SAFE GUARDING NATURE FOR PEOPLE AND WILDLIFE



Climate Change Adaptation

Global warming is already disrupting the natural ecosystems on which both people and wildlife depend. Even with aggressive reductions in greenhouse gases, climate change will place additional strain on the nation's wildlife and natural systems. The fate of our wildlife and wild places will depend on steps we take to help them survive in the face of a changing climate. Climate change adaptation - actions designed to safeguard our wild-life and other natural resources - will largely define a new era in America's conservation.



Dall sheep, Denali National Park.

WHAT IS ADAPTATION?

With impacts of global warming on our wildlife and natural ecosystems increasingly evident — and projected to become even more severe in the coming decades — conservationists and resource managers are now focusing on how best to respond to these changes. Adaptation is the technical term used to describe efforts to prepare for and cope with the impacts of global warming.

Climate change adaptation can be defined as **initiatives and measures designed to** reduce the vulnerability of natural and human systems against actual or expected climate change effects.

Because climate change adaptation is an emerging discipline and not yet familiar to many people, this fact sheet offers a brief summary of several key concepts and principles relevant to natural resources adaptation.

KEY ADAPTATION CONCEPTS

Adapting to climate change will require fundamental shifts in the way conservation and natural resource management are carried out in the future. Several key concepts are at the heart of this shift in thinking and action.

Resilience and Resistance ~ Resilience refers to the ability of a system to bounce back from a disturbance, such as a major wildfire or storm, and return to a functional state. Resistance is the ability to withstand a disturbance without significant loss of function. Increasing ecosystems resilience will be especially important in preparing for and responding to climate change impacts.

Anticipatory vs. Reactive Measures ~ Adaptation measures can prepare in advance for likely impacts, or respond after-the-fact to climate-related disturbances. An anticipatory strategy, for instance, might entail locating new development away from high hazard areas. Reactive strategies might use the aftermath of a major disturbance to shift development out of harms way, or restore an ecosystem with an eye toward future conditions.

Human and Natural Systems ~ Global warming will take a toll not only on natural ecosystems, but also on human systems, such as agriculture, urban infrastructure, and human health. Human-oriented and ecosystem-based adaptation should not be viewed as a tradeoff, however, since healthy natural systems are essential for maintaining a strong economy and safe and livable communities.

Facilitating Change ~ Conservation traditionally has focused on maintaining or restoring past conditions. Unfortunately, with climate change already altering plant and animal distributions, habitats, and ecosystem structure, conservationists increasingly will be challenged to envision an altered future, and work to facilitate the ability of species and ecosystems to respond and adapt to those changes.



Wetland restoration.

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American pika.

OVERARCHING ADAPTATION PRINCIPLES

The development of climate change adaptation strategies for specific places and resources will require collaborative efforts across many fields of expertise and among numerous stakeholders. While the details of such strategies will vary considerably, several overarching adaptation principles are likely to apply broadly.

Reduce Non-climate Stressors ~ Climate change will exacerbate many existing threats to our wildlife and natural ecosystems, such as the loss of habitat and spread of invasive species. Reducing non-climate stressors will be key to promoting ecosystem resiliency. Nonetheless, climate change will require us to be strategic in identifying which existing problems are most important to address.

Manage for Ecological Function and Biological Diversity ~ Healthy and biologically diverse ecosystems will be better able to withstand or bounce back from some of the impacts of climate change. Strengthening the nation's network of protected lands and waters will be essential for maintaining strongholds of wildlife populations and sustaining the full array of species, ecosystems, and their human benefits.

Improve Habitat Connectivity ~ Improving habitat connectivity to facilitate species migrations and range shifts in response to changing climate conditions will be increasingly important. Connecting core habitat areas by establishing buffers and wildlife corridors can reduce or prevent barriers such as urban development, roads, and levees that might otherwise limit a species' ability to inhabit new areas.

Implement Proactive Management and Restoration ~ Efforts that actively facilitate the ability of species, habitats, and ecosystems to accommodate climate change – for example, beach renourishment, enhancing marsh accretion, planting climateresistant species, and perhaps even translocating species – may be necessary to protect highly valued species or ecosystems when other options are insufficient.

Embrace Uncertainty ~ Although uncertainty exists regarding the severity of future climate shifts and the ecological impact of these changes, such uncertainty can no longer be an excuse for inaction. Instead, resource managers must learn to embrace uncertainty, by adopting agile management approaches and monitoring ecosystem conditions and responses.

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For additional information on ecosystem adaptation see P. Glick, A. Staudt, and B. Stein. 2009. *A New Era for Conservation: Review of Climate Change Adaptation Literature*, Washington, DC: National Wildlife Federation (available at: http://www.nwf.org).

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