

Kneitel Lab Research: *The Ecology of California Vernal Pools*

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What is a vernal pool?

California vernal pools are an important and unique part of California's landscape. Vernal pools:

- are seasonal wetlands that fill during the winter (aquatic phase) and dry by late spring (flower phase) (see picture below)
- are found primarily in California's Central Valley
- have been reduced to only 3-10% of its original extent because of conversion to agriculture and urbanization
- support many endemic (species only found in this habitat) and endangered species
- support species that have to survive the dry season:
 - *passive dispersers* create resting eggs that lay dormant in the soil
 - *active dispersers* can move in/out of vernal pools
- are important for wildlife habitat, water quality, flood control



Kneitel lab research

My research interests focus on understanding patterns of species composition and functioning at different spatial and temporal scales. I work in temporary ponds or wetlands (vernal pools and rock pools). This research also bridges basic ecology and conservation, including metacommunity ecology, food webs, and disturbance ecology.

My students and I have recently conducted research on the effects of:

- Nutrients (Kneitel & Lessin 2010, Croel & Kneitel 2011a)
- Tadpole shrimp (Croel & Kneitel 2011b)
- Frog tadpoles (Anderson & Kneitel 2015)
- Plant parasites (Graffis & Kneitel 2015)
- Hydro-regime (Kneitel 2014)
- Latitudinal gradients and climate (Kneitel 2016)



Vernal pool's unique species



Lepidurus packardii
Vernal pool tadpole shrimp

This is an endangered species



Branchinecta lynchi
Vernal pool fairy shrimp

This is an endangered species



Linderiella occidentalis
California fairy shrimp

This species is smaller and more widespread



Mimulus tricolor
Tricolor monkeyflower

One of the many endemic plants found in vernal pools



Vernal pool plant community (terrestrial phase). The orange strings are Cuscuta howelliana (Dodder) gets its water and nutrients by parasitizing other plants.

What are mesocosms?

In addition to field and lab studies, we use mesocosms, which are partially enclosed outdoor experiments. We use pond liners and cattle tanks lined with vernal pool soil to conduct experiments. The advantage is that we have a more controlled setting to conduct studies that could not be done in natural vernal pools.



Current & Future Research

- With support from the **National Science Foundation**, we have been examining how aquatic and terrestrial phases interact with each other. This experiment has 3 sets of treatments (hydro-regime, plant thatch, and nutrient addition) that interact in complex ways.
- With support from **US Fish & Wildlife Service**, East Bay Regional Park District and I will be examining the ecology of *Branchinecta longiantenna* (Longhorn fairy shrimp) in rock pools to better understand this endangered species, which will help in their conservation and management.
- *Student projects*: Metapopulation and metacommunity ecology of rock pool communities; UV light effects on invertebrates; invasive plant effects on insects; predator effects on invertebrates
- With Justin Miller-Schulze (Department of Chemistry), we are beginning to explore indicators of human impact on vernal pools using tracer elements.

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