

Invasive Watersnakes in California: Population Status and Eradication Efforts for *Nerodia* spp.



California Invasive Plant Council
Annual Meeting – November 8, 2018

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Acknowledgement

Valerie Cook Fletcher created and managed the *Nerodia* eradication project for three years and created much of this presentation.



- Background
- Current Distribution
- Suitable Habitat
- Potential Impacts
- Eradication Efforts
- Future Direction

Background



Genus *Nerodia* = watersnakes

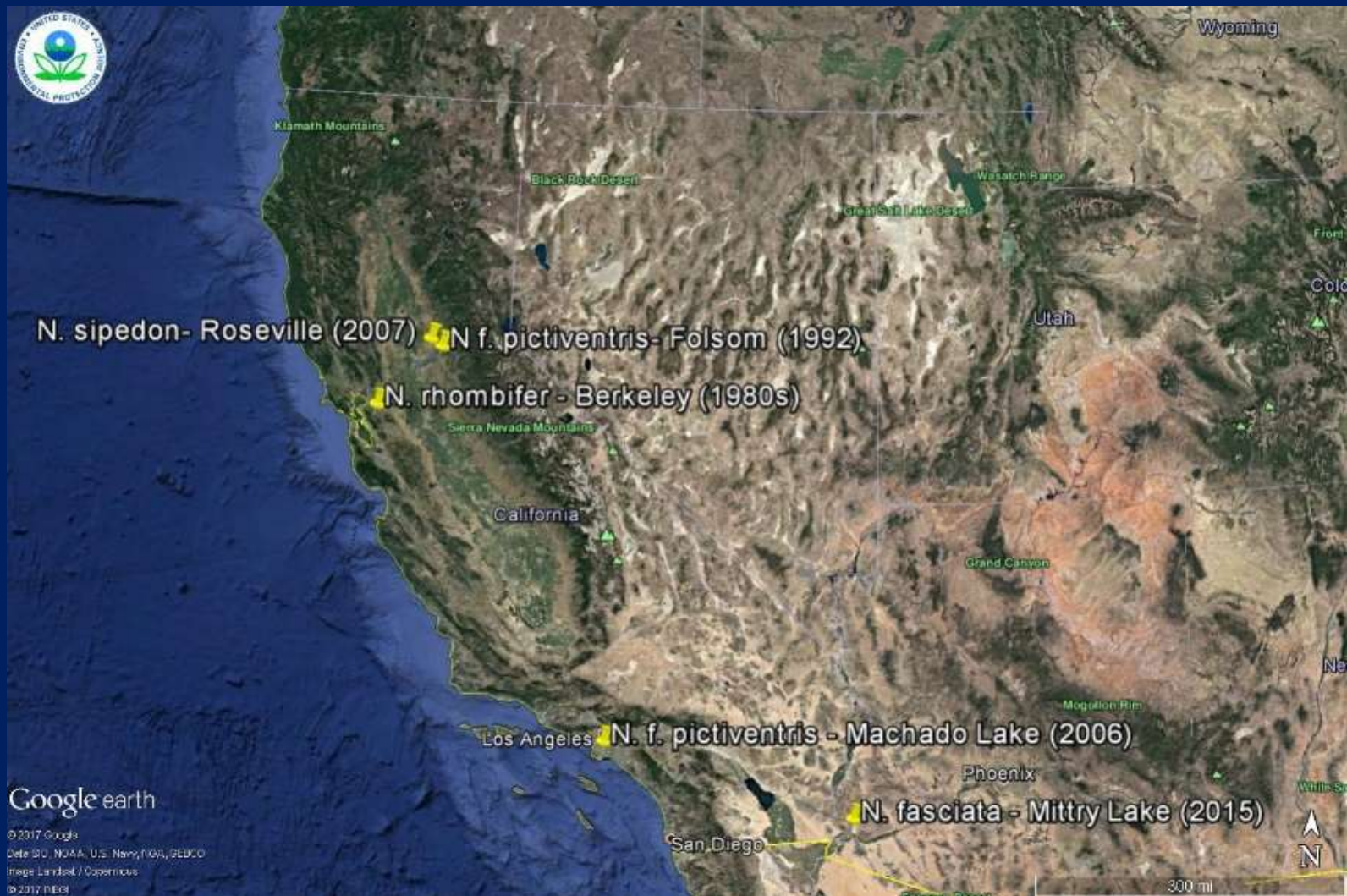
- 9 species, 14 subspecies
- Native to eastern North America
- Prey on fish and amphibians
- Introduced through pet trade
- Restricted in California since 2008



Current Distribution



To date, 5 verified populations of *Nerodia* in California



Current Distribution in Northern California



- Northern watersnake – Kaseberg Creek, Roseville
- Southern (Florida) watersnake – Folsom
- Diamondback watersnake – Lafayette Reservoir*



Nerodia sipedon

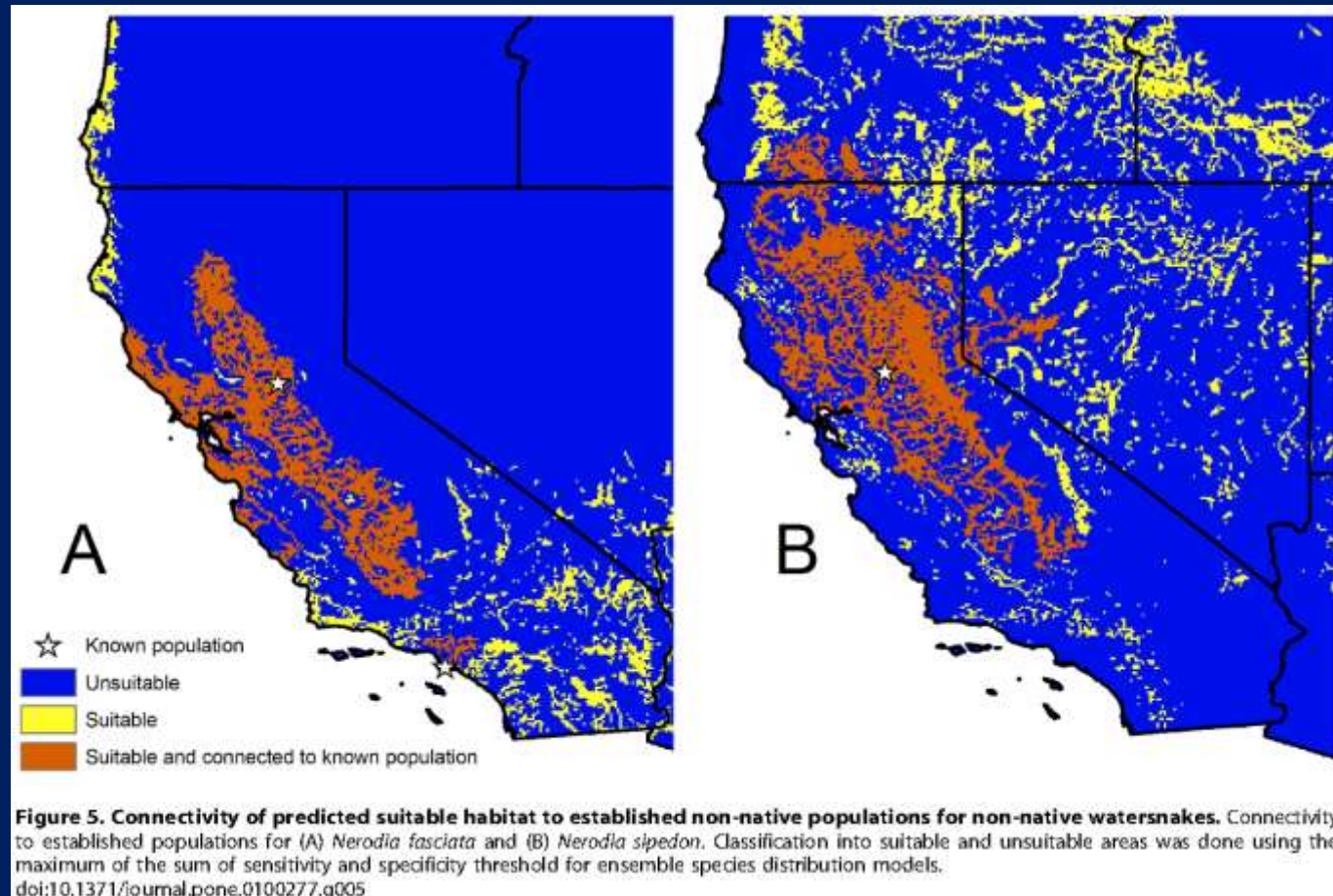


Nerodia fasciata pictiventris

Habitat Suitability



Habitat connectivity for southern (A) and northern (B) watersnakes (Rose and Todd 2014)



Potential Impacts – Sacramento Area



Overlap with California special status species (Rose and Todd 2014)

Proximal populations of concern:

- Natomas Basin giant gartersnakes (FT/ST)
- Dry Creek juvenile steelhead (FT)
- Lower American River juvenile steelhead and Chinook (SSC)
- Upper American River foothill yellow-legged frogs (SSC)



Eradication Project – Roseville, CA

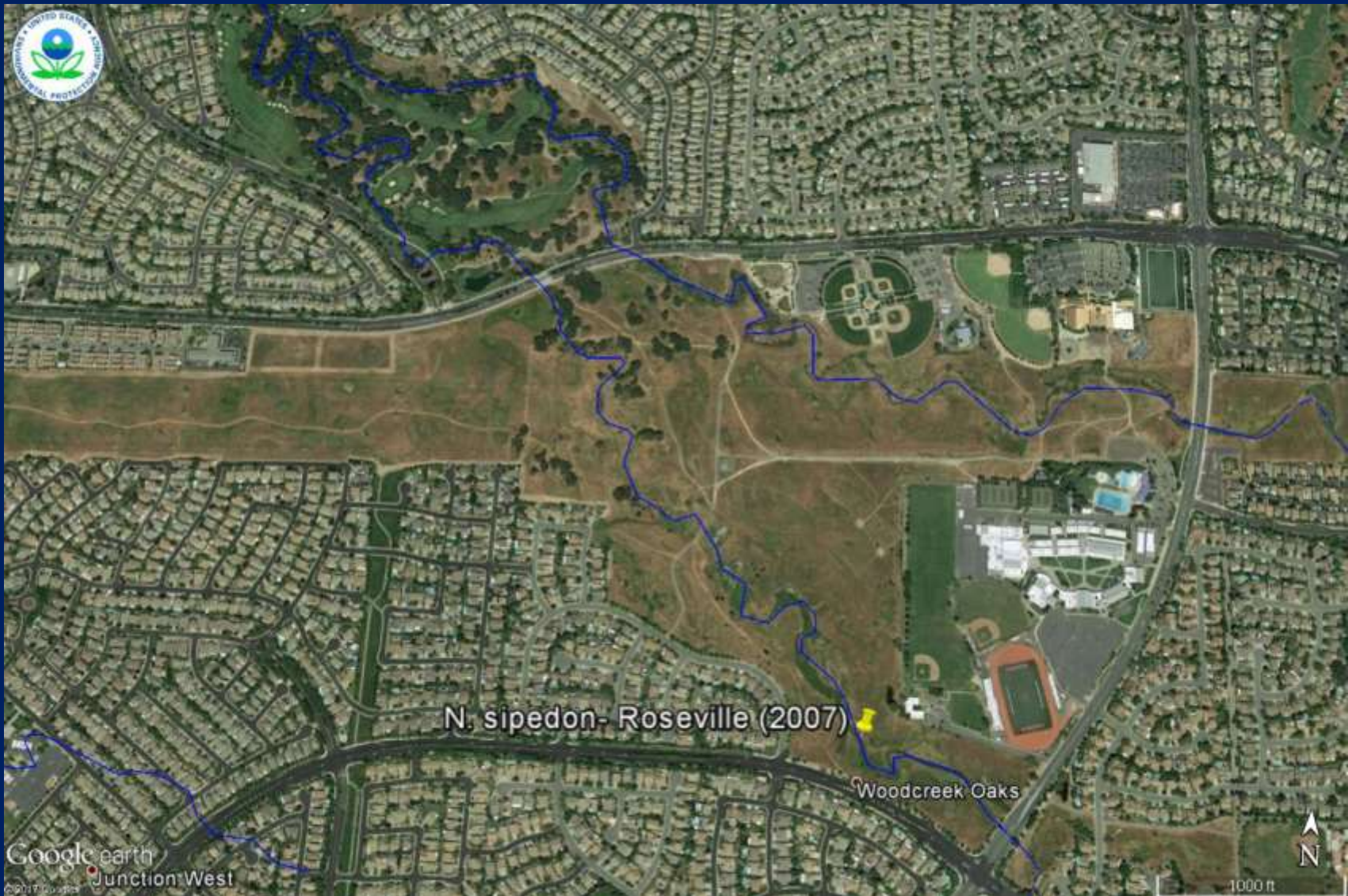


Eradication implementation

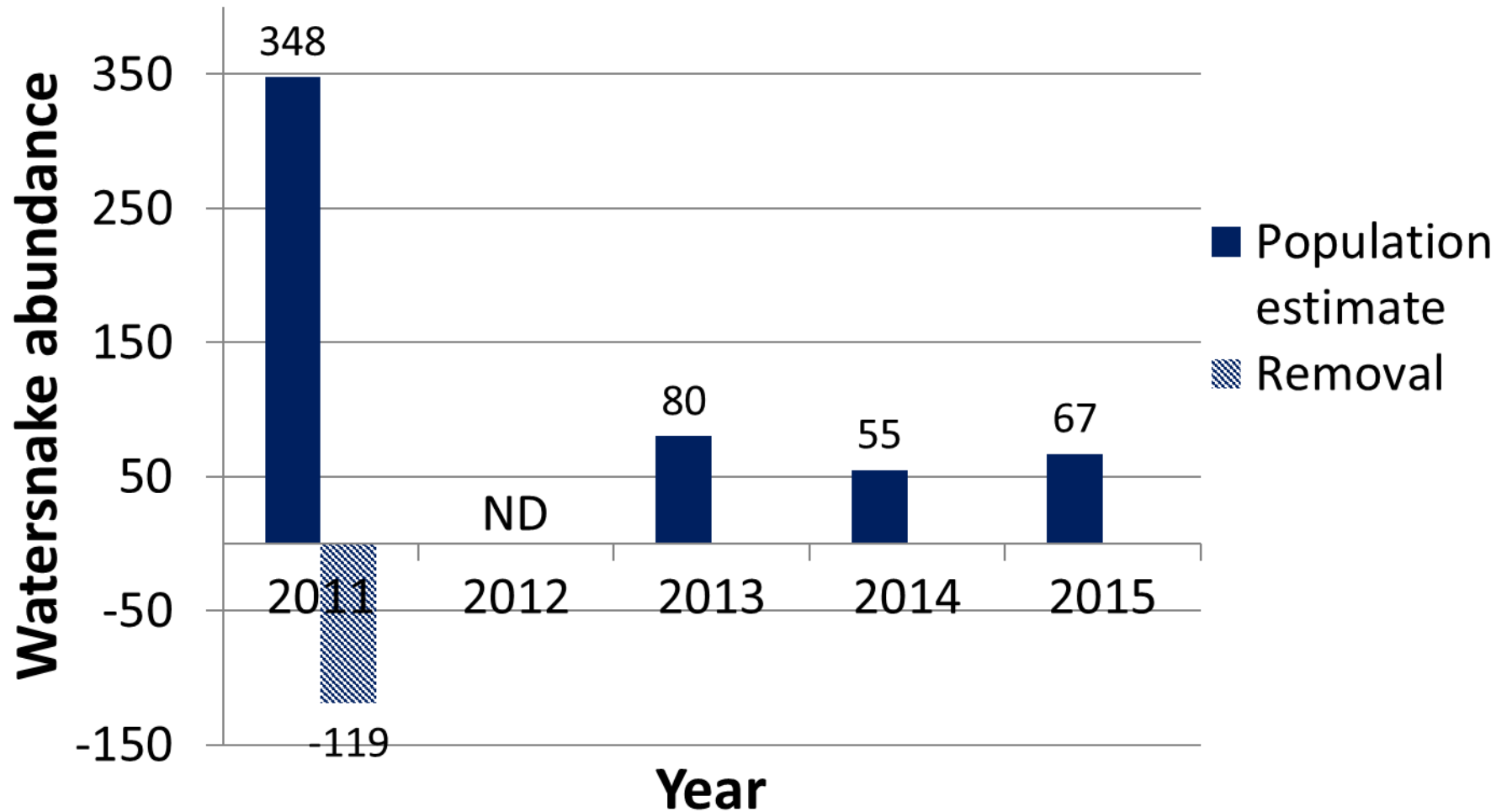
- Initial peripheral survey trapping
- Trapping/removals
 - Plastic, metal minnow traps
 - Eel pots (giant gartersnake traps)
- Captures -> UC-Davis museum



Eradication Project- *N. sipedon*



Nerodia sipedon population estimates and removal events (2011 - 2015)



Eradication Project- *N. sipedon*



2015 Results:

- UCD mark-recapture estimate: 67
- Trapped Aug 24 – Oct 16 (8 wks)
 - 53 removed
 - 26 marked (+ 9)
 - 16 unmarked (1/3)
 - 2 obs. mortalities
- 63 marked
 - 27 not recaptured
- ≥ 40 remaining



Photos: Brian Todd, UCD

Eradication Project- *N. sipedon*



2016 Results:

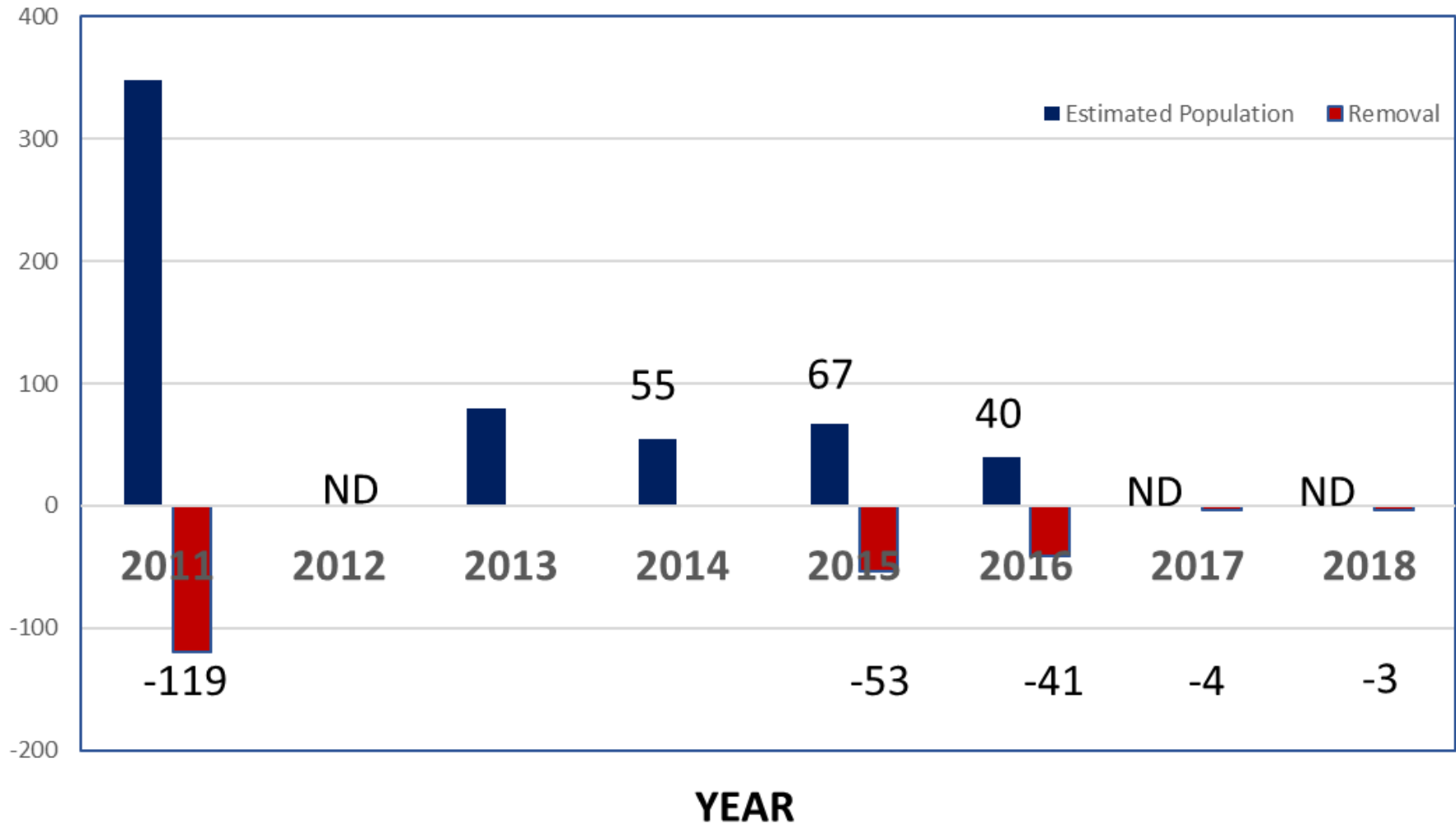
- 2015: estimated ≥ 40 remaining
- Trapped May 24 – Oct 11 (20 wks)
- 41 removed
 - Zero captures after Jul 30
- Delury Depletion estimate
 - Initial abundance: 40



Eradication Project- *N. sipedon*



Nerodia sipedon population estimates and removal events
(2011 - 2018)



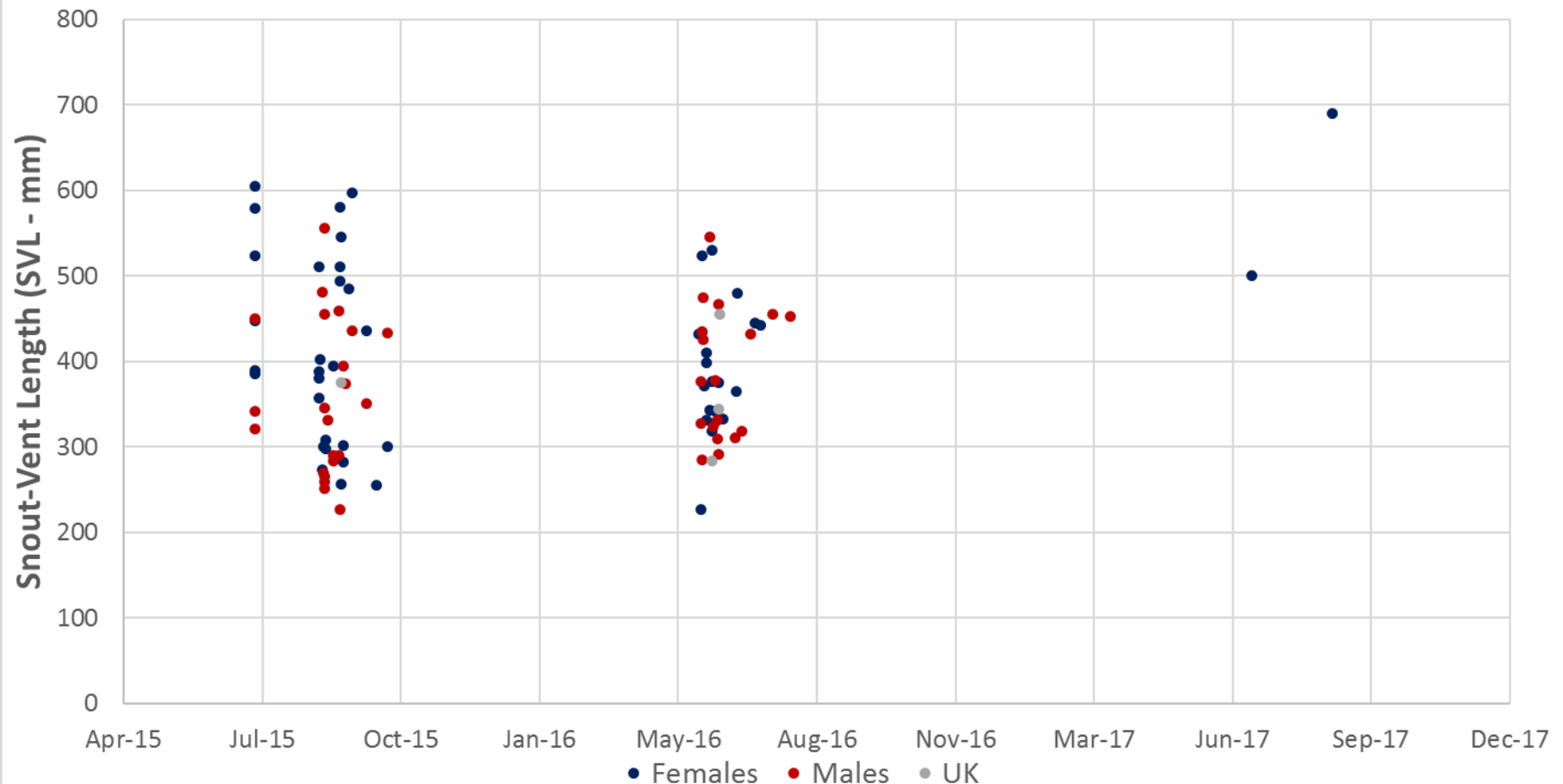
Eradication Project- *N. sipedon*



2017 Results:

- 4 removed (98 total)

Size Distribution of *N. sipedon* Captures (2015-2017)

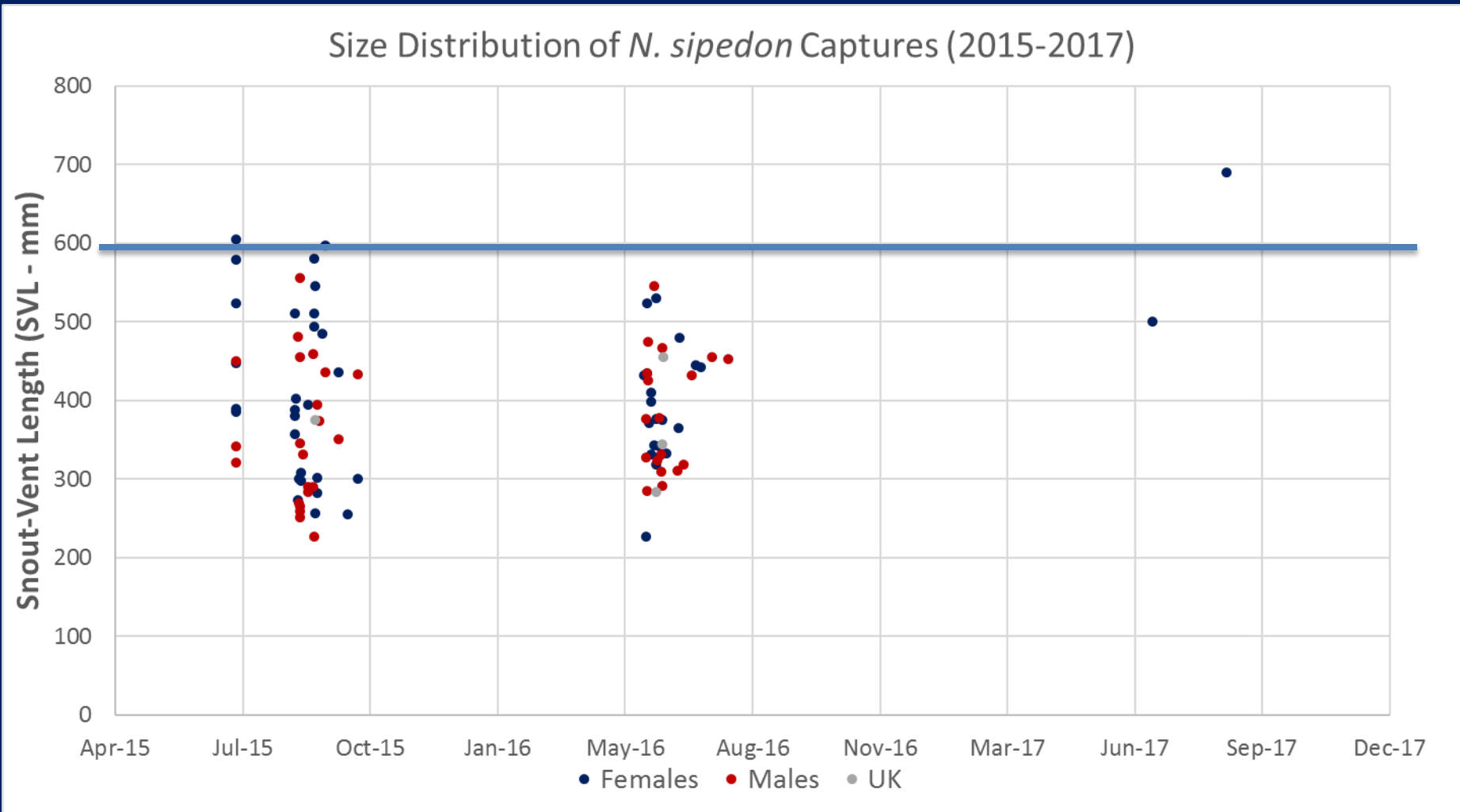


Eradication Project- *N. sipedon*

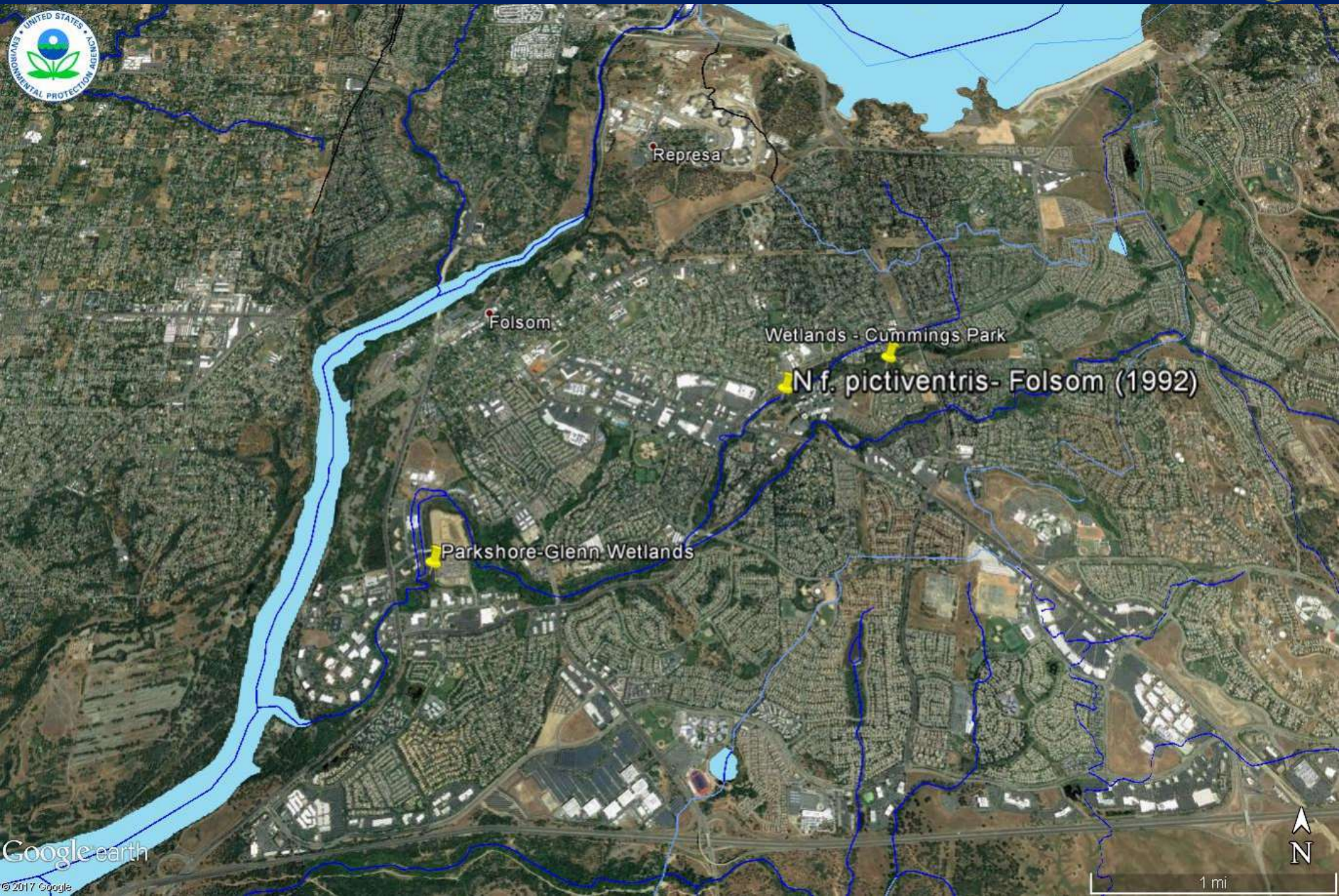


2017 Results:

- 4 removed (98 total)



Eradication Project- *N. fasciata pictiventris*



Eradication Project- *N. fasciata pictiventris*

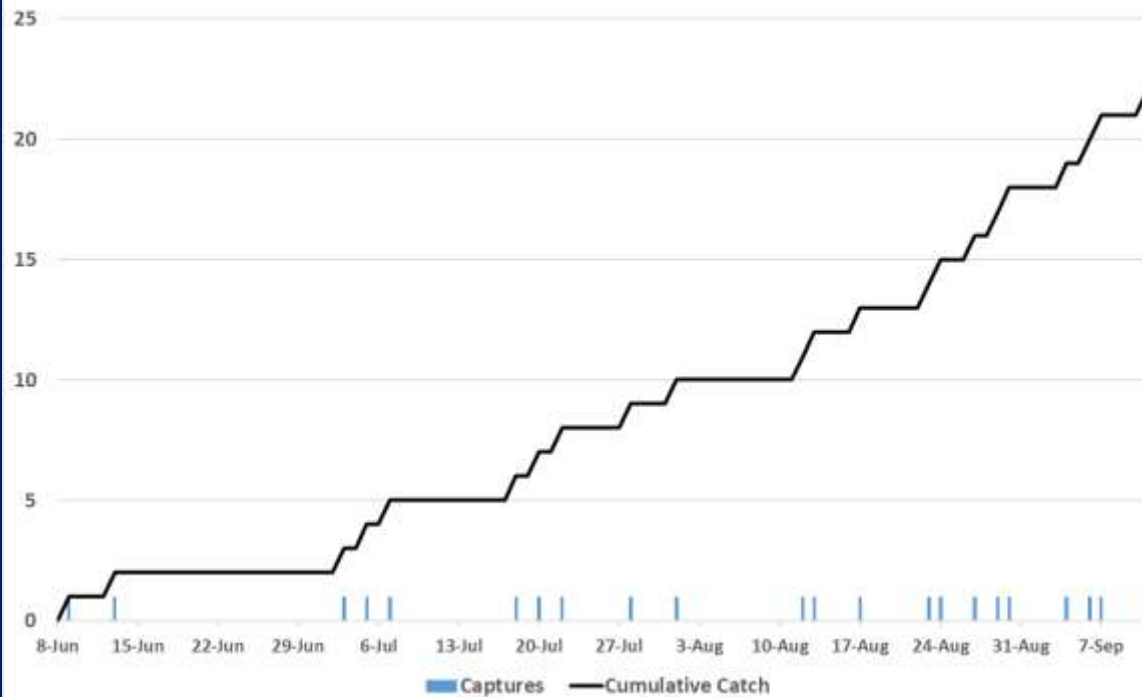


2017 results:

- Traps deployed June 7
- Habitat, access limitations
- 29 captures



Cumulative Catch of *N. f. pictiventris* (Folsom 2017)



Eradication Project- *N. fasciata pictiventris*



2018 Results:

Traps deployed: May 30

Habitat access limitations

27 captures

Trapping effort: 18 Weeks

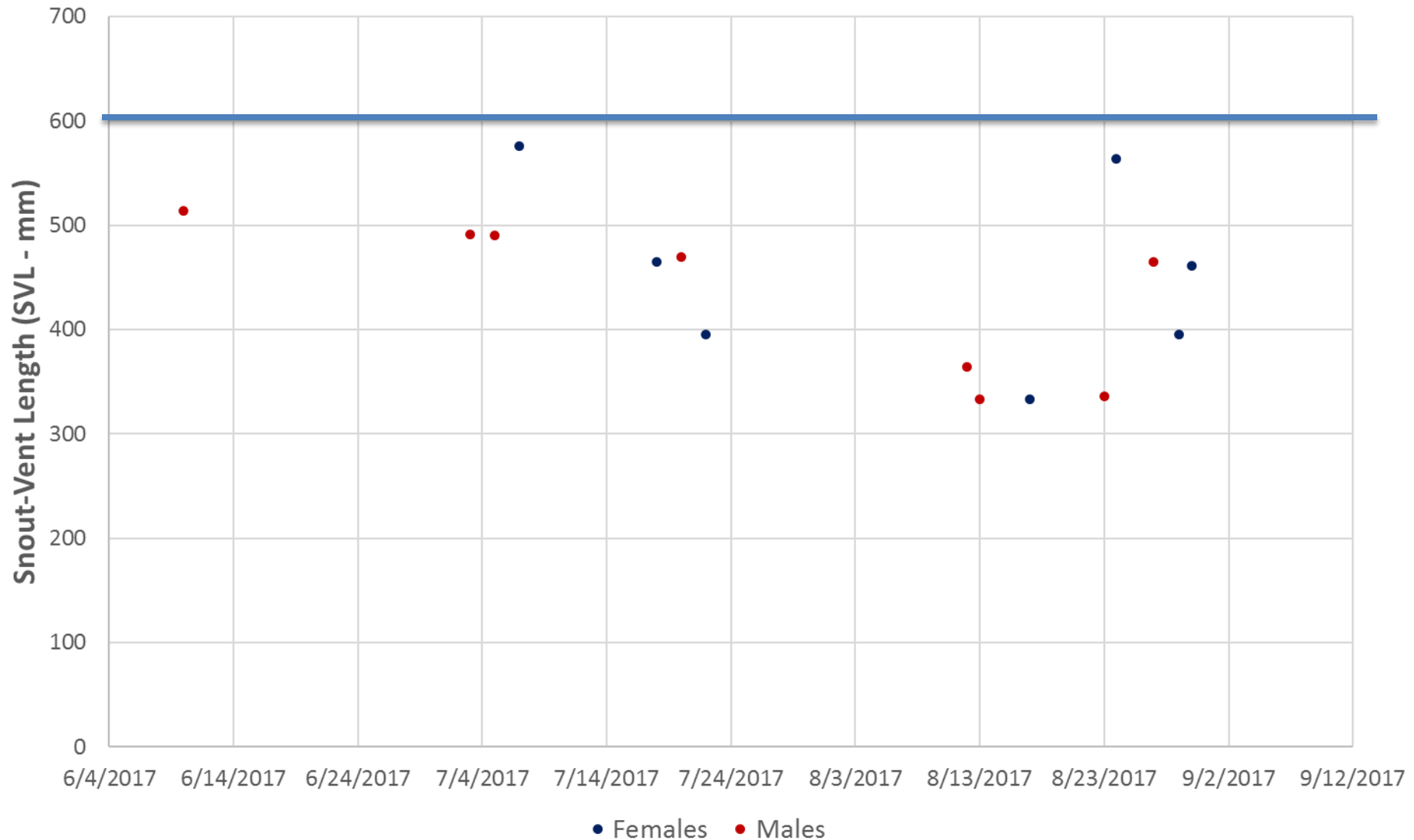
2 year summary: 56 snakes



Eradication Project- *N. fasciata pictiventris*



Size Distribution of *N. f. pictiventris* Captures (2017)



What have we learned?



- Highest capture rates of ~1-2 yr. old snakes
- Preventing recruitment into reproductive size class
- *N. sipedon* project will continue ~1-3 years
- *N. f. pictiventris* project – learning phase
 - *Where do they overwinter?*
 - *When do females give birth*
 - *Do they prefer specific microhabitats?*
- What role does predation play?
 - American mink, river otters
 - Herons, great egrets, hawks
 - California kingsnakes



Future Direction



- Conduct broader surveying
 - Existing project sites
 - Lafayette Reservoir
 - French Camp
 - Lower American River
 - Lake Machado
- Continue outreach for prevention and early detection
 - California Nerodia Watch (iNaturalist project)
 - Volunteers on eradication projects
 - California Invasive Species Action Week
 - “Don’t Let it Loose!” campaign
 - Amnesty Day events



Questions?



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- Rose, J.P. and B.D. Todd. 2014. Projecting invasion risk of non-native watersnakes (*Nerodia fasciata* and *Nerodia sipedon*) in the western United States. PLOS ONE 9(6):e100277
- Stitt, E.W., Balfour, P.S., Luckau, T., and T.E. Edwards. 2005. The southern watersnake (*Nerodia fasciata*) in Folsom, California: History, population attributes, and relation to other introduced watersnakes in North America. Final report to: U.S. Fish and Wildlife Service under Cooperative Agreement # 11420-1933-CM02
- ANSTF Grant #F16AP00369
- State Wildlife Grant #F16AF00303