



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).