Climate Change and the Amphibians of Mount Rainier National Park








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Amphibians of MORA and NOCA

Group	Breeding Habitat	Common Name	Species Name	MORA	NOCA
Frogs – Toads	Streams	Tailed Frog	*Ascaphus truei*	X	X
	Ponds – Wetlands	Cascades Frog	*Rana cascadae*	X	X
		Columbia Spotted Frog	*Rana luteiventris*		X
		Pacific Treefrog	*Pseudacris regilla*	X	X
		Red-legged Frog	*Rana aurora*	X	X
		Western Toad	*Anaxyrus boreas*	X	X
Salamanders	Streams	Pacific Giant Salamander	*Dicamptodon tenebrosus*	X	X
	Ponds – Wetlands	Long-toed Salamander	*Ambystoma macrodactylum*	X	X
		Northwestern Salamander	*Ambystoma gracile*	X	X
		Rough-skinned Newt	*Taricha granulosa*	X	X
	Terrestrial	Ensatina	*Ensatina eschscholtzii*	X	X
		Larch Mountain Salamander	*Plethodon larselli*	X	
		Van Dyke's Salamander	*Plethodon vandykei*	X	
		Western Red-backed Salamander	*Plethodon vehiculum*	X	
TOTAL SPECIES				13	11

Amphibian Declines

- **Most severe in Australia, Central America, and western USA**

- **Major Causes**:
  - Habitat alteration and loss
  - Contaminants (e.g., pesticides, herbicides, fertilizers)
  - Introduced predators (e.g., fish, bullfrogs)
  - Diseases (e.g., chytrid fungus Bd, ranavirus)

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Amphibians and Climate Change

- **Amphibian life history and survival especially sensitive to changes in temperature and precipitation**

- **Changes that could impact amphibians:**
  - Reduction in winter precipitation
  - Increase in summer evaporation
  - Reduction of overall soil moisture
  - Alteration or loss of suitable aquatic and terrestrial habitat

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Climate Change Effects

- Analyses of existing data generally fail to find direct links between climate change and declines
- Correlated Effects:
  - Shift to earlier breeding in some species
  - Increase in El Niño Events =
    - Increase in declines of some Central American species
    - Elevated embryo mortality in some Northwest North American species

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Types of Potential Change

- **OVERALL changes: distribution and abundance**
- **DIRECT changes:**

  Timing of Migration to Breeding Sites
  Timing of Oviposition and Metamorphosis
  Increase in Levels of Physical Stress

- **INDIRECT changes:**

  Predators and Competitors
  Food Supply
  Habitat Quality and Availability

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Contradictory Effects:

- **Earlier breeding can lead to increase in:**

  Time for growth & development
  Probability of survival
  Reproductive fitness
  Recruitment

- **Earlier breeding can also lead to increase in:**

  Risk of exposure to extreme temperatures
  Mortality of early life stages

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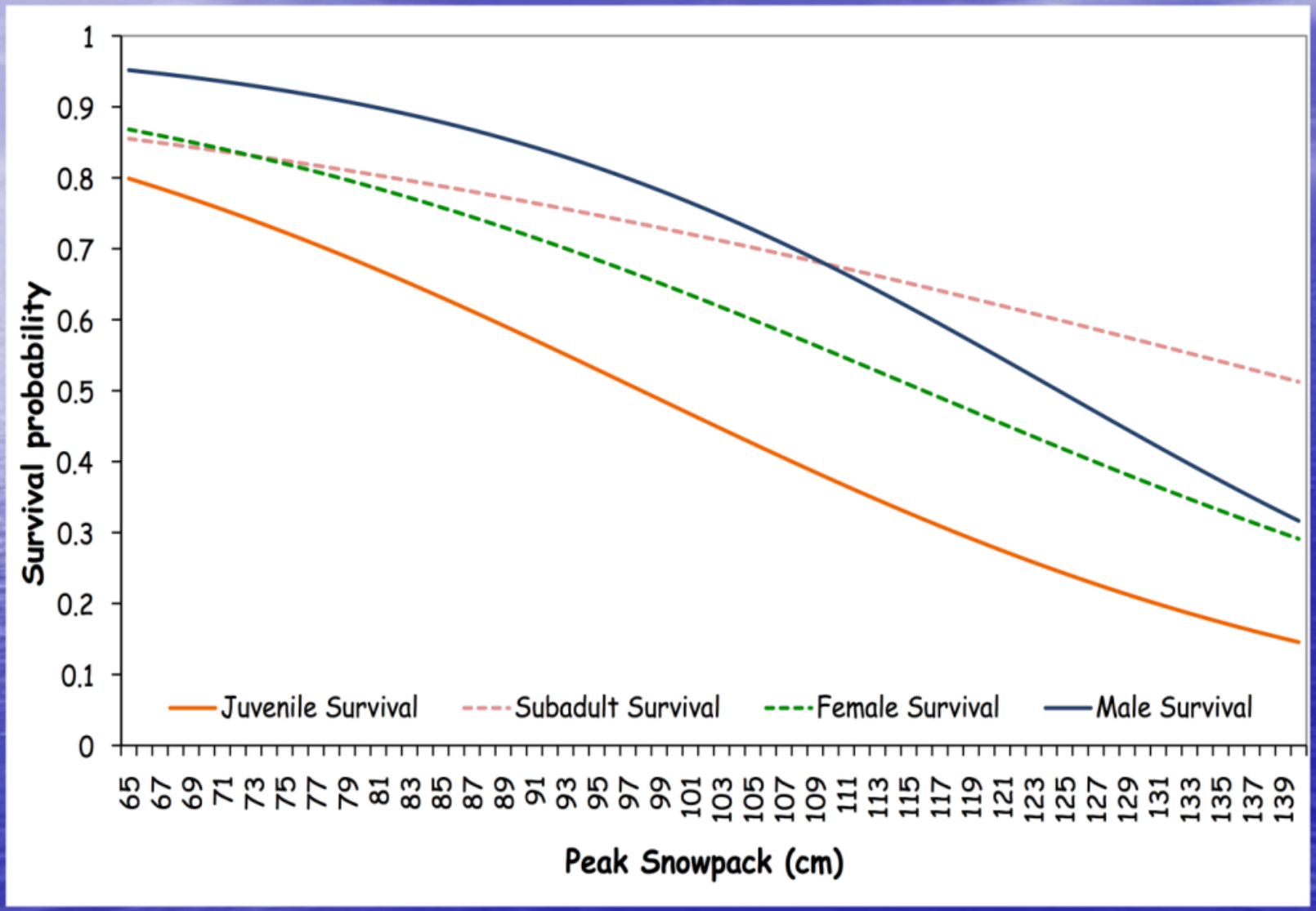
Example:



Survival of Columbia Spotted Frog life stages, Bitterroot Mountains, Montana (McCaffery and Maxell, in review)

Potential Detrimental Effects

- Changes in temperature and precipitation can lead to:

Changes in hydrology and hydroperiod

Earlier drying of temporary & marginally permanent ponds

Decrease in the time for growth to successful metamorphosis

Decrease in recruitment of individuals into populations

Population decline or eventual extinction

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Final Thoughts

- "Climate change may be a relatively minor cause of current amphibian declines, but it may be the biggest future challenge to the persistence of many species." (Corn 2005)

- Effects will most probably compound existing impacts

- We are often able to see change in the short-term (the visible present)

- Long term vision, however, requires continuing research and effective monitoring:

  USGS Project: Montane amphibian response to climate change: Populations, habitat, and non-native fish management (NOCA, MORA, and Glacier)

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Selected References

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