

GLOSSARY

adaptation

Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

adaptive capacity

The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

adaptive governance

Institutional and political frameworks designed to adapt to changing relationships between society and ecosystems in ways that sustain ecosystem services; expands the focus from adaptive management of ecosystems to address the broader social contexts that enable ecosystem-based management.

adaptive management

A process that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process. It also recognizes the importance of natural variability in contributing to ecological resilience and productivity.

anthropogenic stress

(1) Stressors resulting from or produced by human beings (see “stressor” definition below); (2) Any human activity that causes an ecosystem response that is considered negative.

anticipatory adaptation

Adaptation that takes place before impacts of climate change are observed. Also referred to as proactive adaptation.

biodiversity

(1) The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. (2) The diversity of genes, populations, species, communities, and ecosystems, which underlies all ecosystem

processes and determines the environment on which organisms, including people, depend.

catastrophic event

(1) A sudden natural or man-made disturbance that causes widespread destruction. (2) In the context of climate change, a suddenly occurring event having wide distribution and large impacts on human and/or natural systems (*e.g.*, mass extinctions, rapid sea level rise, or shifts in atmospheric or oceanic circulation patterns over less than a decade). Such events have occurred in the past due to natural causes.

climate change

Climate change refers to any change in climate over time, whether due to natural variability or as a result of human activity. This usage differs from that in the United Nations Framework Convention on Climate Change, which defines “climate change” as: “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.”

climate change scenario

A plausible and often simplified representation of the future climate, based on an internally consistent set of climatological relationships, typically constructed for explicit use as input to impact models. A “climate change scenario” is the difference between a climate scenario and the current climate.

climate variability

Climate variability refers to variations in the mean state and other statistics (such as standard deviations, statistics of extremes, etc.) of the climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability).

confidence (in an adaptation approach)

Degree of belief that an event will occur given observations, modeling results, and current knowledge. In this report, confidence is based on the expert opinion of the authors and is composed of two elements: (1) the amount of evidence available to support the determination that the effectiveness of a given adaptation approach is well-studied and understood and (2) the level of agreement or

consensus within the scientific community about the different lines of evidence on the effectiveness of that adaptation approach.

disturbance regime

Frequency, intensity, and types of disturbances, such as fires, insect or pest outbreaks, floods, and droughts.

ecoregions

Areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources.

ecosystem

A system of interacting living organisms together with their physical environment.

ecosystem management, or ecosystem-based management

There are many definitions for this term, and different agencies interpret the term in slightly different ways. Three definitions follow; the first is frequently cited. (1) Management that integrates scientific knowledge of ecological relationships within a complex sociopolitical and values framework toward the general goal of protecting native ecosystem integrity over the long term. (2) Any land-management system that seeks to protect viable populations of all native species, perpetuate natural disturbance regimes on the regional scale, adopt a planning timeline of centuries, and allow human use at levels that do not result in long-term ecological degradation. (3) The application of ecological and social information, options, and constraints to achieve desired social benefits within a defined geographic area over a specified period.

ecosystem services

The conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life.

extreme weather event

An event that is rare within its statistical reference distribution at a particular place. Definitions of “rare” vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile. By definition, the characteristics of what is called “extreme weather” may vary from place to place. Extreme weather events may typically include floods and droughts.

global change

Changes in the global environment (including alterations in climate, land productivity, oceans or other water resources, atmospheric chemistry, and ecological systems) that may alter the capacity of the Earth to sustain life.

human social resilience

The capacity to absorb shocks while maintaining function.

impacts (climate change)

The effects of climate change on natural and human systems. Depending on the consideration of adaptation, one can distinguish between potential impacts and residual impacts:

Potential impacts: All impacts that may occur given a projected change in climate, without considering adaptation.

Residual impacts: The impacts of climate change that would occur after adaptation.

invasive species

Non-native species whose introduction does or is likely to cause economic or environmental harm or harm to human health.

likelihood

The likelihood of an occurrence, an outcome or a result, where this can be estimated probabilistically.

maladaptation

Any changes in natural or human systems that inadvertently increase vulnerability to climatic stimuli; an adaptation that does not succeed in reducing vulnerability but increases it instead.

management plan

In general, a document that provides guidance regarding all activities on federally managed lands. However, the meaning for National Forests is quite distinct. Specifically, the National Forest Management Act (NFMA (16 U.S.C. 1660(6))) requires the Forest Service to manage the National Forest System lands according to land and resource management plans that provide for multiple-uses and sustained-yield in accordance with MUSYA (16 U.S.C. 1604(e) and (g)(1)), in particular include coordination of outdoor recreation, range, timber, watershed, wildlife and fish, and wilderness and determine forest management systems, harvesting levels, and procedures in the light of all of the uses set forth in the Multiple-Use Sustained Yield Act of 1960, and the availability of lands and their suitability for resource management.

mitigation

An anthropogenic intervention to reduce the anthropogenic forcing of the climate system; strategies to reduce greenhouse gas sources and emissions and enhance greenhouse gas sinks.

native species

With respect to a particular ecosystem, a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem.

non-native species

Also referred to as “alien,” “exotic,” and “introduced” species. This term refers to any species (including its seeds, eggs, spores, or other biological material capable of propagating that species) that is not native to a particular geographic region. Non-native species may, or may not be, invasive.

organic acts

Organic acts are fundamental pieces of legislation that signify the organization of an agency and/or provide a charter for a network of public lands. The first “organic act” was the Organic Administration Act of 1897, which outlined the primary purposes of national forests as (1) securing favorable conditions of water flows, and (2) furnishing a continuous supply of timber for the use and necessities of the citizens of the United States.

phenology

The timing of behavior cued by environmental information.

reactive adaptation

Adaptation that takes place after impacts of climate change have been observed.

realignment

Considered in the context of restoration, realignment refers to an adjustment in management or planning goals to account for substantially altered reference conditions and new ecosystem dynamics. The rationale for this adaptation approach is that historical (pre-disturbance) baselines may be inappropriate in the face of a changing climate.

refugia

Physical environments that are less affected by climate change than other areas (*e.g.*, due to local currents, geographic location, etc.) and are thus a “refuge” from climate change for organisms.

relocation

Human-facilitated transplantation of organisms from one location to another in order to bypass a barrier (*e.g.*, an urban area). Also referred to as “assisted migration.”

replication

Multiple replicates of a habitat type (*e.g.*, multiple fore reef areas throughout the reef system) or population are protected as a “bet hedging” strategy against loss of the habitat type due to a localized disaster.

representation

Includes both (1) ensuring that the full breadth of habitat types is protected (*e.g.*, fringing reef, fore reef, back reef, patch reef) and (2) ensuring that full breadth of species diversity is included within sites; both concepts relate to maximizing overall biodiversity of the larger system.

resilience

The amount of change or disturbance that can be absorbed by a system before the system is redefined by a different set of processes and structures (*i.e.*, the ecosystem recovers from the disturbance without a major phase shift).

resistance

Ecological resistance is the ability of an organism, population, community, or ecosystem to withstand perturbations without significant loss of structure or function. From a management perspective, resistance includes both (1) the concept of taking advantage of/boosting the inherent (biological) degree to which species are able to resist change and (2) manipulation of the physical environment to counteract/resist physical/biological change.

restoration

Manipulation of the physical and biological environment in order to restore a desired ecological state or set of ecological processes.

sensitivity

Sensitivity is the degree to which a system is affected, either adversely or beneficially, by climate-related stimuli. The effect may be direct (*e.g.*, a change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (*e.g.*, damages caused by an increase in the frequency of coastal flooding due to sea-level rise).

stressor

Any physical, chemical, or biological entity that can induce an adverse response.

surprises

(1) Sudden, unexpected changes in the environment (biotic or abiotic) that may have disproportionately large ecological consequences. (2) In the context of climate change, unexpected events resulting from climate change (such as a shift in ocean circulation) that may have both positive and negative consequences. (3) In the context of social-ecological systems, a qualitative disagreement between ecosystem behavior and *a priori* expectations—an environmental cognitive dissonance.

trust species

All species where the federal government has primary jurisdiction including federally endangered or threatened species, migratory birds, anadromous fish, and certain marine mammals.

unimpaired

Refers to language in the NPS Organic Act that describes the purpose for which National Parks were established: “... to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave

them unimpaired for the enjoyment of future generations.” “Unimpaired” generally means “not damaged or diminished in any respect.”

vulnerability

The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.

wilderness management

(1) Management activities that aim to preserve the wilderness character of designated wilderness areas, which are “...area[s] where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain.” (2) The planning for and management of wilderness resources.

ACRONYMS AND INITIALISMS

ADCP	Acoustic Doppler Current Profilers
ANILCA	Alaska National Interest Lands Conservation Act
AOGCM	Atmosphere-Ocean Coupled General Circulation Model
APES	Albemarle-Pamlico Estuarine System
APHIS	Animal and Plant Health Inspection Service
APNEP	Abemarle-Pamlico National Estuarine Program
AQRV	Air Quality Related Values
ATBA	Area to Be Avoided
ATBI	All Taxa-Biodiversity Inventory
ATV	All-Terrain vehicle
AVHRR	Advanced Very High Resolution Radiometer
BLM	Bureau of Land Management
CaCO₃	Calcium Carbonate
CCMP	Comprehensive Conservation and Management Plan
CCP	Comprehensive Conservation Plan
CCSP	Climate Change Science Program
CDFG	California Department of Fish and Game
CERP	Comprehensive Everglades Restoration Plan
CHPP	Coastal Habitat Protection Plan
CINMS	Channel Islands National Marine Sanctuary
CO₂	Carbon Dioxide
CoRIS	Coral Reef Information System
CRED	Coral Reef Ecosystem Division
CREIOS	Coral Reef Ecosystem Integrated Observing System
CREWS	Coral Reef Early Warning System
CRMP	Comprehensive River Management Plan
CRP	Conservation Reserve Program
CTD casts	Water Conductivity-Temperature-Depth profiles
CWA	Clean Water Act
CWMTF	Clean Water Management Trust Fund
DDT	Dichloro-diphenyl-trichloroethane
DEFRA	United Kingdom Department for Environment Food and Rural Affairs
DGVM	Dynamic Global Vegetation Model
DO	Dissolved Oxygen
DRBC	Delaware River Basin Commission
EBM	Ecosystem-Based Management
EDRR	Early Detection and Rapid Response
EEP	Ecosystem Enhancement Program
EMA	Existing Management Area

EMS	Environmental Management System	NF	National Forest
ENSO	El Niño/Southern Oscillation	NFMA	National Forest Management Act
EPA	Environmental Protection Agency	NFS	National Forest System
ERA	Estuary Restoration Act	NGO	Non-Governmental Organization
ESA	Endangered Species Act	NMSA	National Marine Sanctuaries Act
EU	European Union	NMSP	National Marine Sanctuary Program
FEMA	Federal Emergency Management Agency	NOAA	National Oceanic and Atmospheric Administration
FHP	U.S. Forest Service Forest Health Protection Program	NOx	Nitrogen Oxides
FKNMS	Florida Keys National Marine Sanctuary	NPDES	National Pollutant Discharge Elimination System
FKNMS Act	Florida Keys National Marine Sanctuary and Protection Act	NPS	National Park Service
FMP	Fishery Management Plan	NRE	Neuse River Estuary
FONSI	Finding of No Significant Importance	NRI	National Rivers Inventory
FPA	Forest Plan Amendment	NWFP	Northwest Forest Plan
FPR	Forest Plan Revision	NWHI	Northwestern Hawaiian Islands
GBR	Great Barrier Reef	NWRS	National Wildlife Refuge System
GBRMPA	Great Barrier Reef Marine Park Authority	NWRSIA	National Wildlife Refuge System Improvement Act
GBRNP	Great Barrier Reef National Park	OHV	Off-Highway Vehicle
GCM	General Circulation Model	ONF	Olympic National Forest
GDP	Gross Domestic Product	ONFP	Olympic National Forest Plan
GIS	Geographic Information Systems	ONP	Olympic National Park
GtC	Gigaton Carbon	ORION	Ocean Research Interactive Observatory Networks
HINWR	Hawaiian Islands National Wildlife Refuge	PCB	Polychlorinated biphenyl
ICRAN	International Coral Reef Action Network	PDO	Pacific Decadal Oscillation
IOOS	Integrated Ocean Observing System	PMNM	Papahānaumokuākea Marine National Monument
IPCC	Intergovernmental Panel on Climate Change	PPR	Prairie Pothole Region
IUCN	International Union for the Conservation of Nature/World Conservation Union	PRE	Pamlico River Estuary
LAPS	Land Acquisition Priority System	RMNP	Rocky Mountain National Park
LIDAR	Light Detection and Ranging	RPA	Resource Planning Act (1974)
LMP	Land and Resource Management Plan	SAC	Sanctuary Advisory Council
LTER	Long-Term Ecological Research	SAMAB	Southern Appalachian Man and the Biosphere
MHI	Main Hawaiian Islands	SAP 4.4	Synthesis and Assessment Product 4.4.
MMA	Marine Managed Area	SAV	Submerged Aquatic Vegetation
MPA	Marine Protected Area	SDM	Species Distribution Model
MSA	Magnuson-Stevens Fishery Conservation Management Reauthorization Act	SFA	Sustainable Fisheries Act
MSX	Multinucleate Sphere X, a parasite affecting oysters	SJRWMD	St. Johns River Water Management District
NAO/NHM	North Atlantic Oscillation/Northern Hemisphere Annular Mode	SLAMM	Sea Level Affecting Marshes Model
NAWQA	National Water Quality Assessment	SPA	Sanctuary Protection Area
NEON	National Ecological Observatory Network	SRES	Special Report on Emissions Scenarios
NEP	National Estuary Program	SST	Summer Sea Surface Temperature
NEPA	National Environmental Policy Act	SVP	Surface Velocity Program
		SW	Southwest
		TMDL	Total Maximum Daily Load
		TNF	Tahoe National Forest

U.S. EEZ	U.S. Exclusive Economic Zone
UNESCO	United Nations Educational Scientific and Cultural Organization
UNF	Uwharrie National Forest
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UW-CIG	University of Washington's Climate Impacts Group
VMS	Vessel Monitoring System
WCA	Watershed Condition Assessment
WMA	Wildlife Management Area
WQPP	Water Quality Protection Program
WSR	Wild and Scenic Rivers
WUI	Wildland Urban Interface
ZIMM	Zonal Inundation and Marsh Model

In order to ensure that the proposed structure and content of each chapter was assessed for technical rigor and feasibility from a management perspective, workshops for a limited set of expert stakeholders were held during the report's earliest development stages. Stakeholders from the management and adaptation research communities were selected from across federal and state governments, territories, non-governmental organizations, and academia to participate in a series of workshops to advise the authors of the report on its content. At each of the six workshops (one for each "management system" chapter), no more than 20 stakeholder participants gathered to have chapter lead and contributing authors present draft information on their chapters and case studies. Stakeholders were able to provide feedback, and authors incorporated the expert input into their revisions.

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* Indicates invitees who participated in the workshops

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CHAPTER 7 REFERENCES

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CHAPTER 3

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CHAPTER 4

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CHAPTER 5

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