Conservation in North America:
An Analysis of Land-based Conservation in Canada, Mexico, and the United States by NAWPA Agencies

The North American Intergovernmental Committee on Cooperation for Wilderness and Protected Area Conservation

Suggested citation

NAWPA Committee. 2016. Conservation in North America: An analysis of land-based conservation in Canada, Mexico, and the United States by NAWPA agencies. Report. North American Intergovernmental Committee on Cooperation for Wilderness and Protected Area Conservation; Canada, Mexico, and the United States of America. Available at http://nawpacommittee.org/wp-content/uploads/2016/08/Conservation-in-North-America.pdf.

For further information on this report and the work of the NAWPA Committee please contact the committee facilitator at nawpa@wild.org.

Images

All photographs included in this report are of North American Protected Areas managed by NAWPA.

Cover: (see legend on figure 3, page 21). Created by USGS.

Chapter 1 (page 15): Glacier National Park, Montana, USA. Credit: NPS/Jacob W. Frank

Chapter 2 (page 29): Bison, USA. Credit: © David Restivo

Chapter 3 (page 35): Coral reef fish, Mexico, CONANP. Credit: Carlos Aguilera

Chapter 4 (page 39): Yellowstone National Park, Wyoming, Montana, Idaho, USA. Credit: © David Restivo

Conservation in North America:
An Analysis of Land-based Conservation in Canada, Mexico, and the United States by NAWPA Agencies

NAWPA Committee

CONANP
Comisión Nacional de Áreas Naturales Protegidas

Parks Canada Parcs Canada

The North American Intergovernmental Committee on Cooperation for Wilderness and Protected Area Conservation
El Comité Intergubernamental de Norteamérica de Cooperación para la Conservación de las Áreas Protegidas y Silvestres
Comité intergouvernemental nord-américain pour la coopéracion sur la conservation des milieux sauvages et des aires protégées

Partner:
Socio:
Partenaire:
USGS science for a changing world

Table of Contents

Message from the Leaders of NAWPA Partner Agencies

As the leaders of partner agencies for NAWPA, the North American Inter-Governmental Committee on Cooperation for Wilderness and Protected Areas Conservation, we are pleased to present "Conservation in North America: An Analysis of Land-based Conservation in Canada, Mexico, and the United States by NAWPA Agencies".

This is a report on our efforts to identify opportunities for achieving biodiversity conservation across our continent through the establishment and sound management of protected areas networks. This report is the result of a collaboration between protected areas agencies in Canada, Mexico, and the United States that illustrates the value—and the importance—of international cooperation to address current and future conservation challenges.

Canada, Mexico, and the United States share a continent with diverse terrestrial and marine ecosystems, ranging from the tundra and boreal forests of the north to the tropical rainforests, coral reefs and deserts of the south, including the wetlands, grasslands, temperate forests, and estuaries in between. Ecological processes, such as the remarkable migration of monarch butterflies, interconnect these ecosystems at regional and continental scales. Much of this rich diversity is represented in protected areas that provide profound opportunities to demonstrate collaborative conservation, restoration, promotion, and recognition.

Conservation challenges know no borders, calling for the coordination of work on shared issues at transboundary scales. In North America, NAWPA is a key institutional instrument that enables such collaboration. The partnership was formed in 2009, at the 9th World Wilderness Congress in Mérida, Mexico, by the six largest North American land-based conservation agencies.[1,2] Since then, NAWPA has been consistently promoting sound protected areas management, ecosystem conservation, restoration, and capacity-building through workshops, publications, and coordinated research.[3]

1 Original signatories: Canada—Parks Canada; Mexico—National Commission for Protected Natural Areas; United States—Department of Agriculture, Forest Service and Office of Environmental Markets; Department of Interior, Bureau of Land Management, Fish and Wildlife Service, and National Park Service; and NAWPA partner (for sharing information and conducting analyses) United States Geological Survey, as of December 2013.

2 For additional information about NAWPA and its history please visit: http://nawpacommittee.org/about.

3 For access to additional resources visit: http://nawpacommittee.org/.

Our concerted effort is built upon four main elements:

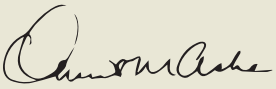
1. Strong **cooperation** among our institutions.
2. Promoting transboundary **connectivity**, when appropriate, between protected areas.
3. Restoring ecosystem **resilience** to face external threats such as climate change, economic shocks, and natural resources governance disturbances.
4. Fostering the **inter-generational relevance** of protected areas among North Americans.

This report is the latest in a series of publications that exemplify the value of international collaboration and our collective efforts. In "Conservation in North America: An Analysis of Land-based Conservation in Canada, Mexico, and the United States by NAWPA Agencies" we demonstrate how our three countries, through the efforts of many land management agencies, manage protected areas, wilderness, and natural resources across the continent. The network of lands we manage contributes to conserving biodiversity at the continental scale and demonstrates the importance of continuing the collaborative and international approaches necessary to protect current conservation investments and to ensure that future conservation objectives can be achieved.

Recognizing that much work remains, we hope this report will spark discussions on opportunities for achieving the global goal of increasing the effective protection of natural, healthy, representative, and interconnected ecosystems and that it will inspire other transboundary initiatives that encourage conservation, resilience, and connectivity.

Proxy Falls, Three Sisters Wilderness, Willamette National Forest, Oregon, USA. Credit: USFS/Thomas Goebel

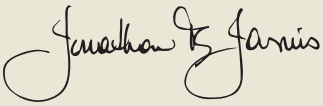
Signatures from the Leaders of NAWPA Partner Agencies:



Daniel M. Ashe, Director, US Fish and Wildlife Service,
US Department of the Interior

Daniel Watson, Chief Executive Officer,
Parks Canada Agency

Thomas L. Tidwell, Chief, US Forest Service,
US Department of Agriculture



Jonathan B. Jarvis, Director, National Park Service,
US Department of the Interior

Alejandro Del Mazo Maza, National Commissioner,
Mexican National Commission of Natural Protected Areas,
Ministry of Environment and Natural Resources

Dr. Suzette Kimball, Director, US Geological Survey,
US Department of the Interior

Neil Kornze, Director, Bureau of Land Management,
US Department of the Interior

Executive Summary

The NAWPA report "Conservation in North America: An Analysis of Land-based Conservation in Canada, Mexico, and the United States by NAWPA Agencies" summarizes our joint effort to identify and assess the extent of lands that are protected and managed for conservation across North America. As part of its ongoing conservation work, and for the preparation of this report, NAWPA combined land conservation data from databases with IUCN designations, political boundaries, and landcover types, all at the continental scale into a single protected areas database. The analysis reveals that NAWPA agencies protect 8% of the North American landmass.[4] When protected areas that are managed by agencies and organizations other than NAWPA are included, the figure rises to 12% total land protected for the North American continent.

For the purposes of this analysis, "protection" is defined by standards articulated by the IUCN (2013). NAWPA agencies also manage lands that do not align with these standards and are managed for different reasons under different mandates.[5] However, some of these "other managed lands" can contribute important conservation value, such as providing habitat connectivity, targeted species conservation, and restoration potential. Considering both protected areas and other managed lands, the total land portfolio of NAWPA agencies represents 15% of the continental landmass.

"Conservation in North America: An Analysis of Land-based Conservation in Canada, Mexico, and the United States by NAWPA Agencies" offers a complex picture, with some ecosystems (e.g. snow and ice, wetland) offered more extensive protection than others (e.g. temperate or sub-polar grasslands). Again, conclusions around conservation accomplishment depend on the types of lands included in the analyses.

The Convention on Biological Diversity (CBD) adopted in 2010 Aichi Target 11, which requests that by 2020 at least 17% of terrestrial and inland water areas be conserved. NAWPA considers this target as a significant benchmark by which to measure its conservation efforts, recognizing that not all of the partners are legally bound by it. NAWPA and other conservation land managers have made significant strides toward achieving this target in North America.

4 All percentages are rounded to the nearest whole integer.

5 For example, public lands managed by the US BLM are managed for "multiple use and sustained yield unless otherwise specified by law."

This report also describes the following efforts:

1. The creation of a protected areas database that combines IUCN-designated status, ownership and management information, geopolitical boundaries, and landcover or ecosystem types for conservation lands in continental North America.
2. An analysis of the extent of conservation lands by both protection status and ecosystem type.
3. Two multilateral demonstration areas.

Overall, this report demonstrates that there is much to celebrate and, at the same time, much work remains. Ongoing cooperation strengthens individual conservation investments and helps to ensure the future viability of our conservation areas. The collaborative approach embraced by NAWPA offers an excellent model for continued and sustainable conservation accomplishment.

El Pinacate Gran Desierto de Altar Biosphere Reserve, Mexico. Credit: CONANP

Acknowledgments

The NAWPA agencies would like to thank the many colleagues in each of our organizations who have contributed to the analyses and to drafting this report. We also acknowledge the substantial contributions of staff and experts with the US Geological Survey, NatureServe and the WILD Foundation.

List of Abbreviations

BLM – Bureau of Land Management

CBD – Convention on Biological Diversity

CEC – Commission for Environmental Cooperation

CONANP – Comisión Nacional de Áreas Naturales Protegidas

GPCA – Grassland Priority Conservation Area

IUCN – International Union for Conservation of Nature

NALCMS – North American Land Change Monitoring System

NAWPA – North American Inter-Governmental Committee on Cooperation for Wilderness and Protected Areas Conservation

NPS – National Park Service

OECMs – other effective area-based conservation measures

OMLs – Other Managed Lands

PAD-US – Protected Areas Database–United States

USFS – United States Forest Service

USFWS – United States Fish and Wildlife Service

USGS – United States Geological Survey

WCPA – World Commission on Protected Areas

WDPA – World Database on Protected Areas

Chapter 1

The Extent of Conservation in North America

Canada, Mexico, and the United States share borders that span ecosystems. Migration patterns and other ecological processes span these borders as well. In each country, a mosaic of protected areas and other lands are managed by multiple agencies and organizations that help conserve these ecosystems and processes. Consequently, cooperation between agencies is necessary to understand and eventually to enhance conservation efforts. This report illustrates how NAWPA's collaboration contributes to conservation accomplishment, helps protect ecosystem values that span regional and international boundaries, and emphasizes the need for an inclusive approach for achieving biodiversity and ecosystem conservation targets.

The objectives of the Convention on Biological Diversity (CBD) are the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. In 2010, State Parties to the Convention adopted a strategic plan for biodiversity to guide international actions through 2020 (UNEP/CBD/COP/10/27 2011). As part of the strategic goal "To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity," Aichi Target 11 was established:

> ***By 2020, at least 17 percent of terrestrial and inland water, and 10 percent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes. (UNEP/CBD/COP 10/27 2011)***

Target 11 provides a benchmark to measure overall land-based conservation progress over time. However, while all ecosystems need a certain level of representation to provide greater assurance of persistence for the full range of biodiversity, there is still much discussion regarding the percentage of individual ecosystems or habitat types that need to be protected to ensure long-term persistence of the full range of biodiversity and ecological processes on which they depend (Wiersma and Nudds 2009). The history of land protection has resulted in uneven and sometimes uncertain long-term protection across ecosystem types (Aycrigg et al. 2013, Scott et al. 2001). To inform future conservation work, this report summarizes the protection status of the main ecosystems in North America, using the best available data for landcover or plant communities and a combined aggregation of spatial data for protected areas.

NAWPA's Protected Areas Database

A. Sources and types of information

In partnership with the U.S. Geological Survey (USGS), NAWPA created a spatial database on protected areas spanning the entire North American continent. NAWPA's Protected Areas Database combined information from five data sources using GIS, to generate a single layer of information that identifies land's protection status, its location within geopolitical boundaries and management authority, and its ecosystem or landcover type for each 250-meter pixel across North America.[6]

1. **IUCN protection status** was compiled from three databases:
   a. PAD-US 1.4 (May 2016)
   b. World Database on Protected Areas (WDPA, May 2016)
   c. Federal Protected Areas of Mexico Version 1 (Nov 2015)

   The information was compiled and reviewed using the Best Practices Guidelines developed by the IUCN (2016) to associate individual protected areas with an IUCN category.[7] USGS standardized the attributes from each database, resulting in the creation of a North American wide file of protected areas with compatible information on WDPA IUCN status, major land designations, and the managers of said lands.

2. **Political boundaries** from the North American Atlas–Political Boundaries File from the Commission for Environmental Cooperation (CEC) were overlaid onto the map of conservation status. A process called rasterization was then applied to reduce the chance that conservation areas would be artificially multiplied by overlaying maps. Prioritization of units was based on IUCN status to eliminate overlaps in spatial boundaries between managing entities and categorization of protection.

3. **Landcover or ecosystem type** was derived from the 2010 North American Landcover Data Set (May 2016), produced as part of the North American Land Change Monitoring System (NALCMS).

NAWPA's Protected Areas Database integrates the most comprehensive and current data available at this time on protected areas in Canada, Mexico and the United States.

6 The database is limited to the extent of NALCMS; therefore, it does not include important conservation lands in Puerto Rico, the U.S. Virgin Islands, and the Hawaiian Islands.

7 The International Union for Conservation of Nature (IUCN) has established six protected areas categories: Ia—Strict Nature Reserve; Ib—Wilderness Area; II — National Park; III — Natural Monument or Feature; IV — Habitat/Species Management Area; V — Protected Landscape/Seascape; VI – Protected Area with sustainable use of natural resources. IUCN also has a "not reported" category that was used in this database but that accounts for an insignificant portion of the results.

B. IUCN designation and other managed lands (OMLs)

NAWPA agencies manage a diverse array of protected areas belonging to every IUCN Category (Figure 1). They also manage large tracts of land for multiple use, hereafter referred to as Other Managed Lands (OMLs). OMLs are largely comprised of rangelands and national forests in the United States (Figure 2) managed by the Bureau of Land Management (BLM) and the U.S. Forest Service (USFS). OMLs are public, are authorized by statute to sustain multiple uses of resources, and are managed in compliance with other applicable statutes. Management may include authorization of extractive uses of nonrenewable resources, such as mineral development. Thus, OMLs do not meet standards for recognition as protected areas established by the IUCN. However, because OMLs can substantially contribute to conservation objectives, they were included in the database and some of the analyses reported on here.

In addition, large areas of conservation lands in North America are managed by government agencies not represented on NAWPA, by non-government organizations, and by private individuals. Where available, information regarding these lands was also included in the database and some analyses.

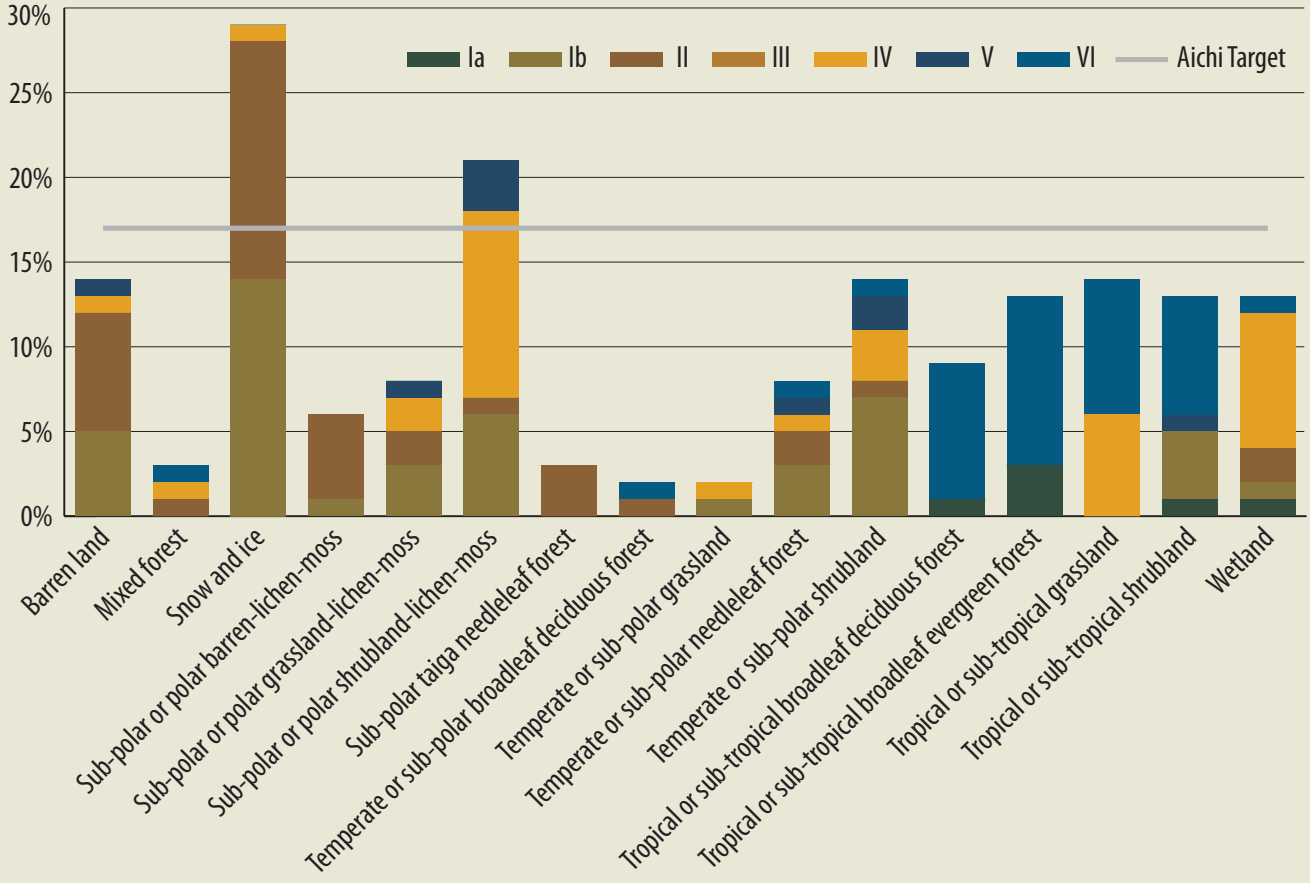


Figure 1. North American protected areas managed by NAWPA agencies and the landcover and ecosystem types they represent; colors identify assigned IUCN categories. The horizontal line identifies Aichi Target 11 for terrestrial and inland water areas.

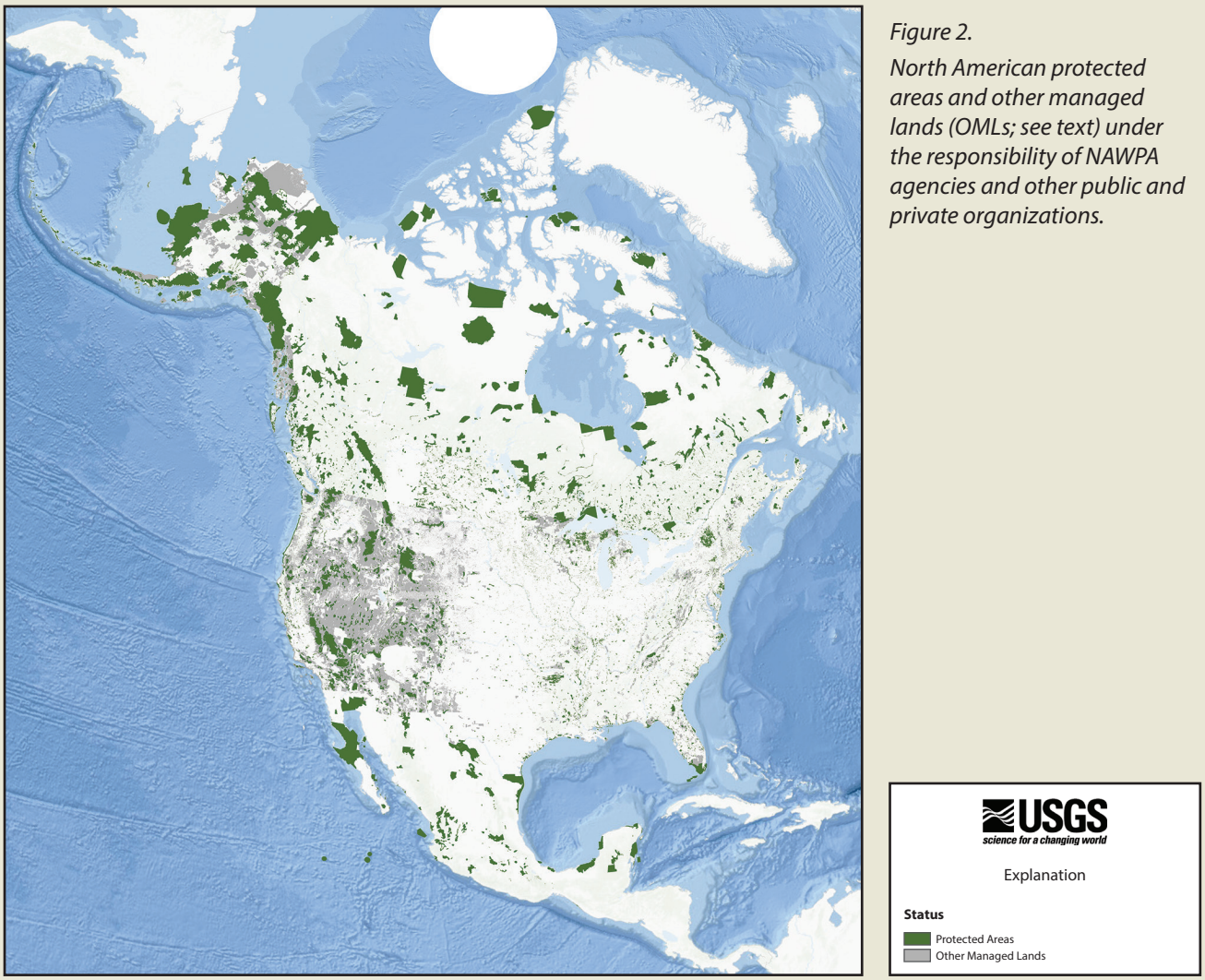


Figure 2.
North American protected areas and other managed lands (OMLs; see text) under the responsibility of NAWPA agencies and other public and private organizations.

Thunder Basin National Grasslands, Wyoming, USA. Credit: USFS/Cristi Painter.

C. Landcover types per NALCMS

Landcover types for each land unit included in NAWPA's Protected Areas Database were provided by the North American Land Change Monitoring System (NALCMS), a trilateral consortium (Latifovic et al. 2012). Their 2010 landcover map was developed using remote sensing and change detection techniques to classify Moderate Resolution Imaging Spectroradiometer satellite imagery at 250-meter resolution into 19 landcover classes, grouped as follows: five general cover types (cropland, urban, water, snow and ice, barren land), two general habitat types (wetland and mixed forest) and 13 biogeographical habitat types (e.g. temperate or sub-polar shrubland, tropical or sub-tropical broadleaf deciduous forests; Figure 3 and Table 1).

NALCMS was chosen because it provides a consistent and repeatable backdrop for a continent-wide assessment. However, its information is limited due to the relatively coarse spatial scale and thematic resolution of the map. The 250-meter resolution source imagery means that fine-scale patterns are not represented and that a range of variation is included within each of the landcover classes. For example, when mapping the same range at a finer level, at least three chaparral classes and three sagebrush–shrubland classes have been identified, each of which provides habitat for a unique suite of species.

Table 1. Extent of major landcover and ecosystem types in North America, as percent of the total continental landmass.

Barren land	5.98%
Cropland	14.67%
Mixed forest	6.92%
Snow and ice	1.55%
Sub-polar or polar barren-lichen-moss	3.09%
Sub-polar or polar grassland-lichen-moss	6.22%
Sub-polar or polar shrubland-lichen-moss	2.17%
Sub-polar taiga needleleaf forest	2.60%
Temperate or sub-polar broadleaf deciduous forest	8.19%
Temperate or sub-polar grassland	8.35%
Temperate or sub-polar needleleaf forest	15.66%
Temperate or sub-polar shrubland	13.18%
Tropical or sub-tropical broadleaf deciduous forest	0.81%
Tropical or sub-tropical broadleaf evergreen forest	0.77%
Tropical or sub-tropical grassland	0.17%
Tropical or sub-tropical shrubland	4.78%
Urban and built-up	1.19%
Wetland	3.72%
Grand Total	100.00%

Aerial view of Korac River, Torngat Mountains National Park of Canada, Newfoundland and Labrador.
Credit: Wittenborn, H. ©Parks Canada.

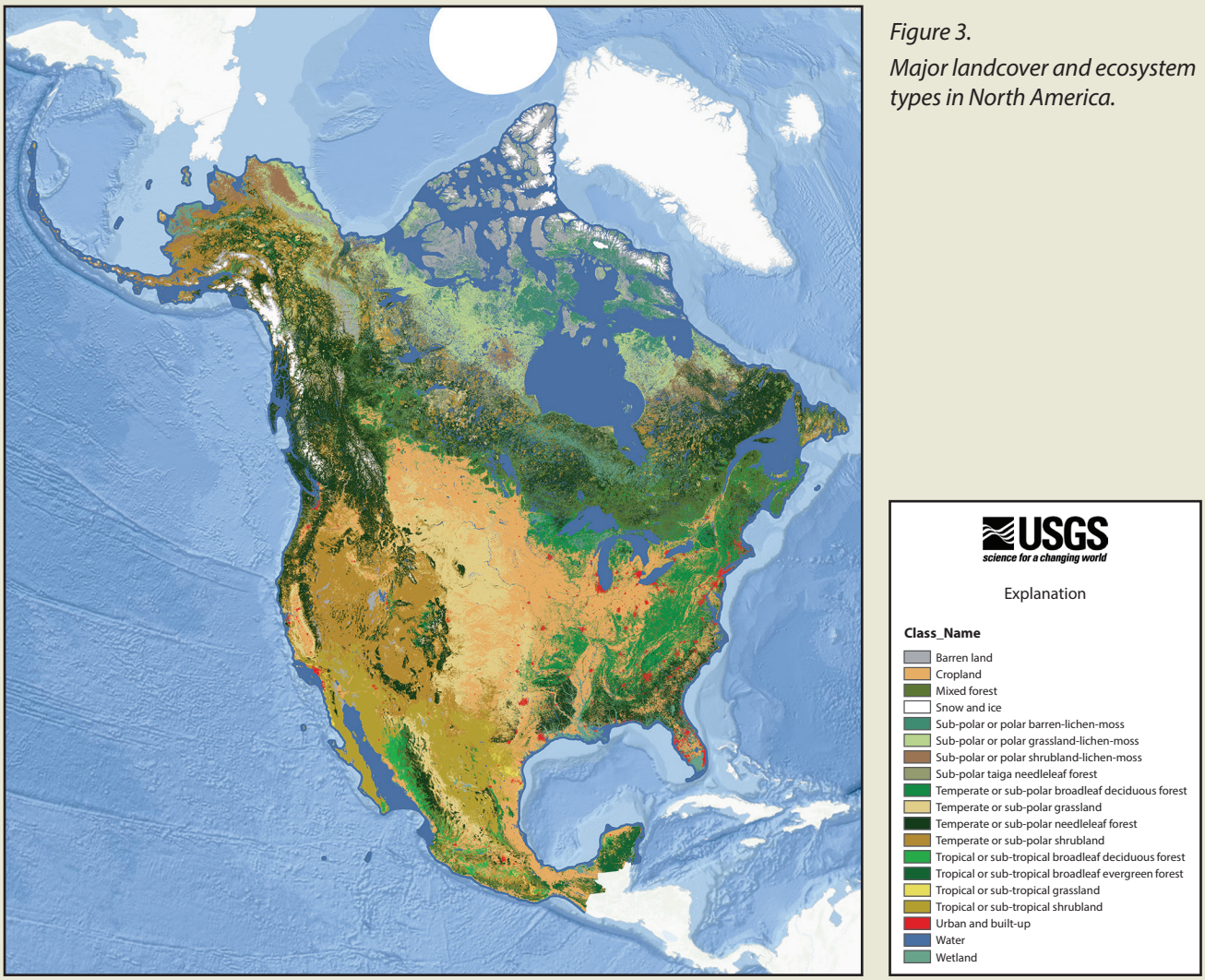


Figure 3.
Major landcover and ecosystem types in North America.

Mariposa Monarca Biosphere Reserve, Mexico. Credit: CONANP/José Ignacio Mijares

Analysis: conserved lands by protection status

A. Protected areas

Public lands with IUCN protected area designation cover nearly 12% of the North American continent (Figure 4 and Table 2).[8] NAWPA agencies manage two-thirds of the protected area cover in North America, or 8% of the continental landmass (Table 2). Establishment of this impressive array of protected areas is a major accomplishment by hundreds of public agencies and private organizations and individuals. Still, more efforts will be needed in the coming years to meet Aichi Target 11.

Protected areas in North America are managed for a range of purpose, from strict protection (IUCN category I) to protection with sustainable use of renewable resources (IUCN category VI). This is reflected in their assignation to different IUCN protected area categories (Figures 1 and 4). It is relevant to note that, for all tropical landcovers, half or more of the protected areas were assigned to IUCN category VI, or protected lands that allow some sustainable use of natural resources.

There are important differences in the amount of each ecosystem or landcover type that is protected in North America (Figure 5). In addition to largely unvegetated landcovers such as snow and ice areas (34% protected), some biodiversity-rich ecosystems are relatively well protected, such as wetlands (20% protected) and temperate shrublands (16% protected). However, several ecosystem types are poorly represented in North American protected area networks.

Table 2. Extent of protected areas and other managed lands (OMLs; see text) in North America, as percent of the total continental landmass.

Category	Managed by NAWPA	Managed by others	Total North America
A. Percentage Land Cover			
Protected Areas	7.69%	4.05%	11.74%
Other Managed Lands	7.23%	1.33%	8.56%
B. NAWPA Contribution to Managed Lands			
Protected Areas	65.44%	34.56%	100.00%
Other Managed Lands	84.44%	15.56%	100.00%

Note: NAWPA agencies manage two-thirds of IUCN-designated lands. Of the OMLs, NAWPA agencies manage 84%.

Big Lake National Wildlife Refuge, Arkansas, USA. Credit: USFWS/Jeremy Bennett

8 As previously noted, Puerto Rico, the U.S. Virgin Islands, and the Hawaiian Islands are beyond the current extent of NAWPA database.

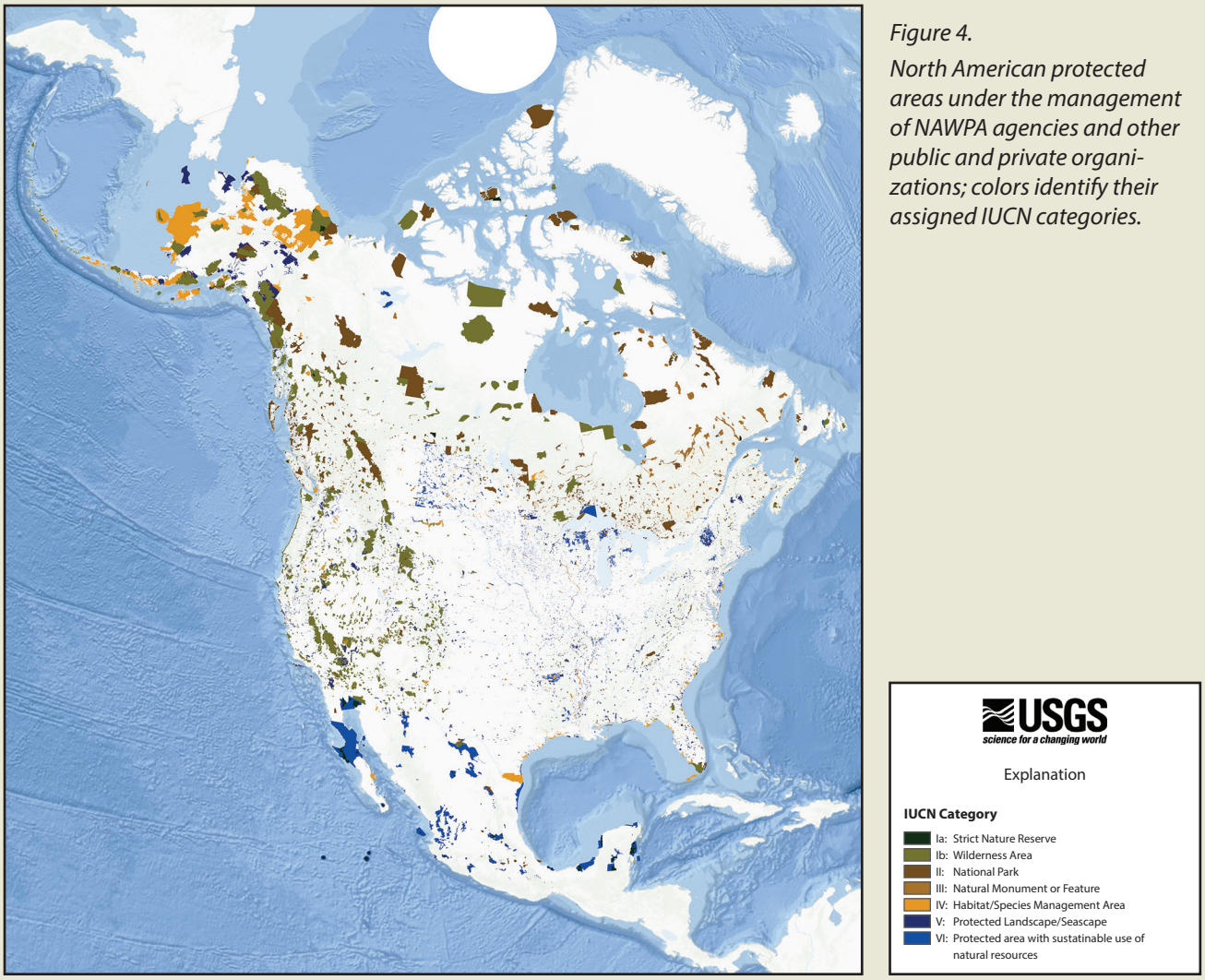


Figure 4.

North American protected areas under the management of NAWPA agencies and other public and private organizations; colors identify their assigned IUCN categories.

Female Polar Bear with yearlings on pack ice, Wapusk National Park of Canada, Manitoba. Credit: Rosing, N. ©Parks Canada

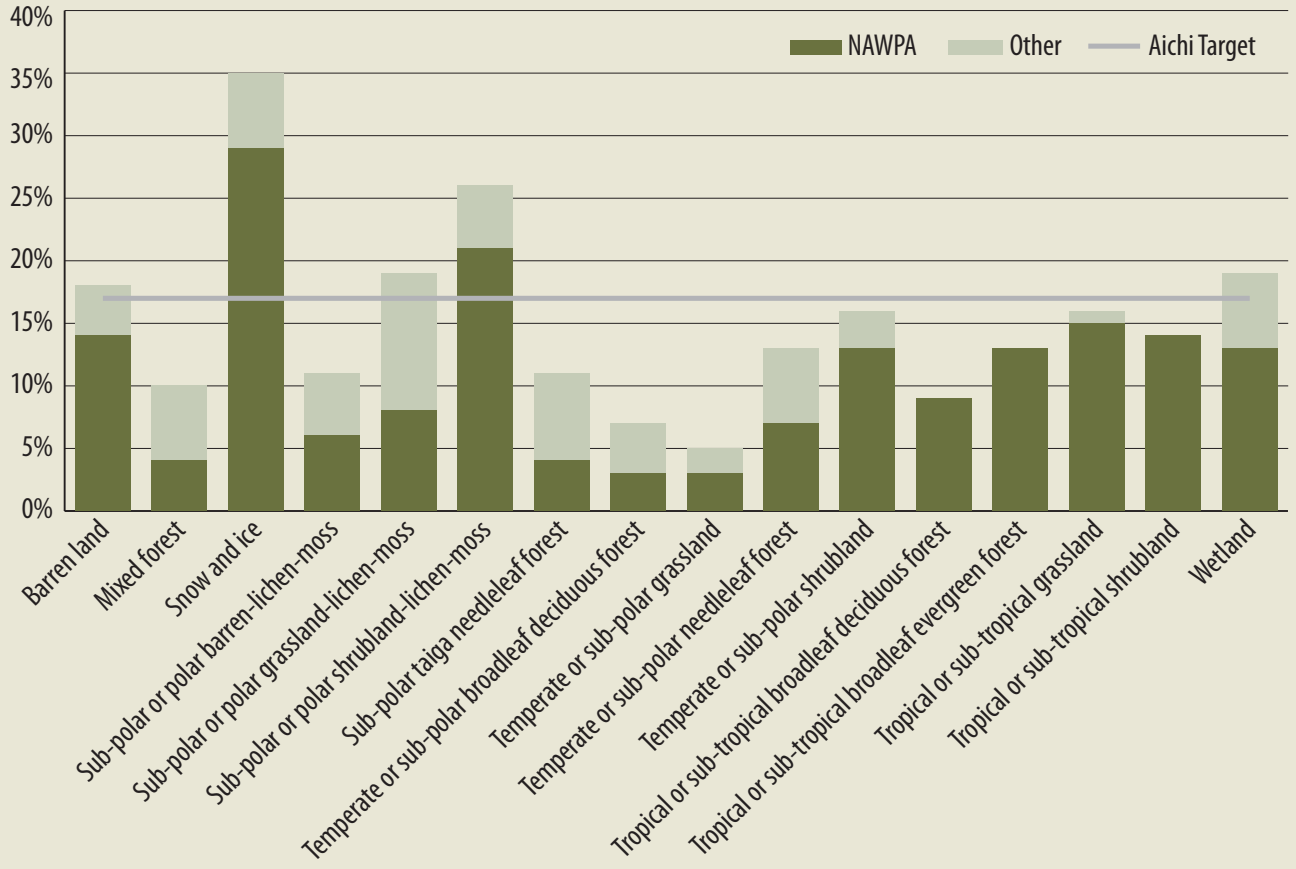


Figure 5. North American protected areas and the landcover and ecosystem types they represent; shades distinguish areas managed by NAWPA agencies and other public and private organizations. The horizontal line identifies Aichi Target 11 for terrestrial and inland water areas.

B. Other managed lands

As discussed above, NAWPA agencies, especially BLM and US Forest Service, have influence or direct management authority over large expanses of "other management lands" (OMLs) that do not meet standards to be recognized as protected areas, but that may contribute to conservation objectives (Figure 2).

OMLs mapped in the United States cover 1.7 million km^2, which represents 9% of the North American landmass (Table 2). OMLs include a wide range of landcovers, but three types of shrubland and needleleaf forests predominate (Figure 6).

Aichi Target 11 identifies a land-based conservation objective that considers both formally recognized protected areas as well as "other effective area-based conservation measures" (OECMs; UNEP 2011). The concept of OECMs is relatively new and still requires a formal definition and standards for its consistent application across jurisdictions. Work towards such definition and standards is underway through national initiatives (e.g. Canadian Council for Ecological Areas),

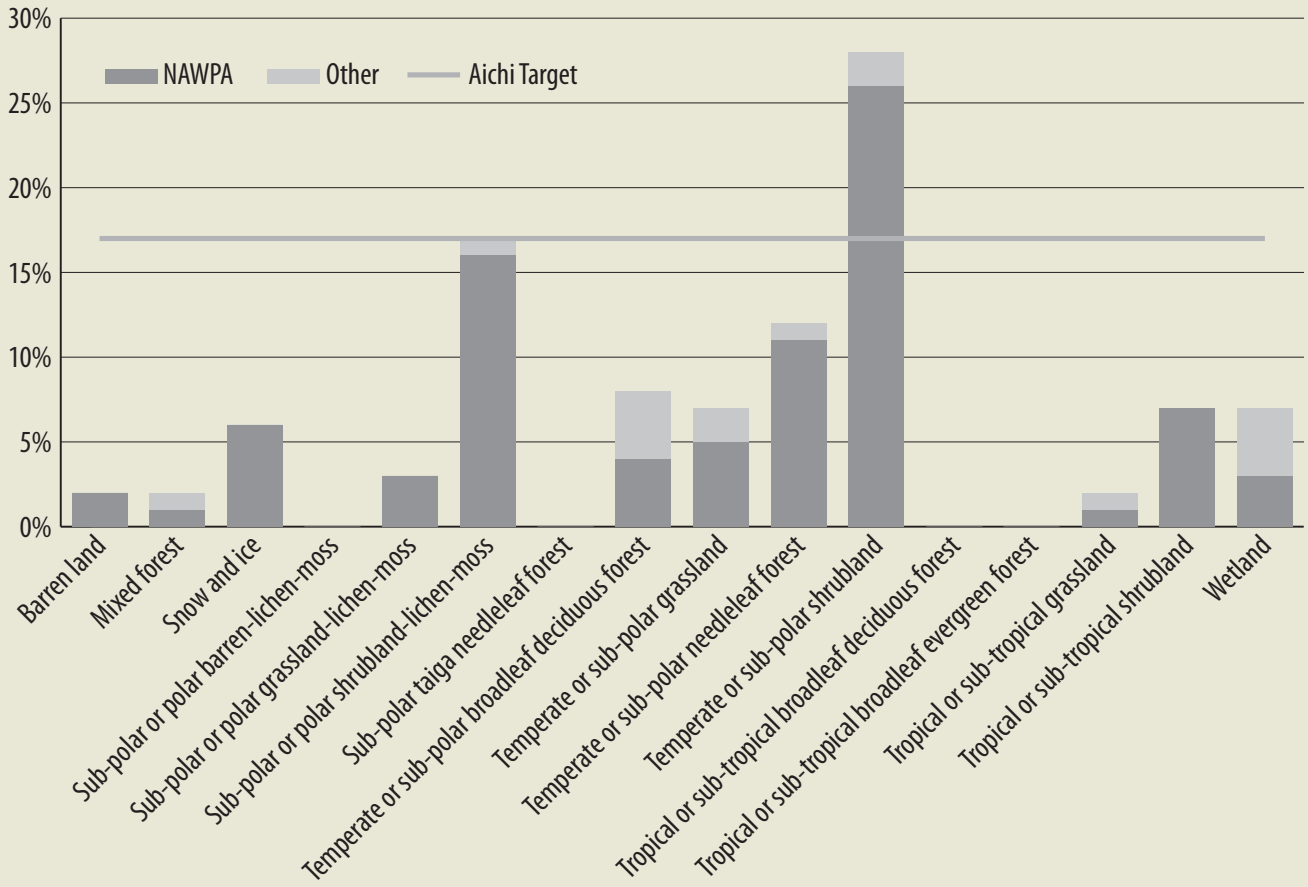


Figure 6. North American Other Managed Lands (OMLs; see text) and landcover and ecosystem types they represent; shades distinguish areas managed by NAWPA agencies and other public and private organizations. OMLs in Canada and Mexico are not all shown. The horizontal line identifies Aichi Target 11 for terrestrial and inland water areas.

the IUCN (MacKinnon 2016), and the CBD (UNEP/CBD/SBSTTA/20/16). Once a definition and standards for OECM are agreed to, a portion of OMLs managed by NAWPA partners may be recognized as contributing to the achievement of Aichi Target 11 (Figure 7).

Basin and Range National Monument, Protected Area, Nevada, USA. Credit: BLM/Bob Wick

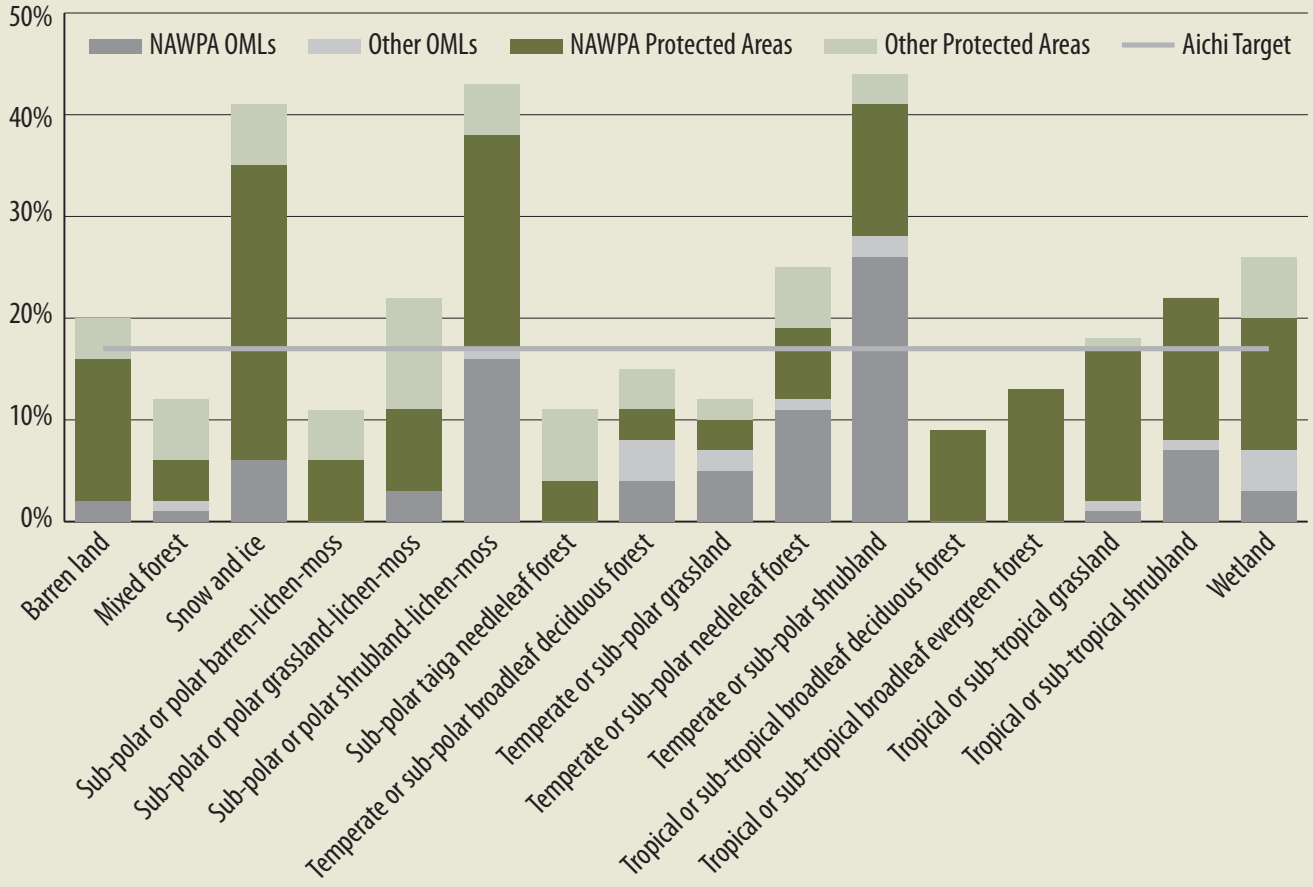
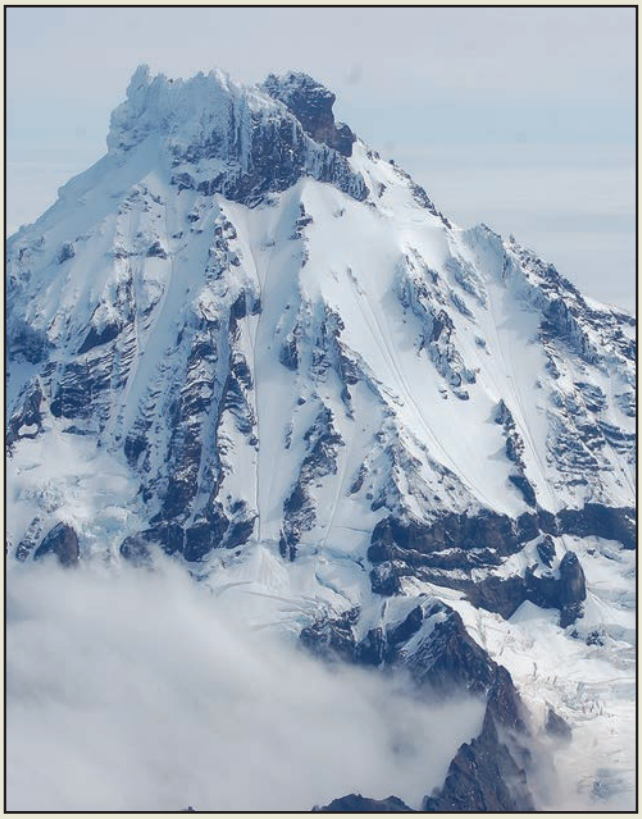


Figure 7. North American protected areas and other managed lands (OMLs; see text), and the landcover and ecosystem types they represent; shades distinguish areas managed by NAWPA agencies and other public and private organizations, and their protection status. The horizontal line identifies Aichi Target 11 for terrestrial and inland water areas.

Citizen science activities. Credit: Reardon, C. ©Parks Canada

The Pacific fisher. Credit: USFS



Alaska Maritime National Wildlife Refuge, Alaska, USA. Credit: USFWS

Helena National Forest, Montana, USA. Credit: USFS

Sierra La Giganta, Mexico, CONANP. Credit: Miguel Ángel de la Cueva

Chapter 2

Demonstration Area: North American Temperate Grasslands

Temperate grasslands in North America and all around the world have been converted for agricultural production and other purposes, causing important habitat loss for grassland-dependent species and critical ecosystem services such as water retention and carbon sequestration. NAWPA partners decided to explore the role protected areas and other conservation measures may play in addressing this challenge.

NAWPA initiated collaborative work with the US Geological Survey and NatureServe to:

a. map the 12 major temperate grassland ecosystem types that were historically dominant across the Great Plains and Chihuahuan Desert regions (Figure 8);

b. document trends in the historical loss of these grassland types;

c. clarify the proportions of each grassland type occurring within current protected areas; and

d. identify priority conservation areas for future consideration.

Future analyses will include an assessment of carbon storage and sequestration potential.

Landscape conservation design

We applied science-based methods, tools, and data to identify grassland priority conservation areas that emphasize feasibility and efficiency.

We used an *efficient type representation* approach to identify priority conservation areas for grassland types that retain either large proportional area or relatively large intact blocks of habitat, or both. Because multiple alternative configurations of conservation areas could equally advance representation and resilience, analyses centered on efficiency as measured by current grassland landscape condition and connectivity.

For grassland types that have experienced extreme loss through long-term land conversion we used a *large-scale restoration potential* approach to identify priority conservation areas. This approach emphasized opportunities to consolidate the remaining high-value grassland areas through restorative actions.

We identified priority conservation areas in clusters of approximately >100km^2, that we refer to as *spatial analysis units*. Initially, we identified areas where biodiversity representation objectives could be met using grassland distribution, existing protected and managed lands, and estimated costs of conservation (based on land-use intensity). We further refined those results using known locations for species of concern as well as measures of landscape connectivity. Finally, we reviewed biodiversity priorities identified through other related efforts, including The Nature Conservancy's Ecoregional Plans (~2000–2006), the U.S.'s State Wildlife Action Plans (2005–2011), and the Commission for Environmental Cooperation's Grassland Priority Conservation Areas (2010).[9]

9 See the CEC Environmental Atlas http://www.cec.org/tools-and-resources/north-american-environmental-atlas.

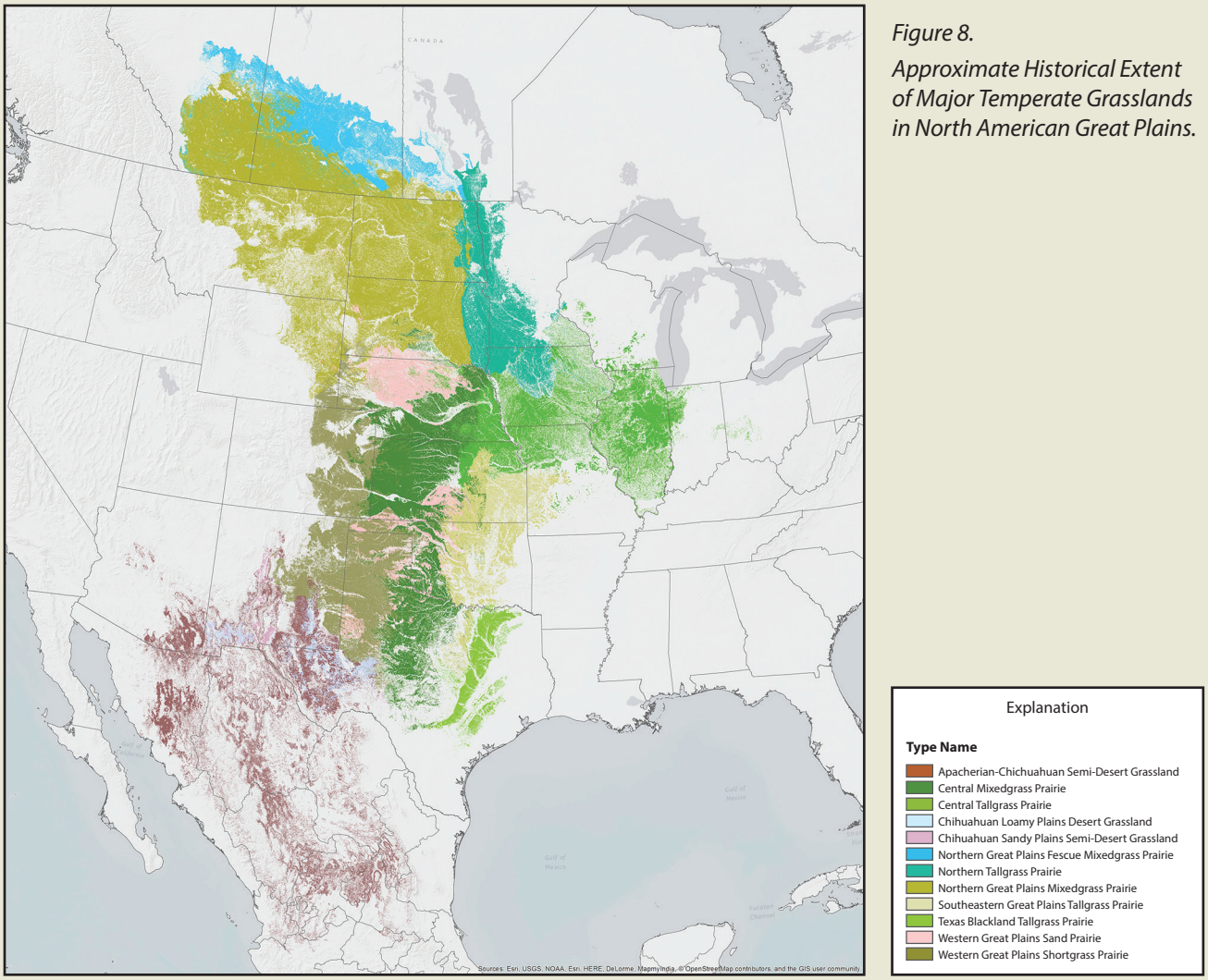


Figure 8.
Approximate Historical Extent of Major Temperate Grasslands in North American Great Plains.

Greater sage-grouse conservation. Credit: BLM/Bob Wick

After the methodology was established and the datasets were assembled, experts from the NatureServe Network, along with experts from each NAWPA agency, collaborated using an online GIS system called *Databasin* to finalize recommendations for priority conservation areas.

The results from this work are presented in Table 3 and illustrated for each major grassland type in Figure 9.

Table 3 highlights that only a small percentage of each major grassland type in North America is conserved within existing protected areas. However, the potential priority conservation areas identified through our analyses cover significant portions of the historical range of most grasslands. Sustained efforts, informed by these results, could allow North America to meet, and potentially exceed the 17% protection target established under the Convention on Biological Diversity. There is greater conservation potential for dominant grassland types along the western side of the project geography. Along the eastern side of the project area, tallgrass prairie types have been the ones most severely converted for other land uses, and habitat conservation possibilities are more limited.

These results are currently used by NatureServe to build a conservation atlas to inform future measures for the conservation of grassland.

Table 3. Historical extent of major temperate grassland types in North American Great Plains, their current protection status, and the extent and proportion within priority conservation areas (PCA) identified through our analyses.

Grassland Type	Historic Extent Estimate (km^2)	% within protected areas as of 2016	PCA extent (km^2)	PCA extent (% of historic)
Western Great Plains Sand Prairie	142,840	0.5	27,276	19
Northwestern Great Plains Mixedgrass Prairie	614,300	1.8	117,251	19
Chihuahuan Loamy Plains Desert Grassland	37,920	0.6	7,229	19
Central Mixedgrass Prairie	214,610	0.1	40,384	19
Southeastern Great Plains Tallgrass Prairie	107,640	0.3	18,925	18
Apacherian-Chihuahuan Semi-Desert Grassland	249,300	3.4	38,902	16
Western Great Plains Shortgrass Prairie	296,960	0.4	44,111	15
Chihuahuan Sandy Plains Semi-Desert Grassland	8,010	2.8	1,064	13
Texas Blackland Tallgrass Prairie	41,120	0.06	5,229	13
Central Tallgrass Prairie	240,150	0.1	10,037	4
Northern Great Plains Fescue Mixedgrass Prairie	136,610	2.2	5,355	4
Northern Tallgrass Prairie	157,420	0.4	3,541	2
Total	2,246,880	1.2	319,303	14

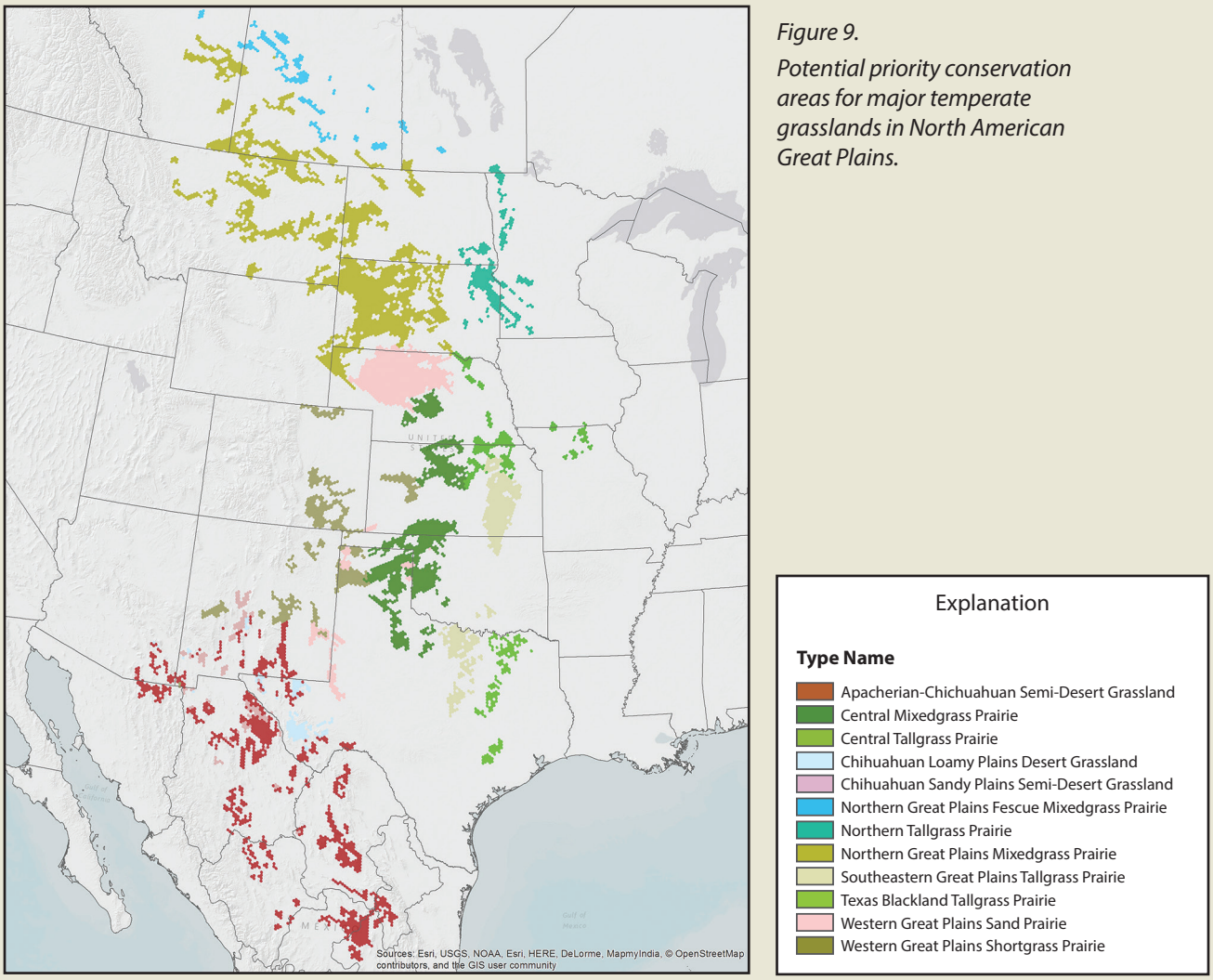
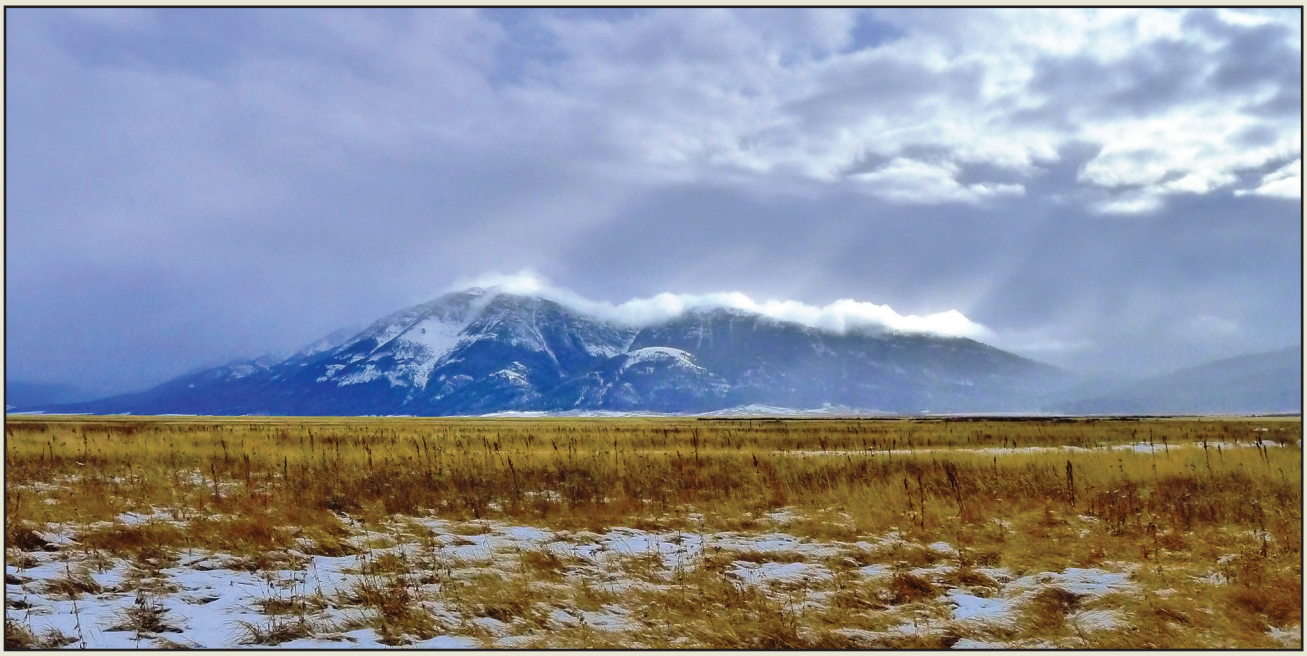


Figure 9.

Potential priority conservation areas for major temperate grasslands in North American Great Plains.



Red Rock Lakes National Wildlife Refuge, Montana, USA. Credit: USFWS/Erin Clark

Chapter 3

Demonstration Area: The Californias

Background

In 2015, NAWPA selected the Californias as a demonstration area. For this purpose, the Californias are defined as the States of California (United States, west of the Colorado River) and Baja California Norte and Sur (Mexico), also known as the Baja California Peninsula. This demonstration area is relevant at the continental scale, as the region provides important habitat for many long-distance migratory species.

NAWPA participates in many coastal-marine conservation efforts, and this area provides an opportunity both for us to demonstrate those efforts and to help Comisión Nacional de Áreas Naturales Protegidas (CONANP) achieve its priorities for the Baja California Peninsula. In particular, both NAWPA and CONANP are working to increase the area's marine-protected area surface so it will eventually meet Aichi Target 11.

At this time, we are analyzing the demonstration area of the Californias as a transboundary region, focusing on marine and coastal environments and incorporating a watershed approach. The demonstration area is currently being mapped by the USGS with information provided from U.S. agencies and CONANP to show areas conserved by NAWPA agencies. In the future, the map will be further complemented with information regarding connectivity, representativeness, and migratory species corridors.

Many marine species migrate along the West Coast of North America's three countries. Watershed and coastal-marine management can be improved through collaboration among these three countries once opportunities for doing so are identified.

Landscape conservation design

While the Californias demonstration area focuses on marine and coastal environments, for reasons explained below, a watershed approach will be used to assess the relation of terrestrial landscapes to coastal-marine systems. Furthermore, the area's representativeness and connectivity will be assessed, possibly resulting in new protected areas along the coast of Mexico.

The demonstration area is a biodiversity hotspot along the Pacific Coast of northern Mexico and southern United States. The portion of this area within the Pacific Ocean forms part of the California Current Large Marine Ecosystem, a transition zone between subtropical and subarctic waters. As a marine ecosystem, it is threatened primarily by intensive fishing and water pollution from urban systems. In addition, the upwelling coastal phenomenon El Niño results in warmer temperatures, a rise in coastal sea levels, and increased coastal rainfalls. This climatic phenomenon means that conditions vary widely from year to year, affecting the productivity of an ecosystem that supports many small fisheries.[10]

The Baja California Peninsula is 1,300 km long and covers 145,000 km^2 of largely mountainous terrain. The Peninsula's mountainous system runs along the center, from north to south, generating two contrasting watershed slopes that result in a bi-seasonal precipitation regime: the Pacific

10 http://www.noaa.gov/iea/regions/california-current-region/about.html

slope, where the climate is controlled by the California current, with winter rains and coastal fogs; and the Gulf slope, where the climate is much warmer, with monsoon-type summer rains. These climatic variations allow different biogeographic regions to be defined and characterized. Although the ecosystem is considered resilient, its dynamic has been severely altered by factors such as overexploitation of fisheries, river water diversions, aquaculture, and increased coastal and maritime tourism.[11]

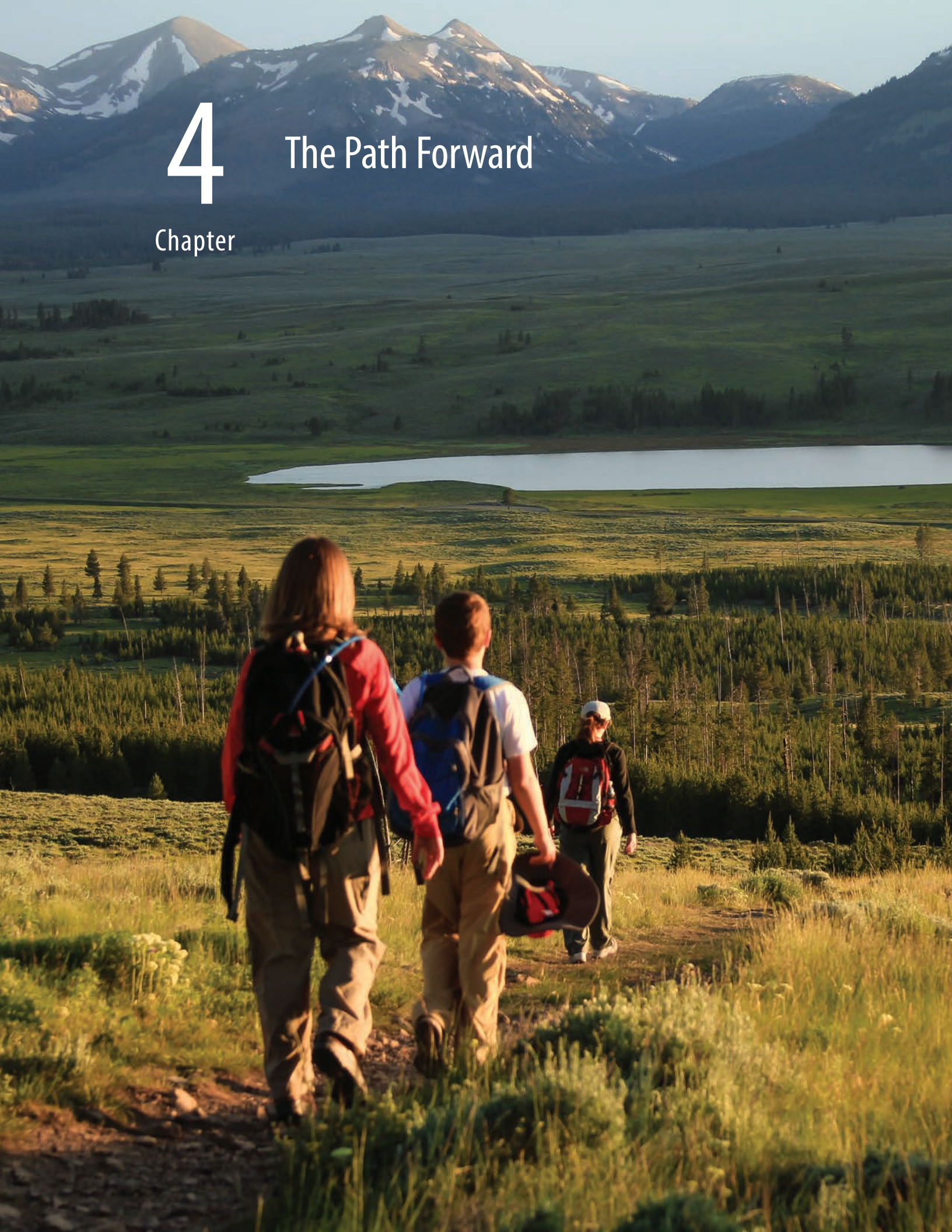
These threats require a better understanding of the Californias' resilience and its available ecosystem services so NAWPA agencies can make informed decisions that will improve ecosystem management, regulate negative impacts, and coordinate efforts between Mexico and the United States. As we study the demonstration area, we are guided by the Seven Principles of Institutional Resilience.[12]

1. Maintain diversity and redundancy
2. Manage connectivity
3. Manage slow variables and feedbacks
4. Foster complex adaptive systems thinking
5. Encourage learning
6. Broaden participation
7. Promote polycentric governance systems

With the help of the USGS, NAWPA is currently analyzing the Californias using a hydrological approach to conduct coastal-watershed and marine-resilience analyses to assess representativeness and connectivity. We intend to complement those analyses with an evaluation of the ecosystem services provided by the Californias, focused on an assessment of climate change vulnerability. Finally, we will rely on The Seven Principles of Institutional Resilience to define coordination strategies among NAWPA agencies that will enhance the site's resilience.

California Coastal National Monument, California, USA. Credit: BLM

11 http://www2.cec.org/nampan/ecoregion/gulf-california
12 http://www.stockholmresilience.org/research/research-news/2015-02-19-applying-resilience-thinking.html



4 The Path Forward

Chapter

Wilderness and protected areas have a uniquely important biological and social role, as well as cultural and spiritual significance, all of which must be shared and transmitted between generations. For this reason, we are committed to continue coordinating actions and re-affirming protected areas as a fundamental instrument for sustainable and inclusive development in North America. Since NAWPA's inception in 2009, we have considered issues of conservation in the marine realm, climate change, and ecosystem services, and we have communicated the relevance of our work to our different, but intricately linked, societies. We are presently exploring practical approaches and opportunities to achieve greater connectivity between protected areas in North America, to promote the role of protected areas as natural solutions to climate change, and to further engage Indigenous and tribal organizations in environmental and cultural conservation efforts into the future.

This report represents one piece of a large picture. A broader piece, one that was endorsed by NAWPA agencies and all protected area leaders who participated in the World Parks Congress in 2014, is the Promise of Sydney, "the global road map" for protected areas for the next decade.

Under the three pillars of the Promise of Sydney, NAWPA agencies have identified common priorities to guide our actions:

I. "We promise to invigorate protected areas" by

- Identifying conservation "gaps"—potential opportunities for improvement—in the areas of ecosystem representation and representativeness, connectivity, and resilience;
- Finding options to address these gaps; and
- Reporting on progress towards achieving Aichi Target 11.

This report, "Evaluating the State of Conservation in North America: an analysis of land-based conservation in Canada, Mexico, and the United States by NAWPA agencies," and other awareness and education products, such as our poster on "A Landscape Approach to Temperate Grassland Conservation in the North American Great Plains" presented at the 2016 World Conservation Congress are good examples of our agencies' commitment to work collectively to identify opportunities for achieving greater connectivity between North American protected areas.

II. "We promise to inspire all people" by

- Connecting more people to nature, especially youth and urban populations,
- Strengthening their appreciation and recognition of protected areas; and
- Managing parks and protected areas in ways that are respectful and inclusive of Indigenous peoples and communities.

Our agencies are collaborating with the IUCN World Commission on Protected Areas (WCPA) and the Commission on Education and Communication (IUCN CEC) on the #NatureForAll initiative, a global movement that aims to raise awareness and motivate people from all walks of life to embrace nature and its values, facilitate opportunities for all to experience and connect with nature, and create transformational moments that become pathways to lifelong personal connections and commitments to conservation action.[13]

III. "We promise to invest in natural solutions" by

- Building resilience of the ecosystems in our protected areas, including through ecological restoration;
- Protecting the ecosystem services delivered by our protected areas;
- Better understanding and, where feasible, enhancing carbon sequestration and long-term storage in natural ecosystems;
- Promoting and adopting appropriate policies that cut carbon pollution and practices and maximize our contributions to climate change mitigation;
- Raising awareness of the benefits of protected areas in combatting climate change; and
- Inspiring people to take action to address the challenge of climate change.

From research on the capacity of mangroves to act as carbon sinks to restoration of spawning grounds for salmon, our publication "North American Protected Areas as Natural Solutions to Climate Change"[14] presents some of the accomplishments and ongoing work of our agencies as well as future areas of collaboration that continue to protect healthy ecosystems for the benefit of future generations.

13 Visit www.NatureForAll.global to learn more.
14 http://nawpacommittee.org/wp-content/uploads/2012/08/NAWPA-CCWG-Brochure.pdf

References and Further Reading

Aycrigg, J. L., A. Davidson, L. Svancara, K. J. Gergely, A. J. McKerrow, and M. J. Scott. 2013. Representation of Ecological Systems within the Protected Areas Network of the Continental United States. PLoS ONE 8(1):e54689. doi:10.1371/journal.pone.0054689.

Boykin, K. G., L. Langs, J. Lowry, D. Schrupp, D. Bradford, L. O'Brien, K. Thomas, C. Drost, A. Ernst, W. Kepner, J. Prior-Magee, D. Ramsey, W. Rieth, T. Sajwaj, K. Schulz, B. C. Thompson. 2007. Analysis based on Stewardship and Management Status. Chapter 5 in J. S. Prior-Magee, ed. Southwest Regional Gap Analysis Final Report. U.S. Geological Survey, Gap Analysis Program, Moscow, ID. Available on-line at http://fws-nmcfwru.nmsu.edu/swregap/.

Brooks, T. M., M. I. Bakarr, T. Boucher, G. A. B. Da Fonseca, C. Hilton-Taylor, J. M. Hoekstra, T. Moritz, S. Olivieri, J. Parrish, R. L. Pressey, A. S. L. Rodigues, W. Schrest, A. Stattersfied, W. Strahm, and S. N. Stuart. 2004. Coverage Provided by the Global Protected-Area System: Is it Enough? Bioscience 54(12):1081–1091.

CCEA. Conservation Areas Reporting and Tracking System (CARTS). Data current as of 31, December, 2015. Downloaded on 6 May 2016.

Consultative Group on International Agriculture Research (CGIAR). "Seven Principles to Guide a Resilience Approach." Research Program on Water, Land and Ecosystems. https://wle.cgiar.org/thrive/2014/05/01/seven-principles-guide-resilience-approach.

Garcillán, P. P., and E. Ezcurra. December 2003. Biogeographic regions and β-diversity of woody dryland legumes in the Baja California peninsula. Journal of Vegetation Science 14(6):859–868.

Homer, C. G., J. A. Dewitz, L. Yang, S. Jin, P. Danielson, G. Xian, J. Coulston, N. D. Herold, J. D. Wickham, and K. Megown. 2015, Completion of the 2011 National Landcover Database for the conterminous United States—Representing a decade of landcover change information. Photogrammetric Engineering and Remote Sensing 81(5):345–354.

IUCN. 2013. Guidelines for Applying Protected Area Management Categories. Editor M. Dudley. Best Practice Protected Area Guidelines Series 21. 143 pages. Accessed 3 June 2016 at https://portals.iucn.org/library/node/30018.

IUCN and UNEP-WCMC. 2016. WDPA [On-line], [WDPA_May2016_Public]. UNEP-WCMC, Cambridge, UK. Available at www.protectedplanet.net.

Jones, H. April 2016. Beyond Protected Areas - Other Effective Area-based Conservation Measures. A presentation to the CBD Subsidiary Body on Science, Technical and Technological Advice (SBSTTA-20) by Harry Jones (Co-Chair, IUCN-WCPA Task Force on OECMs).

Jones, H., and K. MacKinnon. December 2015. Task Force on Other Effective Area-based Conservation Measures. Discussion Paper 1: Framing the Issues.

Latifovick, R., C. Homer, R. Ressl, D. Pouliot, S. H. Hossian, R. R. Colditz, I. Olthof, C. P. Giri, and A. Victoria. 2012. Chapter 20. North American Land-Change Monitoring System. Pages 303–324 in Remote Sensing of Land Use and Landcover. CRC Press. doi: 10.1201/b11964 -24.

MacKinnon, D. 2015. Science-based Guidance for Reporting Protected Areas and "Other Effective Area-based Conservation Measures. A presentation by David MacKinnon (CCEA) to the IUCN-WCPA Task Force on OECMs during a SBSTTA-20 side event.

Nelson, K. J., J. Connot, B. Peterson, and J. J. Picotte. 2013. LANDFIRE 2010—Updated Data to Support Wildfire and Ecological Management. http://earthzine.org/2013/09/15/landfire -2010-updated-data-to-support-wildfire-and-ecological-management.

NABCI. 2016. The State of North American Birds. Environment and Climate Change Canada: Ottawa, Ontario. 8 pages. http://www.stateofthebirds.org.

NALCMS Collection. 2010. North American Landcover at 250 m spatial resolution. Natural Resources Canada/ The Canada Centre for Mapping and Earth Observation (NRCan/ CCMEO), USGS; Insituto Nacional de Estadística y Geografía (INEGI), Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO) and Comisión Nacional Forestal (CONAFOR). 2013. Edition: 1.0. Raster digital data. http://www.cec.org /naatlas/.

Rollins, M. G. 2009. LANDFIRE: A nationally consistent vegetation, wildland fire, and fuel assessment. International Journal of Wildland Fire 18:235–249.

Scott, J. M., F. Davis, B. Csuti, R. Noss, B. Butterfield, C. Groves, H. Anderson, S. Caicco, F. D'Erchia, T. C. Edwards Jr., J. Ulliman, and G. Wright. 1993. Gap Analysis: A geographic approach to protection of biodiversity. Wildlife Monographs 123:1–41.

Scott, J. M., M. Murray, R. G. Wright, B. Csuti, P. Morgan, and R. L. Pressey. August 2001. Representation of natural vegetation in protected areas: capturing the geographic range. Biodiversity & Conservation 10(8):1297–1301.

UNEP—CBD—Conference of Parties to the Convention on Biological Diversity. 2011. Report of the Tenth Meeting of the Conference of the Parties to the Convention on Biological Diversity. 333 pages. https://www.cbd.int/meetings/.

——— 1992. Rio de Janeiro. 5 June 1992. Last visited June 2nd, 2016: https://treaties.un.org/doc/Treaties/1992/06/19920605%2008-44%20PM/Ch_XXVII_08p.pdf.

USGS, Gap Analysis Program (GAP). In Review. National Landcover, Version 3. Beyond Protected Areas - Other Effective Area-based Conservation Measures A presentation to the CBD Subsidiary Body on Science, Technical and Technological Advice (SBSTTA-20, April 2016) by Harry Jones (Co-Chair, IUCN-WCPA Task Force on OECMs).

———. 2016. Protected Areas Database of the United States (PAD-US): USGS Gap Analysis Program (GAP): http://gapanalysis.usgs.gov/padus/, http://gapanalysis.usgs.gov/PADUS, http://gapanalysis.usgs.gov/padus/data/, http://dx.doi.org/10.5066/F7G73BSZ.

Wiersma, Y., and T. D. Nudds. 2009. Efficiency and effectiveness in representative reserve design in Canada: The contribution of existing protected areas. Biological Conservation 142(8):1639–1646.

World Conservation Monitoring Center. January 2016. Task Force on Other Effective Area-based Conservation Measures: Co-Chairs report of first international expert meeting (Cambridge).

NAWPA Committee

CONANP
Comisión Nacional de Áreas Naturales Protegidas

Parks Canada Parcs Canada

The North American Intergovernmental Committee on Cooperation for Wilderness and Protected Area Conservation
El Comité Intergubernamental de Norteamérica de Cooperación para la Conservación de las Áreas Protegidas y Silvestres
Comité intergouvernemental nord-américain pour la coopéracion sur la conservation des milieux sauvages et des aires protégées

Partner:
Socio:
Partenaire:

USGS
science for a changing world