STATE OF WASHINGTON

Natural Heritage Plan 2007

WASHINGTON STATE DEPARTMENT OF
Natural Resources

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1957-2007

State of Washington
Natural Heritage Plan 2007
September 2007

Editor
Princess Jackson-Smith

Graphic Design
Luis Prado

Production Support
Nancy Charbonneau

Cover Photo
Table Mountain, NRCA
DNR Photo

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Washington State Department of Natural Resources
PO Box 47014
Olympia WA 98504-7014
(360) 902-1661

Visit our website:
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STATE OF WASHINGTON

Natural Heritage Plan 2007

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Doug Sutherland - Commissioner of Public Lands

Contents

Aspens near Washington Pass

GREETINGS FROM THE COMMISSIONER

I am pleased to present the 2007 Natural Heritage Plan. It is an important tool to help guide conservation in our state. As citizens of Washington, we are rich with an incredible diversity of natural resources: ocean waters, conifer-covered slopes, volcanic peaks, shrub-steppe and grasslands, deep coulees and more. As stewards of this incredible natural heritage, it is our responsibility to retain it for future generations, so that they, too, can learn from it and enjoy it.

The theme that runs through this year's plan is one of amplifying our impact through partnerships — statewide and national, public and private. This edition of the Natural Heritage Plan illustrates what we do and how we do it and shows the many different ways the information, expertise, and resources within the Natural Heritage Program can and are being used.

Through partnerships, we are able to influence significantly the full spectrum of conservation action, from good land stewardship to dedication of natural areas. Some highlights of those partnerships include:

- The Natural Heritage Program has played a key role in providing scientific support and information to the Washington Biodiversity Council as the council works toward developing a 30-year strategy for the conservation of Washington's biodiversity. Natural Heritage Program staff prepared a report for the council regarding the status of, and trends relating to, Washington's biodiversity.

- The Washington Natural Heritage program was selected as one of five states nationwide to pilot a project with National Geographic and NatureServe. The project will develop a website to inspire conservation action and provide information about the nation's remarkable natural places. This is a recognition of our state's national leadership in conservation work.

You will also find many examples of the work our Natural Heritage and Natural Areas Programs accomplished in adding ecologically important lands to the statewide system of natural areas and conducting research on how to successfully protect rare species and high quality ecosystems.

Looking ahead, the plan identifies our priorities for taking action in the next two years for potential new natural areas, and inventory and research projects. Through science, high quality data, partnerships, and leadership, we can accomplish much more in preserving the best of our natural heritage.

DOUG SUTHERLAND
COMMISSIONER OF PUBLIC LANDS

Golden sedge (*Carex aurea*), one of more than 130 species of sedge known to occur in Washington.

PART I

Introduction

Washington has a remarkably rich natural heritage, rivaled by few places in the world. From pounding surf to alpine meadows, from ancient rainforest to sagebrush desert, our state boasts an incredible diversity of ecosystems, each featuring unique assemblages of plant and animal species. This rich natural heritage is a primary reason that people visit and move to our state. However, recent population growth has created acute threats for many species and ecosystems that are native to Washington, whether through direct loss of habitat or as a result of changes which have been facilitated by growth, such as an increase in invasive species. To ensure the long-term persistence of our uniquely rich natural heritage, it is imperative that we take bold conservation steps, guided by sound policy and science.

Chopaka Mountain
Natural Area Preserve
(NAP)

DNR PHOTO

To ensure the long-term persistence of our uniquely rich natural heritage, it is imperative that we take bold conservation steps, guided by sound policy and science.

NATURAL AREA PRESERVES ACT

The Washington State Legislature took the first bold step thirty-five years ago by passing the Natural Area Preserves Act (RCW 79.70). The Legislature recognized that our natural heritage (i.e., the native species and ecosystems of the state) was potentially at risk and that there were benefits to retaining unaltered ecosystems and the plant and animal species living within those ecosystems. With the passage of the Natural Area Preserves Act, the Legislature created a cornerstone policy regarding conservation of our natural heritage. The Washington State Department of Natural Resources (DNR) was authorized to establish and manage a statewide system of natural areas through cooperation with federal, state and local agencies, private organizations and individuals.

NATURAL HERITAGE PROGRAM

To go along with the policy of establishing a statewide system of natural areas, the Legislature recognized the need for providing an objective, scientific approach to guide the process of identifying candidate sites. In 1981, the Legislature amended the Natural Area Preserves Act and established the Natural Heritage Program within DNR. The Natural Heritage Program had actually been formed in 1977 as a cooperative effort of the Department of Natural Resources, the Department of Fish and Wildlife, the Department of Ecology, the State Parks and Recreation Commission, the Interagency Committee for Outdoor Recreation and the Washington field office of The Nature Conservancy. The program was developed to provide an objective, scientific approach to setting conservation priorities. By formally establishing the Natural Heritage Program within a state agency, the Legislature brought science and policy together.

NATURAL HERITAGE PLAN

The 1981 amendment to the Natural Area Preserves Act also required the Natural Heritage Program to develop a plan each biennium regarding the Act's implementation. Specifically, the purpose of the State of Washington Natural Heritage Plan was to identify:

- Priority species and ecosystems to be considered in the selection of potential natural areas and
- The criteria and process by which natural areas are selected.

The criteria and process are more fully described in Part III. In brief, selection of candidate sites is driven by the presence of priority ecosystems and species. The process of setting these priorities is described in Part III and in Appendix I. Current lists of priority species and ecosystems are available on the Natural Heritage Program's website at: http://www.dnr.wa.gov/nhp/refdesk/plan/index.html.

In addition to the lists of priority species and ecosystems and the documentation regarding criteria and process for selecting natural areas, the Natural Heritage Plan identifies the contributions to the statewide system of natural areas that are made by federal, state and local agencies as well as private conservation organizations.

GOING BEYOND NATURAL AREAS

The statewide system of natural areas is critical to the long-term persistence of our unique natural heritage. But the overall conservation need is much greater than can be provided by simply acquiring and designating sites as natural areas. Use of the full set of conservation tools, from acquisition to easements to good stewardship, is required. And behind the application of all conservation tools or mechanisms is a need for objective information and sound science.

The Natural Heritage Program has been compiling, analyzing and sharing objective information about Washington's biodiversity for 30 years. The information has been used in a number of ways to help achieve conservation. But we believe that we can, and must, do a better job of making biodiversity information available if we are to be successful at ensuring the long-term persistence of our rich natural heritage.

The Washington Biodiversity Council, established by a Governor's Executive Order, is currently looking 30 years into the future, developing a strategy for the conservation of Washington's biodiversity. The implementation of the strategy will require objective, comprehensive information. We believe that the Natural Heritage Program has a critical role to play in that effort. To that end, the 2007 State of Washington Natural Heritage Plan has been prepared with an eye toward making the information that we manage both more accessible and understandable. We hope to encourage all who are engaged in land-use planning and decision-making, from developers to conservation activists, to make use of the best available information and expertise, including that which is available from the Natural Heritage Program.

> "It is, therefore, the public policy of the State of Washington to secure for the people of present and future generations the benefit of an enduring resource of natural areas by establishing a system of natural area preserves, and to provide for the protection of these natural areas."
>
> REVISED CODE OF WASHINGTON, CHAPTER 79.70 (NATURAL AREA PRESERVES ACT)

Current lists of priority species and ecosystems are available online. Visit http://www.dnr.wa.gov and search for the Natural Heritage Program web page.

Tweedy's lewisia, known primarily from the Wenatchee Mountains.

PART II

The Case for Conservation Action

WASHINGTON HAS A RICH NATURAL HERITAGE

Washington has a tremendous diversity of landscapes, ecosystems, and species. We have the marine waters of the outer coast and Puget Sound, volcanic peaks rising up out of the Cascade Mountains, the broad Columbia Plateau formed by unbelievable outpourings of lava millions of years ago, the rolling Palouse hills, one of the world's great rivers in the Columbia River, as well as extensions of the Rocky Mountains.

The diversity of landscapes supports a wealth of ecosystems: marine waters, tidepools, estuaries, rainforests, expansive coniferous forests, subalpine and alpine meadows and parklands, shrub-steppe, grasslands, prairies, sand dunes, riparian areas, and a variety of freshwater wetland types.

The ecosystems are home to a richness of species, from whales and sea anemones to jumping slugs, giant Douglas-fir trees and prickly pear cacti. There are more than 3,100 vascular plant species, 140 mammals, 470 freshwater and marine fishes, 341 birds, 25 amphibians, 21 reptiles, thousands of mosses, lichens, liverworts, and fungi, and tens of thousands of invertebrates.

Continued on next page

KAREN GRAY

JIM RILEY

Top: Asotin milkvetch (*Astragalus asotinensis*) is a newly described species from Asotin County, Washington.

Below: Washington's lichen diversity is still being catalogued. *Vulpicida canadensis*, shown here, is known from nine counties.

Some of the species are unique to Washington, occurring nowhere else on Earth. There are 49 plant species that are endemic to the state. The Olympic and Wenatchee mountains, the Columbia River Gorge, and the Columbia Plateau are all rich in species that are unique to those areas. Yet other species are common. And some species are yet to be discovered, or rediscovered. A new species of milkvetch (*Astragalus asotinensis*) was first described in 2006 from the southeast corner of the state.[1] And in the Palouse, a giant earthworm that had not been seen in decades was found accidentally as a graduate student was doing soils research near Pullman.

OUR ECOSYSTEMS AND SPECIES MATTER

The beauty and diversity of Washington is important because it makes us who we are. We identify with Mount Rainier, killer whales, salmon, old growth forests, the Columbia River, the basalt-walled coulees carved by epoch floods. But our biodiversity provides much more than simply aesthetic or spiritual value.

- Our native species and ecosystems contribute billions of dollars annually to Washington's economy, from fisheries, to timber production, to outdoor recreational pursuits. Natural resource based businesses contribute approximately 13% of our state's annual economic output (Policy Brief from the Office of Governor Chris Gregoire).

Our native species and ecosystems contribute billions of dollars annually to Washington's economy.

- Healthy ecosystems provide us with clean water and clean air. Maintaining our landscapes and ecosystems in a healthy condition provides tremendous savings when it comes to providing clean air and water.
- Intact ecosystems provide land managers and students of all ages with outdoor laboratories from which to learn about the environment and how it functions.
- Our species and ecosystems provide us with a foundation for our cultural and spiritual values.
- Native species are critical in the development of medicines and food crops.

OUR ECOSYSTEMS AND SPECIES ARE UNDER SIEGE

Although we are still rich, we cannot take the continued existence of our biodiversity for granted. A number of factors threaten the very existence of many of our species and have negative impacts on the health and functioning of our ecosystems.

Population growth and our current rate of resource consumption are major drivers of threats to Washington's biodiversity. Our population is currently more than 6 million, having doubled in the last 40 years.[2] By 2030, Washington is expected to have more than 8 million residents.[3] Growth is expected to be the greatest in the Puget Sound region and in Clark and Spokane counties.[4] New homes, commercial buildings, roads, sewers, and water supply systems will be needed. All of these developments will add to the pressures on our species and ecosystems. Those pressures are exacerbated by our collective personal resource consumption: bigger cars, bigger houses, bigger storage units, faster foods.

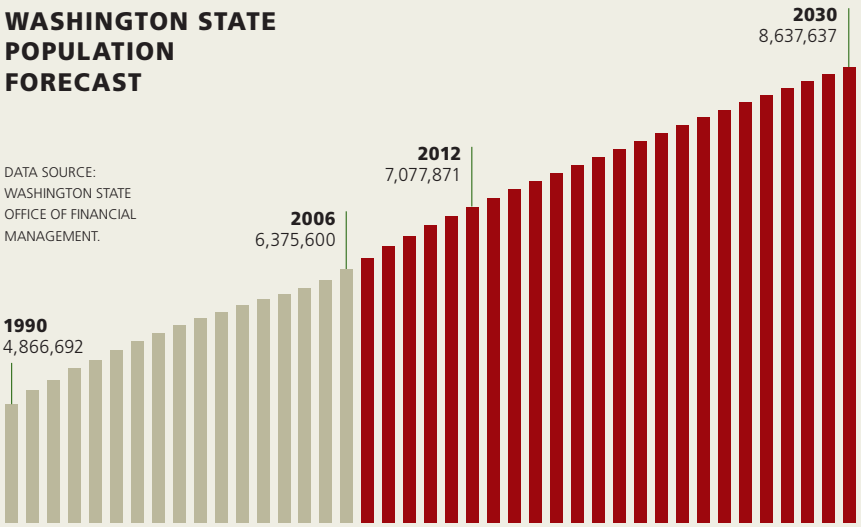
Conversion of land for agricultural, residential and commercial uses continues. We are losing low elevation forests in western Washington as a result of the expansion of cities and suburbs. By 2030, Washington and Oregon are projected to see 1.9 million net acres of forest converted.[5] Lands in eastern Washington continue to be converted to orchards, vineyards, organic farms, golf courses and other recreational developments. And those lands remaining in a natural or semi-natural state are increasingly fragmented and isolated.

The impacts of dam construction on riparian species and ecosystems are still being felt today. Construction of dams, while providing flood control and electricity and water for irrigation, has resulted in significant declines in riparian ecosystems and the species dependent upon those systems. These impacts continue today.

DNR PHOTO

Population growth is often accompanied by conversion of natural landscapes to residential development.

WASHINGTON STATE POPULATION FORECAST



DATA SOURCE: WASHINGTON STATE OFFICE OF FINANCIAL MANAGEMENT.

THREATS TO WASHINGTON'S BIODIVERSITY

- Population growth and personal consumption
- Conversion of habitat to:
  - Agriculture
  - Residential
  - Commercial / industrial
- Dams and other changes to hydrologic systems
- Invasive species
- Pollution / contamination
- Overexploitation
- Climate Change
- Meeting water storage needs
- Pursuit of renewable energy
- Fragmentation and isolation / loss of ecological function

CHARLES AND GRETCHEN LAMBERT

DNR PHOTO

Top: Non-native tunicates (also known as sea-squirts) are a significant threat to Puget Sound's biodiversity. Pictured here is the transparent Ciona tunicate.

Above: Wind farm in Eastern Washington. There can be significant, site-specific ecological cost to pursuit of alternative energy.

Population growth and our current rate of resource consumption are major drivers of threats to Washington's biodiversity.

Invasive species will likely increase in number and in economic and environmental impact. Non-native invasive plant and animal species cause significant economic impact to property owners, farmers and ranchers, people involved in aquaculture and fisheries, and others as a result of reduced yields and the cost of control/eradication efforts. There are also tremendous environmental impacts. Invasive species have been identified as a threat to more than 25% of the state's plant species that are of conservation concern.[6] Aquatic nuisance species, such as the non-native tunicate pictured at left, have been identified as the second leading threat to diversity within Puget Sound.[7]

Pollution and environmental contamination will likely accompany the projected growth in the population of the state. This issue has been highlighted recently for Puget Sound's species and ecosystems. One suspected cause of the explosive increase in non-native tunicates (mentioned above) is the dumping of raw sewage into Puget Sound and Hood Canal. Pollution and contamination are of concern for aquatic and terrestrial ecosystems across the entire state, as wastewater and stormwater runoff and atmospheric pollutants, such as those in automobile emissions, increase. This problem is exacerbated by the concurrent loss of natural environments that help to filter our air and water.

Climate change will likely reshape our ecosystems and alter the mix of species that live within Washington. Rising sea level will impact nearshore habitats (beaches, tidepools, etc.) and estuaries. Changing temperature and precipitation patterns will alter patterns of wildfire frequency and severity, resulting in changes in the species composition and structure of our forests. The flow of water through watersheds will change, altering riparian ecosystems and isolated wetlands. Successful conservation will depend on gaining a better understanding of the impacts of climate change on our species and ecosystems.

Meeting the water storage needs for a growing population, particularly in light of climate change projections, may pose additional risks for species and ecosystems. Our reliance on snow-pack as the primary means of water storage will be tested, resulting in the need to look for alternatives, such as building new reservoirs. The placement of new reservoirs, or increasing the storage capacity of existing reservoirs, will place some components of biodiversity at increased risk.

Pursuit of less expensive, even renewable, energy sources has an environmental cost. As we seek cheaper energy sources, whether it be wind energy or growing crops for biofuels, the components of biodiversity in the effected places may be at increased risk.

Fragmentation, isolation, and loss of ecological function will be increasingly difficult to address. The combination of population growth, conversion of habitat, pollution, invasive species and climate change will further isolate parcels in good ecological condition from the natural ecological processes that are necessary for ecosystem viability. In turn, this makes successful long-term conservation more challenging to achieve.

WE CAN MAKE A DIFFERENCE

In spite of all of the change that has occurred in Washington, and in the face of all of the on-going threats to our biodiversity, we are still rich. There are, and have been, impressive efforts underway to conserve Washington's biodiversity. These efforts are making a difference. A sampling of these efforts includes:

Washington Biodiversity Council Created by an executive order from the Governor's office, the Council is developing a 30-year strategy for the conservation of Washington's biodiversity. The strategy is expected to emphasize landowner incentives and increased efficiency of conservation effort, in particular with regard to government actions.

Puget Sound Partnership Governor Gregoire has made this public/private partnership to restore the Puget Sound ecosystem to health by 2020 a priority for her administration.

The Cascade Agenda This cooperative effort, led by the Cascade Land Conservancy, resulted in the creation of a 100-year vision for King, Pierce, Snohomish and Kittitas counties for sustainable economies and ecosystems.

Comprehensive Wildlife Conservation Strategy Completed by the Washington Department of Fish and Wildlife in 2005, this document provides a strategic framework for the conservation of Washington's wildlife species and their habitats. WDFW is currently engaged in developing action plans for each of Washington's nine ecoregions to implement this strategy.

Ecoregional Assessments The Nature Conservancy, Washington Department of Fish and Wildlife, the Natural Heritage Program and many others have undertaken conservation assessments for each of Washington's nine ecoregions. The assessments are designed to identify the priority areas for conservation of all components of each ecoregion's biodiversity.

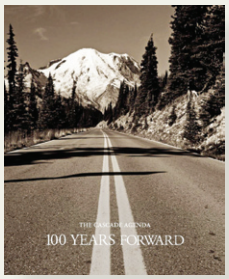
Increasing number of land trusts in Washington The Land Trust Alliance currently lists more than 30 land trusts that operate at the local or regional level within Washington. [8]

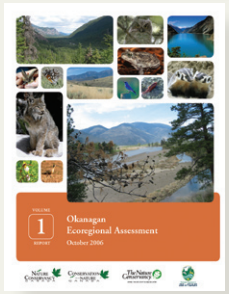
Washington Wildlife and Recreation Program (WWRP) Since 1990, more than 125,000 acres have been acquired for habitat conservation and recreation purposes. Additionally, more than 14,000 acres have been acquired for salmon recovery purposes.[9] Many of the WWRP acquisitions have been for Natural Area Preserves and Natural Resources Conservation Areas.

Forests and Fish Law Enacted in 1999 by the State Legislature, this law increases the protection along 60,000 miles of streams on 9.3 million acres of forest in Washington.

Cooperative Endangered Species Conservation Fund (administered by the U.S. Fish and Wildlife Service to promote conservation and recovery of species on the federal endangered species list) During 2006, the State of Washington received more than $20 million in grants for land acquisition and planning assistance, representing almost 30% of the total for the nation.

The Forest Legacy Program (administered by the U.S. Forest Service to protect forestlands from conversion to non-forest uses) Washington was one of the first states to participate in this grant program, and has used it successfully to reduce urban sprawl and protect forestlands in key locations since 1993.





Top: The Cascade Agenda 100 Years Forward.

Bottom: Okanogan Ecoregional Assessment.

[1] Bjork, Curtis R. and M. Fishbein. Astragalus asotinensis (Fabaceae), a newly discovered species from Washington and Idaho, United States. Novon 16:299-303. November 2006.

[2] Washington State Office of Financial Management. 2005 Data Book.

[3] Washington State Office of Financial Management. Http://www.ofm.wa.gov/pop/gma/projections.asp

[4] Washington State Office of Financial Management, Washington State County Growth Management Population Projections: 2000 to 2005.

[5] Washington State Department of Natural Resources website (Overview of Washington's Forest Legacy Program): http://www.dnr.wa.gov/htdocs/amp/forest_legacy/intro.html.

[6] Bishop, A. A. Dotolo, M. Grady, A. Lillenthal, J. Panza, A. Varlamov and C. Wilson. 2005. Threats to Biodiversity in Washington: A Report Prepared for the Washington Biodiversity Council.

[7] Puget Sound Action Team website—Puget Sound Online (http://www.psat.wa.gov/Programs/Aquatic.htm)—Accessed on March 4, 2007.

[8] LTA website accessed on February 21, 2007: http://www.ltanet.org/findlandtrust/alpha.tcl?state_id=washington53#statewide.

[9] Interagency Committee for Outdoor Recreation. 2005. Toward a Coordination Strategy for Habitat and Recreation Land Acquisitions in Washington State. Submitted to the Washington State Legislature. 39 pp. + appendices.

OBJECTIVE, SCIENTIFIC INFORMATION IS NEEDED

These efforts, and many others, have made and continue to make a difference. They are evidence of a high level of interest and energy dedicated to conserving Washington's species and ecosystems. But given the magnitude of population growth and the reality of climate change, we have a decreasing margin of error when it comes to decisions that will affect the future of biodiversity in Washington. The decisions that are made, whether by state agencies, county planning departments, or conservation organizations, need to be informed decisions. They will require objective information regarding what features are in need of special conservation attention, where those features are found on the landscape, and how best to manage the land for the conservation of those features.

WE'VE GOT THE TOOLS

Enter the Washington Natural Heritage Program. It was created specifically to provide an objective basis for establishing conservation priorities and to inform policy makers and land managers. Which species need conservation attention? What ecosystems are being lost to development or undergoing degradation from other human activities? Where are the best places to conserve rare species and ecosystems? Natural Heritage Programs and the methodology they employ were developed to help answer these questions.

In passing the Natural Area Preserves Act, the Legislature recognized the need for a systematic and objective approach to guide inventory and protection efforts. The Legislature was interested in both effectiveness (protecting those features most at risk) and efficiency (avoiding unnecessary duplication of protection effort). The Natural Heritage Program was established to provide the systematic and objective approach.

The Natural Heritage Program was created specifically to provide an objective basis for establishing conservation priorities.

The Natural Heritage Program's mandate, from the Legislature, was essentially to:

- Identify which species and ecosystems are priorities for conservation effort,
- Build and maintain a database for priority species and ecosystems, including information about known locations and about their ecological requirements, and
- Share the information with others so that it can be used for environmental assessments and conservation planning purposes.

PART III

The Washington Natural Heritage Program

NATURAL HERITAGE NETWORK: NATURESERVE

The Washington Natural Heritage Program is part of a network of 80 natural heritage programs located in all 50 states, all Canadian provinces, as well as in several Latin American and Caribbean countries. This network is known as NatureServe (see map, next page). Information can be readily shared across the network, since similar methodologies and data management standards are used by all network members.

NATURAL HERITAGE METHODOLOGY

The Natural Heritage Program's approach to conservation addresses three questions:

- What are the components of biodiversity (classification)?
- Where do the various components occur (inventory)?
- What needs to be done to protect the individual components (conservation planning)?

These questions are addressed in an ongoing and iterative manner. Each step—classification, inventory, and conservation planning—is repeated as more information is gathered and as conservation actions take place.

THE NATURAL HERITAGE NETWORK: NATURESERVE

The Washington Natural Heritage Program is part of a network of 80 natural heritage programs located in all 50 states, all Canadian provinces, as well as in several Latin American and Caribbean countries. This network is known as **NatureServe**. Information can be readily shared across the network, since similar methodologies and data management standards are used by all network members.

NATURESERVE NETWORK MEMBERSHIP

8 CANADIAN CONSERVATION DATA CENTERS

53 US NATURAL HERITAGE PROGRAMS

18 LATIN AMERICAN CDCS

CLASSIFICATION

IDENTIFYING AND ASSIGNING CONSERVATION PRIORITIES TO THE COMPONENTS OF BIODIVERSITY

Natural Heritage Programs make use of what has been called a "coarse filter / fine filter" approach to account for the different components of biodiversity. The coarse filter consists of all of the ecosystems (both terrestrial and aquatic) occurring within the state. The fine filter consists of rare species and rare ecosystems that may not be adequately protected by using only the coarse filter.

The basic assumption of this approach is that by ensuring the conservation of ecosystem types, the conservation of the common species that make up those types can be achieved in an efficient manner. Species and ecosystems that are rare or have very limited distributions warrant their own specific conservation efforts.

Establishing clear priorities for species and ecosystems is critical to successful conservation.

The success of this approach is dependent upon several factors, including having a well-developed classification of ecosystems, gaining protection for not only all ecosystem types, but for the full range of variability within each ecosystem type, and ensuring that the list of fine filter features includes all species and ecosystems that might not be 'captured' by applying the coarse filter. And of course, conservation efforts, if they are to be successful, must account for the various ecological processes that influence species and ecosystems.

Establishing clear priorities for species and ecosystems is critical to successful conservation. The Natural Heritage Program currently uses two systems to prioritize species and ecosystems: one for overall conservation action, and one specifically for including species and ecosystems within the statewide system of natural areas. The first system, described below, is shared by all members of the NatureServe network. It is used as the starting point for the second system, which is described in Appendix 1. Both systems make use of the objective methodology of the Natural Heritage Program, helping to achieve both effectiveness and efficiency in conservation efforts.

By targeting ecosystem types for conservation, the common species that make up those ecosystem types are protected. Yellow bells (pictured above) occur in a number of different ecosystem types. They are presumably protected by conservation of the ecosystems of which they are a component.

Methodologies shared by Natural Heritage Programs:

- Species and ecosystems approach (coarse filter / fine filter)
- Global and state ranking system applied to species and ecosystems
- Ecosystems classification
  - National Vegetation Classification
  - Ecological Systems
- Data management standards
  - Population delineation
  - Mapping

HOW ARE SPECIES PRIORITIES DETERMINED?

The global and state ranking system facilitates a quick assessment of a species' rarity.

The primary tool used to develop priorities for individual species is the global and state ranking system used by NatureServe and its member Natural Heritage programs. The ranking system facilitates a quick assessment of a species' rarity. Each species is assigned both a global (G) and state (S) rank on a scale of 1 to 5. The global ranks are assigned through a collaborative process involving both NatureServe and individual Natural Heritage Program scientists. State ranks are assigned by scientists within the Natural Heritage Program, who collaborate with other scientists and knowledgeable individuals.

A rank of G1 indicates critical imperilment on a global basis; the species is at great risk of extinction. S1 indicates critical imperilment within a particular state (in our case, Washington), regardless of its status elsewhere. A number of factors, such as the total population size, the number of occurrences, threats, etc., contribute to the assignment of global and state ranks. The information supporting these ranks is developed and maintained by the Natural Heritage Program and NatureServe.

The table below shows the matrix of possible combinations of global and state ranks. Note that some combinations are not possible: a feature cannot be more common in the state than it is for the entire planet. Various examples of species and their ranks are presented on the next page.

Global and state ranks for all species of conservation concern are available online. Visit http://www.dnr.wa.gov and search for the Natural Heritage Program web page.

GLOBAL AND STATE RANKING MATRIX					
	S1	**S2**	**S3**	**S4**	**S5**
G1	G1S1				
G2	G2S1	G2S2			
G3	G3S1	G3S2	G3S3		
G4	G4S1	G4S2	G4S3	G4S4	
G5	G5S1	G5S2	G5S5	G5S2	G5S5

GLOBAL AND STATE RANK DEFINITIONS

1 critically imperiled
2 imperiled
3 vulnerable to extirpation or extinction
4 apparently secure
5 demonstrably widespread, abundant, and secure

GLOBAL AND STATE RANKING FACTORS FOR SPECIES

- Total number and condition of occurrences
- Total population size
- Range and extent of area occupied
- Short- and long-term trends in the factors above
- Threats
- Vulnerability

TOM KAYE

G1S1 The Golden Paintbrush is considered critically imperiled in Washington (S1) as well as globally (G1). It has disappeared from much of its historic range, including southwestern Washington and the Willamette Valley in Oregon. There are now only about a dozen known locations, all between Thurston County, Washington and the southern end of Vancouver Island, British Columbia. Most of the known populations are small and have direct threats, including development pressure, tree and shrub invasion, and invasive species challenges.

GLOBAL AND STATE RANKING MATRIX					
	S1	**S2**	**S3**	**S4**	**S5**
G1	**G1S1**				
G2	G2S1	G2S2			
G3	G3S1	G3S2	G3S3		
G4	G4S1	G4S2	G4S3	G4S4	
G5	G5S1	G5S2	G5S5	G5S2	G5S5

KELLY MCALLISTER

G3S3 The Olympic Torrent Salamander is endemic to the Olympic Peninsula. Despite the relatively small global range, this species can be locally common to abundant. Many other species that are ranked G3S3 exhibit a similar distribution and abundance pattern.

GLOBAL AND STATE RANKING MATRIX					
	S1	**S2**	**S3**	**S4**	**S5**
G1	G1S1				
G2	G2S1	G2S2			
G3	G3S1	G3S2	**G3S3**		
G4	G4S1	G4S2	G4S3	G4S4	
G5	G5S1	G5S2	G5S5	G5S2	G5S5

© ELEANOR SAULYS

G5S1 Threeleaf goldthread (a member of the buttercup family) and Woodland Caribou are examples of species that are secure globally, but are rare within Washington. Both species reach the southern limits of their ranges in Washington, being more common to the north. Neither species is at risk from a global perspective, but both are of conservation concern here in Washington.

GLOBAL AND STATE RANKING MATRIX					
	S1	**S2**	**S3**	**S4**	**S5**
G1	G1S1				
G2	G2S1	G2S2			
G3	G3S1	G3S2	G3S3		
G4	G4S1	G4S2	G4S3	G4S4	
G5	**G5S1**	G5S2	G5S5	G5S2	G5S5

© BEN LEGLER

G5S5 Douglas-fir and Black Bear are examples of species that are "demonstrably widespread, abundant and secure," both within Washington and globally. For conservation assessment and planning purposes an assumption is made that these species are widespread enough that they will be adequately protected by providing ecosystem-level protection.

GLOBAL AND STATE RANKING MATRIX					
	S1	**S2**	**S3**	**S4**	**S5**
G1	G1S1				
G2	G2S1	G2S2			
G3	G3S1	G3S2	G3S3		
G4	G4S1	G4S2	G4S3	G4S4	
G5	G5S1	G5S2	G5S5	G5S2	**G5S5**

HOW ARE ECOSYSTEMS PRIORITIES DETERMINED?

In order to assign conservation priorities to ecosystems, we need to have a consistent list of all ecosytem types in the state. However, the term 'ecosystem' does not have a fixed scale in its general usage. It has been used to characterize areas that vary in size from an individual stand of trees to large landscapes. In part because of this, and in order to better understand the diversity of ecosystems, ecologists have developed various ecosystem classification systems. Classification results in a reasonably definitive list of ecosystem types, and a common language to refer to those types, which then allows the setting of priorities necessary for conservation planning.

The Natural Heritage Program uses several classification systems. Fortunately, the different classification systems largely correspond to different physical environments.

Marine and estuarine classification Developed by Dr. Megan Dethier in 1990,[1] this classification defines ecosystems based on depth, substrate, wave energy and the plant and animal species associated with the combination of habitat variables.

Wetland natural community classification Developed by Linda Kunze in the 1980s,[2] this classification defines ecosystems based on geomorphic province, hydrology, water chemistry, soils and vegetation. Plant associations are components of the wetland community types. Individual plant associations can appear in more than one wetland type.

National Vegetation Classification Developed by NatureServe and its partners,[3] including Washington Natural Heritage Program ecologists, this classification is a hierarchical system with physiognomic classes in the higher (coarser) levels and species composition-based alliances and plant associations at the lowest (finest) levels.

Ecosystem classification results in a definitive list of ecosystem types, which allows the setting of priorities for conservation efforts.

As noted above, the ranking factors for ecosystems are similar, but somewhat different than those for species. Global and state ranks have been assigned to all terrestrial ecosystems and some of the wetland and aquatic ecosystems. Marine ecosystems have not as yet been assigned global or state ranks. The table on the next page provides examples of the global and state ranking for several plant associations.

GLOBAL AND STATE RANK DEFINITIONS

1 critically imperiled
2 imperiled
3 vulnerable to extirpation or extinction
4 apparently secure
5 demonstrably widespread, abundant, and secure

GLOBAL AND STATE RANKING FACTORS FOR ECOSYSTEMS

- Number and condition of occurrences
- Total acreage occupied by the ecosystem type Secondary Factors
- Geographic range
- Long-term trend across ecosystem type's range
- Short-term trend
- Degree of environmental specificity
- Threats

DNR PHOTO

G1S1 Paper birch – red alder / swordfern *(Betula papyrifera – Alnus rubra / Polystichum munitum)* plant association Considered critically imperiled in Washington (S1) as well as globally (G1), this community is limited to the Fraser Lowland and adjacent hills in Whatcom County, possibly occurring in Skagit Co. and adjacent B.C. The few known stands are small and set in an agricultural landscape. This is an early to mid-seral community type.

GLOBAL AND STATE RANKING MATRIX					
	S1	**S2**	**S3**	**S4**	**S5**
G1	**G1S1**				
G2	G2S1	G2S2			
G3	G3S1	G3S2	G3S3		
G4	G4S1	G4S2	G4S3	G4S4	
G5	G5S1	G5S2	G5S5	G5S2	G5S5

DON KNOKE

G3S3 Thyme buckwheat / Sandberg's bluegrass *(Eriogonum thymoides / Poa secunda) plant association* This regionally endemic plant association is known from southeastern Washington and west-central Idaho (within the Columbia Plateau ecoregion). It forms a mosaic with other shallow soil shrub-steppe plant associations. Within appropriate habitat within its range, this association is relatively common, although it typically occurs in relatively small patches. The association is vulnerable to weed invasions and other changes in species composition brought about by intensive livestock grazing.

GLOBAL AND STATE RANKING MATRIX					
	S1	**S2**	**S3**	**S4**	**S5**
G1	G1S1				
G2	G2S1	G2S2			
G3	G3S1	G3S2	**G3S3**		
G4	G4S1	G4S2	G4S3	G4S4	
G5	G5S1	G5S2	G5S5	G5S2	G5S5

DNR PHOTO

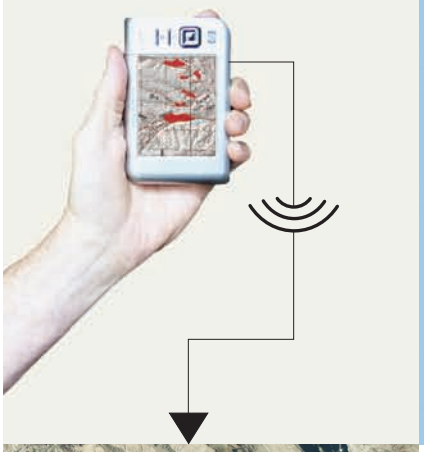
G4S1 Ponderosa pine / bluebunch wheatgrass association (*Pinus ponderosa / Pseudoroegneria spicata*) This woodland type is found in the northern Rocky Mountains, the Intermountain West, and extreme northwestern Great Plains of the U.S. and Canada, extending from the Black Hills of South Dakota and Wyoming west to Oregon, Washington, and British Columbia. It is not of great conservation concern globally, but it is of concern in Washington due to the effects of fire suppression, invasive species, timber harvest and livestock grazing.

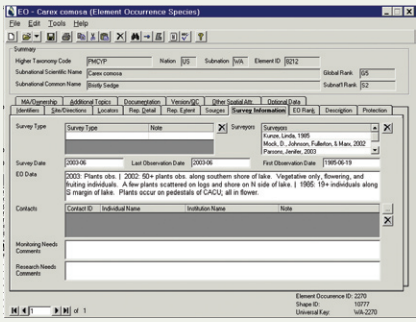
GLOBAL AND STATE RANKING MATRIX					
	S1	**S2**	**S3**	**S4**	**S5**
G1	G1S1				
G2	G2S1	G2S2			
G3	G3S1	G3S2	G3S3		
G4	**G4S1**	G4S2	G4S3	G4S4	
G5	G5S1	G5S2	G5S5	G5S2	G5S5

DNR PHOTO

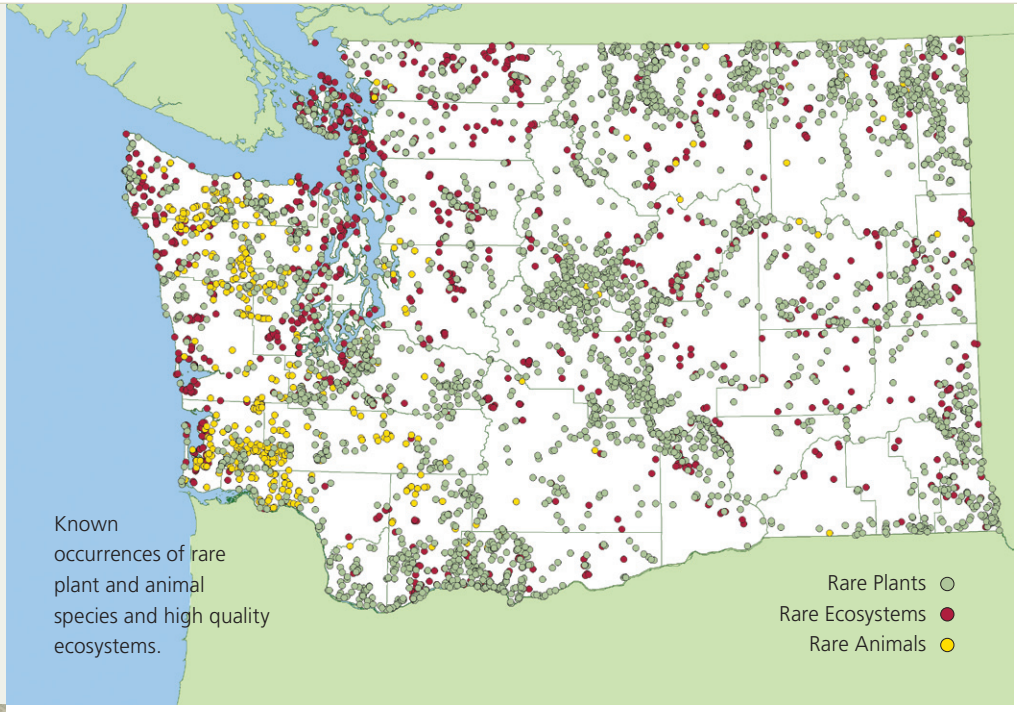
G5S5 Douglas-fir / Pinegrass association (*Pseudotsuga menziesii / Calamagrostis rubescens*) This lower to mid montane woodland association occurs in the central and northern Rocky Mountains from western Montana to eastern Washington and British Columbia, and south to western Wyoming, Idaho and eastern Oregon. In Washington, it occurs in the Blue Mountains, Okanogan, Canadian Rockies, Columbia Plateau and East Cascades ecoregions. As a community type, it is "widespread and demonstrably secure."

GLOBAL AND STATE RANKING MATRIX					
	S1	**S2**	**S3**	**S4**	**S5**
G1	G1S1				
G2	G2S1	G2S2			
G3	G3S1	G3S2	G3S3		
G4	G4S1	G4S2	G4S3	G4S4	
G5	G5S1	G5S2	G5S5	G5S2	**G5S5**





Recording Data
Hand held data recorders and GPS units improve our ability to rapidly and efficiently capture information from the field. Field collected information, such as the red polygons representing rare plant populations, can be displayed with other GIS layers, such as topography and aerial imagery. Field data are then entered into a database for analysis and reporting.



WHAT INFORMATION DOES THE NATURAL HERITAGE PROGRAM MANAGE?

The Washington NHP has been compiling and sharing objective information regarding priority species and ecosystems for almost 30 years now. The information falls primarily into one of two categories: site-specific information or species—and ecosystem—specific information. Both sets of information are necessary for assigning priorities and for conservation planning.

Site-specific Information

The Natural Heritage Program manages information on more than 7,100 individual records of rare species and high quality ecosystems in the state. Each individual record consists of information gathered by scientists in the field. Many older records, such as those originating from natural history work undertaken as part of the transcontinental railway surveys, are less than complete by today's standards. More recent field surveys typically include information regarding:

- site location
- population size and/or area occupied
- associated species
- overall description of site, including landscape context
- threats and/or management comments
- other factors

The field data are recorded using a variety of tools, from field notebooks to hand held data recorders and GPS units. The next step in the process is to integrate the data into the Natural Heritage database. Depending on the technology used by the field scientist, data can be electronically transferred or manually entered.

Once incorporated into the Natural Heritage information system, the new information can be viewed along with other GIS data layers, such as topography and aerial imagery. The new data can then be analyzed and used for a variety of conservation assessment purposes.

Species and Ecosystem-Specific Information

The Natural Heritage Program also compiles information about the biology/ecology of individual priority species and ecosystems. NHP staff have gathered available information regarding the biology and ecology for each priority species and ecosystem. Some of this information is gleaned from the site-specific information, but much of it comes from published and unpublished literature.

NHP scientists also prepare reports on individual species, or groups of species, and ecosystems. For example, the NHP botanists have prepared status reports for many of the state's highest priority plant species. These reports include information from the published literature as well as observations based on detailed field work regarding reproductive biology, response to or role in natural disturbances, existing or potential threats, and other information that applies range-wide to the species. Similar reports have been prepared for some of the state's rare animals.

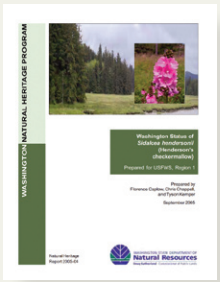
NHP ecologists have authored several reports on the state's ecosystems, primarily new ecosystems classifications efforts.

Information gathered and compiled by the NHP is also shared with NatureServe and its member NHPs. NatureServe's website (http://www.natureserve.org/explorer/) is an excellent source for species-specific and ecosystem-specific information.

WHERE DOES THE INFORMATION COME FROM?

As noted above, the Natural Heritage Program manages information on more than 7,100 occurrences of priority species and ecosystems. This information comes from a wide variety of sources. Federal and state agency biologists submit information on priority species. Members of the Washington Native Plant Society and other conservation organizations provide sighting information. Consultants submit data to the program. The Rare Care program at the UW also provides updated information on species occurring on public lands. And of course, NHP scientists conduct field inventories on high priority species and ecosystems. NHP staff also glean both site-specific and species and ecosystem-specific information from published literature.

RARE CARE PHOTO



NHP scientists prepare reports documenting the findings of their inventory, monitoring and research projects.

INFORMATION CONTRIBUTORS

- Agency biologists
  - **Federal**
    - US Forest Service
    - Bureau of Land Management
    - US Fish & Wildlife Service
    - National Park Service
  - **State**
    - Fish & Wildlife
    - Natural Resources
    - State Parks
    - Ecology
    - Transportation
- Consultants
- Academia
- Conservation organizations / members
- Private industry
- Volunteers / other individuals

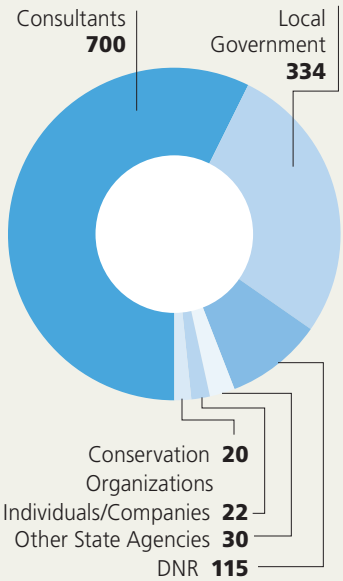
WHO USES NATURAL HERITAGE INFORMATION?

The Natural Heritage Program provides information to a number of agencies, organizations, companies, and individuals. The information is used during the environmental review process for various development projects, as well as by groups engaged directly in conservation planning. The program distributes CDs with species and ecosystems location information (in a GIS format). The program also regularly responds to requests for additional information. Many requests have to do with particular sites. Other requests have to do with the biology/ecology of individual species or ecosystems. The program also continues to make more information available via the Internet, including field guides to species and ecosystems.

CONSERVATION TOOLS

- Acquisition of land for conservation
- Public agency policies
- Laws and regulations
- Restoration
- Education
- Voluntary landowner actions

NATURAL HERITAGE INFORMATION REQUESTS 2005-2006



WHAT IS THE CONSERVATION IMPACT OF THE NHP?

The information housed within the Natural Heritage Information System is being applied to the full range of conservation tools, by a variety of agencies, organizations and individuals.

ACQUISITION / DESIGNATION OF NATURAL AREAS

Application of the objective methodology used by the Natural Heritage Program ensures that potential acquisitions have high conservation value:

- The priorities established in the Natural Heritage Plan for the state's species and ecosystems guide the selection of potential additions to the statewide system of natural areas, which includes federal, state and private natural areas.
- Natural Heritage Plan priorities are also used in the Washington Wildlife and Recreation Program process of identifying key conservation acquisitions for the state.
- Information from the Natural Heritage database is also available to land trusts and conservation organizations for use in strategic planning and to help inform individual acquisition / easement decisions.

PUBLIC AGENCY POLICIES

The Natural Heritage Program database supports land-management policies of agencies and the private sector.

USFS and BLM sensitive species policies Both agencies make use of global and state ranking applied by NatureServe and the Natural Heritage Programs in their internal process of developing a list of Sensitive species. Because the same ranking system is used by NHPs in all 50 states, the USFS and BLM can create a policy that can be evenly applied across the country. In Washington and Oregon, the NHPs also provide the USFS and BLM with the documentation to support the global and state ranks assigned to each species.

Sustainable Forestry Initiative Certification Standards The global and state ranking system for species and ecosystems is also used by the forest products industry as part of their 'green certification.' Under the certification standard, species and ecosystems that are ranked G1 (globally critically imperiled) or G2 (globally imperiled) must be protected. The Natural Heritage Program provides the methodology (the global and state ranking system) and the database regarding the location of G1 and G2 species and ecosystems. The Department of Natural Resources and a number of Washington's private timber companies have been certified, thus making use of Natural Heritage methodology and the database.

LAWS AND REGULATIONS

The Natural Heritage Program has no direct regulatory authority. The conservation status assigned to species and ecosystems is advisory only. However, information and expertise provided by the Natural Heritage Program is used in limited circumstances in the application of laws and regulations.

Endangered Species Act The U.S. Fish and Wildlife Service uses information provided by the Natural Heritage Program in their Endangered Species Act listing and recovery decisions. Much of the information about locations and threats to species (particularly for plant species) originates with the Natural Heritage Program. Natural Heritage Program scientists also serve on recovery technical teams because of their individual areas of expertise.

Growth Management Act The Department of Ecology developed a model wetlands rating system for use by individual counties under the Growth Management Act. One factor that influences the assigned wetland category is whether or not there are priority species or ecosystems (as identified by the Natural Heritage Program and documented in the Program's database) present.

The information housed within the Natural Heritage Information System is being applied to the full range of conservation tools.

ECOSYSTEMS MANAGEMENT AND RESTORATION

Biological / ecological goals for land managers The statewide system of natural areas provides an excellent point of reference for what individual ecosystems should look like. The individual natural areas have each been selected in large part because they are in good to excellent ecological condition. As such, they can be used as templates for good land stewardship. The information and expertise contained within the Natural Heritage Program is also available to help guide ecologically based decision-making.

EDUCATION

The Natural Heritage Program has developed a number of products and the staff participates in various training and educational forums to help field biologists, planners, students, and others learn more about Washington's rare plants, rare animals, and plant communities. Examples include:

- Field guides to rare plants, amphibians and reptiles, and ecosystems in lowland western Washington are available on-line.
- The Natural Heritage Program botanist has provided instruction to the native plant stewards training in King, Pierce and Snohomish counties.
- Natural Heritage Program scientists and information managers give presentations at professional meetings and to conservation organizations.

[1] Dethier, M.N., A Marine and Estuarine Habitat Classification System for Washington State (1990). Washington Natural Heritage Program, Dept. Natural Resources. 56 pp. Olympia, Wash.

[2] Kunze, L. 1994. Preliminary Classification of Freshwater Wetland Vegetation in Western Washington

[3] Grossman, D.H., D. Faber-Langendoen, A.S. Weakley, M. Anderson, P. Bourgeron, R. Crawford, K. Goodin, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, and L. Sneddon. 1998. International classification of ecological communities: terrestrial vegetation of the United States. Volume 1. The National Vegetation Classification System: development, status, and applications. The Nature Conservancy, Arlington, Virginia, USA.

Juniper Dunes Wilderness Area

PART IV

Washington's Statewide System of Natural Areas

In passing the Natural Area Preserves Act in 1972, the Legislature recognized the need for, and benefits of, permanently designating areas explicitly for conservation purposes. The Washington State Department of Natural Resources was authorized to work with federal, state and local agencies and private organizations to establish and manage a statewide system of natural areas. The Natural Heritage Program was given the responsibility of bringing an objective, scientific approach to this effort (see Part III. *The Washington Natural Heritage Program* and Appendix I for a discussion of how conservation priorities for species and ecosystems are established).

The process of evaluating potential natural areas has been designed to ensure that the needs and benefits recognized by the Legislature in 1972 are realized in an efficient and effective manner. The benefits of natural areas, the types of natural areas recognized as being part of the statewide system, and the process used by state agencies for selecting natural areas, are all described below.

WHAT ARE THE BENEFITS OF NATURAL AREAS?

Maintaining biodiversity is critical to our economic, environmental, and social well-being. The values of biodiversity are briefly summarized in Part II: The Case for Conservation. But what specific benefits are gained by designating lands for the long-term persistence of species and ecosystems? Why designate natural areas? Major benefits provided by natural areas include:

DNR PHOTO

- **Maintaining habitats for rare species and for conservation of important examples of terrestrial, aquatic, and marine ecosystems.** More than 150 rare species occur within at least one of the natural areas in Washington. Example: the basalt daisy (shown at left), a candidate for listing under the federal Endangered Species Act, is the primary feature within the Selah Cliffs Natural Area Preserve.

DNR PHOTO

- **Opportunities for research and education about native species and ecosystems.** There are more than 60 research, monitoring or inventory projects underway on DNR's natural areas; more than 250 projects have been completed. Projects are undertaken by DNR scientists, researchers, and students. Example: More than 40 projects have been completed at Pinecroft Natural Area Preserve by science students from North Central High School in Spokane.

DNR PHOTO

- **Baseline reference sites to document environmental change and to learn how ecosystems function.** Research conducted at natural areas has provided information regarding management of invasive species, use of prescribed fire, and documentation regarding what an ecosystem in a reasonably natural condition looks like. Example: At Rocky Prairie, scientists are gaining valuable information that will help land managers retain prairie ecosystems.

DNR PHOTO

- **Contributions to our overall quality of life, providing clean air and water, recreational opportunities, scenic diversity, etc.** Example: DNR manages several large natural areas that contribute to municipal water supplies, such as the NRCAs in the Upper Sultan Basin.

WHAT ARE THE DIFFERENT TYPES OF NATURAL AREAS RECOGNIZED IN THIS PLAN?

In passing the Natural Area Preserves Act, the Legislature emphasized that all lands within the state are "…subject to alteration by human activity…" except those lands that "…are expressly dedicated by law for preservation and protection in their natural condition…"(RCW 79.70.010). That is, most lands are used to meet other objectives, from providing living space, to providing revenue generation, to providing recreation opportunities. On public lands, federal and state agencies have a wide range of land-use designations that provide some level of conservation. But which designations are expressly for '…preservation and protection in their natural condition?' Those designations that emphasize conservation and scientific and educational use are recognized as the core of the natural areas system.

As a result, six land-use designations are recognized as contributing to the statewide system of natural areas: Natural Area Preserves, Natural Resources Conservation Areas, Research Natural Areas, Areas of Critical Environmental Concern, Biological Study Areas, and sites on the Washington Register of Natural Areas. This mix of designations includes federal, state and private lands.

Land-use designations that emphasize conservation and scientific and educational use are recognized as the core of the natural areas system.

Many other land-use designations make significant contributions to the conservation of our native species and ecosystems. National park and wilderness area, for example, are designations for places where human-related impacts are minimized and where native species and ecosystems are maintained in good ecological condition. Their contributions to conservation influence the priorities established in this plan. However, such areas do have major land uses, primarily recreation, in addition to their role in conservation.

Other public land designations, such as DNR-managed lands covered by a Habitat Conservation Plan or national forest, also contribute to species and ecosystem conservation. However, they are also managed for timber, forage for domestic livestock, recreation and a variety of other uses.

NATURAL AREAS DESIGNATIONS

- Natural Area Preserve (NAP)
- Natural Resources Conservation Area (NCRA)
- Research Natural Area (RNA)
- Areas of Critical Environmental Concern (ACEC)
- Biological Study Area (BSA)
- Washington Register of Natural Areas

HOW ARE POTENTIAL NEW NATURAL AREAS IDENTIFIED?

Sites generally become candidates for natural areas status with the discovery of a place that is either in remarkably good ecological condition or is extremely valuable for the continued existence of a rare species.

The process of adding a new natural area to the statewide system is somewhat different for each of the three state agencies that currently manage natural areas. However, all three agencies (State Parks, Department of Fish and Wildlife, and Department of Natural Resources) share the first two steps in the process: (1) candidate sites are reviewed using the selection criteria established in the State of Washington Natural Heritage Plan and (2) sites must be approved by the Natural Heritage Advisory Council.

Each federal agency and private non-profit organization has its own process for establishing new natural areas. Their respective processes are not described in this document.

Sites generally become candidates for natural areas status with the discovery of a place that is either in remarkably good ecological condition or is extremely valuable for the continued existence of a rare species. Some discoveries are made by Natural Heritage scientists during the course of their field work on the priority species and ecosystems. In other cases, a Natural Heritage scientist follows up on a lead provided by another DNR employee, an individual from another agency, or a member of the general public.

Once a prospective natural area has been identified, it is assessed from two different standpoints: the occurrence of priority species and ecosystems within the site, and the site as a whole. This approach ensures that biologically important sites are considered for conservation efforts. The process for assigning priorities to species and ecosystems is presented in Appendix 1.

SPECIES / ECOSYSTEM OCCURRENCE ANALYSIS

Occurrences of priority species or ecosystems within a prospective site are assessed regarding their overall condition and viability; they are compared to other known examples of the same species or ecosystem. For rare species and rare ecosystems, the goal of designating a natural area is to make a significant contribution to the overall conservation of those species and ecosystems. For common ecosystems, the goal of designating natural areas is to provide protection for the best remaining examples. To that end, the degree to which the occurrence is a good representative example of that ecosystem type is also assessed. Factors considered during the species and/or ecosystems occurrence analysis include:

Size referring to population size for rare species and to the area occupied for ecosystems

Condition referring to the appropriateness or quality of habitat for a species, the species composition of the ecosystem or habitat, the functioning of natural processes within the ecosystem, and the relative maturity of ecosystem development.

Landscape context referring to the condition of the landscape surrounding and affecting the occurrence.

DNR PHOTO

Potential natural areas are assessed with regard to (1) the presence of priority species and ecosystems and (2) whether the site can be successfully managed through time to maintain the features of interest. The colored polygons represent different priority species and ecosystems. The site analysis consists of looking at the species and ecosystems occurrences within the context of the surrounding landscape.

SITE ANALYSIS

The site analysis emphasizes ecological quality, diversity and ecological viability as characteristics of the site as a whole. The primary question that must be satisfactorily answered is: can the site be successfully managed through time to maintain the primary species and/or ecosystems? Factors considered and assessed include:

How fragmented is the landscape?
How isolated is the potential natural area from other reasonably intact ecosystems?

Is the site isolated to such a degree that natural processes are disrupted? Can management activities be used to mimic natural processes, such as fire?

Is the site susceptible to changing land uses on adjacent lands?
Would development of adjacent lands have a significant negative impact?

What are known management issues for the site?
Are there existing or anticipated weed control challenges?
Is there existing or incompatible human use of the site?

Most prospective natural areas have more than one priority species or ecosystem. It is clearly a more efficient use of public and private resources to select sites with more than one priority feature, thereby potentially reducing the total number necessary to adequately protect the state's biodiversity. However, a single species or ecosystem may be sufficient to warrant establishment of a natural area.

For potential DNR natural areas, the analysis of the priority species and ecosystems is typically conducted by Natural Heritage Program scientists. The analysis of the site as a whole involves staff from the Natural Heritage and Natural Areas programs, as well as appropriate region personnel.

For potential State Parks and Washington Department of Fish and Wildlife natural areas, the analysis is generally conducted jointly by scientists from the individual agency and the Natural Heritage Program.

The primary question that must be satisfactorily answered is: Can the site be successfully managed through time to maintain the primary species and/or ecosystems?

WHAT IS THE ROLE OF THE NATURAL HERITAGE ADVISORY COUNCIL?

The Natural Heritage Advisory Council advises DNR, WDFW and State Parks regarding selection and management of Natural Area Preserves.

Sites that emerge from the analyses described above are presented to the Natural Heritage Advisory Council (Council), which was established by RCW 79.70.070. The Council advises DNR, WDFW and State Parks regarding implementation of the Natural Area Preserves Act. One of their primary functions is review of potential Natural Area Preserves and Natural Resources Conservation Areas. Based on their evaluation, the Council approves or rejects proposed sites. For sites that are approved by the Council, a recommendation is forwarded to the appropriate state agency head (Commissioner of Public Lands, the Director of the Department of Fish and Wildlife, or the Director of State Parks).

The Council also has two additional major functions:

- providing guidance regarding management of natural areas
- directing DNR staff in the revisions to the State of Washington Natural Heritage Plan

The Council has 15 members, including five state agency representatives. Ten members are appointed by the Commissioner of Public Lands and serve four-year terms. Five of the ten members must be recognized experts in the ecology of natural areas. Of the remaining five members, at least one must be or represent a private forest landowner and at least one must be or represent a private agricultural landowner.

The five non-voting ex-officio members are the directors of the Department of Fish and Wildlife and the Department of Ecology; the supervisor of the Department of Natural Resources; and the directors of the State Parks and Recreation Commission and the Interagency Committee for Outdoor Recreation; or their authorized representatives.

DNR PHOTO

Natural Heritage Advisory Council and DNR staff on field trip to Klickitat Canyon

WHAT IS THE PROCESS FOR DESIGNATING DEPARTMENT OF NATURAL RESOURCES NATURAL AREAS?

Upon approval by the Natural Heritage Advisory Council, all potential natural areas to be managed by the Department of Natural Resources must go through the same steps, described below.

Public Hearings and the Commissioner of Public Lands

For those sites that are intended to be acquired and designated as natural areas by DNR, a public hearing must be held in the county where a majority of the land in the proposed natural area is located. The information gained from the public hearing, along with the site recommendation, is forwarded to the Commissioner of Public Lands for review and potential approval.

DNR's Special Lands Acquisition Program

For those sites that are approved by the Council and the Commissioner of Public Lands, and where DNR is the intended managing agency, DNR staff begin the process of acquiring the lands involved. DNR's Special Lands Acquisition Program is responsible for purchasing land that has been approved for Natural Area Preserve (NAP) and Natural Resources Conservation Area (NRCA) status. It is important to make two key points regarding acquisition of land for natural areas:

- purchases are made only from willing sellers; DNR has no power of eminent domain
- purchase price is based on market value appraisals.

The program evaluates, prioritizes, coordinates, negotiates, and completes the purchase of special lands properties. Special Lands Acquisition also coordinates the department's applications for state and federal land acquisition grants and administers the grant contracts.

DNR's Natural Areas Program

Upon successful acquisition by DNR, the lands involved are considered part of the natural areas system and become the management responsibility of the Natural Areas Program. The NAPs have been acquired for the protection of the priority species and ecosystems they contain and for research and education. NRCAs also often contain priority species or ecosystems. Regional DNR staff are responsible for on-the-ground activities, while program staff in Olympia provide guidance and scientific expertise and ensure consistency of management. Major management issues are brought before the Natural Heritage Advisory Council.

DESIGNATION PROCESS FOR DNR NATURAL AREA PRESERVES

Candidate sites are identified

↓

NHAC reviews/ approves sites

↓

Public meetings/hearings

↓

Commissioner of Public lands makes decision

↓

Lands acquired (but only if landowners are willing sellers)

↓

Sites managed by Natural Areas Program

WHAT IS THE PROCESS FOR DESIGNATING DEPARTMENT OF FISH AND WILDLIFE AND STATE PARKS NATURAL AREAS?

The process for designating natural areas on Washington Department of Fish and Wildlife and State Parks lands also involves review and approval by the Natural Heritage Advisory Council (Council). Upon approval, the Council sends a letter to the appropriate agency director. In the case of the Department of Fish and Wildlife, the appropriate Region Manager and the Director must approve individual natural area designations.

State Parks designates natural areas as part of their overall management planning process. The Classification and Management Planning (CAMP) process has occurred for Mount Moran, Hope Island North, Riverside and Mount Spokane State Parks.

MANAGEMENT ISSUES

Fire Suppression

- Changes in species composition.
- Changes in ecological processes.
- Decreased viability of some priority species and ecosystems.
- Increased likelihood of catastrophic fire.

Non-native Species

Non-native species encroaching upon natural areas results in:

- Direct competition with the native plant and animal species.
- Changes in natural ecosystem processes and interactions, such as fire frequency and severity.
- Pollinator activity.

Public Access

Inappropriate public use has the potential to:

- Spread non-native and invasive weeds.
- Impact native species and ecosystems through trampling.
- Disrupt animals' behavior

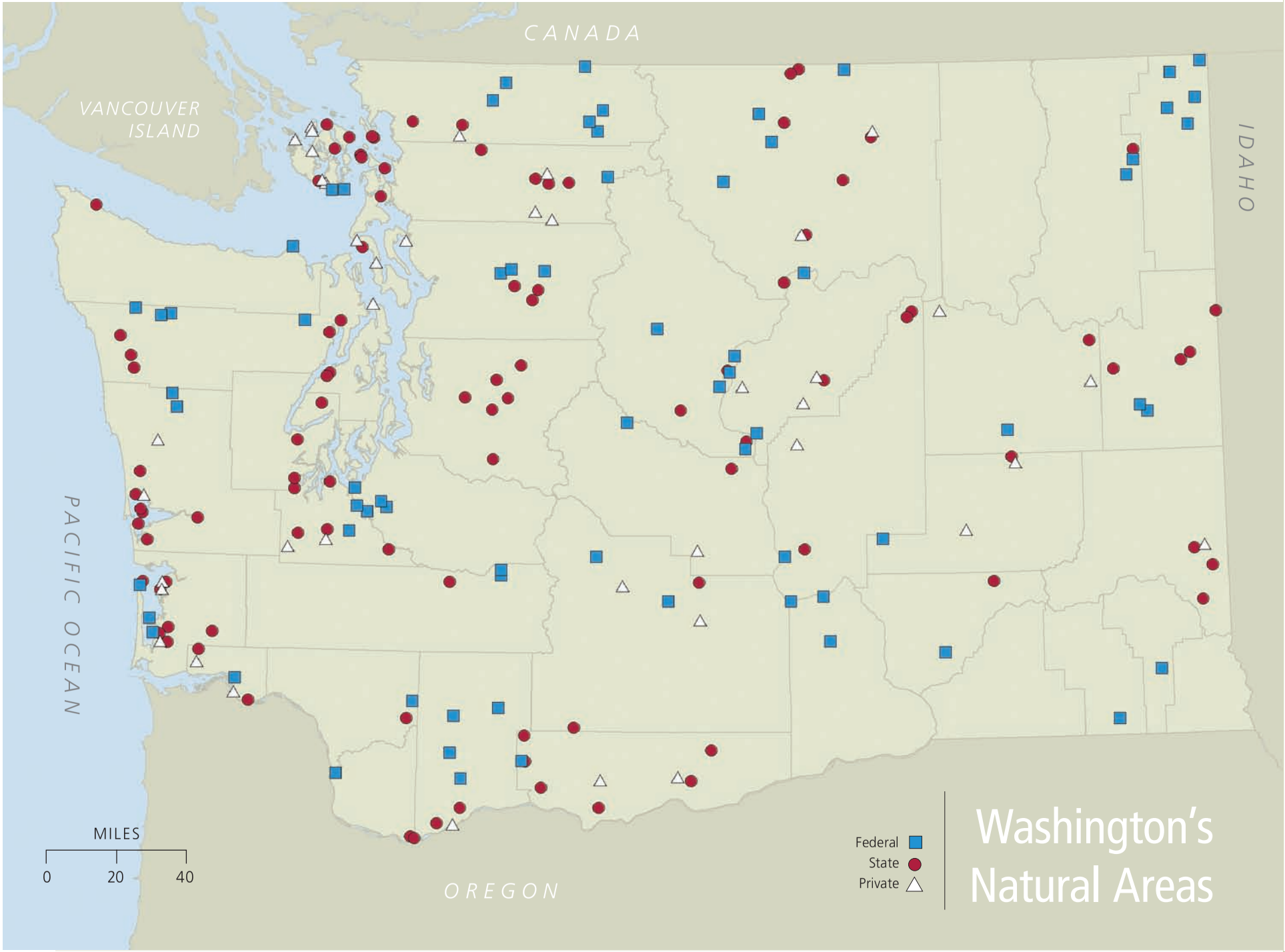
CURRENT STATUS OF THE STATEWIDE SYSTEM OF NATURAL AREAS

The statewide system of natural areas has grown steadily over the years from the first designation of Sand and Goose Islands as Natural Area Preserves (NAPs) in 1973. Today, DNR alone manages 51 NAPs and 31 Natural Resources Conservation Areas (NRCAs). State Parks and WDFW manage an additional 10 natural areas. Washington State University manages 3 Biological Study Areas. Federal agencies manage more than 70 natural areas, including Research Natural Areas (RNAs) and Areas of Critical Environmental Concern (ACECs). Private conservation organizations (primarily The Nature Conservancy) also manage more than 40 natural areas in Washington.

The map on the next page shows the statewide distribution of the more than 200 natural areas recognized in this Plan. Several factors have influenced the number of natural areas in each ecoregion, including the size of the ecoregion and how much of it occurs within Washington, the pattern of land ownership (public vs. private), the degree to which lands within each ecoregion have been converted or degraded, the biotic richness of the ecoregion, and how well the ecoregion has been inventoried.

The natural areas recognized in this Plan are generally in good ecological condition. However, they are not always pristine; in many cases totally undisturbed examples of ecosystems no longer exist or are not available for formal protection. Ideally, natural areas are large enough to protect the priority species and ecosystems present, and to allow the operation of the ecological processes required for their survival.

Active management is required in many natural areas to ensure the long-term viability of the priority species and ecosystems found within them. The management issues are similar regardless of ownership. Major issues include restoring or mimicking natural ecological processes (e.g., fire), control of non-native species, and addressing public access. Each agency participating in the statewide system of natural areas has management responsibility for its individual areas. Management decisions are governed by agency policies, guidelines and regulations.


CANADA
VANCOUVER ISLAND
IDAHO
PACIFIC OCEAN
OREGON
MILES
0
20
40
Federal
State
Private
Washington's Natural Areas

Western juniper (*Juniperus occidentalis*)

PART V

Natural Heritage Plan Implementation

The basic framework of Natural Heritage methodology will continue to be used for the 2007-2009 biennium to identify project and activity priorities for the Natural Heritage and Natural Areas programs. The programs will focus their efforts in three primary areas:

- Developing and maintaining a robust information system about the state's biodiversity,
- Sharing information with agencies and organizations for environmental assessment and land management purposes, and
- Using the information to help guide conservation actions.

Natural Heritage Program staff have identified gaps in the information base, in the products and services that have been developed for delivery of information to others, and in the level of protection provided for ecologically significant sites. These gaps form the basis of the project priorities listed here for the 2007-2009 biennium.

The priorities for management of the Department of Natural Resources' natural areas have their foundation in the purposes of establishing natural areas: providing adequate protection for the significant ecological features present within them and providing appropriate scientific, educational and low-impact public use opportunities.

Following the statewide projects priorities, priorities within each ecoregion are identified. The geographic distribution of priorities is not even. It is driven by the combination of two factors: the distribution, by ecoregion, of biological diversity, and the degree of threat, by ecoregion, posed to the biodiversity. Those ecoregions with high biodiversity and high threat tend to attract more attention and have a greater number of priority projects.

The Natural Heritage and Natural Areas programs will emphasize creating partnerships to enhance their capacity to have a positive conservation impact.

2007-2009 | STATEWIDE PRIORITY PROJECTS AND ACTIVITIES

DEVELOPING A ROBUST INFORMATION SYSTEM

Maintaining a current and comprehensive database on the species and ecosystems of the state is the foundation for establishing conservation priorities, and for making sound conservation decisions. This is a core Natural Heritage Program function. We have been compiling information on the state's biodiversity for almost 30 years now. Despite this accumulation of information, more detailed knowledge of our state's rarest species and ecosystems is needed to carry out effective, on-the-ground, conservation. A few of the more significant projects are briefly described below.

Shrub-steppe species and ecosystems inventory
Shrub-steppe ecosystems are rapidly disappearing from the state. Natural Heritage Program scientists will continue inventory efforts on DNR lands and expand the effort to other ownerships. The outcome will be an improved assessment of conservation priorities throughout the shrub-steppe.

Sand dune ecosystems within the Columbia Plateau
Sand dunes are disappearing from the interior of the state before we have a good understanding of the biodiversity that they support. Natural Heritage Program scientists hope to complete inventory of these systems, to develop refined priorities, and to identify key areas for conservation action.

Rare species inventories
Many of the state's rarest plant species are listed or being considered for listing under the federal Endangered Species Act; these will continue to be a priority for the program's botanist. Our inventory priorities are established in cooperation with the U.S. Fish and Wildlife Service. The program's zoologists will also continue to focus on species such as the Island Marble butterfly, the Pygmy Rabbit, and the Striped Whipsnake.

National Parks vegetation classification
Natural Heritage Program ecologists are assisting the National Park Service (NPS) in the development of a vegetation classification for the state's national parks, national recreation areas, and other NPS-administered lands. The vegetation classification will, in turn, be used to create maps of the parks' vegetation. These maps will be useful for the NPS in a variety of land-management planning and decision-making efforts.

Partnership with Rare Care to continue monitoring rare plant populations on public lands
The Natural Heritage Program currently tracks nearly 4,000 locations of more than 365 rare plant species. In an effort to keep the information as current as possible, we have partnered with the Rare Care program within the University of Washington's Center for Urban Horticulture. Trained volunteers revisit known populations, monitor their overall condition, and provide updated information to the Natural Heritage Program.

07 THROUGH 09

Detailed knowledge of our state's rarest species and ecosystems is needed for effective, on-the-ground, conservation.

2007-2009 | STATEWIDE PRIORITY PROJECTS AND ACTIVITIES

SHARING INFORMATION

Another core function of the Natural Heritage Program is to provide information to agencies, organizations and individuals engaged in land-use planning and decision-making. The NHP has been providing biodiversity information to a wide variety of users since the program's inception. However, we believe that we can have a greater conservation impact by improving our information delivery. A few of the more significant projects are briefly described below.

Increase Web-based delivery of information on Washington's biodiversity

The Natural Heritage Program will complete a project with EPA, NatureServe and a handful of other NHPs to develop the capability of delivering information on priority species and ecosystems, including site-specific information, via the Internet. During the 2007-2009 biennium, the NHP will actively encourage data users to access information in this way. The NHP will also develop the means by which data can be submitted via the Internet, moving closer to real-time delivery of inventory information for land-use planning and decision-making.

National Geographic and NatureServe on-line conservation guide to America's natural places

The Natural Heritage Program (NHP) is a partner with NatureServe, four other NHPs and National Geographic to create an on-line encyclopedia of America's natural places. This project will involve networking with state and federal agencies, land trusts, and other conservation organizations to create a website where people can learn about conservation actions and conservation opportunities within their particular area of interest.

Support for the USFS and BLM Sensitive Species programs

Both federal agencies make use of the NatureServe/Natural Heritage Program global and state ranking methodology in the development of their respective sensitive species lists. The Natural Heritage Program has supported both agencies by developing and analyzing the information necessary to assign global and state ranks.

Vertebrate Distribution Modeling

The Natural Heritage Program is partnering with four other NHPs (Wyoming, Montana, Idaho and Oregon), the University of Wyoming, and the U.S. Geological Survey to prepare distribution models for all native vertebrates (except fishes and marine species) for the five-state area. This project is part of an effort to update various GAP analysis products that were generated a decade ago. The project involves capturing information regarding habitat and life history requirements from literature and experts, applying that information to observations data for each species, and then convening workshops of experts to review and fine-tune distribution models generated at the University of Wyoming.

Sustainable Forestry Initiative (SFI)

07 THROUGH 09

The Natural Heritage Program will provide training to DNR personnel regarding the biodiversity conservation criteria that are part of the forest products industry's green certification process. Certification requires protection of "globally critically imperiled" (G1) and "globally imperiled" (G2) species and ecosystems. These global status rankings are maintained by the network of Natural Heritage Programs. The NHP will also make training and other SFI-relevant information available to private timber companies.

Support for the Biodiversity Council's 30-year strategy

Although the 30-year strategy has not yet been finalized, the Natural Heritage Program will actively look for opportunities to support the final recommendations.

2007-2009 | STATEWIDE PRIORITY PROJECTS AND ACTIVITIES

CONSERVATION PLANNING AND IMPLEMENTATION

The Natural Heritage and Natural Areas Programs will continue to identify priority sites for inclusion within the statewide system of natural areas. Another means by which the Natural Heritage Program can have a strong conservation impact is to provide support, in the form of biodiversity information and expertise, to other agencies and organizations. The more significant conservation planning projects for the 2007-2009 biennium include the following:

Add to the statewide system of natural areas
DNR is actively pursuing acquisition of lands at more than a dozen natural areas. In each case, the natural area boundary has been approved by the Natural Heritage Advisory Council and the Commissioner of Public Lands. Acquisitions are dependent upon the landowners' willingness to sell. Priority acquisition projects are identified within the individual ecoregion sections of this document.

Partner with U.S. Forest Service, Bureau of Land Management, and National Park Service to identify potential natural areas on federal lands
Many of the current gaps in ecosystems' representation in the statewide system of natural areas can best be met on federal lands. Natural Heritage Program scientists will work with counterparts in the federal agencies to address these gaps.

Important Bird Areas
The Natural Heritage Program is partnering with Audubon Washington to identify objective criteria by which Important Bird Areas (IBAs) will be identified, to manage data relevant to the selection of potential IBAs, and to create a process by which sites will be presented to the Natural Heritage Advisory Council for approval. Audubon and the NHP will identify two IBAs and take them through an approval process, including holding public hearings in appropriate counties.

07 THROUGH 09

The Natural Heritage Program can have a strong conservation impact providing support, in the form of biodiversity information and expertise, to other agencies and organizations.

2005-2007 | STATEWIDE CONSERVATION ACCOMPLISHMENTS

The Natural Heritage, Natural Areas, and Special Lands Acquisition programs made a significant number of accomplishments during the 2005-2007 biennium. Some of the statewide accomplishments are highlighted below:

DEVELOPING A ROBUST INFORMATION SYSTEM

Rare Care volunteers revisited and monitored rare plant locations Natural Heritage partnered with Rare Care, a rare plant conservation program at the Center for Urban Horticulture, University of Washington, resulting in volunteers revisiting and monitoring more than 190 occurrences of approximately 50 different rare plant species.

Rare plant inventories undertaken Natural Heritage Program botanists completed more than 20 high priority species inventory, monitoring or research projects.

State Parks rare amphibian and reptile inventories The Natural Heritage Program herpetologist completed an inventory of individual state parks for priority amphibians and reptiles.

Data compiled for vertebrate distribution modeling effort
The Natural Heritage Program completed the first phase of this multi-year project. To date, more than 260,000 records for approximately 500 species have been compiled with the cooperation of WDFW, universities, numerous natural history museums, researchers, Pacific Northwest National Laboratory, and other information sources.

Conservation status of mollusks and dragonflies reviewed
Global and state ranks were assigned to mollusks and dragonflies after extensive literature review and communication with various experts. A number of species have been added to the priority species list in this edition of the State of Washington Natural Heritage Plan.

CONSERVATION PLANNING AND IMPLEMENTATION

Lands acquired within 12 existing natural areas
The DNR acquired lands within several previously established natural areas, using Washington Wildlife and Recreation Program and Trust Land Transfer funding:

- Mt. Si NRCA (30 acres)
- West Tiger Mountain NRCA (15 acres)
- Shumocher Creek NAP (10 acres)
- Woodard Bay NRCA (23 acres)
- Washougal Oaks NAP/NRCA (75 acres)
- Mima Mounds NAP (11 acres)
- Cypress Island NRCA (135 acres)
- Admiralty Inlet NAP (33 acres)
- Charley Creek NAP (1,124 acres)
- Tahoma NRCA (230 acres)
- Upper Sultan Basin NRCAs (4,065 acres)
- Stavis Creek NRCA (492 acres)

New natural area approved in Clark County The Natural Heritage Advisory Council recommended to the Commissioner of Public Lands that Lacamas Prairie (Clark County) be added to the statewide system of natural areas. The area boasts nine priority features, including Bradshaw's lomatium, listed as endangered under the federal Endangered Species Act. The vision for this site includes both NAP and NRCA. Partnerships with Clark County, U.S. Fish and Wildlife Service, Columbia Land Trust, and others will be a key to success at this site.

Natural area expansions recommended Boundary expansions for Bald Hills NAP, Klickitat River NRCA, and Upper Dry Gulch NAP were recommended to the Commissioner of Public Lands by the Natural Heritage Advisory Council.

Invasive species control on 40 natural areas The Natural Areas Program, through the use of staff, contractors and volunteers emphasized weed control as a priority management activity.

SHARING INFORMATION

On-line field guides enhanced
The amphibian and reptile atlas and the guide to plant associations of the Puget Trough were expanded.

Support provided for the U.S. Forest Service and Bureau of Land Management Sensitive Species Program
Natural Heritage Program staff reviewed and made revisions as appropriate to the global and state ranks for rare vertebrates and select groups of invertebrates. The information was provided to both federal agencies for their process of creating sensitive species lists.

Responding to information requests
The Natural Heritage Program responded to more than 1,200 requests for information during the biennium. Requests came from consulting firms, agencies, organizations, and landowners.

Support for the Washington Biodiversity Council NHP staff prepared a report on the status and trends of Washington's biodiversity.

05 THROUGH 07

ECOREGIONS

Ecoregions are delineated based on ecological patterns on the landscape. As a result, they cross political boundaries. There are portions of nine ecoregions within Washington state.

Ecoregions of Washington State

The Natural Heritage Program uses the concept of ecoregions to help identify conservation priorities within Washington. Although use of this concept has been increasingly adopted in Washington, not everyone engaged in conservation planning, or more broadly in land-use planning, is familiar with the concept and why we use ecoregions in our work. An overview of the concept is provided below.

What are ecoregions?

Ecoregions reflect broad ecological patterns occurring on the landscape. In general, each ecoregion has a distinctive composition and pattern of plant and animal species distribution. Abiotic factors, such as climate, landform, soil, and hydrology are important in the development of ecosystems, and thus help define ecoregions. Within an individual ecoregion, the ecological relationships between species and their physical environment are essentially similar.

Why use ecoregions?

Using ecoregions as a framework for assessing the distribution and status of species and ecosystems make biological sense, compared to using politically derived lines, such as county, state or national boundaries. Ecoregions also provide an ecological basis for partitioning the state into subunits for conservation planning purposes.

Where do the ecoregion boundaries come from?

The ecoregion boundaries adopted in this document are derived from boundaries developed by the U.S. Environmental Protection Agency (2000). Minor modifications have been made to these boundaries in Washington by Natural Heritage Program scientists in consultation with conservation planning partners, primarily The Nature Conservancy and Washington Department of Fish and Wildlife. The modifications result in a set of boundaries that better reflect local conditions, primarily because they have been drawn at a finer resolution and have taken into account on-the-ground knowledge regarding boundary placement.

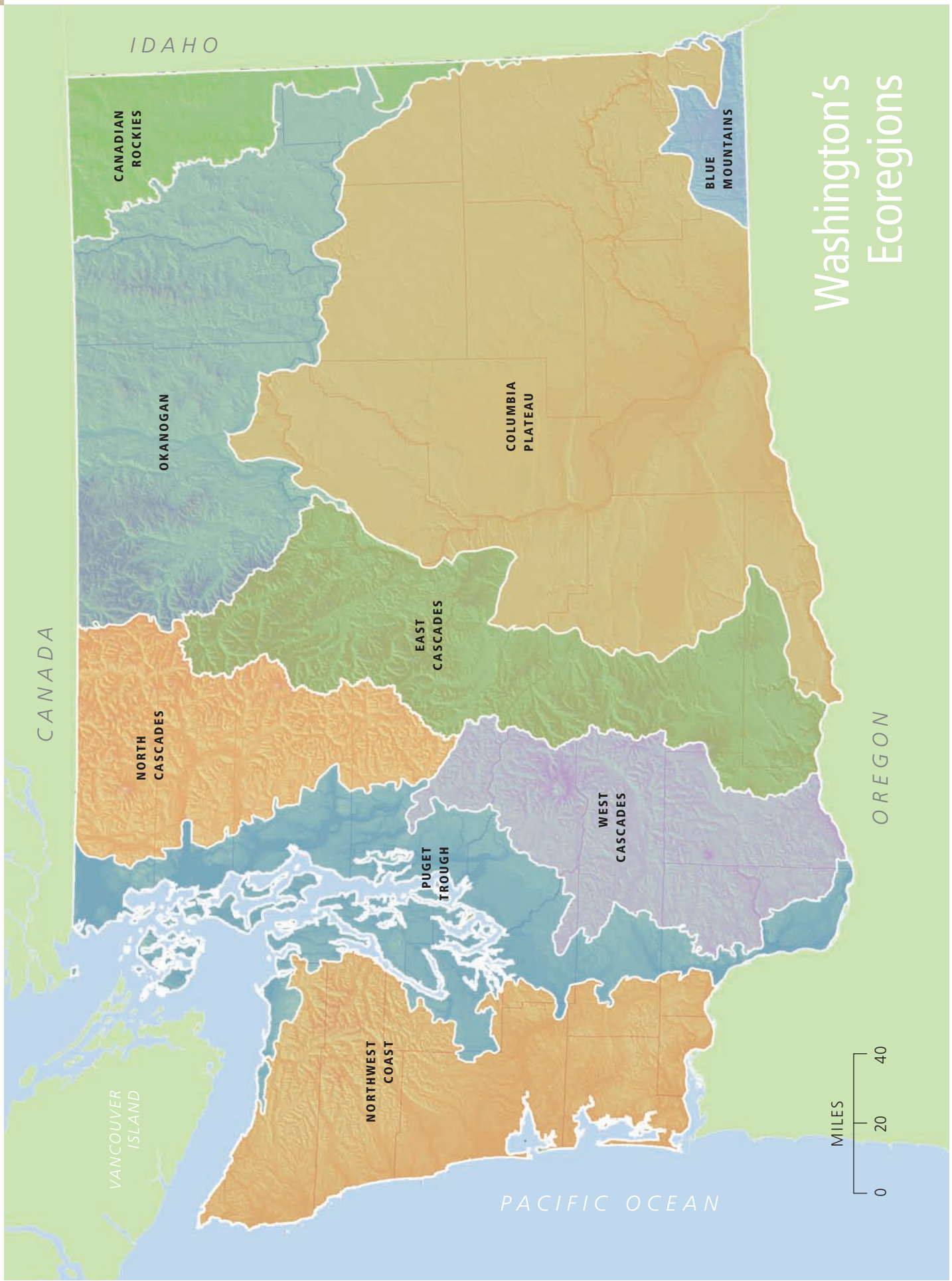
How many ecoregions are there in Washington?

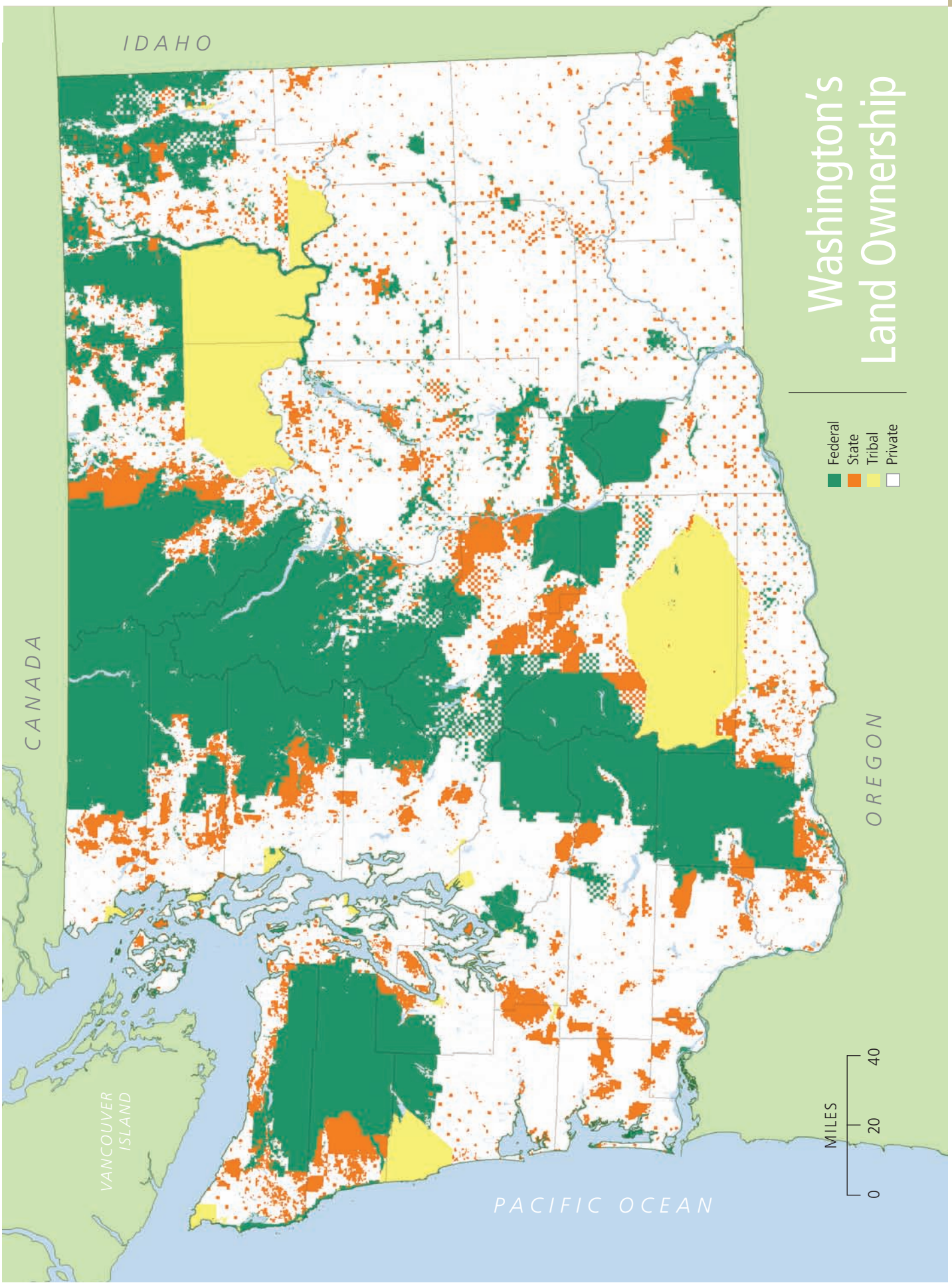
Portions of nine ecoregions occur within Washington's borders. (See map on facing page). Each ecoregion is described on the following pages. Descriptions include information on physiography, climate, biota, land ownership, biodiversity highlights, conservation needs, number of priority species and ecosystems, and a map showing the distribution of natural areas within the ecoregion.

The purpose of including these descriptions is to provide the reader with a snapshot of each ecoregion. The statements regarding biodiversity highlights and conservation needs are not meant to be comprehensive.

ECOREGIONS

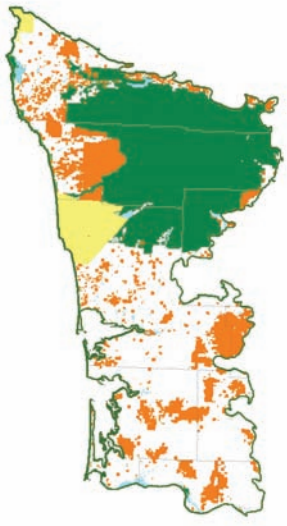
Ecoregions provide an ecological basis for partitioning the state into subunits for conservation planning purposes.


Washington's Ecoregions
IDAHO
CANADA
OREGON
PACIFIC OCEAN
VANCOUVER ISLAND
CANADIAN ROCKIES
OKANOGAN
COLUMBIA PLATEAU
BLUE MOUNTAINS
NORTH CASCADES
EAST CASCADES
WEST CASCADES
PUGET TROUGH
NORTHWEST COAST
MILES
0
20
40


Washington's Land Ownership
Federal
State
Tribal
Private
IDAHO
CANADA
OREGON
VANCOUVER ISLAND
PACIFIC OCEAN
MILES
0
20
40

Northwest Coast Ecoregion

The Northwest Coast ecoregion includes most of the Olympic Peninsula of Washington, the coast mountain ranges extending down to central Oregon, and most of Vancouver Island in British Columbia. Approximately 11 percent of Washington is within this ecoregion. As of 1991, about 5 percent of the Washington portion had been converted to agricultural or urban uses (Washington GAP, 1997).



NORTHWEST COAST LAND OWNERSHIP

- Federal
- State
- Tribal
- Private

CLIMATE

- Precipitation ranges from 60 to 240 inches annually, mostly falling as rain from November through April.
- Snow pack and rain-on-snow zones occur primarily in the Olympic Mountains.
- Due to a rain shadow effect, the northeastern Olympic Mountains receive the lowest precipitation of equivalent elevations anywhere in western Washington.
- Summer fog and cool temperatures are important climatic factors along the outer coast and adjacent valleys.

PHYSIOGRAPHY

- Olympic Mountains, ocean coast, coastal plain, and Willapa Hills are dominant landforms
- Glaciated peaks of the Olympic Mountains rise to nearly 8,000 feet above sea level.
- Streams and rivers typically begin as deeply incised, steep gradient drainages, eventually feeding large, low-gradient river systems on the coastal plain.
- Coastal plain is mostly underlain by glacial till and outwash.
- Major estuaries and associated dunes occur on the southern coast.
- Willapa Hills are well-rounded highlands with old, well-weathered soils.

BIOTA

- Coniferous forests dominate the vegetation of the ecoregion, with lowland forests of western hemlock, Douglas-fir, and western redcedar.
- Sitka spruce is abundant in the coastal fog belt.
- Mountain forests are dominated by Pacific silver fir and mountain or western hemlock.
- Subalpine parkland and alpine habitats occur at high elevations.
- The ecoregion includes two of the largest estuaries on North America's west coast.
- Other special habitats include coastal dunes, wetlands, riparian areas, and sphagnum bogs.
- The Olympic Mountains are rich in rare plant species due to their isolation, the number of unusual habitats, and the presence of steep environmental gradients.

BIODIVERSITY HIGHLIGHTS

- **Dominated by natural and semi-natural vegetation**
- **Large, healthy estuaries**
- **Salmon-bearing rivers**
- **High amphibian diversity**
- **High vascular plant endemism in the Olympic Mountains**

MAJOR LANDOWNERS

- **National Park Service**
- **U.S. Forest Service**
- **Tribes**
- **DNR**
- **Private timber companies**

DOMINANT LAND USES

- **Forestry**
- **Outdoor recreation / conservation**

PRINCIPAL RISKS TO BIODIVERSITY

- **Landscape-level changes in forest composition and structure**
- **Increasing development in coastal areas and valley bottoms**
- **Invasive species**
- **Impacts of climate change to coastal ecosystems**
- **Increased isolation from the Cascades for species and ecosystems**

CONSERVATION NEEDS

- **Protection of forested wetlands**
- **Control of invasive species (spartina, knotweed, tunicates, and others)**
- **Protection of natural-origin forests in Willapa Hills and on Olympic Peninsula coastal plain**
- **Coordination of natural areas system and marine protected areas system**


CANADA
STRAIT OF JUAN DE FUCA
PACIFIC OCEAN
OREGON
Shipwreck Point
Hades Creek
Jackson Creek
Twin Creeks
South Nolan
Wet Weather
Devis Lake
Clearwater Corridor
Clearwater Bogs
Higley Creek
Quinault
Copalis River
Carlisle Bog
North Bay
Humptulips River Delta
Goose Island
Sand Island
Whitcomb Flats
Chehalis River Surge Plain
Elk River
Leadbetter Point
Gunpowder Island
Bone River (Dual Ownership)
Niawiakum River (Dual Ownership)
Diamond Point
South Nemah
Cedar Grove
Teal Slough
Willapa Divide
Ellsworth Creek (Dual Ownership)
Hendrickson Canyon
Grays Bay Estuary
Tenasillahe Island
Puget Island
Whites Island
MILES
0
10
20
FEDERAL
USFS RNA
NPS RNA
USFWS RNA
STATE
WDFW NAP
DNR NAP
DNR NRCA
PRIVATE
NGO NAP

Andrews Creek salt marsh.

DNR PHOTO

Natural Heritage, Natural Areas, and Special Lands Acquisition priority projects and activities for the 2007-2009 biennium are identified below, along with conservation actions undertaken during the 2005-2007 biennium. These are not exhaustive lists; they are meant to provide the reader with an overview of the type and scope of projects being undertaken. A few projects have been highlighted, while others have simply been listed.

05 THROUGH 07 Conservation Actions

Henderson's checkermallow status report

The Natural Heritage Program botanist prepared a report on the status of *Sidalcea hendersonii* (Henderson's checkermallow) in Washington. The final recommendation to the U.S. Fish & Wildlife Service was that listing under the federal Endangered Species Act was not currently warranted.

Chehalis River Basin weed control

Weed control was conducted by Natural Areas Program staff in the Chehalis River basin, including within the Chehalis River Surge Plain NAP.

Olympic National Park vegetation classification

Natural Heritage staff have been entering vegetation plot data from a number of sources and applying statistical analyses in an effort to identify and characterize the many ecosystem types that occur within the park.

Other Activities

- Extensive road abandonment and hydrologic improvements at Elk River NRCA, North Bay NAP, Clearwater Bogs NAP and South Nemah NRCA (including funding from the U.S. Fish & Wildlife Service)
- Control of Spartina in the Bone River and Niawiakum River NAPs (using funding from Department of Ecology and the National Fish & Wildlife Foundation)
- Re-initiation of wave energy mitigation studies for Whitcomb Flats NAP, working with the U.S. Army Corps of Engineers

07 THROUGH 09 Priority Projects/Activities

Olympic National Park vegetation classification and mapping

A vegetation classification for three national parks, including Olympic NP, will be completed by NHP plant ecologists. The classification will be used by the National Park Service as a basis for mapping the vegetation, which will in turn be used as a tool by land management decision-makers.

Natural areas road abandonment and restoration

Implementation of a road abandonment project will be continued at Ellsworth Creek NRCA, Elk River NRCA, Hendrickson Canyon NRCA, Merrill Lake NRCA, South Nemah NRCA, and Willapa Divide NAP.

Other Projects

- Continue efforts to complete acquisitions within the approved boundary for Elk River NRCA
- Identify additional natural areas needs within the ecoregion
- Weed control within Chehalis River Surge Plain NAP
- Hydrology restoration at North Bay NAP

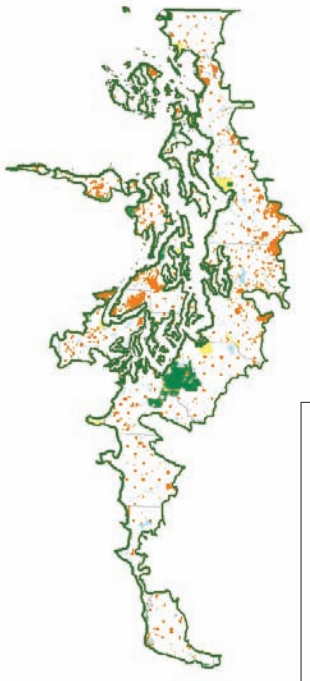
DNR PHOTO

CHRIS WASH

Top: Henderson's checkermallow occurs in estuaries, including several natural areas.
Below: Chehalis River Surge Plain NAP.

Puget Trough Ecoregion

The Puget Trough ecoregion is nestled between the Cascade and Olympic Mountains and the Willapa Hills. It includes Puget Sound and the lowlands south to the Columbia River. The ecoregion extends north into the Georgia Basin in British Columbia and south into the Willamette Valley in Oregon. Roughly 8 percent of Washington is within this ecoregion. It is by far the most populated ecoregion in Washington; as of 1991, more than 50 percent of the Washington portion had been converted to urban and agricultural uses (Washington GAP, 1997).



PUGET TROUGH LAND OWNERSHIP

- Federal
- State
- Tribal
- Private

CLIMATE

- The Olympic Mountains and Willapa Hills create rain shadows that influence this ecoregion.
- Precipitation, primarily rain, ranges from 20 to 70 inches annually over the ecoregion.
- Summers are warm and dry compared to elsewhere within western Washington, and winters are mild.

PHYSIOGRAPHY

- Includes marine waters of Puget Sound and lowlands generally up to 1,000 feet above sea level; isolated highlands extend up to 2,400 feet.
- Retreating Pleistocene glaciers left behind glacial till plains over much of the area north of Olympia, and outwash plains between Tacoma and Centralia. Pleistocene floods formed the smooth floor of the Portland Basin around Vancouver.
- Ancient, well-weathered soils predominate between Centralia and Clark County.
- In the north, the mainland hills and San Juan Islands are composed of rocks common in the adjacent mountainous ecoregions.
- Large, low-gradient rivers begin in the adjacent mountains and flow through this ecoregion.
- Smaller streams originate at low elevations.
- Freshwater lakes are numerous in the glaciated portions of the ecoregion.

BIOTA

- Dominated by Douglas-fir forests with western hemlock and redcedar as the primary late-successional species.
- Oregon white oak, Pacific madrone, bigleaf maple, and red alder forests are plentiful.
- Grassland habitats, often associated with open oak woodlands, were historically maintained with frequent fires; they support rare species such as the federally threatened golden paintbrush and a number of butterfly species.
- Rare grassland species are declining due to development and lack of historic fire regimes.
- Other special habitats include wetlands, riparian areas, bogs and estuaries.

BIODIVERSITY HIGHLIGHTS

- Marine waters, tidelands, and estuaries
- Grasslands and oak woodlands
- Salmon

MAJOR LANDOWNERS

- Department of Defense
- National Park Service
- DNR
- Tribes
- State Parks
- WDFW

DOMINANT LAND USES

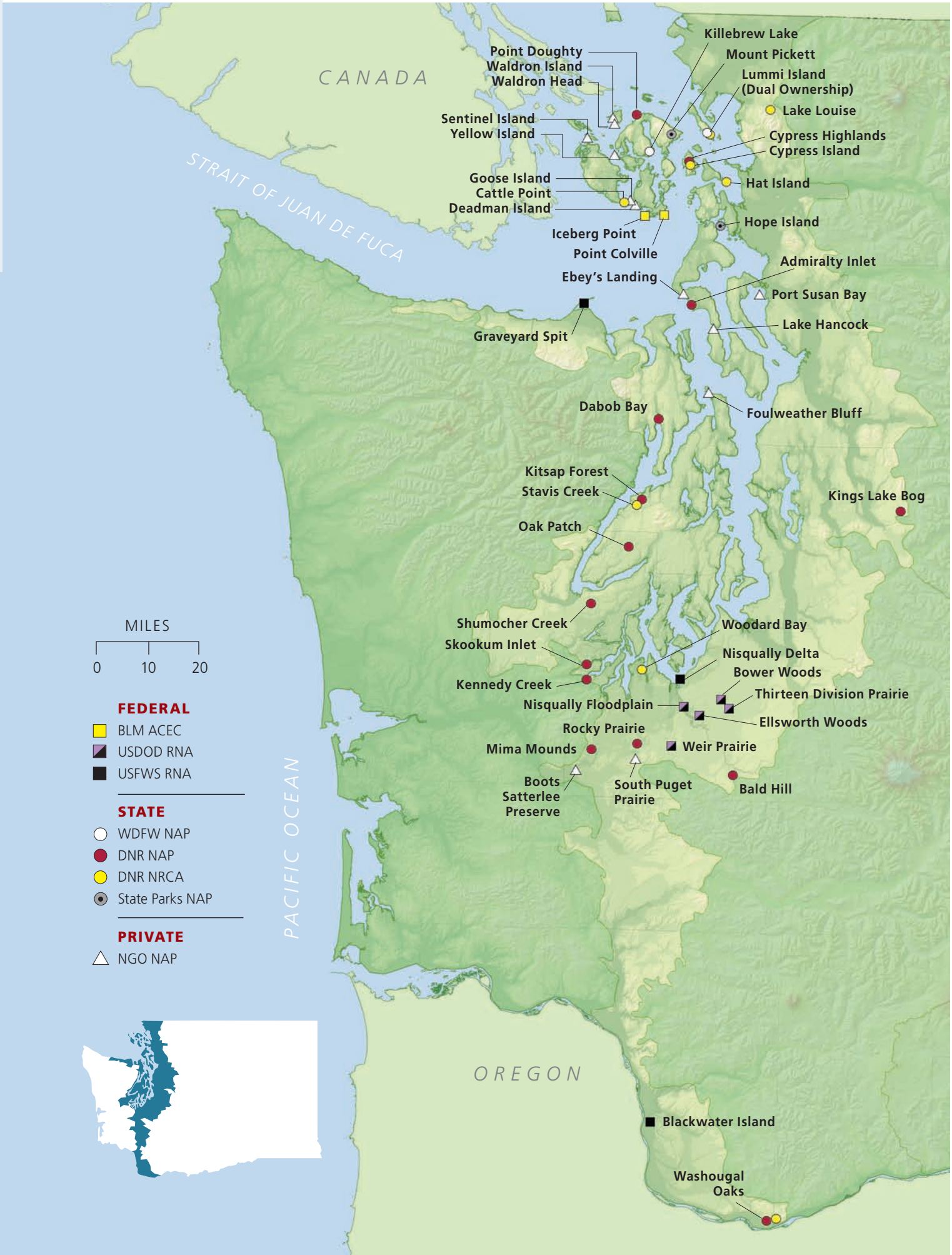
- Industrial / commercial / residential
- Military bases
- Forestry
- Outdoor recreation / conservation
- Agriculture

PRINCIPAL RISKS TO BIODIVERSITY

- Continued rapid development, both in terrestrial habitats and along shorelines
- Increased isolation of remnant natural areas
- Invasive, non-native species
- Climate change and resultant impacts to coastal ecosystems
- Increased contaminants in Puget Sound

CONSERVATION NEEDS

- Protection and restoration of grasslands and oak woodlands and their associated rare species
- Maintenance of existing large blocks of managed forest lands
- Conservation and restoration of estuarine marshes and tidal flats
- Restoration of riparian systems
- Protection of existing high-quality freshwater wetlands and bogs
- Creating functioning landscapes to support remnant ecosystems


CANADA
STRAIT OF JUAN DE FUCA
PACIFIC OCEAN
OREGON
Killebrew Lake
Point Doughty
Waldron Island
Waldron Head
Mount Pickett
Lummi Island
(Dual Ownership)
Lake Louise
Sentinel Island
Yellow Island
Cypress Highlands
Cypress Island
Goose Island
Cattle Point
Deadman Island
Hat Island
Hope Island
Iceberg Point
Point Colville
Admiralty Inlet
Ebey's Landing
Port Susan Bay
Graveyard Spit
Lake Hancock
Dabob Bay
Foulweather Bluff
Kitsap Forest
Stavis Creek
Kings Lake Bog
Oak Patch
Shumocher Creek
Woodard Bay
Skookum Inlet
Nisqually Delta
Bower Woods
Kennedy Creek
Thirteen Division Prairie
Nisqually Floodplain
Ellsworth Woods
Rocky Prairie
Mima Mounds
Weir Prairie
Boots
Satterlee
Preserve
South Puget
Prairie
Bald Hill
Blackwater Island
Washougal
Oaks
MILES
0 10 20
FEDERAL
BLM ACEC
USDOD RNA
USFWS RNA
STATE
WDFW NAP
DNR NAP
DNR NRCA
State Parks NAP
PRIVATE
NGO NAP

DNR staff and partners visit the proposed Lacamas Prairie natural area.

DNR PHOTO

Natural Heritage, Natural Areas, and Special Lands Acquisition priority projects and activities for the 2007-2009 biennium are identified below, along with conservation actions undertaken during the 2005-2007 biennium. These are not exhaustive lists; they are meant to provide the reader with an overview of the type and scope of projects being undertaken. A few projects have been highlighted, while others have simply been listed.

05 THROUGH 07 Conservation Actions

Natural areas acquired

Lands were acquired within existing, approved natural areas, improving the protection for grasslands, oak woodlands, forested and wetland ecosystems, and other priority ecosystems and species. Lands were acquired at Woodard Bay NRCA, Washougal Oaks NAP/NRCA, Mima Mounds NAP, Cypress Island NRCA, Shumocher Creek NAP, and Stavis NRCA.

Partnered with Whidbey Camano Land Trust to establish Admiralty Inlet NAP

Protection of this site boosts the chances for successful recovery of the golden paintbrush, a federally threatened plant species.

Environmental education access provided at Kennedy Creek NAP

An interpretive observation area was constructed.

Other Activities

- Lacamas Prairie approved by the Natural Heritage Advisory Council as a new natural area
- Potential golden paintbrush reintroduction sites in Island and San Juan counties were evaluated (with USFWS, National Park Service, and TNC)
- Surveys were conducted for Island Marble butterfly (with USFWS, NPS, and WDFW)
- Removal of Scot's broom and other invasive species was carried out at Mima Mounds NAP and Rocky Prairie NAP.
- Natural Areas scientists participated in planning and proposal development for South Sound prairie and grassland habitat enhancement through the Ft. Lewis Army Compatible Use Buffer program.

07 THROUGH 09 Priority Projects/Activities

Acquisitions within several approved natural areas

Acquisition priorities (dependent upon availability of funds and willing sellers) include three recently approved natural areas (Lacamas Prairie NAP/NRCA, Washougal Oaks NAP/NRCA, and Stavis NRCA) as well as enlarging several well-established natural areas (Mima Mounds NAP, Kennedy Creek NAP, Woodard Bay NRCA, Cypress Island NRCA, and Bald Hills NAP/NRCA).

Golden Paintbrush Recovery

Natural Heritage and Natural Areas will work to gain a better understanding of the species' habitat requirements to help guide habitat enhancement at Admiralty Inlet and Rocky Prairie NAPs. Prescribed burning and mowing treatments are planned for Rocky Prairie. Potential sites for reintroduction will also be identified. Partners in these efforts include USFWS, National Park Service, The Nature Conservancy, the Whidbey Camano Land Trust and others.

Other Projects

- Conservation planning in southwest Washington, including recovery planning for Nelson's checkermallow, Kincaid's lupine, and Bradshaw's lomatium
- Complete management plans for Mima Mounds and Bald Hill NAPs
- Continue Island Marble butterfly cooperative project with USFWS and WDFW
- Implement intensive efforts to control tall oatgrass at Mima Mounds and Rocky Prairie NAPs
- Enhance grassland bald habitat for Taylor's checkerspot at Bald Hill NAP
- Assess slender-billed white-breasted nuthatch use of Washougal Oaks NAP

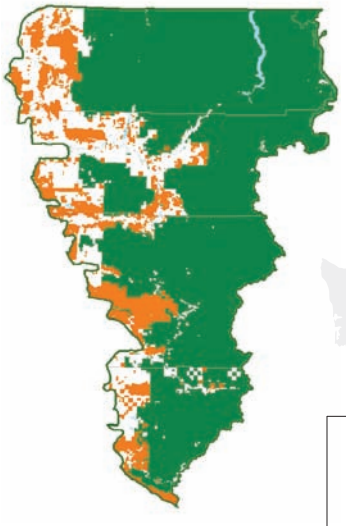
JAMES MISKELLY

DNR PHOTO

Top: Conservation of the Island Marble butterfly is a priority for NHP and several partners.
Below: Washougal Oaks NAP/NRCA.

North Cascades Ecoregion

The North Cascades ecoregion includes the Cascade Mountains north of Snoqualmie Pass and west of the crest extending northward into British Columbia. Approximately 10 percent of Washington occurs within this ecoregion. As of 1991, less than 2 percent of Washington's portion had been converted to urban and agricultural development (Washington GAP, 1997).



NORTH CASCADES LAND OWNERSHIP

- Federal
- State
- Tribal
- Private

CLIMATE

- Precipitation ranges from 60 to 160 inches annually across the ecoregion, most accumulating as snow and rain from October through April.
- The mountains are covered with snow for many months and middle elevations have significant snowpacks that fluctuate over the course of the winter with rain-on-snow events, while lower elevations accumulate little snow.

PHYSIOGRAPHY

- Highly dissected, glaciated mountain terrain, mostly between 1,000 and 7,000 feet above sea level.
- Highest peaks are volcanoes that rise to more than 10,000 feet, with valley bottoms as low as 500 feet.
- Glacially carved U-shaped valleys and cirques are prominent.
- Steep-gradient small stream drainages feed major rivers leading into the adjacent Puget Trough ecoregion.
- Natural lakes, most created by glacial processes, are plentiful.

BIOTA

- Vegetation consists mostly of western hemlock – Douglas-fir – western redcedar forests at low elevations, Pacific silver fir – western hemlock forests at middle elevations, and a mosaic of mountain hemlock – silver fir forests and subalpine parkland at high elevations.
- Natural stand replacement fires occur at irregular intervals of 90 to 250 years.
- Above timberline, alpine heaths, meadows and fellfields are interspersed with barren rock, ice, and snow.
- Special habitats include riparian areas dominated by broadleaf trees, avalanche chutes dominated by Sitka alder or vine maple, and wetlands.
- A number of plant species are considered rare in Washington but are more common to the north.
- One of the few ecoregions in Washington with a variety of large carnivores, including gray wolf, grizzly bear, and wolverine.
- Salmon are found in most of the large rivers.

BIODIVERSITY HIGHLIGHTS

- **Southern edge of the range for many species more common in British Columbia and Alaska**
- **Important habitats for wide-ranging carnivores**
- **Relatively intact, dominated by semi-natural and natural vegetation**

MAJOR LANDOWNERS

- **National Park Service**
- **U.S. Forest Service**
- **DNR**
- **Private timber companies**

DOMINANT LAND USES

- **Forestry**
- **Outdoor recreation / conservation**

PRINCIPAL RISKS TO BIODIVERSITY

- **Landscape-level changes in forest composition and structure**
- **Development and conversion of forest to non-forest uses, primarily in valley bottoms**
- **Increasing outdoor recreational activity**

CONSERVATION NEEDS

- **Protection and restoration of riparian floodplains**
- **Restoration of salmon habitat / populations**
- **Recovery of large carnivores**


CANADA
Silver Lake
North Fork Nooksack
Ronald J. Taylor
Big Beaver
Stetattle Creek
Pyramid Lake
Dailey Prairie
Arlecho Creek
Olivine Bridge
Skagit River Bald Eagle
Boston Glacier
Granite Lakes
Sauk River
Suiattle River
Long Creek
Lake Twenty-Two
Perry Creek
Mount Pilchuck
Morning Star
Greider Ridge
Snoqualmie Bog
Mount Si
FEDERAL
NPS RNA
USFS RNA
STATE
WDFW NAP
DNR NAP
DNR NRCA
PRIVATE
NGO NAP
MILES
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Upper Sultan Basin NRCA

DNR PHOTO

Natural Heritage, Natural Areas, and Special Lands Acquisition priority projects and activities for the 2007-2009 biennium are identified below, along with conservation actions undertaken during the 2005-2007 biennium. These are not exhaustive lists; they are meant to provide the reader with an overview of the type and scope of projects being undertaken. A few projects have been highlighted, while others have simply been listed.

05 THROUGH 07 Conservation Actions

Upper Sultan Basin landscape protection

Through Trust Land Transfer of more than 4,000 acres of state lands, the three NRCAs of Greider Ridge, Morning Star, and Mount Pilchuck are now connected, forming the largest conservation and low-impact recreation landscape — some 30,100 acres — managed by the Natural Areas Program

North Cascades Ecoregional Assessment

Natural Heritage Program staff participated in the development of an ecoregional assessment for the North Cascades.

Whatcom Legacy Project

Natural Heritage Program staff provided information and expertise to assist the Whatcom Legacy Project's initial efforts to develop a 100-year plan for conservation within the county.

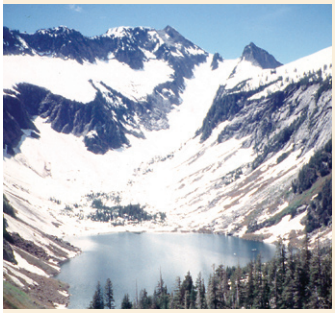
07 THROUGH 09 Priority Projects/Activities

North Cascades National Park vegetation classification and mapping

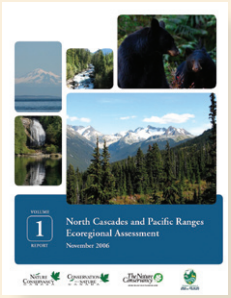
A vegetation classification for three national parks, including North Cascades NP, will be completed by NHP plant ecologists. The classification system will be used by the National Park Service as a basis for mapping the vegetation, which will in turn be used to help inform management decisions. The National Park Service is funding this project.

Other Activities

- Continue efforts to complete acquisition of lands within Mt. Si NRCA
- Identify additional natural area needs within the ecoregion



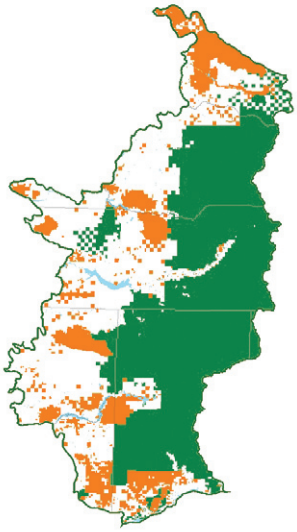
DNR PHOTOS



Top: Upper Sultan Basin NRCA.
Below: NHP scientists participated in the development of the North Cascades ecoregional assessment.

West Cascades Ecoregion

The West Cascades ecoregion extends west from the Cascade crest from Snoqualmie Pass southward to the Oregon-California border. Approximately 8 percent of Washington is within this ecoregion. As of 1991, less than 2 percent of the Washington portion had been converted to urban and/or agricultural use (Washington GAP, 1997).



WEST CASCADES LAND OWNERSHIP

- Federal
- State
- Tribal
- Private

CLIMATE

- Climate is wet and relatively mild.
- Precipitation ranges from 55 to 140 inches annually across the ecoregion, most falling from October through April as snow and rain.
- High elevations in the mountains are continuously covered with snow for months, while middle elevations have significant snow pack that fluctuates over the course of the winter with rain-on-snow events, and the lowest elevations accumulate little snow.

PHYSIOGRAPHY

- Consists mostly of highlands modified by montane glaciers and associated river valleys.
- Typical elevation range is 1,000 to 7,000 feet above sea level, with Mount Rainier at 14,410 feet and the lowest Columbia River Gorge elevation at 50 feet.
- Isolated volcanic peaks and associated high plateaus rise above surrounding steep mountain ridges, formed primarily from extrusive volcanic rocks.
- Small, steep-gradient streams typically feed major rivers.
- Natural lakes are frequent, typically created by glacial processes and landslides.

BIOTA

- Conifer forests are the dominant vegetation. Douglas-fir – western hemlock forests are typical at low elevations, while middle elevations have Pacific silver fir, western hemlock, Douglas-fir, and noble fir, and high elevations have mountain hemlock – silver fir forests and subalpine parklands.
- Higher elevations on volcanic peaks support alpine heath, meadows, and fellfields among glaciers and rock.
- Special habitats include riparian areas dominated by broadleaf species, wetlands, grassy balds, and oak woodlands.
- Mount Rainier and the Columbia River Gorge are areas of high plant diversity; both support rare endemic plant species.
- The Columbia River Gorge has biogeographic significance because of the mixing of coastal and interior floras.

BIODIVERSITY HIGHLIGHTS

- Dominated by native vegetation
- Isolated remnants of old-growth forest remain
- Columbia River Gorge and Mount Rainier are rich in rare, endemic plant species

MAJOR LANDOWNERS

- National Park Service
- U.S. Forest Service
- DNR
- Private timber companies

DOMINANT LAND USES

- Forestry
- Outdoor recreation / conservation

PRINCIPAL RISKS TO BIODIVERSITY

- Landscape-level changes in forest composition and structure
- Loss of old-growth
- Conversion of forest to non-forest uses
- Increasing development in valleys
- Invasive species

CONSERVATION NEEDS

- Protection and restoration of riparian floodplains and corridors
- Conservation of grassy balds and oak woodlands
- Recovery of old-growth dependent species
- Conservation of Columbia River Gorge rare plants


West Tiger Mountain
Rattlesnake Mountain
Charley Creek
Butter Creek (Dual Ownership)
Tahoma Forest
Goat Marsh
Merrill Lake
Cedar Flats
Steamboat Mountain
Sister Rocks
Thorton T. Munger
Table Mountain
Columbia Falls
Pierce Island
OREGON
FEDERAL
USFS RNA
NPS RNA
STATE
DNR NAP
DNR NRCA
PRIVATE
NGO NAP
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Table Mountain NRCA

DNR PHOTO

Natural Heritage, Natural Areas, and Special Lands Acquisition priority projects and activities for the 2007-2009 biennium are identified below, along with conservation actions undertaken during the 2005-2007 biennium. These are not exhaustive lists; they are meant to provide the reader with an overview of the type and scope of projects being undertaken. A few projects have been highlighted, while others have simply been listed.

05 THROUGH 07 Conservation Actions

Two new natural areas created: Charley Creek NAP and Tahoma NRCA

Trust land transfers were completed for both sites before the end of the 2005-2007 biennium. Additional lands will be a priority for transfer during the 2007-2009 biennium.

Table Mountain NRCA Management Plan completed

Sensitive features within the NRCA have also been protected by rerouting and restoring a hiking trail.

Other Activities

- West Tiger Mountain NRCA was enlarged.
- Herbaceous bald inventory and classification completed—Natural Heritage scientists completed an assessment of forest openings dominated by grasses, sedges and forbs.

07 THROUGH 09 Priority Projects/Activities

Charley Creek NAP and Tahoma NRCA acquisitions

Additional transfers are expected to occur within the 2007-2009 biennium.

Habitat restoration within Columbia Falls NAP and Table Mountain NRCA

Old forest roads will be abandoned and restored at these two natural areas.

Other Activities

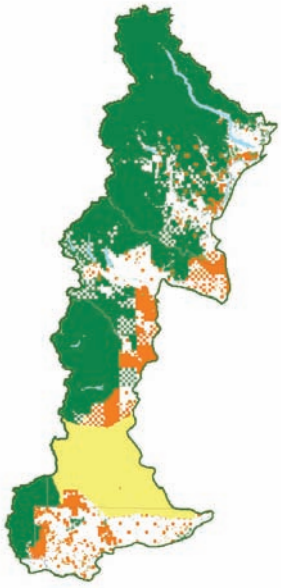
Identify gaps in natural areas system within the ecoregion in partnership with U.S. Forest Service and National Park Service.

DNR PHOTOS

Top: Americorps crew works on restoration project within Table Mountain NRCA. **Below:** Columbia Falls NAP.

East Cascades Ecoregion

The East Cascades ecoregion lies east of the Cascade crest, from Sawtooth Ridge near Lake Chelan south to the Oregon-California border. Its eastern border follows the transition zone between montane forest and lowland shrub-steppe. Approximately 10 percent of Washington is included within this ecoregion. As of 1991, less than 2 percent of the Washington portion had been converted to agricultural or urban development (Washington GAP, 1997). The development that has occurred is concentrated in the Chelan, Wenatchee, upper Yakima, and Little White Salmon valleys.



EAST CASCADES LAND OWNERSHIP

- Federal
- State
- Tribal
- Private

CLIMATE

- Climate changes rapidly west to east, from cold with high precipitation (120 inches) along the Cascade crest to hot and dry with less than 20 inches per year along the foothills.
- Most precipitation falls from November through April, with a snow pack accumulating at higher elevations.

PHYSIOGRAPHY

- Washington's East Cascades were modified by alpine glaciers and landslides, creating rugged ridges extending southeast to east from the Cascade crest, with broad valleys occupying the lowlands between the mountain ridges.
- Isolated volcanic cones occur on the steep mountain ridges.
- Geology of the East Cascades is varied, including large serpentine areas in the Wenatchee Mountains.
- Elevation generally ranges from 2,000 to 7,000 feet, although Mt. Adams rises to 12,276 feet and the lowest elevation in the Columbia River Gorge is 100 feet.
- The Wenatchee and Simcoe mountains are eastward extensions of this ecoregion.

BIOTA

- Conifer forests are dominant and usually more open and patchy than forests of ecoregions west of the Cascades.
- Grand fir – Douglas-fir – ponderosa pine forests are characteristic, while Oregon white oak woodlands appear at lower elevations in the southern half of the ecoregion, and subalpine fir – mountain hemlock – Engelmann spruce are found at higher elevations.
- Douglas-fir – western hemlock – Pacific silver fir forests are present and locally abundant near low divides of the Cascades. Whitebark pine, lodgepole pine, and western larch are common components of these forests.
- Decades of fire suppression have resulted in large areas of dense, fire-prone forests that historically experienced stand replacement fires at irregular intervals, from 10 years in the lowland foothills to 150 years or more at high elevations.
- Shrub-steppe vegetation occurs along the foothills and higher south-facing slopes, generally composed of big sagebrush or antelope bitterbrush with native bunchgrasses.
- Alpine and subalpine parklands occur on the highest ridges, more commonly north of Snoqualmie Pass.

BIODIVERSITY HIGHLIGHTS

- **Relatively intact, dominated by natural and semi-natural vegetation**
- **High concentrations of rare plants in Columbia River Gorge and Wenatchee Mountains**
- **Open ponderosa pine forests maintained by frequent, low-intensity fires**

MAJOR LANDOWNERS

- **U.S. Forest Service**
- **Tribes**
- **DNR**
- **WDFW**
- **Private timber companies**

DOMINANT LAND USES

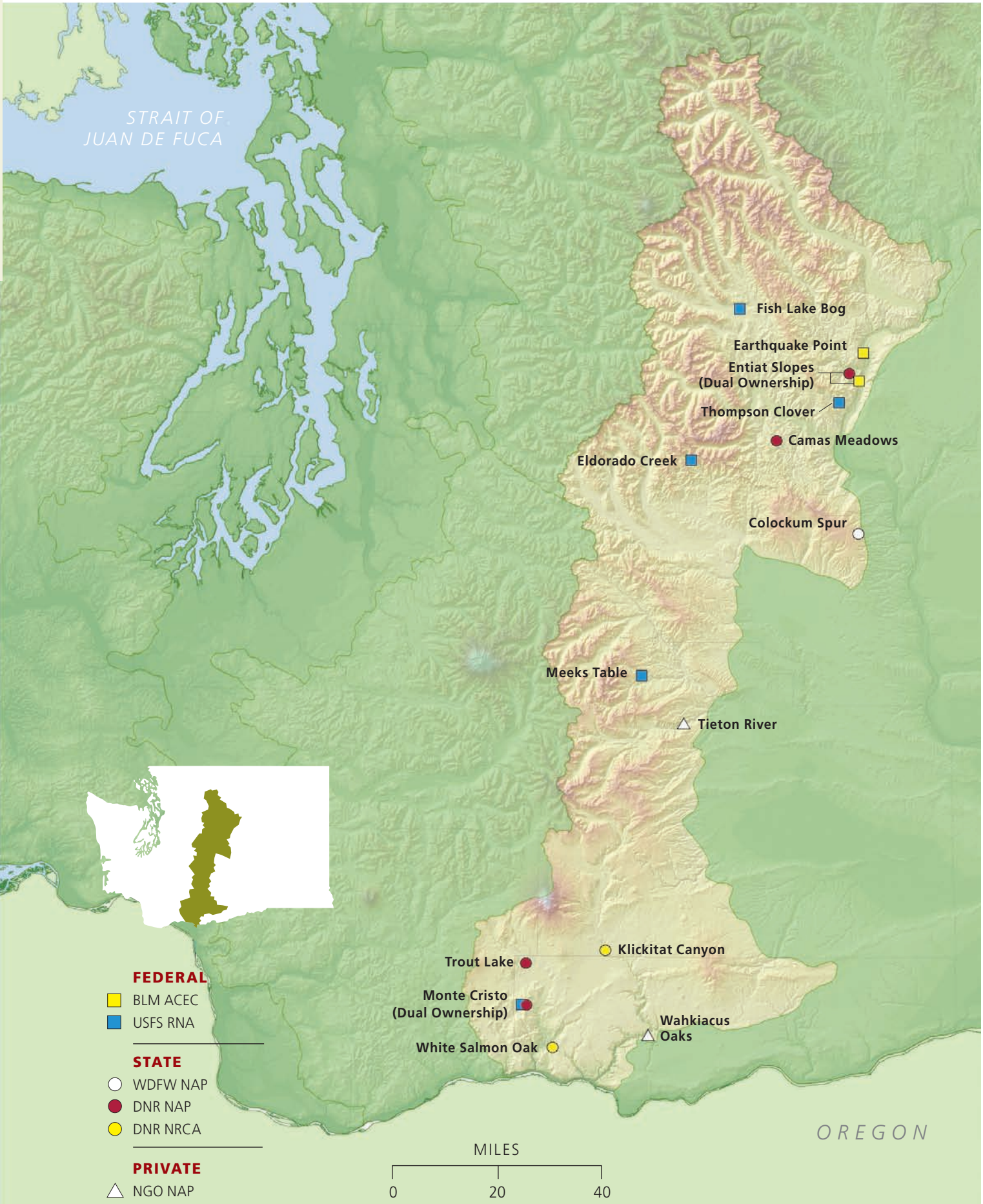
- **Forestry**
- **Livestock grazing**
- **Outdoor recreation / conservation**

PRINCIPAL RISKS TO BIODIVERSITY

- **Landscape-level changes in forest composition and structure**
- **Changes in land use; conversion of forest to non-forest uses**
- **Fire suppression / catastrophic fire**
- **Invasive species**
- **Fragmented ownership along eastern edge of the ecoregion**

CONSERVATION NEEDS

- **Coordinated strategy for recovery of dry, open, low elevation ponderosa pine forests**
- **Improving representation of ponderosa pine and other low elevation ecosystems within natural areas system**
- **Invasive plant species control, particularly in grassland habitats**
- **Coordinated salmonid recovery**
- **Maintaining corridors with the Columbia Plateau ecoregion**


STRAIT OF JUAN DE FUCA
Fish Lake Bog
Earthquake Point
Entiat Slopes (Dual Ownership)
Thompson Clover
Camas Meadows
Eldorado Creek
Colockum Spur
Meeks Table
Tieton River
Klickitat Canyon
Trout Lake
Monte Cristo (Dual Ownership)
Wahkiacus Oaks
White Salmon Oak
OREGON
FEDERAL
BLM ACEC
USFS RNA
STATE
WDFW NAP
DNR NAP
DNR NRCA
PRIVATE
NGO NAP
MILES
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Ponderosa pines in the East Cascades ecoregion.

Natural Heritage, Natural Areas, and Special Lands Acquisition priority projects and activities for the 2007-2009 biennium are identified below, along with conservation actions undertaken during the 2005-2007 biennium. These are not exhaustive lists; they are meant to provide the reader with an overview of the type and scope of projects being undertaken. A few projects have been highlighted, while others have simply been listed.

05 THROUGH 07
Conservation Actions

Showy Stickseed recovery

The Natural Heritage Program botanist participated on the recovery team with USFS and USFWS for Showy Stickseed (*Hackelia venusta*), assisting in development of the draft recovery plan and gathering information to help identify potential introduction sites.

Weevil predation on seeds of rare plant species studied

A monitoring protocol to determine the impact of weevil predation on seeds of Wenatchee Mountains checkermallow (*Sidalcea oregana* var. *calva*) was developed and implemented.

Other activities

- Habitat enhancement work was initiated for two rare plant species within Camas Meadows NAP
- Oregon Spotted Frog (*Rana pretiosa*) egg mass counts were conducted at Trout Lake NAP
- Wetland restoration work was initiated at Trout Lake NAP
- Rare plant survey methodology was shared with staff of Yakama Indian Reservation

07 THROUGH 09
Priority Projects/Activities

Oregon Spotted Frog management at Trout Lake NAP

The Oregon Spotted Frog has undergone significant rangewide declines. Natural Heritage and Natural Areas staff will undertake several projects during the biennium to address the conservation needs of the frog, including monitoring of reproductive success, assessing the significance of a fungal infection, and restoring portions of the wetland.

Rare plant conservation at Camas Meadows NAP

Vegetation restoration is underway at this site, which is extremely important to the long-term survival of two rare plant species: Wenatchee Mountains checkermallow and Wenatchee Mountains larkspur (*Delphinium viridescens*). The site has changed over the years in response to fire suppression, livestock grazing and alterations to the natural flow of water through the meadows.

Additional projects

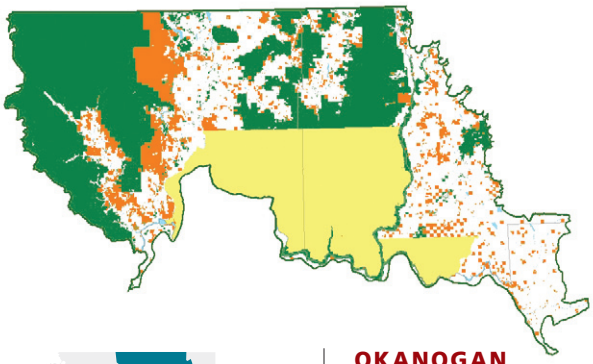
- Identify gaps in the natural areas system within the ecoregion
- Study weevil predation on seeds of Wenatchee Mountains checkermallow
- Develop a habitat characterization for Showy Stickseed

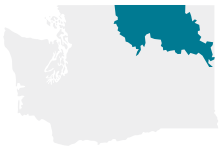
DNR PHOTOS

Top: Trout Lake NAP.
Below: Showy stickseed, a rare plant endemic to the Wenatchee Mountains.

Okanogan Ecoregion

The Washington portion of the Okanogan ecoregion extends from the Cascade crest in the North Cascades east to the Selkirk Mountains. The ecoregion extends up the east slope of the Cascades into Canada and along the west slope of the Canadian Rockies to Kamloops, British Columbia. The southwestern border of the ecoregion follows Sawtooth Ridge northeast of Lake Chelan. The Methow and Okanogan valleys are included, as are the Okanogan Highlands east to the Colville and Spokane valleys. Approximately 14 percent of Washington is within this ecoregion. Less than 10 percent of the Washington portion had been converted to agricultural or urban use as of 1991 (Washington GAP, 1997). Development is concentrated in the Spokane, Colville, Methow and Okanogan valleys.





OKANOGAN LAND OWNERSHIP

- Federal
- State
- Tribal
- Private

PHYSIOGRAPHY

- This ecoregion is less distinct than others in Washington, being more transitional and having characteristics of adjacent areas.
- The northeast Cascades peaks, rising to more than 9,400 feet, are the highest and most rugged part of the ecoregion, giving way to a series of low elevation valleys at about 750 feet.
- The mountains to the east in the Kettle Range and Huckleberry Mountains are more rounded.
- Continental and alpine glaciers played a major role in shaping these landforms.

CLIMATE

- Overall, the ecoregion has the coldest climate in the state due to the presence of cold, dense arctic air in winter. However, it also experiences hot, dry air from the Columbia Basin in the summer.
- The western portion of the ecoregion is in the rain shadow of the Cascade Mountains, while the eastern portion is in a zone of increasing precipitation created by the Rocky Mountains.
- Annual precipitation ranges from less than 12 inches annually in the Okanogan Valley to between 50 and 90 inches in the Cascades, with most of the ecoregion receiving 14 to 24 inches.
- There are fairly steep temperature and precipitation gradients from the mountains to the valleys within this ecoregion.

BIOTA

- Conifer forests dominate the mountain ridges and low hills, and are more open and less continuous, consisting of smaller stands, than forests west of the Cascade crest and in the Canadian Rockies.
- Valleys and lowlands are often non-forested.
- Douglas-fir – ponderosa pine forests are characteristic, transitioning to shrub-steppe in the low broad valleys in the east and to grasslands in the west.
- Subalpine fir – Engelmann spruce forests occur at higher elevations, while Whitebark pine, lodgepole pine, and subalpine larch form parklands in the highest elevations, often associated with dry alpine or subalpine meadows.
- Moister forests are dominated by Douglas-fir, with western larch, western white pine or quaking aspen as common components.
- Stand replacement fires historically occurred at irregular intervals from 10 years in the lowland foothills to 150 years or more at high elevations. Fire suppression has resulted in dense, fire-prone forests.

BIODIVERSITY HIGHLIGHTS

- **Relatively intact, dominated by natural and semi-natural vegetation**
- **High numbers of rare plant species on Chopaka Mountain and in Kettle Range**
- **Many species at the edge of their natural range**
- **Important for wide-ranging carnivore species**

MAJOR LANDOWNERS

- **U.S. Forest Service**
- **Tribes**
- **DNR**
- **WDFW**

DOMINANT LAND USES

- **Livestock grazing**
- **Forestry**
- **Agriculture**
- **Conservation / outdoor recreation**

PRINCIPAL RISKS TO BIODIVERSITY

- **Excessive grazing**
- **Invasive species**
- **Landscape-level change in forest composition and structure**
- **Fire suppression / catastrophic fire**
- **Increasing development, particularly at lower elevations**

CONSERVATION NEEDS

- **Coordinated recovery of dry, open, low elevation ponderosa pine – Douglas-fir forests**
- **Maintenance of lodgepole pine forests**
- **Invasive plant species control in shrub-steppe**
- **Coordinated riparian ecosystem and fish recovery efforts**
- **Coordinated recovery of grizzly bear, gray wolf, lynx, and martin**


CANADA
IDAHO
Hot Lake
Chopaka Mountain
Loomis
Chewuch
Roger Lake
Barker Mountain (Dual Ownership)
Wolf Creek
Riverside Breaks
Davis Canyon (Dual Ownership)
Methow Rapids
Brewster Roost
Pinecroft
Dishman Hills
FEDERAL
BLM ACEC
BLM RNA
USFS RNA
STATE
DNR NAP
DNR NRCA
PRIVATE
NGO NAP
MILES
0
10
20

View from Slate Peak

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05 THROUGH 07 Conservation Actions

Pinecroft NAP used as outdoor lab for high school science students

Students at Spokane's North Central High School conduct research at Pinecroft NAP. The students hold an annual conference and publish their research in the North Central High School Journal of Science. Recent research topics have included assessments of insects, soil fertility, and microclimates within the preserve.

Fire reintroduced to Davis Canyon NAP

Decades of fire suppression has resulted in changes to many of Washington's ecosystems, in particular those within areas with a high natural fire frequency. A controlled burn was used at Davis Canyon NAP to reduce the amount of late-seral bitterbrush/bunchgrass.

Other activities

- Natural Heritage participated with WDFW, TNC and others in development of an ecoregional assessment for the Okanogan
- Natural Areas scientists provided advice regarding fire suppression activities for the Tripod Complex fire, and began restoration efforts on the Loomis NRCA
- DNR staff completed a boundary expansion for Methow Rapids NAP and successfully competed for conservation grant funding
- Natural Areas and the NE Region provided support for volunteer inventory for rare plants on Chopaka NAP and adjacent portions of the Loomis NRCA

07 THROUGH 09 Priority Projects/Activities

Increase protection for Methow Rapids Natural Area Preserve

An expanded boundary was approved last biennium with the goal of improving the protection for the features present within the site. Depending on availability of funds and willing sellers, lands will be acquired and added to this NAP.

Water howellia monitoring

Natural Heritage will implement a monitoring protocol for this federally threatened annual plant species known from Dishman Hills NRCA as well as from one trust land site within the ecoregion. The monitoring protocol is being used on several federally-managed sites that harbor this species.

Additional projects

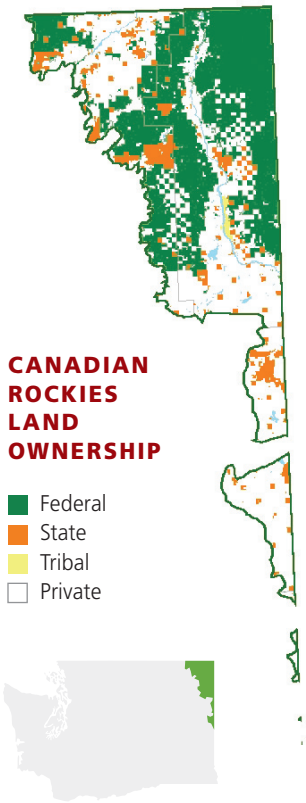
- Identify gaps in the natural areas system within the ecoregion
- Monitor post-fire ecosystem recovery within Loomis NRCA; implement fire rehabilitation projects.
- Monitor the effects of prescribed burning at Davis Canyon NAP

DNR PHOTOS

Top: Prescribed fire used as a management tool at Davis Canyon NAP.
Below: Methow Rapids NAP

Canadian Rockies Ecoregion

The Canadian Rockies ecoregion is located in the northeastern corner of Washington. The vast majority of this ecoregion occurs in adjacent British Columbia and Idaho, extending into Alberta and Montana. Approximately 4 percent of Washington is within this ecoregion. As of 1991, less than 10 percent of the Washington portion had been converted to agricultural and urban land uses (Washington GAP, 1997). Development is concentrated in low, broad valleys along the Pend Oreille River.



PHYSIOGRAPHY

- Selkirk Mountains and Pend Oreille River are dominant landforms within Washington.
- The mountains are transitional between the western rolling Okanogan Highlands and the eastern higher ridges and mountains, interspersed with wide valleys.
- Once completely glaciated, the ecoregion now displays ice-carved, U-shaped valleys and isolated ice-sculpted mountain peaks, with elevations from 1,300 feet at the Columbia River to more than 7,000 feet in the Salmo-Priest Wilderness Area.

CLIMATE

- Precipitation ranges from 18 inches annually along the Columbia River to about 80 inches in the Salmo-Priest Wilderness Area, with most of the ecoregion receiving between 24 and 34 inches.
- Significant snowpack develops at mid and upper elevations.

BIOTA

- Coniferous forests dominate, with composition reflecting variation in moisture, temperature and elevation.
- Douglas-fir – ponderosa pine forests occur at low elevations, with grand fir – western hemlock – western redcedar forests characteristic of mid-montane elevations, and subalpine fir – Engelmann spruce forests at higher elevations.
- Whitebark pine, lodgepole pine, and subalpine larch form parklands in the highest elevations.
- Western larch and western white pine can be major components of the moister forests.
- Fire was significant in developing these forests, with a 10-year return interval for lowland foothills and 150-year return interval for high elevations and protected canyons. Fire suppression has resulted in dense, fire-prone forests.
- Grasslands, variously dominated by green fescue, Idaho fescue, or rough fescue, occur along the foothills and on higher elevation, south-facing slopes.

BIODIVERSITY HIGHLIGHTS

- **Presence of moose, grizzly bear, mountain caribou**
- **Plant species common in Rocky Mountains, but rare in Washington.**
- **Rocky Mountain grand fir – western hemlock – western redcedar forests**

MAJOR LANDOWNERS

- **U.S. Forest Service**
- **U.S. Fish & Wildlife Service**
- **DNR**
- **State Parks**

DOMINANT LAND USES

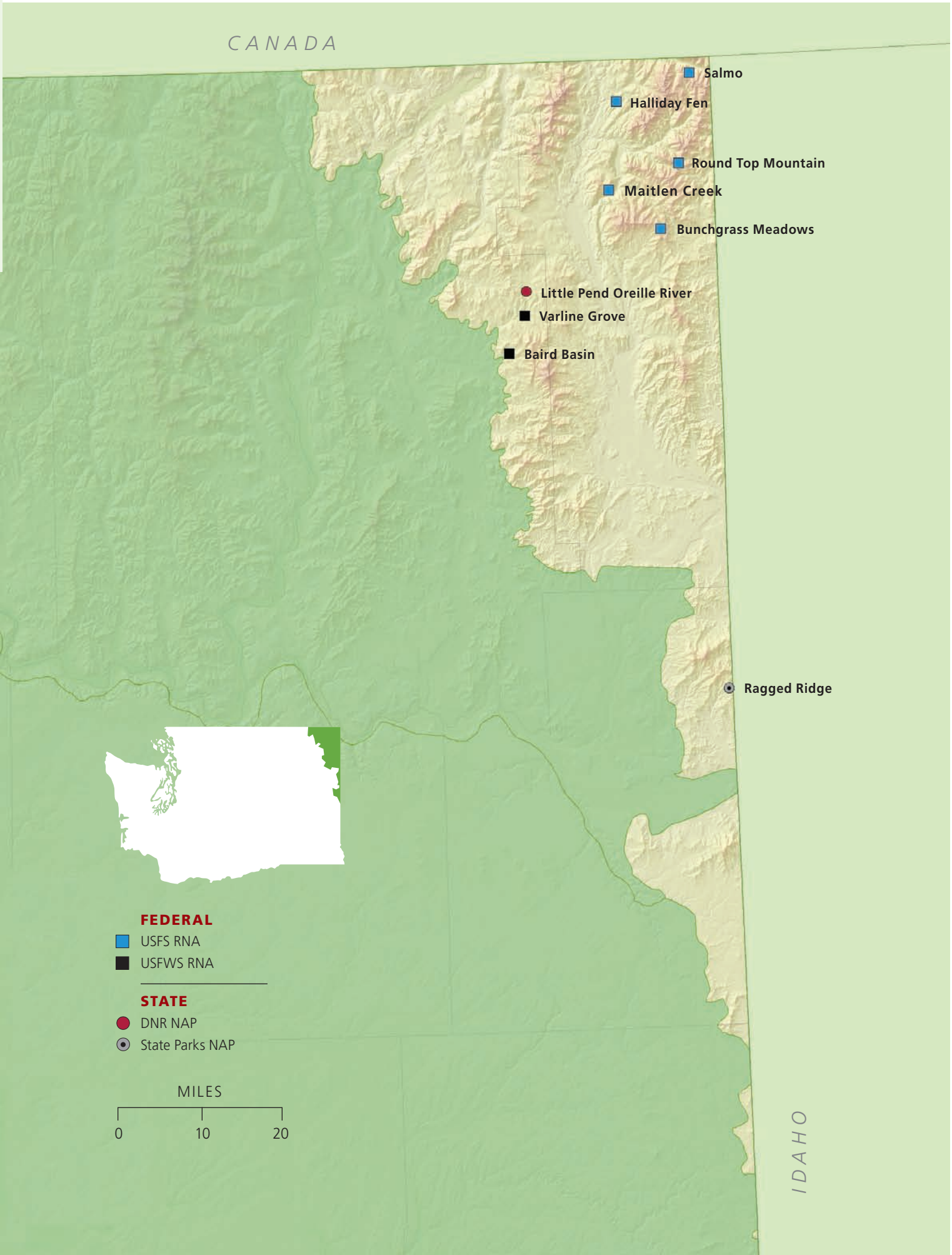
- **Forestry**
- **Agriculture**
- **Outdoor recreation / conservation**
- **Mining**

PRINCIPAL RISKS TO BIODIVERSITY

- **Landscape-level changes in forest composition and structure**
- **Fire suppression / catastrophic fire**
- **Increasing development, primarily at low elevations**

CONSERVATION NEEDS

- **Wetland habitats (bogs, riparian areas, etc.) for rare plants, amphibians, and fish**
- **Coordinated recovery efforts for salmon along Pend Oreille and Columbia rivers**
- **Coordinated recovery efforts for woodland caribou, grizzly bear, gray wolf, lynx and martin in Selkirk Mountains.**
- **Coordinated strategy for recovery of low elevation, dry, open ponderosa pine – Douglas-fir forests**


CANADA
Salmo
Halliday Fen
Round Top Mountain
Maitlen Creek
Bunchgrass Meadows
Little Pend Oreille River
Varline Grove
Baird Basin
Ragged Ridge
FEDERAL
USFS RNA
USFWS RNA
STATE
DNR NAP
State Parks NAP
MILES
0
10
20
IDAHO

Trombetta Canyon,
Stevens County

DNR PHOTO

Natural Heritage, Natural Areas, and Special Lands Acquisition priority projects and activities for the 2007-2009 biennium are identified below, along with conservation actions undertaken during the 2005-2007 biennium. These are not exhaustive lists; they are meant to provide the reader with an overview of the type and scope of projects being undertaken. A few projects have been highlighted, while others have simply been listed.

05 THROUGH 07
Conservation Actions

Little Pend Oreille River NAP fenced

Fencing was installed to protect sensitive features from recreational activities occurring on adjacent lands.

Additional inventory for species and ecosystems is needed to address gaps in the natural areas system.

07 THROUGH 09
Priority Projects/Activities

Identify gaps in natural areas system

Geographic gaps, particularly at low elevations, suggest that better representation within natural areas is needed for the ecoregion's biodiversity. NHP scientists will work with U.S. Forest Service, U.S. Fish & Wildlife Service, Bureau of Land Management, and State Parks to identify needs and potential sites to fill those needs.

Assess conservation status for Onion Ridge

A previous proposal for a natural area along this ridge will be reevaluated by NHP and Natural Areas scientists in cooperation with the Northeast Region of DNR.

Assess the biodiversity values present within Trombetta Canyon

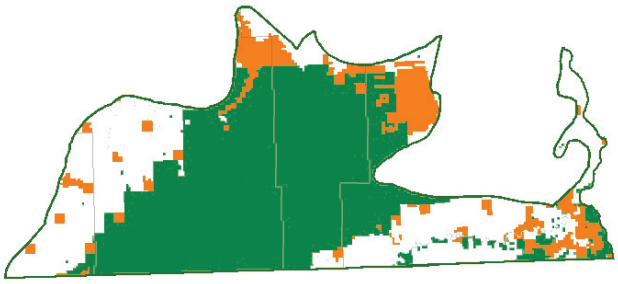
Rare plant species are known from this limestone canyon, but a more comprehensive inventory for both rare species and high quality ecosystems is needed.

DNR PHOTOS

Top: A view of the northern entrance to Trombetta Canyon.
Below: Onion Ridge

Blue Mountains Ecoregion

The Blue Mountains – Middle Rockies ecoregion extends from adjacent Idaho and Oregon into the southeast corner of Washington. It includes the Grande Ronde and Snake River canyons northward to a few miles south of Clarkston. Approximately 1 percent of Washington is within this ecoregion. As of 1991, less than 1 percent of the Washington portion had been converted to agricultural or urban development (Washington GAP, 1997). The limited development that has occurred within the ecoregion has been along the Grande Ronde River.



BLUE MOUNTAINS LAND OWNERSHIP

- Federal
- State
- Tribal
- Private

PHYSIOGRAPHY

- Blue Mountains were formed by uplift of Columbia River Basalt flows and simultaneously down-cut by the Grande Ronde and Snake Rivers.
- Washington's Blue Mountains are typically flat top plateaus above deep canyons.
- The elevation within the ecoregion ranges from 750 feet along the Snake River to 6,387 feet. Most of the ecoregion is between 2,000 and 4,000 feet.
- Windblown silts and volcanic ash cover most of the plateaus, providing material for soil development.

CLIMATE

- Precipitation varies from less than 10 inches annually in the Grande Ronde River canyon to more than 50 inches just 25 miles west in the Wenaha-Tucannon Wilderness Area, with most of the ecoregion between 14 and 24 inches.
- Much of the precipitation occurs as snow, although fall and spring rains are common, often creating floods.

BIOTA

- Dominated by coniferous forest, but also supports grasslands and shrublands along low dry canyons, on broad plateaus and in subalpine meadows.
- Douglas-fir – ponderosa pine forests are characteristic of the low and middle elevations, with subalpine fir – Engelmann spruce occurring at higher elevations.
- Western larch, lodgepole pine, and western white pine are components of mesic forests.
- Canyon grassland vegetation occurs on the steep slopes above the Grande Ronde and Snake Rivers, while plateau grasslands are within the forest matrix, and dense shrublands are in the higher canyons along the Oregon border.
- Stand replacement fires historically occurred at irregular intervals from 10 years in the lowland foothills to 150 years or more at high elevations. Fire suppression has resulted in a semi-natural to natural landscape composed of dense, fire-prone forests.

BIODIVERSITY HIGHLIGHTS

- **Relatively intact, dominated by natural and semi-natural vegetation**
- **Canyon grasslands**
- **Blue Mountains and Snake River Canyon are home to a number of endemic plant species**
- **Common plant and animal species in this ecoregion are characteristic of the Rocky Mountains**

MAJOR LANDOWNERS

- **U.S. Forest Service**
- **WDFW**
- **Bureau of Land Management**
- **DNR**

DOMINANT LAND USES

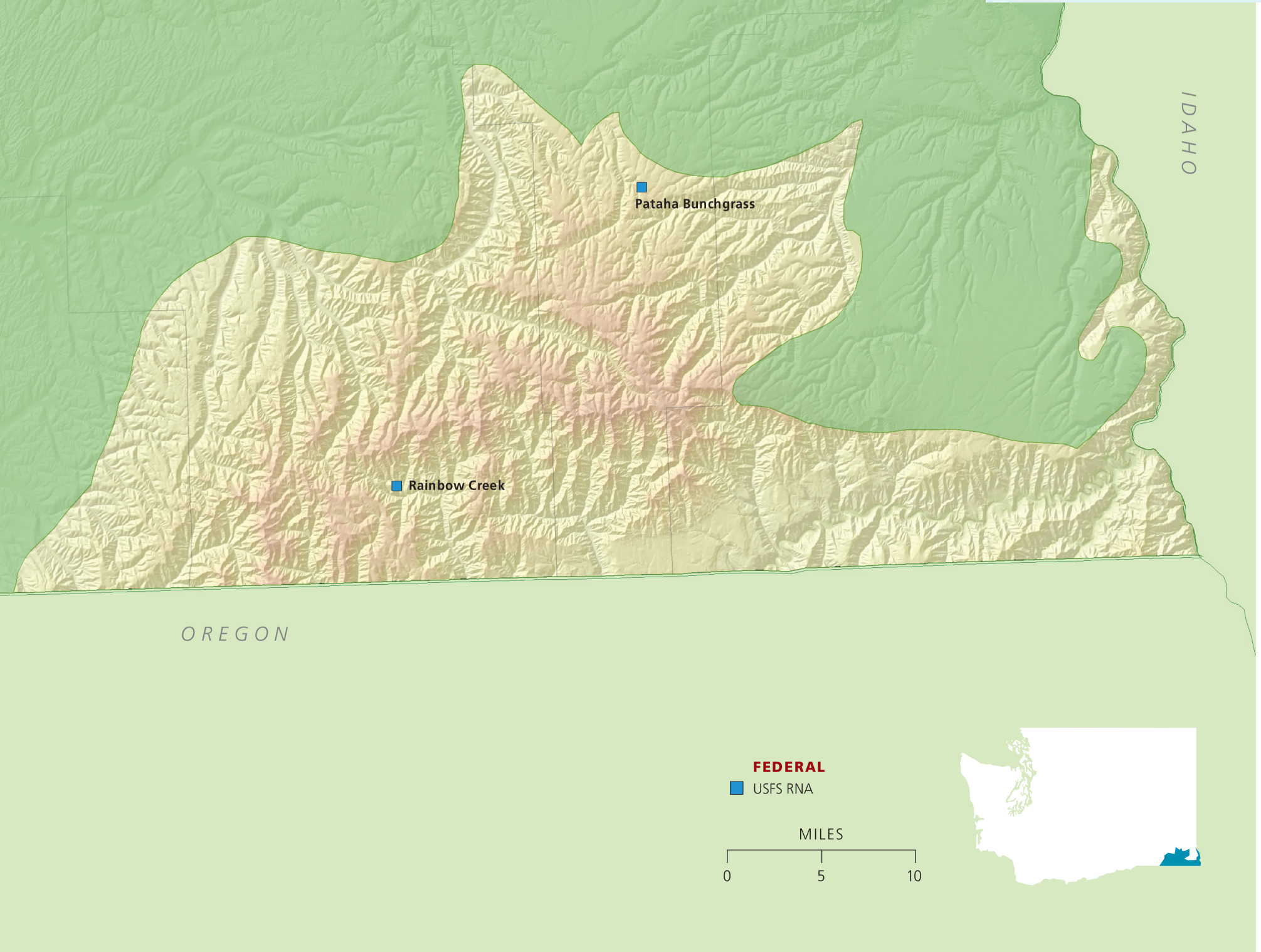
- **Agriculture**
- **Forestry**
- **Outdoor recreation / conservation**

PRINCIPAL RISKS TO BIODIVERSITY

- **Excessive grazing**
- **Invasive species (yellow star-thistle, knapweeds, rush skeleton weed, others)**
- **Landscape-level changes in forest composition and structure**
- **Fire suppression leading to altered forest stand development**

CONSERVATION NEEDS

- **Coordinated strategy for recovery of low and mid-elevation open ponderosa pine – Douglas-fir forests**
- **Invasive plant species control in canyon grasslands**
- **Improved protection of riparian habitats**
- **Maintaining corridors with the Columbia Plateau ecoregion**



Blue Mountains Ecoregion

Lime Hill and the canyon grasslands of the Blue Mountains ecoregion.

DNR PHOTO

Natural Heritage, Natural Areas, and Special Lands Acquisition priority projects and activities for the 2007-2009 biennium are identified below, along with conservation actions undertaken during the 2005-2007 biennium. These are not exhaustive lists; they are meant to provide the reader with an overview of the type and scope of projects being undertaken. A few projects have been highlighted, while others have simply been listed.

05 THROUGH 07 Conservation Actions

Rare plant species inventory of the canyon grassland ecosytems

NHP and other scientists conducted limited inventory of rare plant species and ecosystems occurring within the canyon grasslands. The initial efforts suggest that additional inventory and conservation planning are needed.

The Blue Mountains and canyon grasslands are home to a number of endemic plant species.

07 THROUGH 09 Priority Projects/Activities

Identify gaps in natural areas system

There are currently only two natural areas within this ecoregion. NHP scientists will work with U.S. Forest Service, Bureau of Land Management, and Department of Fish and Wildlife to identify potential additions to the natural areas system for more complete representation of the ecoregion's biodiversity.

Conservation in Lime Hill area

The area south of the confluence of the Grande Ronde and Snake rivers harbors a number of rare plant species and has a variety of ecosystem types (canyon grasslands and shrublands) that are in good ecological condition. None of these features is currently represented within the statewide system of natural areas.

DNR PHOTO

KARL URBAN

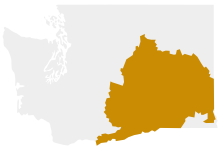
Top: Pataha Bunchgrass RNA, one of the only two established natural areas in the ecoregion.
Below: Sabin's lupine, a rare species endemic to the Blue Mountains

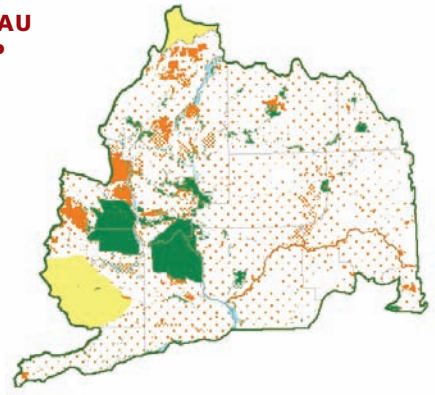
Columbia Plateau Ecoregion

The Columbia Plateau ecoregion includes the area in eastern Washington bounded by the Cascade, Okanogan, Blue and Rocky Mountains. It extends south in eastern Oregon to the Nevada border and then east to the Snake River Plain in Idaho. Approximately one-third of Washington is in this ecoregion. More than 50 percent of the Washington portion of this ecoregion has been developed for agricultural or urban use (Washington GAP, 1997). Agriculture consists of a mixture of dryland and irrigated farming. Urban development is mostly associated with proximity to water.

COLUMBIA PLATEAU LAND OWNERSHIP

- Federal
- State
- Tribal
- Private





CLIMATE

- The hottest and driest ecoregion in Washington, it lies in the Cascade Mountains rain shadow.
- Precipitation increases west to east from about 6 inches annually along the Columbia River's Hanford Reach to 25 inches in the Palouse Hills, with most of the ecoregion between 8 and 14 inches.
- Periodic drought and fire are common environmental features, with fires historically occurring at intervals of 10 to 50 years.

PHYSIOGRAPHY

- Columbia River basalt is the primary, almost exclusive, bedrock within the ecoregion.
- Windblown silts and volcanic ash cover extensive areas, forming rolling, deep, productive soils.
- Ice-age floods carved deep canyons and coulees through the basalt, scouring some areas of soils and vegetation and leaving exposed basalt.
- Dominant landforms include the Palouse Hills, Channeled Scablands, Yakima Fold Hills, Pasco Basin, Crab Creek, and the Frenchman Hills.
- Elevations range from 160 feet above sea level along the Columbia River in the southwestern corner to nearly 4,000 feet above sea level on isolated hills (Badger and Tekoa mountains).

BIOTA

- Dominated by shrub-steppe vegetation, with various species of sagebrush and bunchgrasses. Much of the remaining native vegetation occurs on steep canyon sides and on the shallower soils of basalt scablands.
- Bitterbrush and three-tip sagebrush steppe appear along the foothills of the Cascades.
- Douglas-fir – ponderosa pine forests occur on the moister sites near the foothills of surrounding mountains.
- Special habitats include sand dunes, gravelly areas, basalt cliffs, steep canyons, alkali lakes and vernal pools.
- Many grassland and shrub-steppe species are declining, with isolation and fragmentation of intact habitat as a primary factor and non-native, weedy plant species as an additional factor; weeds are a persistent and increasing feature of the limited semi-natural and natural landscape.

BIODIVERSITY HIGHLIGHTS

- **Rich endemic flora**
- **Many native annual Great Basin plant species**
- **Several shrub-steppe dependent bird species**

MAJOR LANDOWNERS

- **Bureau of Land Management**
- **US Fish and Wildlife Service**
- **US Department of Defense**
- **DNR**
- **WDFW**
- **Tribes**

DOMINANT LAND USES

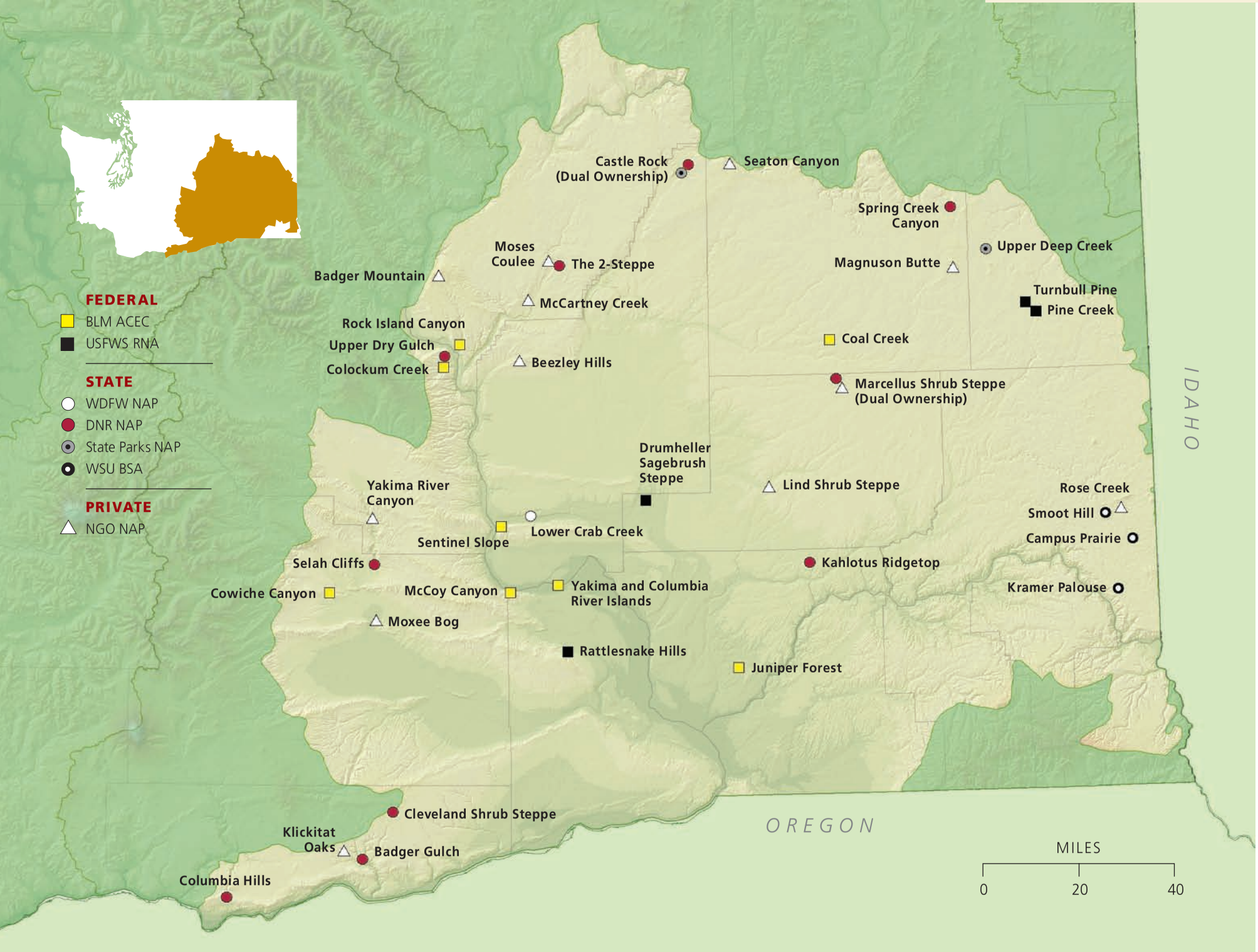
- **Agriculture**
- **Livestock grazing**
- **Outdoor recreation / conservation**
- **Military training**

PRINCIPAL RISKS TO BIODIVERSITY

- **Continued conversion of shrub-steppe to agriculture**
- **Increasing development; isolation of areas with native biodiversity**
- **Invasive species**
- **Excessive grazing**
- **Development of alternative energy sources**
- **Development of increased water storage capacity**

CONSERVATION NEEDS

- **Invasive species control in shrub-steppe and grasslands**
- **Protection and restoration of Palouse Prairie remnants**
- **Coordinated recovery planning for pygmy rabbit, sage grouse, sharptail grouse, shrub-steppe birds, and salmonid species**
- **Conservation planning for sand dunes and vernal pools**
- **Better knowledge of aquatic and terrestrial invertebrates**
- **Creating corridors between shrub-steppe remnants**



Columbia Plateau Ecoregion

Upper Dry Gulch Natural Area Preserve

DNR PHOTO

Natural Heritage, Natural Areas, and Special Lands Acquisition priority projects and activities for the 2007-2009 biennium are identified below, along with conservation actions undertaken during the 2005-2007 biennium. These are not exhaustive lists; they are meant to provide the reader with an overview of the type and scope of projects being undertaken. A few projects have been highlighted, while others have simply been listed.

05 THROUGH 07
Conservation Actions

Upper Dry Gulch NAP expansion approved by Natural Heritage Advisory Council

An expansion of the NAP was proposed to increase the protection for Whited's milkvetch, a species whose worldwide range is limited to less than 10 square miles in Chelan County.

State lands shrub–steppe inventory

NHP scientists began an inventory of DNR-managed lands, focusing on shrub-steppe ecosystems. Knowing the ecological values of the scattered parcels is a first step in making ecologically sound conservation decisions.

Identifying the conservation status of the Striped Whipsnake

Innovative inventory and tracking methods were developed to get a better understanding of the distribution and habitat requirements of this rare snake (*Masticophis taeniatus*).

Pygmy Rabbit recovery efforts

Conducted inventories and represented DNR on the recovery team

Sand dune ecosystems assessment

Conducted inventories, developed preliminary vegetation classification, began overall conservation assessment, and completed report for the BLM.

Rare plant monitoring

Monitored several of Washington's rarest plants, including Umtanum desert buckwheat (*Eriogonum codium*), northern wormwood (*Artemisia campestris* var. *wormskioldii*), obscure buttercup (*Ranunculus reconditus*) and Whited's milkvetch (*Astragalus sinuatus*).

07 THROUGH 09
Priority Projects/Activities

Shrub-steppe conservation on DNR-managed lands

The ecoregion's high natural diversity is at risk as a result of development, conversion, and changing land use patterns. Natural Heritage is conducting inventory work throughout the shrub-steppe to provide land managers with objective information regarding the ecological value of the lands.

Sand dune ecosystems conservation recommendations

Dune ecosystems in eastern Washington have been stabilized, converted to agriculture, and used for recreation. NHP scientists have been cataloging the biodiversity values present in these ecosystems and will develop specific conservation proposals during the 2007-2009 biennium, including the possible creation of a natural area.

Interpretive trail at Selah Cliffs NAP

Planning is complete for an interpretive trail that will provide public access and an opportunity to learn more about the natural history of the area. The trail, signs and additional acquisitions are being funded by the Washington Wildlife and Recreation Program.

Additional projects

- Rare plant conservation recommendations for Palouse and canyon grassland species
- Pursue expansion of Upper Dry Gulch NAP
- Conduct numerous rare plant inventory and monitoring projects (in partnership primarily with the U.S. Fish and Wildlife Service)

DNR PHOTOS

Top: Selah Cliffs Natural Area Preserve.
Below: The Striped Whipsnake has been a target of NHP's inventory and conservation planning efforts.

Munro's Globemallow

APPENDIX I

Assigning Priorities to Species and Ecosystems

HOW ARE PRIORITIES ASSIGNED TO SPECIES?

As noted in Part III, the primary tool used to develop overall conservation priorities for species and ecosystems is the global and state ranking system. This same ranking system is the starting point for assigning priorities to species and ecosystems for inclusion within the statewide system of natural areas. The table on page 20 illustrates the possible combinations of global and state ranks. This matrix is used as the framework for assigning priorities, as indicated by the color-shaded blocks within the matrix. It is important to note that the matrix is used as a guideline only. A number of factors are considered for each species prior to final assignment of a priority. These factors are used to either elevate or lower the priority of individual species. Factors include:

- Is the species suspected of being more widespread than the data indicate?
- Does the distribution pattern (local endemic, peripheral, disjunct, isolated populations, etc.) convey more or less concern?
- Are demographic issues (small populations, declining populations, poor reproduction, etc.) significant?
- Are habitat issues (habitat declining, dependence on natural disturbance, habitat restricted but not threatened, etc.) significant?

PRIORITY 1

These species are in danger of extinction across their range, including Washington. Their populations are critically low or their habitats are significantly degraded or reduced.

PRIORITY 2

These species may become endangered across their range or in Washington if factors contributing to their decline or habitat loss continue.

PRIORITY 3

These species are vulnerable or declining and could become endangered or threatened throughout their range without active management or removal of threats to their existence.

The priorities for all species of conservation concern are available online. Visit http://www.dnr.wa.gov and search for the Natural Heritage Program web page.

APPENDIX I ASSIGNING PRIORITIES TO SPECIES AND ECOSYSTEMS

HOW ARE PRIORITIES ASSIGNED TO ECOSYSTEMS?

As with rare species, the starting point for assigning a priority to each ecosystem for its inclusion within the statewide natural areas system is its global and state rank. Such ranks have been assigned to all terrestrial ecosystems and some of the wetland and aquatic ecosystems. Marine ecosystems have not as yet been assigned global or state ranks. However, there is not a straightforward correlation between global and state rank and Plan priority, as there is with species. Ecosystem priorities for the Plan are based on three criteria:

- How adequately the ecosystem type is represented in the natural areas system,
- Rarity of the ecosystem type, and
- Degree of threat to the ecosystem type

The task of adequately conserving all ecosystems in Washington is considerably greater than getting representation of all ecosystems in the natural areas system. That is, representation is a more immediate, and achievable, goal than is conservation.

And, as stated elsewhere in this plan, achieving conservation of all of our native ecosystems (and species) will require use of all available conservation tools. Natural areas are meant to provide protection for the best quality representative examples. Not only do these examples contribute to conservation, but they are meant to provide baseline reference sites to be used to help guide management and restoration of other areas.

The priorities for all ecosystem types are available online. Visit http://www.dnr.wa.gov and search for the Natural Heritage Program web page.

Adequacy of Representation

Determining how adequately an ecosystem type is represented in the natural areas system involves a complex analysis. The occurrences of each ecosystem type that are protected within natural areas are analyzed from three perspectives:

1. Ecological quality Does the ecosystem occur in an essentially natural condition?

2. Diversity How much of the ecosystem's range of natural variation is already represented in the natural area system? For example, the big sagebrush/bluebunch wheatgrass community incorporates a wide range of variation in species composition and environmental parameters. The occurrence of this ecosystem at the Rattlesnake Hills RNA represents a dry, southern version of the community that differs in many ways from occurrences further north in less dry climates.

3. Ecological viability Do the size, shape, boundary conditions, location and biological properties of the ecosystem within the protected area ensure its persistence? For an ecosystem to be considered adequately represented, there must be occurrences within the natural areas system that are viable, relatively natural in their condition, and which represent the range of natural variation of that ecosystem type.

Rarity of Ecosystem Type

The determination of rarity is derived from analysis of information contained in the Natural Heritage Information System. It is determined by assessing the ecosystem's geographic distribution, the relative degree of loss or degradation since pre-settlement times, and the number of verified, high-quality occurrences remaining in the state and, in some cases, adjoining states and British Columbia.

Degree of Threat

Threat is defined by the known or anticipated activities that are degrading or destroying the ecosystem within Washington, the rate at which these are occurring, the ecosystem's ecological fragility, and the ecosystem's remaining undisturbed habitat. Threats may be lessened by protection policies or management activities on public lands that are not part of the natural areas system, e.g., parks, wildlife areas, etc.

APPENDIX I ASSIGNING PRIORITIES TO SPECIES AND ECOSYSTEMS

Using the guidelines listed, all terrestrial, wetland and aquatic ecosystem types are assigned one of the following representation priority rankings:

REPRESENTATION PRIORITY 1

These ecosystems usually have little or no representation in the natural areas system, little or no representation on other public lands, and appear to be in the greatest jeopardy of being destroyed or degraded. These ecosystems have often been greatly reduced in their extent and typically have very few known occurrences in their natural condition.

REPRESENTATION PRIORITY 2

These ecosystems are intermediate in priority. Typically, they involve one of the two following situations: rare or highly threatened (similar in this respect to Representation Priority 1) that have some existing, but not fully adequate, representation in the natural areas system; or ecosystems with an intermediate degree of threat and rarity that have little or no representation in the system. Ecosystems with an intermediate degree of rarity generally have few occurrences in a natural condition.

REPRESENTATION PRIORITY 3

These ecosystems are of lower priority, generally because they are not in immediate jeopardy of being eliminated or degraded in the state, but are not yet adequately represented in the natural areas system. These ecosystems are typically not rare or threatened. They are often protected de facto on other public lands (especially national parks and wilderness areas), but are not represented in the natural areas system. This category also includes ecosystems that are in intermediate danger of being extirpated (like Representation Priority 2) and have some significant, but not fully adequate, representation in the natural areas system.

REPRESENTATION PRIORITY *

These ecosystems are no longer a priority for inclusion in the natural areas system because of existing adequate representation in the system. These may include rare or threatened ecosystems, if natural areas have been established that represent the range of variation for that ecosystem in relatively natural, viable conditions. For example, Coastal spit with native vegetation is adequately represented in the preserve system with three occurrences, but remains a very rare ecosystem that merits consideration for other types of conservation activity on the remaining occurrences outside the natural areas system.

REPRESENTATION PRIORITY +

These priority ecosystems occur within proposed natural areas. Once these areas are formally designated, the ecosystems will be considered adequately represented in the natural areas system. These ecosystems represent varying levels of rarity or threat and will be Representation Priority * once the proposed natural areas are established.

Taylor's stickseed, endemic to the Wenatchee Mountains

DNR PHOTO

APPENDIX II

Changes in Species and Ecosystems Priorities 2007-2009

A number of changes to the lists of priority species and ecosystems have been made for the 2007-2009 biennium. The changes include addition of new elements, changes to the priority of individual elements (either being elevated or downgraded), and the removal of elements from the list of priorities. The changes are the result of new information gained through inventory, monitoring, research, extensive literature review, and communication with other knowledgeable individuals. The table on the right includes a brief description of the reason for each change.

PLANTS

- One species previously thought to be extirpated from Washington was rediscovered
- Twelve species were added to the lists of priority species, including one that was described as a new species in 2006
- Three species were elevated in terms of priority
- Two species were removed from the lists of priority species

ANIMALS

- Seventy species were added to the lists of priority species
- Three species were downgraded in terms of their priority (one of which was removed from the lists of priority species)
- Four species were elevated in terms of priority

ECOSYSTEMS

- Thirteen ecosystems were added to the lists of priority ecosystems (mostly as a result of new ecosystems classification efforts)
- One ecosystem was downgraded in terms of priority

Changes in Plant Species Priorities 2007-2009

07 THROUGH 09

PLANT SPECIES	2005 NH PLAN PRIORITY	2007 NH PLAN PRIORITY	REASON FOR CHANGE
pink sandverbena (*Abronia umbellata* var. *breviflora*, formerly *A. umbellata* ssp. *acutalata*)	Possibly Extirpated	Priority 1	Rediscovered in Washington in 2006. The name change is based on an increased understanding of variation within the species.
Asotin milkvetch (*Astragalus asotinensis*)	No Priority	Priority 2	Described as a new species in 2006.
blackened sedge (*Carex epapillosa*)	No Priority	Priority 3	Only known in Washington from a limited number of occurrences.
bronze sedge (*Carex foenea*)	Priority 2	No Priority	Occurrence of quill sedge (see below) previously misidentified as bronze sedge, which apparently does not occur in Washington.
quill sedge (*Carex tenera* var. *tenera*)	No Priority	Priority 2	Only one occurrence of this species known from Washington.
paintbrush species (*Castilleja* species novum)	No Priority	Priority 1	Newly discovered species currently being described.
Pacific lanceleaved springbeauty (*Claytonia multiscapa* subsp. *pacifica*, formerly *C. lanceolata* var. *pacifica*)	No Priority	Priority 2	Only known in Washington from two recent occurrences. Name change based on taxonomic revision.
long-bract frog orchid (*Coeloglossum viride*, formerly *Habenaria viridis* var. *bracteata*)	No Priority	Priority 2	Only known in Washington from two small occurrences. Name change based on taxonomic revision
tall bitter fleabane (*Erigeron elatus*, formerly *Trimorpha elata*)	Priority 3	Priority 1	Only known in Washington from two occurrences. Name change based on taxonomic revision.
Taylor's stickseed (*Hackelia* species novum)	No Priority	Priority 2	Very narrow endemic species, known from four occurrences, currently being described.
floating water pennywort (*Hydrocotyle ranunculoides*)	Priority 3	No Priority	More abundant in Washington than previously thought.

Changes in Plant Species Priorities 2007-2009

07 THROUGH 09

PLANT SPECIES	2005 NH PLAN PRIORITY	2007 NH PLAN PRIORITY	REASON FOR CHANGE
Sandberg's desert-parsley (*Lomatium sandbergii*)	No Priority	Priority 2	Only known in Washington from one occurrence.
California sword-fern (*Polystichum californicum*)	Priority 3	Priority 2	Only two small occurrences known in Washington.
sticky goldenweed (*Pyrrocoma hirta*)	No Priority	Priority 3	Only known in Washington from two occurrences. Name change based on taxonomic revision.
Idaho gooseberry (*Ribes oxyacanthoides* ssp. *irriguum*)	Priority 3	Priority 2	Known in Washington from six occurrences.
Oregon white-top aster (*Sericocarpus oregonensis* ssp. *oregonensis*, formerly *Aster oregonensis*)	No Priority	Priority 2	Only known in Washington from two occurrences. Name change based on taxonomic revision
subalpine spiraea (*Spiraea splendens*, formerly *S. densiflora* var. *splendens*)	No Priority	Priority 3	Taxonomic questions have been resolved; eleven occurrences are known from Washington.
narrow-leaf mule's ear (*Wyethia angustifolia*)	No Priority	Priority 3	Very few occurrences have been reported in Washington.

DNR PHOTO

Narrow-leaf mule's-ear, a plant of the Puget lowlands.

Changes in Animal Species Priorities 2007-2009

07 THROUGH 09

ANIMAL SPECIES	2005 NH PLAN PRIORITY	2007 NH PLAN PRIORITY	REASON FOR CHANGE
Pacific Vertigo (*Vertigo andrusiana*)	No Priority	Priority 1	Comprehensive review of mollusc information was completed during the 2005-2007 biennium.
Hoko Vertigo (*Vertigo* sp. 1)	No Priority	Priority 1	
Crowned Tightcoil (*Pristiloma pilsbryi*)	No Priority	Priority 1	
Evening fieldslug (*Deroceras hesperium*)	No Priority	Priority 1	
Columbia Oregonian (*Cryptomastix hendersoni*)	No Priority	Priority 1	
Hell's Canyon Oregonian (*Cryptomastix* sp. 7)	No Priority	Priority 1	
Dalles Hesperian (*Vespericola depressa*)	No Priority	Priority 1	
Oregon Megomphid (*Megomphix hemphilli*)	No Priority	Priority 1	
Umatilla Megomphid (*Megomphix lutarius*)	No Priority	Priority 1	
Humped Coin (*Polygyrella polygyrella*)	No Priority	Priority 1	
Limestone Point Mountainsnail (*Oreohelix* sp. 18)	No Priority	Priority 1	
Dalles Sideband (*Monadenia fidelis minor*)	No Priority	Priority 1	
Rams-horn Valvata (*Valvata mergella*)	No Priority	Priority 1	
Washington Duskysnail (*Amnicola* sp. 2)	No Priority	Priority 1	
Columbia Duskysnail (*Amnicola* sp. 4)	No Priority	Priority 1	
Masked Duskysnail (*Lyogyrus* sp. 2)	No Priority	Priority 1	
Basalt Juga (*Juga* sp. 1)	No Priority	Priority 1	
Brown Juga (*Juga* sp. 3)	No Priority	Priority 1	
Three-band Juga (*Juga* sp. 7)	No Priority	Priority 1	
Nerite Rams-horn (*Vorticifex neritoides*)	No Priority	Priority 1	
Shortface Lanx (*Fisherola nuttalli*)	Priority 1	Priority 2	

Changes in Animal Species Priorities 2007-2009

07 THROUGH 09

ANIMAL SPECIES	2005 NH PLAN PRIORITY	2007 NH PLAN PRIORITY	REASON FOR CHANGE
Magnum Mantleslug (*Magnipelta mycophaga*)	No Priority	Priority 2	Comprehensive review of mollusc information was completed during the 2005-2007 biennium.
Blue-gray Taildropper (*Prophysaon coeruleum*)	No Priority	Priority 2	
Dry Land Forestsnail (*Allogona ptychophora solida*)	No Priority	Priority 2	
Poplar Oregonian (*Cryptomastix populi*)	No Priority	Priority 2	
Disc Oregonian (*Cryptomastix* sp. 3)	No Priority	Priority 2	
Hells Canyon Mountainsnail (*Oreohelix* sp. 29)	No Priority	Priority 2	
Chelan Mountainsnail (*Oreohelix* sp. 1)	No Priority	Priority 2	
Olympia Pebblesnail (*Fluminicola virens*)	No Priority	Priority 2	
Dalles Juga (*Juga hemphilli dallesensis*)	No Priority	Priority 2	
Barren Juga (*Juga hemphilli hemphilli*)	No Priority	Priority 2	
A freshwater snail (*Fossaria perplexa*)	No Priority	Priority 2	
Salmon Coil (*Helicodiscus salmonaceus*)	No Priority	Priority 3	
Keeled Jumping-slug (*Hemphillia burringtoni*)	No Priority	Priority 3	
Thinlip Tightcoil (*Pristiloma idahoense*)	No Priority	Priority 3	
Broadwhorl Tightcoil (*Pristiloma johnsoni*)	No Priority	Priority 3	
Shiny Tightcoil (*Pristiloma wascoense*)	No Priority	Priority 3	
Puget Oregonian (*Cryptomastix devia*)	No Priority	Priority 3	
Pristine Springsnail (*Pristinicola hemphilli*)	No Priority	Priority 3	
Pacific Clubtail (*Gomphus kurilis*)	No Priority	Priority 1	Comprehensive review of dragonfly information was completed during the 2005-2007 biennium.
Whitehouse's Emerald (*Somatochlora whitehousei*)	No Priority	Priority 1	

Changes in Animal Species Priorities 2007-2009

07 THROUGH 09

ANIMAL SPECIES	2005 NH PLAN PRIORITY	2007 NH PLAN PRIORITY	REASON FOR CHANGE
White-belted Ringtail (*Erpetogomphus compositus*)	No Priority	Priority 2	Comprehensive review of dragonfly information was completed during the 2005-2007 biennium.
Subarctic Darner (*Aeshna subarctica*)	No Priority	Priority 2	
Boreal Whiteface (*Leucorrhinia borealis*)	No Priority	Priority 2	
Subarctic Bluet (*Coenagrion interrogatum*)	No Priority	Priority 2	
Northern Spotted Owl (*Strix occidentalis caurina*)	Priority 2	Priority 1	Continuing population decline.
Ferruginous Hawk (*Buteo regalis*)	Priority 3	Priority 2	
Burrowing Owl (*Athene cunicularia*)	Priority 3	Priority 2	
Gray Wolf (*Canis lupus*)	No Priority	Priority 1	Additional review of the species' conservation status was completed during the 2005-2007 biennium.
Sand-verbena Moth (*Copablepharon fuscum*)	No Priority	Priority 2	
Hoary Elfin (*Callophrys polios maritime*)	No Priority	Priority 2	
Harlequin Duck (*Histrionicus histrionicus*)	No Priority	Priority 3	
Arctic Tern (*Sterna paradisaea*)	No Priority	Priority 3	
Great Gray Owl (*Strix nebulosa*)	No Priority	Priority 3	
Acorn Woodpecker (*Melanerpes formicivorus*)	No Priority	Priority 3	
Green-tailed Towhee (*Pipilo chlorurus*)	No Priority	Priority 3	
Lesser Goldfinch (*Carduelis psaltria*)	No Priority	Priority 3	
Pink Salmon (*Oncorhynchus gorbuscha*)	No Priority	Priority 3	
Pygmy Whitefish (*Prosopium coulteri*)	No Priority	Priority 3	
Nooksack Dace (*Rhinichthys* sp. 4)	No Priority	Priority 3	

Changes in Animal Species Priorities 2007-2009

07 THROUGH 09

ANIMAL SPECIES	2005 NH PLAN PRIORITY	2007 NH PLAN PRIORITY	REASON FOR CHANGE
Umatilla Dace (*Rhinichthys Umatilla*)	No Priority	Priority 3	Additional review of the species' conservation status was completed during the 2005-2007 biennium.
Kincaid Meadow Vole (*Microtus pennsylvanicus kincaidi*)	No Priority	Priority 3	
Gray-tailed Vole (*Microtus canicaudus*)	No Priority	Priority 3	
Lustrous Copper (*Lycaena cupreus*)	No Priority	Priority 3	
Island Checkerspot (*Euphydryas chalcedona perdiccas*)	No Priority	Priority 3	
Ringlet (*Coenonympha tullia eunomia*)	No Priority	Priority 3	
Valerata Arctic (*Oeneis chryxus valerata*)	No Priority	Priority 3	
Eared Grebe (*Podiceps nigricollis*)	No Priority	Priority 3	
Clark's Grebe (*Aechmophorus clarkia*)	No Priority	Priority 3	
Brandt's Cormorant (*Phalacrocorax penicillatus*)	No Priority	Priority 3	
Mountain Quail (*Oreortyx pictus*)	No Priority	Priority 3	
Sharp-tailed Grouse (*Tympanuchus phasianellus*)	Priority 2	Priority 1	Less common and more threatened than previously thought.
Dun Skipper (*Euphyes vestris vestries*)	Priority 2	Priority 3	More common and/or less threatened than previously thought.
Piute Ground Squirrel (*Spermophilus mollis*)	No Priority	Priority 2	New taxon for Washington
Inland Tailed Frog		Priority 2	Newly described taxon.
Palouse Giant Earthworm (*Megascolides americanus*)	No Priority	Priority 1	Species was recently rediscovered in Washington.
Barren Juga (*Juga hemphilli*)	Priority 1	No Priority	Both subspecies are prioritized individually

Changes in Ecosystems Priorities 2007-2009

07 THROUGH 09

ECOSYSTEMS	2005 NH PLAN PRIORITY	2007 NH PLAN PRIORITY	REASON FOR CHANGE
western hemlock / dwarf Oregongrape—salal	No Priority	Priority 3 in Puget Trough, North Cascades, West Cascades and Northwest Coast	Newly defined element as a result of revised ecosystems classification
North Pacific herbaceous bald and bluff	No Priority	Priority 1 in Northwest Coast; Priority 2 in Puget Trough and West Cascades	
western hemlock / salal	No Priority	Priority 3 in Northwest Coast and West Cascades	
Douglas-fir—western hemlock / oceanspray / swordfern	No Priority	Priority 2 in Puget Trough	
Douglas-fir / oceanspray	No Priority	* Adequately protected in West Cascades; Priority 1 in East Cascades	
grand fir / pinegrass	No Priority	Priority 1 in Columbia Plateau; Priority 2 in East Cascades and Blue Mtns.	
Oregon white oak / bluebunch wheatgrass	No Priority	Priority 1 in Columbia Plateau; Priority 2 in East Cascades	
ponderosa pine / pinegrass	No Priority	Priority 1 in Okanogan; Priority 2 in Blue Mtns. and Columbia Plateau	
subalpine fir / glandular Labrador-tea	No Priority	Priority 1 in Okanogan	
bluebunch wheatgrass—Idaho fescue canyon	No Priority	Priority 2 in Blue Mtns. and Columbia Plateau	
bluebunch wheatgrass — Sandberg's bluegrass lithosol	No Priority	Priority 2 in Blue Mtns. and Columbia Plateau	
mid-elevation sphagnum bog	No Priority	Priority 2 in Canadian Rockies	Newly recognized element in Canadian Rockies; represented within protected area
subapline fir / Cascade azalea	No Priority	Priority 3 in Canadian Rockies	
Douglas-fir—Pacific madrone / hairy honeysuckle	Priority 1	Priority 2 in Puget Trough	Represented within two protected areas

Acronyms

ACEC Area of Critical Environmental Concern

BLM U.S.D.I. Bureau of Land Management

BSA Biological Study Area

CAMP Classification and Management Planning

CUH Center for Urban Horticulture (College of Forest Resources, U. of Washington)

DNR Washington State Department of Natural Resources

EPA Environmental Protection Agency

IBA Important Bird Area

LTA Land Trust Alliance

NAP Natural Area Preserve

NHAC Natural Heritage Advisory Council

NHP Natural Heritage Program

NPS National Park Service

NRCA Natural Resources Conservation Area

RCW Revised Code of Washington

RNA Research Natural Area

TLT Trust Land Transfer

TNC The Nature Conservancy

USDOD U.S. Department of Defense

USFS U.S. Forest Service

USFWS U.S. Fish and Wildlife Service

USGS U.S. Geological Survey

UW University of Washington

WDFW Washington Department of Fish and Wildlife

USW Washington State University

WWRP Washington WIldlife and Recreation Program

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Doug Sutherland - Commissioner of Public Lands

1111 WASHINGTON ST SE
PO BOX 47014
OLYMPIA WA 98504-7014

www.dnr.wa.gov