



# **The Distribution of Giant Garter Snakes and Their Habitat in The Natomas Basin**

Prepared for:

**U.S. Fish and Wildlife Service**

U.S. DEPARTMENT OF THE INTERIOR  
U.S. GEOLOGICAL SURVEY  
WESTERN ECOLOGICAL RESEARCH CENTER

# The Distribution of Giant Garter Snakes and Their Habitat in The Natomas Basin

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[2002]

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## INTRODUCTION

The Dixon Field Station of the U.S. Geological Survey, Biological Resources Division, entered into an agreement with the U.S. Fish and Wildlife Service in the fall of 2001 to conduct a survey of giant garter snakes (*Thamnophis gigas*) and assess their habitats in the Natomas Basin area (Basin) of northern Sacramento County. Our purpose is to generate current information on distribution and abundance of giant garter snakes and distribution of their habitats in the Basin. This agreement represents a continuation of the giant garter snake project conducted at the Station since 1995. This document is a summary report of our findings.

## METHODS

### Study Sites

Because most lands in the Natomas Basin are privately owned, areas in which we could search for giant garter snakes were limited by specific permission to enter these properties. Our search areas are shown in Figure 1 and Figure 2. Landowners associated with Northern Territories, Inc., allowed us access to their lands, principally north of Elverta Road and east of Highway 99. This includes the East Drainage Canal, which George Hanson and John Brode refer to as “snake alley,” as well as habitat adjacent to this area. The Sacramento International Airport granted us access to their property and Reclamation District 1000 also granted us permission to access the rest of their drainage canal system. We could not secure permission to trap in the northeast quadrant of the Natomas Basin (Northeast Quadrant) bounded by Riego Road to the south, the Cross Canal to the North, the East Main Drainage Canal to the east and Highway 99 to the west, so our searches there were confined to public right of way and the Natomas Basin Conservancy land north of Sankey Road.

### Habitat Assessment

We mapped giant garter snake habitat in the basin using a base map developed with Ducks Unlimited for waterfowl habitat in 2001. This base map was derived from satellite imagery in spring and fall scenes. We verified habitat categories on the ground during this study to take into account land use changes since the satellite imagery. In fall 2001 we conducted a road transect survey in which roads were driven in the Basin (Figure 3) and habitat quality of adjacent ditches and fields assessed every 0.2 miles. Giant garter snake habitat was qualitatively determined based on presence or absence of water, and the relative growth of emergent aquatic vegetation along ditches, and density of terrestrial vegetation on ditch slopes. A laser range finder was used in the vehicle surveys to assess habitat quality 200 meters on either side of the road to the east and west or north and south, depending on the road. In summer 2002 we also walked additional areas in the Basin and classified the giant garter snake habitat along those routes as we searched for snakes (Figure 2). Giant garter snake habitat was classified as good, marginal, and poor. Urban development was also noted and also equates to poor giant garter snake habitat.

## **Capture**

We began trapping giant garter snakes in late April 2002 using floating modified minnow traps deployed along edges of ditches, canals, and wetland vegetation (Casazza et al., 2000). Trap locations, locations of captures, and duration of trapping are shown in Figure 1. We also searched on foot for snakes along the trap locations and other walking routes (Figure 2). We moved traps to new locations if we caught no snakes in a three to four week period. We used global positioning system (GPS) units to determine the geo-coordinates of traps, search areas, and capture locations with an error of about 5 meters. We also recorded environmental characteristics of the sites of snake captures, such as vegetation and substrate types and ambient temperature.

## **Measuring and Marking**

Each snake was processed as soon as possible after capture to determine weight, total length, snout to vent length, and sex. Taxonomic features were also quantified such as labial scale counts on the head and dorsal scale counts at mid-body. Individuals were implanted with passively induced transponder (PIT) tags for permanent identification. All snakes were released at the point of capture as soon as possible after they were processed.

Density estimates were derived from mark and recapture information using the program CAPTURE and two-week sampling intervals.

# **RESULTS**

## **Giant Garter Snake Distribution**

From late April into September we captured 76 female giant garter snakes and 64 male snakes, for a total of 140 individual captures; we captured 58 snakes multiple times. Trap and capture locations are shown in Figure 1 and the distribution of snake captures are shown in Figure 4. The size frequency distributions for the snakes caught in 2002 are shown in Figure 5 and Figure 6, and are consistent with results from previous years. Size frequencies indicate recruitment of young giant garter snakes into the population.

Our mark and recapture information for each of the ten trapping sites is shown in Tables 1-10. Total captures ranged from 35 for the Lucich North property to 0 for the Ayala and Elkhorn sites. We did catch two individual snakes on the western boundary of the newly-created wetlands of the BKS site and found six individuals on the Sills site west of Highway 99 on Elverta. However, we found no snakes in the Ayala site to the south even though the Ayala site is near the canal comprising “snake alley.” We did not capture any snakes in our Elkhorn site, although we did find them there in 2000 (Wylie et al. 2000). Currently the Elkhorn site is surrounded by fallow fields that were rice fields in 2000. We caught one snake in the Meister Road site, which shows their continued presence from 2000, although at low numbers. The Meister Road site is another site surrounded by fallow fields. We did not find any giant garter snakes during our foot searches of the

Northeast Quadrant, which is consistent with the sighting record for giant garter snakes (Figure 7).

### **Habitat Assessment**

Our surveys for giant garter snakes habitat quality show a scattering of what we consider to be good habitat in mostly the northern part of the Basin generally away from the perimeter of the Basin (Figure 8). A corridor along the Sacramento River is poor giant garter snake habitat because the soils there are more permeable with orchards replacing rice fields as an agricultural land use. An increase in fallow land to the east of the Sacramento Airport and increased fallowing and urbanization of land in the southern part of the Basin has greatly diminished habitat quality for giant garter snakes in these areas (Figure 8). In addition, the Basin lacks permanent wetlands, a habitat type we consider good for giant garter snakes. The addition of permanent wetlands on the Betts-Kismat-Silva is a small addition to this habitat type in the Basin. Parts of Fisherman's Lake could be considered permanent wetland, but urban development is encroaching in this area, which will greatly diminish habitat quality for giant garter snakes.

Our assessment of habitat quality does not necessarily imply use or lack of use by giant garter snakes in the Basin. We captured giant garter snakes in ditches with what we would otherwise consider poor quality, but were immediately adjacent to rice fields. We also captured few or no snakes in ditches with good quality habitat (e.g., Elkhorn, Meister), which were surrounded by fallow fields. The landscape implications of general land use have to be taken into consideration concerning giant garter snake habitat. A landowner in the Northeast Quadrant, Chris McKenzie, informed us that most water in this area is from wells and the ditches are small and go dry frequently. Moreover, this implies that the connectivity with the rest of the irrigation supply in the Basin is limited and the opportunity for giant garter snakes to move into the Northeast Quadrant is limited. A map from the Natomas Mutual Water Company showing water flow also supports our observation (Figure 9). The use of well water in the Northeast Quadrant may also diminish and productivity of ditches in this area. In addition, large blocks of land are fallow in the Northeast Quadrant. Habitats in the northwest and central sections of the Basin have connectivity with the water supply and drainage system of the rest of the Basin and rice farming continues to be the dominant land use in these areas. Land use and our capture results in the northwest and central areas show that these sections of the Basin continue to provide good giant garter snake habitat (Figure 8).

### **Literature Cited**

Casazza, M. L., G. D. Wylie, and C. J. Gregory. 2000. A funnel trap modification for surface collection of aquatic amphibians and reptiles. *Herpetological Review* 31(2), 91-92.

Wylie, G. D., M. L. Casazza, L. Martin, and E. Hansen. 2000. Investigations of giant garter snakes in the Natomas Basin: 2000 field season. Progress report to The Natomas Basin Conservancy. USGS-BRD, Dixon, CA.



Ditch on Sills Ranch property.

Table 1. Snake and trapping statistics associated with the Sills Ranch Property trapping effort.

<b>Trapline Name</b>	<b>Population Estimate</b>	<b>Density Estimate (snakes/km)</b>	<b>Total number of captures</b>	<b>Total number of recaptures</b>	<b>Total number of traps</b>	<b>Trap Dates</b>
Sills Ranch	*	*	6	0	55	7/11/02-8/26/02





Ditch located on Airport property, adjoining Miester Road.

Table 2. Snake and trapping statistics associated with trapping effort at Miester Road ditch.

Trapline Name	Population Estimate	Density Estimate (snakes/km)	Total number of captures	Total number of recaptures	Total number of traps	Trap Dates
Miester Road	*	*	1	0	28	8/8/02-9/10/02



Ditch off of Elkhorn Road.

Table 3. Snake and trapping statistics associated with trapping effort at Elkhorn ditch.

<b>Trapline Name</b>	<b>Population Estimate</b>	<b>Density Estimate (snakes/km)</b>	<b>Total number of captures</b>	<b>Total number of recaptures</b>	<b>Total number of traps</b>	<b>Trap Dates</b>
Elkhorn	*	*	0	0	59	7/18/02-8/23/02



Ditch on Bennett South property.

Table 4. Snake and trapping statistics associated with the trapping effort at Bennett South property ditch.

<b>Trapline Name</b>	<b>Population Estimate</b>	<b>Density Estimate (snakes/km)</b>	<b>Total number of captures</b>	<b>Total number of recaptures</b>	<b>Total number of traps</b>	<b>Trap Dates</b>
Bennett S.	27	45 ± 5.99 (95% C.I. 20-47)	20	6	30	6/11/02- 8/8/02



Ditch on Lucich North property

Table 5. Snake and trapping statistics associated with the trapping effort at the Lucich North property.

Trapline Name	Population Estimate	Density Estimate (snakes/km)	Total number of captures	Total number of recaptures	Total number of traps	Trap Dates
Lucich N.	41	$31.8 \pm 7.5$ (95% C.I. 37-64)	35	13	62	4/23/02-6/7/02



Ditch on east side of Ayala property



Ditch at south end of property



Edge of rice located at west side of Ayala property

Table 6. Snake and trapping statistics associated with the trapping effort at the Ayala property.

Trapline Name	Population Estimate	Density Estimate (snakes/km)	Total number of captures	Total number of recaptures	Total number of traps	Trap Dates
Ayala	*	*	0	0	73	7/3/02-8/22/02



Ditch commonly referred to as Snake Alley.

Table 7. Snake and trapping statistics associated with the trapping effort at Snake Alley.

<b>Trapline Name</b>	<b>Population Estimate</b>	<b>Density Estimate (snakes/km)</b>	<b>Total number of captures</b>	<b>Total number of recaptures</b>	<b>Total number of traps</b>	<b>Trap Dates</b>
Snake Alley	38	20 ± 8.3 (95% C.I. 28-64)	24	10	59	5/17/02-7/18/02



Ditch on NTI property near I-99 and an airstrip.

Table 8. Snake and trapping statistics associated with trapping effort at canal known as Airstrip.

<b>Trapline Name</b>	<b>Population Estimate</b>	<b>Density Estimate (snakes/km)</b>	<b>Total number of captures</b>	<b>Total number of recaptures</b>	<b>Total number of traps</b>	<b>Trap Dates</b>
Airstrip	*	*	23	1	55	5/13/02-7/11/02



Ditch on Lucich South property.

Table 9. Snake and trapping statistics associated with trapping effort at Lucich South property.

<b>Trapline Name</b>	<b>Population Estimate</b>	<b>Density Estimate (snakes/km)</b>	<b>Total number of captures</b>	<b>Total number of recaptures</b>	<b>Total number of traps</b>	<b>Trap Dates</b>
Lucich S.	55	55 ± 12.5 (95% C.I. 38-89)	23	3	60	5/10/02- 7/3/02





Pond at east side of BKS



BKS E-W canal adjacent to pond



Pond at west end of BKSE-W canal



Canal middle of BKS property near house



Marsh S-W side of BKS



Ditch at west edge of BKS property

Table 10. Snake and trapping statistics associated with trapping effort at the BKS property.

<b>Trapline Name</b>	<b>Population Estimate</b>	<b>Density Estimate (snakes/km)</b>	<b>Total number of captures</b>	<b>Total number of recaptures</b>	<b>Total number of traps</b>	<b>Trap Dates</b>
BKS	*	*	2	1	63	6/7/02-9/10/02

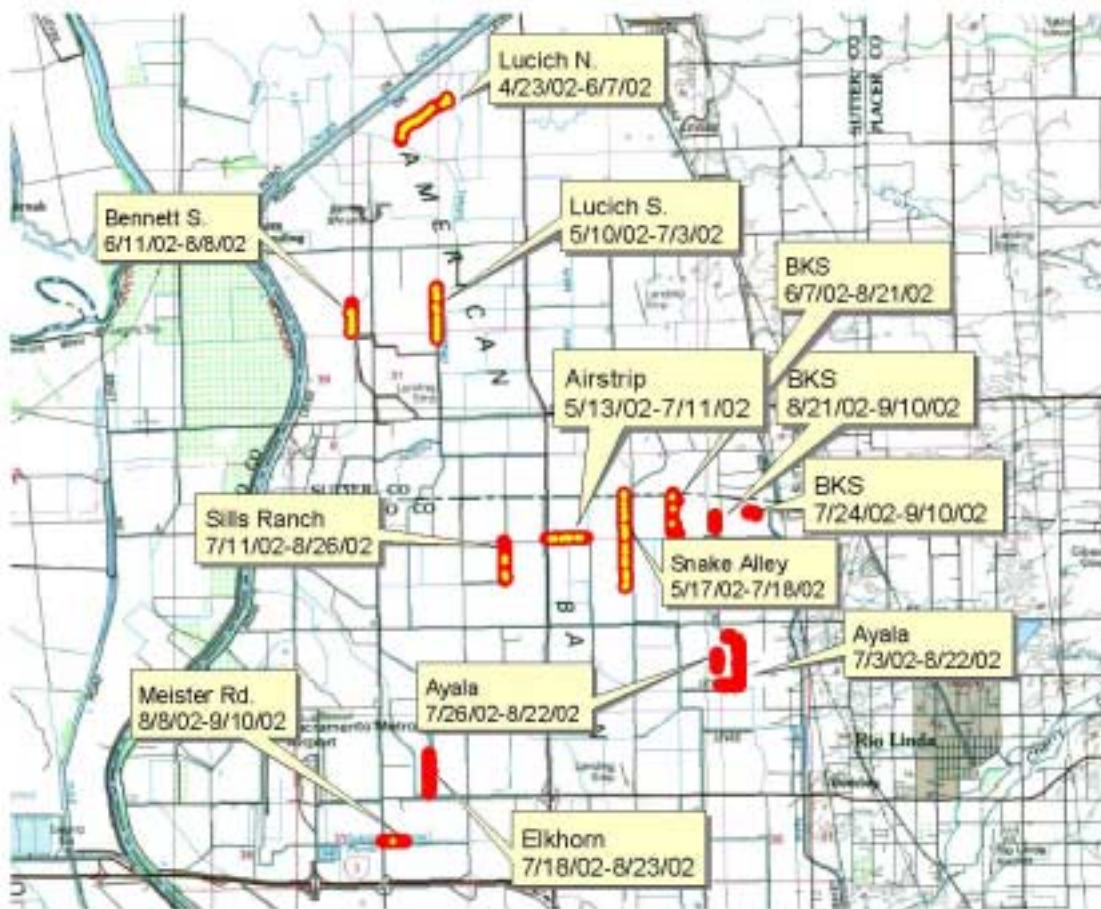


Figure 1. Trap locations showing locations of giant garter snake captures and duration of trapping.

