

# Montana IPM Bulletin



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SHERON CURRY

## Winterizing Spray Equipment and Cold Storage of Pesticides

*Cecil Tharp, MSU Pesticide Education Specialist*

Applicators should take time to prepare spray equipment and pesticide supplies prior to long term storage during the winter months. This is accomplished by cleaning sprayers thoroughly, draining pesticide residual from tanks, decontaminating sprayers and inspecting sprayer components.

**Rinsing & Cleaning Sprayers.** The outside of a sprayer should be washed, while also rinsing spray tanks. Spray tanks can be rinsed by circulating water through the spray system. Add water up to 10% of spray tank capacity and spray on a labeled site. Many pesticide product labels will recommend adding select cleaning agents to spray tanks to aid in removing water and oil soluble pesticides (Table 1). Tank cleaning agents work in a variety of ways including: 1) addition of ammonia to raise pH of rinsate solution to increase water solubility, 2) addition of chlorine bleach to increase the breakdown of many pesticide products into inactive compounds, 3) addition of fuel oil or kerosene for removing oil soluble pesticides including esters and emulsified concentrates. Nozzles, screens, and strainers should be removed and cleaned separately in a bucket containing water and the recommended cleaning agent once tanks have been cleaned. Bleach should never be mixed with ammonia as this creates a deadly chlorine gas.

Fuel or kerosene should be followed by a detergent rinse to remove oily residue. Cleaning agents should be washed through entire spray system

prior to rinsing with clean water. It is critical that all 'rinsate' be sprayed on a site written on the pesticide product label or collected into containers and treated as pesticide waste.

### Final Inspection and Preparation for Storage.

Upon final rinse inspect nozzles, screens, valves, hoses and tank for wear or damage. To protect sprayer pumps and lines from corrosion and freezing damage over the winter months, circulate antifreeze through entire sprayer. A 50/50 mixture of antifreeze and water should be pumped through system for at least 5 minutes. With the antifreeze mixture still in the system remove some components:

- Remove pressure gauges and check valves. Store in marked container at room temperature over the winter to avoid damage from freezing temperatures. Plug assemblies.
- Nozzles and screens should be removed and placed into a marked container filled with lightweight oil (kerosene or diesel fuel).

Correctly plug these assemblies as well. By capping assemblies, remaining antifreeze will ensure that lines don't freeze and crack. Antifreeze should remain in sprayer through winter months to avoid air moisture from corroding internal components of sprayer. Sprayer should be ready for storage in a sheltered location away from liquid and dry fertilizers which will corrode paint and hardware.

### Long Term Storage of Pesticide Products.

Dry formulations (ex. granular and wettable powders) are not generally impacted by freezing but should be stored in a dry location. Liquid pesticides may freeze and result in separation of the active ingredients from carriers, which could reduce effectiveness of pesticide product. This reaction may include coagulation or crystallization which may cause further plugging of spray lines. Some frozen pesticide products often retain effectiveness if applicators follow steps when thawing and re-dissolving the suspension.



USDA

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Pesticide products have different freezing temperatures due to the presence of hydrocarbon solvents in many formulations. Hydrocarbon solvents actually reduce the freezing point below 32 degrees F. Pesticide product labels often explain a pesticides minimum storage temperature, in addition to whether: 1) freezing poses a problem, 2) active ingredients separate from carriers if frozen, 3) effectiveness of a pesticide is reduced if frozen, and 4) the active ingredients and inert ingredients go back into suspension.

Applicators should always be familiar with storage directions on their pesticide product label. For more information, consult the chemical manufacturer or read the MontGuide titled 'Cold Weather Storage and Handling of Pesticides' at [www.pesticides.montana.edu](http://www.pesticides.montana.edu) by selecting 'References.'

**For further information:** See the MSU MontGuide titled "Maintenance, Storage and Cleaning of Sprayers" at [pesticides.montana.edu/Reference/Sprayercleaning-MT198917AG.pdf](http://pesticides.montana.edu/Reference/Sprayercleaning-MT198917AG.pdf). Contact the MSU Pesticide Education Program with any further questions (Cecil Tharp, 406-994-5067, [ctharp@montana.edu](mailto:ctharp@montana.edu)).

**Table 1. Cleaning Solutions for Pesticides.\***

Pesticide Used	Step #1 (per 25 gallons solution)	Step #2	Step #3
Hormone Herbicides (2,4-D salt, amine, brush killers, MCPA, dicamba)	1 qt. household ammonia or 1 lb. washing soda (sal soda) or 2 lb. trisodium phosphate or ½ lb. fine activated charcoal and ½ cup detergent	Agitate solution 15 mins. Agitate solution 15 mins.  Agitate solution 15 mins.  Agitate sprayer 2 mins.	Let stand overnight. Flush with clean water, let stand for 2 hours Flush with clean water, let stand for 2 hours Flush with clean water, let stand for 10 min then flush with clean water.
Hormone Herbicides ester form (2,4-D, brush killers, MCPA)	1 lb. washing soda (sal soda) + 1 gal kerosene + ¼ lb detergent	Rinse inside of tank and flush small amount through system.	Let stand for 2 hours. Flush and rinse.
Amino Acid Inhibitors (SU's including primisulfuron, prosulfuron, and halosulfuron)	2% household ammonia then circulate for 15 mins and flush	1% household ammonia, circulate for 15 mins then flush	Rinse tank for minimum of 5 mins using clean water.
Organophosphate or carbamate insecticides	1 qt. household ammonia + ¼ lb detergent	Flush a small amount through system.	Rinse with clean water.
Other herbicides and insecticides	¼ lb detergent	Flush a small amount through system.	Rinse with clean water.

\*Applicators should always read and follow any pesticide product label cleaning instructions.

## Ask the Expert

**Q:** I heard that jointed goatgrass and wheat are "genetically related." What does this mean?

**A:** Fabian Menalled says...Jointed goatgrass (*Aegilops cylindrica*) is a serious annual weed in winter wheat fields. Not only does it reduce wheat yield by competing with wheat for sunlight, soil moisture, and soil nutrients; it emerges in the fall with the crop and is similar in appearance to wheat, so the problem is often not identified. Also, jointed goatgrass spikelets are the same size as wheat making it difficult to clean from wheat seed and increasing the chance that the weed seed is planted with the crop the following year. Jointed goatgrass is "genetically related" to wheat because these two species can cross and produce a hybrid plant. When



LEFT TO RIGHT: WHEAT, HYBRIDS AND JOINTED GOATGRASS (PHOTO SOURCE: NATIONAL JOINTED GOATGRASS RESEARCH PROGRAM)

mature, this hybrid will share the appearance of both parent plants (see photo). Approximately, 1 to 2% of the seeds on hybrid plants are viable. More information on approaches to manage jointed goatgrass can be found at the National Jointed Goatgrass Research Program website (<http://jointedgoatgrass.wsu.edu/jointedgoatgrass/index.htm>).

**Q:** I noticed a lot of field horsetail this year. Should I be concerned?

**A:** Jane Mangold says...Field or common horsetail (*Equisetum arvense*) is a native plant of the Equisetaceae family. Unbranched stems emerge from tuberous rhizomes and end in spore-bearing cones, resembling asparagus to a certain degree. The jointed nature of these stems gives horsetail a unique look, and makes it a fun plant to pick and pull apart. In fact, I've heard this plant referred to as "puzzle plant." It can be toxic to horses, especially when eaten in large amounts. Horsetail is found most often in wet to moist areas, but once established can grow well in moderately dry areas. We may be seeing more of this plant due to the exceptionally wet and cool spring and early summers we have experienced in the last few years, but it is not something to be overly concerned about. You can read more about horsetail in the Oregon State University Extension publication

found at <http://extension.oregonstate.edu/catalog/pdf/pnw/pnw105.pdf>.

**Q:** I have heard that produce found at grocery stores often contains pesticide residues. Should I be concerned and what steps should I take?

**A:** Cecil Tharp says...It is not uncommon for pesticide residues to be found on produce. Soft tissue fruits and vegetables such as celery, lettuce, spinach, strawberries, and peaches tend to harbor more pesticides even after the washing process. Vegetables and fruits such as onions, avocados, pineapples, sweet peas, asparagus and watermelon tend to be more protected from pesticides. One common misconception is that the presence of any pesticide represents a human health concern. Pesticide residues are regulated through EPA with the tolerance system. An individual tolerance is defined as the maximum allowable level of pesticide residue on a particular crop. If exceeded, the food crop will not be allowed to be sold. The US Food and Drug Administration or US Department of Agriculture inspect produce and compare pesticide residues to the allowable tolerance levels. A vast majority of produce which contain pesticides are at levels which are far below the EPA tolerance levels and shouldn't pose a health concern. Individuals should always wash produce prior to ingestion to remove any external

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# Vehicles and Weed Seed Dispersal

*Jane Mangold, MSU Invasive Plant Specialist*

Vehicles have long been suspected of picking up weed seeds and dispersing them to new locations. Noxious weeds are often found growing along roads and trails likely due to the combined factors of seed dispersal by vehicles and disturbances (e.g. trampling, mowing) associated with such areas. In other words, roads and trails provide good places for weeds to grow because seeds are readily available and the soil and vegetation is often disturbed.

Research conducted by Dr. Lisa Rew and her associates at Montana State University demonstrated the extent to which vehicles can pick up and disperse weed seeds. They conducted three separate field studies that quantified the number of seeds gained and lost by vehicles over varying distances. The first study determined how many seeds all-terrain vehicles pick up driving on and off-trail in Montana. The second study examined the number of seeds gained by military vehicles (Humvees, trucks, ATVs and tanks) in military training areas in Montana and Idaho. The final study determined how long seeds stay attached to a truck before they are dispersed when driven along paved and unpaved roads under both wet and dry conditions.

In the first study, ATVs driven on and off-trail collected a large number of seeds in both spring and fall. Not surprisingly, ATVs picked up more seeds when driven off-trail than on-trail. In the fall, up to 5,500 seeds per mile were picked up off-trail compared to about 400 seeds per mile on-trail. The number of seeds picked up in spring was much lower. The study at the military sites determined that many times more seeds were collected by vehicles driven under wet conditions than under dry conditions and tracked vehicles picked up more seeds than wheeled vehicles. The final study found that up to 99 percent of seeds stayed attached to a truck after traveling 160 miles under dry conditions. Seed retention was much lower under wet conditions, where seed retention varied from zero to 60 percent, depending on where the seed was attached to the vehicle and whether the road was paved or unpaved. In summary, this research showed

that vehicles can pick up large numbers of seeds, especially when driven off-trail and under wet conditions. If seeds are picked up in mud, which then dries on the vehicle, they can travel almost indefinitely until it rains or the road surface is wet, allowing for extremely long distance transport of seeds.

Washing the undercarriage of vehicles to remove weed seeds is often recommended to prevent the spread of weeds. Dr. Rew and her associates also conducted a series of studies to determine optimal vehicle washing duration and compare the effectiveness of various commercial portable vehicle wash units. In two studies testing wash duration, a known amount of soil and debris was sprayed onto the underside of a clean pickup truck and allowed to dry. The truck was then washed with the washing unit for a set number of minutes and the soil collected during the wash was compared to the known amount of soil applied initially. In the study comparing vehicle wash units, three different vehicle types were driven on a specified course covering both off- and on-road sections. Vehicles were washed for five minutes by one of the commercial wash units and then meticulously hand-washed twice. The soil and other debris collected from each vehicle type by each commercial wash unit was collected as was the soil and other debris collected during the follow-up hand washes. The amount of soil collected during the hand washes was compared to the amount of soil collected during the wash unit wash to determine the total amount of soil and other debris not dislodged by the commercial vehicle washing units. Results suggested that wash length and number of washes is important when cleaning a vehicle to remove

soil that may contain weed seeds. Vehicles washed for 6 minutes in one wash or two to three successive 3-minute washes were the cleanest. A 3-minute wash removed much more soil material than a 1.5 minute wash, which is considered standard by some wash unit operators. All commercial wash units, regardless of water pressure or water use, performed similarly.

Outdoor recreationists who drive on remote roads to trailheads or who ride ATVs off-road or on designated trails may unknowingly spread weeds with their vehicles. Preventing the spread of weeds into non-infested areas is the most effective and efficient way to manage weeds over the long term. To help prevent the spread of weeds, washing vehicles frequently is beneficial. Washing vehicles is especially important before and after driving on roads with high densities of weeds along the roadsides or after driving off-road or trail.

You can read more about this research in two new MSU Extension publications “Weed Seed Dispersal by Vehicles” (MT201105AG) and “Washing Vehicles to Prevent Weed Seed Dispersal” (MT201106AG). The publications are free and can be downloaded or ordered through MSU Extension publications online at <http://www.msuxextension.org/store/>; by calling (406)994-3272; or by sending an email to [orderpubs@montana.edu](mailto:orderpubs@montana.edu).



LISA REW 2010

# Weed of the year. And the winner is...Narrowleaf hawksbeard!

*Fabian Menalled, MSU Crop Weed Specialist*



FROM LEFT TO RIGHT, NARROWLEAF HAWKSBEARD SEED, ADULT PLANT, AND INFLORESCENCE.

This summer, we have seen an unprecedented increase in the abundance and distribution of narrowleaf hawksbeard (*Crepis tectorum*), particularly in the northeast region of Montana. For those who haven't had the "pleasure" of knowing this weed; with an erect, up to 3 feet tall stem, and bright yellow flower heads, this summer or winter annual can be described as a dandelion on steroids. A single plant can produce between 3,000 and 50,000 small seeds easily recognized by hairy pappus (featherlike hairs surrounding the seed that aids in wind dispersal). At the seedling and rosette stages, narrow-leaf hawksbeard can be easily confused with dandelion. However, its leaves are a lighter green than those of dandelion and have teeth pointing backwards. Adult plants have a deep taproot and the stem is branched and leafy, with a characteristic milky white sap. Basal and lower leaves are between 4 and 6 inches wide, toothed, or deeply lobed and backward pointing. Stem leaves are sessile, entire, and 0.5 inch wide.

Originally from Eurasia, narrowleaf hawksbeard was introduced to eastern North America prior to 1890, probably as ballast contaminant. By 1949, narrowleaf hawksbeard reached northwest Canada, where it became a problem weed in forage crops. It is unclear if the cold and rainy spring we experienced in 2011 is responsible for its increase in abundance and distribution in Montana.

Narrowleaf hawksbeard can grow in a wide variety of habitats including railroads and roadsides, pastures, fallow fields, reduced- and no-tillage croplands. Despite its high dispersal and colonizing ability, research conducted in Saskatchewan, Canada, and Minnesota indicates that narrowleaf hawksbeard is a weak competitor. Therefore, cultural and preventive management practices such as early detection and mowing of non-crop areas before seed set can help minimize the spread of this species.

A possible reason narrowleaf hawksbeard has been growing into a wide-spread problem is its toughness. At normal rates of 2,4-D, it can escape control, thus higher rates may be required. Unfortunately, while high rates of 2,4-D in the late fall (before soil freeze-up) can help control narrowleaf hawksbeard, it can hurt germination on some crops such as peas, lentils, canola and flax in the spring. Other herbicides including 2,4-DB and glyphosate (Roundup and other products) can also help manage narrowleaf hawksbeard.

In no-tillage wheat fields, without the help of mechanical practices, the only option to manage narrowleaf hawksbeard is with herbicides. While we haven't directly performed any study assessing the performance of herbicides to manage this weed, anecdotal evidences from Canada suggest that the use of Roundup Ready Canola helped reduce the spread and impact of this weed. In-crop applications of Curtail

(Clopyralid + 2,4-D), Curtail M (Clopyralid + MCPA), Stinger (Clopyralid), WideMatch (Clopyralid + Fluroxypyr), and FirstStep (Florasulam) can help control narrowleaf hawksbeard. Be aware that rotation intervals of these herbicides to broadleaf crops such as peas, lentils, alfalfa, and canola range from 4 months up to 18 months, with many labels suggesting or requiring a bioassay.

Is narrowleaf hawksbeard here to stay? Was the peak of emergence we saw during this last summer something that occurred out of the blue? It is too early to know. Yet, many seeds of narrowleaf hawksbeard went into the seedbank. Seeds can remain viable for 5 years. Thus, we should all be prepared for early detection and rapid response in upcoming years.

**Disclosure.** Common chemical and trade names are used in this publication for clarity by the reader. Inclusion of a common chemical or trade name does not imply endorsement of that particular product or brand of herbicide and exclusion does not imply non-approval. Recommendations are not supposed to replace those provided in the label. Readers should consult the label prior to any application.

# It takes a Community...to Manage Plant Diseases

Mary Burrows, MSU Extension Plant Pathologist

The 2011 growing season was one of the most challenging years we've seen recently as far as diseases in wheat. Not only did we start off the year with many observations of wheat streak mosaic virus (WSMV) throughout the state and tan spot that was killing crops at low temperatures, we progressed to the biggest stripe rust epidemic since the 1960s. The increase in disease was primarily due to the late fall, early planted winter wheat, and favorable moisture and temperatures in the spring. When we look at the disease triangle (host, pathogen, and environment) – we had the pathogens, we had susceptible hosts, and we had a favorable environment for disease development and spread.

Wheat streak and stripe rust are both what we call 'community diseases.' By this I mean it takes the community to manage the disease. One neighbor that does everything wrong can provide the source of disease for all his/her neighbors. One of the most important things we can do about plant diseases is accurately identify them so we can manage them better. In the 'ask the expert' section we will go over how to submit a good sample for diagnosis.

Wheat streak mosaic virus is controlled by managing the green bridge, which is the presence of green plant material between the harvesting of one crop and the planting of the next. This green plant material can be wheat or barley, grassy weeds, and volunteer crops. Corn and various grasses are also hosts of the virus and its vector, the wheat curl mite. We've been doing research at MSU for a number of years on WSMV. We've found a number of interesting things, but the bottom line is growers need to manage the green bridge to manage this disease: there aren't any pesticides

to kill the mite or virus. Some things we've learned are:

1. Spring wheat is much more susceptible to WSMV than winter wheat or barley. Spring wheat varieties lose an average of 40% of their yield when inoculated with a strain of the virus from Montana at the 3-5 leaf stage, whereas winter wheat loses an average of 15% of its yield.
2. Many weeds can support the mite vector and the virus including downy brome (cheatgrass), wild oat, Kentucky bluegrass, barnyardgrass, cheat (rye brome), green foxtail, Japanese brome, jointed goatgrass, and quackgrass.
3. The best host for the virus and mite are volunteer (and crop) wheat.
4. High levels of nitrogen make the virus disease worse and the mites reproduce more quickly.

There are no pesticides registered for control of the virus or mite. Mites hide in the curled leaves and whorls of the plant, so they're really hard to get at. Furadan (carbofuran) had some efficacy, but was delisted by the EPA in 2010. Lorsban (clorpyrifos) is not labeled for the wheat curl mite and has no known efficacy. Gaucho (imidacloprid) and Cruiser (thiamethoxam) seed treatments are also not labeled for wheat curl mites and have no known efficacy. In fact, in 1998 Harvey et al. published a paper in the *Journal of Agriculture and Urban Entomology* (volume 20, p. 7-10) where they described how imidacloprid increased wheat curl mite populations. This is actually well-known in the horticultural world – this chemical increases populations of other mites such as spider mites. Oberon

(spiromesifen) is expected to have a registration for wheat, but in an MSU trial showed mixed efficacy.

The other major disease we had to deal with this last year was stripe rust. There are a number of reasons we had such a big problem. We had widespread infection of winter wheat in the fall of 2010. Among these infections was a new strain called PST v-17, which had hopped the Rockies and was present in Toole and Choteau counties (this information is why it is important to submit samples!).



FIELD OF GENOU HARD RED WINTER WHEAT INFECTED BY STRIPE RUST (PHOTO BY BURROWS 2011).

This strain was highly virulent on a widely planted variety, Genou. We also had a warm, extended fall and snowcover on infected plants – both these factors allowed the pathogen to replicate and spread in the fall and overwinter on infected plants. In the spring we had very favorable temperatures, significant moisture and flooding. This resulted in ideal conditions for disease development and high humidity throughout most of the growing season. Yellowstone, a variety that is resistant to the new strain, showed symptoms early in the season due to the low temperatures – this variety, and others, have what we call 'High Temperature Adult Plant Resistance.' The resistance to stripe rust doesn't kick in until after stem elongation (Feekes 4-9 or Zadocks 30-39) and average night temperatures remain above 50°F and day temperatures are between 77 and 86°F. Even after the rains stopped in mid-June and the temperatures during the day turned very warm, night temperatures were still favorable (50-70°F) and the humidity was high.



SYMPTOMS OF WHEAT STREAK MOSAIC VIRUS ON WHEAT (PHOTO BY MARY BURROWS, 2011)

There are a number of things all growers in the state need to do to manage stripe rust:

1. Late planting of winter wheat to eliminate the green bridge. The lack of moisture in much of the state this fall is actually helping to eliminate the green bridge for stripe rust.
2. Plant resistant varieties. The winter wheat list has been sent out via Agalert ([www.mtagalert.org](http://www.mtagalert.org)) or by faxing your contact information to 406-994-7600 attn: Mary Burrows), and is also below. The spring variety reactions will be sent out the same way. Variety reactions will also be published in the annual variety guide from MSU.
3. Use a seed treatment containing strobilurin or triazole classes of fungicide. This will protect the crop for 2-3 weeks after planting.
4. Scout the crop this fall and submit samples to the diagnostic lab so we can keep track of where the disease is located in the state. We also send samples to Washington for race characterization.
5. Eliminate the green bridge by applying a fall herbicide 2-3 weeks before planting a new crop.
6. Scout the crop next spring. Send samples in for confirmation and race characterization.
7. If you are growing a variety that is susceptible to stripe rust, please plan on a full rate fungicide application at tillering, along with your herbicide application. Stripe rust resistant varieties may also benefit from a fungicide application to control diseases such as tan spot and Septoria leaf spot. This is particularly relevant if they are susceptible to leaf diseases and are grown in a continuous wheat, no-till system. Please pay very close attention to labels and mixing restrictions so you do not harm your crop.
8. Watch your crop, apply a fungicide if necessary, and keep me informed – samples submitted to your county agent or the diagnostic lab allow us to keep tabs on what is happening in the state and inform others about what to look for and how to treat it.

Variety	Stripe rust	Tan spot	Wheat stem sawfly
	(2011 Bozeman, Kalispell)	(2011 Havre, Moccasin)	(2011 Loma, Havre Moccasin)
Art	Variable	MR	S
AP503 CL2	Variable	S	S
Bearpaw	S	MR	R
Carter	S	S	MR
CDC Falcon	S	S	R
Decade	S	MR	S
Genou	S	MR	S
Jerry	S	S	S
Judee	R	Moderate	R
Ledger	S	S	S
Norris	S	MR	S
Promontory	R	S	S
Pryor	S	S	S
Radiant	R	S	S
Rampart	R	S	R
WB Quake	R	S	R
Yellowstone	R	S	S

SUSCEPTIBILITY OF WINTER WHEAT VARIETIES GROWN IN MONTANA TO STRIPE RUST, TAN SPOT, AND WHEAT STEM SAWFLY.  
S=SUSCEPTIBLE ; MR=MODERATELY RESISTANT ; R= RESISTANT

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## Ask the Expert

pesticide residual. Some individuals with immune system disorders or severe allergies are highly susceptible to low doses of particular pesticides. These individuals may wish to purchase organic produce to eliminate any possibility of mild reactions to very low doses of pesticides.

**Q:** Where can I get a plant problem diagnosed?

**A:** Linnea Skoglund and Mary Burrows say... If you have a plant you don't think is growing 'as you expected' or you are curious about an insect or plant and want it identified, please bring a sample to your county agent. The MSU Schutter Diagnostic Lab is a resource they use when they don't know the answer. You can also submit samples directly (forms can be found at [diagnostics.montana.edu](http://diagnostics.montana.edu)). Diagnosticians and specialists identify diseases, insects and abiotic problems on plants. There are some requirements to receive a good diagnosis.

- Send in whole plants with roots whenever possible. Wrap plastic around the soil and roots so none gets on the leaves.
- Keep samples fresh by placing in plastic bags.
- Collect samples with mild to severe symptoms as well as a healthy comparison.
- Place samples in a sturdy container and ship early in the week.

Include background information; plant problems often are influenced by many different factors, so include as much information as possible.

- Description of problem
- Plant and variety identification
- Cultural practices (irrigation, fertilizer, pesticides)

MAIL TO:

Schutter Diagnostic Lab, 119 Plant BioScience Facility, Bozeman, MT 59717-3150  
(406-994-5150, [diagnostics@montana.edu](mailto:diagnostics@montana.edu))

**Q:** Did the cool wet spring weather kill the grasshopper outbreak?

**A:** Kevin Wanner says...By all accounts Montana was headed into a hopper outbreak not witnessed since the 1980s. Surveys by the USDA-APHIS group based in Helena detected more than 17 million acres of Montana rangeland with more than 15 grasshoppers per square yard during August of 2009. The cool wet spring suppressed grasshopper development and provided moisture for the grasses to recover from feeding damage. However, the late summer hot and dry spell allowed the hoppers to recover. The USDA-APHIS survey conducted in August 2011 continued to detect high numbers at the same levels observed in 2009. The hot weather allows female grasshoppers to grow larger and lay more eggs. If we experience a hot dry spring in 2012 the hopper hazard may again be very severe.



## Meet Your Specialist

### Kevin Wanner, Assistant Professor, Entomology; Extension Specialist, Cropland Entomology; Department of Plant Sciences & Plant Pathology

Kevin grew up in British Columbia, Canada, coined the “best place on earth.” After living in San Diego and Illinois for several years he no longer finishes all of his sentences with “eh?”, but the distinctive Canadian pronunciation of “about” still gives away his Canuck origins! He received all three of his degrees in British Columbia, a B.S. from the University of Victoria (1990) and a Master’s of Pest Management degree (M.P.M) from Simon Fraser University in Vancouver (1993). Kevin worked as an applied entomologist for seven years, for the Ontario Ministry of Natural Resources and then for Mycogen Corporation in San Diego, before returning to the University of British Columbia in Vancouver to complete his Ph.D. degree (2004) in the Department of Plant Sciences. Prior to joining the MSU Department of Plant Sciences in 2008, Kevin worked as a postdoctoral research associate within the Entomology Department at the University of Illinois at Urbana-Champaign. As an Assistant Professor of Entomology and the MSU Extension Specialist for Cropland Entomology he has a split 60% research and 40% extension appointment.

His interests seek to bridge basic research and the “genomics revolution” with applied research and extension, all towards developing better management options for insect pests of Montana’s crops. He spends much of his personal time exploring Montana, coined the “last best place”. Of course, coming from British Columbia and having spent time in northern Ontario, this means lots of camping and fishing! He also enjoys golf, reading, watching hockey, ice fishing (no surprise!) and gardening (or more accurately, trying to get vegetables to survive frost, hail and snow during the growing season!). When people tell him that he should be use to the cold, he quickly points out that even in Canada tomatoes ripen easily if you live on the West side of the Rockies!

#### Q: What do you feel are some key insect issues affecting Montana’s crops?

Because of Montana’s cold winters and short growing season crops here are not subjected to as much insect pressure as crops farther south.



But there are several insects that cause economic damage. Some of these insects, like cutworms, tend to cause damage periodically. They will exist for several years at low populations until environmental conditions favor an outbreak that might last 2-3 years. At MSU we send attractive lures to collaborators across the state to monitor the population levels of the adults during August when they are laying eggs, so that we can predict the level of infestation by the caterpillars the following spring ([www.cutworm.org](http://www.cutworm.org)). Grasshoppers are similar, building up during hot drought periods. The last major grasshopper outbreak in the West was during the 1980s. We appeared to be entering another catastrophic outbreak in Montana and the West, but the cool wet spring weather of 2010 and 2011 suppressed the outbreak. However, a USDA-APHIS survey during August of 2011 still detected very high numbers in Montana’s rangeland – if next spring is hot and dry the hopper outlook could become bleak again. In the case of cutworms and grasshoppers effective treatments are available. More concerning are insect pests that are chronic and for which effective treatments are not available. The wheat stem sawfly (WSS) and wireworms meet these criteria and are arguably the first and second most important insect pests of Montana’s cropland.

#### Q: What are some of your current research projects?

WSS causes economic damage to wheat every year in Montana. Because the adults fly and lay eggs in developing wheat stems for as long as 6 weeks, insecticide sprays are not effective. Dr. David Weaver at MSU is our “sawfly expert” and he is working to develop a variety of cultural management tools. I am working to complement his work with a different approach, using new DNA technology to sequence the genome of the WSS. This will provide some “basic biology”

information that will support future transgenic approaches to managing this pest.

When I started my job during the summer of 2008 I was immediately called to visit the Conrad area to inspect wheat and barley fields suffering increasing damage from wireworms. Producers believed the problem was getting worse – and they were right! Wireworms are a classic example of pest resurgence as a result of the loss of an insecticide. Current insecticide seed treatments provide some crop protection, but do not kill the larvae in the soil, and as a result their numbers continue to grow until they “eat” their way through the seed treatments. Because the conventional insecticides were so effective for more than 30 years, little research was conducted on this pest and we do not even know which species are infesting Montana’s crops. Wireworms have become the major focus of my field research. We are surveying grain fields in Montana to identify the pest species. The larvae cannot be identified to species using traditional morphology – here I have utilized my molecular biology experience. We sequence the DNA from adult beetles that can be identified to species and match it with the DNA sequenced from larvae that we collect from grain fields. I am also collaborating with industry to test new insecticidal seed treatments that will kill the wireworms in the soil rather than allowing their populations to build up.

#### Q: How can producers use your research to their benefit?

I am excited about the progress that we have made researching wireworms during the last year. Anuar Morales is a graduate student in my lab who drove more than 10,000 miles this summer to different field sites. Anuar came to MSU with an M.S. in Entomology from Cornell University and lots of field experience. I think that we are getting close to finding some real solutions for wireworms - if successful producers will have a seed treatment that “cleans out” the field. This will increase yields while reducing overall insecticide use and cost.

The impact of my research to sequence the WSS genome will be longer term in nature. It will provide the basic biology knowledge that may lead to the development of transgenic solutions. Also, there is concern that WSS may expand into barley crops. The genome sequence will enable genetic tests to determine

## Pest Management

# Tool-kit

## RESOURCES

### MSU Extension Publication provides information on weed control in shelterbelts.

This MontGuide addresses weed management in shelterbelts, which is important as undesired plants can compete for moisture, nutrients and light, and reduce the growth and survival of desirable species. Unmanaged shelterbelts can also serve as a source of weed propagules into surrounding habitats. For more detailed information, order a free copy of "Weed Management in Shelterbelts," (MT201104AG), visit your local county or tribal MSU Extension office or go to the MSU Extension website <http://www.montana.edu/publications>. For other valuable weed management information, visit the MSU Cropland Weed Management website at <http://ipm.montana.edu/cropweeds>.

**New Extension weed publications for yellowflag iris (EB0203), knapweeds (EB0204), and whitetop (EB0138);** contact Extension publications at <http://www.msuextension.org/store/> or 406-994-3273.

### Early Detection and Rapid Response

**(EDRR) to New Plant Invaders workshop.** November 1, 2011, 1-5 p.m., Choteau, Stage Stop Inn; Contact Jane Mangold at [jane.mangold@montana.edu](mailto:jane.mangold@montana.edu); 406-994-5513 with questions or to RSVP.

## EVENTS

**Rosebud / Treasure Counties Pesticide Certification.** November 15. 6 private applicator credits. Forsyth. Haugo Center. Rodent Control, Calibration, and Weed Management. Contact Rosebud/Treasure County Extension Office at (406)346-7320 or see the agenda at <http://www.pesticides.montana.edu/PAT/2011/Region4.html> for more information.

**Last Chance Pest Management Bonanza.** December 13. 6 private applicator credits. Lame Deer. Chief Dull Knife College. Contact Cecil Tharp at [ctharp@montana.edu](mailto:ctharp@montana.edu); 406-994-5067 with questions.

**2012 CPMS:** The 2012 Crop and Pest Management School will be held January 3-5 on the MSU campus. The school will focus on pulse and forage crops and will provide students the opportunity to earn crop consulting and pesticide applicator credits. Watch for an announcement and agenda that

will be posted soon!

**Montana Weed Control Association Annual Conference.** January 10-12, Great Falls, Heritage Inn. Go to <http://www.mtweed.org/> for more information and to register.

**Montana Invasive Species Summit,** January 17-18, 2012, FWP Montana Wild Center in Helena, MT; contact Linnaea Schroeer at [lschroeer@mt.gov](mailto:lschroeer@mt.gov); 406-444-3378 with questions or to RSVP.

**2012 Pulse Pest Calendar.** For pulse crop growers, a calendar is available for 2012 which features four diseases, insects, and weeds that could harm your crop. There are photos and pest descriptions, management recommendations, and highlights within the calendar for scouting and pest management. We've also included a fungicide table, fact sheets on pests and herbicide resistance management, and sample submission instructions. Obtain a copy from your county agent or directly from Mary Burrows (406-994-7766 or [mburrows@montana.edu](mailto:mburrows@montana.edu)). This is a joint publication of MSU and NDSU, and was funded by the Northern Pulse Growers Association.

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

Send your questions or suggestions to:

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**If you wish to have the Montana IPM Bulletin emailed to you for free, contact the MSU Pesticide Education Program office: [ctharp@montana.edu](mailto:ctharp@montana.edu).**



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