



## STAY INFORMED OF THE LATEST FOREST SERVICE RESEARCH & TECHNOLOGY

SUBSCRIBE TO R&D'S MONTHLY NEWSLETTER, WHICH IS POSTED ON R&D'S WEBSITE.

[www.fs.fed.us/research](http://www.fs.fed.us/research)

VISIT **TRESEARCH**— AN ONLINE LIBRARY OF MORE THAN 50,000 PEER-REVIEWED PUBLICATIONS BY FOREST SERVICE RESEARCHERS.

[www.fs.usda.gov/treearch](http://www.fs.usda.gov/treearch)

### SELECTED SCIENCE PRODUCTS AND SERVICES THAT BENEFIT NATIONAL FORESTS AND GRASSLANDS

- Forest monitoring data and advice on the impacts of management actions that are incorporated into forest plans.
- Comprehensive syntheses of existing research on disturbances, such as drought.
- Mapping and Geographic Information Systems (GIS) that support assessments of current conditions, such as watershed attributes and fish habitats.
- Analyses of models and remote sensing data that identify the causes and predict ecological changes, such as tree mortality in California.
- Tools for fighting fires strategically, reducing fuel hazards, forecasting smoke, restoring burned ecosystems, and advising homeowners in the wildland-urban interface.



Collecting water samples for eDNA testing. Credit: Michael Schwartz and Todd Cross, USDA Forest Service.



Invasive cheatgrass. Credit: Jaepil Cho, USDA Agriculture Research Service.



Smokejumpers respond to remote fires. Credit: USDA Forest Service.



United States Department of Agriculture

# THE KEY ROLE OF SCIENCE IN SUSTAINING NATIONAL FORESTS AND GRASSLANDS



As a world leader in forestry research, the Research and Development (R&D) arm of the Forest Service, an agency of the U.S. Department of Agriculture (USDA), generates the best available science to inform sustainable management of forests and grasslands in the National Forest System (NFS). About 500 R&D scientists work in a range of biological, physical, and social sciences throughout the United States.

R&D research addresses various types of stresses that are impacting NFS lands, such as severe wildfires, insects and diseases, invasive species, changing human demands, and intense changes in environmental conditions. Information and tools produced by R&D provide the foundation for science-based decision making that will help NFS lands and other forests and grasslands continue to provide clean water, recreational opportunities, wildlife habitat, forest products, and other benefits to the public and the environment.



Watersheds provide drinking water. Credit: Leslie Brandt, USDA Forest Service

RESEARCH BENEFITS THE ENTIRE NATIONAL FOREST SYSTEM, WHICH MANAGES **154 NATIONAL FORESTS AND 20 GRASSLANDS.**



A river in Fernow Experimental Forest. Credit: USDA Forest Service.



## EXAMPLES OF SCIENCE-BASED DECISION MAKING

### WILDFIRES



An average of 73,000 wildfires annually burn about 7 million acres of Federal, tribal, State, and private land and destroy more than 2,600 structures. The Forest Service—the world’s premier wildland firefighting agency—develops cutting-edge firefighting technologies that help protect firefighters, wildland communities, and natural resources.

Many of the innovative firefighting technologies developed by Forest Service R&D are used extensively in all national forests and by Federal, State, and local firefighting organizations. These technologies include the Wildland Fire Decision Support System (WFDSS), which is the primary system used for strategic decision making on fire incidents. The WFDSS is a user-friendly web-based system that integrates data on weather, changing fire predictions, smoke management, and the economic values of at-risk resources.

R&D is also addressing smoke from severe fires—a risk for sufferers of asthma and other respiratory problems. For example, R&D developed BlueSky—a tool that combines models about factors such as fires, terrain, and weather to provide real-time forecasts about smoke concentrations and behavior that are helpful to land managers. Also, BlueSky supports decision making on when to start and stop prescribed fires, which are planned, controlled fires that reduce hazardous fuels in wildlands.

THE USE OF BLUESKY ACROSS THE UNITED STATES HAS MITIGATED THE HARMFUL EFFECTS OF SMOKE FROM WILDFIRES FOR **THOUSANDS OF PEOPLE.**



Prescribed burns reduce hazardous fuels. Credit: Lance Cheung, USDA Office of Communications.



New tools help plan for recreation on Forest Service lands. Credit: USDA Forest Service.

### RECREATION



Forest Service R&D is producing state-of-the-art tools to help accommodate recreational activities, such as equestrian rides, backpacking, and water sports. These tools include Human Ecology Mapping, which helps managers identify where important user areas exist, overlap, and potentially conflict. This tool supports planning for sustainability and balancing multiple uses.

R&D also developed the Visitor Use Monitoring System, which is an interactive user-friendly computer model used to predict the number of visitors to popular wilderness areas. This system helps managers set quotas for wilderness permits to help ease congestion.

## EXAMPLES OF SCIENCE-BASED DECISION MAKING

### WATER QUALITY



NFS lands provide drinking water to more than 60 million Americans in 3,400 communities. Maintaining watersheds that provide some of the Nation’s cleanest drinking water is integral to the Forest Service’s mission.

But whether developing recreational campsites or restoring stream habitats, work on NFS lands often involves disturbing the ground, which creates opportunities for sedimentation and other negative impacts to water quality. Forest Service R&D pioneered the first national program to strengthen implementation and monitoring of Best Management Practices (BMPs). BMPs are techniques that help reduce water pollution and protect aquatic ecosystems. The nationwide consistency and streamlined approaches of the BMP monitoring program are expected to improve water quality and reduce costs.

**BEST MANAGEMENT PRACTICES PROMISE TO IMPROVE WATER QUALITY AND SAVE MILLIONS OF DOLLARS.**

### INVASIVES



Cheatgrass is a highly flammable invasive plant that covers thousands of square miles of the Great Basin of the Intermountain West. After rangeland in the Great Basin burns, it must be quickly restored to prevent cheatgrass from carpeting the ground and fueling more fires.

To support such post-fire restoration, Forest Service R&D identified strains of native plants that thrive in current local and regional conditions so they can block cheatgrass invasions. Thanks to these efforts, native plant species now account for the majority of seeds planted in restoration efforts in the Great Basin.



Bull trout. Credit: U.S. Department of the Interior, U.S. Fish and Wildlife Service.

### FISH & WILDLIFE



Forest Service R&D is pioneering the development of a new technology—called environmental DNA or eDNA—that can detect the presence of threatened and endangered species in ecosystems and individual animals at the leading edges of invasive species takeovers. This technology can help land managers quickly identify changes in species composition.

Testing with eDNA is noninvasive, about five times faster and costs only 10 to 50 percent as much as conventional invasive testing, which requires capturing individual animals. In the last 4 years, R&D has conducted eDNA testing at more than 8,000 sites with more than 100 partners, including NFS, other Federal and State agencies, nonprofits, tribes, academia, and industry.

#### BY THE NUMBERS

Environmental DNA (eDNA) can detect free floating DNA in soil, water, and air.



These 58 species include bull trout, grizzly bear, coho salmon, and harlequin duck.