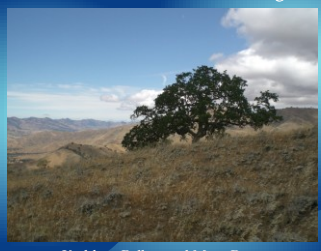
Landscape-Level Strategy for Pond Prioritization
Central Inner Coast Range



Kathleen Pollett and Mary Root
U.S. Fish and Wildlife Service
Partners for Fish and Wildlife Program

Partners for Fish and Wildlife Program

Partners for Fish and Wildlife Program (PFW) Mission Statement:

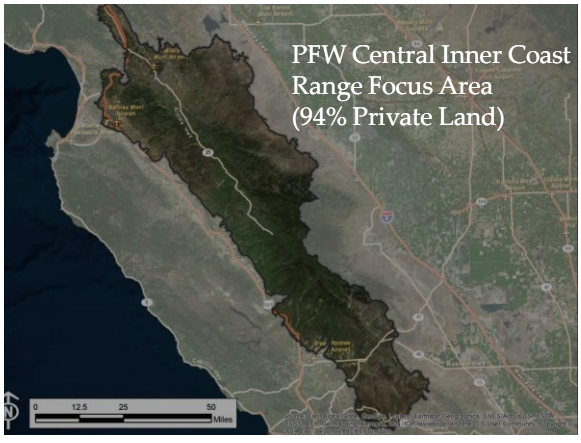
*To efficiently achieve **voluntary** habitat restoration on **private lands**, through financial and technical assistance, for the benefit of Federal Trust Species.*

Natural Resource Conservation Service
USFWS-NRCS Shared Position

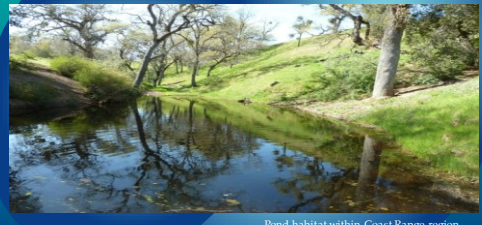
- Conservation of soil, water, and related natural resources (includes wildlife) .
- Mark Moehling, NRCS Engineer (Ponds!!)
- Helping people help the land

Local USFWS Strategic Efforts

- Identify priority ponds and upland areas for which restoration would improve habitat connectivity for native amphibian species
- Identify regions where highly invasive species (i.e. hybrid CTS, bullfrogs, predatory native fish) may limit connectivity and diversity of native amphibians.



Native Amphibian Focus



Pond habitat within Coast Range region.
Photo credit—Kathleen Pollett, USFWS

California red-legged frog recovery

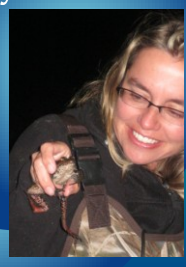
- Recovery Plan available (2002)
- Critical habitat designated

California red-legged frog tadpole, San Benito County.
Photo credit– Mary Root USFWS

California red-legged frog recovery

Pond treatments
- Alter hydroperiod
  - enable metamorphosis
  - discourage non-native predators
- Fence up to a third of pond to enable vegetation to grow

(USFWS 2002 , **Recovery Plan for the California Red-legged Frog, (*Rana aurora draytonii*) Appendix D.)**



California red-legged frog, Elkhorn Slough.
Photo credit– Antonia D'Amore

California tiger salamander recovery

- Recovery Plans in process
- Critical habitat designated
- Hybrid issue (connectivity, ecological function)

California tiger salamander, Monterey County.
Photo credit– Bryan Mori Biological Consulting Services

California tiger salamander recovery

- Pond treatments
  - Alter hydroperiod
    - enable metamorphosis
    - discourage non-native predators

California tiger salamander larvae, San Benito County.
Photo credit–Wes Gray, California State Parks

Potential Factors to Prioritize Ponds

Positive or negative weighting for benefit to :	CRLF	CTS
Within or Linkage, Critical habitat	+	+
Within or Linkage, Recovery Plan Core	+	+
Size of pond	+	+
Cost effective (current soil permeability)	+/-	+/-
Within dispersal distance of native CTS or CRLF	+	+
Within 12 km distance of CTS swarm alleles detected*	-	-
Proximity to un-surveyed perennial pond	-	-

*Fitzpatrick, B.M. and H.B. Shaffer. 2007. Introduction history and habitat variation explain the landscape genetics of hybrid tiger salamanders. *Ecological Applications*

Mapping and Modeling Ponds

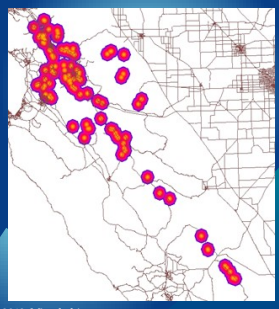
Goal: Using mapping and models to understand how existing ponds may connect in landscape

Why?
- Assess possible wetland habitat treatments and/or information needs before engaging landowners
- Assess managing connectivity in landscape

Simple -Mapping

CNDDB CTS Locations

- Purple
  - 6066 feet
  - 95 % population
- Pink
  - 4800 feet
  - 90 % population
- Orange
  - 1824 feet
  - 50 % population



Searcy, C. A., Gabbai-Saldate, E., and H. B Shaffer. 2013. Microhabitat use and migration distance of an endangered grassland amphibian. Biological Conservation 158:80-87

Population Genetics

- Relatedness among ponds
- Effective population size (N_e)

Resistance surface Mapping

Wang, et al. (2009)
Three vegetation types with empirically derived factors for resistance

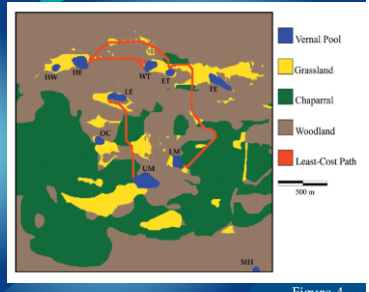


Figure 4

Wang I. J., Savage W. K., and Shaffer H. B. 2009. Landscape genetics and least cost path analysis reveal unexpected migration routes in the California tiger salamander, *Ambystoma californiense*. Molecular Ecology, 18: 1365-1374

Resistance surface Mapping

- Two next steps…
  - Short term - Use resistance values from Wang 2009, et al. for larger Central Inner Coast Range area
    - USFWS
  - Long term - More genetic data and more GIS layers (land cover, roads, slope)
    - UCLA / UC Davis
  - Update surface with new information over time
    - new ponds, location of non-native predators

Evaluation/Monitoring Effectiveness

- Pond scale
  - Gain information to address ephemeral ponding and its effects on non-native allele frequency?
  - Gain information on ecological function of CTS with varying levels of non-native alleles (Shaffer, in press)
- Landscape scale
  - Gain more information regarding non-native alleles on landscape.
  - Gain more information regarding populations on the landscape.

Working groups?

- Monitoring (Questions to be addressed? What to measure? How to measure it?)