

Giant Garter Snake (*Thamnophis gigas*) Monitoring Update

A summary of USGS giant gartersnake monitoring studies in the Natomas Basin, California through 2011

Brian Halstead and Michael Casazza
USGS Western Ecological Research Center

EXECUTIVE SUMMARY

The giant gartersnake (*Thamnophis gigas*) is a large, aquatic snake threatened by habitat loss. The historic occurrence of rice agriculture in the Natomas Basin allowed the snake to persist there, and conservation and monitoring programs outlined in the Natomas Basin Habitat Conservation Plan are designed to ensure its continued existence in the Basin. Sex ratios and size distributions of the giant gartersnake in the Natomas Basin in 2011 were consistent with a healthy giant gartersnake population. The giant gartersnake was broadly distributed throughout Natomas Basin Conservancy reserves in 2011 as well. Demographic monitoring suggested that the giant gartersnake was most abundant in restored marshes in the North and Central Basins, less abundant in rice in the Central Basin, and persists at low abundance in the Fisherman's Lake Area. To learn more about USGS giant gartersnake research, visit: <http://www.werc.usgs.gov/Project.aspx?ProjectID=89>

BACKGROUND

The giant gartersnake (*Thamnophis gigas*) is the largest of the gartersnakes, and federally listed as a threatened species. It is highly aquatic and occurs in marshes, sloughs, and other habitats with slow-moving, relatively warm water and emergent vegetation in California's Great Central Valley. The giant gartersnake primarily feeds upon small fish, frogs, and tadpoles.

The draining of wetlands for agricultural and urban development contributed to the loss of over 95% of the giant gartersnake's original habitat, which resulted in it being listed as a threatened species. Although conversion of wetlands to agriculture has severely reduced the distribution and abundance of the giant gartersnake, the species can be found in rice agriculture. Canals associated with rice agriculture provide marsh-like habitat conditions throughout the giant gartersnake active season (late March – early October), and rice fields themselves are emergent

wetlands for a short time. Marsh restoration and giant gartersnake-friendly rice farming practices have been implemented in the Natomas Basin to help conserve the giant gartersnake.

The Natomas Basin Habitat Conservation Plan (NBHCP) requires an annual assessment of the giant gartersnake populations within the Natomas Basin. The monitoring strategy is designed to accomplish the following three objectives.

- Examine the size distributions and sex ratios of giant gartersnake populations.
- Examine the distribution of the giant gartersnake on Natomas Basin Conservancy (TNBC) reserves.
- Examine the demography of giant gartersnake populations at key locations within the Natomas Basin, with an emphasis on measuring abundance, survival, recruitment, and population growth rate.

MONITORING METHODS

To meet the objectives of the NBHCP, we implemented a two-stage sampling design in 2011. The first stage examines the demography of the giant gartersnake at five sites spread throughout the Natomas Basin (two in the North Basin, two in the Central Basin, and one in the Fisherman's Lake Area). At each demographic monitoring site, we deploy three transects of 50 traps each from late April through early July. Captured snakes are uniquely marked, measured, and released at their location of capture.

The second stage examines the distribution of the giant gartersnake throughout the Natomas Basin. Distribution monitoring involves sampling a larger number of sites (23 in 2011) with only one transect of 50 traps at each site. After the capture of two individual giant gartersnakes we remove the transect and move it to another site, which maximizes the number of sites that can be sampled in a given year. Distribution monitoring occurs from early July through early September.

PRELIMINARY MONITORING RESULTS

The following should be cited only as preliminary results. Final data analysis and interpretation will be published in academic papers and project reports.

Overall, we captured 158 individual giant gartersnakes 181 times on TNBC reserve lands over the course of nearly 59,000 trap-days in 2011. The overall sex ratio in the Basin was 1.001 (95% confidence interval = 0.745 – 1.310) males per female. Size distributions of the giant gartersnake indicated that snakes of all ages were well-represented. The sex ratio and size distributions of the giant gartersnake in the Natomas Basin are consistent with an overall healthy population.

The demographic monitoring allowed the estimation of abundance at each demographic monitoring site. We captured one individual female giant gartersnake twice at Natomas Farms, resulting in an estimated abundance of 3 (95% confidence interval = 1 – 24) individuals. At Betts-Kismat-Silva, we captured 52 individuals 64 times in traps, resulting in an estimated abundance of 175 (101 – 318) individuals. We captured 23 individuals 37 times in traps at Sills, resulting in an estimated abundance of 44 (28 – 75)

individuals. At Lucich North, we captured 25 individuals 28 times in traps, resulting in an estimated abundance of 264 (68 – 673) individuals. We captured 23 individuals 24 times in traps at Lucich South, resulting in an estimated abundance of 309 (70 – 854) individuals.

When interpreting the abundance estimates, it should be noted that only a portion of each reserve was sampled; the number of giant gartersnakes site-wide would likely be greater than the estimated abundance. The greatest utility of the demographic monitoring sites will be realized in future years when survival and population growth rates can be estimated.

We detected the giant gartersnake at 14 of 23 distribution monitoring sites, and estimated that approximately 73% (48% – 96%) of reserve sites were occupied by the giant gartersnake in 2011. Of the sites we monitored, 17 (14 – 22) were estimated to be occupied. This suggests that the giant gartersnake is widely distributed among TNBC reserves.

BIOGRAPHY

Brian Halstead is a Wildlife Biologist with the U.S. Geological Survey Western Ecological Research Center and is based at the Dixon Field Station. His formal experience with gartersnakes began in 1999 with surveys and research on the Butler's Gartersnake. Brian has been studying the Giant Gartersnake and San Francisco Gartersnake with the USGS since 2008. Brian's primary research interests are population ecology, conservation biology, herpetology, and Bayesian statistics. Michael Casazza is a Research Wildlife Biologist with the U.S. Geological Survey Western Ecological Research Center and is based at the Dixon Field Station. He has been studying the ecology and conservation of the Giant Gartersnake since 1995, and developed current survey protocols for the species. In addition to his expertise on the Giant Gartersnake, Michael studies the ecology and conservation of waterfowl, Greater Sage-Grouse, California Clapper Rails, Band-Tailed Pigeons, and Sandhill Cranes.