

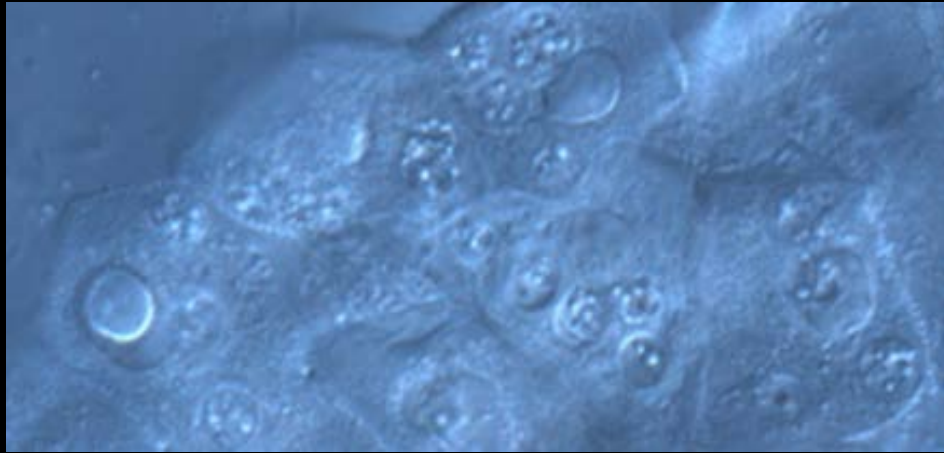
# **DISEASE AND DECLINING AMPHIBIANS IN THE YAKIMA BASIN: Death and Pestilence in Your Backyard**



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University, Biological Sciences***



**Over 1/3 of the world's amphibians are threatened with extinction. –Stuart et al, 2004**



***Batrachochytrium  
dendrobatidis***

# Pestilence

*Saprolognia*



# Washington Amphibians

- 27 total amphibian species
- 11 species have some type of state conservation status



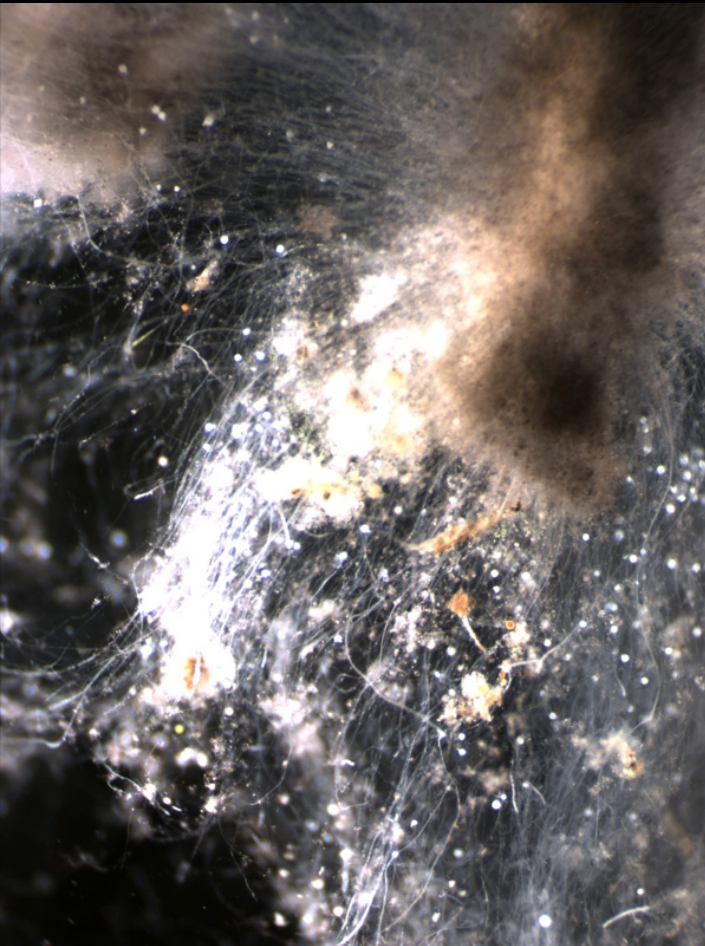
The Northern Leopard Frog is extremely endangered in the state

# Amphibian declines

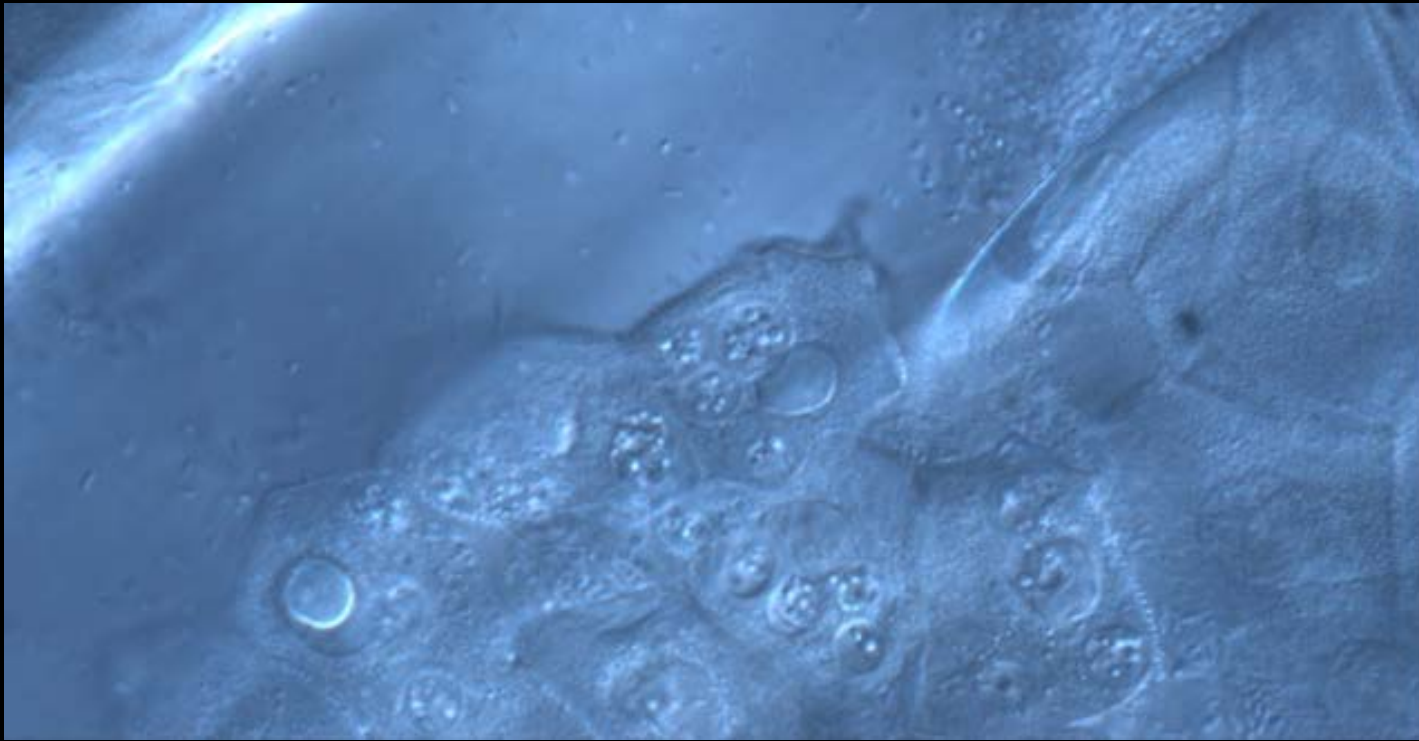


- **Complex causes**
  - Habitat destruction
  - Climate change
  - Pathogens
  - Introduced species
  - Pollution
- **Synergistic interactions**

# Major pathogens of amphibians



- *Saprolegnia ferax*
- *Batrachochytrium dendrobatidis*
- Iridoviruses/Ranaviruses
- *Aeromonas hydrophila*
- *Ribeiroia ondatrae*
- Various parasitic infections

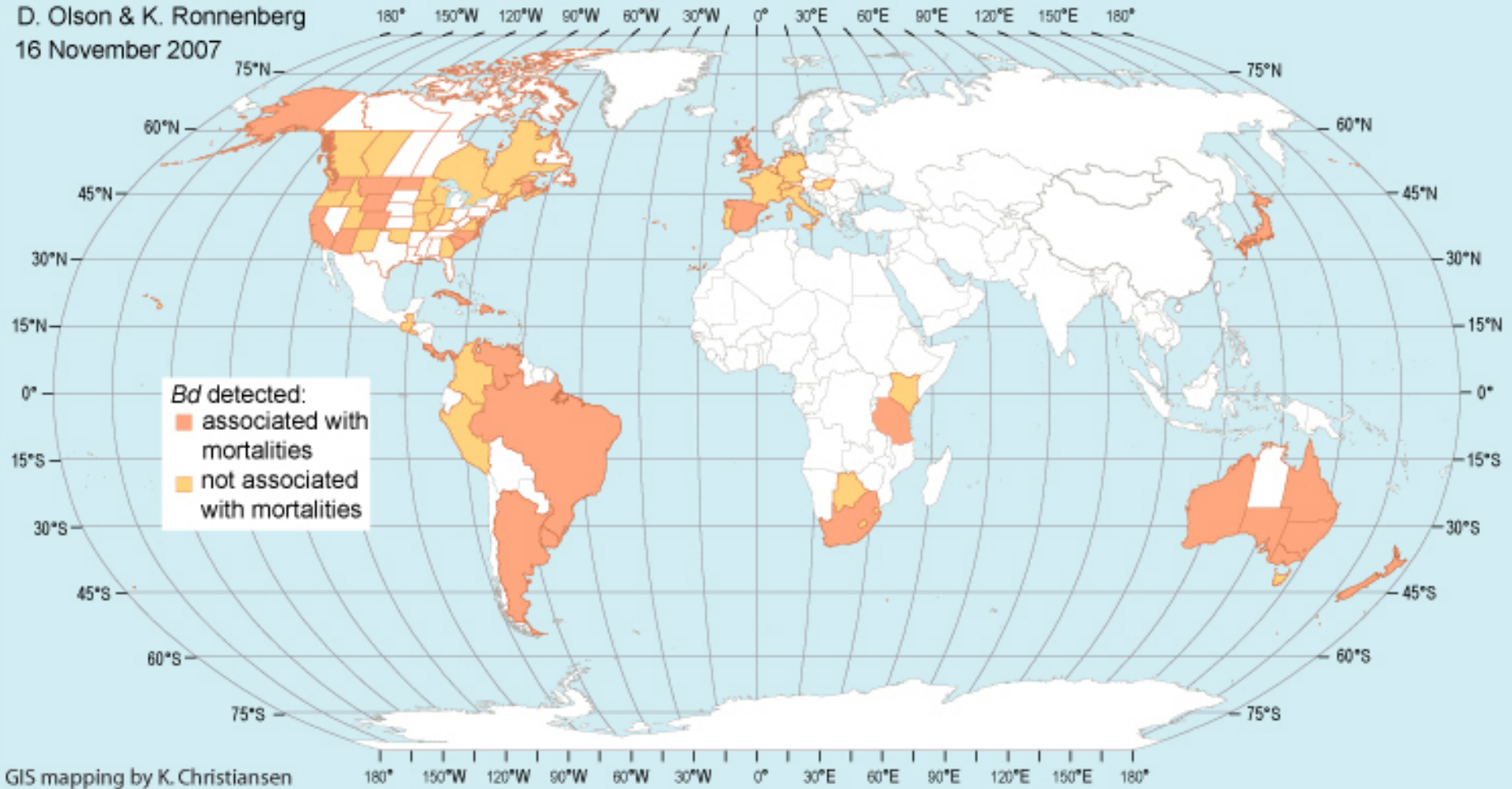


*Batrachochytrium dendrobatidis* (Bd)

A fungus associated with widespread amphibian declines

# Bd Worldwide

D. Olson & K. Ronnenberg  
16 November 2007



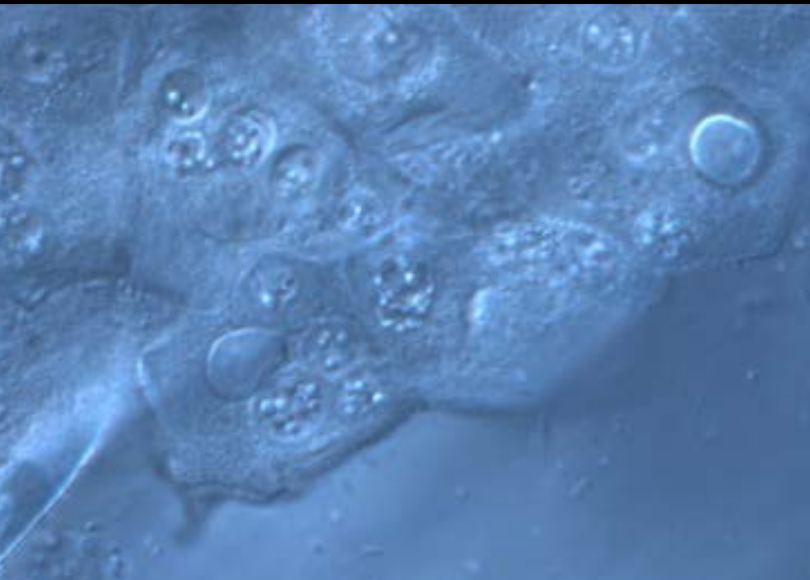
GIS mapping by K. Christiansen



# *Batrachochytrium dendrobatidis*

A member of a larger family of Chytrids

- Produces round, almost spherical zoosporangia with one - several discharge papillae
  - 7-15  $\mu\text{m}$  in diameter
  - Produced within the cells of the *stratum corneum*
- Zoosporangia contain several 2-5  $\mu\text{m}$  in diameter zoospores

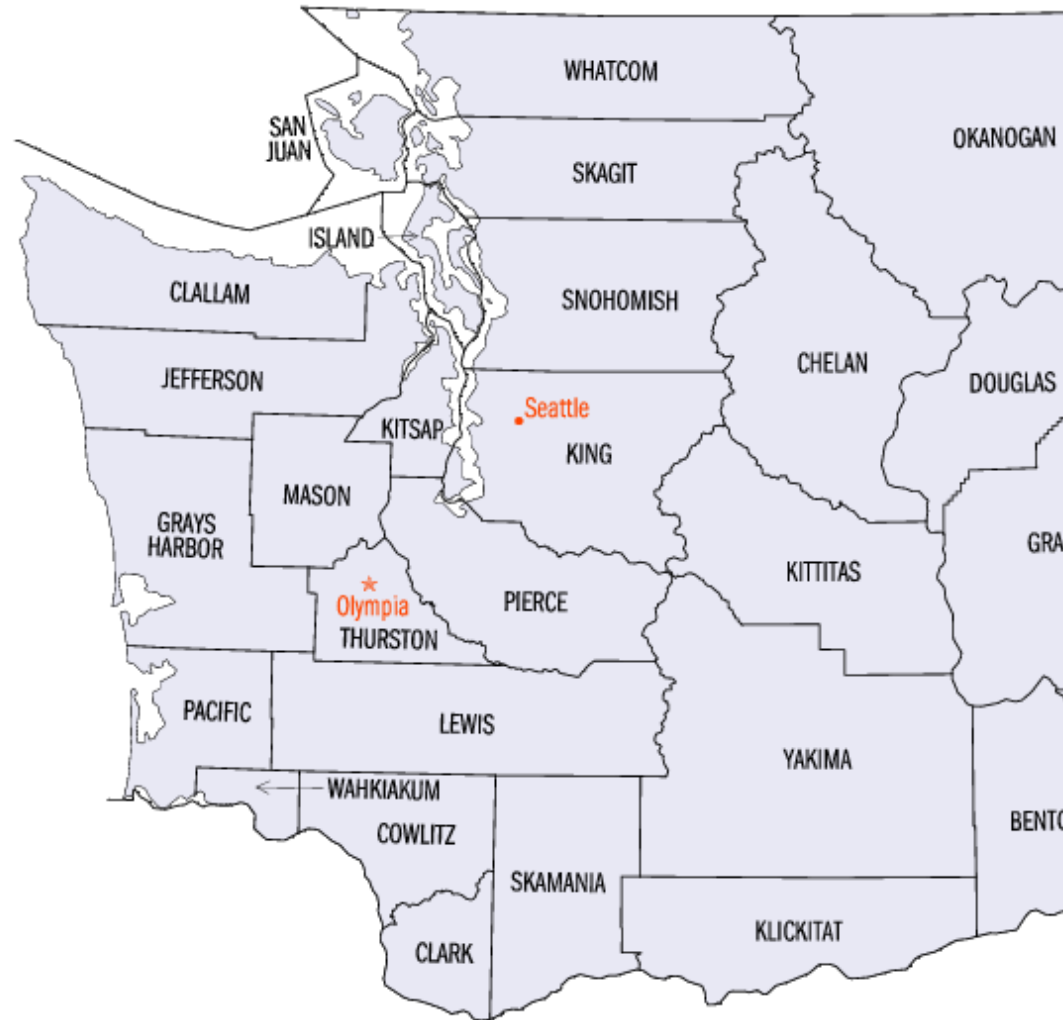


## Symptoms

- Sloughing skin
- Abnormal reddening of the skin
- Lethargy
- Death

# Bd Detection in Washington State

- *Kittitas County*
  - Engelhorn Pond
  - McElroy Pond
  - Naneum Pond
  - Swamp Lake
- *Yakima County*
  - Zillah
- *King County*
  - Auburn
- *Grant County*
  - Potholes
- *Klickitat County*
  - Dog Creek





# *Rana pipiens*



- State Endangered Species

- In 2005:

Washington Department of Fish and Wildlife (WDFW)  
brought 4 individuals to the lab

- All individuals showed symptoms of Bd
- Both histology and PCR were positive

**Bd appears to be playing a role in the extirpation  
of this endangered species**

# Engelhorn Pond

Located adjacent to Central Washington University campus  
(Kittitas Co., Wa)

- Study site since 2003
  - Ongoing mark/recapture study
- Bd detected in 2006
  - Continued mark/recapture study as well as swabbing for Bd



# Mark-Recapture Study

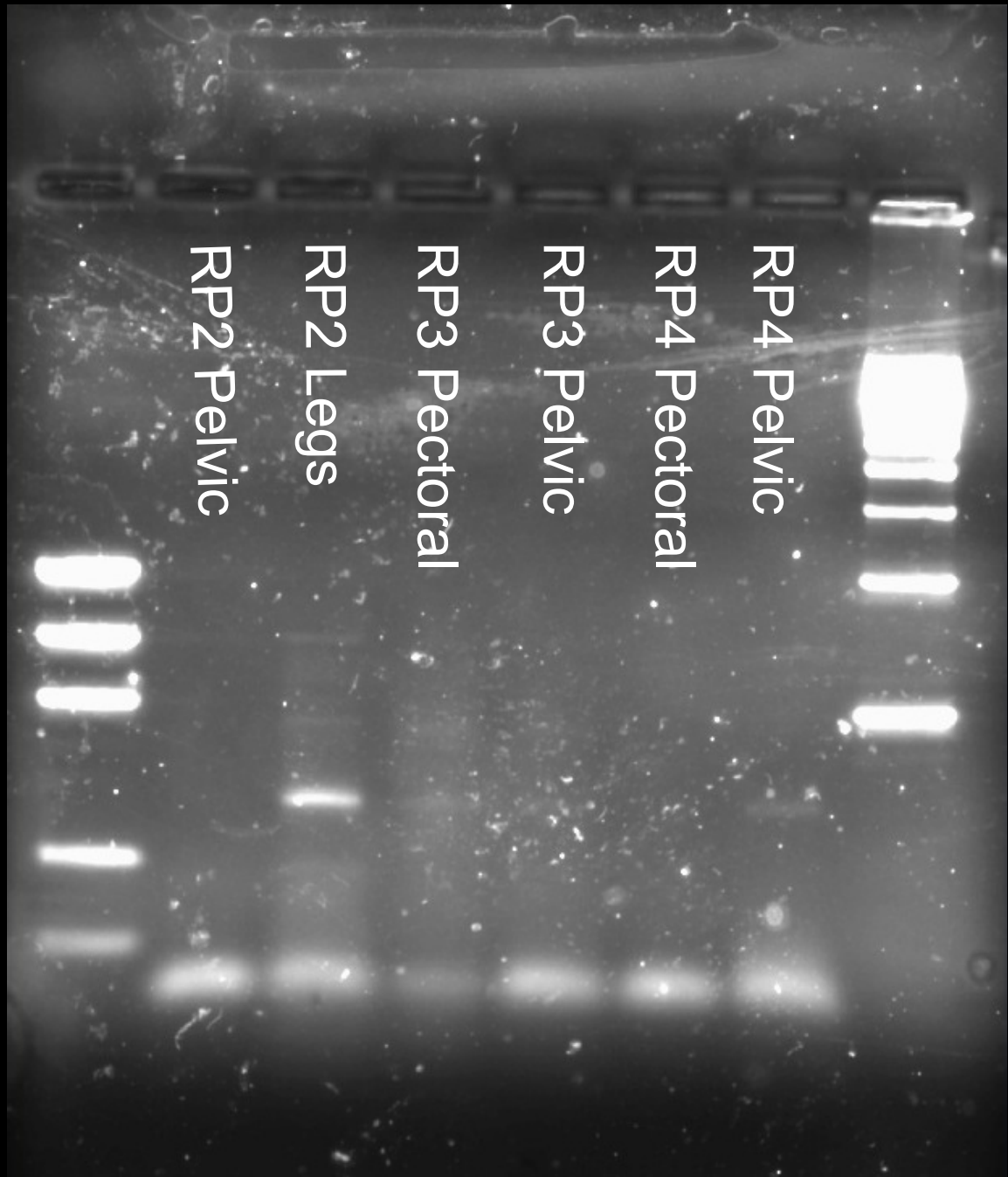
- Visual surveys are used to collect frogs
- Each collected individual is marked with an alpha-numeric fluorescent tag
- Each frog is also swabbed for Bd



Each frog has individual weight, snout-vent length, color, sex, overall appearance, and swab number recorded.

# PCR assay

- Amplification results in a 300 bp fragment



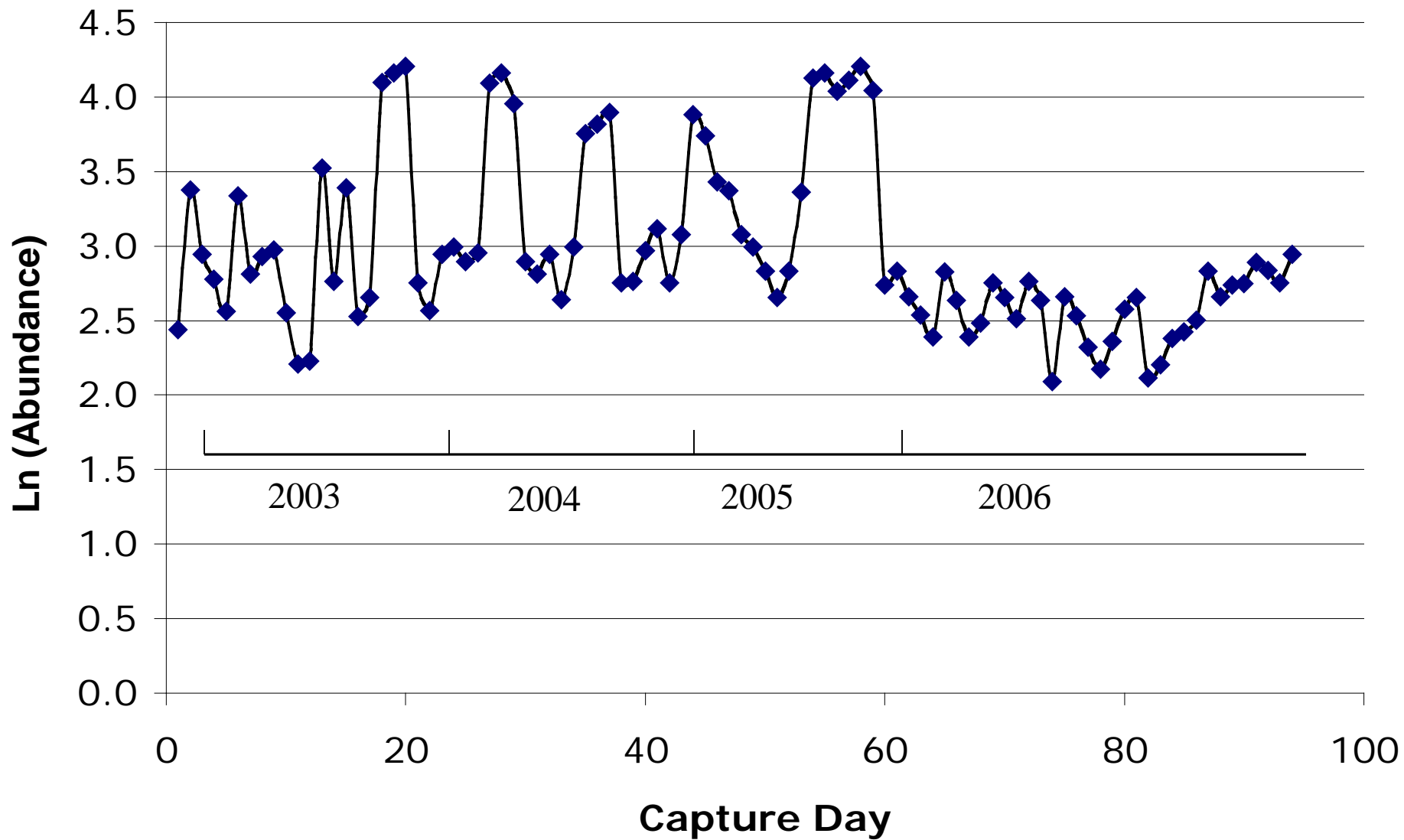
# Engelhorn Pacific Tree Frogs



Is Chytrid the Killer?



# ABUNDANCE ESTIMATES



# Chytrid Conclusions



- Bd has been associated with mortality events throughout the state
- *Bd* may be a significant contributor to the decline and potential extirpation of *Rana pipiens* in WA state
- Bd infection appears to negatively impact recapture of individuals



## *Saprolognia*

Fungus like organism associated with infection  
and mortality of local amphibian egg masses

# *Saprolegnia*

- Small group of fungus-like organisms
- Opportunistic pathogens
  - *Saprolegnia ferax* is the most abundant and widespread species of *Saprolegnia*
    - Causes morbidity and mortality in adult fish
    - Causes mortality in fish embryos
    - Causes mortality in amphibian embryos
    - *S. anisospora*, *S. parasitica*, and *S. diclinia* are also known to parasitize adult fish and embryos
- Often unidentified in amphibians

# Identification?

- Many studies have not or have misidentified *Saprolognia* species
- Difficult to identify
  - Need taxonomic expertise
  - Sexual structures
- DNA barcoding allows for accurate identification of all species present

# Continuing Research

- Sample as many strains as possible from nature
- Investigate the species interactions
  - Different taxa of *Saprolognia*
  - Amphibian specific species
- Look at other synergistic interactions with this fungus
- Monitor amphibian status and infections

