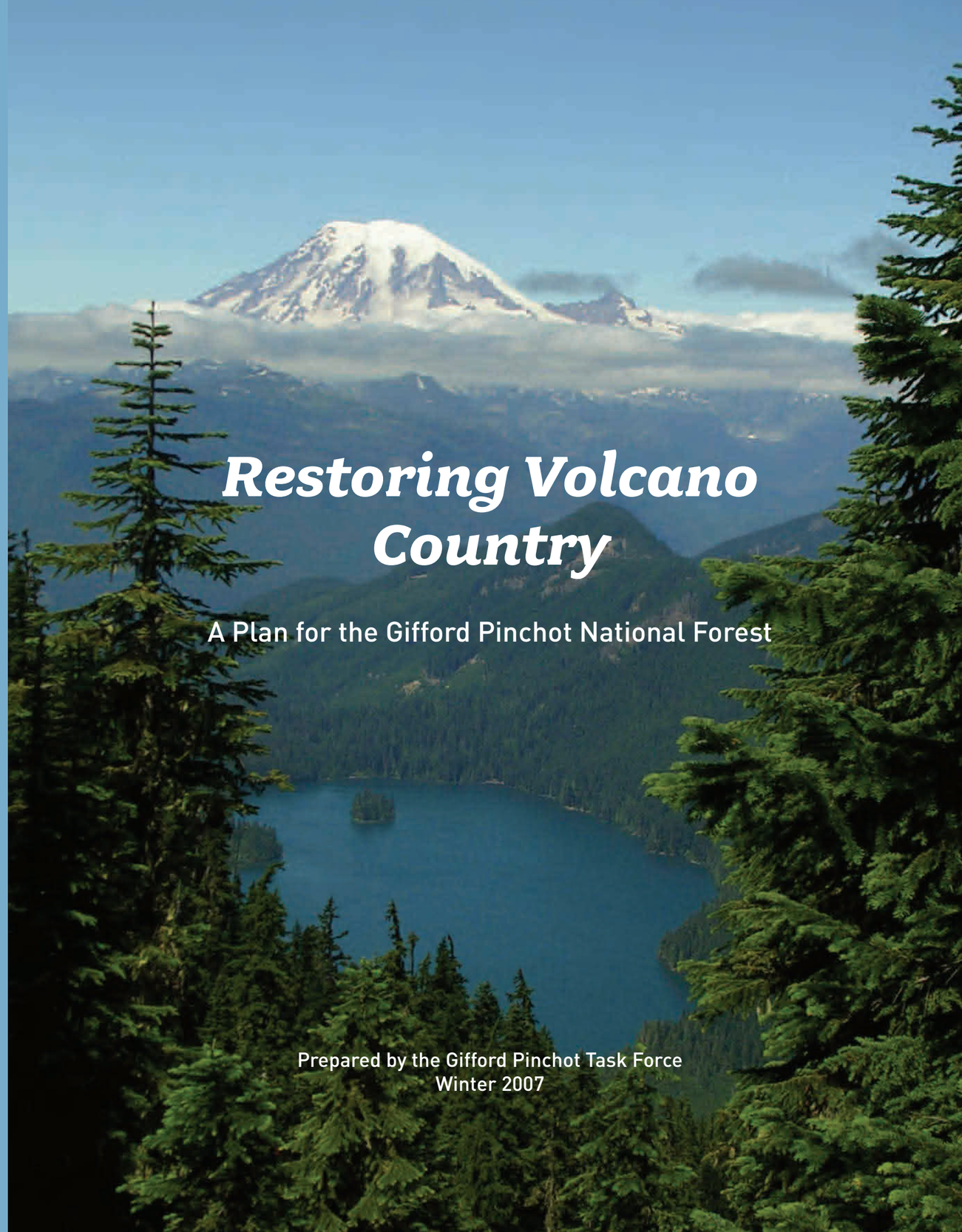
GIFFORD PINCHOT TASK FORCE

Gifford Pinchot Task Force
917 SW Oak Street, Suite 410
Portland, OR 97205
tel: 503-221-2102
fax: 503-221-2146
www.gptaskforce.org



Restoring Volcano Country

A Plan for the Gifford Pinchot National Forest

Prepared by the Gifford Pinchot Task Force
Winter 2007

Restoring Volcano Country

A Plan for the Gifford Pinchot National Forest

The Gifford Pinchot Task Force is a non-profit organization with over 3,000 members. The GP Task Force works to preserve and restore the ecosystems and communities of southwest Washington by promoting conservation of forest ecosystems and sustainable restoration-based employment.

GIFFORD PINCHOT TASK FORCE

The Gifford Pinchot Task Force would like to thank the following people for taking the time to provide comments on drafts of this restoration plan. This restoration plan does not necessarily reflect the views of those who reviewed and commented on the document. We take full responsibility for any and all mistakes and omissions.

John Bailey
Associate Professor of Silviculture
Department of Forest Resources,
Oregon State University

Carlos Carroll
Research Ecologist
Klamath Center for
Conservation Research

Bengt Coffin
Hydrologist
Gifford Pinchot National Forest

Tom Kogut
Wildlife Biologist
Gifford Pinchot National Forest

Dale McCullough
Senior Scientist
Columbia River Inter-Tribal
Fish Commission

Bob Obedzinski
Vegetation Management
Ochoco/Deschutes National Forest

Andrea Ruchty
South Zone Botanist
Gifford Pinchot National Forest

Ruth Tracy
Soil and Water Program Manager
Gifford Pinchot National Forest

Mitch Wainwright
Wildlife Biologist
Gifford Pinchot National Forest

We would also like to thank the Gifford Pinchot Task Force's Board of Directors for reviewing this document.

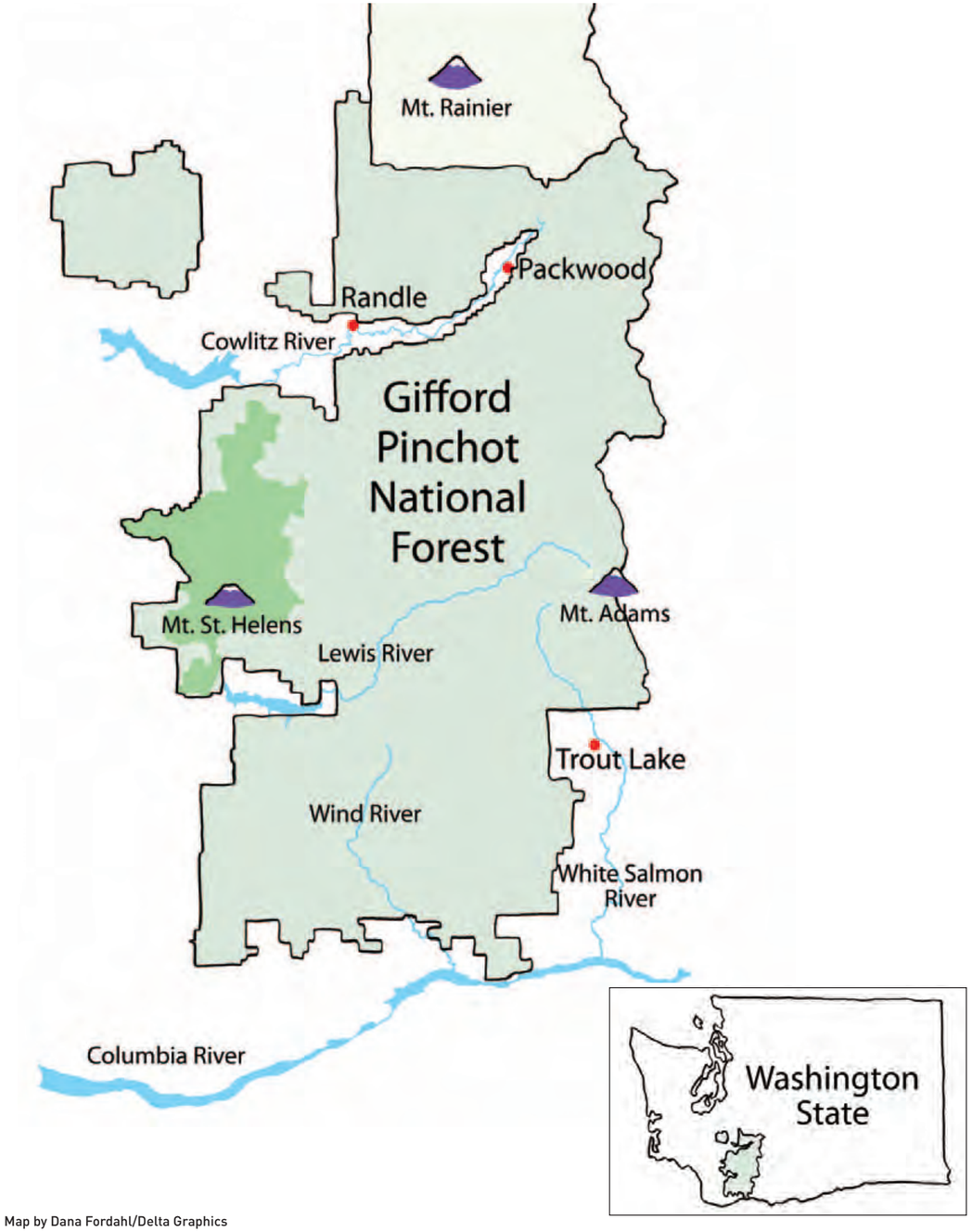
Author: Ryan Hunter
Lead Editor: Emily Platt
Assistant Editor: Lisa Moscinski
Design: Bryan Potter Design
Cover Photo: Jon Moscinski

Table of Contents

Figures

Figure 1

GPNF in Relation to Washington State



Map by Dana Fordahl/Delta Graphics

Executive Summary

Restoring Volcano Country is the Gifford Pinchot Task Force's vision for the future management of the 1.3 million acre Gifford Pinchot National Forest (GPNF) in southwest Washington. The GPNF stretches from the Columbia River Gorge on the south to Mount Rainier National Park on the north and includes Mount St. Helens on the west and about half of Mount Adams on the east. The GPNF's varied landscape ranges from icy Cascade peaks to majestic lowland ancient forest cedar groves and stunning wildflower meadows.

The GPNF is home to a diversity of plant and animal species, many of which are rare, sensitive, or threatened with extinction. The GPNF is also a crucial ecological link between the wildlands of the north (Mount Rainer, Snoqualmie, and Mount Baker areas) and south (Mount Hood), and the Gifford Pinchot shares a long, contiguous border on the east with the Yakama Nation's 1.2 million acre reservation.

Decades of unsustainable logging and excessive road building on the GPNF have fragmented forest habitat and muddied creeks and rivers – playing a major role in pushing species such as the spotted owl and salmon toward extinction.

Yet the tide is shifting in the Northwest, and most federal forestland managers are now moving away from controversial and biologically-destructive projects like ancient forest and roadless area logging. Instead, federal lands managers are finding that diverse public interests are united in their support for restoration of our public lands that returns wildlife to the woods and helps support the revitalization of our region's rural communities.

As this exciting shift begins to take root on the Gifford Pinchot National Forest and across the region, we have an opportunity to focus our restoration efforts and design a strategic restoration program that meets both the challenges and opportunities we will face over the coming decades.

Restoring Volcano Country outlines priority areas for implementing restoration activities over the next twenty years, such as forest thinning and road removal, and calls for management policy changes. It's implementation will require collaboration with diverse interests, new partnerships, creativity, and the ability to adapt as new information or tools become available. The Gifford Pinchot Task Force (GP Task Force) is excited to turn this vision into reality by implementing restoration work to create stable, family-wage forest jobs that will lead to streams thriving with salmon, unbroken expanses of ancient forests teeming with diverse wildlife, and wolves once again howling in the woods.

Restoring Volcano Country is organized into sixteen chapters that describe our approach to: reviving our region's rural communities, protecting existing high quality habitat, restoring forest health, combating invasive species, improving water quality and fish habitat, restoring wolf habitat, enlarging roadless areas, prioritizing restoration work, and changing management policies. Appendices outline and illustrate the methods and results of our analysis.

The restoration work outlined in *Restoring Volcano Country* will return native fish and wildlife to the woods and creeks while providing high quality work in the woods for local rural communities.

Introduction

A quiet but dramatic shift is taking root across the Northwest—a shift away from controversial ancient forest and roadless area logging towards restoration of our degraded public forestlands.

The 1.3 million acre Gifford Pinchot National Forest (GPNF) is nestled in the heart of volcano country – between Mount Rainer, Mount St. Helens, and Mount Adams. Pristine pockets of ancient forest stretch between and through the GPNF's seven wilderness areas and vast roadless areas like the Dark Divide and the Big Lava Beds. The GPNF is home to 51 documented or suspected threatened, endangered, or sensitive plant species, 24 threatened, endangered, or sensitive animal species, and a host of rare and more common wildlife ranging from jumping slugs and ensatina salamanders to coyotes, deer, songbirds, and hawks. The GPNF is a captivating pocket of the Northwest – the perfect place for a demonstration of how Northwest forests can be restored to provide for both biological diversity and rural community vitality.

While the GPNF still harbors a great richness of biodiversity, it was a workhorse during the heyday of logging in the 1980s. Logging of over 600 million board feet a year during its peak – that's about 1,200,000 log trucks – and the construction of more than 4,000 miles of road to facilitate logging severely fragmented and degraded both the forests and the creeks and rivers. This fast and furious logging played a significant role in pushing species such as salmon, steelhead, and the spotted owl to the brink of extinction and has resulted in the loss of the majority of the GPNF's original ancient forests. Yet we now have an incredible opportunity to turn this history into a story of hope and recovery.

A quiet but dramatic shift is taking root across the Northwest – a shift away from controversial ancient forest and roadless area logging toward restoration of our degraded public forestlands. *Restoring Volcano Country* complements this shift by laying out a thoughtful, strategic, twenty-year restoration plan that creates rural forest jobs while returning fish and wildlife to the Northwest's woods.

Unfortunately, over the past decade, the Forest Service has experienced a steep reduction in the staff and funding they need to plan and implement restoration work (or any other work!). The GPNF's overall budget has plummeted 61% since 1992, and it has lost 75% of its full-time employees in that same time period. Until our country's priorities are back on track, the Forest Service will need the support of external partners like the GP Task Force to successfully restore degraded and fragmented habitats and provide local, family-wage forest jobs.

The vision for the GPNF outlined in *Restoring Volcano Country* provides a road map for strategically enhancing wildlife habitat, restoring watersheds, improving overall ecosystem health, and creating family-wage jobs in the woods.

Perhaps most importantly, however, this vision lays a solid foundation of hope for a return to healthy and abundant salmon runs in our streams, large contiguous blocks of ancient forest thriving with wildlife, watersheds that harbor magnificent top predators, and local family-wage jobs in the woods that help revitalize our rural, forest-dependent communities. By working hard and working together, we can effectively implement this vision on the ground.

Bringing the Benefits Home

Removing roads like this one in the Iron Creek watershed protects fish habitat, restores connectivity for terrestrial wildlife, and creates highly skilled, family-wage jobs that support rural economies.

Photo by LKE Corporation

Rural communities near the GPNF, such as Randle and Packwood, rely heavily on federal forestlands for their economic and social health. However, unsustainable logging practices, increased mechanization, increased competition from other regions and countries, and increased protections for threatened and endangered species led to a steep and rapid decline in logging related jobs in the late 1980s and early 1990s. The loss of these communities' main source of quality jobs has had numerous additional impacts: the loss of doctors and pharmacies, the closure of local schools, the out-migration of youth, and drug and alcohol problems.

Rural communities near the GPNF struggle daily to cope with these socioeconomic challenges, and the GP Task Force's restoration plan will help develop healthy and thriving rural communities that have the capacity to engage in the types of restoration work that will be needed in the woods. Many skilled forest workers have already left these communities, and if the restoration of the GPNF is to be successful, we need to encourage and support the development and stability of local restoration businesses that can skillfully thin young, dense stands; remove high impact, unnecessary roads; place wood in streams to restore aquatic habitat; and eradicate non-native invasive species.

Collaboration between diverse interests will be critical to effectively advancing both forest ecosystem restoration and rural community revitalization. Collaboration moves diverse and sometimes bitter and angry interest groups beyond the black and white battles that dominated forest management in the recent past. Collaboration is not a quick and easy solution. It requires a great deal of time and patience from every-

The GP Task Force's restoration plan will help develop healthy and thriving rural communities that have the capacity to engage in the types of restoration work that will be needed in the woods.

one including forest workers, conservationists and the Forest Service. But the results are well worth the investment: long-term agreement for collectively moving forward to restore the region's public lands.

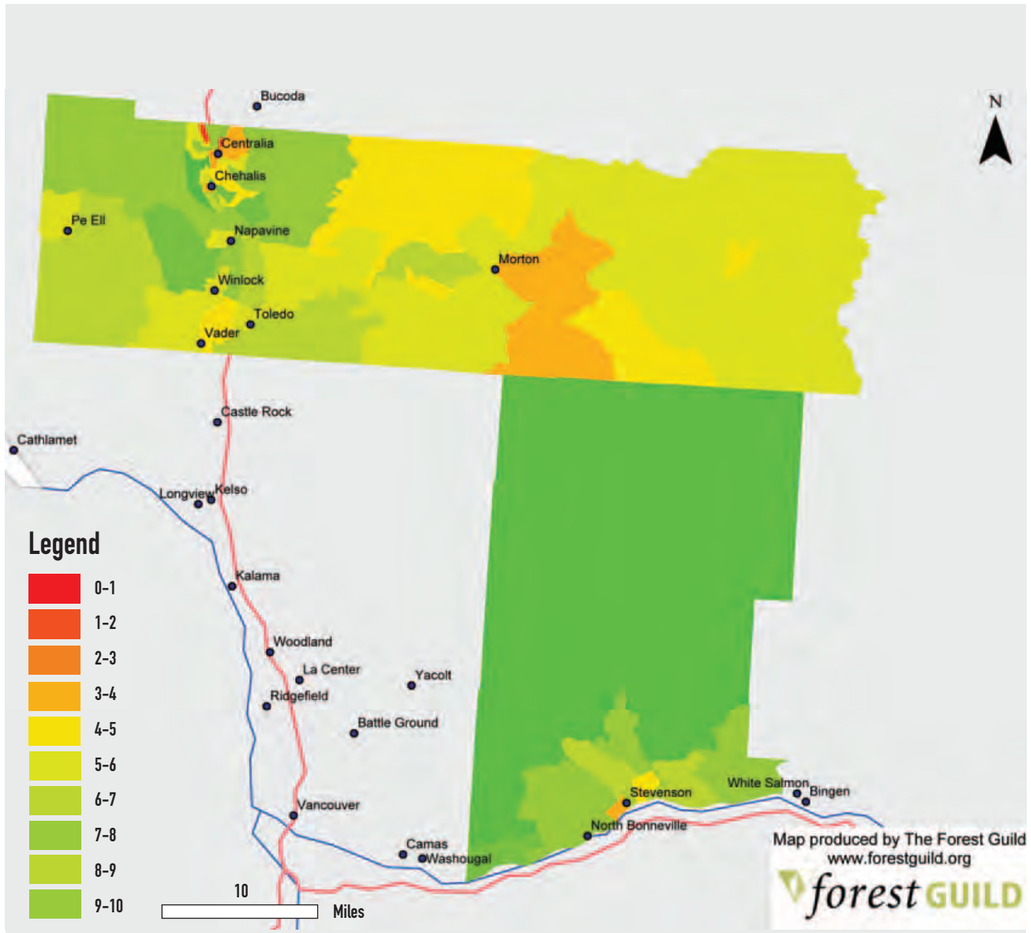
Congress has a role to play in the success of collaborative restoration as well, and congressional leaders need to make funding for restoration work a priority. In recent years, the Forest Service budget line items that support this work have been reduced to dangerously low levels. A dramatic shift toward more funding for collaboration and restoration is now needed. For example, the Forest Service estimates that it needs several billion dollars nationwide to maintain existing roads, replace culverts, and decommission old roads; on the GPNF there is $50 million plus road maintenance backlog. In addition, the Forest Service's budget should be allocated based on measures that truly reflect restoration and other public values. For example, national forests should receive incentives to collaborate with the public and restore the most important habitats instead of receiving money based on how many board feet they plan to log.

Beyond the collaboration and restoration budget line items, Congress should also fund the Secure Rural Schools Act and programs similar to the Economic Action Program. The Secure Rural Schools Act was established to end a perverse incentive that encouraged unsustainable logging. Before the Secure Rural Schools Act, counties were paid a percentage of logging receipts for any logging that took place on federal lands within county lines. For a county like Skamania, with 80% of its land in federal ownership, these timber receipts were a primary funding source for basic county services like schools, road maintenance and search and rescue. The Secure Rural Schools Act decoupled county funding from logging levels and instead offered counties set revenue based on a formula created in the Act. Unfortunately, the Act expired after six years. Plans for long-term reauthorization are currently being debated in Congress. The Economic Action Program provided grants and technical assistance to rural communities for economic development and strategic planning and should be re-funded.

In addition to Congressional funding, collaborative restoration can be supported in part through stewardship contracting. Stewardship contracting was passed by Congress in 2002 and granted the Forest Service and the Bureau of Land Management more flexibility in how they arrange restoration contracts. Stewardship contracting makes restoration more affordable and more adaptable to local capacity and conditions by allowing the Forest Service to credit contractors for the restoration work they accomplish as part of what would normally be a more expensive project. Stewardship contracting also enables the Forest Service to select contractors based on a variety of qualities in addition to the price of their bid. For example, stewardship contracts are rated on the quality of the proposal, the contractor's past work, and benefits to the local community. Stewardship contracting should continue to be honed and adapted on the GPNF to implement collaborative restoration work. ■

Figure 2

Community Capacity for Skamania & Lewis Counties



The ability to get necessary restoration work done on the Gifford Pinchot National Forest depends in part on a skilled workforce in the area prepared to do the work. The Forest Guild created the map in Figure 2 of community capacity in an effort to measure the ability of local communities to respond to changes and opportunities in national forest management in the area. High capacity communities tend to be more resilient and able to respond to ever-changing natural and political circumstances. On the map, communities with greater capacity are represented by yellow and green colors associated with the higher number ratings, whereas communities with less capacity are represented by orange and red colors associated with lower number ratings. While the community capacity index is not a perfect measure, we offer it as a starting point from which to build a realistic model of local communities' ability to adapt, support and benefit from changes in national forest management.

Preserving Our Natural Heritage

Roadless areas serve as important refugia for plant and wildlife species and provide a source of clean, cool water for fish and municipal water supplies.

While a great need for restoration work exists on the GPNF, there is also a network of healthy and productive areas which provide excellent habitat that need to be preserved. Protecting important biological refuges is the foundation of a solid restoration plan.

Ancient forests provide long-term, stable habitat that is essential for a great number of species. The northern spotted owl, marbled murrelet, American marten, and fisher are just a few of the species that are heavily dependent on habitats associated with ancient forests. In fact, over 1,000 terrestrial species not including insects and spiders are closely associated with ancient forest habitat.

Ancient forest habitat is generally defined as structurally diverse forest with a patchy multi-storied canopy with trees of varied ages, large living trees, large standing dead trees (snags) and down woody debris (dead and decaying trees on the forest floor), and species and functional processes that are representative of the potential natural community.

While ancient forests are defined by these specific characteristics, for the purposes of this analysis the GP Task Force used the simplistic but much more practical criteria of forest stands 175 years and older to identify ancient forest habitat (see Figure 3). Forest stands 175 years and older are most likely to contain ancient forest characteristics. Scientists used this definitive criterion when creating the NW Forest Plan - the federal plan created in an attempt to save the spotted owl from extinction.

Federal agencies estimate that of the 24.3 million acres covered by the Northwest Forest Plan, less than 35 percent are comprised of mature and ancient forests. Much of the rest is heavily fragmented by roads and clear-cuts. With so little of the original ancient forest habitat remaining, species such as the northern spotted owl and marbled murrelet are threatened with extinction. Remaining ancient forest stands on the GPNF are therefore of great ecological importance and should be excluded from logging, road building, and other harmful activities.

While stands 175 years and older provide ancient forest habitat, mature stands – approximately 80 to 174 years of age - also provide important forest habitat (see Figure 3). These mature stands have begun to develop some of the structural characteristics associated with ancient forest habitat but have not yet fully developed into a structurally diverse forest. Some management activity such as snag creation may be justified in younger mature forest stands that are dense, have been previously logged, and are lacking in structural diversity. However, the vast majority of mature forest stands should be left to age and develop naturally and would not benefit from active intervention.

Unprotected mature and ancient forests can often be found in roadless areas, but this is only one of the many ecological benefits of roadless areas. Roadless areas are divided into two politically constructed categories – inventoried roadless areas are wildlands identified by the Forest Service that are greater than 5,000 acres in size or are additions to existing wilderness areas, whereas uninventoried roadless areas are wildlands never identified and mapped by the US Forest Service that are greater than 1,000 acres in size (see Figure 4). Both types of roadless areas serve as important refuges for plant and wildlife species and provide a source of clean, cool water for fish and municipal water supplies.

Remaining ancient forests like this grove should be protected to preserve critical habitat for native species.

Photo by James Johnston

Roads can be extremely destructive to forest ecosystems, and there are over 4,000 miles of roads on the GPNF alone. These roads fragment forest habitat, act as a barrier to migrating fish and wildlife, deliver large amounts of smothering sediment to streams, and facilitate human activity such as off-road vehicle use that can disturb wildlife, introduce invasive species and start wildfires. Remaining roadless areas, therefore, are of great ecological value, especially for species that are known to require isolation from humans such as the wolverine or wolf and those requiring clean water such as salmon. Remaining roadless areas deserve to be protected.

To create a solid foundation for restoration on the GPNF, no new roads, temporary or otherwise, should be built in existing roadless areas; and no management activity that compromises the refugia role of roadless areas should be allowed to occur.

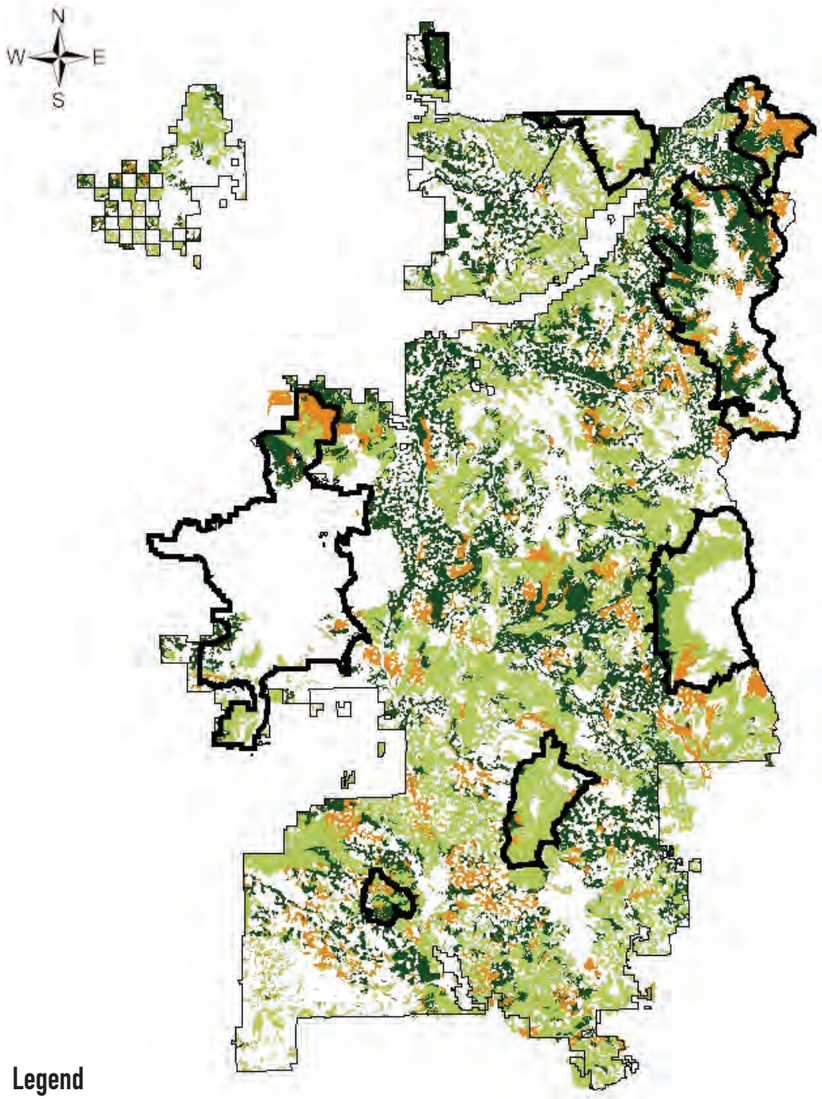
Past management efforts have attempted to protect mature and ancient forests as well as roadless areas. The Northwest Forest Plan, developed under the direction of the Clinton Administration in 1994, intended to protect important forest habitat while also allowing for traditional timber harvest. As such, the plan zoned federal forests within the habitat range of the spotted owl into lands managed for traditional timber harvest and lands managed for ancient forest dependent species. Unfortunately, the plan left nearly half of the GPNF's remaining mature and ancient forest unprotected in areas to be managed for traditional timber harvest, and portions of the land meant to serve as habitat for ancient forest species were nothing more than young, re-growing clear-cuts. The Northwest Forest Plan's value lies in the significant and strategic decision to manage federal forestlands with the landscape scale in mind – critical for the recovery of not only owls but also wolves, salmon and a host of other native species. While the Plan left key areas unprotected, it has been an important step in the right direction for the Forest Service.

The 2001 Roadless Area Conservation Rule protected the remaining inventoried roadless areas across the country from most development threats. This rule was developed after a lengthy public participation process that generated millions of comments in support of roadless area protection. President George W. Bush, after coming into office in 2001, quickly set about revising the rule to gut protections for roadless areas. In the fall of 2006, a federal court determined that President Bush illegally overturned the roadless rule and reinstated it, providing protection once again to the nation's inventoried roadless areas. But the future remains uncertain, and the issue has yet to be fully resolved.

If we act to finally protect remaining mature and ancient forests and roadless areas, we will be able to look to the future with more confidence that we can successfully restore the biodiversity and resilience of our forests and watersheds. ■

Figure 3

Mature & Ancient Forest



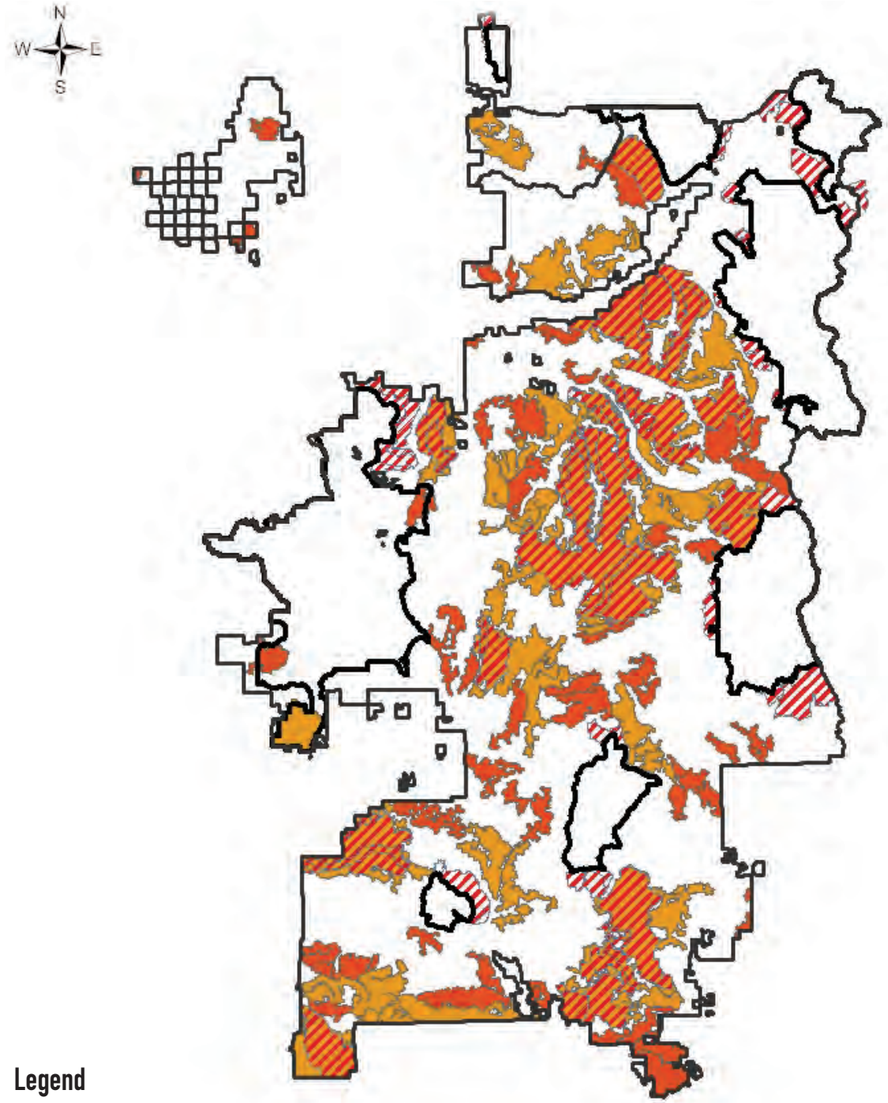
Legend

- GPNF Boundaries
- Congressionally Withdrawn Areas
- Classic Ancient Forest (>=175 years in 2006)
- Ancient Trees Present (>=175 years in 2006)
- Mature Forest (>=80 years in 2006)

10 Miles

Figure 4

Roadless Areas



Legend

- GPNF Boundaries
- Congressionally Withdrawn Areas
- Inventoried Roadless Areas
- Uninventoried Roadless Areas > 5,000 acres
- Univentoried Roadless Areas > 1,000 acres

10 Miles

Mimicking Ancient Forests

Diverse interests agree that restoring stands like this can both create local economic benefit and improve wildlife habitat.

Photo by Emily Platt

The GP Task Force has prioritized dense young plantation stands (previous clear-cut forests) for thinning in order to facilitate the creation of ancient forest characteristics which will improve wildlife habitat and increase habitat connectivity across the forest. If we act to thin these prioritized plantation stands and when necessary encourage a diversity of tree species through underplanting, we will be able to improve plant and wildlife habitat and create stable jobs in the woods at the same time.

After clear-cutting ancient forests, the common practice was to densely replant with Douglas-fir trees. While this approach grows trees for logging quickly, it precludes the development of natural forest habitat features such as large trees, varied tree species, different ages of trees, and a healthy shrub and plant layer. When these forests were clear-cut, all of the standing dead trees, or snags, were cut as well. These snags offer essential habitat to many forest dwellers, including a variety of woodpeckers. Decades of these outdated management techniques have left the GPNF with many timber plantations low in biodiversity and habitat values.

Unlike natural forests, plantations are monotonous and offer relatively little habitat. Natural forests are messy with many different plants and layers while dense timber plantations often do not allow enough light to reach the forest floor, resulting in a lack of plants and shrubs growing on the forest floor. One would be hard pressed to find bunchberry, wild lilies or wild roses in a dense plantation stand. The lack of adequate light also means that there will not be enough cover for some wildlife species to hide from predators and there will be a prolonged absence of a second canopy layer. Densely packed trees also compete with each other for water, nutrients, and sunlight, resulting in small, slow-growing trees. Sometimes these plantations are so densely-packed with trees that it is virtually impossible for humans or animals to walk through them.

Moreover, a dense forest with just one species of tree like Douglas-fir is generally more susceptible to insect and disease outbreaks. Deciduous trees like maples and other conifers such as cedars serve important ecological functions but are scarce in plantations.

The latest science has begun to show that careful and strategic thinning of these young plantations can help improve wildlife habitat by more quickly developing ancient forest characteristics. Plantation thinning projects which create structural diversity, accelerate tree growth, encourage multiple tree species, establish standing dead trees and downed logs, and return scattered light to the forest floor can help create more ecologically healthy forests. As this science is still young a precautionary approach should be taken, and careful monitoring will be essential.

The GP Task Force prioritized plantation stands that:

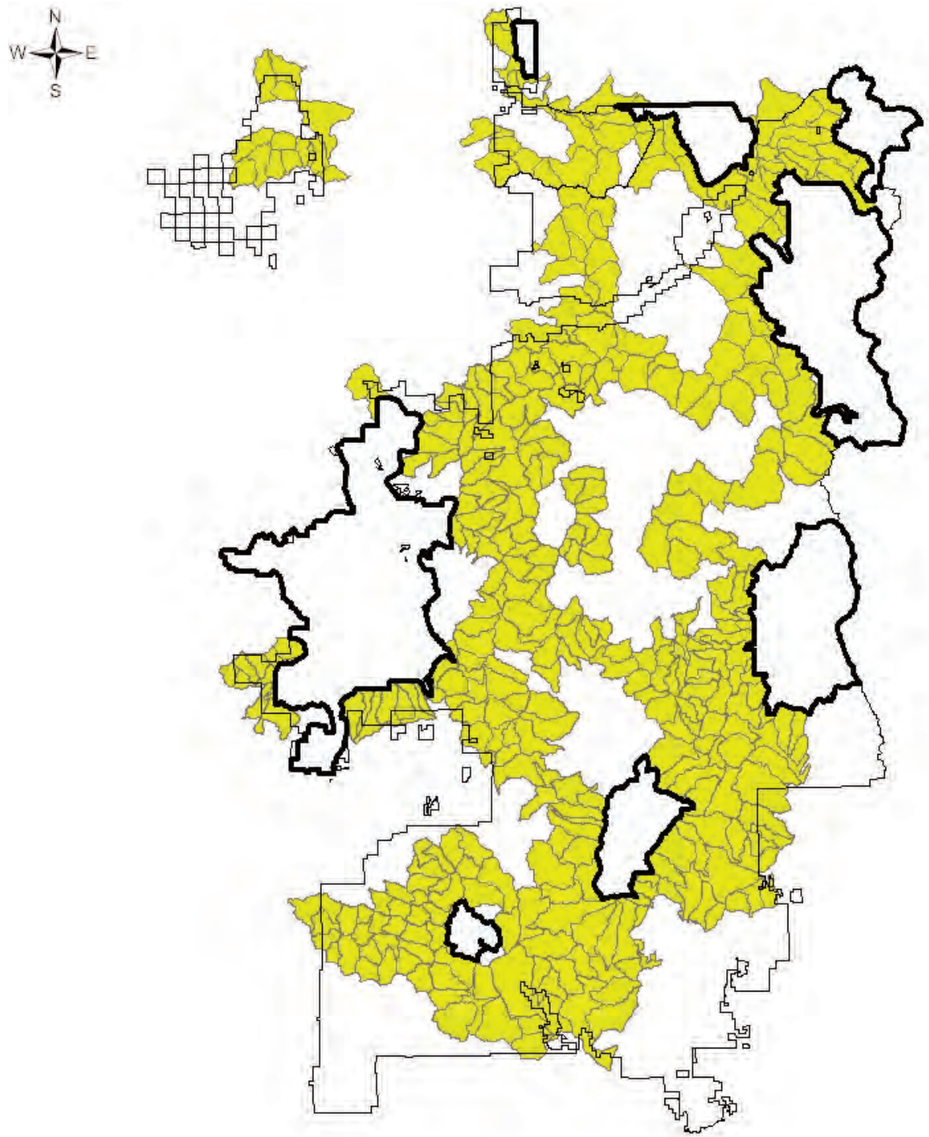
- are 30-57 years of age,
- have not been withdrawn from timber harvest (i.e. not in wilderness or administratively withdrawn areas),
- have not been precommercially thinned,
- are below 4,000 feet, and
- are within priority subwatersheds.

Priority subwatersheds were selected based on a number of considerations such as areas zoned as ancient forest reserves and areas where young stands are interspersed among blocks of ancient forests (see Figures 5 and 6). The prioritized stands for thinning total more than 110,000 acres. Thinning these dense, young plantation stands will improve wildlife habitat and increase habitat connectivity across the forest. ■

Thinning dense, young plantation stands will improve wildlife habitat and increase habitat connectivity across the forest.

Figure 5

Priority Subwatersheds for Thinning



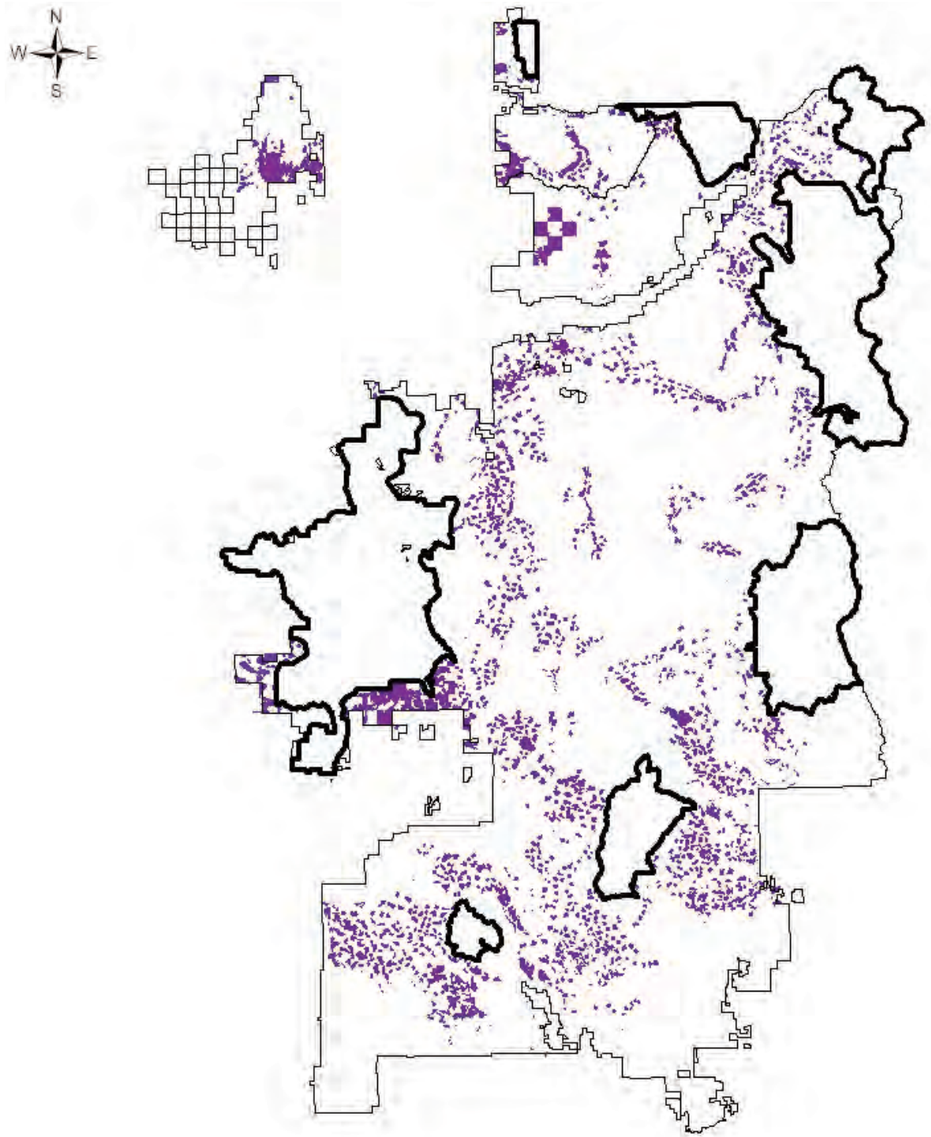
Legend

- GPNF Boundaries
- Congressionally Withdrawn Areas
- Priority Subwatersheds for Thinning

10 Miles

Figure 6

Priority Plantation Stands for Thinning



Legend

- GPNF Boundaries
- Congressionally Withdrawn Areas
- Priority Plantation Stands 30–57 years (2006)

10 Miles

Playing with Fire

This drier eastside GPNF stand was recently thinned to restore historical conditions and the forest's natural resilience.

Photo by Jay McLaughlin

Years of fire suppression by state and federal agencies have resulted in unnatural conditions in forests that evolved with wildfires. Some of these forests could benefit from thinning and/or prescribed fire as a first step toward reestablishing a natural fire cycle.

Drier forests, predominately found on the east side of the Cascade Range, depend upon frequent low and moderate intensity fires to maintain their health and natural composition. For example, some lodgepole pines require fire to release its seed.

With decades of aggressive fire suppression and unsustainable logging, however, these forests have become uncharacteristically dense and some have developed insect and disease problems as a result. These forests are at a greater risk of experiencing large, high intensity fires rather than the historic, less intense natural fires that tended to thin out the smaller trees and burn in a mosaic pattern, leaving large fire resistant trees and some areas entirely untouched.

Thinning the small trees that have established since the misguided practice of fire exclusion began and/or reintroducing low intensity prescribed fire can help to restore the ecological conditions and processes with which these forests evolved.

Thinning the small trees that have established since the misguided practice of fire exclusion began and/or reintroducing low intensity prescribed fire can help to restore the ecological conditions and processes with which these forests evolved.

A small pocket of the drier forest type exists in the southeastern corner of the GPNF, and the GP Task Force has mapped this drier forest pocket along with the subwatersheds in which the vast majority of this habitat type occurs (see Figures 7 and 8).

Thinning small diameter trees from some of the forest stands in these subwatersheds and then reintroducing fire could help restore wildlife habitat and critical ecological processes. Of course, it may not make sense to thin in some of these areas due to stand conditions and ecological concerns.

A precautionary approach is particularly important in this realm because species such as the spotted owl have come to depend on the unnaturally dense vegetation in some of these drier forest stands. While spotted owl may not have used such marginal habitat in the past, the same habitat could now be important for the owl's survival. The decision of where to actively manage drier forest stands is best made on a case by case basis. ■

Figure 7 Drier Forest Type

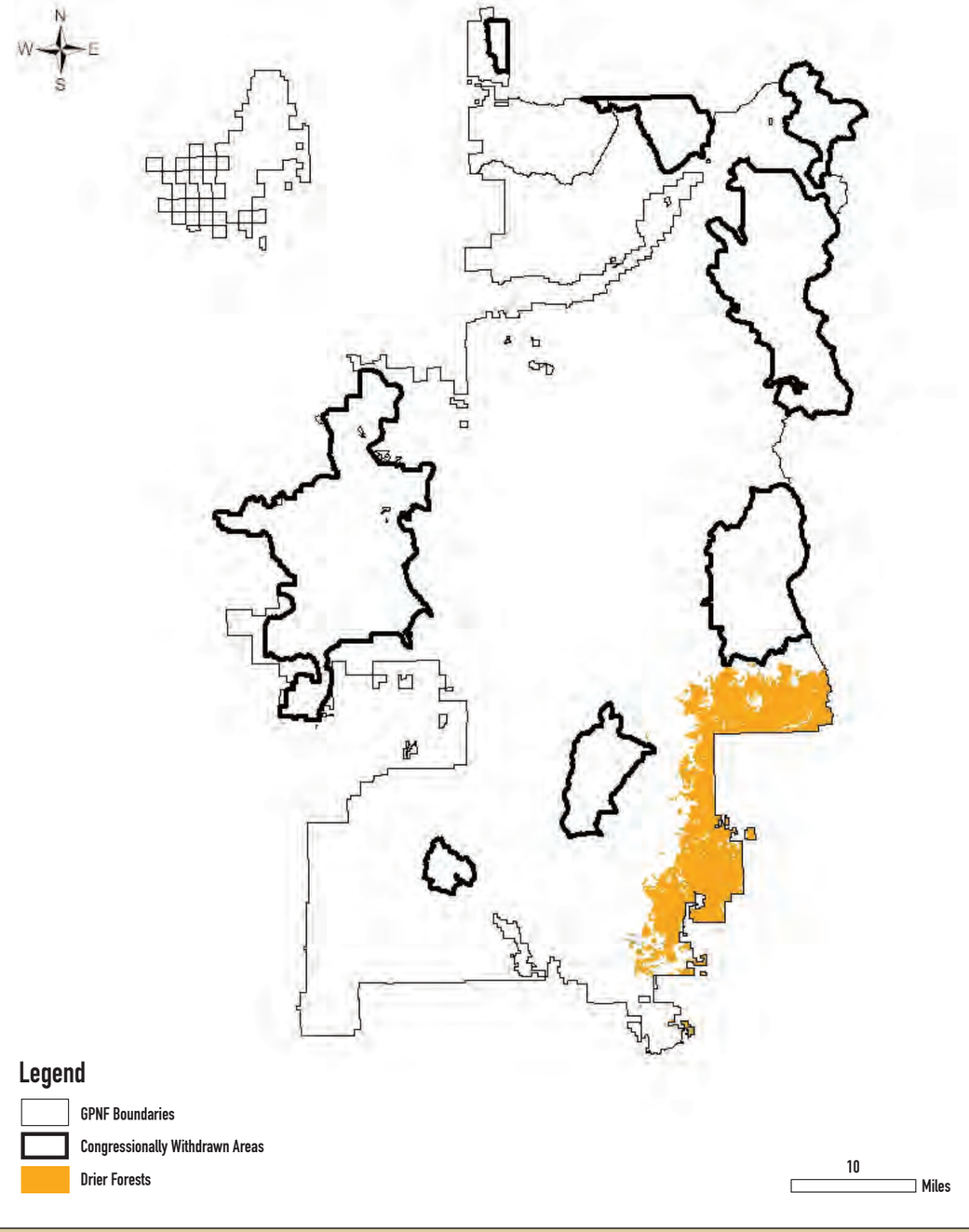
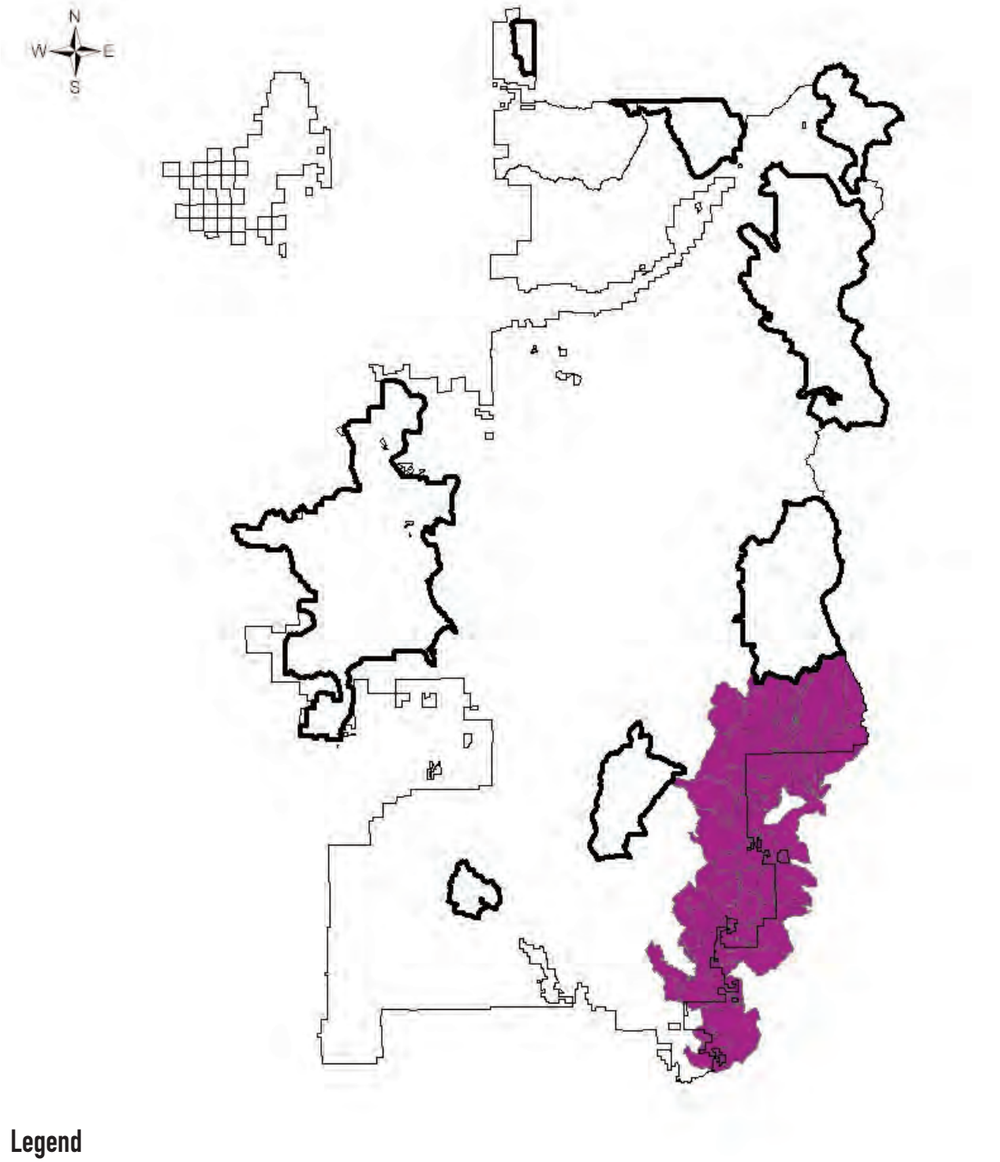


Figure 8

Drier Forests Priority Subwatersheds



Weeding Out Invasive Species

GP Task Force and Forest Service staff and volunteers work together to remove Scotch broom from the edge of Mount St. Helens fragile blast zone.

Photo by Brent Foster

Highly conservative estimates show 30,000 acres of GPNF lands infested with at least 35 invasive plant species. Invasive species pose a significant threat to the health of the Gifford Pinchot's forests, lakes, and rivers. Invasive species can displace native plants; reduce wildlife habitat and forage; impact threatened, endangered, and sensitive species; increase soil erosion; reduce water quality; and reduce soil productivity. In addition, invasive species spread easily and rapidly, making control very difficult. These invasive species need to be eradicated or controlled in order to maintain healthy ecosystems and native fish, plant and wildlife populations.

Japanese knotweed is one example of an incredibly problematic invasive weed. It grows in riparian areas and spreads rapidly along scoured shores and islands. The plant shades out other riparian species, reducing forage for wildlife, stream shade, and the supply of woody debris to the stream. Japanese knotweed, if left untreated, can harm critical salmon habitat. Japanese knotweed crowds out native species that are better able to shield the soil from rain, leading to increased soil erosion and sediment delivery to streams during intense winter rains. Moreover, Japanese knotweed consumes disproportionately large amounts of water, reducing water levels in streams for all aquatic species.

Another ubiquitous example of a local invasive species problem is Scotch broom. This plant was brought to our country because of its beautiful yellow flowers and, ironically, to rehabilitate disturbed areas. However, Scotch broom now displaces endless miles of wildflower habitat in the Columbia River Gorge alone. This plant has also established itself on the edges of the Mount St. Helens blast zone. If Scotch

broom were to overtake the volcano's blast zone, some of our country's best research opportunities on recovering fragile habitats and natural regeneration following volcanic activity would be destroyed.

Invasive animals are also a problem on the GPNF but are not as well documented or understood. Non-native slugs and the bullfrog, for example, may be displacing native species and disrupting ecosystem functions. Unfortunately, there is not currently enough data on invasive animals, so they were not factored in to this restoration plan. We hope to be able to incorporate this aspect of restoration in the future.

For our analysis of non-native species on the GPNF, the GP Task Force mapped and prioritized U.S. Forest Service data on invasive plant species infestations and the subwatersheds in which they can be found (see Figures 9 and 10).

Invasive plants must be treated aggressively on the GPNF if we are to halt their steady growth. Invasive plant treatment should incorporate a variety of techniques including hand pulling, biological controls, and the careful and extremely selective use of herbicides. Biological controls are a concern because of potential impacts to natural insect communities and the ecosystems in which they are found, and herbicide use is a concern because of its potential impact to wildlife and water quality.

It is also important to note that invasive species populations can quickly grow and spread, causing exponential impacts to native ecosystems and quickly spiraling beyond the reach of already-reduced Forest Service budgets. Quick and decisive action should be taken immediately to slow the growth and spread of invasive plants. Priority areas may also quickly change as invasive populations grow, spread, or are newly introduced or eradicated, so flexibility is important in prioritizing this work. Public involvement in the reporting and mapping of invasive species populations will also be key, again because of the current lack of Forest Service capacity for this work: there are only two botanists for the entire 1.3 million acre Gifford Pinchot National Forest. ■

Invasive species need to be eradicated or controlled in order to maintain healthy ecosystems and native fish, plant and wildlife populations.

Figure 9

Invasive Species Priority Areas

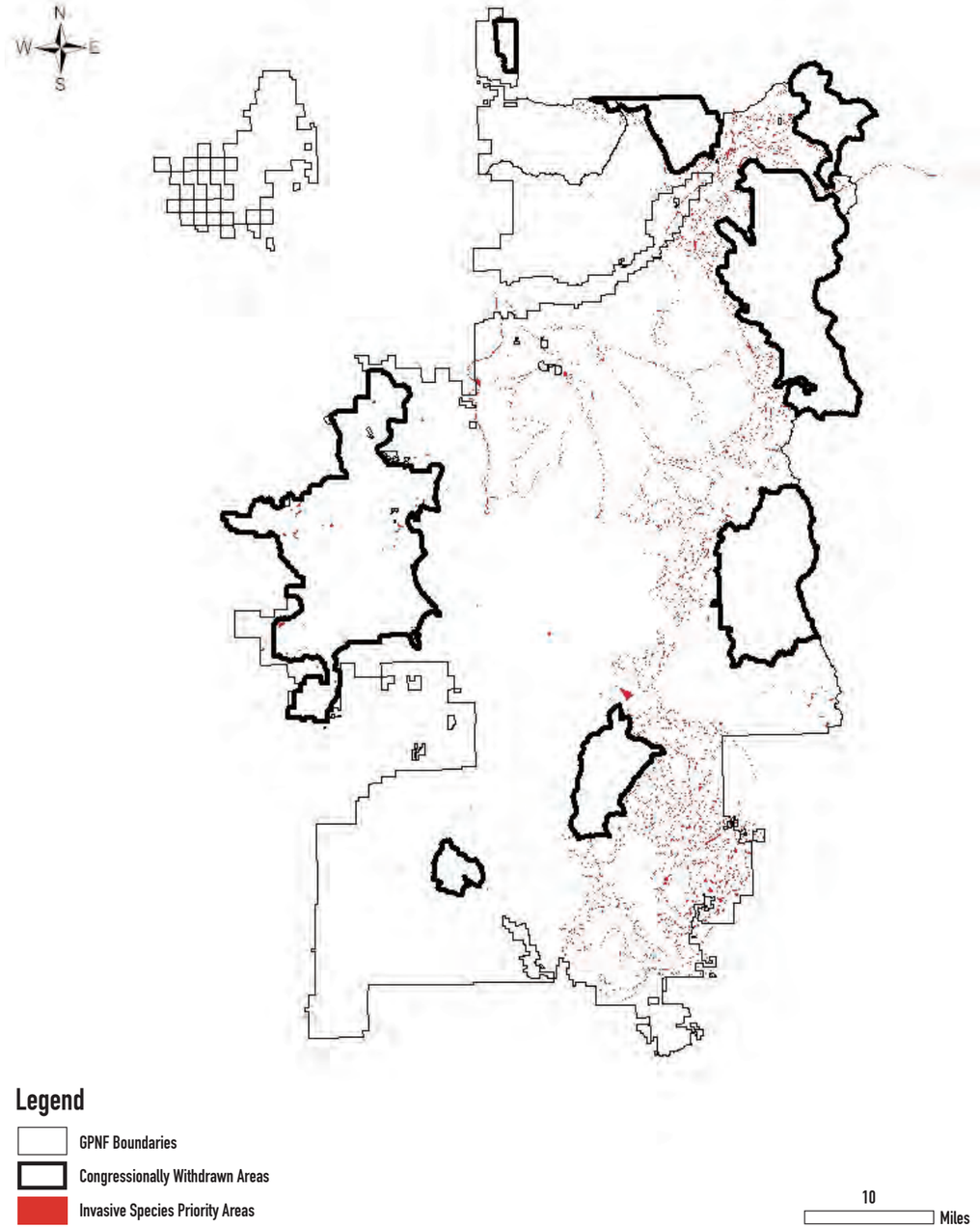
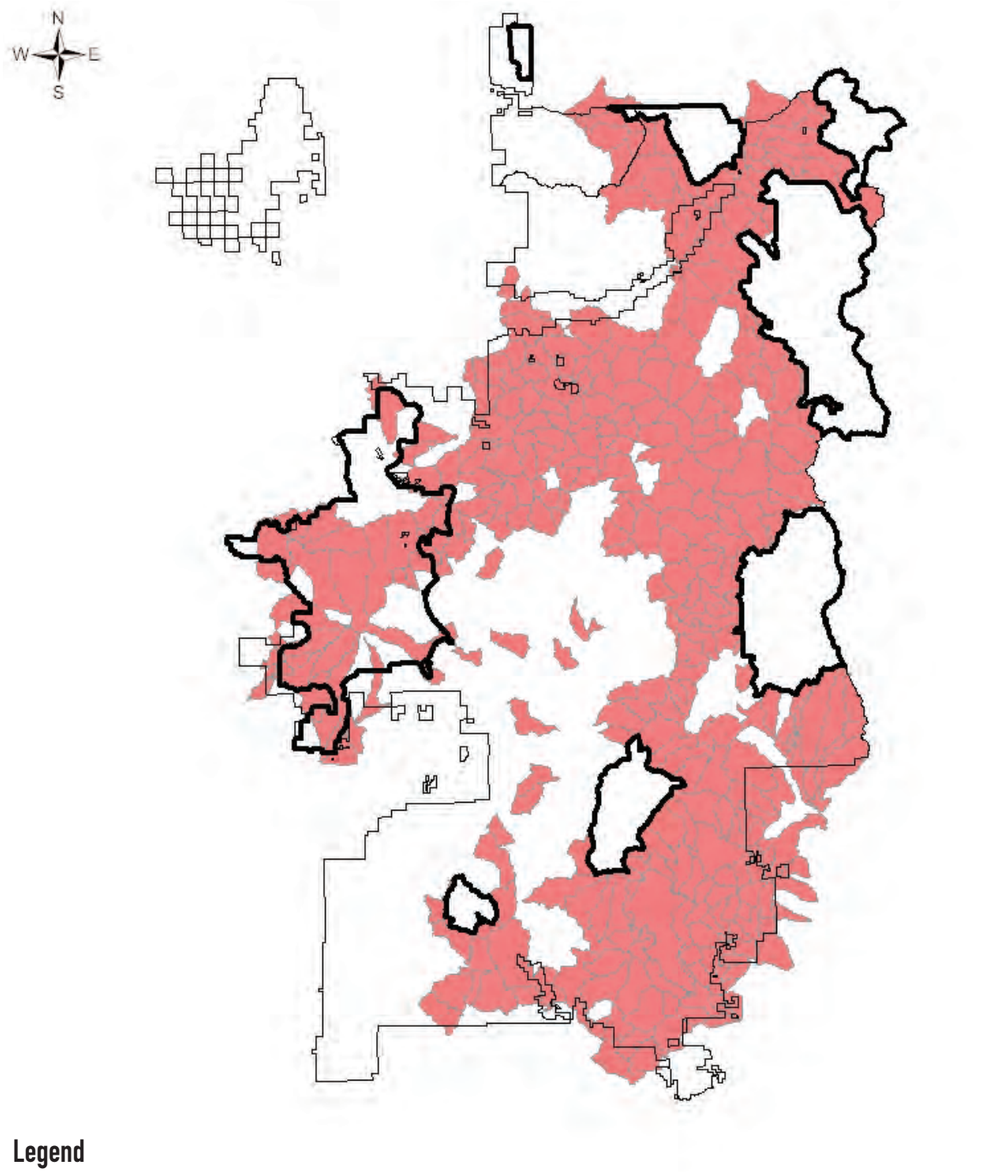


Figure 10

Invasive Species Priority Subwatersheds



A during and after look at the Iron Creek road decommissioning project which reduced the impact of sediment on winter steelhead and coho in the Lower Cispus watershed and created local, family-wage jobs.

Photos by LKE Corporation and Derek Churchill

Over 4,000 miles of roads crisscrossing the GPNF's forests and creeks have created many restoration opportunities on the forest. The GP Task Force envisions a cooperative approach to road removal so that essential roads accessing the forest can be retained while unnecessary roads having a disproportionately large impact on watersheds and wildlife are removed. Moreover, local communities will benefit because removing roads requires a highly skilled workforce that is paid family-wages.

One concern is a road's impact on water quality and fish species. Roads have many impacts on fish and water quality that can be modified or eliminated. For example, roads cut into hillsides interrupt the natural flow of ground water. As anyone who has been on an old logging road in the rain knows, rather than gradually being filtered through the soil to nearby creeks, the rain spills onto the surface of a road or side ditches and rushes toward creeks, picking up gravel and soil along the way. Instead of the natural gradual seep, this sudden pulse of sediment-laden water scours stream channels, buries fish eggs, and reduces the lands' natural water storage capacity.

Moreover, roads were sometimes built on unstable slopes which contribute to road failures during periods of extended precipitation or runoff. Inadequate water drainage systems and a lack of routine maintenance of the roads can also lead to road failure during winter storms. When roads fail they can damage stream channels and dump tons of dirt and debris into streams, destroying fish habitat and raising stream temperatures.

Roads built in riparian areas (areas immediately adjacent to the banks of streams, rivers, and other water bodies) reduce the amount of forest area providing shade to streams, resulting in higher stream temperatures. Riparian roads also reduce the number of trees falling into streams which provide essential nutrients and habitat.

While some of the roads on the GPNF are necessary for access to and passage through the National Forest, many of the GPNF's 4,000 miles of roads are excessive, unnecessary, and too expensive to maintain.

The proximity of a road to a stream also increases the likelihood that the road will deliver sediment to the stream.

In addition to contributing to road failure, inadequate road culverts can block fish migration from many miles of suitable stream habitat. With many species of salmon and steelhead on the brink of extinction, it is important that existing suitable stream habitat be accessible for these species. Restoration opportunities exist to remove problem culverts through road obliteration projects or to replace them with culverts that do not contribute to road failure or block fish migration.

While some of the roads on the GPNF are necessary for access to and passage through the National Forest, many of the GPNF's 4,000 miles of road are excessive, unnecessary, and too expensive to maintain. Some roads need to be removed to eliminate their aquatic impacts. (We focus on additional roads impacting wildlife habitat in a later section.) Decommissioning a road involves removing the road and associated culverts and, in some instances, recontouring the road bed so that its slope is consistent with the existing hillside.

Removing high impact and unnecessary roads will have the added benefit of reducing the Forest Service's road maintenance backlog. In 2005, there was an estimated $50 million (and growing) backlog in road maintenance on the GPNF that the Forest Service simply does not have the capacity to address, and bad winter storm years can increase the figure substantially. For example, the storms in 2006 caused $17 million in damage to roads, trails and campgrounds, and the available funds to address storm damage will not come close to meeting this need.

Using the Forest Service's roads analysis data, the GP Task Force selected non-major road segments that have a high aquatic impact as priority road segments for decommissioning (see Figures 11 and 12). The subwatersheds in which these road segments are located were selected as priority areas for aquatic restoration road decommissioning (see Figure 13). By removing roads we will create family-wage jobs, improve water quality and stream habitat, reduce maintenance costs, save taxpayer dollars, and allow the Forest Service to focus road maintenance dollars on the roads that are used and needed in the GPNF. ■

Figure 11

Major and Non-Major Roads

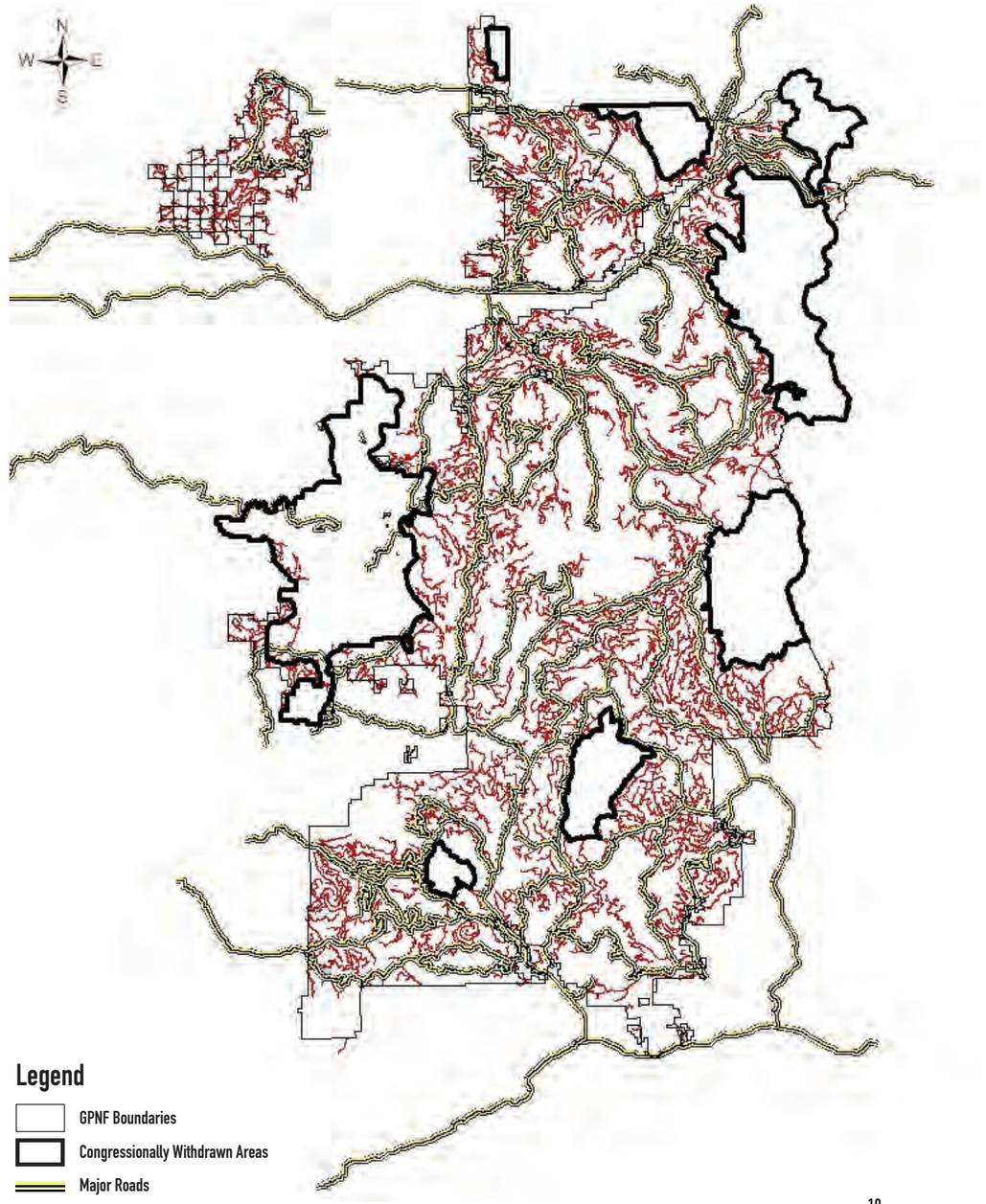
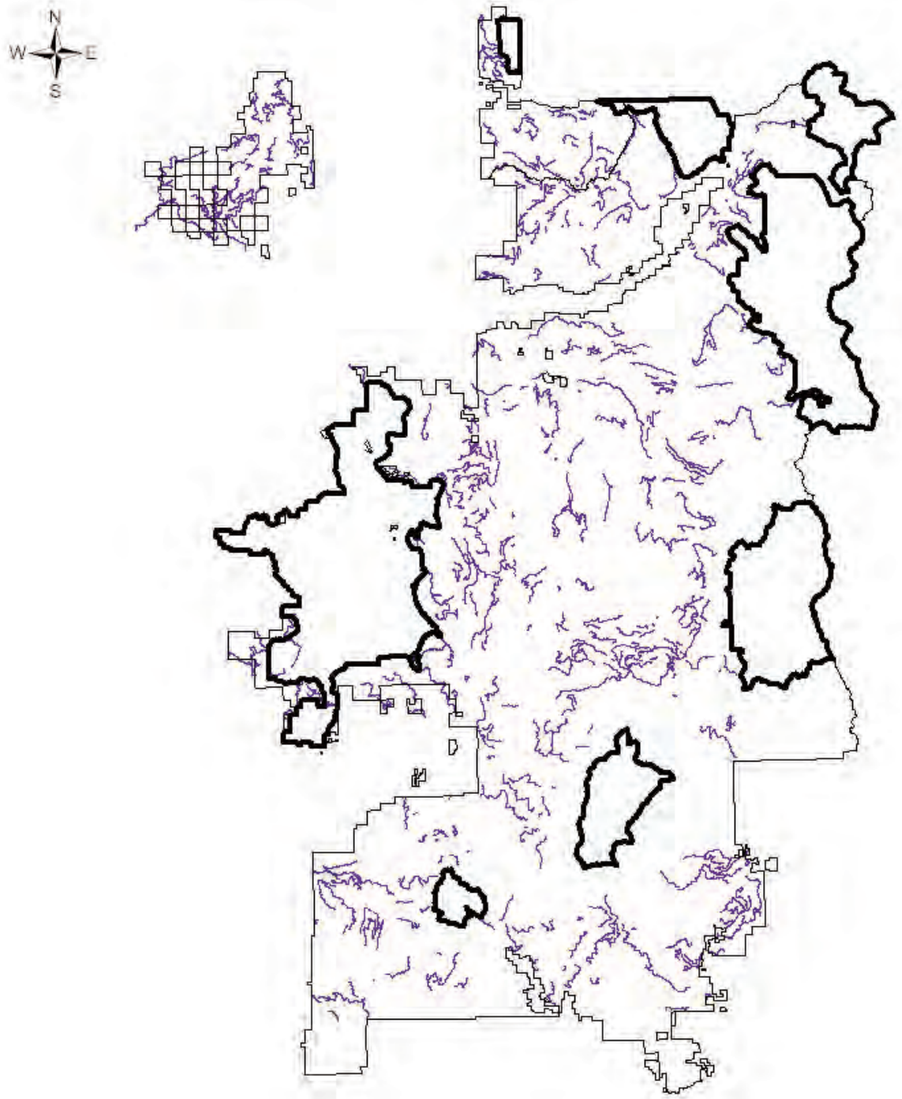


Figure 12

Non-Major Roads with High Aquatic Impact



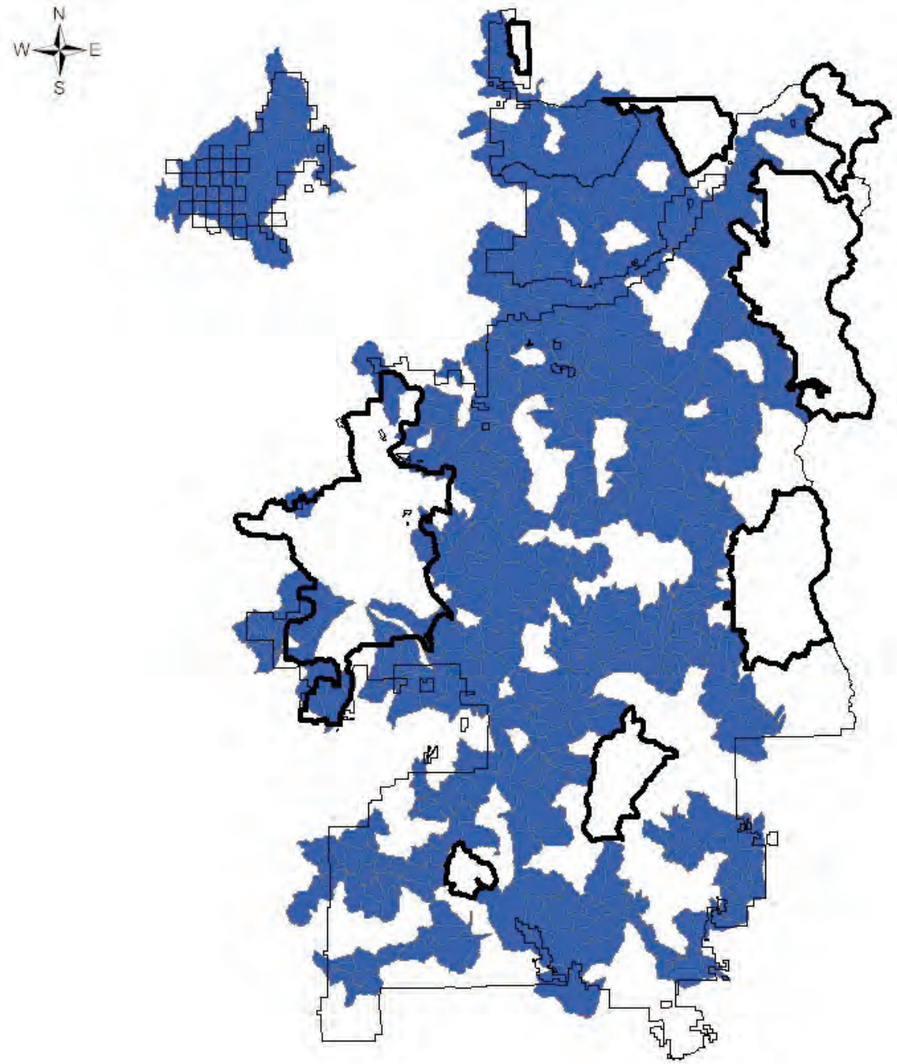
Legend

- GPNF Boundaries
- Congressionally Withdrawn Areas
- Non-Major Roads with High Aquatic Impact

10 Miles

Figure 13

Priority Subwatersheds for Aquatic Road Decommissioning

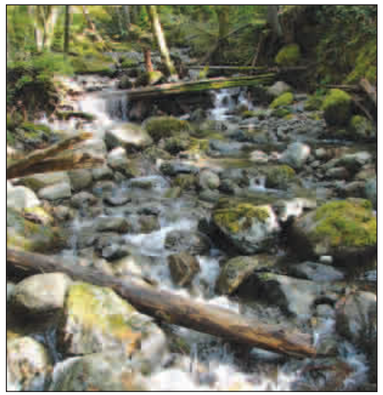


Legend

- GPNF Boundaries
- Congressionally Withdrawn Areas
- Priority Subwatersheds for Aquatic Road Decommissioning

10 Miles

Streams Need Trees



Wood in creeks provides important pool habitat for threatened and endangered fish.

Photo by Emily Platt

In order to achieve restoration on the GPNF, a concerted effort is needed to return large fallen trees to streams and rivers and to grow large trees alongside streams and rivers to provide shade and serve as a source of future fallen trees. This requires the protection of riparian areas and may include limited active management of some riparian areas to ensure future availability of such trees. Direct placement of large logs in streams or nutrient enhancement efforts will also be important components of restoration projects.

Trees serve important ecological functions for riparian areas, streams and rivers. Fallen trees in streams slow and redirect the flow of water which in turn reduces channel erosion and also creates back pools that provide important habitat for fish species such as young salmon and steelhead. Fallen trees also shade the water, providing cooler water temperatures for aquatic species. Fallen trees that maintain their branches or create debris jams in the water provide cover for fish species to hide from predators. As the trees decay, they deliver nutrients to the water that are then utilized by aquatic species. Fallen trees in riparian areas provide habitat for riparian dependent species and also serve to slow flood waters, trap sediment during floods, and provide stream habitat when streams change course during a flood.

Fallen trees in streams and rivers also provide habitat for land-based species. For example, birds use the fallen trees as a perch, other animals use fallen trees to cross swift moving streams, and beavers use fallen trees for dens.

In addition, trees growing alongside streams and rivers shade the water. Without these trees, water temperatures can rise and become lethal to fish and other aquatic species or impair their growth. These trees also drop leaf litter and small branches into the stream which supply important nutrients to the water.

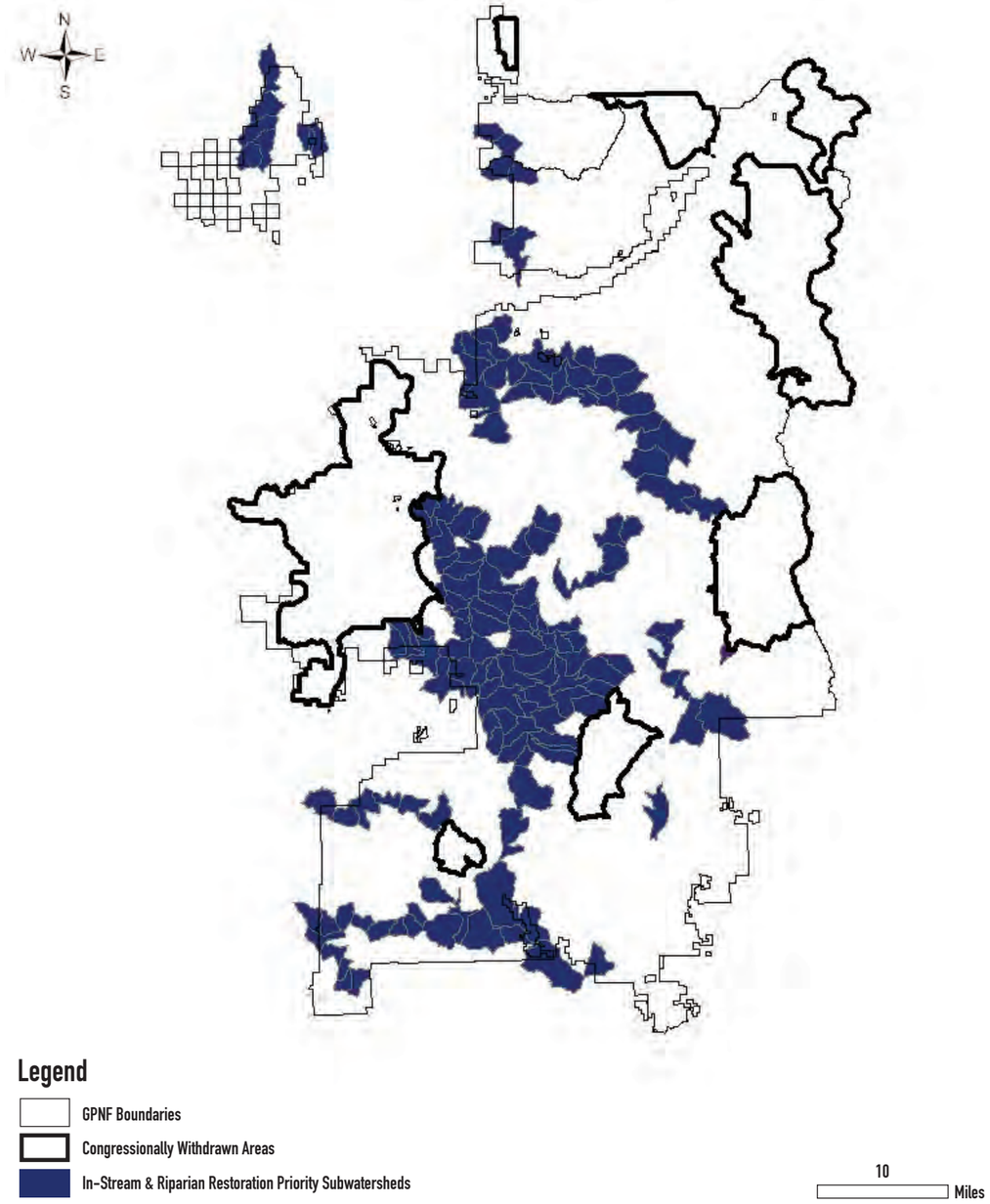
The ecological functions of fallen trees in streams and rivers, however, have not always been understood, and in the past such fallen trees were seen as unwanted debris. The Forest Service once instructed that fallen trees be cleared from streams following logging operations. This practice, combined with clear-cut logging operations that reduced the amount of large trees available to one day fall into a stream or river, has left many streams and rivers unnaturally devoid of fallen trees.

The GP Task Force identified stream segments that have very high water temperatures or are otherwise considered by the Forest Service to be priority streams for restoration work such as wood placement or riparian enhancement. The subwatersheds in which these stream segments are located were selected as priority subwatersheds for in-stream or riparian enhancement restoration work (see Figure 14). By returning large trees to waterways and allowing trees to grow large alongside streams and rivers, we can provide essential habitat for aquatic and land-based species. ■

By returning large trees to waterways and allowing trees to grow large alongside streams and rivers, we can provide essential habitat for aquatic and land-based species.

Figure 14

In-Stream and Riparian Restoration Priority Subwatersheds



Remove the Dams

When Condit Dam on the White Salmon River is removed, 33 miles of steelhead habitat and 14 miles of salmon habitat will be newly available to migrating fish.

To restore magnificent salmon and steelhead runs, and a free flowing river prime for recreation, this restoration plan calls for the removal of Hemlock and Condit dams.

Dams can be lethal to fish. In addition to acting as a significant barrier to fish migration, dams create reservoirs that slow water movement and result in higher water temperatures that can kill or drastically weaken fish. Dams also block the natural flow of coarse sediment and other debris, which provide important habitat and stream stabilization functions.

Hemlock Dam, located on Trout Creek in the Wind River watershed, has had a significant impact on threatened Lower Columbia River steelhead since its construction in the 1930s. Threatened steelhead are often killed trying to migrate past the dam and through the reservoir's warm waters. In fact, during the summer months Trout Creek, due to the dam and other factors such as logging and road building in the watershed, has the highest water temperatures of any major tributary to the Wind River and consistently exceeds state water quality standards for maximum water temperature.

Removal of Hemlock and Condit Dams would open over 40 miles of river and streams to migrating salmon and steelhead.

The Forest Service has decided to remove Hemlock Dam in order to improve habitat in lower Trout Creek and to improve access to the 13 miles of steelhead habitat provided by Trout Creek and its tributaries. This decision is in line with the type of comprehensive restoration sought in *Restoring Volcano Country*.

Condit Dam, though on private land and owned by PacifiCorp, is also detrimental to fish recovery in southwest Washington. Since its construction on the White Salmon River in 1913, it has blocked fish passage entirely for Chinook and coho salmon and wild steelhead. In an effort to comply with the Endangered Species Act, PacifiCorp has decided to remove Condit Dam and allow fish passage to more than 33 miles of habitat beyond the dam.

The Federal Energy Regulatory Commission and Washington State Department of Ecology must both grant permits to PacifiCorp before Condit Dam can be removed. Removal of Hemlock and Condit Dams is critical to restoring threatened salmon and steelhead populations. ■

Let Them Howl

Welcoming wolves back to the forest will help restore ecological balance.

Photo by Corel Corporation

While recovery of healthy wolf populations requires restoration on a geographic scale much larger than the GPNF, restoring wolf habitat on the Gifford Pinchot will contribute a crucial link between the wildlands of the north and south Cascades that will help lay the foundation for the return of healthy wolf populations to Oregon and Washington.

Conservation biologists have increasingly come to recognize that the recovery of predator species is integral to restoring ecosystem health. Predators provide a top-down regulation of ecosystems and are excellent indicators of overall ecosystem health.

The return of wolves in Yellowstone National Park, for example, helped keep elk herds in check which in turn reduced grazing on aspen, willow, and other streamside vegetation which had been in decline. Streamside vegetation provides food for beaver, so with its return beaver populations rebounded and began building natural dams that created new habitat for valued trout populations. The recovery of the wolf is having a cascading beneficial impact on the Yellowstone ecosystem as a whole. Similar ecological benefits would result from wolf recovery on the GPNF.

Wolves need three essentials to survive. They require relatively gentle terrain, an adequate prey population consisting mostly of deer and elk, and freedom from human interference. The GPNF has an adequate supply of terrain and prey, but to recover the wolf we must address freedom from human interference.

Providing wolves with the freedom from human interference will require a commitment from the public to find productive ways to co-exist with predator species. It will also require increasing the land area in which human activity is

Restoring wolf habitat on the Gifford Pinchot will contribute a crucial link between the wildlands of the north and south Cascades that will help lay the foundation for the return of healthy wolf populations to Oregon and Washington.

minimized. The most effective way to accomplish this is to reduce road densities in key wolf habitat.

The GP Task Force identified non-major roads in priority wolf habitat on the GPNF that are suitable for road decommissioning or winter closure to recover the wolf (see Figure 15). The subwatersheds these roads are located in were selected as priority areas for wolf recovery (see Figure 16). Roads should either be removed in these subwatersheds or closed in the winter until there is less than one open road mile per square mile, a density best suited for wolf recovery.

Wolf recovery is about more than just science and ecological restoration. Wolf recovery also revolves around politics, and wolf recovery is still a highly charged, contentious issue in the Northwest. The GP Task Force looks forward to designing strategies and solutions that restore wolves to the Cascades while building support for this exciting work at the local level.

By removing roads in priority wolf habitat we can create family-wage forest work and wildlands that invite the wolf to return to Volcano Country. ■

Drawing of wolf track by Linda Hunter.

Tracking Wildlife

While predator recovery is an important component of ecological restoration, the GPNF currently does not have an adequate system in place to confirm or monitor rare predator populations on the forest. To adequately plan for and restore predator populations, reliable information about their movements and habitat use is vital. Our restoration plan calls for public involvement in establishing a functioning rare predator documentation system as an integral part of predator recovery on the GPNF.

Figure 15

Non-Major Roads in Priority Wolf Habitat

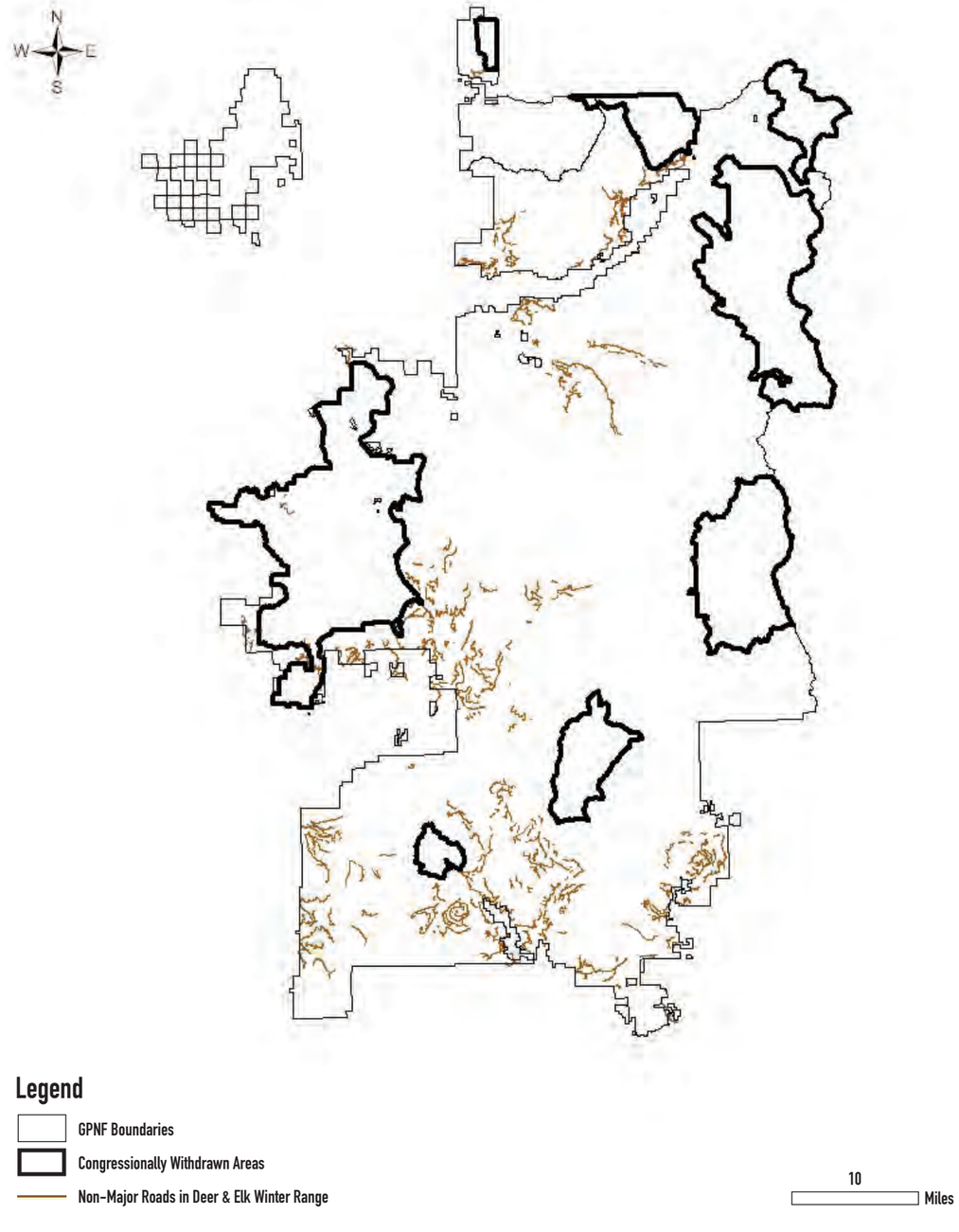
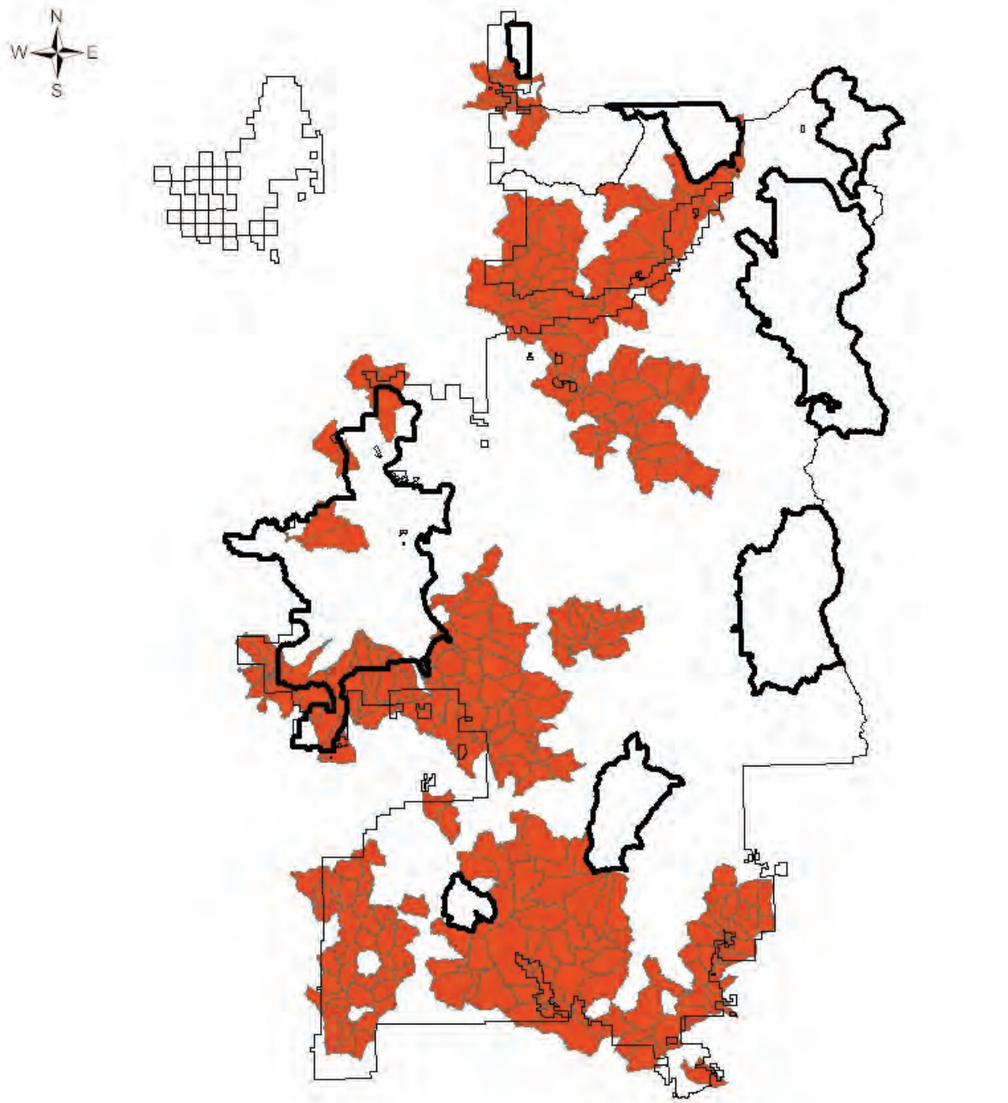


Figure 16

Wolf Recovery Priority Subwatersheds



The native forests and ponds of the Tumwater Inventoried Roadless Area provide large unroaded habitat for elk, bear, and other species.

Photo by Jim Thode

Large blocks of roadless areas serve as an important refuge for wildlife, including species threatened with extinction. If we are to recover many of these threatened species, we will need to protect existing roadless areas and in many cases make them larger.

Roads often impede the movement of wildlife and large blocks of areas without roads can provide necessary habitat connectivity. Roadless areas are also places where wildlife can exist without negative human interference. Moreover, roadless areas limit biologically damaging activities such as clear-cut logging and other developments, and they often provide a source of clear, cold water for fish species and drinking water supplies.

Often the ecological benefits of roadless areas are positively correlated with the size and diversity of the roadless area. Therefore, while it is essential that remaining roadless areas be protected, it is also important to expand the size of roadless areas.

Roadless areas, for example, are particularly important to species which do not cope well with human activity, such as the wolf or wolverine. In 2006, the Yakama Nation reported a confirmed sighting of a wolverine on the east side of Mount Adams. The wolverine's large range implies use of the GPNF as habitat as well. While wolverines are one of the least understood animals in North America, it is known that they are among the least tolerant of human activity and therefore require large blocks of remote and roadless areas. Wolverines are rare and have been considered for possible listing as a threatened species; it is exciting to have the opportunity to restore their populations to the GPNF.

Removing roads with an eye toward creating larger blocks of roadless areas will help to decrease the current fragmentation of forest habitat on the GPNF and further benefit ecosystem recovery. The GP Task Force restoration plan therefore identifies roads that, if removed, would significantly increase the size of large roadless areas (see Figure 17). The subwatersheds in which these roads are found were then selected as priority areas for the enlargement of roadless areas in the GPNF (see Figure 18). ■

Often the ecological benefits of roadless areas are positively correlated with the size and diversity of the roadless area. Therefore, while it is essential that remaining roadless areas be protected, it is also important to expand the size of roadless areas.

Figure 17

Non-Major Roads Separating Major Roadless Areas

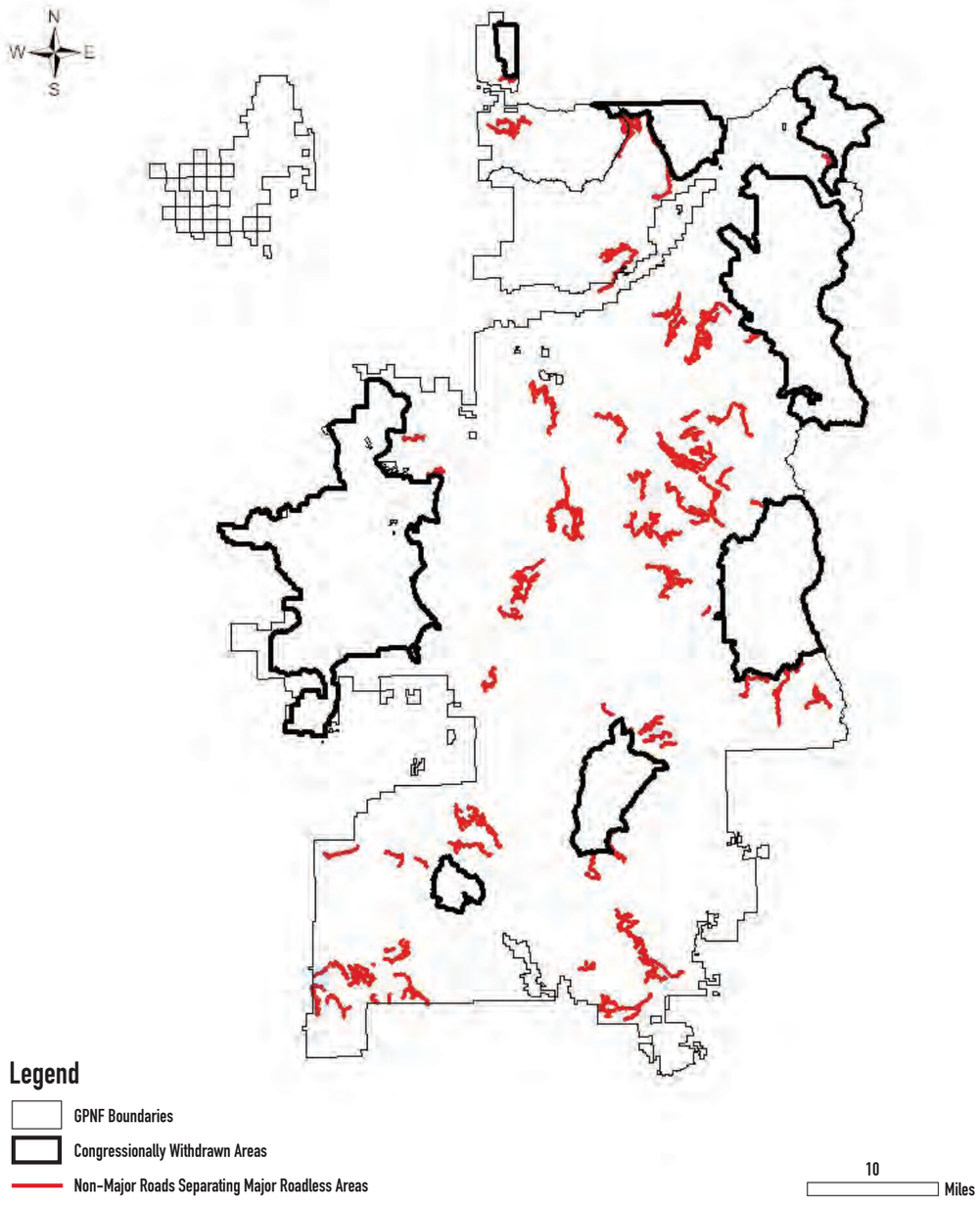
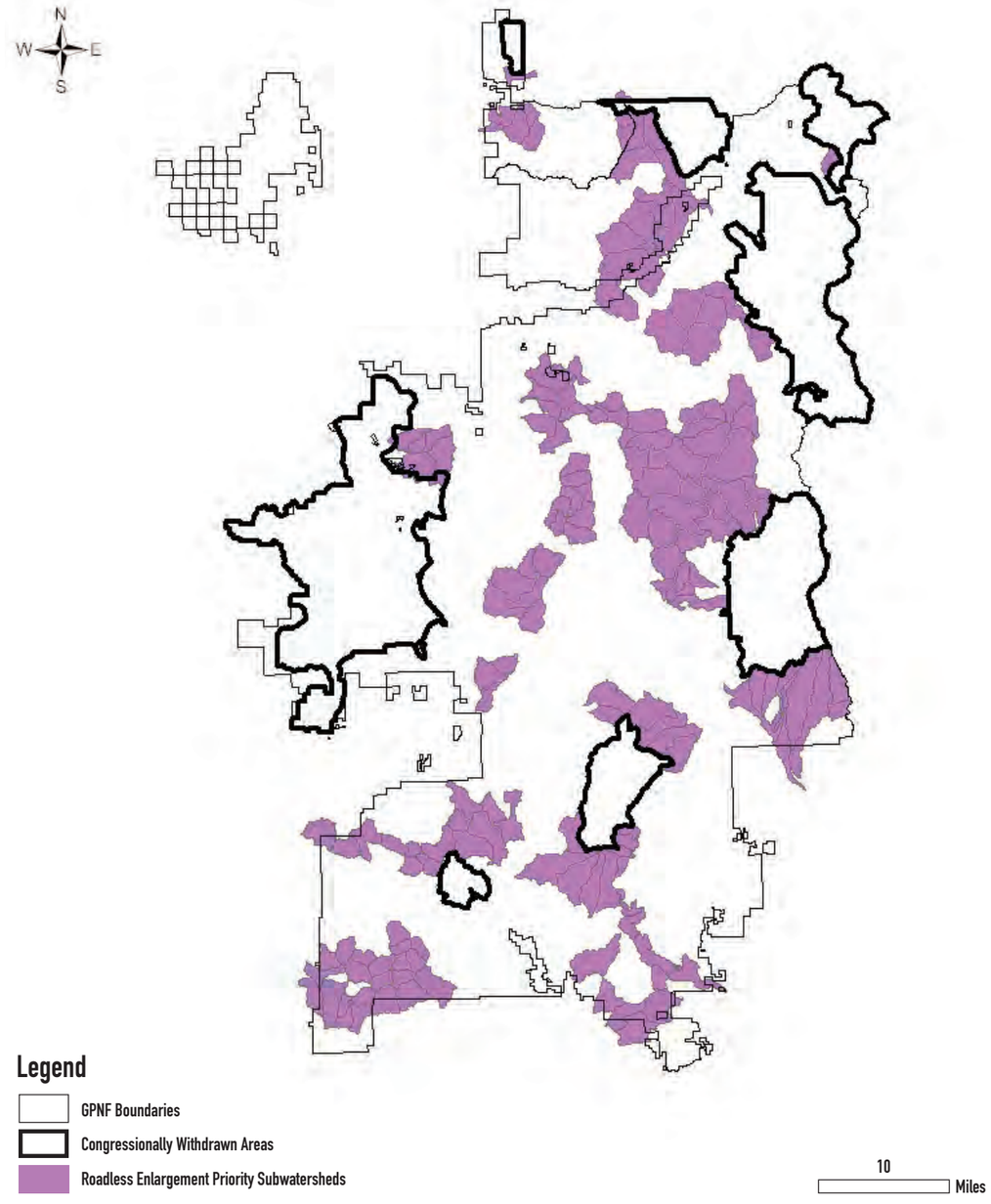


Figure 18

Roadless Area Enlargement Priority Subwatersheds



Strategic Restoration

Focusing restoration in key subwatersheds will provide the GPNF's diverse stakeholder groups with the best investment of public dollars.

Photo by Ryan Hunter

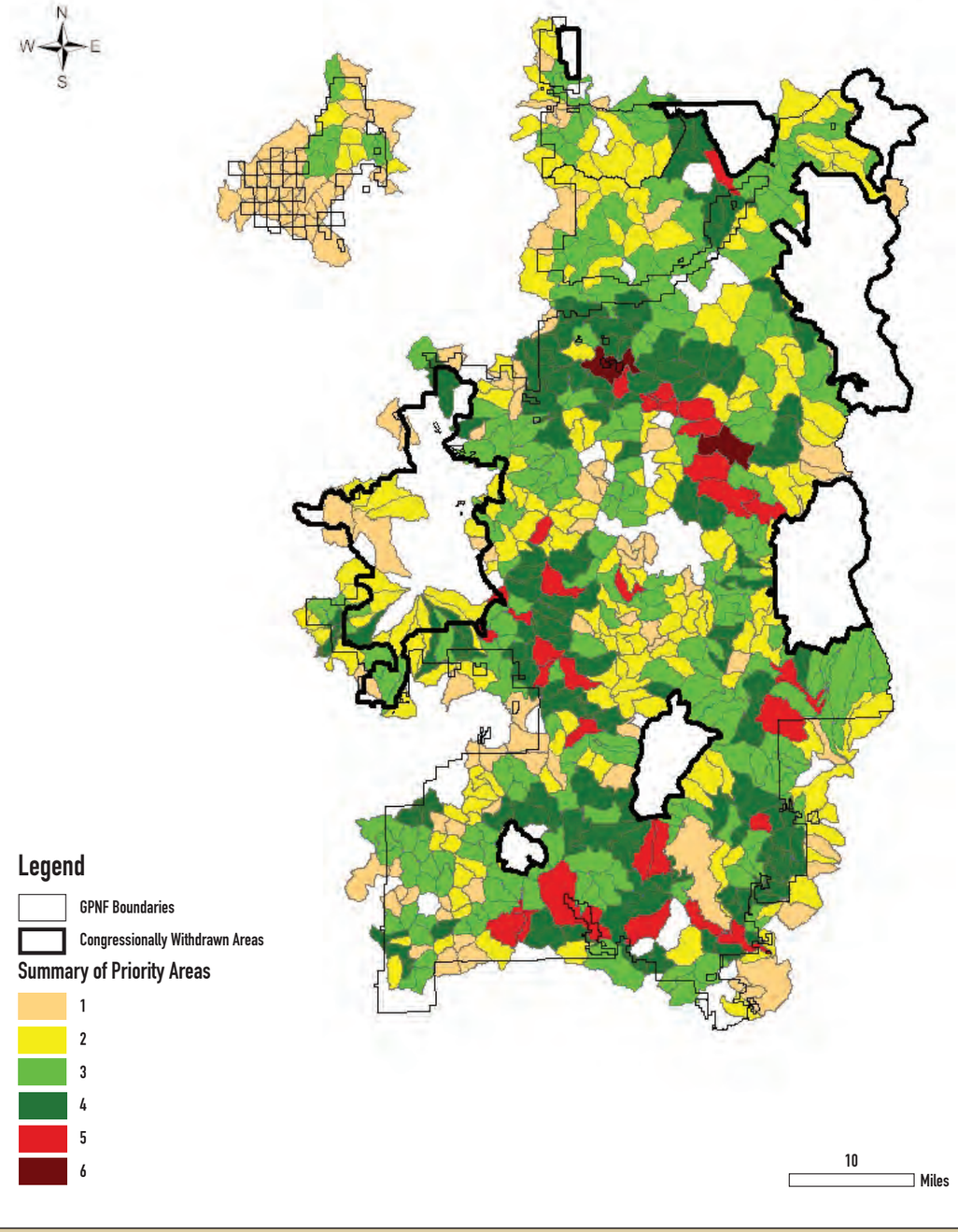
While opportunities for restoration work abound on the GPNF, there are limited resources to get the work done. The GP Task Force has highlighted priority forest stands for thinning, priority roads for removal, priority streams for restoration, and priority areas for invasive species eradication.

These combined restoration needs could seem overwhelming given limited resources so the GP Task Force identified subwatersheds where priority restoration tasks overlapped, and we mapped subwatersheds based on the number of priority restoration tasks located within each of them (see Figure 19). Subwatershed rankings range from a high of 6 priority restoration activities located within them to a low of 1. For example, the Buck Creek subwatershed is ranked 6 because there are six high priority restoration tasks in this subwatershed: thinning to enhance ancient forest characteristics, invasive species eradication, aquatic restoration through road removal, stream restoration through wood placement and riparian enhancement, wolf recovery, and creating larger roadless areas through road removal. The Headwaters of Trout Lake Creek subwatershed was ranked 1 because it was selected as a high priority area solely for enhancing ancient forest characteristics.

Focusing work in key strategic watersheds will allow the Forest Service and the public to get the most restoration benefit from its investment of time and resources.

While such mapping will not prioritize individual restoration tasks, it will indicate where the Forest Service and the public will get the most restoration benefit for its investment in a particular subwatershed. Focusing work in key watersheds can also save money and staff time by limiting the amount of area where planning work, surveys and project preparation needs to occur. ■

Figure 19 Summary of Restoration Priority Areas



Recommended Policy Changes

The restoration outlined thus far requires specific management activities which we have attempted to prioritize. However, some restoration is needed that does not call for active management but rather a change of management policy or enforcement of a policy. Suggested policy changes outlined below aim to protect and improve forest and aquatic ecosystems.

Off-Road Vehicles

Currently, off-road vehicles (ORVs) are not allowed on Forest Service roads due to state highway regulations but are allowed on certain designated trails (see Figure 20). ORV use is also occurring on certain trails on which they are not permitted. These permitted and unpermitted trails access roadless areas, including the Gifford Pinchot's largest roadless area, the Dark Divide. ORV trails also crisscross one of the GPNF's largest wetland complexes just north of Indian Heaven Wilderness.

ORVs have a number of impacts on the land. ORVs can take people into remote wildlife habitat areas. Snowmobiles, for example, have been shown to negatively impact the reclusive wolverine. ORV noise, moreover, can disturb wildlife and other recreationists; their exhaust creates air pollution, and their tracks - with the exception of snowmobiles - tear up soil and destroy trailside vegetation. Such impacts are not appropriate in roadless areas that serve as refugia for wildlife, in areas where threatened and endangered species are present, in sensitive wetland habitats, or in areas set aside to provide ancient forest habitat.

The ecological impacts of ORV use require greater attention from the Forest Service and greater enforcement of existing rules. Action is needed to minimize ORV impacts on forest ecosystems, which will require a net reduction in the number of trail miles open to ORV use, especially in sensitive habitats.

Action is needed to minimize ORV impacts on forest ecosystems, which will require a net reduction in the number of trail miles open to ORV use, especially in sensitive habitats.

Backcountry Horse Riding

Backcountry horse riding has a strong historical connection with our national forests and provides an excellent way for people to access the interior of wildernesses (see Figure 21). However, horse use is having a negative impact on some pond, lake, and streamside vegetation as well as some sensitive high elevation plants. Moreover, horse manure can be found polluting wilderness streams and can facilitate the spread of invasive plants. More careful enforcement of current policies and greater protections during spring and early summer months when sensitive vegetation is more vulnerable to impact could go a long way towards resolving these issues. Reducing horse use in impacted areas and the education of horse riders on responsible ways to enjoy their national forestlands could help protect alpine and riparian resources and reduce the risk of spreading invasive plants. Finally, stewardship or restoration opportunities exist to construct more bridge crossings over streams on popular horse trails to minimize negative impacts.

Figure 20 Off-Road Vehicle Trails

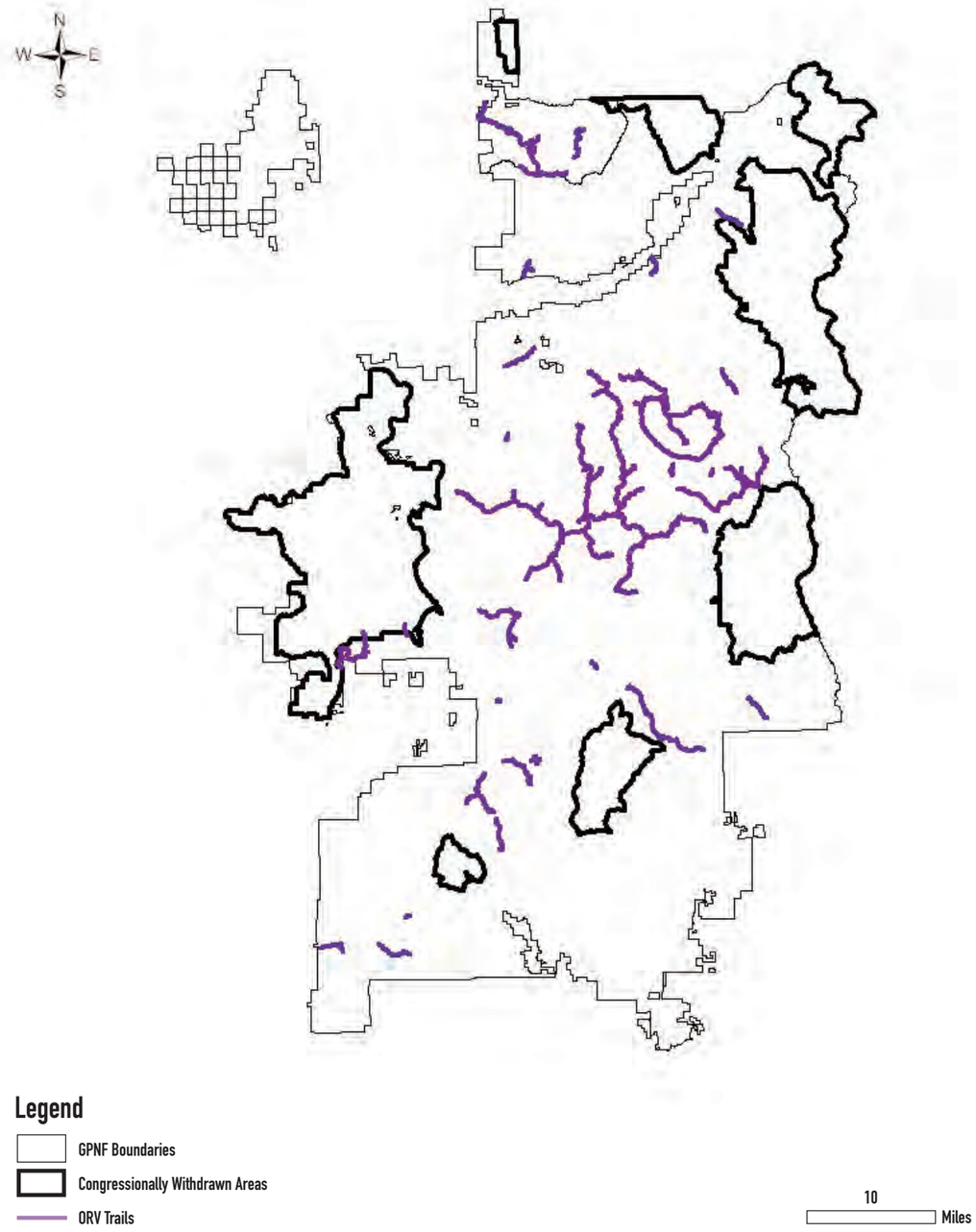
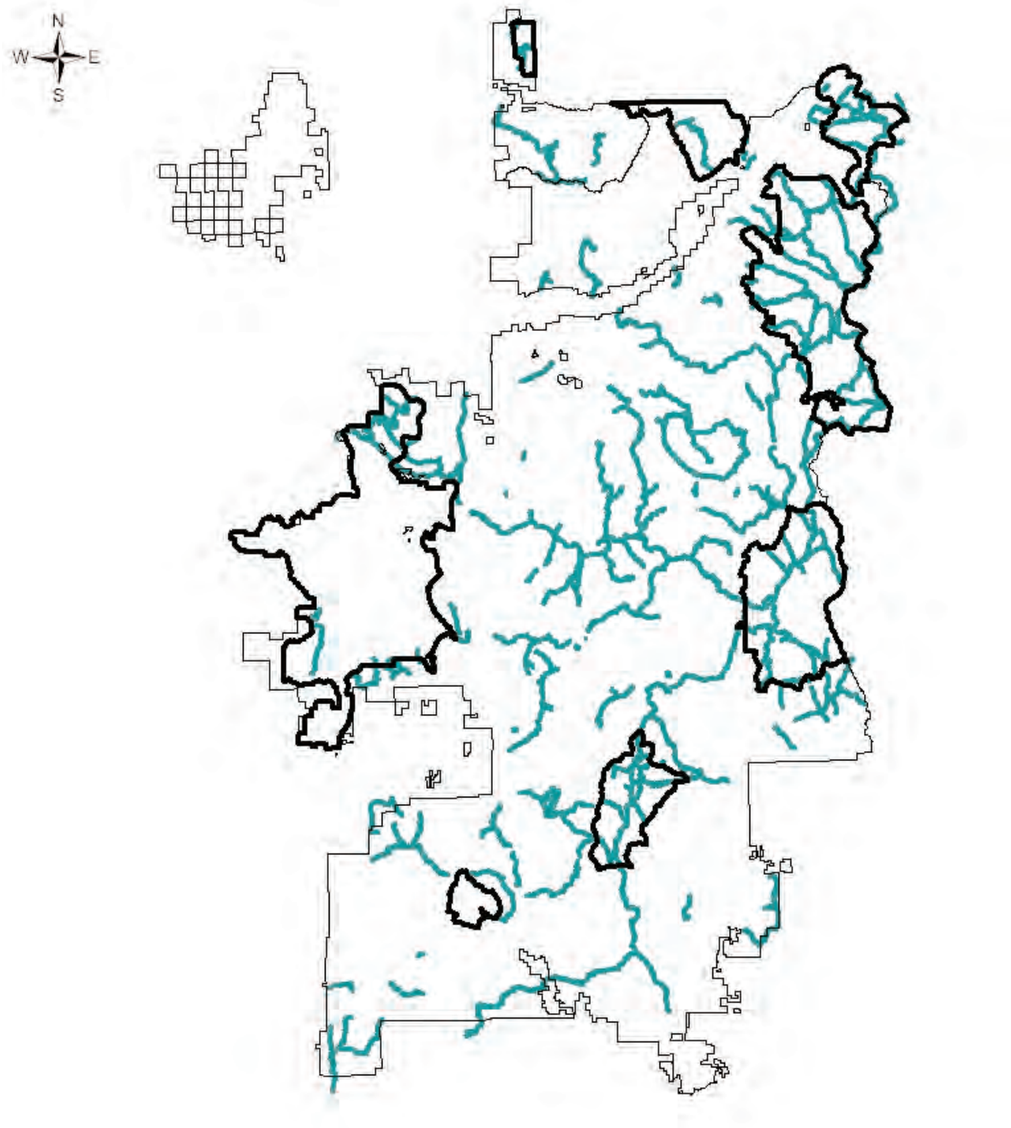


Figure 21

Backcountry Horse Trails



Cattle Grazing

There are three grazing allotments on the GPNF. These allotments allow for livestock grazing on federal forestland. There are currently two active allotments, the 30,000 acre Ice Caves allotment with up to 200 cow/calf pairs allowed to graze during summer months, and the Mount Adams allotment with 512 cow/calf pairs (see Figure 22).

Grazing along streambanks for a short time can decimate streamside vegetation and cause streambanks to collapse, resulting in increased erosion, higher water temperatures, altered water flows, and impaired streamside and in-stream habitat. Resident trout are harmed by the resulting increased sediment and water temperatures and reduced cover and nutrients.

In the Ice Caves Grazing Allotment, resident trout are harmed by a small dam on Lost Creek that diverts water for cattle use. The dam is a migration barrier for resident trout and the water diversion results in water temperatures that exceed state water quality standards.

The Mardon skipper butterfly, which is listed as an endangered species in Washington State, is impacted by grazing on the Ice Caves Allotment as well. Cattle trample the Mardon skipper's eggs/larvae in natural meadow grasses, and they eat both the larvae and the native grasses upon which the butterfly depends. Grazing also increases the population of invasive weeds which displace the natives on which the butterfly depends.

The Ice Caves Grazing Allotment is also one of the few places where Pale blue-eyed grass, a plant threatened with extinction, can be found. In fact, 80 percent of all Pale blue-eyed grass populations and the most genetically diverse site of the species can be found within the grazing allotment. One study found that grazing for a brief time with fewer than 25 cattle caused direct Pale blue-eyed grass mortality. Grazing also causes the grass to grow shorter, potentially reducing its ability to compete with some invasive weeds.

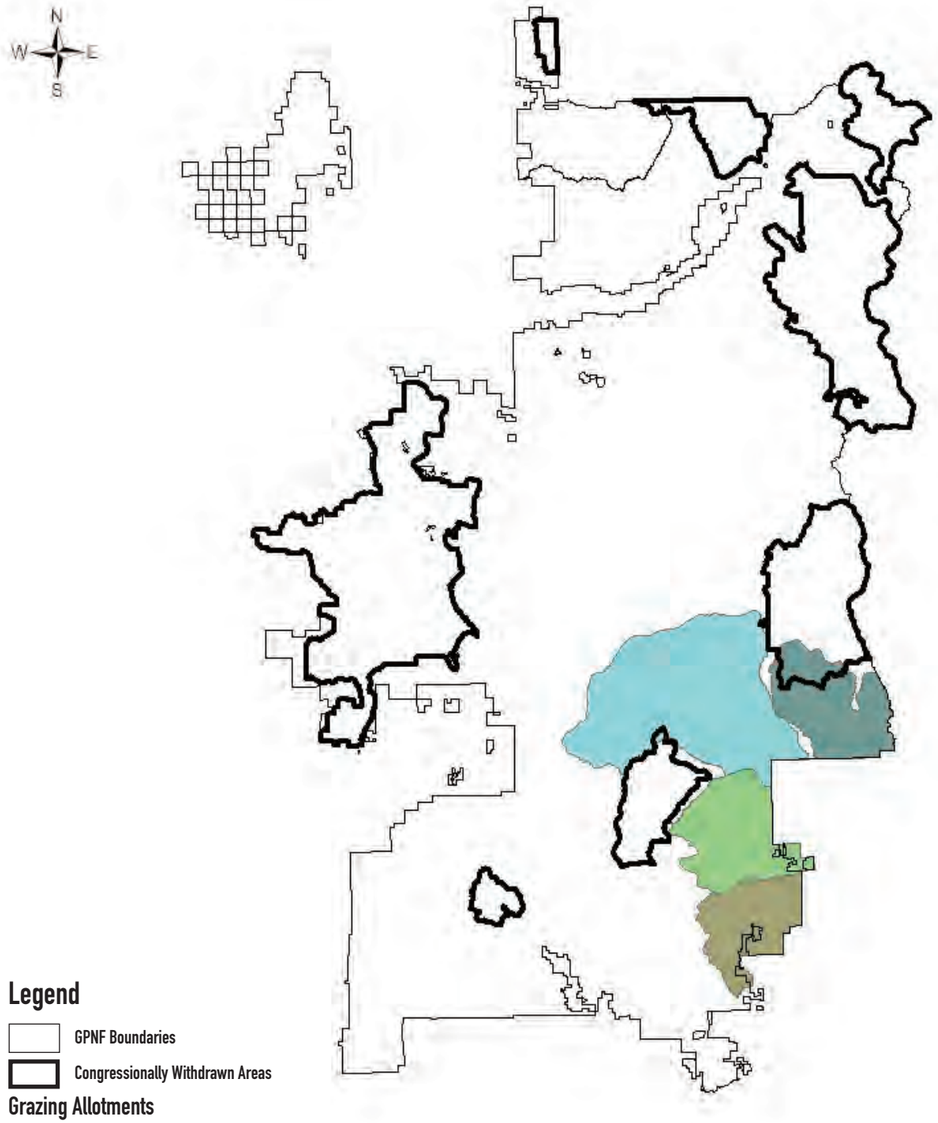
To construct exclusion fencing in the Ice Caves allotment, the Forest Service would need to spend close to $100,000 while it collects less than $10,000 in grazing fees. If the Forest Service instead decides to end grazing on the allotment, they would need to spend only $25,000 to remove existing fencing.

Given the impact cattle grazing has on streambanks, water quality, rare plant and wildlife species, and fragile ecosystems, and given the Forest's Service's extremely limited capacity to monitor a grazing program, we recommend the Forest Service work with people who have cattle allotments to find ways to move cattle grazing off national forestland.

We recommend the Forest Service work with people who have cattle allotments to find ways to move cattle grazing off national forest land.

Figure 22

Grazing Allotments



Goat Mountain, located in the center of this photo, is the site of a proposed 3,000 acre copper mine which would significantly impact water quality and threatened fish runs.

Photo by Darryl Lloyd

Mining

There are numerous mining claims on the GPNF. Most of these mineral claims are either inactive or relatively small in size. A mine being proposed by General Moly, Inc. (GMI) of Lakewood, Colorado, however, is a whole different story.

GMI wants to lease approximately 900 acres of land in the Green River valley just north of Mount St. Helens from the Bureau of Land Management and the U.S. Forest Service. GMI intends to combine this lease with existing mineral claims to develop a 3,000 acre mine to extract copper, gold, silver, and molybdenum.

This proposed 3,000 acre mine would have potentially devastating consequences for municipal drinking water supplies, threatened fish species, wildlife, and popular recreation destinations.

Green River wild fish runs could be devastated by a chemical process resulting from mining activity, known as acid mine drainage, that would leach sulfuric acid and other toxic substances — such as cadmium and lead — into surrounding water bodies. Once this chemical process begins, it is nearly impossible to manage and it could persist for thousands of years.

Moreover, the mining company would construct a dam at the site to hold back stored waste material. The dam could easily fail given the fact that it is near Mount St. Helens which experienced hundreds of thousands of earthquakes over 2.0 on the Richter scale in 2005 alone. Dam failure could potentially cause a flash flood that would release many tons of toxic metals and other substances into the Green River. At least 20 miles of new road construction could also add smothering sediment to streams and rivers, burying fish spawning habitat.

The mine development envisioned by GMI would destroy recreation sites, leach toxic mining waste into drinking water supplies, threaten listed salmon and steelhead and impact a roadless area, ancients forests and the fragile Mount St. Helens blast zone.

Acid mine drainage and associated heavy metals released into the Green River would eventually flow downstream to the Cowlitz River where it could have serious implications for the drinking water supplies of communities such as Kelso and Longview. Agricultural water users could be ruined by contaminated water supplies as well.

The proposed mine would also impact recreation destinations such as hiking trails, popular lakes, and the Green River Horse Camp. The horse camp and many of the trails would likely be destroyed as a result of mine development, and what is not destroyed would be impacted by the movement of approximately 4,000 trucks transporting 80,000 tons of waste per day and the presence of dust laden with heavy metals created by mine activity. Mine development may also impact the groundwater, potentially dewatering streams and popular lakes in the area, such as Deadman's Lake.

The mine development envisioned by GMI is dangerous to the communities, people, and wildlife which currently live near and recreate in the area. We encourage decision makers not to allow GMI to pursue its 3,000 acre mine. Instead, we would like to see local jobs created restoring the wild fish runs and forest habitats outlined by this restoration plan.

Special Forest Products

Over $979,000 worth of special forest products, such as boughs, huckleberries, and mushrooms, were removed for commercial and individual purposes from the GPNF in 2006. The removal of such forest products is a quickly growing industry and can provide important economic benefits to communities and to the Forest Service. However, the current program does not monitor harvest levels, locations, methods, or the positive or negative impacts of harvesting. Monitoring and analysis of the special forest products program should be developed and implemented as soon as possible. Findings should be used to address and refine the program to limit impacts and bolster stewardship opportunities. ■

Linking Landscapes

Forester Jeremy Grose plans a thinning project on state land.

Photo by Michael Rubenstein

The Gifford Pinchot is not an island. Its ecosystems and health are connected to and dependent on the state, tribal, and private land that surround it. Unfortunately, much of this land has been more heavily damaged by intensive logging and poor management than the GPNF. The GPNF serves as the core of our reserve of ancient forests, clean water, and biodiversity in southwest Washington, and it will continue to be central to the restoration of the region. But we must look beyond the borders of the national forest.

This restoration plan is only a beginning. As we accomplish the tasks set forth in this document and build our communities' skills and capacity for restoration, we must also begin to integrate federal lands restoration with work on state, private, and tribal lands. Restoration on these lands will require different approaches and different expectations, but if we work together we can achieve restoration that transcends political boundaries and encompasses complete ecological communities. ■

Moving Forward

Restoration on the GPNF will not occur with implementation of just one or a few of the tasks and policy changes outlined in this document. Rather, restoration should encompass the entire suite of activities recommended. Young, dense forest plantations should be thinned, roads should be removed, invasive species eradicated, and ORV use properly managed. To create a place where healthy and abundant salmon thrive in our streams, large contiguous blocks of ancient forests teeming with its dependent species are plentiful, magnificent top predators have returned, and local family-wage jobs in the woods are reliable, we must take a comprehensive approach and address each of the elements set forth in this restoration plan.

Moreover, ensuring that this restoration plan becomes a reality will require commitment, hard work, cooperation among multiple parties, and funding from Congress. The GP Task Force will work with the Forest Service and local communities to build upon this vision and identify creative strategies for its implementation, and we invite you to join us in making it a reality. Collaboration between the diverse communities and interests of the GPNF will be essential as this restoration plan is implemented on the ground and used as a practical tool to guide restoration on the Gifford Pinchot.

Again, this restoration plan is just a beginning. The GP Task Force recognizes that priorities have changed on the GPNF since the unsustainable logging practices of the 1980s, but resources are not yet adequate to support and develop the restoration businesses, workers and on the ground work that is needed to implement this vision. This vision was created to evolve with additional knowledge and input and will be adjusted over time to reflect changing circumstances. This is a living document, a roadmap with which to guide us as we restore Volcano Country. ■

References

Brown, Rick. *Thinning, Fire and Forest Restoration: A Science-Based Approach For National Forests In The Interior Northwest*. Defenders of Wildlife. October 2002.

Forest Ecosystem Management Assessment Team. *Forest Ecosystem Management: An Ecological, Economic, and Social Assessment*. July 1993.

Franklin, J.; Spies, T.A.; and Van Pelt, R. [et al.]. "Disturbances and Structural Development Of Natural Forest Ecosystems With Silvicultural Implications, Using Douglas-fir Forests As An Example." *Forest Ecology and Management*, 155: 399-423. 2002.

Gifford Pinchot Task Force. *Comments on the "Margaret Deposit" Environmental Assessment of Hardrock Mineral Leasing*. April 2007.

Hayes, J.P.; Chan, S.S.; Emmingham, W.H. [et al.]. "Wildlife Response To Thinning Young Forests In The Pacific Northwest." *Journal of Forestry*, 95(8): 28-33. 1997.

Lewis, J.C. and G.E. Hayes. *Feasibility Assessment for Reintroducing Fishers to Washington*. Washington Department Fish and Wildlife, Olympia. 2004.

Noss, Reed F.; Franklin, Jerry F.; Baker, William L.; Schoennagel, Tania; Moyle, Peter B. "Managing Fire-Prone Forests In The Western United States." *Frontiers in Ecology and the Environment*, 4(9): 481-487. 2006.

Noss, Reed. *The Ecological Effects Of Roads*. Online Wildlands CPR. Internet. April, 2007. Available: http://www.wildlandscpr.org/ecological-effects-roads

Pacific Biodiversity Institute. *Unprotected Wild Lands In Washington State: An Analysis Of Their Current Status and Future Under Current Management Direction*. February 1998.

Pacific Northwest Seismic Network. Phone conversations. University of Washington, 2006.

Sellers, L. Wolves in Yellowstone: *The Benefits of Reintroduction*. Unpublished paper. April 16, 2005.

Stokowski, Patricia A.; LaPointe, Christopher B. *Environmental and Social Effects of ATVs and ORVs: An Annotated Bibliography and Research Assessment*. School of Natural Resources, University of Vermont. November 20, 2000.

U.S. Department of Agriculture. Forest Service. *Changing Timber Sale Levels: Gifford Pinchot National Forest*. 1999.

U.S. Department of Agriculture. Forest Service. *Environmental Assessment: Ice Caves Grazing Allotment*. Mount Adams Ranger District, Gifford Pinchot National Forest. February 2007.

U.S. Department of Agriculture. Forest Service. *Final Environmental Impact Statement: Fish Passage and Aquatic Habitat Restoration at Hemlock Dam*. Mount Adams Ranger District, Gifford Pinchot National Forest. October 2005.

U.S. Department of Agriculture. Forest Service. *Forest Facts 2005: Gifford Pinchot National Forest*. 2005.

U.S. Department of Agriculture. Forest Service. *Gifford Pinchot National Forest: Roads Analysis*. July 2002.

U.S. Department of Agriculture. Forest Service. *Pacific Northwest Region Invasive Plant Program: Preventing and Managing Invasive Plants*. Final Environmental Impact Statement. Volume 1. April 2005.

Washington State Department of Ecology. *Condit Dam Removal: Final SEPA Supplemental Environmental Impact Statement*. March 23, 2007.

Appendix: Methodology

Outlined below is a detailed description of the methodology the GP Task Force used to analyze Geographic Information System (GIS) data and prioritize restoration work. Unless otherwise stated, it should be presumed that the data relied upon originated from the U.S. Forest Service. Conclusions need to be verified in the field before implementation.

All prioritization of subwatersheds was done at the sixth field level. A watershed is an area of land that drains to a common point in a stream, lake, or ocean. Watersheds can be drawn at a range of scales, with multiple subwatersheds nested inside larger watersheds. Small drainage areas are sometimes referred to as catchments, and can be as small or smaller than an acre of land that forms the drainage area for a small creek. Larger drainage areas, such as the entire area draining to the Columbia River, are sometimes referred to as basins. A sixth field subwatershed typically refers to a drainage area that is 10,000 to 40,000 acres in size.

Throughout the Plan, we provide figures (maps generally at a scale of 1:600,000) demonstrating the outcomes of the various analyses we conducted.

Bringing the Benefits Home

Community capacity is the collective ability to prepare for, respond to, and recover from disasters or more generally the "ability or potential to effect positive changes". Communities with greater capacity are more stable and have a higher quality of life. Community capacity is constantly evolving and a community's capacity will fluctuate as changes occur.

To create the index of community capacity map, the Forest Guild, a non-profit forestry organization, identified 10 elements of community capacity based on a preliminary assessment of community capacity in Cuba, NM. Then they examined the 17 reports and articles that dealt most specifically with the quantitative measurement of community capacity (table 1). Some of the articles were themselves reviews of literature on community capacity.

Based on its review, the Forest Guild decided to focus on four facets of community capacity: social capital, human capital, financial capital, and political capital. However, for this report political capital was not able to be included. Forest Guild chose to exclude natural capital and built capital (physical infrastructure) because they are usually included in other planning processes. They also excluded elements such as "Cultural Capital" or "Values" which are particularly difficult to measure and require expensive interviews or surveys to measure effectively. No index of community capacity can exactly measure all facets of a community's strengths. The aim is to build on previous efforts and create an index that will improve resource allocation and permit adaptations as new data become available.

Forest Guild's literature review also examined the indicators that researchers used to measure each facet of community capacity. The indicators varied

Table 1 – Indicators of community capacity identified from the literature

	Population	Poverty	Public assistance	People needing assistance	Gender	Education	Employment	Income	Cultural diversity	Physical infrastructure	Other
Buckland and Rahman 1999		●	●		●	●	●	●	●		●
Buckle et al. 2000				●	●			●	●	●	●
Case et al. 2000				●						●	●
Doak and Kusel 1997	●	●		●		●				●	●
Frankish 2003	●			●		●	●	●		●	●
Goodman et al. 1998						●		●			●
Higgins McCorkle 06			●	●		●	●	●	●	●	●
King and MacGregor 2000	●		●	●	●	●	●	●	●	●	●
Kuban and MacKenzie-Carey 2001	●		●	●	●			●	●	●	●
Lynn and Gerlitz 2005	●	●	●	●	●	●	●	●	●	●	●
Markey and Vodden 1998				●		●	●	●		●	●
Maxim et al. 2001	●	●		●	●	●	●				
Mower 1999		●		●	●				●		
Niemi and Lee 200		●									
PWCH 2003		●					●	●		●	
Watkins 2006		●			●	●	●	●		●	●

based on the scale of the study. For example, many of the communities in their study are too small to have bond ratings. They selected indicators for each of four facets of community capacity that were best supported by the literature and were accessible at the community scale.

Forest Guild chose three indicators to measure social capital. Many of the papers they reviewed focused on the increased vulnerability of the very young and the very old to disasters. They used the age dependency ratio (population < 15 years + population > 64 years / population between 15 and 64 Maxim et al. 2001) where a low dependency ratio is indicative of greater community capacity. They calculated the dependency ratio using US Census data on population by age in Summary File 1, table P12. They also included the percent of the population with disabilities, because they might need extra assistance in an emergency (US Census SF3, P42). Percent of households headed by a single female parent (US Census SF1, P18) is an indicator designed to capture the increased vulnerability of women during emergencies as documented by Morrow (1999).

The three indicators Forest Guild used to measure human capital were education, employment, and ability to speak English well. Percent of the population with a high school diploma is an obvious measure of education while percent of the population employed is a direct measure of employment (US Census SF4, PCT79). Although many communities are multilingual, access to government resources and disaster response are facilitated by ability to speak English well. Therefore, they include the percent of the population that speaks English well or very well as an indicator of community capacity (US Census SF3, P19).

Forest Guild used both income and also percent of the community above the poverty line as indicators of financial capital (Census SF3, P90). Income is a common indicator of community capacity in studies at scales from local to international.

Forest Guild combined the 8 indicators to create an Index of Community Capacity (ICC). The ICC is designed to integrate social, human, and financial capital into a single measure. Each of the 8 indicators is rescaled to a 1 to 10 scale, where 10 indicates high capacity and 1 indicates the most need for assistance. The indicators are scaled based on the range of values in the state. In other words, a scaled value of 10 represents a value in the top 10 percent of the range of values found in the state. The range of values is determined by the lowest and highest values identified in the state. Each of the indicators receives equal weight in the ICC to make the index more transparent and the results easier to interpret. However, in some cases an individual indicator is not available for a particular geography. In the case of missing data, this indicator is excluded from the composite ICC. The composite ICC value is the sum of all the indicators for a particular geography divided by the number of indicators. Therefore, missing values do not affect the ICC unless they are missing because they are unusually high or low, which is not the case with the Census data. Because the index is still in development the value of each of the indicators could be reviewed in addition to the composite index.

Forest Guild's index of community capacity needs further research. The methodology described is untested and is offered as a starting place for continued discussions. Another area where research could improve the ICC is the mapping of communities. Although US Census data often provide the framework for regional comparisons of communities, there are opportunities to improve the geographic depiction of small rural communities. The main unit of analysis was the Census Designated Places. A potential alternative to use of block group level data for communities not delineated as Census Designated Places is to use expert local knowledge to place each community on the ICC.

Preserving Our Natural Heritage

Mature and ancient forests were mapped using the Forest Service's 2005 vegetation GIS data layer (*GPVeg*). As previously stated, the GP Task Force doesn't define ancient and mature forest by age but by forest characteristics. However, age class was used as a practical way to map the approximate location of these stands. As more detailed information on these forest stands are gathered, implementation of the vision can be adapted.

In mapping mature stands, forest stands with a year of origin between 1832 and 1926 were selected to obtain stands 80 to 174 years of age. Ancient forest stands were mapped by selecting stands with a year of origin less than or equal to 1831 so as to obtain stands 174 years and older. Forest stands with a structure labeled as dry meadow/shrub, n/a, rock, rural/administrative, water, and wet/mesic were removed so as to ensure greater accuracy. A small number of stands identified as "Ancient Trees Present" on the map include young or mature stands with the presence of remnant old growth trees and non-forest or lightly forested areas with the presence of dispersed old growth trees.

Roadless areas were mapped by combining the Forest Service's roadless GIS data layer (see

http://roadless.fs.fed.us/documents/feis/) for inventoried roadless areas with an uninventoried roadless layer created by the Pacific Biodiversity Institute out of Winthrop, Washington in 1994.

Mimicking Ancient Forests

In order to identify priority forest stands for thinning, sixth-field subwatersheds (the "old" sixth-fields) were selected based on a qualitative analysis of specific ecological considerations. Each ecological consideration was mapped and core areas were identified. Subwatersheds were then prioritized to capture as many core areas as possible.

Two ecological considerations reviewed in selecting subwatersheds were the location of late successional reserves and spotted owl critical habitat units. These areas have many restoration needs, and once restoration occurs they will serve as core refugia for the recovery of old growth dependent species. We also considered proximity to the rough locations of historic spotted owl nest sites with the hope that careful stand treatment would contribute to the expansion of owl habitat and habitat for other wildlife dependent on ancient forests.

The GP Task Force evaluated the potential for high quality fisher habitat (as outlined in the Feasibility Assessment for Reintroducing Fishers to Washington) as an additional ecological consideration. Fisher, like the spotted owl, are dependent on ancient forests and are in need of recovery because they are currently considered extinct in Washington State. They could be returned to the state with conservation of suitable habitat and reintroductions.

We assessed the location of young stands adjacent to ancient forest with the intention of thinning the young stands to create more contiguous blocks of ancient forest habitat. Great care should be taken not to damage ancient forest associated species that may have found niche habitats in the young stands where work is to be implemented.

Another ecological consideration was the location of major stream and river networks. Intact forest habitat along major streams and rivers serves as a travel corridor for many wildlife species as they migrate through the forest. Forests adjacent to streams and rivers are also home to a greater diversity of wildlife species than upland forests. Restoration of these riparian forests is critical to recovering native species and ecosystem processes.

Another factor in our selection of priority subwatersheds was their proximity to existing wilderness areas. Restoring watersheds near wilderness areas could help create larger blocks of suitable habitat for many wildlife species. Lower elevation areas were considered because of the greater potential for biological diversity and because forest stands at higher elevations do not respond as well to thinning activities.

Priority subwatersheds were selected to establish core ancient forest habitat restoration areas (that will complement existing core habitat areas such as wilderness areas and large blocks of existing ancient forest) and connectivity corridors between them. The core ancient forest restoration areas include the Wind River area, the area to the north and east of Indian Heaven Wilderness, an area to the east of the Mount St. Helens National Volcanic Monument, an area on the western border of Goat Rocks Wilderness, and an area between the Goat Rocks and William O. Douglas Wilderness.

Just as important as what was included is what was excluded when selecting priority subwatersheds. Congressionally and administratively withdrawn areas where commercial timber harvest is prohibited were excluded as were areas that consist predominately of either mature or ancient forests. We also excluded areas that consist predominately of young stands, including young naturally regenerated stands because there are few nearby mature and ancient forest stands to serve as a source of plant and wildlife diversity for recolonization. Moreover, naturally regenerated young stands tend to have a higher proportion of snags and down wood than plantation stands and some of these important legacy features are likely to be damaged or destroyed during thinning operations. Finally, we dropped subwatersheds that had less than half of a selected priority stand located within it.

The above ecological considerations were assessed, and then priority subwatersheds were selected. Finally, individual forest stands between the ages of 30 and 57 years (using the *GPVeg* Year of Origin data) located within the priority subwatersheds were prioritized for thinning. This age category was selected because modern industrial clear-cut logging did not begin on the GPNF until about 1949, which would make the oldest industrial-style plantation stand 57 years old in 2006. Moreover, thinning young stands on the GPNF becomes commercially viable roughly around the age of 40 years. Incorporating 30 year old stands enables long-term strategic planning and encourages consideration of additional restoration opportunities in the area. Elevation was also factored into our selection of individual stands. Forest stands below 4,000 feet were selected because they respond more positively to thinning and support higher levels of biodiversity. Lastly, stands that have not been precommercially thinned (by removing stands with a *GPVeg* Act Code of HSL and HSI) were prioritized.

The stands can be further prioritized by reducing the age range to 40-57 years, which results in over 60,000 acres that could be thinned in the more immediate future. The stands could also be further prioritized by identifying stands closest to local communities, making them more economical. In implementing this vision, field reviews could help identify those stands most in need of increased structural diversity or which prove to have the greatest potential for meeting multiple restoration goals.

Playing with Fire

While no GIS data set identifies the exact boundaries of drier east side forest types on the Gifford Pinchot, grand fir forest stands were used to approximate their location and were selected from the 2005 vegetation data layer. Sixth-field subwatersheds that intersected with these forest stands were selected as priority areas for the purpose of thinning and underburning to restore fire adapted ecosystems. The subwatershed encompassing the Big Lava Bed and a few outlying subwatersheds were removed to assist in prioritization.

Weeding Out Invasive Species

The Forest Service's GIS data prepared for the Pacific Northwest Region Invasive Plant Program Final Environmental Impact Statement was used to identify priority invasive weed infestation areas. While this data is not a complete inventory of infestation areas, it is the best data currently available. As new information becomes available, it can easily be incorporated. There is currently no GIS data available for non-plant invasive species present on the GPNF.

Infestation areas labeled as Priority 1 areas by the Forest Service were selected as priority treatment areas. The Forest Service describes their selection of Priority 1 areas as follows: "Priority varies depending on location of the infestation, the environmental or social values that may be threatened, and the aggressiveness of the invasive species. About two-thirds of the currently infested acreage is considered high priority. Higher priority sites include infested natural areas such as Mardon skipper and Pale blue-eyed grass habitat; Wind River Experimental Forest, Peterson Prairie, Cave Creek, Goat Rocks and Mount St. Helens on the Gifford Pinchot National Forest; and wetlands and ecological restoration sites in the Columbia Gorge. Other examples of higher priority sites include infested road corridors providing vector transmission routes across land ownerships and roads that lead to special areas (Wilderness, Botanical Areas, Research Natural Areas, National Monument, etc.). High public use areas such as campgrounds, parking areas, and viewpoints containing aggressive target species (e.g. butter and eggs, puncturevine, knapweeds, knotweeds, houndstongue, hawkweeds, and purple loosestrife) are also assigned a high priority."

The sixth-field subwatersheds in which these priority infestations were located were selected as priority areas for our restoration plan.

Major & Non-major Roads

The Forest Service's 2005 roads data layer (*GPRds*) was used to identify major and non-major roads on the GPNF. Major roads are generally those that are heavily used and are major access roads into or through the forest. Only roads which have the Forest Service listed as the source of the GIS data are displayed so as to improve data accuracy. A few major roads were recommended for decommissioning in the Forest Service's July 2002 Roads Analysis. These roads were converted to non-major roads so that they would not be "protected" from decommissioning due to major road status. An effort was made to remove roads that have been previously decommissioned from the roads layer, but the GIS data on previously decommissioned roads is not complete.

When Roads Fail

The Forest Service's July 2002 Roads Analysis data was combined with the roads data layer. The Roads Analysis examines the biological, social, physical, and economic information about the existing road infrastructure on the GPNF and communicates current road conditions and management designations and the Forest Service's desired future road conditions and management designations.

Non-major road segments identified as having a high aquatic impact in the Roads Analysis were selected as priority road segments for decommissioning to improve aquatic ecosystems. The July 2002 Roads Analysis identifies road segments as having a high aquatic impact through assessments of the following several factors:

Surface Erosion Risk

Sediment delivery to streams was estimated by the road erosion transported to streams via ditch runoff within 200 feet of a stream and via ditch relief culverts and direct overland flow if roads are within distances ranging from 50 to 100 feet of streams depending on the type of road (local, collector, arterial). A road segment was rated as having a high erosion risk if 20 tons or greater of sediment per year per mile is delivered to streams. Road segments were rated as having a moderate erosion risk if less than 20 tons of sediment per year per mile is delivered to streams. Road segments with no sediment delivery were rated as having a low erosion risk.

Mass Wasting Risk

Road segments were rated a high mass wasting risk if they crossed known previous landslides or were known to have past failures. Road segments were rated a moderate mass wasting risk if they crossed potentially unstable soils. Segments of roads that

did not cross previous landslides or potentially unstable soils were rated a low mass wasting risk.

Riparian Reserve Impacts

The following table summarizes the evaluation criteria for Riparian Reserve impacts.

	Road density in Riparian Reserves within 7th field subwatershed		
Percent of road segment in Riparian Reserve	0–2.4 mi./sq. mi.	2.4–3.5 mi./sq. mi.	>3.5 mi./sq. mi.
0%	Low	Low	Low
0–25%	Low	Mod	High
>25%	Mod	High	High

Channel Process Impacts due to Stream Crossings

The following table summarizes the evaluation criteria for stream crossings.

	Stream Crossing frequency in 7th field subwatershed	
Number of stream crossings on road segment	0–2.5 X'ings/mi.	>2.5 X'ings/mi.
0 X'ings	Low	Low
>0 X'ings	Mod	High

Stream Flow Impacts

Road segments in subwatersheds with at least 20% of its area in forest where the trees are less than 8 inches in diameter and canopy closure is less than 70% (Aggregate Recovery Percentage less than 80) and where at least 30% of its area is between 1500-3500 feet (Rain on Snow percentage greater than 30) were rated as having a high stream flow impact risk.

Segments of road in subwatersheds with at least 10% of its area but no more than 20% of its area in forest where the trees are less than 8 inches in diameter and canopy closure is less than 70% (Aggregate Recovery Percentage less than 90 but greater than 80) or at least 20% of its area is in forest where the trees are less than 8 inches in diameter and canopy closure is less than 70% (Aggregate Recovery Percentage less than 80) and no more than 30% of its area between 1500-3500 feet (Rain on Snow less than 30) were rated as having a moderate stream flow impact risk.

Road segments in subwatersheds with less than 10% of its area in forest where the trees are less than 8 inches in diameter and canopy closure is less than 70% (Aggregate Recovery Percentage greater than 90) were rated as having a low stream flow impact risk.

Fish Passage Impacts

Road segments with a known culvert blocking fish passage were rated as having a high impact on fish passage. Road segments that cross a fish bearing stream in watersheds that did not have culverts surveyed or that had less than a tenth of a mile of upstream habitat available above the impassable fish barrier were rated as having a moderate fish passage impact. Road segments that do not have culverts impeding fish movement or do not cross a fish bearing stream were rated as having a low impact. Though culvert data are not considered totally reliable, it is the best data available at this time. As field reviews of various high priority restoration areas are implemented, all project area culverts should be assessed.

The following table shows the miles of roads in each category:

Aquatic Risk	High (mi.)	Mod (mi.)	Low (mi.)
Surface Erosion	1,248	1,992	1,118
Mass Wasting	1,273	641	2,444
Roads/ Riparian Reserves	3,361	143	853
Stream Crossing	2,302	872	1,184
Stream Flow	2,301	1,424	632
Fish Passage	418	866	3,072

The overall aquatic risk rating of high, moderate or low for a road analysis segment was determined by the composite score of the individual ratings above with high = 3, moderate = 2, and low =1 being assigned to each risk category. A composite score of 14-18 was assigned by the Forest Service a high overall risk rating, a score of 10-13 was assigned a moderate risk, and a score of 6-9 was assigned a low risk. The following table shows the total miles of road in each overall aquatic risk rating.

Aquatic Risk	Miles
High	1,848
Moderate	1,601
Low	963

An effort was made to remove roads that have been previously decommissioned from the roads layer, but the GIS data on previously decommissioned roads is not complete.

Once the road segments with a high aquatic risk were identified, sixth-field subwatersheds that intersected with the road segments were selected as priority subwatersheds. A few subwatersheds were removed because a very small amount of priority road segments intersected with the subwatershed.

The selected roads could be further prioritized by selecting high aquatic impact roads that occur within watersheds that contribute directly to the conservation of at-risk anadromous and resident fish or watersheds that are sources for municipal drinking water supplies. Further prioritization is possible by selecting roads that occur higher in the watershed as they likely have greater water quality impacts than roads lower in the watershed due to reduced flow levels.

Streams Need Trees

Water temperature testing data for the GPNF was used to identify the number of years stream reaches exceeded a 7-day average of the daily maximum temperature of 16.0°C, a temperature above which fish species are likely to be harmed. Those stream reaches in exceedence more than one year were selected as were those in exceedence only for one year but with temperatures in excess of 17.5°C. Based on a review of the available data and knowledge of particular stream reaches, streams that exceeded a 7-day average of the daily maximum temperature of 16.0°C for only one year but had a temperature less than 17.5°C were less likely to be impaired whereas those that had a temperature greater than 17.5°C often were only tested once and were more likely to be impaired.

Lewis River subwatersheds below Lower Falls identified by the Forest Service as priorities for bull trout habitat restoration were prioritized regardless of temperature testing results. A segment of Bear Creek in the Wind River watershed was also selected because the Underwood Conservation District has tested frequent high temperatures in this creek.

Stream reaches that fall within wilderness areas and the Mount St. Helens National Volcanic Monument were removed and Walupt Creek was removed because high temperatures in the subwatershed are the result of a natural lake.

Priority stream reaches were compared with Washington Department of Ecology data on listed 303(d) streams and Forest Service information on priority watersheds for restoration to confirm quality of prioritization process.

Once priority stream reaches were identified, the sixth-field subwatersheds in which they are located were selected as priority subwatersheds for instream and riparian enhancement restoration work.

While the GP Task Force attempted to identify streams in short supply of fallen trees, the available data from the Forest Service was inadequate. The floods of 1996 and 2006 significantly altered the amount of fallen trees in streams, and there have not been enough streams surveys since then to update and track this information.

Let Them Howl

Due to the fact that wolves require an adequate prey base of deer and elk and that winter months are likely to be the most difficult for wolf survival, the Forest Service's 1997 deer and elk biological winter range habitat (*GPDewr*) data layer was used as a proxy for priority wolf habitat.

Non-major roads that intersected with deer and elk biological winter range were prioritized for removal or winter closure in our plan to restore wolf habitat. An effort was made to remove roads that have been previously decommissioned from the roads layer, but the GIS data on previously decommissioned roads is not complete.

Sixth-field subwatersheds were then selected that intersected with the priority roads for decommissioning or winter closure. We removed subwatersheds that contained minimal priority road segments. Some roads prioritized may already be closed during winter months, however we were unable to separate these out during our analysis.

Expanding Wildlands

The GP Task Force used several data sets to conduct a visual assessment of non-major roads to decommission to significantly increase the size of large roadless areas. We used the Forest Service's roads and inventoried roadless areas data and the Pacific Biodiversity Institute's uninventoried roadless areas greater than 5,000 acres data. An effort was made to remove roads that have been previously decommissioned from the roads layer, but the GIS data on previously decommissioned roads is not complete.

Sixth-field subwatersheds in which selected roads were located were prioritized for enlarging roadless areas. Subwatersheds in which a very small segment of road was found were removed from the selection.

Strategic Restoration

To summarize and prioritize an overall restoration plan for the Gifford Pinchot National Forest, we compiled our assessments of each subwatershed's overall potential for restoration. If a subwatershed was selected as a priority area for a restoration component (say wolf recovery), then the subwatershed would be labeled "1." A subwatershed continued to gather "points" for each high priority restoration item identified in that subwatershed. Finally, the total count was color coded for representation in a map. So, for example, if a subwatershed was designated as a high priority for thinning to expand ancient forest habitat, a high priority for road removal to improve wolf habitat, and high priority for invasive species control, it would receive a "3." ■