



Invasive Species Science Update

Number 1, June 2008

Coordinator

Mee-Sook Kim
1221 S. Main St.
Moscow, ID 83843
Phone: 208-883-2362
E-mail: mkim@fs.fed.us

Newsletter Editor

Jack Butler
USDA Forest Service - RMRS
8221 S. Hwy 16
Rapid City, SD 57702
Phone: 605-716-2160
E-mail: jackbutler@fs.fed.us

Upcoming Events:

Conference

November 18-20, 2008

Southwest Vegetation Management
Association—11th Annual Conference
<http://www.swva.org>

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, DC 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

First Edition of Invasive Species Science Update

This electronic newsletter (Invasive Species Science Update) is published by the Rocky Mountain Research Station (RMRS) Cross-Program, Interdisciplinary Project team on Invasive Species. This newsletter will be published 3 times per year and is intended to enhance communication among RMRS scientists, wildland managers, other partners, stakeholders, and customers about predicting, detecting, and monitoring invasive species in forest, rangeland, and aquatic ecosystems. Contributions

for the newsletter are welcome from everyone involved in the ecology and management of any invasive species. We are specifically interested in emerging research and management issues (Science Notes), technology transfer programs (Outreach Activities and Ask The Expert), and noteworthy technical and non-technical publications (Publication News). Please submit contributions and suggestions for improving this newsletter to Mee-Sook Kim (Coordinator) or Jack Butler (Newsletter Editor).

RMRS Cross-Program Project: Invasive Species

Objectives of the Invasive Species Cross-Program project are to 1) identify, revise, and provide current tools developed by RMRS scientists for predicting, detecting, and monitoring invasive species; 2) develop educational and outreach materials to assist land managers in predicting, detecting, and monitoring invasive species; and 3) synthesize RMRS invasive species research activities for marketing, education, and outreach to RMRS stakeholders and customers.

Current members of the Project team include: *Air, Water, and Aquatic Environment*: Mike Young; *Fire, Fuels, and Smoke*: Jane Smith; *Forest and Woodland Ecosystems*: Andy Hudak, Mee-Sook Kim, Ned Klopfenstein,

Jose Negron, Bryce Richardson, Steve Sutherland; *Grasslands, Shrublands and Desert Ecosystems*: Jack Butler, Deborah Finch, Durant McArthur; and *Wildlife and Terrestrial Habitats*: Dean Pearson.

Current activities include the preparation of a RMRS Invasive Species Research Visionary White Paper that will describe and synthesize current RMRS research activities on invasive species across multiple taxa. The target audience for this visionary paper includes the RMRS Leadership Team, the WO National Program Leaders, FS scientists, collaborators, and users. In addition, we plan to establish a website for the RMRS Cross-Program Interdisciplinary Project. The website will serve as a consolidated conduit for delivering RMRS research products on invasive species to RMRS stakeholders and customers.



RMRS New Science Program Areas and Invasive Species Research

The newly established RMRS science programs (Air, Water and Aquatic Environment; Aldo Leopold Wilderness Research Institute; Fire, Fuels and Smoke; Forest and Woodland Ecosystems; Grasslands, Shrublands, and Desert Ecosystems; Inventory, Monitoring and Analysis; Integration of Human and Ecological Sustainability; Wildlife and Terrestrial Habitats) were presented to the USDA Forest Service

Research & Development (R&D) staffs, other interested parties from the FS deputy areas, other federal agency personnel, and several NGOs. Invasive species research is a prominent and cohesive theme among several of the RMRS science programs. The new structure will provide more flexibility for conducting integrated research across science program areas to effectively address invasive species within RMRS.

Aside from the charter presentations, Durant McArthur (Program Manager, Grasslands, Shrublands, and Desert Ecosystems) led a robust discussion on RMRS invasive species research with the RMRS Program Managers and several R&D staff members. For more information on new RMRS Science Program areas, visit: <http://www.fs.fed.us/rmrs/>

Science Notes

Expansion of the RMRS Classical Biological Control of Invasive Plants Program

The RMRS has made the logistical and financial commitment to expand the use of classical biological control to manage invasive plants in the interior west. This commitment includes recruiting 2 Research Entomologists to be stationed at the Forestry Sciences Laboratory in Bozeman, MT. The scientists will have the collective responsibility for: Foreign Exploration--Locating, selecting, and evaluating the natural enemies of target invasive plants in their homeland to serve as potential biocontrol agents; Quarantine Testing--Testing potential biocontrol agents in approved US quarantine facilities to determine their host specificity, effectiveness, and potential as biological control agents; Permitting--Utilizing the regulatory processes necessary to obtain approval from the USDA-APHIS for the release of new biological control agents in the US; Release and Establishment--Colonizing newly approved biocontrol agents in the field and evaluating the factors influencing their establishment and persistence on release sites; and Efficacy--Evaluating the effectiveness of the biological control agents to



reduce the cover and density of the targeted species below an ecological and economic relevant threshold.

Applications are currently being screened by a 7-member Evaluation Panel consisting of researchers and managers. On-site interviews of candidates were conducted May 5-21 at RMRS laboratories in Bozeman and Missoula. For more information, contact

Jack Butler (Team Leader, Bozeman Biocontrol Program).

Fire Effects on Invasive Species

Nancy Shaw (Research Botanist) is conducting research on the relationships among cheatgrass (*Bromus tectorum*), wildfire cycle, and the spread of rush skeletonweed (*Chondrilla juncea*). Initial results of her research funded by the Joint Fire Science Program, indicate that increased rosette density following wildfire develops primarily from vegetative spread, with new rosettes emerging from root sprouts. Seeds germinate rapidly over widely ranging temperatures and may establish episodically on burned or other disturbed sites when moisture patterns are favorable. Limiting seed transport

vectors and destroying small satellite infestations at and beyond the expansion front is essential for reducing the rate of spread. For more information, visit: http://www.fs.fed.us/rm/boise/research/shrub/projects/documents/shaw_rust_tech_transfer110107.pdf

Pete Robichaud (Research Engineer), Sarah Lewis (Civil Engineer), and Andrew Hudak (Research Forester) are conducting a multi-year research project, funded by the Joint Fire Science Program, to study the mitigation effects on native and invasive species response after wildfire. Following the 2005 School Fire that burned ca. 50,000 acres (20,200 hectares) on the Umatilla National Forest, managers were particularly concerned with mitigating invasive species spread. After two monitoring seasons, the research, conducted in partnership with the University of Idaho, showed a significant increase in weed presence within the burned area, although plant abundance has increased dramatically since the first year post-fire. A native-seed treatment was implemented to control erosion and improve native re-vegetation; these seeded areas have established high vegetation cover that may help preclude invasion of weeds. In general, more weeds have been observed in areas that historically had heavy human and machine traffic from camping, grazing, logging, etc. More changes in vegetation are expected in the upcoming seasons and continued monitoring will provide a better indication of weed response to fire and post-fire treatments.

A review and synthesis of literature on fire's relationship to nonnative invasive plants is in press (General Technical Report RMRS-GTR-42-volume 6). This project, funded by the Joint Fire Science Program, explores fundamental concepts for understanding relationships between fire and nonnative invasives, and surveys effects of fire on nonnative invasives and use of prescribed fire to manage them. The lead technical editor is Kristin Zouhar (Technical Information Specialist). Zouhar, Jane Kapler Smith (Ecologist), and Steve Sutherland

(Research Ecologist) are authors of several chapters in the report. More than 100 invasive species are reviewed in the Fire Effects Information System (FEIS, <http://www.fs.fed.us/database/feis/>). These literature reviews synthesize information on a species' biology, ecology, and relationship to fire. For more information visit: <http://www.fs.fed.us/database/feis/plants/weed/index.html>



Molecular Diagnostics for Invasive Forest Pathogens

To help establish baseline information for invasive forest pathogens, the pathology-genetics group in Moscow and their collaborators (Forest Health Protection in Regions 1, 5, 6, and 10) are developing molecular diagnostic techniques to identify pathogen species and subspecies. Once a pathogen is precisely identified, associated information, such as precise geographic

location, hosts, and other environmental factors, can be used to predict pathogen distribution and ecological behavior. This approach may also help determine the origin of invasive pathogens, evolutionary relationships with native pathogens, and predicted impacts of climate change. Current work includes examinations of root rot pathogens (e.g., *Armillaria* spp. and *Fusarium* spp.),

white pine blister rust (*Cronartium ribicola*), and an invasive rust disease in Hawaii (caused by *Puccinia psidii*). For more information, see the following articles listed in "Publication News" at the end of this newsletter: Hanna et al 2007a, b; Kim et al 2006; Richardson et al 2007, 2008; Stewart et al 2006; and Zambino et al 2007.

Impacts of Invasive Plants and Efficacy of Mitigation Efforts

Yvette Ortega (Wildlife Biologist) and Dean Pearson (Research Ecologist) in Missoula have contributed to resolving a longstanding debate in invasion biology about whether invasibility of communities increases or decreases with native diversity. They show that weak invaders (those that establish within native systems with low impact) increase with increasing native diversity while strong invaders (those that overtake native systems) are negatively correlated with native diversity, because they actually reduce native diversity. This work establishes how studies examining diversity-invasibility questions can show confounding results by not distinguishing between strong and weak invaders. It also suggests that even if higher diversity initially inhibits invasion, strong invaders can greatly impact high diversity sites over time. Ortega and

colleagues go on to show how strong plant invaders like spotted knapweed (*Centaurea maculosa*) can affect wildlife populations by eroding native food chains. They found this weed impacted Chipping Sparrow recruitment by reducing the insect food resources for these songbirds and their young. Finally, after long-term, large-scale studies evaluating the efficacy of broadleaf herbicide for restoring communities invaded by spotted knapweed verified herbicide suppression of knapweed and associated release of native grasses, but also



documented side effects of treatment that included depression of native forbs and proliferation of the secondary grass invader, cheatgrass (*Bromus tectorum*). This work provides managers with comprehensive information on the ecological costs and benefits of broadleaf herbicide treatments. For more information, see the following articles listed in "Publication News" at the end of this newsletter: Ortega and Pearson 2005; Ortega et al 2006.

Outreach Activities

Southwest Vegetation Management Association – 11th Annual Conference (Nov 18-20, 2008; location to be announced): Southwest Vegetation Management Association is a statewide Arizona organization for people interested in invasive plant management. The conference offers presentations, a field trip, pesticide certification training & testing sessions. For more information, visit <http://www.swvma.org>

RMRS scientists Dean Pearson and Yvette Ortega from the Wildlife and Terrestrial Ecosystems Program (WTE) recently established a website to facilitate transfer of WTE-generated research information related to invasive species. For more information, visit <http://www.fs.fed.us/rm/wildlife/invasives/>



Ask The Expert



Q: How can I identify white pine blister rust (WPBR) in whitebark pine?

A: Information about recognizing WPBR on whitebark pine is available in Hoff's (1992) publication (http://www.fs.fed.us/rm/pubs/int/int_rn406.pdf). In that publication, a brief history and biology of WPBR are described with 19 color photos that help identify the disease. DNA diagnostics are required for more definitive identification

of WPBR.

The white pine blister rust pathogen (*Cronartium ribicola*) was introduced from Eurasia into North America around 1910. Since then, the pathogen has continued spreading to native five-needled pines including eastern white (*Pinus strobus*), western white (*P. monticola*), sugar (*P. lambertiana*), whitebark (*P. albicaulis*), limber (*P. flexilis*), southwestern white (*P. strobiformis*), foxtail (*P. balfouriana*), and Rocky Mountain bristlecone (*P. aristata*) pines. Currently, the pathogen is spreading into southwestern areas and has caused significant ecological and economical impacts on forest ecosystems.

You can find more information on management of WPBR at the following website:

http://www.forestpathology.org/dis_wpbr.html

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

Publication News

Burns, K.S.; Schoettle, A.W.; Jacobi, W.R.; Mahalovich, M.F. 2008. Options for the management of white pine blister rust in the Rocky Mountain Region. Gen. Tech. Rep. RMRS-GTR-206. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 26 p. http://www.fs.fed.us/rm/pubs/rmrs_gtr206.pdf

Hanna, J.W.; Klopfenstein, N.B.; Kim, M.-S. 2007a. First report of the root-rot pathogen, *Armillaria nabsnana* from Hawai'i. Plant Disease 91:634. <http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-91-5-0634B>

Hanna, J.W.; Klopfenstein, N.B.; Kim, M.-S.; McDonald, G.I.; Moore, J.A. 2007b. Phylogeographic patterns of *Armillaria ostoyae* in the western United States. Forest Pathology 37:192-216. http://forest.moscowisl.wsu.edu/smp/docs/Hanna_et_al_Armillaria_ostoyae_For_Path_2007.pdf

Harvey, A.E.; Byler, J.W.; McDonald, G.I.; Neuenschwander, L.F.; Tonn, J.R. 2008. Death of an ecosystem: perspectives on western white pine ecosystems of North America at the end of the twentieth century. Gen. Tech. Rep. RMRS-GTR-208. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 10 p. http://www.fs.fed.us/rm/pubs/rmrs_gtr208.pdf

Kim, M.-S.; Klopfenstein, N.B.; Hanna, J.W.; McDonald, G.I. 2006. Characterization of North American *Armillaria* species:

Genetic relationships determined by ribosomal DNA sequences and AFLP markers. Forest Pathology 36:145-164. <http://forest.moscowisl.wsu.edu/smp/docs/Kimetal2006ForPath.pdf>

Kinter, C.L.; Meador, B.A.; Shaw, N.L.; Hild, A.L. 2007. Post-fire seed ecology of rush skeletonweed (*Chondrilla juncea* L.): assessment of invasion potential. Rangeland Ecology and Management 60:386-394. <http://www.bioone.org/archive/1551-5028/60/4/pdi/1551-5028-60-4-386.pdf>

Ortega, Y.K.; Pearson, D.E. 2005. Strong versus weak invaders of natural plant communities: assessing invasibility and impact. Ecological Applications 15:651-661. <http://www.rmrs.nau.edu/publications/OrtegaandPearson2005/OrtegaandPearson2005.pdf>

Ortega, Y.K.; McKelvey, K.S.; Six, D.L. 2006. Invasion of an exotic forb impacts reproductive success and site fidelity of a migratory songbird. Oecologia 149:340-351. <http://www.rmrs.nau.edu/publications/OrtegaCHSP/OrtegaCHSP.pdf>

Pearson, D.E.; Callaway, R.M. 2006. Biological control agents elevate hantavirus by subsidizing mice. Ecology Letters 9:442-449. http://www.rmrs.nau.edu/publications/2006/Pearson_Callaway/2006_Pearson_Callaway.pdf

Pearson, D.E.; Fletcher, Jr. R.J. 2008. Mitigating exotic impacts: restoring native deer mouse populations elevated by an exotic food subsidy. Ecological Applications 18(2):321-334. <http://www.rmrs.nau.edu/>

publications/Pearson_and_Fletcher_2008/Pearson_and_Fletcher_2008.pdf

Richardson, B.A.; Zambino, P.J.; Klopfenstein, N.B.; McDonald, G.I.; Carris, L.M. 2007. Assessing host specialization among aecial and telial hosts of the white pine blister rust fungus, *Cronartium ribicola*. Canadian Journal of Botany 85:299-306. http://www.fs.fed.us/rm/pubs/other/rmrs_2007_richardson_b001.pdf

Richardson, B.A.; Klopfenstein, N.B.; Zambino, P.J.; McDonald, G.I.; Geils, B.W.; Carris, L.M. 2008. Influence of host resistance on the genetic structure of the white pine blister rust fungus in the western United States. Phytopathology 98:413-420. <http://apsjournals.apsnet.org/doi/pdf/10.1094/PHYTO-98-4-0413?cookieSet=1>

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>

Stewart, J.E.; Kim, M.-S.; James, R.L.; Dumroese, R.K.; Klopfenstein, N.B. 2006. Molecular characterization of *Fusarium oxysporum* and *Fusarium commune* isolates from a conifer nursery. Phytopathology 96:1124-1133. <http://forest.moscowisl.wsu.edu/smp/docs/Stewartetal2006Phytopathology.pdf>

Zambino, P.J.; Richardson, B.A.; McDonald, G.I. 2007. First report of the white pine blister rust fungus, *Cronartium ribicola*, on *Pedicularis bracteosa*. Plant Disease 91:467. <http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-91-4-0467A>