

Revised Draft Recovery Plan for Giant Garter Snake (*Thamnophis gigas*)



Photo by David Kelly, U.S. Fish and Wildlife Service

EXECUTIVE SUMMARY

The giant garter snake (*Thamnophis gigas*) was federally listed as a threatened species on October 20, 1993. Historical records suggest that the giant garter snake inhabited fresh water marshes, streams, and wetlands throughout the length of the Sacramento and San Joaquin valleys in Central California. Today only about 5 percent of its historical wetland habitat acreage remains. The 13 populations identified at listing were isolated from one another with no protected dispersal corridors. Nine populations are recognized in this revised draft recovery plan following an update of the thirteen populations described in the original listing. This change is based on recent surveys, which indicate that two populations were extirpated, and on genetic research, which lead to the grouping together of some of the populations.

The giant garter snake has specific habitat needs that include summer aquatic habitat for foraging, bankside basking areas with nearby emergent vegetation for cover and thermal regulation, and upland refugia for extended periods of inactivity. Perennial wetlands provide the highest quality habitat for the giant garter snake, and rice lands, with the interconnected water conveyance structures, serve as an alternative habitat in the absence of higher-quality wetlands. The loss and subsequent fragmentation of habitat is the primary threat to the giant garter snake throughout the Central Valley of California. Habitat loss has occurred from urban expansion, agricultural conversion, and flood control. Habitat fragmentation restricts dispersal and isolates populations of the giant garter snake increasing the likelihood of inbreeding, decreasing fitness, and reducing genetic diversity. These factors have ultimately resulted in the snake being extirpated from the southern one-third of its range in former wetlands associated with the historical Buena Vista, Tulare, and Kern lakebeds. In addition to habitat loss, the remaining Central Valley populations of the giant garter snake are subject to the cumulative effects of a number of other existing and potential threats, including: roads and vehicular traffic, climate change, and predation by non-native species.

Recovery Strategy: The strategy used to recover the giant garter snake is focused on protecting existing, occupied habitat and identifying and protecting areas for habitat restoration, enhancement, or creation including areas that are needed to provide connectivity between populations. Appropriate management is needed for all giant garter snake conservation lands to ensure that stable and viable populations can be maintained in occupied areas, and that colonization will be promoted in restored and enhanced unoccupied habitat. We defined nine recovery units that correspond directly to the nine geographically and genetically distinct populations, to aid in our recovery planning: Butte Basin, Colusa Basin, Sutter Basin, American Basin, Yolo Basin, Delta Basin, Cosumnes-Mokelumne Basin, San Joaquin Basin, and Tulare Basin.

Recovery Goal and Objective: The objective of this revised draft recovery plan is to reduce threats to and improve the population status of the giant garter snake sufficiently to warrant delisting. To achieve this goal we have defined the following objectives:

1. Establish and protect self-sustaining populations of the giant garter snake throughout the full ecological, geographical, and genetic range of the species.
2. Restore and conserve healthy Central Valley wetland ecosystems that function to support the giant garter snake and associated species and communities of conservation concern such as Central Valley waterfowl and shorebird populations.
3. Ameliorate or eliminate, to the extent possible, the threats that caused the species to be listed or are otherwise of concern, and any foreseeable future threats.

Recovery Criteria:**Factor A Criteria:**

- Sufficient habitat is protected to support populations of giant garter snakes.
- Populations are connected with corridors of suitable habitat.
- Management plans and best management practices oriented to giant garter snake conservation are developed and implemented (and adaptively updated based on current research).
- Protected habitat is supplied with a reliable source of clean water during the critical active summer months.

Factor C Criteria:

- Threats due to disease are reduced or removed.

Factor E Criteria:

- Monitoring in recovery units demonstrates stable or increasing populations and evidence that the identified populations and their habitats are viable over a 20-year period including at least one 3-year drought.

Actions Needed:

1. Protect existing habitat, areas identified for restoration or creation, and areas that will provide connectivity between preserved areas of habitat.
2. Develop and implement appropriate management of habitat on public and private wetlands and conservation lands.
3. Improve water quality in areas occupied by the giant garter snake and affected by poor water quality conditions.
4. Ensure summer water is available for wetland habitats used by the snake.
5. Establish an incentive or easement program(s) to encourage private landowners and local agencies to provide or maintain giant garter snake habitat.
6. Monitor populations and habitat to assess the success or failure of management activities and habitat protection efforts.
7. Conduct surveys and research to identify areas requiring protection and management.
8. Conduct research focused on the management needs of the species, and on identifying and removing threats.
9. Establish and implement outreach and education, which includes the participation of landowners; interested public and stakeholders; and other Federal, State, and local agencies.
10. Reestablish populations within the giant garter snake's historical range.

Total Estimated Cost of Recovery: As described in the Act, we are required to estimate the cost of implementing all measures described in this recovery plan. In order to best provide for the conservation and recovery of the species and develop a reasonable cost estimate, we will maximize partnerships with Federal, State, and non-governmental partners. Due to the complexity of this plan and number of actions needed to accomplish recovery, we are continuing to develop the cost estimates for the actions described in this draft plan. We will provide a revised draft for further public review and comment once we have completed our cost estimates.

Date of Recovery: Delisting could be initiated by 2045 if recovery criteria have been met including: protection of habitat and creation of population corridors. These criteria are likely to take at least 10 years to achieve. Additionally, recovery requires that giant garter snake populations be self-

sustaining over the long-term. Therefore, a 20-year monitoring period is recommended to cover multiple generations (four to five generations) to provide a reliable estimate of population change. This monitoring period must also include one 3-year drought to ensure that giant garter snakes are no longer threatened by an insufficient water supply.

list of Threatened and Endangered Species.). To achieve this goal the following objectives have been developed:

1. Protect existing and establish (and protect) self-sustaining populations of the giant garter snake throughout the full ecological, geographical, and genetic range of the species.
2. Restore and conserve healthy Central Valley wetland ecosystems that function to support the giant garter snake.
3. Ameliorate or eliminate, to the extent possible, the threats that caused the species to be listed or of concern and any foreseeable future threats.

D. RECOVERY CRITERIA

An endangered species is defined in the Endangered Species Act as a species that is in danger of extinction throughout all or a significant portion of its range. A threatened species is one that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. When we evaluate whether or not a species warrants downlisting or delisting, we consider whether the species meets either of these definitions. A recovered species is one that no longer meets the Act's definitions of threatened or endangered. Determining whether a species should be downlisted or delisted requires consideration of the of the same five categories of threats which were considered when the species was listed and which are specified in section 4(a)(1) of the Endangered Species Act.

Recovery criteria are conditions that, when met, are likely to indicate that a species may warrant downlisting or delisting. Thus, recovery criteria are mileposts that measure progress toward recovery. Because the appropriateness of downlisting or delisting is assessed by evaluating the five threat factors identified in the Endangered Species Act, the recovery criteria below pertain to and are organized by these factors. These recovery criteria are our best assessment at this time of conditions that may indicate that the giant garter snake is ready to be delisted and removed from the list entirely. Because we cannot envision the exact course that recovery may take and because our understanding of the vulnerability of a species to threats is very likely to change as more is learned about the species and its threats, it is possible that a status review may indicate that delisting is warranted although not all recovery criteria are met. Conversely, it is possible that the recovery criteria could be met and a status review may indicate that delisting is not warranted; for example, a new threat may emerge that is not addressed by the recovery criteria below and that causes the species to remain threatened.

1. Recovery Criteria for Factor A: The present or threatened destruction, modification, or curtailment of its habitat or range.

In order to ensure the long term recovery of the giant garter snake, threats to the species habitat must be reduced or removed in order to provide sufficient high-quality habitat and connections between populations. This will have been accomplished if: a) sufficient habitat of suitable quality is protected in each recovery unit, and b) blocks of habitat within each recovery unit are connected. The following provides specific descriptions as to how habitats would be sized and connected to reduce threats associated with habitat loss:

Specified areas in all recovery units with known populations of the giant garter snake are protected in perpetuity as suitable giant garter snake habitat and supplied with sufficient clean water during the

spring and summer to maintain necessary aquatic habitat. The protected areas are buffered from incompatible uses and are connected by corridors of suitable habitat.

Habitat for the giant garter snake will be preserved in multiples of two block pairings of habitat. Each block pair will consist of one 240-hectare (539-acre) block of contiguous buffered perennial wetland habitat (existing, restored or enhanced) and one 639-hectare (1,578-acre) block of contiguous active ricelands separated by no more than 5 miles (8 kilometers)¹. Alternatively, a pair of blocks may also consist of two 240-hectare (539-acre) blocks of buffered perennial wetlands. Between five and ten habitat block pairs may be prescribed for each of the recovery units depending on the size of the recovery unit and the available suitable habitat within the recovery unit. These block pairs should be evenly distributed among the management units. In addition, the habitat pairs must not be separated by more than 5 miles. Paired habitat blocks were selected because perennial wetlands are known to support core populations of the giant garter snake throughout a wide range of hydrologic conditions, while rice fields and the supporting infrastructure can provide habitat for robust populations of the giant garter snake while the rice fields are active. During periods of crop rotation the inactive or dry crop fields may provide some level of connectivity between perennial wetlands by keeping key irrigation canals full.

These pairs of contiguous perennial wetlands and ricelands must be buffered by 0.5 kilometer (.32 mile) of compatible habitat and the two blocks must be connected by a corridor of aquatic and upland habitat with a 0.8-kilometer (0.5-mile) minimum width. Corridor width is based on the distance a giant garter snake is known to travel in one day, which is 0.8 kilometer (0.5 mile) (G. Hansen and Brode 1993). All pairs of habitat blocks must be connected with the other pairs of habitat blocks within and between the management units by corridors of suitable habitat, and recovery units should be connected to one another by similar corridors.

- A1 **Butte Basin Recovery Unit:** Minimum of six habitat block pairs with no less than two block pairs per management unit in the Butte Basin Recovery Unit. Additional protection along the following watercourses in the Butte Basin will provide for connectivity between existing populations of giant garter snakes and will protect habitat immediately on either side of the main watercourse at a minimum of 0.25 miles from each bank:
- Little Chico Creek – 1,036 hectares (2,560 acres) abutting the Llano Seco Unit of the Sacramento NWR and continuing northeastward.
 - Butte Creek – 1,295 hectares (6,400 acres) abutting the Upper Butte Basin management unit and continuing northeastward.
 - Cherokee Canal – 3,108 hectares (7,680 acres) abutting Gray Lodge/Butte Sink management unit and continuing northeastward.
- A2 **Colusa Basin Recovery Unit:** Minimum of six habitat block pairs with no less than two block pairs per management unit in the Colusa Basin Recovery Unit. Additional protection along the following watercourses in the Colusa Basin will provide for connectivity between existing populations of giant garter snakes and will protect habitat immediately on either side

¹ The 240 hectare blocks of perennial wetlands is derived from Wylie *et al.* (2010), who reported that a self-sustaining Badger Creek population of giant garter snakes is supported by 240 hectares of perennial wetlands. This acreage of perennial wetlands is also close to acreages preserved in several giant garter snake conservation banks. The 639 hectare blocks of active ricelands are also derived from Wylie *et al.* (2010) by calculating the acreage of ricelands needed to support a giant garter snake population of equivalent size to the self-sustaining population at Badger Creek. This was done by dividing the target population density from Badger Creek (Wylie *et al.* 2010) by the giant garter snake density observed in rice fields (Wylie *et al.* 2010) and using this ratio to determine the target acreage of ricelands, which is 639 hectares. These values do not represent a minimum or maximum acreage for either perennial wetlands or ricelands, but represent target values.

of the main watercourse at a minimum of 0.25 miles from each bank. – 8,417 hectares (20,800 acres). Final protected canal length should extend at a minimum from the Glenn Colusa Canal in the north to the proximity of Ridge Cut Slough in the south.

- A3 **Sutter Basin Recovery Unit:** Minimum of four habitat block pairs with no less than one block pair per management unit in the Sutter Basin Recovery Unit (areas with high flooding flows within the Sutter Bypass should be considered as unsuitable habitat). In order to provide connectivity between northern and southern populations additional protection should focus on the Sutter Bypass: 3,885 hectares (9,600 acres) comprising a continuous corridor along and outside of the western bank (levee) of the Sutter Bypass out to a width of 0.8 kilometers (0.5 miles) from the bank, and including the Tisdale Bypass 389 hectares (960 acres).
- A4 **American Basin Recovery Unit:** Minimum of eight habitat block pairs with no less than one block pair per management unit in the American Basin Recovery Unit.²
- A5 **Yolo Basin Recovery Unit:** Minimum of five habitat block pairs with no less than one block pair per management unit in the Yolo Basin Recovery Unit (areas with high flooding flows within the Yolo Bypass should be considered as unsuitable habitat).
- A6 **Cosumnes-Mokelumne Basin Recovery Unit:** Minimum of two pairs of habitat blocks in the Cosumnes-Mokelumne Basin Recovery Unit.
- A7 **Delta Basin Recovery Unit:** Minimum of ten habitat block pairs with no less than two block pairs per management unit in the Delta Basin Recovery Unit.
- A8 **San Joaquin Basin Recovery Unit:** Minimum of ten habitat block pairs with no less than two block pairs per management unit in the San Joaquin Basin Recovery Unit.
- A9 **Tulare Basin Recovery Unit:** Minimum of two habitat block pairs in the Mendota management unit in the Tulare Basin Recovery Unit.

All Recovery Units

- A10 Corridors of aquatic habitat with a 0.8-kilometer (0.5-mile) width hydrologically connect adjacent habitat block pairs within Recovery Units.
- A11 Corridors hydrologically connect adjacent Recovery Units.
- A12 Management plans are developed, implemented, and updated as needed for 20 years for all habitat blocks and corridors preserved for the giant garter snake listed in Criteria A1 through A9. Management plans will address as a minimum the following: water management to provide summer aquatic habitat, use of pesticides, best grazing regimes, fallowing of rice fields, eradication of invasive plants, operations and maintenance of canals and flood control structures, control of non-native predators, monitoring of native predators, location and use of roads within the conservation areas)
- A13 Water supplied for use on all giant garter snake preserves will have annual water delivery requirements identified. Garter snake preserves are supplied with water of sufficient quantity to support the aquatic habitat component of the giant garter snake on that property in perpetuity and will be free of contaminants or will contain contaminants at levels that

² This is in addition to the existing 3,541 hectares (8,750 acres) preserved in minimum blocks of 162 hectares (400 acres) with one 1,012 hectare (2,500 acre) reserve provided as compensation through the Natomas Basin HCP and the Metro Air Park HCP.

have been demonstrated to be harmless to giant garter snakes. Monitoring of annual water supplies and water quality standards reveals that water used to provide aquatic habitat is provided each year, and meets or exceeds quality standards over a 20-year monitoring program.

2. Recovery Criteria Factor B: Overutilization for commercial, recreational, scientific or educational purposes.

Overutilization for any purpose is not known to threaten the giant garter snake at this time. Therefore, no recovery criteria have been developed for this factor.

3. Recovery Factor C: Disease or Predation.

In order to ensure the long term recovery of the giant garter snake, threats to the species from disease or predation must be reduced or removed. This will have been accomplished if the following have occurred:

- C1 Introduced snakes (*Nerodia* sp.) are either eradicated or reduced in numbers throughout the historical range of the giant garter snake to the point where the transmission of disease by these non-native snakes is no longer a threat (and competitive interactions are eliminated between introduced snakes and the giant garter snake).
- C2 A management plan is developed and implemented to monitor for the effects of parasites and viruses on the giant garter snake and any discovered threats to the giant garter snake from parasites or viruses are controlled or ameliorated to an extent they are not a threat to the populations.

4. Recovery Factor D: Inadequacy of existing regulatory mechanisms.

If the threats under factors A, B, C and E are ameliorated or eliminated then additional regulatory mechanisms (beyond the existing ones) are not necessary.

5. Recovery Factor E: Other natural or manmade factors affecting its continued existence.

In order to ensure the long term recovery of the giant garter snake, the species must be protected from other natural or manmade factors known to affect its continued existence. This will have been accomplished if all of the preserved perennial marshes and ricelands host a stable population as determined from monitoring over a 20-year period that includes at least one consecutive 3-year period of dry or critically dry weather³, and the following have occurred:

- E1 These populations are protected from predicted alterations of habitat components due to climate change through the development of contingency plans that will provide resources to ensure habitat components are maintained at all preserves during adverse climatic

³ There are multiple determinants of population dynamics of the giant garter snake. Populations of any species typically fluctuate over time depending on density dependent factors like births, deaths, emigrations, and immigration; and also may fluctuate as determined by a number of abiotic environmental factors, the level of resources, the life cycle of the species, and the influence of predators and parasites (Townsend *et al.* 2000). Thus a single year of population surveys is not an accurate portrayal of the stability of a population. Giant garter snake populations will similarly vary among years depending on annual weather patterns, local agricultural practices, degree of predation and recruitment, and other demographic factors. In order to determine whether giant garter snake populations are stable we use 20 years of monitoring as a period of time that will include multiple generations (4 or 5 generations based on the average of 5 years for females to reach sexual maturity) and reflect long-term trends in both demographics and local habitat suitability in response to weather and land use patterns (B. Halstead pers. comm. 2015, E. Hansen pers. comm. 2015).

conditions, such as extended periods of drought, or extended periods of above average temperatures.

- E2 The density found during trapping is at least an average 8 snakes per hectare for buffered perennial wetlands and 3 snakes per hectare for active ricelands.
- E3 The population estimate and density are used for a trend analysis over a 20-year period that demonstrates a 90 percent probability that the population is stable or increasing.
- E4 The habitat requirements described in delisting criteria A/1 – A/9 are available during all surveys.
- E5 The sex ratio is not significantly different than 1:1.
- E6 Age structure analysis reveals that recruitment is occurring at a level that will prevent a senescent population.
- E7 Road mortalities of giant garter snakes are reduced to a level that does not cause declines to populations.

III. RECOVERY ACTION NARRATIVE AND IMPLEMENTATION SCHEDULE

A. Recovery Action Narrative

This chapter lays out the elements of the recovery strategy, then tiers them down to individual recovery actions for implementation. Each most-detailed or stepped-down action has been assigned a priority according to our determination of what is most important for the recovery of giant garter snake. The priority numbers are defined as follows:

Priority 1: An action that must be taken to prevent extinction or to prevent a species from declining irreversibly.

Priority 2: An action that must be taken to prevent a significant decline in the species population/habitat quality or some other significant negative impact short of extinction.

Priority 3: All other actions necessary to provide for full recovery of the species.

Because situations change over time, priority numbers must be considered in the context of past and potential future actions at all sites. Therefore, the priority numbers assigned are intended to guide, not to constrain, the allocation of limited conservation resources.

1. Protect existing habitat, areas identified for habitat restoration or creation, and areas needed to provide connectivity between populations.

Protection of giant garter snake populations includes preserving and restoring the habitat necessary to maintain existing populations, providing for population increase, and ensuring that numbers and populations of giant garter snakes are self-sustaining and sufficient to maintain genetic diversity and adaptive potential of the species.

1.1 Protect, secure, and restore habitat distributed across the historical range of the giant garter snake. All habitat with known giant garter snake populations, based on locality record data, that is currently unprotected should be protected and secured. Habitat for the giant garter snake will be preserved in pairs of contiguous blocks of land as described in the recovery criteria above. (Priority 1)

1.2 Protect and secure corridors linking habitat blocks (within and between management units) and recovery units. Corridors for the giant garter snake need to be protected with an emphasis on accommodating movement that allows genetic exchange between giant garter snakes occupying habitat blocks and between management units and recovery units. (Priority 2)

1.3 Work with city and county governments to buffer areas identified for protection as habitat for the giant garter snake to minimize the effects of urban development on giant garter snakes and their habitat. Buffers may be secured and protected through acquisition, conservation or agricultural easements, through land use planning, or development of regional conservation plans. (Priority 2)