



NORTHWEST FOREST PLAN

THE FIRST 10 YEARS (1994–2003)

First-Decade Results of the Northwest Forest Plan



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Agency Names and Acronyms

USDA Forest Service (FS)

USDA Natural Resources Conservation Service (NRCS)

USDC National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries)

USDI Bureau of Land Management (BLM)

USDI Fish and Wildlife Service (USFWS)

Acronyms

AMA	Adaptive management area
BBF	Billion board feet
EIS	Environmental impact statement
ESU	Evolutionarily significant unit
FEMAT	Forest Ecosystem Management Assessment Team
LSR	Late-successional reserve
MBF	Thousand board feet
MMBF	Million board feet
PAC	Provincial advisory committee
RAC	Resource advisory committee
REO	Regional Ecosystem Office
RIEC	Regional Interagency Executive Committee
ROD	Record of decision
S&G	Standards and guidelines from the Northwest Forest Plan

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Northwest Forest Plan—
The First 10 Years (1994–2003):
**First-Decade Results of the
Northwest Forest Plan**

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Abstract

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The Northwest Forest Plan (the Plan) was developed in 1994 to resolve debates over old-growth forests and endangered species on federal forests in the range of the northern spotted owl. In 2005, federal agencies reviewed the first 10 years under the Plan to learn what worked and what did not, what changed, and what new information or surprises might influence these forests in the future. I highlight the monitoring results and new science from that review. Following are some of the key findings. Nearly all existing older forest habitat on federal land was protected from timber harvest. Older forest on federal land had a net increase of over 1 million acres in the first 10 years of the Plan. Despite protection of northern spotted owl habitat on federal land, spotted owl populations declined at a greater rate than expected in the northern half of their range, likely because of barred owl competition, climate, and the changing condition of historical habitat. Watershed condition improved slightly, because of reduced harvest in riparian areas, tree growth, and increased emphasis on restoration. Federal timber harvest in the Plan area averaged only 54 percent of Plan goals. In spite of mitigation measures, some local communities near federal lands had job losses and other adverse effects. State, federal, and tribal governments worked together on forest issues better than they ever had before. Increased collaboration with communities changed how the agencies get work done.

Keywords: Northwest Forest Plan, northern spotted owl, old growth, forest policy, biodiversity.



Dave Azuma

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Overview of the 10-Year Review

IN 2005, FEDERAL AGENCIES reviewed the first 10 years under the Northwest Forest Plan (the Plan) to learn what worked and what did not, what changed, and what new information or surprises might influence these forests in the future. Key findings and monitoring results from the 10-year review are published in a series of Pacific Northwest (PNW) Research Station general technical reports, which are available on the CD-ROM bound in this publication. The major publications are listed in “For Further Reading.” This publication provides highlights of the series.

Adaptive management is a vital part of the Plan’s approach.

The review was done after only one-tenth of the 100-year timeframe of the Plan, meaning that no final conclusions

could be drawn about the Plan. Outcomes depend on slow natural processes such as trees growing and streams recovering. Full accomplishment of the Plan’s outcomes will take the full 100 years or more. Success or failure of the Plan’s conservation strategies is influenced by the management of private, state, and tribal lands that cover more than half of the range of the northern spotted owl.

Adaptive management—learning while managing, through deliberate testing, monitoring, and change—is a vital part of the Plan’s approach. This review is part of an adaptive approach and asks “What have we learned so far toward modifying the Plan if needed?” Ten years of experience, monitoring data, and new science complete the first full cycle of adaptive management as envisioned in the Plan.



At the 10-year review conference in 2005, people from outside federal agencies spoke about their insights and recommendations for moving ahead in the next 10 years.



Tom Iraci

Northern spotted owl.

Two themes emerged: uncertainty and complexity.

Two themes emerged: uncertainty and complexity. Scientific research over the decade showed that ecosystems were highly dynamic with important implications for management to a degree not recognized in the Plan. Fire regimes and other disturbance patterns such as insect outbreaks have wide variations across the Plan area. Environmental changes such as invasive species and climate change seem more significant than in 1994 when little was known yet about these factors. Also, changes in society such as rapid population growth and changes in the timber

industry affected communities in the Plan area, making it difficult to separate Plan effects from other influences.

The Plan had called for a comprehensive monitoring program to evaluate the Plan's success in conserving old forests and related species, improving watershed conditions, generating forest products, and assisting rural, timber-dependent communities. Once the Plan went into effect in 1994, the Regional Interagency Executive Committee (RIEC) and Regional Ecosystem Office (REO), which were responsible for implementation, also directed the development of the monitoring program that is the major source of information for this review. ■



Development of the Northwest Forest Plan

IN THE 1980S, PUBLIC CONTROVERSY intensified over timber harvest in old-growth forests; declining numbers of spotted owls, marbled murrelets, and some Pacific salmon runs; and the role of federal forests in regional and local economies. The northern spotted owl was listed as a threatened species in 1990. Lawsuits over federal timber sales led to the 1991 injunction issued by federal district judge William Dwyer that shut down the federal timber sale program on nine national forests.

President Clinton convened a forest conference in Portland, Oregon, on April 2, 1993, with representatives from all sides of the issues. He concluded the summit with directions to the federal land management and regulatory agencies to work together on a plan that protected both the ecological health of the forests and the socioeconomic benefits of a thriving timber industry. The 1-day conference led to far-reaching changes in the management of millions of acres of federal forests. These changes, in

1980s	1990	1991	1992	1993	1994	1995	1996	1997	1998
Late 1980s to early 1990s: Series of lawsuits challenging federal forest management in the Pacific Northwest				April 2: Forest conference, Portland, Oregon	April 13: Record of decision (ROD) signed	Regional Interagency Executive Committee (RIEC) approves effectiveness monitoring program and initial protocols for implementation monitoring	Provincial Advisory Committees begin implementation monitoring		
	Northern spotted owl listed as threatened species	Injunction shutting down federal timber sale program in nine national forests, issued by Federal District Judge William Dwyer	Marbled murrelet listed as threatened species	July: Forest Ecosystem Management Assessment Team report	Plan implementation begins				
		1991–1992: Three Snake River salmon stocks listed as threatened and endangered species		National Environmental Policy Act analysis is done	USDC National Oceanic and Atmospheric Administration (NOAA) Fisheries begins status reviews for all wild Pacific salmon and anadromous trout evolutionarily significant units (ESUs) in California, Idaho, Oregon, and Washington				1996–1998: NOAA Fisheries lists five additional anadromous fish ESUs as threatened and endangered species

turn, had ripple effects beyond the region, as others watched the unprecedented attempt at a broad, regional strategy that was a “Forest Plan for a Sustainable Economy and a Sustainable Environment.” ■



In the Pacific Northwest and northern California, timber harvests from federal forests dropped sharply in the early 1990s as public controversy and evolving policies changed management. The 1993 forest plan conference brought all parties together to find solutions.

1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
1998–2004: RIEC approves monitoring protocols for old-growth forests, northern spotted owls, marbled murrelets, tribal issues, watershed condition						April 19–20: Presentation of results from review of the Plan’s first 10 years (1994–2003)	October 2005 to July 2006: Publication of detailed reports from 10-year review of the Plan	New ROD (based on final supplemental EIS) removes and modifies the survey and manage mitigation measure standards and guides and responds to deficiencies identified by the Ninth Circuit Court.	
NOAA Fisheries lists 15 additional anadromous fish ESUs as threatened and endangered species	New environmental impact statement (EIS) and ROD revise the survey and manage program		2001–2003: As a result of new data and species reviews, 108 species dropped from survey and manage program			New ROD (based on new supplemental EIS) drops survey and manage program and moves 152 of the 296 remaining survey and manage species to sensitive/special status species programs	Court injunction on the 2004 ROD reinstates 2001 Survey and Manage ROD with 2001–2003 Annual Species Review modifications.		



Description of the Northwest Forest Plan

THE PLAN PROVIDES policy direction for about 24 million acres of federal land within the 57-million-acre range of the northern spotted owl and the marbled murrelet in California, Oregon, and Washington (fig. 1). It applies principles from conservation biology, ecological science, and forest science on a very large scale.

The Plan applies principles from conservation biology, ecological science, and forest science on a very large scale.

At the 1993 forest conference, President Clinton gave five principles to guide development of the Plan (right).

At the 1993 forest conference, President Clinton gave five principles to guide development of the Plan (right).

Guiding Principles for the Northwest Forest Plan

- ▶ *Never forget the human and economic dimensions.*
- ▶ *Protect the long-term health of our forests, our wildlife, and our waterways.*
- ▶ *Be scientifically sound, ecologically credible, and legally responsible.*
- ▶ *Produce a predictable and sustainable level of timber sales and nontimber resources.*
- ▶ *Make the federal government work together and work for you.*



Tom Iraci

For decades, the Pacific Northwest timber industry relied on the harvest of valuable old-growth trees. The ecological values of old-growth forests only slowly came to be understood.

Northwest Forest Plan Area

Physiographic provinces

1. Washington Olympic Peninsula
2. Washington Western Lowlands
3. Washington Western Cascades
4. Washington Eastern Cascades
5. Oregon Western Cascades
6. Oregon Eastern Cascades
7. Oregon Coast Range
8. Oregon Willamette Valley
9. Oregon Klamath
10. California Klamath
11. California Coast Range
12. California Cascades

-  Lakes and rivers
-  Urban areas
-  Interstate highway

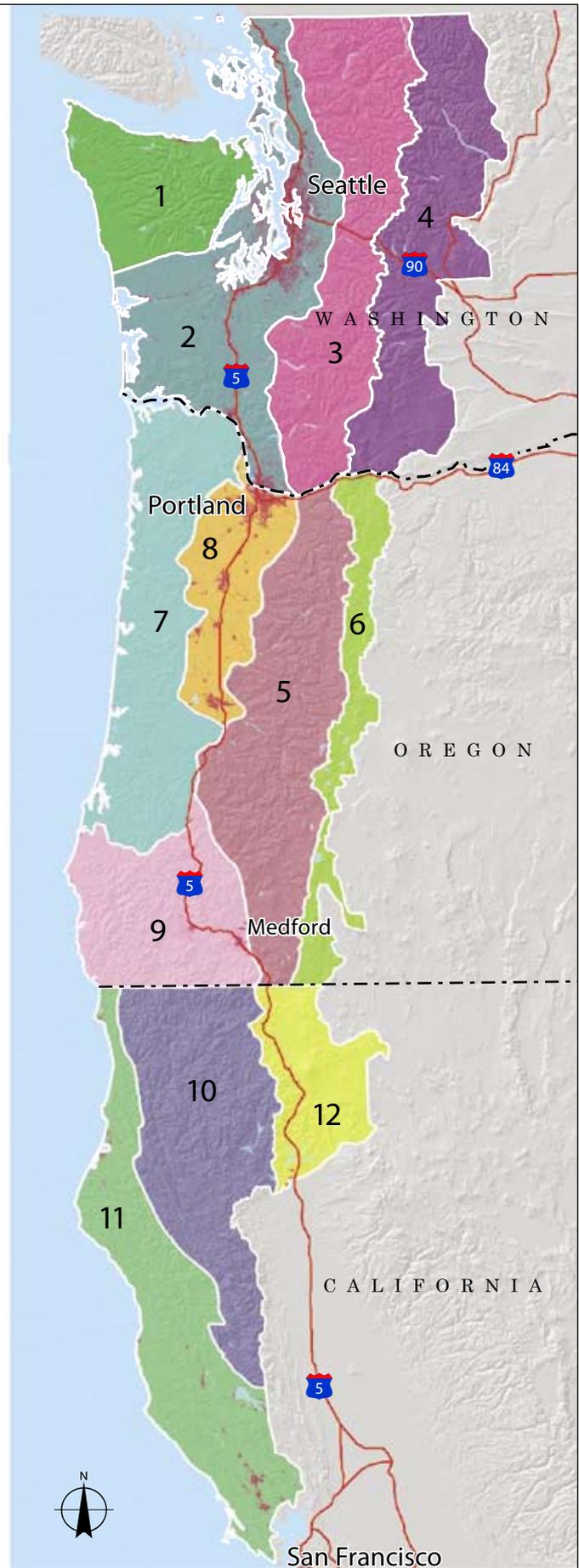
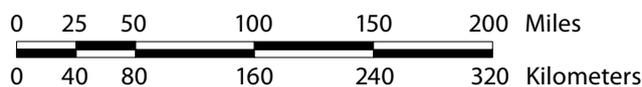


Figure 1—The Plan area has 12 distinct provinces, classified by their differences in climate, vegetation, geology, and landforms. One especially important difference is the fire regime, or characteristic combination of fire frequency, intensity, seasonal timing, and fire size in an ecosystem. Provinces considered to be dry and fire-prone are the Washington Eastern Cascades, Oregon Eastern Cascades, Oregon Klamath, California Klamath, and California Cascades.

The record of decision is the heart of the Plan.

Over the next year, environmental analysis was completed, as required by the National Environmental Policy Act (NEPA) for all federal actions. The 1994 record of decision (ROD) is the official document that legally adopted the Plan and amended existing management plans for 19 national forests and 7 USDI Bureau of Land Management (BLM) districts.

The ROD with its published standards and guidelines is the heart of the Plan. It gave the following purposes:

- ▶ Take an ecosystem management approach to forest management, with support from scientific evidence.
- ▶ Meet the requirements of existing laws and regulations.
- ▶ Maintain a healthy forest ecosystem with habitat that will support



populations of native species (particularly those associated with late-successional and old-growth forests), including protection for riparian areas and waters.

- ▶ Maintain a sustainable supply of timber and other forest products that will help maintain the stability of local and regional economies on a predictable and long-term basis.

The Plan developed a network of connected reserves to conserve the species of concern, given the existing pattern of land ownership and the location of remaining old-growth forests. The Plan's reserve network is embedded in a matrix of "working" forests (see fig. 2 on page 10). The reserve network was designed to maintain late-successional (mature or old-growth) forests in a well-distributed pattern across federal lands, protect stream habitats, and connect old-growth forests with corridors that had old-forest elements. Some designations could overlap, such as wilderness areas and old-forest reserves, or matrix and key watersheds. Other designations could never overlap, such as wilderness (timber harvest prohibited) and matrix (timber harvest allowed). ■

Land Use Designations

- ▶ **Congressionally reserved areas.** Includes national parks and monuments, wildernesses, wild and scenic rivers, national wildlife refuges, Department of Defense lands, and other Congressional designations.
- ▶ **Late-successional reserves (LSRs).** Managed to protect and enhance habitat for late-successional and old-growth-related species including the northern spotted owl. Management actions are allowed to benefit late-successional characteristics or reduce the risk of catastrophic loss.
- ▶ **Managed late-successional areas.** Designated around known spotted owl activity centers in the Washington Eastern Cascades and the California Cascades Provinces. Management actions are allowed to help prevent catastrophic loss to fire, insects, etc.
- ▶ **Riparian reserves.** Areas along all streams, wetlands, ponds, lakes, and unstable and potentially unstable areas managed for aquatic and riparian values.

Matrix. All remaining lands outside reserves and withdrawn areas. Forest lands available for regularly scheduled timber harvests.

Adaptive management areas. Areas designated as places to test new ideas and management approaches. Intended as one way of building learning into the Plan and giving managers the flexibility to adapt the Plan to local circumstances. Available for regularly scheduled timber harvest.

Administratively withdrawn areas.

Lands excluded from scheduled timber harvest. Examples include recreation sites; areas that are visually sensitive, unstable, or have special habitat or sensitive species; or areas where reforestation cannot be ensured.

Key watersheds (tier 1). System of watersheds to be managed to provide high-quality habitat for at-risk salmon and steelhead, bull trout, and resident fish species.

Key watersheds (tier 2). Important sources of high-quality water.



Trained field crews spread out across federal forests in the Plan area and recorded new data on streams, forests, wildlife, and fish. The extensive monitoring data helped managers and scientists understand the dynamics and complexity of these forests and detect trends that were unforeseen in 1994.

Other Designations

Marbled murrelet zone 1. Area close to marine environments associated with most marbled murrelet nesting activity.

Marbled murrelet zone 2. Identifies general inland limits of potential marbled murrelet activity; defined primarily for survey and nest-site protection purposes.

Reserve Network

-  Administratively withdrawn (AW)
-  Congressionally reserved (CR)
-  Late-successional reserve (LSR)*
-  Managed late-successional area (MLSA)
-  Matrix or riparian reserve (MATRR)
-  Adaptive management area (AMA)
-  Not designated

* Includes LSRs associated with marbled murrelet or known owl activity centers. Also includes lands with overlapping LSR and AMA designations.

 Physiographic provinces

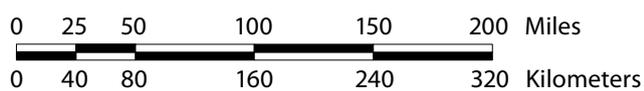


Figure 2—Reserve network of the Northwest Forest Plan.



Summary of Findings From the 10-Year Review

- ▶ Overall, the Plan's conservation strategy and reserve network appear to be working as designed. The conservation of spotted owl habitat may not effectively meet habitat needs for all species that depend on old-forest habitats. Active management within reserves may be needed in both dry and wet forests to restore ecological diversity and reduce potential for losses resulting from severe fires.
- ▶ The total area of medium and large older forests on federal lands in the Plan area gained more than 1 million acres during the 10-year period, almost double the anticipated amount.
- ▶ Spotted owl populations declined about 7.5 percent per year across their northern range and 2 percent per year across their southern range. Declines may have resulted from habitat loss, barred owls, and other factors.
- ▶ The loss of habitat was less than expected, as less timber was harvested and less habitat was lost to wildfire than expected.
- ▶ Marbled murrelet populations showed no change in 4 years (2000–2003), but 4 years is not long enough to test for population trends with confidence. Most marbled murrelet habitat on federal land was conserved, except for losses to fire.
- ▶ For other species associated with older forests, many new sites were discovered and protected. Population trends are yet unknown for most of these species.
- ▶ Watershed conditions improved slightly in the first decade under the Plan, as expected. Improvement resulted in part from less clearcut harvest in riparian areas and growth of the existing trees into larger size classes.
- ▶ Federal timber offered for sale in the Plan area was lower than expected over the past decade, averaging only 54 percent of Plan goals.
- ▶ Effects of the Plan on forest communities differed depending on the strength of the timber sector in 1990, the amount of federal timber supporting it, and the number of federal employees in residence.
- ▶ Some new forms of agency-citizen collaboration occurred. Federal agency-tribal relations improved, although more progress is possible. Relations among federal agencies improved significantly.
- ▶ Change through adaptive management was not achieved to the degree expected. Barriers included different views on what adaptive management is, and a perceived or real lack of flexibility to test strategies that departed from Plan standards and guidelines.
- ▶ Overall, adaptive management was not widely integrated into agency missions.
- ▶ Regional monitoring was well institutionalized. Funding for regional monitoring totaled about \$50 million over 12 years; the single most expensive item was monitoring spotted owls (about \$25 million). ■



Late-Successional and Old-Growth Forests

THE PRECISE DEFINITION of old-growth forests has long been controversial. The 10-year review defined old forests in three main categories by using average tree diameter, canopy layering, canopy closure, and life form as defining attributes, rather than age.

- ▶ **Medium and large older forest.** Forests with a minimum average tree diameter at breast height (d.b.h.) of 20 inches, with either single-storied or multistoried canopies. Corresponds closely to the definition of late-successional forest used in the Plan.
- ▶ **Large, multistoried older forest.** Forests with average tree d.b.h. of 30 inches and greater, with multistoried canopies. Includes minimum structural elements of old-growth forest such as large old-growth trees and multiple canopy layers.
- ▶ **Older forest with tree size appropriate for site productivity.** An alternate definition that recognizes regional variation in productivity owing to climate, topography, and natural disturbance regimes. The definition of average size of large, old trees varies by site productivity.

The precise definition of old-growth forest has long been controversial.

In 1994, the total amount of older forests on federal lands was estimated at 7.87 million acres. By 2003, older forests had increased an estimated 1.25 million acres to 9.12 million

acres (fig. 3). (This amount is about 38 percent of the 24 million acres of federal land within the Plan area.) Most of the increase came from trees growing into the lower end of the medium and large category. The development of medium and

In Summary

- ▶ The total acres of medium and large older forests on federal lands in the Plan area had a net increase of more than 1 million acres during the 10-year period, almost double the expected increase (fig. 3).
- ▶ Most increase came from forests growing into the lower end of the medium and large older forest category.
- ▶ In the Plan's first decade, more older forest was lost to wildfire than to timber harvest. The amount of older forest currently at risk of loss to high-severity wildfire is of increasing concern.

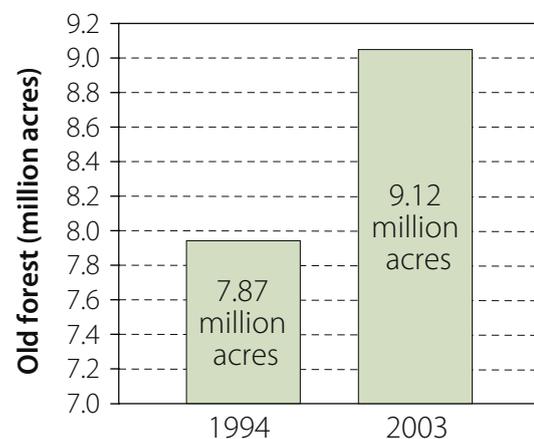


Figure 3—Medium and large older forests on federal lands in the Plan area for 1994 and 2003. Net increase is the total after losses to harvest and fire. Total federal lands in Plan area = 24 million acres.

Distribution of old forests affects the ability of species to move among blocks of suitable habitat.

large forests into multistoried forests with very large trees takes many decades, and little increase occurred in that category.

The current network of older forests appears to achieve the Plan's goals for well-distributed, connected

areas of old forest on federal lands (see fig. 4). Distribution of old forests affects the ability of species, especially smaller ones such as amphibians, to move among blocks of suitable habitat. Much of the remaining large, multistoried old forest is protected in the reserve network.

The reserve network was designed to keep the distances between large blocks of late-successional forest at less than 12 miles on average. Monitoring results found that in most provinces, blocks of older forest were, on average, 4 miles apart, except for the California coast, where older-forest large blocks were more than 12 miles apart. For large, multistoried old forest, blocks averaged less than 12 miles apart, except for the California coast.

In the Plan's first decade, about 102,500 acres of older forest burned in wildfires, an amount roughly five times the 17,000 acres of old forest harvested. Most older forest lost to wildfire burned in just

a few large fires in dry provinces, particularly the 500,000-acre Biscuit Fire in 2002 in southwest Oregon and northern California. Actual timber harvest was substantially less than the 230,000 acres of harvest that had been projected.

The amount of older forest currently susceptible to high-severity wildfire, especially in the dry provinces, concerns scientists and managers. Fire, along with insects, disease, and wind, always changed forests; the forest lands in the Plan area were never all old growth. However, because of the land uses and fire suppression over the past century, along with climate factors, forests in the Plan area have changed in ways that make large, high-severity fires more likely.



Tom Iraci

Medium and Large Older Forest at the Start of the Northwest Forest Plan

■ Medium and large older forest

■ Unclassified

Agency

■ Forest Service

■ Bureau of Land Management

■ National Park Service

▬ Physiographic provinces

0 25 50 100 150 200 Miles
0 40 80 160 240 320 Kilometers

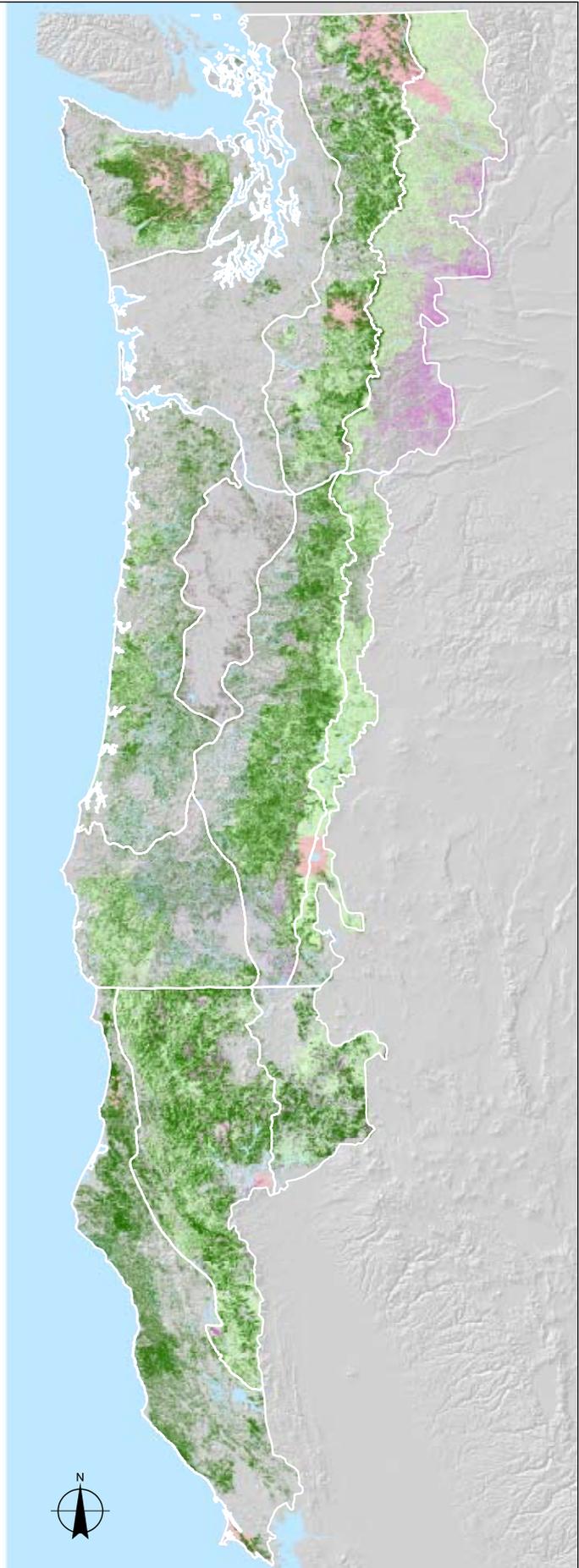


Figure 4—New inventory data and improved mapping showed that the original 1993 estimates of medium and large older forests on federal lands were reasonably accurate. Data are incomplete on ecological legacies such as snags and down wood in the older forests.



Regional variability within old-growth forests is greater than was thought at the outset of the Plan. The southwest Oregon old forest (top) developed with frequent, low-severity fires, averaging 7- to 13-year return interval. The low-intensity fires created brushy open areas within the old forest. The western Washington old forest (bottom) developed slowly in a closed-forest condition with no major disturbances that opened up the stand. Hemlocks and other shade-tolerant trees grew in the understory with little influence from wildfires.

Fire risk is high for much of the 1.7 million acres of older forest in dry, fire-prone provinces, on the eastern slopes of the Cascade Range in Oregon and Washington, the Klamath provinces, and other parts of northwestern California. The 10-year review found that at current rates of loss to fire and other disturbances, the reserve network still appears robust, and acres of forest lost would be compensated for by acres of forest growing into the medium and large older forest category. However, if older forests are lost at higher rates in coming decades, the rate of loss could outdistance the replacement rate.

Early results show that thinning tree plantations and other silvicultural actions can help to restore ecological diversity in young forests and accelerate the development of old-growth characteristics. Although data are sketchy, best estimates are that thinning was done on fewer than 300,000 acres in LSRs over the past decade, out of 2.2 million acres in younger age classes. If the same rate of thinning continues, many of the young stands in LSRs will be more than 80 years old before they are thinned. ■

Key Findings From Relevant Research Studies

- ▶ Definitions of old growth by scientists and society are changing and diverging.
- ▶ Thinning plantations to move in the direction of older forest habitat appears promising.
- ▶ Areas of diverse, early-successional forest will likely decline in the future with current management on public and private lands.
- ▶ In the dry, fire-prone provinces, dense older forest used to exist as patches embedded in a mosaic of single-layered forest and other forest types.
- ▶ In the dry, fire-prone provinces, fixed reserves may not work well as a long-term strategy for conserving older forests and species that use old-forest habitat.

Northern Spotted Owl



Joe Lint

THE NORTHERN SPOTTED OWL was a key species for Plan design. The spotted owl conservation strategy was based on five principles from conservation biology.

- ▶ Species well distributed across their range are less prone to extinction than species confined to small portions of their range.
- ▶ Large blocks of habitat with multiple pairs of the species are superior to small blocks of habitat with only one to a few pairs.
- ▶ Blocks of habitat that are close together are better than blocks far apart.
- ▶ Habitat that occurs in less fragmented (that is, contiguous) blocks is better than habitat that is more fragmented.
- ▶ Species movement (dispersal) between habitat blocks improves as land in the connecting areas more closely resembles suitable habitat for the species.

Other factors in addition to habitat influenced spotted owl habitat trends.

The 10-year report identified suitable northern spotted owl nesting, roosting, and foraging habitat (fig. 5), with individual blocks large enough to support 20 or more pairs of owls and spaced no more than 12 miles apart. In areas between reserve blocks, dispersal habitat would be protected or developed on enough land to meet owl needs for moving between blocks.

The Plan's outcomes for spotted owls were expected to take at least a century. Spotted owl population declines were expected for the first 40 to 50 years under the Plan, with owl populations stabilizing in the mid-21st century and possibly increasing after that as owl habitat recovery exceeded loss.

Other factors, in addition to habitat, influenced spotted owl population trends. The rate of habitat loss on federal lands during the decade was low, overall. The rate of population decline did not follow the trajectory of the habitat trend, particularly in Washington, where 40 to 60 percent of the initial owl population was lost during the decade. Reasons for the decline are

In Summary

- ▶ Spotted owl populations declined about 7.5 percent per year across their northern range, at the high end of the observed decline.
- ▶ Spotted owl populations declined about 2 percent per year across their southern range, at the low end of the observed decline. Averaged across the Plan area, the rate of decline was at the low end of the expected rate (0.7 to 8.4 percent loss per year).
- ▶ Declines may be from habitat loss, barred owls, and other factors.
- ▶ Spotted owl habitat declined less than expected at about 1.5 percent over the decade across the Plan area, owing to stand-replacing timber harvest and wildfire.

Spotted Owl Habitat-Capable Federal Land and Large Reserve Blocks

Federal lands

- Habitat capable
- Not habitat capable
- Large reserve blocks

Physiographic provinces

1. Washington Olympic Peninsula
2. Washington Western Lowlands
3. Washington Western Cascades
4. Washington Eastern Cascades
5. Oregon Western Cascades
6. Oregon Eastern Cascades
7. Oregon Coast Range
8. Oregon Willamette Valley
9. Oregon Klamath
10. California Klamath
11. California Coast Range
12. California Cascades

- Lakes and rivers
- Urban areas
- Interstate highway

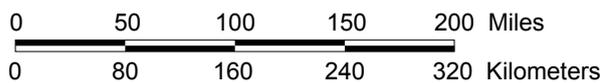


Figure 5—Not all federal land in the Plan area is capable of being owl habitat. Dark green areas on the map show federal land productive enough to grow forest and within the elevation range in which spotted owls nest.

unclear, but possible causes are the lingering effects of past harvest and synergistic interactions of weather, habitat, and displacement by the barred owl.

Spotted owl habitat—

About 59 percent of spotted owl habitat is on federal lands (10.3 million acres total). Only ¼ of 1 percent of owl habitat on federal lands was lost to stand-replacing timber harvest

More owl habitat was lost to fire than was lost to stand-replacing timber harvest.

(in which most of the trees are harvested) over the Plan's first decade, much less than the 2.5 percent loss originally projected. More owl habitat was lost to fire than to stand-replacing timber harvest (fig. 6).



Scott Graham

Loss of owl habitat to fire, although locally important, has not been extensive rangewide. However, the risk of future losses to fire may be increasing in fire-prone provinces.

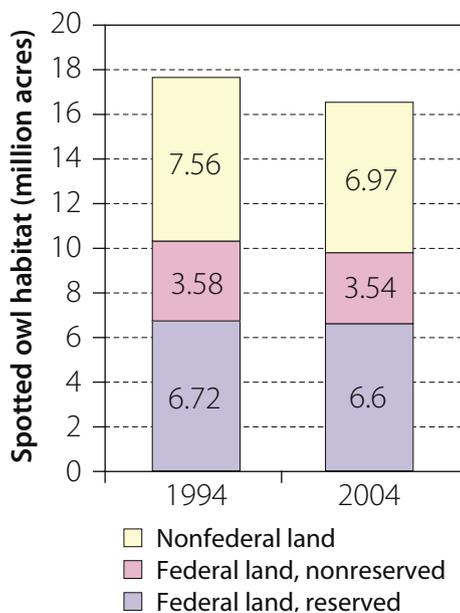


Figure 6—About 1.5 percent of spotted owl habitat on federal lands was lost in the first decade under the Plan. Over 80 percent of the loss resulted from wildfires, with timber harvest accounting for the rest. The loss of owl habitat was within the rate expected for the decade.

Changes in owl habitat from clearcut harvest and severe wildfires are easily detected and well mapped, but changes from partial harvest or moderate fires that kill only some trees are more difficult to detect and may not be as accurately mapped.

The increase in older forests on federal lands is considered positive for spotted owls but does not translate directly to increased owl habitat, because other factors such as multistoried canopies and large snags are required for owl nesting, roosting, and foraging habitat. Because timber harvest was less than expected, more owl habitat remains on matrix lands than was projected in the Plan.

The Plan's reserve network worked well to absorb losses from fire. Owl surveys found that spotted owls are dispersing across the landscape among reserve blocks.

The 41 percent of owl habitat on nonfederal land may not function as well for owls because much of it is in smaller, more

Key findings from relevant research studies

- ▶ Barred owls may be displacing spotted owls, especially in the northern range of the spotted owl.
- ▶ In some areas in the southern portion of the owl's range, forest of various ages and brushy habitat seemed to provide better habitat for spotted owls.

fragmented patches. Also, owl habitat on nonfederal lands was lost at a higher rate, with an estimated 8.0 percent loss over the Plan's first decade.

Spotted owl populations—

Spotted owl population trends are based on a sample of more than 10,000 marked owls captured in study areas that encompassed more than 12 percent of the owl's range. Because of this large sample, estimates of owl survival, reproduction, and population change were very accurate.

Across the southern part of the Plan area, spotted owl populations declined about 2 percent per year, at the low end of the expected rate of 0.7 to 8.4 percent per year. In the northern part of the Plan area, however, spotted owl populations declined about 7.5 percent per year, at the high end

A chief threat to the spotted owl may be the barred owl, which has gradually moved westward.

of the expected rate. The reasons for the high decline were not clear; possible causes include the lingering effects of past timber harvest, displacement by barred owls, and weather patterns over the decade.

Emerging threats—

The reserve design seems to be working as intended. However, new threats that emerged in the past decade are not under control of the Plan. A chief threat may be the barred owl, which gradually moved westward across the Northern United States and Canada over the past 50 years. Recent studies in Oregon and Washington found that spotted owls were displaced from their territories when barred owls were observed within 0.5 mile of the territory center. Scientists do not know how the barred owl-spotted owl competition will play out. The barred owl may displace the spotted owl from much of its native range, or the two species may continue to compete.

Another new threat is the West Nile virus. The virus causes widespread mortality in some wild birds; the spotted owl's vulnerability is not known. Sudden oak death, another recent invader spreading north from central California, can kill tree species that provide cover and prey for the spotted owl, especially in the southern portions of its range where woodrats are an important part of its diet.

Because of the emerging threats, changing habitat conditions, and the uncertain effect of climate change, there is concern for the direction and magnitude of spotted owl population trends in the future, particularly in Washington. ■