



United States Department of the Interior

FISH AND WILDLIFE SERVICE

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IN REPLY REFER TO:

1-1-99-F-0015

December 7, 1998

Memorandum

To: Project Manager, Bureau of Reclamation, Mid-Pacific Regional Office,
Sacramento, California

From: Field Supervisor, Sacramento Fish and Wildlife Office, Sacramento,
California

Subject: Biological Opinion on Conveyance of Refuge Water Supply Project, West
and East Sacramento Valley, California

This is in response to your request for formal consultation with the U.S. Fish and Wildlife Service (Service) on the Conveyance of Refuge Water Supply Project (Conveyance Project), West and East Sacramento Valley, California. Your request was dated and received in our office November 4, 1998. This document represents the Service's biological opinion on the effects of the action on the giant garter snake (*Thamnophis gigas*), in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act).

This biological opinion is based on information provided in: (1) the October 1998 Biological Assessment for Conveyance of Refuge Water Supply Project, West Sacramento Valley Study Area and East Sacramento Valley Study Area; (2) the December 1997 Environmental Assessment for Conveyance of Refuge Water Supply Project West Sacramento Valley Study Area (USBR); (3) the December 1997 Environmental Assessment for Conveyance of Refuge Water Supply Project East Sacramento Valley Study Area; (4) Project Description Amendment for RWS Biological Opinion (memo from Kathy Freas to Ellen Berryman, dated December 3, 1998); (5) field investigations, and other sources of information. A complete administrative record of this consultation is on file in the Sacramento Fish and Wildlife Office (SFWO).

Background/Consultation History

The primary purpose of the Conveyance Project is to provide or upgrade facilities to accommodate "Level 4" refuge water supply (defined below) as required under the Central Valley Project Improvement Act (CVPIA). The Bureau of Reclamation (Reclamation), in cooperation with the Service and the California Department of Fish and Game (Department), is responsible for implementing Section 3406 (d)(5) of the CVPIA, which requires that reliable Level 4 water supplies be delivered to the National Wildlife Refuges (NWRs) and state Wildlife Management Areas (WMAs) specifically included in the CVPIA. Two primary water supply levels, Level 2 and Level 4, have been identified under the CVPIA refuge water supply program. Level 2 water supplies are defined as existing average annual water deliveries, while Level 4 water supplies are defined as those quantities of water required for full habitat development for each of the refuge areas. The CVPIA requires Level 4 water supplies to be provided as firm, reliable, long-term entitlements for each of the refuges.

Because of capacity constraints and/or maintenance requirements in existing delivery systems, existing conveyance facilities need to be modified to provide Level 4 water supplies to Sacramento Valley Refuges. Currently, water supplies are conveyed on an as-available basis, which is not consistent with refuge needs. In most cases, existing facilities were not designed to convey peak refuge requirements in addition to existing agricultural demands, or are dewatered for maintenance purposes and, therefore, do not have year-round delivery capability. Facilities must be modified to support scheduled maximum Level 4 peak flows.

Surveys of the project area were conducted during the fall of 1995 and 1996 to determine whether the project may affect any federally listed or proposed species. A special focus was given to searching for habitats that might support federally listed or proposed species which are known to occur in the vicinity, including the giant garter snake, the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), palmate-bracted bird's beak (*Cordylanthus palmatus*), and vernal pool species such as vernal pool fairy shrimp (*Branchinecta lynchei*), vernal pool tadpole shrimp (*Lepidurus packardii*), Hoover's spurge (*Chamaesyce hooveri*), hairy Orcutt grass (*Orcuttia pilosa*), Colusa grass (*Neostaphia clusana*), and Greene's tuctoria (*Tuctoria greenei*).

No elderberry bushes were found in the area to be impacted by the structural modifications, therefore it was determined that the Conveyance Project is not likely to affect the valley elderberry longhorn beetle. Similarly, vernal pool species are not expected to be affected by the project because no vernal pool habitat was found in the impact area. Habitat for palmate-bracted bird's beak (valley sink scrub and alkali meadow) is not present in the impact area, hence this species is not expected to be affected by the project.

The Sacramento splittail (*Apogonichthys macrolepidotus*) is known from the project area. This species was federally proposed for listing as threatened on January 6, 1994 (59 FR 862). Sacramento splittail occur in the Sutter Bypass, in the vicinity of a proposed siphon installation that would be necessary for water conveyance to Sutter NWR. However, the siphon would be installed just upstream of an existing weir that precludes passage of Sacramento splittail from this part of the bypass, so this species would not be affected by the siphon installation.

Sacramento splittail have also been collected every year from 1993 to 1996 at the Hamilton City Pumping Plant, where the GCID Main Canal is diverted from the Sacramento River (USFWS 1997). A fish screen is currently present at this diversion point, preventing adult splittail from entering the GCID Main Canal, but eggs, larvae, and juvenile splittail would be able to pass through the screen. Project construction will primarily be limited to the period when the Main Canal is dry, between December 1 and mid-March, and construction to occur when the Main Canal is wet will primarily be limited to a period after August 1 of each calendar year, when eggs, larvae, and juveniles are not likely to be present. Temporary diversion of the GCID Main Canal for construction purposes will need to occur at Bondurant Slough in June, when splittail eggs and young could be present, but measures have been incorporated into the project description to minimize any adverse effects to splittail that could result from the short-term water turbidity. The take of Sacramento splittail eggs and juveniles entrained in the GCID Main Canal was already addressed in a separate Biological Opinion for the GCID Fish Screen (Service File #1-1-97-0115). Therefore, this species will not be further addressed in this document.

During meetings on September 3, September 22, and October 8, 1998, Ellen Berryman of the Service and Kathy Freas of CH2M Hill (representing Reclamation) developed a strategy for addressing the numerous activities to be authorized for take under this biological opinion. The Conveyance Project involves 83 minor structural modifications along the Glenn-Colusa Irrigation District (GCID) Main Canal; disturbing less than 0.5 acre of land each, and 29 major structural modifications which generally disturb over 0.5 acre of land each. Only four of the 29 major structural modifications have been designed (at 50% design level); the locations and types of activities to be undertaken for the remaining 25 have been determined (see Appendix A) but no site-specific design has been completed. It was therefore determined that a programmatic approach should be used for these undesigned major modifications, such that: (1) the biological opinion use gross impact estimates to generate "sideboards" for the maximum amount of total habitat to be disturbed for each structure; (2) more precise impact quantification be provided as designs are completed for each structure, and compared to the sideboard estimates to determine compliance with the biological opinion; (3) take be authorized, in the form of a letter appended to the programmatic opinion, for construction at each site once it has been confirmed that the construction would be consistent with the programmatic opinion.

Four of the 29 major modifications are at 50% design level, therefore a more accurate estimate of impact acreage can be made for these sites than for the other 25 sites. During informal consultation, the Service and Reclamation decided that take could be authorized at these four sites through this biological opinion, without the need to append these activities to the opinion, provided more precise impact acreages are reported once construction has occurred.

In early October 1998, Reclamation asked the Service whether the proposed minor modifications along the Glen-Colusa Irrigation District (GCID) Main Canal could be included in a "not likely to adversely affect" letter, because of the relatively small amount of disturbance associated with these modifications to existing structures. On October 22, 1998, Ellen Berryman of the Service, Ben Pennock of GCID, and Kathy Freas of CH2M Hill visited examples of the five general types of minor modifications (delivery setbacks, rip-rap of bridges, extension of wing walls, flapgate removal/siphon installation, and structure demolishing and removal) along the GCID Main Canal. During this site visit, the Service noted the presence of rodent holes and small cracks in the levee along the canal that potentially could be occupied by giant garter snake during the period of inactivity from October 1 through May 1. Because most of the minor modifications would occur between December 1 and February 15, when the Main Canal is largely dry, the Service determined that excavation of the levee could cause mortality in snakes hibernating there. Additionally, limited amounts of aquatic habitat in return and toe drains, and to a lesser extent in the Main Canal, would be permanently affected by the minor modifications. As a result, it was determined that the Minor Structures would be included in the biological assessment and the biological opinion, rather than addressed in a "not likely to affect" letter. Because the impact acreage for each minor modification is only an estimate, it was decided that these estimates would serve as maximum allowable impact acreages, and the actual impact acreages would be determined and reported to the Service after each minor modification has been completed. The minor modification could be authorized for take without the need to be appended to the biological opinion (only the 25 currently-undesigned major modifications would need to be appended to this opinion).

Reclamation initiated formal consultation on the Conveyance Project in a letter dated November 4, 1998, and delivered to the Service that same day. This letter requested the Service to address effects on the giant garter snake that could result from structural modification of the East and West Sacramento conveyance facilities.

To provide Level 4 water supplies in compliance with the CVPIA, Reclamation must undertake a number of interrelated actions that will be addressed in separate biological opinions. The Conveyance Project consultation only addresses the effects of improvements to water conveyance facilities that are necessary to deliver Level 4 water to the refuge boundaries, and does not address potential effects to listed species that could result from: (1) use of that water on the refuges; (2) improvements to conveyance facilities on the refuge; or (3) potential effects of water acquisition for the program. The

effects of taking water from the source where the water is acquired for refuges is being addressed in the programmatic biological opinion for the CVPIA. Additionally, refuge activities that are expected to result from the availability of additional refuge water supply are to be addressed in separate biological opinions on refuge long-term maintenance and operations and refuge conveyance facilities.

Programmatic Consultation Guidelines

The proposed construction activities for the Conveyance Project include 25 major structural modifications, listed in Appendix A of this biological opinion and Table 5 of the Biological Assessment, that have not yet been designed. This consultation takes a programmatic approach for authorizing take that would result from these currently undesignated modifications. For take of giant garter snake to be authorized under this programmatic opinion, the following criteria must be met for each major structural modification.

1. Habitat loss at each site will not exceed the amount specified for that site in Appendix A of this biological opinion (Table 5 of the Biological Assessment).
2. The total cumulative amount of permanent giant garter snake habitat loss for all projects listed in Appendix A has not exceeded 24.5 acres of upland habitat or 29.5 acres of aquatic habitat.
3. The activity has been designed to minimize impacts to giant garter snakes and their habitat to the maximum extent practicable, through consultation between design engineers and a Service-approved biologist familiar with giant garter snake habitat needs.
4. The activity will comply with the terms and conditions of this biological opinion.

Implementing Procedure

Four Major Modifications at 50% Design Level and 83 Minor Modifications: This biological opinion authorizes take for the four major modifications that are currently at 50% design level, and for the 83 minor modifications. These activities do not require a letter from the Service to append them to this biological opinion, provided they are consistent with the project description in this biological opinion and the Biological Assessment, and they comply with the terms and conditions in this biological opinion.

25 Undesignated Major Modifications: This biological opinion can authorize take for the 25 currently undesignated major modifications only after these activities have been appended to this opinion. The following procedure will be used to authorize take for each of these 25

major structural modifications, using a programmatic approach under the biological opinion:

1. Reclamation will submit a letter requesting that the proposed activity be appended to this programmatic biological opinion and provide the Service with the following:
 - a. A 1"=20' site plan with an overlay showing habitat types at the site (open water, marsh, rice field, disturbed upland, etc.), and differentiating areas to be temporarily and permanently impacted.
 - b. Information on the number of acres of habitat to be temporarily and permanently impacted for each habitat type.
 - c. A project description, including details related to the types of disturbance, project timing, and a discussion as to how impacts are minimized to the maximum extent practicable relative to the Service's *Standard Avoidance and Minimization Measures During Construction Activities in Giant Garter Snake Habitat* (Appendix B).
2. The Service will review the information provided to determine whether the activity meets the criteria for being appended to this biological opinion, or whether a separate biological opinion is necessary.
3. If the Service determines that the activity is appropriate for inclusion under this opinion, the Service will provide a letter appending the activity to this opinion.

BIOLOGICAL OPINION

Description of the Proposed Action

The proposed project involves structural modification of water conveyance facilities in Sacramento Valley for additional water conveyance to Sacramento Valley NWRs and Graylodge WMA. The Conveyance Project includes 29 major structural modifications to water conveyance facilities in the Sacramento Valley in the vicinity of the Sacramento, Delevan, Colusa and Sutter NWRs, as well as Gray Lodge WMA, and 83 minor structural modifications along approximately 60 miles of the GCID Main Canal. The locations for the major and minor modifications are shown on Figures 1 through 3 of the October 1998 Biological Assessment. The following summarizes the activities that will be involved for the major and minor modifications, the anticipated impacts to giant garter snakes, and the proposed measures for mitigating these impacts.

1. Major Modifications at 50% Design Level:

Although no design has been completed for 25 of the major structural modifications for the Conveyance Project, four of the major structural modifications are currently at 50% design: Bondurant Slough Siphon, Willows South Drain, Hunter's Creek Siphon, and Lateral 41-1 Extension. These structures will be used to convey water to refuges in the West Sacramento Valley area (Sacramento, Delevan, and Colusa, NWRs).

Under current conditions, the GCID Main Canal carries irrigation water from about mid-March through December 1 and is dry in the winter. The refuge water supply project will allow water to flow through the GCID Main Canal year-round, which necessitates the four major structural modifications.

All four structures currently are scheduled for construction to begin May 1, 1999. Willows South Drain, Hunter's Creek Siphon, and Lateral 41-1 Extension are scheduled to be completed by September 30, 1999, while Bondurant Slough Siphon is scheduled to be completed by March 1, 2000. The four major structures at 50% design are described briefly below, and are described at a greater level of detail in the October 1998 BA.

- a. **Bondurant Slough:** Bondurant Slough is currently siphoned under the GCID Main Canal when water is present in the Main Canal, mid-February through the end of November. The Conveyance Project will allow water to flow through the GCID Main Canal year-round. An empty GCID Main Canal can easily accept flood flows from Bondurant Slough when winter rains start, but a full canal cannot accept flood flows from a 25-year storm event. The existing small siphon cannot manage these flows, thus a new, larger siphon structure must be installed to accept these flows.

Installation of a larger siphon at Bondurant Slough requires the construction of a bypass channel into which water from the GCID Main Canal will be diverted during the construction period. The construction of the bypass channel will begin approximately May 1, 1999. When the bypass channel is complete, the levee between the Main Canal and the bypass channel will be breached to redirect Main Canal flow into the bypass channel. Breaching is expected to occur in early June 1999, and would create some short-term water turbidity in the bypass channel and downstream in the GCID Main Canal. Turbidity will be minimized through the following measures:

- (1) The bypass channel will be fully constructed per design and specification requirements prior to breaching the GCID Main Canal levee.

- (2) The bypass channel will be filled by pumping and/or siphoning flow from the GCID Main Canal. One-fourth to one-eighth inch barrel screening will be used to keep the fish clear of the pump intake, thus out of the bypass, while filling. After pumping, colloids will be allowed to settle for 1-2 days.
- (3) Prior to breaching the Main Canal levee, the Main Canal water surface elevation will be checked up to, or slightly higher than, the water surface elevation of the bypass channel.
- (4) Prior to breaching the downstream levee between the Main Canal and the bypass channel, the upstream levee will be breached, 1-2 additional days of settling time will be allowed, and the Main Canal will be checked to the maximum operating water surface elevation at the next downstream structure to lower the velocity in the GCID Main Canal.
- (5) When the downstream levee between the bypass channel and GCID canal has been breached, flow will be allowed in both the GCID Main Canal and the bypass channel for 1-2 days. (By allowing flow through the Main Canal during this period, velocities will be lower than normally experienced in the Main Canal. This will minimize colloidal transport from the bypass channel during the most vulnerable initial conveyance period.)
- (6) When constructing the sheet piling isolation of the Bondurant Siphon work site, the downstream sheet pile wall will be constructed first.

~~Upland habitat loss and temporary disturbance will occur on the Main Canal levee road and roads bordering the slough upstream of the Main Canal, and in a disturbed area (ruderal vegetation) along the GCID Canal on the downstream side. The upland habitat along the slough banks support some ruderal vegetation that could provide cover for snakes, and a number of ground squirrel burrows that would be suitable for occupation by snakes during their dormant period. Expansion of the siphon capacity for Bondurant Slough will result in permanent loss of 0.1 acre of upland habitat. Construction will also result in temporary disturbance to 1.4 acres of upland habitat and 2.0 acres of aquatic habitat.~~

- b. South Willows Drain: Currently, runoff from south Willows flows into the GCID Main Canal, when it is dry in winter. Once the Main Canal is filled year-round, it will no longer be able to accept water from south Willows.

The Conveyance Project will therefore involve rerouting runoff water from south Willows under the Main Canal land, to a drainage canal that currently adjoins the rice fields.

The project will require widening the drainage canal from 6-12 feet wide to approximately 26 feet wide. The existing canal is currently occupied by cattails (*Typha* sp.), which will be temporarily removed during project construction but will be allowed to re-establish since this drainage canal will not be maintained following construction. Adjacent crop land that is currently used for rice production will be removed to widen the canal, thereby converting aquatic rice field habitat to aquatic cattail marsh habitat. The total amount of temporary disturbance to aquatic giant garter snake habitat for the canal widening, including both the temporary removal of cattail marsh and the conversion of rice field to cattail marsh, is 11.4 acres. As existing dirt road along the canal will displace 3.1 acres of upland habitat along the roadway, but the road will be reconstructed along the new canal, therefore the upland habitat will be able to re-establish.

- c. Hunter's Creek Siphon: Hunter's Creek is currently siphoned under the GCID Main Canal, but the existing siphon threatens the levee structure along the Main Canal, and the siphon must be enlarged to comply with requirements for the increased water supply within the Main Canal. The siphon enlargement will involve dredging and widening a portion of Hunter's Creek upstream from the Main Canal, with rip rap installed along one side of the creek. A "dead end" of Hunter's Creek that abuts the Main Canal (and is weakening it) will be filled with soil and edged with rip rap.

Approximately 0.2 acre of aquatic habitat will be permanently lost as a result of filling the "dead end" of Hunter's Creek. Approximately 0.1 acre of riparian habitat (treated as upland habitat for the giant garter snake) will be permanently lost to enlarge the siphon. The creek dredging and widening will also result in temporary disturbance to 0.9 acre of aquatic habitat and 0.8 acre upland habitat.

- d. Lateral 41-1 Extension: The 41-1 Lateral Canal will be extended to provide winter water supply to Delevan NWR. This will involve construction of approximately 10,000 feet of new conveyance canals. The canals will involve permanent removal of rice fields that currently support good quality aquatic habitat for giant garter snakes, with abundant emergent wetland vegetation and rice in summer. The new facilities will be maintained after construction, therefore, habitat is not expected to establish in the new canals. The Lateral 41-1 Extension is expected in result in permanent loss of up to 5.2 acres of aquatic habitat and 2.2 acres of upland habitat in the form

of levee banks and roads. Temporary upland and aquatic habitat disturbance during construction is estimated at 1.4 and 6.0 acres, respectively. For these four GCID major structures, no new excavation will take place during the giant garter snake's dormant period, October 1 through May 1.

2. Major Structural Modifications, Currently Undesigned

There is currently no planned schedule for constructing 25 of the 29 major structural modifications under the Conveyance Project, and no site-specific design has been initiated for these modifications. Therefore, this biological opinion takes a programmatic approach to authorize these construction activities for take. Major structure construction activities for the Conveyance Project can be appended to this biological opinion if they meet the criteria listed under the Programmatic Consultation Guidelines for this biological opinion (page 4).

When the site-specific design for each major structure has been completed, information will be provided to the Service regarding the nature and extent of anticipated impacts. The construction activity can be authorized for take once the Service has finalized a letter stating that the activity meets the criteria specified above and can be appended to this biological opinion. Permanent loss of up to 24.5 acres of giant garter snake upland habitat and 29.5 acres of aquatic habitat can be authorized for these 25 modifications under this opinion.

3. Minor Structural Modifications

The proposed minor structural modifications for the GCID Main Canal are necessary for conveyance of refuge water supply to the three refuges in the West Sacramento Valley area: Sacramento, Delevan, and Colusa NWRs. Each GCID minor modification can be classified into one of four types of construction, as briefly described below and described in greater detail in the October 1998 Biological Assessment.

- a. Set Back Deliveries. Numerous delivery structures, such as gates and pipes, are present along the GCID Main Canal to convey water from the canal to adjacent fields. The canal has been widened since these delivery structures were put in place, but could not be widened where the these structures obstructed such widening. Therefore, the canal is typically narrower at these delivery structure locations. To accomodate the increased water capacity in the GCID Main Canal, these narrow areas must be widened at 41 locations and the structures must be set back to align with adjacent Main Canal slopes. In most cases, this will require all of the existing structure to be demolished and pipes to be replaced, requiring levee excavation.

Each delivery setback is expected to impact no more than 0.05 acre of giant garter snake habitat, including 0.01 acre of aquatic habitat in the return drain and 0.04 acre of upland habitat along the levy. With 41 delivery setbacks, the total impact is not expected to exceed 2.05 acres, including 1.64 acres of upland habitat and 0.41 acre of aquatic habitat. Each delivery setback will result in creation of approximately 0.02 acre of Main Canal aquatic habitat, for a total increase of 0.82 acre of aquatic habitat, as the canal will be widened at these locations. However, the aquatic habitat along the Main Canal is expected to provide lower quality giant garter snake habitat than what is present in the toe drains, because the Main Canal will be maintained and very little emergent vegetation will grow there.

- b. Flapgate Removal and Siphon Replacement. Drainages that carry winter run-off water cross the GCID Main Canal at 23 locations. These cross drainages typically carry water when the Main Canal is empty, during the winter months. At each of the 23 locations, water crosses the canal by passing into the canal through a gate on the up-slope side and out of the canal through a gravity-drainage on the down-slope side. With year-round water supply through the Main Canal, drainages will no longer be able to cross the canal in this manner. The gates and gravity-structures will therefore need to be removed and replaced with Reinforced Concrete Pipe that siphons under the canal. Each flapgate removal and siphon replacement is expected to result in temporary disturbance of 0.04 acre upland habitat and 0.23 acre return drain aquatic habitat. With 23 sites planned for flapgate removal and siphon replacement, the total amount of temporary disturbance is not expected to exceed 0.92 acre of upland habitat and 5.29 acres of aquatic habitat.
- c. Demolish and Remove. Five minor structures, including old bridges, check structures and pipelines, are scheduled to be removed from the Main Canal banks and replaced with soil conforming to the existing canal slopes. Where the structures are removed, the space will be filled with soil. No aquatic habitat in the GCID Main Canal will be disturbed because this construction will be during winter when the canal is dry. Each demolition and removal is expected to result in a temporary upland habitat disturbance of no more than 0.2 acre. Demolishment and removal of structures at five sites is expected to result in a total temporary loss of 1.0 acre of upland habitat.
- d. Rip Rap Bridges and Extend Wing Walls. Wing walls are the angular walls that extend into canal banks from any given structure. Most wing wall extensions are at bridges, where rip rap will also be placed to prevent erosion. The extension wing walls involves clearing soil from around

existing wing walls, then forming, placing rebar and pouring concrete to extend them for better erosion control. Each wing wall extension is expected to disturb a maximum upland habitat area of approximately 15 feet by 60 feet, or 0.02 acres. With eight sites planned for extension of wing walls, the total upland area to be permanently impacted is approximately 0.16 acre.

Rip rap, used to control erosion requires placing 12 + inch diameter rock on the upstream and downstream side of the structure. The rock will extend a maximum of 100 feet on either side of the structure and cover an area on the canal bank up to 15 feet wide, or 0.07 acre. With eight sites planned for placement of rip-rap, the total area of existing upland to be covered with rip rap is 0.56 acres.

The approximate total habitat disturbance for all 83 GCID Minor Structures is as follows:

- o Maximum permanent upland habitat, 1.8 acres
- o Maximum temporary upland habitat disturbance, 2.48 acres
- o Maximum permanent toe/return drain aquatic habitat loss, 0.41 acres
- o Maximum temporary toe/return drain aquatic habitat loss, 5.29 acres

The exact amount of habitat affected by construction of each minor structure will not be determined until the construction is completed. A qualified biologist will monitor the actual amount and type of habitat that is being affected as construction proceeds at each site. Maximum estimates provided in this document will be used to set an upper limit of habitat disturbance provided for in the biological opinion against which actual disturbance can be measured.

The minor modifications on the GCID Main Canal are expected to begin December 1, 1998. Approximately half of these modifications are expected to be completed from December 1, 1998, to February 15, 1999, with the remaining minor modifications to be completed from December 1, 1999, to February 15, 2000.

For GCID minor structural modifications, giant garter snake upland habitat on the Main Canal levees will need to be excavated when the canal is dry, which is during the dormant period for this species. To help prevent injury or mortality to snakes that may occupy burrows in the levees, a qualified, Service-approved biologist will be present during all excavation activities. Should a dormant giant garter snake be encountered within the construction zone, construction will be halted until the Service is contacted and advises GCID on how and when to proceed. Additionally, Service approved environmental awareness training will be provided to work crews at project sites.

4. Proposed Mitigation.

A mitigation site supporting giant garter snake habitat would be secured prior to initiation of GCID major structural modifications. This site will include a sufficient amount of giant garter snake habitat to mitigate the loss of habitat associated with the following: (1) all GCID minor structural modifications that have been completed at the time the mitigation land is secured; and (2) all 29 GCID major structural modifications. Prior to ground-breaking at each subsequent minor modification site, a sufficient acreage of mitigation land would be secured. For all major and minor structural modifications, mitigation would consist of habitat preservation at a ratio of three acres preserved for each acre impacted. The mitigation area would support both upland and aquatic habitat components, at a ratio of two upland acres for each aquatic acre. All restoration, replacement, and monitoring guidelines included in the Mitigation Criteria for Restoration and/or Replacement of Giant Garter Snake Habitat (Appendix C) would be followed.

Status of the Species/Environmental Baseline

The giant garter snake was federally listed as threatened on October 20, 1993. Please refer to the *Federal Register* notice (58 FR 54053-54066) on federal listing of the giant garter snake for detailed information on the species' biology and ecology, and associated threats to its survival.

Essential habitat components - Endemic to wetlands in the Sacramento and San Joaquin valleys, the giant garter snake inhabits marshes, sloughs, ponds, small lakes, low gradient streams, and other waterways and agricultural wetlands, such as irrigation and drainage canals and rice fields, and the adjacent uplands. Giant garter snakes feed on small fish, tadpoles, and frogs (Fitch 1941, Hansen 1980, Hansen 1988). Essential habitat components consist of: (1) adequate water during the snake's active season (early-spring through mid-fall) to provide food and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season; (3) upland habitat with grassy banks and openings in waterside vegetation for basking; and (4) higher elevation uplands for cover and refuge from flood waters during the snake's dormant season in the winter (Hansen 1980). Riparian woodlands do not typically provide suitable habitat because of excessive shade, lack of basking sites, and absence of prey populations (Hansen 1980).

Foraging ecology - Giant garter snakes are active foragers, feeding primarily on aquatic prey such as fish and amphibians. Historically, prey likely consisted of Sacramento blackfish (*Orthodon microlepidotus*), thick-tailed chub (*Gila crassicauda*), and red-legged frog (*Rana aurora*). Because these species are no longer available (thick-tailed chub are extinct, red-legged frog extirpated from the Central Valley, and blackfish declining/in low numbers), the predominant food items are now Pacific treefrogs (*Hyla regilla*) and