

Western IPM Center

Project Report Form

How to submit: Please submit your completed report electronically, as an attached Microsoft Word file, to Jane Thomas at jmthomas@tricity.wsu.edu. If you have questions, contact Linda Herbst, (530) 752-7010. **Content:** Reports should follow the outline below and include responses to as many of the questions listed in Attachment A as are relevant to your project. *These are guidelines.* Provide your readers with enough detail that someone who is not familiar with your project can understand what you were trying to achieve, how you went about it, and what you accomplished, but please keep it concise.

A. Report Data

Date: 10/15/2009

Reporting Period: 01/01/2008-12/31/2008

Report Type (please check one):

Progress Report Final Report

B. Grant Data

- Grant Agreement #: 07-001492-CSU1
- Title: Process Based Modeling of Ecological Thresholds: Managing Bromus tectorum Invaded Communities
- Grant Type: Addressing IPM Issues
- Lead investigator:
 - Name: Cynthia S. Brown
 - Title: Associate Professor
 - Institution: Colorado State University
 - Address: Bioagricultural Sciences & Pest Management, 1177 Campus Delivery, Fort Collins, CO 80523-1177
 - Phone: 970-491-149
 - Fax: 970-491-3862
 - Email: cynthia.s.brown@colostate.edu
- Team members (name, title, institution): Cynthia S. Brown, Associate Professor – Colorado State University
- K. George Beck, Professor, Extension Weed Specialist – Colorado State University
- Michael B. Coughenour, Senior Research Scientist – Colorado State University
- Maria E. Fernandez-Gimenez, Associate Professor – Colorado State University
- W. Marshall Frasier, Associate Professor – Colorado State University
- Windy Kelley, Graduate Research Assistant – Colorado State University
- Brian Mealor, Assistant Professor, Extension Weed Specialist – University of Wyoming
- Rachel Mealor, Extension Range Specialist – University of Wyoming
- Marques D. Munis, Graduate Research Assistant – Colorado State University
- L. Roy Roath, Associate Professor, Extension Range Specialist – Colorado State University
- Michael Verdone, Graduate Research Assistant – Colorado State University

- State(s) involved: Colorado and Wyoming

C. Nontechnical Summary. An overview of the project, briefly outlining the problem(s), how your project addresses them, and your results, *written to a lay audience*. (500 words)

Bromus tectorum (hereafter, Bromus) has been present in the southern Rocky Mountains since the early 20th century, but has become more abundant in recent decades. Its spread has alarmed land managers and livestock producers who fear loss of valuable wildlife habitat and grazing resources. The Rocky Mountain Cheatgrass Management Project was formed to address these concerns through multidisciplinary research that will generate integrated ecological and economic decision support tools in the form of a handbook and outreach materials. These tools will enable land managers, producers and extension specialists to assess the condition of rangeland with respect to Bromus invasion and its effects, evaluate management inputs necessary to improve the land's condition, weigh the costs and benefits of the options, and improve the ecological state of the land and economic status of the rancher. Focus groups have been held to elicit input from natural resource managers and livestock producers and guide development of a stakeholder survey, which will further inform the development of decision support tools and workshops. Field studies are being conducted to identify topographic positions on the landscape that are at risk for persistent Bromus dominance, to test the efficacy of control of Bromus with herbicide and restoration of native plant communities with seed, and to parameterize a process-based, spatially explicit ecological model. The ecological model will be used to generate risk assessment maps and will be integrated with an economic optimization model to generate management scenarios, which will form the foundation of the decision support tools.

D. Objectives and Progress. List your objectives and describe your progress for each objective.

Objective 1: Model impacts of Bromus invasion under an array of IPM and environmental conditions. Two years of field data have been collected and literature has been surveyed to parameterize SAVANNA, a process-based, spatially explicit ecological model. We are in the process of refining the model at this time. Monitoring plots within areas that had burned within the previous 3 years or burned more than 3 years ago paired with plots in unburned sites indicate the following trends that were not statistically significant: 1) Annual grass (primarily Bromus) cover was higher on north and south facing burned sites than on their unburned counterparts and did not decrease with time since burning. 2) North facing sites had lower annual grass cover than south facing sites. 3) Unburned south facing sites had very low annual grass cover. 4) Perennial grass cover was lower on south facing new burn sites than south facing old burn sites, while the opposite was true of north facing sites. 5) On south facing sites, forb cover was higher on old burn sites than new burn sites. 6) Forb cover was lower on old burn sites than new burn sites on north facing aspects. 7) Shrub cover was lower on burned sites than unburned sites regardless of time since burning. This objective is 50% completed.

Objective 2: Measure effects of fire and IPM practices (imazapic application and seeding of native herbaceous species) on Bromus and the native plant community, and generate data vital to the accurate parameterization of the SAVANNA model. Pre-treatment and one-year post-treatment data have been collected to evaluate the effects of imazapic and seeding on plant community composition. The data last summer (2009) are currently being analyzed. This objective is 90% completed.

Objective 3: Produce invasion risk assessment maps. Risk assessment maps will be generated once the SAVANNA model is parameterized. This objective is 10% completed.

Objective 4: Publish findings. Peer-reviewed publication and website. The prototype website has been developed and will make its debut by November. This portion of this objective is 80% completed. The peer-reviewed paper is under development and is 10% completed.

Objective 5: Conduct a workshop. We are planning the workshop focused on distributing current information and learning how key stakeholders use information in making strategic and operational decisions about managing cheatgrass and how the project could best provide relevant information. The workshop is scheduled for December 3, 2009. This objective is 50% completed.

E. Outputs. List your project’s outputs, which might include publications, information, data, meetings held, attendance at meetings held, etc.

Outputs to date include data collected in the field, from literature and Geological Information Systems. Future outputs will include: (1) A process-based ecosystem model (SAVANNA) adapted to test effects of management and Bromus invasion under different environmental conditions. This addresses the WIPMC priorities to develop and implement models in pest management. It will also predict the effects of IPM practices on habitat for native species of concern, and provide the foundation for future work that will compare the costs, benefits and impacts of adopting these IPM practices. (2) Bromus invasion risk assessment maps, which addresses the WIPMC priorities to assess impacts across production areas and development of early detection and rapid response tools. (3) A peer-reviewed publication in accordance with WIPMC priorities to disseminate knowledge gained through research activities. (4) A website to document findings of the project and progress decision support tool development. (5) A stakeholder workshop, addressing WIPMC priorities of outreach and demonstration activities.

These outcomes will inform the process of creating a decision support tool for the management of Bromus. The tool cannot be created without first establishing biological and ecological relationships within our study area. These relationships will be used to optimize IPM practices for areas at risk of invasion by Bromus. Adaptation of SAVANNA will allow social and economic components to be integrated to develop the decision support tool. The tool can be applied by land managers to choose an optimal set of IPM practices that maximize economic and social benefits while reducing environmental impacts.

F. Impacts and Potential Impacts. The “impacts” and “potential impacts” sections of your report will help the Western IPM Center highlight the value of IPM research and education by detailing the real-world impacts of Center-funded projects. We will use the information in news articles, reports, and informational brochures to showcase the impacts of projects that our program supports. *See Attachment A at end of form for questions to assist you in describing the impacts of your project.*

1. Impacts. Describe any impacts of your work. *Impacts* are specific changes in condition for those affected by your work. Impacts include adoption of technology, creation of jobs, reduced cost to the consumer, less pesticide exposure to farmers, access to more nutritious food, and a cleaner environment and healthier communities.

Stakeholders who have attended focus groups designed to inform a survey that will assess understanding of Bromus and its management are now aware of our efforts to address this important environmental and economic problem.

2. Potential impacts. Describe your project’s potential impacts. *Potential impacts* are the ways that your project’s outputs could directly lead to changes in condition that will unfold in the future.

The information generated by this project provide the essential foundation for decision support tools that will take the form of a handbook and extension materials. Interactions between stakeholders at the workshop combined with the handbook, extension materials, web site and peer-reviewed publication will help land managers prioritize Bromus management and focus their efforts in the areas most likely to be successful. It could lead to the judicious use of imazapic herbicide, which will minimize ecological and economic costs.

G. Appendices

1. With your report, please attach *at least two (2) photographs* that illustrate your project. Please describe the photo and indicate the name and institution of the person who took the photo. (If you submit more than two photographs, please include those additional descriptions and photo credits under "H. Additional Information," below.)

Photo #1 description:

Photos, descriptions and credits are contained in the attached document

Photo #1 credit (photographer's name and institution):

Photo #2 description:

Photo #2 credit (photographer's name and institution):

2. Also attach any printed fact sheets or other publications resulting from your work that will enhance our understanding of your project and its impacts. Please provide a description of each attached publication below.

Document #1 description:

Electronic newsletter sent to stakeholders

Document #2 description:

Document #3 description:

H. Additional Information

Additional photos contained in attached document

Credit: Some of the language about impacts and potential impacts was adapted from a PowerPoint presentation by H. Michael Harrington, Executive Director, Western Association of Agricultural Experiment Station Directors, Colorado State University.

Attachment A

Questions to Help in Reporting Impacts and Potential Impacts

Below are some questions that will guide you in assessing and then describing the impacts and potential impacts of your project. The relevance of each question may vary depending on whether yours is a research or extension project. Please answer as many as you can to the best of your ability, and feel free to describe any additional types of impacts not mentioned below. Remember to identify any potential impacts.

1. Innovations in IPM:

Are there new IPM practices that have been (impacts) or could be (potential impacts) adopted as a direct result of your project? What is the total number of acres (or homes, schools, greenhouses, nurseries) on which these practices could realistically be implemented?

2. Safeguarding human health and the environment:

- a. Has the project reduced risk (or could it potentially do so) by changing the use of pesticides on farms, in homes, in schools, etc.? For example, could it result in fewer sprays per season or a switch to lower-risk pesticides? If possible, quantify the changes in condition. (Since there is no unanimous definition of *high* and *low risk*, investigators selecting this indicator are asked to categorize the pesticides they are reporting on as *high* or *low risk* according to the particular situation [e.g., lower risk to natural enemies]).
- b. Are there any other impacts or potential impacts on human health or the environment as a result of your project?

3. Economic benefits:

- a. What is (or could be) the economic benefit (e.g., dollars saved) for clientele who adopt IPM strategies and systems you studied? Do you envision potential commercialization or mass production of these systems?
- b. How many clients are satisfied with IPM results (such as improved yield, improved quality of yield, reduced pest populations, more effective pest control, greater preservation of nonpest species)?
- c. Are there other financial benefits that might be realized (potential impact) as a result of your project?

4. Implementation of IPM:

- a. How many IPM strategies and systems have been validated through this project (e.g., through on-farm trials, large plot tests, or other methods used to confirm efficacy)?
 - b. How many educational materials were delivered? To whom? And what are the impacts or potential impacts?
 - c. What is the number of growers/personnel trained? And what are the impacts or potential impacts?
 - d. For a Web site, what volume of traffic and type of use has the site experienced? (For example, number of visitors per day or month; number of page views; number of unique user sessions; change in volume during growing season; average viewing time.) And what are the impacts or potential impacts?
 - e. How many more people adopted IPM practices as a direct result of your project, or how many people adopted new IPM practices?
 - f. Are there other ways in which your work will result in improved use or increased implementation of IPM strategies in your region or across the West?
5. Has your project or study increased collaboration among stakeholders interested in the development and implementation of improved IPM strategies and systems?