BITTERROOT ECOSYSTEM MANAGEMENT
RESEARCH PROJECT (BEMRP)

ECO REPORT

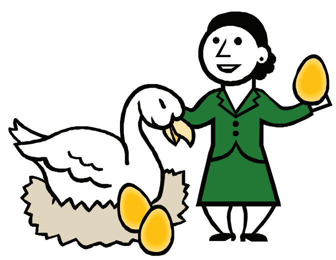
A Progress Report from a Partnership in Landscape Level Ecosystem Management

FALL 2005

Scale Matters—Some Thoughts on Landscape Sustainability

Janie Canton-Thompson, Social Scientist and ECO-Report Editor, R5, Recreation Solutions Enterprise Team, Missoula, MT

"Don't kill the goose that lays the golden egg!" reads an old proverb. Who would want to? Why not? It's all about sustainability. In the context of forested landscapes, sustainability is "the capacity of forests, ranging from stands to ecoregions, to maintain their health, productivity, diversity, and overall integrity in the long run, in the context of human activity and use" (Society of American Foresters [SAF]). However, sustainability is a social concept whose realization is in the eye of the beholder. Sustainability for whom, for what purposes, how, where, for how long? What practices are sustainable and at what scale? Asking the right questions is prerequisite for sustainable management. Once we've asked the right questions, and bounded the things we want to sustain, there are many approaches to sustainability. Although most of us want to perpetuate ecosystems over time and space, we have reached little agreement on which system to sustain, for what purpose, for how long, and for whose good. How do we get a handle on a state of being desired by many but agreed on by few?



A sustainable ecosystem is the goose that lays the golden eggs!

Historically, deforestation has resulted from increased agricultural expansion, industrialization, and national defense support. As these activities have gathered momentum, ability to sustain forested landscapes has declined.

In the late 1800s Americans began realizing their continent's natural resources were finite. By the second half of the 20th century, ecologists, sociologists, and economists were starting to use systems theory to understand ecological, social, and economic relationships and develop ways to ensure steady supplies of natural resources for perpetuity. These professionals soon realized that attempts to improve human socio-economic well-being, including economic development projects aimed at alleviating poverty or promoting wealth, had unanticipated detrimental effects on the natural environment. As they worked to understand the interrelationships among social, economic, and ecological components of the environment, they began thinking in terms of sustainability. (For more than a decade, BEMRP scientists have also been exploring sustainability, including its values-laden nature.) Many articles and books have been written on this topic. Most acknowledge the difficulty of defining, let alone achieving, sustainability in natural systems.

Typically, sustainability literature reveals an inverse relationship between socio-economic and ecological system well-being over time. Forested landscapes have adapted to natural and human-induced disturbance patterns, or perished. While such landscapes have evolved over millennia in a context of disturbances both human and natural, they are increasingly unable to adapt to the magnitude and compacted-in-time effects of human disturbances.

If sustainability is desired, humans must manage their impacts on forested landscapes and collaboratively resolve the values trade-offs involved. Since time immemorial, people have treated forested landscapes as both sacred places and sources of material goods. One person experiences a forested landscape and sees its utilitarian value; the next person looks upon it and feels a sense of spiritual enrichment. Who is correct? Forests don't care. They, in conjunction with other landscape components, adapt often with great resilience until cumulative human and/or natural disturbances push them over a threshold beyond which they cannot sustain their historical character. Systems within the landscape then dramatically change.

Natural resource experts are focusing increasing efforts on reducing the probability of more and more forested landscapes being altered by human activities to a point of being irreversibly degraded. Some ecologists and economists are now conceptualizing components of our

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Inside

Landscape Sustainability . . . *(from page 1)*

Landscapes are a collage of scenes representing various landforms, vegetation types, habitats, and activities. They are ever dynamic but ultimately sustainable with thoughtful scientifically informed management. (Photos by Dan Ritter, Dan Ritter, and Sharon Ritter, respectively.)

natural environment as "natural capital," assets that provide "ecosystem services" and therefore have values even if left intact. As the world's population grows, the supply of services like natural detoxification and waste recycling offered by our natural environment is diminishing. Forests provide services by sequestering carbon; purifying water; reducing potential harm from flooding, drought, and erosion; providing human food and shelter; and rejuvenating human spirits.

To stem the growing liquidation of "natural capital," groups around the world are measuring, capturing, and beginning to protect these newly discovered values via market forces. Such assets can conceivably be traded in the marketplace and valued according to supply and demand. For instance, people might own "carbon rights" (forests' capacity to sequester carbon and stabilize climate). Owning "natural capital" allows bargaining between those affected by an externality (here defined as uncompensated costs or benefits to a third party) and those causing it. Owners can be compensated for the ecosystem services their intact landscapes (natural capital) provide instead of being forced to liquidate that capital to survive. Tropical rainforest owners typically burn and clear forests, planting crops on the tree-denuded landscapes. Were they to be compensated for the ecosystem services their forests provide, they might be willing to keep them intact and even improve their standard of living.

An important aspect of sustainability is deciding "scale." After much deliberation, scientists, managers, and the public have come to realize the importance of "place." Landscape scale best captures that concept. (Landscape is "a spatial mosaic of several ecosystems, landforms, and plant communities across a defined area irrespective of ownership or other artificial boundaries and repeated in similar form throughout" [SAF]).

People in everyday life can tangibly experience a landscape. They can visualize it; travel through it; understand its components and processes; and manage for what they want from it. They can revel in its diversified beauty and solitude as they walk, bike, or ride through it, and/or collect wood and other products to satisfy their needs.

Scientists can establish transects and test treatments at the landscape scale, allowing them to learn about interrelationships between ecological system components and processes. Managers are able to make meaningful decisions and implement treatments at the landscape level. Individual organisms within the system may be lost to death or migration, but the historical percentage and distribution of patch types, age classes, disturbance processes and so forth can be maintained. Periodic disturbances may have a presence on one part of the landscape, while stands of trees and shrubs recovering from these disturbances grow elsewhere. Managers can also think about how the results of management or no management might alter the landscape's historical character.

Landscape modeling, helpful in predicting changes resulting from treatments or lack thereof, is much easier to accomplish at the landscape level than at larger scales. Attempting to manage for sustainability at levels lower than landscape scale becomes more difficult because processes such as food and nutrition cycles become fragmented. Considering and maintaining the integrity of forest ecosystem structure and process requires research, planning, and managing at the landscape level.

Landscape sustainability—where, for whom, what, for what purpose, how, for how long? Each person has a vision of what a sustainable landscape looks like. As a heterogeneous society, we face significant trade-offs in our attempts to achieve sustainability. Instead of insisting on our own individual or group criteria for sustainability being fully met, we must continue collaborating to develop mutually acceptable land management plans. This entails compromises from all sides of the socio-political spectrum. Our landscapes are at or near their sustainability thresholds, meaning all of us must agree to work together to sustain mutually desirable landscapes.

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Visualizing a Forest Landscape Today and Tomorrow

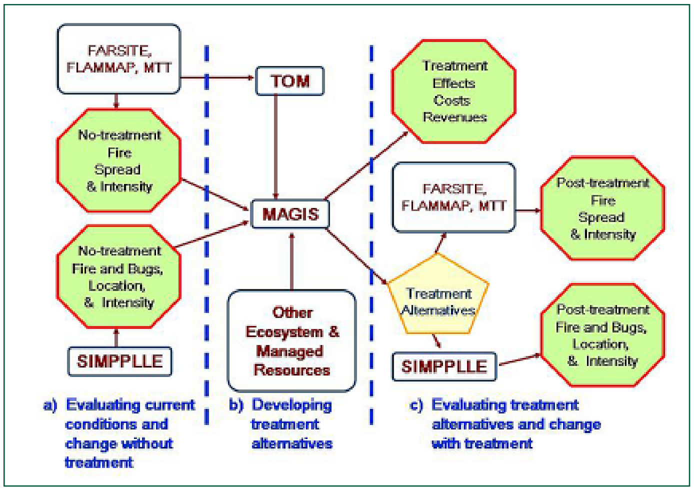

Figure 1 – Flow Chart depicts the use of spatial landscape models to a) analyze current conditions and predicted changes without vegetation treatments, b) develop and map treatment alternatives, and c) analyze effects of treatment alternatives. Treatment alternatives focus specifically on areas of concern identified in step a. (Graphic by Kevin Hyde and Greg Jones.)

Greg Jones, Project Unit Leader and BEMRP Program Leader, RMRS, Economic Aspects of Forest Management on Public Lands, Missoula, MT

Forest managers face many questions about fire-prone forests of the Northern Rockies:

- What values are at risk from catastrophic fires in areas where frequent, low-intensity fire was historically the norm?
- How are the risks changed by treatments designed to reduce fuel and restore forest health?
- What mosaic of treatments is most effective in reducing risk while having acceptable resource impacts?
- What are the trade-offs over time between costs and effects of treatments versus costs and effects if no treatments are done?

An ongoing BEMRP-funded study is addressing these and related questions by testing the integration of information from three types of spatial landscape models, as shown in the accompanying Modeling Flow Chart (fig. 1). The study focuses on a 57,800-acre area within the Bitterroot National Forest's Darby Ranger District, bounded on the north by Bunkhouse Creek and on the south by Trapper Creek.

In Step 1 of the information integration process, we used landscape models to map and assess current fuel conditions, likelihood of fire, and how we expect these conditions to change in response to future vegetation growth and the presence of insects, disease, and wildland fire. This step also addressed meanings attached by residents to specific places in the study area.

Figure 2 – Trapper Bunkhouse interdisciplinary team reviews spatial vegetation treatment scenarios developed by BEMRP scientists using the MAGIS model. (Photo by Sharon Ritter.)

Use of SIMPPLLE (http://www.fs.fed.us/rm/ecology/publications/simpplle/), a vegetation simulation model, enabled us to predict spatially the likelihood of fire across the landscape for current conditions and how we expect these conditions to change over time if there are no management treatments. Changes in vegetation because of insect and disease disturbances affecting future fuels are included in these simulations.

Application of fire behavior models—FARSITE, FLAMMAP, and MTT (http://farsite.org/)—predicted fire spread and intensity for existing landscape conditions in two fire scenarios. Both assumed burning conditions at the 95th percentile. One assumed ignition from lightning on the western edge of the study area with wind from the west, while the other assumed ignition points in the southern edge with wind from the south. The Treatment Optimization Model (TOM) was then used to identify treatment locations that best reduce fire spread rate and intensity for these specific fire scenarios. Approximately 25 percent of treatment locations suggested for the west wind scenario were also selected for the south wind scenario.

MAGIS (http://www.fs.fed.us/rm/econ/magis/), a spatial optimization model, is allowing us to schedule optimal treatment scenarios. It calculates resource and economic trade-offs where one is managing for multiple resource objectives. MAGIS integrates input from fire behavior and disturbance process models and balances treatments to modify fire behavior relative to the location of valued resources—homes, sensitive habitats, and streams— while estimating costs and possible revenues over a range of treatment options.

Researchers presented managers maps of modeled results, with an analysis of possible ecological effects, resource trade-offs, and economic estimates (fig. 2). Managers, in turn, have used this information to guide fieldwork and standard impact analysis as they draft a Proposed Action for the Trapper

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Ecology Research—Something Old, Something New

Ward McCaughey, Research Forester, RMRS, Ecology and Management of Northern Rocky Mountain Landscapes, Missoula, MT

Eric Ziegler collects an increment core from a fire-killed tree on the Bitterroot National Forest to help discover information on historical fire. (Photo by Ethan Mace.)

Spatial fuel treatment strategies, natural and human-caused disturbance history patterns, and fuel reduction treatment effects—managing for sustainability presupposes ecological knowledge about all these topics and more. The Ecology and Management of Northern Rocky Mountain Landscapes Research Work Unit (RWU) conducts research on all three topics.

In 2004, BEMRP started a new, multidisciplinary, landscape-scale project (see articles on pp. 3 and 20)—Trapper Bunkhouse Land Stewardship Project (Trapper Bunkhouse). Phase 1 of Trapper Bunkhouse has produced new information on how landscape and project-specific models can be applied to develop spatial fuel treatment strategies, taking into account other management objectives and limitations.

For a Trapper Bunkhouse "no action" alternative, the Ecology RWU completed several computer simulation runs of landscape processes along the entire Bitterroot National Forest's western side. We used the SIMPPLLE (**SIM**ulating **P**atterns and **P**rocesses at **L**andscape sca**LE**s) model to identify places where wildfires might have the greatest impact on the wildland/urban interface. Interaction with simulated insect and disease activity influenced wildfire occurrences. SIMPPLLE selected three critical areas; these, together with local knowledge from Bitterroot National Forest resource specialists, enabled us to select the area between Trapper and Bunkhouse creeks as highest priority for fuel reduction efforts.

RWU riparian research efforts also continued this year. We collected fire history and vegetation data from 13 headwater stream corridors and associated uplands on the Bitterroot and Lolo National Forests. This summer a four-person crew completed collection of fire scar, increment core, and stand structure data. Research results show that fire frequency in these mixed conifer/lodgepole pine systems was more frequent and less severe than generally supposed. Fires burned the Bitterroot sites approximately every 5 to 36 years. Tree species generally considered sensitive to fire show evidence of fire scars and sometimes display multiple scars. This indicates that low-intensity fires occurred rather frequently on these riparian sites. The existence of pulses of regeneration following fire events that killed trees indicates that some higher-intensity fires were present. Fires were relatively frequent in these systems and occurred at very short intervals—as short as one year.

Managers and researchers tour the Hayes Creek thinning project to evaluate current Bitterroot National Forest management techniques and discuss potential for research on alternative vegetation treatments. (Photo by Ward McCaughey.)

Our riparian research data will be fully analyzed by spring of 2006 and can provide managers with the best available information about disturbance history patterns in sensitive trout-bearing streams. Such information is useful in guiding forest planning efforts, as well as fire and fish management decisions.

The Ecology and Management of Northern Rocky Mountain Landscapes RWU has many projects scattered around the Northern Rockies. BEMRP's projects are just a few of what we are doing to improve knowledge of the ecosystems in this area, a prerequisite to achieving landscape sustainability. For more information on our unit, please see our website at http://www.fs.fed.us/rm/ecology/.

Economics Research Unit Explores Biomass Utilization Opportunities on the Bitterroot National Forest

Dave Calkin, Research Forester, RMRS, Economic Aspects of Forest Management on Public Lands, Missoula, MT

Almost a million tons of biomass left over after thinnings designed to reduce hazardous fuels and increase tree vigor, thus decreasing susceptibility to insects and disease, could provide significant small business opportunities in the Bitterroot Valley. Researchers with the Forest Service Economics Research Work Unit and the University of Montana are exploring opportunities to use forest waste material for industrial and public facilities. An example would be the biomass heating systems recently installed in the Darby and Victor, MT school districts. Biomass utilization 1) encourages sustainable community development, 2) reduces environmental effects associated with open burning of excess forest fuels, and 3) defrays costs of necessary hazardous fuel reduction treatments on public and private lands. Biomass utilization can help the Forest Service achieve its goal of reducing hazardous fuels.

Availability and costs of obtaining materials are key factors in deciding whether biomass industries are financially viable. As such, researchers have evaluated potential volumes and costs of collecting biomass from fuel reduction treatments in Ravalli County, MT. A recent study showed that 12 to 14 green tons per acre of biomass are available from approximately 67,000 acres identified as high priority for selected fuel reduction treatments. This results in over 800,000 tons of potentially available biomass material (enough material to fuel over 50 schools the size of Darby for 20 years). The researchers estimated it would cost approximately $9 per ton to chip the residual material from a whole tree logging operation and transport it to a central collection location in Darby. Collection and delivery costs for the whole tree logging system are comparable to the cost of piling and burning the material on site. Cut-to-length logging systems that process materials in the woods are more expensive—$31 per ton to collect and deliver the materials to Darby.

Additionally, researchers are using landscape modeling tools to determine how small-diameter timber utilization could change fuel treatment opportunities on the Bitterroot National Forest and the Colorado Front Range. These models take into account how the forests change over time because of growth and how fuel treatments can best be scheduled to reduce the effects of wildfire. This information will be incorporated into the Trapper Bunkhouse Land Stewardship Project to estimate potential biomass volumes available from proposed treatments.

Biomass utilization is an integral component in any solution that addresses the hazardous fuels issues currently experienced in much of the western United States. BEMRP research funding is leveraged with other Forest Service funding to identify potential solutions to this challenging problem.

Wood chips ride a conveyor to Darby School's new biomass boiler. This alternative reduces school heating costs and effects associated with open burning of excess forest fuels. (Photo courtesy of USDA Forest Service.)

A slash bundler collects biomass as part of a field trial in the Bitterroot Valley to study the economics of collecting and using biomass from fuel reduction projects compared to burning it on site. (Photo courtesy of the USDA Forest Service.)

Biomass boilers use wood chips, needles, and bark from hazardous fuel reduction projects to provide efficient fuel for school heating systems and reduce air quality impacts from open burning of wood materials. (Photo courtesy of USDA Forest Service.)

Determining Thinning and Prescribed Burning Success from Tree Growth

The photo on the left shows a dense, slow growing, fire-prone stand of pine in the Lick Creek Research Area before treatments in 1991. The photo on the right shows the same view 12 years following thinning and prescribed burning treatments. Crown fire potential has been significantly reduced, and the trees and grasses and forbs are more vigorous. (Photos by Mick Harrington.)

Mick Harrington, Research Forester
RMRS, Fire Ecology and Fuels, Missoula, MT

Looking across the landscape of the Bitterroot Front, we see vast areas covered with dense forests. Some assume this condition is "natural" and has remained unchanged for centuries. However, examination of sites with old trees, indications from historical photographs, and other scientific evidence strongly suggest that lower elevation ecosystems had significantly fewer but larger trees, most of which were ponderosa pine. The dense forests with increased numbers of Douglas-fir that we see today have resulted from 75 to 100 years of active management, including cutting large trees and suppressing wildfires. Apparent consequences of this forest condition are becoming evident and include landscape-level severe wildfire and large-scale insect attacks. Management wants to reduce forest density, primarily the Douglas-fir, and forest fuels accumulation in an attempt to improve tree health and reduce the probability of severe fire.

Several studies initiated by the Fire Ecology and Fuels Research Work Unit at the Fire Sciences Lab were established on a small scale to evaluate the effectiveness of active forest management. If results are favorable, National Forests could apply these treatments on a larger scale. Two studies have been on-going long enough to assess tree growth response. Growth rates we are evaluating would be responses to several thinning and prescribed burning treatments implemented to change forest structure (tree numbers and sizes) and composition (different species) to 1) resemble stable historical conditions, 2) increase forest health by reducing competition, and 3) reduce the probability of uncharacteristically severe wildfire. Tree growth is a good indicator of health because trees add new wood each year in proportion to the amount of food (carbon) produced by photosynthesis.

From 1992 to 1994, we applied different thinning and prescribed burning treatments, using a replicated research design, to several forest stands in the Lick Creek Research Area near Lake Como on the Bitterroot National Forest. One project planned for late summer of 2005 is to determine the success of these early 1990s treatments by remeasuring diameters and heights of several thousand trees 12 years after treatment. We will also take tree cores from a small sample of trees to precisely measure individual yearly growth rings. Tree growth in areas where thinning alone and thinning and prescribed burning occurred will be compared to growth in areas where no treatments took place. In addition, we will compare growth of trees that sustained some inevitable prescribed fire damage, such as scorched foliage, to growth of trees with no damage.

Sites with very old trees, often called old-growth sites, are rare, so there is much interest in preserving them. It has become increasingly clear that historically, fires sustained old-growth stands across the landscape by keeping competition and fuels at a minimum, allowing trees with high fire resistance to become old and large. Sometimes in our effort to protect stands with old trees, we have attempted to remove disturbances that historically kept them viable, such as suppression of wildfires. However, this well-meaning action has increased chances that these old trees will face mounting competition from new trees and the potential of severe wildfire. In 1999, we initiated restoration treatments in a stand of 350-year-old ponderosa pine and western larch just north of Missoula by thinning and prescribed burning the young trees. Six years later we are preparing to measure the growth rates of these old trees to determine if they are healthier as a result of our treatments and better able to resist insect attacks. Diameters will be remeasured and trees' core growth rings evaluated and compared to measurements of old trees in untreated stands.

Earlier measurements have already determined that thinning and fuels reduction activities on these two sites (Lick Creek and the old-growth sites) have significantly reduced risk of a stand-destroying wildfire. Results from this current tree growth research will help determine the important treatment impacts on forest health.

Vegetation Recovery across Wildland Fire Severity Gradients in Western Montana

Peter Kolb, Extension Forestry Specialist, Montana State University/Adjunct Professor, University of Montana, Missoula, MT, and LaWen Hollingsworth, Fire Ecologist, Helena National Forest, Helena, MT

From the warm, dry forests of lower elevations to the cold, wet subalpine forests, western forested landscapes have been shaped by fire. Firefighters, land managers, and researchers want to understand why wildfires behave as they do, what influences the severity of fire effects, and how fire severity affects vegetation recovery. These seemingly simple questions have a myriad of not-so-simple answers that are not always well understood.

The year following the fire season of 2000, we used BEMRP funding to establish 100 transects on the Bitterroot National Forest and Sula State Forest to investigate forest structure effects on fire behavior and fire severity. We remeasured these transects in 2003 to determine post-fire vegetation recovery, which may be influenced by differing management history, fire behavior, fire effects, slope, aspect, slope shape, and position on slope (see photos A - D). We determined fire severity in two ways. First, we used a severity rating based on overstory fire effects—crown fire (high severity), lethal understory (mixed severity), or surface fire (low severity). Second, we examined impacts on the soil surface's organic layer and assigned a rating: 1) litter burned and duff intact, 2) litter and 50 percent duff consumed, 3) all litter and duff consumed, and 4) all organics consumed and mineral soil scorched.

It appeared that pre-fire surface fuel loading and weather conditions during the fire had major effects on fire behavior. A study examining similar stand structures and topographic positions, further stratified by fire weather information (time of day, temperature, relative humidity, wind direction, wind speed, rate of spread, and estimated fire intensity), might provide more conclusive results.

Between initial vegetation sampling in 2001 and remeasurement in 2003, forb and graminoid (a grass-like plant) cover remained nearly equal, but shrubs and moss showed significant increases in cover. Scientific literature indicates post-fire recovery is determined by colonizers that seed into

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A

Summer 2001 photo of a severely burned and subsequently salvage-logged plot on Sula State Forest. Site burned in August 2000 and was salvage logged December 2000 to February 2001. (Photo by Peter Kolb.)

B

Same location as Photo A, taken summer 2003. (Photo by Peter Kolb.)

C

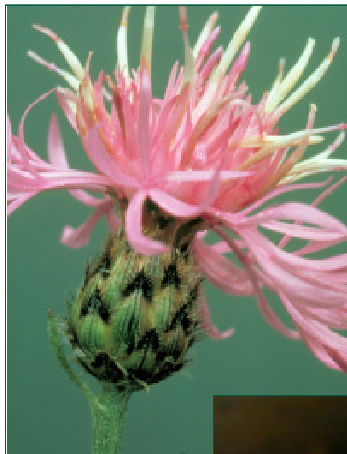
Summer 2001 photo of a site that severely burned in August 2000 but received no post-fire treatment. (Photo by Peter Kolb.)

D

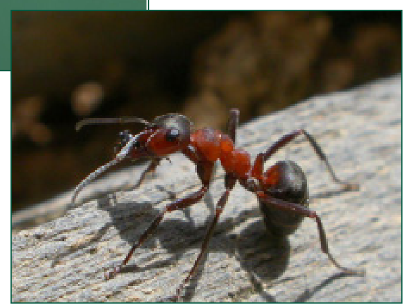
Same location as Photo C, taken summer 2003. Vegetation 3 years post-fire was largely determined by pre-fire vegetation, initial burn severity, and proximity of colonizer plants (including weeds) to the disturbed area. Salvage logging had no effect on vegetation composition and recovery during the first 3 years post-fire. (Photo by Peter Kolb.)

Ants and Spotted Knapweed Team Up

Joe Jensen, M.S. Forestry, University of Montana, College of Forestry and Conservation, Missoula, MT



Left: Spotted knapweed (Centaurea maculosa)*, an exotic plant invader of western North America, overruns native plant communities, affecting native fauna from elk to ants. (Photo by Cindy Roche.)*



Below: Ants like this Formica rufa appear to be attracted to the seeds of spotted knapweed, dispersing them in exchange for a nutritious reward found on the seed called an elaiasome. (Photo by S. Aubert, R. Hurstel, and M. Noël.)

Consider an unusual set of cooperators—ants and spotted knapweed. Ants likely enhance knapweed's territorial conquering of the greater western Montana ecosystem. While it is accepted that invasive plants impact native systems, we know little about the specific nature of these effects. This study examined impacts of spotted knapweed invasion on native ant communities, as part of a larger BEMRP-funded study led by the Wildlife Ecology Research Work Unit of Rocky Mountain Research Station.

Ants are eusocial: they live in a community, with each individual assuming a role within a caste that performs specific duties for the colony. In most ant colonies only one ant, the queen, lays eggs. The queen mates with male ants, which are rare and only found during breeding. In contrast, the majority of ants in a colony are non-breeding individuals known as workers. The workers clean and defend the nest, forage for food, and raise the young.

Ant colonies begin when a newly-mated queen ant digs a small nest and lays eggs therein. The eggs hatch into the colony's first workers, which enlarge the nest and forage for food. The foraging and nest expansion enable the queen to lay more eggs, producing more workers. If and only if the colony is able to secure enough food and survive the predation of larger animals does it undergo a reproductive event, producing unmated queens and males. The colony releases the unmated queens and males at the same time as other ants of the same species so that males and queens from different colonies can mate with each other. After mating, the males fly off to die, while the new, newly mated queens find colonies of their own.

My research suggests that spotted knapweed actually promotes ant communities. I found that savannas invaded by spotted knapweed had a higher diversity of ant species than savannas dominated by native plants. Furthermore, I found that colonies produced more new queens and male ants in knapweed-invaded savannas.

Next, I investigated how spotted knapweed may promote ant communities. Elaiosomes—nutritious nodes found on seeds of some plants—that develop on seeds of spotted knapweed presented one possibility. Ants typically collect seeds of elaiosome-bearing plants, later discarding the seeds and eating the elaiosome. While the ants gain a nutritious food source, the seed also enjoys several benefits, including greater dispersal distances.

To determine whether elaiosome-bearing seeds of spotted knapweed attract ants, I conducted an experiment. I found that native ants readily removed spotted knapweed seeds, but they ignored the seeds of two native plant species. Most of our native plants, including those used in the experiment, lack elaiosomes. This suggests that elaiosomes on spotted knapweed seeds attract ants and serve as a food source. In addition, it is likely that ant dispersal of spotted knapweed seeds enhances the plant's ability to invade undisturbed plant communities.

The fact that ant diversity appears to be greater in areas invaded by spotted knapweed, coupled with the likelihood that ants consume the elaiosomes and disperse the seeds of spotted knapweed, suggests a mutualism may have formed between the plant and insect. A mutualism is a relationship where both participants help the other. In the case of ants and spotted knapweed, ants gain a nutritious food supplement, which promotes ant reproduction and allows for more diverse communities. Spotted knapweed seeds in turn are dispersed farther with the help of ants. If this relationship does exist, then ant communities likely increase the invasiveness of spotted knapweed.

Visualizing a Landscape. . . *(from page 3)*

Bunkhouse Land Stewardship Project (Trapper Bunkhouse). (See also article on p. 20)

The next modeling step entails developing other treatment alternatives for consideration. We will simulate all alternatives using both SIMPPLLE and the fire behavior models FARSITE, FLAMMAP, and MTT, as shown on the right-side of the Modeling Flow Chart. Researchers will compare these results to "no treatment" simulations to predict treatment effectiveness in terms of changes in fire spread rates, fire intensity, and the likelihood of fire at specific locations across the landscape.

Models involved in this study address different important aspects of fuel and forest health restoration. The Trapper Bunkhouse Project gives researchers and managers an opportunity to collaborate on investigating how best to integrate use of these diverse models to effectively address critical questions surrounding vegetation treatment design. The Beaverhead-Deerlodge National Forest is using a similar approach. It's part of a national effort to test alternative approaches for planning locations of fuel treatments to reduce the likelihood of severe wildland fire in locations with significant values at risk.

Human Aspects of Fire and Fuels Management in the Northern Rockies

Katie Knotek, Social Science Research Assistant, RMRS, Aldo Leopold Wilderness Research Institute, Missoula, MT

Humans are a part of forest and grassland ecosystems where we live, recreate, work, obtain timber products, and seek spiritual solace, among many other uses. Therefore, it's important to consider the human aspects of sustainable management of these ecosystems. BEMRP social scientists are working to understand meanings people assign to the Bitterroot National Forest and how these meanings interact with public attitudes toward fire and fuels management. These scientists have also been studying how, on the Lewis and Clark National Forest, the Forest Service has engaged the public in fire and fuels management efforts.

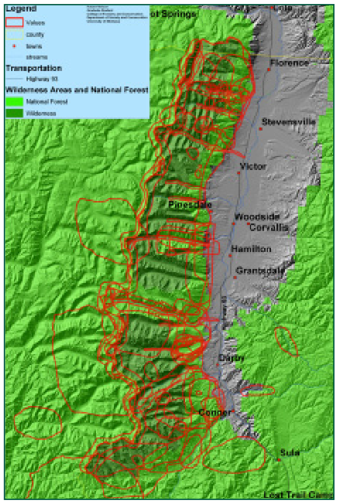


Figure 1 – Some people value specific places, while others value large parts of the Bitterroot Front landscape. (Graphic courtesy of the Leopold Institute.)

The Northern Rockies serves as a unique laboratory for investigating human issues related to fire and fuels management across a landscape that extends from federally protected Wilderness to houses intermingled with forest and grasslands. As part of planning for a landscape-level fuels treatment project on the Bitterroot National Forest, BEMRP social scientists conducted a baseline assessment of human meanings attached to the Bitterroot landscape, from the valley floor to the crest of the Bitterroot Range. Scientists found that people attach meanings both to places they go and places they don't go, and some people value specific places, while others value large parts of the landscape. For example, one describes the familiarity of a canyon he rode with his dad as a child. Another describes an entire watershed that could provide medicinal plants, but he has never personally visited it. GIS mapping (fig. 1) of the spatial distribution of these human values provided social data that, coupled with ecological modeling efforts, could be used to evaluate social and resource trade-offs among alternative fuels treatments.

BEMRP social scientists have also interviewed Lewis and Clark National Forest managers and local community members about a large prescribed burn in the Scapegoat Wilderness (fig. 2). The burn established conditions that will allow fire to play a natural role within the Wilderness in the future while decreasing the chance that fires will move out of the Wilderness. The interviews are helping us better understand how the Forest Service engages the public to accomplish fire and fuels management. Although data analysis is ongoing, preliminary results indicate that certain agency behaviors and organizational characteristics displayed during the planning and implementation of the prescribed burn positively

Figure 2 – Social science project manager, Katie Knotek, interviews community members to understand how landscape changes affect their relationship with public lands. (Photo courtesy of the Leopold Institute.)

influenced public trust in the agency and support for the burn. For example, agency personnel, sensitive to public information needs about the burn, initiated one-on-one contacts with concerned individuals or small groups within the local communities. Also, agency personnel intentionally provided detailed information to the public concerning the Prescribed Fire Plan, including required conditions to ignite the burn and contingency resources that would be available during implementation.

The BEMRP social science research program is helping Forest Service managers assess how their planning and implementation of fire and fuels management influences relationships people have with National Forests and with the Forest Service. Attention to these human aspects is essential for succeeding in fire and fuels management.

New Publication Available

To minimize effects of hazardous fuel reduction projects, land managers need to understand their potential impacts on natural resources. Research and case studies have provided valuable information on effects of thinning and prescribed fire on resources such as soils, wildlife, understory vegetation, and others. A new annotated bibliography focuses on this kind of research in the Northern Rockies, mainly in ponderosa pine, western larch, Douglas-fir, and lodgepole pine forests. The draft bibliography will be published as a General Technical Report through the Rocky Mountain Research Station.

Ritter, Sharon A.; Sutherland, Elaine Kennedy; McCaughey, Ward; Scher, Jan. *Hazardous Fuels Reduction Treatments in the Northern Rockies: An Annotated Bibliography*. Draft available online at http://forest.moscowfsl.wsu.edu/fuels/ (then click on publications).

"It's a Different World"—A Visit with Ranger Chuck Oliver

Janie Canton-Thompson, Social Scientist and ECO-Report Editor, R5, Recreation Solutions Enterprise Team, Missoula, MT

Chuck Oliver, Darby District Ranger, Bitterroot National Forest. (Photo by Nan Christianson.)

"Think outside the box." "Get outside your comfort zone." "Look at the big picture." "See how all the pieces fit together." "Think landscape scale." "Think economy of scale." "Collaborate." "Work through controversy." "Practice multiple use." These statements capture Chuck Oliver's philosophy of work and life. Chuck became Darby's district ranger in October 2003.

Born and raised in Albuquerque, NM, he was a city kid who found school uninteresting and liked having fun. Following graduation and being adrift regarding his future he remembered being enamored with "the guys in the green uniforms" he'd seen in campgrounds on family vacations. He enrolled at New Mexico State University where he received an undergraduate degree in range management and a master's degree in agricultural economics.

In 1989, Chuck obtained his first Forest Service position in Butte, MT, as a range conservationist for the Butte District, Deer Lodge National Forest, eventually transitioning to an operations research analyst/planner job in the Supervisor's Office. Next, he obtained a supervisory range conservationist position on the Reserve District, Gila National Forest, NM, in 1994. The work had its rewards—days on horseback with permittees checking allotments—but included challenges as well. It was the height of the "Sagebrush Rebellion" as livestock numbers were being reduced on allotments, and the environmental community adopted the area as "their poster child for bad grazing." Caught in the middle, Chuck gained valuable experience in diffusing controversy in some pretty ugly situations.

Next, he became District Ranger on the Parks District, Medicine Bow-Routt National Forests, Walden, CO, in October 2001. Chuck's experience on the Reserve District equipped him to deal with more anti-government issues. "All these guys wanted was somebody to talk to."

Although beautiful, Walden had 9 to 10 months of winter so when the Darby Ranger job opened, Chuck applied and was selected. Darby allows him, his wife, Jeanette, and their three children to continue small town rural life while pursuing more warm weather activities.

Both District employees and the Darby community have accepted Chuck. "It's been a good transition," he says. Good relationships persist despite downsizing and unprecedented agency changes. Chuck likes challenges. "I'm always looking for new things to do. There are a lot of opportunities here."

Conflict management experience helps in communities when agency decisions threaten livelihoods. Chuck's a people person who likes to attend community meetings to understand where people are coming from and where things are headed. His strong land ethic and multiple use persuasions run deep. Many times he's at odds with both sides of an issue, which helps him bring people together to reach common ground. "I'm a real strong believer in the collaborative process—having people involved in the development of projects as we move forward."

One of Chuck's biggest challenges is the rampant change within the Forest Service. He's frustrated by his inability to soften impacts of these changes, and he knows what it's like to be on an "excess employees list." Every time he tells his staff, "We've hit the bottom; it can't get any worse," it still gets worse. "We've been a can-do agency forever, always done more with less, and it's leading to a wreck."

Wilderness dams are another challenge. Dam owners want access for equipment to maintain dams at legal levels; yet the Wilderness Act forbids it. The Forest Service is caught in the middle.

The District is trying to recover from the fires of 2000 with an exceedingly short budget. Insects harmful to trees are spreading throughout a forest stressed by fire and drought, and widespread blow-down poses serious travel hazards. Bringing opposing sides together to develop a plan to treat fuels and insect problems is a challenge. Meanwhile, not much management is happening on the ground.

Chuck is a real BEMRP champion. Recently, the Bitterroot National Forest identified critical areas needing management, and BEMRP researchers communicated their own respective study interests. Out of these declarations, the Trapper Bunkhouse Land Stewardship Project (Trapper Bunkhouse) (see also articles on pp. 3 and 20) was launched on the Darby district. Here, managers and researchers are considering everything—fuels, bugs, sedimentation, visuals, fire danger, wildland interface (WUI) concerns, and travel management—holistically instead of taking a "piece-at-a-time approach."

Both researchers and managers realize there's been a gap in how they work together. Managers are encouraged to use "best science," but best science doesn't always seem to fit real world management needs. BEMRP's Trapper Bunkhouse Project has moved both groups beyond this stumbling block. Researchers are participating on the Interdisciplinary team, attending community meetings, and listening to all concerns as

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Big Picture Way of Doing Business—A Ranger's Perspective

Janie Canton-Thompson, Social Scientist and ECO-Report Editor, R5, Recreation Solutions Enterprise Team, Missoula, MT

Tracy Hollingshead, Sula District Ranger, Bitterroot National Forest. (Photo by Nan Christianson.)

"As a wildlife biologist I always had an interest in the big picture, how work at the ranger district could all fit together, and coordinating my work with other functions. That's always been something I've stuck my nose in," says Sula Ranger Tracy Hollingshead.

Living "all over" Washington seemed normal to Tracy. Her father was a banker and transferred offices often. The family always lived in small communities and camped, hiked, and fished together, stimulating Tracy's interest in biology.

Tracy attended Central Washington University at Ellensburg where she received her biology degree, with a wildlife management emphasis, in 1985.
Here, she gained extensive field experience in diverse ecological types. During college, she trapped gypsy moths for the State of Washington and assisted its Department of Fish and Wildlife with mule deer research.

Two months after graduation, she became a fire crew member on the Darrington Ranger District, Mt. Baker-Snoqualmie National Forest, in Washington. Two seasons later, she was offered a seasonal wildlife biologist position, which she accepted. "That was a tough decision. I loved fire."

In 1990, the Mt. Baker-Snoqualmie National Forest's White River District offered Tracy her permanent wildlife biologist appointment. When the spotted owl controversy prompted large-scale Forest downsizing, she volunteered to find other work. "I loved working with spotted owls, but I was also interested in trying something new and working in a different type of ecosystem."

Obtaining a wildlife biologist position on the Wasatch-Cache National Forest in 1993, Tracy "went to a perfect place where elk winter range, aspen, moose, and goshawks were the issues. When I moved there, there were no threatened or endangered species so I was able to get out in the field a lot. It was a great job!" Over time, she increasingly served as acting district ranger.

Wanting to stay in the Northwest, Tracy accepted a permanent district ranger position on the Sula District, Bitterroot National Forest, in 2003. "I've never had a bad experience moving. It's exciting to learn about a new area and meet new people," she says. "The ranger district is where it's at. I enjoy the atmosphere and the camaraderie that goes on at a ranger district. Everybody pitches in to get things done."

I asked Tracy what assets she offers the Forest. "I think it may be people skills. I enjoy dealing with different people, both the public and internally. That's interesting to me—working with people and their issues." Her big picture approach helps too. "The district is where things get done, and this Forest has some great people to work with who are very capable, and team-oriented."

Overall, Tracy feels her reception by the local community and ranger district has been good. Many local landowners are particularly happy about the District's Middle East Fork Hazardous Fuels Reduction Project. After the 2000 fires, much of the surviving forest fell victim to an exploding Douglas-fir beetle population, and local folks fear another devastating fire. With the Middle East Fork Project implementation, fuels in the interface will be reduced, dead and dying trees will be removed, and healthy trees can more easily secure needed water and nutrients, helping them more successfully withstand fire and beetle attacks.

The Healthy Forest Restoration Act (HFRA) requires "upfront collaboration," a huge challenge for stakeholders who embrace fundamentally different perspectives on landscape management. "Many local residents have been very positive. It has not been as positive with some who are not supportive of this project," says Tracy. With HFRA projects, "We have the opportunity for up-front collaboration where we may have very different viewpoints but can talk about things early on in the project planning stage."

Priorities for the District include restoration opportunities in the burned area, the Middle East Fork Project, and travel management. Tracy has joined the Forest's travel management team. "I have gained experience working on similar teams in other places," she says. Travel planning offers many opportunities "to work with the public to develop a road system that makes sense for a variety of recreational uses, forest management, and fire protection." Travel management is also a prerequisite to quality wildlife habitat. Likewise, accommodating and satisfying multiple uses—cattle, horses, skiers, off-highway vehicles, mountain bikers, hikers, and others—are ongoing travel issues.

Also a member of the Forest budget team, Tracy hopes "to afford the folks we have, mentoring and giving people opportunities to try something different, if that's what they're interested in. That's what happened to me. I had district rangers interested in helping me out."

Tracy strongly supports BEMRP. "The project in Laird Creek is a great thing—having the opportunity to interpret and use it as an educational tool about fire and its effects. A lot of people have never really seen what a forest fire looks like. You

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Vegetation Recovery . . . *(from page 7)*

disturbed areas and survivors that resprout following fires. Our data indicated the most prevalent species had a combination of both traits. Post-fire plant recovery data suggested that across Douglas-fir habitat types, immediate post-fire vegetation was dominated (approximately 70 percent) by survivors. Species such as pinegrass and snowberry showed a high resprouting capability immediately after the fire and, in years following, were very aggressive seed and rhizome producers that colonized more severely affected sites.

As predicted, noxious weeds like spotted knapweed appeared to invade burned areas. Where knapweed was present in 2001, this species increased by approximately 30 percent over the next two years. Similarly, by 2003 knapweed occupied slightly more than one-third of the transects that previously had no knapweed. Knapweed survival and invasion occurred most frequently on sites that experienced mixed-severity soil surface effects. We speculate that severely burned areas had little residual survival of preexisting knapweed whereas mixed-severity sites had residual survivors that provided a seed source for invasion into adjoining severely affected soil patches.

Salvage logging occurred on one-third of the transects during the winter following the fires in areas that had experienced stand-replacing fire with complete overstory mortality. When compared with unlogged sites of similar overstory severity, we found no significant difference in vegetation recovery although total vegetation cover was slightly higher on salvage-logged sites. Areas not salvaged displayed less variability in species abundance (high evenness) than vegetation in areas that were harvested. Species diversity was similar on both treatments.

Finally, we compared fire severity estimates across overstory vegetation and soil surface characteristics. Although there was some correlation among these variables, a significant number of transects showed discrepancies in these correlations. We speculate several scenarios are responsible for this. Like the number of factors contributing to overall fire behavior, similar elements may contribute to fire severity. For example, a crown fire supported by low understory fuel loadings may have few impacts on soil surface organic matter. Alternatively, a slow-moving surface fire burning through heavy surface fuel accumulations, such as a thick duff layer, can have significant negative effects on the soil surface and plant community while leaving much of the overstory intact. Such differences need to be recognized during post-fire rehabilitation efforts.

Some correlations between stand structure and fire behavior appeared to exist, but our sample size and replication of similar stand structures were too small to draw significant conclusions. Continuing research, together with the findings of this study, will enhance our knowledge of the subtle, and seemingly obvious, factors that influence fire behavior and effects.

New Faces in Collaboration

Chuck Oliver . . . *(from page 10)*

they formulate research questions. Researchers come to realize what information managers need to make things work on the ground while managers are increasingly aware of what researchers can do for them. "They [researchers] are out with our people on the ground looking at what's out there so we can make the adjustments together to get what they need, and we can get what we need. I'm excited about it. I think it's a great project." From the beginning, the public has been impressed with what researchers and managers can accomplish when they pool their collective skills.

Asked about BEMRP's future direction, Chuck replied, "I'd love to continue down this route getting research folks tied in with on-the-ground projects where what they produce for us becomes a tool for us. We've talked about what's real and what's not real on the ground, what works and what doesn't work. It saves us a lot of time, energy, and money because those questions are answered, and we feel good about them."

Hope permeates Chuck's vision for his District. He'd like to move toward more true collaboration. District projects could be planned and implemented by all interests who willingly talk through differences and develop mutually acceptable solutions. Only then can they say, "We have buy-in from across the spectrum."

Chuck believes economy of scale is important and wants to turn from traditional small projects to large projects where ecosystem or area-wide analyses cover more than one thing at a time. People tell him things like "You can't do this because this is the Bitterroot," "It's too complicated," or "It's a different world." Chuck disagrees. "I'd like to be able to make the transition to looking at a more comprehensive view of the Forest. The Trapper Bunkhouse is my first baby step." In-house skeptics warn "it's going to get shut down as soon as it hits the street," which undermines the ability to accomplish anything on the ground. Chuck says that thoroughly analyzing 10,000 acres doesn't cost much more than analyzing 1,000 acres, and it can be just as sensitive to resource management issues.

Involvement of community young people in District operations is part of Chuck's vision. He believes many of his agency's problems are caused by misperceptions. If the Forest Service can show young people what's happening in our forests, Chuck believes future employees' jobs will be easier. He appreciates employees who set the stage through work-in-school programs. Because of this effort, local schools are asking about opportunities for students to assist with District projects.

While the Bitterroot might be a difficult case, Chuck is determined to prove things can get done on the ground with the endorsement of groups holding multiple perspectives. It takes perseverance, loving a challenge, being a people person, and thinking outside the box. It takes someone like Chuck who reminds us, "If it's not illegal, immoral, or unethical, we need to be considering it." It just might work "in a different world."

Learning About Burned Forests

Sharon Ritter, Research/Management Coordinator and Assistant ECO-Report Editor, Bitterroot National Forest and BEMRP, Hamilton, MT

There's a photo that sticks in my mind. It was taken in September 2000, just a month after fires started burning through more than 360,000 acres of Ravalli County, Montana. The photo (fig. 1) shows an ash-covered forest floor and blackened stems of a shrub. You would think it was a black-and-white photo, except that at the base of the shrub are bright green willow shoots, taking advantage of a flush of nutrients to start reclaiming the forest. To me, it's a symbol of the forest's ability to renew and sustain itself, as long as we don't interfere too much with natural processes.

Figure 1 – A shrub resprouted from roots at its base before the smoke even cleared on the Bitterroot fires of 2000. ((Photo courtesy of USDA Forest Service.)

After the fires, the Bitterroot National Forest led numerous public tours into the burned areas. In 2004, BEMRP and the Forest decided it was time for another tour. This time, we would look at how the land had recovered, both on its own and with human help. We also would listen to researchers and managers who had made the burned area into a laboratory over the past 4 years.

Thirty-two participants, mostly from the public, traveled to the Laird Creek drainage in the southern Bitterroot Valley in Montana. This area includes private and Forest Service lands with a mixture of forest types and fire severities. The area also was hit hard by thunderstorms a year after the fires, causing debris flows and flooding. Since the fires, there have been some salvage logging, erosion control, seeding, road obliteration, new culverts, and planting of trees and shrubs. Beetles flew into the area to take advantage of weakened trees. It was a perfect site to talk about a number of issues related to burned areas.

Our first stop was at the former location of the last private house before the Forest boundary. From there, we could see an empty foundation, debris flows, obliterated roads, vegetation recovery, a new fish passage culvert, and severely burned forest. Kevin Hyde, a hydrologist who studied two drainages involved in the debris flows, encouraged us to think of them as "gully rejuvenation." After all, these are natural events, as evidenced by alluvial fans at the bases of many drainages throughout the valley. Forest Service fisheries biologist Mike Jakober talked about the widespread fish kill that occurred during the fires and the steady recovery of populations of westslope cutthroat and bull trout since (fig. 2).

Figure 2 – The Laird Creek tour gave members of the public a chance to hear from experts such as Bitterroot National Forest Fisheries Biologist Mike Jakober (far right) and Management & Engineering Technologies I'ntl (METI) Landscape Modeling Hydrologist Kevin Hyde. (Photo courtesy of the Ravalli Republic.)

Our second stop gave us a view of old plantations, a mosaic created by the fire, and vegetation recovery. Here, Kristina Smucker from the University of Montana talked about her research on bird use of burned forests compared to unburned ones. Each species responded differently to the burned landscape, leading her to conclude that the best situation for birds is providing a variety of fires over space and time.

At our third stop, Terrie Jain, Rocky Mountain Research Station in Moscow, Idaho, talked about some conditions present on the ground pre-fire such as canopy density, surface fuels, and height to the base of the crown. She then explained how they affected fire severity. As we headed back down the mountain, we stopped to look at some salvage logging and discuss problems with meeting the Forest's fuel reduction goals in the burned area.

The best part of all our field trips over the years has been the interaction among participants. At each stop, pairs and groups of people got into productive discussions about what they had seen and been told. As field trip coordinator, it was my job to keep the tour on schedule. This required some figurative nipping at their heels to get them onto the bus. Tours we've conducted on the Bitterroot have been popular and well-attended. The public and resource managers appreciate the time researchers take out of their busy schedules to share their latest findings.

Of Birds, Bugs, and Weeds

Chipping sparrow with color bands, used to uniquely identify individual birds. (Photo by Aubree Benson.)

Yvette Ortega and Greg Jones, BEMRP Program leader, record information on chipping sparrows at one of the research sites that is mostly knapweed free. (Photo by Sharon Ritter.)

Sharon Ritter, Research/Management Coordinator and Assistant ECO-Report Editor, Bitterroot National Forest and BEMRP, Hamilton, MT

In an ecosystem, everything is connected to everything else in ways that we can just barely begin to comprehend. This interconnection helps sustain ecosystems over the long-term, so that often something that threatens one part of the system threatens all of it. Scientists from different disciplines need to work together to understand ecosystems' complexities and interrelationships. The more we understand, the better we can predict what may happen if something changes in an ecosystem, such as our management actions or invasion of an exotic organism.

BEMRP encourages research that integrates various disciplines. A great example is a project headed by Yvette Ortega, in collaboration with Dean Pearson and Kevin McKelvey from the Wildlife Ecology Research Work Unit, Rocky Mountain Research Station, Missoula. Their project studies impacts of weeds on migratory birds, insects, and native bunchgrasses and forbs. It also assesses effects of herbicide treatments aimed at controlling knapweed. The project started with and continues to receive BEMRP funding, and it has attracted many times more dollars from outside grants because of its interdisciplinary approach and practical value to land managers. Yvette and the Lolo National Forest worked together to find a number of study areas meeting their requirements—similar vegetation community types, some infested with spotted knapweed and others mostly knapweed-free; accessible for study; and at approximately the same elevation.

They also tend to be steep. Greg Jones and I visited a couple of Yvette's study sites in June 2004. Although Greg and I consider ourselves in good shape, we still huffed and puffed behind Yvette, who climbs those hills daily. Fortunately, there were plenty of wildflowers to marvel over while I caught my breath, and the morning fog cooled us.

Yvette chose the chipping sparrow as the focal bird species because it is a common inhabitant of native grasslands that have scattered ponderosa pines and shrubs. Chipping sparrows are easy to observe and common enough to get a good sample size. It is an insectivore during the summer breeding period and a seed eater the rest of the time. It feeds on the ground and nests in trees and shrubs, so it's dependent upon several resources in the study area.

Yvette is clearly tuned into the nuances of chipping sparrow calls and behaviors. She and her crew previously found and marked nests in various stages of construction, and now she checked them to determine their status. By recording nest statistics such as starting date, commencement of incubation, hatching date, number of eggs, and so on, she is able to have a complete record of most if not all chipping sparrows using the study plots. She and her crew also have mist nets set up to capture birds. Yvette and crew broadcast chipping sparrow songs and calls from speakers placed on either side of the net. So, if a bird approaches one side of the net, they can switch on the speaker on the opposite side and hope the bird flies into the net in pursuit of the supposed intruder. They mark the birds with colored bands to identify them. All of this—nest-watching, mist-netting (capturing birds in nets), reading bands—takes a lot of patience. The day we were there, the crew sat huddled in a light mist, frustrated by a bird that kept coming close to, but never into the net.

Yvette also showed us the insect traps that she is monitoring, in collaboration with Diana Six from the University of Montana. They want to know how the presence or absence of knapweed and the application of herbicides affect insect populations.

Yvette has found that knapweed invasions decrease the abundance of some plant groups such as native bunchgrasses and perennial forbs (particularly arrowleaf balsamroot, a major seed resource for birds and mammals), but not annual forbs. She also found that chipping sparrows in knapweed-infested sites had reduced abundance, delayed breeding, reduced reproductive success, and reduced site fidelity. This long-term research study, with data on pre- and post-treatments with herbicides, will give her the data to assess our ability to mitigate ecological impacts of knapweed invasion.

Brochure Update
Lick Creek Demonstration/Research Forest Driving Tour

Brooke Thompson, Fire Management Officer, retired, Bitterroot National Forest, Stevensville, MT

The tall pines and gentle slopes of Lick Creek have a fascinating story to tell, much of it well documented. Simple to find and easy to tour in almost any vehicle, the Lick Creek Demonstration/ Research Forest lets visitors immerse themselves in a pleasant outdoor recreational experience that leaves them a bit better informed and more appreciative of how they relate to the natural world around them. Anyone interested in driving through a stunningly beautiful, well-managed ponderosa pine forest should check out this updated, informative tour opportunity. Situated on the Bitterroot National Forest's Darby Ranger District, and adjacent to the popular Lake Como recreation site, the Lick Creek autotour offers much to a recreational visitor as well as the serious student of forest resources.


United States Department of Agriculture
Forest Service
Bitterroot National Forest

LICK CREEK
Demonstration/Research Forest
Interpretive Auto Tour

Welcome to the Lick Creek Self-Guided Interpretive Auto Tour. The 7 mile tour takes you through the heart of the Lick Creek Demonstration/ Research Forest. You will encounter 11 designated interpretive stops or points of interest. On the tour, you will not only see majestic views of the Bitterroot and Sapphire mountains, but will learn about the early history, geology, resource management and scientific research that is ongoing in the lower elevation ponderosa pine stands of the Bitterroot mountains.

Figure 1. On the Lick Creek Sale, showing original stand before logging at head of gulch east of ranger cabin, section 20. Year 1909.

The tour starts at the campground junction on the north side of Lake Como and follows Road 5621 to Lost Horse Creek. The tour will take about 1 hour to complete. Tour stops are marked with brown marker posts with white letters. In some cases, you will have to walk across or alongside Road 5621 for short distances. PLEASE USE EXTREME CAUTION IN CROSSING THE ROAD.

This pamphlet is designed to guide you through the historic Lick Creek area and make your experience both educational and memorable. When you complete your journey, you will have a better sense for the history of this unique area and the different kinds of resource management being implemented here.

When you finish the tour, feel free to keep this pamphlet, or place it in the box at the end of the tour so that it can be used again.

Please keep your speed between 15-20 mph, and drive defensively! Some sections of the road are narrow and you will need to be alert for oncoming traffic. Please use turnouts where provided, or pull over to the far right side of the road should you chose to stop along the tour.

Enjoy your ride and have a safe trip!

The first Lick Creek timber sale occurred here during 1906 to 1909. Besides being the first National Forest timber offering of its size (37 million board feet) in the ponderosa pine forest type, this sale had the distinction of being visited by Gifford Pinchot, first chief of the Forest Service, who provided instructions for selecting trees to be harvested.

After the sale, a Washington Office Forest Service photographer documented resultant stand conditions in a number of locations within the sale. Since that time, repeat photography from the same points provides a remarkable record of vegetative development and forest succession that has few, if any, equals in any forest type in the world.

Beginning in the 1940s, forest researchers established permanent plots for monitoring stand growth following harvest, plots which still exist and provide data to the present. More recently, researchers have begun looking at more components and processes of Lick Creek's ecosystem, including effects of thinning treatments and prescribed burning on vegetation development, wildlife forage and cover, bird populations, tree growth, and nutrient flux. Even social scientists have used the area to measure public reaction to various vegetative treatments.

In 1994, Forest Service researchers from the Intermountain (now Rocky Mountain) Research Station, together with Bitterroot National Forest managers and faculty from the University of Montana's School of Forestry (now College of Forestry and Conservation), established the Bitterroot Ecosystem Management Research Project (BEMRP). This project, largely an outgrowth of years of research at Lick Creek, provides an opportunity for collaboration and an avenue of dialogue for researchers and managers as they focus on applied research that informs management opportunities and decisions.

Nearly 15 years ago, the Bitterroot Forest developed a driving tour with an interpretative brochure for Lick Creek. Now, BEMRP and the Forest are revitalizing the tour by issuing an updated brochure that should add greatly to the enjoyment and understanding of this wonderful "outdoor classroom." The tour highlights Lick Creek's value in showing both the dynamic characteristics of our forest resources and revealing how research and management have intertwined here to increase understanding of our natural forest ecosystems.

We expect completion of this project will enhance use and enjoyment of this unique area by providing "user friendly" learning opportunities for students as well as visitors at Lake Como recreational facilities. Look for the newly marked tour stops and brochure, available on site and at Darby Ranger Station, to be in place by early 2006.

A 1909 photopoint on the Lick Creek Demonstration Research Forest on the Bitterroot National Forest. (Photo courtesy of USDA Forest Service.)

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 **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.

ALLUVIAL FAN – a fan-shaped sediment deposit at the bottom of a drainage.

BIOMASS – the amount of all living or dead plant material in an area. In terms of forest biomass utilization, it is often used to refer to the woody material (resulting from forest treatments) that is unsuitable for traditional forest products such as pulp wood or lumber.

BROADCAST BURN – Using fire over an entire unit to reduce natural fuels or logging residue or to restore ecosystem function.

CUT-TO-LENGTH YARDING – A method of harvesting trees by removing branches and tops and cutting logs to specific lengths before moving them to the "landing" prior to transport.

DISTURBANCE PROCESS MODEL – A computer model—for example, SIMPPLLE—of processes, typically at landscape scales, that includes 1) natural disturbances such as fire, insects, and diseases that affect distribution of vegetation and 2) human-caused disturbances such as vegetation treatment and cattle grazing.

FIRE BEHAVIOR MODEL – A model that predicts the rate and direction of fire spread and fire intensity. FLAMMAP, MTT, and TOM are examples of fire behavior models.

GIS MAPPING – Computer software for mapping and analysis of spatial relationships.

INCREMENT CORE – A quarter- to third-inch diameter column of wood taken from a tree trunk, usually for examining growth rings and sometimes age.

LANDSCAPE PROCESSES – Physical and biological systems that work together at a moderately large scale (a "landscape" can encompass most of a major watershed, like the Bitterroot River, or a subset of that major watershed). Landscape processes determine patterns of vegetation and stream networks in a watershed. They include things like fire, insects, and diseases that change vegetation, vegetative succession, and physical variables like climate (affected by slope, aspect, and elevation).

MICRO-SITES – VERY small areas in the environment that may have special characteristics different from the general landscape, such as more moisture.

RHIZOME – an underground stem that produces leaves on the upper side and roots on the lower side.

SLASH BUNDLER – a relatively new piece of equipment developed in Scandinavia that collects and bundles forest residue in the forest for utilization in biomass burning industry.

SPATIAL DATA – An electronic map of environmental or demographic information.

SPATIAL LANDSCAPE MODEL – A computer model—for example, SIMPPLLE—of landscape processes that includes spatially explicit data.

SPATIAL OPTIMIZATION MODEL – A computer model—for example, MAGIS—that uses mathematical optimization to find the 'best' solution based on objectives entered by the user and quantities calculated by the model (these quantities could include vegetation parameters, economics, and resource benefits).

WHOLE-TREE YARDING – A method of harvesting trees by cutting and moving the entire tree to a "landing" where its branches and tops are removed in preparation for transport.

Tracy Hollingshead . . . *(from page 11)*

really get the sense of it when you drive up Laird Creek." She praises both the Laird Creek Forest Discovery Site Project being developed by University of Montana professor and extension forester, Peter Kolb, and the Trapper Bunkhouse Land Stewardship Project (Trapper Bunkhouse) (see articles on pp. 3 and 20).

The Trapper Bunkhouse Project, containing BEMRP research activities, allows us "to see how that research can be used to monitor our management. I think it's a great thing to have that tie with research." Tracy embraces such landscape level analysis projects and sees a real need "to have research help us focus our management and our monitoring." She thinks researchers can help the Forest develop standardized monitoring protocols or plans that can be realistically accomplished.

Off-work, Tracy and her husband, Mark, like to camp, snowmobile, cross-country ski, and travel to new places, sometimes with their 12-year-old chocolate Lab, Nikki. Once very active in a Wyoming Rocky Mountain Elk Foundation Chapter, the couple plans to become involved with the Foundation's Bitterroot Chapter.

In sum, Tracy's vision for the Sula District includes "furthering collaboration efforts with different interests and the public, looking at the burned area and restoration opportunities that exist within the large landscape of burned trees, and continuing our fuel reduction treatments." Tracy's vision is landscape sustainability—a big picture way of doing business.

"People and Forests:" How They Fit Together

Janie Canton-Thompson, Social Scientist and ECO-Report Editor, R5, Recreation Solutions Enterprise Team, Missoula, MT

"I'm really interested in how people are engaged in decision making and … in understanding their relationship to the environment at a local level. Whether that's resource advisory councils, collaborative groups, or community forestry, it's all about how people in proximity to the forest participate in decisions about that forest." The trail that led University of Montana (UM) Social Scientist Jim Burchfield, a BEMRP Executive Committee member, to turn from timber production and silviculture to "people and forests" started with cows.

Jim Burchfield, Associate Dean of the College of Forestry and Conservation, University of Montana, Missoula. (Photo by Theron Miller.)

Jim was raised in Adrian, MI, a small farming town near Ann Arbor where a friend's father owned a dairy. This man became one of Jim's most valuable mentors. When he worked at the dairy during his high school summers, he learned "what a connection to the land means," the bonds of friendship, and a sense of place.

Based on a childhood fascination with space travel, Jim studied aerospace engineering at the University of Michigan. Not for long though. While camping, he encountered some foresters by chance who, in conversation, "wed the outdoors with an actual income-generating vocation. I thought, 'It's too good to be true.'"

Jim graduated with a bachelor's degree in Forest Management in 1973 and immediately became a junior forester for the Ontonagon District, Ottawa National Forest, in Michigan. There, he fought his first fire and got married.

The young couple, seeking adventure, became Peace Corps volunteers in a remote Guatemalan village, spending 4 years operating a bee keeping cooperative with the Mayan Indians. Here, he learned what land management, resource conservation, power, geopolitics, and "living poor" really mean. "It was enormously transforming. The thing I learned was you've got to have production before you have conservation. You cannot expect people to starve while watching the trees grow."

In 1978, Jim became a timber forester on the Wayne Hoosier National Forest in Ohio. During a fire assignment in the western United States, he fell in love with the mountains and big trees, and in 1980 he obtained a silviculturist job on the Mount Baker/Snoqualmie Forest in Washington. While there, Jim completed his master's work in silviculture at the University of Washington. In 1984, he became Director of the International Seminar on Forest Administration and Management, a Forest Service program in the International Forestry Division involving training in tropical forest management.

Soon, Jim became interested in community participation and grassroots decision making on forestry issues. Hooked on getting his PhD in "natural resources and sociology," Jim completed his degree at University of Michigan with a comparative study of the structure, function, and leadership of woodland owner associations. His interest is now "people and forests," but he still calls himself "a multiple use guy," believing "if we act with a reasonable amount of humility we can actually intervene in forests."

In 1991, Jim went to the Washington Office as the International Forestry Division's first policy analyst. There, he became a liaison between the Forest Service and Mexico and did several projects in Mexico, Brazil, and Puerto Rico.

Desiring to be closer to family in the Pacific Northwest, he secured a social scientist position on the Interior Columbia Basin Ecosystem Management Project (ICBEM) in Walla Walla, WA, in 1994. Teamed with UM social science professor Steve McCool, whom he describes as an outstanding researcher, mentor, and friend, they studied "the spectacular transformation" happening in the West in the early 1990s. One of their colleagues exclaimed, "Change [in the West] is happening faster than we can create categories to describe it." During this time, they discovered the forest's role in people's lives is much more complex than just providing timber. They also learned that "community stability was not relevant because there is no such thing as community stability. What there is, is the capacity to adapt. That's what federal policy should be addressing."

For political reasons, the ICBEM Project collapsed in mid-1995. Loaded with research data, Jim traveled around the West making presentations. After a presentation in Missoula, MT, he decided to apply for Director of the Bolle Center for People and Forests, a newly created position at UM. It was tough to leave the Forest Service, but the job perfectly matched Jim's interests, and he joined the then School of Forestry faculty in 1996.

As Director of the Bolle Center, he became involved with BEMRP which supported some of his research. In BEMRP, he found a "wonderful cluster of social scientists working in natural resources who were on the cutting edge of the field." Besides studying communities, forests, and collaborative decision making, Jim volunteered his services to "local groups who wanted to participate in grassroots decision making about their communities' change," and studied how communities responded to wildfire following the fires of 2000.

In 2003, Jim became Associate Dean of UM's renamed College of Forestry and Conservation. He currently teaches classes in collaboration in natural resource decisions, focusing on "understanding the basic drivers regarding humans' relationship to the environment." He is also planning to teach

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People and Forests . . . *(from page 17)*

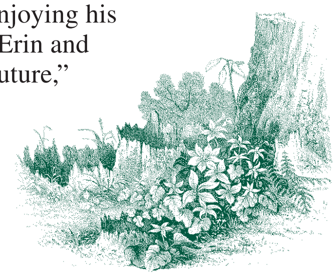
an introductory course on ecological issues—"how we got where we are in the environment and what kinds of choices we have to face in the future. ... I have a great job!" he exclaimed.

Collaboration with graduate students on research concerning people and forests, and psychological meanings associated with attachment to places, is important to Jim. He also remains involved in community service by volunteering to facilitate meetings to help people "negotiate a reasonable course of action [in natural resource decisions]."

Jim noted that during the past decade, public lands have come to be administered by a coalition of interests, with a growing number of organizations engaged in "face to face democracy." He believes community-level decision making can work if it's organized right—not a "free-for-all" with everyone in the room promoting his/her own interests. People can solve seemingly intractable problems by being honest and straightforward, using experts for information and to correct erroneous assumptions, and meeting in a context of mutual respect, information, guided deliberation, and support. While there are no ideal solutions, facilitators who tailor their approach to each community can help make grassroots politics a meaningful experience for people.

Three landmark events have influenced Jim's career: working for the remarkable dairy farmer, "seeing people make a living from the land and understanding the pressure they face to survive" (Peace Corps), and participating in a collaborative group composed of Forest Service and county government officials in southwestern Montana's Ruby Valley. In the latter, he realized that despite significant differences in backgrounds and interests, people "had a lot in common in their expectations for the land." In the future, Jim wants to work more on the sociology of community-based natural resource management. He also intends to ensure that his students understand ecology and social process so that they can knowledgeably contribute to environmental sustainability and understand why others relate to their environment the way they do.

Down the road, Jim wants more involvement with Missoula Valley growth and development. Then there's rafting, swimming, biking, and enjoying his wife, Melissa, and two children, Erin and Alex. "I'm optimistic about the future," he says. I really think that the process of discovery is helping us to make better decisions." People and forests—they are Jim's passion and they fit together.



BEMRP Activities . . . *(from page 20)*

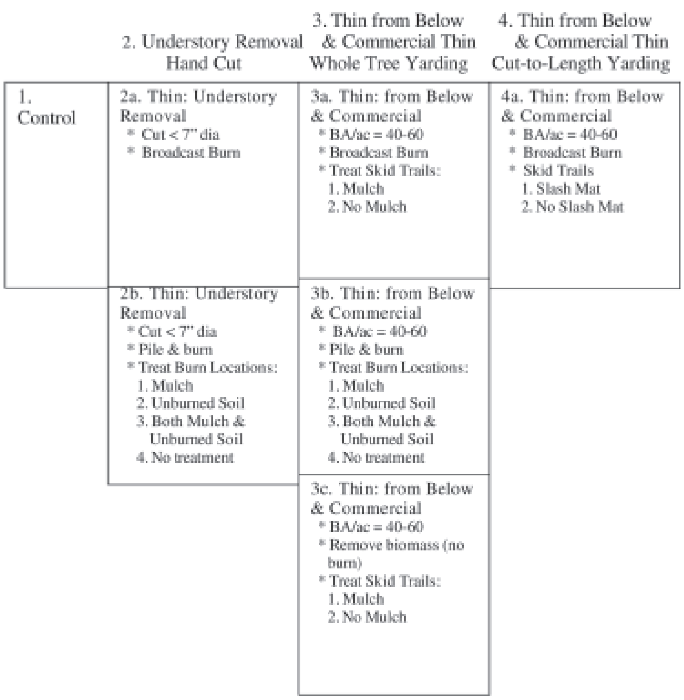


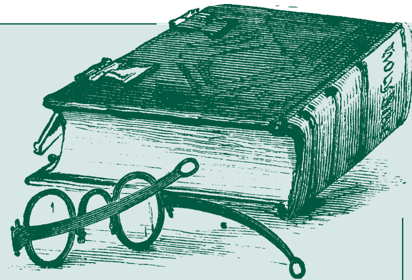
Figure 1 – Schematic diagram for a study plot within the research portion of the Trapper Bunkhouse Project. There would be 3 replications (study plots) of this design. Box shapes are not representative of the shapes of the eventual units on the ground. Unit sizes for vegetation treatments would average 10 acres. (Graphic by Greg Jones.)

that treatments occur by fall 2006 or field season 2007. Studies such as these provide a knowledge base for designing and evaluating impacts of future fuel and forest health restoration treatments.

In addition to the Trapper Bunkhouse Project, BEMRP's cooperating research units have completed some of their studies and continued work on other ongoing research in 2005. These studies address a variety of ecosystem-related topics, including "Ecosystem Management and Invasive Plants: Weed and Biocontrol Impacts on Small Mammals and Efficacy of Herbicide Treatment for Restoration," "Riparian Area Dynamics and Disturbance Processes," "Modeling Alternative Biomass Volumes and Costs from Fuel and Forest Restoration Treatments," and "Mapping Place Meanings on the Bitterroot National Forest—a Landscape Level Assessment of Social Value Input to Fuel Hazard Reduction Treatments." This issue of ECO-Report includes reports about some of the ongoing research.

In other activities, BEMRP sponsored two half-day sessions at the Northern Region Training Academy, one on post-fire research results and the other on fuel reduction research results. Both were very well attended. RMRS selected BEMRP as its representative to provide a display at the White House Conference on Cooperative Conservation in St. Louis, Missouri, at the end of August. BEMRP also submitted a proposal for RMRS conservation education funding and received support for a student-designed and student-conducted habitat restoration project at the Willoughby 40 site southeast of Stevensville, Montana. The project was funded and will provide plants and signs for the site. Finally, the BEMRP website (www.fs.fed.us/rm/ecopartner/) has been updated, including progress reports, publications lists, glossary, and current events. Check it out.

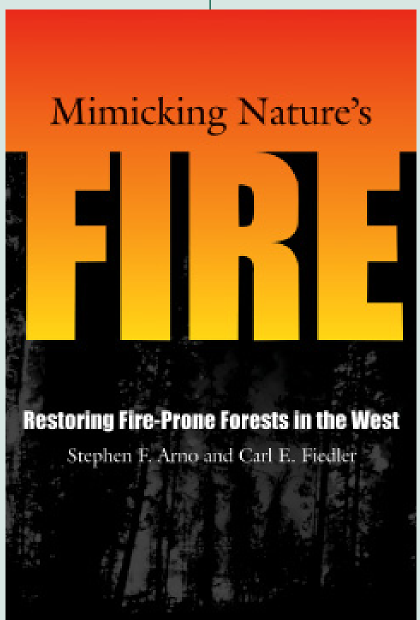
Book Corner



A Review of *Mimicking Nature's Fire: Restoring Fire-Prone Forests in the West*

Sharon Ritter, Research/Management Coordinator and ECO-Report Assistant Editor Bitterroot National Forest and BEMRP, Hamilton, MT

When Steve Arno retired, he knew he had two books in his head. The first, published in 2002, was *Flames in Our Forest: Disaster or Renewal?* with Stephen Allison-Bunnell. They built the case that fire is a natural disturbance process in western forests that we have for too long railed against and now need to accept as a key to sustainably maintaining many of our forest ecosystems. In *Mimicking Nature's Fire: Restoring Fire-Prone Forests in the West*, Arno and Carl Fiedler take the next step by advocating a management approach based on historical natural processes, primarily fire.



The preface presents brief autobiographies of the authors. These glimpses into their backgrounds are important because these are not just two guys giving their opinions. Arno is a forest ecologist who conducted research at the Fire Sciences Lab, Rocky Mountain Research Station, in Missoula, MT. Fiedler is a research professor of silviculture in the College of Forestry and Conservation at the University of Montana. Both came to their conclusions about the role of fire and restoration forestry through decades of observing forests and their management, conducting research, questioning what they had been taught in school, and thinking outside the traditional forestry "box." They call this new approach restoration forestry, defined as "the practice of reinstituting an approximation of historical structure and ecological processes to tree communities that were in the past shaped by distinctive patterns of fire. The intent is not to re-create a single, distinct 'historical condition' but rather a range of conditions representative of historical conditions."

Each forest type has a different natural disturbance regime, and they dedicate an early chapter to describing the three fire regimes prevalent in western forests: understory, mixed-severity, and stand-replacement. Historically, 40 percent of the total forest area experienced an understory fire regime; currently only 15 percent does. On the other hand, historically 20 percent of the forest area experienced a stand-replacement fire regime; that has increased to 50 percent. More than 100 million acres of fire-prone western forests harbor deteriorating conditions outside the historical range of variability. Restoration forestry needs to start with an understanding of how each of the fire regimes historically affected patchiness, understory species, species composition, and age-class structures. It also needs an understanding of how decades of fire suppression and exclusion have altered these features.

The first five chapters of the book provide a lesson in ecological and management principles. When researching information for these chapters, Arno and Fiedler found very little in the forestry literature. "There's nothing else like it out there," said Arno at a talk shortly after the book came out. This confirmed their belief that land managers and private landowners needed a practical book like this. Chapter 5, "Restoration Objectives, Techniques, and Economics," compares traditional timber management with restoration management, providing a brief "how to" guide to getting started.

The authors make a case for why we can't leave the forests alone to heal themselves: "Even if we could allow all lightning fires to burn everywhere—a practical impossibility—the landscape-scale modification and fragmentation of fuels brought about by livestock grazing, development, and roads now greatly constrain the natural spread of fire. Probably half of all western forests have missed natural fire cycles while also having been altered by logging, so lightning fires today burn hotter and cause greater mortality than fires of the past."

The meat of the book is a look at real-world forest restoration projects taking place in a variety of forest types and fire regimes in the West: pinyon-juniper, ponderosa pine/fir, giant sequoia/mixed conifer, western larch/fir, lodgepole pine, whitebark pine, and aspen. Arno and Fiedler remind the reader of the historical fire regime for each forest type and provide a history of past management that resulted in conditions requiring restoration forestry. They also discuss the political background leading up to decisions to treat forest stands and describe the management prescription applied and how it looks now.

Arno and Fiedler admit in their conclusion that these demonstration sites only include a tiny percentage of the forests needing attention and only provide benefits at the stand level. What we need, they argue, is restoration over much larger landscapes of the West. "Only then can the natural disturbance processes such as fire, insects, and disease operate in ways that are healthy and sustainable."

Mimicking Nature's Fire: Restoring Fire-Prone Forests in the West by Stephen F. Arno and Carl E. Fiedler. Published in 2005 by Island Press, Washington, D.C. 242 pages. ISBN: 1-55963-142-2. Available in hard cover ($49.95) and paperback ($24.95).

BEMRP Activities in 2005

Greg Jones, Project Unit Leader and BEMRP Program Leader, RMRS, Economic Aspects of Forest Management on Public Lands, Missoula, MT

In keeping with our roots, BEMRP is cooperating with the Bitterroot National Forest to launch a new multi disciplinary landscape project—the Trapper Bunkhouse Land Stewardship Project (Trapper Bunkhouse). Proposed by the Bitterroot Forest, the Trapper Bunkhouse Project would undertake vegetation management to reduce severe wildland fire risk and restore/maintain forest health in the National Forest area between Trapper and Bunkhouse Creeks in the southern Bitterroot Mountains. Within its scope, the project includes site-specific, on-the-ground research concerning soil compaction, nutrient cycling, establishment of weeds, response of residual vegetation to treatments, and effectiveness of treatments in reducing the likelihood of catastrophic fire.

In conjunction with this project, BEMRP researchers have been testing interaction of three types of spatial landscape models to predict 1) how fire will move on the current landscape, 2) how this will change with forest growth, insects, and disease, and 3) where to place vegetation treatments over time to reduce the likelihood of undesirable severe fire and improve forest health. (See article on page 3 for more details on this work.)

A small portion of the Trapper Bunkhouse Project is comprised of a BEMRP study with replicated tests of on-the-ground treatments (see fig. 1 on page 18). This research focuses on treatments and effects in the frequent low-intensity fire regime forests common in the lower elevations of the Bitterroot Valley. Vegetation treatments include: 1) control with no treatments, 2) removal of understory ladder fuels by hand cutting, 3) commercial thinning using whole-tree yarding that removes ladder fuels and some larger trees, resulting in a "most desirable trees" stand having a density of 40 to 60 square feet of basal area (emulating historical conditions), and 4) commercial thinning using a cut-to-length yarding system with the same objectives as treatment 3. Other treatments associated with areas to be thinned include: a) cut material is eliminated by "pile and burn" or broadcast burn, b) skid trails are treated with mulch or slash mats or left untreated, and c) "pile burn" micro-sites are treated with mulch and/or unburned soil or left untreated. Research questions include impacts of vegetation treatments on soil compaction and nutritional qualities, potential for weed invasion, health and vigor of the resulting stands of trees, and effectiveness in reducing the probability of severe wildfire.

This project is in the planning stages, and we are collecting pre-treatment data this year and next. We propose

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ECO-Report
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