Bitterroot Ecosystem Management Research Project (BEMRP)

ECO REPORT

2008

A Progress Report from a Partnership in Landscape Level Ecosystem Management

Finding Common Ground: Montana Forest Restoration Committee

Sharon Ritter, Research/Management Coordinator and ECO-Report Editor, BEMRP and the Human Dimensions Science Program, RMRS, Stevensville, MT

What in the world made Brian Kahn think he could get consensus among 34 people representing timber, environmental, government, and off-highway vehicle groups—especially when the topic was forest restoration? "Actually," he said, " I didn't believe we **could** get **100%** consensus. But we did."

Brian is the head of Artemis Common Ground in Helena, Montana. He hosts the weekly Yellowstone Public Radio show, "Home Ground: Changes and Choices in the American West," and is skilled in working with community-based conservation efforts.

In 2006, Dave Bull, Supervisor of the Bitterroot National Forest, hired Brian to assess whether mediation could resolve objections to a controversial fuel reduction and forest restoration project. Brian conducted individual interviews with representatives of the various sides, and concluded that things were too far gone for mediation to work. However, according to Brian, "I heard through that experience that there **was** common ground. I felt that if you start with an agreement that our public lands are in trouble, if you took restoration as the issue, there was a shot that you could get broad agreement on what it should look like on the ground. That's why Artemis proposed the initial meeting."

It takes some groups years to make agreements through collatoration. This group did it in nine months.

Brian approached Mary Mitsos of the National Forest Foundation and in August 2006 they convened a small group representing timber industry, conservation groups, national forests, and state forestry. He chose the National Forest Foundation because it was a neutral party that understood the issues, and collaboration is a big part of what the Foundation does.

Restoration Principle #5. Reestablish fire as a natural process on the landscape. Old growth pine stand after understory burn, Swan Valley, MT. (Photo by Dave Powell, USDA Forest Service, Bugwood.org)

The group modeled their work after successful collaboration efforts elsewhere, including the Front Range Fuels Treatment Partnership Round Table in Colorado and Tongass Futures Round Table in Alaska. Mary said, "What we wanted to do was develop a vision for western Montana."

The small group sought wider representation, eventually agreeing on 34 people who, according to Mary, "were knowledgeable, had a long-term involvement with the National Forest System, were considered key players, and

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Restoration Principle #8. Improve terrestrial and aquatic habitat and connectivity. Elk. (Photo by Terry Spivey, USDA Forest Service, Bugwood.org)

Montana Forest Restoration Principles

1) Restore functioning ecosystems by enhancing ecological processes.
2) Apply adaptive management approach.
3) Use the appropriate scale of integrated analysis to prioritize and design restoration activities.
4) Monitor restoration outcomes.
5) Reestablish fire as a natural process on the landscape.
6) Consider social constraints and seek public support for reintroducing fire on the landscape.
7) Engage community and interested parties in the restoration process.
8) Improve terrestrial and aquatic habitat and connectivity.
9) Emphasize ecosystem goods and services and sustainable land management.
10) Integrate restoration with socioeconomic well-being.
11) Enhance education and recreation activities to build support for restoration.
12) Protect and improve overall watershed health, including stream health, soil quality and function and riparian function.
13) Establish and maintain a safe road and trail system that is ecologically sustainable.

had the ability to listen, hear, and learn." This group became the Montana Forest Restoration Working Group.

The group published the "vision" that Mary spoke of in September 2007 in a report that can be found at www.montanarestoration.org. The group agreed on 13 principles of Montana forest restoration (see Sidebar) and an implementation plan.

Where did these principles come from? "We started by brainstorming what Brian called 'restoration vision categories,'" said Marnie Criley, representing a group called Wildlands CPR and chair of the Vision and Principles subcommittee of the Montana Forest Restoration Working Group. "We came up with 60 of these and we wanted to be sure to address all of the ones brought up by the group." The group then referred to other similar lists and used them to refine its list, select language already working for other groups, and be sure all possibilities were covered.

Marnie estimates they spent 44 hours in subcommittee meetings working on the vision and principles, coming back to the full group for approval throughout the process. They started with the easiest ones to give people a chance to have success early on and get to know and trust each other before tackling harder ones. For them, the easiest were adaptive management and monitoring (#2 and #4). "The fire ones, numbers 5 and 6, were hardest," she said.

It takes some groups years to make agreements through collaboration. This group did it in nine months. The group's Code of Conduct was important to its success. It included individual commitments such as "help create a respectful and productive working climate" and "value one another's experiences." The group also committed to making decisions by consensus, defined as "I can live with it." If someone couldn't live with it, she or he had to come up with something that would help the group make progress toward a solution that **would** work. Sometimes, the two strongest opposing voices met separately to work out a solution.

Mary stated that "people put in a heck of a lot of time and effort to get a product that everyone could agree

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For more information, see BEMRP's website at http://www.fs.fed.us/rm/ecopartner/.
Also visit RMRS's website at http://www.fs.fed.us/rm.

BEMRP: Beyond the Bitterroot

Greg Jones, Research Forester and BEMRP Program Leader, and Sharon Ritter, Research/Management Coordinator, Human Dimensions Science Program, RMRS, Missoula, MT

Sometimes a name says it all, and sometimes a name is just a name. Joe's Income Tax and Bookkeeping Service probably does just what it says. On the other hand, there's AT&T. Until 2005, the initials stood for American Telephone & Telegraph, but in the last couple of decades when you saw "AT&T," you didn't think of the telegraph. You thought about other services and products—cell phones, fiber optics, and wireless internet.

The Bitterroot Ecosystem Management Research Project is kind of like AT&T in that research we conduct reflects more than our name implies. The executive committee has Bitterroot National Forest representatives, but our decisions on what research to conduct follow our mission statement: "Strengthen the scientific theory and practice of managing Rocky Mountain ecosystems." This applies not only to the Forest Service, but also to the public and other resource managers.

Much of the research we conduct does not take place on the Bitterroot National Forest. More importantly, all of the research we conduct applies elsewhere and has been used by managers to benefit private and public lands. Here are just a few examples of BEMRP-funded multi-disciplinary research valued locally and elsewhere.

BEMRP's first big research project did start locally at the Lick Creek Demonstration/Research Forest in 1993. Following a prescription designed jointly with scientists, the Forest conducted thinning and prescribed fire treatments to reduce probability of stand-replacement fire and improve tree health. Monitoring shows that physiological performance of trees improved, and both canopy and surface fuels were reduced. These results are applicable elsewhere in dry ponderosa pine forests.

Banding a chipping sparrow to study the effects of invasive plants on songbird breeding productivity. (Photo by Chris Templeton)

Ward McCaughey stands in front of two-age shelterwood treatments in lodgepole pine stands at the Tenderfoot Experimental Forest on the Lewis and Clark National Forest. This is another project BEMRP has supported that has applicability throughout the Northern Rockies. (Photo by Matt Wotherspoon)

Managers throughout the Intermountain West hope to protect and enhance rare old-growth stands, so they're interested in results of another BEMRP study. This one is taking place in an old-growth ponderosa pine/western larch stand that historically experienced frequent fire regimes but has been at increased risk of insect infestation and high intensity fires due to fire exclusion. The study demonstrated that thinning and prescribed fire results in improved vigor of old trees and reduced probability of stand-replacement fire.

Due to concern over global climate change, there is world-wide interest in how we can reduce our use of sequestered carbon and decrease our release of carbon and other greenhouse gases into the atmosphere. A study in the Bitterroot looked at the quantity, cost, and carbon balance associated with utilization of biomass from fuel reduction and forest health restoration treatments. The concepts and methodology are applicable West-wide. This study led to working with the Northern Region to develop a way to estimate net carbon effects of fuel reduction and restoration treatments.

BEMRP modeling efforts have found application beyond the Northern Region. The private Vermejo Park Ranch in New Mexico is using MAGIS, SIMPPLLE, and FLAMMAP models to look at long-range benefits of fuel and forest restoration treatments to the ecosystem. Models developed with BEMRP funding have been used for planning projects in Alaska, California, New Mexico, Colorado, and elsewhere in Montana.

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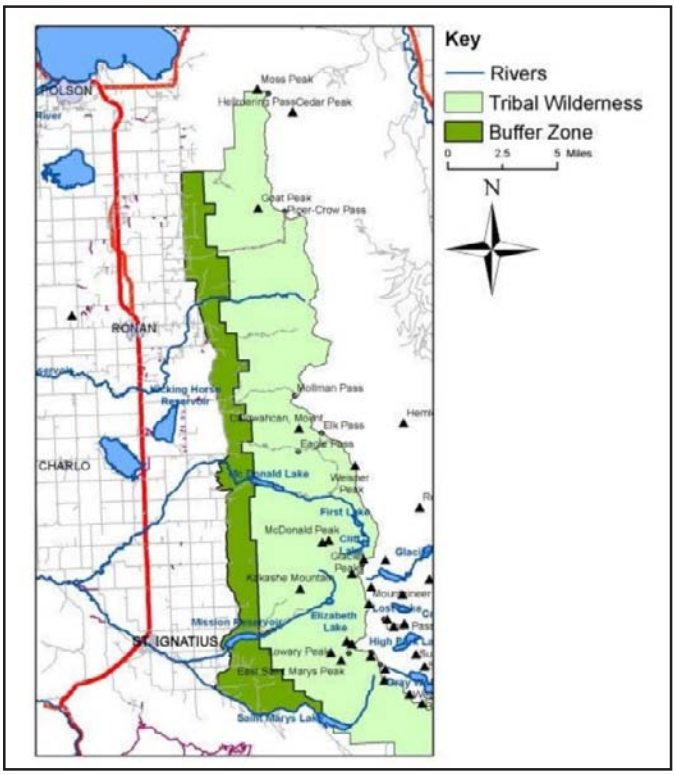
Mapping Social and Cultural Values in the Mission Mountains



The Mission Mountains Tribal Wilderness and Tribal Buffer Zone extend north to south along the eastern border of the Flathead Indian Reservation. (Map prepared by Brett Davis)

Alan Watson, Research Social Scientist, Aldo Leopold Wilderness Research Institute, RMRS, Missoula, MT

Picture a favorite area where you hike, hunt, ride your 4-wheeler, seek solitude and renewal, or maybe just appreciate for its wildlife habitat. How would you feel if that area was burned over, the understory trees were thinned out, or a road built through it? Would you feel that your favorite area has been harmed or protected?

We've been conducting research on the Flathead Indian Reservation in Montana to understand the values that Tribal and non-Tribal members attach to the Mission Mountains Tribal Wilderness and its bordering 22,000-acre Buffer Zone (see map above). To successfully improve forest health within that Buffer Zone and restore fire in the Wilderness, the managing agency and public must work together to find solutions to increasingly threatening fuel buildups. We used qualitative, culturally sensitive research and a computer-based mapping exercise to understand tradeoffs Reservation residents describe in relation to potential Buffer Zone fuel treatment actions.

Fire management focuses on reinstating natural fire regimes through fuel treatment—thinning and burning—and allowing fire to return to function, as nearly as possible, in its natural ecological role. Forest managers use thinning and burning to reduce fuel loads so that natural fire regimes can be allowed to operate. Instilling trust and accomplishing resource management objectives require a high degree of collaboration and participatory planning with the public. From previous BEMRP research on the Bitterroot National Forest, we know that a key contributor to trust in fire and fuel management decisions is procedural justice, or the perceived fairness, equity, and legitimacy of decisions managers make. People want to be assured that managers understand the values they attach to forest lands and that these values are at least considered in decision making.

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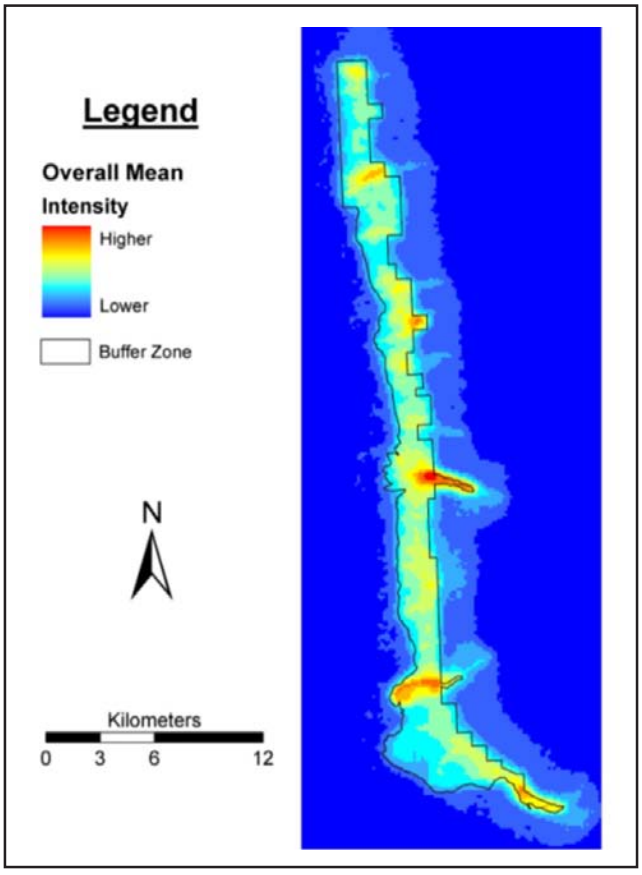

This composite map (across five layers of meanings described by community residents) for overall averaged results (Jenks method, 10 categories) demonstrates how the scale and intensity of social and cultural values can be mapped for a landscape. (Map prepared by Brett Davis)

Wildfire, Research, and a Climate Station

Ward McCaughey, Research Forester, Forests and Woodlands Ecosystems Science Program, RMRS, Missoula, MT

In August, the human-caused Tin Cup Fire took off a few miles to the north of where the Fire Sciences Laboratory crew was busy collecting fuels data on the Trapper Bunkhouse study site west of Darby. The fire demonstrated how quickly wildfire can escape initial attack in untreated stands, especially under extremely dry conditions, and how treated areas helped moderate fire intensities, especially important around homes. These kinds of treatments are a goal of the Trapper Bunkhouse Land Stewardship Project where BEMRP is conducting research to document the ecological effects as well as the effectiveness of fuel treatments in the wildland-urban interface.

As the BEMRP representative from the Forests and Woodlands Ecosystems Science Program, I participated on the Trapper Bunkhouse Treatment Development Team since 2004. This team included RMRS scientists and Bitterroot National Forest managers tasked with developing a study design to test fuel reduction treatments. Early in the year we installed temporary pilot plots to determine within and between stand variability for early grouping of proposed treatment units and determine statistical reliability of the study design. We then worked with Mick Harrington's and Steve Sutherland's crews from the Fire Sciences Laboratory and Forest personnel to establish a grid of permanent plots in proposed treatment units, then collected overstory, regeneration, and understory data. When all pre-treatment data have been collected, we'll be ready if and when the Forest can implement the treatments, which we hope will happen in 2008.

Matt Burbank (right) explaining understory tree measurement procedures to Johannes Kopp in a research unit in the Leavens Gulch area of the Bitterroot National Forest, in July of 2007. (Photo by Ward McCaughey)

Andreas Roeger taking a diameter measurement on a Douglas-fir in a research unit in the Leavens Gulch area of the Bitterroot National Forest in July of 2007. (Photo by Ward McCaughey)

Our program crew included two volunteer students from Germany—Johannes Kopp and Andreas Roeger—who were studying forest engineering at the University of Applied Forest Sciences of Rottenburg, Germany. Others on the crew included Janelle Anderson, a work/study student from the University of Montana, and two term employees—Karen Stockmann and Matt Burbank.

We have another project at the Tenderfoot Creek Experimental Forest on the Lewis and Clark National Forest where we study the lodgepole pine forest type (see http://www.fs.fed.us/rm/ecology/demo/tenderfoot/). Because Tenderfoot is known for its past and current research efforts, it has been selected along with the Fraser Experimental Forest in Colorado, Sierra Ancha Experimental Forest in Arizona, and Glacier Lakes Ecosystem Experiments Site in Wyoming to receive a $36,000 International Cooperative Program (ICP) Level II specialized climate station. This climate station will monitor and measure critical loads of nitrogen, sulfur, and ozone, as well as standard meteorological parameters such as wind speed, wind direction, solar radiation, precipitation, relative humidity, and temperature. Bob

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on." Bob Ekey, representing The Wilderness Society, agreed and expressed his appreciation that "a lot of people really rose to the challenge to stretch themselves. Many of them had never really sat down at the table together before."

Brian said that dealing with hard issues like reintroducing fire requires focusing on areas of agreement, not disagreement: "Think of two overlapping circles, with the overlap representing areas of agreement. The more people **talked** and really **listened**, the more they found that the overlap, the area of agreement, was bigger than they thought."

"Where the rubber hits the road," said Mary, "is the implementation, what it looks like on the ground." The next step will be to apply the collaborative model and principles on some actual projects. They want to replicate the diversity of their group within local working groups, and find projects that will show results fairly quickly.

Julia Altemus, representing the Montana Logging Association, said that getting a project in its early stages will be the key to success. That means "bringing an area that is 'out of balance' to the Forest Service as a project, an area that hasn't already started in the NEPA process." Julia said that a bundled project is preferable—for example, one that combines fisheries improvements, has some timber harvest, and improves roads and trails.

The group selected the Lolo and Bitterroot National Forests for pilot projects. According to Mary, "The time is right. People are willing to come to the table to find solutions." Brian, Mary, Julia, and Bob agree that success in these forest-level efforts would be getting good projects designed and implemented on the ground. That includes finding funding to get the work done. Nonprofits and the Forest Service's Regional Office are interested in providing some funding, but eventually they would like Congress to step up to the plate to provide serious support on a much broader scale.

Mary feels that success at the local level will come because there is a high level of trust in the representatives that were on the original working group. Thanks to them, she expects a high level of buy-in to the forest restoration principles. The group, now called the Montana Forest Restoration Committee, will oversee these local efforts. They hope to see their hard work pay off, and because they set the example on collaborating and have provided a carefully designed framework, it just might.

Restoration Principle #9. Emphasize ecosystem goods and services and sustainable land management. Stream improvement, Kootenai National Forest. (Photo by Paul Hooper, USDA Forest Service, Bugwood.org)

Beyond the Bitterroot . . . (from page 3)

BEMRP-funded social science research has focused on understanding how people interact with the Forest Service and how the agency can more effectively communicate with the public. Research that started in the Bitterroot Valley on understanding the meanings people place on public lands has since expanded to the Flathead and Blackfoot Reservations, the Kootenai National Forest, and will appear in a textbook for land managers elsewhere interested in using this methodology. Similarly, BEMRP work to develop a toolkit for off-highway travel planning was circulated nationally by our Washington Office and a paper summarizing findings on the historical, ecological and social implications of dams in the Selway-Bitterroot Wilderness was presented at an international conservation congress.

Research on invasive weeds and biocontrol impacts on small mammals has documented previously unrecognized side effects of biological control in natural systems, examined ways to reduce those nontarget effects in biological control programs, and illustrated how to mitigate this problem within knapweed-infested systems in the West. This information is applicable to the practice of biological control worldwide.

Other research showed that spotted knapweed has very significant impacts on native ecosystems by reducing abundance and richness of native plants and invertebrates and by reducing recruitment of native songbirds. Information gained is directly applicable to grasslands and savannahs of the northern Rocky Mountains but has generic ramifications for understanding how invasive weeds impact native systems across North America.

The Bitterroot Ecosystem Management Research Project is more than its name implies. We are proud of the quality of multi-disciplinary research we have produced by focusing research locally but with an eye to widespread applications, by taking advantage of long-term study sites, and by fostering relationships with our partners.

What Kind of Cutting and Thinning Can Prevent Crown Fires?

Mick Harrington, Research Forester, Fires, Fuels, and Smoke Science Program, RMRS, Fire Sciences Lab, Missoula, MT; Erin Noonan, Fire Ecologist, Systems for Environmental Management, Missoula, MT

Many land managers are attempting to lessen the probability of severe wildfire behavior and impacts, especially near communities, by manipulating canopy and surface fuel characteristics. Various interest groups have questioned the value of fuels treatments. In reality, apart from fire exposure when a real fire went through a treated stand, effectiveness of fuel treatments has not been quantifiable until the recent development of protocols for canopy fuels assessment and crown fire behavior modeling.

The Bitterroot National Forest recently implemented the Sheafman Fuels Reduction Project to reduce the probability for high intensity crown fire impacting the watershed and community of Pinesdale, Montana. Much of the Sheafman treatment area was heavily logged a century ago, resulting in a dense Douglas-fir stand.

We conducted a study to evaluate pre-and post-treatment fuels at the Sheafman project and model the effects of the treatments on anticipated fire behavior. Fuels treatments within the 475-acre project area were called either understory cutting (UC) where only small trees were cut, or overstory thinning (OT) which left a semi-open stand with 50 to 80 large trees/acre. We established 40 plots for pre-treatment (2002) and post-treatment (2004) sampling of fuels and stand structure. We then used fire behavior models to evaluate the pre- and post-treatment level of wildfire hazard and assess the effect of the fuel treatments.

With the fuels treatment, the densities in OT plots were reduced from 580 to 73 trees/acre, while the UC plots were reduced from 380 to 154 trees/acre because only small trees were cut. There also were changes in canopy fuel base height and canopy fuel quantity which determine, in part, the initiation and spread of crown fire. The higher the crown base and the lower the canopy fuels amounts, the less the chance of crown fire. The canopy base heights were raised from 17 to 32 ft in the OT plots compared to an increase in the UC plots from 12 to 19 ft. The high, pre-treatment stand densities produced substantial canopy fuel quantities that were reduced by 75% in the OT plots but only 15% in the UC plots. Pre-treatment surface fuel loadings averaged 4 tons/acre and increased by 1 and 4 tons/acre due to thinning in the UC plots and OT plots, respectively. Surface wind speeds (measured at eye level), which are affected by stand density and which, in turn, greatly influence fire intensity, are expected to double in the more open stand of the OT plots but increase only by 25% in the UC plots.

Based on these changes, the model predicted that fire intensity measured by surface fire spread rates and flame lengths wouldn't change significantly as a result of treatments until tree-top wind speeds exceed 20 mph. The torching index (wind speed at which a surface fire will become a crown fire) exceeded 80 mph for the OT treatment for both pre- and post-treatment, a condition which is highly unlikely. For the UC treatment, the mean torching index was raised from 27 mph to 50 mph with treatment, changing the likelihood of torching from

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Fuel reduction treatment in the Sheafman Creek drainage. The left photo shows pre-treatment conditions, and the right photo shows the same area after treatment. (Photos by Mick Harrington)

Are Mice Eating Up All the Pine Seeds?

Rafal Zwolak, Kerry Foresman, and Elizabeth Crone, Division of Biological Sciences, University of Montana, Missoula, MT; Dean Pearson and Yvette Ortega, Wildlife Biologists, Wildlife and Terrestrial Habitats Science Program, RMRS, Missoula, MT

Wildlife, even miniscule mice, can play an important role in forest regeneration and composition by consuming seeds, seedlings, and saplings. Mice can, through sheer numbers, consume a tremendous number of seeds. We wanted to learn if deer mice could affect how ponderosa pine forests regenerate after fire.

(above) Rafal Zwolak recording data on seedling establishment in a pair of experimental cages. In 2007, seedlings emerged only in those cages that excluded mice. The experiment will be continued in 2008. (Photo by Leigh Ann Reynolds) (left) Don't be misled by their small stature! Abundant and voracious, deer mice are capable of exerting strong ecological influences. (Photo by Rafal Zwolak)

In the late 1800s, ponderosa pines commonly formed open, park-like forests at lower elevations in the West. Today, these forests are often overrun with shade-tolerant Douglas-fir trees that suppress the pines and increase the risk for stand-replacing fires. Historically, frequent, low-intensity fires were thought to maintain the dominance of ponderosa pines by periodically killing Douglas-firs. Although efforts are underway to return fire to the landscape to restore ponderosa pine forests and reduce the risk of stand-replacing fires, widespread house building around forests limits the use of fire and therefore limits the modern role of fire in these systems. This exclusion of fire requires that we understand how other forces may influence the composition of trees and rate of succession.

In the West, small mammals like deer mice are voracious seed predators that could greatly influence tree regeneration and forest composition. Deer mice numbers increase following disturbance and deer mice tend to select larger seeds over smaller ones. Therefore, they could affect both the rate of tree regeneration following disturbance and the relative abundance of Douglas-fir versus ponderosa pines by targeting the larger ponderosa pine seeds. To better understand the role of these mice in affecting tree regeneration and tree species composition following disturbance, we monitored deer mouse populations

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Meet BEMRP's Executive Committee

BEMRP is a multi-disciplinary partnership that brings together scientists from the U.S. Forest Service Rocky Mountain Research Station and the University of Montana, together with managers from the Bitterroot National Forest and Northern Region.

Greg Jones—RMRS Human Dimensions Science Program
Krista Gebert—RMRS Human Dimensions Science Program
Mick Harrington—RMRS Fire, Fuels, and Smoke Science Program
Ward McCaughey—RMRS Forest and Woodland Ecosystems Science Program
Alan Watson—Aldo Leopold Wilderness Research Institute
Dean Pearson—RMRS Wildlife and Terrestrial Habitats Science Program
Jim Burchfield—The University of Montana College of Forestry and Conservation
Sue Heald—Bitterroot National Forest
Chuck Oliver—Bitterroot National Forest
Dan Ritter—Bitterroot National Forest
Kerry McMenus—Northern Region Office

What Pollutes More: Burning Logging Scraps On-Site or Hauling Them to Boilers?

A grinder in northern Idaho reduces biomass to the size needed for use in biomass burners. (Photo by Han-Sup Han)

A truck dumps biomass to be ground for use as fuel in burners in northern California. (Photo by Han-Sup Han)

Greg Jones, Research Forester, Human Dimensions Science Program, RMRS Missoula, MT; Dan Loeffler, Research Associate, College of Forestry and Conservation, The University of Montana, Missoula, MT

Publicity and debate about global climate change has fueled interest in the role forests and forest management activities play in carbon sequestration and greenhouse gas emissions. Our previous ECO-Report contained an article on greenhouse gas emissions released when woody biomass from forest residues are used for energy (see page 9 of 2007 ECO-Report at www.fs.fed.us/rm/ecopartner/ecoreport.shtml). That article compared the overall emissions of: 1) transporting woody residues from forest treatments to burn in a boiler for heat energy (including emissions from collecting, chipping, and hauling) with 2) leaving those residues on-site and disposing of them by open pile burning and using fossil fuels (fuel oil or natural gas) instead of biomass in the boilers. For the Bitterroot Valley, the results showed that following the first option (rather than the second option) would reduce average carbon dioxide (CO_2) emissions by 50%, particulate matter emissions less than 10 microns in size (PM-10) by 75%, and methane emissions by 90%.

These average reductions in emissions computed for biomass use in the Bitterroot Valley indicate that using these forest residues for energy can substantially reduce both greenhouse gas and particulate emissions. However, we wondered how increasing distances for hauling biomass affects these results. In other words, to what extent do the increased diesel emissions emitted by longer haul distances overshadow the decreased emissions of burning this biomass in a boiler for heat energy instead of pile-burning the biomass in the forest and relying on fossil fuels for the equivalent heat energy?

We also wondered about the wisdom of expending fossil fuels to collect and deliver biomass for heat energy. Recently there have been scientific reports and newspaper articles criticizing the use of agriculture products such as corn to produce ethanol for fuel because they provide a low energy return for the required energy inputs. We wondered how this woody forest biomass for heat energy stacks up with regard to this question, especially as haul distance increases.

We used the spatial landscape treatment/transportation model, MAGIS, to analyze how emissions and fossil fuel energy (diesel) consumption change with increasing average distance of hauling biomass from the forest to the site where biomass energy is used. To add

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Diesel emissions as a percentage of total emissions in the biomass-for-energy option.

	(CO_2)	PM10
47-mile average haul distance:		
Harvest & Grind Activity	2.5%	3.0%
Hauling	1.0%	1.5%
Total	**3.5%**	**4.5%**
85-mile average haul distance:		
Harvest & Grind Activity	2.5%	3.0%
Hauling	2.0%	2.5%
Total	**4.5%**	**5.5%**

The "Spotlight"...highlighting researchers at work

KRISTA GEBERT "The Beauty of Economics"

Sharon Ritter, Research/Management Coordinator, Social, Economics, and Decision Sciences Program, RMRS, Missoula, MT

Janie Canton-Thompson (left, former ECO-Report editor) and Krista Gebert. (Photo by Carol Pyle)

"Economics is the science of allocating scarce resources among unlimited wants." That was Krista Gebert's response when I asked her to define economics for me. Having taught several economics classes at the University of Montana after graduate school, Krista had the definition down to its essence. As an economist with RMRS in Missoula, Krista applies economics to a variety of scarce forest and human resources. Krista is the newest executive committee member of BEMRP, representing the Human Dimensions Science Program of RMRS.

Krista grew up in and around Dillon, Montana. She inherited a strong work ethic from her parents. After high school, Krista attended two years of college in Dillon in business administration before getting married and starting her family. Her husband, John, is a math and physics teacher. During the early years they lived in Helena, then Chester, Montana. She stayed home with her young sons but she always knew she would eventually go back to school and work. John prepared her by teaching her trigonometry and pre-calculus to boost her math skills. Then a great teaching job came up for John in Missoula.

When her youngest son was 4, Krista went back to school. I asked her why she went into economics. She said she started in business classes, figuring she would go into accounting. "But I felt sick to my stomach every time I opened up my accounting book." However, economics excited her, and she had always been good at math and science, so despite there being "no jobs" in that field, at least not in Missoula, John encouraged her to switch. So she went for it.

Landing a job with RMRS was "serendipitous." In 1996, during her last week of graduate school, she applied for a job at the Forestry Sciences Laboratory in a temporary, entry-level economist position. Her supervisor, Erv Schuster, served as her mentor. He gave her lots of responsibility early on, and urged her to move up. "Erv was great. He hired people who could do the job, then left you alone to do it." Krista held several temporary and term positions until 2000, then moved over to the University for a year and a half working for the Bureau of Business and Economic Research. She enjoyed her time with the Bureau and it was not easy making the decision to go back to RMRS when a permanent job opened up. However, she loves working for the Forest Service and with all the great people she has met over the years, "I'm impressed with the caliber of people I've met and work with in the Forest Service and Department of Interior. They're dedicated, hard-working, and really involved."

Krista's research in the past few years has focused on fire economics, especially wildland fire suppression and suppression costs. One piece of that is providing forecasts for the Forest Service and Department of Interior on what they're likely to spend on fire suppression for the coming year. The forecasts produced early in the fiscal year in collaboration with researchers at the Southern Research Station use climate information and time trends to make predictions of suppression expenditures for the upcoming fire season. During the summer, personnel at the National Interagency Fire Center in Boise forecast anticipated fire activity using their best professional judgment. Those predictions then go into the economics models that Krista uses to produce monthly updates of anticipated suppression spending. Krista finds her work both rewarding and challenging. "I can email the forecasts of suppression expenditures to the Washington Office at 5:30 at night and the next morning I see it in the paper." This is nerve-wracking (the challenge), but also evidence that her work is actually getting used (the reward). Krista's

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The "Spotlight"...highlighting researchers at work

WARD MCCAUGHEY "Don't Sweat the Small Stuff"

Sharon Ritter, Research/Management Coordinator and ECO-Report Editor, BEMRP, RMRS, Stevensville, MT

One of Ward's summertime fish sampling excursions in western Montana. (Photo by Randy Boehnke)

Ward McCaughey has spent 99% of his career in forestry research. It appears the aptitude test he took in high school was right; he **should** be in forestry. Ward is a research forester in the Forests and Woodlands Ecosystems Program for RMRS. He has been on BEMRP's executive committee since 2002. However, his association with BEMRP goes back to its inception in 1994 when he worked for Clint Carlson, Project Leader and the original lead scientist for the team that initiated BEMRP. Ward's association with the Rocky Mountain Research Station goes back to 1974 when he supervised summer crews.

Ward grew up in Pierre, the capitol of South Dakota, a small city surrounded by farms, ranches, and Missouri River breaks. He fished the Missouri, hunted deer and antelope in the breaks and ranches, and pheasants in the fields. He worked summers either for his father's floor covering business or on ranches. This background gave him a love of the outdoors, but it was vacationing in the ponderosa pine forests of the Black Hills that stimulated his interest in forestry.

For college, he headed west to the University of Montana in Missoula for his bachelors and masters, and Montana State University in Bozeman for his PhD. While majoring in forestry at the University of Montana, Ward worked summers and falls for Wyman Schmidt and Ray Shearer of the Intermountain Research Station. It was a long-lasting relationship, morphing from work as a seasonal summer crew leader to mixing work and schooling to conduct his master's research on subalpine fir and Engelmann spruce, and later his PhD research on whitebark pine.

His study of whitebark pine was one of the first to look at factors affecting natural and artificial regeneration. He also worked on whitebark pine cone and seed studies, again relating his research to natural regeneration and nursery problems. The mid-1980s marked the beginning of interest in forest ecology approaches to whitebark pine research, with Station scientists including Ward, Steve Arno, and Bob Keane looking into this formerly underappreciated species. Ward continues his interest in whitebark pine research. He also continues monitoring spruce/fir forests he studied while conducting his master's research. "These long-term studies are key to understanding forest ecology and effects of management activities,"

Ward takes special pride in his lodgepole pine research on the Tenderfoot Creek Experimental Forest located on the Lewis and Clark National Forest. The Research Station conducted silvicultural treatments there in 1999 and 2000 to study the effects of restoring two-age lodgepole pine forest structure similar to what historically occurred on much of the area. However, work toward conducting those treatments actually began in 1988 when he, Wyman Schmidt, the Northern Region Office, and the Lewis and Clark National Forest planned research there. They assembled a team representing several National Forests, the University of Montana, Montana State University, Rocky Mountain Research Station, Northern Region Office, and Natural Resources Conservation Service. One of the key issues in the West is water, so they installed 10 flumes and collected several years of water quantity and quality data prior to doing any cutting. They measure stream flow, sediment production, water temperature and nutrients, and other measures of water quality and quantity. They also set up two SNOTEL sites (SNOw TELemetry) for monitoring snowpack and related climatic data. The SNOTEL sites included snow pillows, which are 10-ft diameter bladders that measure water content of snow.

Ward has found it very rewarding taking Tenderfoot Creek EF from an experimental forest with no studies to the level where so many people want to use the site for hydrological, climatological, and ecological studies. Said

(continued on page 13)

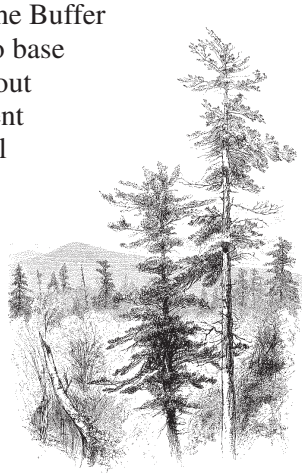
Mapping Cultural Values . . . (from page 4)

On the Reservation, we found that the primary meanings Tribal members associate with the Buffer Zone are wilderness protection, wildlife and water quality, access and functional attachments (such as a source of medicinal plants), recreation and scenic values, and personal and cultural meanings symbolic of long-term associations with nature in the Northern Rockies. We used a computer-based mapping exercise to develop 154 community resident maps of important places in the Buffer Zone across these five types of meanings. The map on the bottom of page 4 represents an overall average of those maps.

We also asked study subjects to identify major threats they perceive to these meanings. Initial analysis reveals that residents perceived four primary categories of threats to the meanings they attached to the Buffer Zone: wildfire, intense logging, roads and development, and off-highway vehicle use. The threat of wildfire was broadly recognized by many subjects and blamed on years of fire restriction, resulting in the feeling that now uncontrolled fires would be disastrous due to over-stocked or dense vegetation.

Logging also was commonly listed among threats, giving rise to the dilemma that Tribal resource managers face. Specifically, people expressed fears about intense logging, extreme logging, commercial logging, and large scale logging, suggesting that people are more threatened by the scale and intensity it might entail than the logging itself.

Residents are also concerned about other threats to the Buffer Zone such as perceived increases in road access, subdivision of property, and ATV and motorcycle use on and off roads. Some miscellaneous threats attached to specific areas in the Buffer Zone were cattle grazing, recreation over use, horses, litter, weeds, impacts to water quality, and insect outbreaks. While many of these threats exist at a large scale, many were attached to specific places in the Buffer Zone, providing opportunity to base discussions with the public about priorities for future management actions. BEMRP scientists will continue to facilitate interaction between forest managers and the public as proposals are developed in 2008 to reduce fire hazard, increase forest health, and restore the natural role of fire on Tribal lands.



Mice . . . (from page 8)

following natural wildfire, evaluated deer mouse seed predation on Douglas-fir and ponderosa pine seeds, and determined whether seed predation affected tree regeneration.

At two different sets of study sites on the Lolo National Forest, we confirmed that deer mouse populations increase dramatically in the first years after forest fires. At one set of study sites, we put out ponderosa pine and Douglas-fir seeds in trays to evaluate deer mouse seed selection. We also placed seeds on the ground in cages that either allowed or precluded mouse access to evaluate the effect of seed predation on seedling recruitment. Our preliminary data indicate that 1) mice did not exhibit size-dependent seed selection, i.e., mice consumed Douglas-fir seeds as readily as ponderosa pine seeds, 2) mice consumed large numbers of both seed species, and 3) seed predation by mice greatly reduced recruitment of seedlings for both species. Thus, mice may influence the *rate* of post-fire regeneration, but not the *trajectory*, meaning the direction the system is going such as toward a forest dominated by one tree species over another. When finished, our study will improve our understanding of animal-plant interactions in western forest succession and determine whether deer mice warrant special management in regenerating forests.

What Kind of Cutting . . . (from page 7)

possible to improbable. The crowning index (wind speed at which fire will spread in the tree crowns) almost tripled in the OT plots from 12 to 34 mph with thinning but changed minimally (17 to 19 mph) in the UC treatment. This contrast reflects the large and small canopy fuels changes for the OT and UC plots, respectively.

Therefore, models show that surface wind speeds increase as a result of thinning, which in turn leads to an increase in surface fire intensity. However, this expected fire intensity increase should not result in increased crown fire potential. Instead, reductions in canopy fuel quantities and increases in canopy base heights in the OT treatment results in a low probability of crown fire spreading or even initiating. Increases in canopy base heights with removal of ladder fuels in the UC treatment greatly reduce the chance of crown fire initiation. But with the overstory fuels virtually unaltered, the likelihood of crown fire spread remains unchanged. So, the trade-off for increased fire intensity is a substantial decrease in crown fire potential.

Krista Gebert . . . (from page 10)

forecasting work earned her the Forest Service Chief's Award in 2003.

Another rewarding and challenging line of research is the Stratified Cost Index. This compares the estimated cost of the fire with what was actually spent. She reviews costs and sends a list of the fires that cost significantly more than estimated to the Fire and Aviation Management office in Washington, D.C. and they follow up with fire managers to learn why they were so expensive. This results in better tracking of fire expenditures by the fire managers and helps all participants understand what causes higher costs.

Krista is looking forward to working on ecosystem management research with BEMRP. She got a taste for it when she helped out with the Trapper-Bunkhouse project. In a project like that with multiple goals, there are always budget constraints. "That's the beauty of economics; providing information helps managers make decisions about tradeoffs. You can't do everything with the land, you have to make choices," she said. At Trapper-Bunkhouse there are fish culverts to install, trails to fix, hazardous fuels to reduce, roads to rehabilitate, and more. Yet there aren't enough funds to cover all of that. That's where economics comes in to help with those choices.

As a new BEMRP team member, Krista looks forward to branching out into a new realm and working more with field folks. She likes knowing when research she does is applied on the ground. Sometimes, researchers conduct their research, write their journal articles, and are not sure if anyone is actually using the results. That's one of the reasons she likes doing applied research: "Over the years, there's been a lot of direct interaction with management and that's given us a lot of research ideas. Working with managers is how most of our research topics came up, and we can see it put to use." She is excited that being involved with BEMRP will give her the opportunity to do more of this type of collaborative research.

Ward McCaughey . . . (from page 11)

Ward: "Development of the entire hydrology, vegetative, and climate monitoring system on the Experimental Forest has drawn researchers from all over the U.S. to install collaborative studies." He's excited about a new $36,000 climate station that will collect data on hydrology, atmospheric oxygen, daily and seasonal carbon exchange, snow melt, atmospheric deposition, pH, particulates, and more. Ward has also been approached by the National Oceanic Atmospheric Administration to use Tenderfoot as one of eight sites in the United States to calibrate a Geostationary Satellite Server (GOES) atmospheric weather satellite using climate and snow data.

Setting up experiments and learning from them is intellectually stimulating. "Scientists go into the science field because it's their nature to learn through experimenting," he said. Ward loves working in Forest Service research, explaining, "We have flexibility and latitude in the types of studies we work on."

He also enjoys working with resource managers in the National Forest System, including the Northern Region Office, the Bitterroot National Forest, the Lewis and Clark National Forest, and BEMRP. He says that "Forest Service people are great people to work with. It's the best ecological organization in the world, well-known and respected in Europe because of our research publications and how we manage our forests."

Ward looks forward to the intellectual challenges coming up with the Trapper-Bunkhouse project, Northern Region Aspen Working Group, Whitebark Pine technical committee, and National Experimental Forests Managers Working Group, and ballroom dancing. Ballroom dancing? "I used to dance a lot in Bozeman and I'm looking forward to doing more of it here in Missoula." Ward's advice to everyone is, "Don't sweat the small stuff. Go out and do the best you can." That would apply to work, play, and dancing.

New Publication Available

The Rocky Mountain Research Station's leadership team recently awarded its Outstanding Scientific Publication award to Dean Pearson for his role as principal author and team leader of the publication *Biological Control Agents Elevate Hantavirus by Subsidizing Deer Mouse Populations* (Ecology Letters 9(4): 443-450, published in 2006, co-authored by Ragan Callaway of the University of Montana).

The paper looks at indirect risks of using exotic insects to control weeds. See the 2002-03 ECO-Report for an article about this research and last year's ECO-Report where we reported on an interview with Dean in which he talked about the surprising response to his findings (http://www.fs.fed.us/rm/ecopartner/ecoreport.shtml).

Glossary — "What Do You Mean By That?"

Despite our efforts to write ECO-Report articles in "jargon-free" language, we still have to use terminology unfamiliar to some readers. Should you not recognize a term in ECO-Report, this glossary may help. If you don't find the word here, visit BEMRP's Glossary web page at http://www.fs.fed.us/rm/ecopartner. Remember some definitions change over time as new information develops. Periodically, we revise our web glossary page to reflect these changes.

BIOCONTROL—The use of living organisms, such as predators, parasites, and pathogens, to control weeds, pest insects, or diseases.

FLAME LENGTH—The distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface); an indicator of fire intensity.

FLUME—A flume is an instream structure used to measure the rate of flow. Flumes can also be designed to collect water quality data and other measurements such as temperature.

SNOTEL—A SNOTEL is an automated station that collects information on snowpack and climate. They are usually set up in areas difficult to access in the winter. SNOTEL sites record data on snow water content, precipitation, and sometimes other information. The acronym stands for SNOw TELemetry. Anyone with internet access can get readouts from SNOTEL sites at http://www.wcc.nrcs.usda.gov/snotel/.

TRAJECTORY—A trajectory is a path that a moving object follows. In forest ecology terms, it is the developmental pathway of the forest ecosystem over time.

Burning or Hauling? . . . *(from page 9)*

reality to these computations, we assumed that the forest biomass is hauled from various locations in the Bitterroot Valley to the paper mill near Frenchtown, which has a boiler for generating energy from woody biomass. We used the same published diesel consumption and emission factors used in the previously reported results. Diesel consumption and emission amounts are based on the round trip, because one must first get the empty truck to the forest site where the biomass is located.

Our analysis found that when forest residue biomass is used for energy on only the northern portion of the Valley, the average haul distance is 47 miles, increasing to an average of 85 miles when utilization is extended to the entire valley. At the 47-mile average distance, diesel CO_2 and PM10 emissions from hauling each represent only about 1% and 1.5%, respectively, of the total emissions for the biomass-for-energy option (see table). These increase to about 2% for CO_2 and 2.5% for PM10 of the total emissions at the 85-mile average haul distance. This means that reduction in emissions associated with using forest residues for heat energy is little affected even at relatively long haul distances. Emissions from harvest and grinding represent a slightly larger portion of the total emissions, around 2.5% for CO_2 and 3% for PM10. Summing the two components for CO_2, total diesel emissions represent 3.5% at the 47-mile average, increasing to 4.5% at the 85-mile average haul distance. Total PM10 emissions from diesel range from 4.5% to 5.5% of the total biomass-for-energy emissions, indicating the difference in emissions is minimal over this range in haul distance.

What about the amount of fossil fuel (diesel) energy needed to harvest, grind, and haul the forest residue biomass to produce the heat energy? At the average haul distances we used, diesel energy consumption represents 4.7% to 5.7% of the total biomass energy produced. That means at the shorter haul distance about 21 units of biomass energy are produced for each unit of diesel energy used to get it. At the longer distance this drops to 17 units of biomass energy for each unit of diesel energy. To determine if this is a good return of energy for the energy expended, we can use the breakeven point, where it takes one unit of energy for each unit produced. Getting a return of 17 to 21 units of energy for 1 unit of energy expended is clearly well above the breakeven point.

We thought it would be interesting to compare this with uses of other types of biomass for producing other forms of energy. Researchers at the Argonne National Laboratory have published that 1.35 units of energy of ethanol made from corn are produced for each unit of fossil fuel energy used. Compared to ethanol, 17 to 21 units of biomass heat energy for 1 unit of diesel energy used to produce it is a good energy return. However, we recognize that using ethanol for fuel and burning biomass for direct heat are not substitutes for each other.

BEMRP and Jamaica?

Marilyn Headley (second from left), Conservator of Forests, Jamaican Forestry Department, asks questions about the role of research in the U.S. Forest Service. (Photo by Dana Roth)

Sharon Ritter, Research/Management Coordinator and ECO-Report Editor, BEMRP, RMRS, Stevensville, MT

While it wasn't quite as good as actually going to Jamaica, visiting with Jamaican forest managers on the Bitterroot was still fun. In late September 2007, the Northern Region hosted a visit from Marilyn Headley—Conservator of Forests, Keith Porter—Senior Director (both from the Forestry Department) and Lorna Jones-Lee from the Cabinet Office in Jamaica; Karyll Aitcheson, Coordinator for the joint USFS/ USAID Protected Areas and Rural Enterprise Project in Jamaica; Dana Roth, Caribbean Program Specialist for Forest Service International Programs; Kirsten Kaiser, Forest Planner on the Kootenai National Forest; and Tom Rhode, Regional Planner for the Northern Region.

In spring 2007, Kirsten and Tom visited Jamaica to help Forestry Department consultants and local forest management committees develop a land management plan and identify sustainable livelihood projects for one of their protected areas. This trip to the Northern Region was an opportunity for members of the Jamaican Forestry Department and government to learn how the Forest Service conducts its land management programs and coordinates with other entities.

Greg Jones and I represented BEMRP by taking them to the Lick Creek Demonstration/Research Forest. We talked about how and why RMRS established the BEMRP partnership and how researchers and managers work together. We emphasized the importance of research and in particular having the research and management branches as separate, independent entities within the Forest Service (see Len Ruggiero's article in last year's ECO-Report at http://www.fs.fed.us/rm/ecopartner/ecoreport.shtml).

With the newly available Lick Creek autotour brochure and last year's ECO-Report in hand, we also talked about how we share research results with the public and resource managers. The visitors weren't shy about asking questions. Their warmth and openness made for an enjoyable morning.

Tour guests included: Kneeling: Tom Rhode. Standing left to right: Keith Porter, Kirsten Kaiser, Marilyn Headley, Dana Roth, Karyll Aitcheson, Lorna Jones-Lee. (Photo by Tim Love)

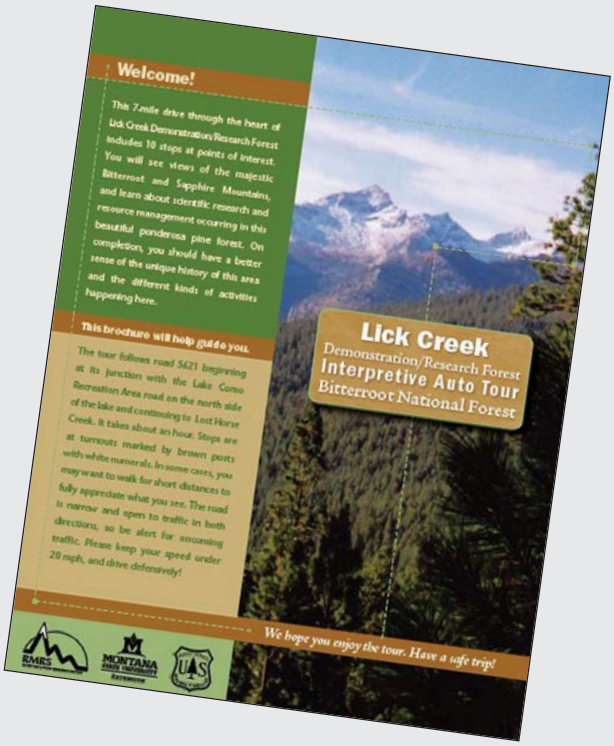
Wildfire, Research, Climate . . . *(from page 5)*

Musselman, RMRS Research Plant Physiologist, will help with installation on all RMRS sites. According to Bob, "Level II Critical Loads stations were initially established more than 20 years ago in Europe by the European Union International Cooperative Program as part of the Convention on Long-range Transport of Air Pollutants, of which most European countries and the United States and Canada are signatories. This is the first network of ICP Level II stations to be established in the United States as a coordinated effort by the U.S. Forest Service." We feel honored and lucky that Tenderfoot was selected as one of the locations and look forward to making use of the additional data it will provide.

New Publication Available

A new, colorful brochure leads visitors on a 7-mile roadside tour of the Lick Creek Demonstration/Research Forest in Montana's Bitterroot Valley. Fourteen years ago, the Bitterroot National Forest and scientists from the Rocky Mountain Research Station and University of Montana conducted thinning treatments and prescribed burning at Lick Creek. Several stops on the autotour allow visitors to compare several treatments at once and learn about research results. The autotour also features history, geology, wildlife, and vegetation in the Lick Creek area. Brooke Thompson, a contractor for RMRS, rewrote and redesigned the brochure with the help of Peter Kolb, Montana State University Extension.

Lick Creek was the site of one of BEMRP's first research projects. Researchers are still monitoring the effects of treatments on vegetation development, snag survival, wildlife forage and cover, tree growth, weeds, and soils. Pick up the brochure at the Darby, MT, district office or visit our website: http://www.fs.fed.us/rm/ecopartner/.



ECO-Report

Bitterroot Ecosystem Management Research Project
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