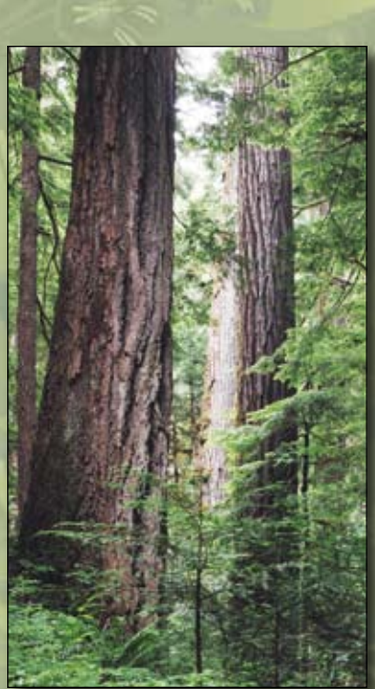
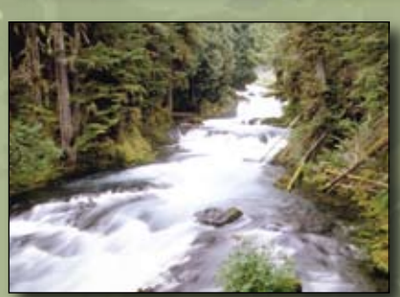
NORTHWEST
FOREST PLAN
THE FIRST 10 YEARS (1994–2003)

First-Decade Results of the Northwest Forest Plan








General Technical Report
PNW-GTR-720
January 2008

USDA United States Department of Agriculture
Forest Service
PNW Pacific Northwest Research Station

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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Acknowledgments

I gratefully acknowledge the many people who have contributed to the studies underlying this summary. I am grateful to Richard Haynes, Bernard Bormann, and Jon Martin for their help in planning and providing oversight in the development of this document. The information in this report is based on the other 10-year review reports, and at times I paraphrased text from those reports. I acknowledge my debt to Susan Charnley, Gary Falxa, Kirsten Gallo, Mark Huff, Steve Lanigan, Joseph Lint, Melinda Moeur, and Martin Raphael. Many reviewers helped improve this report. Becky Gravenmier provided important assistance at a critical point. Cindy Miner played a valuable role in reconciliation and editing. Also, Keith Routman designed the report and Frank Vanni managed its production.

Northwest Forest Plan—
The First 10 Years (1994–2003):

First-Decade Results of the Northwest Forest Plan

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Forest Service
Pacific Northwest Research Station
Portland, Oregon

General Technical Report PNW-GTR-720
January 2008

Abstract

Rapp, Valerie. 2008. Northwest Forest Plan—the first 10 years (1994–2003): first-decade results of the Northwest Forest Plan. Gen. Tech. Rep. PNW-GTR-720. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 42 p.

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

Contents

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.

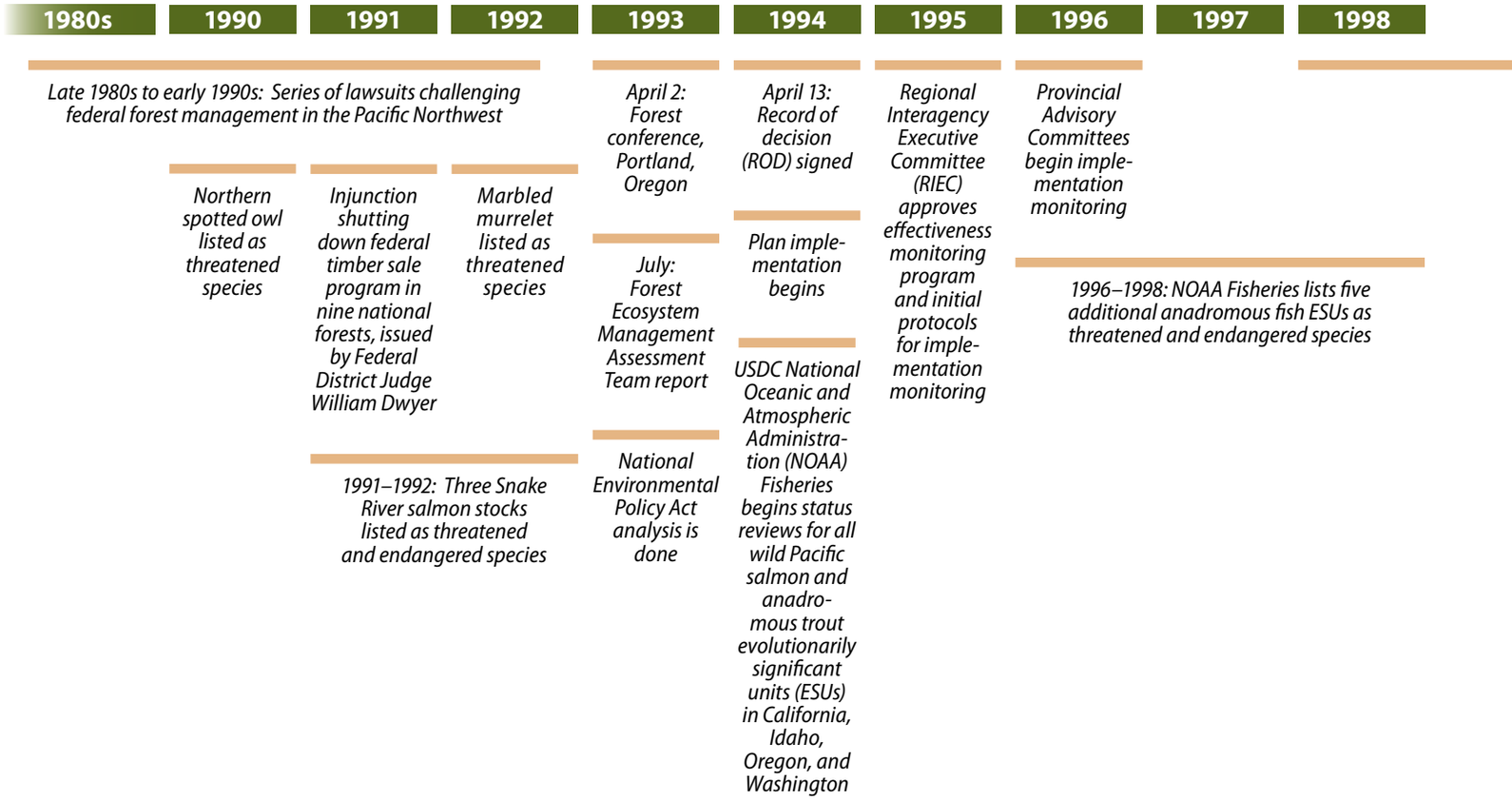
Two themes emerged: uncertainty and complexity. Scientific research over the decade showed that ecosystems were highly dynamic with important implications for management to a degree not recognized in the Plan. Fire regimes and other disturbance patterns such as insect outbreaks have wide variations across 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



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

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

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

Court injunction on the 2004 ROD reinstates 2001 Survey and Manage ROD with 2001–2003 Annual Species Review modifications.

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.

Description of the Northwest Forest Plan

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

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.

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.

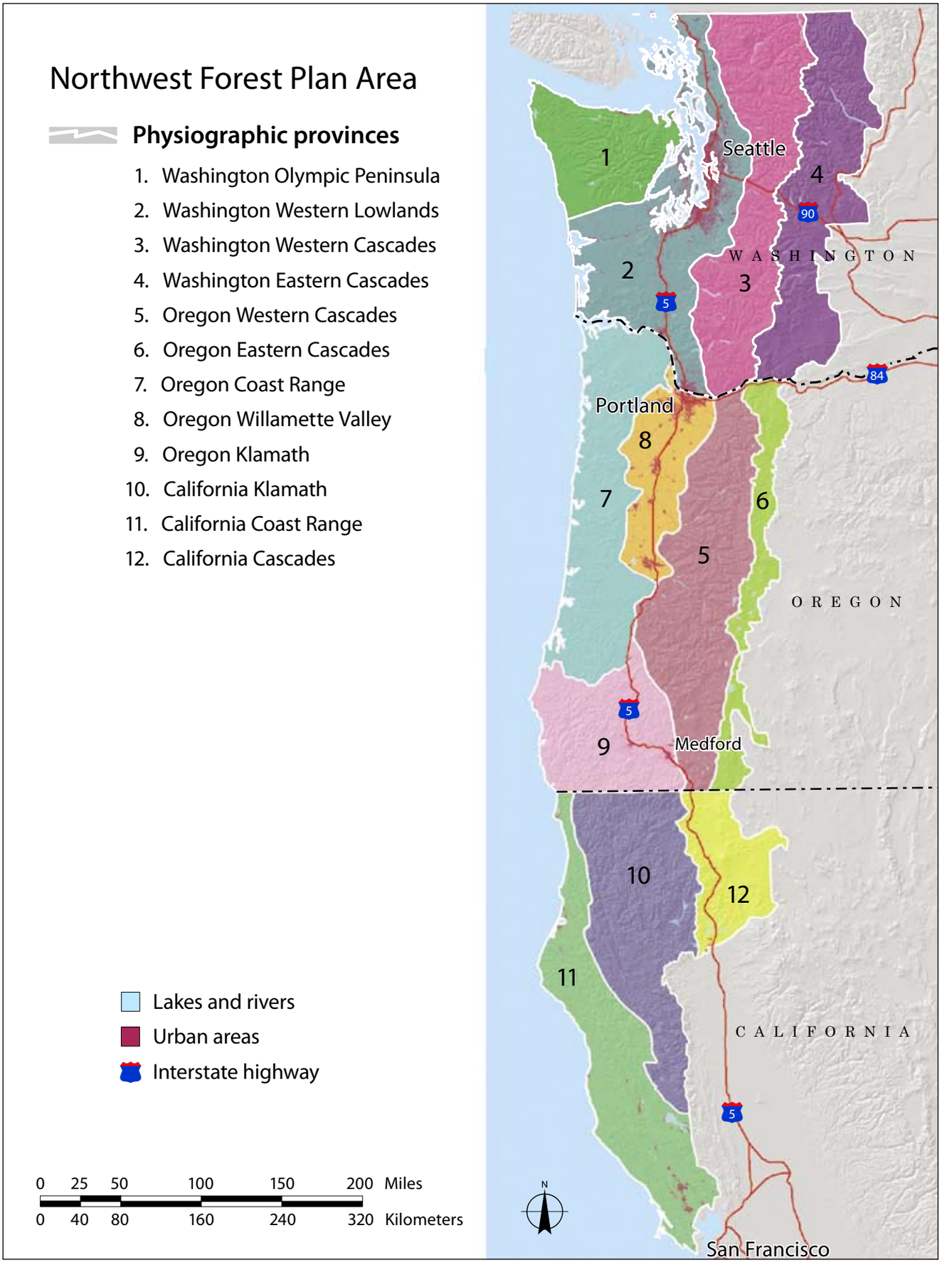


Figure 1—The Plan area has 12 distinct provinces, classified by their differences in climate, vegetation, geology, and landforms. One especially important difference is the fire regime, or characteristic combination of fire frequency, intensity, seasonal timing, and fire size in an ecosystem. Provinces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

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 record of decision is the heart of the Plan.

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.

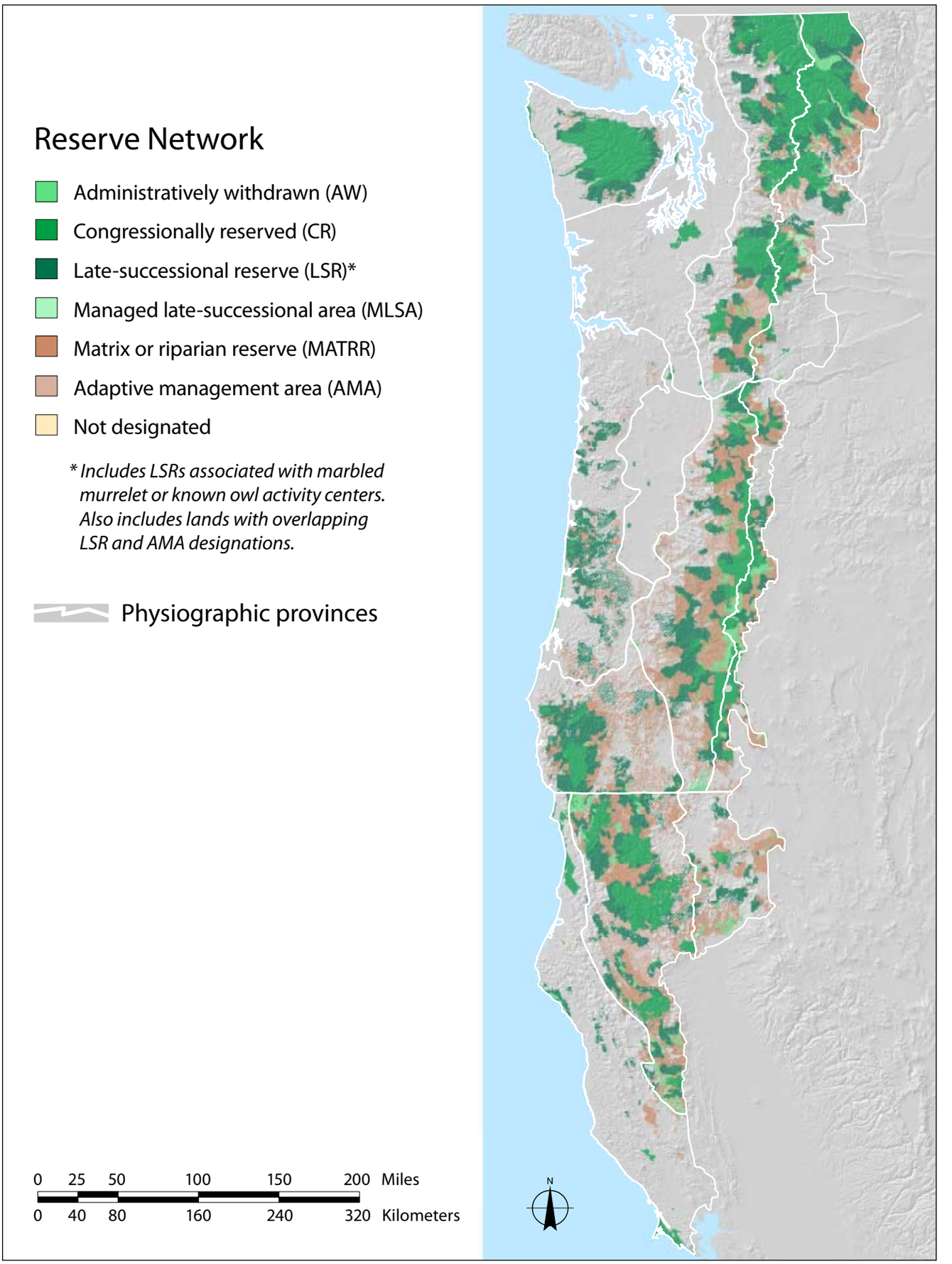


Figure 2—Reserve network of the Northwest Forest Plan.

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.

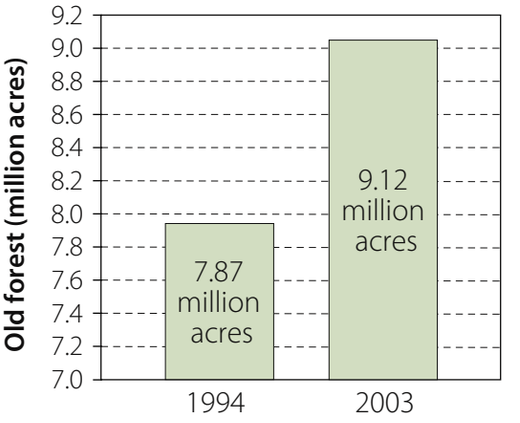


Figure 3—Medium and large older forests on federal lands in the Plan area for 1994 and 2003. Net increase is the total after losses to harvest and fire. Total federal lands in Plan area = 24 million acres.

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

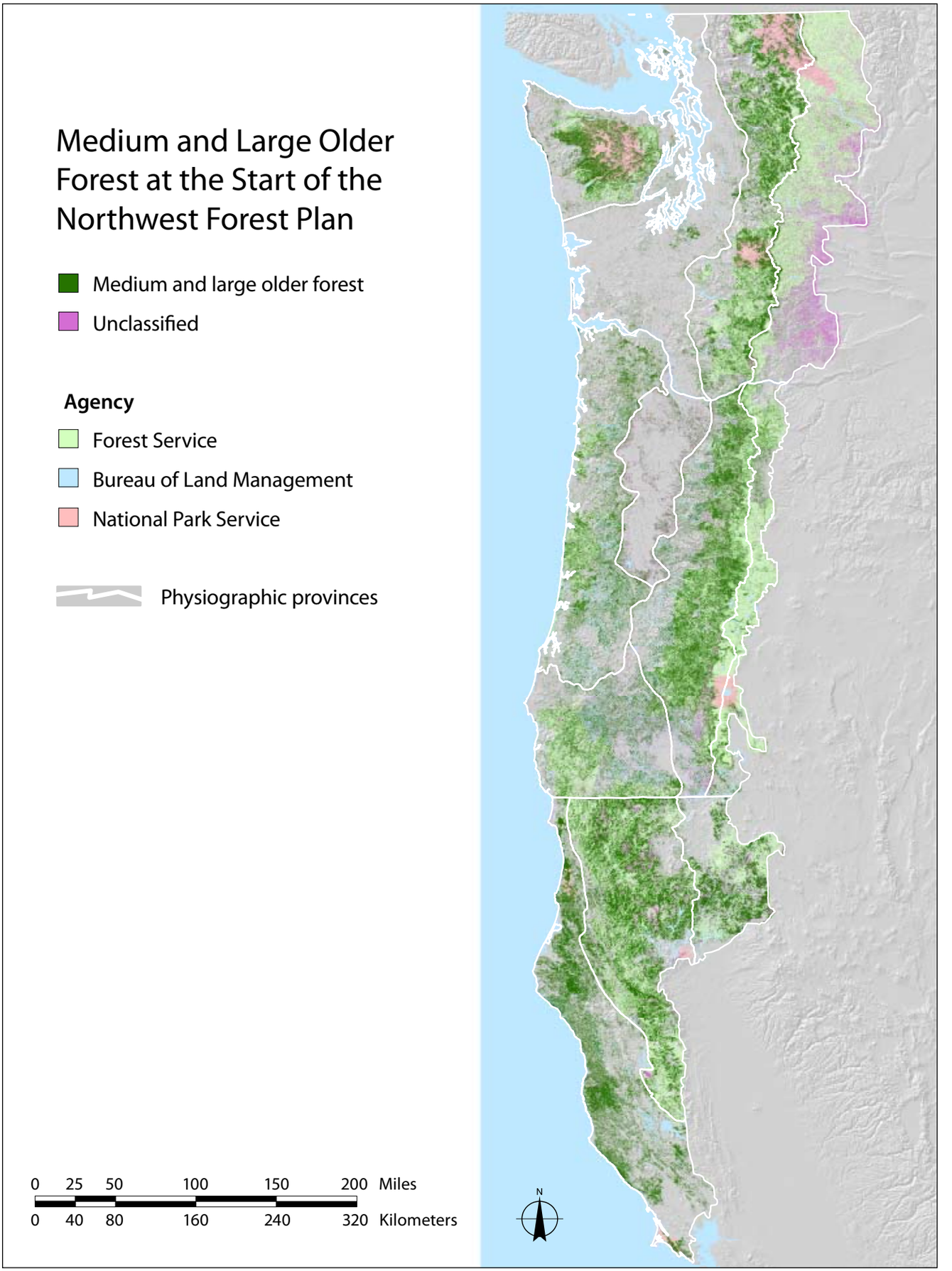


Figure 4—New inventory data and improved mapping showed that the original 1993 estimates of medium and large older forests on federal lands were reasonably accurate. Data are incomplete on ecological legacies such as snags and down wood in the older forests.

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.

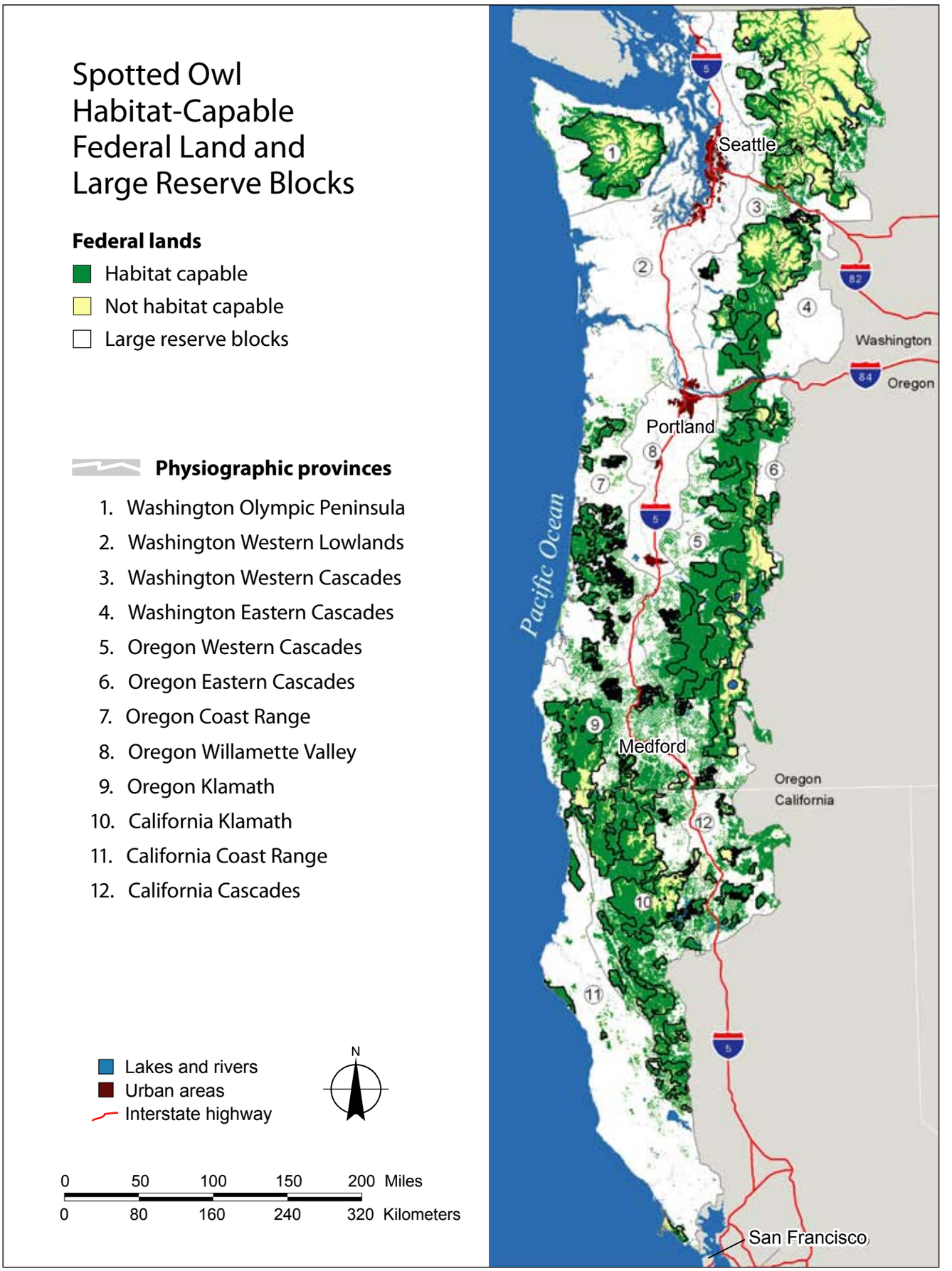


Figure 5—Not all federal land in the Plan area is capable of being owl habitat. Dark green areas on the map show federal land productive enough to grow forest and within the elevation range in which spotted owls nest.

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 (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).

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

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.

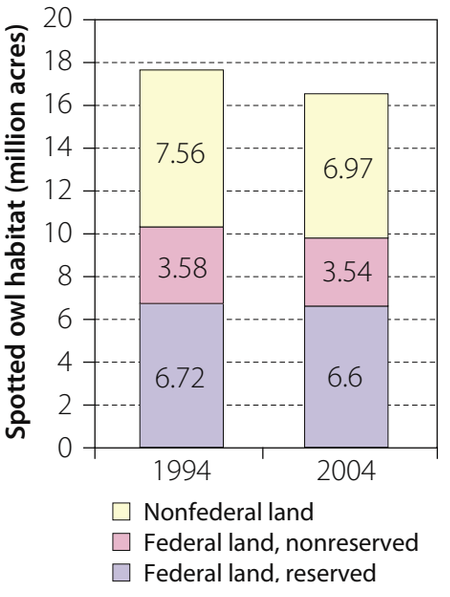


Figure 6—About 1.5 percent of spotted owl habitat on federal lands was lost in the first decade under the Plan. Over 80 percent of the loss resulted from wildfires, with timber harvest accounting for the rest. The loss of owl habitat was within the rate expected for the decade.

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 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.

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

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. ■

Continue to Part 2

Marbled Murrelet

Tom Hamer

Marbled murrelets are robin-sized seabirds that divide their time between the ocean, where they forage, and the forest where they nest. Nests are very hard to detect, so biologists monitor nesting behavior.

The Plan's marbled murrelet strategy was to conserve most marbled murrelet nesting habitat and prevent any loss of occupied habitat on federal lands (fig. 7). At the time of the Plan, Congressionally reserved lands and LSRs encompassed about 2.0 out of the estimated 2.55 million acres of federal lands that were thought to have the characteristics needed for murrelet nesting habitat. On the remaining acres, the Plan required surveys for nesting murrelet behavior before timber harvest, and if nesting behavior was found, additional habitat was protected.

On acres of potential habitat not in reserves, the Plan required surveys for murrelet nesting behavior before timber harvest.

A comprehensive analysis of potential marbled murrelet nesting habitat throughout the Plan area was conducted for the 10-year review. This analysis led to a revised estimate of about 1.9 million acres of potential nesting habitat on federal lands, down from the original estimate of 2.55 million acres. Of the 1.9 million acres, 81 percent is in reserved land use allocations (see fig. 8). The Olympic Peninsula has about 20 percent of the higher quality potential nesting habitat on federal land, with much of it protected in Olympic National Park.

The loss of marbled murrelet habitat was small on federal lands, an estimated 30,000 acres total for the Plan's first decade. Most of the loss was from stand-replacing timber harvest and wildfires. The acres of forest with trees greater than 20 inches in diameter increased over the past 10 years in the coastal zone, but marbled murrelets generally nest on large branches of trees with diameters of 40 inches or more.

Nonfederal lands in the Plan area were estimated to contain about 2.1 million acres of higher-quality potential murrelet nesting habitat (actual murrelet use is not known). This represents about 52 percent of the higher-quality potential nesting habitat estimated for the entire Plan area. On nonfederal lands, an estimated 249,000 acres (12 percent) of potential nesting habitat were lost to timber harvest over the first 10 years of the Plan.

In Summary

- Marbled murrelet populations showed no apparent trend between 2000 and 2003, but 4 years is not long enough to detect a trend with confidence.
- Most marbled murrelet habitat on federal land was conserved, except for losses to fire.

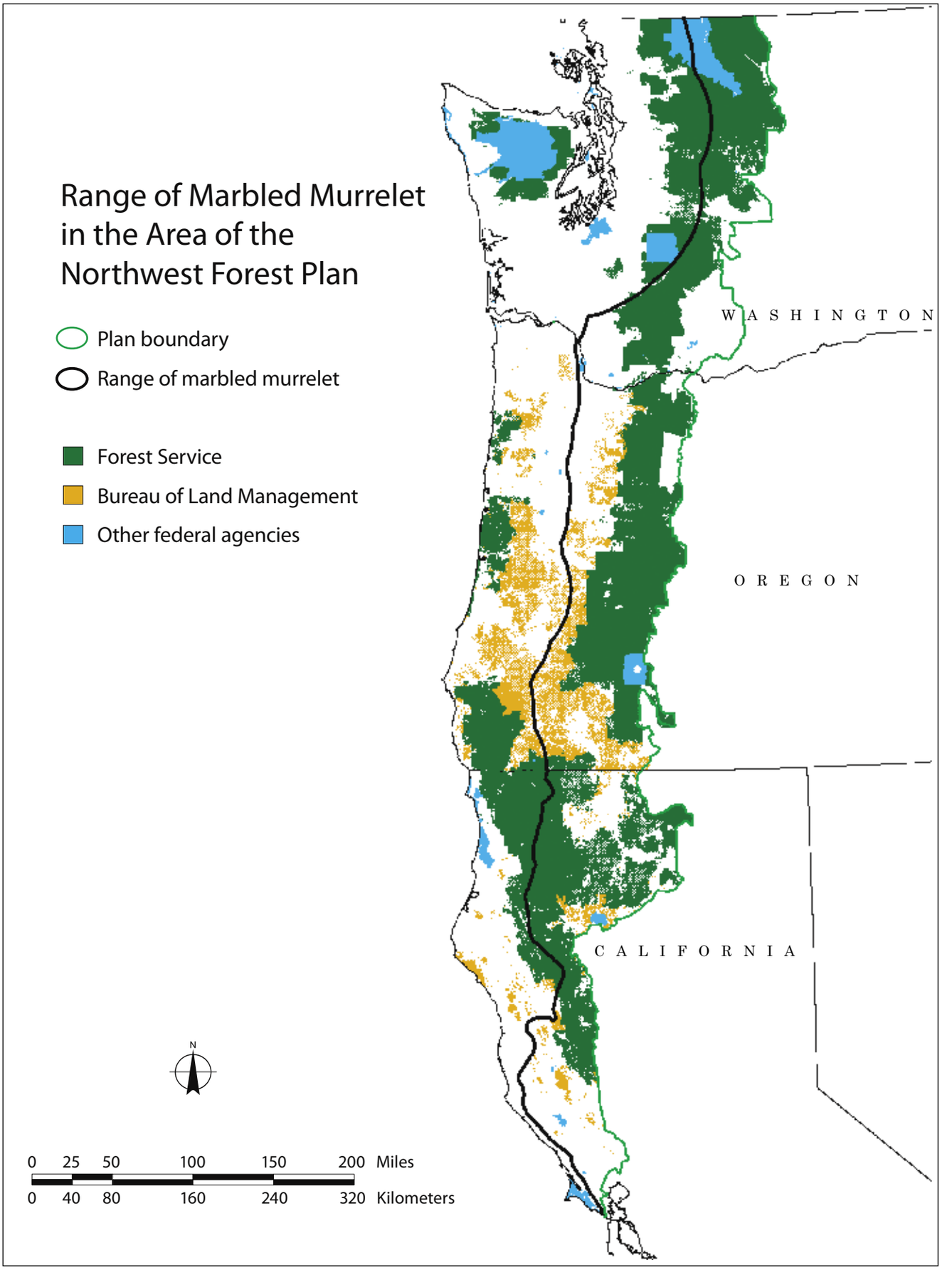


Figure 7—Coastal area that marbled murrelets use for nesting. Within this range, marbled murrelets prefer to nest in marine-influenced old-growth forests in large unfragmented blocks. The inland fringe of their nesting range is less important for murrelet nesting than originally thought.

Marty Raphael

Survey team searches for marbled murrelets in coastal waters.

Independent population models had projected a decline in murrelet populations of about 35 percent over the decade, but the initial population monitoring results, from 2000 to 2003, did not detect a decline of this magnitude. Population monitoring for marbled murrelets did not start until 2000, owing to difficulties in developing statistically reliable survey methods. For the 4 years of monitoring (2000–2003), total marbled murrelet population averaged about 22,000 birds, on any single day, in coastal waters adjacent to the Plan area. The population fluctuated from 18,600 to 23,700, but the 4 years of data were not enough to separate actual trends from normal variations in marbled murrelet populations. Among five study areas, the highest population of marbled murrelets was found in the Puget Sound and Strait of Juan de Fuca of Washington, and the smallest population was in north-central California.

Favorable ocean conditions may explain the unexpected stability. The Plan's strategy is effective, so far, in slowing or stopping the loss of marbled murrelet nesting habitat in federal forests. Although nesting habitat is necessary, many other factors affect marbled murrelets. These factors include ocean conditions, movement of individual birds to other parts of the murrelet range, and oil spills, which are beyond control of the Plan. Therefore, the long-range trend for marbled murrelets is still uncertain. ■

Key findings from relevant research studies

- Federal lands provide half of the higher suitability marbled murrelet habitat.
- Marbled murrelets are unlikely to nest in zone 2, the eastern fringe of their nesting range, except in a few localized areas that may be important.

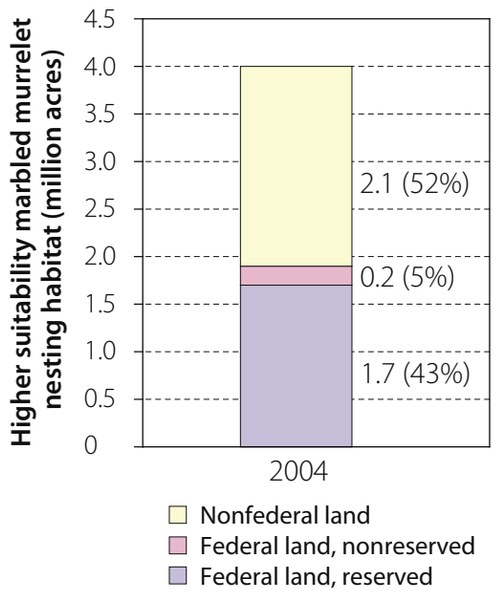


Figure 8—Higher suitability nesting habitat for marbled murrelets is estimated at 4.0 million acres on all lands in the Plan area. It is not known how much of the high-quality habitat is actually used by marbled murrelets for nesting.

Conservation of Other Species Associated With Older Forests

MANY RARE AND little-known species are associated with older forests but not listed under the Endangered Species Act (ESA). These species include amphibians, lichens, mosses, fungi, plants, small animals, and arthropods (insects, spiders, and mites). The Plan included strategies for conservation of these species as well as the listed species.

Steve Tilley

Along with field surveys, new genetic analysis techniques helped scientists to learn more about little-known forest species. Scientists identified several new species including the Scott Bar salamander, found only in northern California and southwestern Oregon.

In Summary

- The Plan's reserve system provides for the needs of some old-forest-dependent species but cannot be assumed to meet the needs for all such species. Additional strategies or habitat protection may be needed for some species.
- For other species associated with older forests, many new sites were discovered and protected; for most of these species, population trends are yet unknown.
- Most species in the survey and manage program were found to be rare (42 percent of the species have been identified at 10 or fewer sites) with many sites outside reserve land allocations.

The Plan's reserve network and standards and guidelines (S&Gs) were expected to meet the needs of most little-known older-forest species. For those species needing additional protection, the Plan protected known sites and habitats outside reserves and included other actions specific to individual species. After an original list of 1,120 species was evaluated, a list of 404 individual species and 4 arthropod species groups became the starting list for the survey and manage program.

Most species associated with older forests are likely far better conserved.

The survey and manage program focused on the inventory and conservation of the 404 species and 4 species groups. Through surveys and studies, much was learned about the abundance and habitat needs of these species. Protection of specific sites and management S&Gs reduced the risk to many species.

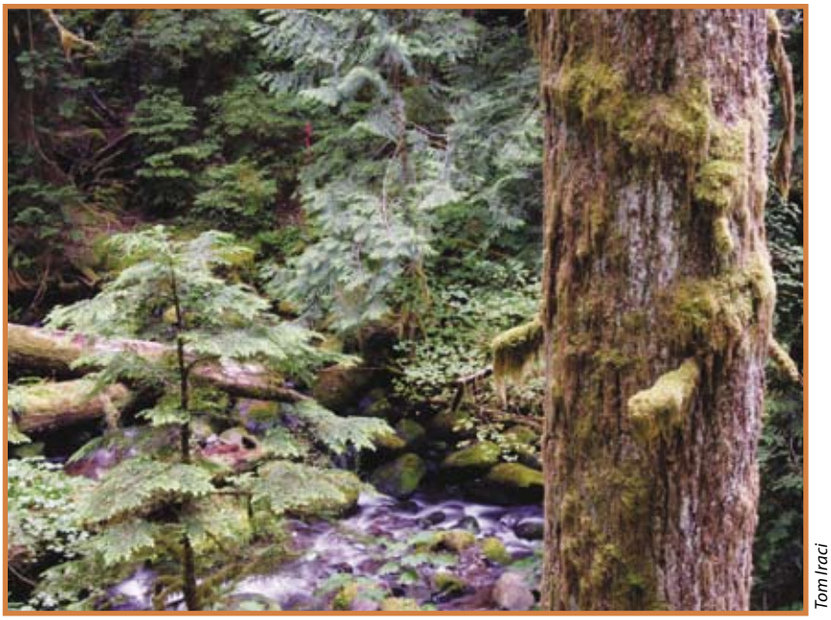
Nan Vance

Research into rare species associated with old-growth forests, such as the mountain lady's slipper, resulted in new information on habitat needs and response to fire and other disturbances. Managers can use new findings to revise management recommendations for species.

Most species associated with older forests are likely far better conserved because of the Plan's conservation of older forests and riparian reserves and protection of known locations in matrix lands. However, it is still uncertain if the Plan will adequately protect these species in the long term. It also cannot be assumed that the Plan meets the needs for all old-forest-dependent species. ■

Watersheds and Streams

The aquatic conservation strategy was designed to maintain healthy watersheds and streams and restore degraded ones.



Tom Iraci

Riparian reserves, a key part of the watersheds strategy, are corridors along streams to provide ecological functions and maintain habitat for stream and riparian life, corridors for terrestrial wildlife to travel between old-forest patches, and connection between stream networks and watersheds.

The Plan was designed to protect the long-term health of waterways as well as forests and wildlife. Three fish stocks had been listed as threatened or endangered in 1993, and since then, 23 evolutionarily significant units of Pacific salmon and 3 population segments of bull trout have been listed in the Plan area. Other concerns included water quality, city water supplies from federal forest lands, and other stream-associated species such as amphibians.

The aquatic conservation strategy was designed to maintain healthy watersheds and streams and restore degraded ones. The term "healthy watersheds" describes watersheds with ecological integrity and functioning ecological processes, including high water quality, sufficient instream flows, a connected stream network to protect fish migration and travel of other species, and the full range of stream dynamics such as flood cycles and changes in riparian forests. Habitat was the strategy's focus, because species such as salmon and steelhead spend only part of their lives in freshwater habitats and are affected by many factors outside federal forest lands.

In Summary

- Watershed conditions improved slightly in the first decade, as expected. Improvement came in part from less clearcut harvest in streamside (riparian) areas and existing tree growth into larger size classes.
- Condition scores improved in nearly 70 percent of the key watersheds over the Plan's first decade, compared to improvement in less than 50 percent of other watersheds. A crucial factor was that twice as many miles of roads were decommissioned in key watersheds as in other watersheds.
- Few riparian reserve boundaries were modified from the Plan's standards and guidelines although modifications had been expected.

The aquatic conservation strategy was based on stream networks and watersheds, and integrated with the old forest and wildlife conservation strategies based on forest reserves.

The strategy's short-term goal (10 to 20 years) was to protect watersheds that currently have good habitat and fish populations. Its long-term goal (100 years) is to develop a network of functioning watersheds that support populations of fish and other aquatic and riparian life across the Plan area.

Watershed monitoring results cover the full decade from 1994 to 2003. A set of biological and physical indicators was used to track changes in watershed conditions in the Plan area. The expectation was that 10 years was not long enough for large improvements in watershed conditions, and that, at best, degradation would be slowed or halted, with minor to moderate improvements in watershed conditions. As expected, watershed conditions improved slightly in the first decade under the Plan (see fig. 9), in part from less clearcut harvest in riparian areas and existing tree growth into the category of trees greater than 20 inches in diameter.

The Plan identified 141 tier 1 key watersheds (total of 8.1 million acres) as anchors for fish recovery or with greatest potential for restoration, and 23 tier 2 key watersheds (total of 1 million acres), as additional sources of high-quality water. Key watersheds overlapped or included LSRs as much as possible.

Conditions improved in nearly 70 percent of the key watersheds over the Plan's first decade, compared to improvement in less than 50 percent of other watersheds. A crucial factor was that twice as many miles of roads were decommissioned in key watersheds as in other watersheds. Several watershed restoration initiatives were successful, but the stream reaches in which habitat was improved or fish passage restored were a small fraction of total stream miles.

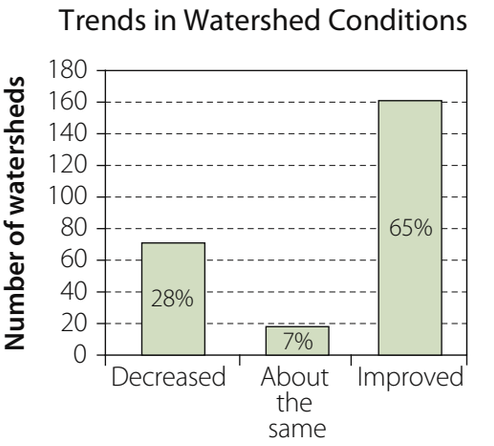


Figure 9—Based on a sample, 65 percent of watersheds showed small positive changes in condition scores. Condition scores declined for about 28 percent of watersheds, and stayed about the same for 7 percent of watersheds.

The Plan's S&Gs set interim boundaries for riparian reserves, based on available science (see fig. 10) with the expectation that these boundaries would be adjusted through watershed analysis. Managers found the burden of proof to be weighty and required procedures difficult, so most riparian reserves were established at the fixed widths of the Plan's original standards.

Restoration work was done on 2.6 percent of the estimated total area of riparian reserves. Precommercial thinning occurred on 1.8 percent of total area of riparian reserves.

Steve Lanigan

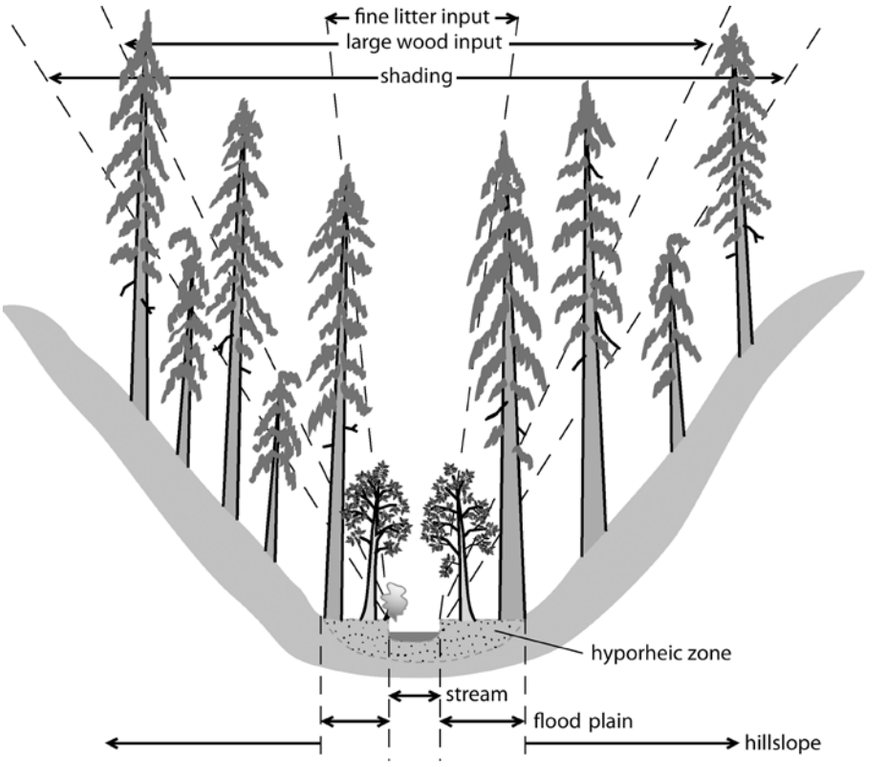


Figure 10—Riparian reserves were based on ecological processes important for streams. Reserve width was based on the height to which a tree could potentially grow (site potential). Minimum reserve widths, for intermittent streams and some streams without fish, protected most ecological processes such as litterfall and shading. Along fishbearing and some other streams, expanded reserves protected additional functions.

Key findings from relevant research studies

- Streams and watersheds are far more dynamic than was understood previously. Benefits from some fires and landslides are newly recognized in some systems.
- The natural landscape has a mix of watershed conditions, with individual streams and small watersheds at varying stages of development and complexity at any one time.
- Small headwater streams provide habitat for amphibians and macroinvertebrates and are sources of nutrients for the downstream food web and large wood and sediment for fish-bearing streams.

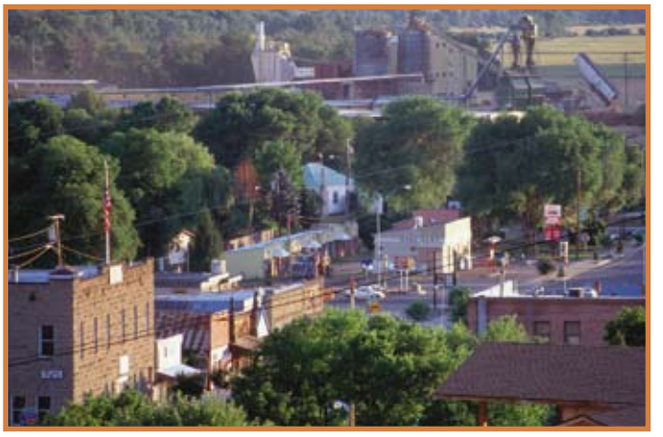
The Plan established a common framework for managing streams, riparian areas, and watersheds on federal forests, and it required managers to look at the entire watershed when designing timber sales or other projects.

Scientific findings during the Plan's first decade support the underlying concepts of the aquatic conservation strategy, particularly the dynamics of streams, ecological importance of headwater streams, retention of streamside forests, and special management considerations for riparian areas.

However, the strategy's focus on stream and watershed dynamics was not well understood. Questions continue to be asked about stream and watershed dynamics as our understanding evolves. ■

Continue to Part 3

Socioeconomics: Communities, Timber, and Economies



In Summary

- Federal timber offered for sale in the Plan area was lower than expected over the past decade, averaging only 54 percent of Plan goals. The low harvest rate was in part from increased sale preparation costs, appeals, and litigation.
- The effect of the reduced timber harvest on the regional economy was mitigated by regional economic growth in other sectors.
- Local communities had widely differing effects from the reduced timber flow. For some, decline in federal timber caused hardship. Other communities found new economic opportunities.
- Surveys of social values found broad support for multiple-use management. Clearcutting is unpopular, and most people favor protecting old-growth forests. Most people also believe that active forest management is needed to maintain forest health.

PROGRESS TOWARD MEETING the Plan's socioeconomic goals was mixed during the first decade. The Plan aimed to maintain a predictable and sustainable supply of timber, other forest products, and recreation opportunities to help maintain the long-term stability of local and regional economies. For communities affected by cutbacks in federal timber sales, federal resource agencies were expected to assist with economic development.

The Plan's original estimate was that more than 900 million board feet of timber could be sold annually from federal forests in the Plan area. However, nearly half the harvest was expected to come from forests more than 200 years old, which never occurred. After reaching a low point in 2000, timber sale levels rose slightly, but in 2003 were less than half of the Plan's original estimate (fig. 11).

The reduced timber sales were less than 25 percent of 1980s levels on the same federal forests. Wood products employment in the

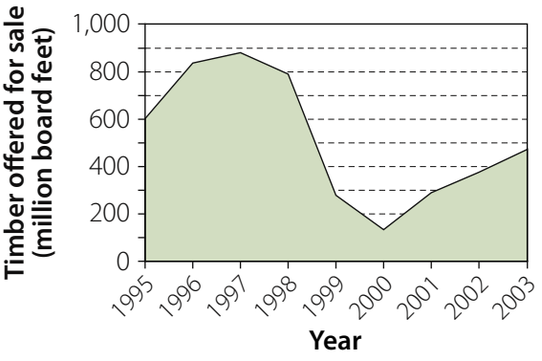
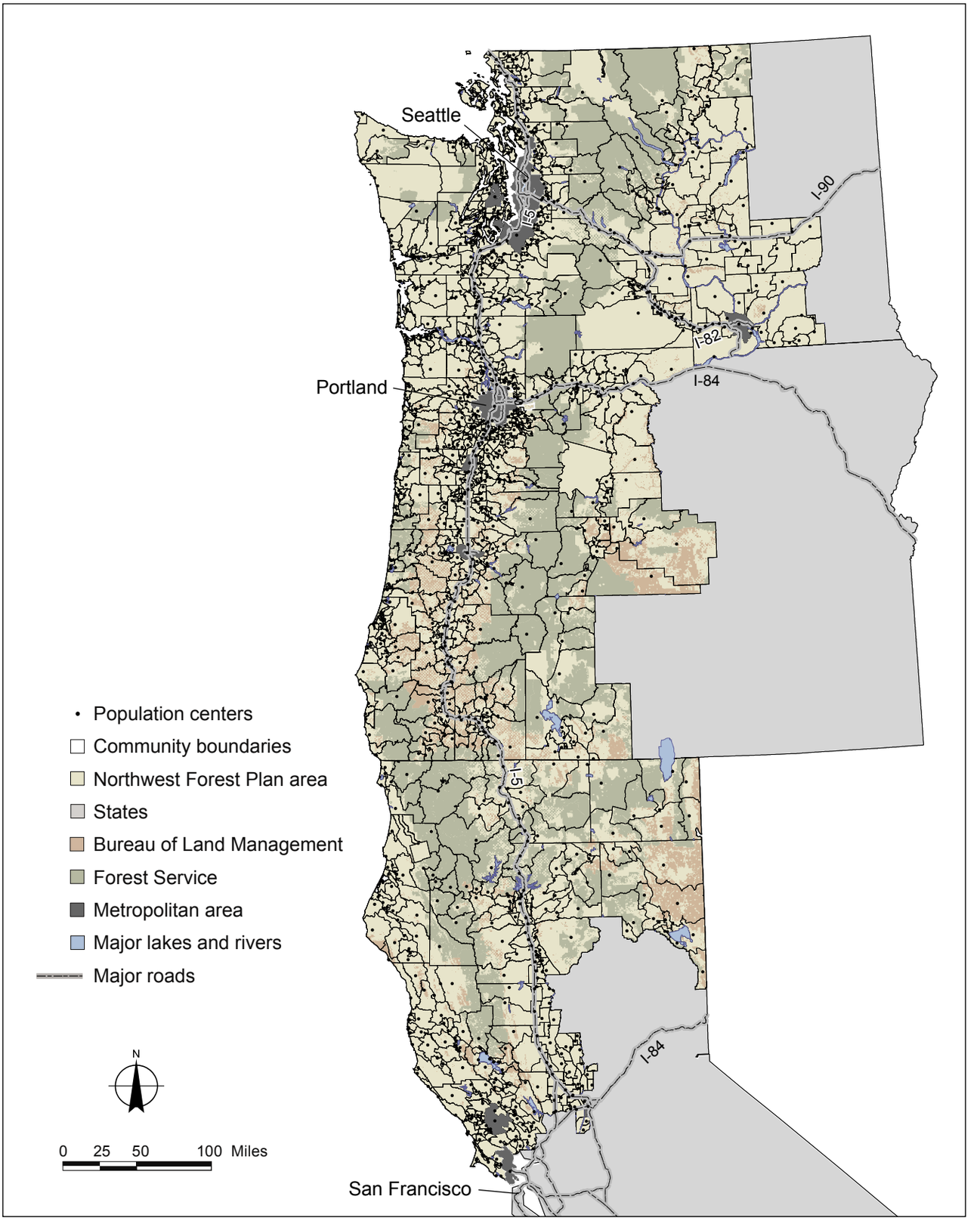


Figure 11—More than 800 MMBF from federal forests in the Plan area were offered in 1996 and 1997. Timber volume offered dropped to a low of 148 MMBF in 2000 and climbed back to 473 MMBF in 2003.



Community boundaries and population centers for the Plan region.

Plan area had been declining since 1980 and dropped by 30,000 jobs from 1990 to 2000, partly because of cutbacks in federal timber harvest and partly because of continued industry restructuring. The remaining wood products employment in the Plan area in 2000 was about 70 percent of what it had been at the peak in 1980.

Reduced timber flows caused hardship in some communities, while others adapted to new economic opportunities.

Total population for the Plan area was about 10.26 million people in 2000 (2000 national census). Following Plan direction, the team evaluated changes in the 1,314 nonmetropolitan communities in the Plan area (total population of about 5 million), but not in the 10 large urban areas. The evaluated communities changed in many ways over the past decade, making it difficult to determine changes caused by the Plan from other changes.

Based on a socioeconomic well-being score developed from U.S. census indicators, socioeconomic well-being between 1990 and 2000 increased for about 36 percent of communities in the Plan area, decreased for another 37 percent, and remained the same for the remaining 27 percent (fig. 12). For communities within 5 miles of federal forest, the percentage with declining socioeconomic well-being scores was slightly higher, at 40 percent.

Key findings from relevant research studies

- The timber industry has adapted to changes, and some of the adaptations benefit regional employment by providing more manufacturing jobs per volume of wood processed.
- Communities show different degrees of adaptability and resilience.

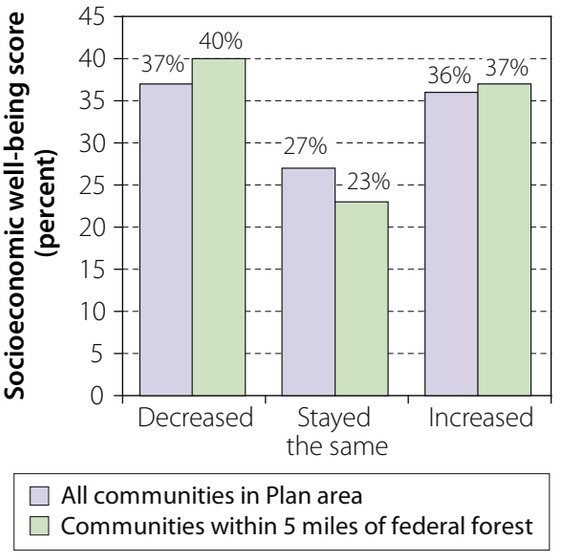


Figure 12—For the 1,314 communities in the Plan area, socioeconomic well-being scores improved over the past decade for about one-third, declined for one-third, and stayed about the same for one-third.

Local communities had widely differing effects from the reduced timber flow, depending on the original strength of the timber sector, the dependence on federal timber, and the number of agency employees living there. For some communities, the decline in federal timber caused hardship. In other places, communities and agencies worked together on forest stewardship and found new economic opportunities.

Frank Vanni

Although the decline in federal timber harvest caused hardships for some rural communities close to forests, others were less affected because of population growth and changing economies. Recreation opportunities remained relatively constant.

Overall, growth in regional economies reduced the regionwide impact of harvesting less federal timber. Economic ties changed between communities and forests as timber workers and agency employees moved out and new residents moved in who were attracted to the amenities of nearby federal forests. Communities adapted to change in many ways, including focusing on agriculture, investing in recreation and tourism, using nearby major transportation corridors to attract business and to commute where possible, expanding as regional centers, and depending on the growth of tribal business, administration, and services. ■

Frank Vanni

The economy of the Coos Bay area, on the Oregon coast, was built on timber, wood products, shipbuilding, and commercial fishing. By 2003, Coos Bay had become a regional trade and service center with a growing number of retirees and more tourism. Timber and shipping are now secondary industries.

People Working Together

The Plan aimed to improve collaboration in forest management with citizens, tribes, and among agencies. Two formal institutions were set up initially to promote agency-citizen collaboration: provincial advisory committees (PACs) and adaptive management areas (AMAs). The AMAs are discussed in the next section.

The PACs provide a forum for ongoing discussion of forest issues among decisionmakers and other interested parties and have completed regionwide, multiparty compliance monitoring. Although flow of information has improved and people learn more about forest management through them, the PACs have not significantly shaped decisionmaking.

Many groups are pooling time, people, funds, and ideas with agencies to build recreation programs and restore habitats and riparian areas.

To mitigate the loss of federal timber sales, the Northwest Economic Adjustment Initiative (NEAI) was to provide more than $1 billion of federal funding over 5 years to rural communities for infrastructure development, assistance to businesses, retraining, and job creation. Some communities used the grants to leverage money from other sources and some individual projects were successful, but overall the NEAI did not create sustainable, forest-related local jobs comparable to the number and quality of those lost.

Resource advisory committees (RACs) were established in 2000 to recommend projects that benefit federal lands for funding under the 2000 Secure Rural Schools and Community Self-Determination Act, such as road maintenance, watershed restoration, and hazardous fuels reduction projects. Funding went to counties that historically received revenues from federal timber sales and helped mitigate the loss of those revenues. However, the future of the law, which sunset in 2006, is uncertain.

In Summary

- Agency-citizen relations improved slightly. Formal and informal organizations had varying levels of success in collaboration on management of federal forests.
- Federal agency-tribal relations improved, although more progress is possible. The Plan improved protection for American Indian trust resources, and consultation with tribes increased.
- Relations among federal agencies improved significantly. Interagency collaboration worked well in many, but not all, cases.

Overall, the various initiatives broadened collaboration in forest management. Many groups are pooling time, people, funds, and ideas with agencies to build recreation programs, to restore wildlife habitats and streams, and to accomplish other projects. The diversity of partners now ranges from local watershed councils and "Friends of" groups to national groups like Ducks Unlimited and the Rocky Mountain Elk Foundation. However, the traditionally strong partnership between the timber community and federal forests, weakened by reduced timber harvest and local influence in federal forest management, was diminished.

In the 10-year review, federal agencies and tribes generally agreed that their government-to-government relations improved over the past decade, although opinions differed about how well consultation was working.

The Plan changed the relations of federal agencies with each other in many ways. It established new work groups such as the REO and the RIEC to coordinate activities. Although these coordinating groups are not formally a part of the 10-year review, agency members commonly perceive improved cooperation. The Plan's emphasis on science, monitoring, and adaptive management requires managers and scientists to work together closely. Managers increased the strength of partnerships with research, including Forest Service research stations, the Cooperative Forest Ecosystem Research Program, the U.S. Geological Survey, and Environmental Protection Agency. ■

On the Olympic Peninsula, the long-dominant timber industry dropped by 2003 to a secondary role behind recreation and tourism. The forest-restoration economy anticipated under the Plan never really developed. The Quinault Indian Nation received more than $5 million through the NEAI and used the funds to develop tribal administration buildings, a store, a gas station, an interpretive center, and a watershed restoration program. The tribe and Olympic National Forest worked together on watershed assessments, a land transfer, and revenue-sharing from another parcel of land, and the tribe hired some former Forest Service employees.

Continue to Part 4

Adaptive Management and Monitoring

THE PLANNING TEAM expected that managers in partnership with scientists would test the Plan's strategies, monitor the results, and adapt Plan direction and strategies as more was learned (fig. 13). Adaptive management was intended to balance the Plan's use of the precautionary principle and prescriptive nature with some flexibility for managers.

Adaptive management has proceeded unevenly so far and has not been widely integrated into agency missions.

Flexibility, however, involves uncertainty and risk. The 10-year review found that adaptive management has proceeded unevenly so far and has not been widely integrated into agency missions. Most common has been a passive form of adaptive management, using a single management approach with regional monitoring as the primary mechanism for feedback and learning. Protective measures were often favored over active management.

Four main barriers kept adaptive management from being more successful.

- Perceived or real lack of flexibility for managers to test strategies that departed from Plan S&Gs. Examples are riparian reserve boundaries and management of LSRs.

In Summary

- Change through adaptive management was not achieved as 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 S&Gs.
- Overall, adaptive management was not widely integrated into agency missions. In the designated AMAs specifically, few have high levels of activity, and AMA activities are not thoroughly integrated into agency operations.
- Forest Service field units in the Plan area lost over one-third of their budgets and their workforce over the past decade, significantly affecting their capability to accomplish work. The BLM units in the Plan area had slight declines over the decade, with agency capability largely maintained.
- 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).

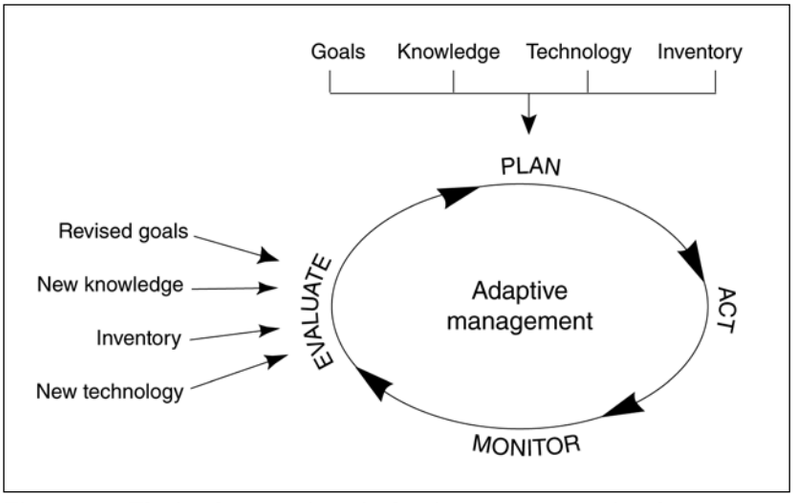
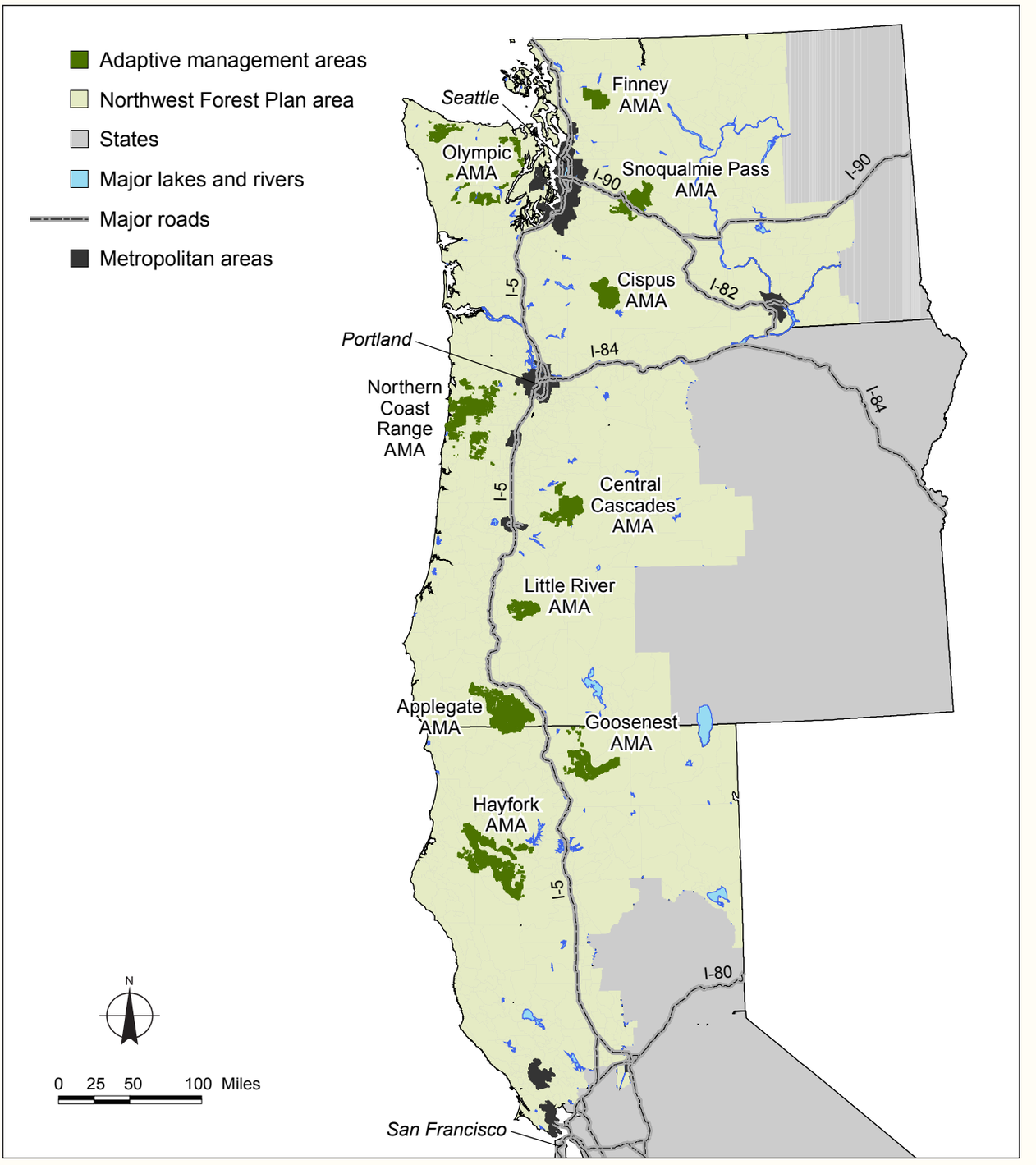


Figure 13—The implementation of adaptive management involves a four-phase cycle. The 10-year review found that most energy had been devoted to the first three phases with less attention to evaluating outcomes and adjusting allocations or standards and guides.



About 1.5 million acres (6 percent of the Plan area) were included in 10 designated AMAs, which were given a special mandate to test new ideas and management approaches. Although several highly relevant research projects were carried out, successes and lessons from the AMAs were not communicated widely.

Large-scale management experiments happened in only a few AMAs. For example, the Little Horse Peak Project in the Goosenest AMA (California) tested different combinations of silvicultural treatments (especially tree harvest and prescribed fire) and their success in accelerating the development of old-forest attributes in mixed stands of ponderosa pine and white fir. The Blue River Landscape Study in the Central Cascades AMA (Oregon) is testing a landscape management strategy based on a disturbance ecology approach, which involves deviations from the Plan's standards and guidelines.

One example of successful adaptive management was the use of new science information in managing even-aged plantations in late-successional reserves (LSRs). Studies showed that thinning these second-growth stands, along with other techniques, could speed the development of older forest characteristics. Such thinnings became a major source of timber in some federal forests, benefiting local economies and moving stands toward the old-forest habitat.

- Caution about the burden of proof for modifying S&Gs prevented adapting some active management even in cases with apparent benefits, such as reducing fire risk in fire-prone areas.
- Insufficient resources to carry out adaptive management. Forest Service field units in the Plan area lost more than one-third of their budgets and workforce over the decade, about one-quarter of Forest Service field offices closed or consolidated, and contracts for ecosystem management work dropped nearly 70 percent. The number of BLM employees in the Plan area declined slightly over the decade, and BLM capability was maintained.
- Perception of adaptive management as limited to a public participation process or a way to create new partnerships. Although new partnerships were created in some areas, many had lost momentum by the end of the decade.

Some adaptive management processes have occurred. One is the modified survey and manage program for rare species. Survey schedules, species classifications, and management requirements were changed for a number of these species in response to new information.

Regional Monitoring Program

The regional monitoring program was to be a key part of the adaptive management cycle, with a dual role of measuring progress and advancing learning. Regional monitoring was well institutionalized, with agencies committing resources and a full-time team to the program (fig. 14). Monitoring

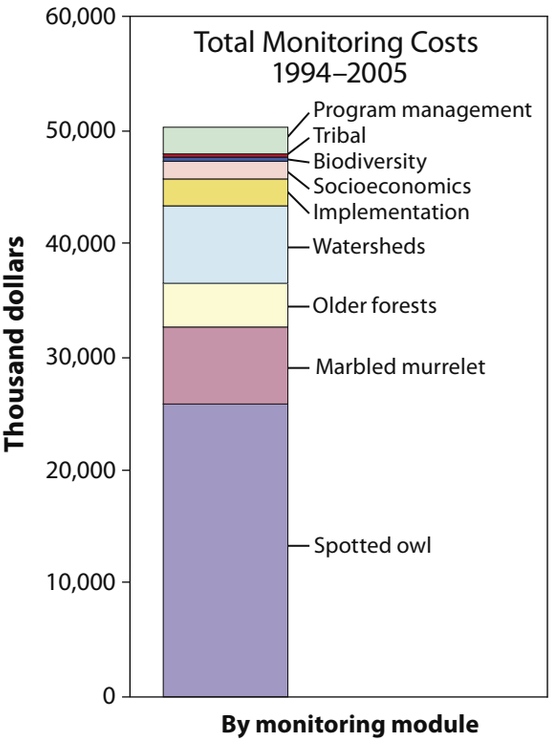


Figure 14—The single most expensive monitoring module during the Plan's first decade was monitoring of spotted owl populations (about $25 million). Marbled murrelet and watershed conditions were the next two most expensive modules.

produced a wealth of data, culminating in a series of status and trend reports, the 10-year review, and a science synthesis. Reports are listed in the "References and CD-ROM Contents" section on page 40 and are included as PDF files on the CD-ROM bound in this publication.

Three distinct types of monitoring were identified.

- **Implementation monitoring.** Verifies that the specified activities actually take place. A full implementation monitoring program began in 1996.
- **Effectiveness monitoring.** Evaluates if the specified activities actually accomplish the goals. Spotted owl monitoring had been going on since well before the Plan. Monitoring protocols had to be developed for some resources and were phased in as available: late-successional and old-growth forests (1998), marbled murrelets (1999), socioeconomic monitoring (2002), tribal consultation (2004), watershed condition (2004).
- **Validation monitoring.** Evaluates if a cause and effect relationship exists between management actions and outcomes.

The federal agencies involved in the Plan spent about $50 million on regional monitoring over 12 years, about 12 percent of the total cost of implementing the Plan. ■

Looking Ahead: Challenges for the Next 10 Years

THE 10-YEAR REVIEW suggests that the overall framework of the Plan is working, but certain improvements are needed to meet all the Plan's goals. The Plan's most notable successes are the protection of old-growth and riparian forests and associated species. Most existing old-growth stands are now protected from future harvest, and other middle-aged stands are slowly developing older-forest characteristics such as large trees. Watersheds are being restored, roads decommissioned, and rare species are protected.

Certain improvements are needed to meet all the Plan's goals.

New partnerships forged among managers, scientists, and the public are likely to yield new ideas to be tested in managing forests.

Yet the Plan fell short in some areas. Timber harvests were lower than expected and few new, year-round, high-wage jobs were created in communities hit hard by timber shortfalls. Active fuels management in the fire-prone forests of the eastern Cascade Range and Klamath-Siskiyou regions lagged behind expectations, perhaps increasing the risk of severe fire in these areas. However, fire losses averaged over the Plan area thus far are consistent with projections made at the outset. The Plan was not entirely successful in ending gridlock or controversies about federal land management.

The 10-year review found that the Plan's science base generally held up well, but some new scientific ideas emerged. Forest and stream ecosystems are more highly dynamic and have more variability than was recognized a decade ago. Thus fixed reserves may not be the best long-term strategy for conserving biodiversity, especially in fire-prone provinces. For ecosystems that change constantly under both natural and managed conditions, the most important characteristic may be the ability to recover after a disturbance.

In Summary

- The Plan's most notable successes are the protection of old-growth and riparian forests and associated species.
- Cooperation improved among agencies and between research and management.
- Timber harvests were lower than expected and few new, year-round, high-wage jobs were created in communities hit hard by timber shortfalls.
- Active fuels management in the fire-prone forests of the eastern Cascade Range and Klamath-Siskiyou regions lagged behind expectations.
- The Plan's conservation strategies are tightly connected, making it difficult to modify one without potentially compromising other strategies.
- The term "forest-based" includes a sense of place, recreation values, and other amenities that connect communities with forests, along with a timber economy.

Challenges for the Next 10 Years

The 10-year review concluded with a look ahead at the next decade's challenges for the Plan.

- Emerging issues such as climate change and invasive species.
- The risk of high-severity fires in the dry, fire-prone provinces.
- Issues related to postfire management, including salvage logging.
- Comprehensive strategy for managing forest ecosystems of all ages and types.
- Integration of regional Plan direction with expert knowledge of local conditions.
- Maintenance of technical expertise across multiple disciplines in field units.
- Issues related to the key watersheds network, management direction for key watersheds, and watershed restoration priorities.
- Real or perceived barriers to testing new approaches and taking measured risks to meet challenges such as large fires.
- Real or perceived barriers to diversifying practices to meet local conditions.
- Objective ways to measure ecosystem resilience and adaptation to climate change and other disturbances.
- Greater collaboration with tribes, the public, and among agencies.
- Improvements in the management of information, especially accessibility and consistency.

Tom Iraci

"It is our collective and individual responsibility to protect and nurture the global family, to support its weaker members, and to preserve and tend to the environment in which we all live."

—Tenzin Gyatso (the Dalai Lama)

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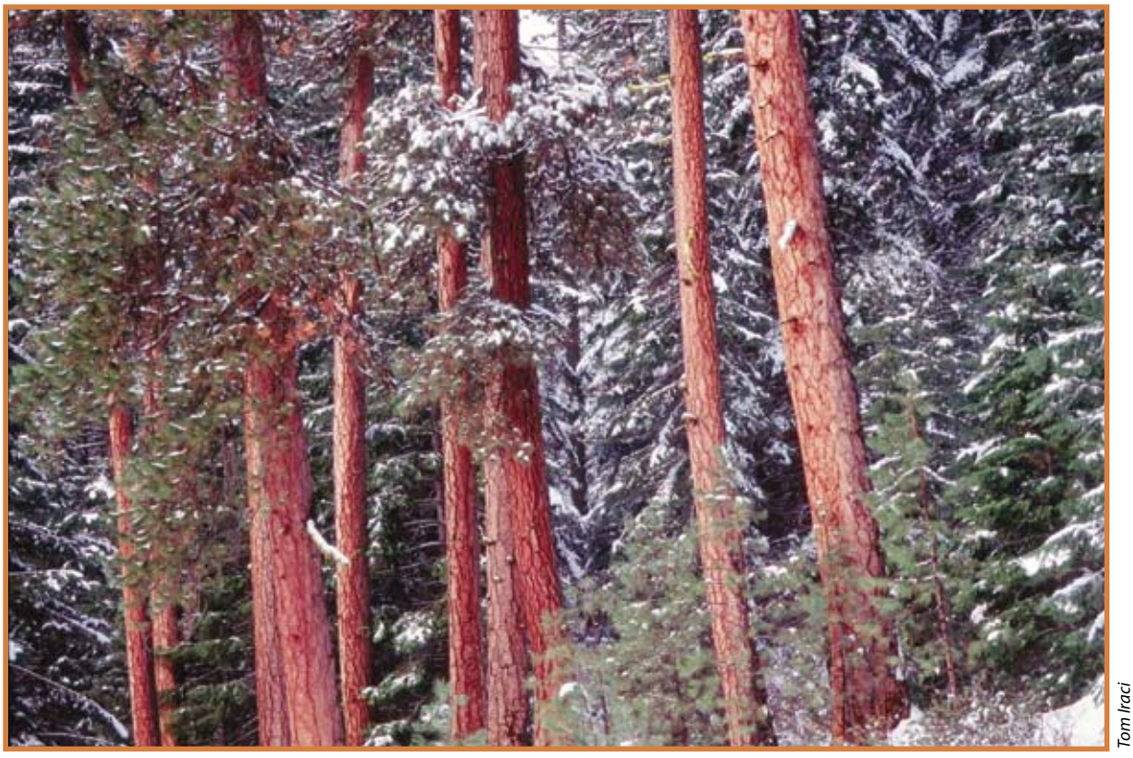

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