

Surveys for the northern Mexican gartersnake (*Thamnophis eques megalops*) at Havasu NWR



United States Fish and Wildlife Service

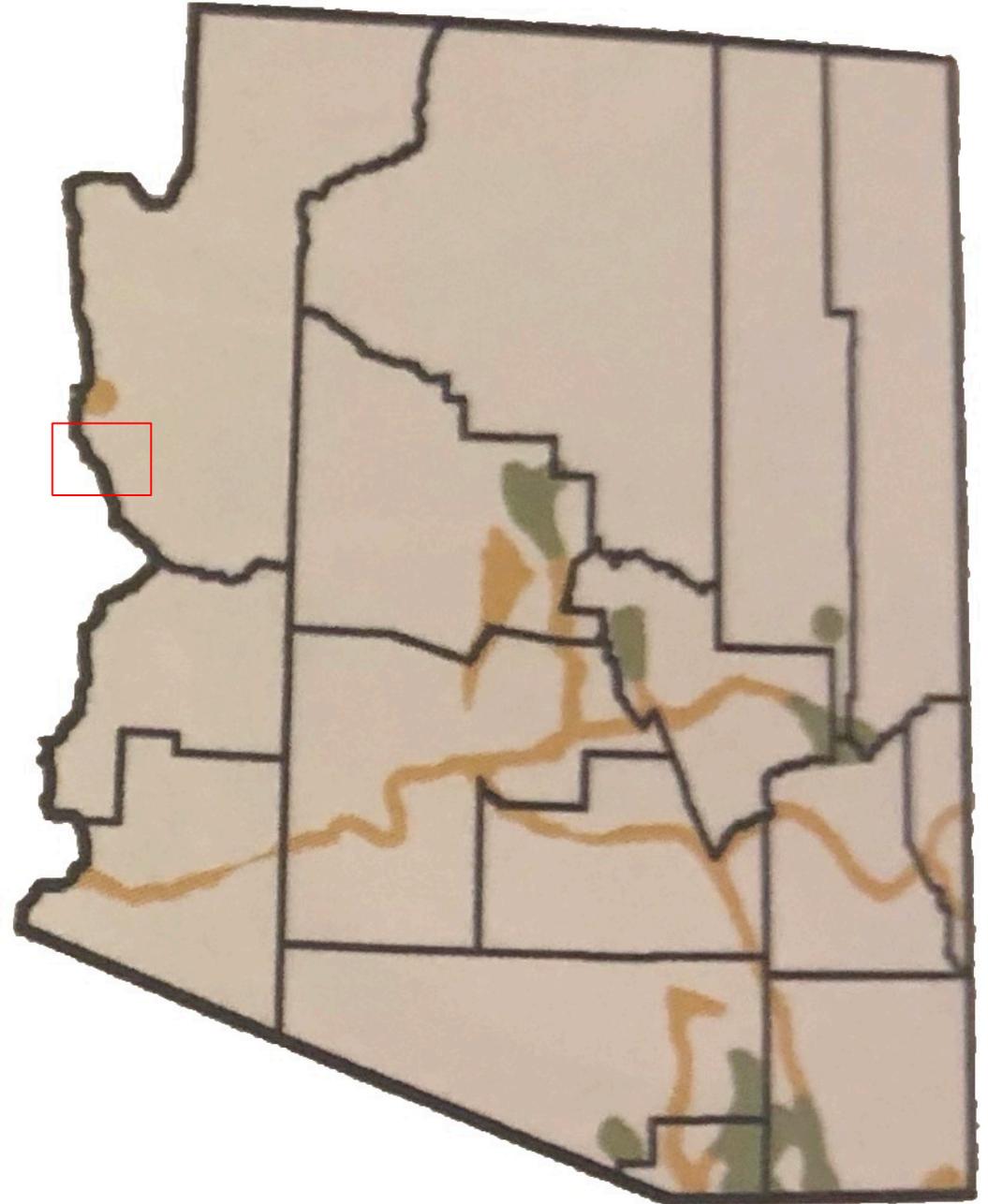
Havasu National Wildlife Refuge

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Northern Mexican Gartersnake (NMGS) Status

- Listed as federally threatened under the Endangered Species Act on July 8, 2014
 - Predation from and competition with nonnative species
 - Habitat loss/ alteration
- Historic U.S. distribution included a few streams in New Mexico and all major Arizona watersheds
- Believed to be extirpated from lower Colorado River



Life History

Habitat

- River pools, backwaters of lentic and lotic systems
- Hunting on waterbody banks
- Very cryptic

Prey/Predators

- Primarily native fish and amphibian species
- Shift observed toward non-native prey
- Predated by spiny-rayed fishes, bullfrogs, crayfish



History of NMGS in Lake Havasu Refuge Complex

Havasu NWR

- Historic sighting along LCR in early 1900's
- Great Basin Bird Observatory staff reported sighting at Beal Lake Conservation Area in 2014

Bill Williams River NWR

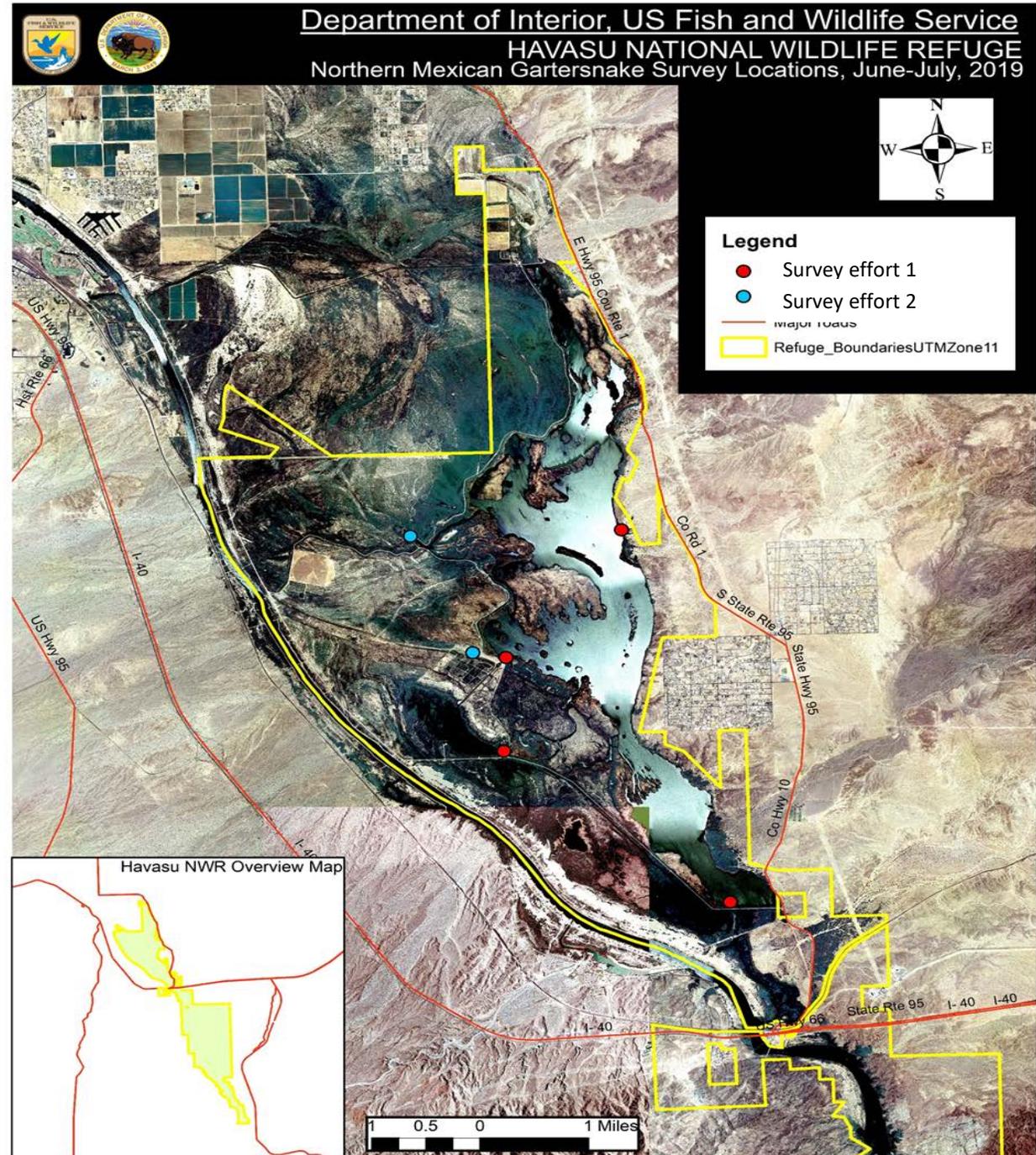
- Historic sightings at Planet Ranch

No specific survey effort for this species



Survey Locations

- 1st Rotation: 6/11/19 – 7/3/19
 - South Dike Interior, South Dike East, 5-mile landing, Beal Lake Slough
- 2nd Rotation: 7/5/19 – 7/25/19
 - Willow Marsh, Glory Hole
- 4,100+ Trap days



Survey Methods

- 100 1/8th inch mesh modified gee minnow traps
- 25 meters apart
- Checked twice daily
- Prey counted
- Captured NMGS processed



NMGS Processing

- Weight
- Sex
- Snout to Vent Length
- Tail Length
- Tail Clip
- Scars
- Brand



Predator/Prey captures

Species	5-mile Landing		Beal Lake Slough		Glory Hole		South Dike East		South Dike Interior		Willow Marsh		Total	
	Abundance	Catch per unit effort	Abundance	Catch per unit effort	Abundance	Catch per unit effort	Abundance	Catch per unit effort	Abundance	Catch per unit effort	Abundance	Catch per unit effort	Abundance	Catch per unit effort
Mosquitofish	286	0.51071	112	0.23188	171	0.43511	159	0.28909	273	0.47478	38,653	24.27952	39,654	9.54828
Unidentified Freshwater Shrimp spp.	8,699	15.53390	2,951	6.10973	21	0.05344	3,879	7.05273	1,213	2.10957	298	0.18719	17,061	4.10811
Northern Crayfish	30	0.05357	14	0.02899	84	0.21374	156	0.28364	341	0.59304	1,553	0.97550	2,178	0.52444
Bullfrog (pre-metamorph)	18	0.03214	3	0.00621	657	1.67176	1	0.00182	282	0.49043	556	0.34925	1,517	0.36528
Bullfrog (post-metamorph)	0	0.00000	1	0.00207	796	2.02545	1	0.00182	1	0.00174	411	0.25817	1,210	0.29136
Belostomatid spp.	56	0.10000	11	0.02277	6	0.01527	14	0.02545	10	0.01739	498	0.31281	595	0.14327
Unidentified Spider	64	0.11429	102	0.21118	2	0.00509	66	0.12000	144	0.25043	122	0.07663	500	0.12039
Bass spp.	22	0.03929	70	0.14493	1	0.00254	62	0.11273	147	0.25565	3	0.00188	305	0.07344
Unidentified Odonate larve	0	0.00000	0	0.00000	3	0.00763	1	0.00182	12	0.02087	215	0.13505	231	0.05562
Sunfish spp.	13	0.02321	33	0.06832	0	0.00000	43	0.07818	1	0.00174	1	0.00063	91	0.02191
Baja California Treefrog (pre-metamorph)	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	22	0.01382	22	0.00530
Diving Beetle spp.	16	0.02857	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	16	0.00385
Baja California Treefrog (post-metamorph)	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	8	0.00503	8	0.00193

South Dike Interior

- 25 traps
- Prey:
 - Mosquitofish
 - Bullfrog Tadpoles
- Predators:
 - Northern Crayfish
 - Spiny-rayed fishes
 - Bullfrog

○ 6/11/19-7/3/2019

NMGS **not** detected





South Dike East

- 25 traps
- Prey:
 - Mosquitofish
- Predators:
 - Northern Crayfish
 - Spiny-rayed fishes

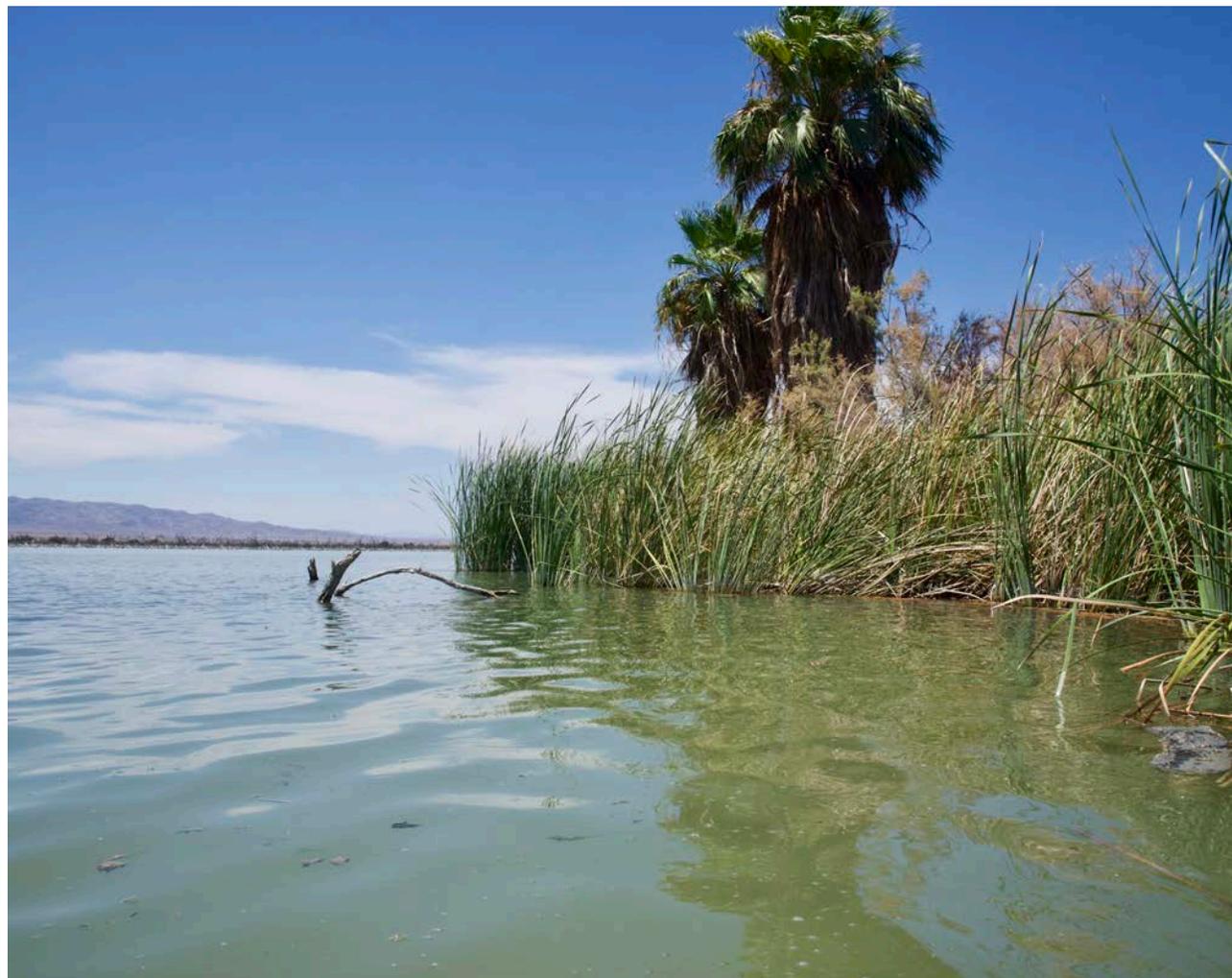
○ 6/11/19-7/3/2019
NMGS **not** detected

5 Mile Landing

- 25 traps
- Prey:
 - Mosquitofish
 - Freshwater shrimp
- Predators:
 - Northern Crayfish
 - Spiny-rayed fishes
 - Bullfrog

○ 6/11/19-7/3/2019

NMGS **not** detected





Beal Lake Slough

- 21 traps
- Prey:
 - Mosquitofish
- Predators:
 - Spiny-rayed fishes
 - Northern Crayfish

○ 6/11/19-7/3/2019

NMGS **not** detected

Willow Marsh

- 4 traps (part of Beal Lake Slough array)
 - 6/11/2019-7/3/2019
 - 75 traps
 - Prey:
 - Mosquitofish
 - Bullfrog tadpoles
 - Juvenile bullfrogs
 - Baja California Treefrog
 - Predators:
 - Bullfrog
 - Northern Crayfish
 - 7/5/2019-7/25/2019
- 7 NMGS captured**





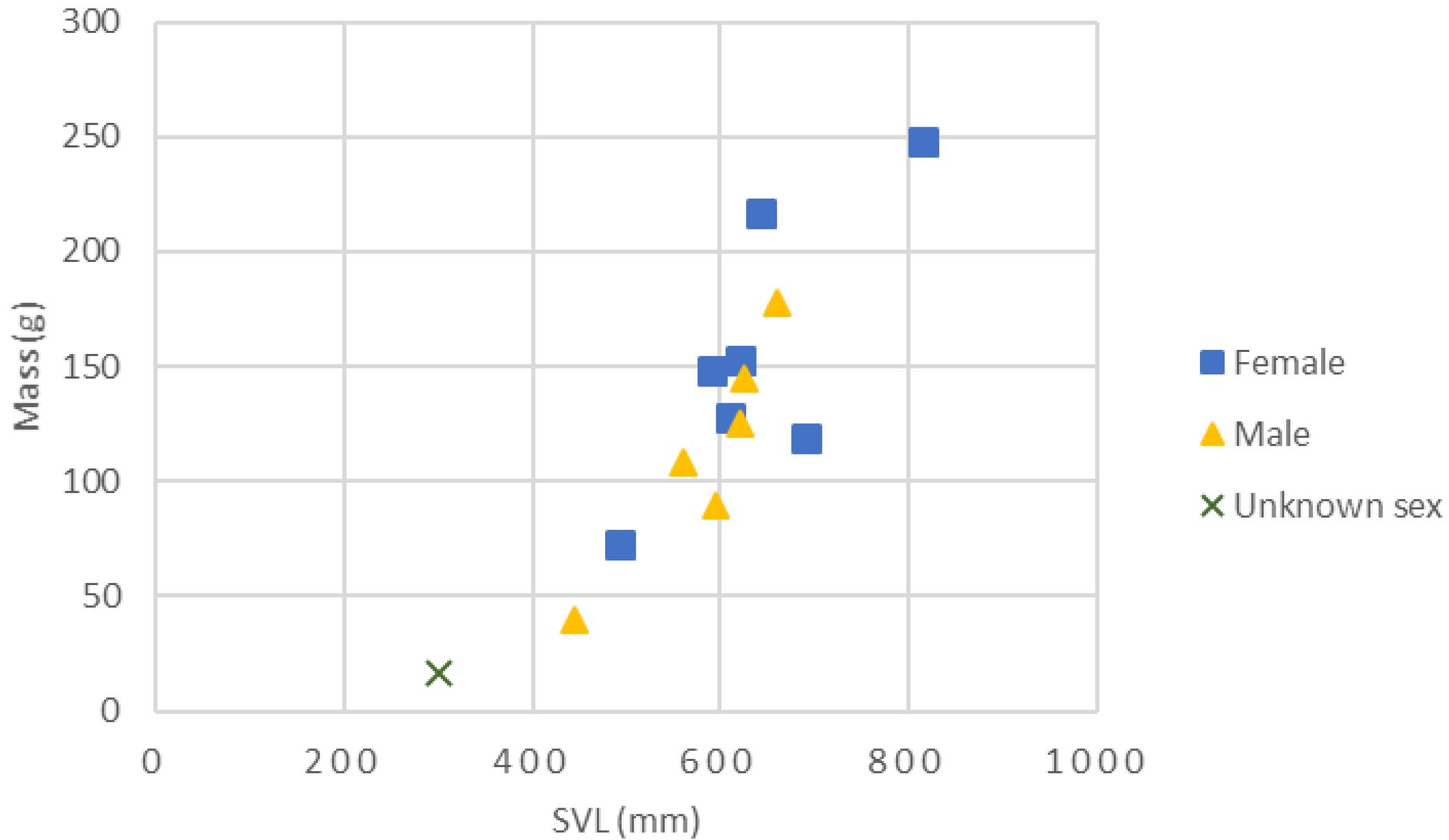
Glory Hole

- 25 traps
 - Prey:
 - Bullfrog tadpoles
 - Mosquitofish
 - Predators:
 - Bullfrog
 - Northern Crayfish
- 7/5/2019-7/25/2019
- 8 NMGS caught**

Captured Snakes

Survey Location	Trap-Days	Trap-Hours	# Individual T. eques	Total Captures T. eques	Detection Rate
5-mile Landing	560	13,440	0	0	0
Beal Lake Slough	483	11,592	0	0	0
Glory Hole	393	9,432	8	11	0.027/0.0008
South Dike East	550	13,200	0	0	0
South Dike Interior	575	13,800	0	0	0
Willow Marsh	1592	38,208	7	21	0.013/0.0005
Total	4153	99,672	15	32	0.007/0.0003

- 7 females | 6 males | 2 unknown sex
- 13 adults | 2 juveniles



Conclusions/future efforts

- **Adjacent native riparian vegetation**
- **Isolated wetlands/dense vegetation**
- **Aquatic Invasive species**

- **Future Surveys**
- **Bill Williams NWR 2020**

Acknowledgements

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Mason Ryan – AZGFD



Citations

- Arizona Ecological Services and Field Office. 2013. Current Population Status of Northern Mexican and Narrow-headed Gartersnakes in the United States.
- Arizona Ecological Services and Field Office. 2014. *General Species Information*[PDF].
- Brennan, T. C., & Holycross, A. T. 2006. *A field guide to amphibians and reptiles in Arizona*. Phoenix, AZ: Arizona Game and Fish Dept.
- Nowak, E.M. 2013. Protocol for Surveys and Monitoring of Narrow-headed Gartersnakes (*Thamnophis rufipunctatus*) and Northern Mexican Gartersnake (*T. eques megalops*). Unpublished protocol of Colorado Plateau Research Station, Northern Arizona University, Flagstaff, Arizona.
- U.S. Fish and Wildlife Service. 2013. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Northern Mexican Gartersnake and Narrow-headed Gartersnake; Proposed Rule (78 FR 41550).
- U.S. Fish and Wildlife Service. 2014. Endangered and Threatened Wildlife and Plants; Threatened Status for the Northern Mexican Gartersnake and Narrow-headed Gartersnake; Final Rule (79 FR 38677).

