

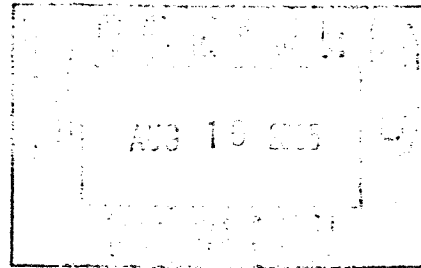
# United States Department of the Interior



FISH AND WILDLIFE SERVICE  
Sacramento Fish and Wildlife Office  
2800 Cottage Way, Room W-2605  
Sacramento, California 95825-1846

In reply refer to:  
1-1-05-F-0106

10 August 2005



Mr. Tom Cavanaugh  
Sacramento Valley Office Chief  
U.S. Army Corps of Engineers, Sacramento District  
1325 J Street  
Sacramento, California 95814-2922

Subject: Formal Consultation on the Proposed Feather River, Bear River, and Western Pacific Interceptor Canal Levee Improvements Project (Corps file number 200400685), Yuba County, California

Dear Mr. Cavanaugh:

This letter is in response to the U.S. Army Corps of Engineers (Corps) request for formal consultation with the U.S. Fish and Wildlife Service (Service) on the proposed Feather River, Bear River, and Western Pacific Interceptor Canal (WPIC) Levee Improvements Project (proposed project) in Yuba County, California. Your March 28, 2005, request was received in our office on March 30, 2005. This document represents the Service's biological opinion on the effects of the action on the federally threatened vernal pool fairy shrimp (*Branchinecta lynchi*), the endangered vernal pool tadpole shrimp (*Lepidurus packardii*) (vernal pool crustaceans), the threatened valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) (beetle), and the threatened giant garter snake (*Thamnophis gigas*) (snake). This document is issued in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act).

The findings and recommendations in this biological opinion are based on: (1) the March 28, 2005, letter from the Corps initiating consultation for the proposed project; (2) the March 2005, *Revised Biological Assessment for the Feather-Bear-WPIC Levee Project* prepared by Jones and Stokes Associates; (3) the June 2005, *Final Biological Assessment for the Feather-Bear-WPIC Levee Project*; and (4) other information available to the Service.

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**BIOLOGICAL OPINION**  
**Consultation History**

*October 7, 2004.* The Corps requested initiation of formal consultation on the proposed project.

*December 16, 2004.* The Service issued a letter requesting additional information on the proposed project (Service file number 1-1-05-I-0056).

*March 30, 2005.* The Service received the March 28, 2005, revised request for initiation of formal consultation with the Corps and a copy of the updated biological assessment from Jones and Stokes Associates.

*May 10, 2005.* The Service attended a meeting held by Jones and Stokes Associates regarding environmental effects attributable to the project. The Service provided comments on the draft biological assessment and asked for a revision of the document.

*June 22, 2005.* The Service received the June 2005, *Final Biological Assessment for the Feather-Bear-WPIC Levee Project* from Jones and Stokes Associates.

*June 28, 2005.* In a telephone conversation between Jennifer Hobbs of the Service and Harry Oakes of Jones and Stokes Associates, the Service requested acreages for all upland habitats within 200 feet of giant garter snake aquatic habitat.

*July 13, 2005.* The Service received figures and acreages for upland impacts to giant garter snake habitat.

*July 20, 2005.* Jennifer Hobbs of the Service and Harry Oakes and Chris Eliot of Jones and Stokes Associates met to discuss the effects to upland habitat for the giant garter snake

*July 25, 2005.* The Service received final acreage numbers for effects of the project to giant garter snake upland habitat.

**Proposed Project Description**

The proposed project is located in the southern portion of Yuba County. This project is part of an overall plan to enhance flood protection to properties in the Three Rivers Levee Improvement Authority's (TRLIA) service area. These levee improvements are intended to reduce potential threats to three factors of levee integrity: stability, height, and susceptibility to erosion.

The project is divided into several components. A description of each component follows below.

Fill WPIC Borrow Ditch

A borrow ditch exists along the west side of the WPIC levee. It was likely created during the construction of the railroad berm. Although it is not openly connected to another waterway or

channel, it supports wetland vegetation and associated wildlife. The presence of the borrow ditch compromises the stability of the WPIC levee because hydrostatic pressure from the adjacent canal cannot be fully contained by the available soil material. The borrow ditch would be filled to an elevation equal to the surrounding ground surface. Ground-disturbing activities associated with placing fill in the borrow ditch would occur between station 0+00 (the confluence of the WPIC and the Bear River) and station 130+00.

Filling of the borrow ditch would occur primarily during the dry season (i.e., from June to October, subject to extension) and would include the removal of vegetation using a bulldozer, the tilling of the area to loosen the dirt, and the filling of the trench with borrow material. Approximately 78,000 cubic yards of borrow material would be used to fill the trench to the adjacent ground level. Fill would be imported from a permitted source, which may include the Olivehurst detention basin, a concurrently planned project by Yuba County. Up to 7,800 truck trips, occurring over a period of 116 days would be necessary to import all the material. Two bulldozers would place the materials, and two sheepsfoot compactors would compact the soils into place.

After the fill material has been placed, all disturbed areas will be seeded with a mixture of native and naturalized grass and forb species. Implementation of these improvements is planned to begin in 2005 and culminate in 2006.

#### Orchard Removal

Removal of a privately owned walnut orchard from the Bear River floodway is expected to take place over a period of 3 months. Approximately 252 acres would be removed and replaced with a native land cover type. The primary native land cover type would consist of grasslands. A portion of this area would also be used to compensate for effects on valley oak and riparian habitats, and other cover types.

#### Construct Setback Levee

Construction of the setback levee would include clearing and grubbing, construction of a slurry wall, excavation of an inspection trench, preparatory levee foundation work, and the removal or relocation of structures and utilities. The western terminus of the setback levee would tie into the Feather River levee near station 45+00, just south of Pump Station #2. The setback levee would extend northeastward from the Feather River levee for approximately 2 miles to its eastern terminus near station 130+00 on the Bear River levee. Land within the footprint of the setback levee would total approximately 45 acres. The lands between the setback levee and the existing Feather and Bear River levees would range from 0.10 – 0.80 mile and total approximately 300 acres.

Prior to construction of the levee a slurry wall would be constructed below grade. The top of the slurry wall would be equal to the existing soil surface grade. The setback levee would then be constructed on top of the slurry wall alignment. The construction of a slurry cutoff wall along the setback levee alignment would reduce seepage beneath the levee by creating a low-

permeability barrier and dispersing hydrostatic pressure. The maximum depth of the slurry wall is expected to be approximately 80 feet. Slurry wall construction would include trench excavation, backfill preparation, and the placement of fill material.

The soil fill required to construct the setback levee would be obtained from one or more of the following sources: stockpiled material excavated during the implementation of other project elements (e.g., detention basins), an offsite commercial source, and from borrow areas located on the agricultural lands between the setback levee and the existing Feather and Bear River levees. Approximately 1.0 million cubic yards of borrow material would be required to construct the setback levee. The existing Feather and Bear River levees would be left in place. No soil would be removed from these levees to construct the setback levee.

The existing agricultural lands in the levee setback area would be permanently impacted by levee construction. All or portions of this approximately 300 acre area would be excavated to gather borrow material. Following completion of the setback levee, this area would be set aside as a habitat mitigation area. A final mitigation design has not been prepared for this area, but it is expected that target habitats would include wetland, riparian, oak woodland and grassland. Passive and/or active mitigation strategies may be implemented. A detailed mitigation strategy will be developed at a later time.

Construction of the setback levee would include the use of heavy equipment, including scrapers and bull dozers. Approximately 5,800 truck trips will be required to haul in quarry material (e.g., drain rock, aggregate roadway materials) and other materials. An additional 400 truck trips would be needed to remove waste materials. Approximately 50,000 truck trips would be necessary to deliver all the soil material for the setback levee. Most of these trips would occur within the levee setback area if the primary borrow source is located onsite. It is anticipated that the setback levee would be constructed in 150 working days.

Staging areas for the setback levee would be located within the construction corridor along the setback levee alignment. It is anticipated that the staging areas would be located on agricultural lands and that no additional impacts to native land cover types would occur.

### Construct Detention Basin

A detention basin would be constructed to compensate for the lost detention storage in the setback levee area. The detention basin would be constructed as a means to offset the need for increased pumping associated with the loss of water storage area. The detention basin would be located on the east side of Clark Slough and north of the setback levee. The 23-acre detention basin would have a capacity of 230 acre-feet and would be excavated to a depth of 10 feet.

Construction of the detention basin would include the use of heavy equipment, including scrapers and bulldozers. Approximately 37,000 cubic yards of material would be excavated and stockpiled for use in the setback levee construction or the construction of other project elements.

### Reconstruct Bear River Levee

As a result of both stability and height issues, the Bear River levee requires a levee raise and the construction of an impervious soil layer on the waterside of the levee from station 131+00 to station 140+00 to stabilize the levee. The area would occur between the eastern terminus of the proposed setback levee and the Algodon Canal. This location is the approximate area of the breach that occurred during the 1997 floods. The levee would be dismantled and reconstructed to a height approximately 0.3 foot higher than the existing levee crown.

Construction would begin by removing approximately the top 3 feet of existing soil and excavating a 5 foot deep toe trench on the waterside levee slope. The soil removal would be performed using two bulldozers and an excavator. Approximately 8,400 cubic yards of levee material would be excavated and spoiled on site or used as fill for other project improvements (e.g., WPIC borrow ditch fill).

It is estimated that up to 8,400 cubic yards of material would need to be imported to the project area. Approximately 840 truck trips would be required to import the necessary materials and an equal number of trips would be needed to transport spoils to onsite spoils locations. The levee improvements would be implemented using an excavator, two bulldozers and two compactors. It is anticipated that reconstruction would last up to 30 days.

### Relocate Pump Station #6

Pump Station #6 is located just west of SR 70 and north of the Bear River levee. The pump station is located at the southern terminus of the Algodon Canal. The pump station has decreased the levee stability because of its proximity to the levee. Relocating the pump station would involve dismantling the existing pump station and constructing a replacement facility approximately 150 feet north of the existing location. The portion of the Algodon Canal between the new and old pump station locations would be backfilled to increase levee stability.

The existing pump station would be removed using a crane, and waste materials would be disposed of off-site by truck. Approximately four truck trips would be necessary to remove the waste to a permitted disposal or recycling facility. An additional four truck trips would be required to import the new pump station materials. A crane would place the new pump, and hand crews would secure it. The pump relocation/replacement would last approximately 7 days. The area between the new and old pump stations would be filled with approximately 5,300 cubic yards of borrow material. This material could be imported from Reclamation District (RD) 1001, or the remainder of soil excavated during the Bear River levee reconstruction could be used. If the material was imported, it would require 270 truck trips. The material would be placed and compacted by simultaneously using a bulldozer and a compactor. It is anticipated that relocation of the pump station, and the associated backfill, would last up to 30 days.

### Raise Bear River Levee

Portions of the Bear River levee between stations 151+00 and 169+00 need to be raised or widened to meet freeboard standards. This levee section would be raised an average of 1.5 feet by adding soil materials to the landside and crown of the levee. To raise the levee, four haul trucks would import 8,500 cubic yards of soil from RD 1001 and would place the material adjacent to the existing levee. Approximately 20 truck trips a day would be necessary to deliver the material. Two bulldozers would position the material, and two compactors compact it into place. In addition, a 10-foot easement would be purchased to allow access for levee maintenance. It is anticipated that raising the levee would last up to 30 days.

### Construct WPIC Slurry Cutoff Wall

The construction of a slurry cutoff wall on a portion of the WPIC levee would reduce seepage in the levee by creating a low-permeability barrier and dispersing hydrostatic pressure. A 50-foot-deep slurry cutoff wall would be constructed between stations 251+00 and 270+50.

The construction of a slurry cutoff wall would use conventional slot trench methods: a trench would be excavated through the levee and subsurface materials and would then be backfilled with low-permeability materials. During construction, the trench, which would be 2-3 feet wide and extend to depths of up to 50 feet, would be kept open using a bentonite-water slurry. The soil excavated from the trench would be hauled to a mixing location near station 220+00, where it would be mixed with hydrated bentonite and cement to reduce permeability and increase strength. The soil-cement-bentonite mixture would then be hauled to the levee and backfilled into the trench. This mixture would create a low-permeability barrier in the levee.

During slurry cutoff wall construction, one crew would be able to construct up to 100 linear feet of slurry wall (for depths of to 50 feet) in an 8-hour shift. Equipment needed would include a long-stick excavator (80-foot reach), three or four dump trucks (10-cubic yard capacity each), and tow loaders at the mixing location. Approximately 7,000 dump truck trips would be necessary to haul material between the excavator and the mixing area along the levee. The mixing area would be used to prepare the soil-bentonite mixture and supply the bentonite-water slurry. All of this equipment would operate simultaneously for 8-12 weeks.

Vertical clearance of about 40 feet would be needed for the excavator boom. Horizontal clearance of about 10 feet beyond the levee crest may be required for excavator swing when loading dump trucks.

Materials imported to the site would include bentonite, cement, water (if a domestic supply is not available nearby), and construction support materials.

Although the exact locations of the mixing areas have not been identified at this time, all soil mixing will occur within the areas of temporary or permanent impact identified in this assessment. Excess soils remaining after construction of the slurry wall will be used to construct other project elements (e.g., setback levee).

The only permanent facility associated with the construction of the slurry cutoff wall would be the wall itself, which may be 2-3 feet wide, up to 36 feet deep, and up to 1,700 feet long. The entire wall would be within the levee. The mixing area would be restored to preproject conditions after the slurry cutoff wall was constructed.

#### Raise WPIC Levee Crown-Unchanged Footprint

To increase freeboard, the WPIC levee crown would be raised between stations 296+00 and 332+50. This reach would be raised an average of 0.5 foot.

Approximately 7,000 cubic yards of soil would be imported using haul trucks. The material would come from RD 1001. A total of 700 truck trips would be required; approximately 16 truck trips would be required each day, using tow trucks, over a period of 45 days. Two bulldozers and tow compactors (one each at each site) would be needed to place, position, and compact material on the levee crown. Disturbance may occur up to 100 feet from the levee in these locations. However, the area would be returned to preproject conditions after construction was completed.

#### Raise WPIC Levee-Widened Footprint (Waterside of Levee)

Portions along the WPIC between stations 0+00 and 137+50 and stations 210+00 and 25+00 would be raised to accommodate freeboard standards. The crown would be raised an average of 1.2 feet by adding soil to the levee crown as well as the waterside slope of the levee, which would increase the levee footprint.

Raising the levee by extending the footprint into the water would include the construction of a ramp on the landside of the levee to allow access to the levee. The ramp would be 12 feet wide and 60 feet long, made of imported material, and constructed using a bulldozer in a location where it would have the least effect on existing resources. Staging of equipment would be primarily on the levee crown, but some equipment would be kept adjacent to the landside of the levee. Approximately 80,000 cubic yards of material would be imported using haul trucks. Bulldozers would place and position the material on the waterside of the levee and crown, and compactors would compact the material. The levee footprint would be extended by 6 feet. Four bulldozers and four compactors would complete the full levee raise in 30 days. The area disturbed for the construction of the ramp and staging areas would be returned to preproject conditions after construction was completed.

#### Implement Erosion Control Measures

Portions of the Bear River levee slopes are proposed to be protected with riprap to minimize erosion along the waterside banks. Approximately 4,000 cubic yards of riprap would be placed on the Bear River levee between approximately stations 145+50 and 150+50 and between stations 164+00 and 169+00.

The riprap would be 2-3 feet in diameter and would be placed on the waterside of the levee to protect against erosional forces, such as wind-generated waves and high water velocities. The

riprap would come from a permitted quarry within 25 miles of the project area. Areas disturbed by the equipment or riprap stockpiling would be returned to preproject conditions after construction was completed.

#### Temporary Staging, Storage, and Work Areas

The specific locations of the temporary staging, storage, soil-mixing and other work areas have not been identified at this time. Although these locations have not been identified, all activities associated with these areas will occur within areas of temporary or permanent impact identified in this assessment.

### **Proposed Conservation Measures**

#### All Listed Species

1. A Service approved biologist will identify boundaries of sensitive habitats and have the contractor fence the areas with orange construction fencing. Erosion control fencing will be placed at the edges of construction where the construction activities are upslope of wetlands and channels to prevent washing of sediments offsite. All fencing will be installed prior to any construction activities beginning and will be maintained throughout the construction period.
2. An environmental training program will be provided for all construction personnel prior to the start of construction activities. The program will provide workers with information on their responsibilities with regard to the special-status species, an overview of the life-history of the species, information on the protections afforded to these animals under the Act and take prohibitions, and an explanation of the relevant terms and conditions of this biological opinion. All on-site construction personnel shall be notified about the potential presence of special-status species and any special-status species encountered during construction shall be left unharmed. Written documentation of the training must be submitted to the Chief of the Endangered Species Division (Sacramento Valley) at the Sacramento Fish and Wildlife Office within 30 days of the completion of training.
3. All trash and construction debris will be removed following construction. Revegetation will occur on all areas temporarily disturbed during construction.
4. Fugitive dust emissions will be minimized by adhering to the Feather River Air Quality Management Districts requirements for the control of dust emissions.

#### Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp

1. Compensation at a ratio of 1:1 for creation and 3:1 for preservation will be done at an approved mitigation bank for direct effects. Indirect effects will be compensated at a ratio of 3:1 preservation at an approved mitigation bank.

2. A Stormwater Pollution Plan will be prepared for the proposed project, with the following objectives: (1) to identify pollutant sources, including sources of sediment, that may affect the quality of storm water discharges from the construction of the proposed project; (2) to identify Best Management Practices (BMPs) to reduce or eliminate pollutants in stormwater discharges and authorized non-stormwater discharges from the proposed project site during construction; (3) to outline and provide guidance for BMPs and stormwater monitoring; (4) to address post-construction BMP implementation and monitoring; and (5) to address sediment, siltation, turbidity, and non-visually detectable pollutant monitoring, and outline a sampling and analysis strategy.
3. Standard BMPs will be incorporated into all construction designs, plans, and specifications, and will be required of contractors during construction. The BMPs for the proposed project will include the following specific measures:

*Hydroseeding:* All constructed slopes adjacent to the vernal pool preserves will be hydroseeded with a native grassland mix. The hydroseed will be applied with a tackifying agent at a rate of at least 2 tons per acre, and based on manufacture's recommendations. The tackifying agent will be a hydraulic matrix which when applied, and upon drying, adheres to the soil to form a 100 percent cover which is biodegradable, promotes vegetation, and prevents soil erosion. The hydroseed mix will not be applied before, during, or immediately after rainfall so that the matrix will have an opportunity to dry 24 hours after installation.

*Sediment and Erosion Control:* Certified weed-free straw wattles will be installed at the base of all slopes adjacent to the opens space preserve, along the perimeters of the pond complex, and along of the property lines of the proposed project site. Prior to installation of the straw wattles, a concave key trench 2 to 4 inches deep will be contoured along the proposed installation route. Soil excavated for the trenching will be placed on the uphill or flow side of the straw wattles to prevent water from undercutting the straw wattles. Stakes will be driven in on alternating sides of the straw wattles, to hold them in place. The straw wattles will be maintained for a period of time as least until the native grassland vegetation is fully established and the soil is stabilized.

*Excavated Areas:* During construction all excavated materials will be deposited or stored such that this material cannot be washed into any water sources, and excess supplies of certified weed-free straw bales and/or sediment fencing will be available at the construction site for periodic site-specific use as needed.

*Staging Areas:* Staging areas for construction will be located so that spills of oil, grease, or other petroleum by-products will not be discharged into any watercourse or sensitive habitat. No refueling, storage, servicing, or maintenance of equipment will take place within 250 feet of the vernal pools. All machinery will be properly maintained and cleaned to prevent spills and leaks. Any spills or leaks will be

reported and cleaned up in accordance with applicable local, State, and/or Federal regulations.

*Construction Fencing:* Temporary fencing will be installed prior to construction along the boundaries of the construction zone to clearly mark this zone and to prevent construction equipment, vehicles, or construction personnel from entering into avoided vernal pool areas.

#### Valley Elderberry Longhorn Beetle

1. Pre-construction and post-construction surveys will be done of the elderberry shrubs in the project area. The post-construction survey will confirm that there was no additional damage to any of the elderberry shrubs than as described in this BO.
2. All areas to be avoided during construction activities will be fenced and flagged. In areas where encroachment on the 100-foot buffer has been approved by the Service, a minimum setback of at least 20 feet from the dripline of each elderberry plant will be provided.
3. Transplant 21 elderberry shrubs with 38 stems between 1 and 3 inches, 4 stems between 3 and 5 inches and 15 stems greater than 5 inches at ground level, and provide additional plantings as described in Service's 1999 *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (Conservation Guidelines).
4. To minimize for transplanting the elderberry shrubs outside of the transplant window described in the Conservation Guidelines, the number of additional elderberry seedlings and associated native plantings will be increased 2.5 times. TRLIA is planning on planting the elderberry seedlings and associated natives on the existing Bear River levee, planting will not occur until fall or winter of 2006 after the old Bear River levee has been decommissioned and the new setback levee is in place. Due to the delay in planting the elderberry seedlings and associated natives the number of elderberry seedlings and associated natives will be increased 2 times. The final number of elderberry seedlings and associated natives planted in fall of 2006 will be increased by 4.5 times.
5. A qualified biologist (monitor) will be on-site for the duration of the transplanting of the elderberry shrubs to ensure that no unauthorized take of the beetle occurs. If unauthorized take occurs, the monitor will have the authority to stop work until corrective measures have been completed. The monitor must immediately report any unauthorized take of the beetle or its habitat to the Service and to the California Department of Fish and Game.
6. Dust control measures will be employed during all construction activities.

7. No insecticides, herbicides, fertilizers, or other chemicals will be applied within 100 feet of an elderberry shrub during construction. All drainage water during and following construction will be diverted away from the elderberry shrubs.

#### Giant Garter Snake

1. At least 30 days prior to initiating construction activities, the project proponents will submit the names and curriculum vitae of the biological monitor(s) for the project to the Service for review and approval.
2. Within 24-hours prior to commencement of construction activities, the site will be inspected by a Service-approved biologist. The project area will be re-inspected by the monitoring biologist whenever a lapse in construction activity of two weeks or greater has occurred.
3. Prior to working in aquatic areas capable of supporting prey for the giant garter snake, the habitat shall be dewatered and remain dry for at least 15 consecutive days prior to excavation or filling. A Service-approved biological monitor will be present during all dewatering activities.
4. Most of the construction activity within snake habitat (*e.g.*, aquatic, upland, and rice habitat) would be conducted between May 1 and October 1. This is the active period for the snake and direct mortality is lessened because snakes are expected to actively move and avoid danger. More danger is posed to snakes during their inactive period because they are occupying underground burrows or crevices and are more susceptible to direct effects, especially during excavation activities. For work involving the tie in of the new setback levee to the Feather River levee, work is likely to extend past October 1. To minimize effects to snakes from work occurring during their less active period the following measures would apply: (1) work would only occur in areas that have been fenced with construction fencing and ground disturbing work has been occurring for two weeks prior to October 1; (2) a biological monitor would be on site every day and would perform a survey every morning prior to construction work beginning, to ensure there are no snakes in the area.
5. The project proponent(s) will meet water quality objectives through the implementation of construction provisions (Best Management Practices), precautions, and stipulations addressed in the Section 404 permit, the condition of the 401 Water Quality Certification and the 1601 Streambed Alteration Agreement.
6. Any areas of potential suitable habitat used by the snake within or adjacent to the project area will be flagged and designated as an Environmentally Sensitive Area (ESA). The area inside the ESA boundaries will not be disturbed during construction activities.

7. To eliminate an attraction to predators of the snake, all food-related trash items, such as wrappers, cans, bottles, and food scraps, must be disposed of in closed containers and removed at least every other day from the entire project site.
8. Impacts of temporary losses and degradation of habitat shall be minimized to the greatest extent practicable.
9. The project proponent(s) would not place any plastic, monofilament, jute, or similar erosion control matting that could entangle snakes on the project site.
10. The project proponent(s) would maintain and monitor the project site for one year following the completion of construction and restoration activities. Monitoring reports documenting the restoration effort should be submitted to the Service upon the completion of the restoration implementation and one year after the restoration implementation. Monitoring reports should include photo-documentation, when restoration was completed, what materials were used, specific plantings, and justifications of any substitutions to the Service-recommended guidelines.
11. After completion of construction activities, the project proponent(s) would remove any temporary fill, stockpiled materials, trash, and construction debris. The proposed area would be regraded to its preexisting contour, or to a contour that would improve the restoration potential of the project site. The project area would be reseeded with erosion control seeding consisting of a sterile, non-proliferating grass species. The seed mix shall not contain fertilizers or chemicals. The project proponent(s) would restore all temporarily disturbed snake habitat (including aquatic and upland habitats) within the same construction season (*i.e.*, May 1 through October 1) that disturbance occurs and according to the *Guidelines for Restoration and/or Replacement of Giant Garter Snake Habitat*.
12. Movement of heavy equipment to and from the project site will be restricted to established roadways to minimize habitat disturbance. Stockpiling of construction materials, including portable equipment, vehicles, and supplies, will be restricted to the designated construction staging area and exclusive of wetland avoidance areas. Snake habitat adjacent to the project area will be flagged and avoided by all construction personnel.
13. The applicant will restore 96.12 acres (38.90 ha) of temporarily affected snake habitat, including 0.36 ac (0.14 ha) of aquatic habitat and 95.76 ac (38.75 ha) of upland habitat, would be restored according the *Guidelines for Restoration and/or Replacement of Giant Garter Snake Habitat* (Appendix A) and the *Standard Avoidance and Minimization Measures During Construction Activities in Giant Garter Snake (*Thamnophis gigas*) Habitat* (Appendix C).
14. Permanent loss of giant garter snake habitat will be compensated for at a ratio of 3:1 at a Service approved mitigation bank.

## STATUS OF THE SPECIES AND ENVIRONMENTAL BASELINE

### Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp

#### *Status of the Species*

The vernal pool tadpole shrimp and vernal pool fairy shrimp were listed as endangered and threatened, respectively, on September 19, 1994. Complete descriptions of these species are found in the final rule listing these species under the Act (Service 1994). These branchiopods are restricted to vernal pools and swales and other seasonal aquatic habitats. The vernal pool fairy shrimp is found in California and southern Oregon, and the vernal pool tadpole shrimp is found in California. Eng *et al.* (1990) and Simovich *et al.* (1992) provide further details about their life history and ecology.

Life history of vernal pool tadpole shrimp - The vernal pool tadpole shrimp has dorsal compound eyes, a large shield-like carapace that covers most of its body, and a pair of long cercopods at the end of its last abdominal segment (Linder 1952; Longhurst 1955; Pennak 1989). It is primarily a benthic animal that swims with its legs down. Vernal pool tadpole shrimp climb or scramble over objects, and plow along bottom sediments as they forage for food. Its diet consists of organic detritus and living organisms, such as fairy shrimp and other invertebrates (Pennak 1989; Fryer 1987). The females deposit their eggs on vegetation and other objects on the pool bottom. Tadpole shrimp eggs are known as cysts, and during the dry months of the year, they lie dormant in the dry pool sediments (Lanaway 1974; Ahl 1991).

The life history of the vernal pool tadpole shrimp is linked to the environmental characteristics of its vernal pool habitat. After winter rains fill the pools, dormant vernal pool tadpole shrimp cysts may hatch in as little as four days (Ahl 1991; Rogers in litt. 2001), and tadpole shrimp may become sexually mature within three to four weeks after hatching (Ahl 1991; Helm 1998; King 1996). A portion of the cysts hatch immediately and the rest remain dormant in the soil to hatch during later rainy seasons (Ahl 1991). The vernal pool tadpole shrimp is a relatively long-lived species (Ahl 1991), and will generally survive for as long as their habitats remain inundated, sometimes for six months or more (Ahl 1991; Gallagher 1996; Helm 1998). Adults are often present and reproductive until the pools dry up in the spring (Ahl 1991; Simovich *et al.* 1992). Mature adults may be present in pools until the habitats dry up in the spring (Ahl 1991; Gallagher 1996; Simovich *et al.* 1992).

Life history of vernal pool fairy shrimp - Vernal pool fairy shrimp have delicate elongate bodies, large stalked compound eyes, no carapace, and 11 pairs of phylloids, or gill-like structures that also serve as legs. The swim or glide gracefully upside-down by means of complex, wavelike beating movements. Fairy shrimp feed on algae, bacteria, protozoa, rotifers, and detritus. The second pair of antennae in fairy shrimp adult males are greatly enlarged and specialized for clasping the females during copulation. The females carry eggs in an oval or elongate ventral brood sac. The eggs are either dropped to the pool bottom or remain in the brood sac until the female dies and sinks. The dormant cysts are capable of withstanding heat, cold, and prolonged

desiccation, and they can remain viable in the soil for decades after deposition. When the pools refill in the same or subsequent seasons, some, but not all, of the cysts may hatch. The cyst bank in the soil may therefore be comprised of cysts from several years of breeding (Donald 1983). The early stages of the fairy shrimp develop rapidly into adults. The vernal pool fairy shrimp can mature quickly, allowing populations to persist in short-lived shallow pools (Simovich *et al.* 1992). In pools that persist for several weeks to a few months, fairy shrimp may have multiple hatches during a single season (Helm 1998; Gallagher 1996).

Vernal Pool Ecology and Species Adaptations – The hydrology that maintains the pattern of inundation and drying characteristic of vernal pool habitats is complex. Vernal pool habitats form in depressions above an impervious soil layer (duripan) or rock substrate. After winter rains begin, this impervious layer prevents the downward percolation of water and creates a perched water table causing the depression (or pool) to fill. Due to local topography and geology, the depressions are generally part of an undulating landscape, where soil mounds are interspersed with basins, swales, and drainages (Nikiforoff 1941; Holland and Jain 1978). These features form an interconnected hydrological unit known as a vernal pool complex. Although vernal pool hydrology is driven by the input of precipitation, water input to vernal pool basins also occurs from surface and subsurface flow from the swale and upland portions of the complex (Zedler 1987; Hanes *et al.* 1990; Hanes and Stromberg 1998). Surface flow through the swale portion of the complex allows vernal pool species to move directly from one vernal pool to another. Upland areas are a critical component of vernal pool hydrology because they directly influence the rate of vernal pool filling, the length of the inundation period, and the rate of vernal pool drying (Zedler 1987; Hanes and Stromberg 1998). Upland areas associated with vernal pools are also an important source of nutrients to vernal pool organisms (Wetzel 1975). Vernal pool habitats derive most of their nutrients from detritus that is washed into the pool from adjacent uplands, and these nutrients provide the foundation for the vernal pool aquatic community food chain.

Both of the vernal pool crustaceans addressed in this biological opinion have evolved unique physical adaptations to survive in vernal pools. Vernal pool environments are characterized by a short inundation phase during the winter, a drying phase during the spring, and a dry phase during the summer (Holland and Jain 1978). The timing and duration of these phases can vary significantly from year to year, and in some years vernal pools may not inundate at all. In order to take advantage of the short inundation phase, vernal pool crustaceans have evolved short reproduction times and high reproductive rates. The listed crustaceans generally hatch within a few days after their habitats fill with water, and can start reproducing within a few weeks (Eng *et al.* 1990; Helm 1998; Eriksen and Belk 1999). Vernal pool crustaceans can complete their entire life cycle in a single season, and some species may complete several life cycles. Vernal pool crustaceans can also produce numerous offspring when environmental conditions are favorable. Some species may produce thousands of cysts during their life spans.

To survive the prolonged heat and desiccation of the vernal pool dry phase, vernal pool crustaceans have developed a dormant stage. The dormant egg, or cyst, can withstand temperatures near boiling (Carlisle 1968), fire (Wells *et al.* 1997), freezing, and anoxic conditions without damage to the embryo. The cyst wall cannot be affected by digestive enzymes, and can be transported in the digestive tracts of animals without harm (Horne 1967). Most fairy shrimp cysts can remain viable in the soil for a decade or longer (Belk 1998). Because the cyst contains a well developed embryo, the animal can quickly develop into a fully mature adult. This allows vernal pool crustaceans to reproduce before the vernal pool enters the dry phase, sometimes within only a few weeks (Helm 1998; Eriksen and Belk 1999). In some species, cysts may hatch immediately without going through a dormant stage, if they are deposited while the vernal pool still contains water. These cysts are referred to as quiescent, and allow the vernal pool crustacean to produce multiple generations in a single wet season as long as their habitat remains inundated.

Distribution of vernal pool tadpole shrimp - Vernal pool tadpole shrimp are found only in ephemeral freshwater habitats in California. The vernal pool tadpole shrimp is known from 168 occurrences in the Central Valley (CNDDDB 2005), ranging from east of Redding in Shasta County south to Fresno County, and from a single vernal pool complex located in the San Francisco Bay National Wildlife Refuge in Alameda County. It inhabits vernal pools containing clear to highly turbid water, ranging in size from 54 square feet in the Mather Air Force Base area of Sacramento County, to the 89-acre Olcott Lake at Jepson Prairie in Solano County. Although vernal pool tadpole shrimp are found on a variety of geologic formations and soil types, Helm (1998) found that over 50 percent of vernal pool tadpole shrimp occurrences were on High Terrace landforms and Redding and Coming soils.

Based on genetic differences, King (1996) separated vernal pool tadpole shrimp populations into two distinct groups. One group was comprised of animals inhabiting the floor of the Central Valley, near the Sacramento and San Joaquin Rivers. The other group contained vernal pool tadpole shrimp from sites along the eastern margin of the valley. King (1996) concluded that these two groups may have diverged because cyst dispersal by overland flooding historically connected populations on the valley floor, while populations on the eastern margin of the valley were not periodically connected by large scale flooding, and were therefore historically more isolated. When dispersal of these foothill populations occurred, it was probably through different mechanisms such as migratory birds.

Distribution of vernal pool fairy shrimp - Vernal pool fairy shrimp are found only in ephemeral freshwater habitats in California and Southern Oregon. The vernal pool fairy shrimp is known from 342 occurrences extending from the Stillwater Plain in Shasta County through most of the length of the Central Valley to Pinnacles in San Benito County (Eng *et al.* 1990; Fugate 1992; Sugnet and Associates 1993; CNDDDB 2005). Five additional, disjunct populations exist: one near Soda Lake in San Luis Obispo County; one in the mountain grasslands of northern Santa Barbara County; one on the Santa Rosa Plateau in Riverside County; one near Rancho California in Riverside County; and one on the Agate Desert near Medford, Oregon. Three of these isolated populations each contain only a single pool known to be occupied by the vernal pool fairy shrimp. The vernal pool fairy shrimp inhabits vernal pools with clear to tea-colored water, most

commonly in grass- or mud-bottomed swales, basalt flow depression pools in unplowed grasslands, or even sandstone rock outcrops or alkaline vernal pools.

Although the vernal pool crustaceans addressed in this biological opinion are not often found in the same vernal pool at the same time, when coexistence does occur, it is generally in deeper, longer lived pools (Eng *et al.* 1990; Thiery 1991; Gallagher 1996; Simovich 1998). In larger pools, vernal pool crustacean species may be able to coexist by utilizing different physical portions of the vernal pool or by eating different food sources (Daborn 1978; Mura 1991; Hamer and Appleton 1991; Thiery 1991), or by hatching at different temperatures or developing at different rates (Thiery 1991; Hathaway and Simovich 1996).

Dispersal - The primary historic dispersal method for the vernal pool tadpole shrimp and vernal pool fairy shrimp likely was large scale flooding resulting from winter and spring rains which allowed the animals to colonize different individual vernal pools and other vernal pool complexes (J. King, pers. comm., 1995). This dispersal is currently non-functional due to the construction of dams, levees, and other flood control measures, and widespread urbanization within significant portions of the range of this species. Waterfowl and shorebirds may now be the primary dispersal agents for vernal pool tadpole shrimp and vernal pool fairy shrimp. The eggs of these branchiopods are either ingested (Krapu 1974; Swanson *et al.* 1974; Driver 1981; Ahl 1991) and/or adhere to the legs and feathers where they are transported to new habitats. Cysts may also be dispersed by a number of other species, such as salamanders, toads, cattle, and humans (Eriksen and Belk 1999).

Vernal pool crustaceans are often dispersed from one pool to another through surface swales that connect one vernal pool to another. These dispersal events allow for genetic exchange between pools and create a population of animals that extends beyond the boundaries of a single pool. Instead, populations of vernal pool crustaceans are defined by the entire vernal pool complex in which they occur (Simovich *et al.* 1992, King 1996). These dispersal events also allow vernal pool crustaceans to move into pools with a range of sizes and depths. In dry years, animals may only emerge in the largest and deepest pools. In wet years, animals may be present in all pools, or in only the smallest pools. The movement of vernal pool crustaceans into vernal pools of different sizes and depths allows these species to survive the environmental variability that is characteristic of their habitats.

Reasons for Decline and Threats to Survival - The genetic characteristics of these species, as well as ecological conditions, such as watershed continuity, indicate that populations of vernal pool crustaceans are defined by pool complexes rather than by individual vernal pools (Fugate 1992). Therefore, the most accurate indication of the distribution and abundance of these species is the number of inhabited vernal pool complexes. The pools and, in some cases, pool complexes supporting these species may be small. Human-caused and unforeseen natural catastrophic events such as long-term drought, non-native predators, off-road vehicles, pollution, berming, and urban development, threaten their extirpation at some sites. Vernal pool fairy shrimp and vernal pool tadpole shrimp continue to be threatened by all of the factors which led to the

original listing of this species, primarily habitat loss through agricultural conversion and urbanization (CNDDB 2005).

### *Environmental Baseline*

Historically, vernal pools and vernal pool complexes occurred extensively throughout the Sacramento Valley of California. Conversion of vernal pools and vernal pool complexes, however, has resulted in a 91 percent loss of vernal pool resources in California (State of California 2003d). By 1973, between 60 and 85 percent of the area within the Central Valley that once supported vernal pools had been destroyed (Holland 1978). In subsequent years, threats to this habitat type have continued and resulted in a substantial amount of vernal pool habitat being converted for human uses in spite of Federal regulations implemented to protect wetlands. For example, between 1987 and 1992, 467 acres of wetlands within the Sacramento area were filled pursuant to Nationwide Permit 26 (Service 1992). A majority of those wetlands losses involved vernal pools, the endemic habitat of the vernal pool tadpole shrimp, the vernal pool fairy shrimp and slender and Sacramento Orcutt grasses. It is estimated that within 20 years human activities will destroy 60 to 70 percent of the remaining vernal pools (Coe 1988).

In addition to direct habitat loss, the two shrimp populations have been and continue to be highly fragmented throughout their ranges due to conversion of natural habitat for urban and agricultural uses. Fragmentation results in small isolated shrimp populations. Ecological theory predicts that such populations will be highly susceptible to extirpation due to chance events, inbreeding depression, or additional environmental disturbance (Gilpin and Soulé 1988; Goodman 1987a, b). If an extirpation event occurs in a population that has been fragmented, the opportunities for re-colonization would be greatly reduced due to physical (geographic) isolation from other (source) populations.

The proposed project is located in southern Yuba County, which is within the northern portion of the Southeastern Sacramento Valley Vernal Pool Region and the southern portion of the Northern Eastern Sacramento Valley Vernal Pool Region (Keeler-Wolf *et al.* 1998). In Yuba County, between 1995 and 1997, vernal pool acres declined at a rate of 1.47 percent per year, down from 12,229 ac (4,949 ha) to 11,871 ac (4,804 ha). To date, past section 7 consultations have resulted in projects in Yuba County affecting approximately 1,300 ac (526 ha).

The vernal pool fairy shrimp is known from 34 populations extending from Shasta County south through the Central Valley to Tulare County. This species also occurs along the central coast from northern Solano County south to San Benito County. Vernal pool tadpole shrimp are known from 19 populations in Central Valley, ranging from Shasta County south to Fresno County, with one disjunct population in Alameda County. Yuba County represents only 0.005 percent of the 366 known occurrences of vernal pool fairy shrimp and 0.04 percent of the known occurrences of 209 vernal pool tadpole shrimp (CNDDB 2005). Although Yuba County does not appear to represent important habitat for the vernal pool tadpole shrimp and the vernal pool fairy, the existing vernal pool habitats in Yuba County are crucial to the persistence of these listed species within Yuba County itself.

The fate of these remaining fragments of ephemeral wetlands for the listed vernal pool branchiopods is threatened by direct and indirect effects of urbanization, mining, and conversion to vineyards, as well as by their isolation. The increased urban development and conversion of agricultural lands has resulted in the loss of vernal pool resources. Historically, California has lost an estimated 91 percent of vernal pool resources (State of California 2003). The vernal pool tadpole shrimp and vernal pool fairy shrimp are imperiled by a variety of human-caused activities. Their habitats have been lost through direct destruction and modification due to filling, grading, disking, leveling, and other activities. In addition, vernal pools have been imperiled by a variety of anthropogenic modifications to upland habitats and watersheds. These activities, primarily urban development, water supply/flood control projects, land conversion for agriculture, off-road vehicle use, certain mosquito abatement measures, and pesticide/herbicide use can lead to disturbance of natural flood regimes, changes in water table depth, alterations of the timing and duration of vernal pool inundation, introduction of non-native plants and animals, and water pollution. These indirect effects can result in adverse effects to vernal pool species.

A number of State, local, private, and unrelated Federal actions have occurred within the project area and adjacent region affecting the environmental baseline of these species. Some of these projects have been subject to prior section 7 consultation. These actions have resulted in both direct and indirect impacts to vernal pools within the region, and have contributed to the loss of vernal pool tadpole shrimp and vernal pool fairy shrimp populations. Although a reduction of federally-listed vernal pool branchiopod populations has not been quantified, the acreage of lost habitat continues to grow.

CNDDDB (2004) indicates six locality records of the vernal pool fairy shrimp and two records of the vernal pool tadpole shrimp in Yuba County. Most of these records are from the Beale Air Force Base, located approximately 10-11 miles (16-17.7 km) east of the proposed project site. Seasonal wetlands and seasonal ponds are located on the proposed project site. Wet-season sampling for listed branchiopods were completed by Jones and Stokes on March 17, 2004, in three of the seasonal wetlands. Vernal pool tadpole shrimp were observed in the project area in one of the seasonal wetlands. Because vernal pool fairy shrimp are known to occur in the vicinity of the proposed project, all of the on-site seasonal wetlands and seasonal ponds identified during the field evaluation are considered suitable habitat for the vernal pool fairy shrimp and vernal pool tadpole shrimp. Based on this information the Service has determined that there is a high likelihood that the vernal pool fairy shrimp inhabit the proposed project site and the vernal pool tadpole shrimp does inhabit the proposed project site.

#### Valley Elderberry Longhorn Beetle

##### *Status of the Species*

The beetle was listed as a threatened species under the Act on August 8, 1980 (45 FR 52803). Critical habitat for the species was designated and published at 50 CFR §17.95. Two areas along the American River in the Sacramento metropolitan area have been designated as critical habitat for the beetle. Critical habitat for this species has been designated along the lower American River at Goethe and Ancil Hoffman parks (American River Parkway Zone) and at the

Sacramento Zone, an area about a half mile from the American River downstream from the American River Parkway Zone. In addition, an area along Putah Creek, Solano County, and the area west of Nimbus Dam along the American River Parkway, Sacramento County, are considered essential habitat, according to the Valley Elderberry Longhorn Beetle Recovery Plan (Service 1984). These critical habitat and essential habitat areas within the American River parkway and Putah Creek support large numbers of mature elderberry shrubs with extensive evidence of use by the beetle.

The beetle is dependent on the elderberry, its host plant, which is a locally common component of the remaining riparian forests and savannah areas and, to a lesser extent, the mixed chaparral-foothill woodlands of the Central Valley. Use of the elderberry shrubs by the animal, a wood borer, is rarely apparent. In most cases, the only exterior evidence of the shrub's use by the beetle is an exit hole created by the larva just prior to the pupal stage. Observations made within elderberry shrubs along the Cosumnes River, in the Folsom Lake area, and near Blue Ravine in Folsom indicate that larval galleries can be found in elderberry stems with no evidence of exit holes; the larvae either succumb prior to constructing an exit hole or are not far enough along in the developmental process to construct an exit hole. Beetle larvae appear to be distributed in stems which are 1.0 inch or greater in diameter at ground level. The Valley Elderberry Longhorn Beetle Recovery Plan (Service 1984) and Barr (1991) contain further details on the valley elderberry longhorn beetle's life history.

Population densities of the beetle are probably naturally low (Service 1984). It has been suggested, based on the spatial distribution of occupied shrubs (Barr 1991), that the beetle is a poor disperser (Collinge *et al.* 2001). Low density and limited dispersal capability cause the beetle to be vulnerable to the negative effects of the isolation of small subpopulations due to habitat fragmentation.

When the beetle was listed as threatened in 1980, the species was known from less than ten localities along the American River, the Merced River, and Putah Creek. By the time the Valley Elderberry Longhorn Beetle Recovery Plan was prepared in 1984; additional occupied localities had been found along the American River and Putah Creek. As of 2005, the California Natural Diversity Database (CNDDDB 2005) contained 190 occurrences for this species in 44 drainages throughout the Central Valley, from a location along the Sacramento River in Shasta County, southward to an area along Caliente Creek in Kern County (CNDDDB 2005). The beetle continues to be threatened by habitat loss and fragmentation, predation by the non-native Argentine ants (*Linepithema humile*) (Holway 1998; Huxel 2000; Huxel and Hastings 1999; Ward 1987), and possibly other factors such as pesticide drift, non-native plant invasion, improper burning regimes, off-road vehicle use, rip-rap bank protection projects, wood cutting, and over-grazing by livestock (CNDDDB 2005).

### *Environmental Baseline*

Riparian forests, the primary habitat for the beetle, have been severely depleted throughout the Central Valley over the last two centuries as a result of expansive agricultural and urban development (Katibah 1984; Roberts *et al.* 1977; Thompson 1961). Since colonization, these

