2013

Cooperative Agricultural Pest Survey Report

MONTANA
Department of
AGRICULTURE

Montana Department of Agriculture

Ron de Yong, Director

Agricultural Sciences Division

Greg Ames, Administrator

Cooperators

USDA APHIS Plant Protection and Quarantine

USDA Forest Services

Montana State University Extension

Montana Department of Natural Resources and Conservation

US Department of the Interior

Table of Contents

Cover photo: *Xerolenta obvia* (Menke) in Cascade County Montana collected as part of a “snail round-up,” 2013. I. Foley.

Introduction to the Program

The Cooperative Agricultural Pest Survey (CAPS) is a nationwide survey effort initiated by the USDA Animal Plant Health Inspection Service (APHIS) Plant Protection and Quarantine (PPQ), to detect and/or monitor the spread of introduced plant pests. To achieve this goal, the USDA APHIS PPQ enlists the assistance of state cooperators. In Montana, state cooperators are coordinated through the Montana Department of Agriculture (MDA), and include not only the Department of Agriculture, but also Montana State University, the Montana Department of Natural Resources and Conservation, USDA Forest Service, and others.

The Interns and Other Program Assistants

The Montana Department of Agriculture conducts several of the surveys. This would not be possible without the assistance of a group of dedicated people who join the department for the summer as interns and/or survey technicians. We also had the invaluable assistance of Montana USDA-APHIS-PPQ and Amy Gannon, Forest Entomologist with DNRC. In addition, several MDA Agricultural Specialists assisted in gathering Karnal bunt samples.

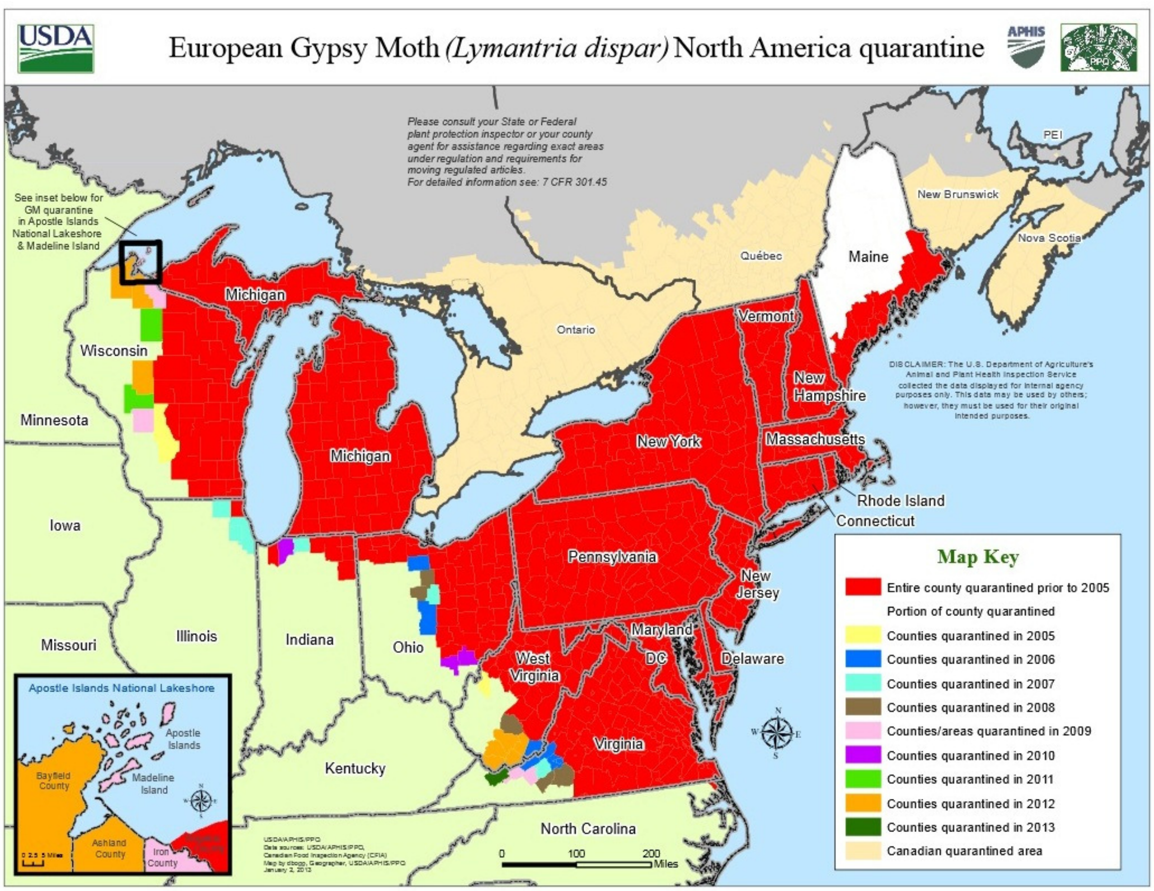
In 2013, the CAPS program hired Patricia Wherley and Adam Burch as Survey Technicians; the program could not have gone forward without their assistance.

Gypsy Moth (GM) Detection Survey

Lymantria dispar (L.)

The European strain of the gypsy moth (*Lymantria dispar* (L.)) was initially introduced into the Eastern U.S. in the mid-1800s. It established rapidly and became a serious defoliating pest. Over 500 susceptible host plants have been identified. Most are deciduous trees and shrubs, but older gypsy moth larvae will also consume pines and spruces. In Montana, aspen and western larch are particularly important potential native tree hosts of the gypsy moth, especially in the western half of the state. Most landscape plants, urban trees and shrubs throughout the state would also be subject to GM defoliation.

Females of the European strain are flightless but crawl actively as they seek out oviposition sites. The egg masses are covered with scales and hairs, and have been found on Christmas trees, boats, RVs, outdoor furniture, RV's, firewood, and virtually any other object that might be left outdoors in an infested area. They are thus readily transported to new areas by human activity. The gypsy moth is the most destructive forest pest in the Eastern United States and large areas of the northeastern and Midwestern US are under a federal quarantine to prevent the spread of this pest.



http://www.aphis.usda.gov/plant_health/plant_pest_info/gypsy_moth/downloads/gypmoth.pdf

There have been several positive GM traps in Montana counties in recent years: Cascade (1989, 1990), Gallatin (1988), Glacier (2001, 2003, 2007, and 2008), Lewis and Clark (1988), Lincoln (2009), Liberty (1992), Missoula (1996), Park (2001), and Yellowstone (1993 and 2011). Given the distance between Montana and the quarantined portions of the US and eastern Canada, it is almost certain that these introductions were the result of human activity. Isolated detections result from the movement of egg masses and pupae on contaminated vehicles and equipment or adult moths “hitchhiking” with vehicles or other conveyances.

Male Gypsy Moth. Traps are baited with a female sex-pheromone lures and only attract males.

Gypsy moth caterpillar

In Montana, responsibility for the trapping of gypsy moth is a multi-agency cooperative effort between the USDA APHIS PPQ, the Montana Department of Agriculture (MDA), the Montana Department of Natural Resources & Conservation (DNRC), and the USDA Forest Service (USDA FS). The USDA APHIS PPQ placed traps mainly in the northeastern portion of the state, while the MDA trapped in the western part of the state. The DNRC put out traps in Mineral and Missoula Counties. The USDA Forest Service, US Fish and Wildlife Service, Bureau of Indian Affairs, and other agencies coordinate trapping at a large number of campgrounds and other public recreation areas. The Department of the Interior placed traps in Glacier and Yellowstone National Parks. All traps were placed by early June, and checked throughout the summer.

RESULTS: 150 traps were placed by MDA in 2013. All traps were negative in 2013.

Emerald Ash Borer (EAB) Detection Survey

Agrilus planipennis Fairmaire

The emerald ash borer (EAB) is an exotic wood-boring pest that attacks and kills ash trees (*Fraxinus* sp.). In the eastern United States it is a severe threat to ash trees in hardwood forest ecosystems and the urban landscape. While native ash in Montana and the intermountain west is limited to riparian areas, *F. pennsylvanica* or green ash (due to its rapid growth, hardiness, and cold tolerance) has been planted in some Montana neighborhoods at densities approaching 75%.

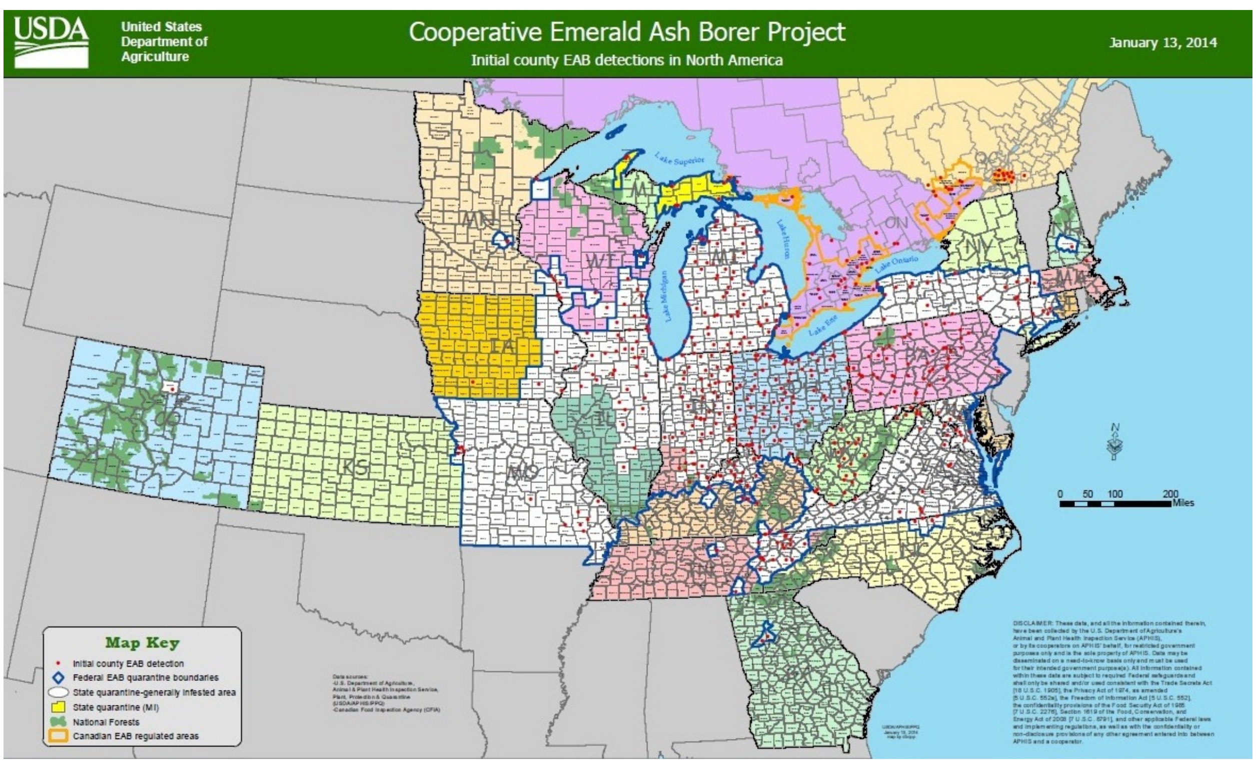
Emerald Ash Borer

The emerald ash borer is native to Asia, but was introduced into the eastern United States through international trade sometime in the 1990s, most likely in solid wood packing materials. It was first discovered in southeastern Michigan in 2002 and has spread to most states and provinces of eastern North America. In 2013, EAB was detected for the first time in the western US in Boulder, Colorado. EAB larvae consume the cambium layer of ash trees, preventing the flow of nutrients and water up and down the tree. The insect will attack and kill both healthy and stressed trees; the average time to mortality, even for a healthy tree, is only two to three years. It is estimated that EAB has killed 40 million ash trees in Michigan alone, with tens of millions more having been killed in other adjacent states.

The success of outreach efforts regarding EAB is indicated by the increasing number of inquiries we receive each year about this insect. Unfortunately, the increasing number of reports also suggests a general decline in the health of Montana's ash trees. Each report is investigated on a case by case basis. So far, EAB has not been found in Montana.

Emerald ash borer traps are hung in ash trees (*Fraxinus* sp.). The large purple trap is sticky on the outside and acts as a panel flight intercept trap. The trap is baited with a Manuka oil lure that mimics the volatile compounds released by a damaged ash tree (image on the right courtesy of entomology.wisc.edu). Many ash trees in Montana are highly stressed because of site conditions, old age, other insect pests, and a variety of abiotic factors. Damaged or poorly growing ash trees should be inspected for emerald ash borer damage.

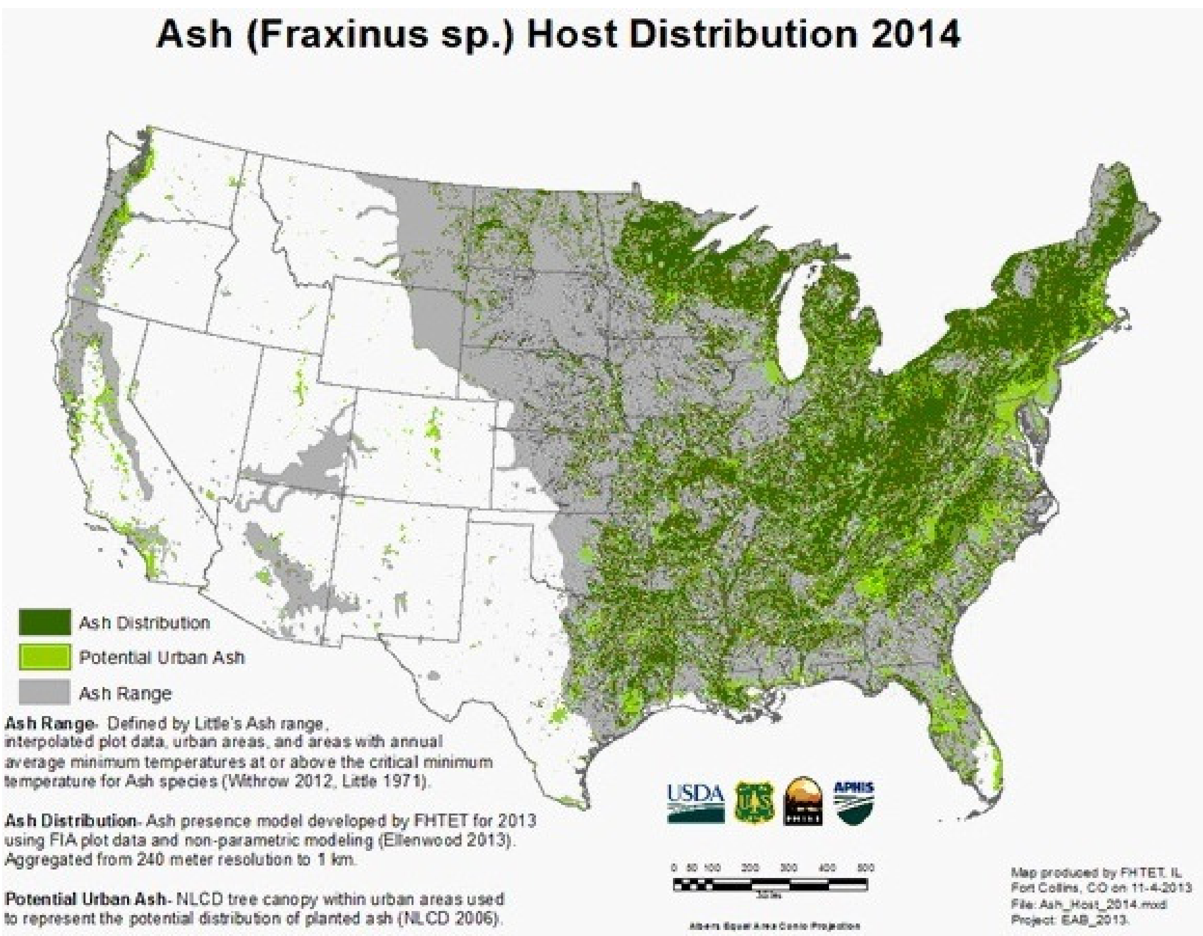
The map below shows the national distribution of EAB as of January 2014.



EAB trapping in Montana has focused on highways, campgrounds, and urban areas where the insect is most likely to be introduced. Starting in 2012, the majority of traps in the eastern part of the state followed a risk based model developed by the USFS Forest Health Technology Enterprise Team (FHTET).

RESULTS

The EAB National Survey Program is being modified based on the widespread establishment of this pest in the US, pest prioritization, and decreased funding available to USDA-APHIS-PPQ for emerald ash borer. The Montana Department of Agriculture remains concerned about the potential impacts of this pest in Montana, particularly on ash trees in Montana urban communities. In 2013, MDA placed only 10 traps in the Helena area. In addition to trapping, MDA has been cooperating with the Montana Urban and Community Forestry Association to sample ash branches that have been pruned from urban trees for the presence of EAB larvae or galleries. This so called "destructive sampling" method is another tool for the early detection of EAB in Montana.

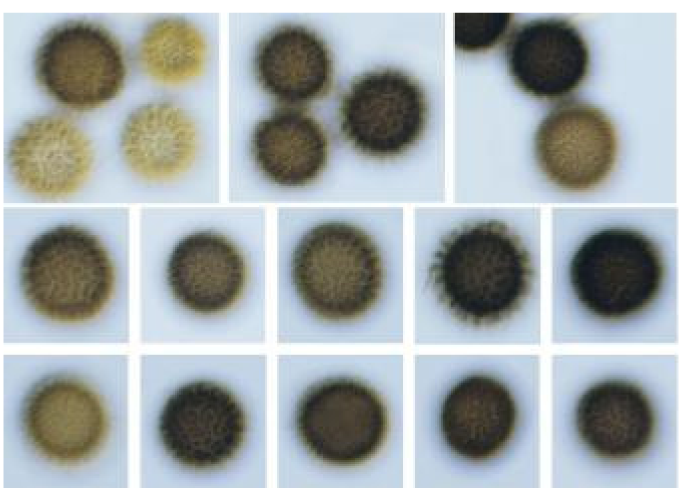


Karnal Bunt Detection Survey
Tilletia indica Mitra

Karnal Bunt (KB) is a fungal disease that affects wheat, durum wheat and triticale. The disease was discovered near Karnal, India in 1931, hence the name. The first detection of KB in the United States was in Arizona in 1996, in durum wheat seed. Subsequently, the disease was found in portions of Southern California and Texas. The disease has never been detected in Montana field production. KB thrives in cool, moist temperatures as the wheat is starting to head out.

Karnal Bunt spores are windborne and can spread through the soil. Spores have the ability to survive within the soil for several years. Grain can also become contaminated through equipment. Therefore, controlling the transportation of contaminated seed is essential in preventing the spread to Montana production areas. In addition, early detection is essential if any type of control or eradication is to be attempted. Montana's participation in the annual karnal bunt survey is part of the early detection grid set out across the United States.

RESULTS: Montana continued to sample for KB during the 2013 harvest. A total of 157 samples were collected from 34 counties across Montana. The APHIS Arizona State Plant Health Director's (SPHD) office, Karnal bunt lab conducted the testing. All samples tested negative for the presence of KB. This sampling is critical for wheat growers in Montana. It confirms our wheat is free from KB, ensuring access to international export markets.



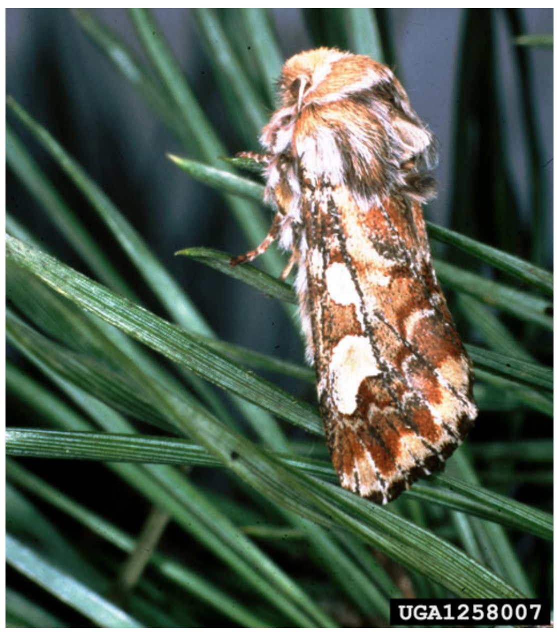
Credits: Teliospores of Tilletia indica (Karnal bunt of wheat) showing surface ornamentation patterns. EPPO.

Credits: R. Duran, Washington State University
www.forestryimages.org **Bunted Wheat**

Forest Pest Survey
Pest Detection Survey

Pine Beauty Moth (PB) Detection Survey
Panolis flammea (Denis & Schiffermüller)

The pine beauty moth is considered a severe defoliator of certain *Pinus* spp. throughout many parts of Europe. Larvae can be observed feeding on new growth at the base of developing needle pairs (Hicks et al., 2001). Larval feeding on young buds can be very damaging to the host trees (Kolk and Starzyk, 1996). Complete defoliation of host plants can occur in serious outbreaks of this pest. When outbreaks occur, they usually last from two to three years. This species is found throughout Europe and Asia (Novak, 1976). *P. flammea* has caused serious damage to *Pinus contorta* (lodgepole pine) in Scotland (Hicks et al., 2001). Lodgepole pine is native North America and is abundant in Montana.



Pine beauty moth in Poland. Stanislaw Kinelski, Bugwood.org

RESULTS: 25 pine beauty traps were placed by MDA in 2013. All traps were negative.

Siberian Silk Moths (SSM) Detection Survey
Dendrolimus sibiricus (Chetverikov), *D. superans* (Butler), *D. punctatus* (Walker), *D. pini* (L.)

The Siberian silk moths are polyphagous defoliators of conifers with confused taxonomic histories and species concepts. Laboratory tests in the US have indicated that Douglas Fir would be a highly preferred host in the western states. In its native range (Russia, Kazakhstan, North and South Korea and Mongolia) SSM is responsible for damage similar to that done by the European gypsy moth in outbreak areas of eastern North America.

SSM adult male, Image from http://www.padil.gov.au

If established in western North America, the impact on forest health would probably be greater than that of the gypsy moth on northeastern forests because conifers are more prone to mortality when repeatedly defoliated. Infestations can lead to slower overall forest growth as well as the death of repeatedly or heavily infested trees. In addition, infested forests are unsightly and unattractive for tourism and other recreation, a major issue in Montana and other western states. Trapping for this moth involves green gypsy moth milk carton traps that are modified to capture a larger moth (40-80mm).

RESULTS: A total of 25 SSM traps were placed in Montana. No SSMs or suspects were trapped or submitted. The most commonly collected moth in the SSM traps was the western forest tent caterpillar, *Malacosoma californicum* (Packard).

Rosy Gypsy Moth (RGM) Detection Survey
***Lymantria mathura* Moore**

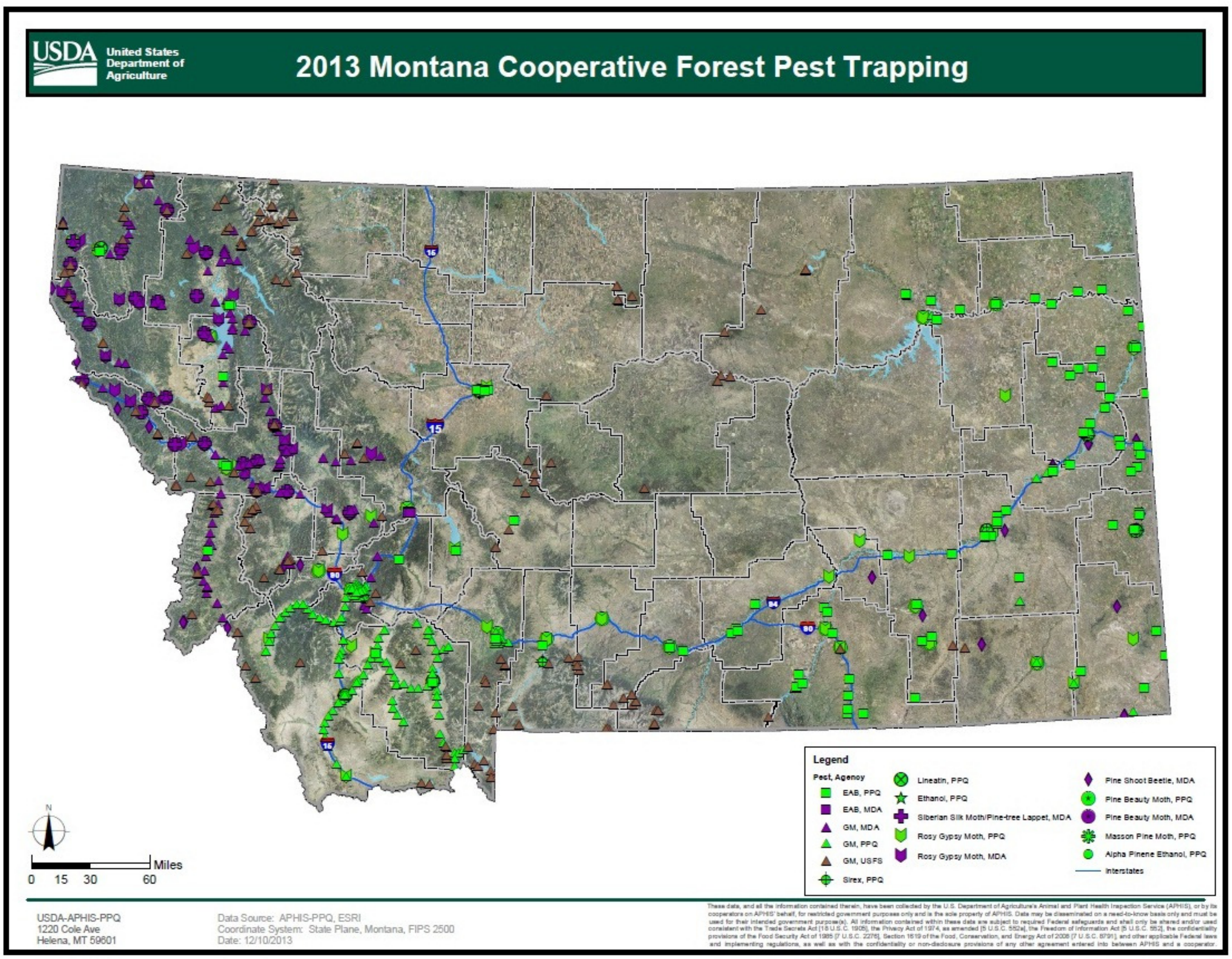
Both the gypsy moth and the rosy gypsy moth are members of the moth family Lymantridae. This family includes several native tussock moth forests pests. Many members of the family are serious plant defoliators.

Images from http://www.padil.gov.au

Female (left) and male (right) rosy gypsy moth

Rosy gypsy moth larvae are polyphagous and feed on a diverse range of deciduous trees. Hosts include oaks, willows, fruit trees, birches, and ashes. Larvae can feed on some conifers, but those hosts are generally not preferred and result in lower levels of survivorship. This moth is native to China, Bangladesh, India, Japan, Korea, Pakistan, Taiwan, and the Russian Far East and is not established anywhere in North America. The rosy gypsy moth and other exotic moths in the CAPS surveys are considered to have a higher risk of introduction in the western portion of the state, and also to pose a higher risk to that area should they be introduced.

RESULTS: A total of 50 rosy gypsy moth traps were placed in Montana. No RGM or suspects were trapped or submitted. These traps were concentrated west of the Continental Divide and placed during different trips than European GM traps because the pheromone lures have been shown to have antagonistic affects (CAPS approved methods, 2013).



Fruit Pest Survey
Farm Bill 10201

Montana has a small, usually unnoticed, fruit industry. Cherries from the Flathead Valley in northwestern Montana fill a niche market between California cherries and Pacific Northwest cherries, and are also exported to markets in Europe and Asia. A portion of the cherry orchards in this area operate organically, and are certified organic by the USDA. In addition to Flathead cherries, Montana also has some apple orchards in the Bitterroot Valley and small acreages of other fruit production including grapes, apricots, and choke cherries.

There are several invasive fruit pests whose arrival in Montana could bring disaster to these delicate industries. Invasive moths pose a particular threat. These organisms, “little brown moths” to the non-taxonomist, are often overlooked because of their appearance and lifestyles (they are generally small, bland, and have cryptic habits such as rolling up in leaves). Included in the survey are the summer fruit tortrix (*Adoxophyes orana* (Fischer von Roslerstamm)), the false codling moth (*Thaumatotibia leucotreta* (Meyrick)), the plum fruit moth (*Cydia funebrana* (Treitschke)), European grape vine moth (*Lobesia botrana* Denis & Schiffermüller) and last but certainly not least, the light brown apple moth *Epiphyas postvittana* (Walker). Other pests are also targeted in the national "bundled surveys." The latter two pests, light brown apple moth and European grapevine moth, are of special concern because they have both recently been discovered in California.

While the above are all pests of (primarily) fruits that might be expected in Montana, the European grape vine moth (*Lobesia botrana*) is a pest that most people wouldn't think of as a pest in our state. However, there are a number of vineyards in the same general area as the other major fruit production areas. In 2013, pheromone baited traps were placed at 15 high risk sites in the Flathead and Bitterroot areas, for the summer fruit tortrix (*Adoxophyes orana* (Fischer von Roslerstamm)), the false codling moth (*Thaumatotibia leucotreta* (Meyrick)), the plum fruit moth (*Cydia funebrana* (Treitschke)), and the Cherrybark Tortrix (*Enarmonia formosana* (Scopoli). In addition to pheromone trapping, visual surveys were conducted for several insect pests and plant diseases listed below.

RESULTS: All traps were placed and monitored by Montana State University. All traps were negative for target species at fruit pest survey sites.

Brown marmorated stink bug has not yet been detected in Montana. Suspect samples of native species of *Holcostethus* and *Euschistus* stink bugs are frequently submitted as BMSB suspects.

From left to right, summer fruit tortrix, false coddling moth, Images from www.norfolkmoth.co.uk, www.ukmoths.org/uk, cdfa.ca.gov, www.bugguide.net (Sean McCann).

Target Species	Common Name	Approved Method
Tortricidae		
Adoxophyes orana (F. v. Roslerstamm)	summer fruit tortrix	Delta trap/ADOX
Grapholita funebrana Treitschke	plum fruit moth	Wing trap/PFM
Enarmonia formosana Scopoli	cherry bark tortrix	Delta Ttrap/CBT
Thaumatotibia leucotreta Meyrick	false coddling moth	Wing trap/FCM
Diptera		
Rhagoletis cerasi Linnaeus	European cherry fruit fly	Yellow sticky card
Coccidae		
Ceroplastes japonicus Green	Japanes wax scale	Visual
Chrysomelidae		
Diabrotica speciosa Germar	cucurbit beetle	Visual
Scarabaeidae		
Popillia japonica Newman	Japanese beetle	Yellow vane/JB
Pentatomidae		
Halyomorpha halys (Stal)	BMSB	Visual
Diseases		
Candidatus Phytoplasma prunorum	European Stone Fruit Yellows	Visual (symptomatic plants)
Monilia polystroma (anamorph)	Asiatic brown rot	Visual (symptomatic plants)
Potyvirus : Potyviridae	plum pox virus	Visual (ELISA)

2013 Plum Pox Virus Survey
Farm Bill 10201 National Detection Survey

Plum pox virus (PPV) is a devastating disease of stone fruit tree species such as cherries, peaches, and plums. PPV can be spread throughout live nursery stock in grafts and budwood of infected plants. It is transmitted from one plant to another by the feeding of several species of aphid.

PPV poses a special threat in Montana due to the cherry industry around Flathead Lake. Many nurseries in the area also produce various types of ornamental *Prunus.* There are native populations of *Prunus virginiana,* or chokecherry, throughout the state that are susceptible to PPV.

Sampling is done in the early summer months because as temperatures increase the PPV virus in infected trees is harder to detect. Samples are collected from throughout the tree canopy and are immediately sent to the diagnostic lab for testing.

During the survey in 2013, 125 *Prunus* samples were collected. 110 of the samples were collected from two nurseries and 15 were sampled from wild *Prunus* trees from 6 counties. The samples were tested by personnel at the Schutter Diagnostic Laboratory at Montana State University using the ELISA method.

RESULTS: All samples were found negative for all strains of PPV.

Plum pox potyvirus: spots on apricot stones (left).

Status Report
Japanese Beetle (*Popillia japonica* Newmann)

Japanese beetles (JB) were discovered in Billings in 2001 near Logan International Airport. Early delimitation surveys found Japanese beetles in the neighborhoods below the "Rimrocks," a series of dry sandstone cliffs immediately south of the airport. In 2008 an official regulated area was established to prevent the spread of infested material out of this area. The regulated area includes over 650 properties, ranging from private single family homes to a few large landowners (MSU-Billings, Rocky Mountain College, the airport and other large parcels managed by the City of Billings). Details of the State of Montana interior quarantine can be found here:
http://agr.mt.gov/agr/Programs/PestMgt/quarantines/PDFs/MTQ_2008-003.pdf
In 2013 there was a significant increase in the number of beetles brought into Montana associated with regulated nursery stock importation. In response, the Department re-instated an exterior JB Quarantine in July of 2013. Details can be found here:
http://agr.mt.gov/agr/Programs/PestMgt/quarantines/PDFs/JB_MTQ-2013-01.pdf
In 2013, a limited number of traps were placed in areas that were found to have had JB in previous years, as well as at several high-risk nursery sites. Plastic JB traps baited with a floral scent and female sex pheromones were used to survey for JB adults (Figure 1).

Figure 1. Japanese beetle trap placed below Virginia creeper vines on the Leavens pumping station fence. This trap yielded more than 400 adult JB in 2009. The fence encloses a large area of well irrigated turf grass, some of which appears to be damaged by wild turkeys foraging for JB larvae.

RESULTS: In 2013, MDA placed a total 251 JB traps; 214 traps were placed at 75 different nursery business locations and 38 were placed at high-risk turf grass sites (parks/golf courses) in Bozeman, Great Falls, Missoula, and Helena. A total of 216 JB adults were trapped at 17 nurseries located in Kalispell, Columbia Falls, Bozeman, Belgrade, Big Sky, Big Fork, Big Timber, Billings, Great Falls, and Helena. The Department is evaluating the results and planning a course of action for 2014. Landowners of positive locations are being encouraged to treat susceptible turf-grass areas and monitor for grubs.

2013 National Honey Bee Survey
Farm Bill 10201

Montana has a substantial beekeeping industry and thus was one of the participating states in the 2007 pilot program of this survey. (The other was Florida, which also has a large beekeeping industry and, like Montana, statutory authority and an established bee-inspection program.)

In an average year Montana has about 150,000 to 160,000 beehives, of which the majority are migratory. Montana has about 150 registered beekeepers, about half of whom are commercial operators. Most of these provide commercial pollination services outside Montana. Migratory beekeepers typically travel to California in the early spring for almond pollination, then move to fruit crops in Washington and Oregon before moving back to Montana for the summer. Ranked by revenue, beekeeping is the 10th largest agricultural industry in Montana; pollination fees make up the majority of that income.

Pests of honey bees are a serious threat to the agricultural economy of Montana as well as to the states where Montana-based bees provide pollination. USDA estimates that honey bee pollination adds some $15 billion to the value of American agriculture. In 2006 beekeepers began reporting unexplained and unexpected losses of 30% or more of their hives. What eventually came to be called “colony collapse disorder” was characterized by the rapid disappearance of worker bees from apparently healthy hives. Despite a considerable increase in honey bee research, the cause of colony collapse remains unknown, and unexplained losses continue at about 30% per year.

Montana bee yard.

A healthy frame of brood.

In 2009 the USDA-APHIS initiated the National Honey Bee Pests and Diseases Survey in all 50 states. The primary objectives of the survey are to confirm the absence of tropical bee mites in the genus *Tropilaelaps*, the absence of the Asian honey bee *Apis ceranae*, and the absence of slow paralysis virus, a honey bee disease associated with *A. ceranae*. Secondary objectives include evaluating the overall health of the apiaries sampled to establish a baseline for future research. Samples submitted from the survey will be evaluated for their mite loads (*Varroa,* tracheal mites, and other parasitic mites) and the degree to which viruses and other pathogens are present (particularly *Nosema ceranae*, a more virulent *Nosema* species associated with tropical honey bees). Viruses will be identified at the molecular level by the USDA “bee lab” in Beltsville, MD.

Varroa mites on a drone pupa.

RESULTS: All 24 samples were collected and submitted to the USDA approved laboratories at the University of Maryland.

Pollen samples were collected from 10 of the sampled hives for pesticide analysis. The most common pesticides (including metabolites) in Montana beehives were fluvalinate, used in “Apistan” strips for control of Varroa mites, coumaphos, used in “Checkmite+” strips for the same purpose, and chlorpyrifos. Chlorpyrifos is an older organophosphate insecticide used extensively in almonds against several insect pests. Azoxystrobin fungicide residues were also surprisingly common, occurring in 5 of the commercial samples. Despite widespread anecdotal reports of off-label use of amitraz, it was found in only 3 of the Montana samples and only .3% of samples, nationally. (It should be noted, however, that amitraz has a very short residual life.) It is likely that more amitraz residues will be detected next year, as “Apivar” strips containing the product have recently been registered in all 50 States.

Montana samples were collected in June, immediately after most commercial bees had returned from California almond orchards. Other results included pre-emergent herbicides, carbaryl and its metabolites, and several other fungicides. In almost all cases, compounds were recovered at well above trace levels. These data indicate that honey bees do pick up residues of almost every product applied in their foraging environments, whether those products are applied to the trees (carbaryl and chlorpyrifos) or to the orchard floor (the herbicides). This is contrary to the current conventional wisdom that the use pattern and formulation can largely prevent the exposure of honey bees to pesticides, and strongly suggests that pesticide label language may be insufficiently protective of honey bee colonies placed in treated areas.

2013 Khapra Beetle National Survey

Farm Bill 10201

The khapra beetle (*Trogoderma granarium* Everts) is one of the world's most destructive pests of grain products and seeds. It damages far more product than it actually eats because of its habit of feeding only slightly on multiple seeds or particles. Infestations of even small numbers of khapra beetles can result in 30% to 50% of stored products being unusable.

The cosmopolitan distribution of most stored-product pests makes it difficult to pinpoint their origins. The khapra beetle is thought to have originated in southern Asia; its native range is the area from 35° N to the equator, between Thailand and western Africa. It is considered established throughout most of Southeast Asia, Africa, the Middle East, and Uruguay and Venezuela in South America.

Figure 1. Khapra beetle adult, larvae, and cast skins.

As one would expect from its specific epithet, grains and seeds are the most common commodities infested with khapra beetles. Processed commodities can also be infested, including grain-based pet foods. Wheat, rice, and legumes for human consumption (peas and lentils) are the most common imports to the US that are found to be infested. Lentils and rice are particularly problematic due to their cultural significance and near-ubiquity in the daily diet of most of the khapra beetle's native range; a majority of airport and passenger-carried interceptions of khapra beetle are associated with small quantities of lentils or rice in luggage, gifts, and household goods.

Khapra beetles are also exceptionally difficult to control. Even among the Dermestidae, a difficult group of stored product pests to begin with, it stands out. Khapra beetles can survive for several months without food or water; even longer if temperatures drop enough to allow them to enter diapause. They can successfully develop in materials with as little as 2% moisture content. While they prefer grain, they have also been observed completing their development on animal products and carrion. They are exceptionally resistant to insecticides, requiring treatment rates (even for fumigants) at the upper limits of allowable levels.

Khapra beetle and associated host material are regulated by the USDA under authority of 7 CFR 319.75. Isolated infestations of khapra beetle have been discovered and eradicated from California and Texas through Maryland, New York, and other eastern States. While there are no known infestations currently in the U.S., interceptions at ports of entry have dramatically increased recently and the pest risk potential of khapra beetle is high. The goal of the national survey is to determine if the U.S. remains free from khapra beetle.

Montana depends on the export of cereal grains for much of its agricultural income (wheat alone was valued at $1.3 Billion in 2011, National Ag Statistics Service). The incursion of this pest into Montana would be a significant concern for the Montana Department of Agriculture and the grain industry.

RESULTS: A total of 150 khapra beetle traps were placed at 25 sites across Montana. Traps were placed at grain handling facilities, seed dealers, plant pest laboratories, and other high risk locations. All traps were negative for khapra beetle; two *Trogoderma* sp. samples were sent to the USDA identifiers following the national program protocol. There are several native species of *Trogoderma* in Montana.

Images from left to right: *Trogoderma variabile* (Ballion), *Trogoderma sternale* Jayne, *Trogoderma glabrum* (Herbst), I. Foley.

Pulse Crop Commodity Survey
Pest Detection Survey

For over a decade, the production of pulse crops (peas, lentils, and chickpeas) has seen substantial growth in Montana. Looking ahead, Montana is poised to become a world-class pulse production region as acreages continue to expand and as Montana's reputation for quality becomes increasingly recognized across the globe. Pea acres increased from 35,000 in 1998 to 227,000 acres in 2010. Lentil acres increased from 16,000 acres in 1998 to 255,000 acres in 2010. In recent years, there has been some substitution of lentil acres for pea acres attributable to lentil's high profit potential. In 2011, Montana took over the lead in lentil and pea production in United States, accounting for over half of all lentil acres and nearly half of all pea acres.

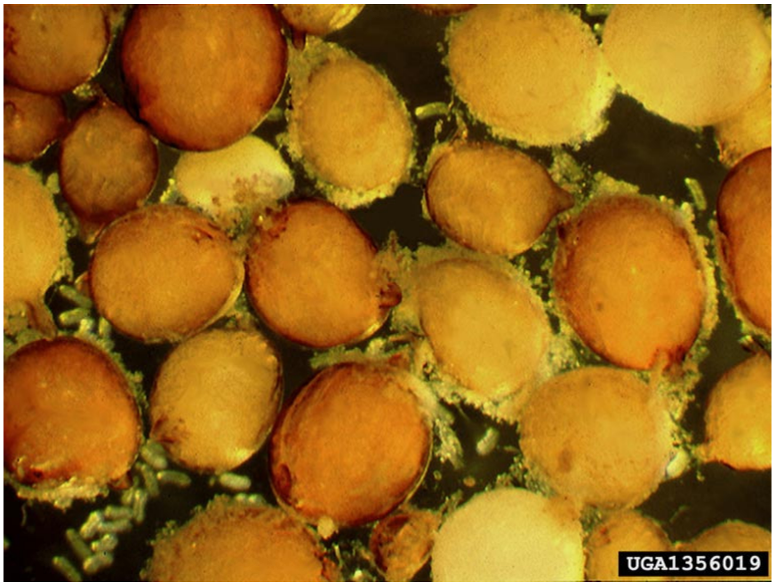
There are a number of factors driving expansion of the pulse industry. Global demand is being driven by population growth and economic gains in other parts of the world. Additionally, Montana peas and lentils serve as less expensive substitutes for other pulses and beans grown in south Asia. Exports from Montana are not limited to south Asia and China; significant volumes are exported to countries in Europe, South America, Latin America, Africa, and the Middle East. In recent years, the world pulse supply has been tight because of demand factors, weather events, and loss of acres to other crops.

Montana's major pulse crop production region is northeastern Montana. In the past decade, northeastern Montana has accounted for roughly 80% of Montana's pulse crop acreages. In 2010, northeastern Montana's share dropped to 75%. In 2011, it was 65%. Despite the likelihood that pulse acres will continue to increase in northeastern Montana, that region's share of the total pulse acreage in Montana will likely decline as pulse acreage growth accelerates elsewhere in the state, particularly in the Golden Triangle (the region in north central Montana defined by an imaginary line between Great Falls, Havre, and Cut Bank that includes Cascade, Chouteau, Glacier, Hill, Pondera, Teton, and Toole counties).

PULSE CROP PEST DETECTION SURVEY RESULTS: All moth traps, visual surveys, soil sample, and plant samples were negative for target species.

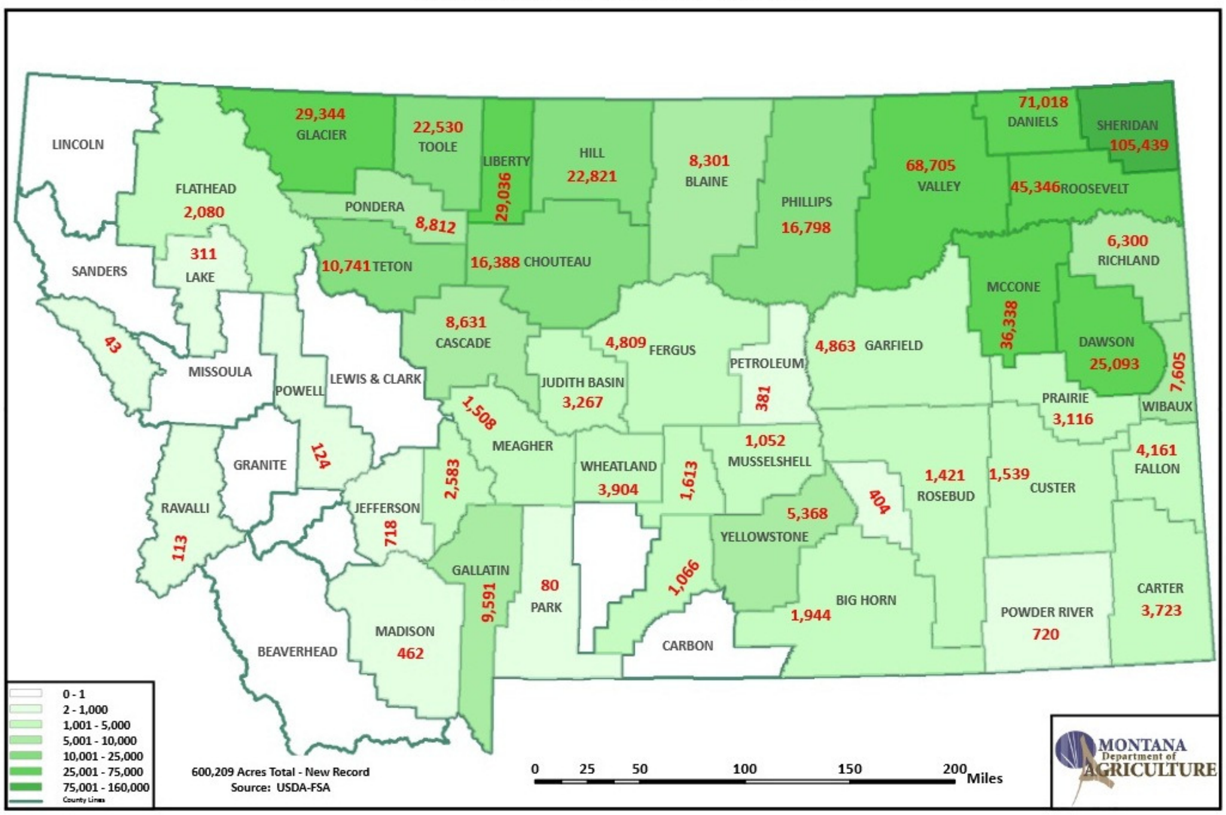
Target Species	Common Name	Approved Method
Lepidoptera		
Helicoverpa armigera (Hübner)	old w orld bollw orm	plastic bucket trap/lure
Chilo suppresalis (Walker)	Asiatic rice borer	large delta trap/ lure
Spodoptera littoralis (Boisduval)	Egyptian cottonw orm	plastic bucket trap/lure
Coleoptera		
Diabrotica speciosa Germar	cucurbit beetle	visual
Heteroptera		
Halyomorpha halys (Stal)	BMSB	visual
Nysius huttoni (White)	w heat bug	visual
Nematodes		
Heterodera cajani	pigeonpea cyst nematode	soil sample
Heterodera latipons	Mediterranean cereal cyst	soil sample
Heterodera filipjevi	cereal cyst nematode	soil sample
Ditylenchus dipsaci	stem and bulb nematode	soil sample
Diseases		
Phakopsora pachyrhizi Syd. & P. Syd.	Asian soybean rust	visual

2013 NEMATODE SURVEY RESULTS		
Species of Regulatory or Economic Concern	**Group**	**POSITIVE/NEGATIVE**
Bursaphelenchus xylophilus (Steiner and Buhrer)	Pine wilt	NEGATIVE
Ditylenchus destructor Thorne	Potato rot	NEGATIVE
Ditylenchus dipsaci (Kühn)	Bulb and stem	NEGATIVE
Globodera pallida (Stone)	Potato cyst	NEGATIVE
Globodera rostochiensis (Wollenweber)	Potato cyst	NEGATIVE
Heterodera glycines Ichinohe	Soybean cyst	NEGATIVE
Heterodera latipons Franklin	Cereal cyst	NEGATIVE
Meloidogyne arenaria (Neal)	Root knot	NEGATIVE
Meloidogyne artiellia Franklin	Root knot	NEGATIVE
Meloidogyne chitwoodi Golden et al.	Root knot	NEGATIVE
Meloidogyne fallax Karssen	Root knot	NEGATIVE
Meloidogyne hapla Chitwood	Root knot	NEGATIVE
Meloidogyne incognita (Kofoid & White)	Root knot	NEGATIVE
Meloidogyne javanica (Treub)	Root knot	NEGATIVE
Meloidogyne mayaguensis Rammah and Hirschmann	Root knot	NEGATIVE
Nacobbus aberrans (Thorne)	False root knot	NEGATIVE
Other Plant-Parasitic Genera	**Group**	**POSITIVE/NEGATIVE**
Anguina	Seed gall	NEGATIVE
Aphelenchoides	Bud and leaf	NEGATIVE
Belonolaimus	Sting	NEGATIVE
Cactodera	Cactus cyst	NEGATIVE
Ditylenchus other species	Other	POSITIVE
Helicotylenchus	Spiral	POSITIVE
Heterodera other species	Cyst	NEGATIVE
Hemicycliophora	Sheath	NEGATIVE
Hoplolaimus	Lance	NEGATIVE
Longidorus	Needle	NEGATIVE
Mesocriconema	Ring	NEGATIVE
Paratrichodorus	Stubby root	NEGATIVE
Paratylenchus	Pin	POSITIVE
Pratylenchus	Root lesion	POSITIVE
Quinisulcius	Stunt	POSITIVE
Rotylenchulus	Reniform	NEGATIVE
Trichodorus	Stubby root	NEGATIVE
Tylenchorhynchus	Stunt	POSITIVE
Xiphinema	Dagger	POSITIVE



Corn Cyst Nematode. Jonathan D. Eisenback, Virginia Polytechnic Institute and State University, Bugwood.org

2013 MONTANA PULSE CROP ACREAGE



Eastern Heath Snail Update
Xerolenta obvia Menke
Farm Bill 10201

Background

Snail samples collected in Cascade County in late July of 2012 were confirmed as eastern heath snail, *Xerolenta obvia*, one of twelve USDA listed invasive terrestrial snails. The Montana Department of Agriculture and the United States Department of Agriculture conducted survey work in August and September of 2012 to delimit the infested area, determine whether eastern heath snail was present in grain and alfalfa production areas in the state, and to support export of Montana agricultural commodities and products. Survey work confirmed the presence of snails in the Belt area along transportation corridors, residential areas, rangeland, and hay fields and yards. In at least six areas, the density of snails was estimated at a million per acre or more. Extensive survey work outside the infested area showed that snails were not yet present in grain production areas. Along some infestation boundary edges, density is very low. The western edge of the infestation appeared to be one mile west of Belt along highway 87, between Belt and Great Falls. However, given the concern that the snails could move with people, vehicles, and materials between Belt and Great Falls, USDA canine teams were used to conduct surveys in areas of concern in Great Falls. Canines are especially useful for survey work in areas where snails may be present in very low numbers or to confirm their absence. While the canine surveys did reveal the presence of native terrestrial snails, there was no detection of *Xerolenta obvia* in any of the Great Falls canine survey locations.

Through a public meeting sponsored by the Montana Farmer's Union and Montana Grain Growers and discussion with individual Belt area landowners and residents, it was determined that the snails have been present in the area for at least 25 years, perhaps much longer. Pathways of introduction include rail, mining, travel, and trade/commerce. There is a strong correlation between rights-of-way activities and local distribution of the snail.

The USDA APHIS PPQ malacologist indicated that eastern heath snail exhibits high adaptability and, as a result, the Montana population would not necessarily exhibit the same behavior and biology of the snail populations in either Europe (where they originate from) or Detroit (the other US location of snails). Observations (not study or research) indicated differences in life cycle, reproduction, and life span and possible differences in aestivation behavior. Biological and behavioral studies were strongly recommended.

Funds were sought from USDA APHIS, Montana Governor's office, and Montana Wheat and Barley to support 2013 survey work, education and outreach, biology/behavioral studies, and treatments. USDA APHIS PPQ awarded the Department Farm Bill 10201 funds to conduct survey work, education and outreach and treatment of several high snail density population areas.

2013 Activities

Education and Awareness

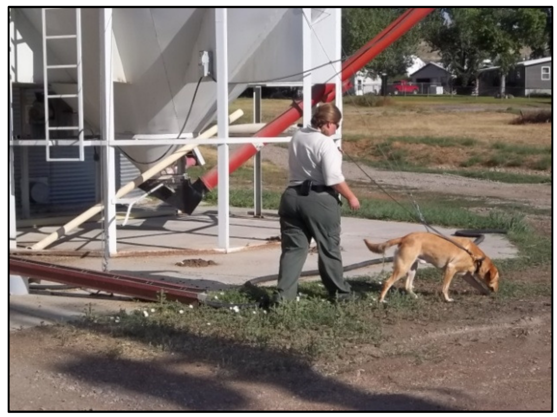
Education, awareness, and outreach activities occurred in 2013. To enhance our knowledge and expertise in invasive terrestrial snails and slugs, department personnel attended a malacology workshop hosted by USDA in March at UC-Davis. The training focused on mollusk morphology, public health concerns, snails and slugs as disease vectors, and anatomy, dissection and taxonomic identification. The department and USDA hosted a meeting on June 18 in Great Falls that included basic snail and slug training by the national malacologist, field observations of snails at a DEQ mine-impacted site in the Belt area, snail management and control strategies provided by industry representatives, and a status update on eastern heath snail in Montana. The department also conducted field evaluations and assessments at several infested sites the day before and day following the meeting.

In August, the department hosted a "Snail Round-up" in the Belt area. Participants were provided with a basic overview of eastern heath snail, had a safety briefing, and provided with gloves and zip lock bags. Children, working as individuals or on teams, collected a whopping 489.50 pounds of snails. This represented approximately 572,400 snails. An additional 21 pounds of snails were turned after the close of the official weigh in, bringing the total to 510.5 pounds. This was an exceptional awareness and outreach event.

The department is working on adding eastern heath snail to an EDDMapS or similar format app, an early detection and distribution system for invasive species. The App allows upload of photos and records location information of species submitted, which are then verified by a designated expert. The App is expected to assist with reporting of snails by the public and verification by the department. It is highly desirable to use a system that the public is already familiar with and that is already being used to report sightings of other invasive species, such as noxious weeds. Another project being worked on involves inclusion of eastern heath snail in the development of invasive species education packets.

Containment and Mitigation
The department has secured Farm Bill 10201 funding for treatment of infested areas. Current efforts have been focused on treatment trials, preparation of an environmental assessment, and consideration of quarantine status. It is anticipated that these activities will be complete and treatments can begin in the spring of 2014.   Funding will be used to either conduct the treatments, hire a contractor to conduct treatments, or to purchase chemical for treatments for landowner application.

Survey work
The goals of survey work in 2013 included gathering additional survey data to better define the infested area boundary and conducting surveys in grain production areas, processing and inspection facilities, and transportation areas to determine the absence or presence of snails. While additional visual survey work did add data concerning the main infested area, large areas are not road accessible and additional resources, time and surveyors would have been necessary to survey these areas by foot. Survey work did, however, provide a reasonable estimation of population distribution and density. Survey work confirmed the absence of eastern heath snails in grain production areas of the state. The department also verified reported sightings of eastern heath snail in Great Falls and near Monarch. The Great Falls site is located approximately 2 city blocks from the Missouri River, which is of concern when considering spread pathways. Landowners associated with the Monarch infestation have been notified and provided information.



The department had also received funding to conduct a broad invasive snail and slug survey across Montana. Survey sites included high-risk transportation areas, recreational areas, and nurseries. Eastern heath snail was not detected in the survey.

Transportation is a major pathway of introduction and spread of snails. Eastern heath snails aestivate in masses on elevated structures (fence posts, plant stems, buildings, and similar locations) during hot, dry weather. Visual surveys are effective during this time, particularly along right-of-ways. During non-optimal visual survey periods, when snail presence is unknown, and when snail density is very low, canine surveys can quickly and efficiently cover large areas. A USDA canine survey team was brought in to conduct surveys the first week of September. Areas identified for canine surveys included grain/seed terminals, storage, production, and processing facilities and co-operatives; pea production areas; an apiary; soil and gravel source areas; staging areas for materials and equipment for construction; transportation corridors and rest areas; an oil company;

ARCO Smelter Works, and Ports of Entry at Wildhorse and Sweetgrass in and between Great Falls, Shelby, and Havre. However, travel delays, canine team reduction (from two dogs to one), incorporation of safety briefings and safety measures, driving distances, and scheduling challenges required several changes to the scope and schedule of the canine surveys. Canine surveys were conducted in a pea production fields near Great Falls, Malt Europ, Sweetgrass Port of Entry, Northern Seed, CHS, the BNSF railroad yards in Shelby and Havre, Montana Flour and Grain, and two Columbia Grain locations. Sites not surveyed this year may be completed in the future, dependent upon availability of the USDA canine teams, time, and funding. All canine survey sites were negative for the presence of eastern heath snail.

In 2013, over 2,000 negative survey sites were reported in all other Montana Counties to demonstrate freedom from this quarantine pest. Survey work was focused on presence or absence of snails and no attempt was made to quantify the snail population. Survey work appears to indicate that snails have not spread beyond the infested boundaries identified in 2012. However, little is known about the biology or invasive behavior of this snail and a prediction of future population growth or spread cannot be made with any certainty with current information and data. It remains important to conduct survey work in the future to monitor the snail population in the Belt area and determine presence or absence to support Montana's export market. Survey and education, awareness, and outreach are planned for 2014 but will depend on funding availability.

***Cochlicella* sp. on grain**

Maritime garden snail, *Cernuella virgata*

Mollusks have only recently been identified as a threat in Montana. Movement of various materials protected by solid wood packing material into and through Montana increases the risk of introduction of pests – not only through standard commerce, but also through the movement of materials from the seaport inland. Interstate 90, a major route across the U.S., travels the entire width of Montana, from a point just west of Missoula to east of Glendive. The Montana "banana belt," a region of milder climate, runs from the Flathead Valley to the Bitterroot. This area has experienced a rapid influx of people and an increase in the building of higher-value homes. These properties often include high-value imported materials such as tile, marble, and wood.

The entire state of Montana is a Mecca for recreation including water activities of all types. All of these serve as routes of entry into the state for organisms such as the various Veroncellid snails, as well as *Monacha* spp., *Cernuella* spp., and *Cochlicella* spp. These snails could, if established, not only out-compete native species, but also eliminate portions of the food web that are currently supporting the state's famous trout fisheries, become mechanical obstacles to field crop harvest, and directly damage desirable plant species including wheat.

RESULTS: No additional invasive mollusk species were discovered in 2013. Two additional populations of *Xerolenta obvia* were confirmed in Cascade County (in the city of Great Falls and near Monarch).

National Agriculture Pest Information System (NAPIS)

2013 Summary Report

Common Name	Scientific Name	Data Source	Traps/Sites	Positives	Negatives
Summer Fruit Tortrix Moth	Adoxophyes orana	UNIVERSITY/EXTENSION	15	0	15
Small Hive Beetle	Aethina tumida	STATE AG. DEPT.	24	0	24
Emerald Ash Borer	Agrilus planipennis	MUNICIPAL/CITY	4	0	4
Emerald Ash Borer	Agrilus planipennis	STATE AG. DEPT.	20	0	20
Emerald Ash Borer	Agrilus planipennis	USDA-APHIS	92	0	92
Asian Honey Bee	Apis ceranae	STATE AG. DEPT.	24	0	24
European Stone Fruit Yellows	Candidatus Phytoplasma prunorum 16Sr)	UNIVERSITY/EXTENSION	15	0	15
Maritime Garden Snail	Cernuella (Helicella) virgata	STATE AG. DEPT.	109	0	109
Japanese Wax Scale	Ceroplastes japonicus	UNIVERSITY/EXTENSION	15	0	15
Asiatic Rice Borer	Chilo suppressalis	STATE AG. DEPT.	25	0	25
Pine-tree Lappet	Dendrolimus pini	STATE AG. DEPT.	25	0	25
Pine-tree Lappet	Dendrolimus pini	USDA-APHIS	26	0	26
Siberian Silk Moth	Dendrolimus sibiricus	STATE AG. DEPT.	25	0	25
Siberian Silk Moth	Dendrolimus sibiricus	USDA-APHIS	26	0	26
Cucurbit Beetle	Diabrotica speciosa	STATE AG. DEPT.	25	0	25
Cucurbit Beetle	Diabrotica speciosa	UNIVERSITY/EXTENSION	15	0	15
Stem and Bulb Nematode	Ditylenchus dipsaci	STATE AG. DEPT.	25	0	25
Cherry Bark Tortrix (CBT)	Enarmonia formosana	UNIVERSITY/EXTENSION	15	0	15
Plum Fruit Moth	Grapholita (Cydia) funebrana	UNIVERSITY/EXTENSION	15	0	15
Brown Marmorated Stink Bug	Halyomorpha halys	STATE AG. DEPT.	25	0	25
Brown Marmorated Stink Bug	Halyomorpha halys	UNIVERSITY/EXTENSION	15	0	15
Old World Bollworm	Helicoverpa armigera	STATE AG. DEPT.	25	0	25
Pigeonpea Cyst Nematode	Heterodera cajani	STATE AG. DEPT.	25	0	25
Cereal Cyst Nematode	Heterodera filipjevi	STATE AG. DEPT.	25	0	25
Mediterranean Cereal Cyst Nema	Heterodera latipons	STATE AG. DEPT.	25	0	25
Large Pine Weevil	Hylobius abietis	USDA-APHIS	9	0	9
Lesser Spruce Shoot Beetle	Hylurgops palliatus	USDA-APHIS	9	0	9
Redhaired Pine Bark Beetle	Hylurgus ligniperda	USDA-APHIS	9	0	9
Gypsy Moth (European)	Lymantria dispar	STATE AG. DEPT.	150	0	150
Gypsy Moth (European)	Lymantria dispar	USDA-APHIS	146	0	146
Asian Gypsy Moth	Lymantria dispar asiatica	STATE AG. DEPT.	150	0	150
Asian Gypsy Moth	Lymantria dispar asiatica	USDA-APHIS	146	0	146
Rosy Moth	Lymantria mathura	STATE AG. DEPT.	50	0	50
Rosy Moth	Lymantria mathura	USDA-APHIS	45	0	45
Hygromiid Snails	Monacha spp.	STATE AG. DEPT.	109	0	109
Asiatic Brown Rot	Monilia polystroma	UNIVERSITY/EXTENSION	15	0	15
Japanese Pine Sawyer	Monochamus alternatus	USDA-APHIS	9	0	9
Wheat Bug	Nysius huttoni	STATE AG. DEPT.	25	0	25
Pine Beauty Moth	Panolis flammea	STATE AG. DEPT.	25	0	25
Pine Beauty Moth	Panolis flammea	USDA-APHIS	26	0	26
Australasian Soybean Rust	Phakopsora pachyrhizi	STATE AG. DEPT.	25	0	25
Plum Pox ; C-strain	Plum Pox Virus; C-strain (PPV)	STATE AG. DEPT.	125	0	125
Plum Pox ; D-strain	Plum Pox Virus; D-strain (PPV)	STATE AG. DEPT.	125	0	125
Plum Pox ; Ea-strain	Plum Pox Virus; Ea-strain (PPV)	STATE AG. DEPT.	125	0	125
Plum Pox ; M-strain	Plum Pox Virus; M-strain (PPV)	STATE AG. DEPT.	125	0	125
Plum Pox; W-strain	Plum Pox Virus; W-strain (PPV)	STATE AG. DEPT.	125	0	125
Japanese Beetle	Popillia japonica	STATE AG. DEPT.	75	13	62
European Cherry Fruit Fly	Rhagoletis cerasi	UNIVERSITY/EXTENSION	15	0	15
Banded Elm Bark Beetle	Scolytus schevyrewi	USDA-APHIS	3	3	0
Sirex Woodwasp	Sirex noctilio	USDA-APHIS	9	0	9
Egyptian Cottonworm	Spodoptera littoralis	STATE AG. DEPT.	25	0	25
Snail	Succinea spp.	STATE AG. DEPT.	109	0	109
False Codling Moth	Thaumatotibia (Cryptophlebia) leucotreta	UNIVERSITY/EXTENSION	15	0	15
White Garden Snail	Theba pisana	STATE AG. DEPT.	109	0	109
Karnal Bunt	Tilletia (Neovossia) indica	STATE AG. DEPT.	155	0	155
Pine Shoot Beetle	Tomicus destruens	USDA-APHIS	9	0	9
Pine Shoot Beetle (PSB)	Tomicus piniperda	UNIVERSITY/EXTENSION	29	0	29
Khapra Beetle	Trogoderma granarium	STATE AG. DEPT.	5	0	5
Khapra Beetle	Trogoderma granarium	UNIVERSITY/EXTENSION	15	0	15
Parasitic mite	Tropilaelaps spp.	STATE AG. DEPT.	24	0	24
European Hardwood Ambrosia Bee	Trypodendron domesticum	USDA-APHIS	8	0	8
Leatherleaf Slugs	Veronicella spp.	STATE AG. DEPT.	109	0	109
Eastern Heath Snail	Xerolenta obvia	JOINT STATE/FEDERAL	2	2	0
Eastern Heath Snail	Xerolenta obvia	STATE AG. DEPT.	27	2	25
Eastern Heath Snail	Xerolenta obvia	STATE AG. DEPT.	269	0	269
Eastern Heath Snail	Xerolenta obvia	USDA-APHIS	2256	0	2256