Invasive Species Symposium

The following abstracts are from the "Invasive Species Symposium" at the campus of Montana State University—Billings 16 April 2004. The syposium was jointly sponsored by Montana State University—Billings, Montana Academy of Sciences, Montana Weed Control Association, and Center for Invasive Plant Management. For more information regarding the symposium, contact James Barron, Department of Biological and Physical Sciences, MSU - Billings: jbarron@msubillings.edu.

Role of Usda, Aphis, and PPQ in Prevention, Eradication, and Management of Invasive Plant Pests[MAS]

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The United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine and the Department of Homeland Security, Customs and Border Protection are the first line of defense in preventing the introduction of new Plant and Animal pests. Since 1 March 2003 some of PPQ's responsibility has been transferred to the DHS, CBP. PPQ is responsible for inspecting propagative plant products, identification of potential pests, issuing or denying permits to import products that could pose a risk to plant health in the United States, and responding to potential and new introductions through eradication, containment, and/or management of plant pests. PPQ also regulates the importation of biological control organisms utilized for control of non-indigenous plant/ weeds.

Bozeman Fish Health Center's Invasive Species Diagnosis and Monitoring Program[MAS]

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Invasive species have become an integral component to fish health. In the past, the Bozeman Fish Health Center primarily dealt with fish health diagnostics and hatchery certification. Currently, the facility is branching out to incorporate a more total ecosystem approach. Impacts to fish health from invasive species include infectious disease and environmental changes. Three infectious diseases the Center monitors in wild and hatchery systems are *Myxobolus cerebralis*, the causative agent of whirling disease, largemouth bass virus and spring viremia of carp virus. Examples of invertebrates that indirectly impact fish health are the New Zealand mudsnail (*Potamopyrgus antipodarum*), the Zebra Mussel (*Dreissena polymorpha*) and snail, *Melanoides tuberculata*. These organisms have an impact on the ecology of the aquatic environment and can also be utilized as an intermediate host for digenetic trematodes. The parasitic digenetic trematodes have the potential to become fish

pathogens. Research is being conducted to determine if any parasitism of fish is taking place via the New Zealand mudsnail.

Montana's Noxious Weeds—History and Needs[MAS]

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The presentation provides an overview of the current status of the noxious weed problem in Montana. It contains some historical information regarding some of Montana's most invasive plant species and the most current data available on existing infestations of the various species. A current overview was presented of the multi-disciplined resources that are being applied to combat this ecological threat along with identification of the scope of future efforts needed to successfully reduce the invasive plant problem in Montana. Excerpts from the current Montana Noxious Weed Management Plan were included to reflect the coordinated efforts being implemented to give Montanans a clearer picture of the role that invasive plants play in our environment.

How Much Do We Know About the Effects of Wildfire on the Occurrence and Expansion of Non-native Plant Species' Distributions in Natural Areas?[MAS]

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Invasion of non-native plant species into natural and managed ecosystems is a widespread problem with potentially devastating ecological and economic consequences. Increased occurrence and severity of wildland fires has been identified as a potential threat to natural and managed ecosystems. Wildfire is often linked with the introduction of non-native species and subsequent expansion of their populations. However, much of the information concerning non-native species and wildfire is descriptive and anecdotal. In addition, much of the information available on wildfire and non-native plants comes from research in areas where the native vegetation composition, structure, and natural processes are no longer intact. We have performed an extensive literature search on non-native plant species and wildfire in natural areas of the Western United States. We have synthesized and critiqued this literature, identified research gaps, and clarified the information that is scientifically supported. For this symposium, we will focus on the information gathered on the relationship between wildfire and non-native plant species that is pertinent to the forest, shrubland, and grassland types of Montana.

Detecting Change in Invasive Plant Populations for Prioritization of Management[MAS]

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Notoriously invasive plant species may not be increasing in population size in all environments. Therefore, it is crucial to develop methods that will allow quantification of invasiveness so that populations can be prioritized for management. Simulation models were used to identify efficient methods for detecting change in density and spatial extent of plant metapopulations. In addition, models allowed exploration of the relative importance of specific processes on population growth. Efficient methods for change detection may rely on species-specific knowledge of the dominant processes influencing population growth. Seed dispersal as well as response to intra- and interspecific density may be important properties to assess in order to select the best methods to detect change.

Whirling Disease In Yellowstone National Park[MAS]

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The European parasite *Myxobolus cerebralis* (the cause of salmonid whirling disease) exhibits a complex two-host life cycle involving an aquatic oligochaete (*Tubifex tubifex*) and a salmonid fish. This pathogen was first detected in Yellowstone cutthroat trout (YCT) from Yellowstone Lake in 1998. Between 1999 and 2001, a large-scale investigation to determine severity and spatial extent of M. cerebralis in the lake and its tributaries revealed that prevalence of the parasite ranged (in 1999) from greater than 20 percent in the northern section of Yellowstone Lake to 5 percent in the West Thumb. Sentinel fry exposures detected mild infection in Clear Creek in 2000 and in the Yellowstone River proper in 2001, and moderate to severe infection in fry exposed in Pelican Creek in 2000 and 2001. The present investigation began in 2002 focusing on these three YCT spawning tributaries described as *M. cerebralis*-positive using sentinel fry, collection of wild fry, collection of oligochaetes, prevalence of infection in oligochaetes, and measurement of physico-chemical features of the streams. Polymerase chain reaction (PCR) analyses have detected *M. cerebralis*-positive sentinel YCT from all study reaches in Pelican Creek but no infection in sentinel or wild fry from the study reaches in each of the Yellowstone River and Clear Creek. We collected 1020 live oligochaetes from the sentinel study reaches in 2002, four of which released actinospores that PCR tests failed to classify as *M. cerebralis*. About 150 oligochaetes that were not producing actinospores were also tested, two of which (from Pelican Creek) tested positive for *M. cerebralis*. Part of the environmental assessment data from each of the study reaches will be processed during spring 2003, but some physico-chemical characteristics (e.g., water temperature, conductivity) appear correlated to distribution and abundance of *M. cerebralis* in

tributaries to Yellowstone Lake. The goal is to identify potential factors influencing incidence of whirling disease in YCT to aid the park's fish biologists and other regional fisheries managers to develop possible management strategies for this invasive pathogen threatening native YCT and other salmonid populations.

Intensive Monitoring Of Linaria Vulgaris At The Patch Scale[MAS]

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Non-native species vary in their level of invasiveness in different natural plant communities. While land managers recognize this, the information behind this idea is anecdotal. Quantitative data for documenting, facilitating and directing management efforts does not exist. The invasion of Linaria vulgaris into native plant communities in the Rocky Mountains is a challenge for managers because this species is perceived to invade upland plant communities that lack obvious human disturbance. Our goal with this experiment was to gain an understanding of the demographic and ecological factors that facilitate *L. vulgaris* invasion of native plant communities. The study had three main objectives: to quantify the invasive potential of *L. vulgaris* in three different community types; to characterize which life history states are more responsible for invasiveness; and to quantify how population demographics and invasion rates vary between patch interiors and edges. Results from the first three years of the study indicate that rates of invasion varied significantly for each of the different plant communities. Seed production and seedling emergence have been extremely low over the study period and vegetative production has been the life history state most responsible for invasion. Finally, the data showed little difference for rates of invasion, in terms of both density and spatial extent, between patch edges (the invading front) and patch interiors for the three habitats studied.

Sampling To Understand Non-indigenous Plant Species Occurrence And Develop Probability Maps Of Occurrence[MAS]

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Many natural areas have a mandate to preserve the natural systems under their control and to manage non-indigenous species. However, in order to manage such species one has to know which and where species occur. We believe that there is a three-phase process in non-indigenous management; inventory/survey, monitoring, and management. We surveyed the northern range of Yellowstone National Park using a stratified sampling method. Transect start locations were stratified on a known disturbance, roads and trails, but to ensure unbiased sampling they finished 2000 m from any road or trail. Continuous data were collected along each transect, information on biotic and abiotic variables were collected along with data on the occurrence of non-indigenous species. Logistic regression was used to analyze the data for correlations between non-indigenous species occurrence and the independent variables. The best model was assessed using Akaike Information Criterion (AIC). Coefficients from the best model were then used to produce probability maps of target species for the area of interest.

Effect On Grassland Invasability Of Vegetation Type, Weakening Disturbance, And Destructive Disturbance[MAS]

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We expect invasability of steppe vegetation to differ among vegetation types and to be facilitated by disturbance, which weakens the community fabric (e.g. fire or grazing) or locally destroys it (cultivation, machine, or animal). Three experiments examine aspects of this hypothesis. We expect a colonizer to perform differently in environments with different physical or biotic stresses. Thus, invaders should perform differently on topographic gradients from moist tall-grass through mixed-grass to dry short-grass prairie. And, in a mixed-grass environment, invaders might perform differently in the native grass type or in clones of invading *Bromus inermis* (exotic grass) or *Symporicarpos occidentalis* (native shrub). On either gradient, a recently burned site might be more invasible than a healed site. Surrogate weeds both well adapted to the environment and having large seeds (*Hordeum vulgare*, grass, and *Helianthus annus*, forb) were planted into disturbances (7 cm dia) in five such great plains vegetation types, each with examples of recent burning. Survival to flowering was ~30-50 percent and equal in all the communities. Height (9-22 cm) and weight (0.2-0.7 gm/ plant) growth were poor and roughly equal throughout. One might conclude that, regardless of vegetation type, most of the limiting resource is used by the established community and unavailable to any invader. We expect colonizing success to increase linearly with the area of a denuding disturbance. This hypothesis was rejected when seeds planted in 1-, 10-, 10-, and 1000-cm^2 holes grew similarly and poorly while plants growing in >10,000-cm2 holes grew well. We speculate that, while disturbance released resources to invading plants in large disturbances, resources also released in smaller holes were pre-empted by roots invading from adjacent undisturbed vegetation. The experiment was conducted in two rangelands (dry *Bouteloua gracilis* and moister *Festuca idahoensis*) and replicated in five blocks and two years. The plants studied included, in order of seed size, grasses (*Zea mays*, *Triticum aestivum*, and *Bromus tectorum*) and forbs (*Helianthus annus*, *Melilotus officinalis*, and *Centaurea maculosa*). The forbs in 1000-cm^2 holes performed slightly better than the grasses, perhaps because forb taproots reached below densely rooted surface horizons. Some hypothesize that fire weakens native vegetation to facilitate weed invasion. A corollary is, that if invaders are perennial and fire resistant, successive fires will allow increase of the weed both by providing damaged sites for new infections and reducing resistance to lateral spread of established colonies. We tested this hypothesis by comparing ubiquity (percent of m^2 plots infected) and dominance (percent cover in infected plots) in management units protected from fire 1935-1972 and burned 0, 1, 2, 3, 4, 5, or 6 times since 1972. Vegetation of moist bottoms, mixed grass slope sites, and short-grass hilltop sub-sites was separately examined. Preliminary analyses show no fire-related difference in either establishment (ubiquity) or expansion (cover at occupied sites) for major weeds including *Bromus inermis* and *Poa pratensis* (exotic grasses) or *Symphoricarapos occidentalis* (native brush).