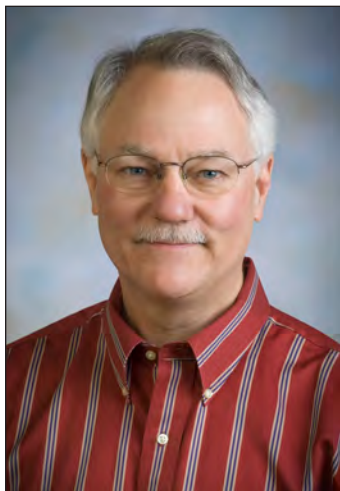




Science For Our Nation's Forests and Grasslands

2013-2014 Annual Report Rocky Mountain Research Station





With great pleasure I bring you the 2013-2014 Research Highlights Report of the Rocky Mountain Research Station. We lead in providing state-of-the-art knowledge and tools that enhance the resiliency of landscapes and human communities. Future challenges such as climate change, population growth, and the ever increasing need for clean air and water, test our skills and expertise as we continue to provide the best, most relevant science information to resource specialists and others throughout the world. Please find in this report several excellent examples of our research and the many ways that we care for the land and serve the people through science. Additional Research Highlights can be found at <http://www.fs.fed.us/rmrs/research/highlights/>

George S. Foster
Station Director

The Rocky Mountain Research Station is one of seven regional units that make up the USDA Forest Service Research and Development organization—the most extensive natural resources research organization in the world. We maintain 12 field laboratories throughout a 12-state territory encompassing the Great Basin, Southwest, Rocky Mountains and parts of the Great Plains (see map). Our research program serves the Forest Service as well as other federal and state agencies, international organizations, Tribes, academia, non-profit groups and individuals.



This year, we released a new Strategic Framework update and a Strategic Business Plan to guide our future research investments and provide the greatest potential for us to positively influence the health, resiliency and productivity of natural landscapes and communities. The Framework is based on the following seven research priorities, established in 2013:

1. Disturbance ecology
2. Fire sciences
3. Human-landscape interactions
4. Inventory and Monitoring
5. Resilient landscapes
6. Species endangerment
7. Water and watersheds

Aldo Leopold Wilderness Research Institute

(<http://leopold.wilderness.net>)

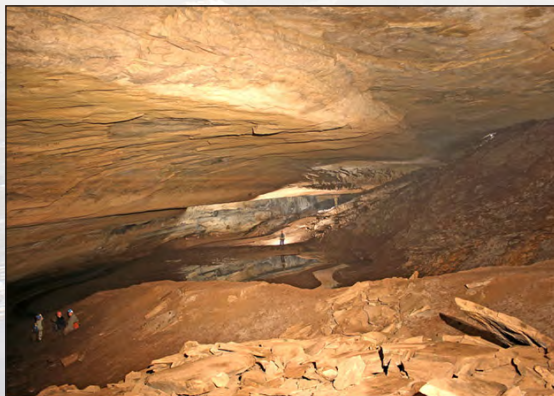
Director: Susan Fox, sfox@fs.fed.us, 406-542-4193

The Aldo Leopold Wilderness Research Institute, located in Missoula, Montana, is the only federal research group in the United States dedicated to studying and improving the management of wilderness, parks and similarly protected areas. Managers and scientists from partner agencies play an active role in developing the Institute's programs and priorities. As a national center for scientists to address wilderness research needs, studies focus on a program built around five priorities:

- Recreation experiences and the impacts of recreation
- Relationships between people and protected lands
- Stewardship of wildland fire as a natural process
- Wilderness in the context of large ecological and social systems
- Delivery and application of scientific knowledge and tools

During 2014, the Nation celebrates the 50th anniversary of the Wilderness Act. The National Wilderness Preservation System contains 758 Wilderness areas comprising nearly 110 million acres. The Forest Service manages 439 designated wilderness areas.

Many caves, like this on the Monongahela National Forest in West Virginia, are closed to public access to help minimize the spread of white nose syndrome, a devastating bat disease. Station scientists cooperated on a study of the caving community to better understand the social and economic impacts of the closures. Findings help evaluate the impacts of such closures on cave users and communities, and facilitate future decisions about closures.



Air, Water and Aquatic Environments

(www.fs.fed.us/rm/boise)

Program Manager: Frank McCormick, fmccormick@fs.fed.us, 208-373-4351

Natural disturbances and land management and other activities affect the quality and quantity of our air, water and aquatic resources. Researchers explore the complex relationships among the physical, chemical and biological properties of watersheds, the ecosystem processes that sustain biodiversity, and resource conservation and restoration to meet the science needs of resource managers and natural resource policy. Discoveries about basic ecological and biological processes provide models to predict how watersheds respond to changing landscape and climate conditions, and applications that transfer knowledge into scientifically sound management recommendations.

A team of RMRS scientists and partners designed, built and installed a 48-foot sampling platform over the South Fork of the Cache la Poudre River in Colorado. The platform assists in monitoring the effects of the recent High Park Fire on stream sedimentation. Results provide critical information on how fires affect stream water quality.



Fire, Fuel and Smoke

(www.firelab.org)

Program Manager: Colin Hardy, chardy01@fs.fed.us, 406-329-4978

Scientists and technicians with the Fire, Fuel and Smoke Science Program conduct international, cutting-edge work in wildland fire research, from fire physics to fire ecology. Specific research activities center on wildland fire processes, terrestrial and atmospheric effects of fire, and ecological adaptations to fire. The Program also improves the safety and effectiveness of fire management by creating and disseminating fire science knowledge, tools and applications for scientists and managers.

RMRS and cooperators initiated the Prescribed Fire and Combustion and Atmospheric Dynamics Research Experiment (RxCADRE) to develop, validate and evaluate next generation fire and smoke models. Results help resource managers make informed decisions regarding both wildland and prescribed fires, and help improve guidelines for firefighter safety zones and fire growth models, and link remote sensed data to fire energy release. Here, a researcher preps a video camera prior to igniting a grass/shrub burn.



Forest and Woodland Ecosystems

(www.fs.fed.us/rm/forest-woodland)

Program Manager: Alison Hill, ahill01@fs.fed.us, 928-556-2105

Managers need science-based knowledge to predict how forests and woodlands respond to a changing environment. The cumulative effects of management activities and other stresses result in new management challenges such as dealing with large-scale wildfires, the widespread occurrence of insect epidemics, and the decline of aspen, to name a few. Scientists with the Forest and Woodland Ecosystems Science Program provide:

- Knowledge about basic ecological and biological processes
- Models that predict changes in forest and woodland ecosystems
- Tools that transfer knowledge into scientifically sound management recommendations

Research partners collect data on post-wildfire plant communities following Arizona's 2002 Rodeo-Chediski Fire. Findings answer questions about fuel treatments and if they help reduce fire severity and post-wildfire fuels. Researchers believe the effects of pre-wildfire treatments are long-lasting and may help maintain overstory pines and associated native plant communities following large wildfires.



Grassland, Shrubland and Desert Ecosystems

(www.fs.fed.us/rm/grassland-shrubland-desert)

Program Manager: Deborah Finch, dfinch@fs.fed.us, 505-724-3671

Disturbances, invasive species and climate change constantly threaten our Nation's grasslands, shrublands and desert ecosystems. These ecosystems provide considerable value in the form of wildlife habitat, clean air and water, biological diversity and recreation. Program scientists develop and deliver knowledge, technology and tools that enable people to restore damaged lands, improve wildlife habitat and increase the benefits people enjoy when visiting public lands.

Station scientists and partners developed an aggressive approach to investigate the biological and habitat characteristics of sickleweed, a rapidly expanding invasive plant in the Northern Great Plains. Cutting-edge laboratory research on population genetics (photo), and seed germination and establishment characteristics of the weed help develop a range of management alternatives that reduce new populations of sickleweed and limit expansion of existing populations.



Human Dimensions

(<http://www.fs.fed.us/rm/human-dimensions>)

Program Manager: Cindy Swanson, cswanson@fs.fed.us, 406-329-3388

Understanding how and why people use natural resources and public lands, and the ways they respond to changes in our forests and grasslands, are important in managing these lands. The Human Dimensions program provides social and economic science-based innovation to human societies as they develop a sustainable relationship with their environment. Major issues confronting societies across the globe, like climate change, energy, fire, and water, all have important social-economic dimensions explored and addressed by this program. Scientists work closely with other Station programs to improve firefighter and public safety, reduce large fire costs, expand the wildland fire use program, and expand the treatment of hazardous fuels for watershed restoration. Work is also underway on the potential impacts of climate change on our forests and the necessary adjustments to management that such changes will demand; and the importance and values of market and non-market benefits and services provided by our forests and rangelands.

Forest fuel treatments and other vegetation removal projects produce large quantities of residue. RMRS scientists recently partnered with the forest industry and others to evaluate the financial feasibility of using mobile and modular systems to produce high carbon, char-based bio products, such as fuel pellets, soil amendments and activated carbon (photo) from these residues. Results show many potential benefits of using this process, help guide the sustainability of the forest industry, and assist forest managers, technology firms, policy makers and others with critical forest management decisions.



Inventory and Monitoring

(www.fs.fed.us/rm/ogden)

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The Inventory and Monitoring program provides information and tools that identify current status, health and trends of our nation's forests and grasslands, and the impacts of fire, management activities, and insects and disease on these resources. Scientists maintain a database of up-to-date statistics that provide resource information to the Forest Service and other agencies, cooperators, and the public.

When carbon is stored in forests and forest products, greenhouse gases remain out of the atmosphere. However, fires release large amounts of carbon through combustion, and create even larger amounts of dead material that breaks down and releases carbon over time. To evaluate how management and natural disturbances affect carbon stored in national forests, RMRS and NASA partnered to develop ForCaMF, a computer application that measures the impact of natural disturbances, such as fire, and management on carbon storage. Today, every national forest in the United States uses ForCaMF—highlighting the important role of fire in carbon storage.



Wildlife and Terrestrial Ecosystems

(www.fs.fed.us/rm/wildlife-terrestrial)

Program Manager: William Block, wblock@fs.fed.us, 928-556-2161

More ecosystem types occur within RMRS boundaries than any other Forest Service research station, spanning prairie, temperate and tropical steppe, desert, coniferous and riparian forests, and tundra. This diversity of ecosystems translates into a broad diversity of plants and animals. Scientists with this program conduct multi-scale studies, including the use of DNA, that identify a variety of factors affecting the sustainability of species, such as northern goshawks in southwestern ponderosa pine forests, and forest carnivores in the Northern Rockies. Research also informs federal, state, tribal and local resource agencies on interactions between people and wildlife, and provides a better understanding of public-use effects on these resources and the connectivity of habitat critical to animal species.

Studies on the rare wolverine in the Northern Rockies evaluate the impacts of winter recreationists on the animals' movements, reproduction, behavior and resource use. Scientists and cooperators use a novel approach that includes trapping and fitting wolverines with GPS collars to plot their movements in areas of high winter recreation. Findings, which show that wolverines may be more tolerant to recreation than previously believed, provide a solid scientific basis for recreation management in areas occupied by wolverines. A remote camera photographed this wolverine as it approached a researcher's trap in Montana.



Science Application and Integration

(www.fs.fed.us/rm/science-application-integration)

Program Manager: Jan Engert, jengert@fs.fed.us,
970-498-1377

The Science Application and Integration program provides leadership for the integration and use of scientific information in natural resource planning and management across the Interior West. Land managers benefit from access to relevant science and technology, and scientists benefit from on-the-ground observations of managers. However, researchers and managers often operate in very different realms. SA&I staff helps address these differences so researchers and managers can partner in mutually beneficial knowledge exchange. This program also oversees two research development and application programs:

1. **Human Factors and Risk Management** helps the Forest Service develop a reliable and resilient safety culture. Researchers provide support for accident investigations and incident reviews of escaped fires, and they undertake high-priority research to further organizational learning.

2. **Wildland Fire Management** serves as point-of-contact for communication between scientists and field managers in the wildland fire environment.

Managing firefighter safety, costs, community impacts, ecological consequences and political pressures during wildfire incidents requires sound, defensible decisions based on reliable information and analyses. A new RMRS guide, [Decision Making for Wildfire: A Guide to Applying a Risk Management Process at the Incident Level](http://treesearch.fs.fed.us/pubs/43638) (<http://treesearch.fs.fed.us/pubs/43638>), assists fire managers, resource specialists and agency administrators to develop and communicate timely sound risk management-based decisions for managing wildfires.



Experimental Forests and Ranges

A unique and valuable part of the infrastructure within which we conduct research includes a network of experimental forests, ranges and watersheds. They are living laboratories where Forest Service scientists conduct studies and demonstrate research results for our stakeholders. The Station administers and conducts research on 14 experimental sites (see map inside front panel). The Fort Valley Experimental Forest near Flagstaff, Arizona, established in 1908, is the site of the first Forest Service research investigations in the Nation. Learn more at www.fs.fed.us/rm/main/expfor.html.



Desert Experimental Range, Utah.

Conservation Education

The Station's Conservation Education program helps people of all ages understand and appreciate our country's natural resources and how to conserve those resources for future generations. Our employees participate in a variety of structured educational programs and activities that enable people to realize how natural resources and ecosystems affect each other and how to wisely use resources.

During Hispanic Camp at Pingree Park in Colorado, Station researchers and others introduced area Hispanic students to methods for studying fish, such as electro fishing.



Check out additional research highlights at
<http://www.fs.fed.us/rmrs/research/highlights/>

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The Business Side

The success of our research programs would not be possible without the critical team support provided by our administrative employees. Most are located at Station headquarters in Fort Collins, Colorado; others work at laboratory locations. Our 2014-2017 Strategic Business Plan outlines how we transition to a financially sustainable business model while continuing to excel in research and delivery of scientific tools and knowledge. Look for it on our website at www.fs.fed.us/rmrs.

In Fiscal Year 2013, RMRS secured \$79.3 million for research and operations from federal appropriations, partners and clients. Total Expenditures were \$70.9 million.

