

LITERATURE CITED

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APPENDIX A

Table 5
Estimates of Permanent Upland and Aquatic Habitat Loss and Creation for 25 Other West and East Sacramento Valley
Areas Project Site Without Design Documents

Site Description and Location (Figure and Site Number)	Refuge or WMA Served/ USGS Quad	Existing Habitat for Giant Garter Snake	Maximum Acreage Permanent Loss Upland/Aquatic	Maximum Acreage Permanent Created Upland/Aquatic
Install flow measurement device. Fig. 1, No.5	Sacramento NWR/Logandale	Moderate quality aquatic and upland	0.5/0.5	0.0/0.0
Install new turnout. Fig. 1, No. 6	Sacramento NWR/Logandale	Good quality aquatic and upland. Known snake population present.	0.5/0.5	0.0/0.0
Install flow measurement device. Fig.1, No.7	Delevan NWR/Moulton Weir	Good quality aquatic and upland. Known snake population present in this NWR	0.5/0.5	0.0/0.0
Install flow measurement device. Fig. 1, No. 8	Colusa NWR/Colusa	Moderate quality aquatic (no water present in August 98) and upland. Known snake population present in this NWR.	0.5/0.5	0.0/0.0
Enlarge culvert under Ware Rd. Fig. 1, No. 9	Colusa NWR/Arbuckle	Moderate quality aquatic and upland. Known snake population present in this NWR.	0.05/0.05	0.0/0.0
Enlarge Nugent Flume. Fig. 2, No.1	Gray Lodge WMA/Biggs	Low to moderate quality aquatic and upland	1.0/1.0	0.0/0.0
Enlarge Garcia Siphon. Fig. 2, No. 2	Gray Lodge WMA/Biggs	Low to moderate quality aquatic and upland	0.5/0.5	0.0/0.0
Enlarge Razorback Siphon. Fig. 2, No. 3	Gray Lodge WMA/ Biggs	Low to moderate quality aquatic and upland	0.5/0.5	0.0/0.0
Enlarge Colusa Hwy Culvert Fig. 2, No. 4	Gray Lodge WMA/Gridley	Low to moderate quality aquatic and upland	0.5/0.5	0.0/0.0
Replace Schwind Pump Station. Fig. 2, No. 5	Gray Lodge WMA/ Pennington	Low to moderate quality aquatic and upland	1.0/1.0	0.0/0.0
Install/enlarge water delivery point. Fig 2., No. 6	Gray Lodge WMA/ Pennington	Low to moderate quality aquatic and upland	1.0/1.0	0.0/0.0
Install/enlarge water delivery point on Cassidy Lateral. Fig.2, No. 7	Gray Lodge WMA/ Pennington	Moderate to good quality aquatic and upland	0.5/0.5	0.0/0.0
Install/enlarge water delivery point on Jakey Lateral. Fig. 2, No. 8	Gray Lodge WMA/ Pennington	Moderate to good quality aquatic and upland	0.5/0.5	0.0/0.0

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Increase Sunset Pumping Station Capacity. Fig 3, No. 9	Sutter NWR/ Sutter	Low to moderate quality aquatic and upland	0.5/0.5	0.0/0.0
Enlarge Sanders Road culvert. Fig. 3, No. 10	Sutter NWR/ Sutter	Moderate quality aquatic and upland	1.0/1.0	0.0/0.0
Install Sand Creek Siphon. Fig. 3, No. 11	Sutter NWR/ Sutter	Moderate quality aquatic and upland	1.0/1.0	0.0/0.0
Enlarge Butte House Road siphon. Fig. 3, No. 12	Sutter NWR/ Sutter	Moderate quality aquatic and upland	1.0/1.0	0.0/0.0
Enlarge siphon at Humphrey and South Butte. Fig.3, No. 13	Sutter NWR/ Sutter	Moderate quality aquatic and upland	1.0/1.0	0.0/0.0
Enlarge siphon at abandoned RR. Fig. 3, No. 14	Sutter NWR/ Sutter	Moderate quality aquatic and upland	1.0/1.0	0.0/0.0
Enlarge Hwy 20 siphon. Fig 3, No. 15	Sutter NWR/ Sutter	Low to moderate quality aquatic and upland	2.0/2.0	0.0/0.0
Enlarge Humphrey Road siphon D/S of Hwy 20 culvert. Fig. 3, No.16	Sutter NWR/ Sutter	Moderate to good quality aquatic and upland	1.0/1.0	0.0/0.0
Enlarge Franklin Clements siphon. Fig 3. No. 17	Sutter NWR/ Sutter	Low to moderate quality aquatic and upland	1.0/1.0	0.0/0.0
Enlarge Lincoln Road siphon. Fig 3. No. 18	Sutter NWR/ Gilsizer Slough	Moderate quality aquatic and upland	1.0/1.0	0.0/0.0
Install refuge supply pipeline along McClatchy Road to Sutter Bypass. Fig. 3, No. 19	Sutter NWR/ Tisdale Weir	Moderate to good quality aquatic and upland. Dense <i>Ludwigia</i> present along approx 150 feet of existing drain	4.0/9.0 including approx. 0.09 acres <i>Ludwigia</i>	0.0/0.0
Install siphon to Sutter NWR	Sutter NWR/ Tisdale Weir	Low to moderate quality aquatic and upland	2.0/2.0	0.0/0.0
Install toe drains along Farrington Lateral Sutter. Figure 3, shaded labeled area	Sutter NWR/ aquatic and upland	Moderate quality	0.0/0.0	0.0/2.5
Total			24.5/29.5	0.0/2.5

APPENDIX B

Standard Avoidance and Minimization Measures During Construction Activities in Giant Garter Snake Habitat

GIANT GARTER SNAKE (*Thamnophis gigas*)

HABITAT TYPE:

Marshes, sloughs, ponds, small lakes, low gradient streams, irrigation and drainage canals, and rice fields. Permanent aquatic habitat, or seasonally flooded during the snake's active season (early-spring through mid-fall), with herbaceous wetland vegetation, such as cattails and bulrushes, grassy banks (often salt grass), and uplands for cover and retreat sites during the snake's active season and for refuge from flood waters during the dormant season (winter). Giant garter snakes are typically absent from larger rivers and other water bodies that support introduced populations of large, predatory fish, and from wetlands with sand, gravel, or rock substrates. Riparian woodlands typically do not provide suitable habitat because of excessive shade, lack of basking sites, and absence of giant garter snake prey.

AVOIDANCE AND MINIMIZATION MEASURES:

Avoid construction activities within 200 feet from the banks of giant garter snake aquatic habitat. Confine movement of heavy equipment to existing roadways to minimize habitat disturbance.

Construction activity within habitat should be conducted between May 1 and October 1. This is the active period for giant garter snakes and direct mortality is lessened, because snakes are expected to actively move and avoid danger. Between October 2 and April 30 contact the Service's Sacramento Fish and Wildlife Office to determine if additional measures are necessary to minimize and avoid take.

Confine clearing to the minimal area necessary to facilitate construction activities. Flag and designate avoided giant garter snake habitat within or adjacent to the project area as Environmentally Sensitive Areas. This area should be avoided by all construction personnel.

Construction personnel should receive Service-approved worker environmental awareness training. This training instructs workers to recognize giant garter snakes and their habitat(s).

24-hours prior to construction activities, the project area should be surveyed for giant garter snakes. Survey of the project area should be repeated if a lapse in construction activity of two weeks or greater has occurred. If a snake is encountered during construction, activities shall cease until appropriate corrective measures have been

completed or it has been determined that the snake will not be harmed. Report any sightings and any incidental take to the Service immediately by telephone at (916) 979-2725.

Any dewatered habitat should remain dry for at least 15 consecutive days after April 15 and prior to excavating or filling of the dewatered habitat.

After completion of construction activities, remove any temporary fill and construction debris and, wherever feasible, restore disturbed areas to pre-project conditions. Restoration work may include such activities as replanting species removed from banks or replanting emergent vegetation in the active channel.

Compensate loss and disturbance of giant garter snake habitat according to Table 1. Mitigation ratios are based on the acreage and on the duration of disturbance.

TABLE 1 - SUMMARY OF GIANT GARTER SNAKE PROGRAMMATIC MITIGATION LEVELS

	IMPACTS: DURATION	IMPACTS: ACRES	MITIGATION: COMPENSATION
LEVEL 1	1 season	Less than 20 and temporary	Restoration
LEVEL 2	2 seasons	Less than 20 and temporary	Restoration plus 1:1 replacement
LEVEL 3	More than 2 seasons and temporary Permanent loss	Less than 20 and temporary Less than 3 acres total giant garter snake habitat AND Less than 1 acre aquatic habitat; OR Less than 218 linear feet bank habitat	3:1 Replacement (or restoration plus 2:1 replacement) 3:1 Replacement

Giant garter snake habitat includes 2.0 acres of surrounding upland habitat for every 1.0 acre of aquatic habitat. The 2.0 acres of upland habitat also may be defined as 218 linear feet of bankside habitat which incorporates adjacent uplands to a width of 200

feet from the edge of each bank. Each acre of created aquatic habitat should be supported by two acres of surrounding upland habitat. Compensation may include creating upland refuges and hibernacula for the giant garter snake that are above the 100-year flood plain.

A season is defined as the calendar year period between May 1 and October 1, the active period for giant garter snake when mortality is less likely to occur.

Information to Include in a Project Monitoring Report for Giant Garter Snake

1. Date
2. Surveyor
3. Project information (should include the following):
 - a. Project name
 - b. Location
 - c. Project impacts and acres impacted
4. Survey information (should include the following):
 - a. Time of day
 - b. Temperature at start and end of survey. Include ambient temperature, temperature at ground level, and at approximately 3 inches above ground level.
 - c. Weather conditions (include wind conditions and cloud cover)
 - d. Acres/area surveyed
5. Site description (may include the following):
 - a. Habitat types present, substrate/soils, etc.
 - b. Topography/elevation
 - c. Surrounding land-use/activity
 - d. Description of project features
6. Habitat characteristics:
 - a. Burrows/potential hibernacula present? (Y/N)
 - b. Amount and type of cover present, including upland and emergent vegetation
 - c. Prey species present? (Y/N)
 - d. Distance to nearest available habitat
 - e. Other species observed
7. Giant garter snakes present? (Y/N) If observed provide the following information:
 - a. Number of individuals, and if possible to determine, whether juveniles or adults
 - b. Location(s)
 - c. Describe behavior and activity
 - d. Describe protective measures implemented
8. Describe on site mitigation and avoidance measures implemented (fencing, dewatering, worker awareness training, etc.). Include any difficulties implementing measures and corrective measures taken.

Report all sightings to the US Fish and Wildlife Service, Sacramento Fish and Wildlife Office at (916) 979-2725, and to the California Department of Fish and Game (CDFG). The monitoring biologist must submit all sightings to CDFG Natural Diversity Data Base (NDDB) using a California Native Species Field Survey Form and provide copies to CDFG and the Service.

APPENDIX C

Mitigation Recommendations for Restoration and/or Replacement of Giant Garter Snake Habitat

Replacement and Restoration Guidelines are provided together, as the two types of mitigation may not be mutually exclusive. Replacement of habitat may also require restoration of some areas. Preserved habitat may additionally be improved for giant garter snake by using some of the restoration guidelines.

Reference sites

A nearby reference site should be chosen both for restoration of giant garter snake habitat and for creation of replacement habitat. The reference site will be used to determine the success of mitigation efforts. For restoration of habitat, the pre-project condition may be used as a reference site if adequate documentation exists. For creation of replacement habitat or for restoration where pre-project conditions are not documented, the reference site should be nearby or adjacent and should represent high quality giant garter snake habitat.

Restoration of giant garter snake habitat

Restoration may include incorporating some of the Replacement guidelines to enhance habitat value for giant garter snake. Restoration should follow the guidelines outlined below:

1. Restoring giant garter snake habitat includes minimizing impacts of project activities to the existing habitat, including using silt fencing, designating environmentally sensitive areas, using protective mats, preventing runoff, and providing worker awareness training. Measures to minimize impacts include:
 - a. Avoid construction activities within 200 feet from the banks of giant garter snake aquatic habitat. Confine movement of heavy equipment to existing roadways to minimize habitat disturbance.
 - b. Construction activity within habitat should be conducted between May 1 and October 1. This is the active period for giant garter snakes and direct mortality is lessened, because snakes are expected to actively move and avoid danger. Between October 2 and April 30 contact the Service's Sacramento Fish and Wildlife Office to determine if additional measures are necessary to minimize and avoid take.
 - c. Confine clearing to the minimal area necessary to facilitate construction activities. Flag and designate avoided giant garter snake habitat within or adjacent to the project area as Environmentally Sensitive Areas. This area should be avoided by all construction personnel.

- d. Construction personnel should receive Service-approved worker environmental awareness training. This training instructs workers to recognize giant garter snakes and its habitat(s).
 - e. 24-hours prior to construction activities, the project area should be surveyed for giant garter snakes. Survey of the project area should be repeated if a lapse in construction activity of two weeks or greater has occurred. If a snake is encountered during construction, activities shall cease until appropriate corrective measures have been completed or it has been determined that the snake will not be harmed. Report any sightings and any incidental take to the Service immediately by telephone at (916) 979-2725.
 - f. Any dewatered habitat should remain dry for at least 15 consecutive days after April 15 and prior to excavating or filling of the dewatered habitat.
2. Remove all construction debris and stockpiled materials.
 3. Regrade area to preexisting contour, or a contour that would improve restoration potential of the site.
 4. Replant and hydroseed the restoration area. Recommended plantings consist of a) wetland emergents, b) low-growing cover on or adjacent to banks, and c) upland plantings/hydroseeding mix to encourage use by other wildlife. Riparian plantings are not appropriate because shading may result in lack of basking sites. Native plantings are encouraged except where non-natives will provide additional values to wildlife habitat and will not become invasive in native communities. The applicant should obtain cuttings, plantings, plugs, or seeds, from local sources wherever possible. The applicant should attempt to restore conditions similar to that of adjacent or nearby habitats.
 - a. Emergent wetland plants recommended for giant garter snake habitat are California bulrush (*Scirpus californicus*), cattail (*Typha* spp.), and water primrose (*Ludwigia peploides*). Additional wetland plantings may include common tule (*Scirpus acutus*), Baltic rush (*Juncus balticus*), or duckweed (*Lemna* spp.).
 - b. Cover species on or adjacent to the bank may include California blackberry (*Rubus vitifolius*) or wild grape (*Vitis californica*), along with the hydroseeding mix recommended below.
 - c. Upland plantings/hydroseeding mix: Disturbed soil surfaces such as the levee slopes should be hydroseeded to prevent erosion. The Service recommends a mix of 20-40 percent native grass seeds [such as annual fescue (*Vulpia* spp.), California brome (*Bromus carinatus*), wild rye (*Elymus glaucus*), and needle grass (*Nasella* spp.)], 2-10 percent native forb seeds, five percent rose clover (*Trifolium hirtum*), and 5 percent alfalfa (*Medicago sativa*). Approximately 40-68

percent of the mixture may be non-aggressive European annual grasses [such as wild oats (*Avena sativa*), wheat (*Triticum* spp.), and barley (*Hordeum vulgare*)]. The Corps will not include aggressive non-native grasses, such as perennial ryegrass (*Lolium perenne*), cheatgrass (*Bromus tectorum*), fescue (*Festuca* spp.), giant reed (*Arundo donax*), medusa-head (*Taeniatherum caput-medusae*), or Pampas grass (*Cortaderia selloana*) in the hydroseed mix. The Corps will not include endophyte-infected grasses in the mix. One-hundred percent native grass and forb mixes may also be used.

Replacement of giant garter snake habitat

Location

Replacement location should be within the same population cluster boundaries (population clusters are defined in 58 FR 54053) as the habitat lost. For example: The boundaries of the Sacramento Basin population cluster are approximately, Highway 16 to the north, Sacramento River to the west, Twin Cities Road to the south, and the Folsom Aqueduct to the east. Habitat lost within this area must also be replaced within this area.

Habitat components

Giant Garter Snake Habitat. The giant garter snake inhabits marshes, sloughs, ponds, small lakes, low gradient streams, other waterways and agricultural wetlands such as irrigation and drainage canals and rice fields, and the adjacent uplands. Essential habitat components consist of (1) adequate water during the snake's active period, (early spring through mid-fall) to provide a prey base and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat; (3) upland habitat for basking, cover, and retreat sites; and (4) higher elevation uplands for cover and refuge from flood waters. For the purposes of this programmatic opinion, a basic giant garter snake habitat unit will incorporate 2.00 acres (0.81 hectares) of surrounding upland for every 1.00 acre (0.40 hectare) of aquatic habitat. The 2.00 acres (0.81 hectares) of upland also may be defined as 218 linear feet (66 meters) of bankside habitat which incorporates adjacent uplands to a width of 200 feet (61 meters) from the edge of the bank.

Replacement habitat must provide the above mentioned essential habitat components and include the following:

1. All replacement habitat must include both upland and aquatic habitat components. Upland and aquatic habitat components must be included in the replacement habitat at a ratio of 2:1 upland acres to aquatic acres
2. A semi-permanent or permanent aquatic habitat which provides water during the active period for giant garter snakes (April through October) with suitable vegetative cover present. Linear or meandering channels with slow flowing water over mud or silt

substrate are preferred.

3. Upland basking and retreat sites with low growing vegetation cover adjacent to aquatic habitat, and upland retreats and flood refugia with partially buried broken concrete or animal burrows.
4. Small fish and amphibian larvae for foraging, but predatory "gamefish" (bass, *Micropterus* spp.; sunfish, *Lepomis* spp.; catfish, *Ictalurus* spp. and *Ameiurus* spp.) absent or controlled.
5. An adequate buffer (at least 200 feet) from roadways to reduce vehicular mortality.
6. Follow planting recommendation provided above under restoration guidelines.

Monitoring of mitigation areas

Habitat restoration

Restoration of habitat should be monitored for one year from implementation of restoration. Monitoring reports documenting the restoration effort should be submitted to the Service: (1) upon completion of the restoration implementation; and (2) one year from restoration implementation. Monitoring reports should include photodocumentation, when restoration was completed, what materials were used, plantings (if specified) and justification of any substitutions to the Service recommended guidelines. Monitoring reports should also include recommendations for remedial actions and approval from the Service, if necessary, and justification from release of any further monitoring, if requested.

Creation of replacement habitat

Replacement habitat should be monitored for 5 years from implementation of mitigation. Hydrology of the mitigation area should be monitored for the first two years after creation of wetlands. The monitoring effort should continue for three additional years to ensure success criteria are met. Monitoring reports documenting the mitigation implementation should be submitted to the Service: (1) upon completion of wetland creation; (2) yearly for the first two years of monitoring; (3) 5 years from implementation of mitigation. Monitoring reports should include photodocumentation, when restoration was completed, what materials were used, plantings (if specified) and justification of any substitutions to the Service recommended guidelines. Monitoring reports should also include recommendations for remedial actions and approval from the Service, if necessary, and justification from release of any further monitoring, if requested.

Success criteria for replacement habitat:

1. At completion of monitoring, the cover measured on the mitigation area should be 90 percent of cover measured on the reference site.
2. At completion of monitoring, the species composition measured on the mitigation area should be 90 percent of that measured on the reference site.
3. At completion of monitoring, wetlands created on the mitigation site should meet Corps jurisdictional criteria.

Maintenance and management of replacement giant garter snake habitat

1. A final management plan of replacement habitat must be approved by the Service.
2. All maintenance activities should follow Standard Avoidance and Minimization Measures During Construction Activities in Giant Garter Snake Habitat.
3. Additional guidance includes:
 - a. Canal Maintenance - Hand clearing of canals is preferred for removal of excessive vegetation or debris. Any equipment should be operated from the bank top. Excavate from only one side of the canal during a given year. Avoid excavating the banks above the high water level. Preferably, one side of the canal should be left undisturbed indefinitely (the preferred side would be the west or north side) so that emergent vegetation and bank side cover is left in place.
 - b. Place the spoils from canal clearing in a designated location, rather than along bank tops. This will prevent burying or crushing snakes basking on the banks, or trapping snakes taking cover in burrows or bank-top soil crevices.
 - c. Vegetation control - Uplands should not be disced. Leave vegetation on levees and canal sides wherever possible. Mowing to control vegetation should take place July through September and mower blades should be raised at least six inches to avoid injuring snakes and to leave some grassy cover.
 - d. Traffic - Control vehicle access to avoid vehicular mortality of giant garter snakes.
4. Use a water maintenance regime that will maintain some open water to provide vegetated edge for giant garter snake to forage along.
5. Eradicate/control non-natives and invasive exotics.