

Informing Action: Mountain Yellow Legged Frogs

San Diego
Dec. 15, 2013



Initial questions for the genetic study

1. What are the levels of genetic variation in southern California *Rana muscosa* and is there a reduction of variation in the captive population relative to its source population?
2. How is genetic variation structured among populations at a local and regional scale?
3. What is the history of population divergence and gene flow in southern *R. muscosa*?

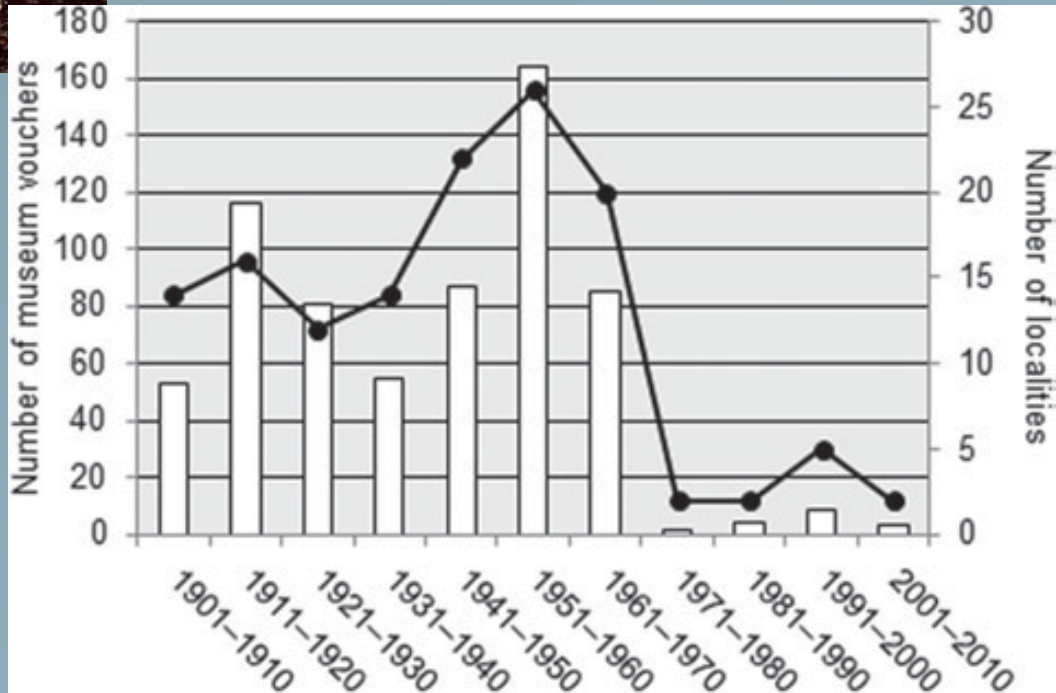
Schoville, S. D., T.S. Tunstall, V.T. Vredenburg, A.R. Backlin, E. Gallegos, D.A. Wood, and R.N. Fisher. 2011. Conservation genetics of evolutionary lineages of the endangered mountain yellow-legged frog, *Rana muscosa* (Amphibia: Ranidae), in southern California. **Biological Conservation** 144:2031-2040.

Backlin, A.R., Hitchcock, C., Gallegos, E., Yee, J., and R.N. Fisher. 2013. The precarious persistence of the endangered Sierra Madre yellow-legged frog (*Rana muscosa*) in southern California. **Oryx – The International Journal of Conservation** 47:XX-XX.



Temporal and extent of declines in Sierra Madre Mountain yellow-legged frogs

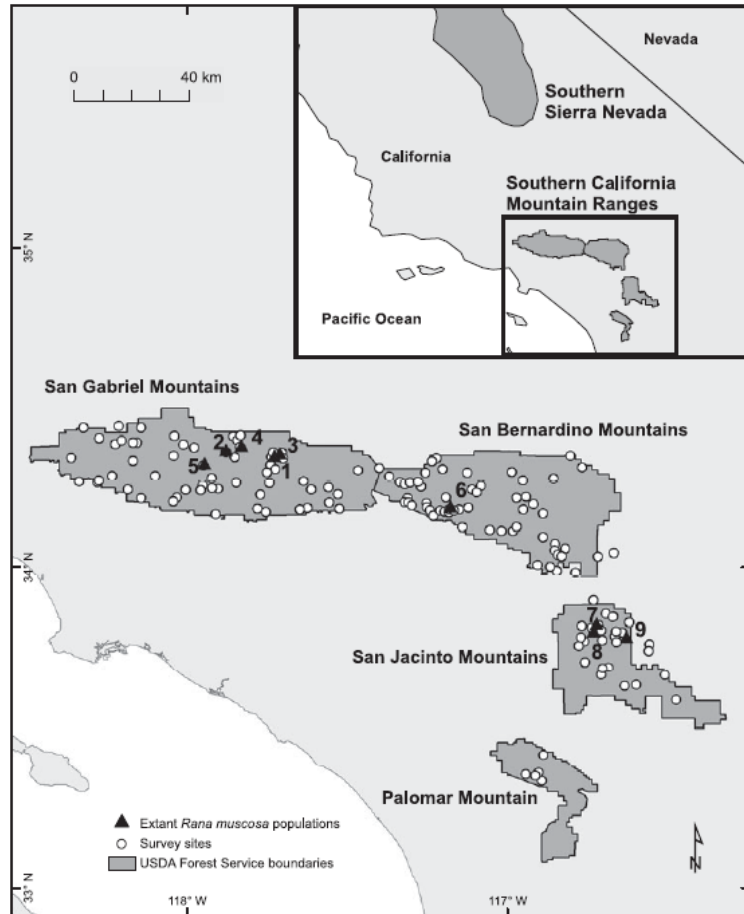
Listed by FWS 2002; listed by DFW 2012



9 populations across
three mountains
since 2000

Extirpated from San
Diego County since
the 1970's.

Possibly only 7 pops
left in Dec 2013.





2003

Southern California Firestorms
City Creek watershed burned



2007 Upper watersheds in San Bernardino Mtns burned

Station Fire 2009



**Devil's Canyon population and upper watershed was all burned
Also half of Little Rock Creek burned, but not the frog population**

July 2013

**Mountain Fire in
San Jacinto
Mountains.**

**Lost Tahquitz
Creek population**



Christmas Day Storm debris flow 2003 Waterman Canyon

16 people
died

Large
economic
losses





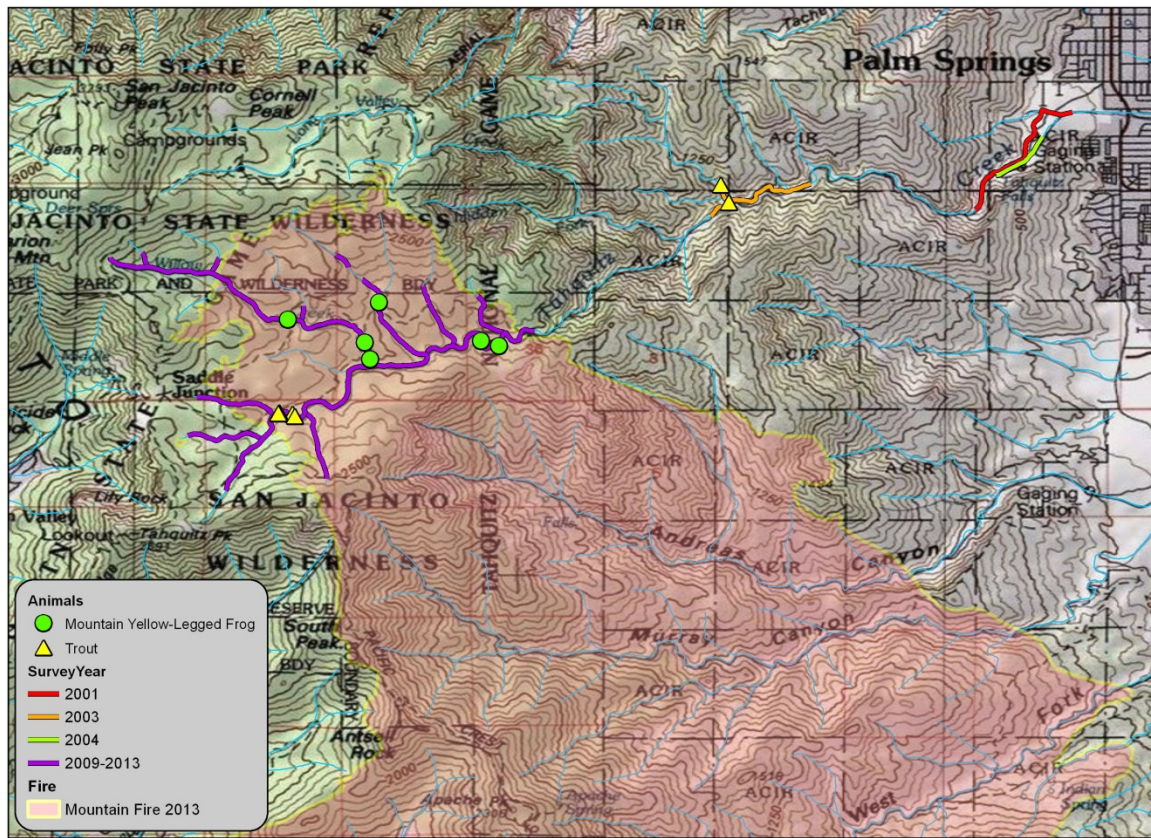
Repeat Photos: City Creek, Mountain yellow-legged frog habitat



Before



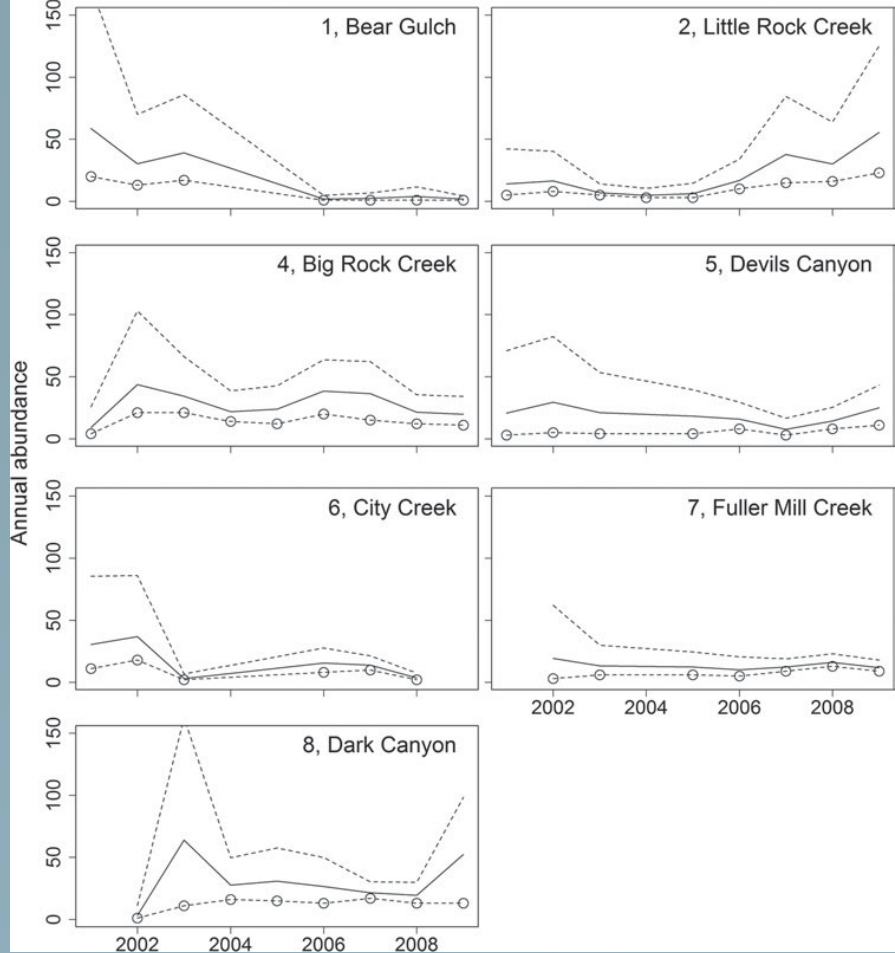
After



**Estimated 166 adults
in wild in 2013.**

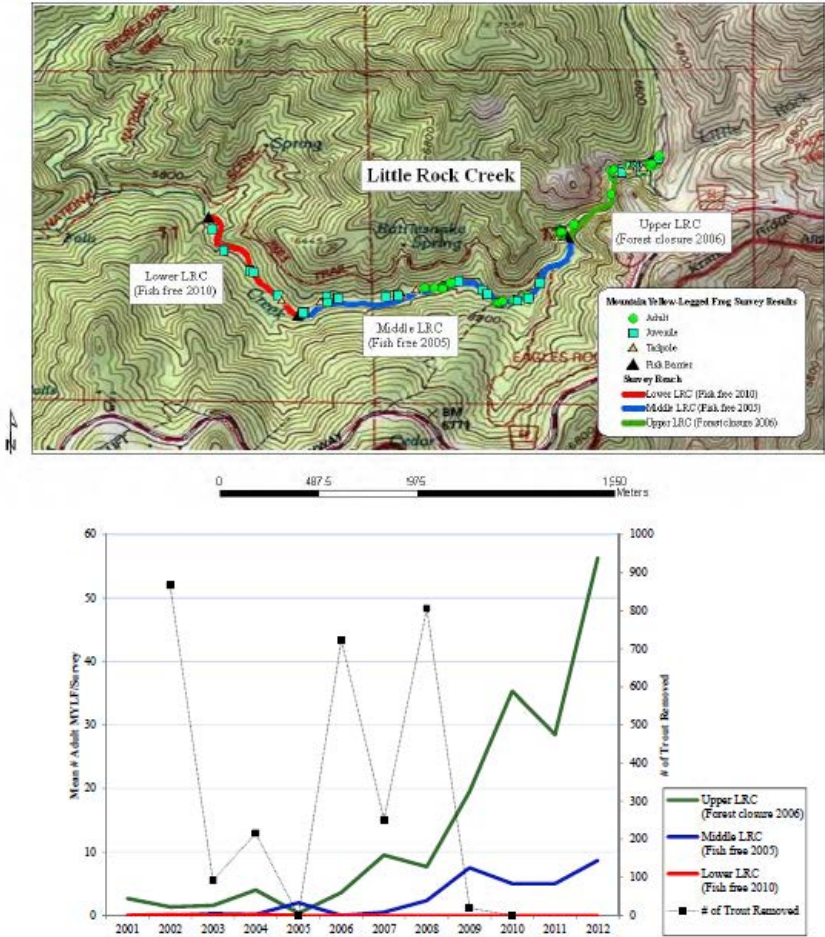
**Over 9 years only 314
unique individuals
have been marked
across all sites.**

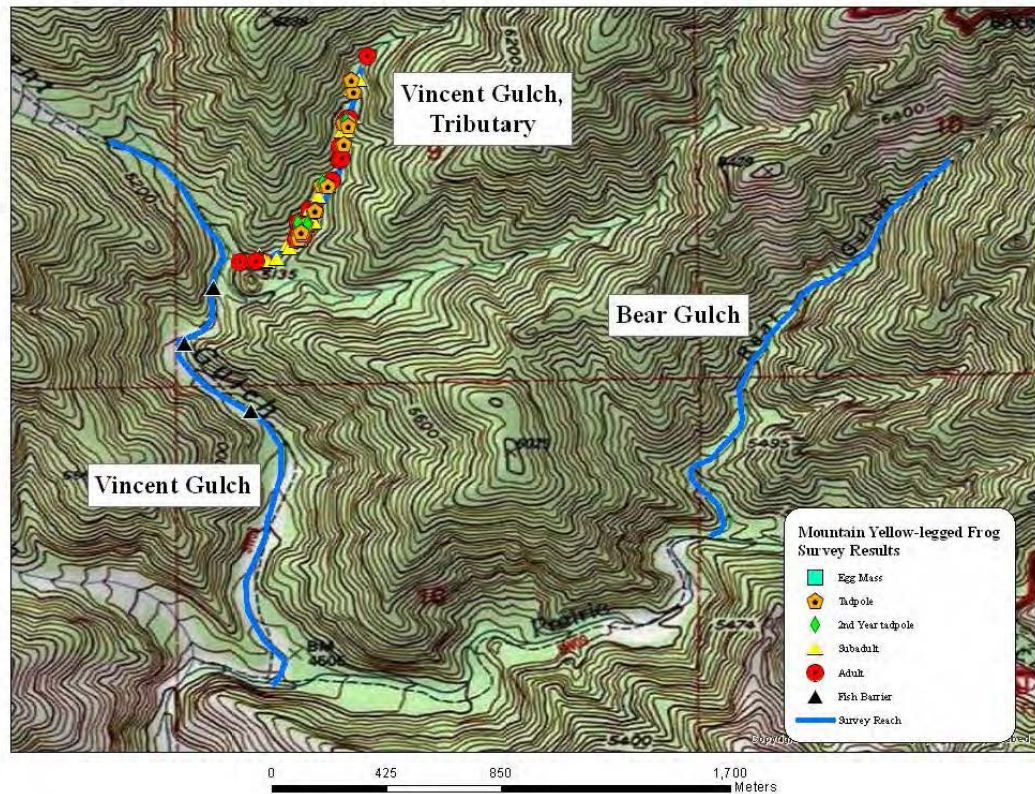
**Individuals >13 years
old in wild.**



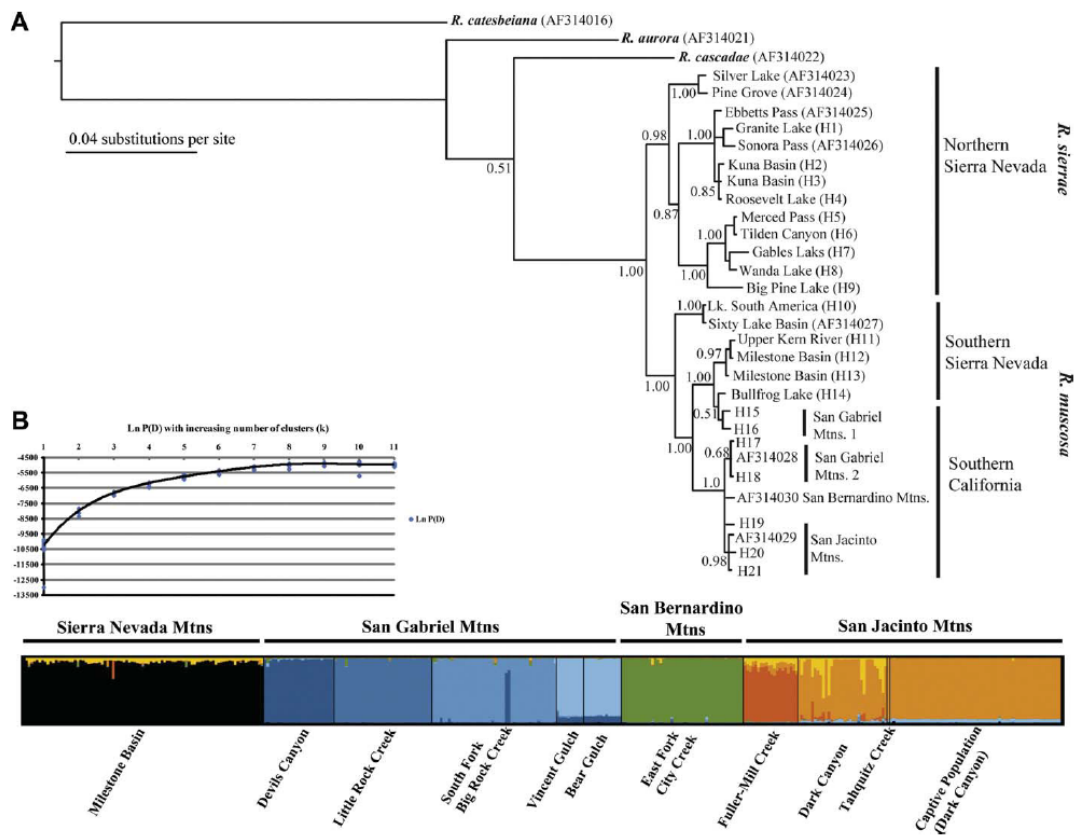
Recovery of Little Rock Creek

– until 2006 this could be the entire population in the canyon

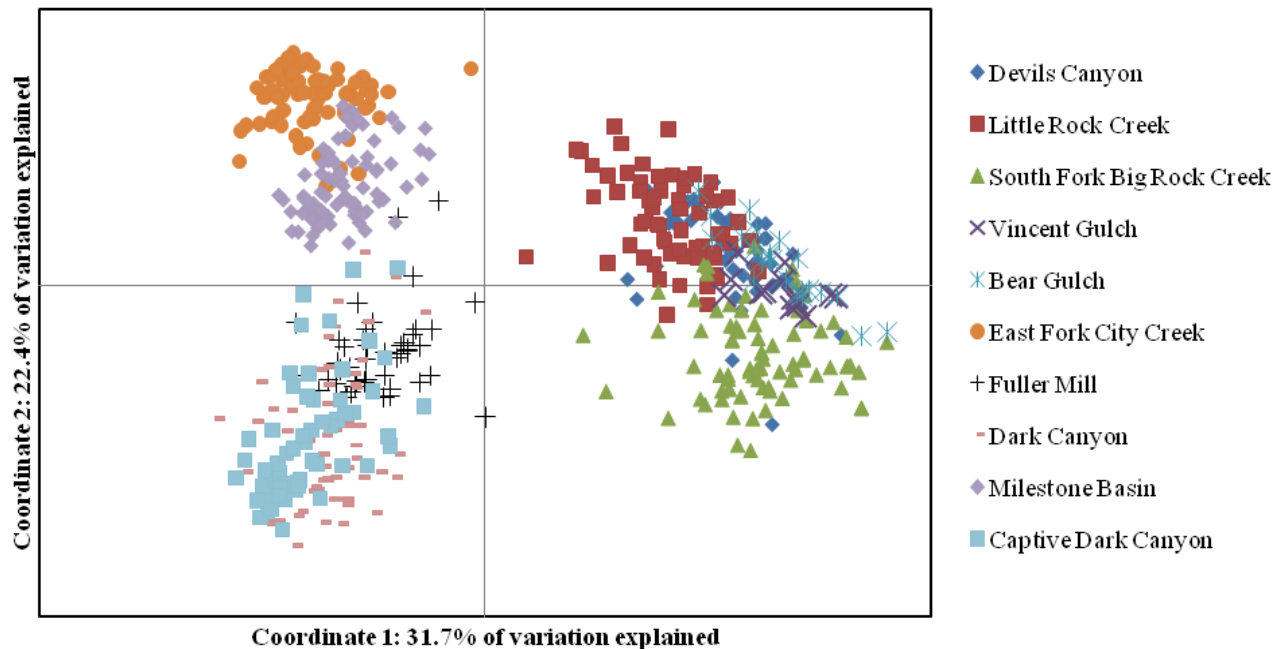




Genetic data consists of mtDNA (A) and microsatellite loci (B)



Principal Coordinates Analysis



Principal coordinates analysis of microsatellite variation in adult frogs of southern California *Rana muscosa*. The first two components account for 54.1% of the total genetic variation.

Microsatellite variation in Dark Canyon Rana muscosa.

Allelic diversity 3.2 – 5.5 mean number of alleles per locus – across all populations

Dark Canyon – wild frogs 4.6 alleles/locus

Dark Canyon – captive population (w/SDZoo-ICR and LAZoo) 1.6 alleles/locus

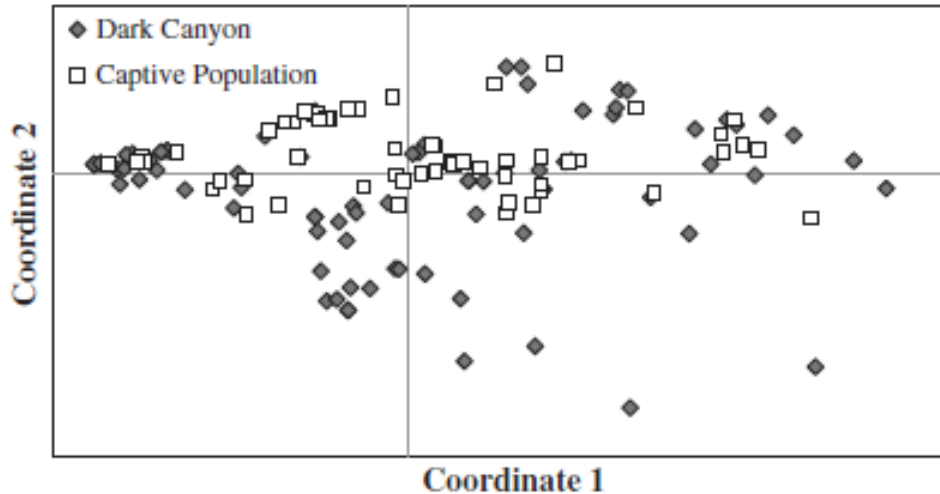


Fig. 2. Principal coordinates analysis of microsatellite variation in the Dark Canyon resident population and captive breeding population. The first two components account for 52% of the total genetic variation.





Winter 2010 Both HWY330 and HWY 2 collapsed into MYLF Habitat

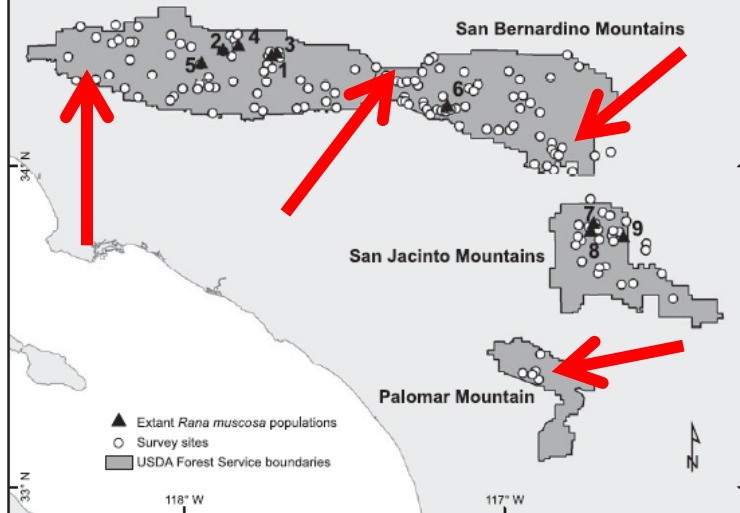
Currently have entire City Creek frog population in captivity at ICR except 1 male.

Resilience of Infrastructure for current or future climate?



What about use of ancient DNA (aDNA) – ie archival samples, for filling in gaps in current knowledge of genetic landscape to decide who to translocate?

Examples: San Gorgonio Watershed, Mojave River, Los Angeles River, or Palomar Mountain



Conclusion

Having the genetic data is informing our approach -

1. Where we should harvest frogs
2. Where we should put frogs to build resiliency
3. Where risk still exists across their range to genetic diversity

