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America's Forests

2003

Health
Update



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Introduction

America's forests cover 747 million acres, of which 20 percent are on National Forest System lands, 49 percent are owned by nonindustrial landowners, 8 percent by States, 13 percent by other Federal agencies, and 10 percent by industrial landowners. The forest land is an invaluable asset to the American people, providing water, recreation, wildlife habitat, and future timber. America's forests, however, continue to face many risks, including fires, invasive species, and fragmentation. Hundreds of millions of trees and invaluable habitats are impacted each year by severe wildfires and insect and pathogen outbreaks. These disturbances are a result of an excessive buildup of fuels caused by decades of fire suppression.

To assist the U.S. Department of Agriculture (USDA) Forest Service in maintaining the health and sustainability of natural resources, President Bush announced the Healthy Forest Initiative in 2002. The Healthy Forest Initiative will implement core components of *The National Fire Plan's 10-Year Comprehensive Strategy and Implementation Plan*. This historic plan—which was adopted by Federal agencies and western governors in collaboration with county commissioners, State foresters, and tribal officials—calls for more active forest and rangeland managements. Complementing the Healthy Forest Initiative and the National Fire Plan, the Western Bark Beetle and Southern Pine Beetle Plans establish a framework for protecting communities and the environment through local collaboration on thinning, planned burns, insect and pathogen suppression and prevention, and forest restoration projects.

Our definition of a healthy, sustainable forest—A condition wherein a forest has the capacity across the landscape for renewal, for recovery from a wide range of disturbances, and for retention of its ecological resiliency while meeting current and future needs of people for desired levels of values, uses, products, and services.

The USDA Forest Service's Forest Health Protection (FHP) program works collaboratively with State foresters, State departments of agriculture, and other USDA agencies, including the Animal and Plant Health Inspection Service (APHIS), to protect America's forests from native and introduced insects, pathogens, and invasive plants. The FHP program provides technical information and assistance in management and control of forest insects, diseases, and invasive plants; forest health monitoring; technology development; and pesticide use to Federal, State, tribal, and private managers of forest lands.

This report provides a summary of current forest ecosystem health issues in America's forests. There are five general areas of concern:

- Wildfires and forest health
- Nonnative invasive insects and pathogens
- Invasive plant species
- Outbreaks of native insects
- Changing ecological processes

For further information, please visit our Web site: <http://www.fs.fed.us/foresthealth>



The USDA Forest Service is committed to maintaining healthy, sustainable forests.

Fire and Forest Health

National Fire Plan: Thousands of Communities at Risk

The 2000 and 2002 fire seasons—the worst seasons in 50 years—demonstrated the scope of fire risk to the wildland-urban interface and general forest areas. On August 29, 2000, the highest day of activity:

- 28,462 people were fighting fire
- 84 large fires (100 acres or more) were burning
- 1,642,579 acres were on fire in 16 States

During the 2002 fire season, firefighters battled 88,458 separate fires that left behind over 7.1 million scorched acres and cost the Government \$1.7 billion. Fifteen million acres burned during the 2000 and 2002 seasons, three times the 10-year average from 1990 to 1999. The fire risk in many forested areas remains high. Fire suppression practices, overcrowded and overmature forests, snow and wind storms, unprecedented drought, and forest insect and disease dam-



Wildland-urban interface wildfires destroy forests, property, and wildlife habitats.

age have led to huge fuel (combustible forest material) loadings in America's forests. As communities expand into forests and rangelands, people, property, and water supplies become more at risk to the effects of catastrophic fires.

As a result of the fires of 2000, the USDA Forest Service, along with its partners, developed the

National Fire Plan in 2001 to galvanize fire preparedness, suppression, and prevention efforts. Working together, Federal agencies and State, tribal, and local governments set out to:

- Identify communities threatened by wildfires.
- Develop strategies and prioritize projects to avoid, reduce, and mitigate fire losses in those communities.
- Increase efforts to protect natural resources, including wildlife and threatened and endangered species habitats.
- Rehabilitate and restore forests.



Mechanical treatments with prescribed fires reduce the risk of catastrophic wildfires.

In 2001, States and tribes identified over 22,000 communities threatened by wildfire, and the Departments of Agriculture and the Interior and State governors developed a 10-year strategic plan, *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment*. The plan embodies a comprehensive approach to wildfire and hazardous fuels management and ecosystem restoration and rehabilitation for forests and rangelands. Implementing this plan is now a top priority for the Departments of Agriculture and the Interior, as well as many State, tribal, and local governments. In 2002, fuels reduction treatments were completed on 1.2 million acres, of which 733,219 acres were within the wildland-urban interface. The FHP program also treated about 1.6 million acres to reduce risk of mortality due to insects, pathogens, and invasive plants. The National Fire Plan funded treatments on 406,770 of the 1.6 million acres. Similar work on 3.1 million acres is planned for 2003.

Blowdown in Minnesota

One of the largest blowdown events ever recorded in North America struck Minnesota's Superior National Forest and the Boundary Waters Canoe Area Wilderness (BWCAW) on July 4, 1999. Heavy rain and 90-mph winds leveled trees across 470,000 acres of the forest and BWCAW, dramatically increasing fire risks and effectively altering the ecosystems for the next 100 years.

The blowdown fell on already dangerously high fuel loads. Those fuel loadings were the cumulative effect of a century of fire suppression practices and recurring spruce budworm infestations. Intermingled human settlements within forest areas added to the complexity and urgency of fire suppression. In response, the USDA Forest Service initiated:

- A partnership among all levels of government agencies, businesses, and citizens to implement an on-going, joint clean-up and recovery effort.

- A research partnership to study the storm's and the subsequent recovery efforts' effects on the forest ecosystems. Partners include the North Central Research Station, Superior National Forest, and the University of Minnesota.

In 2001, cooperators reduced fuel loads on more than 10,000 acres outside the BWCAW. Prescribed burns on 75,000 acres in the BWCAW are planned over the next 5 to 7 years. The burns will reduce the risk of a wildfire spreading from wilderness to homes and other property and threatening public safety. Conducted by the research partnership, studies in the affected areas will provide critical information on tree mortality and insect populations, help predict future conditions, and aid in reducing fire risks. FHP provides essential survey information for the development and monitoring of the effectiveness of these plans.



Untreated blowdown provides habitat for bark beetles, resulting in bark beetle outbreaks and increased fire hazard in standing forest.

Nonnative Invasive Insects and Pathogens

Nonnative Invasive Species Cost Americans \$137 Billion a Year

Invasion of Nonnative Invasive Species

Global trade and travel are causing an unprecedented movement of animals, plants, and microorganisms across continents and oceans. All too often, these nonnative species are invasive and can cause impacts that are extremely costly to both the U.S. economy and environment. When brought into new ecosystems, nonnative invasive species have no natural enemies and can cause extensive damage. Nearly 50 percent of the plants and animals on the Federal endangered species list have been negatively impacted by nonnative invasive plants, animals, insects, and microbes. These species threaten biodiversity and have caused catastrophic damage to agriculture, forest products, recreation, and natural resources across North America. Examples include Sudden Oak Death, emerald ash borer, gypsy moth, American chestnut blight, and white pine blister rust.

In February 1999, the President issued Executive Order 13112 on Invasive Species, establishing the National Invasive Species Council. The council provides, for the first time, a coordinated effort of 10 member Departments. In October 2001, the council completed a management plan, *Meeting the Invasive Species Challenge*, to address the Executive order. The plan is designed to raise public awareness and control the introduction and spread of nonnative invasive pests. According to the plan, the economic cost of invasive species is estimated at \$137 billion every year.

The USDA Forest Service spends more than \$97 million to control the introduction and spread of nonnative species. The control efforts include refining, developing, and deploying a broad array of technologies to minimize the

MEETING THE INVASIVE SPECIES CHALLENGE

Management Plan
National Invasive Species Council
2001



impacts of invasive species. Technology includes remote sensing, computer modeling, mechanical treatments, biopesticides, biological controls, and conventional pesticides. FHP and APHIS have started an early detection and rapid response program to detect and promptly eradicate any new invasive species. Invasive pests are dealt with as aggressively as possible, within budget constraints, before they become well established.

Sudden Oak Death: A New Threat to the Nation's Forests

Sudden Oak Death (SOD)—a disease caused by *Phytophthora ramorum*, a newly discovered pathogen of uncertain origin—has killed thousands of trees in coastal, mixed evergreen forests and urban-wildland interfaces in California and southern Oregon. It kills coast live oak, California black oak, shreve oak, tan oak trees, and madrone and infects several other plant species, including rhododendron, manzanita, California bay laurel and buckeye, evergreen huckleberry, and big leaf maple. The disease degrades ecological

processes and watershed functions and lowers forest productivity. It reduces aesthetic, recreational, and economic values and leaves forests susceptible to invasive plant infestations. Dead trees add fuel to an already high fire risk.

We don't know enough about how the disease spreads and its biology. We know it is spreading rapidly and has been found in nursery stock (particularly rhododendron) in a few ornamental nurseries, raising concerns that it could be transported to and infect the extensive, susceptible oak forests of the Eastern United States. The oak-hardwood forest is the largest forest type in the United States.

USDA Forest Service responses to the current outbreak include—

- Spending over \$5 million to research, monitor, manage, and educate the public about SOD.
- Working closely with APHIS to assist in implementing a quarantine and to regulate the transportation of wood, bark, and nursery stock that

White Pine Blister Rust: Pathways to Restoration

White pine blister rust (WPBR), an introduced fungus from Asia, has decimated several species of native white pines across the American West and Canada. Native white pines are an integral part of the natural biodiversity of western forests. The ecological and economic impacts have been most acute on the two large commercial species—western white pine and sugar pine. WPBR entered North America through the east and west coasts on European nursery stock around 1910. In the West, it quickly spread from Vancouver, British Columbia, Canada, south through the Cascades and Sierra Nevada, and east into the Rocky Mountain States of Idaho, Montana, Colorado, Wyoming, and New Mexico. The pest has

also inflicted severe ecological damage in high-altitude white-bark and limber pine forests. In susceptible stands, WPBR can kill over 95 percent of mature trees, effectively altering a forest ecosystem forever.

Strategies for control include:

- Restoration of white pine forests through development and planting of white pines that are genetically resistant to WPBR. More than 8 thousand acres of forest lands have been planted with resistant seed from seed orchards and proven resistant seed trees.
- Restoration of white pines through deployment of silviculturally integrated practices, such as pruning the infected plantation trees and planting in low-hazard areas.



White pine blister rust killed 95 percent of western white pine in forests. Inset: Aecia spores of white pine blister rust.



Oak mortality due to SOD reduces property value and increases fire risk. Inset: SOD canker.

might harbor the SOD pathogen.

- Developing a national SOD detection survey of oak forests to detect new infestations of the pathogen outside the known infested areas. Surveys initiated in the spring of 2003 are in partnership with the States of Washington, Virginia, North Carolina, South Carolina, Georgia, Tennessee, West Virginia, and Pennsylvania.
- Cooperating with the California Oak Mortality Task Force, a public-private coalition, to protect the Nation's oak forests.
- Implementing effective SOD research, monitoring,

management, and educational programs to stop the spread of SOD.

In 2000, FHP provided funds to help investigate the cause of this disease. Investigations led to the discovery that the primary cause of SOD is a previously undescribed species of *Phytophthora*. In 2001, FHP provided additional funds to determine the extent and severity of SOD in oaks and other native plants in California and Oregon. The funds were also used to develop diagnostic and survey methodologies for the SOD pathogen, evaluate fungicide treatments and other management strategies, and assess the fire risk and other ecosystem effects of accelerated oak mortality. FHP continues to support cooperative efforts in 2002 to monitor the disease development and spread. Forest health monitoring surveys detected the pathogen in southwestern Oregon. In the fall of 2001, the Oregon Department of Forestry attempted to eradicate the pathogen. Monitoring efforts to determine the effectiveness of the eradication treatment are underway.



Quarantine regulations to prevent the spread of SOD.



Old-growth western white pine is also killed by WPBR.

The USDA Forest Service has extensive on-going resistance-breeding programs that began in the 1950s. These breeding programs continue to discover and develop WPBR-resistant varieties of white pines. These programs helped save the western white and sugar pine from extinction. In California, a total of 1,329 proven resistant seed



White pine blister rust spread in the West, 1926-1998.

trees have been identified, and two seed orchards are established. In the Pacific Northwest, the resistance-breeding program supports 40 seed orchards. The Rocky Mountain Region has identified more than 3,100 trees and planted 96,255 acres with WPBR-resistant white pine seedlings.



Planting resistant western white pine seedlings restores western white pine ecosystem.

Gypsy Moth: Slowing The Spread

Since 1930, the gypsy moth has defoliated more than 80 million acres of forests in the Eastern United States, with most of that damage occurring during the past 20 years. A hardwood defoliator native to Europe and Asia, the gypsy moth arrived in the United States in the 1800s, established itself in the oak forests of southern New England, and then spread south and west across 19 States. Occasionally, it appears in western forests but has been successfully eradicated each time. Unfortunately, the gypsy moth is now a permanent resident of eastern forests.

During outbreaks, moth populations often outpace the few natural enemies, parasites, predators, and pathogens that attack them. The gypsy moth feeds on the delicate first flush of leaves in the spring. It prefers oaks, but it will feed on 500 species of woody plants. The attacked trees become highly susceptible to secondary attacks from other insects and pathogens. Often, the trees die. The deaths alter the forest ecosystem dramatically; usually

dead oaks are replaced not with more oaks, but with other species that do not produce as much mast for wildlife.

In response to this pest, the USDA Forest Service adopted the following strategies:

- Implementing programs and providing technical and financial assistance to States and other Federal agencies to suppress and slow the spread of the gypsy moth in the East.
- Detecting and eradicating—along with APHIS, State governments, and other Federal agencies—localized introductions of the gypsy moth in the West.

A gypsy moth virus and aerial treatments with biological and chemical insecticides conducted over 575,000 acres in 2002 have effectively suppressed or slowed the spread of the gypsy moth in nine Northeastern States. The USDA Forest Service's Gypsy Moth Slow-the-Spread program slows the south-westerly spread of the insect by 60 percent through concentrated monitoring and by using environmentally



Mortality of hardwoods caused by gypsy moth.

Tim Tigner, Virginia Dept. of Forestry



Biological control (Gypcheck) used to slow the gypsy moth spread.

benign mating disruption techniques. After discovering adult gypsy moths in pheromone traps in seven Western States in 2000, steps were taken that eradicated the pest from these States. The USDA Forest Service and many other cooperators continue to develop new controls and delivery methods to use against this pest.

Eastern Hemlock Forests Are Dying: Hemlock Woolly Adelgid on the Attack

The hemlock woolly adelgid (HWA) is one of the most serious forest pests threatening eastern forests. The insect defoliates eastern hemlock; trees can die within 4 years of infestation. Native to China and Japan and introduced to the American Northwest in the 1920s, it has spread quickly across the Northern United States. Fortunately, the western hemlock proved resistant to HWA. Unfortunately, the eastern hemlock is highly susceptible to HWA. Beginning in the 1950s, the pest began a destructive march north and south through eastern forests. Today, it infests nearly half of the hemlock forests across 11 States from Massachusetts to

South Carolina and as far west as the southwestern tip of West Virginia.

Eastern hemlock is a pivotal player in eastern forest ecosystems. It is especially important along streams and creeks where its shade helps control water temperatures, thereby helping to sustain aquatic ecosystems. Eastern hemlocks span the Eastern United States from Maine west to northern Wisconsin and south along the Appalachians to north Georgia. The span also includes small pockets in Indiana and Mississippi. To arrest the pest's advance, the USDA Forest Service has:

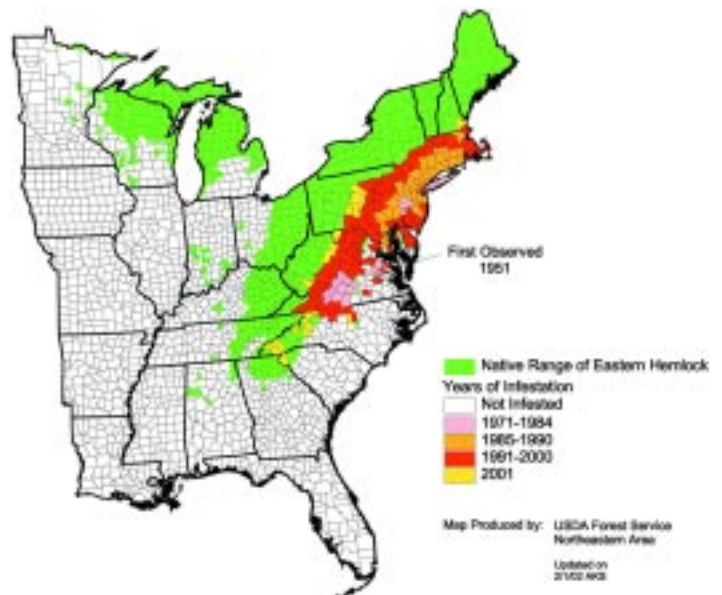
- Implemented spray programs on individual trees wherever practical and environmentally safe, such as in nonriparian settings.
- Identified, developed, and released HWA-specific biological control agents.
- Developed an integrated plan to address the problem as funding permits.

The USDA Forest Service identified a number of pathogens and predators native to the United States that would attack

HWA. The most effective to date is the Japanese ladybird beetle. This predator attacks only HWA, will feed on all stages (egg to adult) of HWA, and, in sufficient numbers, will consume up to 97 percent of an HWA population. Since 1999, the USDA Forest Service has raised and released over half-a-million beetles in nine States. Additional research, development, and subsequent management actions are expected to reduce the impacts of this destructive pest.



Japanese ladybird beetle used for biological control of HWA.



Hemlock woolly adelgid distribution, 1995-2001

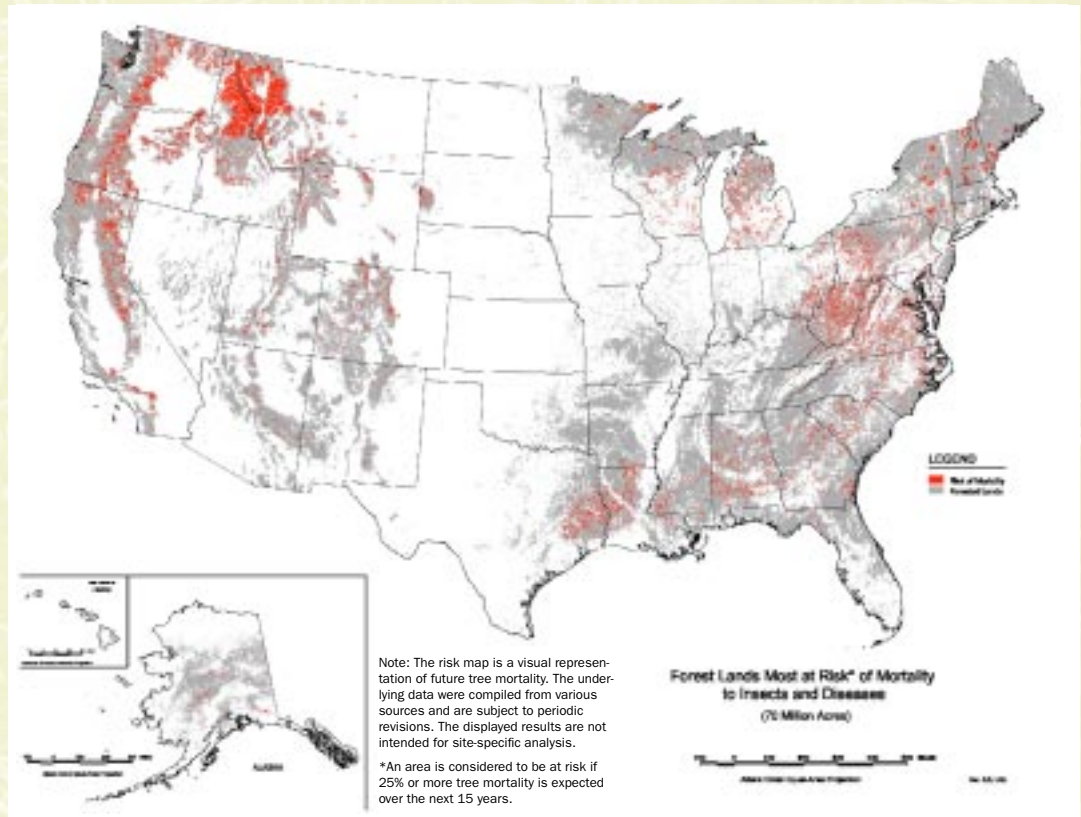


The introduced adelgid kills hemlocks, which degrades stream ecosystems.

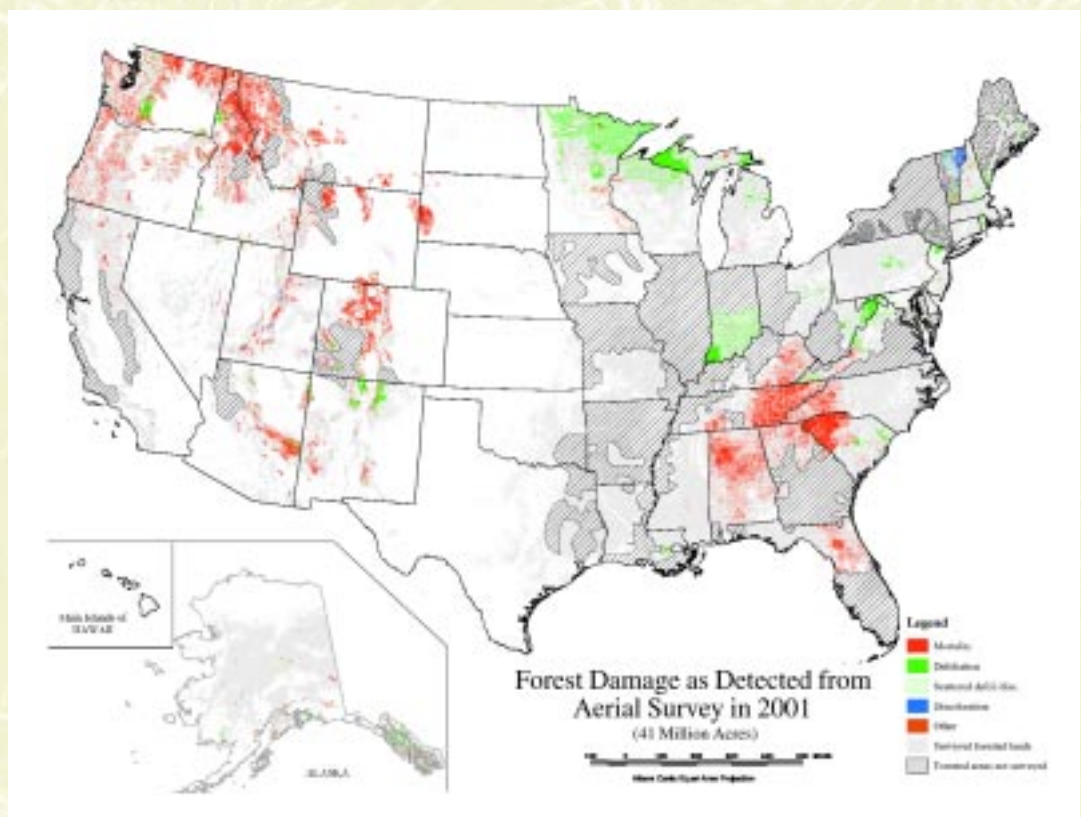
Forest Health Maps

These three maps have been developed over the last several years and are important tools in guiding the action of Forest Health Protection Program.

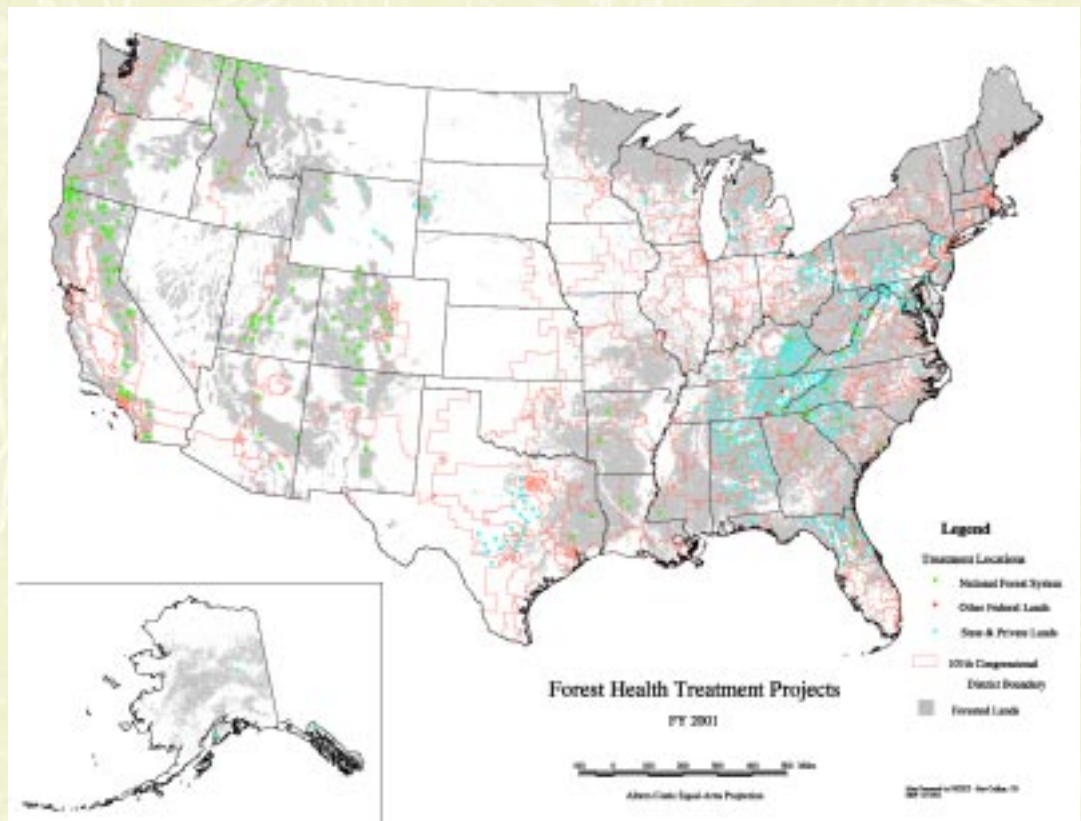
► The risk map depicts where USDA Forest Service scientists predict mortality will occur over the next 15 years. Areas in red will experience at least 25 percent mortality over and above normal levels (under 1 percent per year) due to the actions of insects and pathogens. The map is not site-specific. It is a coarse-filtered map and, along with other data, is used to plan where FHP treatments will take place. Based upon our definition of "risk," it depicts about 70 million acres at risk out of a total of 749 million acres of forest land in the United States. Four pests are responsible for 66 percent of the risk acres: gypsy moth in the East, southern pine beetle in the South, root disease in the Interior West, and bark beetles in the West.



► The current condition map shows that in 2001 approximately 41 million acres were damaged by insects and pathogens. This damage includes defoliation and mortality by various insects. Experts use data gathered annually by aerial sketch mapping techniques to map forest damage. The data is used to design suppression, prevention, and restoration projects to restore, maintain, and protect forest lands.



► The treatment projects map displays where treatments were applied in 2001. Treatments consist of thinning trees, trapping insects, spraying insecticides, cutting and removing trees, and other techniques. About 2 million acres were treated. Treatment locations generally follow where the current condition map indicates mortality events occurred.



Working collaboratively with State agencies, the FHP program uses all three maps and other information to guide the national program. Areas that are at risk will experience defoliation or mortality events

unless the USDA Forest Service and others take preventive actions. While native insects and pathogens serve a vital role in maintaining the health of ecosystems, sometimes humans need to intervene. In areas of

special concern—such as recreation sites, water supply areas, and areas important for wildlife or timber—treatments take place to protect the tangible and intangible amenities that society values.

Invasive Plants— Everybody's Business

Thousands of invasive plant species have been introduced in the United States. About 1,400 are recognized as pests that pose significant threats to the biodiversity of forest and grassland ecosystems. Experts estimate that well over 100 million acres are infested with invasive plants, and that between 8 million and 20 million more acres are being added every year. An estimated 3.6 million acres on National Forest System lands are infested.

Many of the invasive plants are not native to the United States. Therefore, they have no natural enemies to limit their reproduction and spread. Although rangelands are the primary targets of many invasive plants, they are showing up everywhere—in forests, parks, preserves, wilderness areas, wildlife refuges, croplands, and urban spaces. Invasive plants threaten two-thirds of the habitat of all threatened and endangered species.

Two federally coordinated efforts are:

- The Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW)—comprised of 17 Federal agencies with a common goal of developing biologically sound techniques to manage invasive plants on all lands.
- The National Fire Plan—focused on rehabilitating and restoring forests and rangelands, specifically reducing the spread of invasive plants.

In 2002, the USDA Forest Service spent over \$16 million to prevent and control the spread of invasive plants on more than 152,000 acres of National Forest System lands. Part of these funds, \$2 million, was allocated to Idaho and

Montana to protect approximately 15,760 acres of State and private lands from invasive plants.

The USDA Forest Service and its cooperators are conducting extensive research and development that is needed on biological control agents for use against many invasive plants, such as mile-a-minute weed, a major problem in five Northeastern States. Biological control agents are showing some success in slowing the spread of invasive plants, such as leafy spurge in the West.

Mile-a-Minute Weed

Mile-a-minute weed is a prickly, annual vine that, true to its name, grows very rapidly and overpowers virtually all vegetation in its path. Originally from Asia, it first appeared on the west coast in the 1890s. In 1946, it was found in nurseries in Pennsylvania. It has spread to New York, Ohio, Maryland, New Jersey, Virginia, West Virginia, Delaware, and the District of Columbia. Seeds are spread by birds and rodents and are

carried in rivers and streams. The plant is an excellent climber and easily overpowers, engulfs, and displaces much of the native flora in its path. It invades nurseries, forest openings, railroads, utility rights-of-way, roadsides, and riverbanks. It also threatens forest regeneration and recreational activities. In short, mile-a-minute weed is degrading plant diversity in North America.

Controlling the spread of mile-a-minute weed presents a tremendous challenge to forest and rangeland managers. The USDA Forest Service and its cooperators are working diligently to identify and apply effective biological controls to use against this nonnative pest, including:

- Identifying over 20 varieties of fungi that attack and/or kill the weed. Additional tests on the fungi are planned.
- Evaluating three insects from China known to attack the weed. One of the insects in particular, a weevil, shows promise for future release.

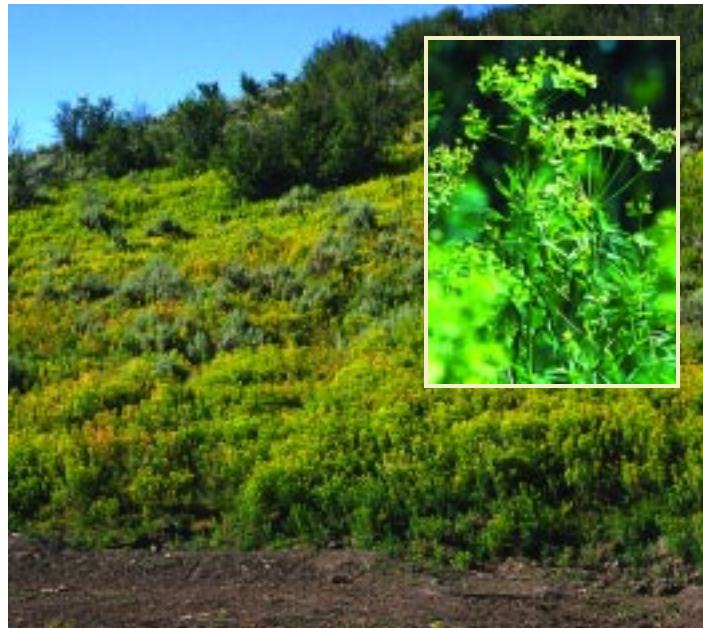


Mile-a-minute weed spread to Wood County, WV. Inset: A promising weevil for biological control of mile-a-minute weed.

Leafy Spurge

Leafy spurge is the classic non-native, invasive plant. Arriving on North America from Eurasia in the 1890s, it now infests over 2.5 million acres of rangeland in southern Canada and the Northern United States. At maturity, it can reach heights of 7 feet. Leafy spurge can kill cattle and horses, and its sap can cause irritation to the eyes, mouths, and digestive systems of all domestic and wild grazing animals, except goats and sheep. The sap can also cause blistering, severe dermatitis, and permanent blindness among humans. Seedpods explode when touched, scattering seeds up to 15 feet. It has a nutrient-storing taproot system that can reach soil depths of 20 feet. Pulling the plant actually encourages it to spread.

Although conventional herbicides are effective against leafy spurge, they have a limited use. Due to this limited use, the USDA Agricultural Research Service, in cooperation with APHIS, developed and evaluated integrated approaches to managing leafy spurge. Now a cooperator, the USDA Forest Service is researching and applying several biological



Leafy spurge infests over 2.5 million acres. Inset: Leafy spurge plant.

control agents to suppress the pest's spread, including:

- Grazing goats and sheep.
- Fungal controls that kill the plant by causing root rot.
- Flea beetles that feed specifically on leafy spurge.

Of these three, the flea beetles appear to be most effective against this pest, especially when used as an integral part of a pest management approach that includes grazing by sheep

and goats and use of conventional herbicides whenever possible. Imported from Asia, beetle populations have been established in Montana, the Dakotas, and Wyoming. Adult insects weaken the plants by attacking leaves and stems, and the larvae feed upon the roots. The USDA Forest Service and other cooperators are refining laboratory techniques so that the beetles can be mass produced.



Leafy spurge infestation in Montana before release of the flea beetle—a biological control.



The leafy spurge site in Montana 4 years after release of the flea beetle. Inset: Flea beetle.

Outbreaks of Native Insects

Native insects such as bark beetles in the West and southern pine beetle in the South act as “agents of change” in conifer forests. At the endemic level, they play a critical role in the development, aging, and rebirth of entire forests. At the landscape level, insect-caused mortality contributes to the structural and mosaic diversity within ecosystems. Insects can also cause major disturbances within U.S. forests. For example, tree mortality due to bark beetle outbreaks can be extensive, affecting thousands of acres.

Certain circumstances can exert uncommon stress on forests and predispose them to extraordinary insect outbreaks and damage. These circumstances include drought, over-

stocking, and large areas of aging forest. During the last decade, several of these circumstances have arisen simultaneously, causing extensive tree mortality. In turn, that mortality has threatened wildlife, endangered and threatened species habitat, and degraded recreational quality. The increased mortality has contributed to considerable fuel accumulation, which in turn increases the risk of catastrophic fires.

In 2001, the USDA Forest Service spent about \$10 million to suppress and prevent bark beetle outbreaks. Because more work is needed, FHP has developed management plans to address the problem in an integrated manner and will implement these long-term plans as funding permits.



Densely stocked ponderosa pine at risk of bark beetle infestation and fire.



Prevention treatment results in thinned stands that are less susceptible to bark beetles and that reduce fire hazard.

Southern Pine Beetle: Laying Waste to Southern Forests

Southern pine beetle (SPB) is the most destructive forest pest in the South. Over 90 million acres of southern forests are at a moderate to high risk of SPB infestation. In 2001, due to a combination of a mild winter and a prolonged drought, the South experienced its most severe and prolonged SPB outbreak in history. SPB infested tens of thousands of acres and caused over \$200 million in damages. A single SPB “spot” (outbreak) can spread very quickly and cover up to 1,000 acres in one season. The situation was especially dire in Alabama, where more than 25,000 SPB spots have been detected. In the southern Appalachian Mountains, SPB has killed thousands of acres of pines. It has killed more than 70 percent of the pine forest habitat of the red-cockaded woodpecker, a federally listed endangered species, on the Daniel Boone National Forest in southern Kentucky.

In response, the USDA Forest Service has:

- Stepped up its funding of programs to detect, suppress, and prevent SPB infestation and restore southern pine forests.
- Modernized and improved computer modeling and tracking technology—including the Southern Pine Beetle Information System (SPBIS), which enables national forest field staffs to quickly log information about SPB spots and schedule, execute, and monitor treatments on those spots.

In 2001, FHP doubled its financial commitment from the previous year and provided over \$13 million to fund SPB suppression projects on Federal, State, and private lands across



Kentucky lost 70 percent of the red cockaded woodpecker habitat because of SPB-caused mortality. Inset: Southern pine beetle.

Inset: Ronald F. Billing, Texas Forest Service



Ronald F. Billing, Texas Forest Service

SPB infestation starts with a spot.



Ronald F. Billing, Texas Forest Service

Prompt treatment of SPB spots prevents large-scale outbreaks.

the South. A comprehensive plan focusing on prevention and restoration has been developed and will be implemented as funding permits.

Mountain Pine Beetle in Colorado: Cooperative Management

The native mountain pine beetle (MPB) kills more pines in the American West than any other bark beetle. A regional assessment conducted by FHP staff of the forests in Vail's wildland-urban interface found that almost all of the 34,000 acres of lodgepole pine in the area were at moderate to high risk of MPB infestation because of tree age, density, and drought.

Vail, CO, the site of the 1999 World Alpine Ski Championships, is a world-class recreation setting. Vail also has some of the most valuable real estate

in the United States. Among Vail's natural treasures is the nearby White River National Forest, a large, and mostly wild, expanse of forest land. Increases in MPB infestations among Vail's lodgepole pine forests started in 1996. Increases in the MPB infestation were also detected in the forest around the Steamboat Springs area. The management of these outbreaks highlighted the importance of early communication and better understanding of science-based management methods to implement suppression and restoration practices within the wildland-urban interface.

Sensitive to community concerns, while recognizing the urgent need to address the growing MPB problem, the USDA Forest Service:

- Initiated a cooperative effort to address landowner and-

public concerns with the Colorado State Forest Service; the Town of Vail; and the ski area management company, Vail Associates.

- Devised and implemented a comprehensive plan to address the MPB problem.

Since 1997, the USDA Forest Service has provided technical assistance through the Colorado State Forest Service. This assistance has helped implement prevention and suppression programs on private property, within the White River National Forest, and on property owned by the Town of Vail. The USDA Forest Service has also conducted programs to peel and remove bark from beetle-infested trees in isolated locations, conducted field trials to identify and deploy pheromones effective against MPB, and applied insecticides to select individual trees. In April 2002, the USDA Forest Service published *Western Bark Beetle Report: A Plan to Protect and Restore Western Forests*, which addresses the prevention, suppression, and restoration needs related to bark beetle outbreaks.

The USDA Forest Service is an active member of the Bark Beetle Information Task Force that helps residents of Routt



Removing infested MPB trees reduces the risk of an outbreak.



In Colorado, public involvement and cooperation have been critical to successful control of MPB outbreaks and reduce fire risk.

County and surrounding areas understand the potential effects of bark beetles on national forests and State and private lands. The task force was formed in 1999 to provide the public with information about bark beetles and potential tree mortality so that they could make informed decisions about protecting their private property and provide meaningful input on proposed actions on public lands.



Lodgepole pine killed by MPB poses management challenges to landowners and forest managers in Vail.

Changing Ecological Processes: Southern Appalachians Under Attack

Fire, human migration and colonization in the 19th century, and the introduction of nonnative, invasive forest pests from Europe and Asia have so disturbed the ecosystems in the southern Appalachians that whole new forest types have been created.

Southern Hardwoods, Hemlocks, and Fraser Fir

For centuries, the American chestnut had been the most abundant species in the hardwood forests of southern Appalachia. The picture began to change around 1900, the year the nonnative chestnut blight fungus arrived in New York from Europe. It spread quickly, and, by 1950, had all but eliminated the American chestnut from the southern Appalachians. Oaks had been filling in where the chestnuts used to be. Now, however, oak forests are threatened by oak decline, a complex interaction of environmental stresses, and other pests, such as red oak borer and gypsy moth. Nonnative pests threaten other trees in the South, including American elm, eastern and Carolina hemlock, Fraser fir, dogwood, beeches, and butter-nut trees.



The size of typical mature American chestnut trees in historic eastern forest.

The USDA Forest Service is committed to restoring forest health in the Appalachian forests. The agency is a member of a broad partnership that is locating, breeding, and planning to reintroduce pest-resistant chestnuts to the southern Appalachians. Cooperators include the American Chestnut Foundation (ACF), the Connecticut Agricultural Experiment Station, American Chestnut Cooperators' Foundation (ACCF), Northern Nut Grower's Association, Inc., and University of Tennessee School of Forestry. The

Manchester Ranger District (Green Mountain National Forest), Daniel Boone National Forest, and Monongahela National Forest are working with the ACF to locate and study chestnut hybrids. A promising 97-percent American hybrid that is resistant to the blight and still retains good form is being developed and may soon be available for restoration plantings.



The disease American chestnut blight nearly eliminated all large trees from the forest.



Restoration of American chestnut trees depends on growing resistant seedlings.



2002 Greg Janney / AYN Photo

Planted seedling is key to longleaf pine restoration.



2002 Greg Janney / AYN Photo

A healthy restored longleaf pine forest stand.

Southern Pines

Southern pine forests are also under attack. For centuries, longleaf pine had been the dominant species across the South. By the early 1900s, human migration, clearing, fire suppression practices, and expanding agriculture had decimated the longleaf forests. Today, loblolly pine is the dominant species because of planting practices—loblolly pine was the main species planted in plantations. These resultant loblolly pine plantations have created an opportunity-rich environment for the pine's most serious pest, the southern pine beetle.

Preventing the spread of the southern pine beetle and restoring longleaf pine to southern forests are high priorities for the USDA Forest Service. The USDA Forest Service is working hard to re-establish longleaf pine forests that are the optimum habitat for the federally endangered red-cockaded woodpecker. Cooperators include Federal agencies, State and local authorities, universities, environmental organizations, private landowners, the Alabama Alliance, and Tall Timbers Research, Inc.



2002 Greg Janney / AYN Photo

Prescribed fire plays an important role in longleaf pine restoration.

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