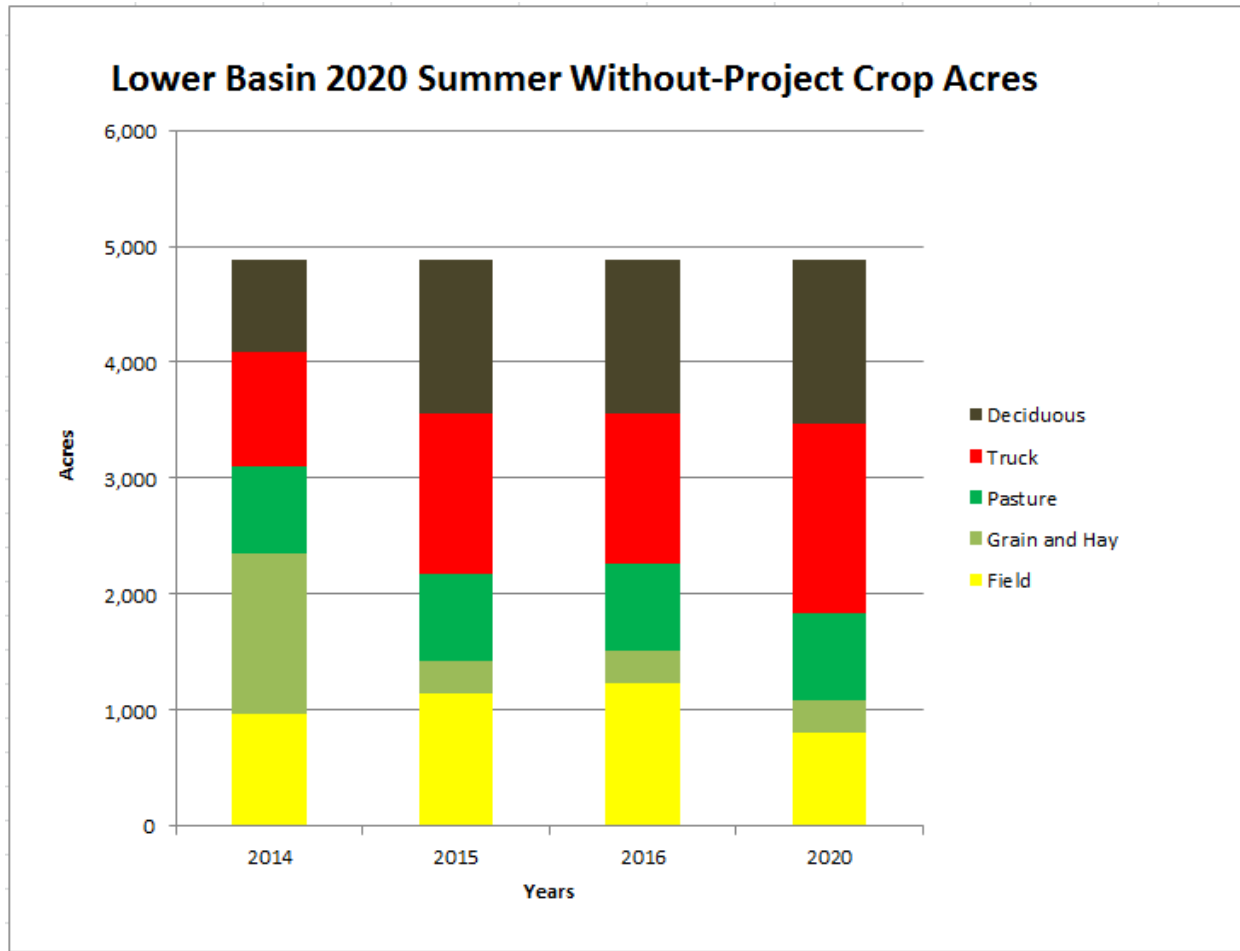


**Figure 2. Lower Basin Reclamation Districts**



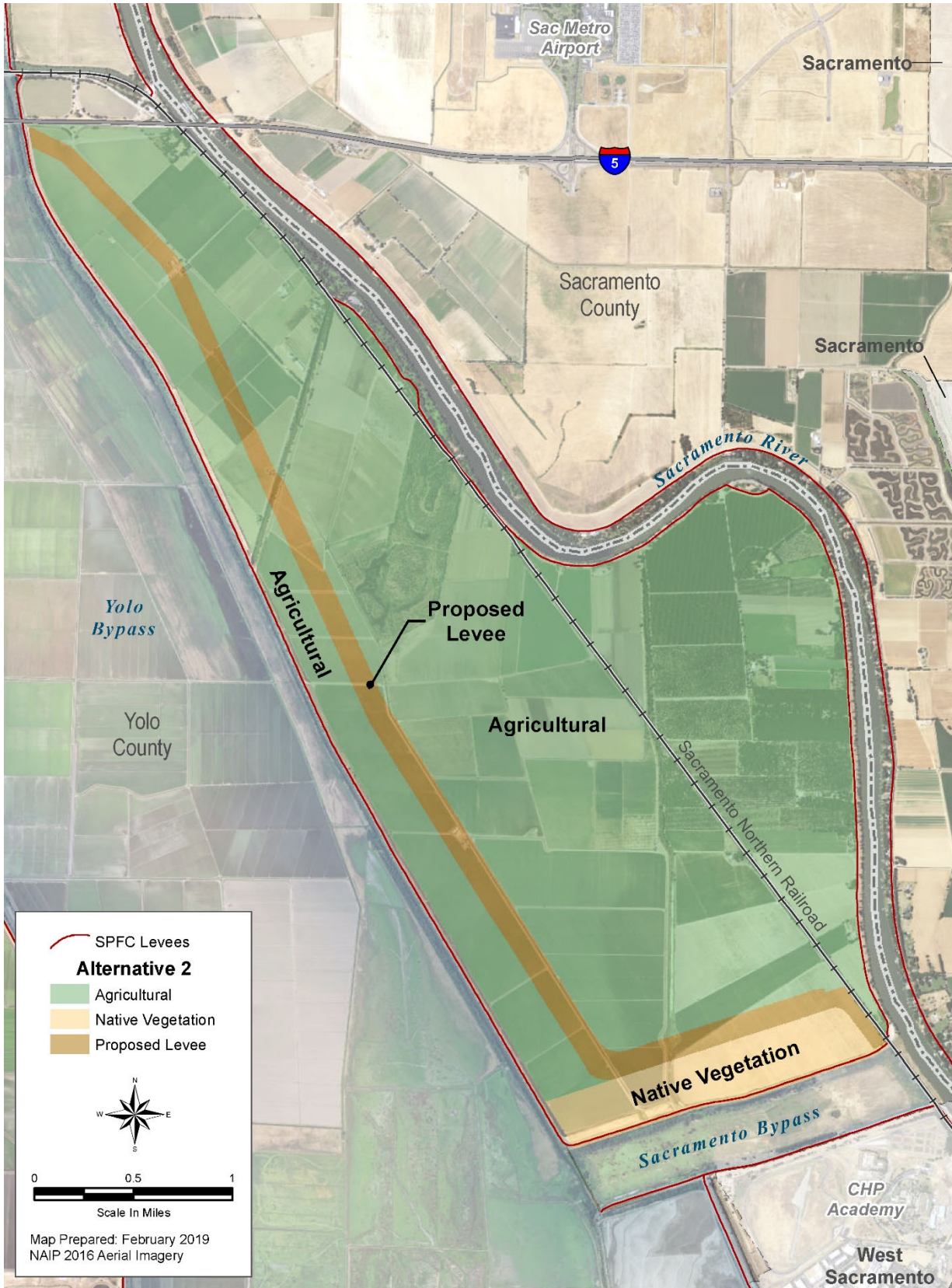


**Figure 3. Lower Basin Without-Project Summer Crop Acres (REVISED)**



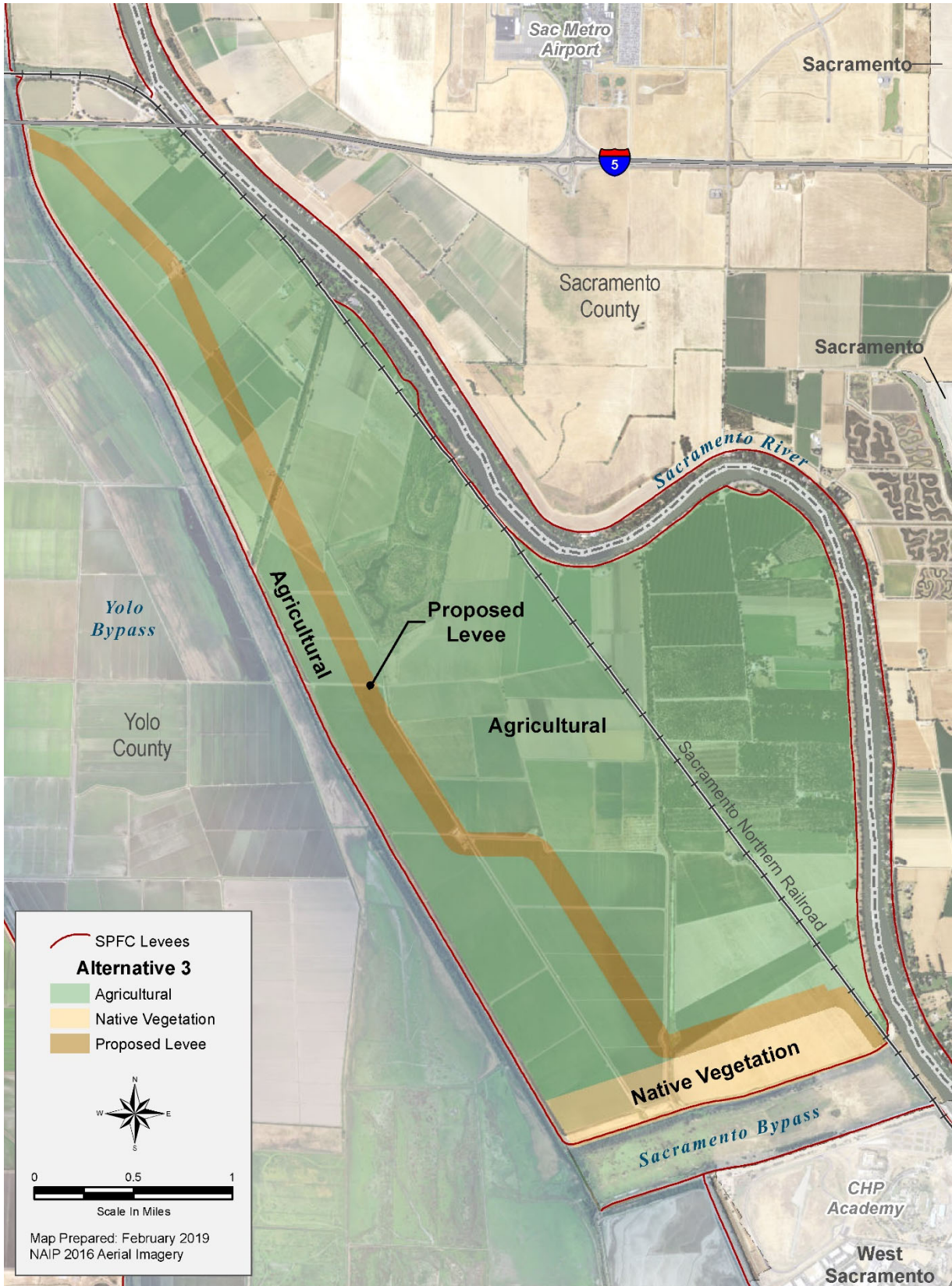
Sources:  
 2014: DWR Yolo County land use surveys.  
 2015: grower input  
 2016: observed cropping patterns.  
 2020: grower input.

**Figure 4. Alternative 2 Levee Setback Alignment**



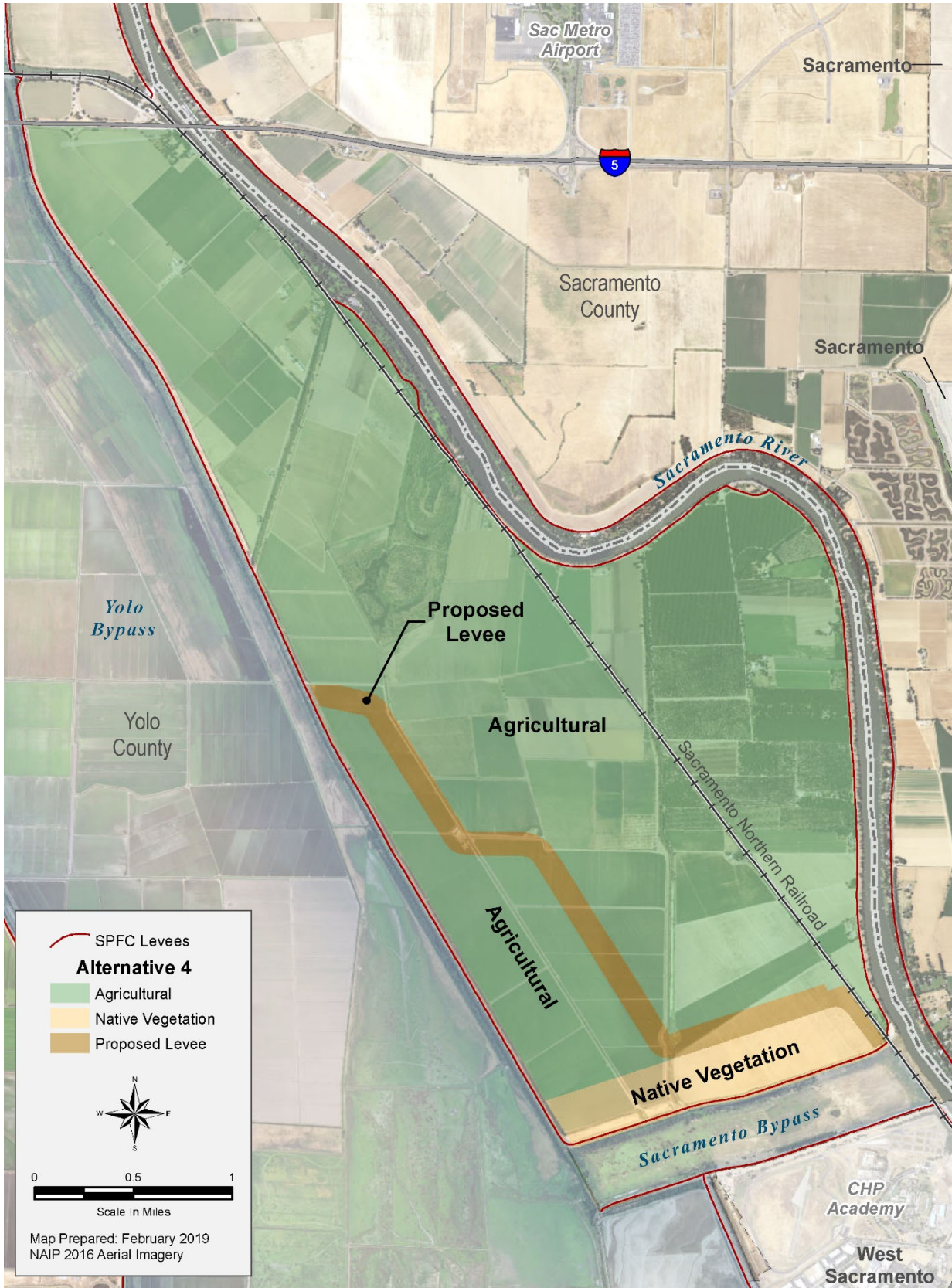


**Figure 5. Alternative 3 Levee Setback Alignment**



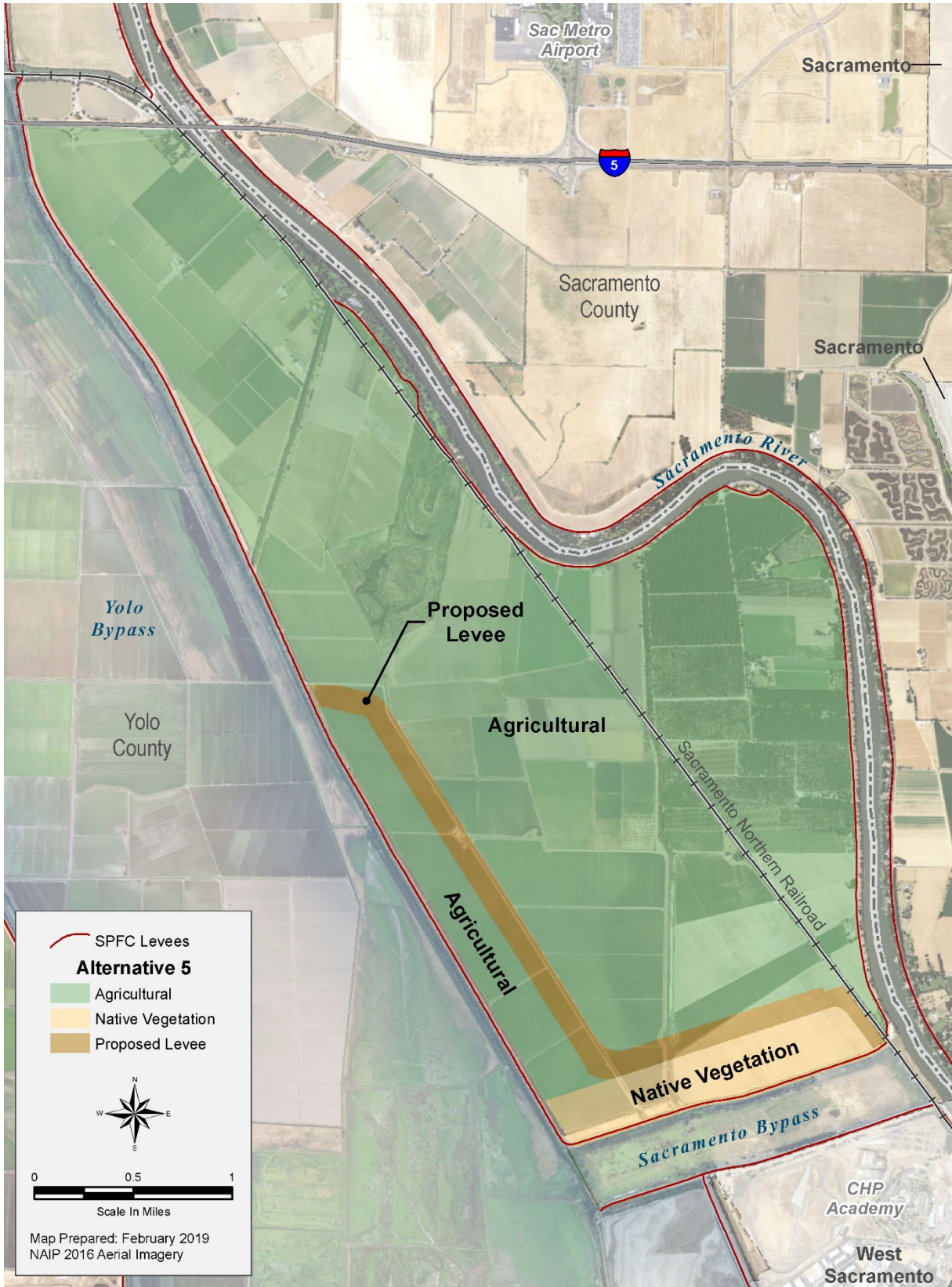


**Figure 6. Alternative 4 Levee Setback Alignment**



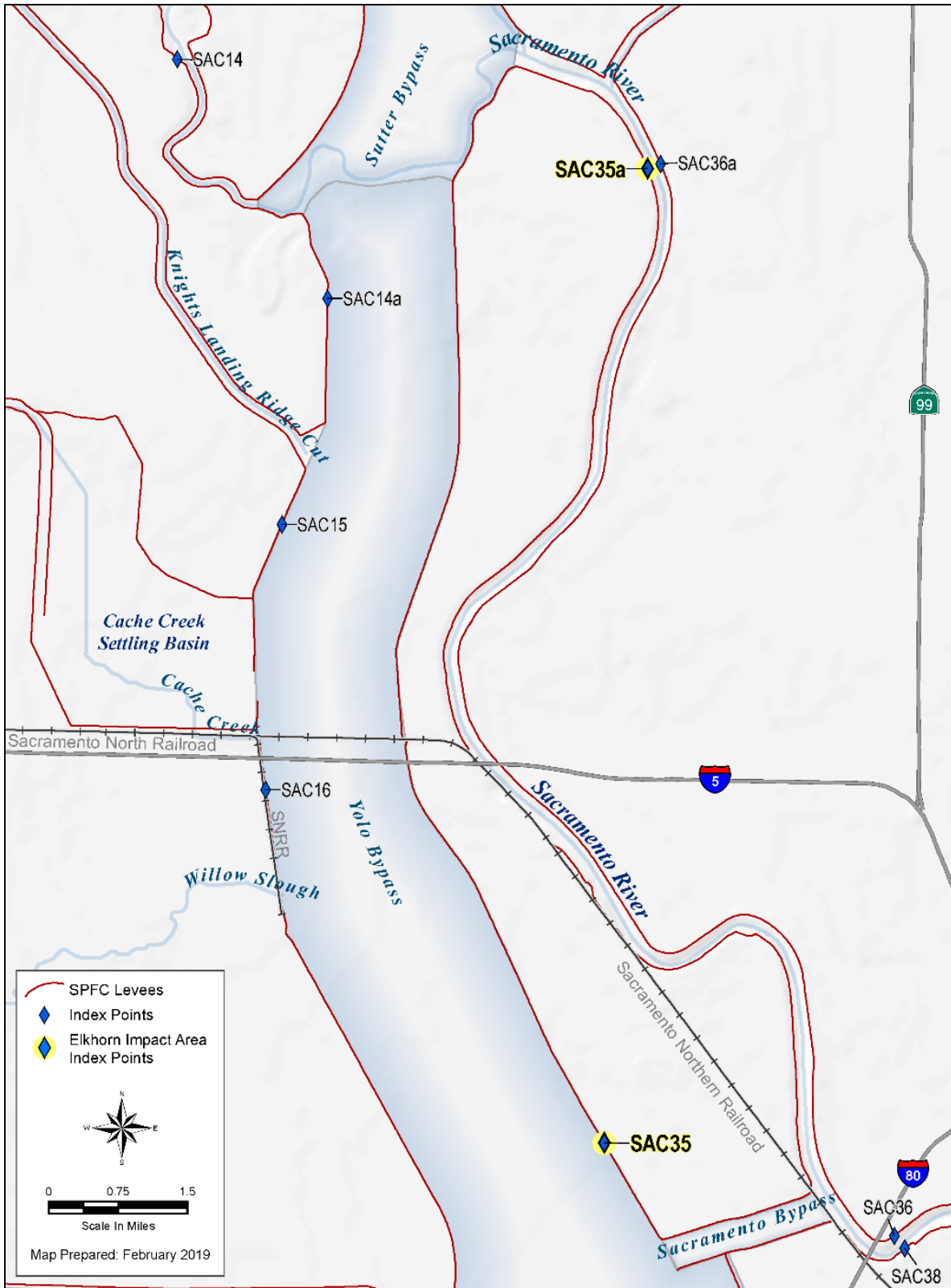


**Figure 7. Alternative 5 Levee Setback Alignment**





**Figure 8. Location of HEC-FDA Elkhorn impact area index points**



**Figure 9. Existing RD 537 pump station**



Source: Cowdin personal picture (February 2017)

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## **Appendix I. Traffic and Transportation Data**

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Alternative 2 - Reuse Scenario  
 Vehicle Trips During Peak Hour  
 Calculation of Equivalent Trips  
 Notes:

On road truck trips  
 On road commuter vehicle

All Peak Hour trips equivalent basis =  $2x \text{HDT}/10 + \text{LDT}/2$

Construction Phase/Vehicle Type	EMFAC20 11 Class	Year 1	Year 2	Notes:	Year	Year
		Daily One- Way Trips	Daily One- Way Trips		1Peak Hourly Trips	2Peak Hourly Trips
<b>Mobilization</b>					<b>17</b>	<b>17</b>
Equipment/supply Transport Trucks	HDT	10	10	On road	2	2
Construction Workers	LDA-LDT	30	30		15	15
<b>Site Preparation/Stripping</b>					<b>16</b>	<b>16</b>
Highway Dump Truck	HDT	4	4	On road	0.8	0.8
Highway Dump Truck	HDT	4	4	Onsite only		
Construction Workers	LDA-LDT	30	30		15	15
<b>Structure Demolition</b>					<b>8</b>	<b>8</b>
Highway Dump Truck	HDT	16	16	On road	3.2	3.2
Construction Workers	LDA-LDT	10	10		5	5
<b>Existing Road Removal</b>					<b>13</b>	<b>11</b>
Highway Dump Truck	HDT	40	30	On road	8	6
Construction Workers	LDA-LDT	10	10		5	5
<b>Trench Excavation and Forcemain Installation</b>					<b>5</b>	<b>5</b>
Highway Dump Truck	HDT	280	110	Onsite only		
Construction Workers	LDA-LDT	10	10		5	5
<b>New Road Construction</b>					<b>15</b>	<b>12</b>
Aggregate and Asphalt Truck	HDT	24	12	On road	4.8	2.4
Construction Workers	LDA-LDT	20	20		10	10
<b>New Levee/Seepage Berm &amp; Soil Borrow Extraction</b>					<b>25</b>	<b>15</b>
Onsite Dump Truck	HDT	6150	4100	Onsite only		
Offsite Dump Truck	HDT	0	0	On road	0	0
Water Truck	HDT	2	2	Onsite only		
Lubricating/Fuel Truck	T7 Utility	2	2	On road	0.4	0.4
Construction Workers	LDA-LDT	50	30		25	15
<b>Offsite Borrow Material Transport</b>					<b>0</b>	<b>465</b>
Highway Dump Truck	HDT	0	2300	On road	0	460
Construction Workers	LDA-LDT	0	10		0	5
<b>Cutoff Wall Installation (Open Trench Method)</b>					<b>12</b>	<b>8</b>
Highway Dump Truck	HDT	8	14	Onsite only		
Material Transit Truck	HDT	8	14	On road	1.6	2.8
Construction Workers	LDA-LDT	20	10		10	5
<b>Erosion Protection Installation</b>					<b>150</b>	<b>150</b>
Highway Dump Truck	HDT	700	700	On road	140	140
Construction Workers	LDA-LDT	20	20		10	10
<b>Relief Well Installation</b>					<b>5</b>	<b>0</b>
Construction Workers	LDA-LDT	10	0		5	0
<b>Existing Pump Station Removal</b>					<b>6</b>	<b>6</b>
Highway Dump Truck	HDT	4	4	On road	0.8	0.8
Construction Workers	LDA-LDT	10	10		5	5
<b>Pump Station Installation</b>					<b>5</b>	<b>0</b>
Concrete Transit Truck	HDT	2	0	On road	0.4	0
Construction Workers	LDA-LDT	10	0		5	0
<b>Existing Levee Degrade</b>					<b>10</b>	<b>10</b>
Highway Dump Truck	HDT	5200	6900	Onsite only		
Water Truck	HDT	2	2	Onsite only		
Construction Workers	LDA-LDT	20	20		10	10
<b>Ecosystem Project Elements</b>					<b>0</b>	<b>10</b>
Water Truck	HDT	0	1	Onsite only		
Construction Workers	LDA-LDT	0	20		0	10
<b>Site Restoration and Demobilization</b>					<b>10</b>	<b>10</b>
Equipment/supply Transport Trucks	HDT	26	26	On road	5.2	5.2
Construction Workers	LDA-LDT	10	10		5	5

Alternative 2 - Reuse Scenario  
 Schedule of vehicles - equivalent trip basis

	apr	may	jun	jul	aug	sept	oct	nov	dec	apr	may	jun	jul	aug	sept	oct	nov
	Year 1 (2018)									Year 2 (2019)							
Construction Activity	1	2	3	4	5	6	7	8	9	13	14	15	16	17	18	19	20
Mobilization	17									17							
Site Preparation/Stripping	16	16	16							16							
Structure Demolition	8									8							
Existing Road Removal	13									11							
Trench Excavation and Forcemain Installation		5	5								5						
New Road Construction			15	15	15						12	12					
New Levee/Seepage Berm & Soil Borrow Extraction	25	25	25	25	25	25	25				15	15	15	15	15		
Offsite Borrow Material Transport											465	465	465	465	465		
Cutoff Wall Installation (Open Trench Method)			12	12	12	12	12						8	8	8		
Erosion Protection Installation						150	150								150	150	
Relief Well Installation					5	5											
Existing Pump Station Removal					6									6			
Pump Station Installation					5	5											
Existing Levee Degrade							10	10	10							10	10
Ecosystem Project Elements																10	
Site Restoration and Demobilization							10									10	
Total Peak Hour Equivalent Vehicle Trips (need to allocate to haul/access routes)	79	46	73	52	68	197	207	10	10	52	498	493	488	494	638	180	10

Alternative 2 - Long Haul Scenario  
 Vehicle Trips During Peak Hour  
 Calculation of Equivalent Trips  
 Notes:

On road truck trips  
 On road commuter vehicle

All Peak Hour trips equivalent basis =  $2x \text{HDT}/10 + \text{LDT}/2$

Construction Phase/Vehicle Type	EMFAC20 11 Class	Year 1	Year 2	Notes:	Year	Year
		Daily One- Way Trips	Daily One- Way Trips		1Peak Hourly Trips	2Peak Hourly Trips
<b>Mobilization</b>						
Equipment/supply Transport Trucks	HDT	10	10	On road	20	20
Construction Workers	LDA-LDT	30	30		30	30
					<b>50</b>	<b>50</b>
<b>Site Preparation/Stripping</b>						
Highway Dump Truck	HDT	4	4	On road	8	8
Highway Dump Truck	HDT	4	4	Onsite only		
Construction Workers	LDA-LDT	30	30		60	60
					<b>52</b>	<b>52</b>
<b>Structure Demolition</b>						
Highway Dump Truck	HDT	16	16	On road	32	32
Construction Workers	LDA-LDT	10	10		20	20
					<b>100</b>	<b>80</b>
<b>Existing Road Removal</b>						
Highway Dump Truck	HDT	40	30	On road	80	60
Construction Workers	LDA-LDT	10	10		20	20
					<b>20</b>	<b>20</b>
<b>Trench Excavation and Forcemain Installation</b>						
Highway Dump Truck	HDT	280	110	Onsite only		
Construction Workers	LDA-LDT	10	10		20	20
					<b>88</b>	<b>64</b>
<b>New Road Construction</b>						
Aggregate and Asphalt Truck	HDT	24	12	On road	48	24
Construction Workers	LDA-LDT	20	20		40	40
					<b>9320</b>	<b>6208</b>
<b>New Levee/Seepage Berm &amp; Soil Borrow Extraction</b>						
Onsite Dump Truck	HDT	1536	1024	Onsite only		
Offsite Dump Truck	HDT	4608	3072	On road	9216	6144
Water Truck	HDT	2	2	Onsite only		
Lubricating/Fuel Truck	T7 Utility	2	2	On road	4	4
Construction Workers	LDA-LDT	50	30		100	60
					<b>0</b>	<b>4620</b>
<b>Offsite Borrow Material Transport</b>						
Highway Dump Truck	HDT	0	2300	On road	0	4600
Construction Workers	LDA-LDT	0	10		0	20
					<b>56</b>	<b>48</b>
<b>Cutoff Wall Installation (Open Trench Method)</b>						
Highway Dump Truck	HDT	8	14	Onsite only		
Material Transit Truck	HDT	8	14	On road	16	28
Construction Workers	LDA-LDT	20	10		40	20
					<b>1440</b>	<b>1440</b>
<b>Erosion Protection Installation</b>						
Highway Dump Truck	HDT	700	700	On road	1400	1400
Construction Workers	LDA-LDT	20	20		40	40
					<b>20</b>	<b>0</b>
<b>Relief Well Installation</b>						
Construction Workers	LDA-LDT	10	0		20	0
					<b>28</b>	<b>28</b>
<b>Existing Pump Station Removal</b>						
Highway Dump Truck	HDT	4	4	On road	8	8
Construction Workers	LDA-LDT	10	10		20	20
					<b>24</b>	<b>0</b>
<b>Pump Station Installation</b>						
Concrete Transit Truck	HDT	2	0	On road	4	0
Construction Workers	LDA-LDT	10	0		20	0
					<b>40</b>	<b>40</b>
<b>Existing Levee Degrade</b>						
Highway Dump Truck	HDT	5200	6900	Onsite only		
Water Truck	HDT	2	2	Onsite only		
Construction Workers	LDA-LDT	20	20		40	40
					<b>0</b>	<b>40</b>
<b>Ecosystem Project Elements</b>						
Water Truck	HDT	0	1	Onsite only		
Construction Workers	LDA-LDT	0	20		0	40
					<b>72</b>	<b>72</b>
<b>Site Restoration and Demobilization</b>						
Equipment/supply Transport Trucks	HDT	26	26	On road	52	52
Construction Workers	LDA-LDT	10	10		20	20

Alternative 2 - Long Haul Scenario

Schedule of vehicles - equivalent trip basis

	apr	may	jun	jul	aug	sept	oct	nov	dec	apr	may	jun	jul	aug	sept	oct	nov	
	Year 1 (2018)									Year 2 (2019)								
Construction Activity	1	2	3	4	5	6	7	8	9	13	14	15	16	17	18	19	20	
Mobilization	50									50								
Site Preparation/Stripping	68	68	68							68								
Structure Demolition	52									52								
Existing Road Removal	100									80								
Trench Excavation and Forcemain Installation		20	20								20							
New Road Construction			88	88	88						64	64						
New Levee/Seepage Berm & Soil Borrow Extraction	9320	9320	9320	9320	9320	9320	9320				6208	6208	6208	6208	6208			
Offsite Borrow Material Transport											4620	4620	4620	4620	4620			
Cutoff Wall Installation (Open Trench Method)			56	56	56	56	56						48	48	48			
Erosion Protection Installation						1440	1440								1440	1440		
Relief Well Installation					20	20												
Existing Pump Station Removal					28									28				
Pump Station Installation					24	24												
Existing Levee Degrade							40	40	40							40	40	
Ecosystem Project Elements																40		
Site Restoration and Demobilization							72									72		
Total Peak Hour Equivalent Vehicle Trips (need to allocate to haul/access routes)	9,590	9,408	9,552	9,464	9,536	10,860	10,928	40	40	250	10,912	10,892	10,876	10,904	12,316	1,592	40	

Alternative 4 - Reuse Scenario  
 Vehicle Trips During Peak Hour  
 Calculation of Equivalent Trips  
 Notes:

On road truck trips  
 On road commuter vehicle

All Peak Hour trips equivalent basis = 2x HDT/10

Construction Phase/Vehicle Type	EMFAC201 1 Class	Year 1		Notes:
		Daily One-Way Trips	Year 1 Peak Hourly Trips	
<b>Mobilization</b>				<b>17</b>
Equipment/supply Transport Trucks	HDT	10	2	On Road
Construction Workers	LDA-LDT	30	15	
<b>Site Preparation/Stripping</b>				<b>16</b>
Highway Dump Truck	HDT	4	0.8	On Road
Highway Dump Truck	HDT	4		Onsite Only
Construction Workers	LDA-LDT	30	15	
<b>Structure Demolition</b>				<b>8</b>
Highway Dump Truck	HDT	16	3.2	On Road
Construction Workers	LDA-LDT	10	5	
<b>Existing Road Removal</b>				<b>19</b>
Highway Dump Truck	HDT	68	13.6	On Road
Construction Workers	LDA-LDT	10	5	
<b>Trench Excavation and Forcemain Installation</b>				<b>99</b>
Highway Dump Truck	HDT	470	94	Onsite Only
Construction Workers	LDA-LDT	10	5	
<b>New Road Construction</b>				<b>18</b>
Aggregate and Asphalt Truck	HDT	40	8	On Road
Construction Workers	LDA-LDT	20	10	
<b>New Levee/Seepage Berm &amp; Soil Borrow Extraction</b>				<b>25</b>
Onsite Dump Truck	HDT	6400		Onsite Only
Offsite Dump Truck	HDT	0	0	On Road
Water Truck	HDT	1		Onsite Only
Lubricating/Fuel Truck	T7 Utility	2	0.4	On Road
Construction Workers	LDA-LDT	50	25	
<b>Offsite Borrow Material Transport</b>				<b>309</b>
Highway Dump Truck	HDT	1520	304	On Road
Construction Workers	LDA-LDT	10	5	
<b>Cutoff Wall Installation (Open Trench Method)</b>				<b>12</b>
Highway Dump Truck	HDT	10		Onsite Only
Material Transit Truck	HDT	10	2	On Road
Construction Workers	LDA-LDT	20	10	
<b>Erosion Protection Installation</b>				<b>158</b>
Highway Dump Truck	HDT	740	148	On Road
Construction Workers	LDA-LDT	20	10	
<b>Relief Well Installation</b>				<b>5</b>
Construction Workers	LDA-LDT	10	5	
<b>Existing Pump Station Removal</b>				<b>6</b>
Highway Dump Truck	HDT	4	0.8	On Road
Construction Workers	LDA-LDT	10	5	
<b>Pump Station Installation</b>				<b>5</b>
Concrete Transit Truck	HDT	2	0.4	On Road
Construction Workers	LDA-LDT	10	5	
<b>Existing Levee Degrade</b>				<b>10</b>
Highway Dump Truck	HDT	5400		Onsite Only
Water Truck	HDT	2		Onsite Only
Construction Workers	LDA-LDT	20	10	
<b>Ecosystem Project Elements</b>				<b>10</b>
Water Truck	HDT	1		Onsite Only
Construction Workers	LDA-LDT	20	10	
<b>Site Restoration and Demobilization</b>				<b>10</b>
Equipment/supply Transport Trucks	HDT	26	5.2	On Road
Construction Workers	LDA-LDT	10	5	



Alternative 4 - Reuse Scenario

Schedule of vehicles - equivalent trip basis

	apr	may	jun	jul	aug	sept	oct	nov	dec
Year 1 (2018)									
Construction Activity	1	2	3	4	5	6	7	8	9
Mobilization	17								
Site Preparation/Stripping	16	16	16						
Structure Demolition	8								
Existing Road Removal	19								
Trench Excavation and Forcemain Installation		99	99						
New Road Construction			18	18	18				
New Levee/Seepage Berm & Soil Borrow Extraction	25	25	25	25	25	25	25		
Offsite Borrow Material Transport						309			
Cutoff Wall Installation (Open Trench Method)			12	12	12	12	12		
Erosion Protection Installation						158	158		
Relief Well Installation					5	5			
Existing Pump Station Removal					6				
Pump Station Installation					5	5			
Existing Levee Degrade							10	10	10
Ecosystem Project Elements								10	
Site Restoration and Demobilization							10		
<b>Total Peak Hour Equivalent Vehicle Trips (need to allocate to haul/access routes)</b>	<b>85</b>	<b>140</b>	<b>170</b>	<b>55</b>	<b>72</b>	<b>515</b>	<b>216</b>	<b>20</b>	<b>10</b>

Alternative 4 - Long Haul Scenario  
 Vehicle Trips During Peak Hour  
 Calculation of Equivalent Trips  
 Notes:

On road truck trips  
 On road commuter vehicle

All Peak Hour trips equivalent basis =  $2x \text{HDT}/10 + \text{LDT}/2$

Construction Phase/Vehicle Type	EMFAC201 1 Class	Year 1		Notes:
		Daily One-Way Trips	Year 1 Hourly Trips	
<b>Mobilization</b>			<b>17</b>	
Equipment/supply Transport Trucks	HDT	10	2	On Road
Construction Workers	LDA-LDT	30	15	
<b>Site Preparation/Stripping</b>			<b>16</b>	
Highway Dump Truck	HDT	4	0.8	On Road
Highway Dump Truck	HDT	4		Onsite Only
Construction Workers	LDA-LDT	30	15	
<b>Structure Demolition</b>			<b>8</b>	
Highway Dump Truck	HDT	16	3.2	On Road
Construction Workers	LDA-LDT	10	5	
<b>Existing Road Removal</b>			<b>19</b>	
Highway Dump Truck	HDT	68	13.6	On Road
Construction Workers	LDA-LDT	10	5	
<b>Trench Excavation and Forcemain Installation</b>			<b>99</b>	
Highway Dump Truck	HDT	470	94	Onsite Only
Construction Workers	LDA-LDT	10	5	
<b>New Road Construction</b>			<b>18</b>	
Aggregate and Asphalt Truck	HDT	40	8	On Road
Construction Workers	LDA-LDT	20	10	
<b>New Levee/Seepage Berm &amp; Soil Borrow Extraction</b>			<b>985</b>	
Onsite Dump Truck	HDT	1600		Onsite Only
Offsite Dump Truck	HDT	4800	960	On Road
Water Truck	HDT	1		Onsite Only
Lubricating/Fuel Truck	T7 Utility	2	0.4	On Road
Construction Workers	LDA-LDT	50	25	
<b>Offsite Borrow Material Transport</b>			<b>309</b>	
Highway Dump Truck	HDT	1520	304	On Road
Construction Workers	LDA-LDT	10	5	
<b>Cutoff Wall Installation (Open Trench Method)</b>			<b>12</b>	
Highway Dump Truck	HDT	10		Onsite Only
Material Transit Truck	HDT	10	2	On Road
Construction Workers	LDA-LDT	20	10	
<b>Erosion Protection Installation</b>			<b>158</b>	
Highway Dump Truck	HDT	740	148	On Road
Construction Workers	LDA-LDT	20	10	
<b>Relief Well Installation</b>			<b>5</b>	
Construction Workers	LDA-LDT	10	5	
<b>Existing Pump Station Removal</b>			<b>6</b>	
Highway Dump Truck	HDT	4	0.8	On Road
Construction Workers	LDA-LDT	10	5	
<b>Pump Station Installation</b>			<b>5</b>	
Concrete Transit Truck	HDT	2	0.4	On Road
Construction Workers	LDA-LDT	10	5	
<b>Existing Levee Degrade</b>			<b>10</b>	
Highway Dump Truck	HDT	5400		Onsite Only
Water Truck	HDT	2		Onsite Only
Construction Workers	LDA-LDT	20	10	
<b>Ecosystem Project Elements</b>			<b>10</b>	
Water Truck	HDT	1		Onsite Only
Construction Workers	LDA-LDT	20	10	
<b>Site Restoration and Demobilization</b>			<b>10</b>	
Equipment/supply Transport Trucks	HDT	26	5.2	On Road
Construction Workers	LDA-LDT	10	5	

Alternative 4 - Long Haul Scenario

Schedule of vehicles - equivalent trip basis

	apr	may	jun	jul	aug	sept	oct	nov	dec
Year 1 (2018)									
Construction Activity	1	2	3	4	5	6	7	8	9
Mobilization	17								
Site Preparation/Stripping	16	16	16						
Structure Demolition	8								
Existing Road Removal	19								
Trench Excavation and Forcemain Installation		99	99						
New Road Construction			18	18	18				
New Levee/Seepage Berm & Soil Borrow Extraction	985	985	985	985	985	985	985		
Offsite Borrow Material Transport						309			
Cutoff Wall Installation (Open Trench Method)			12	12	12	12	12		
Erosion Protection Installation						158	158		
Relief Well Installation					5	5			
Existing Pump Station Removal					6				
Pump Station Installation					5	5			
Existing Levee Degrade							10	10	10
Ecosystem Project Elements								10	
Site Restoration and Demobilization							10		
<b>Total Peak Hour Equivalent Vehicle Trips (need to allocate to haul/access routes)</b>	<b>1,045</b>	<b>1,100</b>	<b>1,130</b>	<b>1,015</b>	<b>1,032</b>	<b>1,475</b>	<b>1,176</b>	<b>20</b>	<b>10</b>

## **Appendix J. Regional Trails Information**

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**Potential Recreational Trail Opportunities for the  
Lower Elkhorn Basin Levee Setback Project**

**Prepared by Lower Sacramento/Delta North RFMP Team - May 4, 2017**

The California Department of Water Resources (DWR) has expressed an interest in identifying recreational components that could be integrated into the Lower Elkhorn Basin Levee Setback Project (Lower Elkhorn Project). In addition, the Lower Sacramento/Delta North Regional Flood Management Plan Team (RFMP Team) is developing a Regional Trails Initiative that may include extending a regional trail connection north from the City of West Sacramento. Based on this alignment of interests, the RFMP team identified five recreational trail options that could be integrated into the Lower Elkhorn Project. These options are not exhaustive but are intended to represent a range of approaches to integrating recreational trails into the Lower Elkhorn Project. Also, the individual components of each option are not exclusive; they can be combined with other options as appropriate. For example, the educational placards and way-finding signage identified in Option 5 can be integrated into any of the options.

The RFMP team is requesting that DWR include these recreational trail components in the project description for the Lower Elkhorn Project and that the environmental impacts of their implementation be evaluated in the Lower Elkhorn Project Draft EIR/EIS. The agency(ies) responsible for repairing and maintaining these trail alignments has/have not been identified in the descriptions. Yolo County would not be one of the agencies responsible for their repair or maintenance.

The following is the list of potential recreational trail options for consideration:

**Option 1 – New Levee Waterside Toe Bike Path/Hiking Trail**

Install a paved or gravel-lined bike path/hiking trail on the waterside toe of the new Lower Elkhorn levee that would extend west from the Sacramento Weir and turn north as the new levee turns north, continuing along the levee's waterside toe until the levee intersects with County Road 22 north of Interstate 5. A gravel parking lot would be constructed within the expanded Sacramento Bypass to accommodate trail users. The parking lot would be designed to be regularly inundated and would be accessed from a ramp constructed along the southern face of the new Sacramento Bypass setback levee. Bicyclists could use this alignment to form a 15-mile loop connected to County Road 22/Old River Road.

**Option 2 – Tule Canal Remnant Levee Bike Path/Hiking Trail**

Install a paved or gravel-lined bike path/hiking trail on the east side of the Tule Canal generally along the alignment of the existing riparian corridor and the remnant levee. Similar to Option 1, this alignment would extend west from the Sacramento Weir along the waterside toe of the new Lower Elkhorn levee but would not turn north until it reaches the east side of the Tule Canal. The trail would continue north to its intersection with County Road 22 north of Interstate 5.

Much of the existing Yolo Bypass east levee is proposed to be removed to provide soil material for the new setback levee, although some segments would remain to provide wind wave protection. The path/trail would extend either up and over, or along the sides, of the remnant levee segments. The trail would take advantage of the shade provided by the Tule Canal's existing riparian tree canopy to the extent practical. Similar to Option 1, a gravel parking lot would be constructed within the expanded Sacramento Bypass to accommodate trail users and a 15-mile bicycle loop would be formed by connecting to County Road 22/Old River Road.

### **Option 3 – Top of Setback Levee Bike Path/Hiking Trail**

This option would be similar to Option 1 but the path/trail would be located along the top of the new setback levee rather than along the waterside toe. The path/trail would extend west from the Sacramento Weir and then north to the levee's intersection with County Road 22 north of Interstate 5. Parking would be provided in the existing dirt lot directly northeast of the northern terminus of the Sacramento Weir, east of Old River Road. Similar to Option 1, this alignment would form a 15-mile bicycle loop connected to County Road 22/Old River Road.

### **Option 4 – Combined Top of Levee/Landside Levee Toe and County Road 124 Bike Path**

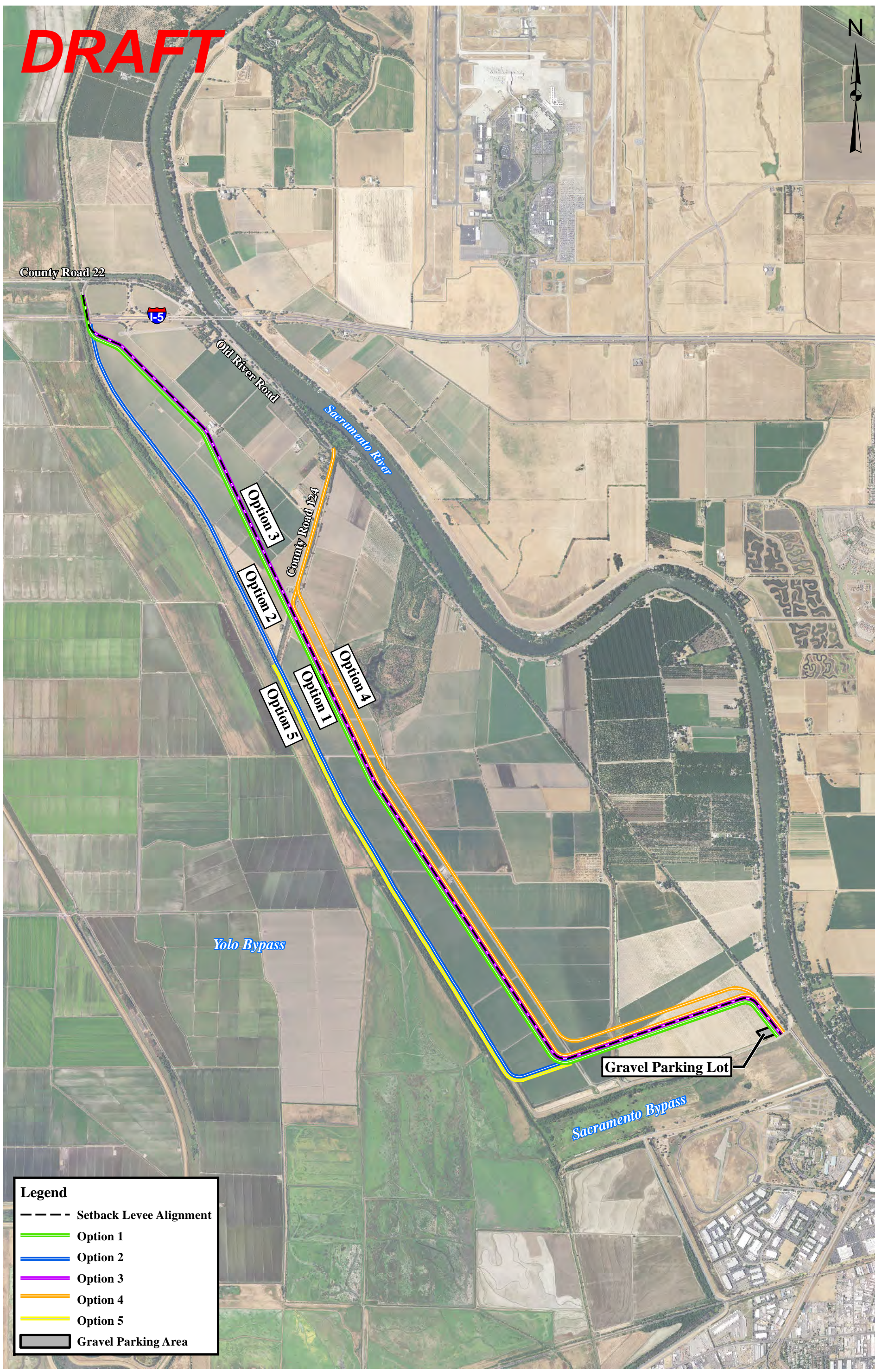
This option would use the same southern alignment as Option 3. A paved bike trail would extend west along the top of the new setback levee from the Sacramento Weir and would continue north as the levee turns north. However, at the levee's intersection with the northeast-oriented segment of County Road 124, a ramp would be provided to connect the levee-top bike trail to CR 124. A new Class 2 bike path (i.e., a striped bike path within the existing roadway right-of-way) would extend northeast from the levee along CR 124 to its intersection with Old River Road. This option would also include a parallel trail alongside the landside levee toe that would provide continuous access when the top of the levee is closed for operations and maintenance purposes. This parallel trail would be either located directly along the landside toe of the levee or within the right-of-way of the realigned County Road 124 adjacent to the levee. Parking for this option would be provided at both the existing dirt lot directly northeast of the northern terminus of the Sacramento Weir and at the Elkhorn Boat Launch near the intersection of CR 124 and Old River Road. Bicyclists could use this alignment to form a 12-mile loop connected to Old River Road. If hunting were to occur within the levee setback area, this option would have the least potential for conflicts between trail users and hunters of the five options identified.

### **Option 5 - Tule Canal Access Hiking Trail**

This option is intended to provide primarily pedestrian access to the Tule Canal without providing through access to the north. The alignment for this option would be similar to Option 2 but the unpaved trail would terminate at the location where CR 124 extends to the northeast. The purpose of this option would be to provide one-way in and one-way out access to the Tule Canal riparian corridor for native plant walks, bird watching, general wildlife viewing, and environmental education purposes. Recreational components that could be integrated into this option include bird blinds, picnic areas, interpretive trails, educational placards, and way-finding signage. Parking would be provided in the existing dirt lot directly northeast of the northern terminus of the Sacramento Weir, east of Old River Road.



**DRAFT**



**Legend**

- Setback Levee Alignment
- Option 1
- Option 2
- Option 3
- Option 4
- Option 5
- Gravel Parking Area



