

# Montana IPM Bulletin



MONTANA  
STATE UNIVERSITY

EXTENSION

Fall 2012



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## Rangeland Revegetation Revisited: Do short-term results predict long-term outcomes?

Jane Mangold, MSU Invasive Plant Specialist

Highly degraded rangeland in some areas of Montana is dominated by invasive noxious weeds. When noxious weeds are controlled via herbicides, grazing, mowing, biocontrol, or other methods, open niches are created in the plant community. Desirable species, released from the competitive effects of the invasive plant, often respond to re-occupy the site. However, in rangeland plant communities that have been dominated by weeds for many years, desirable species may be exceedingly rare or even completely absent from existing vegetation and the seed bank. If noxious weeds are controlled, but desirable species are not present to occupy open niches, noxious weeds are likely to re-establish. In some cases the same weed re-establishes, but in other cases a different, but no less troublesome, weedy plant becomes dominant. For example, in a study conducted in western Montana, the

root weevil *Cyphocleonus achates* drastically decreased spotted knapweed populations, but the invasive annual grass cheatgrass comprised 50 to 90 percent of the replacement vegetation. In such cases, combining weed control measures with revegetation may be the best long-term sustainable method for suppressing dominance and re-establishment of invasive plants.

While revegetation of invasive plant-infested rangeland sounds ideal in theory, it is challenging in practice and often results in weedy plants remaining dominant. Many factors contribute to success or failure, including weather (especially precipitation), weed control and re-seeding practices, soil characteristics, and land-use history. Revegetation is further complicated by the fact that few efforts are ever monitored

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BLUEBUNCH WHEATGRASS GROWING ON STUDY SITES NEAR HAMILTON, MONT. NOTE PREVALENCE OF BUNCHGRASS AND ABSENCE OF SPOTTED KNAPWEED COMPARED TO NON-SEEDED PLOT ON LOWER LEFT SIDE OF PHOTO. PHOTO BY JANE MANGOLD.



long-term to see if short-term results predict long-term outcomes. Monitoring long-term outcomes would help to identify effective practices and species for revegetating invaded rangeland.

Researchers from Montana State University, USDA-Agricultural Research Service (ARS), and Natural Resources Conservation Service (NRCS) revisited four revegetation studies that were applied to rangeland in western Montana in the 1990s. Three of the four studies occurred near Hamilton where rangeland was dominated by spotted knapweed. A fourth study occurred near Ronan where spotted knapweed and sulfur cinquefoil co-dominated. The sites were treated with an array of weed control methods then revegetated with various seeding techniques. Weed control treatments included herbicide applications, mechanical disturbance, and biological control. Both native and introduced grasses were tested at different seeding rates along with drill versus broadcast seeding, imprinting, and the inclusion of a cover crop into the seeding mix. At the Hamilton studies, the short-term (2-4 years) results of revegetation were not very promising with only small and sparsely distributed seedlings occurring while spotted knapweed remained dominant. However,

results were quite different 15 years later. Two of the seeded grasses, intermediate wheatgrass and bluebunch wheatgrass, were thriving and greatly suppressing spotted knapweed. In one of the revisited studies, seeded grass biomass increased from about 27 pounds per acre in year two to about 1780 pounds per acre in year 15. In another study, intermediate wheatgrass reduced spotted knapweed biomass by 93 percent 15 years after seeding. While intermediate and bluebunch wheatgrass did well at the Hamilton site, Russian wildrye and Idaho fescue did not fare so well and disappeared from the site over the 15-year period. In general, different weed control treatments did not appear to play a role in the long-term success of revegetation. However in one study, seeded grasses produced more biomass and spotted knapweed was more suppressed where picloram was applied prior to seeding 15 years earlier.

At the Ronan study, short-term results falsely suggested that seeded species were well-established and capable of persisting; however, when the study was revisited nine years after seeding, very few seeded species could be found and the site remained dominated by a suite of exotic grasses and forbs.

In spite of the disappointing long-term outcome at one site, it is encouraging that at three of the four sites certain seeded grasses flourished and suppressed spotted knapweed. Although revegetation can be expensive up front, seeding desirable grasses can be a one-time event that suppresses weeds for a long time. When compared to repeated applications of other weed control techniques like herbicides or grazing, the cost of revegetation relates favorably.

The rangeland revegetation revisited study shows that seeded species sometimes persist and suppress noxious weeds for a long time, but short-term data cannot predict if, when, or where this will occur. Because short-term results are not indicative of long-term outcomes, more studies are needed to find revegetation practices that successfully restore noxious-weed infested rangeland.

You can read more about this study in the manuscript "Long-term population dynamics of seeded plants in invaded grasslands" by Matt Rinella, Jane Mangold, Erin Espeland, Roger Sheley, and Jim Jacobs. You can access a PDF of the publication at <http://www.msuxextension.org/invasiveplantsMangold/researchsub.html> or by calling Jane Mangold at (406)994-5513.

## Weed management lessons from a dry and hot summer

*Fabian Menalled, MSU Crop Weeds Specialist*

This spring and summer we experienced higher than normal temperatures and low precipitation. Across Montana, weed management in most crops was severely complicated by these conditions. Drought and hot weather affected the germination, growth, hardiness, and competitive ability of many crops and complicated weed control practices. Revisiting what went wrong could teach us important lessons. Drought inhibits seed germination, leading to decreased weed abundance. However, if weeds with well-established root systems were already present on fallow land or before crop emergence, the lack of soil moisture probably enhanced

their competitive ability. Also, herbicide performance was compromised by the lack of moisture. In many cases the joint effect of enhanced weed competition and drought stress severely harmed crop yield.

High temperatures and low humidity at the beginning of the summer could have resulted in increased herbicide volatilization. These conditions usually translate into reduced effectiveness of pre-emergence herbicides, particularly of those that have not been mechanically incorporated. Also, when soils were too dry it was very difficult to achieve uniform herbicide incorporation. Furthermore, as soil moisture decreases, herbicide

molecules tend to bind more tightly with soil particles, reducing the effectiveness of soil-applied herbicides.

Weeds responded to moisture stress by thickening their leaf cuticle and reducing their vegetative growth. These drought-stressed weeds were more difficult to be controlled with post-emergence herbicides because of reduced herbicide absorption and low physiological activity. Many growers used crop oil concentrates or N-based spray additives to improve application efficacy.

During this season, we have seen an unprecedented number of cases of crop



## Ask the Expert

**Q. A so-called organic producer distributed tomatoes that were sprayed with a pesticide labeled 'neem.' He maintains some pesticides are allowed on organic produce. Is that true?**

**A. Cecil Tharp says:**

Many individuals assume produce labeled 'organic' is free of all pesticides. That simply is untrue. The USDA National Organic Program (NOP) recognized pesticides from natural sources as 'organically approved.' Natural sources include mineral, botanical and biological sources such as pyrethrum (derived from chrysanthemum flower), mint oil (mint plant), and azadirachtin (neem oil from seeds of the neem tree). Many neem products are labeled for organic use by the Organic Material Review Institute (OMRI). OMRI-approved products can be viewed online at <http://www.omri.org/omri-lists>.

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damaged due to abiotic factors. Drought and heat not only complicate weed management, they also increase crop susceptibility to pre-emergence and post-emergence herbicides. Dry weather reduces microbial and chemical degradation of soil-applied herbicides, increasing carryover injuries. Also, drought stressed crops are more susceptible to post-emergence herbicides and the combined effect of herbicide injury and drought may reduce crop yield.

Let's hope this fall will bring those much-needed rains!

## Driftwatch™ now available in Montana

*Cecil Tharp, MSU Pesticide Education Specialist*



UNIVERSITY OF FLORIDA EXTENSION

According to Montana Pesticide Education Program surveys, 33 percent of certified private applicators caused spray damage to an adjacent crop at some point in their career. This is likely due to a majority of applicators (71 percent) finding it necessary to spray under windy conditions (over 10 mph) at least once in their career. Although applicators should never spray when conditions are unacceptable, risks do vary. The risks associated with spraying under windy conditions may vary due to drift protection devices (wind baffles, low drift spray nozzles), however the most important risk factor is a sensitive crop area nearby. Aerial and ground applicators should have a clear understanding of sensitive crop areas in the vicinity prior to applying pesticides. Some common drift scenarios reported to the MSU Pesticide Education Office include:

- applications of broad-leaf herbicides in a small grain field adjacent to alfalfa, pea, and/or potato fields.
- applications of insecticides in alfalfa fields adjacent to beehives.
- applications of glyphosate in fallow fields adjacent to alfalfa or small grain fields.

Applicators should take extra time identifying sensitive areas to avoid costly mistakes. Driftwatch™ is now available for Montana applicators, specialty crop growers, and at-risk habitat managers/owners. This online

registry efficiently communicates pesticide sensitive areas to ground and/or aerial applicators to prevent non-target injury. Sensitive crop areas registered on Driftwatch™ in Montana include beehives, alfalfa, grapes, mint, herbs, dry peas, lentils, potatoes, certified organic, apples, cherries, and other (includes apples, cherries, grains, hops, small fruits, sugar beets, unsprayed crops).

Applicators can go to [www.driftwatch.org](http://www.driftwatch.org) and select 'Montana Driftwatch Site.' Individuals may register prior to watching a short instructional video. Once registered, growers can easily enter sensitive crops on a Google Map™ interface by locating the field of interest and outlining. This shows applicators sensitive areas and contact information so they can take appropriate precautions.

Growers and stewards should register their site, while applicators should use this interface to locate sensitive areas. By registering, applicators also receive email messages alerting them to new drift-sensitive areas.

Driftwatch™ was designed by staff from the Purdue University Agricultural and Biological Engineering and Agricultural Communications departments with input and support from Purdue University Cooperative Extension Specialists.

Driftwatch is not intended to be a registry for homeowners or sites less than half an acre.

*Register for Driftwatch™ at [www.driftwatch.org](http://www.driftwatch.org) and select 'Montana Driftwatch Site.' See the Driftwatch™ userguide webpage for instructional videos on using this interface (<http://montana.agriculture.purdue.edu/userguide.html>). Contact the MSU Pesticide Education Program for any other questions: (406) 994-5067, [ctharp@montana.edu](mailto:ctharp@montana.edu).*

**Q. Can I spray glyphosate as a harvest aid in seed crops?****A. Fabian Menalled says:**

The short answer is no. Glyphosate, the active ingredient in RoundUp and other herbicides, should not be used as a desiccation tool on seed crops. Producers may be tempted to apply glyphosate when a late start in spring delayed crop maturity. However, as a translocated herbicide, glyphosate sprayed on the leaves could move into the developing seeds and compromise their viability.

**Q. How can I control diseases in my crop?****A. Mary Burrows says:**

The first thing you should do is get it accurately diagnosed. There are a lot of occasions where the core problem is not a disease, it's actually due to environmental conditions or a management practice. Bring a good sample (generally, a large, fresh clump of whole plants with roots) to your county agent or ag professional. Pictures are always nice too – particularly if they're in focus. If they can't help you, they or you

can always send a sample into the diagnostic lab (diagnostics.montana.edu; 994-5150). This is a free service, and we can be pretty helpful. If you know what your current pest problems are, you can usually plan ahead to avoid them in the future.

**Q. How does the cutworm forecast look for next spring?****A. Kevin Wanner says:**

Collaborators around the state have monitored army and pale western cutworm moths during August and September for more than a decade. Fall trap catches provide a region-wide forecast of spring larval populations. Cutworm populations increased during 2006 and 2007, peaking in 2008, and declined significantly during 2009 and 2010. In 2011 we saw a small uptick in catches but they remained relatively low. Preliminary results from 2012 look like the catches will be similar to 2011, and statewide risk from cutworm damage to small grains should remain low during the spring of 2013. However, local isolated outbreaks will still occur and scouting in the spring is important. More information will be released as an AgAlert over the winter.

**Q. Are there any special aspects of rangeland weed management that I should consider in light of the 2012 wildfires and drought?****A. Jane Mangold says:**

Both wildfire and drought are disturbances and unfortunately, disturbances often lead to an increase in weeds. With that in mind, monitoring for increasing weeds as vegetation returns with precipitation this fall and next spring is critical. If some weeds were present before the wildfire and/or drought even in small quantities, they may increase following fire due to the increase in nutrients and lack of competition from other vegetation. Be especially vigilant of creeping, rhizomatous weeds. If equipment was moved around in an effort to fight a wildfire or hay was brought in from other locations as supplemental forage, new weedy species could have been introduced. Therefore, be on the lookout for new weeds that were not present prior to the disturbance. Addressing potential infestation early will yield great returns in the long run.

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## Montana Producers Should Monitor Fields for Wireworms

*Kevin Wanner, MSU Cropland Entomologist*



WIREWORM PHOTO BY KEVIN WANNER.

Damage to grain fields in Montana by wireworms was controlled for more than three decades by the insecticide lindane, an older organochlorine class pesticide applied as a seed treatment. Since its deregistration by the EPA, reports of wireworm damage to small grains has increased. Recent research has demonstrated that neonicotinoid insecticides like Cruiser® 5FS, active ingredient (a.i.) thiamethoxam, Gaucho® 600, a.i. imidacloprid, and NipsIt

Inside®, a.i. clothianidin\* that are currently used to treat grain seed do not kill and suppress wireworm populations in the soil. Rather, they protect crops by repelling the wireworms. Because of this, wireworm populations may continue to increase within infested fields.

Wireworms are the larval stage of click beetles, the common name for species in the taxonomic Family Elateridae. More than 150 different click beetle species have been identified in Montana, of which more than two-dozen may be pests of crops grown in Montana. During May and June the adult female beetles deposit their eggs in

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# Meet Your Specialist

**Mary Burrows, Extension Plant Pathologist, Plant Sciences and Plant Pathology**



## **Tell us about your background:**

I was born in Fargo but raised in Moorhead, Minn. I have two older brothers and one brother and my parents still live in Fargo/Moorhead. The other brother lives in Burnsville, Minnesota.

## **Where/when did you receive your degrees?**

I received my B.A. in Biology from Moorhead State University (now Minnesota State University – Moorhead) in 1997. My Ph.D. is from the University of Wisconsin-Madison, where I worked on phytoplasmas and viruses in soybean. I switched to viruses after the soybean aphid was discovered in my lab in 2000. It was the first aphid to colonize soybean and there were a lot of unknowns about what affect it would have on virus diseases. In 2003 I moved

to Ithaca, New York, to become an aphid breeder. I worked for the USDA on the Cornell campus looking at genetic components contributing to barley yellow dwarf virus transmission. My ‘babies’ have been pretty significant in subsequent experiments to find the genes and proteins involved in vector transmission of viruses. I’m very proud. I also became a Master Gardener with Cornell Cooperative Extension. That’s where I got the idea for the Bozeman Farmers Market booth for MSU Extension.

## **What is your field of interest (scholastic and research)?**

I am primarily a virologist, and have been working on arthropod-transmitted pathogens for the last 15 years. I have an 80 percent Extension appointment at MSU, so I do a lot of adult education and assessment activities these days. My favorite part of the job is tromping around sick fields, though.

## **When did you arrive in Bozeman?**

2006

## **What do you like to do in your spare time?**

I have two girls, who turn 2 and 4 in December. I don’t have a whole lot of spare time, but I get a few minutes with my Kindle app from time to time and I used to really like to knit. I also have an expensive gardening habit. The family likes to camp. You might see my camper and girls in rural

Montana from time to time while I run around with the agents. Don’t worry, they have adult supervision.

## **What are some of your past and current projects?**

In addition to running the diagnostic lab and doing a lot of IPM programming, my team does a wide variety of applied research that complements my Extension program. I just try to do research on what I think is or will be important in the future. I get a lot of feedback from growers, ag groups, and individual farmers and county agents to focus my activities. We’ve tested seed treatments for pulse crop diseases, foliar fungicides in cereals, and wheat virus variety trials, but I’ve also had a student work on assessment of IPM practices by landscape professionals to identify educational needs and barriers to IPM implementation. Some upcoming projects include the role of disease in survival of fall-planted canola and a big education/Extension/research project on wheat viruses. I’m really looking forward to developing educational modules on wheat viruses, having kids learn about biology and pests from them, then going on school visits as a ‘capstone’ to their activities. We will also be doing some agricultural tours with the kids to discuss the lessons they’ve learned and expose them to everything that goes into raising and processing their food.



grassland including wheat and barley fields. After hatching, the larvae live in the soil for 1 to 5 years before developing to adults, feeding on decaying organic material, seeds and seedlings.

Wireworm damage to wheat and barley crops in Montana appears to be increasing. MSU Extension Entomology has begun to survey wireworm populations across the state to better understand the dynamics of this complex of pest species. During the 2012 field season, crops in 25 different counties were surveyed, mostly small grain fields, with about 35 percent potato fields. Many growers are surprised to learn that they have any wireworms at all in their fields, yet we collected at least one wireworm in 51 percent of the small grain fields and 41 percent of potato fields surveyed. At low densities wireworm damage is easily overlooked and continued monitoring is important. For example, we found low numbers of wireworms (0.2 – 2.0 wireworms per trap) in 39 percent of small grain fields and 14 percent of potato fields that reported no prior known history of wireworm damage. In both small grains and potatoes, the economic threshold is a field average of 1-2 larvae per bait trap. Wireworms can be clumped in their distribution in the field and for this reason regular monitoring is important. One important question is whether populations in lightly infested fields will continue to increase to eventually cause economic damage.

Wireworm larvae in the soil are attracted to CO<sub>2</sub> produced by germinating seeds. Grain seed soaked overnight to promote germination can be used as bait. A half-cup of soaked grain seed can be buried 6-8 inches deep in the soil. An easier method is to fill a nylon stocking with the half-cup



NYLON STOCKINGS WITH SOAKED GRAIN SEED. PHOTO BY KEVIN WANNER.

of soaked grain seed and tie a string to the end. The stocking contains the seed as it germinates and it is easier to retrieve and sort for wireworms, after about 10 days in the ground. The larvae can be found in the soil surrounding the stocking, sticking out of the stocking mesh, and within the stocking mixed in with the germinating seed. Remember to mark your locations with a flag!

Bait stations can be deployed early in the spring season prior to planting to inform seed treatment applications. At this time it is helpful to cover the surface area with a small square of black plastic to help warm the soil. To simply determine if wireworms are present in a field, scout for thin patchy areas after germination and during establishment. At this time wireworms can be found feeding around the seedling roots. Bait stations can be deployed in patchy areas to trap wireworms. Alternatively, traps can be placed randomly throughout the field. More traps are better, but five can be considered a minimum number to detect wireworms presence within a field.

During May 2013 MSU Extension Entomology will conduct a wireworm survey by mailing out wireworm bait traps (plastic canisters with holes drilled into the sides). The canisters are filled with wheat seed and soil and should be buried in the field for 10-14 days. A postage paid box is provided so that the traps can be mailed back to MSU where the wireworms can be counted. Funding for this survey has been provided by a USDA Crops at Risk (CAR) grant, the Montana Wheat and Barley Committee and the Montana Seed Producers Association. For more information or to participate in this survey, please contact Kevin Wanner ([kwanner@montana.edu](mailto:kwanner@montana.edu)).

*\*Discrimination or endorsement is not intended with the listing of commercial products by Montana State University Extension. Due to labels and registrations that are constantly changing, applicators must always read and follow the product label. Extension cannot assume liability for the suggested use of chemicals herein.*

# Pest Management Tool Kit

## From Fabian Menalled:

IPM researchers at Michigan State University (the other MSU) produced a new guide to ID weeds. The guide, entitled “An IPM Pocket Guide for Weed Identification in Field Crops” is a comprehensive resource for broadleaf and grassy weed identification. It can be downloaded free of charge at <http://www.ipm.msu.edu/weeds-field.htm>. Those interested in purchasing the guide can do so at <http://bit.ly/MSUfieldGuide>.

## From Mary Burrows:

A Pulse Pest Calendar for 2013 was printed by the Northern Pulse growers association and the Montana Wheat and Barley Committee reprinted the ‘Wheat Disease ID guide.’ Both are available from your county Extension agent or by contacting Mary Burrows directly. A PDF is available at <http://www.msuextension.org/plantpath/>.

Look for ‘Diseases of Cool Season Legumes (Pulse crops: dry pea, lentil, and chickpea)’ by M. Burrows, soon to be available online through MSU Extension publications.

## From Kevin Wanner:

The 2013 Crop and Pest Management School will be held on the MSU campus January 2-4. The 2½ day workshop will focus on small grain topics, with guest speakers and MSU staff covering topics in weed, disease, insect and nutrient management as well as spring wheat and barley breeding. Credits for crop consulting and pesticide application will be available. The schedule and registration information is available online as a brochure: <http://plantsciences.montana.edu/mtproducerinfo.html>. For more information contact Kevin Wanner, [kwanner@montana.edu](mailto:kwanner@montana.edu).

## From Jane Mangold:

There is a new coordinator for Montana Noxious Weed Education Campaign. Shantell Frame-Martin is based in Helena with the Montana Department of Agriculture. She can be reached at 406-444-9491 or [sframe-martin@mt.gov](mailto:sframe-martin@mt.gov).

Interested in receiving the monthly Weed Post, a two-page PDF featuring timely information about weeds and a crossword puzzle to reinforce the information presented in the Weed Post? If so, email Jane Mangold at [jane.mangold@montana.edu](mailto:jane.mangold@montana.edu). Previous Weed Posts can be viewed at <http://www.msuextension.org/invasiveplantsMangold/extensionsub.html>.

## From Cecil Tharp:

To determine how many Montana certified applicator credits you’ve accumulated, navigate your web browser to <https://app.mt.gov/pest/index>. Enter your applicator license number to determine number of credits accumulated as well as program information of classes attended.

Crow Agency, Mont. January 9. Six private applicator credits. Initial Private Applicator Training Program. Veteran applicators or individuals in need of a private applicator license may attend this six-hour training which covers pesticide safety, pesticide movement in the environment, pesticide law, calibration, integrated pest management, and the private applicator certification system. Contact Cecil Tharp ([ctharp@montana.edu](mailto:ctharp@montana.edu); 406-994-5067) for more information.



**DO YOU HAVE A COMMENT OR QUESTION  
REGARDING THE MONTANA IPM BULLETIN?**

Send your questions or suggestions to:

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