Montana State University: Montana Agricultural Experiment Station and Extension Service

REPORT FOR THE MONTANA NOXIOUS WEED TRUST FUND ADVISORY COUNCIL

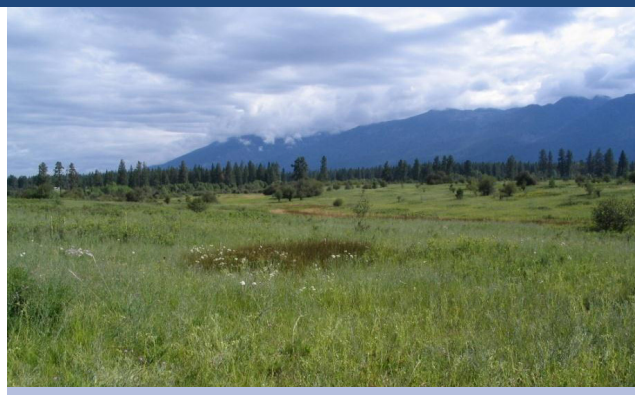
JUNE 2013

INTRODUCTION

This report for the Montana Noxious Weed Management Advisory Council was assembled in compliance with the Montana Noxious Weed Trust Fund Act and Administrative Rules which require an annual report from the Montana Agricultural Experiment Station and Montana State University Extension Service on current projects and future plans. This report is a compilation of major weed science research and education activities conducted by MSU over the past three years and includes highlights of funded Montana Noxious Weed Trust Fund grants as well as comprehensive reporting of all weed science research products and education funding and activities.

MONTANA NOXIOUS WEED TRUST FUND PROJECTS 2010–2012

Project Title, *PI*	2010	2011	2012
Biological Control of Common Tansy and Oxeye Daisy, *Jeff Littlefield*	●	●	●
Biological Control of Invasive Hawkweed and Tansy Ragwort, *Jeff Littlefield*	●	●	●
Biological Control of Russian Knapweed, *Jeff Littlefield*	●	●	●
Biological Control of Whitetop and Perennial Pepperweed, *Jeff Littlefield*	●	●	●
Can Biological Control and Targeted Sheep Grazing be Integrated to Suppress Spotted Knapweed?, *Jeff Mosley*		●	●
Cheatgrass Ecology and Integrated Management, *Jane Mangold*	●		
Continental Divide Invasive Weed Barrier Zone, *Kim Goodwin*	●		
Establishing and Monitoring Insectaries for Yellow Toadflax Biocontrol, *David Weaver*	●	●	●
Herbicide Resistance Extension Information for Montana Producers, *William Dyer*	●		
Identifying and Testing Candidate Agents for Russian Olive Biocontrol, *David Weaver*		●	●
Implementing EDRR in Montana Using the INVADERS Database, *Jane Mangold*	●		
Integration of Pathogens, Sheep, and Herbicides to Manage Cheatgrass, *Fabian Menalled*		●	
Missouri River Watershed Coalition Coordination, *Elizabeth Galli-Noble*	●	●	●
Rangeland Revegetation Revisited, *Jane Mangold*	●		
Saltcedar Effects on Mycorrhizal Fungal Communities and Screening of Native Species for Restoration, *Erik Lehnhoff*	●		
Tall Buttercup Ecology and Integrated Management, *Jane Mangold*			●
Weed Free Borders Protection Program, *Kim Goodwin*			●
Weed Management Certification Program, *Jane Mangold*		●	
Weed Seedling Identification Guide, *Jane Mangold*			●



DEPARTMENTS INVOLVED WITH WEED RESEARCH AND EDUCATION

Montana Agricultural Experiment Station
MSU Extension Service

Animal and Range Sciences

Rachel Frost, *Rangeland Ecology and Management*
Pat Hatfield, *Range Sheep Nutrition*
Rodney Kott, *Range Sheep Production*
Jeff Mosley, *Rangeland Ecology and Management*
Bret Olson, *Rangeland Ecology and Management*

Center for Invasive Species Management

Elizabeth Galli-Noble, *CISM Director*
Kim Goodwin, *Weed Science*

Land Resources and Environmental Sciences

Erik Lehnhoff, *Invasive Plant Ecology*
Jeff Littlefield, *Biological Control of Weeds*
Jane Mangold, *Integrated Invasive Plant Management*
Bruce Maxwell, *Agroecology*
Fabian Menalled, *Weed Ecology and Management*
Zach Miller, *Plant Ecology*
Robert Peterson, *Plant-Insect Interactions*
Lisa Rew, *Non-native Plant Ecology*
Sharlene Sing (*Affiliate Research Professor from US Forest Service*), *Biological Control of Weeds*
Tracy Sterling, *Weed Physiology*
David Weaver, *Entomology*

Plant Sciences and Plant Pathology

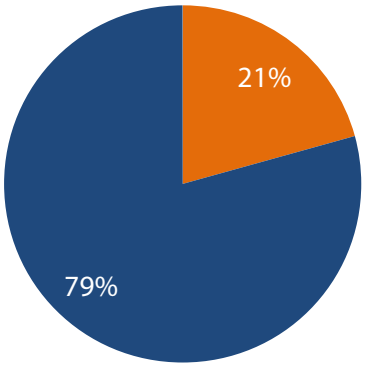
Mary Burrows, *Plant Pathology*
William Dyer, *Weed Physiology*

Research Centers

Prashant Jha, *Weed Science*

MSU WEED PROJECT FUNDING 2010–2012

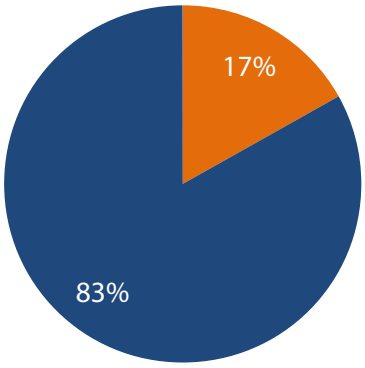
NEW AWARDS 2010



Noxious Weed Trust Fund
$538,784 ..... 21%

Other
$2,067,023 ..... 79%

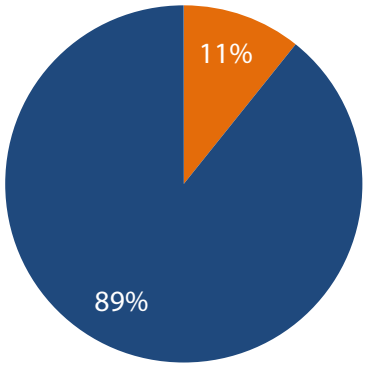
NEW AWARDS 2011



Noxious Weed Trust Fund
$298,983 ..... 17%

Other
$1,476,437 ..... 83%

NEW AWARDS 2012



Noxious Weed Trust Fund
$302,835..... 11%

Other
$2,512,766 ..... 89%

OTHER FUNDING SOURCES FOR WEED RESEARCH AND EDUCATION

NATIONAL

US Department of Agriculture
- Animal and Plant Health Inspection Service
- Forest Service
- National Institute of Food and Agriculture
- National Resources Conservation Service

US Department of the Interior
- Bureau of Indian Affairs
- Bureau of Land Management
- Fish and Wildlife Service
- National Park Service

US Department of Defense

National Science Foundation

REGIONAL

- Algoma University
- Gonzales Stoller LLC
- MJ Murdock Charitable Trust
- North Dakota State University
- Northern Pulse Growers Association
- Utah State University
- Western Integrated Pest Management Center
- Western Sugar Cooperative
- Western Sustainable Agriculture Research and Education Program
- Wyoming Department of Agriculture

STATE

- Farm Services Agency
- Fort Belknap Indian Community
- Montana Weed Control Association
- Montana Wheat and Barley Committee

FUTURE PLANS: 2013 MONTANA NOXIOUS WEED TRUST FUND GRANTS

Montana State University

Assessing the Influence of Fire and Grazing on Cheatgrass Spread and Plant Community Composition, *Erik Lehnhoff*
Biological Control of Common Tansy and Oxeye Daisy, *Jeff Littlefield*
Biological Control of Invasive Hawkweed and Tansy Ragwort, *Jeff Littlefield*
Biological Control of Whitetop and Perennial Pepperweed, *Jeff Littlefield*
Determining the Efficacy of Biocontrol Using *Mecinus janthinus* Strains on Dalmatian, Yellow, and Hybrid Toadflax, *David Weaver*
Identifying and Testing Candidates for Biocontrol of Russian Olive, *David Weaver*
Pine Creek Fire Recovery Program, Park County, *Tracy Mosley*
Predicting Plant Community Response to Weed Control: When is Revegetation Necessary?, *Jane Mangold*
Tall Buttercup Ecology and Integrated Management: Phase II, *Jane Mangold*
Update and Expand the *Mapping Noxious Weeds in Montana* Publication, and Conduct EDDMapS West Trainings, *Elizabeth Galli-Noble*

University of Montana/MSU Collaborative Projects

Environmental DNA for Eurasian Watermilfoil, *Adam Sepulveda*
Search Dogs for the Detection of Dyer's Woad, *Marilyn Marler*
Missoula Conservation Lands Restoration Project, *Morgan Valliant*

Examples of Extension Participation in Montana Noxious Weed Trust Fund Grants

Blackfoot Challenge, *Powell County*
Clearwater River Yellowflag Iris Eradication Project, *Missoula County*
Cottonwood Creek Cooperative Weed Management Area, *Powell County*
Leave No Weeds, *Missoula County*
Sentinel/South Hills Weed Management Area, *Missoula County*
Sunrise Weed District, *Granite County*
Swan Valley Cooperative Weed Management Project, *Missoula County*
Treatment of Eurasian Watermilfoil and Curlyleaf Pondweed on Noxon Reservoir, *Sanders County*

RESEARCH IMPACTS 2010–2012

MSU WEED SCIENCE RESEARCH ACTIVITY

Peer-reviewed journal articles: 51
Invited book chapters: 4
Peer-reviewed conference abstracts: 118
Completed theses and dissertations: 12
Graduate students in training: 15
Extension publications: 23
TV and radio appearances: 14

Research Collaborators

Agriculture and Agri-Foods Canada
BBCA Rome
CABI Europe
Landcare New Zealand
Montana Department of Agriculture
Montana Department of Environmental Quality
Private landowners
Russian Zoological Institute
Task Force/Consortium Groups
USDA Agricultural Research Service
USDA Animal and Plant Health Inspection Service
USDA ARS European Biological Control Lab
USDA Forest Service
USDA National Institute of Food and Agriculture
USDA Western Invasive Pest Management Center
USDI Bureau of Land Management

Target Weeds

Canada thistle *(Cirsium arvense)*
Cheatgrass *(Bromus tectorum)*
Common tansy *(Tanacetum vulgare)*
Dalmatian toadflax *(Linaria dalmatica)*
Douglas fir *(Pseudotsuga menziesii)*
Field bindweed *(Convolvulus arvensis)*
Juniper *(Juniperus* spp.)
Leafy spurge *(Euphorbia esula)*
Orange hawkweed *(Hieracium aurantiacum)*
Oxeye daisy *(Leucanthemum vulgare)*
Perennial pepperweed *(Lepidium latifolium)*
Ponderosa pine *(Pinus ponderosa)*
Rush skeletonweed *(Chondrilla juncea)*
Russian knapweed *(Acroptilon repens)*
Russian olive *(Elaeagnus angustifolia)*
Saltcedar *(Tamarix* spp.)
Spotted knapweed *(Centaurea stoebe)*
St. Johnswort *(Hypericum perforatum)*
Sulfur cinquefoil *(Potentilla recta)*
Tall buttercup *(Ranunculus acris)*
Tansy ragwort *(Senecio jacobaea)*
Western salsify *(Tragopogon dubius)*
Whitetop *(Cardaria draba)*
Wild oat *(Avena fatua)*
Yellow toadflax *(Linaria vulgaris)*

MONTANA NOXIOUS WEED TRUST FUND PROJECT HIGHLIGHTS

Biological Control of Weeds Research

PI: Jeff Littlefield, LRES

Objectives

- Host specificity testing and screening of new agents
- Steer agents through regulatory channels
- Augment populations of agents for release
- Conduct field releases
- Monitor agents and their success.

Current Target Weeds and Agents Released

- Russian knapweed, gall midge and wasp
- Tansy ragwort, flea beetle
- Hawkweeds, gall wasp and host testing
- Weedy mustards, gall mite and host testing
- Field bindweed, gall mite
- Rush skeletonweed, root moth and host testing
- Other projects: St. Johnswort, common tansy, oxeye daisy, and spotted knapweed.

Herbicide Resistance Extension Information for Montana Producers

PI: Bill Dyer, PSPP **Co-PIs:** Fabian Menalled, LRES; Prashant Jha, Southern Agricultural Research Center

Outcomes

- Resistant kochia and Russian thistle can be controlled with in-crop Bronate, Vendetta, Husky, and Aim on very small weeds and with Roundup in fallow.
- There are no other selective herbicides to control resistant wild oats in small grain crops; however, Syngenta and Valent have promised new selective herbicides about three years from the market that should control them.
- None of the resistant biotypes shows a consistent fitness penalty (i.e., less competitive or produces fewer seeds) than susceptible types.
- Fabian Menalled gave numerous Extension talks on resistance management and prevention. The topic was also addressed in several MSU press releases.

Integration of Pathogens, Sheep, and Herbicides to Manage Cheatgrass

PI: Fabian Menalled, LRES **Co-PIs:** Rick Engel, Jane Mangold, and Zach Miller, LRES; Patrick Hatfield, ANRS; Mary Burrows, PSPP

Outcomes

- The project tested the effectiveness of chemical control, biocontrol, and their integration on cheatgrass performance, and assessed the impact of sheep grazing on cheatgrass abundance and dynamics.
- Research showed that (1) *Pyrenophora semeniperda,* a soil-borne fungal pathogen, inhibits cheatgrass seed germination and reduces seedling vigor; and (2) sheep consume cheatgrass seedlings and can significantly reduce its abundance, in comparison with chemically-based approaches to manage this weed. This information was used to develop management strategies that integrate biological, cultural, and chemical practices to reduce cheatgrass abundance.
- A manuscript is in review for *Weed Technology*.

Missouri River Watershed Coalition Coordination

PI: Elizabeth Galli-Noble, CISM

Outcomes

- The MRWC and CISM launched EDDMapS West, a regional EDRR reporting system, and conducted numerous trainings.
- Several outreach publications were developed and distributed throughout the MRWC states.
- A series of invasive species awareness videos/PSAs for sportsmen was produced and each episode was broadcast to over 500,000 viewers.
- The MRWC and CISM secured a $1 million NRCS Conservation Innovation Grant to investigate herbicide treatments on saltcedar and Russian olive, and innovative bioenergy technologies that utilize the resulting invasive plant biomass.

Establishing and Monitoring Insectaries for Yellow Toadflax Biocontrol

PI: David Weaver, LRES **Co-PIs:** Sharlene Sing and Jeff Littlefield, LRES

Outcomes

- Yellow toadflax biocontrol agents are being evaluated annually. The weevil *Mecinus janthinus* is established in Powell County and the project is measuring weevil impacts on toadflax in Powell County and at newly established locations. There is very little visible damage on yellow toadflax by this weevil until the stems are very heavily infested, so the insect may be reducing toadflax growth even without major visible damage.
- A stem galling weevil, *Rhinusa pilosa*, that attacks younger yellow toadflax shoots was obtained from CABI and tested in MSU quarantine on target yellow toadflax and toadflax hybrids. These weevils are highly specific and established on yellow toadflax in 2010 and 2011 (but failed on hybrid toadflax) and culture was continued in the MSU quarantine. CABI has identified additional agents and is working on delivering adequate numbers of agents that specifically target hybrid toadflax. They have promised an adequate number of good quality individuals of several stem-galling weevil species for specific, focused testing on hybrid toadflax in the fall of 2013. Concern about the challenges posed for biological control hybrid toadflax remains, but provision of new agents has promise.

Saltcedar Effects on Mycorrhizal Fungal Communities and Screening of Native Species for Restoration

PI: Erik Lehnhoff, LRES **Co-PIs:** Fabian Menalled, Lisa Rew, and Cathy Zabinski, LRES; Matt Lavin, PSPP

Outcomes

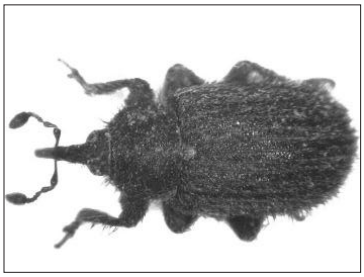
- Saltcedar was evaluated and determined to have negatively affected the beneficial soil fungi (mycorrhizae).
- All plant species evaluated grew better in soil from invaded sites compared to when grown in soil from un-invaded sites. This indicates that saltcedar adds nutrients to soil, possibly because of slower litter decomposition rates.
- All plants grew poorly in Yellowstone River soil, compared to Fort Peck and Bighorn River soils. This indicates that soil differences across sites are important to consider for revegetation.
- Two manuscripts were published, one in *Wetlands* and the other in *Applied Vegetation Science*.

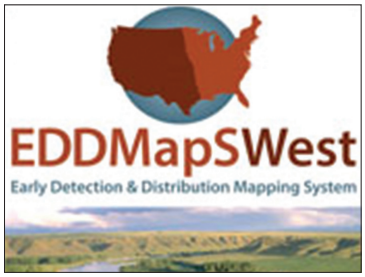
Weed Management Certification Program

PI: Jane Mangold, LRES **Co-PI:** Kim Goodwin, LRES

Outcomes

- In the first year, a curriculum for a weed management certification program for land managers and weed coordinators was developed.
- Two 3-day, Level 1 workshops were held in April and October 2012, and had a combined total of 72 participants. Feedback from participants included: "Best workshop that I have attended in the last 25 years!" and "I thought the training was great and probably the best I've been to."
- A Level 2 workshop was held in April 2013 and had 25 participants. Level 3 will be held in late summer/early fall 2014.



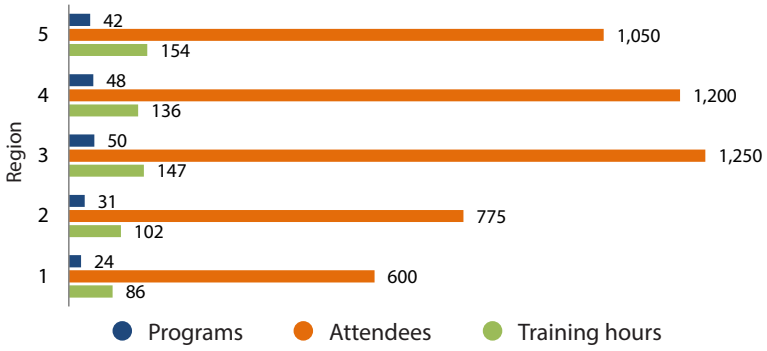


From left: A potential yellow toadflax biocontrol agent, *Rhinusa brondelii*; participants at the first Weed Management Certification Program workshop; EDDMapS West, the MRWC's regional invasive species reporting system; potential restoration plant species for use at saltcedar-invaded sites.

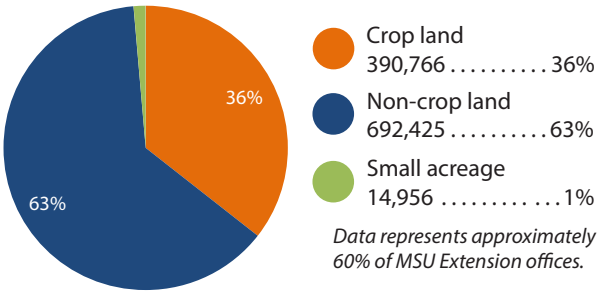
EDUCATION IMPACTS 2010–2012

MSU EXTENSION

PESTICIDE EDUCATION DELIVERED 2012



WEED MANAGEMENT CONSULTATIONS (ACRES) 2012

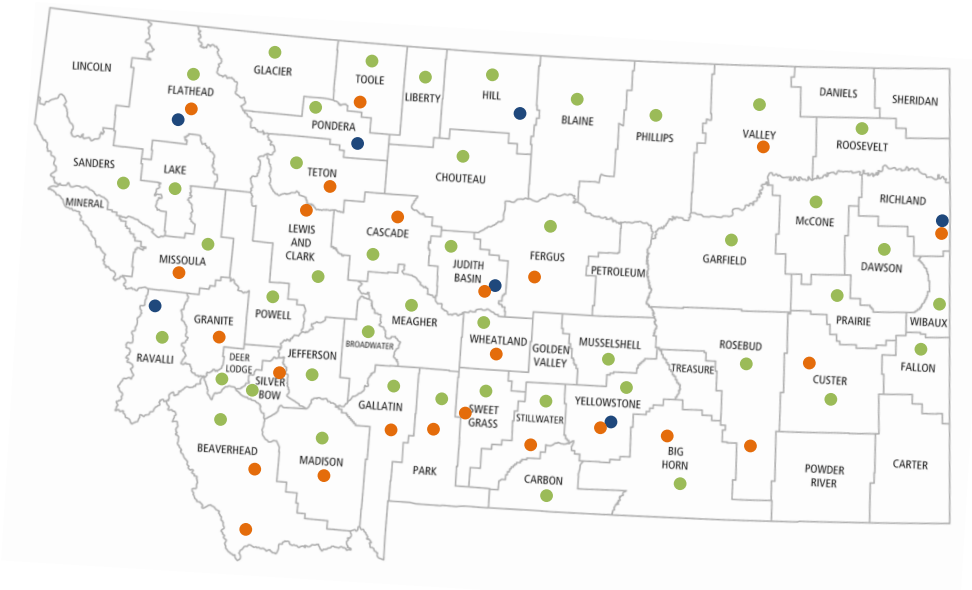


Data represents approximately 60% of MSU Extension offices.

MSU Extension Personnel Responding to a Survey About Weed Education Contributions in 2012

Larry Brence, *Eastern Region Department Head* • Joe Broesder, *Central Region Department Head* • Steve Siegelin, *Western Region Department Head* • Dave Bertelsen, *Wibaux County* • Dave Brink, *Mineral County* • Chrissy Cook, *Judith Basin County* • Darren Crawford, *Fergus and Petroleum Counties* • Jesse Fulbright, *Liberty County* • Nicole Gray, *Hill County* • John Halpop, *Sanders County* • Marc King, *Sweet Grass County* • Virginia Knerr, *Broadwater County* • Emily Lockard, *Gallatin County* • Dan Lucas, *Granite County* • Jerry Marks, *Missoula County* • Patricia McGlynn, *Flathead County* Eric Miller, *Garfield County* • Shelley Mills, *Valley County* • Tracy Mosley, *Park County* • Ken Nelson, *McCone County* Jodi Pauley, *Powell County* • Steffany Rogge, *Missoula County* • Ann Ronning, *Roosevelt County* • Bobbie Roos, *Daniels County* • Mary Rumph, *Powder River County* • Sharla Sackman, *Prairie County* • Andrea Sarchet, *Madison and Jefferson Counties* • Brent Sarchet, *Lewis and Clark County* • Lee Schmelzer, *Stillwater County* • Michael Schuldt, *Custer County* • Jack Stivers, *Lake County* • J.P. Tanner, *Beaverhead County* • Elin Westover, *Fallon and Carter Counties*

MAES RESEARCHERS AND EXTENSION SPECIALISTS CONTRIBUTING TO EDUCATION AND OUTREACH



- MSU Research Centers
- MSU outreach and education program locations
- Counties which submitted plant sample(s) for identification by Schutter Diagnostic Lab

Off-Campus Educational Programs

Programs delivered: 317
Individuals reached: 15,038

Schutter Diagnostic Lab

Weed samples identified: 1,389

Undergraduate and Graduate Level Courses

AGSC 401: Integrated Pest Management
ENSC 443/LRES 543: Weed Ecology and Management
ENSC 410/LRES 510: Biodiversity Survey and Monitoring Methods
LRES 540: The Ecology of Plants and Plant Communities
LRES 569: Ecology of Invasive Plants in the Greater Yellowstone Ecosystem
PSPP 546: Herbicide Mode of Action

RESEARCH PUBLICATIONS 2010–2012

JOURNAL ARTICLES AND INVITED BOOK CHAPTERS

Bold denotes an MSU employee

Cropland Weed Management

Jha P, Norsworthy JK. 2010. Annual changes in temperature and light requirements for germination of Palmer amaranth seeds retrieved from soil. *Weed Science* 58: 426–432.

Jha P, Norsworthy JK. 2010. Cyhalofop application timing and adjuvant selection for *Echinochloa crus-galli* control in rice. *Crop Protection* 29: 820–823.

Jha P, Norsworthy JK, Riley MB, Bridges Jr. W. 2010. Shade and plant location effects on germination and hormone content of Palmer amaranth seed. W*eed Science* 58: 16–21.

Early Detection

Goodwin KM, **Engel RE**, **Weaver DK**. 2010. Trained dogs outperform human surveyors in the detection of rare spotted knapweed. *Invasive Plant Science and Management* 3: 113–121.

Goodwin KM, Sheley RL, Jacobs JS, Wood S, et al. 2012. Cooperative prevention systems to protect rangelands from the spread of invasive plants. *Rangelands* 34: 26–31.

Integrated Pest Management

Davis PB, **Menalled FD**, **Peterson RKD**, **Maxwell BD**. 2011. Refinement of weed risk assessment for biofuels using *Camelina sativa* as a model species. *Journal of Applied Ecology* 48: 989–997

Gan Y, Kutcher HR, **Menalled FD**, Lafond G, Brandt SA. 2010. Intensifying production of using broadleaf crops in cereal-based cropping systems in the Northern Great Plains. In *Current Advancements in Soil Science and Agronomy Research in the Northern Great Plains*, ed. Malhi D., 277–299. Kerala, India: Research Signpost.

Ito D, **Miller Z**, **Menalled FD**, **Moffet M**, **Burrows ME**. 2012. Relative susceptibility among alternative host species prevalent in the Great Plains to wheat streak mosaic virus. *Plant Disease* 98: 1185–1192.

Menalled FD. 2010. Ecological considerations in the design of integrated weed management programs. *Agroecologia* 5: 73–78.

Menalled FD, **Keren EN**, **Weaver DK**, **Dyer A**, **Robinson-Cox J**. 2012. Assessing the ecological basis of a multi-pest approach to management of wheat-fallow systems. *Canadian Journal of Plant Science* 92: 595–596.

Miller Z, **Menalled FD**, **Burrows ME**. 2012. Downy brome increases disease-induced overwinter mortality in wheat *(Triticum aestivum)*. *Canadian Journal of Plant Science* 92: 1185–1192.

Smith R, Ryan MR, **Menalled FD**. 2011. Direct and indirect impacts of weed management practices on soil quality. In *Soil Management: Building a Stable Base for Agriculture,* ed. Hatfield J and Sauer T, 275–286. Madison, WI: American Society of Agronomy.

Herbicide Resistance

Bagavathiannan MV, Norsworthy JK, **Jha P**, Smith KL. 2011. Does resistance to propanil or clomazone alter the growth and competitive abilities of barnyardgrass? *Weed Science* 59: 353–358.

Egan FL, **Maxwell BD**, Mortensen DA, Ryan MR, Smith RG. 2011. 2,4-D resistant crops and the potential for evolution of 2,4-D resistant weeds. *Proceedings of the National Academy of Sciences* 108: E37.

Harker KN, O'Donovan JT, Blackshaw RE, Beckie JJ, Mallory-Smith C, **Maxwell BD**. 2012. Our view. *Weed Science* 60: 143–144.

Jha P, Norsworthy JK. 2012. Influence of late-season herbicide applications on control, fecundity, and progeny fitness of glyphosate-resistant Palmer amaranth biotypes from Arkansas. *Weed Technology* 26: 807–812.

Keith BK, **Kalinina EB**, **Dyer WE**. 2011. Differentially expressed genes in dicamba-resistant and susceptible biotypes of *Kochia scoparia*. *Weed Biology and Management* 11: 224–234.

Mortensen DA, Egan JF, **Maxwell BD**, Ryan MR, Smith RG. 2012. Navigating a critical juncture for sustainable weed management. *BioScience* 61: 75–84.

Norsworthy JK, **Jha P**, Steckel LE, Scott RC. 2010. Confirmation and control of glyphosate-resistant giant ragweed in Tennessee. *Weed Technology* 24: 64–70.

Norsworthy JK, Riar D, **Jha P**, Scott RC. 2011. Confirmation, control, and physiology of glyphosate-resistant giant ragweed in Arkansas. *Weed Technology* 25: 430–435.

Rangeland Weed Management and Restoration

Fansler VA, **Mangold JM**. 2011. Restoring native plants to crested wheatgrass stands. *Restoration Ecology* 19: 16 –23.

Lehnhoff EA, **Menalled FD**. 2012. Impacts of *Tamarix*-mediated soil changes on restoration plant growth. *Applied Vegetation Science*. Published online 27 Nov 2012.

Lehnhoff EA, **Menalled FD**, **Rew LJ**. 2011. Tamarisk *(Tamarix* spp.) establishment in its most northern range. *Invasive Plant Science and Management* 4: 58–65.

Lehnhoff EA, **Rew LJ**, **Zabinski CA**, **Menalled FD**. 2012. Reduced impacts or a longer lag phase? *Tamarix* in the northwestern United States. *Wetlands* 32: 497–508.

Mangold JM. 2012. Ecological restoration using ecologically-based IPM. *Rangelands* 34: 39–43.

Mangold JM. 2012. Revegetation: using current technologies and ecological knowledge to manage site availability, species availability, and species performance. In *Invasive Plant Ecology and Management: Linking Processes to Practice*, ed. Monaco TA and Sheley RL, 176–195. Wallingford, UK: CABI Publishing.

Pokorny ML, **Mangold JM**, Denny K, Hafer J. 2010. Managing spotted knapweed infested rangeland after wildfire. *Invasive Plant Science and Management* 3: 183–189.

Rew LJ, **Johnson MP**. 2010. Reviewing the role of wildfire on the occurrence and spread of invasive plant species in wildland areas of the intermountain western United States. *Invasive Plant Science and Management* 3: 347–364.

Rinella MJ, **Mangold JM**, Espeland EK, Sheley RL, Jacobs JS. 2012. Long-term dynamics of seeded plants in invaded grasslands. *Ecological Applications* 22: 1320–1329.

Stott L, Dougher TAO, **Rew LJ**. 2010. Developing native multispecies sod: an alternative restoration method for disturbed lands. *Restoration Ecology* 18: 742–752.

Weise JL, **Keren E**, **Menalled FD**. 2011. Native wildflower spe-

cies seedling tolerances to post-emergence herbicides. *Native Plants Journal* 12: 31–36.

Weed Biocontrol

Campbell EJ, **Frost RA**, **Mosley TK**, **Mosley JC**, et al. 2010. Pharmacokinetic differences in exposure to camphor following intraruminal dosing in selectively bred lines of goats. *Journal of Animal Science* 88: 2620–2626.

Henderson SL, **Mosley TK**, **Mosley JC**, **Kott RW**. 2012. Spotted knapweed utilization by sequential cattle and sheep grazing. *Rangeland Ecology and Management* 65: 286–291.

Sciegienka J, **Keren E**, and **Menalled FD**. 2011. Interaction of two biological control agents and a herbicide for Canada thistle suppression. *Invasive Plant Science Management* 4: 151–158.

Schat M, Sing SE, **Peterson RKD**, **Menalled FD**, **Weaver DK**. 2011. Growth inhibition of Dalmatian toadflax, *Linaria dalmatica* (L.) Miller, in response to herbivory by the biological control agent *Mecinus janthinus* Germar. *Entomological Science* 46: 1–15.

Sing SE, **Peterson RKD**. 2011. Assessing environmental risks for established invasive weeds: Dalmatian *(Linaria dalmatica)* and yellow *(L. vulgaris)* toadflax in North America. *International Journal of Environmental Research and Public Health* 8: 2828–2853.

Surber LMM, **Rude ME**, **Roeder BL**, **Mosley TK**, **Grove AV**, Walker JW, **Kott RW**. 2011. Percent spotted knapweed *(Centaurea stoebe)* in the diets of grazing sheep. *Invasive Plant Science and Management* 4: 95–101.

Weed Biology and Ecology

Alexander JM, Kueffer C, Daehler CC, Edwards PJ, Pauchard A, **Seipel T**, Arevalo J, Cavieres L, Dietz H, Jakobs G, McDougall K, Naylor B, Otto R, Parks CG, **Rew LJ**, Walsh N. 2011. Assembly of non-native floras along elevational gradients explained by directional ecological filtering. *Proceedings of the National Academy of Sciences* 108: 656–661.

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