

A detailed topographic map of North America, showing the rugged terrain of the western United States and Canada, the Great Lakes region, and the eastern United States. The map uses a color gradient from green for low elevations to brown and orange for higher elevations, with blue representing water bodies. The title text is overlaid on the upper left portion of the map.

Water Resources of Wilderness & Protected Areas of North America

Ecosystem Services: Our Life Support System

The people of Canada, the U.S., and Mexico share a continent with interconnected water resources. These life-giving waters and their sources warrant protection for the services they provide to nature and people.



NAWPA

The Memorandum of Understanding (MOU) on Cooperation for Wilderness Conservation was signed by seven North American government agencies at WILD9, the 9th World Wilderness Congress, in Mérida, Mexico, in 2009 (<http://www.wild.org/where-we-work/north-american-wilderness-collaborative/>).

Under the MOU, Parks Canada, Mexican National Commission for Natural Protected Areas, U.S. Forest Service, National Park Service, U.S. Fish & Wildlife Service, Bureau of Land Management, and the USDA Office of Environmental Markets collaborate on conservation actions at a continental scale, and ecosystem services valuation is a priority measure. Water security is an ecosystem benefit to people continent-wide and a priority for these agencies.

For more information, contact the North American Intergovernmental Committee for Wilderness and Protected Areas Cooperation: <http://nawpa.net/>



We hope to inform policy makers about the important benefits of protecting North America's areas that provide life-sustaining water-based ecosystem services.

What are ecosystem services?

Wilderness and protected areas located throughout the North American continent generate a wide variety of benefits for people and the environment. These benefits, often referred to as ecosystem services, include water; food; spiritual and cultural values; recreation; aesthetics; mitigation of climate change impacts; protection against flood, drought, and disease; and maintenance of biodiversity.

Why focus on water?

The Millennium Ecosystem Assessment, released in 2005, is an international synthesis by more than 1,500 of the world's leading scientists, who describe natural systems as humanity's "life-support system." They have reported that the degradation and loss of wetlands is more rapid than that of other ecosystems (<http://millenniumassessment.org/documents/document.358.aspx.pdf>). When both the marketed and nonmarketed economic benefits of wetlands are included, the total economic value of unconverted wetlands is often greater than that of converted wetlands. A priority when making decisions that directly or indirectly influence wetlands is to ensure that information about the full range of benefits and values provided by different wetland ecosystem services is considered. Physical and economic water scarcity and limited or reduced access to water are major challenges facing society and are key factors limiting economic development in many places in North America.

North American Land Management Agency	Protected Lands	Acres (million)	Hectares (million)
US Forest Service	All Lands	193	78.1
	Wilderness	36	14.5
US National Park Service	All lands	84	34
	Wilderness	44	17.8
US Fish & Wildlife Service	National Wildlife Refuge System	150	60.7
	Wilderness	21	8.5
US Bureau of Land Management	National Landscape Conservation System	27	11
	Wilderness	8.7	3.5
Mexico National Commission for Natural Protected Areas	All lands	61	25
Parks Canada	Total terrestrial and marine	78.2	31.6

The total land and water in wilderness and other protected areas managed by these NAWPA agencies is greater in size than Alberta, Texas and Chihuahua combined.

Protecting Water

Services from Wetlands and Watersheds	Benefits from Wilderness and Protected Areas
Fresh drinking water	<ul style="list-style-type: none"> • Provide the sources of a significant portion of the drinking water for about one-third of the world's largest cities. • Provide the sources of some of the world's highest-quality drinking water. • Prevent the loss and degradation of wetlands, securing long-term storage and a consistent water supply.
Multiple-use water for industry	<ul style="list-style-type: none"> • Ecosystems with intact groundcover and root systems remove pollutants and sediment from surface runoff and groundwater. • High-quality water is important for food processing, bottling beverages, and other commercial uses.
Mitigation of natural disasters	<ul style="list-style-type: none"> • Mitigates the destructive and costly effects of flooding and drought. • Helps to ensure that water is available for recreation, fishing, irrigation, and power generation. • Protects coastal marshes, barrier islands, and mangroves that are important in reducing the impacts from floodwaters.
Fish and wildlife populations for food, recreation, and cultural purposes	<ul style="list-style-type: none"> • Protection of fisheries increases sustainability and high productivity through vital habitat protection for resident and migratory species, including threatened and endangered species. • Protecting a wetland's hydrological regime and natural variability maintains its biodiversity.
Opportunities for recreation, tourism and human well-being	<ul style="list-style-type: none"> • Provides physical and mental challenges in an environment removed from modern civilization. • Provides opportunities for boating, rafting, and other recreation activities, such as camping and hiking. • Supports local economies through tourism and value added to adjacent private properties.
Cultural values and practices	<ul style="list-style-type: none"> • Ensures that wetlands are available for artistic and spiritual inspiration. • Protects sacred cultural sites, subsistence uses of natural materials, and traditional practices.
Future knowledge	<ul style="list-style-type: none"> • Ensures opportunities for discovery of new products and services such as medicines and genetic material. • Encourages knowledge about interactions within aquatic systems.
Climate change adaptation and mitigation	<ul style="list-style-type: none"> • Contributes to knowledge gained about the effects of global climate change on natural water ecosystems. • Provides a baseline for comparing climate-induced changes in various world locations.

From: Daly, H., and Farley, J. (2004) Ecological economics: principles and applications. Washington D.C.: Island Press; and Krieger, D.J. (2001) The economic value of forest ecosystem services: a review. Washington D.C.: The Wilderness Society.

Water is essential to life on earth and is a shared global resource. Water is transported around the world through vapor, rivers, and ocean currents. The largest shared freshwater resource between Canada and the United States is the Great Lakes – St. Lawrence River System. This system contains fully one-fifth of the world's



freshwater. The major shared water resources between Mexico and the United States include the Colorado River and Rio Grande/Rio Bravo and the Gulf of Mexico. Whether for drinking and agricultural uses, as habitat for fish and other foods, and even as travelways, the quality and quantity of water that comes from wilderness and protected areas is crucial to your life today and tomorrow.

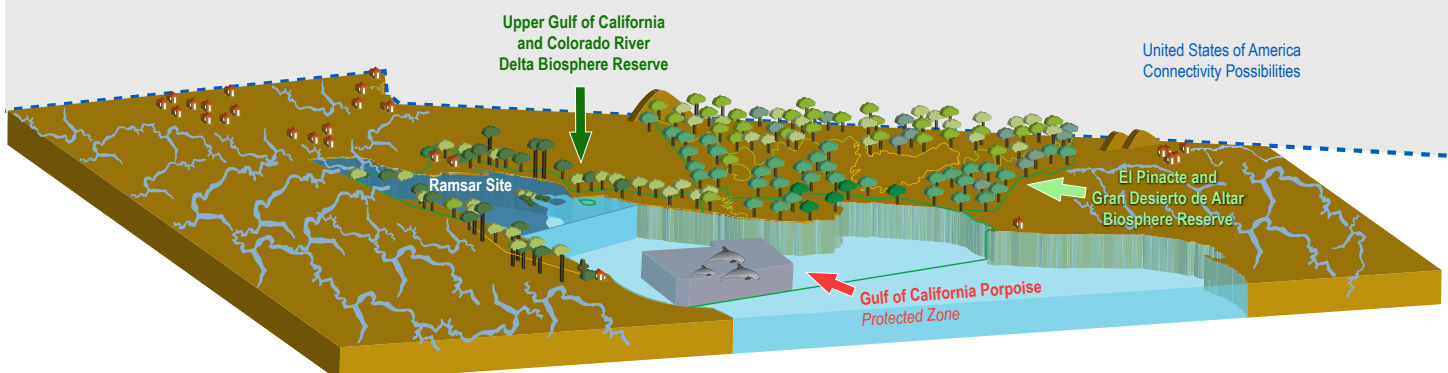
Water: A Shared Global Resource

The coastal and marine zones of the Upper Gulf of California and Colorado River Delta Biosphere Reserve are home to a great diversity of species, many of which are yet to be described. The Colorado River Delta comprises a fragmented system of natural and artificial wetlands that stand as a main component of the Colorado River watershed, which supplies the agricultural valleys of Yuma and Welton Mohawk (Arizona), the hydraulic system of the Irrigation and Drainage District of the Colorado River, and the marine section of the higher Gulf of California (Sea of Cortez).

The Colorado River Delta and the associated ecosystems are one of the most important areas in the region for the reproductive cycles of many endangered species, such as the Gulf of California

porpoise (*Phocoena sinus*), and for many endemic species, such as the totoaba (*Totoaba macdonaldi*) and the Sonora clingfish (*Tomicodon humeralis*).

Fishing is one of the most important and traditional activities in these areas. This area is one of the most fruitful in terms of fishery production, possessing around 70 different species, including the Gulf weakfish (*Cynoscion othonopterus*), the flathead mullet (*Mugil cephalus*), the Pacific sierra (*Scomberomorus sierra*), as well as many invertebrates, such as the blue shrimp (*Litopenaeus stylirostris*), fresh water crabs (*Callinectes* spp.), and several species of clams.



North American Water Treasures



Photo: U.S. Bureau of Land Management

Steens Mountain Wilderness, Oregon, United States **170,166 acres (68,863 hectares) – Designated 2000**

This wilderness protects some of the wildest and most remote land remaining in Oregon. Wilderness designation ensures habitat protection for the threatened redband trout (*Oncorhynchus mykiss gairdnerii*) and endemic plant species. Several wild and scenic rivers are also protected by legislation in the Steens. Many ecosystem values, including species habitat and cultural resources, are protected by wilderness areas, wild and scenic rivers, and other specially designated areas in the National Landscape Conservation System, which is administered by the Bureau of Land Management.



Photo: Parks Canada

Fundy National Park, New Brunswick, Canada **51,151 acres (20,700 hectares) – Designated 1948**

Fundy National Park protects the last remaining wilderness in southern New Brunswick. The conifer-dominated Caledonia Highlands roll down to meet the fog-generating Bay of Fundy. The tidal fluctuation of the Bay of Fundy is the highest in the world. The salt marshes of Fundy National Park provide coastal protection and sea defense that save significant capital and maintenance costs each year. This area offers many opportunities for recreation and tourism. The total value of the park experience to visitors, beyond the amount they spent on their visit, has been estimated at over \$11 million per year.



Photo: Mexican National Commission for Natural Protected Areas

Chichinautzin Biological Corridor Flora and Fauna Protection Area, Morelos, Mexico **92,175 acres (37,302 hectares) – Designated 2000**

The Chichinautzin Biological Corridor is in Northern Morelos State, a few kilometers south of Mexico City. This area is characterized by great biodiversity and high levels of endemism. It was originally created to establish a connection between Lagunas de Zempoala and El Tepozteco National Parks. One of the main threats for this protected area is the growing populations in Mexico City and the State of Mexico. Besides working as an oxygen factory for the entire region, the Chichinautzin Biological Corridor is one of the main areas for water capture and rain regulation for Cuernavaca Valley and Mexico City.



Photo: U.S. Fish & Wildlife Service

Okefenokee National Wildlife Refuge Wilderness, Georgia, United States **353,981 acres (143,256 hectares) – Designated 1974**

Okefenokee National Wildlife Refuge encompasses the Okefenokee Swamp, one of the best-preserved freshwater areas in America. This vast bog, measuring about 38 miles (61 kilometers) long and 25 miles (40 kilometers) wide, lies inside a huge depression that was once the ocean floor. The Okefenokee Swamp forms the headwaters of the Suwannee and St. Mary's Rivers and is recognized internationally for its vast diversity of habitats and species. The total value of ecosystem services provided by the U.S. Fish & Wildlife Service National Wildlife Refuge System in the contiguous United States is approximately \$26.9 billion per year. The value of freshwater regulation and supply across open water and wetlands alone is estimated at \$6.5 billion per year.

Gulf Islands National Seashore Wilderness, Mississippi and Florida, United States
4,000 acres (1,619 hectares) – Designated 1978

Horn and Petit Bois Islands are part of the 139,000-acre (56,000-hectare) Gulf Islands National Seashore, which stretches about 160 miles (257 kilometers) from Mississippi to Florida. Built through the centuries from sand washed down from the north, the fragile barrier islands, held together by vegetation, helps to protect the mainland coast from erosion and seawater intrusion caused by storms and hurricanes. However, channels dredged to allow large ships to reach ports along the coast has diverted sediments away from the barrier islands. Ship Island, one of the larger islands, was cut in two by Hurricane Camille in 1969 and continued to erode as a result of successive storms. In 2006, the U.S. Congress authorized more than \$400 million to support restoration of the sediment of the barrier islands within the Mississippi portion of Gulf Islands National Seashore. Restoration of these valuable islands means a reduction in hurricane and storm damage, prevention of saltwater intrusion and erosion, and protection of fish and wildlife species.



Photo: Gail Bishop

Reef System of Veracruz National Park, Veracruz, Mexico
29,085 acres (52,239 hectares) – Designated 1992

Located in the Gulf of Mexico, in the central part of Veracruz State, the wetland contains 23 reefs of varying sizes, shapes, and depths that are distributed into two groups separated by the Jamapa River. With its great biodiversity, productivity, and scenic beauty, the protected area enhances local fisheries and promotes genetic exchange and recolonization, as well as general ecosystem balance.

During the summer, winds from the northern hemisphere are stronger and generate a more intensive swell and increase of marine currents. The coral reefs found at the park reduce the impact of these conditions off shore. Through stabilization of substrate, due to roots and vegetable-matter deposits, the reef system helps protect the coastal zone, working as a barrier against wind and swells.

The overwhelming biodiversity in the reef system amazes visitors, who enjoy outstanding recreation and sport activities, which also provide new economic opportunities for local communities. The park's scenic beauty increases the economic value of adjacent properties and enhances other cultural values.



Photo: Mexican National Commission for Natural Protected Areas

Shoshone National Forest, Wyoming, United States
2,400,000 acres (971,245 hectares) – Designated 1891

Originally part of the Yellowstone Timberland Reserve, the Shoshone National Forest was the first designated national forest in the United States. Stretching across western Wyoming, the Shoshone is an integral part of the 10 million-acre (4 million-hectare) Greater Yellowstone Ecosystem, centered in Yellowstone National Park, which is one of the greatest wild regions in the United States.

Shoshone National Forest contains all or part of five wildernesses, totaling over 1.3 million acres (526,000 hectare). With more than 500 lakes, more than 2,500 miles (4,000 kilometers) of streams and rivers, more glaciers than on any other national forest, and protection of the headwaters of several regionally important rivers, (including the Big Horn and Yellowstone), the Shoshone National Forest is a critical water provider. With a rich Native American presence for more than 8,000 years and a pioneer history connected to cattle and agriculture, this landscape also protects many cultural values.



Photo: Leopold Institute

Lake Superior National Marine Conservation Area, Ontario, Canada
2,471,053 acres (1,000,000 hectares) – Established 2007

Lake Superior National Marine Conservation Area is the world's largest freshwater marine protected area. The marine conservation area protects 6,000 miles (10,000 kilometers) of Lake Superior's water and shoreline. More than 70 species of fish inhabit the near-pristine waters of Lake Superior, the largest of the Great Lakes. Gulls, herons, eagles, and pelicans feed in these waters, while some also use island habitats for breeding. There may be as many as 50 shipwrecks within the conservation area that attract local and international divers. The area boasts many other attractions related to geology and geomorphology.



Photo: Klaus Rossler

From Flood Prevention to Fresh Water Resources

The Intergovernmental Panel on Climate Change (2007) reports a likely 2°C to 4.5°C temperature rise in the upcoming decades. This warming is likely to affect natural ecosystems and their ability to provide services that benefit human well-being. If natural flood prevention functions of wetlands and coastal marshes are destroyed or diminished, then flood damage costs to individuals and communities will increase substantially.



Freshwater Benefits to Distant Places

Banff National Park, Alberta, Canada
1,641,026 acres (664,100 hectares) –
Designated 1885

Banff National Park, Canada's first national park, supplies clean water that supports farmers and industries and provides recreational opportunities well beyond its boundaries. Lake Minnewanka, the largest water body in the park, is a reservoir that has a rich cultural heritage, offers a wide variety of recreation opportunities, and stores water for a downstream hydro-electric plant. Fifty-three percent of the park watershed drains into the Bow River Basin. Protection of the Bow River headwaters is critical to the health and prosperity of communities throughout the greater basin. Approximately 1.2 million people, or 34 percent of Alberta's population, live within the basin. In 2010, municipalities in the Bow River basin were allocated 510 million cubic meters of water, representing 18 percent of all allocations. Agricultural uses and irrigation accounted for the majority of use at 1,980 million cubic meters or 71 percent of total allocations.



Turner, R.J.W., Franklin, R.G., Grasby, S.E., and Nowlan, G.S., 2005. Bow River Basin Waterscape; Geological Survey of Canada, Miscellaneous Report 90, 2005.

Protected Ecosystems Provide Important Services to People and Nature

Photo:
U.S. Fish
& Wildlife
Service



Photo:
Mexican
National
Commission
for Natural
Protected
Areas



- Ensure availability of some goods that people use or harvest (provisioning services)
- Mitigate the negative impact of natural processes like floods and droughts (regulating services)

Photo:
Mexican
National
Commission
for Natural
Protected
Areas



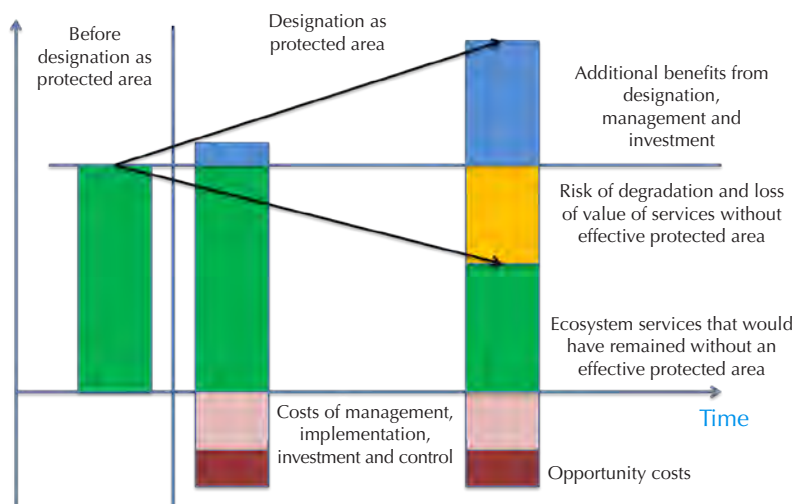
Photo:
U.S.
Forest
Service



- Are the foundation for many services to humans and nature, including water purification and soil formation (supporting services)
- Protect the relationship between humans and nature through spiritual, aesthetic, and recreation benefits (cultural services)

Protection Increases the Benefits Received From Nature

Value of ecosystem services



The total **VALUE** of a protected area includes the added value of designation and the value of services maintained without designation.

Costs

Kettunen, M., Dudley, N., Burner, A., Berghöfer, A., Vakrou, A., Mulongoy, K.J., 2009. Chapter 8: recognising the value of protected areas. TEEB – The Economics of Ecosystems and Biodiversity for National and International Policy Makers, 50p.

Ecosystems Support People — People Support Ecosystems



Photo: U.S. Fish & Wildlife Service

“The degradation and loss of wetlands is more rapid than that of other ecosystems. Similarly, the status of both freshwater and coastal wetland species is deteriorating faster than those of other ecosystems.”

Millennium Ecosystem Assessment (2005) Ecosystems and human well-being: Biodiversity synthesis: Synthesis. Washington D.C.: Island Press

- Wilderness and protected areas play a critical role in providing a variety of benefits that people depend on, including key wetland and watershed ecosystem services.
- As human populations continue to grow and urbanization further expands, more people will rely on ecosystem benefits to meet their most fundamental needs.
- In both rural and urban areas, marginalized populations are likely to suffer most when the availability and quality of water and food are reduced, whether due to failures in infrastructure and trade networks or to the demise of wetlands.

To Increase Sustainability of Water-Based Ecosystem Services From Wilderness and Protected Areas

At Wilderness and Protected Areas:

- Encourage public support of government and non-government efforts to improve stewardship of protected areas to sustain water-based ecosystem services.
- Encourage awareness of the benefits of water from protected areas to local industry, local communities, and people of your nation; think globally, act locally.
- Provide opportunities to volunteer on a project, such as removing litter or controlling invasive species, at a favorite protected area to safeguard water-based ecosystem services.
- Provide examples of good ethics by avoiding behaviors that impact water quality; know and follow relevant regulations.

In Communities:

- Encourage conserving water in homes; make good choices; demonstrate good stewardship.
- Know the sources and threats to a community's water supply.
- Encourage participation in a "friends" group that focuses on protecting water-based ecosystem services.
- Create a "friends" group if one doesn't exist for a protected area.
- Help others become aware of the many benefits we receive by protecting watersheds and wetlands: talk about the full range of provisioning, regulating, supporting, and cultural services.
- Share this brochure widely and especially with those who may become active partners in protecting water within natural systems, which is essential to our health, our food supply, our environment, and our economic well-being.

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