Cooperative Agricultural Pest Survey (CAPS)

Annual Report
Colorado
2013

Compiled by:
John Kaltenbach
Colorado Department of Agriculture
Plant Industry Division

CONTENTS

Colorado Cooperative Agricultural Pest Survey 2013

This is a report of the activities and surveys accomplished in Colorado for the CAPS program in 2013 (funding year March 1, 2013 to February 28, 2014). The cooperators for this year's work include Colorado State University (CSU), and the United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (USDA, APHIS, PPQ).

CSU cooperators carried out the following surveys: Small Grains-Corn Mixed Commodity-Based Survey, Karnal Bunt Survey and Grape Commodity-Based Survey. The Colorado Department of Agriculture (CDA) conducted surveys for Emerald Ash Borer, Forest Pests, and a Farm Bill funded survey of Honey Bee Health. CDA and CSU also performed work for biological control of noxious weeds. USDA, APHIS, PPQ set traps for the Emerald Ash Borer survey.

CAPS Infrastructure Accomplishment Report Template Appendix P-1

Year:	2013
State:	Colorado
Cooperative Agreement Name:	Infrastructure
Cooperative Agreement Number:	13-8508-0013-CA
Project Funding Period:	March 1, 2013 to February 28, 2014
Project Report:	**CAPS Infrastructure Mid Year Report**
Project Document Date:	May 30, 2014
Cooperators Project Coordinator:	John Kaltenbach
Name:	John Kaltenbach
Agency:	Colorado Department of Agriculture
Address:	305 Interlocken Parkway
City/ Address/ Zip:	Broomfield, CO 80021
Telephone:	(303) 869-9037
E-mail:	john.kaltenbach@state.co.us

Quarterly Report	☐
Semi-Annual Accomplishment Report	☐
Annual Accomplishment Report	☒

A. Compare actual accomplishments to objectives established as indicated in the workplan. When the output can be quantified, a computation of cost per unit is required when useful.

This report is to outline the accomplishments of the State Survey Coordinator and Infrastructure work plans for the Cooperative Agricultural Pest Survey (CAPS) of Colorado. The main goal of this cooperative program is to coordinate surveys for the early detection of exotic plant pests prior to their establishment. Additional goals include; the strengthening of a state-wide network of cooperators that will help identify exotic pest threats, determine and implement the most effective means of preventing, detecting, and responding to new exotic pests, and communicate risks and needs to land management personnel, relevant industries, and the public. The CAPS program provides the structure and funding to coordinate detection surveys and outreach by the Colorado Department of Agriculture and its cooperators around the state. The Infrastructure funding provides full-time support for a State Survey Coordinator who is responsible for coordinating the efforts of various state and federal agencies, private businesses, and the general public, and works as a liaison with the Colorado PPQ Office.

- **Activities:**
  - **Committee Service:**
    - CAPS committee conference call was held in June.
    - The Annual Colorado CAPS Committee meeting was held in January 8, 2014
    - Attended National CAPS Committee (NCC) Meeting in Florida in place of Helmuth Rogg (SSC, Oregon)
  - **Other Survey Work:**
    - State Survey Coordinator (SSC) supervised surveys for Forest Pests and Vegetable Pests, Farm Bill survey for Khapra beetle and Honey Bee Health. Coordinated with cooperators on the following: Stone Fruit/PPV Survey, Grape Commodity-Based Survey, Small Grains-Corn Bundled Survey and two Biocontrol projects
    - Hired and supervised two seasonal trapper
    - Coordinated vehicle use with State Fleet
    - Submitted revised plans for Farm Bill projects: Khapra Beetle Survey and Grape Survey
    - Distributed traps and lures to cooperators (April)
    - Submitted work and financial plans for EAB survey (May)
    - Coordinated with Colorado Department of Wildlife for trapping in State Parks
    - Sampled apiaries as part of the Honey Bee Health Survey (July (10) and August (4))
    - Coordinated a branch peeling day for USDA and CSU-Extension personnel to get experience peeling branches in a survey for Emerald ash borer.

- Led EAB tree dissection and branch peeling training for CSU Extension personnel, Front Range Foresters and Arborists, 10/31, 11/5, 11/19 and 11/21: approximately 100 people trained.

- **Outreach and Education:**
  - **Interviews (TV/Radio/Newspaper/Magazines):**
    - Press release for EAB Survey (May) see attached
    - Interviews with CBS, Channel 4; The Denver Post and KGNU radio about EAB (October)
    - Interviews with Fox 31, The Denver Post, Channel 8 in Boulder and Lakewood Sentinel about EAB (November)
  - **Booth/Trade Shows:**
    - Booth at EAB Workshop, Fort Collins CO, June
    - Set up CDA Plant Industry/CAPS booth and Don't Move Firewood Booths at State Fair and helped set up Ag Pavilion (August)
    - Set up CDA Plant Industry/CAPS booth and Don't Move Firewood Booths at the Pro-Green Expo
  - **School Presentations**
    - Presentation to Munroe Elementary school 3rd graders, talked about my job, CAPS and Agriculture in Colorado and read a book on where vegetables come from (April)
    - Presentation about EAB at Central Elementary School in Longmont to a group of 3rd graders (November)

- **Meetings:**
  - **Conference calls:**
    - Western Region SSC conference call monthly
  - **Conferences:**
    - Attended all day EAB Workshop put on by EPIC Committee in Fort Collins, CO (June)
    - Participated in an EAB panel at the ISA Pesticide Workshop
    - Attended Davey Tree EAB Seminar
    - Presentation on EAB at the Annual meeting of the Colorado Weed Management Association (December)
  - **Other**

- Attended Emerging Pests in Colorado (EPIC) meetings in Fort Collins (March, April
- Attended Colorado/Wyoming Joint Risk Committee meetings at Customs and Border Protection (March,
- Presentation to CDA, Division of Plant Industry Multiple Inspectors on "pest to watch out for" (April and October)
- Attended FRUFC (Front Range Urban Forestry Council) meeting to talk about an encourage foresters to try the EAB Branch Sampling technique (September)

- **Other:**
  - March: Processed paperwork for Cooperative Agreement for Pest Detection money; 32% of funds for Infrastructure and Surveys
  - Entered NAPIS data for a new state record, Phloeotribus frontalis a bark beetle without a common name. The beetle was caught in a trap put out by PPQ. It is native to the East coast, has also been reported in Missouri and Nebraska.
  - May: Processed Compliance Agreement for the remaining 68% of Infrastructure and Pest Detection as well as CDA Biocontrol, CSU Toadflax Biocontrol, EAB and Karnal Bunt surveys.
  - Wrote up a PCN survey summary report for USDA summarizing program from 2007 to 2013
  - Secured Interagency contracts with CSU for their projects
  - Completed and submitted Work and Financial plans to USDA for CAPS 2014
  - EAB response: meetings with City and County of Boulder; CSU Extension; Front Range Urban Foresters and Boulder County and Denver Metro arborists
  - Presentation about EAB at City of Longmont tree service contractors meeting
  - Worked to coordinate survey for EAB outside of Boulder; work with Longmont, Louisville and Erie, having the USDA supply grid maps for survey and technical assistance
  - Part of Colorado's EAB Incident Command Team as Logistics Coordinator
  - Helped develop an Ash Management Zone tool to help the public determine how close they are to known EAB locations

B. If appropriate, explain why objectives were not met.*(*Provide a narrative in this section if the stated objectives from work plan are not completed. For example: if a survey or other activity was delayed or cancelled due to weather or other factor indicate the reasons here.***)**

All objectives were met.

C. Where appropriate, explain any cost overruns or unobligated funds in excess of $1,000. * (Required for Final Reporting. Report on semi-annual report if information is available.**)**

There were no cost overruns and all funds were obligated.

D. Supporting Documents (if applicable**)**

Attached is a Press release regarding the discovery of Emerald ash borer.

indicates information is required per 7 CFR 3016.40 and 7 CFR 3019.51

Approved and signed by

_____ **Date:** _____
Mitch Yergert, SPRO, Cooperator

_____ **Date:** _____
Pat McPherren, SPHD, ADODR

media release

Colorado Department of Agriculture
www.colorado.gov/ag
www.facebook.com/coloradoag

FOR IMMEDIATE RELEASE
May 17, 2013
Contact: Christi Lightcap, (303) 239-4190, Christi.lightcap@state.co.us

Survey to Begin for Destructive Insect

LAKEWOOD, Colo. – Staff with the Colorado Department of Agriculture's Cooperative Agricultural Pest Survey (CAPS) program are preparing to put out large purple survey tools or *traps* for the detection of the Emerald Ash Borer (EAB). The project is in coordination with the US Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (USDA-APHIS-PPQ), and City Foresters from 27 communities on the Front Range

This is the fifth year of the survey program in Colorado; staff will be placing traps in high risk areas around the state starting in late May and monitoring them until they are taken down in September.

The emerald ash borer (EAB), *Agrilus planipennis*, is a highly destructive invasive insect that has killed over 50 million ash trees since its initial discovery in Michigan in 2002. In the last ten years the small green metallic colored pest, originally from Asia, has spread from Michigan to 19 states.

"While the pest has not reached Colorado, it was found last summer in Kansas City, KS, and has been detected as far east as New Hampshire. This year's effort to survey for Emerald Ash Borer is targeted for the highest risk sites in our state," said John Kaltenbach, CDA's cooperative agricultural pest survey coordinator.

It is possible that EAB could infest an Ash tree for 3 or 4 years before visible signs of decline of the tree. Trapping for insects is one way to detect beetles but you can also be on the lookout for the following signs of an EAB infestation in your ash tree:

- Sparse leaves or branches in the upper part of the tree
- D-shaped exit holes about 1/8 inch wide.
- New sprouts on the lower trunk or lower branches
- Vertical splits in the bark
- Winding S-shaped tunnels under the bark
- Increased woodpecker activity

National Emerald Ash Borer Awareness Week is May 19-25, 2013. The purpose of the week is to highlight the vital role that the public can play in the detection and reporting of exotic pest as well as in the effort to keep exotic pests out of Colorado. Of particular importance is the role that the movement of firewood plays in the spread of pests.

"Moving firewood across the state can contribute to tree mortality," said Kaltenbach. "Insects and diseases can be transported with the wood and can hurt or even kill Colorado's forests."

One easy tip is to *Buy It Where You Burn It*. Campers are urged to buy their firewood at their destination, thus preventing the spread of any insects or diseases that can be found in or on the wood.

The CDA's CAPS program is an early detection program to find exotic insects and diseases that could cause significant economic damage to our agriculture and natural resources. Targeted surveys, trapping or sampling, are conducted annually to detect pests that are likely to be introduced to Colorado via commerce, human travel or natural spread.

The CAPS program is funded and directed by the USDA-APHIS-PPQ and combines the efforts of the CDA, Colorado State University, Colorado State Forest Service, other state agencies, industries and professional organizations.

For more on the EAB and other exotic pest threats, visit the USDA site http://www.hungrypests.com. A fact sheet on the EAB survey is also available at http://www.aphis.usda.gov/publications/plant_health/2013/faq_eab_survey.pdf.

If you think you have EAB in your ash trees, or if you have any questions or concerns, or would like additional information, please contact John Kaltenbach, CAPS Coordinator, John.Kaltenbach@state.co.us or call 303-239-4131.

###

Media: For an interview or to see traps being placed, contact Christi.Lightcap@state.co.us or call (303) 239-4190.

CAPS Survey Accomplishment Report Template

Appendix P-2

CAPS Survey Report

Year:	2013
State:	Colorado
Cooperative Agreement Name:	Forest Pest Survey
Cooperative Agreement Number:	13-8508-0013-CA
Project Funding Period:	March 1, 2013 to February 28, 2014
Project Report:	**Mid-year Report Forest Pest Survey**
Project Document Date:	May 30, 2014
Cooperators Project Coordinator:	John Kaltenbach
Name:	John Kaltenbach
Agency:	Colorado Department of Agriculture
Address:	305 Interlocken Parkway
City/ Address/ Zip:	Broomfield, CO 80021
Telephone:	(303) 869-9037
E-mail:	john.kaltenbach@state.co.us

Quarterly Report	☐
Semi-Annual Accomplishment Report	☐
Annual Accomplishment Report	☒

A. Write a brief narrative of work accomplished. Compare actual accomplishments to objectives established as indicated in the work plan. When the output can be quantified, a computation of cost per unit is required when useful.*(*Use a narrative or insert tables to document completed work. Document work accomplished by the cooperator, as determined by the objectives in the work plan*).**

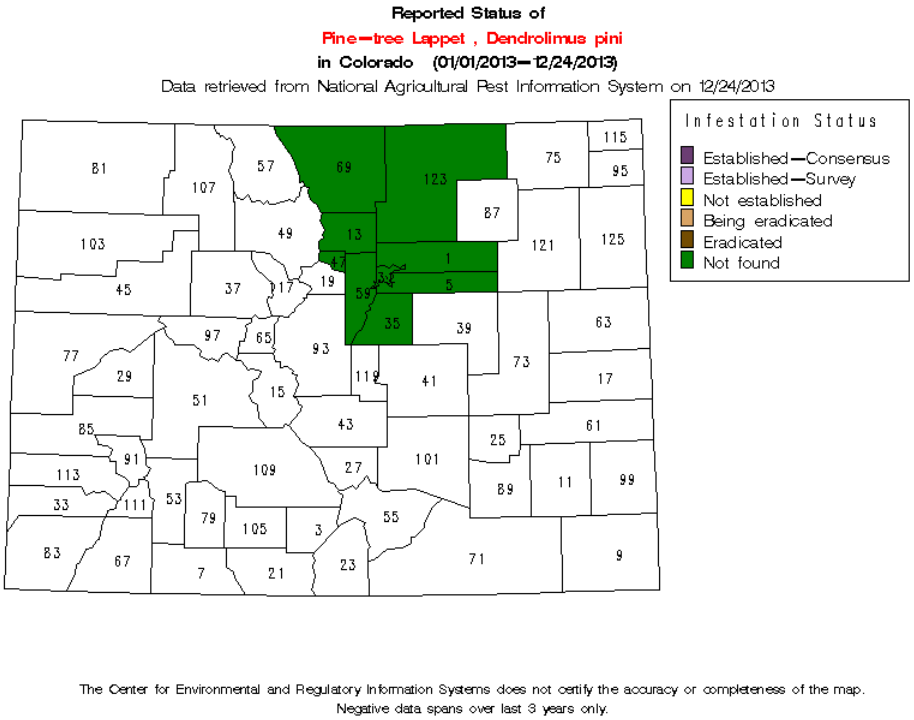
The purpose of this project was to conduct an early detection survey of conifer infesting moths and non-native wood boring and bark beetles in and around the potential pathways of introduction. Insects have emerged as the most significant pests of U.S. forestland, accounting for a three-fold increase in the incidence of insect-induced tree mortality since 2002. In Colorado, nearly twenty percent of forested land has been impacted by insects in the last 20 years, mostly from three insects, mountain pine beetle, spruce beetle and Douglas fir beetle. These are native pests, but the ones exotic species targeted in this survey could have compounding effects on our forest health if they were to become established. Exotic insect species pose threats to Colorado's urban and woodland forests which provide important economic and environmental values such as improved air quality, energy conservation, reduced storm water run-off and increased property values.
The proposed survey was for 25 different sites using CAPS approved trap and lure combinations. The work plan was changed to 15 sites when a reduced budget was awarded.

Funding Amount	Total Number of Traps	Cost Per Unit
Proposed = $26,515	Proposed = 300	Proposed= $88
Actual = $15,055	Actual = 172	Actual = $88

All of the targeted pests in this survey have the potential to arrive and establish in Colorado through pathways of introduction or predicted distributions. If one or more of the targeted pest were to establish in Colorado there could be severe adverse economic and/or environmental effects. Early detection of an invasive species, prior to establishment, provides regulators and land managers more options for eradication, control and management. The counties proposed for survey included Adams, Arapahoe, Boulder, Delta, Denver, Douglas, El Paso, Jefferson, Larimer, Mesa, Montrose, and Weld counties. With the budget reduction, the counties on the west slope were eliminated from the plan.

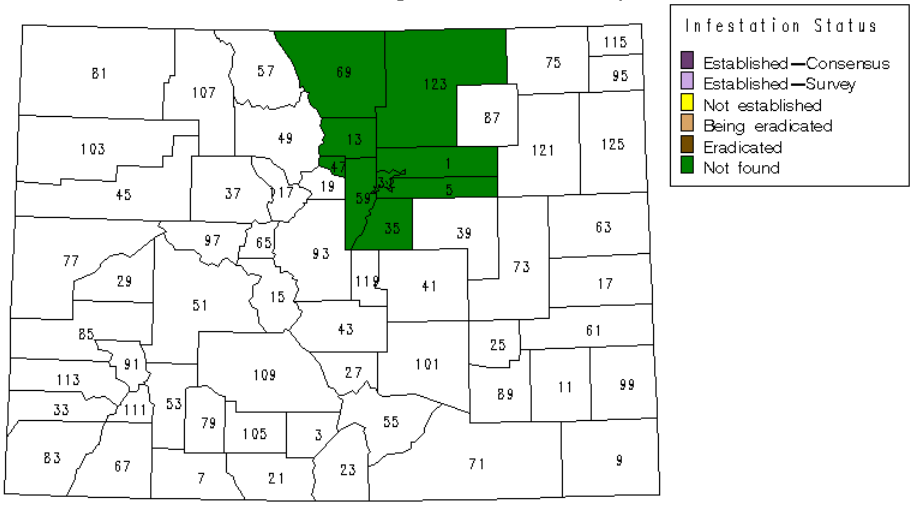
Traps were set between May 2, 2013 and June, 14 2013. Traps were set at a total of 18 sites, with 3 to 4 Lindgren traps, 4 traps for *Dendrolimus* spp. and 4 traps for *Lymantria mathura*. Representaive maps for *Dendrolimus* spp. (Figure 1), *Lymantria mathura* (Figure 2) and *Tomicus destruens* (Figure 3) below.

Figure 1



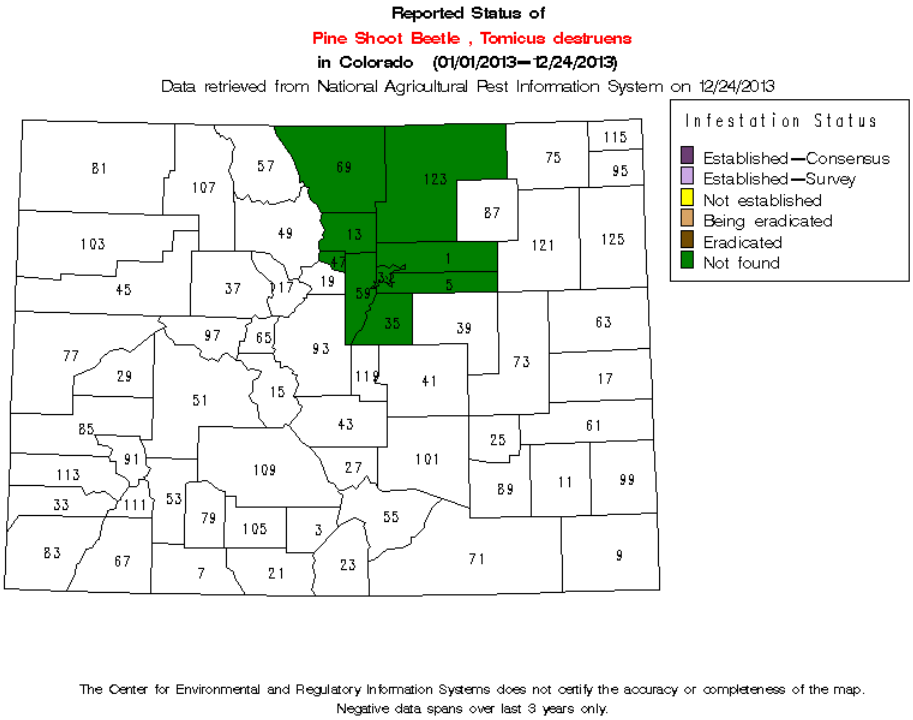
The Center for Environmental and Regulatory Information Systems does not certify the accuracy or completeness of the map.
Negative data spans over last 3 years only.

Figure 2



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 3



1. Survey methodology (trapping protocol):

Fifteen sites were selected and 4 Lindgren funnel traps were set at each site, each with a different lure (see table 1). At all but one site, 4 modified GM traps were set for Dendrolimus spp. and 4 Pherocon wing traps were set for Rosy gypsy moth for a total of 172 traps. The traps and lure were set and monitored according to CAPS Approved Methods for 2013. The Lindgren funnel traps were "wet" traps using propylene glycol, and were serviced every two weeks. The other traps were serviced as necessary lure change according to approved methods from May to October. March to May.

Samples were taken from the Lindgren traps every two weeks, and suspects were taken to Dr. Boris Kondratieff with Colorado State University for identification.

	Common Name	Scientific Name
Pest:	Pine shoot beetle	*Tomicus destruens*
Pest:	Red-haired pine bark beetle	*Hylurgus ligniperda*
Pest:	Lesser spruce shoot beetle	*Hylurgops palliatus*
Pest:	Japanese pine sawyer	*Monochamus alternatus*
Pest:	Siberian silk moth	*Dendrolimus sibiricus*

Pest:	Pine-tree lappet	*Dendrolimus pini*
Pest:	Rosy gypsy moth	*Lymantria mathura*
Pest:	Sirex Woodwasp	*Sirex noctilio*
Pest:	Sixtoothed bark beetle	*Ips sexdentatus*
Pest:	European spruce bark beetle	*Ips typographus*
Pest:	Mediterranean Pine Engraver	*Orthotomicus erosus*
Pest:	Sixtoothed Spruce Bark Beetle	*Pityogenes chalcographus*

	Proposed	**Actual**
Sites (Locations):	15	18
Traps:	180	172

Number of Counties:	9
Counties:	Adams, Arapahoe, Boulder, Denver, Douglas, Gilpin, Jefferson, Larimer and Weld counties

Table 1

Trap Type	**# at each site**	**Lure**	**Target (s)**
Lindgren funnel	1	ethanol and alpha-pinene	*Tomicus destruens* *Hylurgus ligniperda* *Hylurgops palliates* *Monochamus alternatus*
Lindgren funnel	1	70% alpha pinene 30% beta-pinene	*Sirex noctilio*
Lindgren funnel	1	3-part Ips lure: cis-verbenol; ipsdienol; 2me-3-buten-2-ol	*Ips sexdentatus* *Ips typograhus* *Orthotomicus erosus*
Lindgren funnel	1	chalcogran	*Pityogenes chalcographus*
Modified GM trap	4	Z5E7-12Ald Z5E7-12OH butylated hydroxytoluene Tinuvin	*Dendrolimus sibiricus* *Dendrolimus pini*
Wing trap	4	Z3Z6-9R10S-epo-19Hy Z3Z6-9S10R-epo-19Hy	*Lymantria mathura*

2. <u>Survey dates</u>:

	Proposed	**Actual**
Survey Dates:	Install May and June, Remove October	Installed June 11 to July 3 Removed in October

3. Benefits and results of survey:

None of the targeted pests were found during this survey. All of the targeted pests in this survey have the potential to arrive and establish in Colorado based on climate and host plant availability and/or predicted distributions. If one or more of the targeted pest were to establish in Colorado there could be severe adverse economic and/or environmental effects. Early detection of an invasive species, prior to establishment, provides regulators and land managers more options for eradication, control and management.

	Positive	Negative	Total Number
Traps	0	172	172

4. Database submissions:

Data for each species was submitted to the NAPIS database.

B. If appropriate, explain why objectives were not met.* (*Provide a narrative in this section if the stated objectives from work plan are not completed. For example: if a survey or other activity was delayed or cancelled due to weather or other factors indicate the reasons here.***)**

At 14 of the 15 sites all traps were set and monitored as proposed. One site was missing the Rosy gypsy moth and Dendrolimus traps which was an oversight.

C. Where appropriate, explain any cost overruns or unobligated funds in excess of $1,000. * (Required for Final Reporting. Report on semi-annual report if information is available.**)**

Not applicable

---

indicates information is required per 7 CFR 3016.40 and 7 CFR 3019.51

Approved and signed by

_____ Date: _____
Mitch Yergert, SPRO

_____ Date: _____
Pat McPherren, ADODR

CAPS Survey Accomplishment Report Template

Appendix P-2

CAPS Survey Report

Year:	2013
State:	Colorado
Cooperative Agreement Name:	Vegetable Crop Pests Survey
Cooperative Agreement Number:	13-8508-0013-CA
Project Funding Period:	March 1, 2013 to February 28, 2014
Project Report:	**Mid-year Report Vegetable Crop Pests Survey**
Project Document Date:	May 30, 2014
Cooperators Project Coordinator:	John Kaltenbach
Name:	John Kaltenbach
Agency:	Colorado Department of Agriculture
Address:	305 Interlocken Parkway
City/ Address/ Zip:	Broomfield, CO 80021
Telephone:	(303) 869-9037
E-mail:	john.kaltenbach@state.co.us

Quarterly Report	☐
Semi-Annual Accomplishment Report	☐
Annual Accomplishment Report	☒

A. Write a brief narrative of work accomplished. Compare actual accomplishments to objectives established as indicated in the work plan. When the output can be quantified, a computation of cost per unit is required when useful.*(*Use a narrative or insert tables to document completed work. Document work accomplished by the cooperator, as determined by the objectives in the work plan*).**

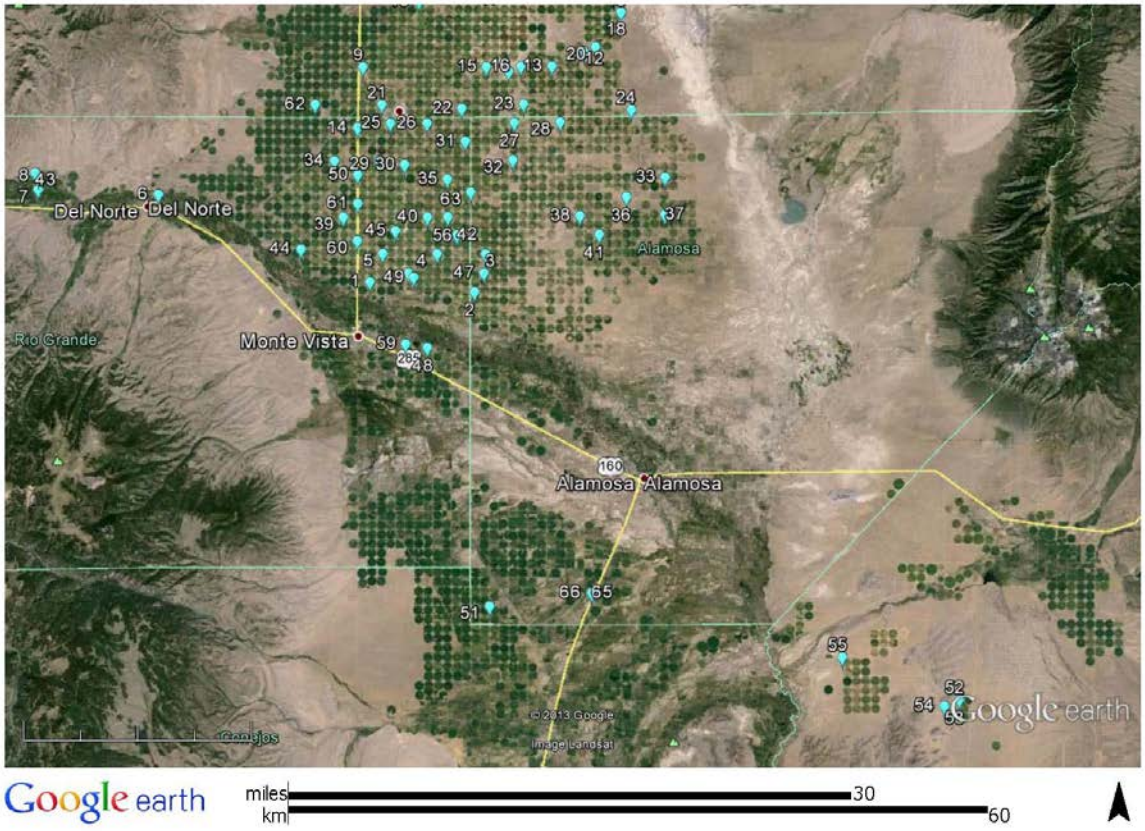
The purpose of this project was to conduct an early detection survey for 5 moth species that are pests of Solanaceous crops (see table below for pests). The proposal was to place one trap for each of the 5 species at 90 sites (potato fields) for a total of 450 traps, and attempt to distribute the traps in each of 5 counties in approximate proportion to their typical potato acreage. In the San Luis Valley (SLV) the typical acreage planted in potatoes would have equated to the following site totals; Alamosa-30 sites, Rio Grande-27 sites, Saguache-24 sites, Costilla-8 sites and Conejos- 1 site.

Funding for the project was received on May 28, 2013. The survey technician was hired and started work on June 10th. An email was sent to the potato growers (through the Colorado Potato Administrative Committee, as well as through the Colorado State University Potato Certification Program) describing the survey, methods and pests.

This was the first year of this survey and the first time the CAPS program has set traps in the San Luis Valley (SLV). The criteria for setting the traps was that they needed to be adjacent to potato fields, with a minimum distance between traps of the same species of at least 1.5 miles. Trap setting began on June 11th and concluded on July 3rd. On average, the traps were out for a total of 95 days. Finding sites to place the traps was not too difficult, but we were unable to find more than 66 sites that meet the criteria to place traps. Either the potato fields were too close to other sites or there was not a spot to place the traps. The number in each county worked out to be Alamosa – 18 sites, Costilla – 4 sites, Rio Grande – 30 sites, Saguache – 14 sites and we were unable to find a suitable site in Conejos – 0 sites. Ninety traps may have been too ambitious, but the 66 spots were spread fairly well throughout the SLV (see Figure 1, Map of Trap Sites).

Trap contents were taken to Colorado State University and Dr. Boris Kondratieff for identification.

Figure 1



Funding Amount	Total Number of Traps	Cost Per Unit
Proposed = $18,484	Proposed = 450	Proposed= $41
Actual = $18,484	Actual = 330 3	Actual = $56

1. Survey methodology (trapping protocol):

The survey was performed using CAPS approved trap and lure combinations (Table 1). Plastic bucket traps were used for *Helicoverpa armigera*, *Spodoptera littoralis* and *S. litura*. Large delta traps were used for *Tecia solanivora* and *Tuta absoluta*.

Table 1			
Target(s)	**Lure**	**Trap Type**	**Change lure**
Helicoverpa armigera	Z11-16Ald Z9-16Ald	Plastic Bucket Trap	Every 28 days

	butylated hydroxytoluene		
Spodoptera litura	Z9E11-14Ac Z9E12-14Ac	Plastic Bucket Trap	Every 84 days
Spodoptera littoralis	Z9E11-14Ac Z9E12-14Ac	Plastic Bucket Trap	Every 84 days
Tuta absoluta	E3Z8Z11-14Ac E3Z8-14Ac	Large Plastic Delta Trap	Every 28 days
Tecia solanivora	E3 – 12Ac Z3 – 12Ac 12Ac	Paper Delta Trap	Every 30 days

	Common Name	**Scientific Name**
Pest:	Old World Bollworm	*Helicoverpa armigera*
	Egyptian Cottonworm	*Spodoptera littoralis*
	Cotton Cutworm	*Spodoptera litura*
	Guatemalan Potato Moth	*Tecia solanivora*
	Tomato Leaf Miner	*Tuta absoluta*

	Proposed	**Actual**
Sites (Locations):	90	66
Traps:	450	330

Number of Counties:	5
Counties:	Alamosa, Saguache, Rio Grande, Costilla, Conejos

2. <u>Survey dates</u>:

	Proposed	**Actual**
Survey Dates:	Install May and June, Remove October	Installed June 11 to July 3 Removed in October

3. <u>Benefits and results of survey</u>:

No target pests were found during this survey. All of the targeted pests in this survey have the potential to arrive and establish in Colorado based on climate and host plant availability and/or predicted distributions. If one or more of the targeted pest were to establish in Colorado there

could be severe adverse economic and/or environmental effects. Early detection of an invasive species, prior to establishment, provides regulators and land managers more options for eradication, control and management. Currently, there are inadequate state funds to complete this survey.
Potatoes are the fourth most valuable field crop in Colorado behind corn, wheat and hay, with the 2010 crop valued at $293 million. Colorado is ranked 4th in the US in total potato production, and 3rd in the US for seed potato production1. Over 90% of all of the potato production occurs in the San Luis Valley of Colorado, in the counties of Alamosa, Rio Grande and Saguache, and it is the primary industry in the area.

	Positive	Negative	Total Number
Traps	0	330	330

4. Database submissions:

Data for each species was submitted to the NAPIS database.

B. If appropriate, explain why objectives were not met.* (*Provide a narrative in this section if the stated objectives from work plan are not completed. For example: if a survey or other activity was delayed or cancelled due to weather or other factors indicate the reasons here.***)**

Finding sites to place the traps was not too difficult, but we were unable to find more than 66 sites that meet the criteria to place traps. Either the potato fields were too close to other sites or there was not a spot to place the traps.

C. Where appropriate, explain any cost overruns or unobligated funds in excess of $1,000. * (Required for Final Reporting. Report on semi-annual report if information is available.**)**

Not applicable

---

indicates information is required per 7 CFR 3016.40 and 7 CFR 3019.51

Approved and signed by

_____ Date: _____
Mitch Yergert, SPRO

_____ Date: _____
Pat McPherren, ADODR

CAPS Survey Accomplishment Report Template

Appendix P-2

CAPS Survey Report

Year:	2013
State:	Colorado
Cooperative Agreement Name:	Emerald Ash Borer Survey
Cooperative Agreement Number:	13-8508-0013-CA
Project Funding Period:	March 1, 2013 to February 28, 2014
Project Report:	**Mid-year Report Emerald Ash Borer Survey**
Project Document Date:	May 30, 2014
Cooperators Project Coordinator:	John Kaltenbach
Name:	John Kaltenbach
Agency:	Colorado Department of Agriculture
Address:	305 Interlocken Parkway
City/ Address/ Zip:	Broomfield, CO 80021
Telephone:	(303) 869-9037
E-mail:	john.kaltenbach@state.co.us

Quarterly Report	☐
Semi-Annual Accomplishment Report	☐
Annual Accomplishment Report	☒

A. Write a brief narrative of work accomplished. Compare actual accomplishments to objectives established as indicated in the work plan. When the output can be quantified, a computation of cost per unit is required when useful.*(*Use a narrative or insert tables to document completed work. Document work accomplished by the cooperator, as determined by the objectives in the work plan*).**

The objective of this project was to conduct an early detection trapping survey of emerald ash borer at high risk areas and cell locations as identified by the U.S. Forest Service's Forest Health Technology Enterprise Team (FHTHET) Survey Sampling Design for 2013. Working collaboratively, the cells were divided up between the Colorado Department of Agriculture and with Colorado PPQ. CDA had 20 traps to set and all work was done according to National EAB trapping protocols.
Apart from the trapping, Emerald Ash Borer was discovered in Boulder in September 2013. The Colorado Department of Agriculture worked with the city and county of Boulder, Colorado State University Extension, Colorado State Forest Service, USDA, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, to conduct a branch sampling survey to determine the extent of the infestation.

Funding Amount	Total Number of Traps	Cost Per Unit
Proposed = $1,800	Proposed = 20	Proposed= $90
Actual = $1,770	Actual = 20	Actual = $88

1. <u>Survey methodology (trapping protocol)</u>:

Purple prism traps and lure (80:20 Manuka oil:Phoebe oil and Z-3-hexanol) provided by USDA APHIS PPQ were used. Traps were set according to the National Emerald Ash Borer Survey Guidelines at pre-selected geographic locations (cells) designated by the U.S. Forest Service's Forest Health Technology Enterprise Team (FHTHET) Survey Sampling Design 2013. Of the 20 cell, 10 had suitable ash trees from which to hang traps. The other 10 cells did not have Ash trees so alternate, high risk sites were selected for trap placement. Traps were set starting May 13 and the last trap set was June 5th. The lure was replaced once in July and the traps were removed in September. There were not suspects on any of the traps. See Maps below (Figures 1 and 2) for trap locations.

	Common Name	Scientific Name
Pest:	Emerald Ash Borer	*Agrilus planipennis*

	Proposed	Actual
Sites (Locations):	20	20
Traps:	20	20

Number of Counties:	8
Counties:	Adams, Arapahoe, Denver, Delta, Garfield, Jefferson, Larimer

	and Montrose counties

Figure 1 EAB CDA Trap Distribution

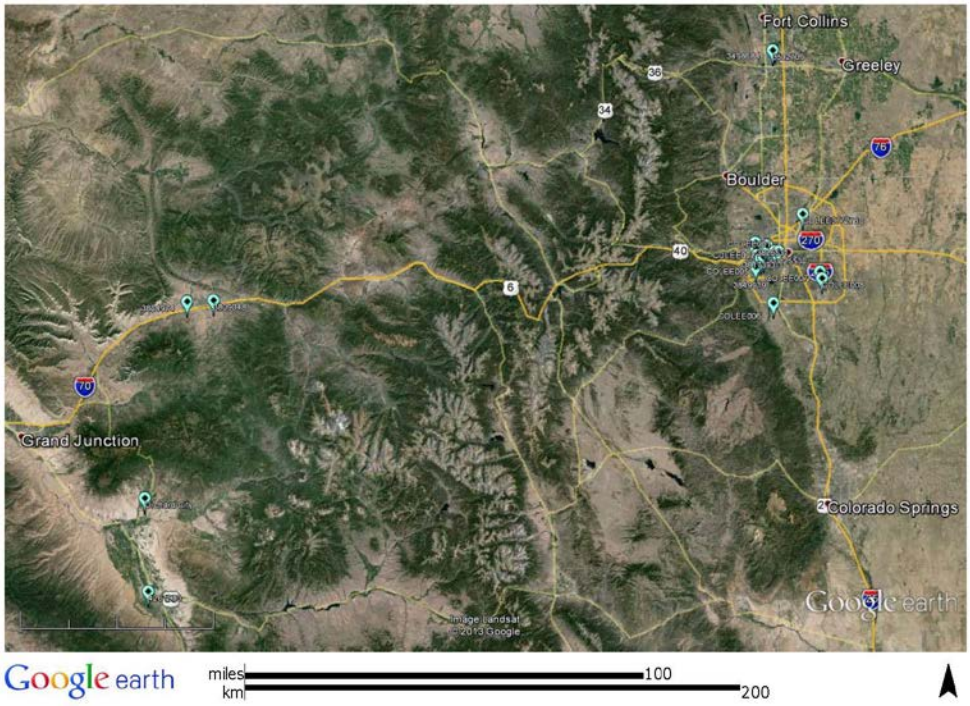
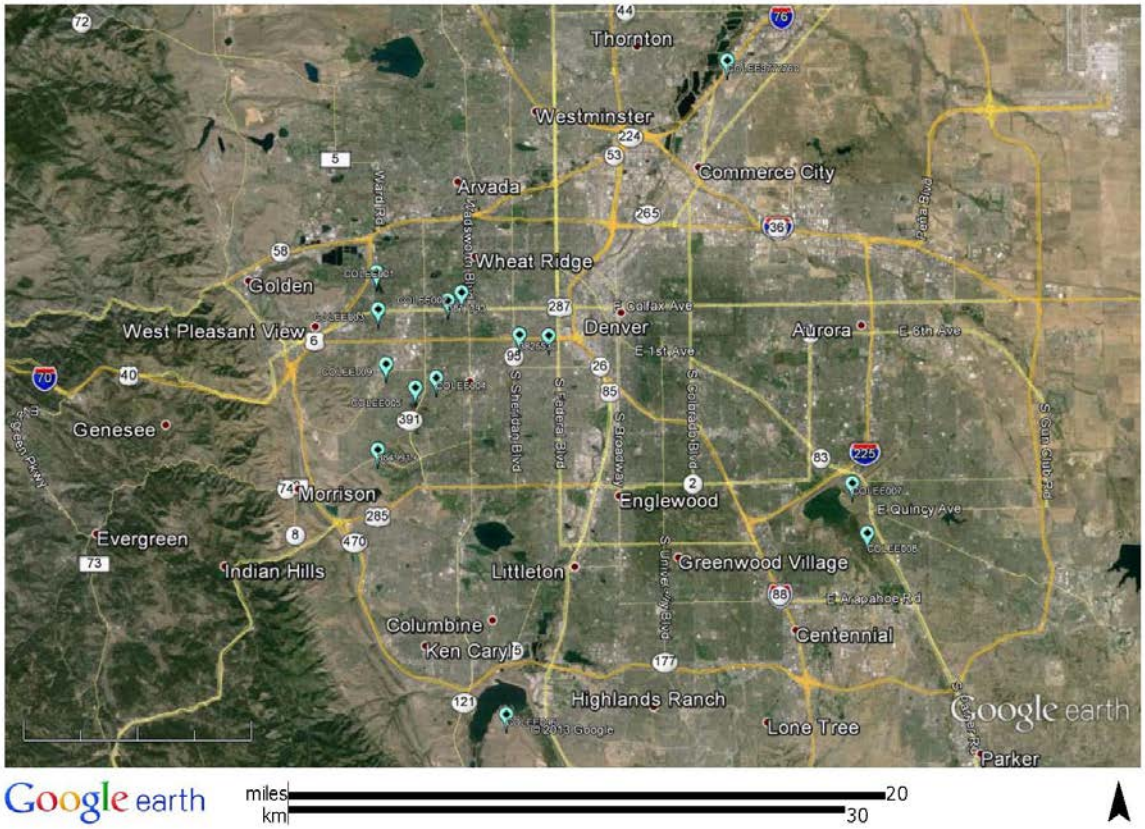


Figure 2 EAB Traps in the Denver Metro Area



2. Survey dates:

	Proposed	Actual
Survey Dates:	Install May, Replaced Lure July, Removed September	Installed May13 -June 5th, Replaced Lure July, Removed September

3. Benefits and results of survey:

Emerald Ash Borer was deemed to have the highest potential to arrive and establish in Colorado based on its rapid distribution the past 10 years. The arrival of EAB will most likely cause severe adverse economic and/or environmental effects. Early detection of the beetle in other Colorado locations, outside of the Boulder area will provide regulators and tree owners more options for eradication, control and management.

	Positive	Negative	Total Number
Traps	0	20	20

4. Database submissions:

Data for EAB trapping was submitted to the IPHIS database. The find of EAB in Boulder county by City of Boulder Forestry staff was submitted to NAPIS.

B. If appropriate, explain why objectives were not met.* (*Provide a narrative in this section if the stated objectives from work plan are not completed. For example: if a survey or other activity was delayed or cancelled due to weather or other factors indicate the reasons here.***)**

All objectives were met.

C. Where appropriate, explain any cost overruns or unobligated funds in excess of $1,000. * (Required for Final Reporting. Report on semi-annual report if information is available.**)**

There were no cost overruns and all funds were obligated.

---

indicates information is required per 7 CFR 3016.40 and 7 CFR 3019.51

Approved and signed by

_____ Date: _____
Mitch Yergert, SPRO

_____ Date: _____
Pat McPherren, ADODR

CAPS Survey Accomplishment Report Template

Appendix P-2

CAPS Survey Report

Year:	2013
State:	Colorado
Cooperative Agreement Name:	Mixed Commodity Small Grains and Corn Bundled Survey
Cooperative Agreement Number:	13-8508-0013-CA
Project Funding Period:	March 1, 2013 to February 28, 2014
Project Report:	Mixed Commodity Small Grains and Corn Bundled Survey Report
Project Document Date:	May 30, 2014
Cooperators Project Coordinator:	John Kaltenbach
Name:	Lou Bjostad, Janet Hardin
Agency:	Colorado State University
Address:	Dept. of Bioagricultural Sciences and Pest Management
City/ Address/ Zip:	Fort Collins, CO 80523-1177
Telephone:	(970) 491-5987
E-mail:	Janet.Hardin@colostate.edu

Quarterly Report	☐
Semi-Annual Accomplishment Report	☐
Annual Accomplishment Report	☒

A. Write a brief narrative of work accomplished. Compare actual accomplishments to objectives established as indicated in the work plan. When the output can be quantified, a computation of cost per unit is required when useful.

The purpose of this project was to conduct an early detection commodity-based survey in wheat, barley and corn fields as a bundled (Mixed Commodity) survey. These crops are highly valuable to Colorado's agriculture and can be hosts to one or more of the target pests, as either a major minor host. They crops are largely grown in the same geographic areas, often in adjacent fields, and to increase the efficiency the commodity-based surveys have been bundled together. The following table list the target pests for this survey.

	Common Name	Scientific Name
Pest:	Old World Bollworm	*Helicoverpa armigera*
Pest:	Egyptian Cottonworm	*Spodoptera littoralis*
Pest:	Cotton Cutworm	*Spodoptera litura*
Pest:	False Codling Moth	*Thaumatotibia leucotreta*
Pest:	Cucurbit Beetle	*Diabrotica speciosa*
Pest:	New Zealand Wheat Bug	*Nysius huttoni*
Pest:	Cotton Seed Bug	*Oxycarenus hyalinipennis*
Pest:	European Grapevine Moth	*Lobesia botrana*

Funding Amount	Total Number of Traps	Cost Per Unit
Proposed = $16,930	Proposed = 100	Proposed= $169
Actual = $17,031	Actual = 125	Actual =$136

1. <u>Survey methodology (trapping protocol)</u>:

Using the CAPS Approved Methods (2013) for each species. pheromone traps were set at wheat and corn fields in 2013 to survey for the moth species listed below. Although we did not originally propose to trap for it, we received traps and lures for the European Grapevine Moth (*Lobesia botrana*) so placed those traps at each survey site as well. Visual and sweep surveys were also conducted for New Zealand wheat bug (*Nysius huttoni*) and the cucurbit beetle (*Diabrotica speciosa*) in wheat fields adjacent to the moth traps. Traps were set in Kit Carson, Yuma, Washington and Larimer counties. Traps were also set for the same moth species at corn fields in Weld, Adams and Larimer counties for a total of 25 wheat and corn sites. At corn fields, visual surveys were also made while plants were blooming (tassels and silks) to survey for the cucurbit beetle and cotton seed bug (*Oxycarenus hyalipennis*). Traps were taken down in October. None of the target species were observed during visual surveys or captured in traps. Because traps for *Helicoverpa armigera* typically attract the native species *H. zea*, which is nearly identical in outward appearance to the target species, captured individuals of *Helicoverpa* were frozen and the genitalia dissected in the laboratory. A total of 1,927 dissections were performed and none of the moths proved to be *H. armigera*.

	Proposed	Actual
Sites (Locations):	25	25
Traps:	100	125

Number of Counties:	6
Counties:	Kit Carson, Larimer, Washington, Weld, Yuma, Adams

2. Survey dates:

	Proposed	Actual
Survey Dates:	May-October	May-October

3. Benefits and results of survey:

None of the target pests were detected in either the visual or sweep surveys. This result provides some security to Colorado wheat and corn producers that these exotic pests are absent and do not pose a threat to trade in these commodities. Visual and sweep surveys were completed. Contents of the sweep surveys were retained and screened for *Diabrotica speciosa, Nysius huttoni,* and/or *Oxycarenus hyalipennis*. Trap contents were screened as encountered, with the exception of those from the *Helicoverpa* traps. Genitalic dissections of *Helicoverpa* sp. captures were performed to be certain that none of the target pest had been found.

	Positive	Negative	Total Number
Traps	0	125	125

4. Database submissions:

All data were entered into the NAPIS Database. See NAPIS maps for each species below.

B. If appropriate, explain why objectives were not met.*

All objectives were met.

C. Where appropriate, explain any cost overruns or unobligated funds in excess of $1,000. *

All funds have been obligated.

indicates information is required per 7 CFR 3016.40 and 7 CFR 3019.51

Approved and signed by

_____ **Date:** _____

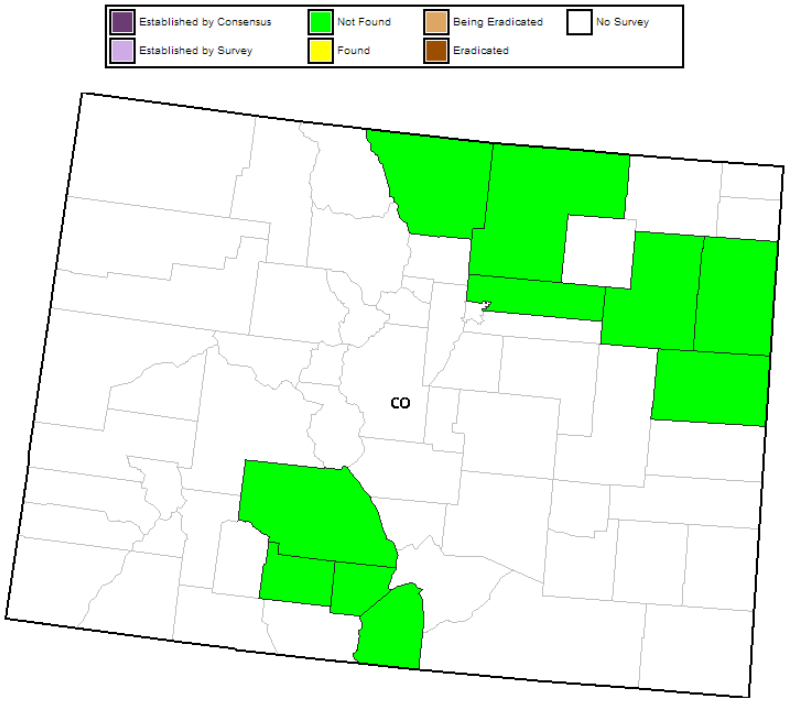
Mitch Yergert, SPRO

_____ **Date:** _____

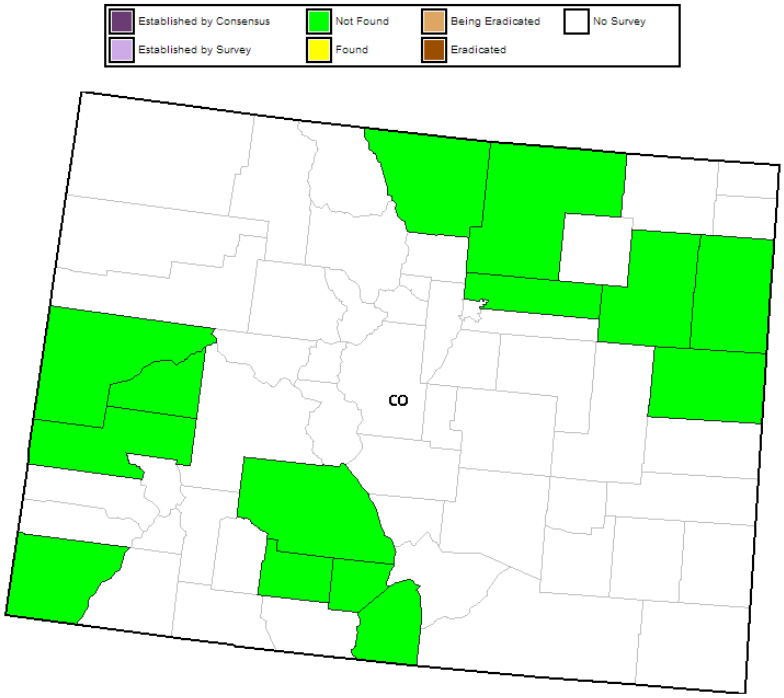
Pat McPherren, ADODR

Appendix A: NAPIS Maps

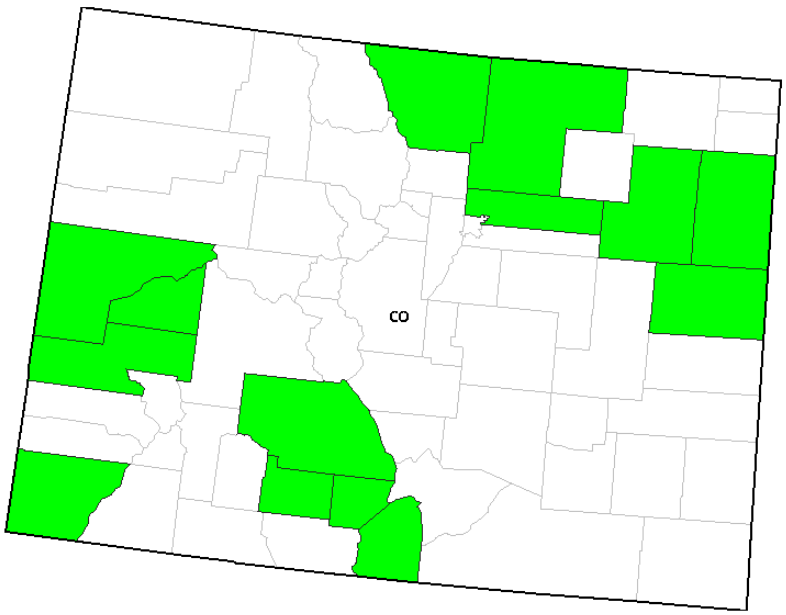
Reported Status of
Old World Bollworm / *Helicoverpa armigera*
(01/01/2013 - 12/31/2013)
in Colorado
Data retrieved from NAPIS on Fri May 30 2014 09:50:55 GMT-0600 (Mountain Daylight Time)



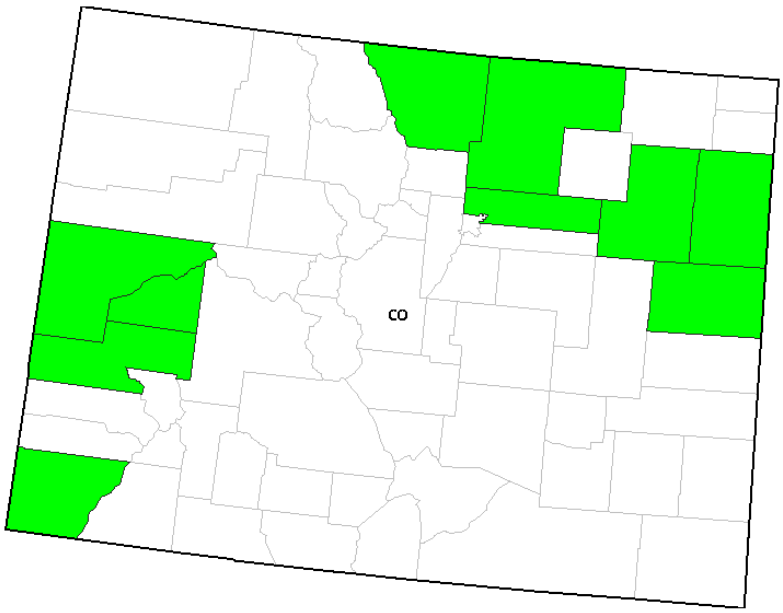
Reported Status of
Cotton Cutworm / *Spodoptera litura*
(01/01/2013 - 12/31/2013)
in Colorado
Data retrieved from NAPIS on Fri May 30 2014 09:51:50 GMT-0600 (Mountain Daylight Time)



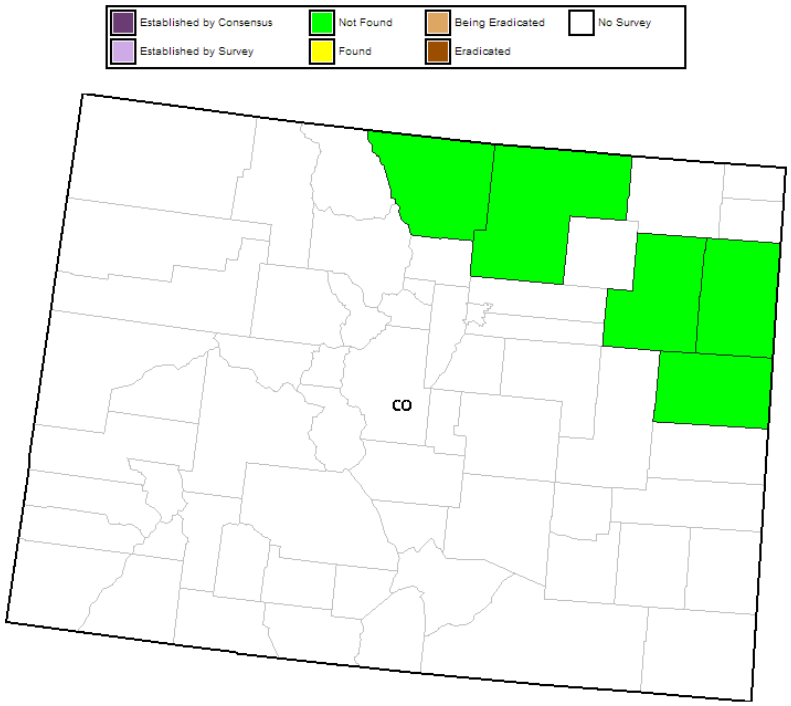
Reported Status of
Egyptian Cottonworm / *Spodoptera littoralis*
(01/01/2013 - 12/31/2013)
in Colorado
Data retrieved from NAPIS on Fri May 30 2014 09:52:32 GMT-0600 (Mountain Daylight Time)



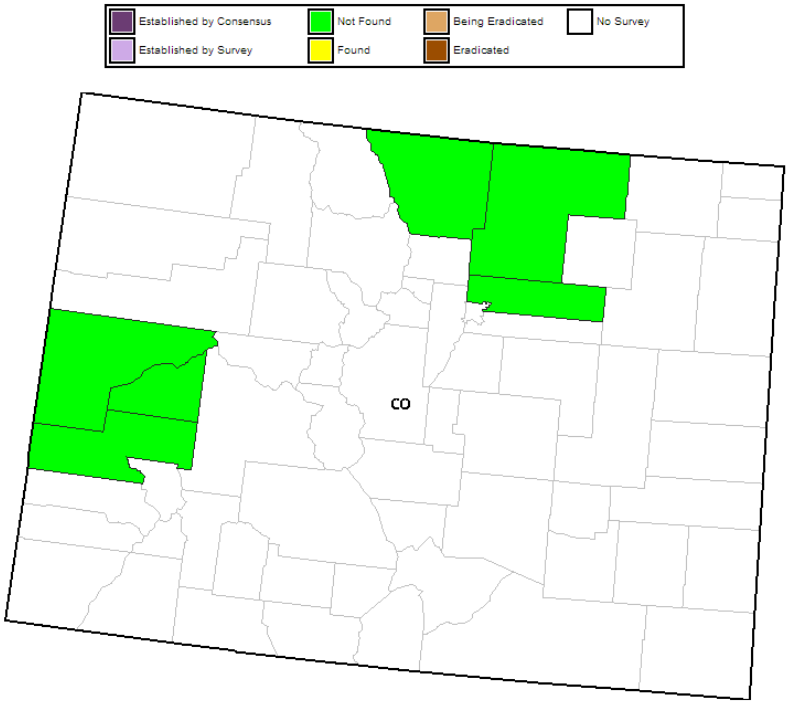
Reported Status of
False Codling Moth / *Thaumatotibia leucotreta*
(01/01/2013 - 12/31/2013)
in Colorado
Data retrieved from NAPIS on Fri May 30 2014 09:53:23 GMT-0600 (Mountain Daylight Time)



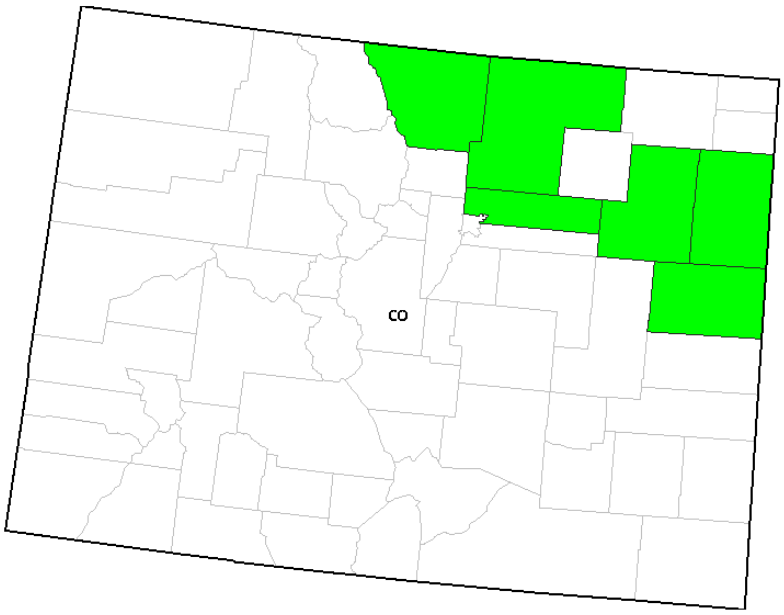
Reported Status of
Wheat Bug / *Nysius huttoni*
(01/01/2013 - 12/31/2013)
in Colorado
Data retrieved from NAPIS on Fri May 30 2014 09:54:10 GMT-0600 (Mountain Daylight Time)



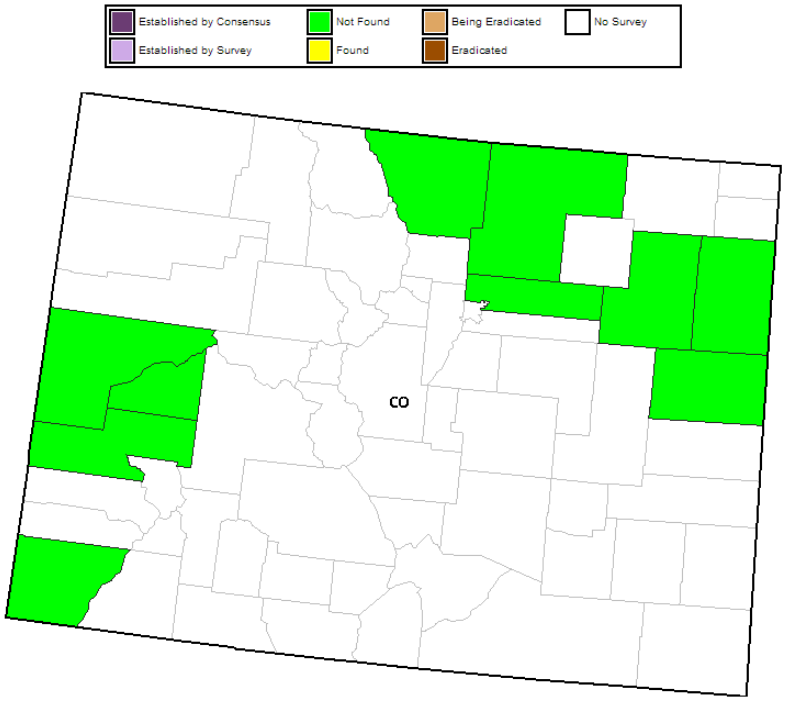
Reported Status of
Cotton Seed Bug / *Oxycarenus hyalinipennis*
(01/01/2013 - 12/31/2013)
in Colorado
Data retrieved from NAPIS on Fri May 30 2014 09:54:55 GMT-0600 (Mountain Daylight Time)



Reported Status of
Cucurbit Beetle / *Diabrotica speciosa*
(01/01/2013 - 12/31/2013)
in Colorado
Data retrieved from NAPIS on Fri May 30 2014 09:55:37 GMT-0600 (Mountain Daylight Time)



Reported Status of
European Grapevine Moth / *Lobesia botrana*
(01/01/2013 - 12/31/2013)
in Colorado
Data retrieved from NAPIS on Fri May 30 2014 09:56:20 GMT-0600 (Mountain Daylight Time)



CAPS Survey Accomplishment Report Template

Appendix P-2

CAPS Survey Report

Year:	2013
State:	Colorado
Cooperative Agreement Name:	Karnal Bunt
Cooperative Agreement Number:	13-8508-0013-CA
Project Funding Period:	March 1, 2013 to February 28, 2014
Project Report:	**CAPS Survey Report**
Project Document Date:	February 2014
Cooperators Project Coordinator:	John Kaltenbach
Name:	Lou Bjostad, Janet Hardin
Agency:	Colorado State University
Address:	Dept. of Bioagricultural Sciences and Pest Management
City/ Address/ Zip:	Fort Collins, Colorado 80532-1177
Telephone:	(970) 491-5987
E-mail:	Janet.Hardin@colostate.edu

Quarterly Report	☐
Semi-Annual Accomplishment Report	☐
Annual Accomplishment Report	☒

A. Write a brief narrative of work accomplished. Compare actual accomplishments to objectives established as indicated in the work plan. When the output can be quantified, a computation of cost per unit is required when useful.

The purpose of this survey is was to monitor the distribution and spread of Karnal Bunt in the United States and to facilitate the export of wheat from areas that are identified as being free of the disease. Samples collected from representative grain elevators in wheat-producing counties in Colorado were analyzed for the presence of Karnal Bunt spores by an approved laboratory, and compile and summarize laboratory results for reports and entry into an APHIS approved database.

Wheat is ranked as the #4 crop in terms of value produced in Colorado. The value of wheat produced for 2006 was $191,800,000.00.

"Colorado consistently ranks among the top ten states in total wheat production. Each year, more than $250 million in income is directly generated from the sale of wheat produced in Colorado, a quantity in excess of 96 million bushels. Because of its extremely high quality, Colorado Hard Winter Wheat is much in demand both domestically and internationally. Nearly 80 percent of Colorado's wheat production is exported to foreign countries."

Funding Amount	Total Number of Traps	Cost Per Unit
Proposed = $4,159	Proposed = 10 elevators	Proposed= $416
Actual = $4,159	Actual = 10 elevators	Actual = $416

1. <u>Survey methodology (trapping protocol)</u>

Wheat samples were collected from 10 grain elevators in Kit Carson, Yuma, Washington, Morgan and Weld counties. Samples were submitted to the USDA testing laboratory in Phoenix, AZ for analysis. The laboratory reported negative results in every sample.

	Common Name	Scientific Name
Pest:	Karnal Bunt	*Tilletia indica*

	Proposed	Actual
Sites (Locations):	10	10
Traps:	4 samples from each elevator	4 samples from each elevator

Number of Counties:	5
Counties:	Elevators located in Kit Carson, Yuma, Washington, Morgan and Weld counties. Wheat in samples also came from Lincoln and Logan

	counties in Colorado, and possibly some from Cheyenne Co., Kansas.

2. Survey dates:

	Proposed	Actual
Survey Dates:	During wheat harvest, when wheat being received at elevators	During wheat harvest (July 2013)

3. Benefits and results of survey:

	Positive	Negative	Total Number
Traps	0 No samples were positive for karnal bunt	40	40

4. Database submissions:

All survey data was entered into IPHIS.

B. If appropriate, explain why objectives were not met.*

All objectives have been met.

C. Where appropriate, explain any cost overruns or unobligated funds in excess of $1,000. *

N.A.

****indicates information is required per 7 CFR 3016.40 and 7 CFR 3019.51***

Approved and signed by

_____ **Date: _____**

Mitch Yergert, SPRO

_____ **Date: _____**

Pat McPherren, ADODR

Farm Bill Survey Report

Year:	2013
State:	Colorado
Cooperative Agreement Name:	**Grape Commodity Survey**
Cooperative Agreement Number:	13-8508-0013-CA
Project Funding Period:	May 15, 2013 to May 14, 2014
Project Report:	**Farm Bill Survey Report**
Project Document Date:	December 2013
Cooperators Project Coordinator:	John Kaltenbach
Name:	Lou Bjostad, Janet Hardin
Agency:	Colorado State University
Address:	Dept. of Bioagricultural Sciences and Pest Management
City/ Address/ Zip:	Fort Collins, Colorado 80523-1177
Telephone:	(970) 491-5987
E-mail:	Janet.Hardin@colostate.edu

Quarterly Report	☐
Semi-Annual Accomplishment Report	☐
Annual Accomplishment Report	☒

Write a brief narrative of work accomplished. Compare actual accomplishments to objectives established as indicated in the work plan. When the output can be quantified, a computation of cost per unit is required when useful.

The purpose of this project is to conduct early detection commodity-based surveys in vineyards and fruit orchards located in Colorado to look for the following pests:

	Common Name	Scientific Name
Pest:	European grapevine moth	*Lobesia botrana*
Pest:	cotton cutworm	*Spodoptera litura*
Pest:	Egyptian cottonworm	*Spodoptera littoralis*
Pest:	cotton seed bug	*Oxycarenus hyalinipennis*
Pest:	false codling moth	*Thaumatotibia leucotreta*
Pest:	summer fruit tortrix	*Adoxophyes orana*
Pest:	glassy-winged sharpshooter	*Homalodisca vitripennis*
Pest:	spotted wing drosophila	*Drosophila suzukii*

The growing importance of vineyards and wine production in Colorado is suggested by the federal designation of two American Viticultural Areas (AVA) in the state. Lobesia botrana and other exotic grape pests should be surveyed for in Colorado because if these pests were to become established the economic impact would be devastating. Determining the presence or absence of the targeted pests will support agricultural exports and help assess specific pest risks to Colorado and the United States. Grape production and tourism-driven wineries are a relatively new but thriving industry in Colorado. Estimates from the Colorado Wine Industry Development Board place the retail value of wine production in Colorado at over $14 million, with an economic impact of $21.1 million dollars in Colorado in 2005. Production equivalents of wine in Colorado have increased from nearly 30,000 gallons in 1995 to an estimated 281,196 gallons in 2011. The number of vineyards in Colorado has increased from 5 in 1990 to 80 that are currently in operation. During the past twenty-five years the number of licensed wineries operating in the state has grown from 1 to 42.

A.

Funding Amount	Total Number of Traps	Cost Per Unit
Proposed = $17,241	Proposed = 84	Proposed= $205
Actual = $17,241	Actual = 92	Actual = $187

1. <u>Survey methodology (trapping protocol)</u>:

Trapping and survey was conducted in accordance with the CAPS Approved Methods for 2013. Peromone traps were set for the 5 moth species listed above at vineyards in Mesa, Delta, Montrose and Montezuma counties. Visual surveys for Cotton Seed Bug (*Oxycarenus hyalipennis*) were conducted in Mesa, Delta, Montrose and Montezuma counties. Also, yellow sticky card traps were placed at the same locations in order to survey for the Glassy-winged Sharpshooter (*Homalodisca vitripennis*), an important vector of Pierce's Disease of grapes, which has recently been detected in Kansas. No target species were found in any traps or during visual surveys. However, non-target tortricid species, notably the cherry fruitworm (*Graphoita packardi*) have been common in some locations on the West Slope.

Traps for Spotted Wing Drosophila (*Drosophila suzukii*) were set at 12 locations in the counties listed above, as well as at 8 locations in Fort Collins, Larimer County, where *D. suzukii* made its first appearance in Colorado in 2012. Because this pest has caused millions of dollars of damage to fruit crops in other states, we felt it was important to determine whether it had overwintered successfully and persisted along the Front Range. To date, *D. suzukii* has most definitely persisted in Fort Collins, and Colorado State Extension personnel have received and confirmed reports from 6 counties along the Front Range as well as Morgan County in eastern Colorado. Interestingly, after two years of trapping it has thus far **not** been detected in fruit-growing areas on the Western Slope.

Drosophila cup trap, grapevines
Fort Collins

Initial surveys for Spotted Wing Drosophila were completed in October 2013. Of the traps set in Fort Collins, flies were captured at all but one location. However, in an attempt to elucidate the life history of the fly where it occurs in Colorado, one trap in Fort Collins was maintained throughout the winter. Traps were checked weekly, except during winter (2014) when the remaining trap was occasionally checked every two weeks when subfreezing weather had occurred. The last date on which *D. suzukii* was found in that trap was December 2, 2013. On April 10, 2014 traps were again set up at 4 locations where flies had been trapped in 2013, as well as one location on the CSU campus where Spotted Wing Drosophila had been reared from fruit collected from an ornamental shrub. As of the conclusion of this survey, no *D. suzukii* have yet been trapped in 2014.

In addition to concerns that *D. suzukii* along the Front Range could pose a threat to the fruit industry on the Colorado western slope (where vineyards and fruit orchards generate a combined total of $62.2 - $110.4 million annually), CSU Extension is keenly interested in the problem that Spotted Wing Drosophila presents along the Front Range. Because *Drosophila suzukii* is known from a wide variety of fruits and had succeeded in overwintering when no food crops were fruiting, an informal survey was conducted of potential non-cultivated hosts in Fort Collins. This year we hope to conduct more formal, collaborative surveys of the local host range of this economically significant pest.


Drosophila suzukii larvae (white raspberries) and pupa
in the laboratory, Fort Collins

Female and male *D. suzukii* reared from non-crop host
Fort Collins

	Proposed	Actual
Sites (Locations):	> 13	20
Traps:	> 84	92

Number of Counties:	5
Counties:	Delta, Mesa, Montezuma, Montrose, Larimer

2. <u>Survey dates</u>:

	Proposed	Actual
Survey Dates:	May – September 2013	May – October 2013 (but *Drosophila* – May 2014)

3. <u>Benefits and results of survey</u>:

	Positive	Negative	Total Number
Traps (moths & sharpshooter)	0	72	72

Drosophila suzukii	8 (Larimer Co. only)	12	20

4. Database submissions:

All data was entered into the NAPIS Database. See maps below.

B. If appropriate, explain why objectives were not met.*

All objectives were met. Numbers of traps include those set for the 5 moth species and glassy-winged sharpshooter at 12 vineyards, plus 20 traps set for spotted-wing drosophila at the same 12 vineyards and 8 sites in Larimer County. Visual surveys were done at vineyards for the cotton seed bug.

C. Where appropriate, explain any cost overruns or unobligated funds in excess of $1,000. * (Required for Final Reporting. Report on semi-annual report if information is available.**)**

All fund were obligated and there wer no cost overruns.

---

indicates information is required per 7 CFR 3016.40 and 7 CFR 3019.51

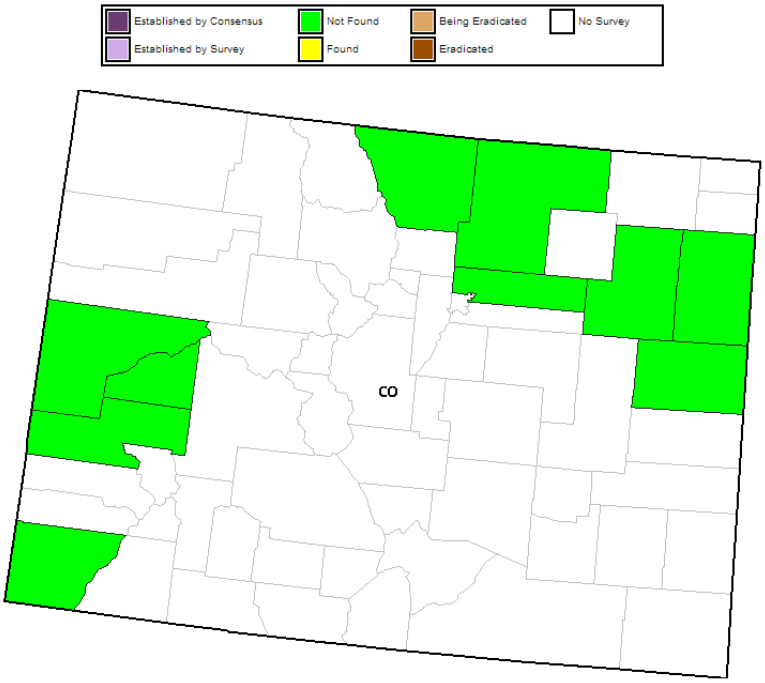
Approved and signed by

_____ Date: _____
Mitch Yergert, SPRO

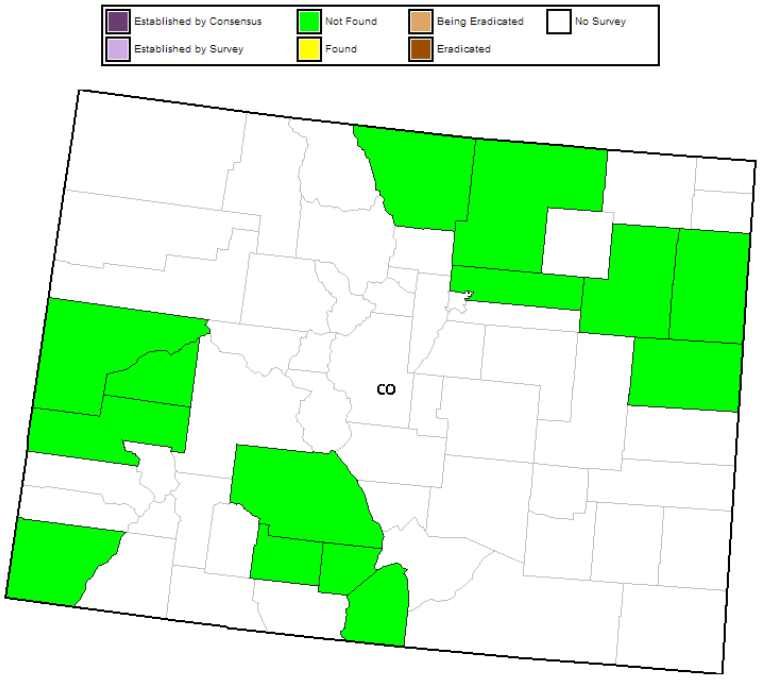
_____ Date: _____
Pat McPherren, ADODR

NAPIS Survey Maps

Reported Status of
European Grapevine Moth / *Lobesia botrana*
(01/01/2013 - 12/31/2013)
in Colorado
Data retrieved from NAPIS on Fri May 30 2014 09:56:20 GMT-0600 (Mountain Daylight Time)



Reported Status of
Cotton Cutworm / *Spodoptera litura*
(01/01/2013 - 12/31/2013)
in Colorado
Data retrieved from NAPIS on Fri May 30 2014 09:51:50 GMT-0600 (Mountain Daylight Time)



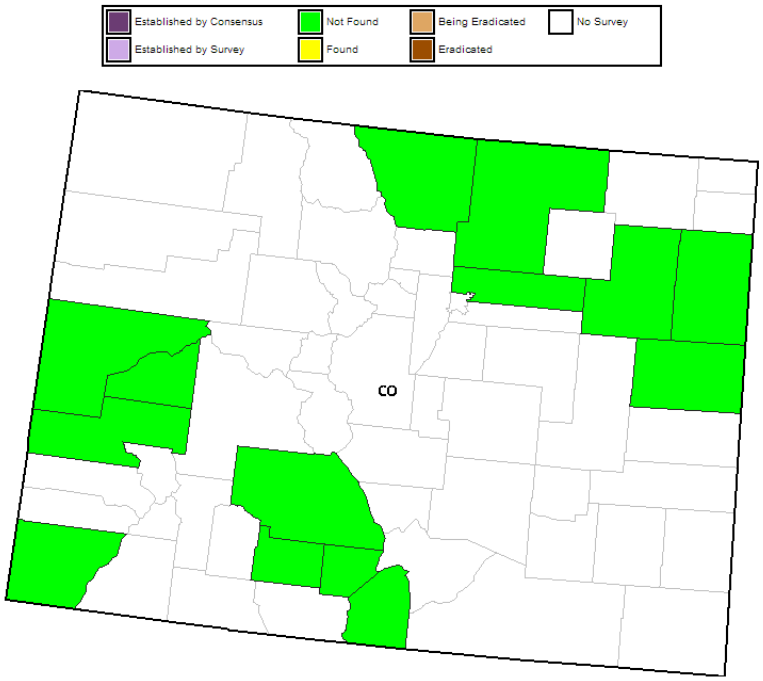
Reported Status of

Egyptian Cottonworm / *Spodoptera littoralis*

(01/01/2013 - 12/31/2013)

in Colorado

Data retrieved from NAPIS on Fri May 30 2014 09:52:32 GMT-0600 (Mountain Daylight Time)



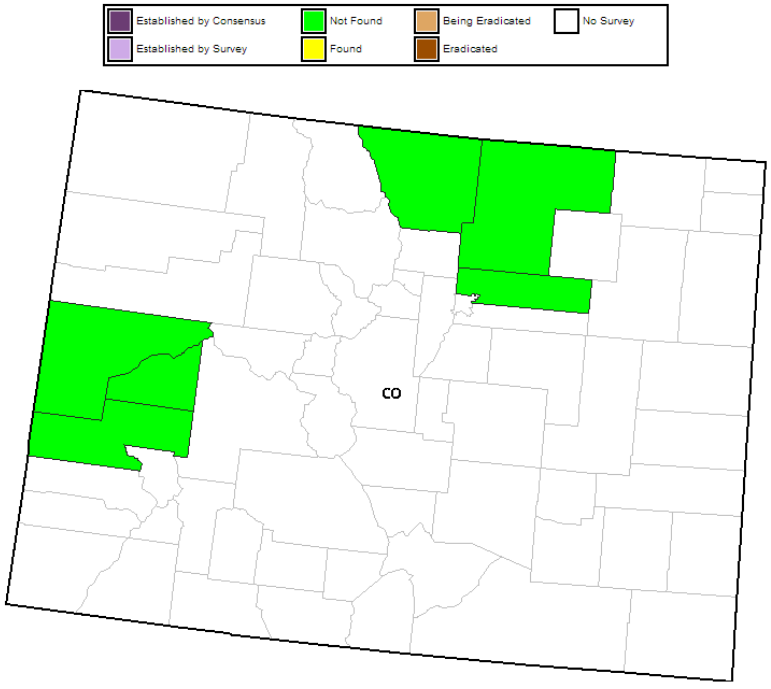
Reported Status of

Cotton Seed Bug / *Oxycarenus hyalinipennis*

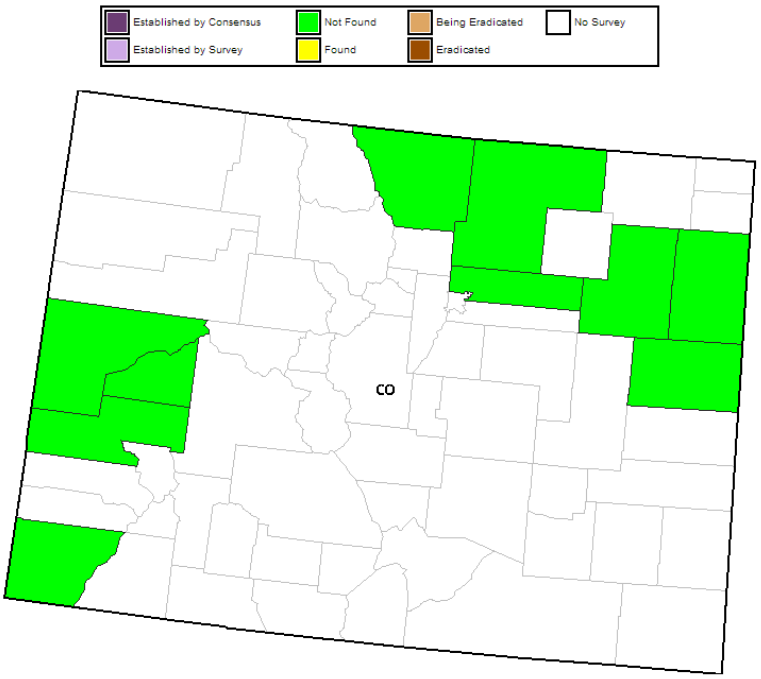
(01/01/2013 - 12/31/2013)

in Colorado

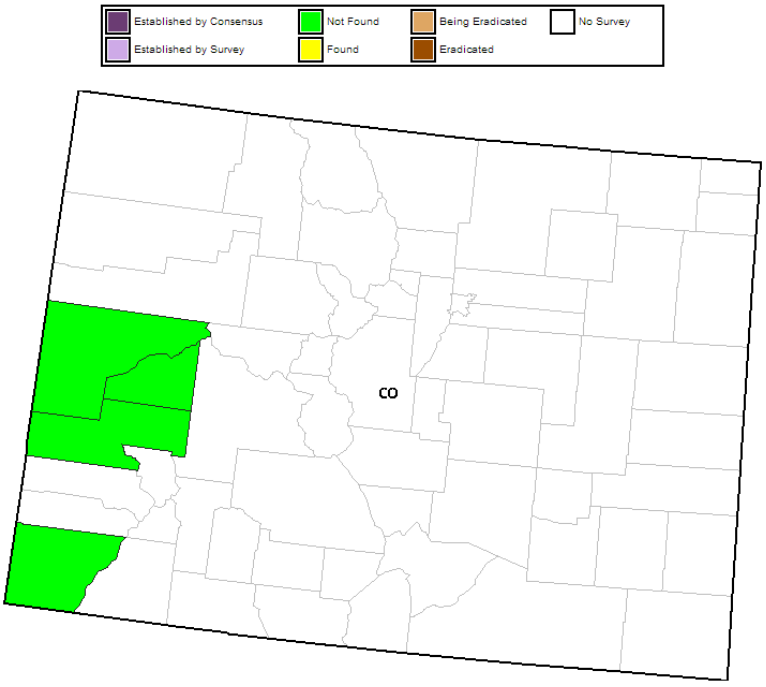
Data retrieved from NAPIS on Fri May 30 2014 09:54:55 GMT-0600 (Mountain Daylight Time)



Reported Status of
False Codling Moth / *Thaumatotibia leucotreta*
(01/01/2013 - 12/31/2013)
in Colorado
Data retrieved from NAPIS on Fri May 30 2014 09:53:23 GMT-0600 (Mountain Daylight Time)



Reported Status of
Summer Fruit Tortrix Moth / *Adoxophyes orana*
(01/01/2013 - 12/31/2013)
in Colorado
Data retrieved from NAPIS on Fri May 30 2014 10:29:02 GMT-0600 (Mountain Daylight Time)



CAPS Survey Accomplishment Report Template

Appendix P-2

Biocontrol Report

Year:	2013
State:	Colorado
Cooperative Agreement Name:	Biocontrol/Weed Management: Biological Control of Invasive Weeds: Russian knapweed and yellow toadflax.
Cooperative Agreement Number:	13-8508-0013-CA
Project Funding Period:	March 1, 2013 to February 28, 2014
Project Report:	**Annual Accomplishment Report**
Project Document Date:	**May 30, 2014**
Cooperators Project Coordinator:	Dan Bean and John Kaltenbach
Name:	John Kaltenbach
Agency:	Colorado Department of Agriculture
Address:	305 Interlocken Parkway
City/ Address/ Zip:	Broomfield, CO 80021
Telephone:	303-869-9037
E-mail:	john.kaltenbach@state.co.us

Quarterly Report	☐
Semi-Annual Accomplishment Report	☐
Annual Accomplishment Report	☒

A. Write a brief narrative of work accomplished. Compare actual accomplishments to objectives established as indicated in the work plan. When the output can be quantified, a computation of cost per unit is required when useful.

There were four objectives in the work plan and they are listed below.

1. To collect, rear, and release the toadflax stem borer *Mecinus janthinus* for control of yellow toadflax (*Linaria vulgaris)* and the Russian knapweed gall midge, *Jaapiella ivannikovi* for control of Russian knapweed (*Rhaponticum repens*).

2. To monitor establishment and impact of *M. janthinus* on yellow toadflax and *J. ivannikovi* on Russian knapweed at sites throughout Colorado.

3. To monitor changes in vegetation, other than the target weeds, at *M. janthinus* and *J. ivannikovi* release sites.

4. To provide weed biocontrol agents to cooperators outside of Colorado, at the request of the USDA APHIS.

Accomplishments:

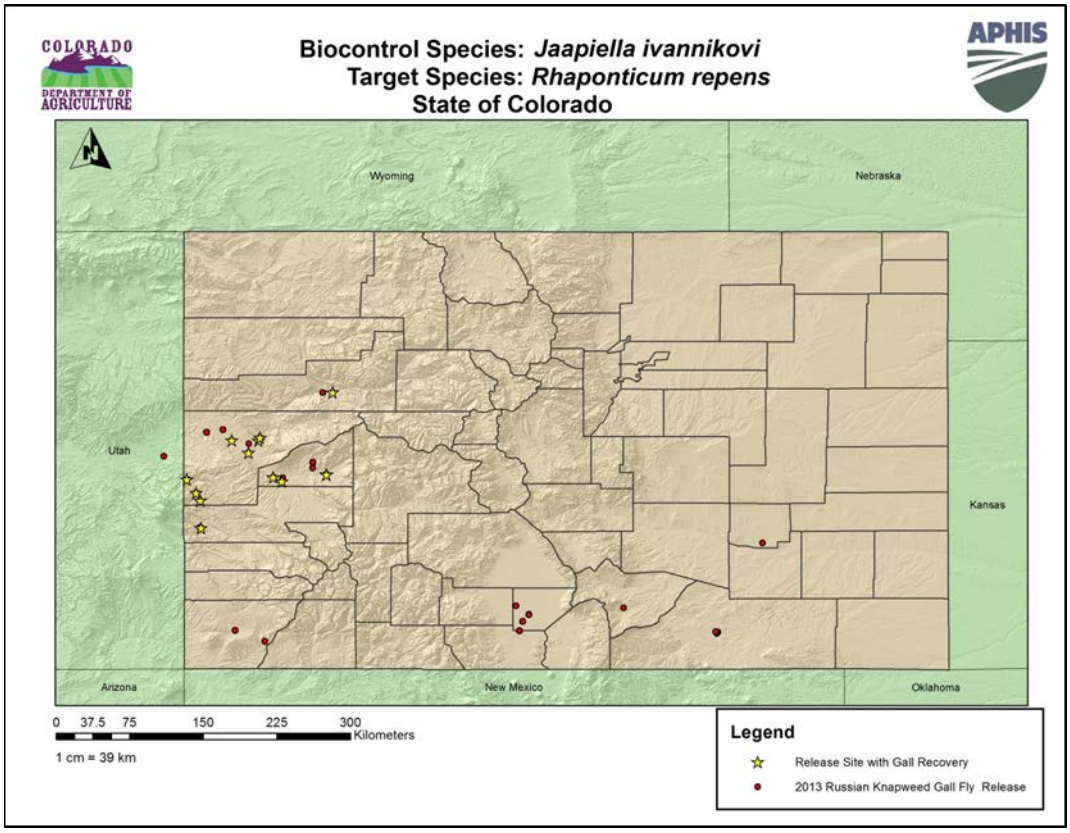
1. Collection and release of *J. ivannikovi* and *M. janthinus.*

We reared Russian knapweed gall midges, J. ivannikovi, in our greenhouses on live Russian knapweed plants. The goal was to have sufficient gall numbers to allow us to release in the spring, when growing tips of knapweed plants (the preferred target) are most abundant. Knapweed was planted at regular intervals so that we had a continuous supply of fresh plants which we rotated into the greenhouse. From March to mid-April we steadily increased gall numbers (infested plants) so that we had over 150 gall-containing plants when field season began. We put out whole potted plants for these releases of greenhouse material. 2,558 galls were released in this way and many of the release were made early in the season. We noted the appearance of the first galls in the Palisade insectary gardens on May 3, 2013. This population has been established and has overwintered since 2010. We collected galls from the garden and released them as bouquets of knapweed. We released a total of 2,153 galls collected from the garden. We surveyed areas in and around Palisade for the occurrence of gall midges that may have moved out from the Palisade Insectary garden. Galls were found on one property located 1.8 kilometers from the Insectary. This establishment was not the result of a release but of insects moving from our garden. The landowner was contacted and we were given permission to harvest galls from his property. He mowed about every three weeks which stimulated knapweed growth and appeared to stimulate gall formation. Since we released galls rather than individual flies, we are unable to get an exact count of the total number of insects released. According to the work of Dr. Richard Hansen (APHIS- Ft. Collins) there are about 15 flies per gall on average and as many as 30 per gall. Using 15 as an average number per gall our summary of insects released so far this year would be 105,015 flies (7,001 galls) (Table 1). Russian knapweed gall flies were maintained over the winter (2013-2014) in the greenhouse.

Table 1: 2013 Weed biological control releases			
Agent	Target	# of Releases	Total Agents
Jaapiella ivannikovi	Russian Knapweed	88	7,001 galls
Aulacidea acroptilonica	Russian Knapweed	3	117 galls

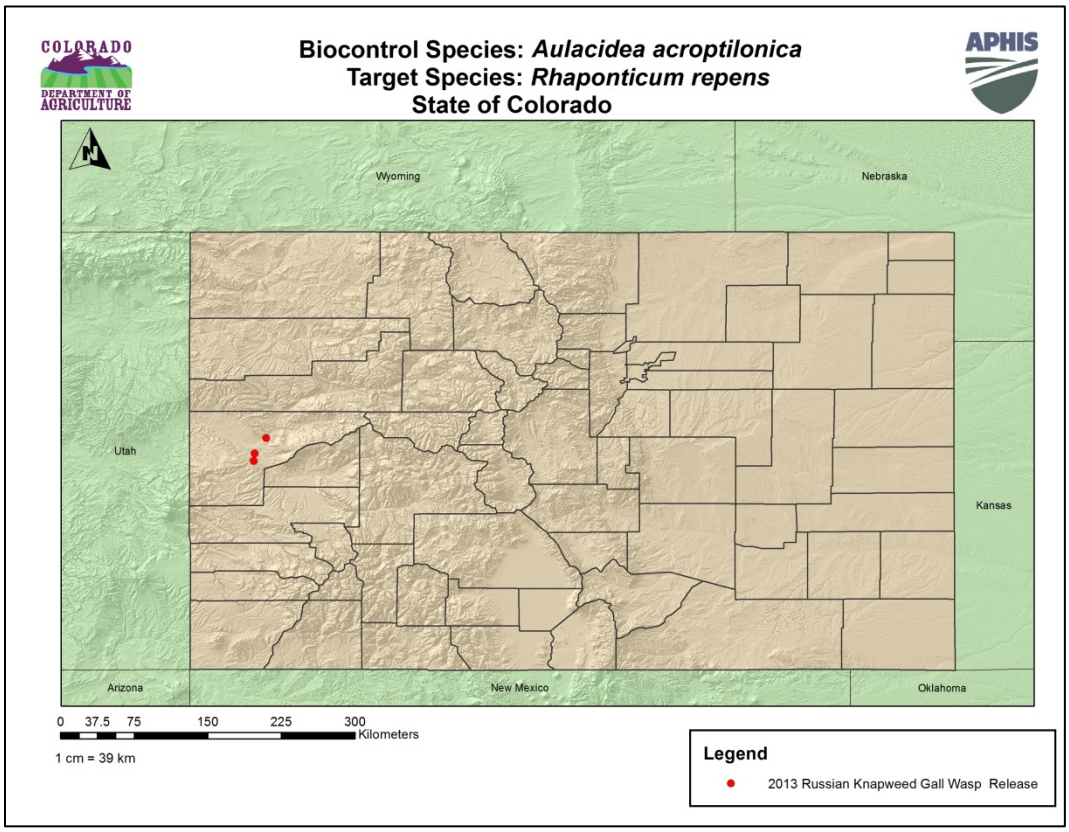
Releases of *J. ivannikovi* have been made at sites in the Arkansas River Basin, at sites in the San Luis Valley (Rio Grande River Basin) and at sites on the western slope (Colorado River Basin) (Figure 1).

Figure 1



We received our first shipment of the Russian knapweed gall wasp, *Aulacidea acroptilonica*, which came through R. Hansen. We released some in our garden and some on private property. On the private property we released gall wasps into the open field and we also released some into a cage (see sites in Figure 2).

Figure 2



Yellow toadflax weevils, *Mecinus janthinus*, were received from our cooperators in Montana and released at three locations where yellow toadflax densities were highest last season (Table 2).

Table 2: Mecinus janthinus release locations

Location	County	Date	Amount	Latitude	Longitude	Elevation (meters)
Silver Falls in Pagosa Springs	Mineral	6/3/2013	150	37.419336	-106.791506	2,497
Silver Falls in Pagosa Springs	Mineral	6/3/2013	150	37.416814	-106.800252	2,493
Priest Lake in Telluride	San Miguel	5/31/2013	300	37.833631	-107.882569	2,918

Early season surveys of our existing release sites showed overwinter establishment at three out of ten sites. Of those three sites only one site, the Oakridge Wildlife Area site in Rio Blanco County, had sufficient numbers of weevils to consider as a collection site. We decided not to collect from that site since we could only have collected enough for a single release and we felt that the site needed at least another year for continued population expansion.

2. Monitoring establishment and impact of M. janthinus and J. ivannikovi.

M. janthinus have been released at 11 sites and we recovered weevils at three of them during early season monitoring. The three recovery sites were the same as last year and we have no evidence that weevils have established at the other 8 sites. *J. ivannikovi* were recovered at one out of 11 monitoring sites. The recovery site was the same site where we noted in-season establishment of galls last year.

3. Monitoring changes in vegetation composition at biocontrol sites.

We monitored 11 sites (yellow toadflax) and 11 sites (Russian knapweed) for changes in vegetation following biocontrol implementation. In no case have we noted shifts in vegetation patterns although we haven't had well established biocontrol at any of the sites.

Vegetation monitoring showed no overall pattern of decline in Russian knapweed stem densities following introduction of flies. For example, at one site where galls had established stem densities increased while at another they declined (see Figures 3, 4 and 5).

Figure 3- Reid Property: galls recovered stem density decline

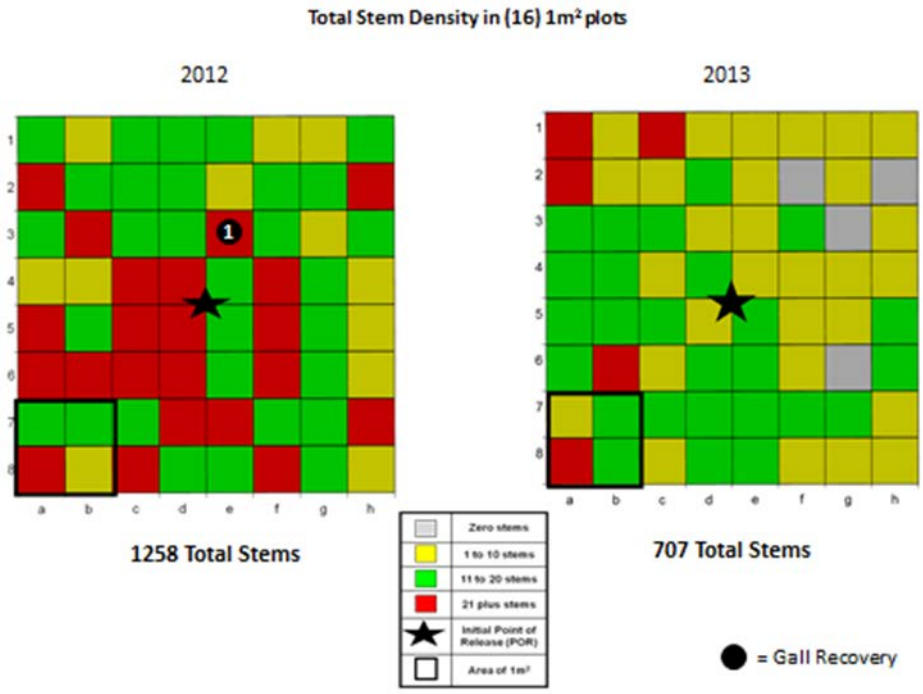


Figure 4 - Tom Kay property: no galls and stem density increase

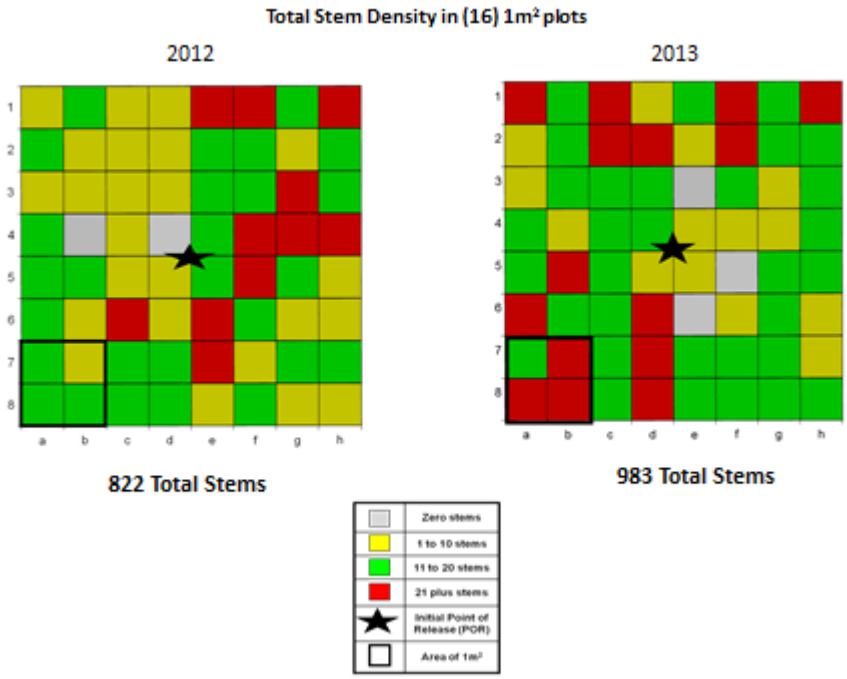
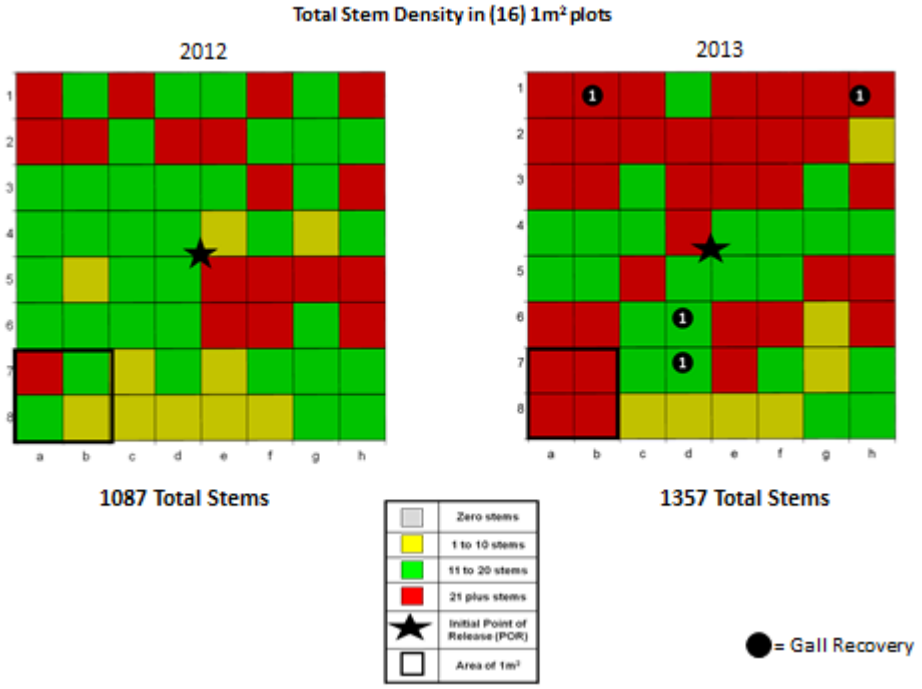


Figure 5- Stanley Road: galls recovered stem density increase



4. Providing biocontrol agents for establishment in other states.

We collected and shipped 178 releases of the bindweed mite, *Aceria malherbae*, for release in other states. Most of these were done at the request of USDA APHIS officials. We also shipped 7 releases of the bindweed moth, *Tyta luctuosa*, to three states (Table 3 and Figures 6 and 7). *Jaapiella ivannikovi* galls were sent out for early releases to Utah and New Mexico: 309 galls were sent to Grand County, Utah (Tim Higgs) and 50 galls were shipped to NMSU, Las Cruces (Josh Brown)(Table 3).

Table 3: Out of state shipments

Agent	Target	Stage	Location	# Releases	Total Agents
Aceria malherbae	Field Bindweed	Gall	Kansas	2	2000
Aceria malherbae	Field Bindweed	Gall	Wyoming	6	6,000
Aceria malherbae	Field Bindweed	Gall	Pennsylvania	10	10,000
Aceria malherbae	Field Bindweed	Gall	Kansas	10	10,000
Aceria malherbae	Field Bindweed	Gall	Idaho	10	10,000
Aceria malherbae	Field Bindweed	Gall	South Dakota	10	10,000
Aceria malherbae	Field Bindweed	Gall	Nebraska	130	130,000
Tyta luctuosa	Field Bindweed	Larvae	Kansas	1	1,000
Tyta luctuosa	Field Bindweed	Larvae	Oregon	3	1,340
Tyta luctuosa	Field Bindweed	Larvae	Washington	3	2,300
Jaapiella ivannikovi	Russian Knapweed	Gall	New Mexico	50	750
Jaapiella ivannikovi	Russian Knapweed	Gall	Utah	309	4,635

Figure 2

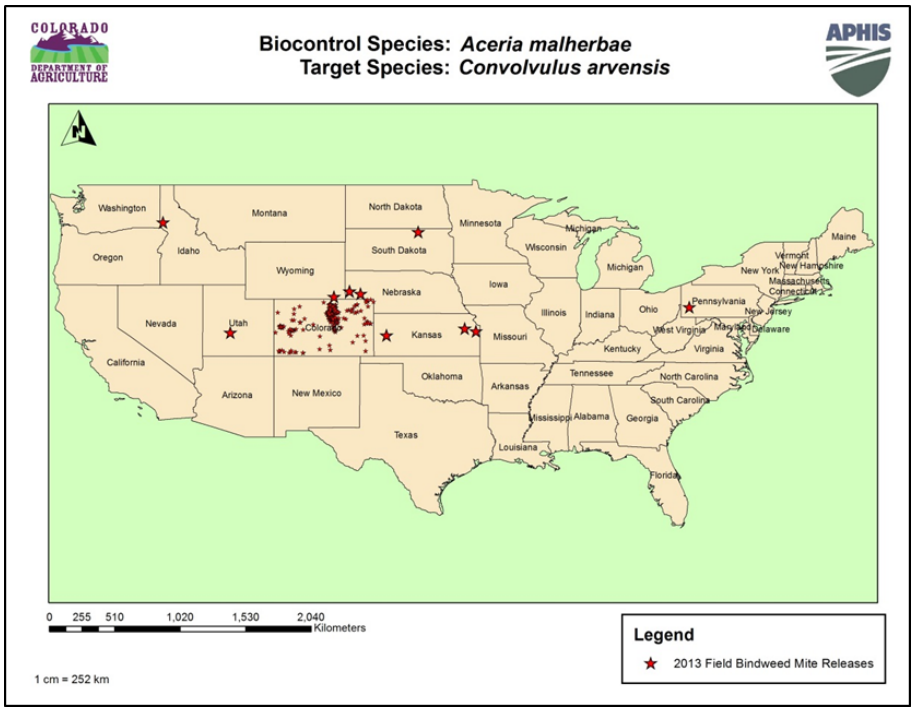
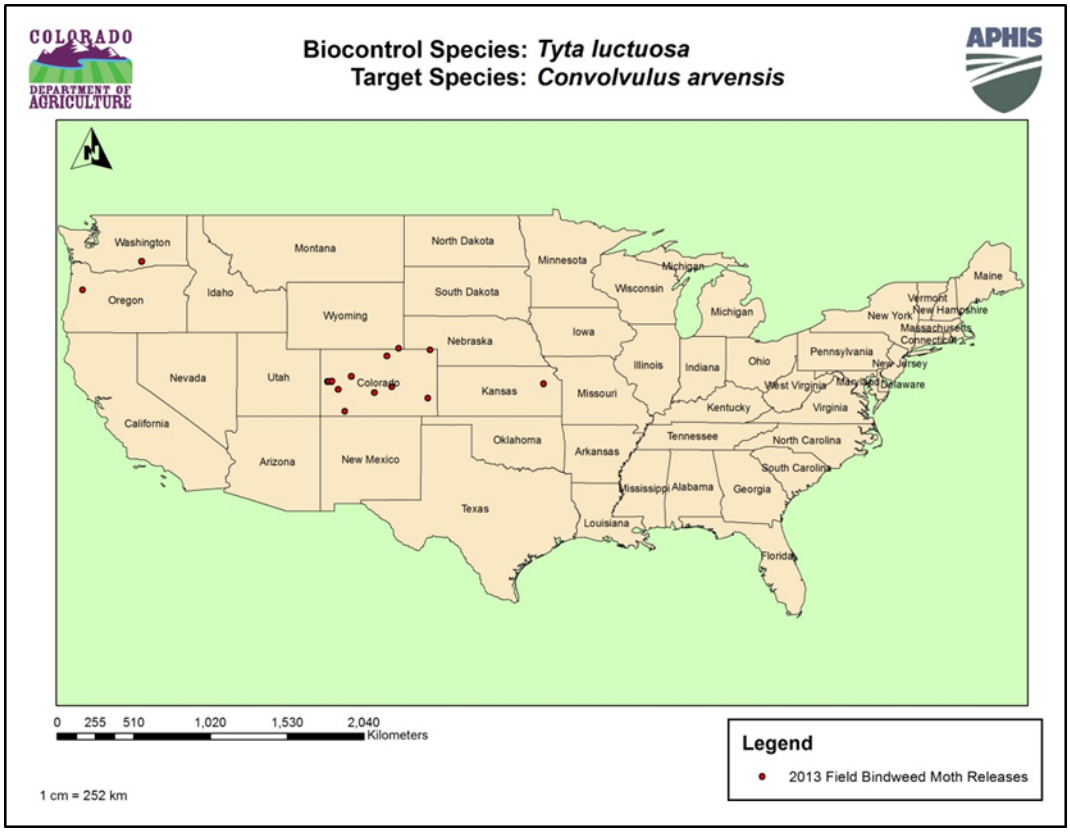


Figure 3

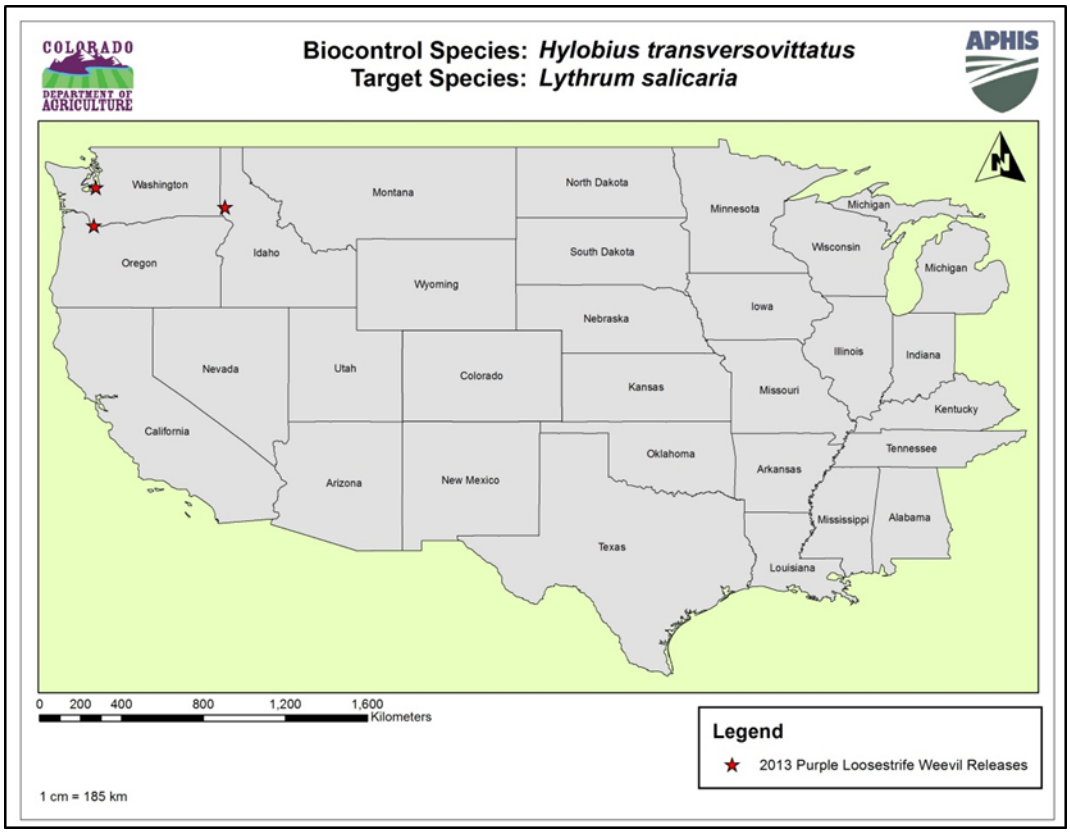


The Palisade Insectary is now the only facility that rears the purple loosestrife root boring weevils, *Hylobius transversovittatus*. The weevils are reared on an artificial diet where they develop to adulthood. Weevils are shipped as adults (Table 4 and Figure 8).

Table 4: Out of state Hylobius shipments for control of purple loosestrife

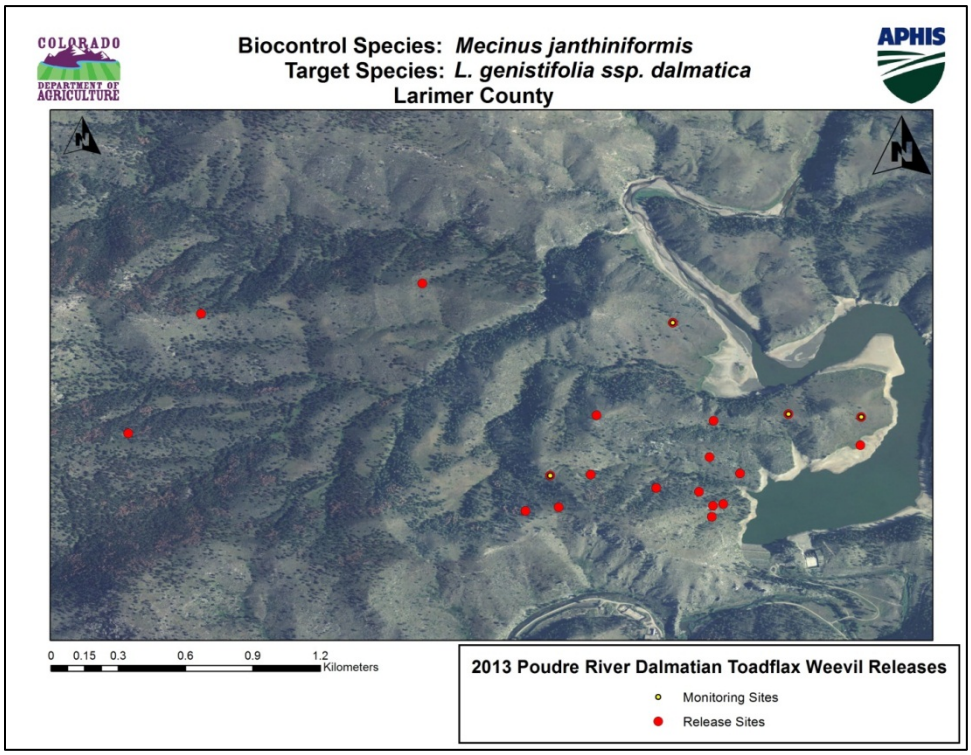
Agent	Target	Stage	Date	Location	Total Agents
Hylobius transversovittatus	Purple loosestrife	Adult	05/06/13	Washington	200
Hylobius transversovittatus	Purple loosestrife	Adult	06/24/13	Washington	356
Hylobius transversovittatus	Purple loosestrife	Adult	06/24/13	Oregon	450
Hylobius transversovittatus	Purple loosestrife	Adult	06/24/13	Idaho	450
Hylobius transversovittatus	Purple loosestrife	Adult	08/29/13	Oregon	500
Hylobius transversovittatus	Purple loosestrife	Adult	09/02/13	Washington	300

Figure 4



After the work plan was finalized last year the Palisade Insectary joined with a consortium of agencies (including the USDA APHIS) and local weed control groups to form the Poudre River partnership. The partnership was formed to devise and implement strategies for weed control throughout the vast High Park fire burn west of Ft. Collins, CO. The project presents challenges in coordination for agencies and landowners as well as in delivering weed control to a vast area (about 90,000 acres) that is severely disturbed by fire. Our role was to provide *Mecinus janthiniformis* to control tens of thousands of acres of Dalmatian toadflax that has become dominant following the fire. We released agents at 20 sites (5,000 total) and set up 4 sites for long term monitoring, both of toadflax density and vegetation cover. Below is a map of the area with our release and monitoring sites marked. This project will continue for at least three more years and we will continue to release *M. janthiniformis* and monitor the impact on Dalmatian toadflax.

Figure 5 - Release sites for M. janthiniformis in areas burned by the High Park fire of 2012. The body of water along the right border is Seaman Reservoir and the North Fork of the Cache la Poudre River is seen in the lower right corner.



Benefits and results of work: Russian knapweed is one of Colorado's top five worst weeds in terms of area covered and economic impact. We have established the gall midge at two locations (overwinter establishment) and we anticipate that after this season we will have overwinter establishment at 5-10 additional sites. We have also released *Aulacidea acroptilonica* at two sites and anticipate releasing at more sites in 2014. We are measuring impact with a rangeland weeds monitoring protocol and will be able to tell if one or both agents are having an impact. We are also establishing field nursery sites that will enable us to make large scale releases in Colorado and the west.

We have released the yellow toadflax stem boring weevil, *M. janthinus* at 13 sites, mostly in remote and mountainous areas where other control methods are difficult. In many areas biological control is the only practical way to reduce stand densities of this weed. It is also apparent that yellow toadflax is a major problem and spreading within Colorado. Our established populations remain small and continued monitoring is essential in order to decide if the agent will be effective and how long it will take to see a population level impact on yellow toadflax.

We continue to provide other agents as needed by states outside of Colorado. This includes major efforts to establish the field bindweed mite, *Aceria malherbae*, in other states. Given our success with the mites there is great promise, especially in the west, for achieving bindweed control with them.

The Poudre River project offers a chance to use biological control to contain a weed that has taken advantage of fire disturbance. This could save hundreds of thousands of dollars in control costs.

Funding Amount
Proposed = $98,942
Actual = $98,942

B. If appropriate, explain why objectives were not met.*
All of our objectives were met.

C. Where appropriate, explain any cost overruns or unobligated funds in excess of $1,000. *
There were no cost overruns nor any unobligated funds.

****indicates information is required per 7 CFR 3016.40 and 7 CFR 3019.51***

Approved and signed by

Mitchell Yergert

Mitch Yergert, SPRO **Date:** 6/17/2014

Pat McPherren, ADODR **Date:** _____

CAPS Survey Accomplishment Report Template

Appendix P-2

Biocontrol Report

Year:	2013
State:	Colorado
Cooperative Agreement Name:	**Collection and Redistribution of Biological Control Insects for the Control of Invasive Toadflaxes (*Linaria* spp.)**
Cooperative Agreement Number:	13-8508-0013-CA
Project Funding Period:	March 1, 2013 to February 28, 2014
Project Report:	**Annual Accomplishment Report**
Project Document Date:	February 26, 2014
Cooperators Project Coordinator:	John Kaltenbach
Name:	Andrew Norton, Janet Hardin
Agency:	Colorado State University
Address:	Dept. of Bioagricultural Sciences & Pest Management
City/ Address/ Zip:	Fort Collins, CO 80523-1177
Telephone:	(970) 491-7421
E-mail:	Andrew.Norton@colostate.edu

Quarterly Report	☐
Semi-Annual Accomplishment Report	☐
Annual Accomplishment Report	☒

A. Write a brief narrative of work accomplished. Compare actual accomplishments to objectives established as indicated in the work plan. When the output can be quantified, a computation of cost per unit is required when useful.

Accomplishments:

Objective 1: Collect *Mecinus janthinus* and *M. janthiniformis* from established populations in Colorado

We collected 290 *Mecinus janthiniformis* weevils from a colony of Dalmatian-type toadflax on the Colorado State University (CSU) campus and provided them to the Larimer County Weed District. We also visited two locations in Boulder County where *M. janthiniformis* has been established on Dalmatian toadflax for several years and we have collected weevils in the past. We collected 1,435 weevils at those sites.

We also visited sites where *M. janthininformis* was released on Dalmatian toadflax in 2010 to determine establishment and collectability. The weevils have definitely established at those sites but indications are that the populations are not yet collectable for redistribution. We also attempted to visit other sites where weevils were released in 2008, but weather events and subsequent flooding in September 2013 prevented completion of that effort.

Objective 2: Release *Mecinus janthinus* and *M. janthiniformis* into new populations of susceptible *Linaria vulgaris* and *L. dalmatica* (respectively) in Colorado.

The Larimer County Weed District released the weevils from the CSU colony at a site in the High Park Fire burn area of the Roosevelt National Forest. Subsequent to that release we visited the release site, set up vegetation monitoring plots, and recorded baseline data on toadflax density, other noxious weeds and native vegetation in order to assess establishment and impact of the weevils in future years.

Weevils collected at the Boulder County sites were released at 5 other sites in Larimer County, including a private ranch. Baseline data were similarly made at these release sites by establishing vegetation plots for future assessments of impact. Continued monitoring of these and previous release sites will allow us to determine where *Mecinus* has the greatest impact on toadflax abundance.

We also visited sites where we had released *Mecinus janthinus* on yellow toadflax in Douglas and Boulder counties in order to ascertain whether weevils have established at those locations and whether their populations could be considered collectable for redistribution. At the Boulder County site we also collected data in monitoring plots that were set up in 2010, following the initial releases. Weevils have become established on yellow toadflax at the Boulder County location and weed density has been reduced to the point that, while weevils appear to have had a positive impact on toadflax, the population is now too low to be collected

for redistribution. *Mecinus janthinus* was first released on yellow toadflax in Douglas County in 2011, and while establishment there is at present debatable, we remain hopeful that the population will take hold and expand.

Objective 3: Release captive-reared *Rhinusa linariae* onto field populations of susceptible *L. vulgaris* in Colorado.

Unfortunately we were unable to release *R. linariae* for the reasons given below in Section B.

Summary: We have successfully collected and redistributed *Mecinus* weevils at appropriate toadflax infestations in Colorado. Plots were established and baseline data collected for use in future monitoring of biocontrol impacts on toadflax density and plant community response. Those data have been entered into electronic data files. We have also assessed the collectability of *Mecinus* spp. at other locations where populations are not yet high enough for collection and redistribution of weevils.

Benefits and results of work:

The Larimer County open space program has made releases of toadflax biocontrol agents over the last several years and continues to do so. With their encouragement we visited areas where they have made releases in an effort to determine whether weevils might be collectable for redistribution. We also visited sites on CSU's Maxwell Ranch where weevils were released 3 years previously. We found that, while *Mecinus* has definitely established at most (perhaps all?) locations visited, a more focused and intense survey would be necessary to determine whether populations are high enough for redistribution. Weevils appear to be successfully moving between toadflax infestations on their own.

In the course of collecting and distributing these biological control agents we have worked in cooperation with federal, state and academic colleagues, local weed managers, landowners and stakeholders. The private ranch where we released *Mecinus* is enrolled in the Colorado Natural Areas Program as a designated protected area. In the field we met with personnel from the Larimer County Parks and Open Lands office as well as the Larimer County Weed District and worked in collaboration with them to distribute toadflax weevils to new locations. In May of 2013 the Colorado State Weed Coordinator organized the Poudre Invasive Species Partnership (PISP), a collaborative group of federal, state and municipal weed managers, in order to facilitate management efforts in areas along the North Fork Poudre River burned in the 2012 Hewlett Fire. Dalmatian toadflax is one of the primary weeds expanding in that watershed as well as in the adjacent High Park burn. We participated in the initial PISP field day and attended a subsequent meeting of the Colorado Interagency Noxious Weed Team in order to communicate our activities and assess interest in biological control in the burned areas. Land managers, particularly in Larimer County, continue to express interest in obtaining and releasing insects, especially the *Mecinus* spp., for control of toadflax.

Funding Amount
Proposed = $16,566
Actual = $16,597

	Proposed	Actual
Sites (Locations):	Not enumerated	NA

B. **If appropriate, explain why objectives were not met.***

In FY 2012 we created a rearing facility for *Rhinusa linariae*, a weevil that lays eggs and creates galls on the roots of yellow toadflax and has shown promise as a much-needed biological control agent for this species. Our original plan was to release the weevils reared in that program at field sites this year, but unfortunately no galls (thus no offspring) resulted from that effort.

C. Where appropriate, explain any cost overruns or unobligated funds in excess of $1,000. *

All funds are obligated.

Indicates information is required per 7 CFR 3016.40 and 7 CFR 3019.51

Approved and signed by

_____ Date: _____
Mitch Yergert, SPRO

_____ Date: _____
Pat McPherren, ADODR

Colorado Honey Bee Health Survey and Pesticide Prevalence

2011 to 2013

Project Coordinator: John Kaltenbach

Colorado Department of Agriculture

Introduction

This survey was conducted in Colorado as part of a National Honey Bee Health Survey to document the presence or absence of bee diseases, parasites and/or pests of honey bees as well as sampling pollen for the presence of pesticides. One of the main goals of the national survey was to establish the absence of the parasitic mite *Tropilaelaps* in the US as well as other exotic honey bee pests such as *Apis cerana* and Slow Paralysis Virus. Table 1 is a list of the surveyed pests. One of the main benefits of the survey is to determine the baseline health of managed honey bee colonies across the United States. For more information on the national survey and reports go to http://beeinformed.org/aphis/ .

Photo 1: Opening a hive to take samples. Photo by John Kaltenbach

The samples were collected between September 2011 and September 2013. The work was funded by the USD. In 2011, the Colorado Department of Agriculture was given funds to survey 25 apiaries for 2011-2012. In 2012, additional work was funded to survey another 24 apiaries during 2012 and 2013. The pollen was sampled at 10 hives for each of the survey periods, for a total of 20 samples.

Table 1: Target diseases and parasites

Common Name	Scientific Name
Honey Bee Mite	*Acarapis woodi*
Acute Bee Paralysis	Acute Bee Paralysis Virus
Asian Honey Bee	*Apis ceranae*
Cape Honey Bee	*Apis mellifera*
Bee Slow Paralysis	Bee Slow Paralysis Virus (SPB)
Black Queen Cell	Black Queen Cell Virus (BQCV)
Chronic Bee Paralysis	Chronic Bee Paralysis Virus
Deformed Wing	*Iflavirus* Deformed Wing Virus (DWV)
Israeli Acute Bee Paralysis	*Israeli* Acute Paralysis Virus (IAPV)
Nosema Disease	*Nosema apis*
Nosema Disease	*Nosema ceranae*
Parasitic mite	*Tropilaelaps sp./spp.*
Varroa Mite	*Varroa destructor*

Methods

Following the protocol established by the USDA ARS Bee Research Lab, three composite samples were taken from each apiary: one sample of live adult honey bees, one sample of honey bees in alcohol and a sample of the wash from brood frame knocking. Eight hives in each apiary were sample to make the composite sample. A total of 44 apiaries in 16 different counties in Colorado were sampled; Alamosa, Arapahoe, Boulder, Delta, Denver, Dolores, Eagle, El Paso, Fremont, Garfield, Jefferson, Kit Carson, Larimer, Montrose, Mesa and Pueblo counties (Figure 1). At 20 of the apiaries, fresh pollen was collected to be sent to a lab to test for the presence of pesticides.

The live bee samples were shipped on the day they were taken (or if taken late in the day, shipped as soon as possible the next day) via priority mail to the USDA Bee Research Lab in Beltsville, MD. Survivorship was noted upon arrival at the lab and most samples arrived with 100% survivorship, however 3 samples were delivered 2 weeks late and all the bees had perished. The samples of bees in alcohol, and the wash taken from knocking the brood frames, were mailed separately. The molecular analysis was performed on a composite sample of 50 live bees sent from each apiary. The bees were frozen, pooled, and their extracted nucleic acids were analyzed using molecular techniques to look for the presence of pathogens (viruses, Nosema, etc.) and exotic bee and mite species.

Photo 2: Live bees packaged for shipment. Photo by John Kaltenbach

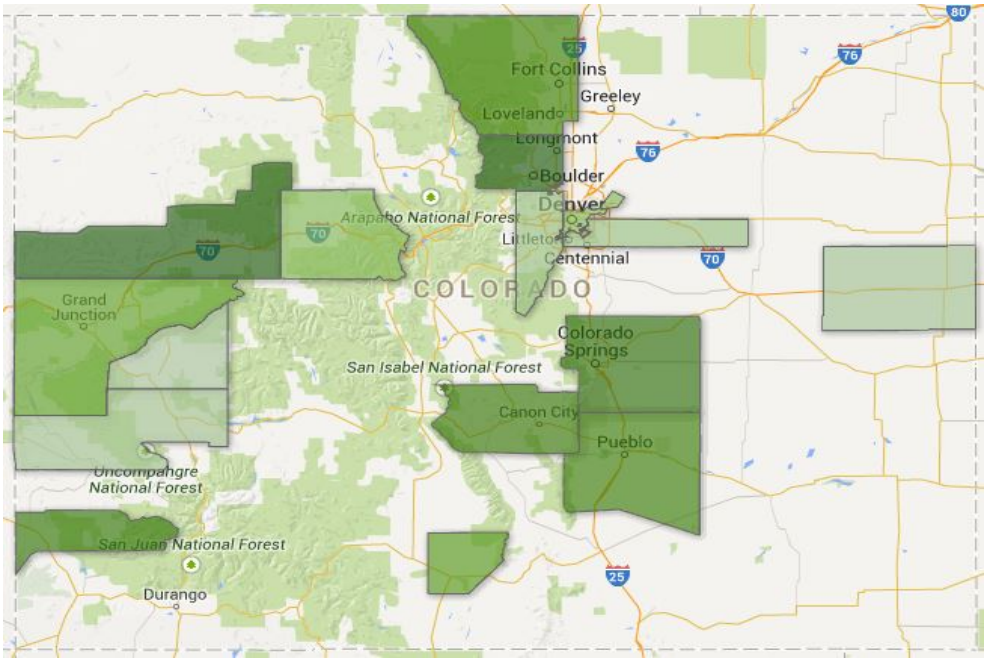


Figure 1: Counties highlighted that had at least one sampled apiary

Results

In the first round of sampling (fall of through spring of 2012) there was a high prevalence of Deformed Wing Virus (92%) and Black Queen Cell Virus (64%). In addition, there was one case of Israeli Acute Paralysis Virus, previously unreported in Colorado. About 32% of the colonies were positive for *Nosema* ceranae, and only one with *Nosema* apis. For the samples taken in with funding for 2012, a lower percentage of colonies were found with Deformed Wing Virus (74%) and there was a higher incidence of Black Queen Cell Virus (79%). There was a higher incidence of *Nosema ceranae* and no *Nosema apis* was detected. One hive was positive for the Kashmir Bee virus and two were found to have Acute Bee Paralysis virus. Table 2 has the totals and percentages for Virus detected and *Nosema* species for all sampling (n=44).

Table 2: Total colonies and percentage found with virus and prevelance of Nosema

	Virus							Nosema species	
44 total samples	IAPV	KBV	CBPV	DWV	ABPV	SBPV	BQCV	Nosema ceranae	Nosema apis
Total	1	1	2	37	2	0	31	21	1
Percent	0.02	0.02	0.05	0.84	0.05	0.00	0.70	0.48	0.02

IAPV	Israeli Acute Paralysis Virus (common in some regions, has been associated with colony losses)
KBV	Kashmir Bee Virus, uncommon, has been associated with colony losses
CBPV	Chronic Bee Paralysis Virus (rare, can cause colony losses)
DWV	Deformed Wing Virus (very common, often associated with Varroa mites)
ABPV	Acute Bee Paralysis Virus (rare, has been associated with colony losses)
SBPV	Slow Bee Paralysis Virus (not known to be in the U.S.)
BQCV	Black Queen Cell Virus (very common, may be associated with Nosema disease)

Microscopic and visual analysis was conducted on the alcohol samples to determine the Varroa mite count, the Nosema spore load, and any *Apis cerana* and or *Tropilaelaps* mites found. Eight of the 25 apiaries in 2011-2012 had *Nosema ceranae* and only one had *Nosema apis.*

In the second year of sampling (fall of 2012 to fall of 2013), viruses were found in 15 of the 19 samples analyzed. Three of them, Kashmir Bee Virus, Chronic Bee Paralysis Virus and Acute Bee Paralysis Virus, were been previously unreported in Colorado. All but two apiaries had Varroa

mites. Israeli Acute Paralysis Virus (common in some regions, has been associated with colony losses).

Pollen Pesticide Residue Results

Samples were taken from 19 apiaries and sent the National Science Laboratories in Gastonia, North Carolina for analysis. In the lab, they were screened for 174 different pesticides. Eleven different pesticides had some level of detection in the samples from Colorado (Table 3). In 3 of the 19 samples there were no pesticides detected. Also included in the table is the average level of detection and prevalence for all 451 samples taken across the United States.

Table 3: Prevalence of Pesticides found in Pollen Samples 2011 to 2013

Pesticide	Level of Detection (ppb)	Number of Apiaries With Level of Detection in Colorado (n=19)	Average Level Detected in Colorado (ppb) (n=19)	Average Level Detected Nationally (ppb) (n=451)	Prevalence in National Samples % (n=451)
2,4 Dimethylphenyl formamide (DMPF)	4	2	26.5	205.7	21.3
Carbendazim (MBC)	5	1	8.1	50.8	4.2
Chlorfenvinphos	6	2	53.0	53.1	1.3
Coumaphos	1	1	4.0	76.4	37.7
Cyhalothrin total	1	1	10.8	9.6	8.0
Fenpyroximate	5	2	8.8	33.5	6.2
Fluvalinate	1	13	44.3	52.3	50.8
Metribuzin	1	1	3.5	3.5	0.2
Prallethrin	4	2	10.7	76.7	0.7
Thymol	50	2	230.6	1799.2	21.1
Trifluralin	1	3	1.5	170.8	3.1

Of the 174 pesticides screened for detection in the samples, there were 80 pesticides found nationally. Table 5 shows all the pesticides detected. Highlighted in orange are the pesticides detected in Colorado samples. Highlighted in yellow are neonicotinyl pesticides, of which none were detected in Colorado samples.

Table 5: Prevalence of Pesticides detected in all pollen samples nationally (n=451) analyzed for the National Honey Bee disease survey.

Found in Colorado samples

Neonicotinyl

Pesticide	LOD (ppb)	Prevalence %	Average Detection if positive for target (ppb)	Range if positive for target (ppb)
1-Naphthol	10	0.2	52.1	52.1*
2,4 Dimethylphenyl formamide (DMPF)	4	21.3	205.7	6.6 - 12700
Acephate	50	0.7	216.3	67.8 - 410
Acetachlor	10	0.2	52.7	52.7*
Acetamiprid	8	0.2	9.4	9.4*
Alachlor	10	0.4	93.4	93.4*
Aldicarb sulfone	3	0.2	14	14*
Aldicarb sulfoxide	20	0.2	35.9	35.9*
Atrazine	6	7.1	79.1	9.8 - 996
Azoxystrobin	2	9.5	34.8	4.6 - 280
Benoxacor	4	0.2	Trace	Trace
Bifenthrin	1	6.9	19.5	1.2 - 130
Boscalid	4	5.3	692.5	16.2 - 3510
Captan	10	2.4	264.9	18.3 - 395
Carbaryl	30	0.9	192.5	78 - 442
Carbendazim (MBC)	5	4.2	50.8	7.3 - 233
Chlorfenvinphos	6	1.3	53	40.3 - 75.1
Chlorferone	50	0.2	192	192*
Chlorothalonil	1	1.8	1073.9	111 - 4900
Chlorpyrifos	1	20.4	21.5	1.1 - 303
Chlothianidin	1	2.2	27.7	5.5 - 62.8
Coumaphos	1	37.7	76.4	1.1 - 6260
Coumaphos oxon	1	3.5	28.1	5.5 - 180
Cyfluthrin	4	0.7	37.8	3.9 - 58.8
Cyhalothrin total	1	8	9.6	1.9 - 54.2
Cypermethrin	4	0.9	36.4	7.2 - 100
Cyprodinil	4	5.3	180.4	4.3 - 2800
Diazinon	1	0.7	15.2	6.6 - 21.1
Dichlorvos (DDVP)	10	0.2	205	205*
Dicloran	1	0.2	25	25.0*
Dicofol	1	0.7	13.4	3.2 - 21
Dieldrin	10	0.2	12.4	12.4*
Diflubenzuron	20	0.7	145.3	84.3 - 252
Endosulfan I	2	2.4	36.9	2.2 - 124
Endosulfan II	2	2	19.2	2.1 - 54.9
Endosulfan sulfate	2	2.2	11.9	1.6 - 50.4
Esfenvalerate	2	3.3	14.5	3.7 - 77.4
Etoxazole	1	0.4	2.2	1.2 - 3.2

Pesticide	LOD	Prevalence	Average Detection if positive for target	Range if positive for target
Fenbuconazole	2	2.2	409.6	9.2 - 3470
Fenpropathrin	1	1.3	43.2	20.7 - 93.6
Fenpyroximate	5	6.2	33.5	2.1 - 266
Flonicamid	8	0.4	42.2	11.3 - 73.1
Fludioxonil	20	0.4	51.9	30.5 - 73.3
Fluridone	10	2.2	1279	108 - 4220
Fluvalinate	1	50.8	52.3	2.2 - 1700
Imidacloprid	1	2.9	23.3	2.8 - 216
Metalaxyl	2	0.7	20.5	10.2 - 37.9
Methamidophos	4	1.1	14.5	5 - 36.5
Methomyl	10	0.2	23.6	23.6*
Methoxyfenozide	2	2.2	32.4	5.7 - 84.6
Metolachlor	6	1.1	921.4	14.7 - 2550
Metribuzin	1	0.2	3.5	3.5*
MGK-326	10	0.4	142.9	95.7 - 190
Myclobutanil	15	1.3	503.2	30.1 - 1330
Oxyfluorfen	1	4.4	7.7	1.7 - 13.7
Paradichlorobenzene	10	7.1	420.3	80.9 - 1820
Parathion methyl	2	0.2	6.6	6.6*
Pendimethalin	6	11.3	29.2	5.1 - 92.8
Permethrin total	10	0.7	206.3	20 - 421
Phosmet	10	1.1	194.5	7.3 - 785
Prallethrin	4	0.7	76.7	21.3 - 132
Propachlor	10	0.2	Trace	Trace
Propanil	10	0.4	1704.1	78.1 - 3330
Propazine	4	0.2	34.3	34.3*
Propham	20	0.2	Trace	Trace
Pyriproxyfen	2	0.4	10.5	8.6 - 12.4
Pyraclostrobin	15	5.3	212.7	2.6 - 1400
Pyridaben	1	0.7	1.5	1.2 - 1.8
Pyrimethanil	3	1.3	10.2	3.2 - 18.4
Tebuconazole	8	2.7	52.9	9.9 - 276
Tebufenozide	5	0.2	22.7	22.7*
Tebuthiuron	2	0.9	4.8	2.2 - 12.1
Thiabendazole	1	1.1	2.2	1.1 - 4.7
Thiacloprid	1	0.7	151.2	49.1 - 326
Thiamethoxam	1	2.4	13.5	1.2 - 39.6
THPI	50	1.8	2007.5	37.6 - 7060
Thymol	50	21.1	1799.2	37.5 - 39700
Trifloxystrobin	1	0.9	238.4	61.5 - 638
Trifluralin	1	3.1	170.8	1 - 510
Vinclozolin	1	0.4	3.3	3.3*