
Cooperative Agricultural Pest Survey (CAPS)

Annual Reports Colorado FY2008

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Annual Report for Colorado
Cooperative Agricultural Pest Survey

February 28, 2009

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Department of Plant Industry
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Colorado CAPS 2008

Summary

The following document contains information on the 12 CAPS projects carried out in Colorado for 2008. For the CAPS program in Colorado for the 2008 fiscal year (March 1, 2008 to February 28, 2009) a variety of activities and surveys were completed. The cooperators for this year's work with the Colorado Department of Agriculture include Colorado State University (CSU), Colorado State Forest Service (CSFS), and the United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (USDA, APHIS, PPQ)(See Table 1).

Table 1.

Project/Survey	Cooperator(s)
Exotic Woodboring Beetles	CSU and CDA
Firewood and Campground Exotic Pest Survey	CSU
Exotic Fruit Pests Surveys	CSU and CDA
Exotic Moth Survey	CSU
Emerald Ash Borer	CDA, CSFS and PPQ
Weed Survey and Biocontrol Project	CDA
Cereal Leaf Beetle Survey	CSU
Monitoring <i>Diorhabda elongata</i>	CSU
Yellow Star Thistle	CDA
Karnal Bunt Survey	CSU
Potato Cyst Nematode Survey	CDA and CSU

In February I was hired to be the CAPS Coordinator (State Survey Coordinator) by the Colorado Department of Agriculture. I've spent the year getting familiar with the various members of the State CAPS Committee and the various cooperators in the CAPS program. I've also had the chance to meet other individuals and groups that are

concerned with, or work on exotic/invasive plant pest issues. A State CAPS Committee meeting was held at CSU on April 4, 2008.

For the CDA's portion of the trapping two seasonal technicians were hired in May. One full-time technician (Mark Origer) was hired to cover the Denver Metro area setting traps for the exotic woodboring beetles, exotic fruit pests and Japanese beetles. The other part-time technician (Brook Mark) was hired out of Colorado Springs to set traps for the exotic woodboring beetles, exotic fruit pests and Emerald Ash Borer in Colorado Springs and Cañon City. Mr. Origer has done the trapping for a number of years, and the program was fortunate to have his experience and dedication. Training for the technician in Colorado Springs, Ms. Mark was also a good learning experience for me, especially the trapping for Emerald Ash Borer.

The sampling for the Potato Cyst Nematode (PCN) survey was carried out for Colorado from June through October. After some late changes to the sampling protocol, we were able to get a contractor up and running to take the samples in the San Luis Valley.

Outreach

The following is a list of some of the CAPS outreach activities for the year:

- Gave a talk to the Colorado Weed Management Association at their annual meeting Provided information and brochures to Colorado Nursery and Greenhouse Association
- Brochures and posters to US Forest Service for distribution to National Parks in CO
- Article for Colorado Nursery and Greenhouse Association newsletter
- Television interview with KOAA TV (NBC) in Colorado Springs regarding Emerald Ash Borer trapping and the importance of not moving firewood
- Booth at the Colorado State Fair
- Presentation to the Garden Club of Denver (about 50 people)
- Booth at the ProGreen Expo in Denver

- Staffed a booth at the National Ski Area Association meeting in coordination with The Nature Conservancy's Invasive Species Team, "Don't Move Firewood"



Don't Move Firewood Outreach at State Fair

In December I attended the National CAPS Conference in Phoenix Arizona and I also attended 3 days of Pest Survey Specialist Training at the USDA APHIS Professional Development Center in Frederick, Maryland.

The rest of this document contains the reports for all of the 2008 Colorado CAPS Projects.

PEST SURVEY

1. Exotic Wood Associated Insect Survey

Project Coordinators: Lou Bjostad and David James (CSU) and John Kaltenbach (CDA)

Objective:

The purpose of this project was to conduct an early detection visual survey along with Lindgren trapping for the following:

1. Mediterranean pine engraver beetle – *Orthotomicus erosus* (National List)
2. European spruce bark beetle - *IPS typographus* (National List)
3. European wood wasp – *Sirex noctilio* (National List)
4. Red-haired bark beetle - *Hylurgus ligniperda* (National List)
5. Emerald ash borer - *Agrilus planipennis* (National List)
6. Asian Longhorned Beetle - *Anoplophora glabripennis* (National List)
7. Pine shoot beetle - *Tomicus piniperda* (National List)

Surveys were done by following the Exotic Wood Borer Bark Beetle National Survey protocol. Exotic wood associated insects have emerged as significant pests to established landscape plantings as well as wood commodities. As these insects continue to spread and inflict economic injury it is prudent for Colorado to establish an effort to monitor for them. The above mentioned exotic wood associated insects have recently been targeted by APHIS as posing a serious threat to wood commodities. Valuable wood resources in the state of Colorado are at risk to these types of exotics.

Methods and Results:

Colorado State University and the Colorado Department of Agriculture deployed one 12-funnel Lindgren funnel trap or Box style trap at each of 38 high-risk sites in Colorado (Photo 1, 2). Each trap was baited with a variety of lures including ethanol, alpha-pinene, and 3-part IPS lures. On the western slope, 3 sites were checked in Mesa County, 4 sites were checked in Delta County, 3 sites were checked in Ouray, and 1 site was checked in Montrose County. In eastern Colorado, 8 sites were checked in Larimer County, 4 sites were checked in El Paso County, 3 sites were checked in Weld County, 2 sites were checked in Boulder County, 2 sites were checked in Denver County, 2 sites were checked in Douglas County, and 1 site was checked in Morgan, Yuma, and Logan

Counties. Most sites were trapped with a single Lindgren funnel trap in which different lures were alternated. Visual surveys were also performed at each site. Most sites were visited every other week. Sites included distribution centers, lumber and saw mills, nurseries, locations near airports, state parks, and mills. Suspect specimens were sent to Dr. Boris Kondratieff at CSU for identification. No target specimens were found. One non-native/exotic beetle was found, the Peach Bark Beetle, *Phloeotribus liminaris* (Curculionidae). The Peach Bark Beetle (PBB) is native to the northeastern US and can be an economical pest of Black Cherry Trees and an occasional pest of stone fruit trees. The find was in Douglas County, on the eastern side of the Rockies, not on the West Slope where Peaches are valuable Colorado commodity.

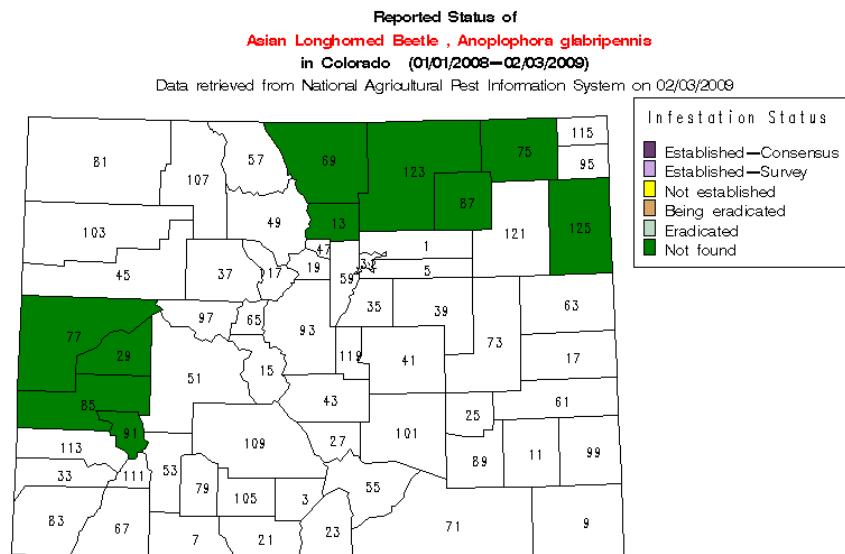
Sinoxylon anale, the auger beetle (Bostrichidae), was found in a walk-in sample at the Grand Junction cooperative extension office. This beetle was found emerging from pallets originating in India. Bob Hammon worked along with APHIS personnel to burn 100 wooden pallets from the suspect facility in Grand Junction.



Photo 1. Lindgren funnel trap.

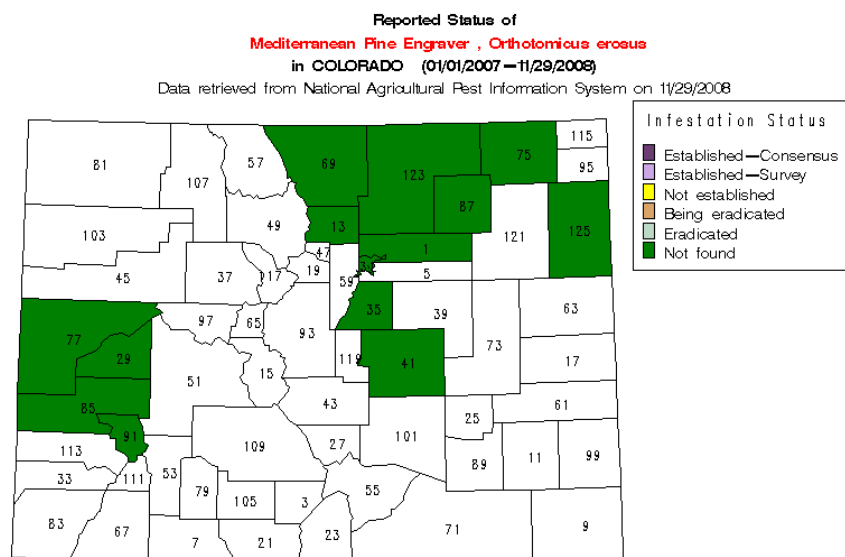


Photo 2. Wood Pallet Site.



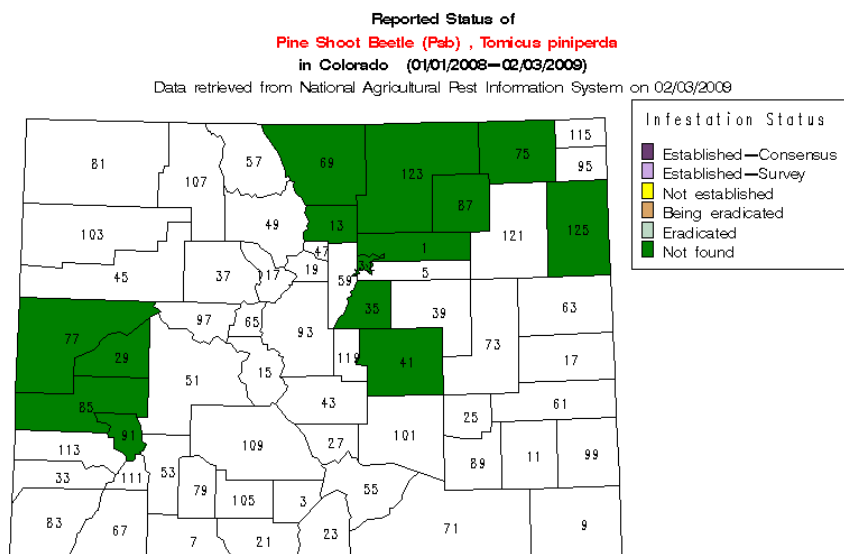
The Center for Environmental and Regulatory Information Systems does not certify the accuracy or completeness of the map.
 Negative data spans over last 3 years only.

Figure 1. NAPIS map of counties surveyed for Asian longhorned beetle in Colorado.



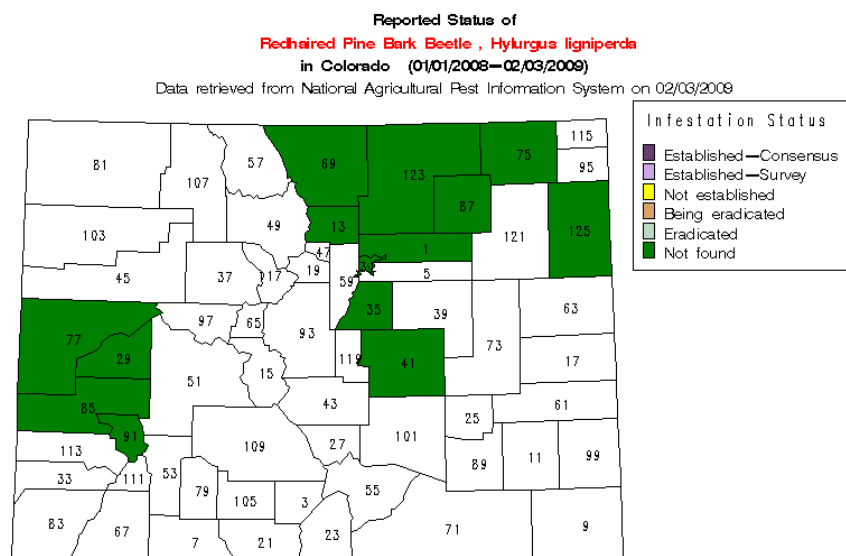
The Center for Environmental and Regulatory Information Systems does not certify the accuracy or completeness of the map.
 Negative data spans over last 3 years only.

Figure 2. NAPIS map of counties surveyed for Med Pine Engraver in Colorado.



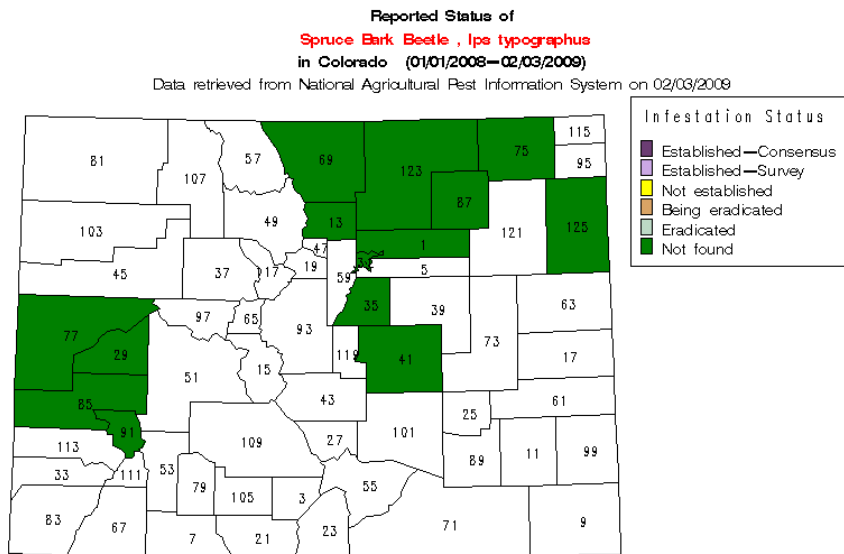
The Center for Environmental and Regulatory Information Systems does not certify the accuracy or completeness of the map.
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Figure 3. NAPIS map of counties surveyed for Pine Shoot Beetle in Colorado.



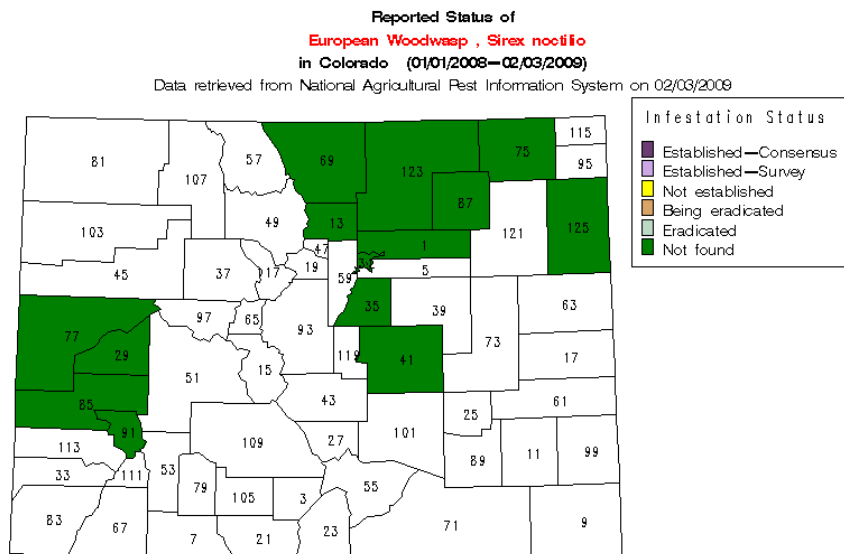
The Center for Environmental and Regulatory Information Systems does not certify the accuracy or completeness of the map.
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Figure 4. NAPIS map of counties surveyed for Redhaired Beetle in Colorado.



The Center for Environmental and Regulatory Information Systems does not certify the accuracy or completeness of the map.
Negative data spans over last 3 years only.

Figure 5. NAPIS map of counties surveyed for Spruce Bark Beetle in Colorado.



The Center for Environmental and Regulatory Information Systems does not certify the accuracy or completeness of the map.
Negative data spans over last 3 years only.

Figure 6. NAPIS map of counties surveyed for European Woodwasp in Colorado.

2. Exotic Fruit Pest Survey

Project Coordinators: Lou Bjostad and David James (CSU) and John Kaltenbach (CDA)

Objective:

The purpose of this project was to continue a trapping survey for early detection of the following insects:

1. Light brown apple moth - *Epiphyas postvittana* (National List)
2. False Codling Moth - *Thaumatotibia leucotreta* (National List)
3. Pear Leaf Blister Moth - *Leucoptera malifoliella* (State List)
4. Apple Ermine Moth - *Yponomeuta malinellus* (Colorado List)
5. Summer Fruit Tortrix Moth - *Adoxophyes orana* (National List)
6. Plum Fruit Moth - *Cydia funebrana* (State List)
7. Cherry Ermine Moth – *Yponomeuta padellus* (Colorado List)
8. Fruit Piercing Moth – *Eudocima fullonia* (National List)

This was done to help maintain a pest-free zone in Colorado for these pests, and to provide a means for early detection of insect pests which could pose restrictions for products exported from Colorado.

Methods and Results:

Pheromone-baited Pherocon 1C wing-style traps were installed at sites such as orchards, vineyards, botanical gardens, and nurseries where host plants occur (Photo 3). CSU surveys were conducted by Rick Zimmerman of Rogers Mesa Extension, Janet Hardin and David James and the by Mark Origer and Brook Mark of the Colorado Department of Agriculture. Surveys were performed with pheromone baited pherocon 1C wing traps. 8 traps were placed at each site by CSU personnel and 4 per site by CDA personnel. Sites surveyed this year included orchards, and nurseries in high fruit production areas on the western slope, and at high-risk nurseries and orchards on the Front Range. Counties surveyed include Delta, Weld, Adams, Fremont, El Paso and Larimer. (Table 2). Traps were installed by mid-May and serviced bimonthly or monthly depending on location through mid-September. Servicing of traps included collection of all contents and replacement of traps and attractants as directed. All trap contents for CSU were initially screened by Rick Zimmerman, Janet Hardin, and/or David James at

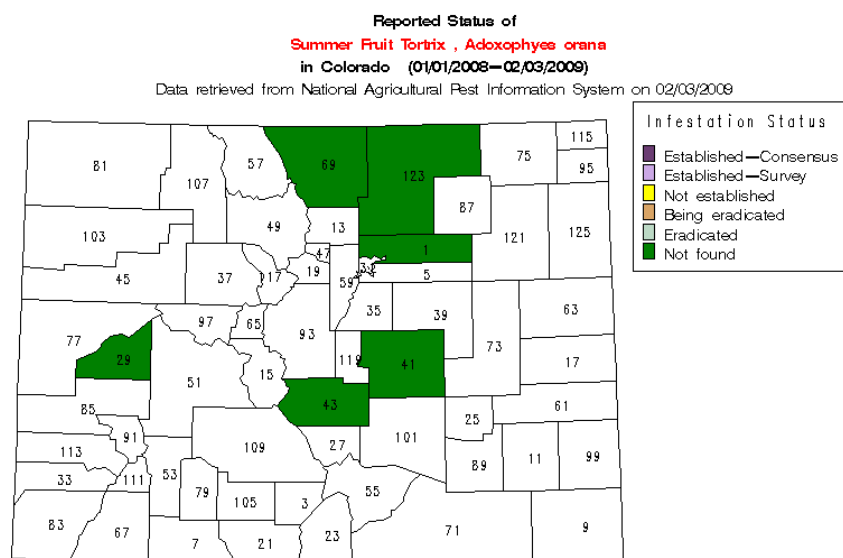
Colorado State University. Suspect material was sent to Boris Kondratieff, systematic entomologist at Colorado State University. No targeted pests were found (Fig 7-14). In addition to surveying for the Light Brown Apple Moth in the Exotic Fruit Pest Survey, an additional 50 traps were set by the Colorado Department of Agriculture as part of the National Light Brown Apple Moth Survey (see page 18).



Photo 3. Cooperator site used in this survey

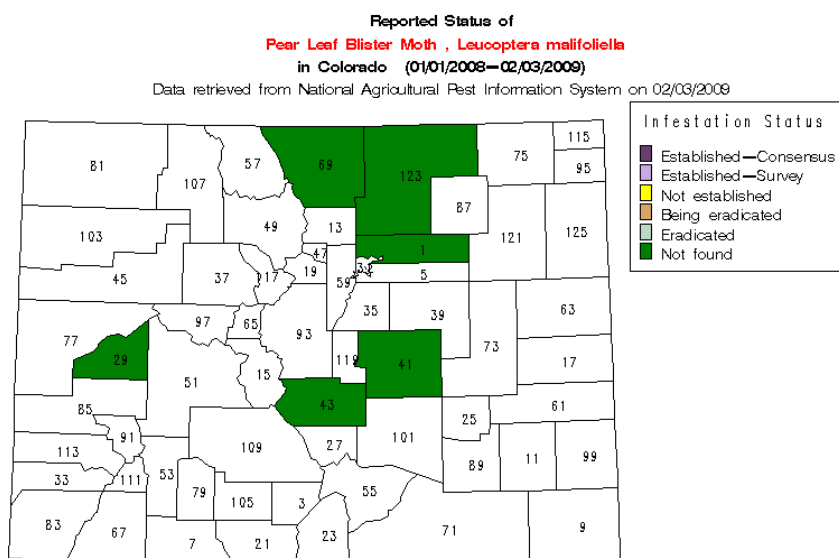
Table 2. Summary of trap- site numbers and results for exotic fruit pest surveys.

<u>Surveyor</u>	<u>County</u>	<u>No. Sites/Traps</u>	<u>No. Pos. Catches</u>
<u>CSU</u>			
Rick Zimmerman	Delta	6/48	0
David James	Larimer	1/8	0
Janet Hardin	Larimer	3/24	0
David James	Weld	1/8	0
Mark Origer	Adams	2/8	0
Brook Mark	Teller	4/16	0



The Center for Environmental and Regulatory Information Systems does not certify the accuracy or completeness of the map.
 Negative data spans over last 3 years only.

Figure 7. NAPIS map of counties surveyed for summer fruit tortrix in Colorado.



The Center for Environmental and Regulatory Information Systems does not certify the accuracy or completeness of the map.
 Negative data spans over last 3 years only.

Figure 8. NAPIS map of counties surveyed for Pear leaf blister moth in Colorado.

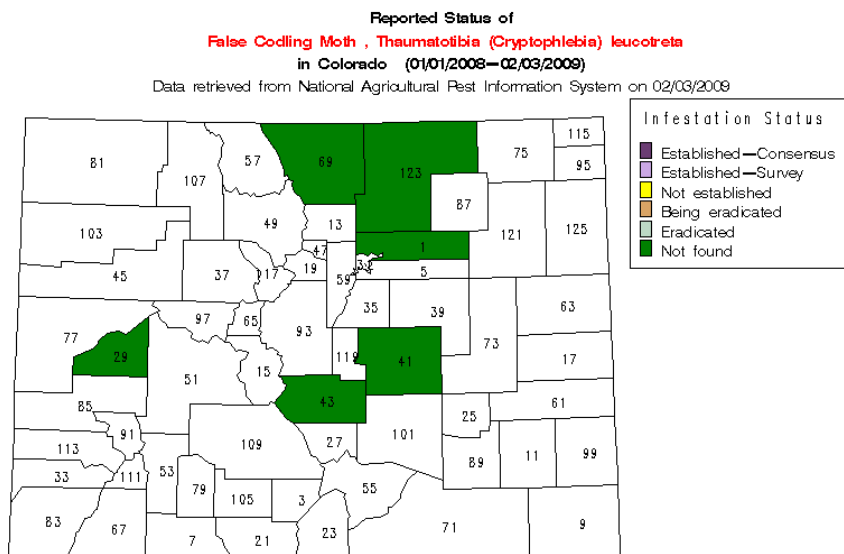


Figure 9. NAPIS map of counties surveyed for false coddling moth in Colorado.

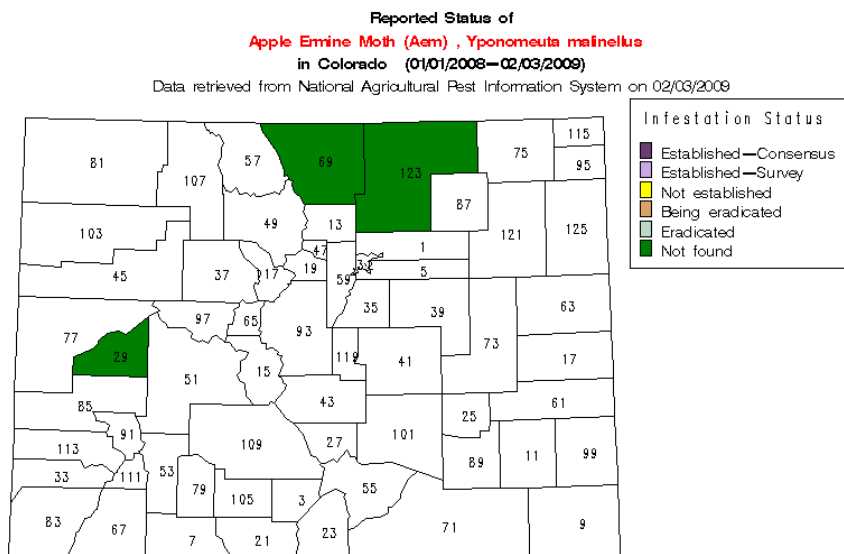
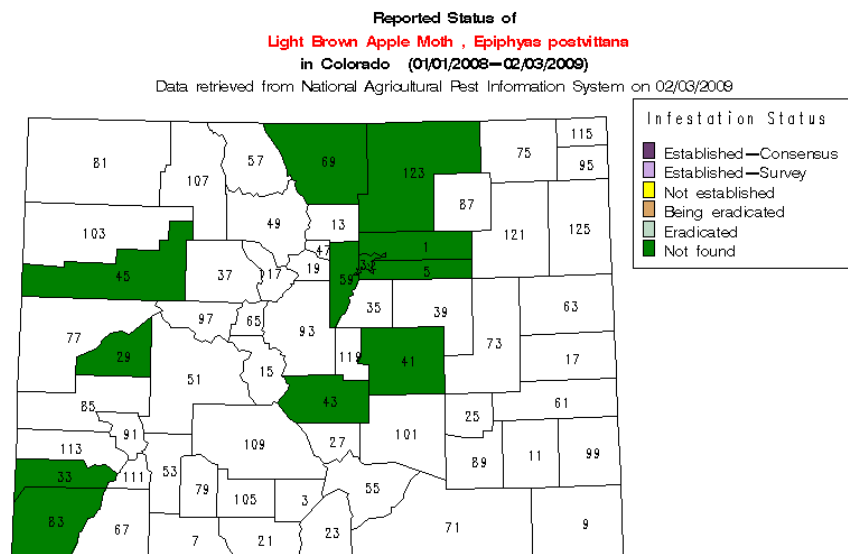
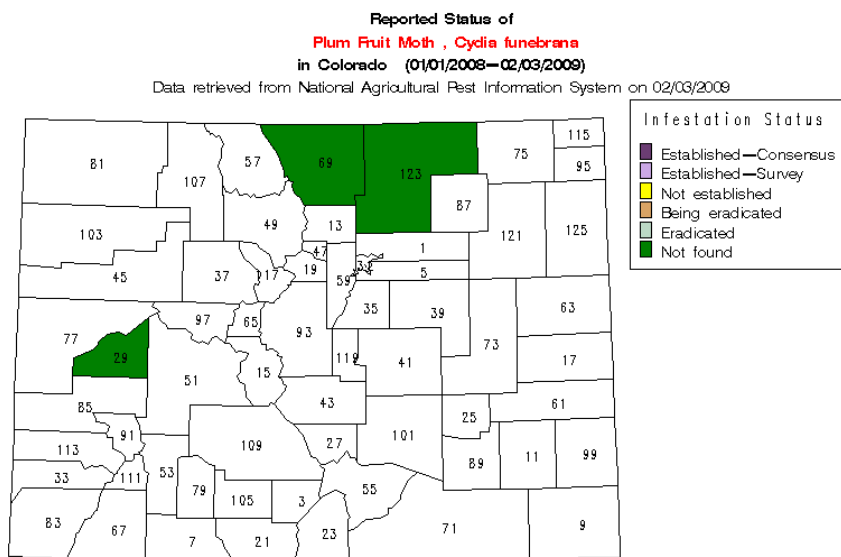


Figure 10. NAPIS map of counties surveyed for apple ermine moth in Colorado.



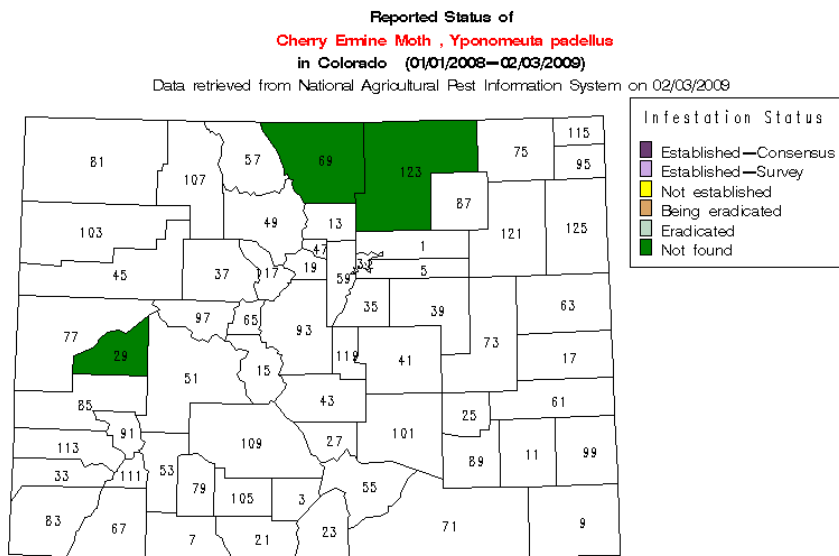
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 Negative data spans over last 3 years only.

Figure 11. NAPIS map of counties surveyed for LBAM in Colorado.



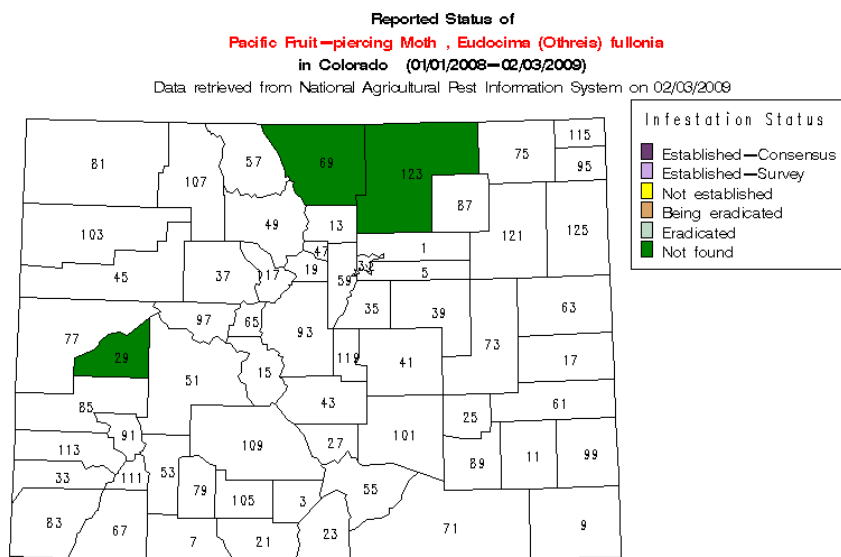
The Center for Environmental and Regulatory Information Systems does not certify the accuracy or completeness of the map.
 Negative data spans over last 3 years only.

Figure 12. NAPIS map of counties surveyed for plum fruit moth in Colorado.



The Center for Environmental and Regulatory Information Systems does not certify the accuracy or completeness of the map.
 Negative data spans over last 3 years only.

Figure 13. NAPIS map of counties surveyed for cherry ermine moth in Colorado.



The Center for Environmental and Regulatory Information Systems does not certify the accuracy or completeness of the map.
 Negative data spans over last 3 years only.

Figure 14. NAPIS map of counties surveyed for fruit-piercing moth in Colorado.

3. National Light Brown Apple Moth Survey

Project Coordinator: John Kaltenbach (CDA)

Objective:

The purpose of this project was to conduct the early detection survey for the Light Brown Apple Moth (*Epiphyas postvittana*) LBAM. Surveys were done at the request of USDA APHIS PPQ as part of a nationally directed survey for LBAM due to the occurrence of LBAM in California.



Colorado's risk was considered medium and therefore put out 50 traps at 25 sites (2 traps per site) baited with pheromone (Figure 11). Locations included nurseries, retail stores that import nursery stock and orchards. Ten counties were trapped: Adams, Arapahoe, Denver, Dolores, Douglas, El Paso, Fremont, Garfield, Jefferson and Montezuma. Traps were initially screened by John Kaltenbach for Tortricidae moths, and forwarded on to Dr. Boris Kondratieff at CSU for final disposition.

No LBAM were detected.

4. Exotic Moth Survey

Project Coordinators: Dr. Lou Bjostad and David James, (CSU)

Objective:

The purpose of this project was to conduct early detection surveys for the following exotic moths:

Old World Bollworm - *Helicoverpa armigera*
Egyptian Cottonworm - *Spodoptera littoralis*
Silver Y Moth - *Autographa gamma*

This was done to help establish state or county level exemptions for Colorado in the export of agricultural commodities if negative data is found. These pests all share corn

and wheat as potential hosts. According to Colorado Agricultural Statistics for 2005 (2004 data), Corn and wheat are the number 1 and number 3 crops in terms of value produced in Colorado. All three species can occur on most if not all of the top 20 crops produced in Colorado.

Methods and Results:

Surveys were performed by Bob Hammon of Mesa County Extension, David James, and Janet Hardin of Colorado State University. Surveys were performed with pheromone baited pherocon 1C wing traps in corn and/or wheat field. Overall, 24 sites were trapped for these exotic moths. On the western slope, 3 sites were trapped in each of the following counties: Mesa, Delta, and Montrose. In eastern Colorado, 12 sites were checked in

Larimer County, 2 sites were checked in Weld County, and 1 site was checked in Adams County.

Each site had a single trap for each exotic species (Table 3).

Each site had a single trap for each exotic species. Because screening for these



exotics often involves dissection of the suspect moths, trap numbers were reduced in order to allow time to properly screen what was caught.

Traps were serviced bimonthly or monthly depending on location through mid-September. Servicing of traps included collection of all contents and replacement of traps and attractants as directed. All trap contents were initially screened by Bob Hammon, Area Extension Agent, Tri River Area Extension. Suspect material was sent to

Boris Kondratieff, systematic entomologist at Colorado State University. No suspect moths were found. All trap catches were negative (Fig. 18-20).

Table 3. Summary of trap-site numbers and results for Exotic Moth Surveys.

Surveyor	County	Sites/Traps	# Positive traps
Bob Hammon	Delta	3/9	0
Bob Hammon	Montrose	3/9	0
Bob Hammon	Mesa	3/9	0
Hardin/James	Larimer	12/36	0
Hardin/James	Weld	2/6	0
Janet Hardin	Adams	1/3	0

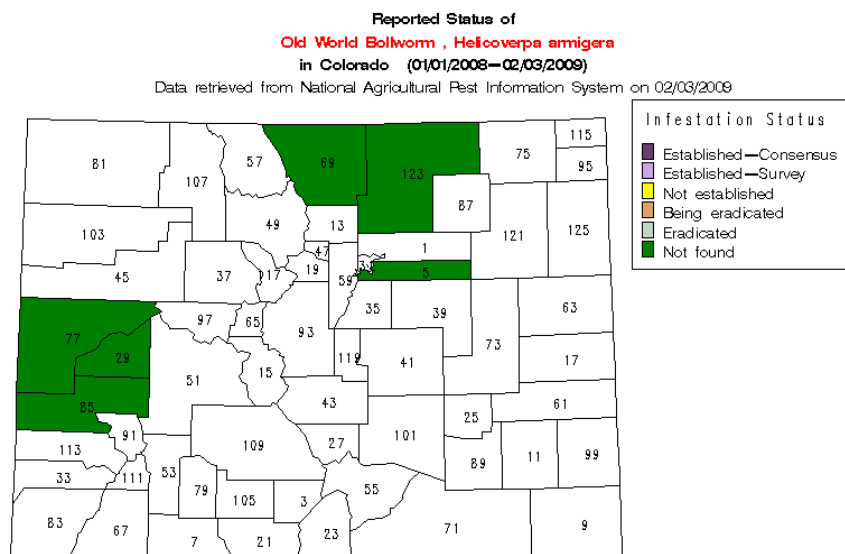


Figure 15. NAPIS map of counties surveyed for Old World bollworm in Colorado.

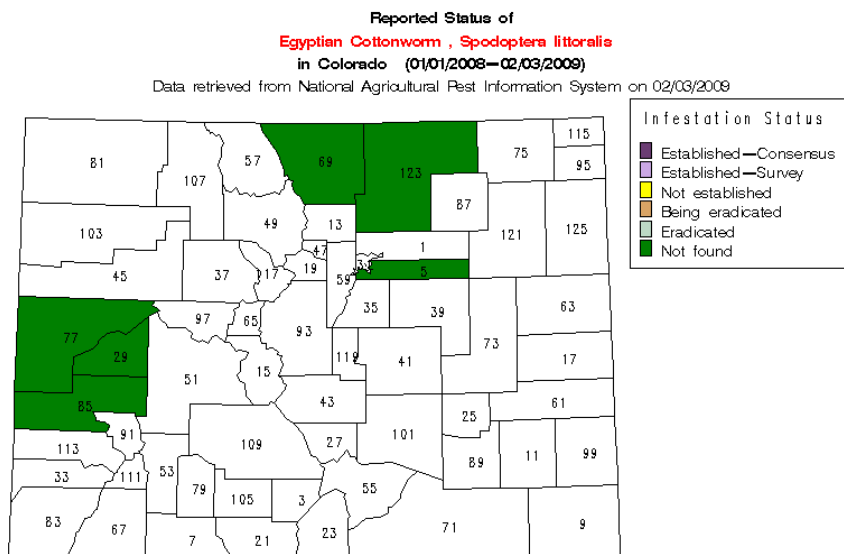


Figure 16. NAPIS map of counties surveyed for *Spodoptera littoralis* in Colorado.

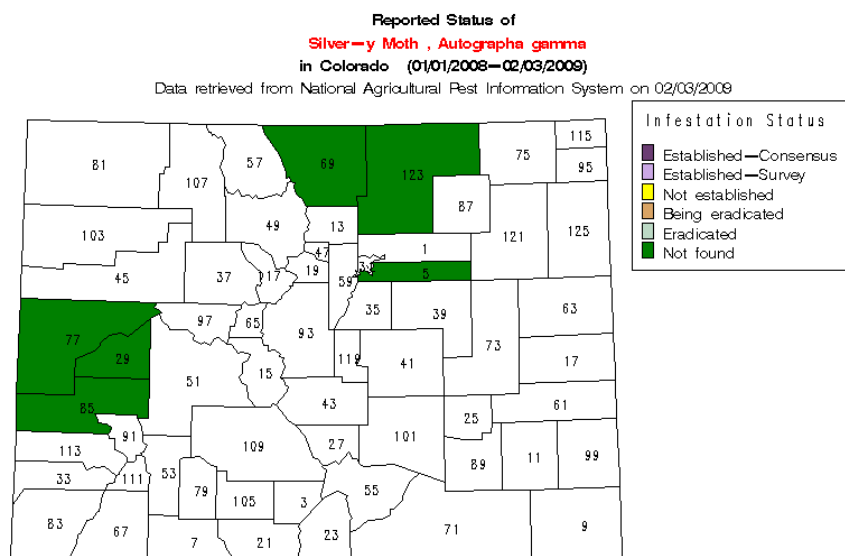


Figure 17. NAPIS map of counties surveyed for *Autographa Gamma* in Colorado.

5. Firewood Transportation in Colorado: Assessing the Risk of Forest Pest Movement

Project Coordinator, Colorado State University

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Introduction

Quantifying the movement of insects and pathogens on commercial firewood has not been assessed, and the volume and directional movement across state lines is not known. Firewood can harbor insects and fungi and transport those organisms across state borders. There are currently several exotic insects and fungi we hope to prevent from moving into new areas of the U.S., including the emerald ash borer (*Agrilus planipennis* Fairmaire), Sirex woodwasp (*Sirex noctilio* F.), Asian longhorned beetle (*Anoplophora glabripennis* Motschulsky) and *Phytophthora ramorum*, the pathogen responsible for sudden oak death and Ramorum blight. Future movement of non-native pests might be prevented if we can learn how to manage and restrict the movement of infested wood, particularly firewood.

Study Objectives

- Park visitor (camper) surveys: Quantify the number of campers visiting Colorado bringing firewood from out-of-state.
- Commercial firewood sales: Quantify the percentage of commercial firewood for sale in Colorado from out-of-state sources and the amount of insect and fungal evidence.
- Firewood pest collections: Determine if insects and viable fungal pathogens are transported into Colorado on commercial firewood.

Park Visitor (Camper) Surveys

Objectives: Quantify the number of campers visiting Colorado parks who are bringing firewood from outside of Colorado.

Colorado parks and campgrounds visited in summer 2008:

COLORADO NATIONAL PARKS

Rocky Mountain National Park

- Glacier Basin CG
- Moraine Park CG
- Aspenglen CG

Great Sand Dunes National Park and Preserve

- Pinyon Flats CG

COLORADO STATE PARKS

11-Mile State Park

- Stoll Mountain CG
- North Shore CG
- Rocky Ridge CG

Arapahoe Headquarters

Recreation Area

- Rincon CG
- Ruby Mountain CG
- Hecla Junction CG

Chatfield State Park

- A – D CGs combined

Cherry Creek State Park

- Albilene Loop CG

Golden Gate Canyon State Park

- Aspen Meadows CG
- Reverend's Ridge CG

Jackson Lake State Park

- Pelican, Cove, Lakeside CGs combined

North Sterling State Park

- Elks, Chimney, Inlet CGs combined



Results: 2008 Campground Surveys in Colorado NATIONAL PARKS (n = 290)

- 61% of visitors were from outside CO.
- 21% had no firewood
- 6% had out-of-state firewood, of which:
 - 10% purchased from out-of-state retailer
 - 20% purchased from out-of-state park vendor

- 5% cut out-of-state by visitor
- 20% scrap lumber / 2x4's
- 45% from other sources (pallets, slash, lumber, collected)
- 68% had Colorado firewood, of which:
 - 60% purchased from park vendor
 - 18% purchased outside park
 - 5% cut by visitor
 - 17% from other sources

Results: 2008 Campground Surveys in Colorado STATE PARKS (n = 366)

- 35% of visitors were from outside CO.
- 37% had no firewood
- 2% had out-of-state firewood, of which:
 - 25% purchased from out-of-state retailer
 - 13% cut or collected out-of-state by visitor
 - 22% scrap lumber / 2x4's
 - 41% from other sources
 - 53% had Colorado firewood, of which:
 - 40% purchased from park vendor
 - 21% purchased outside park
 - 10% cut by visitor
 - 29% from other sources

Commercial Firewood Sales in Colorado

Objectives: Determine where retail/pre-packaged firewood is distributed from

- *in-state movement*
- *out-of-state imports*
- *who sells firewood, who does not sell firewood*

Twenty-seven cities throughout Colorado were chosen to survey local businesses for firewood sales. The majority of stores were visited and firewood was visually assessed for type, bark presence, previous insect and/or fungal evidence. The exceptions were cities on the eastern plains, which were surveyed through phone interviews. If retailers on the eastern plains had sold firewood, we would have visited that part of the state to assess firewood sales, but the majority of retailers did not sell firewood.

Western slope

- Durango
- Glenwood Springs
- Grand Junction
- Frisco
- Georgetown
- Rifle
- Vail

Eastern plains

- Sterling
- Burlington
- Lamar
- Wray
- Yuma
- Lamar

Front Range

- Lakewood
- Fort Collins
- Colorado Springs
- Pueblo
- Castle Rock
- Estes Park
- Thornton
- Englewood
- Lakewood
- Loveland

Retail Types Chosen for Colorado Firewood Survey:

- Big box/department stores (i.e. Wal-Mart)
- Grocery stores (i.e. Safeway)
- Convenience stores (i.e. 7-11, gas stations)
- Other (farm and ranch stores, hardware stores, etc.)
- Firewood retailers

Other Firewood facts (n = 72 bundles):

- conifer: 66%
- hardwood: 29%
- bark attached: 93%
- out-of-state source: 43%
- Out-of-state distributors (and species distributed from that state or headquarters):
California (California laurel, alder, western red cedar, jeffrey pine), Kansas (oak, hickory), Missouri (oak, apple, persimmon), New Mexico (ponderosa, jeffrey pine) Pennsylvania (yellow poplar), Texas (unknown spp.), British Columbia, Canada (lodgepole pine)

Retail Firewood Sales: Who Sells Firewood in Colorado?

We visited or contacted 138 retailers in Colorado in 27 cities and asked if they sold firewood at all, year-round, or seasonally. Results are separated by region and retailer below:

Retailer Type	Never sell	Seasonal sales (winter)	Year-round sales
Eastern Colorado (n = 21)	90%	0%	10%
Front Range (n = 69)	32%	10%	58%
Western Slope (n = 48)	38%	31%	31%

Retailer Type	Never sell	Seasonal sales (winter)	Year-round sales
Corner stores / gas stations (n = 63)	56%	6%	38%
Grocery stores (n = 39)	28%	5%	67%
Big box stores (n = 21)	19%	62%	19%
Other (hardware, farm and ranch stores) (n = 13)	77%	15%	8%

Firewood pest collections

Determine if insects and viable fungal pathogens are transported into Colorado on commercial firewood.

A visual survey of firewood status (wood supplier and contact information, wood type (hardwood or conifer), insect exit holes, insect galleries, fungal fruiting body presence, fungal stain, etc.) was conducted at randomly selected stores prior to visiting a city. A proportion of visually surveyed firewood was purchased (n = 50 firewood bundles) and brought back to CSU in Fort Collins, Colorado for insect rearing and fungal isolations.

Previous or current evidence of (n = 72 bundles):

- bark beetles: 56%
- wood boring insects: 58%
- Ascomycetes (incl. blue stain fungi): 55%
- Basidiomycetes (decay fungi, conks, etc.): 27%

Insects collected from purchased firewood as of 10/31/08:

643 insects collected from 50 firewood bundles

Major families collected broken down into common groups (and number of individuals):

- **Bark beetles and weevils**
 - Scolytidae (n = 530, including 402 *Ips* spp. and 125 *Scolytus schevyrewi*)
 - Curculionidae (n = 29)
- **Other beetles**
 - Scarabaeidae (scarab) (n = 2)
 - Elateridae (click) (n = 2)
 - Throscidae (throscid) (n = 1)
 - Tenebrionidae (darkling) (n = 1)
- **Wood boring beetles**
 - Buprestidae (metallic) (n = 4)
 - Cerambycidae (longhorn) (n = 6)



Scolytus schevyrewi. Jim Labonte

- **Other insects**
 - Miridae (plant / leaf bugs) (n = 1)
 - Chalcidoidae (wasps) (n = 2)
 - Coccinellidae (ladybeetles) (n = 4)
 - Blattidae (cockroaches) (n = 1)

Wood Species identified (and state source or company headquarters):

Evergreen spp.

- lodgepole pine (CO and BC)
- ponderosa pine (AZ and NM)
- jeffrey pine (CA)
- western red cedar (CA)
- Douglas-fir (CO)
- California laurel (CA)

Deciduous spp.

- oak spp. (KS and MO)
- apple (MO)
- persimmon (MO)
- hickory (KS)
- yellow poplar (PA)
- aspen (CO)
- elm (CO)
- alder (CA)

2007-08 Project Presentations

Goodrich, B.A. and W.R. Jacobi. 2009. Firewood Transportation in Colorado: A Free Ride for Forest Pests? ProGreen Expo, January 12-16, 2009. Denver, CO. [Poster Presentation]

Jacobi, W.R. and B.A. Goodrich. 2008. Firewood Transport in Western United States:

Surveys and Risk Assessments. 56th Annual Western International Forest Disease Working Conference. October 28-31, 2008. Missoula, MT. [Oral Presentation given by W.R. Jacobi]

Goodrich, B.A. and W.R. Jacobi. 2008. Firewood Transportation in Colorado: A Free Ride for Forest Pests? 56th Annual Western International Forest Disease Working Conference. October 28-31, 2008. Missoula, MT. [Poster Presentation]

Jacobi, W.R. and Goodrich, B.A. 2008. NCERA 193. Firewood Transportation in Colorado: Surveys and Risks Assessments. August 25-29, 2008. East Lansing, Michigan [Oral Presentation given by W.R. Jacobi].

Goodrich, B.A. and W.R. Jacobi. 2008. Firewood Transportation in Western United States: Surveys and Risks Assessments. Great Plains Tree Pest Council Meeting [Oral Presentation given by B.A. Goodrich].

Jacobi, W.R. and B.A. Goodrich. 2007. Risk of interstate movement of invasive tree pests. 55th Annual Western International Forest Disease Working Conference. September 15-19, 2007. Sedona, Arizona [Oral Presentation given by W.R. Jacobi].

Jacobi, W.R. 2007. Invasive species movement risk assessment. Forest Health Discussion Group, Colorado State University. Sept 20, 2007. Fort Collins, Colorado.

Jacobi, W.R. 2007. Invasive species movement risk assessment. Great Plains Tree Pest Council Meeting. April 19, 2007. Manhattan, Kansas.

Additional Outreach and Extension

- ProGreen Expo, Denver, Colorado (January 2008)
- Boulder Valley Science Fair (Poster Presentation, February 2008)
- Colorado State Science Fair, CSU, Fort Collins, Colorado (Oral Presentation, April 2008)

6. Gypsy Moth Survey

Project Coordinator: Ingrid Aguayo-Colorado State Forest Service

The Gypsy Moth Survey program for FY08 was coordinated by Ingrid Aguayo, forest entomologist for Colorado State Forest Service (CSFS). This year CSFS hired three hourly workers to deploy the traps. They were given appropriate background and training for this task. The traps were deployed from May 28 through July 10, 2008. This year a total of 1544 traps were deployed throughout Colorado, in municipal, private and state lands (Table 4). There were 284 missing traps. Each trap was labeled and its location was registered with a lat/long coordinate.

Trap collection started August 27 and finished November 10, 2007. The slow collection is due to trap number and lay-out throughout the state. Moth catch was processed by Ingrid Aguayo. This was finished by January 5, 2009.

In 2008 there was one trap that caught one male gypsy moth. This trap was located in 6th and Mapleton Street, Boulder. The trap number with the gypsy moth was BL-040. Dr. Kondratieff confirmed identification of species, and the trap was sent to Otis laboratories for molecular analysis. The specimen caught in trap BL-040 was identified to be typed North American with the FS1 marker and Nla positive and Bam negative (N+B-). Thus, the specimen can be considered North American as it falls within the usual variance we normally see within the US population.



Egg mass check was carried out in February, 2009. The group of observers were Lisa Peraino (USDA-APHIS-PPQ), John Kaltenbach (CDA), Sheryl Costello (USDA-FS), Keith Wood (CSFS), and Ingrid Aguayo (CSFS). No egg masses were detected at this time. In June 2009 there will be high density delimitation trapping around 6th and Mapleton streets in a perimeter of 1 square mile, at a density of 25 traps/square mile. The

City of Boulder was notified of this finding and CSFS will keep updating Boulder city forester, Kathleen Alexander, with pertinent information.

Table 4. Number of gypsy moth traps by county for the state of Colorado, FY08.

County	Number of traps	County	Number of traps	County	Number of traps
Archuleta	10	El Paso	98	Mineral	1
Arapahoe	103	Fremont	36	Montezuma	18
Alamosa	15	Grand	25	Ouray	7
Adams	81	Garfield	16	Otero	20
Baca	11	Gilpin	3	Park	11
Broomfield	4	Gunnison	12	Pueblo	60
Boulder	93	Huerfano	15	Phillips	8
Bent	14	Hindsdale	3	Pitkin	10
Clear Creek	7	Jackson	5	Prowers	17
Chaffee	18	Jefferson	141	Rio Blanco	4
Cheyenne	5	Kit Carson	9	Rio Grande	10
Conejo	7	Kiowa	5	Routt	15
Custer	5	Larimer	121	San Juan	1
Costilla	5	Lake	4	Saguache	7
Crowley	6	Lincoln	11	San Miguel	8
Douglas	46	Logan	16	Summit	15
Denver	72	La Plata	26	Sedgwick	5
Dolores	3	Las Animas	26	Teller	16
Delta	21	Mesa	61	Weld	62
Eagle	28	Moffat	8	Washington	8
Elbert	4	Montrose	16	Yuma	15
El Paso	98	Fort Morgan	12		

7. Potato Cyst Nematode and Golden Nematode Surveys

Project Coordinator: John Kaltenbach (CDA)

Summary

Sampling for the Potato Cyst Nematode (PCN) and Golden Nematode Trace Forward surveys were carried out in Colorado from June to October. All of the sampling was done in the San Luis Valley in south central Colorado. This is the only location where seed



potatoes are grown in Colorado. The samples were stored at the CSU Potato Research Center until they could be transported to the CSU Plant Diagnostic Lab in Fort Collins, CO. All samples have been analyzed for Golden Nematode for the Alberta Trace Forward, and all were negative.

Approximately 60% of the samples have been analyzed for PCN, and so far, all have been negative. Analysis of the samples for PCN will take a few more months and will be completed by May 31, 2009.

Methods and Site Selection

The Golden Nematode trace forward survey was done on one farm in the San Luis Valley. The farm identified 950 production acres that had the potential to be exposed. Sampling was done at a rate of 1 pound per acre. Analysis of the samples was done at the CSU Plant Diagnostic Clinic in Fort Collins, CO. The sampling was contracted out by CDA to Biel Crop Consulting Inc. who had also performed the sampling in 2007. For the PCN national survey, a total of 6,958 seed field acres were sampled at a rate of 1 pound per acre. To date, no PCN have been identified.

8. Emerald Ash Borer Survey

Project Coordinators: Ingrid Aguayo (CSFS), John Kaltenbach (CDA), and Lisa Peraino (PPQ)

Summary

Sampling for the Emerald Ash Borer using purple prism traps baited with Manuka Oil was performed by the CSFS, PPQ and CDA. A total of 184 traps were placed, 132 by the CSFS, 40 by PPQ and 12 by CDA.

Methods and Site Selection

Sites were selected for the presence of ash trees in a variety of locations, including campgrounds, urban forests and residential trees. There were a number of campgrounds throughout the state that did not have any ash trees. Traps were put up starting in late June and taken down in September and October. No Emerald Ash Borer, or suspect Emerald Ash Borer were found.

CSFS set their traps in conjunction with setting their gypsy moth traps, which allowed for widespread coverage across the state. In addition to the trapping, PPQ and CDA peeled 4 ash trap trees that had been girdled in 2007. No signs of EAB were detected. CDA and CSFS were unable to incorporate ISIS into the data collection and entry portion of survey projects this year due to time constraints. However, the SSC will be attending the ISIS training in March, and will hopefully be able to get set up for next season.



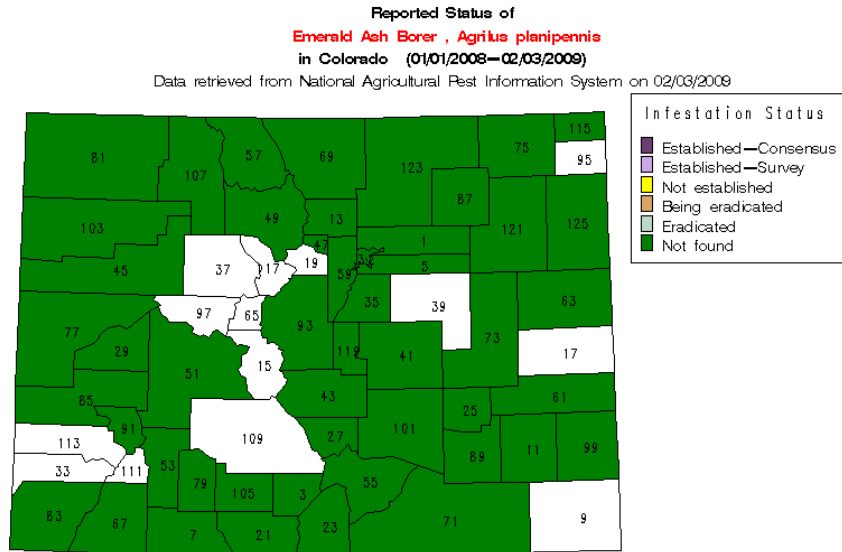


Figure 18. NAPIS map of counties surveyed for EAB in Colorado.

9. Cereal Leaf Beetle

Project Coordinators: Lou Bjostad and David James (CSU)

Objective:

The purpose of this project was to conduct a general trapping survey for *Oulema melanopus* (cereal leaf beetle) in Colorado. This pest is a threat to Colorado cereal commodities, chiefly wheat. Data obtained from a detection survey would be useful for purposes of eradication and planning of biocontrol efforts. Cereal leaf beetle has been found in Colorado in past surveys, and therefore, it is important to continue monitoring their population level and geographic range.

Methods and Results:

At 37 sites in Colorado, wheat, barley, rye or oats fields were surveyed using the following visual and sweep survey protocol:

Visual Survey: Surveys were conducted to detect larvae, adults and feeding damage. A minimum of 200 feet were walked in each field.

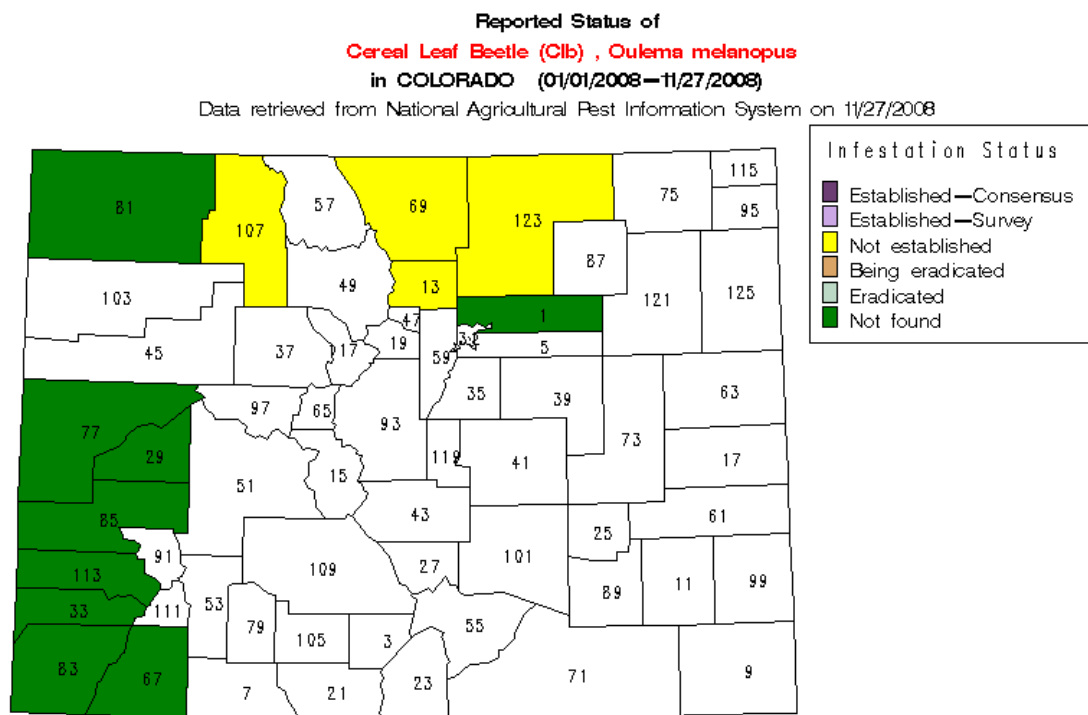
Sweep Survey: A minimum of 1000 sweeps were taken at each site and suspect specimens were preserved in alcohol for later examination. Counties surveyed include Mesa, Delta, Montrose, San Miguel, Dolores, Montezuma, La Plata, Moffat, Routt, Larimer Weld, Adams, and Boulder counties. Most surveys were done in late May/early June when CLB is most likely to be present (Table 5). CLB was found in Boulder, Larimer, Routt and Weld County.



Photo 4. Wheat field in Boulder County swept for CLB.

Table 5. Summary of site numbers and results for Cereal Leaf Beetle Surveys.

<u>County</u>	<u># Sites</u>	<u>No. Positive Catches</u>
Adams	1	0
Boulder	1	2
Delta	3	0
Dolores	3	0
La Plata	2	0
Larimer	7	67
Mesa	3	0
Moffat	3	0
Montezuma	3	0
Montrose	3	0
Routt	2	9
San Miguel	3	0
Weld	3	18



The Center for Environmental and Regulatory Information Systems does not certify the accuracy or completeness of the map.
Negative data spans over last 3 years only.

Figure 19. NAPIS map of counties surveyed in 2008 for cereal leaf beetle in Colorado.

10. Karnal Bunt

Project Coordinators: Lou Bjostad and David James (CSU)

Objective:

The purpose of this project was to continue the Karnal Bunt National Surveys in Colorado to help monitor the distribution and spread of Karnal Bunt in the United States and facilitate wheat exports by identifying areas free of disease.

Methods and Results:

Surveys were performed by Janet Hardin and David James of Colorado State University, Department of Bioagricultural Sciences and Pest Management. Karnal Bunt surveys were done by visiting granary locations (Photo 5) and collecting wheat grain samples to be sent on to Olney, Texas for optical scanning. This year 40 samples were collected from 7 counties (Table 6). Hold-back samples were taken and stored at Colorado State University. Counties targeted for this survey were those that had not been sampled in the last few years. All samples tested negative for Karnal Bunt (Fig. 20)



Photo 5. Granary located in Ault sampled for Karnal Bunt.

Table 6. Summary sample numbers and results for Karnal Bunt Surveys.

County	# Samples	No. Positive Samples
Kit Carson	4	0
Morgan	4	0
Phillips	4	0
Sedgwick	6	0
Washington	4	0
Weld	8	0
Yuma	10	0

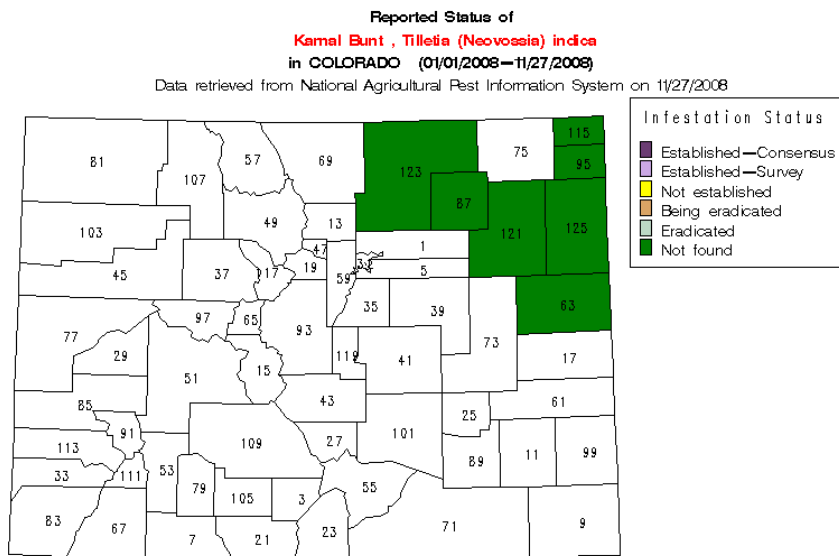


Figure 20. NAPIS map of counties surveyed for Karnal Bunt in Colorado.

Biological Control

11. Monitoring *Diorhabda elongata* releases in Colorado.

Project Coordinator: Dr. Andrew Norton (CSU)

Summary of Accomplishments

1) *Diorhabda* population densities

We determined *Diorhabda* population size and age structure at 5 separate release sites in Colorado. At each site we used two different sampling methods: Counts by age class from 12 measured stems per focal tree and a 3 minute visual search of the entire focal tree. The first measure is a more precise measure of *Diorhabda* density at a site, while the latter is a more sensitive metric, allowing us to determine *Diorhabda* presence and spread when the beetle occurs at low densities.

Sites sampled are as follows:

1) Adams County, CO (20 focal trees), Yuma County #1, CO, 25 focal trees, Yuma County #2, CO, 25 focal trees, Moffat County (25 focal trees), and Mesa County (40 focal trees). Each site was sampled every other week, starting the beginning of June and ending in Late August. Sites were sampled between 6 and 8 times this season. Over the course of this summer, we obtained 821 stem and visual counts from the 5 sites. See the attached table for a breakdown of the number of samples taken from each of the 5 sites. *Diorhabda* first appeared in early June. At two sites (Horsethief Canyon in Mesa County and Dinosaur National Monument in Moffat County) *Diorhabda* populations rapidly increased over the course of the summer, and had partially or entirely defoliated the focal trees at these sites by the end of the summer. No *Diorhabda* were recovered at the Adams County site this year, and the Yuma County # 1 site also remained without beetles. In June of this year we initiated a second release site in Yuma County approximately 1.5 Km from the first site. Beetles established and became abundant at this site by the middle of August.

2) Tree health data.

At each of the *Diorhabda* sampling events (above), we also recorded the percentage of each focal tree that was dead, living but defoliated, living but yellow, or living green. We also recorded the presence of flowers and seeds. Over the course of the summer we performed 821 such assessments.

3) Tree size and vegetation community data.

In mid June, we recorded the height, maximum width and width perpendicular to maximum width for each of the focal trees at each site, for a total of 137 measurements. These data have been entered but we have not yet analyzed them. On the same sample dates as for the Tree size data, we recorded the percentage cover of vegetation from each of 2 1 x 1 m plots located underneath each focal tree, for a total of 174 measurements. As above, these data have been entered but we have not yet analyzed them. Sample dates for these measurements were June 17, 2008 (Adams County), June 18, 2008 (Yuma County #1), June 19, 2008 (Yuma County #2), June 25, 2008 (Moffat County), and June 26, 2008 (Mesa County).

12. Weed Survey and Biocontrol Project, 2008

Project Coordinator: Dan Bean (CDA)

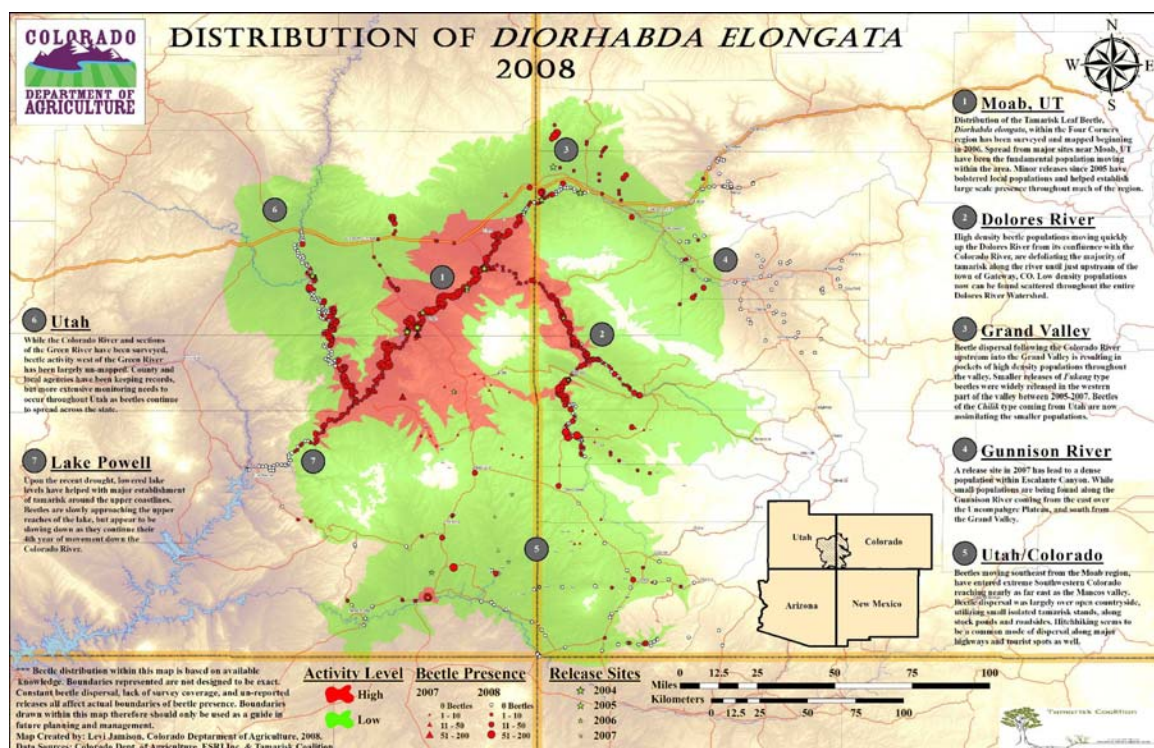
Summary

Tamarisk

Over 100,000 tamarisk leaf beetles (*Diorhabda elongata*, Fukang ecotype) were collected this spring from western Nevada. The collections were made by the Colorado Department of Agriculture, Biological Pest Control in collaboration with USDA APHIS. The Palisade Insectary housed and fed the adult beetles until APHIS cooperators were ready to receive them for field releases. Beetles were sent to and releases were made in 8 western states (Wyoming, South Dakota, Washington, Oregon, Nebraska, Iowa, Kansas and Colorado).

The second part of the tamarisk project for 2008 was monitoring field sites throughout the state and mapping beetle movement in western Colorado. Ten field sites

were monitored in western Colorado, including two on Ute Mountain Ute Tribal Reservation lands, and two sites were set up and monitored on the Arkansas drainage near the town of Pueblo. Beetle movements were also followed by sweep sampling along the Dolores River and at selected sites in San Miguel, Dolores, Montezuma, Montrose and Mesa Counties as well as sites in Utah near the Colorado border. By the end of 2008 beetles had been detected over a very large area in western Colorado (see map page 40) and tamarisk defoliation had spread up the Colorado River about 15 miles from the Utah border and up the Dolores River at east 50 miles.



Yellow Toadflax

The Toadflax Consortium, headed up by Rose De Clerck-Floate (AAFC Lethbridge) and Andrew Norton (CSU) sent three hundred root galling weevils *Rhinusa linariae* to the Insectary for release at two sites; one near the town of Paonia (Delta County) and the other near the town of Buford (Rio Blanco County). Releases were made into cages covering yellow toadflax plants. The beetles develop underground in

root galls so it was impossible to tell if they had taken without digging up plants. Sampling will begin next season to see if they overwintered. After establishment beetles can be moved to numerous sites around the state.

Other Targets and Agents

The Insectary continued release and monitoring of the stem boring weevil, *Mecinus janthinus*, on Dalmatian toadflax. Two new sites were added in Garfield County to go with three sites in Mesa County. The Insectary made ten releases of the leafy spurge long horned beetle *Oberea erythrocephala* on leafy spurge infestation in four counties. This beetle will complement the leafy spurge flea beetles that are currently being released.

The Insectary continues to monitor, collect and redistribute other biological control agents throughout the state (see Table 7). In particular, over 850,000 bindweed gall mites (*Aceria malherbae*) were distributed throughout Colorado.

Table 7

Target Weed	Biocontrol Agent	Number Released
Leafy spurge	<i>Aphthona spp.</i>	8,000
Field bindweed	<i>Aceria malherbae</i>	851,000
	<i>Tyta luctuosa</i>	27,410
Tamarisk	<i>Diorhabda elongata</i>	306,000
Diffuse & spotted knapweed	<i>Larinus minutus</i>	4,600
	<i>Cyphocleonus achates</i>	848
Puncturevine	<i>Microlarinus lareynii</i>	4,300
Canada thistle	<i>Urophora cardui</i>	5,020
Yellow & Dalmation toadflax	<i>Calophasia lunula</i>	6,806
	<i>Mecinus janthinus</i>	11,115
	<i>Rhinusa linariae</i>	300
Musk thistle	<i>Trichosirocalus horridus</i>	3,400

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