

# Global Climate Change

## The Most Important Cause of Amphibian Declines



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## Global Climate Change

- ▶ Stressor of amphibians
- ▶ Decreased prey availability
- ▶ Time of breeding
- ▶ Increased desiccation
- ▶ Dramatic Video



<http://www.youtube.com/watch?v=2hBdHydtF1I>

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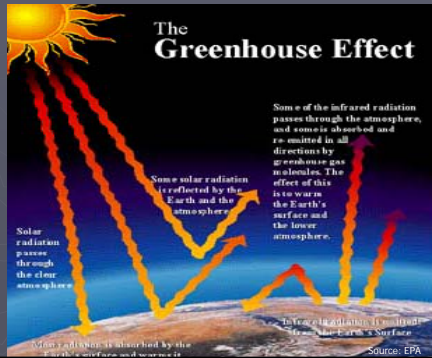
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## What is Climate Change?

- ▶ Accumulation of greenhouse gasses in the atmosphere
- ▶ Heat radiating off of the earth's surface is trapped increasing the average temperature on Earth



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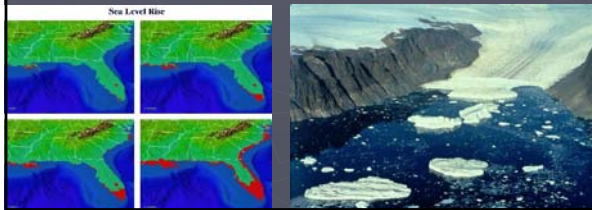
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## What is Climate Change?

- ▶ Increased temperatures lead to glacial melt and increased sea levels, which change weather patterns globally.
- ▶ Fewer and smaller glaciers reduce the amount of water supplied to lotic systems.



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## How is Climate Change Affecting Amphibians?

- ▶ Projected western hemisphere climate change study by Lawler et al. 2009, assesses the suitability of a species' current range over the next century.
- ▶ 80% of climate projections based on low greenhouse-gas emissions result in the loss of at least 20% of the vertebrate fauna (Amphibians, birds, and mammals) over much of North and South America.
- ▶ At least 50% lost at mid-high emission projections
- ▶ Amphibians are predicted to undergo a high degree of turnover at high northern latitudes, the Andes, Mexico, Central America, and in the Eastern United States

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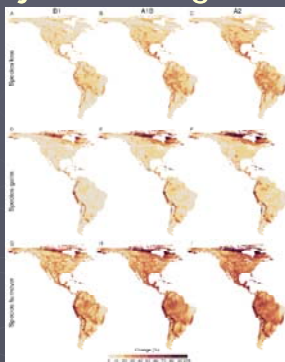
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## Projected Range Shifts

High species loss in Mexico, Central America

High species gains in the Arctic Tundra and Andes Mountains

High species turnover in mountains, tundra, and southeast US



Questions for future research.

Will amphibians be able to travel great distances to new suitable habitat?

Is global climate change occurring too fast for species to keep up?

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## Documented Declines

- ▶ Declines have been studied since 1979 in Australia.
- ▶ Major declines and extinctions have been documented in 7 species of upland rainforests which are believed to be attributed at least indirectly to climate change.
- ▶ Mean annual minimum temperatures increased over time in the years preceding frog declines in tropical eastern Australia possibly leading to more optimal growth conditions for a chytrid pathogen (Laurance 2008).



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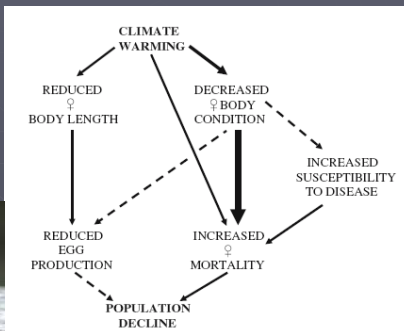
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## Irrefutable Evidence

- ▶ In the UK, increased temperatures affect the availability of prey or the ability of toads to feed and assimilate body mass leading to declining populations (Reading 2007).



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## How does climate change affect amphibians?

- ▶ Temperature and moisture are affected by climate change
- ▶ Heat exchange occurs with air, water, soil, or solar heat gain
- ▶ Body temperature determines biochemical, cellular and physiological rate processes.
- ▶ Because temperature and moisture have such strong effects on amphibian biology, including reproduction, and because of their limited mobility, amphibians should be relatively vulnerable to the effects of rapid climate change (Carey 2003).



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## Why study amphibians?

- ▶ Amphibians are potentially good bioindicators of environmental health because of highly permeability of skin and eggs, and because of a biphasic life cycle.
- ▶ Negative effects on amphibians can have cascading effects on many other animals in the ecosystem (Donnelly and Crump 1998).



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## Problems caused by Climate Change

- ▶ If an amphibian is rehydrating from moist soil that contains contaminants because of drought and concentrated toxins, it will absorb higher concentrations of toxins.
- ▶ Environmental cues for breeding will not occur at the usual time.
- ▶ More arid conditions lead to high rates of desiccation (Donnelly and Crump 1998).



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## Importance of Climate Change

- ▶ Wide spread effects
- ▶ Occurring fast
- ▶ Effects all factors that could lead to amphibian declines



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## Literature Cited

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## Questions?



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