

Conservation of Frog Populations In the Sierra Nevada, CA

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Yosemite Toad
Bufo canorus



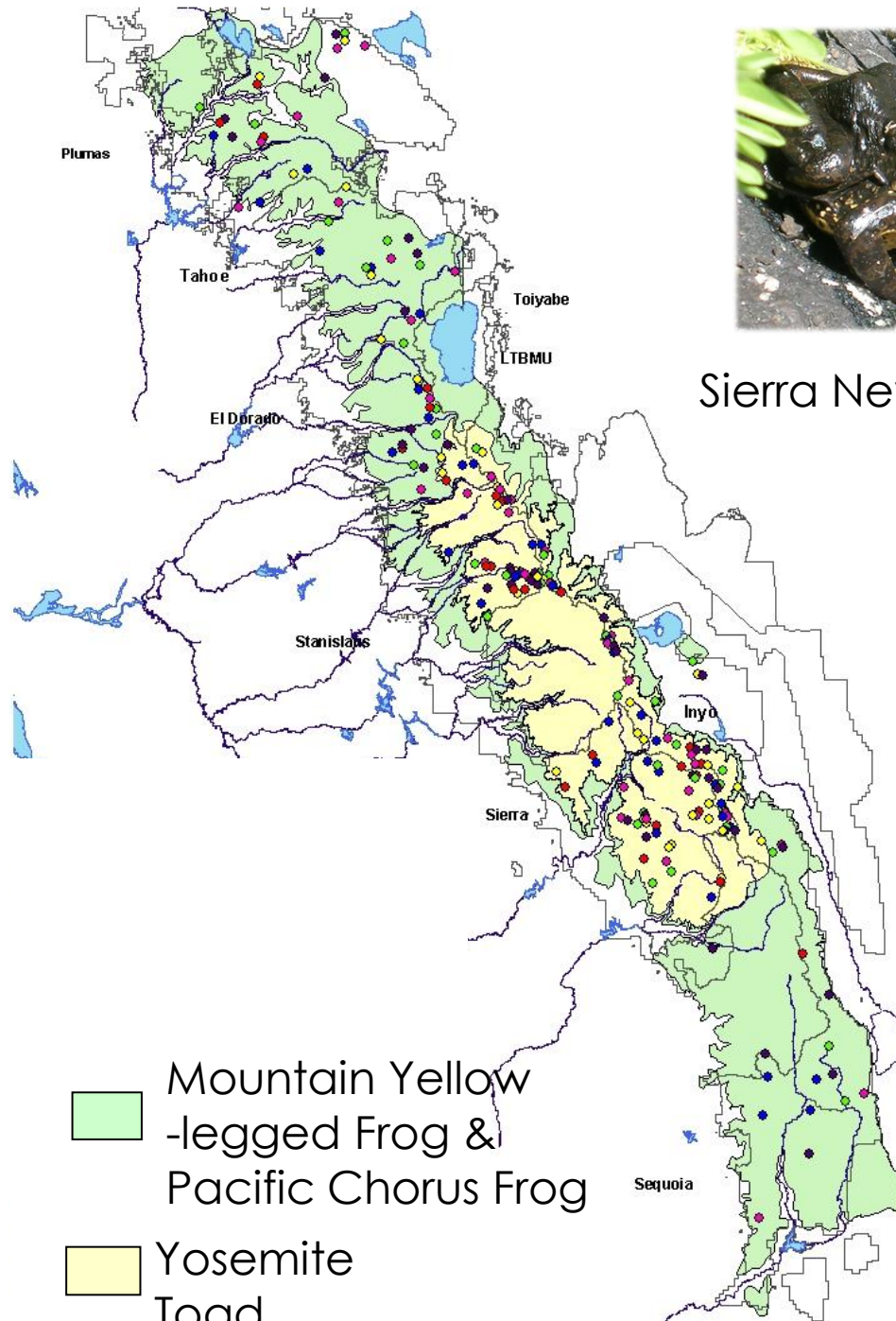
Pacific Chorus Frog
Pseudacris regilla



Southern Mtn.
Yellow-legged Frog
Rana muscosa



Sierra Nevada
Yellow-legged Frog
Rana sierrae



Sierra Nevada YI Frog



Yosemite Toad



Pacific Chorus Frog



Southern Mtn. YI Frog

USFS Sierra Nevada Amphibian Monitoring Program

Extensive and Intensive Surveys



Extensive

- Rangewide surveys on national forests in Sierra Nevada
- Surveyed all lentic, sample of lotic habitat in small watersheds (2-4 km²)
- Occupancy, MYLF Relative Abundance

Intensive for Yosemite toad

- Detailed demography in two watersheds
 - Adult male abundances (Mark-Recapture)
 - Egg mass counts
 - Egg and tadpole habitat

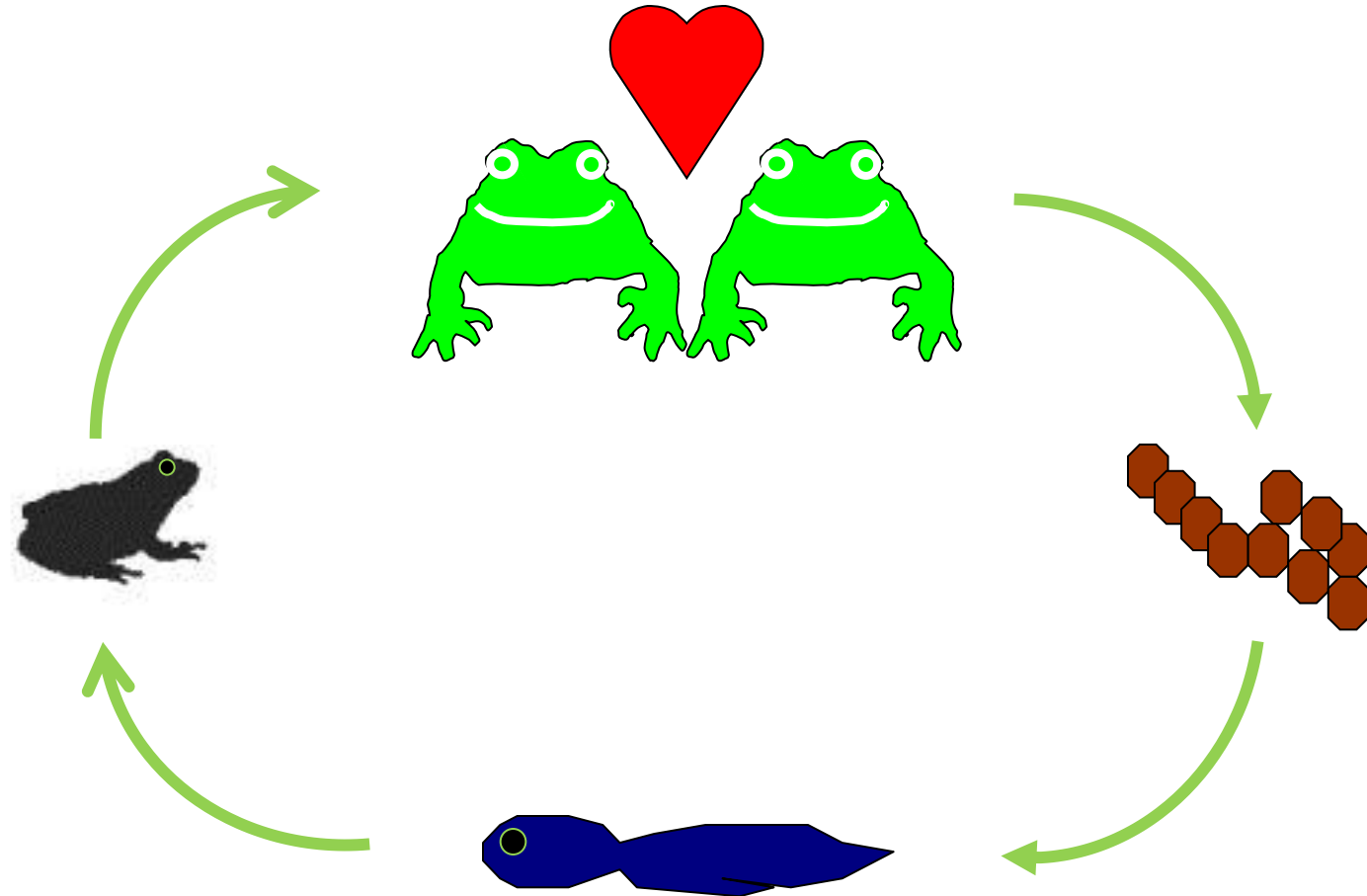
Topics

Compare the 3 taxa:

- **Natural History**
- Status
- Threats
- Conservation

Natural History

Complex Life Cycle of Frogs



Natural History

Ectotherms – > Temperature
Permeable Skin -> Water



Warm Water ->
Fast Growth

Natural History

Mountain Yellow-legged Frog

- Breeds at Snowmelt
- Multi-Year Tadpole Stage
- Permanent Water - Lakes (Streams\Meadows)
- Highly Aquatic- Adults, Subadults Stay Near Water



Natural History

Yosemite Toad

- Breeds at Snowmelt
- Warm Water Habitat
(Wet Meadows, small ponds)
- Fast Development in single season
- Adults Disperse from Breeding Sites
- Metamorphs Disperse from Breeding Sites



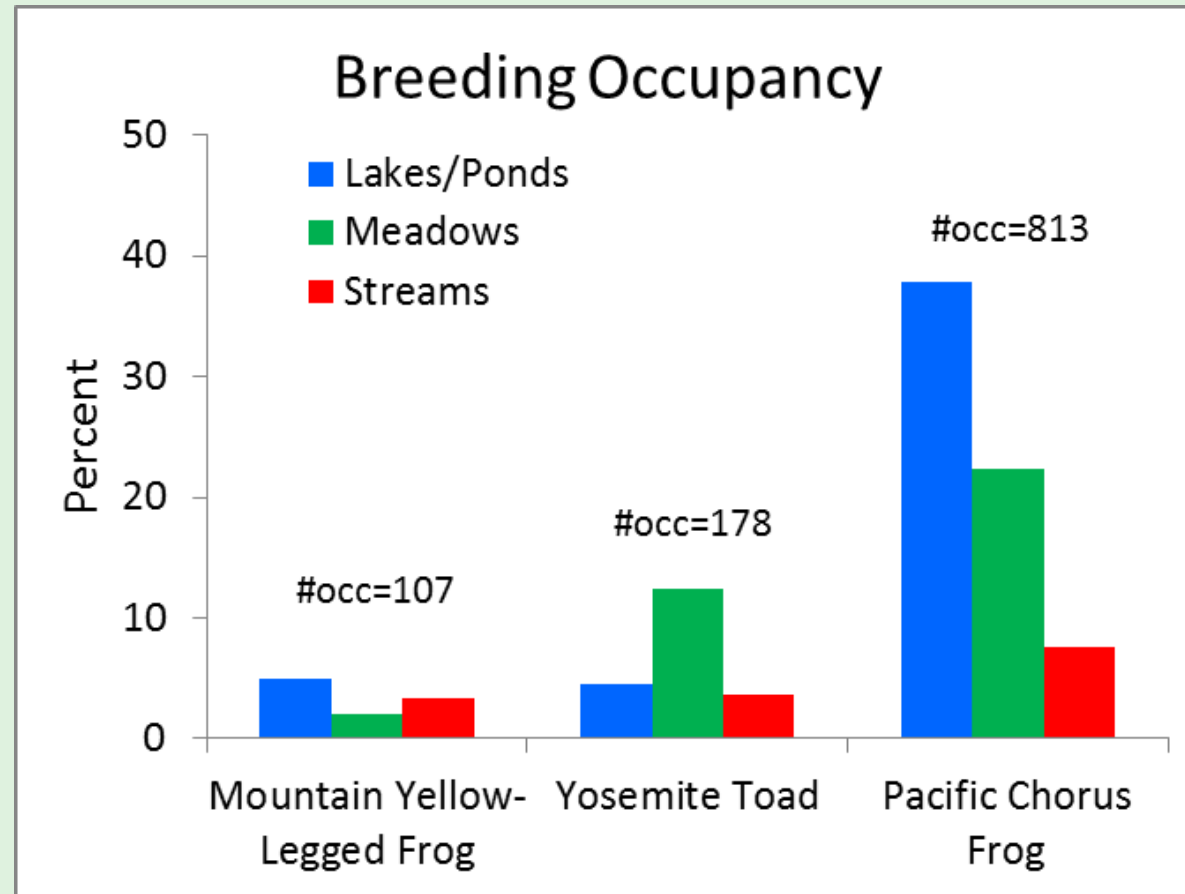
Natural History

Pacific Chorus Frog



- Breeds at Snowmelt in Warm Water Habitats
- Wider Variety of Habitats
- Tadpoles Metamorphose within Summer
- Adults Nocturnal and Terrestrial after Breeding
- Metamorphs Disperse from Breeding Sites

Habitats Types Used



Habitat Relationships

Water Availability

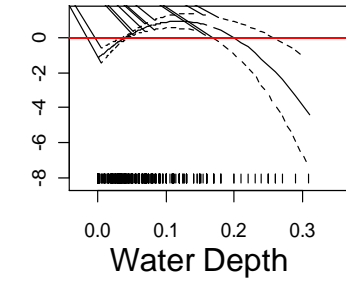
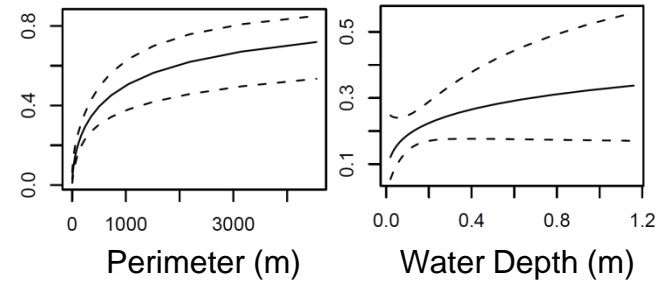
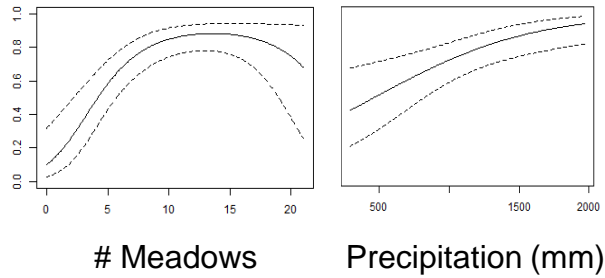
Watershed

Meadow

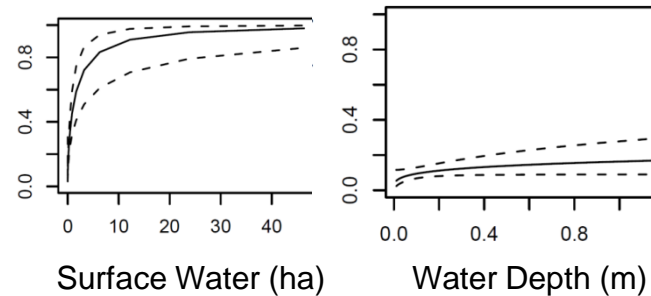
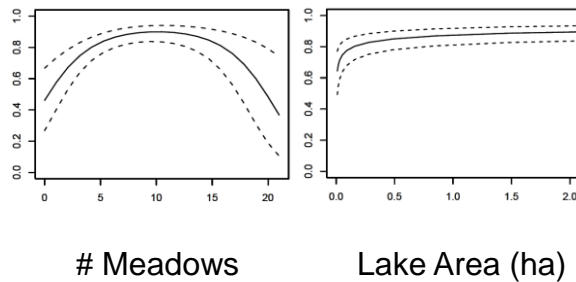
Microhabitat

Yosemite Toad

Prob. of Occupancy



Pacific Chorus Frog



Habitat Relationships

Temperature

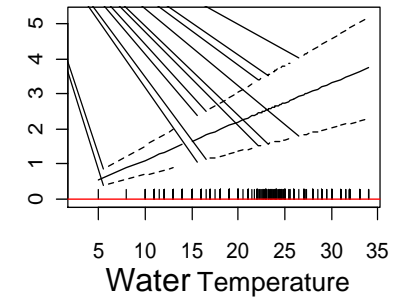
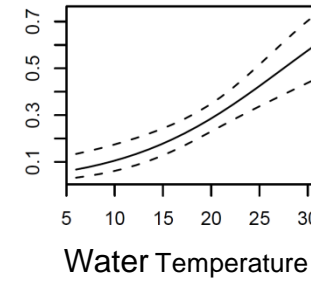
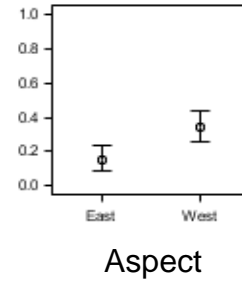
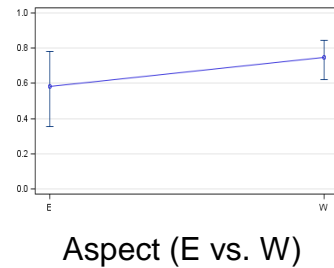
Watershed

Meadow

Microhabitat

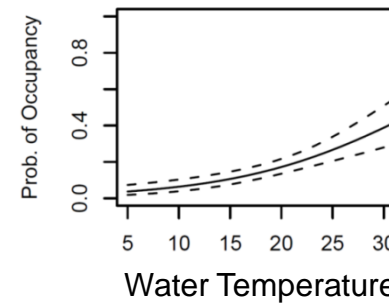
Prob. of Occupancy

Yosemite Toad



Pacific Chorus Frog

SW Aspect



Status

Historical Data

Widely Distributed and Abundant

Mt. Yellow legged Frog:

Yosemite Toad

Early 1900's:

'100's of frogs'

'very numerous'

(Drost & Fellers 1996)

Researchers Experience

1979: Ridge Lake (SEKI NP)

790 frogs

1100 tadpoles

(Bradford 1991)

1997-98: Dusy Basin (SEKI NP)

582 frogs

(Pope 1999)

Tioga Pass Meadow (INF)

1971-1982

2270 toads

1974-1979

162-342 males/year

Saddlebag Lakes (INF)

1976-1981:

177 adults

Frog Lakes (TOI)

1976

70 toads

Kagarise Sherman and Morton 1993

Current Status

Mountain Yellow-legged Frog (Vredenburg et al. 2007, Brown et al. 2014)

- Declined in distribution and abundance
- USFS monitoring surveys found few large populations
 - ~60% of watersheds had only a few individuals
 - ~10% of watersheds had abundances comparable to historical levels
- CDFW surveys have similar results

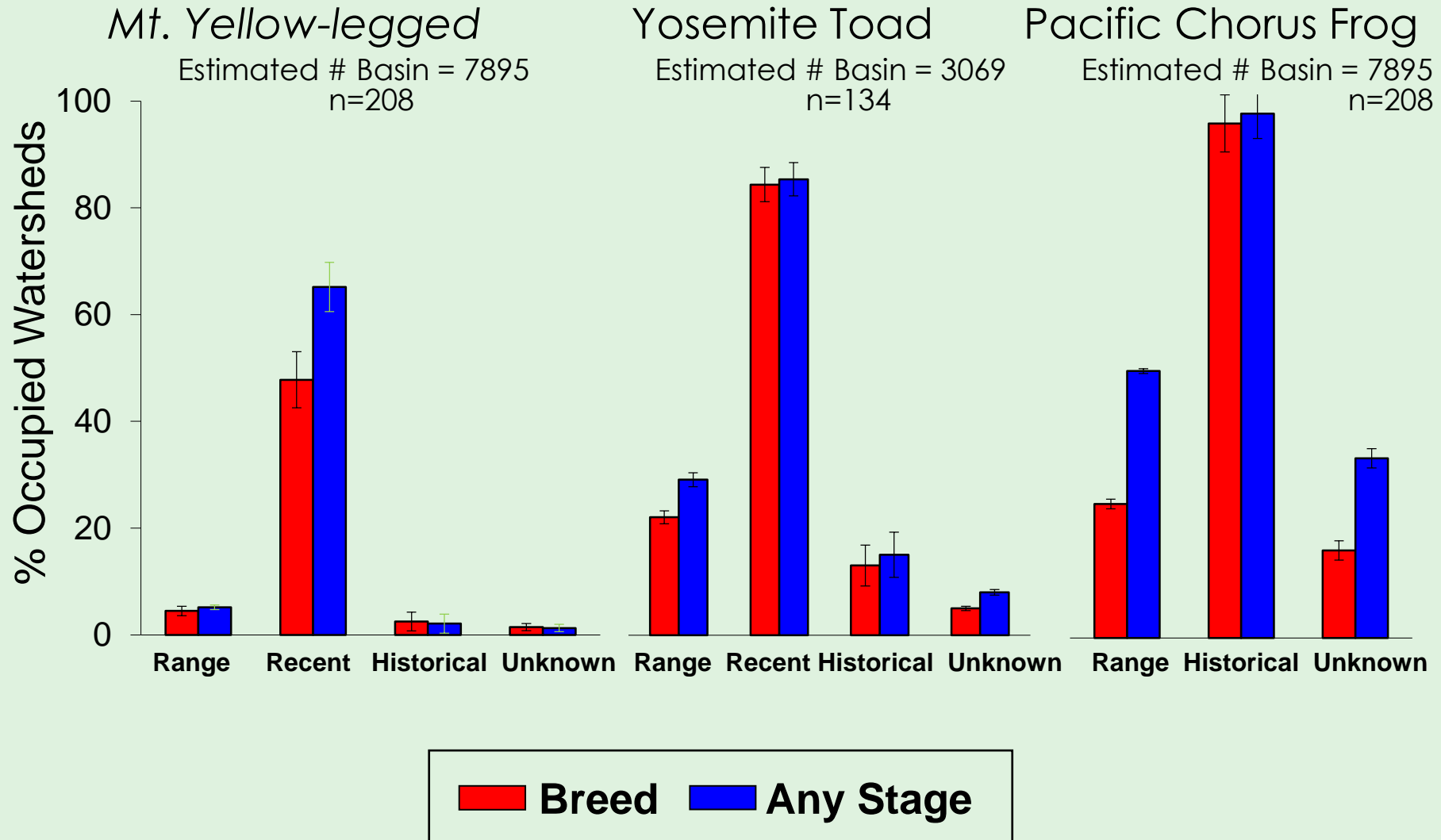
Yosemite Toad (Brown et al. 2012)

- Seem to be declining but more slowly
- Populations appear small (e.g., <20 breeding males)

Pacific Chorus Frog (Brown et al. 2014)

- Still present in many watersheds
- Abundance data is needed

Current Status: Watershed Occupancy (2002-2009)



Current Status

Mountain Yellow-legged Frog

- Federally Endangered (ESA) (*R. sierrae*, *R. muscosa*)
- SN Yellow-legged Frog - CA. State Threatened
- Southern Mtn. Yl Frog CA. State Endangered
- USFS Sensitive Species

Yosemite Toad

- Federally Threatened(ESA)
- USFS Sensitive Species

Pacific Chorus Frog

- Considered Not at Risk

Threats

Mountain Yellow-legged Frogs

Introduction of non-native trout

- Now in majority of most lakes and streams in the Sierra Nevada
- Historically fishless
- Caused decline of frogs.
- Fish removal is a highly effective restoration tool.

Amphibian disease –chytridiomycosis

- *Batrachochytrium dendrobatidis* (Bd)
- Global including Sierra Nevada
- Kills adults and juveniles primarily
Mountain yellow-legged frogs highly susceptible with mass die-offs.



Threats

Yosemite Toads

- Causes of decline unknown
- Susceptibility
 - High elevation, uncertain environments, on-edge habitats
 - High mortality of early life stages with minimal recruitment
 - Adults long-lived
 - Persistence depends on long-lived adults with periodic high recruitment



Threats

Yosemite Toads

Actions that impact:

- Meadow hydrology
 - shallow warm water
- Long-lived adults/subadults
 - meadow and upland habitats

Chytrid (*Bd*)

- Is present
- Infection rates and intensity appear low
- Decline pattern similar to typical *Bd* signature
- Can kill metamorphs but susceptibility unknown

Threats

Pacific Chorus Frog

- Introduced fish (Matthews et al. 2001)
- *Bd* resistant (Reeder et al. 2012)
- Shallow water breeder
 - Actions that impact hydrology of habitats (e.g., meadows)
- Generalist
 - Use of lakes and meadows may provide resilience



Threats

Small Populations

Management Activities



Conservation

Mt. yellow-legged frog/Yosemite toad

- Conservation Assessments (multi-agency)
- Conservation Strategy (MYLF)
- Mt Yellow-legged Frog Research
 - Bd
 - Translocation given Bd presence
 - Captive breed and rearing
- Yosemite Toad Research
 - Hydrology of breeding meadows
 - Adult movement and habitat use
 - Demography
 - Effects of thinning and prescribed burns
 - Bd - needed



Acknowledgements

Sierra Province Assessment and Monitoring Team

Herpetological Expertise

Contributors:

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Questions?

Carpenter Ants



Thamnophis