Station Briefing Papers

Science-Based Solutions for the Four Threats to the Health of the Nation's Forests and Grasslands

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FIRE AND FUELS

Current Emphasis

- ✓ Validating fire forecasting models and refining atmospheric research while transferring new technologies for widespread application and understanding.
- ✓ Assessing the need, costs, and potential benefits of prescribed fire and mechanical treatments to reduce fire hazard in the interior West at the stand and landscape level.
- ✓ Evaluating the public's understanding and acceptance of different fuel treatments and assessing how communities form risk perceptions and take action in response to forest-related risks.
- ✓ Developing a transect of predictive models, which includes the world's fire and climate regimes, for use as decision-support systems for fire management, ecosystem restoration, and global climate change response.
- ✓ Coordinating a large-scale effort to quantify the costs and effects of fire and fire surrogate treatments on 13 sites across the United States. Results will help land managers and specialists implement land and fuel management treatments.
- ✓ Evaluating the recovery of critical ecosystem processes such as carbon, nutrient, and water cycling after uncharacteristically severe wildfire.
- ✓ Assessing the impact of fire on carbon storage in Interior Alaska boreal forests.
- ✓ Modeling the composition of forests in response to wildfire.

Research Results

- ✓ Long-term fire forecasts suggest increases in woody and grass fuels in the West for the 21st century, with much increased risk of fire during localized droughts.
- ✓ In the Interior Columbia Basin, the probability has more than doubled that a wildfire will be a stand replacement fire on federal lands, due to fire exclusion, timber harvest, livestock grazing, and the introduction of exotic plant species.
- ✓ In examining the feasibility of using low-value wood from fuel reduction projects for a biomass power plant, the BIOSUM model shows that opportunities for profitable mechanical treatment are limited on federal forests using current technologies.
- ✓ Commercial wood products can improve the value of small-diameter trees removed in thinning and fuel-reduction projects, thus creating opportunities to implement fuel treatments.
- ✓ Models have been developed to simulate chronologies of landscape vegetation and disturbance over four landscapes in Idaho, Montana, and Oregon. Other simulations can aid in designing landscape treatment guidelines and simulate outcomes of various management alternatives across broad-scale landscapes.
- ✓ More than 25 years of work on fire history in western Oregon and Washington can be applied to sustaining old-growth attributes in forests that are prone to moderate- and low-severity fire.
- ✓ The Emission Production Model demonstrates methods to reduce emissions while increasing fuel reduction. The Consume fuel model is used to track daily smoke emissions and help land managers estimate emissions from individual fires and manage prescribed burns.
- ✓ The BlueSky real-time smoke dispersion modeling system shows the cumulative effects of smoke across land ownerships and helps state regulators and land managers negotiate alternatives when scheduling prescribed burns.

Further Research

- ✓ Improve fire-weather and fire-seasons forecast to allow more accurate predictions and define uncertainties for decision support at multiple scales.
- ✓ Develop risk assessment methods for prioritizing fire management techniques, including fuel treatments in wildland and urban interfaces.
- ✓ Develop systems for predicting extreme fire events that pose catastrophic risk to life, property, and ecosystems.
- ✓ Develop restoration techniques.

- ✓ Assess the effectiveness of BAER treatments in preventing erosion and promoting ecosystem recovery.
- ✓ Assess the financial viability and effectiveness of landscape-scale treatments to reduce fire hazard and supply wood-processing plants.

INVASIVE SPECIES

Current Emphasis

- ✓ Determining how invasive plants respond to disturbance and management, particularly to wildfire, prescribed fire, and fuel treatment.
- ✓ Describing the biology of key invasive plant species that have not been well researched such as sulfur cinquefoil, knapweeds, Dalmatian toadflax.
- ✓ Studying the joint effects of fire, fuel treatments, and grazing on invasive plants in dry ponderosa pine forests
- ✓ Developing techniques to favor native grasses and forbs over invasive plants such as by seeding the native plants after the prescribed burn.
- ✓ Developing landscape-scale invasive plant detection, inventory, and monitory methods to assist in documenting impact and designing prevention or mitigation strategies.
- ✓ Determining invasive plant biology, distributions, eradication possibilities, and control techniques.
- ✓ Analyzing the effects of fire and fuel treatments on several species of invasive plants.
- ✓ Building risk assessments to help managers understand how landscape disturbances and activities interact, how to minimize invasive plant risks, and how to prioritize treatment of existing invasive plants.
- ✓ Investigating the impact of invasive plant species on communities of microbial symbionts critical to the re-establishment of forest stands.
- ✓ Determining the response in terms of host chemistry to infection by *Phytophthora ramorum*, the cause of sudden oak death.
- ✓ Conducting aerial and ground surveys, as part of the Forest Health Monitoring program, to assess insect and disease risks to forests. Aerial surveys cover more than 100 million acres of forests in Alaska, California, Oregon, and Washington.
- ✓ Educating the public through fact sheets and presentations at cattlemen's associations, non-government organizations, university classes, and residents of weed-management areas.

Research Results

- ✓ Invasive nonnative plants impose significant risks to forests and rangelands in the interior Pacific Northwest by reducing biodiversity of native species, changing natural disturbance regimes, and reducing rangeland productivity. (e.g., , a nonnative invasive, sulfur cinquefoil, has reduced rangeland productivity across the West)
- ✓ The spread of nonnative plant species can be unintentionally encouraged by management activities such as post-fire treatments to prevent erosion, certain prescribed burning and fuel management treatments, and grazing.
- ✓ The timing of prescribed burning in dry ponderosa pine forests affects invasive plant responses as different species react differently.
- ✓ Variable-density thinning increases the diversity of native plants in the understory. Native plant diversity increased by 50 percent over the original level under the more complex canopy of the variable-density stands compared to evenly spaced thinning.

Further Research

- ✓ Devise new ways to restore areas severely infested with invasive non-native plants.
- ✓ Develop new ways to identify and assess plant species that have the potential to become a major invasive problem in the future.
- ✓ Predict landscape-scale risks associated with invasive plants; the model should integrate risk factors including disturbances and management actions.
- ✓ Develop landscape-scale restoration strategies in addition to site-scale strategies.
- ✓ Predict the potential impact of sudden oak death on under- and over-story composition of North American forests.
- ✓ Quantitatively analyze the sudden oak death epidemic to develop effective control strategies.
- ✓ Find how non-native plants invade floodplains and roadsides in Alaska.
- ✓ Determine how rivers act as vectors in the spread of invasive plants.

UNMANAGED RECREATION

Current Emphasis

- ✓ Examining how elk and mule deer respond to people engaged in off-road recreation.
- ✓ Developing integrated management strategies for riparian environments.

- ✓ Developing strategies and techniques to assess people's attitudes, values, behaviors related to recreational activities.
- ✓ Assessing how people's values about places affect their expectations, experiences, and patterns of visiting national forests.
- ✓ Updating recreation non-market values and developing improved models of recreation demand.
- ✓ Developing ways to help recreation managers access research information more easily.

Research Results

- ✓ Alaska residents have much higher rates of participation in outdoor recreation than those who live in the contiguous 48 states with visitor and resident demands expected to increase.
- ✓ In the national forests, the fastest growing recreation interests are wildlife and scenery viewing and "soft adventures" that combine comfort and recreation with enjoyment of the outdoors. Examples include fishing trips that offer comfortable lodging at the end of the day.
- ✓ Much of dispersed recreation takes place in riparian environments that also are habitat for sensitive species and are critical for water quality.
- ✓ Recreation patterns and demands change as people locate homes in the forest and create new informal communities.
- ✓ Fragmentation or loss of open space causes genetic isolation in small mammal populations and restricts the range of forest carnivores such as the fisher.

Further Research

- ✓ Interaction of recreation values with other resources.
- ✓ Changes in recreation visitation and demand caused economic and other variables.
- ✓ Determine the effects of ATV use and other off-road activities on resource conditions.

LOSS OF OPEN SPACE

Current Emphasis

- ✓ Analyzing the effects of demographic trends on forests and their management.
- ✓ Describing how human populations are changing and how the attitudes of residents change towards forest management at multiple scales.

Research Results

- ✓ Policies for public forestland in the Pacific Northwest can induce substantial consequences for land use, land cover types, and intensity of land management in other regions.
- ✓ Tradeoffs among forest production, wildlife habitat, residential development, and forest recreation can be described with a forest and agriculture sector optimization models.
- ✓ Low-density residential development decreases forest stocking and the likelihood that private forest owners will pre-commercially thin stands or plant trees after harvest. This reduces the quantity of timber supplied from private forestlands and alters the ecological characteristics of the landscape.
- ✓ In western Oregon, the proportion of land in low-density and urban developed uses is projected to nearly double by 2055.
- ✓ Fragmentation is an important factor in predation, and therefore the nesting success of marbled murrelet.
- ✓ Fragmentation causes genetic isolation in small mammal populations and prevents expansion in the range of forest carnivores such as fisher.

Further Research

- ✓ Determine how mixed ownership and forest management practices fragment landscapes.
- ✓ Integrate land-use models with other models to describe the effects of fragmentation, ecological conditions and processes.
- ✓ Assess the relative utility, reliability, and compatibility of remotely sensed and ground survey data pertaining to land use changes and forest fragmentation
- ✓ Develop data on the effects of fragmentation on wildlife, including aquatic species and large mammals and birds.