
APPENDIX D

Terrestrial Species

2-Gate Fish Protection Demonstration Project

Habitat Assessment for the Giant Garter Snake (*Thamnophis gigas*)

Prepared for:

Mosaic Associates
647 Tennent Avenue, Suite 102
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Prepared by:

Swaim Biological, Inc
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Livermore, CA 94551

October 9, 2008

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1.0 Executive Summary

Swaim Biological conducted a habitat assessment for the federally and state threatened giant garter snake (*Thamnophis gigas*) for the 2-Gate Fish Protection Demonstration Project. The project area is located within the historic and current range of the garter snake and contains habitat suitable to support the species. Its presence in the project area should be assumed, and appropriate minimization and mitigation measures should be implemented during construction activities.

2.0 Introduction

This report assesses the suitability of habitat in the vicinity of the 2-Gate Fish Protection Demonstration Project for the giant garter snake or GGS. The purpose of this report is to assess the suitability of the habitat to support the GGS in order to determine the likelihood of the species and its habitat being affected by the project.

2.1 Project Location and Environmental Setting

The proposed 2-Gate Fish Protection Demonstration Project is located in western San Joaquin and eastern Contra Costa counties. The project would involve the installation and operation of operable gates on the Old River between Holland and Bacon Islands and on Connection Slough near Middle River between Bacon and Mandeville islands. Initial construction activities in 2009 would be conducted between January and March and the gates would be operated through June. Between 2010 and 2014, the gates would be operated between November and June. Project activities would include:

- The excavation of peat from beneath the gate foundations, estimated at 7,000 cubic yards at the Old River site and 5,500 cubic yards at Connection Slough
- Deposition of excavated materials at the Bacon Island spoils disposal site southeast of the Connection Slough gate
- Installation on the river bottom at Old River and Connection Slough of two commercial barges of approximately 200 feet in length, converted to a butterfly gate structure
- Installation of a combination of sheet piles and/or rock to secure the barges in place and to extend the structure to the adjacent levees
- Construction of pile supported boat ramps and a turn-around at the gates on Mandeville Island and on Holland Tract
- Construction of a toe berm to reinforce the levee on Bacon Island extending 500 feet upstream and downstream of the gate
- Seasonal removal of the barges and sheet piles, or partial removal of these structures after June and reinstallation of prior to November 30 between 2010 and 2014

- Temporary storage of construction materials at a site on Holland Tract, if needed

These activities could result in impacts to GGS habitat and individuals located within the project area.

The proposed project area consists primarily of open-water riverine habitat. Adjacent property is mainly privately owned agricultural land irrigated by canals. Vegetation types in the project vicinity include mixed riparian woodland, freshwater marsh, seasonal wetland, ruderal, and planted trees including cottonwood and walnut.

2.2 Natural History and Status of the Giant Garter Snake

The state and federally threatened GGS (U.S. Fish and Wildlife Service 1993) is one of the most aquatic garter snake species in California. It is a large snake ranging from 94 to 165 cm in length (Stebbins 2003). Coloration is highly variable, but GGS often have a brown head and a dorsum characterized by small dark spots in a checkered arrangement between two indistinct yellowish stripes (Stebbins 2003). Prey preferences include small fish and amphibians (U.S. Fish and Wildlife 2005). The distribution of GGS corresponds with historical flood plains, freshwater marshes, and tributary streams of the Central Valley of California (Hansen and Brode 1980).

The GGS overlaps in range with the common garter snake (*Thamnophis sirtalis*) and the western terrestrial garter snake (*Thamnophis elegans*) and can be differentiated from these other species by examining color patterns, scale numbers, and head shape (U.S. Fish and Wildlife Service 1999). The GGS does not display the red markings of the common garter snake and does not always have well-defined stripes. Furthermore, the GGS has a maximum of 21 or 23 scale rows and 8 supralabials. The 7th supralabial is wider than the 6th and the head is elongated with a pointed muzzle (Stebbins 2003).

Distribution and Demography

The GGS is endemic to California's central valley, the lowland area between the Sierra Nevada and Coast Ranges (Hansen and Brode 1980). GGS are typically found in fresh water marshes and wetland areas. They can also be found in modified habitats like agricultural canals and ditches often associated with rice farming and flooding. There are 13 separate populations of GGS in 11 counties including Butte, Colusa, Glenn, Fresno, Merced, Sacramento, San Joaquin, Solano, Stanislaus, Sutter and Yolo (U.S. Fish and Wildlife Service 1999). Although Contra Costa County is not specifically mentioned, it is only because surveys have not been done in the project region, which is contiguous with the populations in San Joaquin and Sacramento County, with no barriers to dispersal or colonization.

The GGS is active from early spring (April–May) through mid-fall (October–November), although patterns vary with weather (Brode 1988). During the winter season they are inactive and rarely emerge from wintering burrows. When active they usually remain near wetland habitat, although they can move up to 0.8 km in a day (U.S. Fish and Wildlife Service 1999). The GGS breeds primarily in March–May, although some mating

takes place in September. They are viviparous and the young are born late July to early September. Litter size ranges from 10-46, with an average of 23. Males reach sexual maturity at three years and females at five years of age (U.S. Fish and Wildlife Service 1999).

Habitat

The GGS has four main habitat requirements as outlined by the draft recovery plan: (1) adequate water during active season to support prey species (i.e., blackfish (*Orthodox microlepidotus*), Pacific tree frog (*Pseudacris regilla*), carp (*Cyprinus carpio*), mosquito fish (*Gambusia affinis*) and bullfrogs (*Rana catesbeiana*)); (2) emergent wetland vegetation (i.e., cattails *Typha* spp.) and bulrushes (*Scirpus* spp.) for foraging habitat and cover from predators; (3) upland habitat with grassy banks and openings in vegetation for basking; (4) higher elevation upland habitats for cover and refuge (i.e., burrows and crevices) from flood waters during winter (U.S. Fish and Wildlife Service 1999).

Status

The GGS is listed as a threatened species at the state and federal level. Recovery priorities, objectives and criteria, and further conservation efforts have been outlined in a draft recovery plan by U.S. Fish and Wildlife Services (U.S. Fish and Wildlife Service 1999). Some threats to GGS populations include habitat loss and adverse habitat alteration. They may also be negatively affected by selenium pollution, livestock grazing, hunting, introduction of predatory fish and bullfrogs, and victim to road kills and parasites (U.S. Fish and Wildlife Service 1999; U.S. Fish and Wildlife Service 2005).

3.0 Methods

Information on the distribution of giant garter snakes in the vicinity of the project area was compiled from several sources prior to conducting fieldwork. These included the California Natural Diversity Database (CNDDB), The Draft Recovery Plan for the Giant Garter Snake (USFWS 1999), *A Field Guide to Western Reptiles and Amphibians* (Stebbins 2003), published accounts of surveys conducted in the area, and email communications with other biologists who conducted surveys in the vicinity. Habitat that could support giant garter snakes and geographic features that could facilitate or deter snake movement were identified to the extent possible on topographic maps and aerial photographs.

In addition to gathering information from the above sources, we conducted field assessments to evaluate habitat suitability for the species within the proposed project area. SBI biologists Karen Swaim, Tammy Lim, and Jeff Mitchell visited the project area on 15 September 2008 to assess habitat suitability. We recorded habitat data including water availability, presence of prey species, presence of emergent vegetation, presence of basking sites, and presence of suitable upland refugia.

4.0 Results

4.1 Occurrences within the Project Vicinity

The project site is located within the historic and current range for GGS (Fitch 1940 in Hansen 1988). The nearest recent observations of GGS recorded in the California Natural Diversity Database (CNDDDB) (CDFG 2008) are a 2002 record of an adult snake captured on the levee on the southwest corner of Webb Tract approximately five miles northwest of the project area, and a 1996 record of a shed skin recovered from the southwest edge of Medford Island, approximately 1.5 miles northeast of the project area (Figure 1.). Two other CNDDDB observations of GGS individuals both located approximately 8.5 miles from the project area include a 1998 observation of an adult snake on a levee south of Brannan State Recreation Area, and another in the San Joaquin River at the north end of the Antioch Bridge. Multiple GGS observations were documented during the 1970s and 1980s from the area near Coldani Marsh, located 0.8 miles west of the intersection of Thornton Road and State Highway 12 approximately nine miles from the project area. These include three GGS sightings at Coldani Marsh proper, one at nearby White Slough, and one on Shin Kee Tract, 1.5 miles south of State Highway 12.

4.2 Habitat Assessment

Habitat quality is generally good at all sites within the project area. The main waterways, including the Old River, are likely not highly preferred habitat, but may provide corridors for movement. These contain the basic features necessary for GGS, including emergent vegetation and cover. The banks of the Old River are lined with rip-rap with interstitial spaces that provide cover from predators and that also may aid in thermoregulation. Much of the Old River is also lined by cattails and bulrush. Both plants provide cover and are positively associated with GGS presence. The results of the habitat features associated with each site are summarized in Table 1 and discussed in greater detail below.

Old River Gate Site

The west bank of the Old River is adjacent to high-quality GGS habitat. A small canal that runs parallel to the levee road (Figure 2) may provide foraging habitat though the deep banks and quantity of emergent vegetation creates a fair amount of shade that may inhibit thermoregulation. The larger, diked canal perpendicular to the levee road provides better foraging habitat for GGS (Figure 3 and 4). The banks are moderately sloped with abundant emergent vegetation for cover, and with adequate exposure for thermoregulation. The canal itself appears to have slow-flowing water, and a silt substrate, features positively associated with GGS. We visually identified small schools of catfish (*Ictalurus* spp.) in the canal. These are generally regarded as predatory game fish, but young catfish may also be a prey source for GGS (USFWS 1999). The levee provides upland habitat and winter refugia above the high water mark. California ground

squirrels (*Spermophilus beecheyi*) are absent, but other rodents such as California meadow voles (*Microtus californicus*) are likely present and provide burrows that may be used as retreats.

The west bank of the Old River site has suitable habitat and there are seasonal wetlands that provide potential forage and cover habitat during the GGS active season that are just to the west across the dirt road. The wetlands directly fringing the riverbank comprise the best GGS habitat on the east of the Old River.

Connection Slough

This site is adjacent to an irrigation ditch with shallow water flowing over silt. During our site visit we observed abundant bullfrogs and mosquitofish in the ditch, both prey species for GGS. The presence of bullfrogs suggests that the channel provides water year-round since bullfrog tadpoles do not metamorphose until their second season, overwintering in their larval form. Other crucial habitat features such as emergent vegetation and upland habitat were present at the site. We observed California ground squirrels whose burrows provide ideal hibernacula for GGS. A seasonal wetland (Figure 5) may provide additional foraging areas in the spring.

Table 1. Summary of GGS habitat features present at each site.

| Site Location | Water Availability | Prey Species | Emergent Vegetation | Basking sites | Upland refugia and burrows |
|--|---------------------------|------------------------------------|-----------------------------------|----------------------|-----------------------------------|
| Old River Gate Site | Year-round. | Fish present. | Present. | Present. | Present. |
| Connection Slough Gate Site | Year-round. | Fish present Bullfrogs present. | Present. | Present. | Present. |
| Holland Tract Spoils Storage Site | Seasonal | Fish present | Present but sparse due to grazing | Present | Present |

5.0 Conclusion

The California Natural Diversity Database contains two records of GGS within a five-mile radius of the project location. Two additional sightings are within eight miles of the project location, and there are multiple sightings within nine miles at Coldani Marsh. This likely represents the largest population of GGS in the vicinity of the project site. The sightings were reported in the 1970's and 1980's, but are presumed extant.

These localities are within dispersal distances for GGS. They have been known to move up to eight kilometers (five miles) within a few days in search of appropriate habitat

(Wiley *et al.* 1997). The Old River, and other large waterways in the Delta may facilitate long distance movements by sweeping individuals in currents to new locations.

Given the proximity of the project to known GGS sightings and suitable habitat at both the Old River and Connection Slough sites, its presence should be assumed in the project area.

If the construction activities begin during the summer (April-October), take-avoidance measures described in the Programmatic Biological Opinion issued by the US Fish and Wildlife Service for GGS will be implemented. We will contact the Service as requested to determine whether additional take-avoidance measures are required.

6.0 Figures

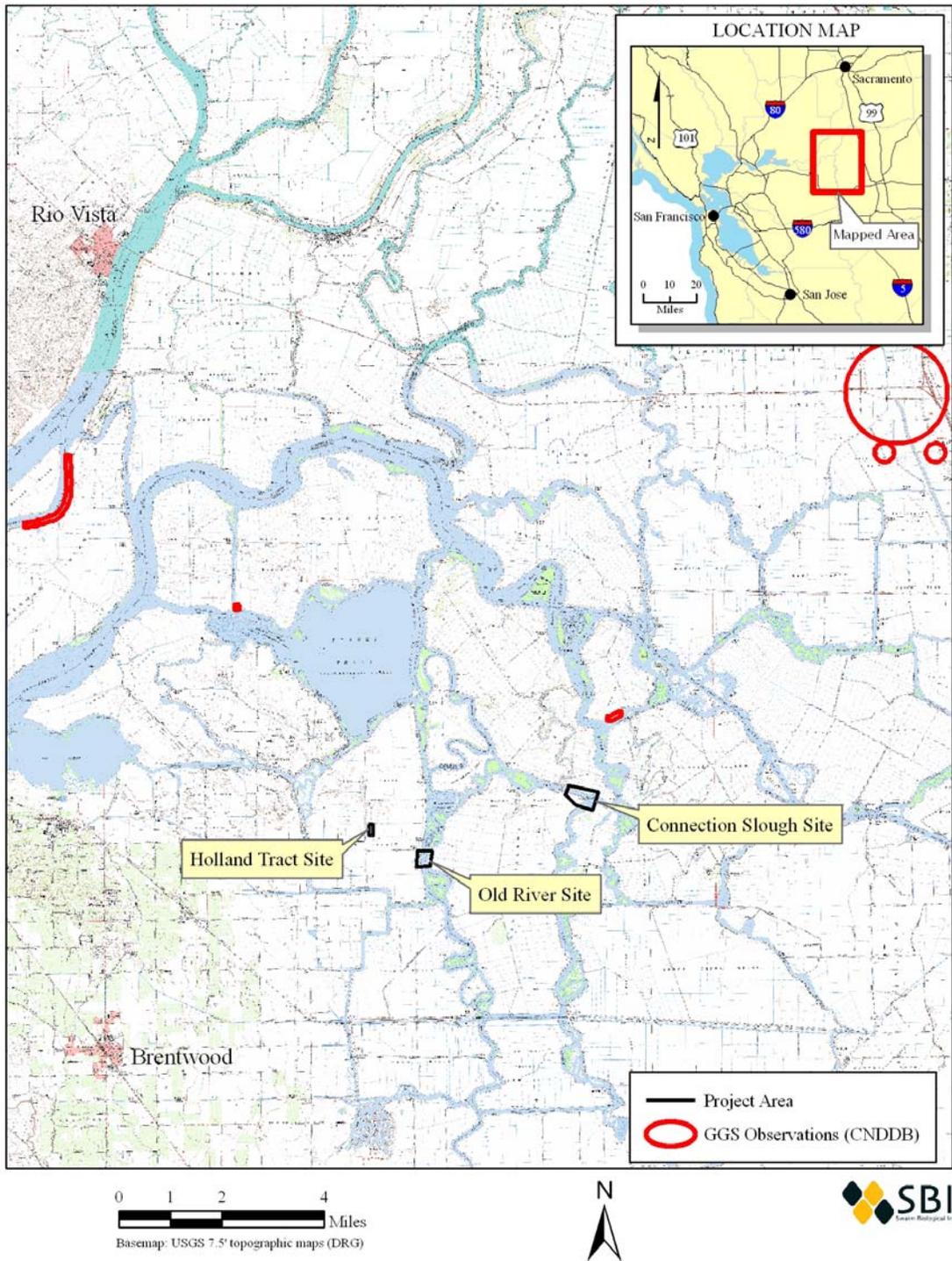


Figure 1. California Natural Diversity Database records of GGS in the project vicinity



Figure 2. West bank of Old river, small canal parallel to road.



Figure 3. West bank of the Old River, diked canal perpendicular to the levee road.



Figure 4. West bank of Old River, view of diked canal.



Figure 5. Seasonal wetland at Connection Slough site.

7.0 Literature Cited

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**DRY-SEASON SAMPLING
FOR
FEDERALLY-LISTED LARGE BRANCHIOPODS
AT THE
CONNECTION SLOUGH AREA
OF THE
2-GATES PROJECT**



Prepared for: **MOSAIC ASSOCIATES, LLC**
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Prepared by: **HELM BIOLOGICAL CONSULTING, LLC**
2273 Nolen Drive
Lincoln, CA 95648
Contact: Brent Helm
(916) 543-7397

February 2009



“I certify that the information in this survey report and attached exhibits fully and accurately represent my work.”

Todd F. Wood Signature  Date 2-13-09



**DRY-SEASON SAMPLING
FOR
FEDERALLY-LISTED LARGE BRANCHIOPODS
AT THE
CONNECTION SLOUGH AREA
OF THE
2-GATES PROJECT**

INTRODUCTION

Helm Biological Consulting, LLC was contracted by Mosaic Associates, LLC to conduct dry-season sampling for large branchiopods (fairy shrimp, tadpole shrimp, and clam shrimp) that are listed as threatened or endangered under the federal Endangered Species Act (e.g., vernal pool fairy shrimp [*Branchinecta lynchi*] and vernal pool tadpole shrimp [*Lepidurus packardii*]) at the Connection Slough Area of the 2-Gates Project .

The Connection Slough Area of the 2-Gates Project is located west of McDonald Island, north of Mildred Island, and southeast of Connection Slough, San Joaquin County, California. Additionally, the Connection Slough Study Area is located in an unsectionalized portion off the Bouldin Island U.S. Geological Survey 7.5 Minute Topographical Quadrangle Map (center coordinates in North American Datum 1983 Universal Transverse Mercator Zone 10 North: Easting 596109.7 and Northing 4252148.6) (Figure 1).

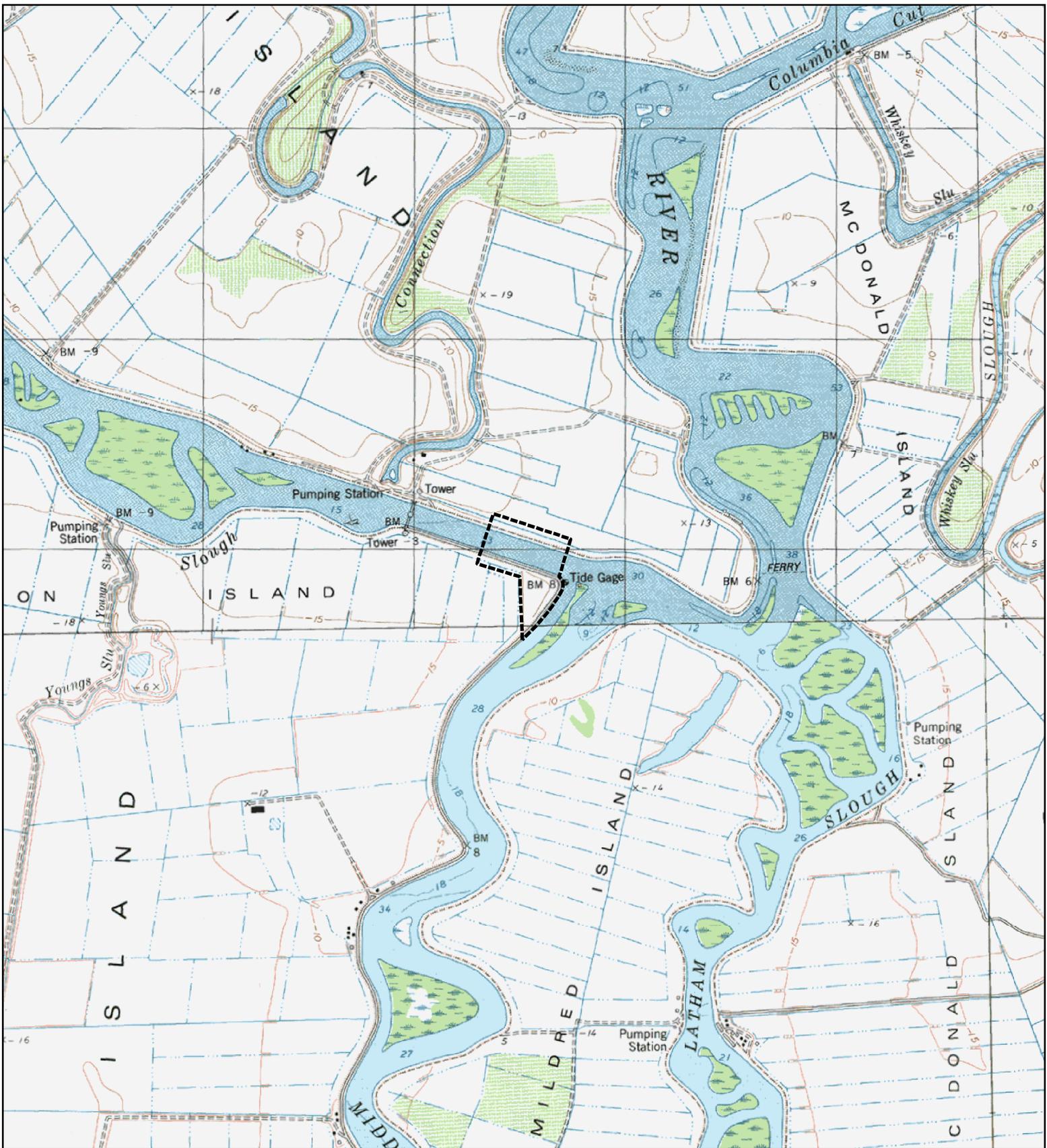
The 2-Gate Project consists of a fish protection plan intended to reduce the take of Delta smelt and other listed fish species, in compliance with the federal and state Endangered Species Acts. Entrainment of Delta smelt at the State Water Project (SWP) and Central Valley Project (CVP) export pumps would be reduced by the installation and operation of two operable gates in the central Delta. The project would also increase the certainty of water supply, and improve water quality. The 2-Gate Project is a five-year pilot project that is fully removable once installed.

Two gates would be installed in two separate locations, one on Old River and the other on Connection Slough. A wetland delineation has been conducted by Mosaic Associates,



LLC, and a single 0.5 acre seasonal wetland feature within the Connection Slough Area was assessed as potential to support the vernal pool fairy shrimp and vernal pool tadpole shrimp.

This report discusses the methods and results of the dry-season sampling for the presence of federally-listed large branchiopod at the Connection Slough Area of the 2-Gates Project.



Property Center Coordinates in NAD 1983 UTM Zone 10 N
 Easting 629442.5 Northing 4207129.5

1:24,000
 1 inch equals 2,000 feet

 Study Area



Prepared By:
 Date: 10-1-08



HELM
 BIOLOGICAL CONSULTING, LLC.
 2273 Nolen Drive, Lincoln, CA 95648

Figure 1. Connection Slough Area of the 2-Gate Project Location

(Source: U.S. Geological Survey Bouldin Island 7.5 minute Topographical Quadrangle Map)



METHODS

Mr. Todd Wood conducted dry-season sampling on October 29, 2008 as authorized by the U.S. Fish and Wildlife Service (USFWS) (Appendix A). Sampling was conducted under permit TE-795930-5 of Section 10(a)(1)(A) of the federal Endangered Species Act, 16 U.S.C. 1531 *et seq.*, and its implementing regulations. Methods generally followed USFWS's Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods (1996) and are described below.

Dry-season sampling involved the collection of 20 sub-samples of soil, mainly from the lowest topographic areas within the basin considered potential habitat for federally-listed large branchiopods by Mosaic and Associates, LLC. Soil samples were placed in liter size plastic freezer bags and marked with the project name, basin number, and date. The soil was then transported to Helm Biological Consulting's, LLC laboratory for processing and analysis.

In the laboratory, a brine solution was prepared by mixing table salt (NaCl) with lukewarm tap water in a large container. The collected soil material was placed in the brine solution. The soil material was then gently worked by hand to breakdown any persistent soil structure. The organic material rising to the top of the brine solution was skimmed off and placed in a 710-micron diameter pore-size sieve stacked atop a 75-micron diameter pore-size sieve. The soil material was processed through the top sieve by flushing it with lukewarm tap water while gently rubbing it with a soft-bristle brush. The soil retained from the 75-micron diameter pore size sieve was then removed and thinly (≈ 1.0 mm) spread into plastic petri dishes.

The contents of each petri dish were examined under a 10 to 252-power zoom binocular microscope. A minimum of 0.5-hour was spent searching the contents of each petri dish for large branchiopod cysts (embryonic eggs). Helm Biological Consulting's, LLC large branchiopod cyst reference collection and scanning electron micrographs of cysts (Hill and Shepard 1998, Mura 1991, and Gilchrist 1978) were used to identify and compare any cysts observed within the soil samples.



RESULTS

Visual examinations of the soil collected from the basin on site did not reveal any evidence of federally-listed large branchiopods (e.g., cysts or carapaces of *Lepidurus* sp.) (Exhibit A). The soils supported only evidence of insects exoskeletons (mainly ants) and flatworm cysts (microturbellaria).

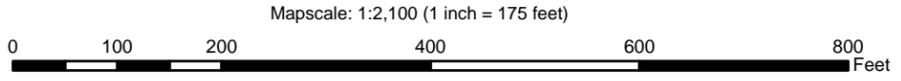
Representative photographs of the basins on site are in Appendix B.



Legend

-  Study Area
-  Coastal and Valley Freshwater Marsh
-  Seasonal Wetland
-  Ruderal Herbaceous
-  Agricultural
-  Open Water

Exhibit A. Habitats on the Connection Slough Study Area.
 Basemap Source: CASIL 2005.



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LITERATURE CITED

Gilchrist, B. M. 1978. Scanning electron microscope studies of the egg shell in some Anostraca (Crustacea: Branchiopoda). *Cell Tiss. Res.* 193: 337-351.

Hill, R. E., and W. D. Shepard. 1998. Observation on the identification of California anostracan cysts. *Hydrobiologia* 359: 113-123.

Mura, G. 1991. SEM morphology of resting eggs in the species of the genus *Branchinecta* from North America. *J. Crust. Biol.* 11: 432-436.

U. S. Fish and Wildlife Service. 1996. Interim Survey Guidelines to Permittees for Recovery Permits under Section 10 (a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods. 11 pp.



APPENDIX A. USFWS AUTHORIZATION LETTER

From: David_Kelly@fws.gov

To: bhelm69485@aol.com

Cc: Susan_P_Jones@fws.gov; Mary_Hammer@fws.gov

Subject: Authorization to conduct wet and dry season VPb surveys at Connection Slough in San Joaquin County

Date: Thu, 16 Oct 2008 2:40 pm

By this electronic mail message and in response to your recent request (October 1, 2008, fax), Mr. Brent Helm (TE-795930-5) is authorized to conduct:

Dry-season survey and follow-up wet season survey of vernal pool branchiopods (including *Branchinecta* spp.) per the conditions of his Recover Permit, under the Endangered Species Act and the Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods (USFWS; April 19, 1996) at the Connection Slough area of the 2-Gate Project in San Joaquin County.

Please remember to have all biologists carry a copy of their permit while doing the work, and to follow the terms and conditions of the permit and the survey protocol, including the reporting requirements. In your report, please include which surveys were authorized, the names of all persons involved the surveys, their recovery permit numbers, and the date of this authorization, to help ensure that we correctly record the fulfillment of the reporting requirement under this authorization. Please let us know if the surveys are not performed as authorized, or if they are done by a different permittee under a separate authorization.

Please keep in mind that the Service can authorize surveys that establish presence, but not surveys where the purpose is to determine absence when there is a reason to believe that the species can be present even when they are not detected. Such reasons would include species characteristics that make it hard to detect, habitat suitability, and proximity to known occurrences of the species. Therefore, if additional information becomes available to us that indicate that listed crustaceans are likely to be present at the project site, the Service may determine that the species are present even if your surveys have failed to detect individuals or cysts. Please keep in mind; all soil samples collected for dry-season sampling must be collected during the dry season. The dry season is defined generally as that time between April 15th and until the first qualifying rain event on or before October 15th, defined as a frontal precipitation of more than one half of an inch for 24 hours.

Please send separate copies of the report(s) to the San Joaquin Valley Branch (Attn. Mary Hammer) and David Kelly (of this office) at the time of any formal or informal consultation under section 7 of the Endangered Species Act with the Fish and Wildlife Service.

Please reference track number 84120-2009-TA-0051 in future correspondence concerning this sampling.
Thank you.

David Lee Kelly
Fish and Wildlife Biologist
Recovery Branch
US Fish and Wildlife Service
2800 Cottage Way
Sacramento, CA 95825
Ph. (916) 414-6492



APPENDIX B. REPRESENTATIVE PHOTOGRAPH

Large Branchiopod Dry-Season Sampling
Connection Slough Area of the 2-Gates Project

Ph: (916) 543-7397
Fax: (916) 543-7398



2-Gates Project – The seasonal wetland found on site photograph taken facing northwest.



April 20, 2009

Mr. David Lee Kelly
Recovery Branch
U.S. Fish and Wildlife Service
2800 Cottage Way, W-2605
Sacramento, CA 95825-1846

RE: RESULTS OF THE 2008/2009 WET-SEASON SAMPLING FOR
FEDERALLY-LISTED LARGE BRANCHIOPODS AT THE CONNECTION
SLOUGH AREA OF THE 2-GATES PROJECT.

Dear Mr. Kelly:

Wet-season sampling was conducted at the Connection Slough Area of the 2-Gates Project during the 2008/2009 wet-season (Figure 1). Sampling was conducted by Dr. Brent Helm and Mr. Todd Wood under permit TE-795930-5 of Section 10(a)(1)(A) of the federal Endangered Species Act, 16 U.S.C. 1531 *et seq.*, and its implementing regulations. Site visits were conducted on November 14, 2008; December 24, 2008; January 8 and 30, 2009; February 18, 2009; and March 5, 2009 after all major storm events of the 2008/2009 wet-season. The site supports one ½ acre basin on the south side of Connection Slough which never had ponded water during any of the wet-season visits (Exhibit A). Similar results were obtained from dry-season sampling conducted by Helm Biological Consulting, LLC in 2008 (only ant exoskeletons and microturbellaria cysts were observed), indicating a more xeric environment. In conclusion, the basin on site is not considered potential habitat for federally-listed large branchiopods based on our observations during the 2008/2009 wet-season and the results of 2008 dry-season sampling.

This letter constitutes our 90-day report, as per our section 10(a)(1)(A) permit requirements, for wet-season sampling efforts at the Connection Slough Area of the 2-Gates Project.

If you need additional information, please call us at (916) 543-7397. Thank you for your time and consideration in this matter.

Sincerely,

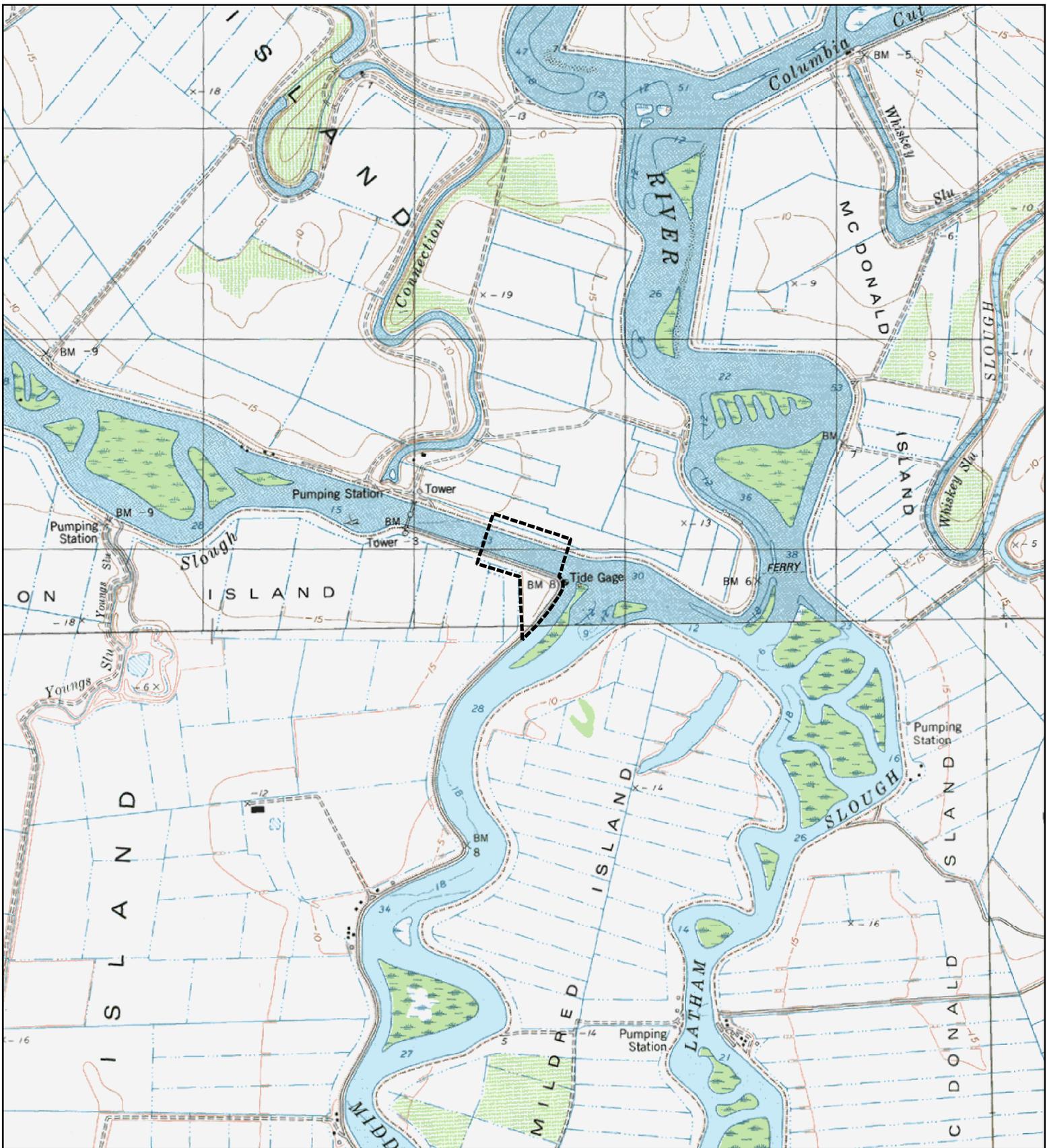


Brent Helm, Ph.D.
Senior Ecologist

and

Todd Wood
Wetland Ecologist

CC: Judy Bendix of Mosaic Associates, LLC



Property Center Coordinates in NAD 1983 UTM Zone 10 N
 Easting 629442.5 Northing 4207129.5

1:24,000
 1 inch equals 2,000 feet

 Study Area



Prepared By:
 Date: 10-1-08



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 2273 Nolen Drive, Lincoln, CA 95648

Figure 1. Connection Slough Area of the 2-Gate Project Location

(Source: U.S. Geological Survey Bouldin Island 7.5 minute Topographical Quadrangle Map)



Legend

-  Study Area
-  Coastal and Valley Freshwater Marsh
-  Seasonal Wetland
-  Ruderal Herbaceous
-  Agricultural
-  Open Water



Mapscale: 1:2,100 (1 inch = 175 feet)



Exhibit A. Habitats on the Connection Slough Study Area.
 Basemap Source: CASIL 2005.

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