# MONTANA DEPARTMENT OF AGRICULTURE COOPERATIVE PEST SURVEY REPORT
# 2009

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## Cooperators

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USDA Forest Service
Montana Department of Natural Resources & Conservation
Montana State University

## 2009 Surveys

- Gypsy Moth-GM
- Karnal Bunt-KB
- Pulse Crop Nematodes
- Emerald Ash Borer-EAB
- European Pine Shoot Moth-EPSM
- Small Grains Commodity Based
- Japanese Beetle Delimitation
- Potato Cyst Nematodes-PCN

This report was compiled by Patricia Denke, Kenneth P. Puliafico and Ian Foley with contributions from our survey interns.

# Table of Contents

## 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, and include not only the Department of Agriculture, but also Montana State University, the Montana Department of Natural Resources and Conservation, US-Forest Service, and others. In 2009, the Beaverhead County Weed and Pest District joined the other cooperators.

## 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 survey technicians. We also had the invaluable assistance of Margaret Rayda, Pest Survey Specialist for North Dakota and Montana with the USDA-APHIS-PPQ and Amy Gannon, Forest Entomologist with DNRC. In addition, several Montana Department of Agriculture field inspectors, led by Velda Baltrusch of Great Falls, assisted in gathering Karnal bunt samples.

Interns for 2009 included Craig Carlson, Forest Miller, and Brooke Cather. Brooke Cather was enrolled at Montana State University but transferred to BYU-Idaho for the winter semester. She has a life-long love of the outdoors. She has been a strong member of both her local 4-H club, and the FFA in Lolo, Montana. Brooke worked with the Pest Management Group as "the moth intern" on the western side of the continental divide. Craig Carlson is a student at North Dakota State University, studying horticulture. He was excited to be in Montana, and was headquartered in Bozeman. Craig worked primarily on the emerald ash borer project (with the big sticky purple things), all over the state. Forrest Miller joined the Pest Management Section for a summer internship from Missoula. He actually hails from Maryland. His major is environmental studies. His previous experiences have included working for the Maryland National Park and Planning Commission as a do-almost-everything person. He grew up on a farm in Maryland, which is something many people fail to realize exists. For the Montana Department of Agriculture, he worked on the small grains survey, which is a joint survey with Montana State University plant pathologist Dr. Mary Burrows.

In addition to the interns, we had the assistance of Dr. Ken Puiliafico as a technician. Ken graduated from MSU, and then worked in American Samoa for several years, where he (among other things) taught math and physics. He toiled under the auspices of people at MSU (in Europe) to obtain a Masters of Science in Entomology. He then proceeded to the University of Idaho, where he obtained his PhD. While his immediate training is related to biological control of weeds, Ken is a versatile person who can shift gears rapidly. His primary area of responsibility this summer was the entire Japanese beetle situation in the state. This included creating the plan and leading a delimiting survey, and beginning the transition of the Billings infestation to a formal regulated area with a structured eradication plan.

## Cereal Leaf Beetle Detection Survey
## *Oulema melanopus* (L.)

Cereal leaf beetle (CLB), pictured below, is an exotic quarantine pest of forage and cereal grains. It is commonly found on small grains, particularly wheat, barley, and oats. The adults and immatures feed on the developing plants, at times causing extreme defoliation.


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

**Adult cereal leaf beetle.**
**Approximate length 1/8 to 1/4 inch long.**

During 2009, the Cereal Leaf beetle survey was conducted alongside of a bundled small grain survey that is described later in this document. Sweep net samples were taken for the general survey and samples were screened specifically for CLB adults and larvae. Whole plants were also collected to check for the presence of eggs and larval feeding damage.

Cereal leaf beetles were found in 7 Montana counties during the 2009 sampling season. Counties that had been found positive for CLB in the past were not necessarily sampled during 2009. In total, 48 of Montana's 56 counties have had CLB detections since the discovery of the pest in the late 1980's. There were no noted range expansions for this pest during 2009 and the counties that remain free of CLB based on official survey are: Glacier, Liberty, Hill, Phillips, Valley, Daniels, Sheridan, Roosevelt, and Fallon.

## Cereal Leaf Beetle Parasitoids
## *Tetrastichus julis* (Walker) & *Anaphes flavipes* (Förster)

The Cereal leaf beetle has spread across much of Montana during the past two decades. While initial movement was accompanied by severe outbreaks and economic damage, in more recent years the outbreaks have not been as severe. This may be, in part, due to the nature of the newly infested areas, which are generally drier and therefore less hospitable to the immature beetles. It may also be due to the presence of two parasitoids released by the United States Department of Agriculture, Animal & Plant Health Inspection Service, Plant Protection & Quarantine (USDA APHIS PPQ) to assist in the management of this pest.

The first of these parasitoids to be released and recovered was *Tetrastichus julis*, an internal parasitoid of the CLB larva. The larvae of *T. julis* are maggot-like and bright orange in color. In some samples 100 percent of CLB larvae contained parasitoids, although this varies not only from place to place but also from day to day in the same place. Data suggest that this parasitoid is capable of movement as rapidly as CLB. CLB larvae were only collected at 3 sites in 2009 with parasitism rates by *T. julis* ranging between 0 and 66.67% in 2009.

The second parasitoid, *Anaphes flavipes*, is an egg parasitoid. Although this insect has been released at several Montana locations, the exact status has been more difficult to assess. This is due partially to the small size of the insect, and partially to the fact that CLB eggs are prone to desiccation, making it more difficult to determine when mortality was due to the parasitoid versus other causes. Based on previous year's data and recommendations from the Western Region CLB working group, this parasitoid was not a part of the official survey conducted by the MDA in 2009.

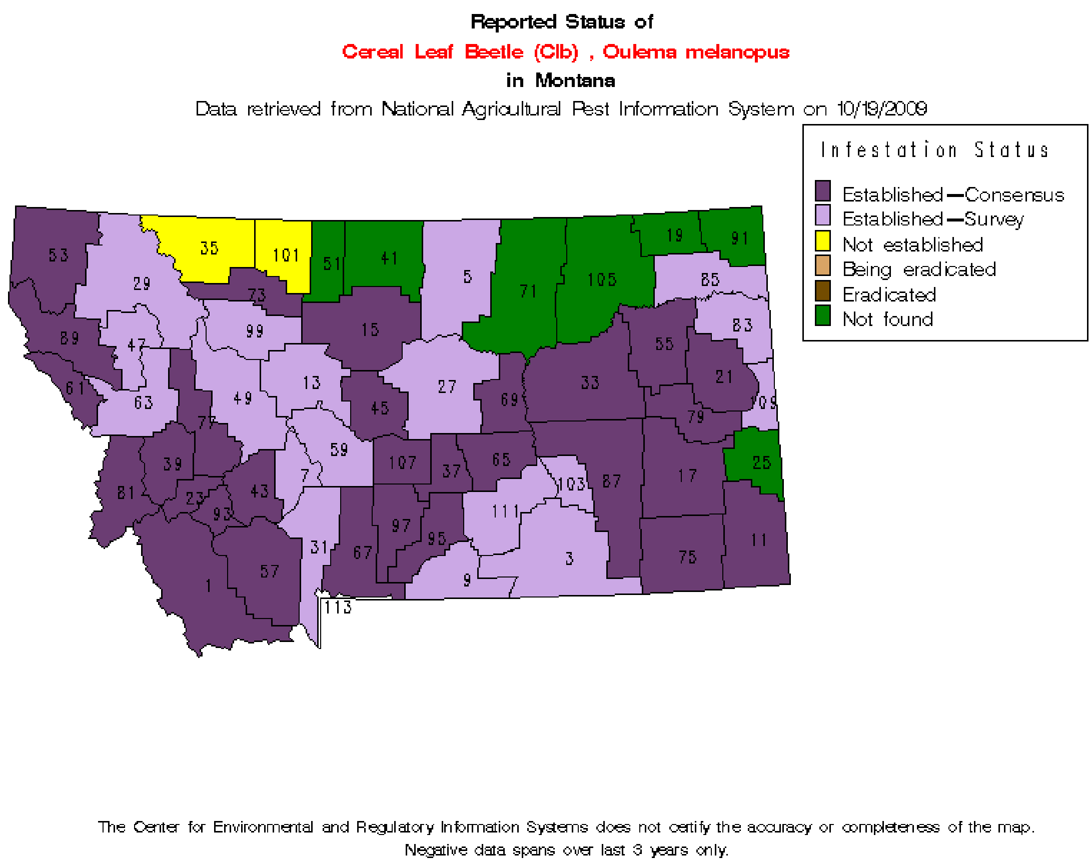
Image, Claude Pilon, www.buguide.net

**CLB larva parasitized by *T. julis*.**

**2009 sites positive for the presence of CLB and/or *Tetrastichus julis* (Walker)**

| Sample Number | County | CLB Adults | CLB larvae % TJ |
|---|---|---|---|
| SG10JUN09FLM001 | BROADWATER | POSITIVE | No larvae |
| SG10JUN09FLM002 | BROADWATER | POSITIVE | No larvae |
| SG14JUN09FLM002 | YELLOWSTONE | POSITIVE | No larvae |
| SG14JUN09FLM003 | YELLOWSTONE | POSITIVE | No larvae |
| SG15JUN09FLM002 | BIG HORN | POSITIVE | 10% |
| SG15JUN09FLM003 | BIG HORN | POSITIVE | 0% |
| SG15JUN09FLM004 | BIG HORN | POSITIVE | No larvae |
| SG22JUN09FLM002 | CASCADE | POSITIVE | No larvae |
| SG22JUN09FLM005 | TETON | POSITIVE | 66.67% |
| SG29JUN09FLM002 | CHOUTEAU | POSITIVE | No larvae |
| SG18AUG09FLM001 | FLATHEAD | POSITIVE | No larvae |

**RESULTS:** Cereal leaf beetle was found at 11 sites in 7 counties; Broadwater, Yellowstone, Big Horn, Cascade, Teton, Chouteau, and Flathead. Larvae parasitized by *Tetrastichus julis* were recovered at two sites, one each in Bighorn and Teton counties.



# Gypsy Moth (GM) Detection Survey
## *Lymantria dispar* (L.)

Gypsy moth (*Lymantria dispar* (L.)) was initially introduced into the Eastern U.S in the mid 1800's. It established rapidly and became a serious defoliating pest of various deciduous trees. The females oviposit on various surfaces, covering the eggs with hairs or scales. This insect is frequently moved on a variety of objects, such as RV's, firewood, furniture and other recreational equipment that has been left outdoors. The gypsy moth is the most destructive forest pest in the Eastern United States and large areas of the Northeastern US are under a federal quarantine to prevent the spread of this pest.

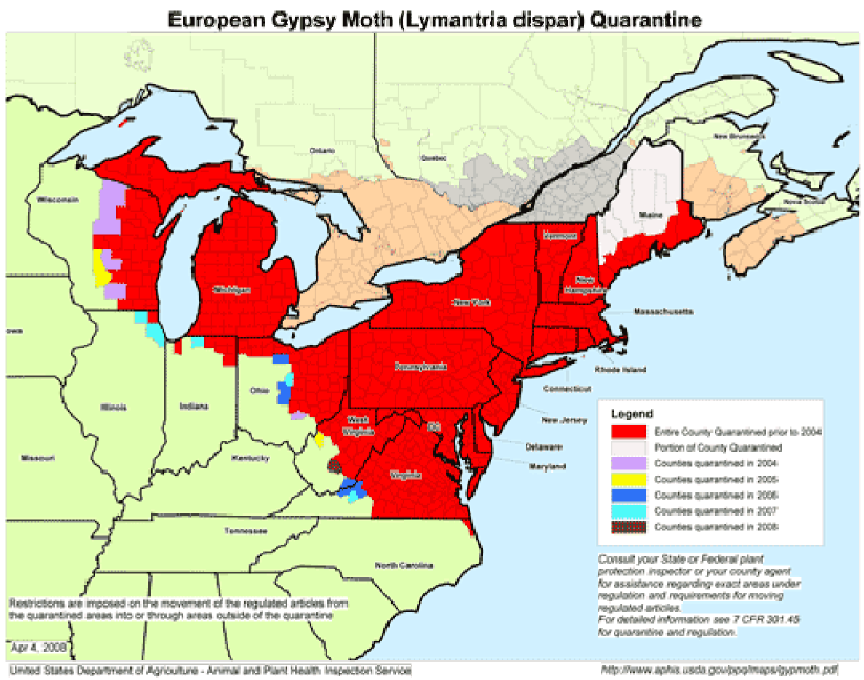




Image from http://www.padil.gov.au

**Male Gypsy Moth**

**Traps are baited with a female sex-pheromone and only attract males.**

Larvae are voracious predators and feed on over 500 different species of plants. Important native potential tree hosts of the Gypsy Moth in Montana include Aspen and Western Larch. Older larvae will also actively feed on Pines and Spruce. Many landscape plants, urban trees and shrubs across Montana would be subject to GM defoliation. There have been several positive GM traps in Montana in recent years: Cascade (1989, 1990), Gallatin (1988), Glacier (2001, 2003, 2007, and 2008), Lewis and Clark (1988), Liberty (1992), Missoula (1996), Park (2001), and Yellowstone (1993). All of these moths were certainly moved through anthropogenic means and this human caused movement of immobile egg masses and pupae represents the most significant entry pathway of the Gypsy Moth into Montana.

Major native Montana host plants are generally concentrated in the Western half of the state (see Western larch and quacking aspen distribution maps below), but suitable landscape and urban gypsy moth host plants can be found across Montana.

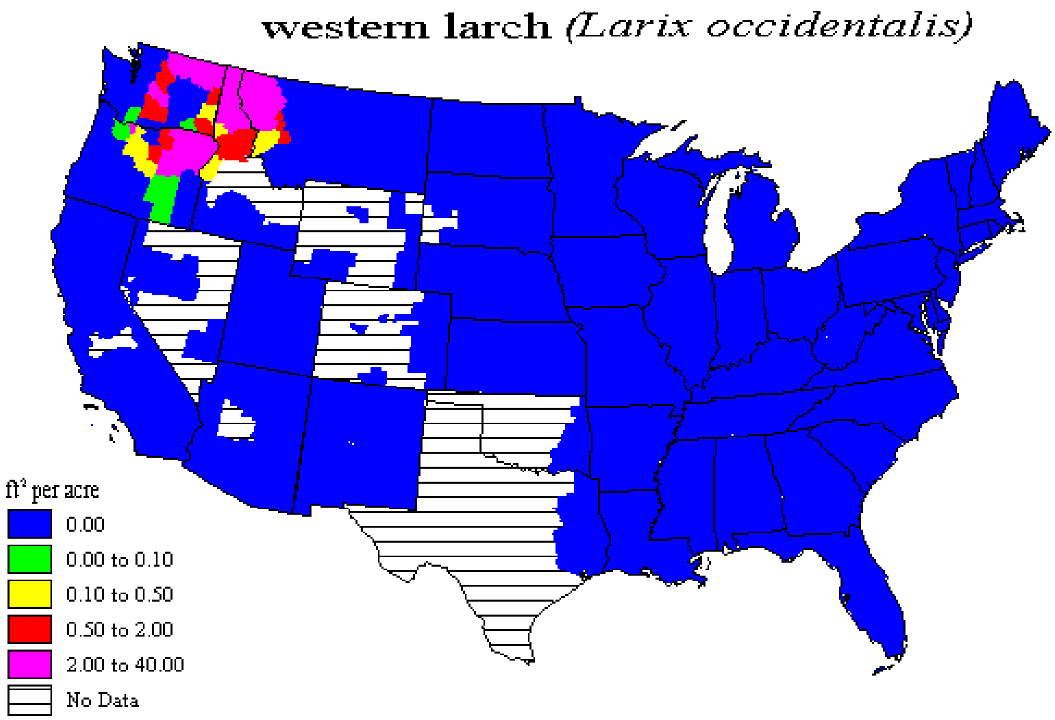

**Gypsy moth caterpillar**

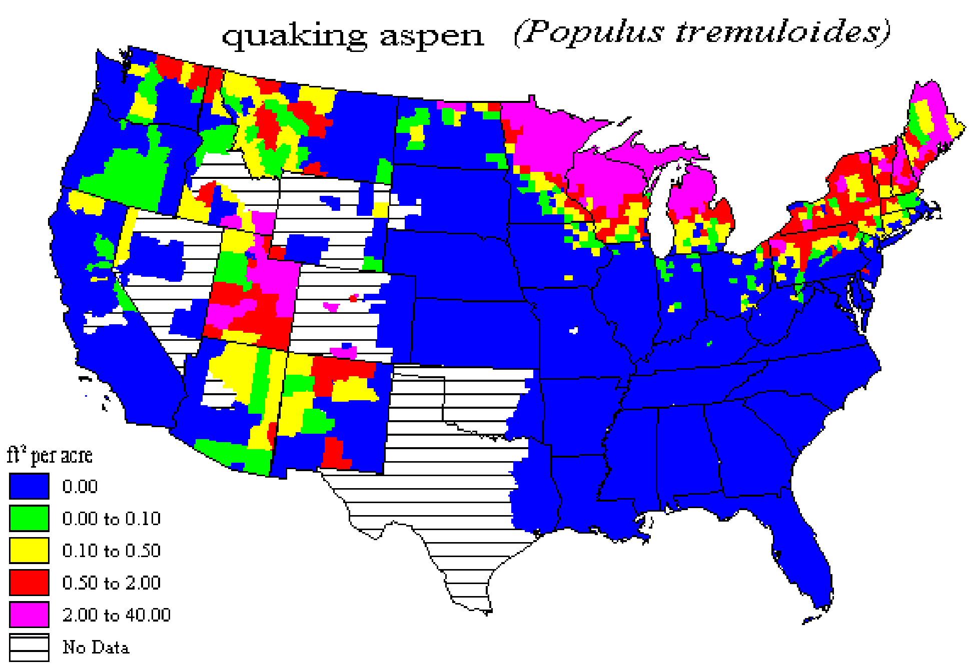
| 2009 MDA GYPSY MOTH TRAPS BY COUNTY | |
|---|---|
| **# of Traps** | **County** |
| 15 | BEAVERHEAD |
| 1 | MISSOULA |
| 4 | LAKE |
| 25 | RAVALLI |
| 2 | GRANITE |
| 7 | DEER LODGE |
| 1 | SILVER BOW |
| 11 | MINERAL |
| 19 | SANDERS |
| 27 | LINCOLN |
| 20 | FLATHEAD |
| 10 | LAKE |
| **142** | **Total** |

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 is responsible for trapping in mainly the eastern portion of the state, while the MDA traps mainly in the western part of the state. The DNRC sets traps in Mineral and Missoula Counties and the USDA-FS sets traps in a large number of campgrounds, as well as other public recreation areas. All traps were placed by early June, and checked throughout the summer at two to three week intervals.

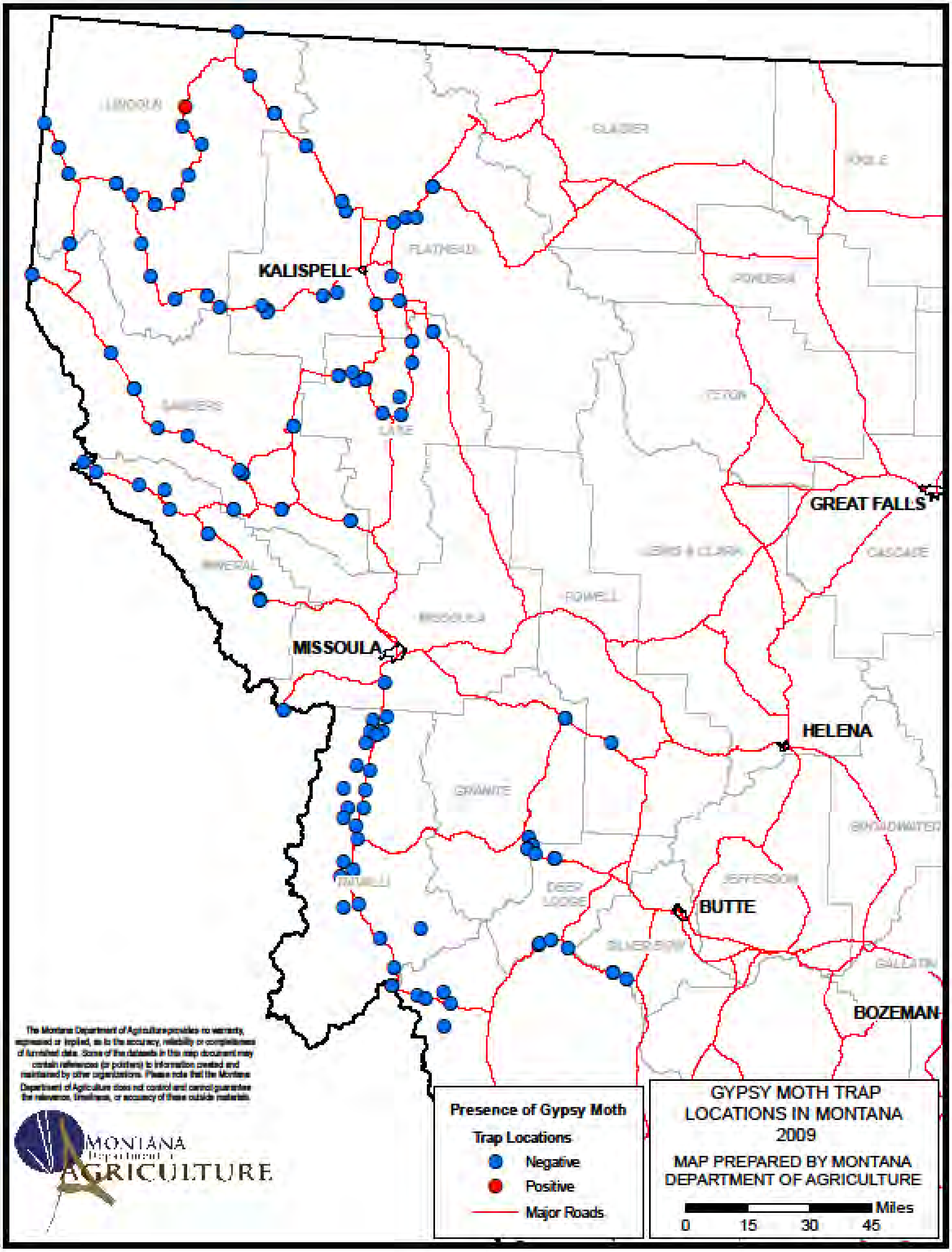
**RESULTS:** 142 GM traps were placed by MDA personnel in 2009. One trap (2 moths) in Lincoln County was confirmed positive for European Gypsy Moth by the USDA lab in Otis, MA. A more intense survey will take place in the area in 2010. The National Park Service trapped one male moth in the Many Glacier area of Glacier National Park in 2009. This area will also be trapped intensely in 2010.

**Potentially important native Montana host plants of the Gypsy Moth**



## Locations of gypsy moth traps placed in Montana by MDA



## Small Grains Commodity Based Survey (SG)
## Detection Survey

The USDA published guidelines for a small grains commodity based survey in 2008. The idea behind commodity based surveys is to target export commodities rather than individual pests. When undertaking a commodity based survey, multiple survey methods are used to take samples from a single commodity or group of similar commodities over a longer time period. In the small grains survey, the Department used sweep net samples, visual surveys, soil samples for nematodes, and whole plant samples for diseases. This methodology allows the survey to maximize the potential for pest detection and minimize the cost compared to several different surveys for individual pests.


The small grains survey targets 14 different types of exotic pests (see table 1 below) that could potentially damage small grains crops and negatively impact Montana exports. These pests include 8 arthropods, 2 mollusks, 3 nematodes, and 1 fungus like pathogen. In addition to the 14 exotic pests, samples were also screened for cereal leaf beetle and a number of other economically important nematodes and plant diseases.

Montana generally ranks in the top 5 nationally in the value of both wheat and barley crop production. Chouteau County, Montana is one of only two counties in the U. S. that produced over 20 million bushels of wheat in 2007.

**Table 1. List of target species of the Small Grains Commodity Based Survey**

| Common Name | Species | Group |
|---|---|---|
| New Zealand Wheat Bug | *Nysius huttoni* White | Hemiptera: Lygaeidae |
| Old World Bollworm | *Helicoverpa armigera* Hübner | Lepidoptera: Noctuidae |
| Rice Cutworm | *Spodoptera litura* (F.) | Lepidoptera: Noctuidae |
| Egyptian Cotton Leafworm | *Spodoptera littoralis* (Boisduval) | Lepidoptera: Noctuidae |
| Owlet Moths | *Copitarsia* spp. | Lepidoptera: Noctuidae |
| Grape Berry Moth | *Lobesia botrana* (Denis & Schiffermuller) | Lepidoptera: Totricidae |
| Silver-Y Moth | *Autographa gamma* (L.) | Lepidoptera: Noctuidae |
| African Black Beetle | *Heteronychus arator* F. | Coleoptera: Scarabaeidae |
| British Root-Knot Nematode | *Meloidogyne artiellia* Franklin | Nematoda: Meloidogynidae |
| Mediterranean Cereal Cyst Nematode | *Heterodera latipons* Franklin | Nematoda: Heteroderidae |
| Cereal Cyst Nematode | *Heterodera filipjevi* (Madzhidov) | Nematoda: Heteroderidae |
| Conical Land Snails | *Cochlicella* spp. | Pulmonata: Helicidae |
| Maritime Garden Snail | *Cernuella virgata* | Pulmonata: Hygromiidae |
| Philippine Downy Mildew | *Peronosclerospora philippinensis* | Oomycete |

Since the initiation of the Small Grains Commodity Based survey, two of the target pests have been detected in North America for the first time. The Cereal Cyst Nematode was detected in Oregon (Union County) in 2008 (Smiley et al. 2008). This survey season, the Grape Berry Moth was detected in California (Napa County).

**New Zealand Wheat Bug**

**Results:** During the 2009 survey, 175 sweep net/visual survey samples were submitted. No suspect target pests were detected in any of the samples. Cereal Leaf Beetle (see CLB section) was detected in 11 samples. Economic levels of Wheat Stem Sawfly and Grasshoppers were found in a number of samples. Blister beetles populations (*Epicauta* sp.) were high in several samples and can be a pest in livestock feed, but no specific economic threshold have been established for Montana species.

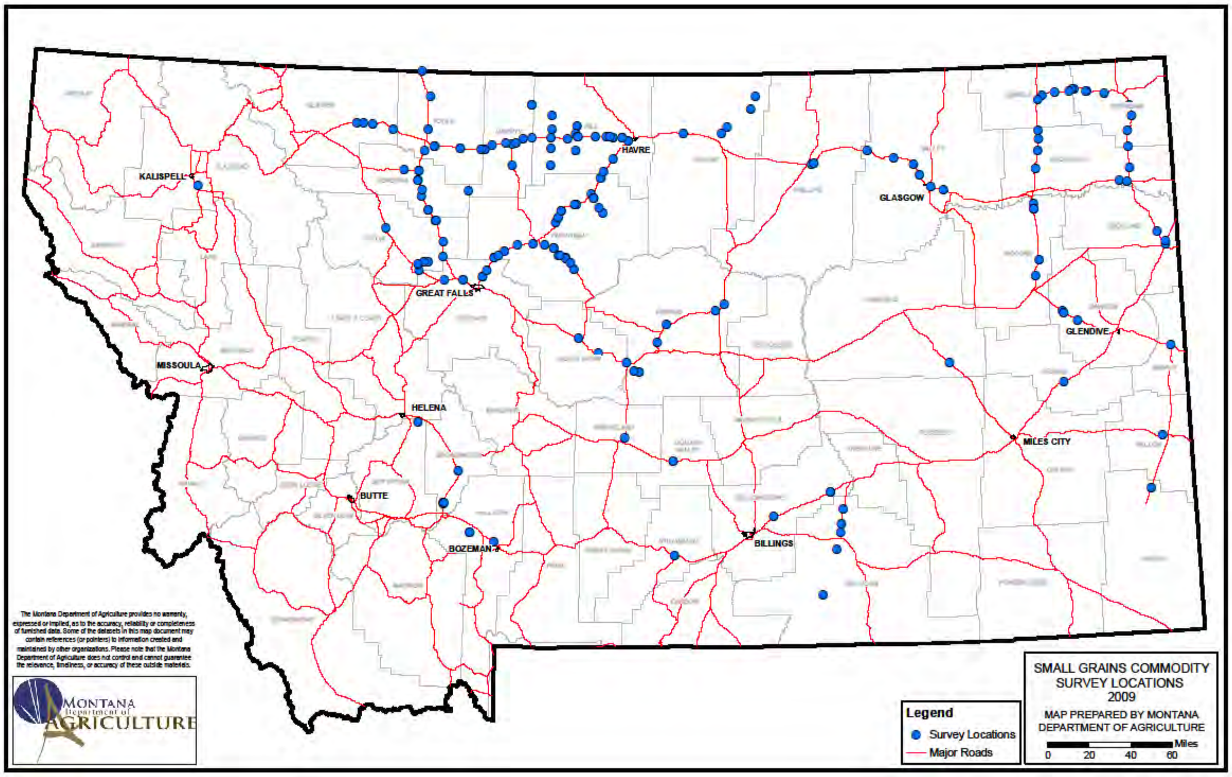
The Montana State University Plant Pathology lab processed 141 samples for plant diseases (see results table 2 below). Wheat Streak mosaic virus was detected in 7 samples. Wheat mosaic virus was detected in 2 samples. Triticum mosaic virus, rust, and barley and wheat yellow dwarf diseases were not detected in any of the samples. The abbreviations in table 2: Triticum mosaic virus = TriMV, Wheat Streak mosaic virus =WSMV, Wheat mosaic virus (High Plains virus) = WMoV(HPV), Barley yellow dwarf disease = BYDV-PAV, and Cereal yellow dwarf disease = CYDV-RPV

Soil samples for nematode detection analysis were sent to the University of Nebraska in Lincoln. *Heterodera trifolii* (Goffart), the clover cyst nematode, and *H. schachtii* Schmidt, the sugarbeet cyst nematode were tentatively identified morphologically pending DNA confirmation. Root lesion nematodes in the genus *Pratylenchus* were detected in several samples at levels that are probably causing yield reduction. For a complete list of nematodes detected in the samples see the table on page 29.

**Table 2. Disease results. 0-negative, 1-positive. Orange rust diseases, green viruses.**

| Sample no. | Stripe Rust | Leaf Rust | Stem Rust | WSMV | WMoV(HPV) | TriMV | BYDV-PAV | CYDV-RPV |
|---|---|---|---|---|---|---|---|---|
| SG09JUN09FLM001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG04JUN09BEC002 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG10JUN09FLM02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG04JUN09BEC001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG11JUN09FLM001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG14JUN09FLM001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG14JUN09FLM002 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG15JUN09FLM001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG15JUN09FLM002 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| SG15JUN09FLM003 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG15JUN09FLM004 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG15JUN09FLM005 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG15JUN09FLM006 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG16JUN09FLM001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG16JUN09FLM002 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG16JUN09FLM003 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG16JUN09FLM004 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG22JUN09FLM001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG22JUN09FLM002 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG22JUN09FLM003 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG22JUN09FLM004 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG22JUN09FLM005 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG22JUN09FLM006 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG22JUN09FLM007 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG23JUN09FLM001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG23JUN09FLM002 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG23JUN09FLM003 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG23JUN09FLM004 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG23JUN09FLM005 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG23JUN09FLM006 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG23JUN09FLM007 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG23JUN09FLM008 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG23JUN09FLM009 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG23JUN09FLM010 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG29JUN09FLM001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG29JUN09FLM002 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG29JUN09FLM003 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG29JUN09FLM004 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG29JUN09FLM005 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG29JUN09FLM006 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG29JUN09FLM007 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG29JUN09FLM008 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG29JUN09FLM009 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG29JUN09FLM010 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG29JUN09FLM011 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| SG29JUN09FLM012 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| SG29JUN09FLM013 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| SG30JUN09FLM001 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| SG30JUN09FLM002 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG30JUN09FLM003 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG30JUN09FLM004 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG30JUN09FLM005 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG30JUN09FLM006 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| SG30JUN09FLM007 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| SG30JUN09FLM008 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG30JUN09FLM009 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG30JUN09FLM010 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG30JUN09FLM011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG30JUN09FLM012 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG30JUN09FLM013 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG30JUN09FLM014 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SG30JUN09FLM015 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Small Grain Survey location in 2009



## 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. KB was first detected in the United States in 1996, within the state of Arizona 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 by 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.


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

**Bunted Wheat**

**Montana's Grain Crop Production for 2008**

| ITEM | BUSHELS | RANK | % U.S. Total |
|---|---|---|---|
| All Wheat | 164,730,000 | 5 | 6.6 |
| Winter Wheat | 94,380,000 | 5 | 5.1 |
| Durum Wheat | 10,830,000 | 4 | 12.9 |
| Other Spring | 70,500,000 | 6 | 12.0 |
| Barley | 37,740,000 | 3 | 15.7 |

http://usda.mannlib.cornell.edu/usda/current/CropProdSu/CropProdSu-01-12-2006.txt

**RESULTS:** Montana continued to sample for KB during the 2009 harvest. A total of 152 samples were collected from 34 counties across Montana. The USDA Laboratory in Olney, Texas 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 export markets.

**Wheat Production in Montana (2008)**

**2009 Karnal Bunt Survey Numbers**

| County | 2008 Production Total Bushels | # of 2009 KB Samples | County | 2008 Production Totals Bushels | # of 2009 KB Samples |
|---|---|---|---|---|---|
| Choteau | 22,923,000 | **23** | Prairie | 892,000 | **1** |
| Hill | 16,336,000 | **14** | Wheatland | 722,000 | **1** |
| Roosevelt | 5,907,000 | **8** | Carter | 1,150,000 | **1** |
| Sheridan | 5,840,000 | **7** | Lake | 895,000 | **1** |
| Valley | 7,077,000 | **7** | Musselshell | 603,000 | **0** |
| Daniels | 4,794,000 | **5** | Stillwater | 1,208,000 | **1** |
| Fergus | 6,922,000 | **7** | Custer | 737,000 | **0** |
| McCone | 4,597,000 | **5** | Golden Valley | 835,000 | **1** |
| Liberty | 8,274,000 | **7** | Lewis & Clark | 683,000 | **0** |
| Toole | 6,430,000 | **6** | Beaverhead | 696,000 | **0** |
| Pondera | 7,781,000 | **7** | Madison | 670,000 | **0** |
| Blaine | 5,524,000 | **5** | Petroleum | 718,000 | **0** |
| Cascade | 5,574,000 | **6** | Treasure | 604,000 | **0** |
| Teton | 7,712,000 | **6** | Powder River | 697,000 | **0** |
| Richland | 2,631,000 | **4** | Park | 363,000 | **0** |
| Dawson | 3,475,000 | **3** | Meagher | 297,000 | **0** |
| Big Horn | 4,420,000 | **4** | Carbon | 285,000 | **0** |
| Glacier | 4,187,000 | **4** | Missoula | 142,500 | **0** |
| Phillips | 3,498,000 | **3** | Jefferson | 153,000 | **0** |
| Gallatin | 2,856,000 | **3** | Ravalli | 105,500 | **0** |
| Judith Basin | 2,415,000 | **3** | Sweet Grass | 173,000 | **0** |
| Garfield | 3,179,000 | **2** | Sanders | 51,500 | **0** |
| Yellowstone | 3,236,000 | **2** | Mineral | 0 | **0** |
| Broadwater | 1,751,000 | **1** | Deer Lodge | 0 | **0** |
| Flathead | 1,095,000 | **1** | Granite | 0 | **0** |
| Rosebud | 1,742,000 | **1** | Lincoln | 0 | **0** |
| Fallon | 1,065,000 | **1** | Powell | 0 | **0** |
| Wibaux | 638,000 | **1** | Silver Bow | 0 | **0** |
| | | | Totals | 164,559,500 | **152** |

| Sample | County | Results | Date Read | Sample | County | Results | Date Read |
|---|---|---|---|---|---|---|---|
| MT-105 | Blaine | Negative | 9/8 | MT-101 | Big Horn | Neg | 10/8 |
| MT-106 | Blaine | Negative | 9/8 | MT-102 | Big Horn | Neg | 10/13 |
| MT-107 | Blaine | Negative | 9/8 | MT-103 | Big Horn | Neg | 10/13 |
| MT-108 | Blaine | Negative | 9/8 | MT-104 | Big Horn | Neg | 10/13 |
| MT-109 | Blaine | Negative | 9/8 | MT-110 | Broadwater | Neg | 10/8 |
| MT-112 | Cascade | Negative | 9/8 | MT-111 | Carter | Neg | 10/8 |
| MT-113 | Cascade | Negative | 9/8 | MT-133 | Chouteau | Negative | 9/9 |
| MT-114 | Cascade | Negative | 9/8 | MT-134 | Chouteau | Negative | 9/9 |
| MT-115 | Cascade | Negative | 9/8 | MT-135 | Chouteau | Negative | 9/9 |
| MT-116 | Cascade | Negative | 9/8 | MT-136 | Chouteau | Negative | 9/9 |
| MT-117 | Cascade | Negative | 9/8 | MT-137 | Chouteau | Negative | 9/9 |
| MT-118 | Chouteau | Negative | 9/9 | MT-138 | Chouteau | Negative | 9/9 |
| MT-119 | Chouteau | Negative | 9/9 | MT-139 | Chouteau | Negative | 9/9 |
| MT-120 | Chouteau | Negative | 9/9 | MT-140 | Chouteau | Negative | 9/9 |
| MT-121 | Chouteau | Negative | 9/9 | MT-141 | Daniels | Neg | 10/8 |
| MT-122 | Chouteau | Negative | 9/9 | MT-142 | Daniels | Neg | 10/8 |
| MT-123 | Chouteau | Negative | 9/9 | MT-143 | Daniels | Neg | 10/8 |
| MT-124 | Chouteau | Negative | 9/9 | MT-144 | Daniels | Neg | 10/8 |
| MT-125 | Chouteau | Negative | 9/9 | MT-145 | Daniels | Neg | 10/8 |
| MT-126 | Chouteau | Negative | 9/9 | MT-146 | Dawson | Neg | 10/8 |
| MT-127 | Chouteau | Negative | 9/9 | MT-147 | Dawson | Neg | 10/8 |
| MT-128 | Chouteau | Negative | 9/9 | MT-148 | Dawson | Neg | 10/8 |
| MT-129 | Chouteau | Negative | 9/9 | MT-149 | Fallon | Neg | 10/8 |
| MT-130 | Chouteau | Negative | 9/9 | MT-150 | Fergus | Negative | 9/9 |
| MT-131 | Chouteau | Negative | 9/9 | MT-151 | Fergus | Negative | 9/9 |
| MT-132 | Chouteau | Negative | 9/9 | MT-152 | Fergus | Negative | 9/9 |
| MT-155 | Fergus | Negative | 9/14 | MT-153 | Fergus | Negative | 9/9 |
| MT-156 | Fergus | Negative | 9/14 | MT-154 | Fergus | Negative | 9/9 |
| MT-158 | Gallatin | Negative | 9/14 | MT-157 | Flathead | Neg | 10/8 |
| MT-164 | Hill | Negative | 9/8 | MT-159 | Gallatin | Neg | 10/8 |
| MT-165 | Hill | Negative | 9/8 | MT-160 | Gallatin | Neg | 10/8 |
| MT-166 | Hill | Negative | 9/8 | MT-161 | Garfield | Neg | 10/8 |
| MT-167 | Hill | Negative | 9/8 | MT-162 | Garfield | Neg | 10/8 |
| MT-168 | Hill | Negative | 9/8 | Mt-163 | Golden Valley | Neg | 10/8 |
| MT-169 | Hill | Negative | 9/8 | MT-181 | Lake | Neg | 10/13 |
| MT-170 | Hill | Negative | 9/8 | MT-189 | McCone | Neg | 10/8 |
| MT-171 | Hill | Negative | 9/8 | MT-191 | McCone | Neg | 10/13 |
| MT-172 | Hill | Negative | 9/8 | MT-192 | McCone | Neg | 10/13 |
| MT-173 | Hill | Negative | 9/8 | MT-193 | McCone | Neg | 10/13 |
| MT-174 | Hill | Negative | 9/8 | MT-194 | Phillips | Neg | 10/13 |
| MT-175 | Hill | Negative | 9/8 | MT-195 | Phillips | Neg | 10/13 |
| MT-176 | Hill | Negative | 9/8 | MT-196 | Phillips | Neg | 10/13 |
| MT-177 | Hill | Negative | 9/8 | MT-204 | Prairie | Neg | 10/13 |
| MT-178 | Judith Basin | Negative | 9/14 | MT-205 | Richland | Neg | 10/13 |
| MT-179 | Judith Basin | Negative | 9/14 | MT-206 | Richland | Neg | 10/13 |
| MT-180 | Judith Basin | Negative | 9/14 | MT-207 | Richland | Neg | 10/13 |
| MT-182 | Liberty | Negative | 9/14 | MT-208 | Richland | Neg | 10/13 |
| MT-183 | Liberty | Negative | 9/14 | MT-210 | Roosevelt | Neg | 10/13 |
| MT-184 | Liberty | Negative | 9/14 | MT-211 | Roosevelt | Neg | 10/13 |
| MT-185 | Liberty | Negative | 9/14 | MT-212 | Roosevelt | Neg | 10/13 |
| MT-186 | Liberty | Negative | 9/14 | MT-213 | Roosevelt | Neg | 10/13 |
| MT-187 | Liberty | Negative | 9/14 | MT-214 | Roosevelt | Neg | 10/13 |
| MT-188 | Liberty | Negative | 9/14 | MT-215 | Roosevelt | Neg | 10/13 |
| MT-190 | McCone | Neg | 10/8 | MT-216 | Roosevelt | Neg | 10/13 |
| MT-197 | Pondera | Negative | 9/8 | MT-217 | Rosebud | Neg | 10/13 |
| MT-198 | Pondera | Negative | 9/8 | MT-218 | Sheridan | Neg | 10/13 |
| MT-199 | Pondera | Negative | 9/8 | MT-219 | Sheridan | Neg | 10/13 |
| MT-200 | Pondera | Negative | 9/8 | MT-220 | Sheridan | Neg | 10/13 |
| MT-201 | Pondera | Negative | 9/9 | MT-221 | Sheridan | Neg | 10/13 |
| MT-202 | Pondera | Negative | 9/9 | MT-222 | Sheridan | Neg | 10/13 |
| MT-203 | Pondera | Negative | 9/9 | MT-223 | Sheridan | Neg | 10/13 |
| MT-209 | Roosevelt | Negative | 9/14 | MT-224 | Sheridan | Neg | 10/13 |
| MT-226 | Teton | Negative | 9/14 | MT-225 | Stillwater | Neg | 10/13 |
| MT-227 | Teton | Negative | 9/14 | MT-238 | Valley | Neg | 10/13 |
| MT-228 | Teton | Negative | 9/14 | MT-239 | Valley | Neg | 10/13 |
| MT-229 | Teton | Negative | 9/14 | MT-240 | Valley | Neg | 10/13 |
| MT-230 | Teton | Negative | 9/14 | MT-241 | Valley | Neg | 10/13 |
| MT-231 | Teton | Negative | 9/14 | MT-242 | Valley | Neg | 10/13 |
| MT-232 | Toole | Negative | 9/14 | MT-243 | Valley | Neg | 10/13 |
| MT-233 | Toole | Negative | 9/14 | MT-244 | Valley | Neg | 10/13 |
| MT-234 | Toole | Negative | 9/14 | MT-246 | Wibaux | Neg | 10/13 |
| MT-235 | Toole | Negative | 9/14 | MT-247 | Yellowstone | Neg | 10/13 |
| MT-236 | Toole | Negative | 9/14 | MT-248 | Yellowstone | Neg | 10/13 |
| MT-237 | Toole | Negative | 9/14 | MT-250 | Glacier | Neg | 10/13 |
| MT-245 | Wheatland | Negative | 9/14 | MT-251 | Glacier | Neg | 10/13 |
| MT-249 | Glacier | Negative | 9/14 | MT-252 | Glacier | Neg | 10/13 |

USDA-APHIS-PPQ-Karnal Bunt Project, Olney, TX

## Emerald Ash Borer (EAB) Detection Survey
## *Agrilus planipennis* Fairmaire

The emerald ash borer (EAB) is an exotic and extremely damaging pest that attacks and kills ash trees (*Fraxinus* sp.). In hardwood forests of the Eastern United States, this beetle is a severe threat to native forest ecosystems, as well as urban landscape trees. While native ash in Montana and the Intermountain West is limited to riparian areas, ash is a very significant urban landscape tree. Due to its hardy nature and cold tolerances, green ash has been planted in some Montana neighborhoods at densities approaching 100%.


**Emerald Ash Borer**

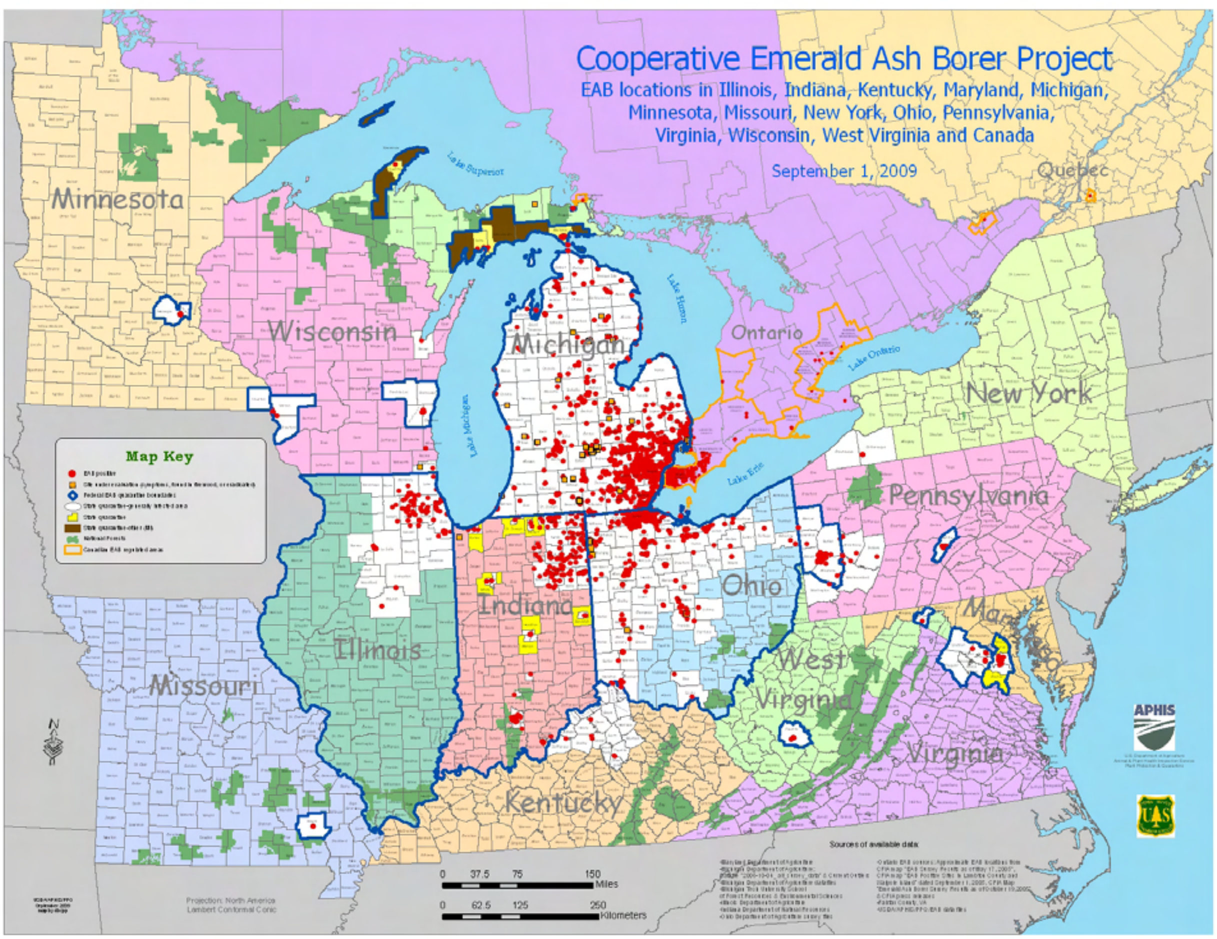
The emerald ash borer is native to Asia, but was introduced into the Eastern United States sometime in the 1990's. It was first discovered in southeastern Michigan in 2002. It is suspected to have arrived in North America in solid wood packing materials (SWPM) used to ship commodities in the international market. Since 2002, EAB has been detected in Indiana, Illinois, Maryland, Michigan, Ohio, Pennsylvania, West Virginia, Wisconsin, Missouri, and Minnesota. EAB attacks and kills both healthy and stressed or dying trees, with the time from infestation to tree mortality being 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.

Declining ash due to EAB damage. www.entomology.wisc.edu

Emerald ash borer traps (image on left) are hung preferably in ash trees (*Fraxinus* sp.). The large purple trap, which is sticky on the outside, acts as a panel flight intercept trap, with insects that fly into the panels become irremovably stuck in Tanglefoot®. The trap is baited with a Manuka Oil lure that mimics the plant volatiles released by a damaged ash tree.

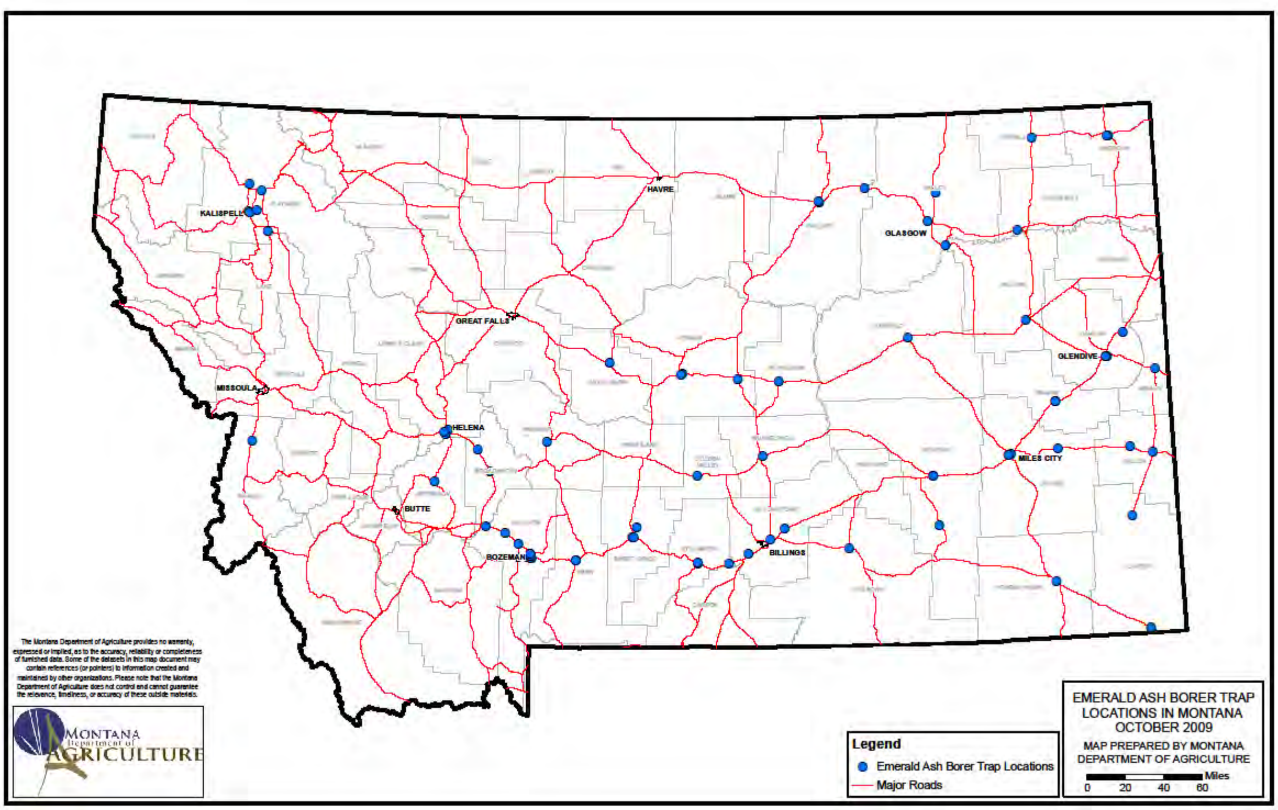
The map below shows (red dots) the current positive finds of EAB. In 2009, EAB was newly confirmed in the state of Minnesota.

Due to various outreach efforts across the state and nation regarding EAB and the general poor health of ash trees in Montana, the Department has started to receive reports from the public about suspect EAB in Montana. Each report is investigated on a case by case basis.



| 2009 MDA EMERALD ASH BORER TRAPS BY COUNTY | | | |
|---|---|---|---|
| # of Traps | County | # of Traps | County |
| 1 | MEAGHER | 3 | CARTER |
| 2 | PRAIRIE | 3 | STILLWATER |
| 1 | JEFFERSON | 3 | YELLOWSTONE |
| 2 | FALLON | 3 | ROSEBUD |
| 1 | RAVALLI | 1 | GARFIELD |
| 11 | GALLATIN | 1 | MCCONE |
| 5 | LEWIS AND CLARK | 1 | PETROLEUM |
| 1 | BIG HORN | 3 | FERGUS |
| 2 | SHERIDAN | 1 | WIBAUX |
| 1 | DANIELS | 1 | GOLDENVALLEY |
| 3 | PHILLIPS | 1 | MUSSELSHELL |
| 3 | VALLEY | 3 | SWEET GRASS |
| 1 | ROOSEVELT | 1 | JUDITH BASIN |
| 4 | DAWSON | 2 | BROADWATER |
| 4 | CUSTER | 2 | PARK |
| 1 | POWDER RIVER | 8 | FLATHEAD |
| | | 80 | Total |

## Locations of EAB traps placed in Montana by MDA



**RESULTS:** No suspect EAB were trapped in 2009 by MDA personnel. The native species *Agrilus politus* (Say) and *A. granulatus* (Say) were caught in EAB traps in 2009 (see image below).

***Agrilus politus* (Say), image by I. Foley.**

| 2009 Statewide Emerald Ash Borer Traps | |
|---|---|
| **Agency** | **Total Number of Traps** |
| MDA | 80 |
| DNRC | 40 |
| USDA-APHIS-PPQ | 60 |
| **Total** | **180** |

**European Pine Shoot Moth (EPSM)**
***Rhyacoinia buoliana*** **(Denis & Schiffermüller)**
**Quarantine Support Survey**

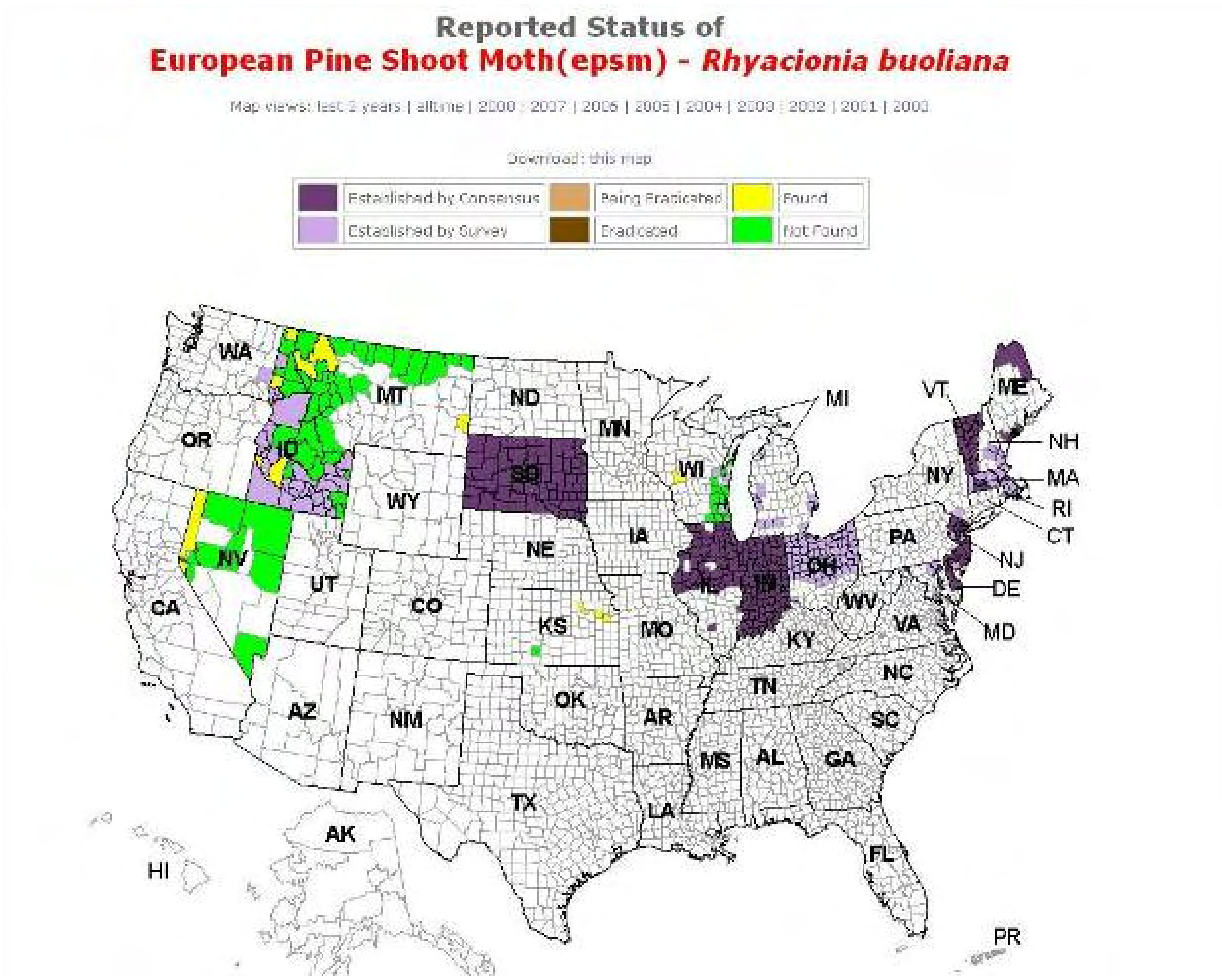
Montana has had a quarantine for the European pine shoot moth (EPSM) since prior to 1962. This insect is a pest in the production of lumber, nursery trees and Christmas trees that are long-needled pines. Feeding by the larval stage in the growing tips causes death of leaders, resulting in trees with Y-shaped trunks, or other deformities, which are aesthetically unpleasing (lowering value in nursery and Christmas tree trade) or are not usable for major lumber markets due to a need for additional work to salvage merchantable trunks.

Adult European pine shoot moth, www.padil.gov.au

The insect itself is very small. The wingspan of the typical adult is under ¼ inch. However, the adult is very brightly colored, with orange and silver patterning on the wings. There are a number of native pine shoot moths with similar coloration, so identification is dependent on dissection of the male genitalia. The larvae initially feed in the tips of the branches in the new year's growth where they web the needles together for protection. Older larvae move to the needle sheath and mine into individual needles, after which they move on to the needle buds. They overwinter as larvae in the infested branch tips. Larvae emerge to feed again in the spring. This spring feeding is the most damaging, as it involves large larvae feeding on new foliage. The larvae pupate in the needle foliage in the tunnels and webbing they created while feeding. Moths emerge in mid-summer.

Monitoring for the EPSM is done using wing traps and species specific pheromones. These pheromones are attractive to the male moths, but female moths can also be caught in the traps.

The majority of the areas of concern for EPSM are in the western portion of the state, west of the continental divide. This area is trapped each year for the presence of EPSM. MDA is responsible for exotic moth trapping in high risk counties west of the continental divide. This includes the following counties; FLATHEAD, GRANITE, LAKE, LINCOLN, MISSOULA, MINERAL, POWELL, RAVALLI, and SANDERS. There are several native tortricid species in the genus *Rhyacoinia* that occur in Montana.

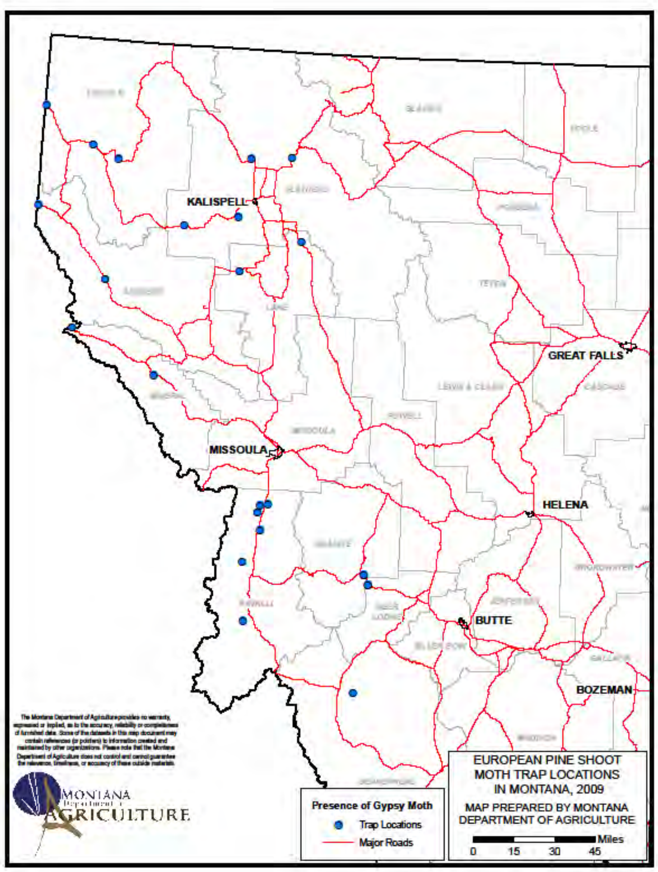



| 2009 MDA EUROPEAN PINE SHOOT MOTH TRAPS BY COUNTY | | | |
|---|---|---|---|
| # of Traps | County | # of Traps | County |
| 1 | BEAVERHEAD | 2 | SANDERS |
| 2 | MINERAL | 3 | LINCOLN |
| 4 | DEER LODGE | 4 | FLATHEAD |
| 6 | RAVALLI | 2 | LAKE |
| | | 24 | Total |

**Figure 1. European pine shoot moth wing trap.**

**RESULTS:** No traps were positive for EPSM in 2009. The Washington State Department of Agriculture regional Lepidoptera screening lab identified the following species in EPSM traps in 2009: *Ancylis mediofasciana* (Tortricidae), *Dichrorampha sedatana* (Tortricidae), *Grapholita imitativa* (Tortricidae), *Rhyacionia zozana* (Tortricidae), and *Sitochroa chortalis* (Crambidae).

## Locations of EPSM traps placed in Montana by MDA



# Pulse Crop Nematode Survey
# Export Support


William M. Brown Jr., www.Bugwood.org
Howard F. Schwartz, Colorado State University

Damage to an alfalfa field caused by the stem and bulb nematode, *Ditylenchus dipsaci*.

Nematodes can cause dramatic reductions in pulse crop yields. The nematodes surveyed for are primarily of regulatory significance and could negatively impact agricultural export markets if detected within Montana.

Damage caused by the pea cyst nematode, *Heterodera goettingiana* results in patches of stunted, bright yellow plants. Yellowing begins at the base of the plant with the older leaves and continues to move up the plant affecting the entire plant. Some of the affected plants may also die prematurely due to lack of chlorophyll. The roots of affected plants develop abnormally and nitrogen deficiency typically occurs due to a lack of nitrogen fixing nodules on the roots. As a result, seed production is also significantly reduced. The nematodes can persist for an extended period of time within the soil without a known host, yet cause significant damage when crops are planted again.

Montana Department of Agriculture employees collected 45 soil samples throughout Daniels, Roosevelt, Sheridan and Valley Counties. Crops represented in the samples included chickpeas, lentils, green peas, yellow peas and fallow fields.

Soil was analyzed for over thirty five nematode species, sixteen species of regulatory concern and nineteen other plant-parasitic genera, including: *Globodera rostochiensis, Globodera pallida, Ditylenchus destructor, Ditylenchus dipsaci, Meloidogyne chitwoodii, Meloidogyne fallax, Meloidogyne hapla, Meloidogyne javanica, Meloidogyne artiellia, Nacobbus abberans, Heterodera glycines, Heterodera latipons, Heterodera goettingiana and Pratylenchus* sp.

This information is important for Montana farmers in their management techniques and it also allows specific areas to be certified as free from some of these nematodes. This enables

Montana producers to gain access to a wider agricultural export market for their crops. Montana growers plant over 500,000 acres of pulse crops (dry peas, dry beans, lentils, and garbanzo beans) annually, harvested crops are valued at over $50 million. Montana pulse crops are exported to many Asian and Middle Eastern countries including China, India, Pakistan, Egypt, Nepal, and Turkey.

**RESULTS:**

| **2009 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 | POSITIVE |
| *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 | POSITIVE |
| *Ditylenchus* other species | Other | POSITIVE |
| *Helicotylenchus* | Spiral | POSITIVE |
| *Heterodera* other species | Cyst | POSITIVE |
| *Hemicycliophora* | Sheath | NEGATIVE |
| *Hoplolaimus* | Lance | NEGATIVE |
| *Longidorus* | Needle | NEGATIVE |
| *Mesocriconema* | Ring | POSITIVE |
| *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 |
| *Merlinius* | Stunt | POSITIVE |

All samples were processed in the lab of Dr. Thomas O. Powers at the Department of Plant Pathology, University of Nebraska.

*Meloidogyne hapla* Chitwood, the northern root knot nematode was detected in a single sample. The northern root knot nematode affects many species of vegetables and weeds and can cause significant economic damage. Root lesion nematodes, *Pratylenchus* sp., are probably causing yield losses for some growers. Other plant parasitic genera that were detected were not found in high enough numbers to indicate that they are causing yield losses. Typically, genera such as *Paratylenchus* and *Quinisulcius*, only are injurious to crops when numbers approach 500-1,000 individuals per 100 cc of soil.

Pea field in Northeastern Montana.

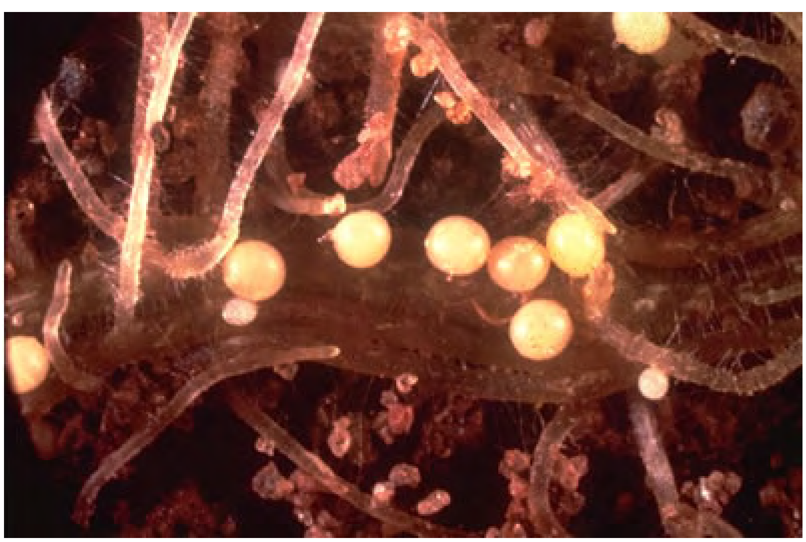
## Potato Cyst Nematodes
## *Globodera pallida* (Stone) & *G. rostochiensis* (Wollenweber)
## Detection Survey

### INTRODUCTION

Montana is a supplier of seed potatoes for much of the Pacific Northwest. Because of this, it is imperative that the quality of Montana's potatoes, and their reputation, be maintained. Recently, *Globodera pallida* was found in Idaho, in commercial potato fields. In the aftermath of this find, several trading partners closed their doors not only to Idaho potatoes but also to other crops including nursery stock. In addition, farms in the "infested area" as undergoing treatments to eliminate the nematodes and operate under restrictions that create new challenges. If this organism were discovered on seed potatoes from Montana, there is a real possibility that it would destroy the seed potato industry. The Montana potato industry plants over 10,000 acres annually with crops valued at over $30 million.

Shortly after this find, producers in Alberta (Canada) found golden cyst nematode (*Globodera rostochiensis*) in fields. This initiated international action again, with subsequent trace-forward action involving a Montana field.

The presence of either of these organisms in Montana would have devastating impacts on the seed potato industry. Action can be taken now to 1) systematically determine if these pests have invaded Montana and, 2) shield the potato industry by creating an internal quarantine system, so that if potato cyst nematodes were found in any area of the state, the remaining production areas could continue to ship.



*Globodera pallida* cysts, www.eppo.org/

*Globodera rostochiensis* cysts, www.eppo.org/

**PLAN OF ACTION**

A statewide survey of seed potato producers was developed to adequately represent and sample potato production areas. Surveys in 2009 were conducted in several counties with potato crops identified as economically important to Montana's export markets. The counties sampled in 2009 were Beaverhead, Gallatin, Madison, and Sheridan.

Samples were collected using USDA protocols. Each sample consisted of five pounds of soil per acre of crop in field that were just harvested from potatoes. Data collected included date of collection, collector, potato variety, seed generation, and field number.

**RESULTS**

Six grower operations were sampled for a total of 658 acres samples. Sample processing is ongoing, but so far, no positive samples have been found. This survey is planned to continue in the spring, prior to planting.

## Status Report
## Japanese Beetle (*Popillia japonica* Newmann)

## Billings, Montana 2009

Japanese beetles (JB) were discovered in Billings in 2001 near the Logan International Airport and have spread into the city of Billings over the following years. Early delimitation surveys found that the JB were in the neighborhoods below the Rimrocks, a series of dry sandstone cliffs immediately south of the airport. Thus far JB have only been found in an area within a one mile radius of the campus of Montana State University – Billings, near the intersection of Montana State Highway 3 and Rimrock Road. 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 including many private homes and a few large landowners including MSU-B and Rocky Mountain College, the airport and other land managed by the City of Billings.

During 2009 an adaptive survey for JB was established in June, with a limited number of traps placed in areas that were found to have JB in previous years. Plastic JB traps baited with a floral scent and female sex pheromones were used to survey for JB adults (Figure 1). Throughout the summer whenever any of the traps were found to be positive additional traps were placed in the surrounding area to determine the full extent of the infestation.

**Figure 1. Japanese beetle trap placed below Virginia creeper vines on the Leavens Pumping Station fence. This trap yielded more than 400 adult JB. 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:** The first adult JB were detected in mid-July 2009, while adult emergence peaked by the first week of August and then decreased throughout the summer. By August 21, a total of 149 traps were placed and 49 were positive for JB (Figure 2). A total of 1,377 adult JB were captured during this period (Figure 3) and a total of 1,906 were captured in the area after first frost. This is almost ten times the combined total number of beetles captured in all the previous years of the survey program. Over 92% of the JB adults were found around the Leavens Pumping Station on Rimrock Road which is managed by the City of Billings Public Works Department (Figure 1). This property is adjacent to MSU-B, where an additional 70 JB or 5% of the total JB captured were found across the campus and on University-owned rental properties. These results are consistent with previous years' surveys and suggest that a population has become established in this area. It also appears that the majority of the JB population is still localized in the center of the regulated area and only a few individuals are dispersing outwards. The furthest JB positive trap was found 0.8 miles south of the Leavens Pumping Station.

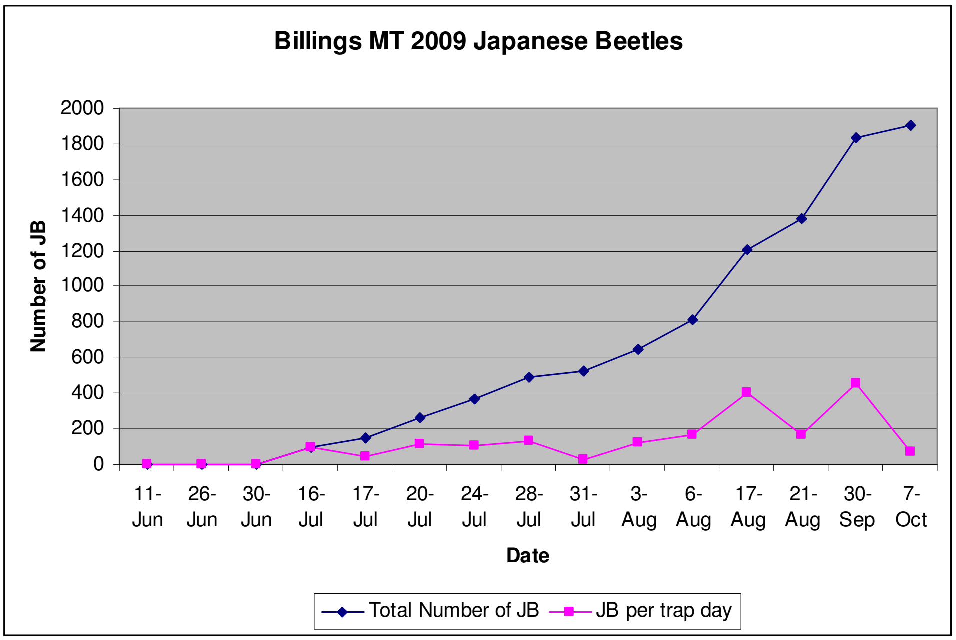



**Figure 2. A total of 1377 JB adults were captured by the 21st of August, 2009 and 1,906 at the end of the flight season. The calculated number of JB adults per positive trap per day shows that adult beetle emergence peaks late in the summer.**

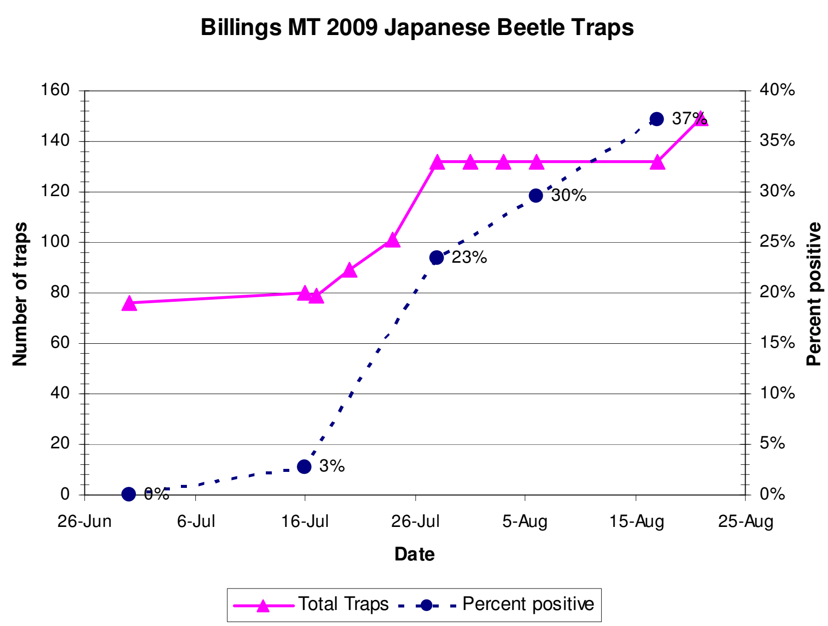
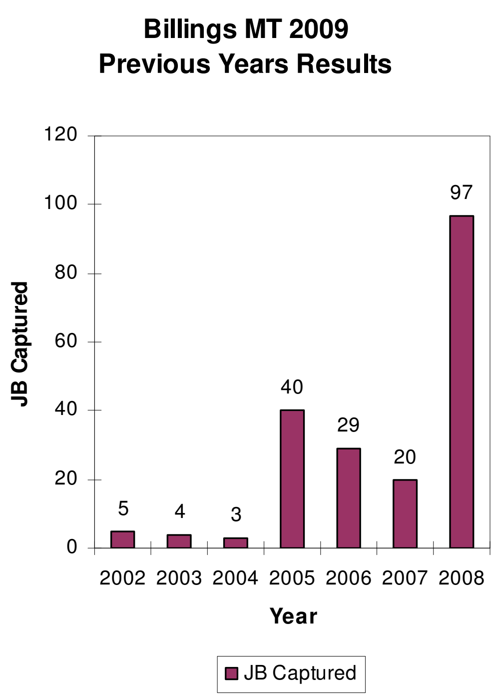
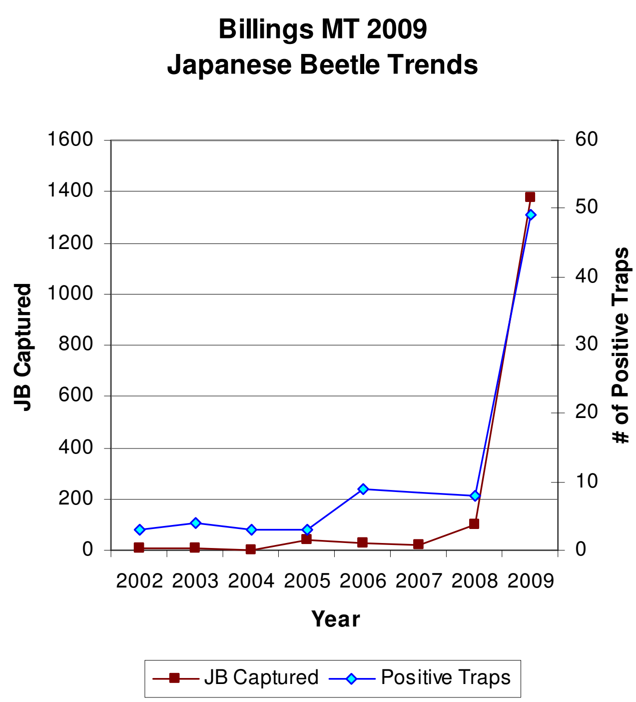


**Figure 3. The number of traps placed in Billings was increased throughout the season in response to positive findings to a total of 149 traps (solid line). The percent of individual traps found with JB adults at least once during the season also increased (dotted line).**

The Montana Department of Agriculture produced a new informational pamphlet to help homeowners and other land owners to voluntarily control JB on their properties. This year the City of Billings, Public Works Department has treated for both adult and larval JB. On August 4 and 25 a long lasting pyrethroid insecticide was sprayed on the Virginia creeper on the fences of the Leavens Pumping Station. The City also treated turf grass within the facility with Merit WS 75® on August 19 to eliminate larvae. Annual treatment of MSU-B grounds with Merit WS 75® is scheduled to continue during fall turf management on both campus lawns and University owned rental properties. The airport regularly treats for white grubs as part of their landscape maintenance program. The combined efforts of all the landowners within the regulated area are necessary to prevent further increases in the JB population. Long-term trends suggested by this year's results (Figure 4) make it clear that immediate action is needed if we hope to stop the spread of JB in Billings.

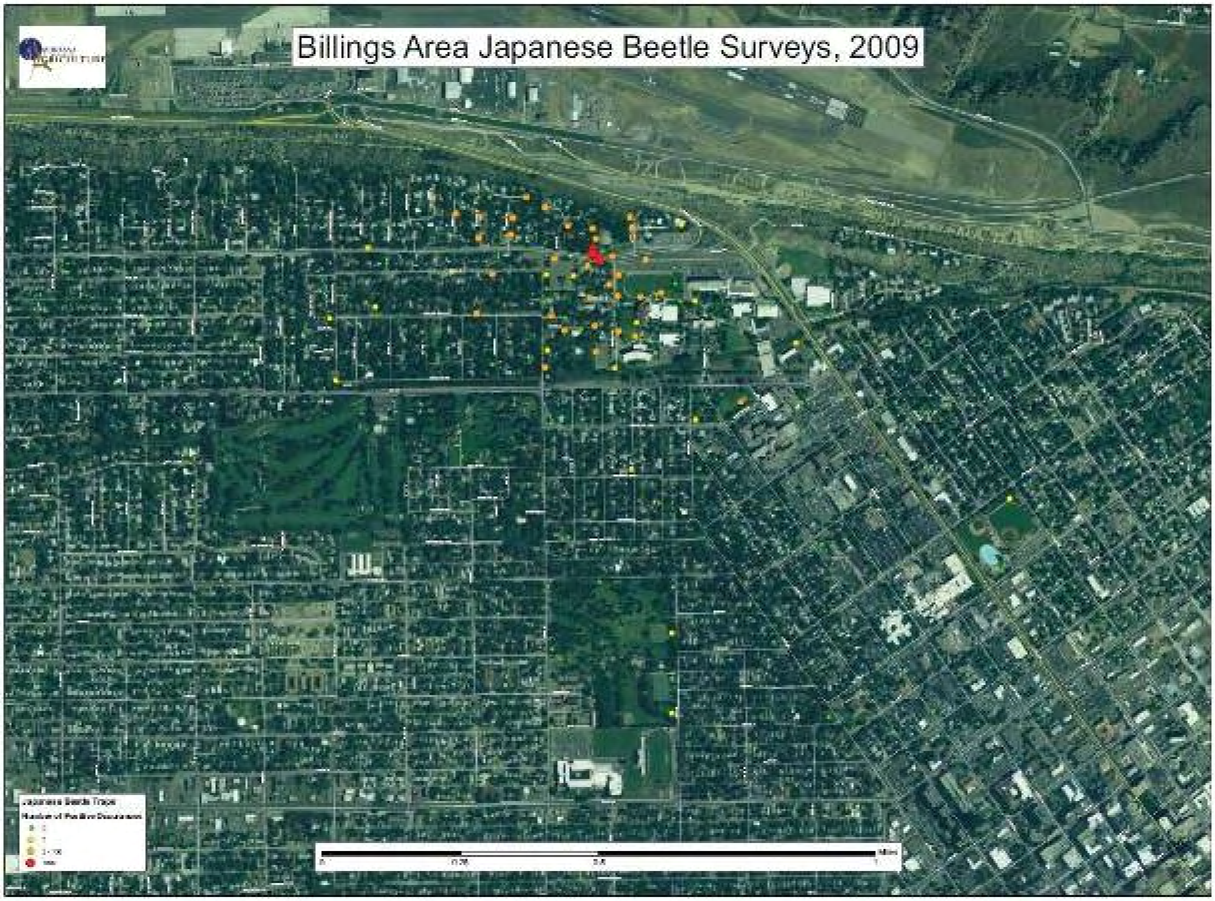



A)




B)

**Figure 4.A) Results from 2002 to 2008 show an increasing number of JB captured. B) Trends from 2009 data indicate the potential for exponential increases in JB populations in Billings with a corresponding increase in JB distribution as seen in the number of positive traps.**


Billings Area Japanese Beetle Surveys, 2009

## Flathead County, Montana 2009
## Delimitation Survey

In 2008 two adult male JB were captured in a surveillance trap near the loading dock of a nursery near Kalispell, MT. This are of Kalispell is located within the lower Flathead River valley and was traditionally wheat and canola farms and hay fields. There are also a number of nurseries, tree farms, sod farms and market gardens scattered throughout the valley that are threatened by any potential JB outbreak. Development within the last 20 years has greatly increased the number of private residences, some of which have extensive landscaping which may be susceptible to JB attack. Furthermore, this area is within 20 miles of the Flathead cherry orchards – an important cultural and agricultural product enjoyed throughout the state.

The discovery of JB initiated a delimitation survey of the lower Flathead Valley in the first week of June, 2009. A delimitation survey is used to determine the presence, location and extent of possible JB infestations, and is recommended by the National Plant Board's Japanese Beetle Harmonization Plan. The prescribed survey plan covers 49 square miles within a 7 x 7 mile grid (see Figure 7). JB traps are placed within the grid with at least 49 traps in the center, and decreasing to 25 traps in the surrounding inner grids, while the outermost grids have five traps per square mile. A total of 449 traps were baited with the floral scented and sex pheromone lures and distributed (Figure 5). Eight teams of 2-3 people from the staff of the Montana Department of Agriculture – Pest Management Bureau and USDA APHIS PPQ placed traps, mapped the location and recorded their positions using GPS units. Teams also recorded trap information in personal digital assistants (PDAs) provided by the USDA. It took approximately 2 days to complete the distribution of the traps.

**Figure 5. Japanese beetle traps prepared for distribution.**

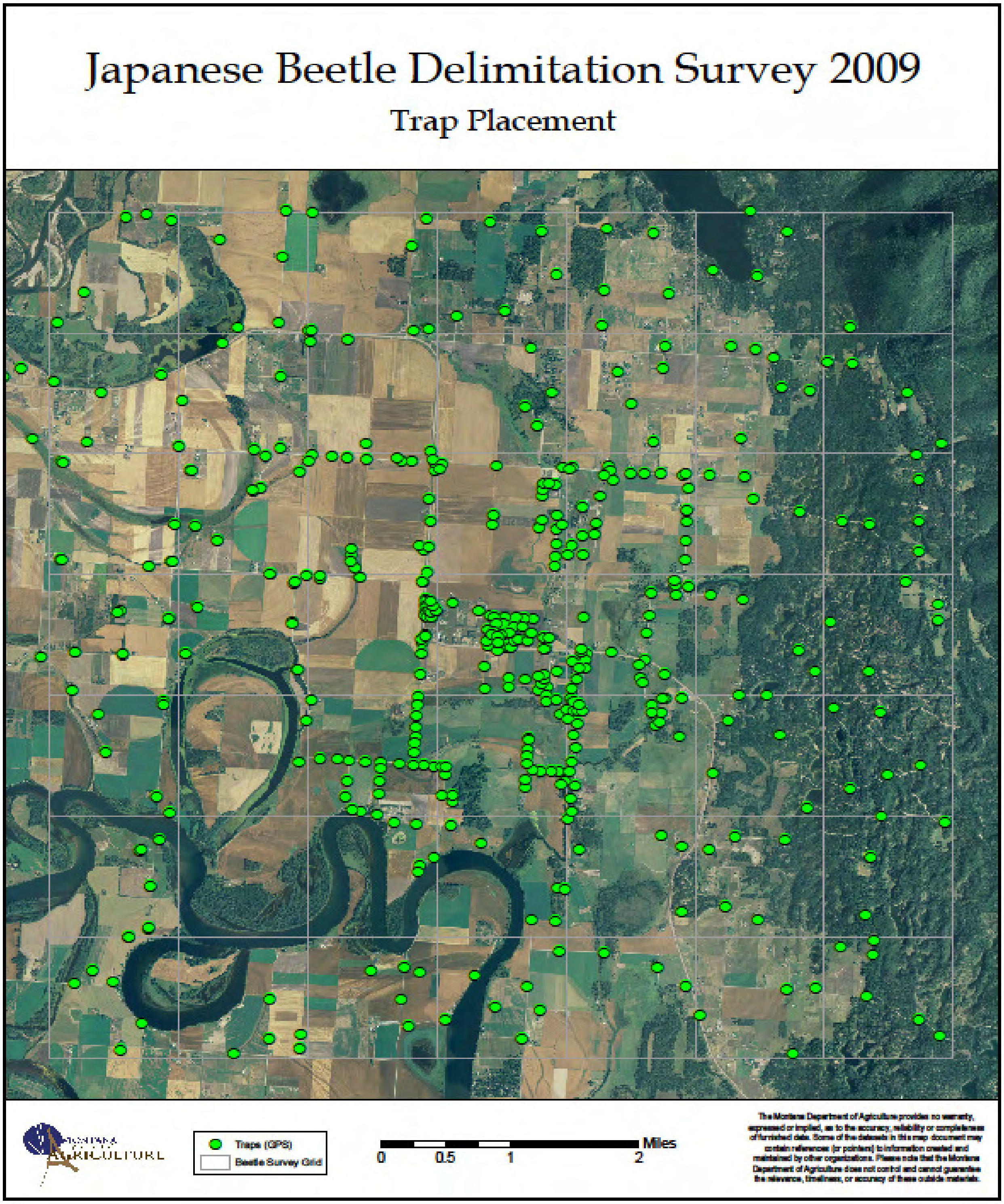
Due to the rural and agricultural landscape, several traps were placed in habitats usually considered unsuitable for JB larval establishment, but that might provide food for adults during dispersal (Figure 6.). These habitats also made locating traps difficult as crops and roadside plants grew. To facilitate future monitoring all of traps were revisited throughout June to adjust the hand-drawn maps and confirm GPS coordinates. Then every two to three weeks all 449 traps were inspected for JB, and monitoring continued throughout the summer.

**Figure 6. Japanese beetle traps placed within agricultural habitats in the lower Flathead River valley near Creston, MT in 2009.**

**Results:** No JB were discovered in any of the traps in Flathead County. Accidental bi-catch included several species of bees, wasps, flies, butterflies, moths and beetles. Bees (Hymenoptera superfamily Apoidea) and ladybird beetles (Coleoptera family Coccinellidae) were collected from the bi-catch for further study.

The outermost traps were removed on the last week of August, and the remaining traps are scheduled for final inspection and removal in late September. From these results we can conclude that initial finding of JB must have come from "hitchhikers" on nursery stock delivered from an infested area. Continued monitoring of high-risk nurseries and plant retailers by both the business owners and MDA personnel is necessary to prevent future JB establishment in the Flathead area.

**Figure 7. Location of delimitation survey traps 2009. All traps were negative for JB.**



**Japanese Beetle Trapping**
**USDA APHIS PPQ**
**MONTANA AIRPORTS**
**2009**

The USDA APHIS PPQ traps for Japanese beetles at selected high risk airports within the state. Based on airport size, and number of flights from infested areas, traps are placed around the perimeter of the airports, and in any landscaping that might increase risk of JB infestation.

During 2009, the USDA APHIS PPQ placed and monitored 60 traps at seven airports. These were Billings (29 traps), Bozeman (5 traps), Butte (5 traps), Great Falls (5 traps), Helena (5 traps), Missoula (6 traps), and Kalispell (5 traps).

There were no detections of JB during the 2009 season in traps monitored by the USDA APHIS PPQ.

# Multicolored Asian Lady Beetle Detected in Montana

In 2009, the Multicolored Asian Lady Beetle *Harmonia axyridis* (Pallas) was found in trap residues of EAB and JB traps in both Kalispell and Billings. The first report of this potential pest species was confirmed from Department CAPS trap residues from 2006 and 2007 (Foley et al. 2009).

Initially introduced into North America as a classic biological control agent of aphids, the multicolored Asian Lady beetle is now considered a pest itself. The negative impacts include a decrease in native predators, contaminant on, and physical damage to fruit, as a nuisance to apiculturists via seasonal aggregations in bee hives, and as a physical nuisance, source of bites, and even human allergens when seeking seasonal shelter in homes and other structures. Population levels of this beetle will continue to be informally monitored to see if they reach the extremes that have been seen in other states.

**Figure 1. Multicolored Asian lady beetles attempting to enter a home.**

# Continental Divide Trail Project

The project started July 1, 2009 or as soon as travel was possible. We had a pre-meeting with the contractors to discuss what was expected. The project required the contractor to employ the following: two inventory personnel, four llamas, and one re-supply person.

Total area covered along the Beaverhead County / Idaho border along the Continental Divide was 310 miles. During this project the two inventory personnel monitored the border taking hundreds of photos and GPS points to correlate with photos.

Nothing alarming was found during the two month project. We had suspicions that Spotted Knapweed was coming at us from Idaho and this project showed that our suspicions was correct. One other species that was found right on top of the Divide that was a surprise was Hoary Alyssum. This species was found at about 7500 feet in elevation along a two track road.

Canada Thistle

Tall Buttercup

Hounds Tongue Hawk Weed

# Final Report
# Project Title: A Survey of Biological Weed Control Agents Adventive to the US
## Agreement #: MDA 10-30-003

December 17, 2009

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**Watermillfoil Site - Lincoln Co., MT**

## INTRODUCTION

Numerous weed feeding arthropod species have been introduced into the United States. In some cases these organisms apparently arrived with their weedy host, where as others were intentionally released or became established by unknown means. Currently biological control agents of weeds are rigorously tested to determine their environmental safety prior to their introduction into the United States. These potential biocontrol agents are required to meet NEPA guidelines prior to APHIS issuing a 526 permit for their importation or interstate movement. A number of arthropod species which have not gone through the review process are or have been utilized for weed control. Some of these insects are "adventive" in that they were unintentionally introduced into the US but historically have had a limited distribution. Several biocontrol agents were "approved" prior to the enactment of NEPA. Although they were tested for host specificity the testing criteria was less rigorous compared to today's standards. Some agents have been approved for release in Canada but not in the US, but may have already dispersed into the United States. To compound the issue a number of these arthropods have been collected and redistributed by commercial companies selling biological control agents. Recently APHIS has rescinded permits for interstate shipments of these insects. Little is known regarding the establishment or distribution of these adventive arthropods, or possible feeding on non-target plant species.

## OBJECTIVES

The objectives of our survey were to determine in the State of Montana:

- The extent of establishment of these adventive insects
- The extent which they may utilize their weedy host; indicating possible impact
- If non-target impacts occur, i.e. feeding on other plant species

## METHODS

Survey Organisms & Weed Hosts

Initially we conduct a survey of eleven arthropod species and their weedy hosts (Table 1). In the course of this survey we added the stem mining weevil, *Microplontus edentulus*, on scentless chamomile based on an additional survey of the literature of agents released in Canada. Also during the survey additional arthropod species and plant diseases were also observed and noted.

Survey Methods

This survey was conducted from mid June to late September depending upon the phenology (i.e. presence) of the insect. The survey was conducted primarily in western Montana (Figure 1) concentrating our efforts in counties bordering other states and Canadian provinces, major metropolitan areas, and/or in known weed infestations. The number of survey locations varied as to the extent of the weed infestation, e.g. more Canada thistle sites were sampled compared to scentless chamomile.

Table 1. Survey organisms and their host plants.

| Arthropod | Feeding Habits | Host(s) |
|---|---|---|
| *Agonopterix alstroemeriana* | Defoliating moth | Poison hemlock- *Conium maculatum* |
| *Brachypterolus pulicarius* | Flower weevil | Toadflax – *Linaria* spp. |
| *Cassida rubiginosa* | Defoliating tortoise beetle | Musk thistle - *Carduus nutans*<br>Canada thistle - *Cirsium arvense* |

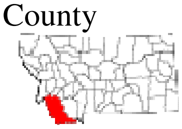
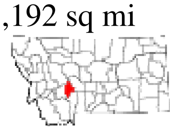
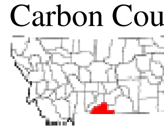
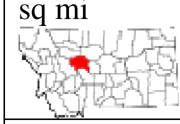
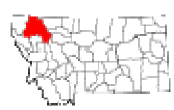
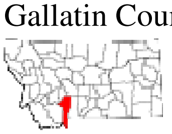
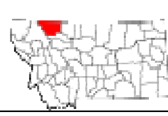
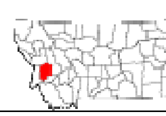
| | | |
|---|---|---|
| *Euhrychiopsis lecontei* | Stem mining weevil | Eurasian watermilfoil - *Myriophyllum spicatum* |
| *Gymnetron antirrhini* | Seed head weevil | Toadflax - *Linaria* spp |
| *Gymnetron tetrum* | Seed head weevil | Mullein - *Verbascum thapsus* |
| *Larinus planus* | Seed head weevil | Canada thistle - *Cirsium arvense* |
| *Microplontus edentulus* | Stem weevil | Scentless chamomile - *Tripleurospermum perforatum* |
| *Mogulones cruciger* | Crown weevil | Houndstongue - *Cynoglossum officinale* |
| *Omphalapion hookeri* | Seed weevil | Scentless chamomile - *Tripleurospermum perforatum* |
| *Rhopalomyia tripleurospermi* | Gall midge | Scentless chamomile - *Tripleurospermum perforatum* |
| *Trichosircalus horridus* | Crown weevil | Musk thistle - *Carduus nutans* |

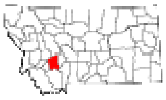
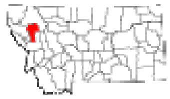
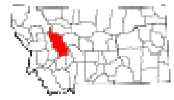
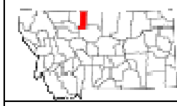
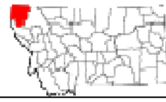
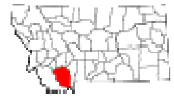
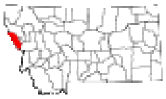
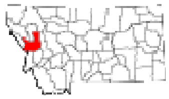
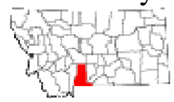
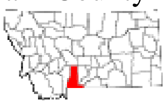
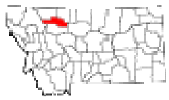
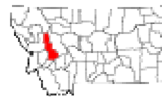
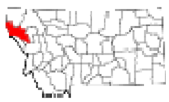
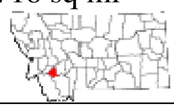
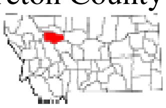
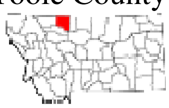
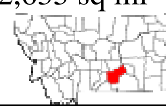
At each survey site the following information was recorded: GPS location, site/ habitat descriptions, size and estimated density of the host weed, and the estimated abundance and feeding intensity of the survey insect. Plants that are closely related to the weed host (i.e. same plant tribe) and that were adjacent to the site were also inspected for the survey insect and feeding. Most insects were readily identified in the field but immature insects were reared to the adult. During the survey additional arthropod species and plant diseases were observed and noted. Some of these organisms were also considered adventive where as others were known biocontrol agents that have been 'approved' for release.

<u>Results</u>

Approximately 223 sites were visited during this survey (Table 2). Often multiple weeds were surveyed at individual sites. In total 354 collections were made consisting of twenty four different plants and twenty four arthropod and/or pathogen species. Closely related plant species (to that of the target weed) were generally lacking at collection sites, therefore non-target impacts to these natives could not be estimated reliably. Summaries of the survey are provided for each different weed species or species groups (see below).

Figure 1. Montana counties surveyed.

| | | |
|---|---|---|
| Beaverhead County 5,543 sq mi  | Broadwater County 1,192 sq mi  | Carbon County 2,048 sq mi  |
| Cascade County 2,712 sq mi  | Deer Lodge County 737 sq mi  | Flathead County 5,099 sq mi  |
| Gallatin County 2,507 sq mi  | Glacier County 2,995 sq mi  | Granite County 1,728 sq mi  |

| | | |
|---|---|---|
| Jefferson County 1,657 sq mi  | Lake County 1,494 sq mi  | Lewis and Clark Co. 3,461 sq mi  |
| Liberty County 1,430 sq mi  | Lincoln County 3,613 sq mi  | Madison County 3,587 sq mi  |
| Mineral County 1,220 sq mi  | Missoula County 2,598 sq mi  | Park County 2,656 sq mi  |
| Park County 2,656 sq mi  | Pondera County 1,625 sq mi  | Powell County 2,326 sq mi  |
| Ravalli County 2,394 sq mi  | Sanders County 2,762 sq mi  | Silver Bow County 718 sq mi  |
| Teton County 2,273 sq mi  | Toole County 1,911 sq mi  | Yellowstone County 2,635 sq mi  |

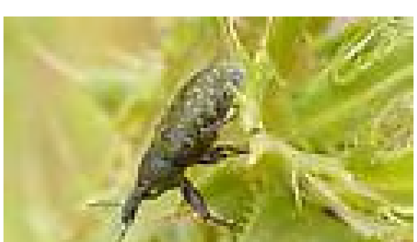
***Carduus/ Cirsium* Thistles - *Carduus nutans* (Musk thistle) & *Cirsium arvense* (Canada thistle)**

Several adventive organisms were found associated with *Carduus* and *Cirsium* thistles in Montana. These include: *Aceria anthocoptes*, *Cassida rubiginosa*, *Larinus planus*, and *Puccinia carduorum*.

*Aceria anthocoptes* was widely distributed in Montana (over 30% of sites N=58 sites). This mite is associated primarily with leaves of Canada thistle plants although wavyleaf thistle (*Cirsium undulatum*) was infested at one site in Yellowstone County, and a few mites were found on bull thistle (*Cirsium vulgare*) in Carbon County. The mite does not appear to have much impact on Canada thistle plants.

*Cassida rubiginosa*, a defoliating tortoise beetle, was also wide spread in western Montana. Over 55% of musk and Canada thistle sites (N=79) surveyed had evidence of beetle feeding. *Cassida* has two generations per year but adults were more prevalent in the spring.

Defoliation was variable



**Larinus planus (photo Knapperbill)**

**Cassida rubiginosa (photo Giethoorn)**

ranging up to 60% or more. Generally defoliation was light (< 25%). Both musk and Canada thistles were fed upon and at several sites some light feeding was observed for wavyleaf and bull thistles.

The flower feeding weevil, *Larinus planus* was also widely distributed in Montana but somewhat localized (over 31% of sites N=58 sites). The weevil was slightly more common in northern Montana but populations were also found in Yellowstone and Carbon Counties. *Larinus* was found infesting primarily Canada thistle but was occasionally observed in wavyleaf and bull thistles. Weevil populations were relatively low and appeared to have limited impact on seed production of thistles.

The musk thistle rust, *Puccinia carduorum*, was accidently intruded into Virginia and purposefully redistributed in 1987. It is now present in much of the eastern half of the US and in California, Oregon, and Wyoming. We observed the rust on musk thistle leaves and tertiary flower buds at three sites located in Deer Lodge, Granite and Ravalli Counties. Infections were only slight and were observed in late summer or early autumn. This is the first report of the rust in Montana.

The root crown feeding weevil *Trichosircalus horridus* was initially released in Ravalli, Gallatin, Park, Yellowstone and Broadwater Counties in the 1980's. Now the weevil is widely distributed in western Montana. Musk thistle is its preferred host although Canada and bull thistle may also be attack (to a lesser degree on Canada thistle). One wavyleaf thistle plant in Gallatin County appeared to be infested with larvae although these were dead. It was not certain if these larvae were *T. horridus* or a *Baris* sp. which also infests *Cirsium*. At this site adult *T. horridus* were also found resting on the plant. Two biocontrol agents for Canada thistle, the stem gall fly *Urophora cardui* and the stem mining weevil *Ceutorhynchus litura* were also found at a number of sites.

***Centaurea* Knapweeds - Spotted knapweed (*Centaurea* stoebe ssp. *micranthos*) & Diffuse knapweed (*Centaurea diffusa*)**

An eriophyid mite was collected on both diffuse and spotted knapweed. This mite has been tentatively identified as Aceria sp. although it is very similar to Aceria thessalonicae, an eriophyid investigated as a potential biological control agent of diffuse knapweed (Littlefield per. com.). The mite is widespread and was observed at 70% of the sites (N=17). This mite is a vagrant mite often associated with leaves and stems of the plant. In most cases mite populations were relatively low to moderate. The mite was also observed on ornamental knapweeds such as bigheaded knapweed (*Centaurea macrocephala*) and cornflower (*Centaurea cyans*). This is the first record on an eriophyid mite on *Centaurea* species in North America.

*Puccinia. jaceae* originates in Western Europe and first recorded in North American in 1988 from Oliver, BC. The rust appears to be fairly dispersed in the western US and Canada. One infested spotted knapweed plant was observed in Lewis and Clark County during this survey. An adjacent diffuse knapweed plant was uninfected.

***Conium maculatum* (Poison hemlock)**

The defoliating moth *Agonopterix alstroemeriana* (Lepidoptera: Oecophoridae) was first recorded in North America in New York State in 1973. The moth has since been accidentally introduced to

**Agonopterix alstroemeriana (photo Coombs)**

the Pacific Northwest and has rapidly colonized poison hemlock infestations in the western US. In Montana the moth appears widely distributed being found at two thirds of the sites sampled (N=9). Defoliation of plants were at times heavy (90+%), although most or our sampling occurred while the larvae were still small. The moth appears to be specific to poison hemlock. Although we observed feeding on *Cicuta* species, this feeding was attributed to other lepidopteron species (probably Tortricidae).

***Cynoglossum officinale* (Houndstongue)**

Mogulones cruciger (Coleoptera: Curculionidae) is a root weevil released in 1997 in Canada for the biological control of hounds tongue. This weevil has not been approved for release in the US due to concerns regarding non-target impacts on native Boraginaceae. *Mogulones* is well established in many areas of Alberta and British Columbia. Adult specimens or suspect feeding damage has been reported in Montana, although the exact locations of collections were unknown (J. Story, Montana State University; M. Schwarzlaender, University of Idaho; G. Markin, USFS per. comm.). During this survey, fifty six locations were sampled throughout western Montana. No adults or larvae were collected although suspect feeding in the roots were observed at four sites located in Missoula, Pondera, and Toole Counties.

Mogulones cruciger damage (top) adult (to right) (photo DeClerck-Floate)

Another weevil similar in appearance, *Ceutorhynchus punctiger*, was collected on hound tongue in Gallatin County. This weevil did not appear to be feeding on hounds tongue. Its host has been reported as dandelion, *Taraxacum officinale*; which was intermixed with hound tongue at the sample site.

***Hypericulm perforatum* (St Johnswort)**

During this survey we also sampled St Johnswort. We observed an eriophyid mite *Aculus* sp. (probably (*Aculus hyperici* Family Eriophyidae). This mite appears to be widespread being found at 70% of the sample sites (N=10). This is a vagrant mite (non-gall forming), generally located at the leaf-stem axil or among flower bracts. Significant impact to the plant was not apparent; although some russetting of the leaves occurred. This lack if impact could be because mite populations were relatively low. *Aculus hyperici* has been introduced to Australian and New Zealand for the biological control of St Johnswort. Feeding by this species may result in the stunting of the plant.

Another biological control agent, *Aplocera plagiata* (Lepidoptera: Geometridae) was also observed in Lake County. This moth appeared to have a limited distribution within Montana; the other known population that we are aware of is in Gallatin County. *Chrysolina* beetles were also found to be ubiquitous in Montana, although not recorded at every site.

***Linaria* Toadflaxes – *Linaria vulgaris* (Yellow toadflax) & *Linaria genistifolia* ssp. *dalmatica* (Dalmatian toadflax)**

Two flower/bud feeding beetles were accidently introduced into the United States in the early 1900's. Both species were most likely brought in with contaminated yellow toadflax nursery stock. Both beetles are now wide spread in distribution in northeastern and northwestern North America.

***Gymnetron antirrhini*.**
**(photo Hansen)**

The flower feeding weevil, *Gymnetron antirrhini*, was commonly observed feeding on yellow toadflax. Nearly 85% of yellow toadflax sites (N=26) had the weevil present. The weevil was not found on Dalmatian toadflax, with the exception of one site in Saunders County where the weevil was feeding on Dalmatian toadflax but did not infest the flower heads.

Another beetle, *Brachypterolus pulicarius*, was also common on yellow toadflax but to a lesser extent compared with *Gymnetron antirrhini*. *Brachypterolus* was collected at nearly 35% of the yellow toadflax sites and at only one Dalmatian toadflax site (Park County). Two other biocontrol agents, the stem mining weevil *Mecinus janthinus* and the defoliating moth *Calophasia lunula* were collected. Nearly 30% of Dalmatian toadflax sites and only one yellow toadflax site in Mineral County had *Mecinus janthinus* feeding. Feeding by *Mecinus* on yellow toadflax in North America is uncommon. *Calophasia lunula* was observed feeding on both toadflax species but was less common (17% of sites) compared with other agents.

***Myriophyllum spicatum* (Eurasian watermilfoil)**

Eurasian watermilfoil, *Myriophyllum spicatum*, is an introduced aquatic weed widespread throughout much of the US. The only known occurrence in Montana is in the Noxon and Cabinet Reservoirs in Sanders County. *Euhrychiopsis lecontei* is a native stem mining weevil found across much of the Northern US. This weevil has been utilized as a potential biological control agent, but its presence and distribution is not known in Montana.

**Eurasian watermilfoil (bottom)**
**native watemilfoil (top)**

Thirty-one sites were inspected for Eurasian watermilfoil. Of these sites only one had *Myriophyllum spicatum* present (at a known infestation in the Noxon Reservoir. Nineteen sites had native watermilfoil present (either *Myriophyllum sibiricum* or *Myriophyllum verticillatum*). The native watermilfoils could not be differentiated since they were not in flower. One collection made at the Toston Dam, Broadwater County could be a possible hybrid between a native and Eurasian watermilfoils (similar leaflet numbers as Eurasian but turions were present). Other sites sample either had no watermilfoil present or had other aquatic plants (fanweed, coontail or pondweed). *Euhrychiopsis lecontei* was collected at two sites. One adult was collected in Lincoln County and several larvae were found in Broadwater County. At Broadwater County a moth larva was also found, but died before pupating. The moth, *Acentria ephemerella* (Lepidoptera:

Crambidae), is an European adventive widely distributed in the Lake States and Northeastern US and Canada, as well as central Alberta. An unidentified weevil (perhaps *Phytobius* sp.) was also collected in Lincoln, Granite and Teton Counties.

***Tripleurospermum perforatum*** **(Scentless chamomile)**

*Tripleurospermum perforatum* (= *Matrcaria perforate*) has been a target for a biological control program in western Canada since 1992. Three agents have been released and established: *Rhopalomyia tripleurospermi* a tip gall midge; *Omphalapion hookeri*, a flower feeding weevil, and *Microplontus edentulous*, a stem mining weevil. Scentless chamomile was not frequently encountered during our survey in Montana. Six locations were surveyed in Missoula, Pondera, Saunders, and Toole Counties. Most sites were roadsides or disturbed areas and were somewhat moist; at least during part of the growing season. A weevil (possibly *O. hookeri*) was found within the flowers of chamomile plants in Toole County, but none were located within the flower samples collected. At a nearby site, stems of some plants had emergence holes caused by a stem mining insect. It was not determined if this feeding was caused by *M.* edentulous. This was probably unlikely since the weevil has an apparent limited distribution in Canada (http://www.for.gov.bc.ca/HFP/ biocontrol/agents/ Microplontus_edentulus.htm).

**Gymnetron tetrum (photo mantine)**

***Verbascum thapsus*** **(Common mullein)**

The flower feeding weevil, *Gymnetron tetrum* was accidentally introduced into United States before prior to 1876 and to Washington State prior to 1942. The weevil is widespread in the eastern half of the US, and in the western half of the US is found in Oregon and California and has also been redistributed to Idaho, South Dakota and Wyoming. Fifty-five sites in Montana were surveyed. Weevils were observed at 19 sites widely distributed in the western half of Montana. Although adults have been observed elsewhere feeding on early developing flowers, in Montana we observed adults throughout the flowering period of common mullein. Weevil populations appear to be low. Typically we collected only a couple of adult weevils per plant, seldom more than five adults. Gross and Werner (1978) reported that up to 50 percent of seeds may be destroyed by the larval feeding of this species in Washington. However in Montana, weevil populations appear to be much lower than those found elsewhere in the western US. It is uncertain whether these populations will increase with time.

**(photo jhwma.org)**

<u>Summary</u>

Most of the adventive agents initially surveyed for were found to be widely distributed within western Montana, although populations tend to be somewhat localized. Impacts of these organisms on their weedy hoist appear somewhat limited, primarily due to low populations. It is uncertain whether these populations will increase with time or if they will remain relatively static due to environmental conditions or other factors. The possible utilization of native plants by these adventive was not determined since there was limited overlap with the native plants and the related weed species. Many of our collection sites were located in disturbed habitats that may be less conducive to the establishment of many of the native species. Several new adventive species were also collected during this survey and are reported for the first time in the US.

Acknowledgements

We thank the assistance of C. Delphia, K. Puliafico and J. Peckham in the collection and preparation of samples. We also thank J. Story, A. Knutson, G. Markin and various land mangers for suggesting potential collection sites. Special thanks to P. Denke (MDA) for assisting in the data entry and project coordination.

Table 3. Species codes used for plants, arthropods and pathogens (Plant codes – taken from Plants.gov Insect codes – first two letters of genus-species)

| Plant Code | Plant Species | Common Name | | Insect Code | Insect Species |
|---|---|---|---|---|---|
| CABOM | *Cabomba* species | Fanweed | | ACAN | *Aceria* anthocoptes |
| CANU4 | *Carduus nutans* | Musk thistle | | ACsp | *Aceria* species |
| CEDE4 | *Ceratophyllum demersum* | Coontail | | Ausp | *Aculus* species |
| CEDI3 | *Centaurea diffusa* | Diffuse knapweed | | AGAL | *Agonopterix alstroemeriana* |
| CECY2 | *Centaurea cyans* | Cornflower | | APPL | *Aplocera plagiata* |
| CEDE15 | *Centaurea dealbata* | Persian knapweed | | BRPU | *Brachypterolus pulicarius* |
| CEMA9 | *Centaurea macrocephala* | Bigheaded knapweed | | CALU | *Calophasia lunula* |
| CEMO | *Centaurea montana* | Montane knapweed | | CARU | *Cassida rubiginosa* |
| CEST8 | Centaurea stoebe ssp. *micranthos* | Spotted knapweed | | CELI | *Ceuthorhynchus litura* |
| CIAR4 | *Cirsium arvense* | Canada thistle | | EULE | *Euhrychiopsis lecontei* |
| CIRSI | *Cirsium* species | Thistles | | GYAN | *Gymnetron antirrhini* |
| CISC2 | Cirsium scariosum | Elk thistle | | GYTE | *Gymnetron tetrum* |
| CIUN | Cirsium undulatum | Wavyleaf thistle | | LAPL | *Larinus planus* |
| CIVU | Cirsium vulgare | Bull thistle | | MEJA | *Mecinus janthinus* |
| COMA2 | *Conium maculatum* | Poison hemlock | | MIED | Microplontus edentulus |
| CYOF | *Cynoglossum officinale* | Houndstongue | | MOCU | *Mogulones cruciger* |
| HYPE | *Hypericulm perforatum* | St Johnswort | | OMHO | *Omphalapion hookeri* |
| LIDA | *Linaria genistifolia* ssp. *dalmatica* | Dalmatian toadflax | | PUCA | Puccinia carduorum |
| LIVU2 | *Linaria vulgaris* | Yellow toadflax | | PUJA | Puccinia jaceae |
| MYRIO | *Myriophyllum* species | Watermilfoil | | RHCO | Rhinocyllus conicus |
| MYSP2 | Myriophyllum spicatum | Eurasian watermilfoil | | RHTR | *Rhopalomyia tripleurospermi* |
| POTAM | *Potamogeton* species | Pondweed | | TRHO | *Trichosircalus horridus* |
| TRPE21 | *Tripleurospermum perforatum* | Scentless chamomile | | URCA | Urophora cardui |
| VETH | *Verbascum thapsus* | Mullein | | RHTR | *Rhopalomyia tripleurospermi* |

Table 2. Listing of adventive agents and their plant host - 2009.

| Weed | Agent Present | Latitude | Longitude | Location | Waypoint | Date |
|---|---|---|---|---|---|---|
| **CANU4** | RHCO | N47° 19' 43.3535 | W115° 1' 20.0667 | Beaverhead Co. – Rt 43 Powerhouse | Bvhd01 | 09/11/09 |
| **CANU4** | RHCO | N46° 37' 21.1141 | W111° 37' 29.5820 | Broadwater Co. - Canyon Ferry Hellgate Rd & HWY 284 | BW06 | 07/17/09 |
| **CANU4** | CARU RHCO | N46° 9' 20.3037 | W111° 29' 33.6551 | Broadwater Co. – Frank Rd Jaapiella site | BW04 | 08/25/09 |
| **CANU4** | CARU RHCO | N46° 29' 20.6246 | W111° 31' 10.6140 | Broadwater Co. – Lower Confederate Gulch Rd | BW07 | 07/17/09 |
| **CANU4** | CARU RHCO | N46° 11' 40.2325 | W112° 58' 11.0492 | Deer Lodge Co. – Road to Lost Creek SP | Dl2 | 08/11/09 |
| **CANU4** | CARU PUCA RHCO | N46° 10' 12.7752 | W113° 10' 12.1462 | Deer Lodge Co. – Road to Warm Springs Picnic Area | DeerCn002 | 09/23/09 |
| **CANU4** | TRHO RHCO | N48° 8' 51.8423 | W114° 34' 41.0182 | Flathead Co. – Ashley Lake Rd | Ad 11 | 07/22/09 |
| **CANU4** | CARU RHCO | N45° 36' 17.7007 | W110° 55' 36.8573 | Gallatin Co. – Bear Canyon New World Trail | Galla2 | 09/02/09 |
| **CANU4** | CARU TRHO | N45° 41' 54.8980 | W111° 3' 27.9023 | Gallatin Co. – Bozeman N 19th | T1 | 07/16/09 |
| **CANU4** | TRHO RHCO | N45° 48' 54.0589 | W111° 10' 10.3958 | Gallatin Co. – N. Belgrade | Belg2 | 07/16/09 |
| **CANU4** | TRHO RHCO | N45° 48' 54.0551 | W111° 10' 10.3928 | Gallatin Co. – N. Belgrade | Horr1 | 07/16/09 |
| **CANU4** | CARU TRHO RHCO | N45° 48' 0.3118 | W111° 11' 11.9360 | Gallatin Co. – N. of Belgrade | Belg1 | 07/16/09 |
| **CANU4** | CARU TRHO | N45° 48' 0.3118 | W111° 11' 11.9343 | Gallatin Co. – N. of Belgrade | Wavyleaf | 07/16/09 |
| **CANU4** | RHCO | N48° 25' 18.6717 | W112° 53' 7.8469 | Glacier Co. – Hyw 89 | Ad12 | 07/23/09 |
| **CANU4** | CARU TRHO RHCO | N46° 39' 35.4078 | W113° 8' 48.2504 | Granite Co. – Drummond Fairgrounds | Gran2 | 08/13/09 |
| **CANU4** | CARU TRHO PUCA RHCO | N46° 9' 57.0069 | W113° 19' 43.3897 | Granite Co. – FS Rd 672 & 406 | GranCn002 | 09/23/09 |
| **CANU4** | RHCO | N45° 49' 21.1008 | W111° 51' 6.9333 | Jefferson Co. – Lewis & Clark Caverns | L&c cavern | 07/17/09 |
| **CANU4** | CARU RHCO | N47° 12' 12.8105 | W114° 6' 41.3329 | Lake Co. - Arlee | La02 | 09/09/09 |
| **CANU4** | CARU TRHO | N46° 37' 27.1957 | W111° 58' 51.1230 | Lewis & Clark Co. – Near Helena | Lc7 | 09/03/09 |
| **CANU4** | RHCO | N45° 18' 37.0182 | W111° 58' 22.8367 | Madison Co. – Granite Creek Rd | Mad7 | 08/05/09 |
| **CANU4** | CARU | N47° 1' 18.0082 | W113° 22' 49.4374 | Missoula Co. – Harpers Lake | Ad8 | 07/22/09 07/30/09 |
| **CANU2** | CARU TRHO RHCO | N45° 28' 59.7882 | W110° 37' 16.3874 | Park Co. – Mallards Rest Fishing Access | Mallards Rest | 07/14/09 |
| **CANU4** | RHCO | N48° 10' 32.0083 | W112° 28' 47.0525 | Pondera Co. – Hyw 89 | Ad16 | |
| **CANU4** | CARU TRHO RHCO | N46° 43' 21.3172 | W112° 39' 56.6136 | Powell Co. – Rt 114 near sawmill | Pow7 | 08/18/09 |
| **CANU4** | CARU TRHO PUCA RHCO | N46° 15' 17.4540 | W114° 11' 41.1970 | Ravalli Co. – East Side Hwy s. Corvallis | RavaCn002 | 09/25/09 |
| **CANU4** | CARU RHCO | N46° 35' 7.8982 | W114° 4' 47.4808 | Ravalli Co. – Near Poker Joe's Fishing Access | Rav2 | 08/12/09 |
| **CANU4** | TRHO RHCO | N47° 19' 32.0477 | W114° 12' 23.0467 | Sanders Co. - Bison Range | Agrilus002 | 06/18/09 |
| **CANU4** | CARU RHCO | N47° 31' 42.2243 | W111° 14' 16.1081 | Teton Co. – Eyraud Lakes | Teton01 | 09/04/09 |

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|---|---|---|---|---|---|---|
| **CANU4** | RHCO | N47° 59' 27.6496 | W112° 19' 4.3947 | Teton Co. – Road to Byrum | Ad17 | 07/23/09 |
| **CANU4** | TRHO RHCO | N48° 27' 49.0568 | W111° 28' 39.6487 | Toole Co. – N. of Devon Rd | ToolCn001 | 09/13/09 |
| **CANU4** | RHCO | N45° 16' 41.0154 | W109° 12' 30.1102 | Toole Co. - Shelby | ToolCn002 | 09/15/09 |
| **CIAR4** | CARU | N44° 58' 31.2853 | W112° 54' 39.6307 | Beaverhead Co. – Red Rock | Red | 07/22/09 |
| **CIAR4** | CARU | N45° 16' 35.0307 | W112° 30' 49.8247 | Beaverhead Co. – Stone Creek Raceway | Bh1 | 08/05/09 |
| **CIAR4** | | N46° 37' 21.1141 | W111° 37' 29.5820 | Broadwater Co. - Canyon Ferry Hellgate Rd & HWY 284 | BW06 | 07/17/09 |
| **CIAR4** | ACAN | N46° 9' 20.3037 | W111° 29' 33.6551 | Broadwater Co. – Frank Rd Jaapiella site | BW04 | 08/25/09 |
| **CIAR4** | LAPL CARU URCA ACAN | N45° 59' 15.0859 | W108° 7' 9.0571 | Carbon Co. – Hw 310 & Edgar Rd | CarbCa002 | 09/21/09 |
| **CIAR4** | LAPL URCA | N45° 20' 8.6434 | W109° 10' 53.4817 | Carbon Co. – S. of Roberts | CarbCa001 | 09/20/09 |
| **CIAR4** | CARU | N47° 9' 43.8484 | W111° 49' 19.9068 | Cascade Co. – Great Falls Big Springs SP | Cas3 | 09/04/09 |
| **CIAR4** | CARU | N46° 37' 25.9683 | W111° 58' 50.9578 | Cascade Co. – I-15 exit 244 | Cas1 | 09/03/09 |
| **CIAR4** | CARU ACAN | N46° 11' 40.1810 | W112° 58' 11.0720 | Deer Lodge Co. – Galen | Dl3 | 08/11/09 |
| **CIAR4** | | N46° 5' 48.3368 | W112° 50' 28.8091 | Deer Lodge Co. – Near Opportunity | Dl1 | 08/11/09 |
| **CIAR4** | | N48° 7' 57.8053 | W114° 34' 43.6635 | Flathead Co. – Ashley Lake Rd | Ad 10 | 07/22/09 |
| **CIAR4** | LAPL CELI | N48° 11' 59.0236 | W114° 58' 47.8484 | Flathead Co. – Lynch Lake | FlatH01 | 08/19/09 |
| **CIAR4** | TRHO | N45° 41' 54.8980 | W111° 3' 27.9023 | Gallatin Co. – Bozeman N 19th | T1 | 07/16/09 |
| **CIAR4** | CARU | N45° 39' 24.8855 | W110° 56' 46.6008 | Gallatin Co. – E. of Bozeman | Galla1 | 09/02/09 |
| **CIAR4** | CARU ACAN | N45° 40' 7.8832 | W111° 3' 10.2808 | Gallatin Co. - MSU | MSU | 09/22/09 |
| **CIAR4** | CARU | N45° 53' 56.9537 | W111° 32' 0.3787 | Gallatin Co. – Three Forks Ponds | 3forks ponds | 07/17/09 |
| **CIAR4** | LAPL ACAN | N48° 51' 16.7341 | W112° 14' 4.1462 | Glacier Co. – Hay Lake Rd | GlacCa002 | 09/13/09 |
| **CIAR4** | LAPL ACAN | N48° 34' 39.1393 | W112° 51' 40.1019 | Glacier Co. – HY2 Sullivan Bridge | GlacCa001 | 09/10/09 |
| **CIAR4** | CARU LAPL ACAN | N46° 39' 40.4469 | W113° 8' 52.6476 | Granite Co. – Drummond Fishing Access | Gran1 | 08/13/09 |
| **CIAR4** | CARU RHCO | N45° 54' 57.0199 | W111° 44' 30.6680 | Jefferson Co. – Boulder cut-off Rd | J4 | 08/11/09 |
| **CIAR4** | CARU | N47° 10' 8.5604 | W114° 4' 51.9037 | Lake Co. – Jacko River Fish Hatchery | La01 | 09/09/09 |
| **CIAR4** | CARU | N47° 17' 51.8656 | W114° 8' 37.4538 | Lake Co. - N. Polson | La04 | 09/09/09 |
| **CIAR4** | TRHO | N46° 37' 27.1957 | W111° 58' 51.1230 | Lewis & Clark Co. – Near Helena | Lc7 | 09/03/09 |
| **CIAR4** | CAUR | N46° 37' 4.5422 | W112° 3' 30.5121 | Lewis & Clark Co. – Helena Fairgrounds | Lc4 | 09/03/09 |
| **CIAR4** | | N47° 15' 9.2164 | W112° 3' 49.4070 | Lewis & Clark Co. – RT 287 mile post 14 N | Lc2 | 08/07/09 |
| **CIAR4** | LAPL URCA ACAN | N48° 33' 26.7938 | W111° 46' 20.2021 | Liberty Co. – Black Jack Rd | LibeCa001 | 09/15/09 |
| **CIAR4** | CARU | N48° 19' 15.5110 | W111° 4' 10.1665 | Liberty Co. - Joplin | LibeCa002 | 09/15/09 |
| **CIAR4** | LAPL CARU | N48° 52' 37.0118 | W115° 3' 10.0291 | Lincoln Co. - Eureka | Eureka1 | 07/29/09 |

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|---|---|---|---|---|---|---|
| **CIAR4** | LAPL | N48° 45' 0.1833 | W114° 59' 25.8192 | Lincoln Co. – Fortine  Meadow Creek Rd | Fortine003 | 07/30/09 |
| **CIAR4** | LAPL | N48° 44' 57.2882 | W114° 56' 32.0768 | Lincoln Co. – Fortine Marl Lake Rd | Fortine 002 | 07/30/09 |
| **CIAR4** | LAPL | N48° 44' 57.2882 | W114° 56' 32.0768 | Lincoln Co. – Fortine Marl Lake Rd | Fortine 002 | 07/30/09 |
| **CIAR4** | LAPL | N48° 45' 53.3204 | W114° 53' 54.5681 | Lincoln Co. – Fortine roadside river park | Fortine | 07/30/09 |
| **CIAR4** | LAPL | N48° 51' 38.3098 | W114° 55' 46.8181 | Lincoln Co. – Therriault Road | Therri | 07/30/09 |
| **CIAR4** | | N45° 26' 35.7870 | W111° 42' 21.4633 | Madison Co. –  Meadow Lake Fishing Access | Mad3 | 08/05/09 |
| **CIAR4** | CARU | N47° 34' 24.2764 | W115°  9' 56.3355 | Mineral Co. – RT 135 near Co. line | Min01 | 09/09/09 |
| **CIAR4** | CARU LAPL URCA ACAN | N46° 45' 11.1858 | W113° 56' 33.6488 | Missoula Co. -  Miller Creek Rd | MissCa002 | 09/24/09 |
| **CIAR4** | CARU ACAN URCA | N46° 22' 43.8396 | W112° 44' 11.0321 | Missoula Co. – S. of Lolo | Mis1 | 08/12/09 |
| **CIAR4** | CARU URCA CELI | N45° 39' 37.1026 | W110° 44' 41.1374 | Park Co. – Lake Drive w of Livingston | Pois1 | 07/14/09 |
| **CIAR4** | CARU TRHO | N45° 28' 59.7882 | W110° 37' 16.3874 | Park Co. – Mallards Rest Fishing Access | Mallards Rest | 07/14/09 |
| **CIAR4** | RHCO | N48° 17' 30.8888 | W112° 31' 52.4044 | Pondera Co. – Hyw 89 | Ad14 | 07/23/09 |
| **CIAR4** | ACAN | N48° 17' 46.8836 | W112° 14' 41.9907 | Pondera Co. – S. Cutbank MT358 | PondCa | 09/11/09 |
| **CIAR4** | CARU | N46° 22' 43.5216 | W112° 44' 10.6399 | Powell Co. – Deer Lodge exit Arrowstone Park | Pow1 | 08/11/09 |
| **CIAR4** | CARU LAPL | N46° 29' 53.1105 | W112° 44' 27.7033 | Powell Co. – Kohrs Bend Fishing Access | Pow2 | 08/12/09 |
| **CIAR4** | TRHO ACAN | N46° 43' 21.3172 | W112° 39' 56.6136 | Powell Co. – Rt 114 near sawmill | Pow7 | 08/18/09 |
| **CIAR4** | LAPL CARU URCA ACAN | N46° 10' 5.2027 | W114°  9' 33.3410 | Ravalli Co. – Demmons Rd | RavaCa002 | 09/25/09 |
| **CIAR4** | ACAN | N46° 35' 9.5788 | W114°  4' 13.2795 | Ravalli Co. – Poker Joe's Fishing Access | Rav1 | 08/12/09 |
| **CIAR4** | CARU ACAN | N46° 35' 7.8694 | W114°  4' 47.6602 | Ravalli Co. – S. of Stevensville | Rav3 | 08/12/09 |
| **CIAR4** | | N47° 34' 24.3175 | W115°  9' 56.3952 | Sanders Co. – Between Thompson Falls & Plains | San05 | 09/09/09 |
| **CIAR4** | CARU | N47° 21' 22.0990 | W114° 10' 51.5376 | Sanders Co. - Bison Range | Agrilus005 | 06/18/09 |
| **CIAR4** | | N47° 42' 5.7211 | W114° 40' 14.2944 | Sanders Co. – Dry Fork Reservoir | San1 | 09/09/09 |
| **CIAR4** | | N45° 59' 35.0968 | W112° 31' 47.2197 | Silver Bow Co. – KOA CG | Sb2 | 08/11/09 |
| **CIAR4** | CARU URCA | N47° 32' 59.5980 | W112° 19' 27.0236 | Teton Co. – Flowcree Canal Rd | Tet1 | 08/07/09 |
| **CIAR4** | | N47° 59' 27.6496 | W112° 19' 4.3947 | Teton Co. – Road to Byrum | Ad17 | 07/23/09 |
| **CIAR4** | LAPL | N48° 31' 29.8690 | W111° 51' 15.8472 | Toole Co. – Shelby Shel-oole Lake | ToolCa001 | 09/13/09 |
| **CIAR4** | LAPL ACAN | N48° 53' 2.0883 | W111° 54' 8.9107 | Toole Co. – Stevens Rd Kevin | ToolCa002 | 09/14/09 |
| **CIAR4** | LAPL URCA | N45° 44' 46.1284 | W108° 31' 20.2433 | Yellowstone Co. – Billings Riverfront Park | YellCa001 | 09/18/09 |
| **CIAR4** | URCA RHCO ACAN | N45° 46' 17.5250 | W108° 29' 26.2708 | Yellowstone Co. – Billings Two Moon Park | YellCa002 | 09/18/09 |
| **CIAR4** | CELI ACAN | N45° 44' 32.4732 | W108° 32' 19.6652 | Yellowstone Co. – Billings Two Moon Park | YellCo002 | 09/18/09 |

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|---|---|---|---|---|---|---|
| **CIRSI** | RHCO | N48° 10' 2.6028 | W115° 37' 23.9402 | Lincoln Co. – Bear Creek Rd | Hawk3 | 07/28/09 |
| **CIRSI** | RHCO | N45° 18' 10.8787 | W111° 58' 35.4868 | Madison Co. – Browns Gulch Rd | Mad6 | 08/05/09 |
| **CIRSI** | CARU | N48° 11' 11.9052 | W112° 34' 15.0695 | Pondera Co. – Swift Creek Road | Ad15 | 07/23/09 |
| **CISC2** | RHCO | N48° 19' 7.5710 | W113° 21' 3.3588 | Flathead Co. – Marias Pass CG | FlatLv003 | 09/11/09 |
| **CIUN** | RHCO | N45° 48' 0.3118 | W111° 11' 11.9360 | Gallatin Co. – N. of Belgrade | Belg1 | 07/16/09 |
| **CIUN** | Weevil sp | N45° 48' 0.3118 | W111° 11' 11.9343 | Gallatin Co. – N. of Belgrade | Wavyleaf | 07/16/09 |
| **CIUN** | RHCO | N48° 42' 39.4089 | W111° 54' 2.4633 | Glacier Co. – E. of Sweetgrass Rd | GlacWlt001 | 09/13/09 |
| **CIUN** | LAPL | N45° 49' 21.1008 | W111° 51' 6.9333 | Jefferson Co. – Lewis & Clark Caverns | L&c cavern | 07/17/09 |
| **CIUN** | RHCO | N47° 23' 18.5124 | W112° 18' 35.9841 | Lewis & Clark Co. – RT 287 Bowans Corner | Lc3 | 08/07/09 |
| **CIUN** | | N47° 7' 38.3385 | W112° 2' 30.8672 | Lewis & Clark Co. – RT 287 n. of Wolf Creek | Lc1 | 08/07/09 |
| **CIUN** | | N47° 31' 42.2243 | W111° 14' 16.1081 | Teton Co. – Eyraud Lakes | Teton01 | 09/04/09 |
| **CIUN** | | N47° 59' 27.6496 | W112° 19' 4.3947 | Teton Co. – Road to Byrum | Ad17 | 07/23/09 |
| **CIUN** | CARU ACAN | N45° 39' 39.4496 | W108° 23' 3.4771 | Yellowstone Co. – Wets Creek Rd | YellWlt001 | 09/18/09 |
| **CIVU** | RHCO | N45° 16' 35.0307 | W112° 30' 49.8247 | Beaverhead Co. – Stone Creek Raceway | Bh1 | 08/05/09 |
| **CIVU** | TRHO | N45° 16' 40.5532 | W109° 12' 31.0822 | Carbon Co. – Cooney State Park | CarbBt001 | 09/20/09 |
| **CIVU** | | N45° 41' 54.8980 | W111° 3' 27.9023 | Gallatin Co. – Bozeman N 19th | T1 | 07/16/09 |
| **CIVU** | | N45° 53' 56.9537 | W111° 32' 0.3787 | Gallatin Co. – Three Forks Ponds | 3forks ponds | 07/17/09 |
| **CIVU** | | N48° 34' 35.1735 | W112° 51' 48.6877 | Glacier Co. – HY 2 Blackfoot | GlacVt001 | 09/11/09 |
| **CIVU** | | N46° 37' 27.1957 | W111° 58' 51.1230 | Lewis & Clark Co. – Near Helena | Lc7 | 09/03/09 |
| **CIVU** | | N48° 52' 37.0118 | W115° 3' 10.0291 | Lincoln Co. - Eureka | Eureka1 | 07/29/09 |
| **CIVU** | | N48° 45' 0.1833 | W114° 59' 25.8192 | Lincoln Co. – Fortine Meadow Creek Rd | Fortine003 | 07/30/09 |
| **CIVU** | | N48° 44' 57.2882 | W114° 56' 32.0768 | Lincoln Co. – Fortine Marl Lake Rd | Fortine 002 | 07/30/09 |
| **CIVU** | | N48° 44' 57.2882 | W114° 56' 32.0768 | Lincoln Co. – Fortine Marl Lake Rd | Fortine 002 | 07/30/09 |
| **CIVU** | | N48° 14' 51.4410 | W114° 58' 15.0870 | Lincoln Co. - Island Lake | Isl | 08/18/09 |
| **CIVU** | CARU | N46° 35' 7.8694 | W114° 4' 47.6602 | Ravalli Co. – S. of Stevensville | Rav3 | 08/12/09 |
| **CIVU** | CARU | N47° 21' 22.0990 | W114° 10' 51.5376 | Sanders Co. - Bison Range | Agrilus005 | 06/18/09 |
| **CIVU** | RHCO | N48° 29' 53.2451 | W111° 50' 44.7637 | Toole Co. - Sunburst | ToolBt001 | 09/14/09 |
| **CIVU** | LAPL | N45° 59' 49.8618 | W108° 7' 36.1516 | Yellowstone Co. – West M Rd Warden | YellBt001 | 09/21/09 |
| **CECY2** | ACsp | N45° 46' 44.1841 | W111° 10' 39.6582 | Gallatin Co. - Belgrade | Belg005 | 08/18/09 |
| **CEDA3** | ACsp | N46° 35' 16.8908 | W111° 55' 0.6538 | Lewis & Clark Co. – East Helena | East Helena | 07/04/09 |
| **CEDE15** | | N45° 46' 44.1841 | W111° 10' 39.6582 | Gallatin Co. - Belgrade | Belg005 | 08/18/09 |
| **CEDI3** | | N48° 27' 49.0568 | W111° 28' 39.6487 | Toole Co. – N. of Devon Rd | ToolCn001 | 09/13/09 |
| **CEDI3** | | N48° 31' 29.8690 | W111° 51' 15.8472 | Toole Co. – Shelby Shel-oole Lake | ToolCa001 | 09/13/09 |

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| **CEMA9** | ACsp | N45° 46' 44.1841 | W111° 10' 39.6582 | Gallatin Co. - Belgrade | Belg005 | 08/18/09 |
| **CEMO** | | N45° 46' 44.1841 | W111° 10' 39.6582 | Gallatin Co. - Belgrade | Belg005 | 08/18/09 |
| **CEST8** | ACsp | N46° 11' 40.2325 | W112° 58' 11.0492 | Deer Lodge Co. – Road to Lost Creek SP | Dl2 | 08/11/09 |
| **CEST8** | ACsp | N46° 10' 12.7752 | W113° 10' 12.1462 | Deer Lodge Co. – Road to Warm Springs Picnic Area | DeerCn002 | 09/23/09 |
| **CEST8** | ACsp | N45° 46' 44.1841 | W111° 10' 39.6582 | Gallatin Co. - Belgrade | Belg005 | 08/18/09 |
| **CEST8** | | N45° 53' 13.1862 | W112° 6' 27.4805 | Jefferson Co. - Cardwell | J5 | 08/11/09 |
| **CEST8** | PUJA ACsp | N46° 35' 16.8908 | W111° 55' 0.6538 | Lewis & Clark Co. – East Helena | East Helena | 07/04/09 |
| **CEST8** | ACsp | N46° 56' 7.5989 | W113° 58' 47.7941 | Lincoln Co. – Little Wolf Creek | Linc01 | 07/09/09 |
| **CEST8** | ACsp | N48° 14' 32.7018 | W114° 52' 26.5350 | Lincoln Co. – No Bear Creek | No bear | 08/19/09 |
| **CEST8** | | N47° 1' 4.8490 | W114° 44' 13.0739 | Mineral Co. – Tarkis Rd | Min2 | 08/13/09 |
| **CEST8** | ACsp | N46° 45' 11.1858 | W113° 56' 33.6488 | Missoula Co. – S. access Mt Jumbo | MissLd002 | 09/24/09 |
| **CEST8** | | N48° 16' 53.2192 | W112° 52' 31.9197 | Pondera Co. – Heart Butte Rd | PondCo001 | 09/12/09 |
| **CEST8** | ACsp | N46° 22' 43.5216 | W112° 44' 10.6399 | Powell Co. – Deer Lodge exit Arrowstone Park | Pow1 | 08/11/09 |
| **CEST8** | ACsp | N46° 35' 9.5788 | W114° 4' 13.2795 | Ravalli Co. – Poker Joe's Fishing Access | Rav1 | 08/12/09 |
| **CEST8** | ACsp | N45° 58' 34.7281 | W112° 28' 34.5953 | Silver Bow Co. – I-90 Exit 227 frontage Rd | Sb1 | 08/11/09 |
| **CEST8** | | N45° 59' 35.0968 | W112° 31' 47.2197 | Silver Bow Co. – KOA CG | Sb2 | 08/11/09 |
| **CEST8** | | N47° 31' 42.2243 | W111° 14' 16.1081 | Teton Co. – Eyraud Lakes | Teton01 | 09/04/09 |
| **CEST8** | ACsp | N45° 44' 30.3730 | W108° 32' 24.3630 | Yellowstone Co. – Riverfront Park Billings | Yell008 | 07/28/09 |
| **COMA2** | | N45° 27' 52.9720 | W108° 51' 37.2182 | Carbon Co. – Hy 212 s. Laurel | CarbPh001 | 09/21/09 |
| **COMA2** | AGAL | N46° 37' 25.9683 | W111° 58' 50.9578 | Cascade Co. – I-15 exit 244 | Cas1 | 09/03/09 |
| **COMA2** | AGAL | N45° 41' 58.0063 | W111° 3' 28.8571 | Gallatin Co. – Bozeman N 19th | P2 | 07/16/09 |
| **COMA2** | AGAL | N45° 53' 56.9537 | W111° 32' 0.3787 | Gallatin Co. – Three Forks Ponds | 3forks ponds | 07/17/09 |
| **COMA2** | AGAL | N45° 52' 23.5704 | W112° 11' 53.0740 | Jefferson Co. – Pipestone Pass | Pipe stone | 07/17/09 |
| **COMA2** | AGAL | N45° 39' 37.1026 | W110° 44' 41.1374 | Park Co. – Lake Drive w of Livingston | Pois1 | 07/14/09 |
| **COMA2** | | N46° 36' 34.2730 | W112° 36' 7.6381 | Powell Co. – Avon | Ad 6 | 07/22/09 |
| **COMA2** | AGAL | N45° 37' 49.7111 | W108° 25' 6.5699 | Yellowstone Co. - Billings | YellPh001 | 09/18/09 |
| **COMA2** | | N45° 36' 1.8675 | W108° 24' 19.5087 | Yellowstone Co. – Pryor Creek Rd | YellPh002 | 09/19/09 |
| **CYOF** | | N45° 45' 37.3317 | W112° 47' 35.4850 | Beaverhead Co. – Jerry Creek Rd | Bvd2 | 09/11/09 |
| **CYOF** | | N45° 47' 37.9708 | W112° 54' 4.7556 | Beaverhead Co. – Jerry Creek Rd | Bvd3 | 09/11/09 |
| **CYOF** | | N46° 37' 21.1141 | W111° 37' 29.5820 | Broadwater Co. - Canyon Ferry Hellgate Rd & HWY 284 | BW06 | 07/17/09 |
| **CYOF** | | N46° 13'28.9316 | W111° 10' 9.8173 | Broadwater Co. – Dry Creek | BW02 | 08/25/09 |
| **CYOF** | | N46° 29' 20.6246 | W111° 31' 10.6140 | Broadwater Co. – Lower Confederate Gulch Rd | BW07 | 07/17/09 |
| **CYOF** | | N45° 27' 15.4361 | W109° 5' 31.3672 | Carbon co. – S. of Roberts | CarbCo001 | 09/20/09 |

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| **CYOF** | | N47° 9' 43.8484 | W111° 49' 19.9068 | Cascade Co. – Great Falls Big Springs SP | Cas3 | 09/04/09 |
| **CYOF** | | N46° 37' 25.9683 | W111° 58' 50.9578 | Cascade Co. – I-15 exit 244 | Cas1 | 09/03/09 |
| **CYOF** | | N48° 7' 57.8053 | W114° 34' 43.6635 | Flathead Co. – Ashley Lake Rd | Ad 10 | 07/22/09 |
| **CYOF** | | N48° 11' 59.0236 | W114° 58' 47.8484 | Flathead Co. – Lynch Lake | FlatH01 | 08/19/09 |
| **CYOF** | | N45° 36' 17.7007 | W110° 55' 36.8573 | Gallatin Co. – Bear Canyon New World Tr | Galla2 | 09/02/09 |
| **CYOF** | | N45° 40' 0.1506 | W110° 49' 2.7287 | Gallatin Co. – E. of Jackson Creek Rd | Toad1 | 07/14/09 |
| **CYOF** | | N48° 51' 33.8695 | W113° 19' 20.5723 | Glacier Co. – Duck Lake CG | GlacCo001 | 09/11/09 |
| **CYOF** | | N48° 27' 24.0468 | W112° 49' 7.9587 | Glacier Co. – Hyw 89 | Ad13 | 07/23/09 |
| **CYOF** | | N48° 48' 40.1348 | W112° 14' 29.2033 | Glacier Co. – Whiskey Gap Rd | GlacCo002 | 09/12/09 |
| **CYOF** | | N46° 39' 40.4469 | W113° 8' 52.6476 | Granite Co. – Drummond Fishing Access | Gran1 | 08/13/09 |
| **CYOF** | | N46° 32' 36.0181 | W111° 55' 25.9719 | Jefferson Co. – Montana City | Jef1 | 09/03/09 |
| **CYOF** | | N47° 10' 8.5604 | W114° 4' 51.9037 | Lake Co. – Jacko River Fish Hatchery | La01 | 09/09/09 |
| **CYOF** | | N47° 17' 51.8656 | W114° 8' 37.4538 | Lake Co. - N. Polson | La04 | 09/09/09 |
| **CYOF** | | N46° 37' 4.5422 | W112° 3' 30.5121 | Lewis & Clark Co. – Helena Fairgrounds | Lc4 | 09/03/09 |
| **CYOF** | | N47° 7' 38.3385 | W112° 2' 30.8672 | Lewis & Clark Co. – RT 287 n. of Wolf Creek | Lc1 | 08/07/09 |
| **CYOF** | | N48° 53' 35.9345 | W115° 7' 16.6509 | Lincoln Co. – Eureka Black Lake Rd & RT 37 | Eureka1 003 | 07/29/09 |
| **CYOF** | | N48° 45' 0.1833 | W114° 59' 25.8192 | Lincoln Co. – Fortine Meadow Creek Rd | Fortine003 | 07/30/09 |
| **CYOF** | | N48° 44' 57.2882 | W114° 56' 32.0768 | Lincoln Co. – Fortine Marl Lake Rd | Fortine 002 | 07/30/09 |
| **CYOF** | | N48° 45' 53.3204 | W114° 53' 54.5681 | Lincoln Co. – Fortine roadside river park | Fortine | 07/30/09 |
| **CYOF** | | N48° 16' 34.7437 | W115° 3' 18.7869 | Lincoln Co. – FS 536 Road | 536rd | 09/09/09 |
| **CYOF** | | N48° 52' 13.3837 | W114° 56' 57.1057 | Lincoln Co. – Glenn Lake | Glen | 07/29/09 |
| **CYOF** | | N48° 44' 59.4497 | W114° 53' 19.1446 | Lincoln Co. – Ranger Station Murphy Lake | Dickey 002 | 07/30/09 |
| **CYOF** | | N48° 52' 36.7103 | W115° 5' 15.2080 | Lincoln Co. – W. of Eureka | Eureka1 002 | 07/29/09 |
| **CYOF** | | N48° 25' 46.8283 | W114° 28' 16.1169 | Madison Co. – Sterling Rd w of Norris | Mad1 | 08/05/09 |
| **CYOF** | | N47° 0' 44.5878 | W114° 40' 47.5395 | Mineral Co. – I-90 Fish Creek exit (66) | Min1 | 08/12/09 |
| **CYOF** | | N47° 0' 46.9928 | W114° 44' 4.1121 | Mineral Co. – N. of Superior Slomay Gulch | Min4 | 08/12/09 |
| **CYOF** | | N47° 15' 55.2966 | W114° 59' 19.7797 | Mineral Co. – Tamarack Rd | Min5 | 08/13/09 |
| **CYOF** | | N46° 5' 38.4347 | W112° 48' 25.6492 | Missoula Co. – HWY 95 n. of Missoula | Mis01 | 09/08/09 |
| **CYOF** | MOCU? | N48° 59' 39.2783 | W111° 58' 0.4304 | Missoula Co. - Miller Creek Rd | MissCo003 | 09/24/09 |
| **CYOF** | | N46° 19' 24.7632 | W113° 17' 12.6486 | Missoula Co. – Duncan Rd n. Missoula | MissCo002 | 09/24/09 |
| **CYOF** | MOCU? | N46° 52' 6.9242 | W113° 58' 27.8829 | Missoula Co. – Hwy 12 Lolo Creek CG | MissCo004 | 09/24/09 |
| **CYOF** | | N47° 1' 16.9274 | W114° 6' 45.0135 | Missoula Co. – Hy 93 n. Missoula | MissCo001 | 09/24/09 |
| **CYOF** | | N46° 50' 8.3128 | W114° 6' 7.3340 | Missoula Co. – McClay Park Missoula | Mcalay 002 | 06/03/09 |

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| **CYOF** | | N46° 52' 41.2894 | W113° 58' 35.9204 | Missoula Co. – Missoula Greenough Park | Miss3 | 06/30/09 |
| **CYOF** | | N46° 52' 43.05 | W113° 58' 24.42 | Missoula Co. – Missoula Greenough Park | Miss4 | 06/30/09 |
| **CYOF** | | N48° 17' 19.4783 | W114° 52' 46.4180 | Missoula Co. – Missoula Wy 12 & Yuma ranch Rd | Miss007 | 06/03/09 |
| **CYOF** | | N46° 7' 18.8017 | W111° 24' 13.8694 | Missoula Co. – Sawmill Gulch | Miss008 | 06/03/09 |
| **CYOF** | | N45° 42' 55.4150 | W110° 15' 39.8423 | Park Co. – Hwy 89 | ParkCo002 | 09/19/09 |
| **CYOF** | | N45° 28' 59.7882 | W110° 37' 16.3874 | Park Co. – Mallards Rest Fishing Access | Mallards Rest | 07/14/09 |
| **CYOF** | | N48° 16' 53.2192 | W112° 52' 31.9197 | Pondera Co. – Heart Butte Rd | PondCo001 | 09/12/09 |
| **CYOF** | MOCU? | N48° 16' 53.7594 | W112° 52' 29.7899 | Pondera Co. – Spotted Eagle Rd | PondCo002 | 09/12/09 |
| **CYOF** | | N46° 48' 9.9956 | W112° 48' 29.3727 | Powell Co. – Nevada Lake | Nevada | 08/18/09 |
| **CYOF** | | N46° 46' 31.4523 | W114° 22' 47.5522 | Ravalli Co. – Demmons Rd | RavaCo001 | 09/25/09 |
| **CYOF** | | N46° 10' 5.2027 | W114° 9' 33.3410 | Ravalli Co. – Sleeping Child Rd | RavaCo002 | 09/25/09 |
| **CYOF** | | N47° 42' 5.7211 | W114° 40' 14.2944 | Sanders Co. – Dry Fork Reservoir | San1 | 09/09/09 |
| **CYOF** | | N46° 1' 39.1627 | W112° 43' 42.1674 | Silver Bow Co. – I-90 exit | Sb3 | 08/11/09 |
| **CYOF** | | N47° 32' 59.5980 | W112° 19' 27.0236 | Teton Co. – Flowcree Canal Rd | Tet1 | 08/07/09 |
| **CYOF** | MOCU? | N48° 59' 39.2783 | W111° 58' 0.4304 | Toole Co. - Sweetgrass | ToolCo001 | 09/13/09 |
| **CYOF** | | N45° 48' 32.6671 | W108° 27' 41.8135 | Yellowstone Co. – Billings Riverfront Park E. side | YellCo001 | 09/18/09 |
| **CYOF** | | N45° 44' 32.4732 | W108° 32' 19.6652 | Yellowstone Co. – Billings Two Moon Park | YellCo002 | 09/18/09 |
| **HYPE** | AUsp | N48° 11' 59.0236 | W114° 58' 47.8484 | Flathead Co. – Lynch Lake | FlatH01 | 08/19/09 |
| **HYPE** | | N48° 19' 29.6737 | W114° 47' 32.0888 | Flathead Co. – Sylivia Lake Rd | Siteb 003 | 08/20/09 |
| **HYPE** | AUsp | N45° 40' 49.8195 | W110° 56' 40.9553 | Gallatin Co. – Bozeman Story Hills | Gall01 | 08/18/09 |
| **HYPE** | APPL AUsp | N48° 2' 11.6692 | W113° 57' 41.4940 | Lake Co. – Hwy 83 & Red Owl Rd/ Kelley Rd | Ad21 | 07/27/09 |
| **HYPE** | | N47° 17' 51.9669 | W114° 8' 37.4538 | Lake Co. – RT 28 Elms | La05 | 09/09/09 |
| **HYPE** | AUsp | N48° 10' 5.8609 | W115° 36' 15.6920 | Lincoln Co. – Bear Creek Rd | Mul | 07/28/09 |
| **HYPE** | AUsp | N48° 14' 58.6634 | W114° 59' 44.1232 | Lincoln Co. – Surprise Hill & Island Lake | Surpup | 08/18/09 |
| **HYPE** | AUsp | N47° 0' 46.9928 | W114° 44' 4.1121 | Mineral Co. – N. of Superior Slomay Gulch | Min4 | 08/12/09 |
| **HYPE** | | N46° 35' 9.5788 | W114° 4' 13.2795 | Ravalli Co. – Poker Joe's Fishing Access | Rav1 | 08/12/09 |
| **HYPE** | AUsp | N47° 34' 24.3175 | W115° 9' 56.3952 | Sanders Co. – Between Thompson Falls & Plains | San05 | 09/09/09 |
| **LIDA** | | N46° 37' 21.1141 | W111° 37' 29.5820 | Broadwater Co. - Canyon Ferry Hellgate Rd & HWY 284 | BW06 | 07/17/09 |
| **LIDA** | | N46° 15' 3.2068 | W111° 40' 20.3049 | Broadwater Co. – Crow Creek CG n. of Raidersburg | BW03 | 08/25/09 |
| **LIDA** | | N47° 9' 43.8484 | W111° 49' 19.9068 | Cascade Co. – Great Falls Big Springs SP | Cas3 | 09/04/09 |
| **LIDA** | MEJA | N46° 37' 25.9683 | W111° 58' 50.9578 | Cascade Co. – I-15 exit 244 | Cas1 | 09/03/09 |
| **LIDA** | | N46° 32' 36.0181 | W111° 55' 25.9719 | Jefferson Co. – Montana City | Jef1 | 09/03/09 |
| **LIDA** | MEJA | N47° 17' 30.3306 | W114° 10' 14.5368 | Lake Co. – Ravalli | La03 | 09/09/09 |

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| **LIDA** | CALU | N47° 17' 51.9669 | W114° 8' 37.4538 | Lake Co. – RT 28 Elms | La05 | 09/09/09 |
| **LIDA** | | N46° 37' 0.2877 | W111° 57' 31.5679 | Lewis & Clark Co. – E. of Helena HW 430 | Lc6 | 09/03/09 |
| **LIDA** | | N48° 45' 53.3204 | W114° 53' 54.5681 | Lincoln Co. – Fortine roadside river park | Fortine | 07/30/09 |
| **LIDA** | | N47° 1' 4.8490 | W114° 44' 13.0739 | Mineral Co. – Tarkis Rd | Min2 | 08/13/09 |
| **LIDA** | MEJA | N46° 52' 41.2894 | W113° 58' 35.9204 | Missoula Co. – Missoula Greenough Park | Miss3 | 06/30/09 |
| **LIDA** | | N46° 45' 11.1858 | W113° 56' 33.6488 | Missoula Co. – S. access Mt Jumbo | MissLd002 | 09/24/09 |
| **LIDA** | MEJA | N46° 49' 15.7353 | W113° 48' 18.5613 | Missoula Co. – Turah fishing access | Mis3 | 08/13/09 |
| **LIDA** | BRPU CALU | N45° 28' 59.7882 | W110° 37' 16.3874 | Park Co. – Mallards Rest Fishing Access | Mallards Rest | 07/14/09 |
| **LIDA** | GYAN | N47° 34' 34.2672 | W115° 15' 9.3708 | Sanders Co. – Airport Rd near Thompson Falls | San03 | 09/09/09 |
| **LIDA** | MEJA | N47° 19' 32.0477 | W114° 12' 23.0467 | Sanders Co. - Bison Range | Agrilus002 | 06/18/09 |
| **LIDA** | | N47° 1' 20.5275 | W114° 6' 40.2375 | Yellowstone Co. – Pryor creek Rd | YellTv002 | 09/19/09 |
| **LIVU** | GYAN | N48° 10' 40.4504 | W114° 57' 56.9676 | Flathead Co. – Lost Trail Refuge | Lost | 08/18/09 |
| **LIVU** | GYAN | N46° 39' 40.4469 | W113° 8' 52.6476 | Granite Co. – Drummond Fishing Access | Gran1 | 08/13/09 |
| **LIVU** | BRPU GYAN | N45° 49' 56.6424 | W112° 21' 55.1497 | Jefferson Co. – Pipestone Pass | Pipestone2 | 07/17/09 |
| **LIVU** | GYAN | N46° 29' 53.1105 | W112° 44' 27.7033 | Powell Co. – Kohrs Bend Fishing Access | Pow2 | 08/12/09 |
| **LIVU2** | | N45° 47' 37.9708 | W112° 54' 4.7556 | Beaverhead Co. – Jerry Creek Rd | Bvd3 | 09/11/09 |
| **LIVU2** | GYAN | N45° 36' 55.2463 | W108° 47' 15.8984 | Carbon Co. – S. of Red Lodge Bull Spring Fishing Access | CarbLv001 | 09/20/09 |
| **LIVU2** | GYAN | N46° 1' 58.8319 | W112° 44' 25.3670 | Deer Lodge Co. - Galen | DL3 | 08/11/09 |
| **LIVU2** | GYAN | N45° 42' 55.0968 | W110° 27' 53.8485 | Deer Lodge Co. – Hwy 1 near Silver Lake | DeerLv002 | 09/23/09 |
| **LIVU2** | GYAN | N46° 5' 30.9495 | W112° 48' 27.4787 | Deer Lodge Co. – Near Opportunity | Deer01 | 09/08/09 |
| **LIVU2** | | N48° 19' 7.5710 | W113° 21' 3.3588 | Flathead Co. – Marias Pass CG | FlatLv003 | 09/11/09 |
| **LIVU2** | GYAN | N48° 25' 46.7047 | W114° 28' 15.6239 | Flathead Co. – Stillwater State for Hyw 93 | Still2 | 07/30/09 |
| **LIVU2** | GYAN | N45° 39' 24.8855 | W110° 56' 46.6008 | Gallatin Co. – E. of Bozeman | Galla1 | 09/02/09 |
| **LIVU2** | BRPU GYAN CALU | N45° 40' 0.1506 | W110° 49' 2.7287 | Gallatin Co. – E. of Jackson Creek Rd | Toad1 | 07/14/09 |
| **LIVU2** | | N46° 39' 40.4469 | W113° 8' 52.6476 | Granite Co. – Drummond Fishing Access | Gran1 | 08/13/09 |
| **LIVU2** | BRPU CALU | N46° 9' 55.8126 | W113° 19' 43.3597 | Granite Co. - Phillipsburg | GranLv002 | 09/23/09 |
| **LIVU2** | GYAN BRPU | N45° 51' 19.5138 | W111° 57' 2.1302 | Jefferson Co. – I-90 Mulligan Canyon exit | J3 | 08/11/09 |
| **LIVU2** | CALU | N47° 10' 8.5604 | W114° 4' 51.9037 | Lake Co. – Jacko River Fish Hatchery | La01 | 09/09/09 |
| **LIVU2** | | N46° 36' 43.7392 | W112° 4' 27.9777 | Lewis & Clark Co. – Helena Spring Meadows SP | Lc5 | 09/03/09 |
| **LIVU2** | GYAN | N48° 40' 1.7671 | W114° 45' 11.9817 | Lincoln Co. – Stillwater State for Hyw 93 | Still | 07/30/09 |
| **LIVU2** | | N45° 34' 13.9144 | W111° 41' 32.3141 | Madison Co. – Sterling Rd w of Norris | Mad2 | 08/05/09 |
| **LIVU2** | GYAN | N45° 17' 5.1395 | W111° 53' 24.0359 | Madison Co. – Virginia City Pass | Mad4 | 08/05/09 |
| **LIVU2** | GYAN | N47° 0' | W114° 44' | Mineral Co. – Tarkis Rd | Min3 | 08/13/09 |

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| | MEJA | 45.1702 | 4.3636 | | | |
| **LIVU2** | GYAN<br>BRPU<br>CALU | N47° 2'<br>44.5552 | W113° 7'<br>56.9332 | Powell Co. – Brown Lake Rd | Ad7 | 07/22/09 |
| **LIVU2** | GYAN | N46° 22'<br>43.5216 | W112° 44'<br>10.6399 | Powell Co. – Deer Lodge exit Arrowstone Park | Pow1 | 08/11/09 |
| **LIVU2** | GYAN | N46° 35'<br>9.5788 | W114° 4'<br>13.2795 | Ravalli Co. – Poker Joe's Fishing Access | Rav1 | 08/12/09 |
| **LIVU2** | GYAN<br>BRPU | N46° 35'<br>7.8694 | W114° 4'<br>47.6602 | Ravalli Co. – S. of Stevensville | Rav3 | 08/12/09 |
| **LIVU2** | GYAN<br>BRPU<br>CALU | N46° 18'<br>0.6496 | W114° 6'<br>48.4958 | Ravalli Co. – Woodside Bridge Fishing Access | RavaLv002 | 09/25/09 |
| **LIVU2** | GYAN<br>BRPU<br>CALU | N46° 1'<br>58.4671 | W112° 44'<br>25.3636 | Silver Bow Co. – Craddock Rd near exit 211 | Sb4 | 08/11/09 |
| **LIVU2** | GYAN | N45° 58'<br>34.7281 | W112° 28'<br>34.5953 | Silver Bow Co. – I-90 Exit 227 frontage Rd | Sb1 | 08/11/09 |
| **LIVU2** | GYAN<br>BRPU<br>CALU | N45° 56'<br>58.3029 | W112° 28'<br>3.5341 | Silver Bow Co. – Near Winter Sports Complex | Butte1 | 07/17/09 |
| **MRRIO** | | N45° 44'<br>18.0971 | W108° 32'<br>20.1877 | Yellowstone Co. – Billings Riverfront Park W. side | YellMs001 | 09/18/09 |
| **MYRIO** | | N46° 20'<br>4.3762 | W111° 31'<br>45.3165 | Broadwater Co. – Indian Road CG | Ad 4 | 07/22/09 |
| **MYRIO** | EULE | N46° 7'<br>18.8017 | W111° 24'<br>13.8694 | Broadwater Co. – Toston Dam | BW01 | 08/25/09 |
| **MYRIO** | | N47° 9'<br>14.1742 | W111° 50'<br>23.3602 | Cascade Co. – Missouri River Mountain Place | Cas2 | 09/03/09 |
| **MYRIO** | | N45° 44'<br>14.6712 | W108° 32'<br>25.4734 | Glacier Co. – Hy2 Blackfoot | GlacEa001 | 09/11/09 |
| **MYRIO** | Weevil | N46° 9'<br>44.3448 | W113° 5'<br>45.1693 | Granite Co. – Georgetown lake Comers Point Fishing Access | GranEa001 | 09/23/09 |
| **MYRIO** | | N48° 53'<br>35.9350 | W115° 7'<br>16.6483 | Lincoln Co. – Solfie Lake | Eureka1 003 | 07/29/09 |
| **MYRIO** | No<br>weed | N48° 28'<br>59.1319 | W115° 16'<br>13.6911 | Lincoln Co. – Lake Koocanusa Cripple Horse boat ramp | Lake1 | 07/30/09 |
| **MYRIO** | No<br>weed | N48° 39'<br>5.3553 | W115° 18'<br>44.2383 | Lincoln Co. – Lake Koocanusa Rocky Gorge CG | Lake2 | 07/30/09 |
| **MYRIO** | Weevil | N48° 14'<br>51.4410 | W114° 58'<br>15.0870 | Lincoln Co. - Island Lake | Isl | 08/18/09 |
| **MYRIO** | | N48° 44'<br>59.4497 | W114° 53'<br>19.1446 | Lincoln Co. – Ranger Station Murphy Lake | Dickey 002 | 07/30/09 |
| **MYRIO** | EULE | N48° 51'<br>38.3098 | W114° 55'<br>46.8181 | Lincoln Co. – Therriault Road | Therri | 07/30/09 |
| **MYRIO** | | N45° 26'<br>35.7870 | W111° 42'<br>21.4633 | Madison Co. – Meadow Lake Fishing Access | Mad3 | 08/05/09 |
| **MYRIO** | | N45° 17'<br>40.0935 | W111° 57'<br>32.7624 | Madison Co. – Virginia City | Mad5 | 08/05/09 |
| **MYRIO** | CARU | N47° 1'<br>18.0082 | W113° 22'<br>49.4374 | Missoula Co. – Harpers Lake | Ad8 | 07/22/09<br>07/30/09 |
| **MYRIO** | | N46° 39'<br>38.4970 | W114° 4'<br>23.1935 | Missoula Co. – Chief Looking Glass Rd | Mis2 | 08/12/09 |
| **MYRIO** | | N47° 42'<br>5.3662 | W114° 40'<br>15.1235 | Sanders Co. – Dry Fork Reservoir | San2 | 09/09/09 |
| **MYRIO** | | N47° 57'<br>37.2455 | W112° 24'<br>17.6956 | Teton Co. – Byrum Reservoir | Ad19 | 07/23/09 |
| **MYRIO** | Weevil | N47° 31'<br>42.2243 | W111° 14'<br>16.1081 | Teton Co. – Eyraud Lakes | Teton01 | 09/04/09 |
| **MYRIO** | | N45° 48'<br>31.8393 | W108° 27'<br>41.3333 | Yellowstone Co. – Voyagers Rest Fishing Access | YellEa002 | 09/21/09 |
| **MYRO** | | N44° 59'<br>39.5529 | W112° 51'<br>14.8001 | Beaverhead Co. – Clark Reservoir | Clark | 07/22/09 |
| **MYRO** | | N44° 59'<br>21.0199 | W112° 51'<br>5.3499 | Beaverhead Co. – Clark Reservoir | Clark 002 | 07/22/09 |
| **MYRO** | No | N46° 39' | W113° 8' | Granite Co. – Drummond Fairgrounds | Gran2 | 08/13/09 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | weed | 35.4078 | 48.2504 | | | |
| **MYRO** | No weed | N46° 39' 35.4078 | W113° 8' 48.2504 | Granite Co. – Drummond Fairgrounds | Gran2 | 08/13/09 |
| **CABOM** | | N47° 1' 14.2995 | W113° 22' 50.2627 | Missoula Co. – Blanchard Lake | Ad9 | 07/22/09 |
| **MYSP2** | | N47° 50' 29.24 | W115° 35' 46.71 | Sanders Co. – Noxan Reservoir Trout Creek | San5 | 09/16/09 |
| **CABOM** | | N48° 14' 50.6478 | W112° 46' 15.7730 | Pondera Co. – Lake Frances | PondEa001 | 09/12/09 |
| **CABOM** | | N48° 36' 7.2924 | W112° 15' 7.4259 | Pondera Co. – Spotted Eagle Rd | PondEa002 | 09/12/09 |
| **CABOM** | | N46° 18' 49.5327 | W114° 8' 37.1265 | Ravalli Co. – Sleeping Child Rd | RavaEa001 | 09/25/09 |
| **POTAM CEDE4** | | N45° 36' 17.7007 | W110° 55' 36.8573 | Gallatin Co. – Bear Canyon New World Tr | Galla2 | 09/02/09 |
| **POTAM CABOM** | | N46° 36' 43.7392 | W112° 4' 27.9777 | Lewis & Clark Co. – Helena Spring Meadows SP | Lc5 | 09/03/09 |
| **POTAM** | | N47° 42' 5.7211 | W114° 40' 14.2944 | Sanders Co. – Dry Fork Reservoir | San1 | 09/09/09 |
| **TRPE21** | | N46° 5' 38.4347 | W112° 48' 25.6492 | Missoula Co. – Hwy 95 n. of Missoula | Mis01 | 09/08/09 |
| **TRPE21** | | N46° 53' 56.3397 | W113° 58' 40.2225 | Missoula Co. - Hwy 93 n. Missoula | MissAa001 | 09/24/09 |
| **TRPE21** | | N48° 16' 17.2141 | W112° 53' 48.2309 | Pondera Co. – Spotted Eagle Rd | PondAa001 | 09/12/09 |
| **TRPE21** | | N47° 42' 5.7211 | W114° 40' 14.2944 | Sanders Co. – Dry Fork Reservoir | San1 | 09/09/09 |
| **TRPE21** | OMOH ? | N48° 50' 52.3056 | W113° 25' 15.0440 | Toole Co. - Shelby | ToolAa001 | 09/15/09 |
| **TRPE21** | Stem miner | N45° 16' 41.0154 | W109° 12' 30.1102 | Toole Co. - Shelby | ToolCn002 | 09/15/09 |
| **VEHT** | | N48° 53' 18.4511 | W113° 12' 50.9772 | Glacier Co. – S. of Babbs | GlacVt002 | 09/12/09 |
| **VETH** | | N47° 19' 43.3535 | W115° 1' 20.0667 | Beaverhead Co. – Rt 43 Powerhouse | Bvhd01 | 09/11/09 |
| **VETH** | | N46° 15' 3.2068 | W111° 40' 20.3049 | Broadwater Co. – Crow Creek CG N. of Raidersburg | BW03 | 08/25/09 |
| **VETH** | | N46° 7' 35.4812 | W111° 23' 39.7905 | Broadwater Co. – Road to Toston Dam | BW05 | 08/25/09 |
| **VETH** | GYTE | N45° 27' 6.8952 | W109° 12' 36.2475 | Carbon Co. – Cooney Dam Rd Boyd | CarbTv001 | 09/20/09 |
| **VETH** | | N45° 20' 9.1412 | W109° 10' 53.8057 | Carbon Co. – S. of Red Lodge Bull Spring Fishing Access | CarbTv002 | 09/20/09 |
| **VETH** | | N47° 9' 43.8484 | W111° 49' 19.9068 | Cascade Co. – Great Falls Big Springs SP | Cas3 | 09/04/09 |
| **VETH** | | N46° 37' 25.9683 | W111° 58' 50.9578 | Cascade Co. – I-15 exit 244 | Cas1 | 09/03/09 |
| **VETH** | GYTE | N46° 12' 5.5803 | W113° 10' 6.4086 | Deer Lodge Co. – Hwy 1 | DeerTv002 | 09/23/09 |
| **VETH** | | N46° 11' 40.2325 | W112° 58' 11.0492 | Deer Lodge Co. – Road to Lost Creek SP | Dl2 | 08/11/09 |
| **VETH** | | N48° 11' 59.0236 | W114° 58' 47.8484 | Flathead Co. – Lynch Lake | FlatH01 | 08/19/09 |
| **VETH** | | N45° 41' 58.0063 | W111° 3' 28.8571 | Gallatin Co. – Bozeman N 19th | P2 | 07/16/09 |
| **VETH** | GYTE | N45° 53' 56.9537 | W111° 32' 0.3787 | Gallatin Co. – Three Forks Ponds | 3forks ponds | 07/17/09 |
| **VETH** | | N48° 34' 35.1735 | W112° 51' 48.6877 | Glacier Co. – HY 2 Blackfoot | GlacVt001 | 09/11/09 |
| **VETH** | | N46° 39' 35.4078 | W113° 8' 48.2504 | Granite Co. – Drummond Fairgrounds | Gran2 | 08/13/09 |
| **VETH** | | N46° 39' 35.4078 | W113° 8' 48.2504 | Granite Co. – Drummond Fairgrounds | Gran2 | 08/13/09 |
| **VETH** | | N46° 10' 51.5699 | W113° 19' 0.4246 | Granite Co. – FR 672 & 406 | GranTv002 | 09/23/09 |
| **VETH** | | N45° 51' | W111° 57' | Jefferson Co. - Cardwell | Card | 07/17/09 |

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|---|---|---|---|---|---|---|
| | | 13.9014 | 0.0657 | | | |
| **VETH** | GYTE | N45° 49' 21.1008 | W111° 51' 6.9333 | Jefferson Co. – Lewis & Clark Caverns | L&c cavern | 07/17/09 |
| **VETH** | | N45° 49' 6.0392 | W111° 42' 49.4812 | Jefferson Co. – Near Willow Creek | Willow creek | 07/17/09 |
| **VETH** | GYTE | N48° 2' 11.6692 | W113° 57' 41.4940 | Lake Co. – Hwy 83 & Red Owl Rd/ Kelley Rd | Ad21 | 07/27/09 |
| **VETH** | | N47° 10' 8.5604 | W114° 4' 51.9037 | Lake Co. – Jacko River Fish Hatchery | La01 | 09/09/09 |
| **VETH** | | N47° 17' 51.8656 | W114° 8' 37.4538 | Lake Co. - N. Polson | La04 | 09/09/09 |
| **VETH** | | N46° 36' 43.7392 | W112° 4' 27.9777 | Lewis & Clark Co. – Helena Spring Meadows SP | Lc5 | 09/03/09 |
| **VETH** | | N47° 15' 9.2164 | W112° 3' 49.4070 | Lewis & Clark Co. – RT 287 mile post 14 N | Lc2 | 08/07/09 |
| **VETH** | | N48° 29' 53.2632 | W111° 50' 55.5814 | Liberty Co. – Tiber Dam | LibeVt001 | 09/15/09 |
| **VETH** | | N48° 10' 5.8609 | W115° 36' 15.6920 | Lincoln Co. – Bear Creek Rd | Mul | 07/28/09 |
| **VETH** | | N48° 53' 35.9345 | W115° 7' 16.6509 | Lincoln Co. – Eureka Black Lake Rd & RT 37 | Eureka1 003 | 07/29/09 |
| **VETH** | GYTE | N48° 45' 0.1833 | W114° 59' 25.8192 | Lincoln Co. – Fortine Meadow Creek Rd | Fortine003 | 07/30/09 |
| **VETH** | GYTE | N48° 45' 53.3204 | W114° 53' 54.5681 | Lincoln Co. – Fortine roadside river park | Fortine | 07/30/09 |
| **VETH** | GYTE | N48° 43' 9.0417 | W114° 49' 23.8034 | Lincoln Co. – Hyw 93 near Dickey Lake | Dickey | 07/30/09 |
| **VETH** | | N48° 30' 50.3616 | W115° 15' 24.2743 | Lincoln Co. – Lake Koocanusa Warland Creek Rd | Lake1 002 | 07/30/09 |
| **VETH** | | N48° 28' 59.1319 | W115° 16' 13.6911 | Lincoln Co. – Lake Koocanusa Cripple Horse boat ramp | Lake1 | 07/30/09 |
| **VETH** | GYTE | N48° 39' 5.3553 | W115° 18' 44.2383 | Lincoln Co. – Lake Koocanusa Rocky Gorge CG | Lake2 | 07/30/09 |
| **VETH** | | N48° 52' 36.7103 | W115° 5' 15.2080 | Lincoln Co. – W. of Eureka | Eureka1 002 | 07/29/09 |
| **VETH** | | N45° 18' 37.0182 | W111° 58' 22.8367 | Madison Co. – Granite Creek Rd | Mad7 | 08/05/09 |
| **VETH** | | N45° 17' 40.0935 | W111° 57' 32.7624 | Madison Co. – Virginia City | Mad5 | 08/05/09 |
| **VETH** | GYTE | N47° 0' 44.5878 | W114° 40' 47.5395 | Mineral Co. – I-90 Fish Creek exit (66) | Min1 | 08/12/09 |
| **VETH** | GYTE | N47° 0' 45.1702 | W114° 44' 4.3636 | Mineral Co. – Tarkis Rd | Min3 | 08/13/09 |
| **VETH** | | N46° 47' 30.1495 | W112° 1' 41.2834 | Missoula Co. – National Cemetery Rd | Ad 20 | 07/27/09 |
| **VETH** | | N46° 22' 43.8396 | W112° 44' 11.0321 | Missoula Co. – S. of Lolo | Mis1 | 08/12/09 |
| **VETH** | GYTE | N46° 15' 17.4540 | W114° 11' 41.1970 | Park Co. – I-90 exit 350 | ParkTv002 | 09/19/09 |
| **VETH** | GYTE | N45° 28' 59.7882 | W110° 37' 16.3874 | Park Co. – Mallards Rest Fishing Access | Mallards Rest | 07/14/09 |
| **VETH** | | N47° 59' 43.2098 | W112° 1' 39.6380 | Pondera Co. - Brady | Pon01 | 09/04/09 |
| **VETH** | GYTE | N46° 34' 29.1198 | W112° 30' 35.1028 | Powell Co. - Avon | Ad 5 | 07/22/09 |
| **VETH** | GYTE | N46° 48' 9.9956 | W112° 48' 29.3727 | Powell Co. – Nevada Lake | Nevada | 08/18/09 |
| **VETH** | GYTE | N46° 35' 9.5788 | W114° 4' 13.2795 | Ravalli Co. – Poker Joe's Fishing Access | Rav1 | 08/12/09 |
| **VETH** | | N46° 35' 7.8694 | W114° 4' 47.6602 | Ravalli Co. – S. of Stevensville | Rav3 | 08/12/09 |
| **VETH** | | N46° 10' 5.2027 | W114° 9' 33.3410 | Ravalli Co. – Sleeping Child Rd | RavaTv002 | 09/25/09 |
| **VETH** | | N47° 34' 15.3923 | W115° 15' 51.5505 | Sanders Co. – Airport Rd near Thompson Falls | San04 | 09/09/09 |
| **VETH** | | N47° 42' | W114° 40' | Sanders Co. – Dry Fork Reservoir | San1 | 09/09/09 |

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|---|---|---|---|---|---|---|
| | | 5.7211 | 14.2944 | | | |
| **VETH** | GYTE | N45° 58' 34.7281 | W112° 28' 34.5953 | Silver Bow Co. – I-90 Exit 227 frontage Rd | Sb1 | 08/11/09 |
| **VETH** | GYTE | N45° 56' 58.3029 | W112° 28' 3.5341 | Silver Bow Co. – Near Winter Sports Complex | Butte1 | 07/17/09 |
| **VETH** | | N48° 55' 42.4374 | W111° 11' 12.8386 | Yellowstone Co. – Billings Riverfront Park w. side | YellTv001 | 09/18/09 |
| **VETH** | GYTE | N47° 1' 20.5275 | W114° 6' 40.2375 | Yellowstone Co. – Pryor creek Rd | YellTv002 | 09/19/09 |