

# Ecosystem Thresholds and Climate Tipping Points: Implications for Policymakers

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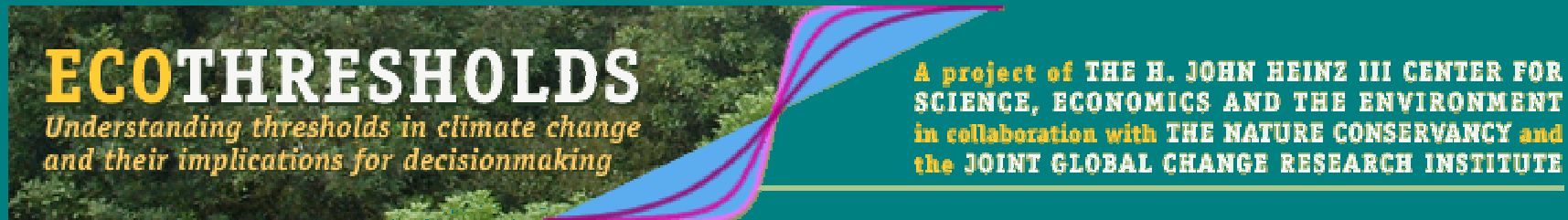
Joint Global Change Research Institute

**Battelle**



**Pacific Northwest  
National Laboratory**  
Operated by Battelle for the  
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# A New Initiative



- Addressing major strategic issue
- Begun in 2006
- Involving research institutions, federal agencies, conservation organizations, private industry

# 2007 IPCC Conclusions

- The observed change in the climate system over roughly the past century is virtually certain to be due in part to human influences.
- The observed changes in climate are very likely to continue, and even accelerate during the current century.
- There are now many observed, well-documented impacts of changes in natural resources, animal and plant species, and ecosystems in many regions of the world.
- Impacts in the future are very likely to grow in both number and magnitude.
- Climate change and its impacts present challenges for adaptation in both the developing world, and as well among developed countries.

# A Major Strategic Challenge

- ▶ Understanding the speed, magnitude, and potential for irreversibility of the impacts of climate change
- ▶ Of particular concern are those impacts that arise rapidly, result in extremely large changes in resources, or are irreversible in nature, and therefore are difficult to predict
- ▶ I.e. those impacts that appear to be the results of crossing thresholds or tipping points in ecosystems

# Nature of the Challenge

- ▶ Thresholds exist in many ecosystems.
- ▶ As our climate continues to change, we must now begin to understand
  - What are our options for responding?
  - What areas of new and better understanding are necessary to minimize the risks from such changes?

# Management and Research

- ▶ Is there a known threshold in managers' systems that their clientele would prefer not to have crossed?
- ▶ Given current trends or predictive capabilities, can we determine how much more time is available until the threshold would be passed, in the absence of further action?
- ▶ Can the threshold be avoided, either by reduction of stresses (e.g. reducing change in the physical climate system) or by ecosystem management?
- ▶ What options exist for managing the ecosystem and coping with the consequences of going through a threshold if it cannot be avoided?

# Ecotreshholds Initiative

- ▶ Catalyzing a productive exchange among resource managers, policy decision-makers, and scientists
  - To understand the prevalence and contributors to threshold changes in ecosystems, and
  - To understand what options managers and policy makers have to address them

# Workshop Questions

- ▶ Threshold responses are *changes in the ecosystem or natural resource that outstrip current adaptive capacity, requiring a response that is novel, rapid or very large.*
- ▶ What insights can we garner from existing cases where threshold changes in ecosystems have been important?
- ▶ What lessons are there for managers and scientists?
- ▶ When do multiple and interacting stresses – physical, ecological, and social – move us beyond our current capacity to adapt?

# Main Workshop Conclusions

- ▶ Climate is indeed driving many ecosystems across thresholds that are important for managers to consider;
- ▶ The consequences of known thresholds challenge our current capacity to manage those ecosystems sustainably; and
- ▶ We require both better management techniques and a much better predictive capability to use our knowledge of thresholds more effectively in building adaptive management capacity.

# What Will We Do Today?

- ▶ Explore several important case studies from the initial workshop
- ▶ Discuss next steps
- ▶ Build a foundation for further discussion

# Closing Thoughts

“Much work and experience has shown that long-term environmental problems can seldom be dealt with by single discrete actions or policies but respond only to continuing, sustained efforts at learning, supported by steady public attention and visibility.”

# So What Next?

- ▶ Our task is now to build that sustained dialogue.
- ▶ Topical workshops as well as focused field and modeling studies
- ▶ This will require collaboration across government, business, academia, and the non-governmental community to identify their key issues of concern that arise from abrupt changes in ecological systems.
- ▶ We need to plan for long-term engagement among sectors and stakeholders to find workable ways to cope with threshold changes in natural, managed, and socio-economic systems.
- ▶ And we need to pursue the larger discussion about acceptable levels of greenhouse gases necessary to mitigate those threshold changes that cannot be addressed through management actions.