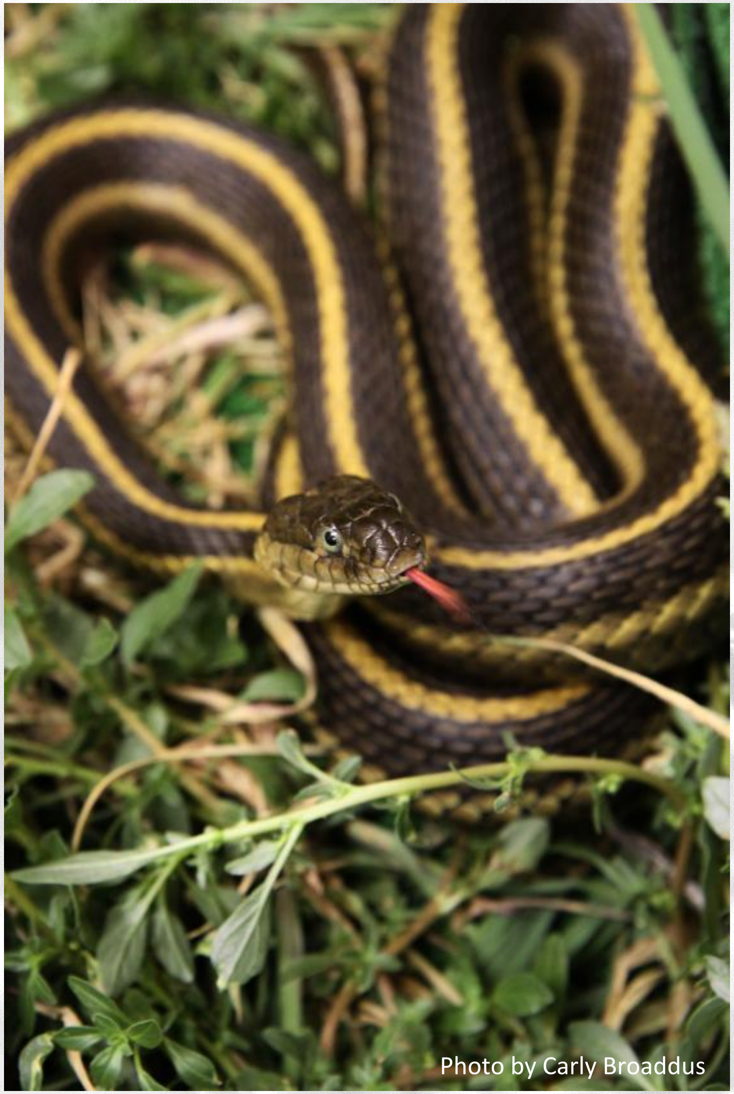
Giant Gartersnake Ecology and Management

Brian J. Halstead, Glenn D. Wylie, Shannon Skalos, and Michael L. Casazza

U.S. Geological Survey
Western Ecological Research Center
Dixon Field Station

Overview

- History
- Research Methods
- Identification
- Biology
- Management
  - All interspersed with research results



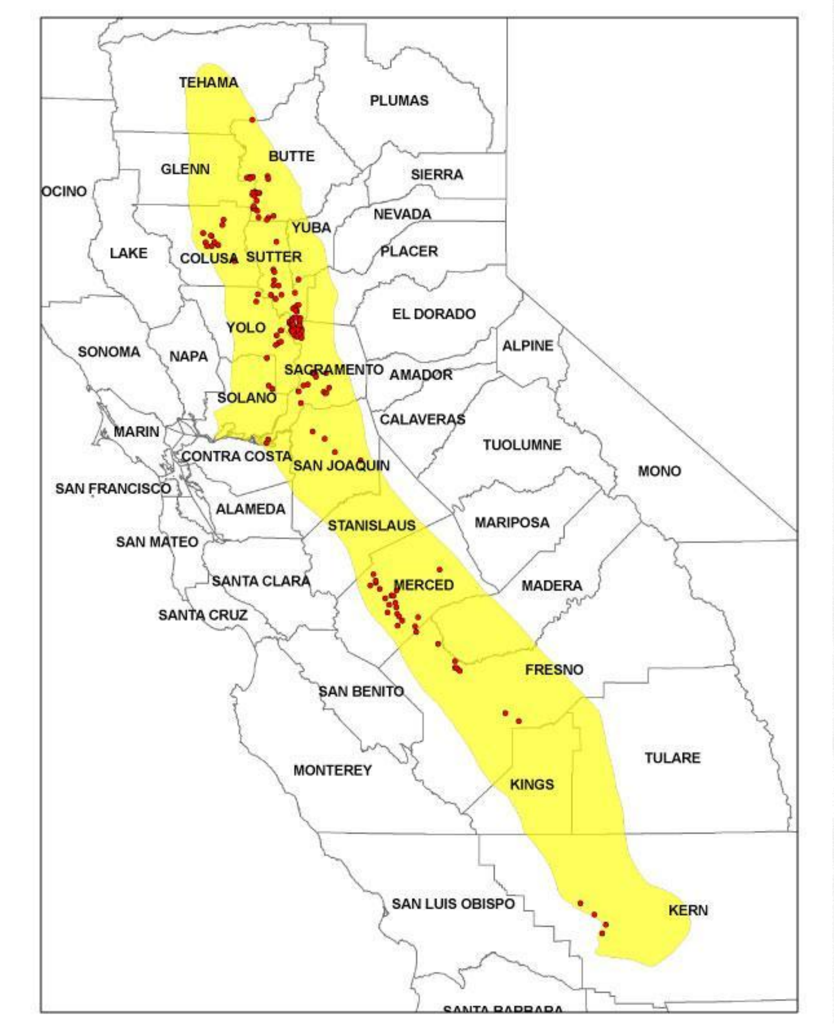
History

- Described by Fitch (1940) as *Thamnophis ordinoides* (later *couchii*) *gigas*
- Elevated to full species (*Thamnophis gigas*) in 1987
- State listed as Threatened in 1971
- Federally listed as Threatened in 1993

Photo by Carly Broaddus

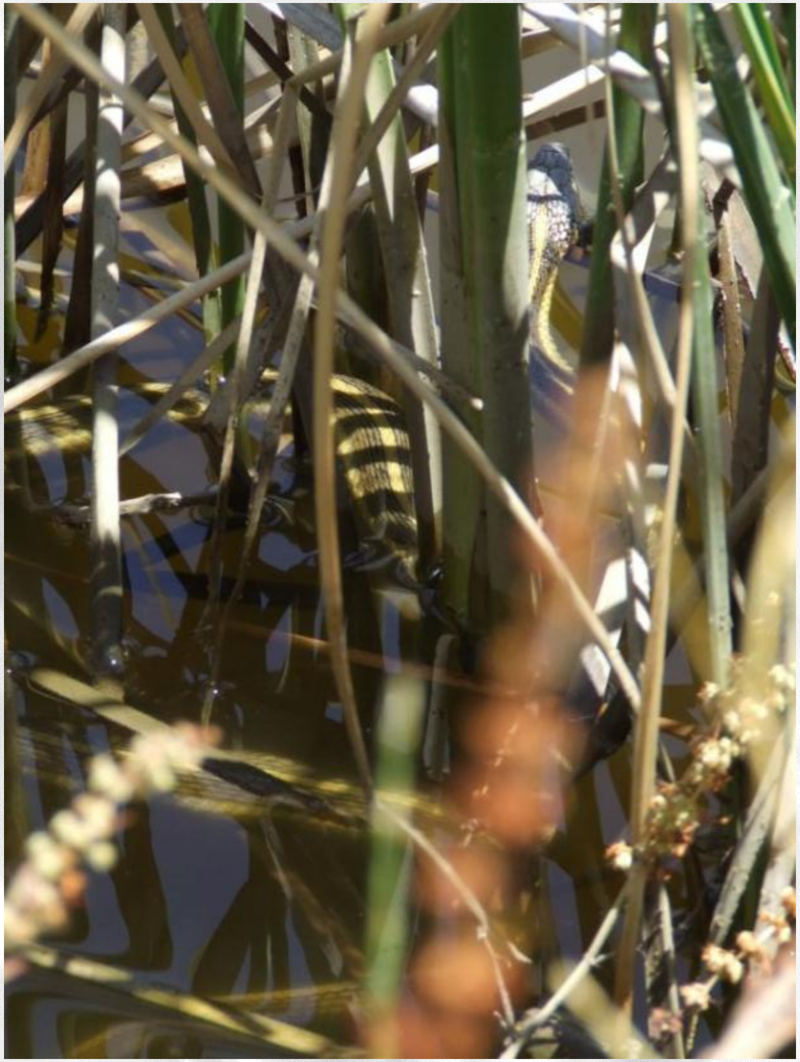
Historic Range

- Endemic to Central Valley
- Tule marsh habitat
- Extirpated from much of range with conversion of wetlands to agriculture



USGS Giant Gartersnake Research

- Est. 1995
- Detection/non-detection
- Capture-mark-recapture



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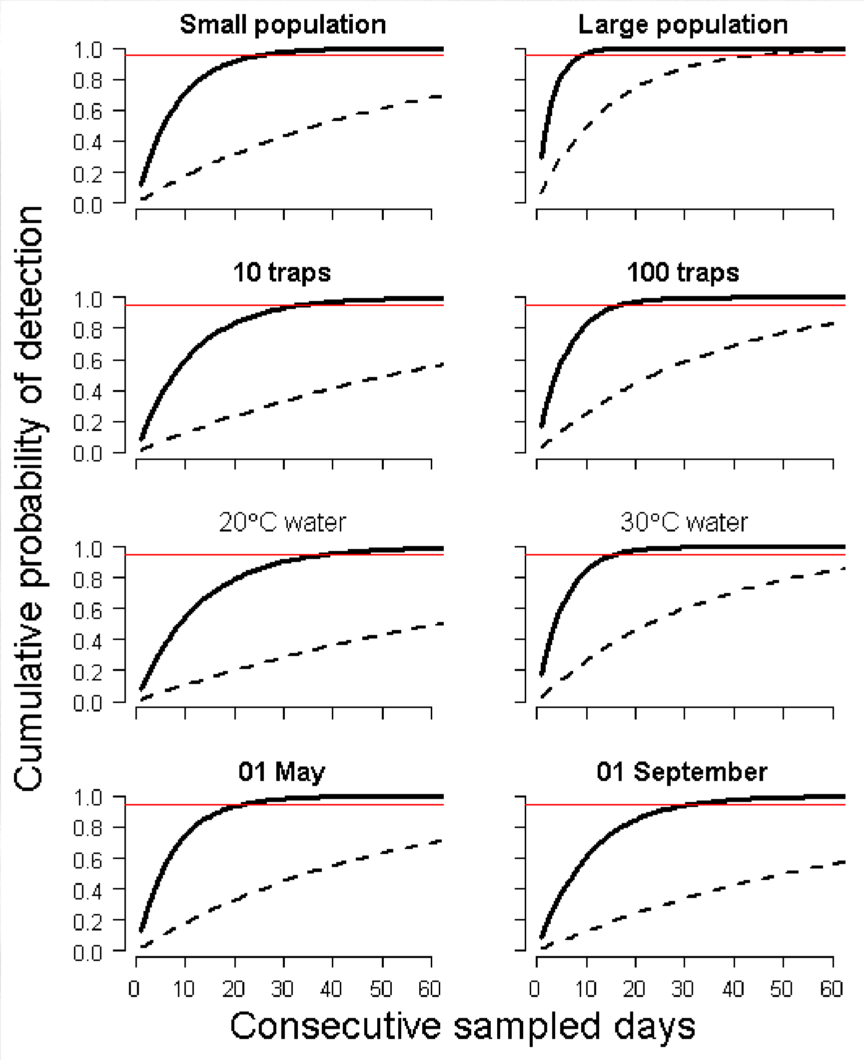
Sampling Protocols

- Survey conditions affect detection probability
  - Abundance
  - Number of traps
  - Water temperature
  - Date
- Must be accounted for when interpreting negative survey results



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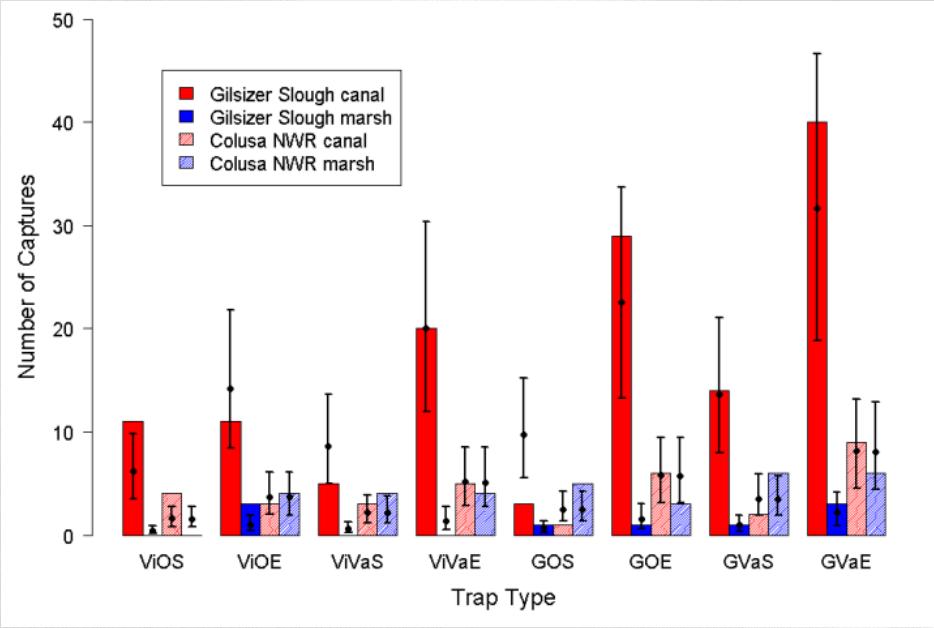
Trap Design



50
40
30
20
10
0
Number of Captures
Gilsizer Slough canal
Gilsizer Slough marsh
Colusa NWR canal
Colusa NWR marsh
ViOS
ViOE
ViVaS
ViVaE
GOS
GOE
GVaS
GVaE
Trap Type

Photo by Margaret Mantor

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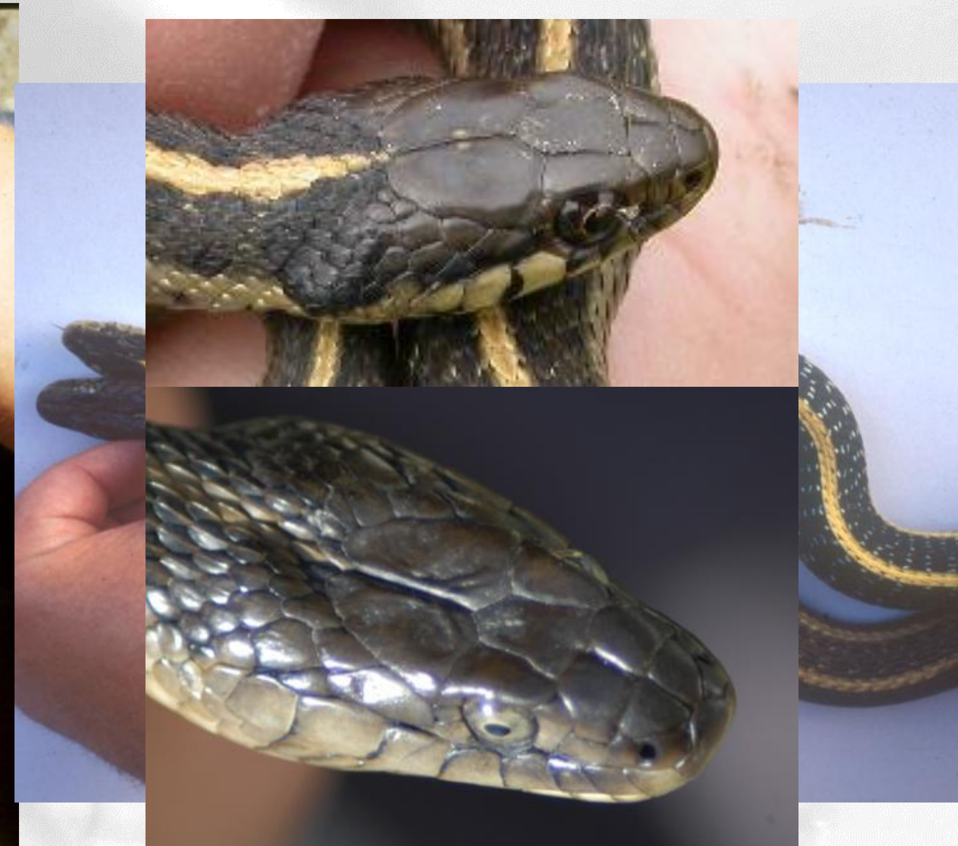
Phenotypic Variation

Sympatric Gartersnakes

Common (Valley) Gartersnake

Terrestrial (Mountain) Gartersnake



Length

- Can reach lengths > 1.2 m

Mass

- Can weigh more than 1 kg

USGS

Prey

- Fish

Prey

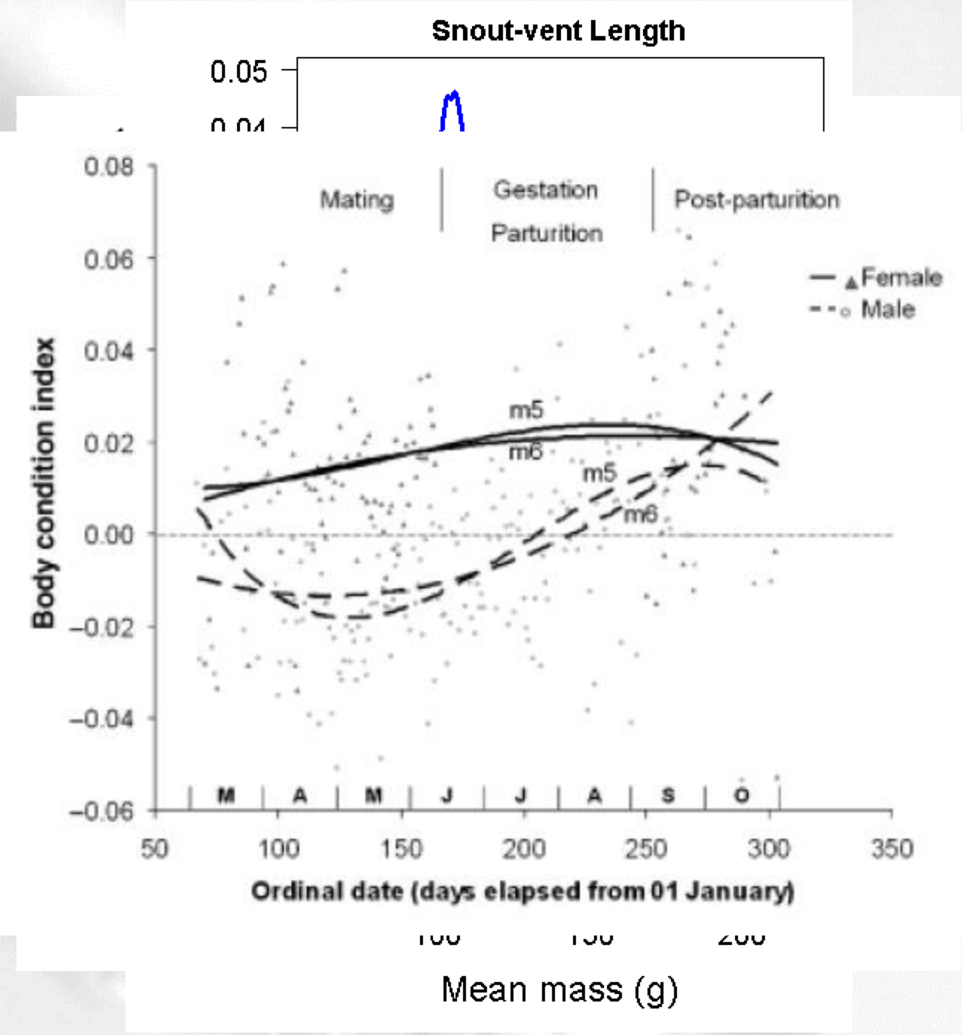
- Fish
- Tadpoles

Prey

- Fish
- Tadpoles
- Frogs

Growth and Body Condition

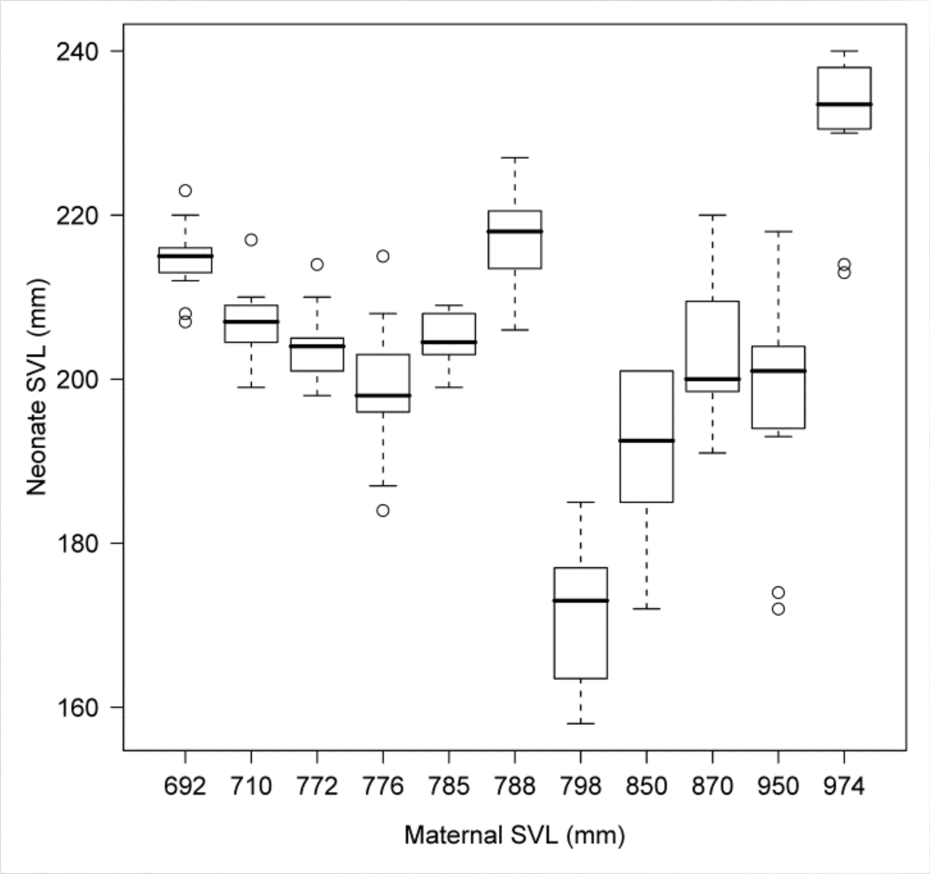
- Growth slows with size
- Differing patterns of growth
  - Males exhibit retarded growth in early spring
- Sexual size dimorphism
  - Females larger sex
- Differing patterns of body condition
  - Greatest difference in spring; female condition greater than males

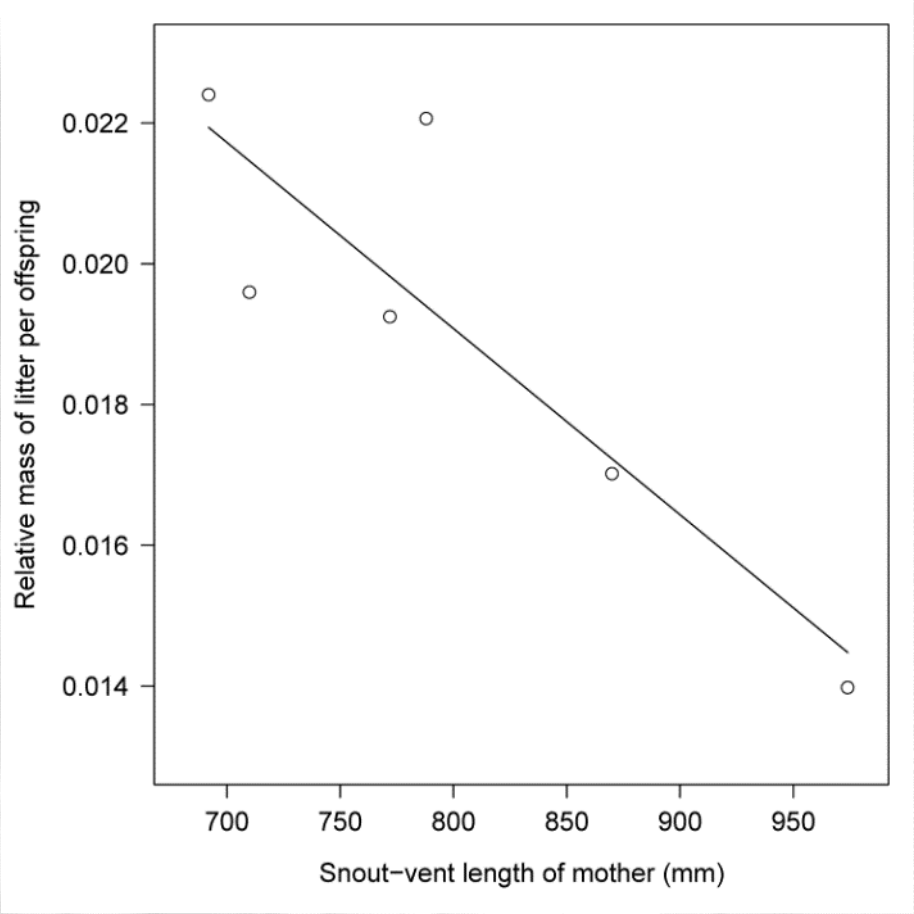


Reproduction

- Mean litter size = 17 (13 – 21)
- Litters usually born mid July – mid September
- Neonate size
  - SVL = 209 (197 – 221) mm
  - Mass = 4.9 (4.1 – 5.7) g

Reproduction





USGS Giant Gartersnake Research

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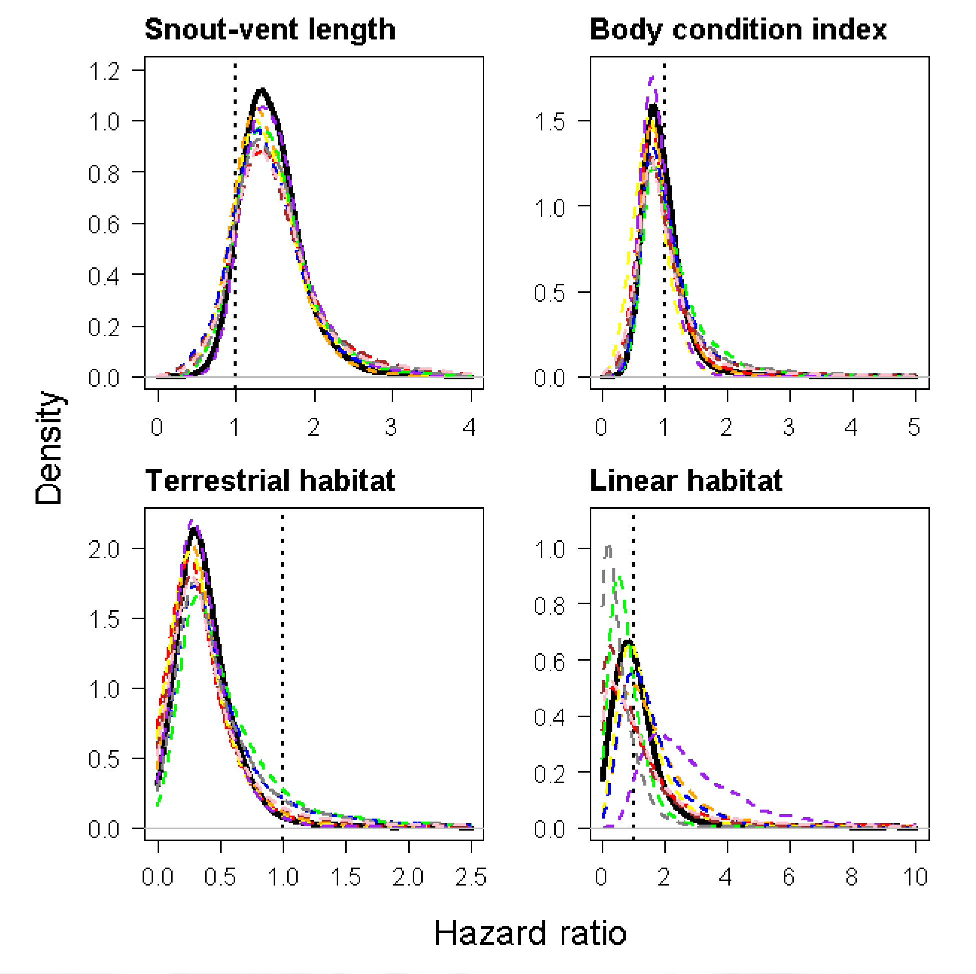
- Detection/non-detection
- Capture-mark-recapture
- Radio telemetry

Adult Female Survival

- Annual probability of survival = 0.61 (0.41 – 0.79)
- Substantial among-site variation in risk of mortality
- Substantial among-year variation in risk of mortality
- Lower risk of mortality when in terrestrial habitat
- Sites vary in riskiness of linear habitats



Predators

- Raptors
- Wading birds

Predators

- Raptors
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- Otters

Predators

- Raptors
- Wading birds
- Otters
- Bullfrogs
- Fish

Other Sources of Mortality

- Parasites
- Disease

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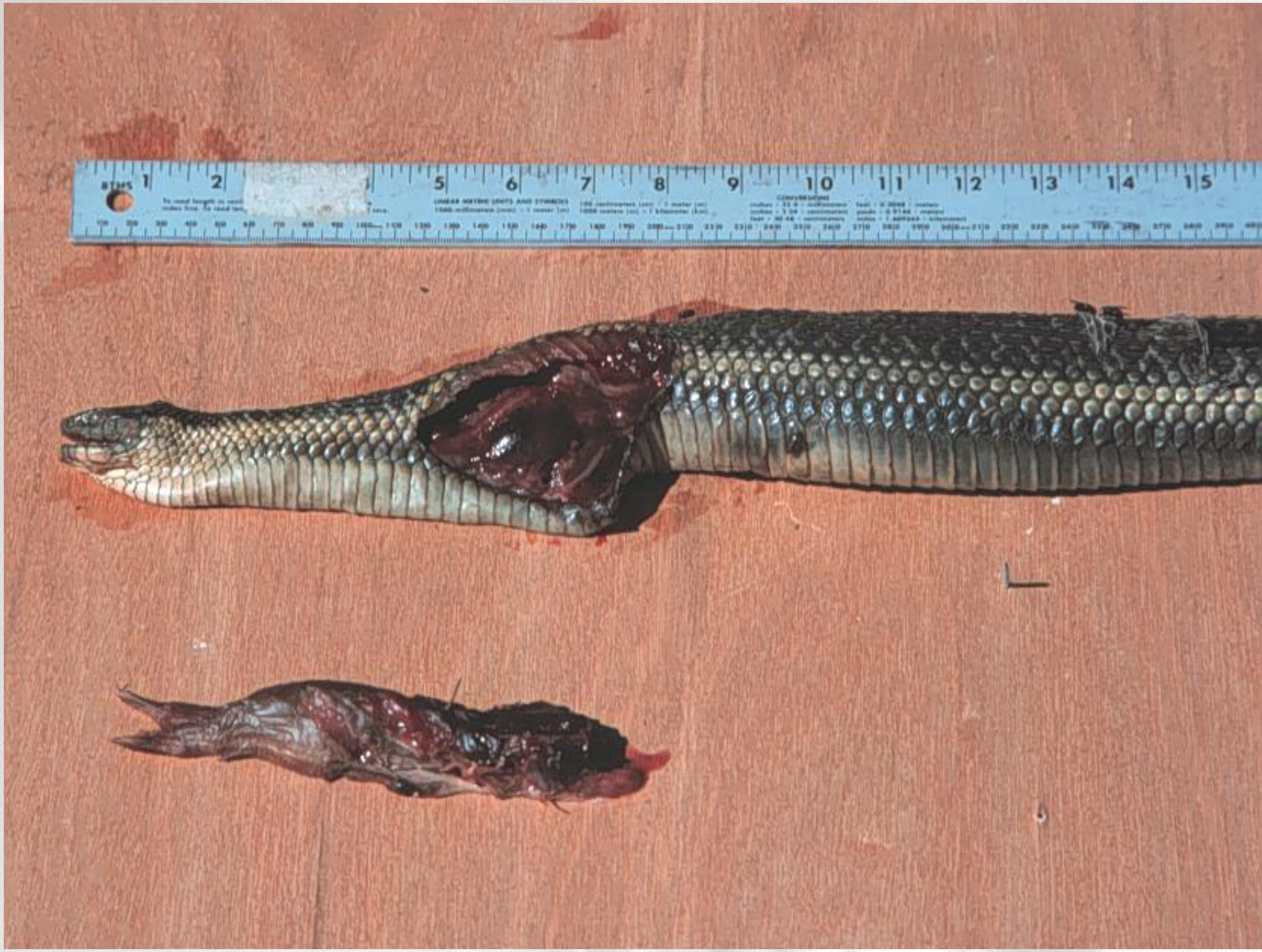
- Parasites
- Disease
- Introduced Prey

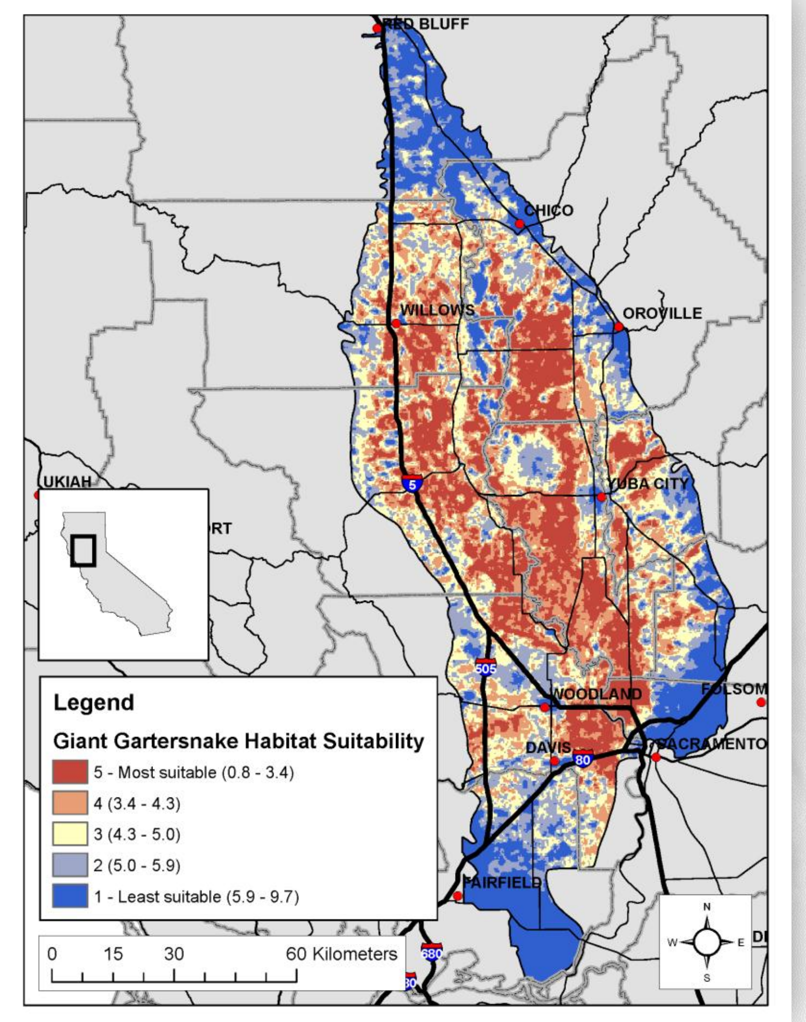


Other Sources of Mortality

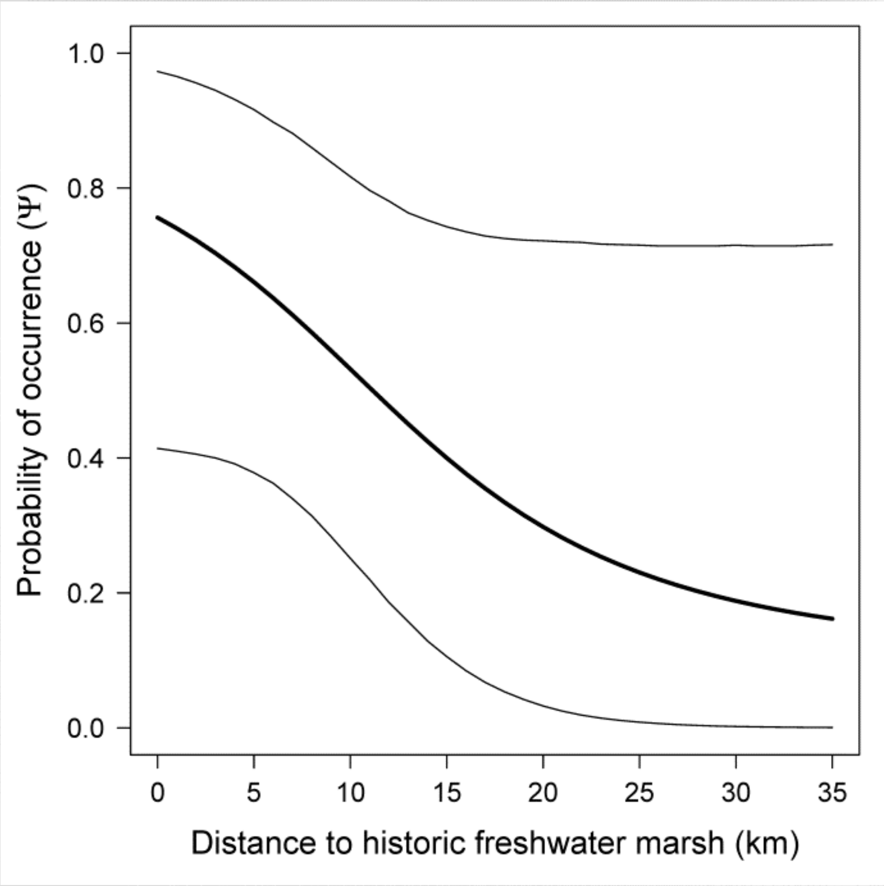
- Humans

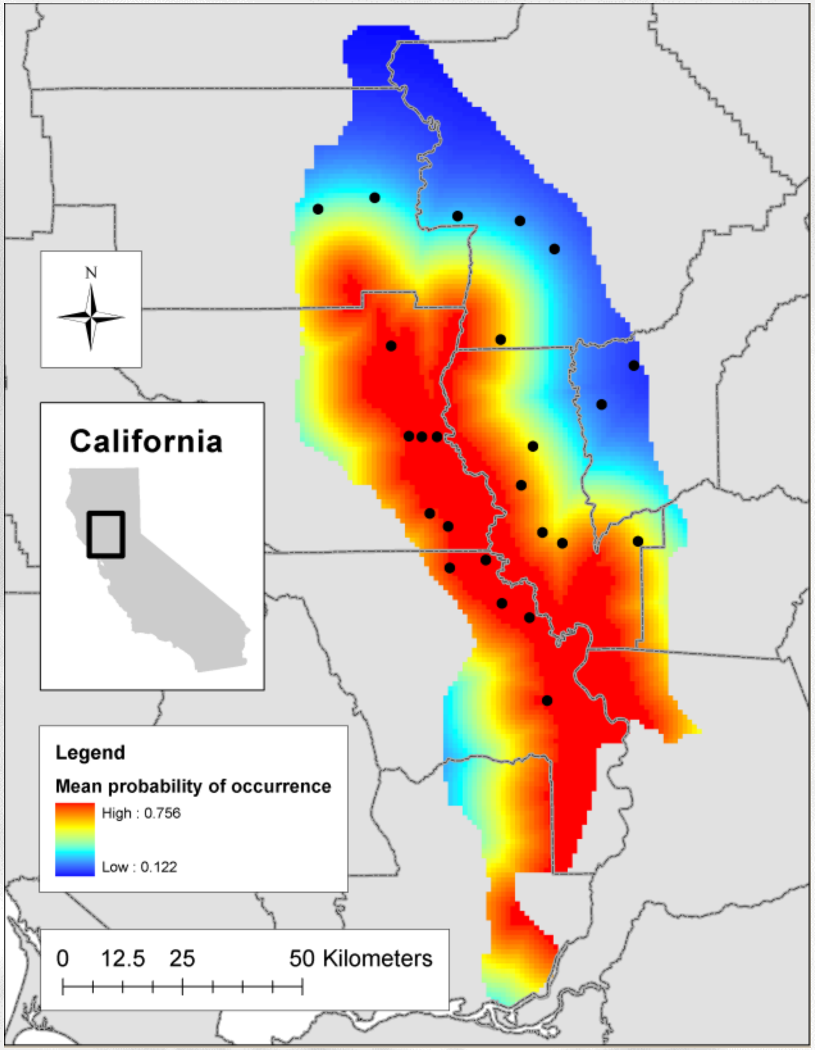
Habitat Suitability

- More likely to be found
  - Near rice
  - Near open water
  - High density of canals
  - (Near wetlands)
- These conditions primarily occur on floor of Sacramento Valley



Probability of Occurrence

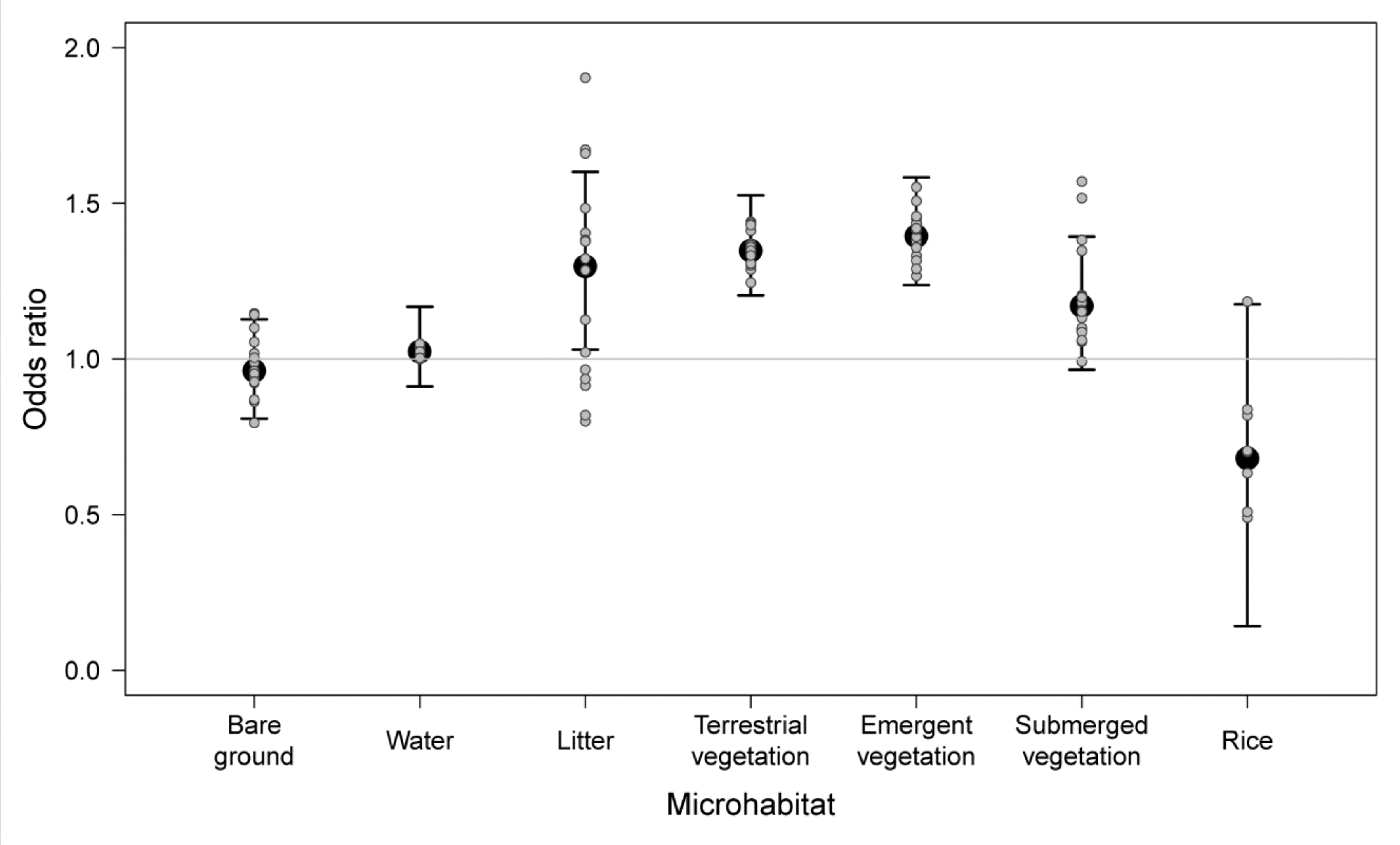




Macrohabitat Selection

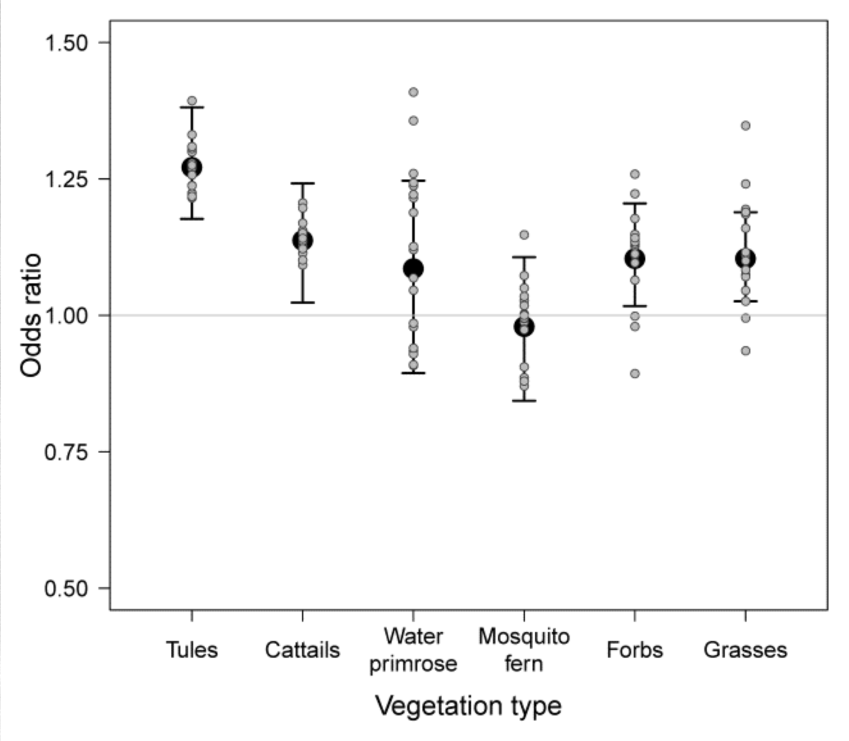
- Context-dependent
- In general,
  - Permanent marsh most positively selected
  - If permanent marsh not available, rice positively selected
  - Open water and linear waterways also important
  - Positive response to edge of water

Microhabitat Selection



Vegetation Selection

- Tules most strongly selected
- Cattails, forbs, and grasses positively selected
- Individual selection for primrose and terrestrial vegetation types variable



Active Season Habitat

- Marshes

Active Season Habitat

- Canals

Active Season Habitat

- Rice

Winter Habitat

- Banks


Winter Habitat

- Uplands

Winter Habitat

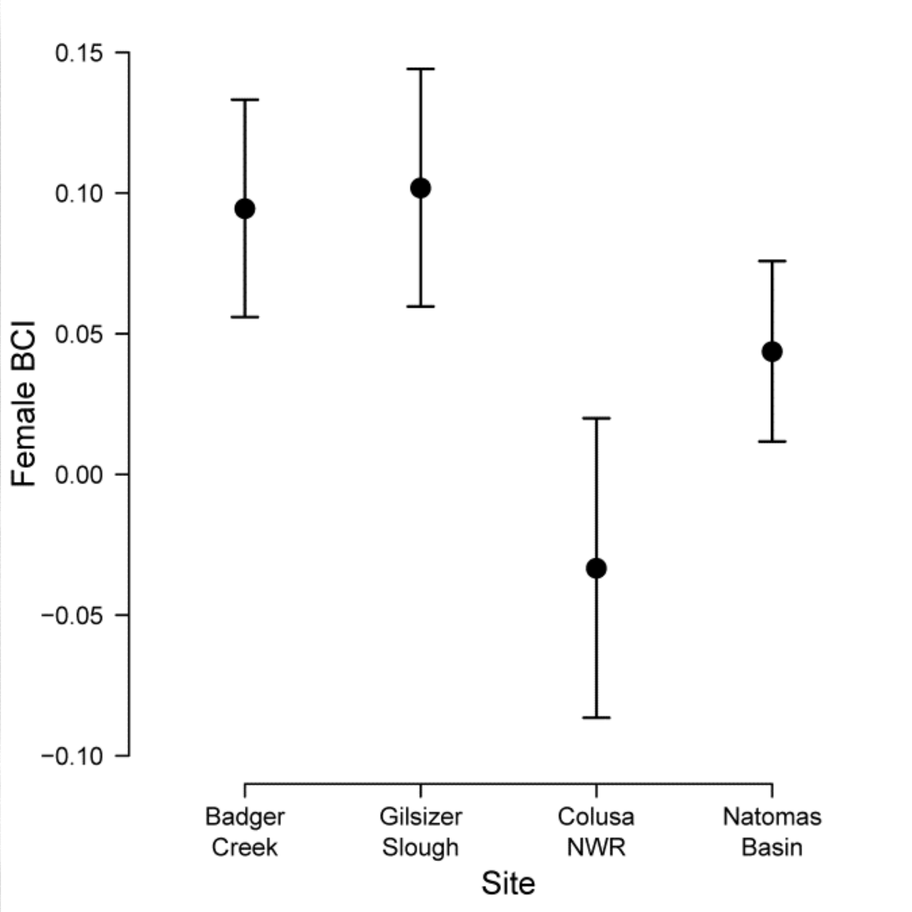
- Roadsides

Winter Habitat

- Riprap

Abundance and Density

- Sex ratio = 0.93 (0.75 – 1.15)
- Abundance and density vary with context
  - Lowest in managed seasonal marshes (dry in summer, flooded in winter)
  - Greatest in natural marshes
  - Rice intermediate
- Body condition follows similar patterns



Habitat Management

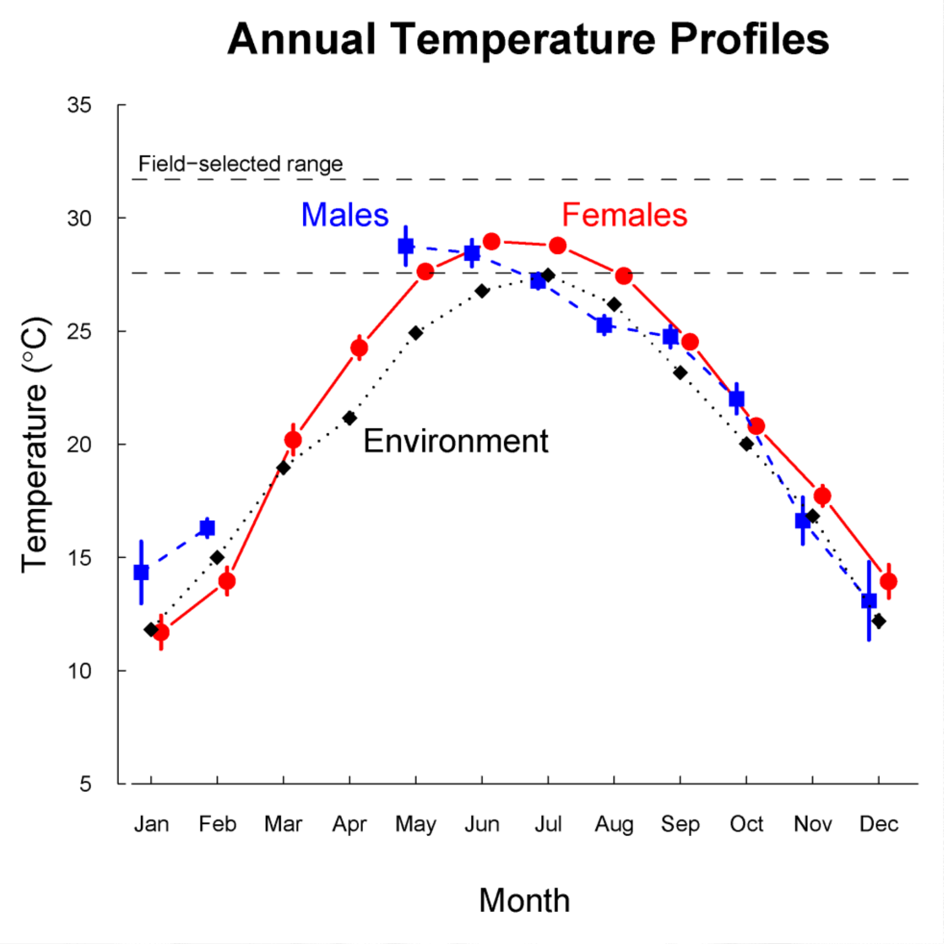
- Water management

Habitat Management

- Invasive plant control

Thermal Ecology

- Snakes don't use thermal environment at random
- Males and females use thermal environment differently
  - Males elevate body temperature in late winter/early spring
  - Females elevate body temperature in late spring/early summer



Habitat Management

- Timing of mowing important
  - Cold, overcast days during inactive season
  - Hot afternoons during active season
  - AVOID warm sunny mornings, especially in spring

Habitat Management

- Spoil piles from dredging can entomb snakes at any time of year

Habitat Management

- Debris piles near canals and wetlands attract giant gartersnakes
  - Best to leave them
  - Alternative is to move debris away as it is removed from water control structures

Habitat Management

- Avoid ground-disturbing activities during hibernation

Summary

- Greatly increased knowledge about giant gartersnakes
- Many information gaps remain
  - Response to management practices
  - Restoration ecology
  - Relative value of different habitat types
  - Effects of invasive species (prey, predators, plants)
  - Male and juvenile survival
  - Many more

Acknowledgments

- California and U.S. Wildlife Refuges/Areas
- Numerous Biological Technicians
- Numerous Landowners
- Numerous Water Districts
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  - California Waterfowl Association
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  - Solano County Water Agency
  - U.S. Army Corps of Engineers
  - U.S. Bureau of Reclamation
  - U.S. Fish and Wildlife Service
  - Yolo Resource Conservation District

Questions?


Photo by Carly Broaddus

For more information…

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