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**Giant Garter Snake**

**Habitat Model Description**

The modeled habitat for giant garter snake in the study area is bound to the west by GCID Canal, including areas of upland habitat 200 feet west of GCID.

The modeled aquatic habitat for giant garter snake includes the following land cover categories:

* Canal (includes agricultural ditches and earthen lined canals)
* Freshwater marsh
* Managed wetland
* Rice

Modeled upland habitat for giant garter snakes includes the following terrestrial land cover types immediately adjacent to and within 200 feet (61 meters) of the aquatic habitat types previously listed.

* Annual grassland
* Disturbed (includes barren areas)

**Assumptions**

Giant garter snakes inhabit marshes, ponds, sloughs, small lakes, low-gradient streams and other waterways, and agricultural wetlands, including irrigation and drainage canals, rice fields, and the adjacent uplands (U.S. Fish and Wildlife Service 2006). Suitable aquatic habitat consists of slow-moving or static water that is present from March through November with a mud substrate and the presence of prey (amphibians or fish) (USFWS 2017). Emergent and bankside vegetation that provides cover from predators and for thermoregulation is also required. Other components of suitable aquatic habitat are the absence of a continuous riparian canopy, basking sites with supportive vegetation (such as folded tule clumps) adjacent to escape cover, the absence of large predatory fish, and upland refugia in locations subject to recurrent flooding (USFWS 2017). Riparian woodland is generally considered unsuitable habitat because of the lack of basking sites, excessive shade, and lack of prey.

Upland habitat consists of land that is not typically inundated during the active season and is adjacent to aquatic habitat. Characteristics of suitable upland habitat are available bankside vegetation, such as cattails or tule, permanent shelter, such as bankside cracks and crevices, holes or small mammal burrows, and areas that are not overgrazed. Giant garter snakes use upland habitat for basking, to regulate body temperature, and for cover. Giant garter snakes use mammal burrows to avoid predation, shed skin, and cool their bodies during hot days (USFWS 2017).

* **Assumption:** Giant garter snakes do not use areas west of GCID Canal; however the model does include upland habitat 200 feet west of GCID.

**Rationale:** Areas east of GCID Canal support agricultural areas including rice and agricultural ditches that are typically used by giant garter snakes. There are also managed wetlands east of the canal. West of the canal consists primarily of grasslands and creeks that generally don’t have slow moving or static water for an extended period of time between March and November and have substrates dominated by gravel, which are not suitable for giant garter snake as they are found in areas with mud substrates (USFWS 2017). These streams have high flows during the winter and spring, and generally go dry toward the middle of the summer. Funks Creek, Antelope Creek, Grapevine Creek, and Stone Corral Creek have been defined as intermittent streams (Sites 2017). During summer, much of the streambed of these streams are dry, except for occasional pools or when receiving agricultural drainage or runoff. In addition, water quality is reported to be poor and high in dissolved minerals (Brown, 2000). West of GCID in the project vicinity there is no rice and ditches there are not directly connected to ditches east of GCID. Also, there are no giant garter snake occurrences west of GCID in the project vicinity; however, there is one record (Occurrence Number 205) from 1984 on Stone Corral Creek, which is plotted in the CNDDB as being west of GCID and which is adjacent to areas of rice. This occurrence is approximately 3.2 miles south of the project footprint.

**Assumption:** Giant garter snakes may use earthen canals but do not likely use concrete lined canals due to a lack of soft substrate (e.g., mud, silt).

* **Rationale:** Giant garter snakes prefer emergent, herbaceous aquatic vegetation accompanied by vegetated banks (USFWS 2017). Concrete lined canals do not allow for establishment of the vegetation and support of the prey base needed to support giant garter snakes.

**Assumption:** Potentially occupied giant garter snake upland habitat consists of the vegetation types listed in *Habitat Model Description*, above.

**Rationale:** Giant garter snakes require basking habitat of grassy banks and openings in waterside vegetation. They also require uplands for cover and refuge from floodwaters during the snake’s dormant season in the winter (USFWS 2017). Riparian woodlands are unlikely to provide suitable habitat as a result of excessive shade and generallack of basking sites.

**Assumption:** Potentially occupied giant garter snake upland habitat consists of appropriate land cover types within 200 feet (61 meters) of modeled aquatic habitat.

**Rationale:** Giant garter snakes use grassy stream banks and upland habitats adjacent to perennial watercourses or wetlands as overwintering, areas to temporarily seek refuge during the summer, and movement habitat (USFWS 2017).

**Model Limitations**

The model is limited primarily by the accuracy of aerial imagery interpretation and the inability to ground truth the land cover mapping (e.g., identifying area with suitable upland refugia). The model provides a conservative estimate of potentially suitable giant garter snake habitat because the amount of aquatic habitat and upland habitat mapped is all deemed to be equally suitable.

References

Brown, C. J. 2000. *North of the Delta Offstream Storage Investigation Progress Report.* Appendix D: Fish Survey Summary. Assisted by W. Yip, G. Gorden, G. Low, and A. Scholzen. CALFED Bay-Delta Program.

U.S. Fish and Wildlife Service. 2017. Recovery Plan for the Giant Garter Snake (*Thamnophis gigas*). U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California. vii + 71 pp..