



Invasive Species Science Update

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RMRS Cross-Program Project Update: Invasive Species

Currently, the Invasive Species Cross-Program team is expanding across RMRS Science Program Areas. For more information on the new RMRS Science Program areas, visit <http://www.fs.fed.us/rmrs/>. Please contact Jack Butler if you are interested in this cross-program project or have any questions related to the project.

Current activities include the preparation of an RMRS Invasive Species Research Visionary White Paper that will describe and synthesize current RMRS research activities on invasive species across multiple taxa. This visionary paper will be targeted to a diverse audience, including the RMRS Leadership Team, WO National Program Leaders, FS scientists, collaborators, and other users.

Upcoming Events: Feb 2009-Nov 2009

Invasive Plants Association of Wisconsin Conference and The Prairie Enthusiasts Banquet—"Invasive Plants of Grasslands: Advanced Strategies for their Management." February 21, 2009, Madison, WI.
(<http://www.ipaw.org/index.htm>)

National Invasive Weeds Awareness Week. February 22-27, 2009, Sheraton Four Points Hotel, Washington, DC. (http://www.nawma.org/niwaw/NIWAW%20X/niwaw_index.htm)

29th Annual Midwest Aquatic Plant Management Society Conference. March 1-4, 2009, Chicago, IL.

Michigan Invasive Plant Council 2009 Symposium—"Minimizing and Preventing the Spread of Invasive Plant Species Through Public Spaces and Corridors." March 6, 2009, East Lansing, MI.
(<http://www.invasiveplantsmi.org>)

Western Society of Weed Science Annual Meeting. March 10-12, 2009, Albuquerque, NM. (<http://www.wsweedscience.org/meeting/meeting.asp>)

The 10th International Conference on the Ecology and Management of Alien Plant Invasions (EMAPI). August 23-27, 2009. Stellenbosch, South Africa.

North American Weed Management Association (NAWMA) 2009 Conference and Trade Show—"Response to the Riparian Invasion." September 21-24, 2009, Kearny, NE.
(<http://www.nawma.org/>)

World Conference on Biological Invasions and Ecosystem Functioning. October 27-30, 2009, Porto, Portugal.

International Congress on Biological Invasions. November 2-9, 2009. This congress is co-organized by the Chinese Academy of Agricultural Sciences (CAAS), CABI, Fujian Agriculture and Forestry University, and in collaboration with AAFC, CSIRO, KSU, FAAS, GISP, and TNC. Fuzhou, China.



From the Newsletter Editor

"Information exchange does not just arm people with knowledge, it also helps to strengthen networks and generate support and political commitment for action."

Browne, Pagad, and Poorter, "The crucial role of information exchange and research for effective responses to biological invasions," *Weed Research*, 49:6-18 (2009).

Although scientific journals (such as the outlet where this quote was published) are the traditional method for disseminating research results, information must be distributed more rapidly and widely using approaches that connect researchers *directly* with managers. The exchange of

information between science producer and science user would appear to be straightforward because, for the most part, the two groups speak the same language. An equally important goal involves supplying relevant information to the decision makers who allocate resources but who often lack specific knowledge of the issue. Done correctly, this three-way exchange of information among researchers, managers, and deciders on invasive species issues has great potential for increasing awareness, political commitment and, by extension, financial commitment. Browne and his colleagues also stressed the need to incorporate

ecosystem approaches, adaptive management, stakeholder involvement, and a mechanism for feedback. Conceptually, the process makes sense—especially for invasive species, which have such an immediate, direct, and devastating impact on natural resources. However, from a variety of perspectives, the current level of investment in invasive species research and management is incongruent with the scale and long-term implications of their impacts.

Science Notes

Decision Support Tool to Manage Invasive Plants

"Weed Treatment Planner (WTP): A landscape-level decision support tool for weeds management." By Woodam Chung, Assistant Professor, Department of Forest Management, University of Montana, Missoula, MT, (406) 243-6606, woodam.chung@umontana.edu; Greg Jones, Research Forester, Forestry Sciences Lab, Missoula, MT, (406) 542-4167, gjones@fs.fed.us.

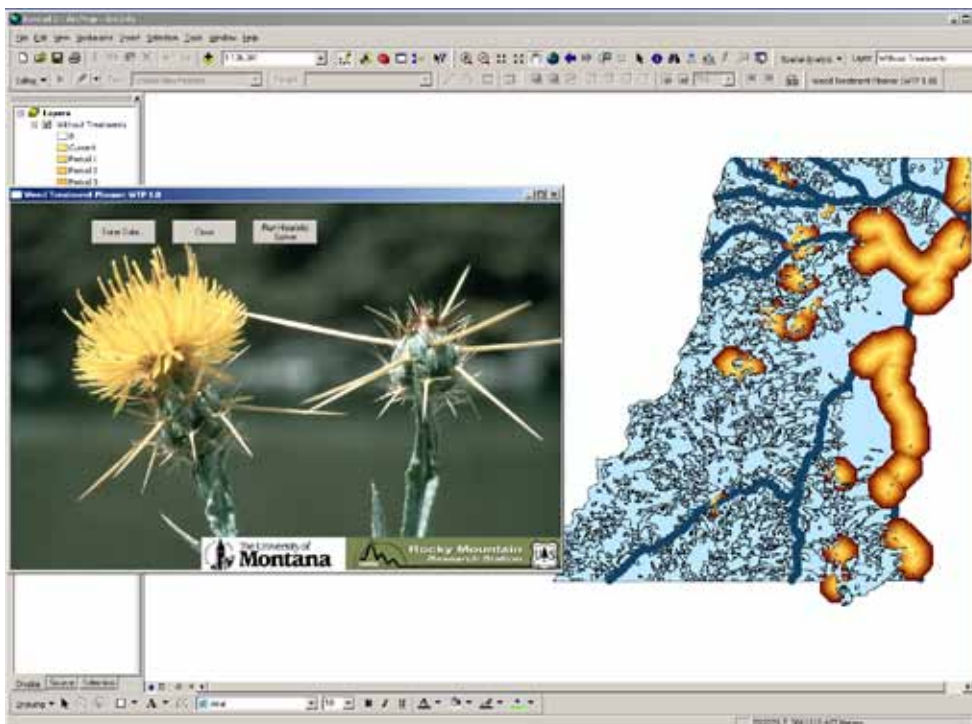
In order to select effective treatments, managers of invasive weeds should consider the terrain in which the weeds are found. The costs of not treating should be accounted for through predicting the spread of the plant and its environmental and economic impacts. Selecting potential treatments appropriate to site conditions, assessing the impact of the species, and forecasting the costs into the future would allow a weed manager to select treatments that reduce costs and provide measurable benefits. A decision tool currently under development is expected to assist land managers in creating management plans that consider a forecast of costs of treatments and costs of not treating. The tool will

allow managers to select techniques that address the plant's biology and the terrain and costs of treatment as well as market and non-market costs of not controlling the species. RMRS scientist Greg Jones is collaborating with University of Montana (Woodam Chung and Peter Rice) and University of Idaho (Tim Prather) scientists to develop this landscape decision support tool for weeds management. For more information, contact Woodam Chung or Greg Jones.

Fire Effects on Roadside Invasive Species

"Prescribed Fire Effects on Roadside Exotic Plant Species Diversity." By James Fowler, Ecologist, Forest Science Complex, Flagstaff, AZ, (928) 556-2172, jffowler@fs.fed.us.

Roadside habitats help distribute exotic plant species. The construction, use, and maintenance of roadside habitats influence which species are present and their abundance. Researchers in Flagstaff recently published an article in *Rangeland Ecology and Management* on how prescribed fire influences the number and abundance of exotic plant species along roadside habitats and in nearby ponderosa pine forest habitats. The study showed that most exotic plant species had no change in abundance after prescribed fire at sites in three Northern Arizona national forests. One of the three sites showed a decline in the number of exotic plant species one year after prescribed fire while the other two





sites showed no change. This suggests that low intensity prescribed fire may have minimal effects. A comparison of roadside and forest habitats before the prescribed fires showed that although roadsides do have more exotic plant species, only some species are more or equally abundant along roadside habitats. Of the 20 exotic plant species found on these sites, 18 have been intentionally seeded in the Western United States or are known seed contaminants. This list includes cheatgrass. A legacy of roadside seeding may have more influence on exotic plant species diversity than prescribed fire. For more information, see Fowler and others 2008 listed in "Publication News" at the end of this newsletter.

Predicting and Preventing Invasive Species

"Predicting and Preventing Invasive Species in Pacific Northwest Coniferous Forests." By Melissa Smith, Ph.D. Candidate, School of Biological Science, Washington State University, Pullman, WA, (509) 288-4049, mcsmith81@wsu.edu.

Horticulture imports continue to bring invasive species into the United States. While the Pacific Northwest has been fortunate to receive very few of these invaders, imports are now coming in from regions with similar climates

and forests. Melissa Smith's work at the Priest River Experimental Forest (PREF; USDA Forest Service, Rocky Mountain Research Station) focuses on describing the sites to gauge any biotic resistance that could prevent the entrance of an invader. Conversely, strong invaders could overcome the conditions in forests. Smith has measured the light regime within stands of *Tsuga heterophylla* and *Abies lasiocarpa* for the last two summers. While light, or the absence of it, tends to keep the forest floor sparsely populated in native Northwest communities, plants from similar communities in Asia may be preadapted to these conditions and may pose an invader threat. Using the light measurements from the forests at PREF as a guide for experiments, Smith found that temperate Asian bamboos are able to grow in all Northwest forest light regimes (50%, 70%, and 90% shade). Therefore, light is not a limiting resource for these organisms that inhabit forest understories in Asia. Light is only one aspect that a species must overcome, and tests will continue on other environmental effects on bamboos as well as the effects that bamboos may have on the communities they invade. Smith plans to experiment with conifer seedling recruitment under bamboo leaf litter and the effects of bamboo seed mast events on the small mammal populations. PREF will be instrumental in this research as it has excellent examples of hemlock and subalpine fir communities in which to test hypotheses and measure biotic resistance.

Factors Influencing Plant Invasiveness

Submitted by Yvette Ortega, Wildlife Biologist (406 542-3246, yortega@fs.fed.us), and Dean Pearson, Research Ecologist (406 542-4159, dpearson@fs.fed.us), Wildlife and Terrestrial Ecosystems, Forestry Sciences Laboratory, Missoula, MT.

Invasiveness of spotted knapweed and biological control agents. Dean and Yvette are examining the influence of drought on the invasiveness of spotted knapweed (*Centaurea maculosa*) and its susceptibility to herbivory by biological



control agents. In collaboration with the University of Montana and Forest Health Protection, researchers have constructed 150 experimental plots. Treatments involve controlling precipitation levels by using mechanized rain covers and manipulating access to plants by the biocontrol agent, *Cyphocleonus achates*, a root-boring weevil. Preliminary analyses indicate that the drought treatment depressed survival of knapweed.



Cyphocleonus achates also reduced survival of knapweed, but only in plots receiving normal precipitation. In contrast, survival of native grasses was not affected by drought or *C. achates* impacts on knapweed. These preliminary results suggest that drought may decrease the advantage of knapweed over native grasses but may also limit the effectiveness of the biocontrol agent. Further analyses will consider effects of drought and *C. achates* on reproduction and recruitment of knapweed and native species, ultimately to provide understanding of climatic factors influencing exotic plant invasions and their management.

Superweeds in Montana and

Argentina. Dean Pearson recently spent two weeks in the pampas/caldenal region of Argentina initiating a new study with collaborator Dr. Jose Hierro, Assistant Professor of the Universidad Nacional de La Pampa, Argentina. This is the first phase of a new study expanding Montana research on exotic plant invasions into Turkey and Argentina. The intent of this work is to examine how mild-mannered plants that are native to Turkey become superweeds in Montana and Argentina. Initial work is focused on the role of the plant consumers in preventing or facilitating invasion. For example, ongoing work in Montana shows that native deer mice and ground squirrels strongly suppress the mild-mannered invader, salsify (*Tragopogon dubius*), which increases 200-fold when these consumers are removed. Meanwhile, the super-invader spotted knapweed (*Centaurea maculosa*) appears to have seeds that are chemically defended against deer mice. Laboratory trials suggest that because of the chemical, knapweed may get a huge recruitment advantage over natives and tasty, undefended exotics. A seed addition study underway in the field is expected to confirm laboratory results this spring. Work in Turkey and Argentina is beginning along similar lines with the hope of expanding research to include studies examining how disturbance, seed limitation, and consumer interactions interplay to release or control exotics in different regions. The intent is to improve weed management through better use of augmentative and classical biological control, disturbance management, and supplemental seeding, particularly following disturbances and weed management actions such as herbicide treatments.

Risk Assessment of Nonnative Fish

“Analysis of trade-offs between threats of invasion by nonnative brook trout and intentional isolation for native westslope cutthroat trout.” By Michael Young, Research Fisheries Biologist, Forestry Sciences Laboratory, Missoula, MT, (406) 542-3254, mkyoung@fs.fed.us.

RMRS scientists (Bruce Rieman and Michael Young) recently published a paper on risk assessment of a nonnative fish, brook trout (*Salvelinus fontinalis*). They developed a Bayesian belief network to help managers decide whether to install or remove barriers to fish migration. The model attempts to quantify risks from nonnative fish invasions as well as the benefits of connectivity among native fish (westslope cutthroat: *Oncorhynchus clarkia lewisi*) populations. For more information, see Peterson and others 2008 listed in “Publication News” at the end of this newsletter.

Update on Classical Biological Control Team

Submitted by Jack Butler, Research Ecologist, Forest and Grassland Research Laboratory, Rapid City, SD, (605) 716-2160, jackbutler@fs.fed.us.

The Rocky Mountain Research Station’s commitment to expanding research in classical biological control of invasive plants was highlighted in the first issue of the RMRS Invasive Species Science Update (February 2008). As part of that commitment, the Station recruited two Research Entomologists (Sharlene Sing and Justin Runyon) at the Bozeman Forestry Sciences Laboratory, located on the campus of Montana State University (see second issue of ISSU). A Classical Biocontrol Team has been formed, of which I have been assigned the role of Team Leader. Other Team members include

Sharlene and Justin in Bozeman, and RMRS Research Ecologist Dean Pearson and Wildlife Biologist Yvette Ortega, both located at the Missoula Forestry Sciences Laboratory. The basic goal of the Team is to rigorously screen, apply, and evaluate classical biological control agents, both new and existing agents, to increase invasive plant management options. The Classical Biological Control Team is in the process of developing a research charter, a plan that will help guide both short- and long-term research and provide guidance on communication and outreach activities. I recently met with the Invasive Species Coordinators for Regions 1-4, Jim Oliveraz (R1), Tom McClure (R2), Leonard Lake (R3), Rick Vanbebber (R4), Janet Valle (R1/R4 Pesticide Coordinator and State Noxious Weed Grant Coordinator), and Mike Ielmini (National Invasive Species Coordinator [WO]) to discuss ways to improve communication between research and management on the use of classical biological control of invasive plants. Our discussions centered on how managers can provide feedback to researchers on the development, delivery, and evaluation of biocontrol tools. Such feedback is a very important component in completing the research and development loop, and it will be featured prominently in the Biocontrol Team Research Charter. To initiate the feedback process, Janet Valle has developed a short questionnaire that provides managers the opportunity to describe their attitudes and obstacles to using biological control on invasive plants. If you would like a copy of the questionnaire, please contact me, Janet, or the Invasive Species Coordinator for your Region. Although the questionnaire was designed for invasive plant managers, input from researchers on all aspects of classical biological control is also important. I am especially interested in receiving comments and suggestions regarding the Classical Biological Control Team. For more information, contact Jack Butler (jackbutler@fs.fed.us).

Outreach Activities

The Petition to List Whitebark Pine Highlights Relevance of RMRS Invasives Research. Submitted by Anna Schoettle, Research Plant Ecophysiologist, Rocky Mountain Research Station, Ft. Collins, CO, (970) 498-1333, aschoettle@fs.fed.us.

The degraded ecosystem condition that prompted the recent petition to list whitebark pine (Natural Resources Defense Council 2008) under the Endangered Species Act highlights the severity of the problem and the relevance of the Station's past and current research on high elevation 5-needle pines. High elevation 5-needle pines, also called high elevation white pines, occurring within the Interior West include whitebark pine, limber pine, Rocky Mountain bristlecone pine, and Great Basin bristlecone pine. Research by RMRS has shown these pines are keystone species that play critical roles in maintaining the resilience and integrity of many Western ecosystems. Climate change, the mountain pine beetle, and the introduced invasive fungus that causes the white pine blister rust disease are threatening the sustainability of these ecosystems. *Whitebark Pine Communities* (2001), co-edited by RMRS scientists, is acknowledged as providing much of the research information for the petition.

The current situation of whitebark pine in the Northern Rockies provides a preview of what may occur, without intervention, in other 5-needle pine ecosystems over time. RMRS has developed proactive intervention frameworks to prepare the 5-needle pine landscapes of the Southern Rockies for rust invasion in order to alter the trajectory of impacts and mitigate consequences; special attention is focused on limber and Rocky Mountain bristlecone pine. The mountain pine beetle epidemic in the Southern Rockies further elevates the urgency for intervention and conservation of these species.

Research by RMRS has demonstrated the prospect of management solutions to sustain these ecosystems; however, further research to answer critical questions and refine restoration technologies is needed. These pine species and their remote mountain-top ecosystems are clearly not beyond the reach of human-caused stresses that threaten their health and sustainability.

Additional references on white pine:

- Tomback, D.F.; Arno, S.F.; Keane, R.E., editors. 2001. *Whitebark Pine Communities*. Island Press, Washington, DC. 440 p.
- Schoettle, A.W.; Sniezko, R.A. 2007. Proactive intervention to sustain high

elevation pine ecosystems threatened by white pine blister rust. *Journal of Forest Research*. 12 (5): 327-336. <http://www.springerlink.com/content/9v91t44278w74430/fulltext.pdf>.

Schoettle, A.W. and M. Laskowski. 2006. High elevation white pine educational website. <http://www.fs.fed.us/rm/high-elevation-white-pines/>.

For more information, contact Anna Schoettle and Bob Keane, rkeane@fs.fed.us, (406) 329-4846.

Courses Related to Weed Management Offered in Missoula Via AgLearn.

Submitted by Jack Butler, Research Ecologist, Forest and Grassland Research Laboratory, Rapid City, SD, (605) 716-2160, jackbutler@fs.fed.us.

Northern Region University 2009 is sponsoring two courses this spring that may be of interest to weed managers. Jack Butler, Research Ecologist, Rocky Mountain Research Station, Forest and Grassland Research Laboratory, Rapid City, will present a 2-hour course titled "Patterns of vegetation recovery following weed control: examples from biological and chemical control of leafy spurge." The course will center on evaluating some of the factors that may influence the rate and direction of vegetation change following successful weed control using examples from long-term study plots in southeastern Montana and western North Dakota. The course is scheduled for 1300 to 1500 on Thursday, April 2, 2009. Please contact Jack Butler (jackbutler@fs.fed.us) for more information. Margie Ewing (mewing@fs.fed.us) is scheduled to teach "Conserving Open Space—Tools to be a Partner" on Wednesday, April 1, 2009, from 1300 to 1700. The objective of this course is provide a basic understanding of land management tools such as conservation easements, land adjustments, and how to get involved in local land use planning. Both courses will be delivered on the University of Montana campus in Missoula.

For more information, including how to register for the courses through AgLearn, visit the Northern Region University website at <http://fsweb.r1.fs.fed.us/rta/nru2009/>.



Proactive intervention positions the ecosystem for increased resiliency to novel stresses such as climate change and invasives.

Ask The Expert



Q: What is the RMRS doing to help with the buffelgrass problem?

Submitted by David Tippets, Public Affairs Officer, USDA Forest Service, Fort Collins, CO.

A: Buffelgrass [*Pennisetum ciliare* (L.) Link] is a native bunchgrass of Africa and southern Asia. It was introduced in Texas and northern Mexico during the 1930s and 1940s to increase livestock forage and to assist in soil erosion control.

Buffelgrass is able to thrive in arid and semiarid regions because of its high drought tolerance and rapid response to rain. These characteristics have enabled the species to spread to neighboring areas, out-competing many of the native species. Buffelgrass has recently become a concern because of its contribution to reducing native plant diversity, which in turn has a negative impact on invertebrate and vertebrate species diversity. It has also modified fire regimes. Fires that were once localized surface fires have evolved into high intensity fires carried on by the presence of continuous fuels, contributing to the introduction of fire in areas that are not well adapted to such disturbance. Even though buffelgrass is beneficial for increased grazing for livestock, it is considered an invasive species in some areas because of its ability to spread and out-compete native vegetation. It is listed as a “Prohibited Noxious Weed” in Arizona. No current studies by RMRS scientists were found. For more information go to: <http://www.buffelgrass.org/research.php>. (Answer by Sarah Harrelson, Forest and Grassland Research Laboratory, Rapid City, SD.)

Please submit your “Ask the Expert” questions to Mee-Sook (mkim@fs.fed.us).



PUBLICATION NEWS

Fowler, J.F.; Sieg, C.H.; Dickson, B.G.; Saab, V. 2008. Exotic species diversity: influence of roads and prescribed fire in Arizona ponderosa pine. *Rangeland Ecology and Management*. 61:284-293.

Peterson, D.P.; Rieman, B.E.; Dunham, J.B.; Fausch, K.D.; Young, K.Y. 2008. Analysis of trade-offs between threats of invasion by nonnative brook trout (*Salvelinus fontinalis*) and intentional isolation for native westslope cutthroat trout (*Oncorhynchus clarkia lewisi*). *Canadian Journal of Fisheries and Aquatic Sciences*. 65:557-573.

Bradley, B.A., Oppenheimer, M.; Wilcove, D.S. 2009. Climate change and plant invasions: restoration opportunities ahead? *Global Change Biology*. Advance copy available at <http://www3.interscience.wiley.com/journal/119881750/issue>.

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