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### What is Climate Change?

- Climate change refers to any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among other effects, that occur over several decades or longer (EPA).

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### What Happens?

- Causes
  - Floods
  - Droughts
  - Heat Waves
  - Severe Storms
  - Changing Temperature
  - Drier Environments

A photograph of a brown frog sitting on a green leaf, with a water droplet on the leaf.

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### Breeding and Climate Change

- ▣ Breeding timing is based on Temp and moisture for amphibians.
- ▣ Climate change is causing some species to breed earlier making them susceptible to sudden changes. Ex: *Pseudacris crucifer*, *Hyla versicolor*, *Rana catesbeiana*. (Blaustein)



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### Breeding and Climate Change

- ▣ Increase in desiccation (Corn & Muths 2002).



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### Spread of Disease

- ▣ A study by Pounds suggest that these new conditions favorable for new diseases such as Chytridomycosis (aka chytrid fungus)



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### Spread of Disease

- Climate change is believed to have created ideal conditions for the spread of the fungus, which grows best at temperatures between 63° and 77°F (Pounds).



110 species of Harlequin have disappeared in the 80's & 90's (Pounds).

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### Spread of Disease

Increasing water and air temps are blamed for fueling the fungus responsible for the disappearance of Harlequin frog species (*Atelopus*)



Critically Endangered



*A. carrikeri*

- "Disease is the bullet killing frogs, but climate change is pulling the trigger," - Pounds

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### Habitat Loss

- Golden toad (*Bufo periglenes*) described in 1966 missing since 1989.
- Went extinct from Costa Rica's Cloud Forest after extreme dry season brought on by El Nino in 86-87 (Pounds 1999).



Take Action: Protect wildlife from the disastrous effects of climate change.

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### Habitat Loss

- ❑ South Carolina 4 out of 9 species in decline due to drought over a 35 year period.
- ❑ Species affected had longest larval period. (Daszak et al. 2005).
- ❑ Almost no specimens had Chytrid. 3 out of 137
- ❑ *Ambystoma talpoideum*, *A. tigrinum*, *Pseudacris ornata*, *Rana sphencephala*.



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### Why Does This Matter?

- Spread of Disease
- Habitat Loss
- Population Movements
- Sequential repercussion on polar movement
- Species decline and extinction
- Breeding season changes
- Overlapping breeding
- Amphibian inability to retreat
- Specialization species no hope
- The unknown???

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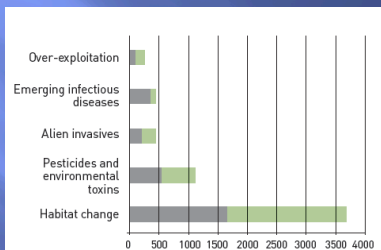
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### Is This A Really Big Deal?



The State of the Worlds Amphibians.  
Figure 1: Species affected by six major environmental risks (Chanson et al., 2008)

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## How Bad Is It Really?

<https://youtu.be/bHuY4BE50Ik>

:45-1:22

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## REFERENCES

- EPA. United States Environmental Protection Agency. *Climate Change: Basic Information*.
- Pounds J. A., and M. L. Crump, 1994. Amphibian declines and climate disturbance: The case of the golden toad and the harlequin frog. *Conservation Biology* 8:72-85.
- Blaustein, A. R., A. C. Hatch, L. K. Belden, E. Schussler, and J. M. Kiesecker. 2003. Global Change: challenges facing amphibians. Pages 199-213 in R. D. Semlitsch, editor. *Amphibian Conservation*. Smithsonian Institution, Washington.
- Pounds JA, Fogden MPL, Campbell JH (1999). Biological response to climate change on a tropical mountain. *Nature*398, 611-5.
- Daszak P, Scott DE, Kilpatrick AM, Faggioni C, Gibbons JW, Porter D (2005). Amphibian population declines at savannah river site are linked to climate, not chytridiomycosis. *Ecology* 86, 3232-7.
- Corn PS, Muths E (2002). Variable breeding phenology affects the exposure of amphibian embryos to ultraviolet radiation. *Ecology* 83, 2958-63.
- Chanson, J. *et al.* (2008). The State of the World's Amphibians. In: Stuart *et al.* (Eds.) *Threatened Amphibians of the World*, pp. 33-52. Barcelona/Gland/ Arlington: Lynx Edicions/IUCN/Conservation International.

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