

**Cooperative Agricultural Pest Survey
(CAPS)
Annual Report
Colorado
2014**

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Plant Industry Division



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Colorado Cooperative Agricultural Pest Survey 2014

This is a report of the activities and surveys accomplished in Colorado for the CAPS program in 2014 (funding year March 1st 2014-February 28, 2015). Program work was accomplished in collaboration with Colorado State University and the United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (USDA, APHIS, PPQ).

Colorado State University cooperators completed the following surveys: Small Grains and Corn Bundled Survey, Grape Commodity Survey, Stone Fruit Commodity Survey, Karnal Bunt Survey. The Colorado Department of Agriculture (CDA) coordinated surveys for Forest Pests, the Emerald Ash Borer, and a Vegetable Pests Survey. CDA and CSU also performed work for biological control projects.

Year:	2014
State:	Colorado
Cooperative Agreement Name:	Infrastructure
Cooperative Agreement Number:	14-8508-0013-CA
Project Funding Period:	March 1, 2014 to April 30, 2015
Project Report:	CAPS Infrastructure Report
Project Document Date:	June 1, 2015
Cooperators Project Coordinator:	Jeanne Ring
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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.

- **Activities:**

- **Committee Service:**

- CAPS committee conference call was held in June 2014. The Annual CAPS Committee meeting was held in January, 2015
 - EAB Boulder 2013 incident: Assigned as Deputy in the planning section under USDA's ICS system (July). The ICS system has been changed to function as a collaborative program between several agencies.

- **Other Survey Work:**

- Supervised surveys for Forest Pests, Vegetable Pests, Emerald Ash Borer, Farm Bill survey for Khapra beetle. Coordinated with cooperators on surveys for Stone Fruit/PPV, Grape Commodity-Based, Small Grains-Corn Bundled survey and two Biocontrol projects
 - Provided administrative and field support for seasonal survey technicians
 - Coordinated vehicle use and maintenance with State Fleet Department
 - Distributed traps and lures to cooperators (May)
 - Supported USDA gypsy moth survey; set up traps (June) removed traps (September) and entered data in approved database

- **Outreach and Education:**

- **Email and telephone inquires**

- Responded to approximately 20 inquires per month (May-August)

- **Booth/Trade Shows:**

- Set up Plant Industry and Don't Move Firewood Booths at State Fair and help set up Ag Pavilion (August)
 - Assisted at CDA booth at Pro Green (January 2015)
 - EAB booth at Englewood tree sale (April)

- **Meetings:**

- **Conference calls:**

- Western Region SSC conference call monthly
 - EAB biological control agents and acceptable use in Colorado

- **Conferences:**

- Continental Dialogue on Non-Native Forest Insects and Disease (November 2014)

- Greely plant healthcare workshop (February)
- Tree Diversity Conference (March)
- Eastern Colorado Community Forestry Conference (April)
- **Webinars**
 - USFS webinar on Asian Gypsy Moth modeling
- **Other**
 - Attend the Colorado Wyoming Joint Risk meeting quarterly
 - Attended Emerging Pests in Colorado (EPIC) meetings in Fort Collins monthly
 - Presented at CDA, Division of Plant Industry Multiple Inspectors on “pest to watch out for” (April and October)
 - Attended FRUFC (Front Range Urban Forestry Council) meetings
 - Assisted in branch peeling workshops throughout fall and winter
- **Other:**
 - Processed paperwork for Cooperative Agreement for Pest Detection funding
 - Secured Interagency contracts with CSU for their projects
 - Completed and submitted Work and Financial plans to USDA for CAPS 2015

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

Not applicable

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

Not applicable

D. Supporting Documents

Not applicable

Year:	2014
State:	Colorado
Cooperative Agreement Name:	Forest Pest Survey
Cooperative Agreement Number:	14-8508-0013-CA
Project Funding Period:	March 1, 2014-April 30, 2015
Project Report:	CAPS Survey Report
Project Document Date:	July, 29 2015
Cooperators Project Coordinator:	Jeanne Ring

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 survey of conifer infesting moths and non-native wood boring/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 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 20 different sites using CAPS approved trap and lure combinations. The counties proposed for survey included Adams, Arapahoe, Boulder, Denver, Douglas, Jefferson, and Weld counties. Montrose, Mesa and Delta counties were added to the survey.

Funding Amount	Total Number of Traps	Cost Per Unit
Proposed = \$19,422	Proposed = 240	Proposed= \$80.96
Actual = \$19,422	Actual = 240	Actual = \$80.96

Traps were set between May 12, 2014 and June, 20 2014 at 20 sites, with 4 Lindgren traps, 4 traps for *Dendrolimus* spp. and 4 traps for *Lymantria mathura*.

Survey methodology (trapping protocol):

Twenty sites were selected and 4 Lindgren funnel traps were set at each site, each with a different lure (see table 1). Four modified GM traps were set for *Dendrolimus* spp. And four Pherocon wing traps were set for *Lymantria mathura*. Traps and lure were set and monitored according to CAPS Approved Methods for 2014. The Lindgren funnel traps were “wet” traps using propylene glycol, and were serviced every two weeks. The other traps were serviced as necessary according to CAPS approved methods from May to October.

Suspect species were brought to Dr. Boris Kondratieff with Colorado State University for identification.

	Common Name	Scientific Name
Pest:	Pine Shoot beetle	<i>Tomicus destrunes</i>
	Red-haired pine bark beetle	<i>Hylurgus ligniperda</i>
	Lesser spruce shoot beetle	<i>Hylurgops palliatus</i>
	Japanese pine sawyer	<i>Monochamus alternatus</i>
	Siberian silk moth	<i>Dendrolimus sibiricus</i>
	Pine tree lappet	<i>Dendrolimus pini</i>
	Rosey gypsy moth	<i>Lymantria mathura</i>
	Sirex Woodwasp	<i>Sirex noctilio</i>
	Sixtoothed bark beetle	<i>Ips sexdentatus</i>
	European spruce bark beetle	<i>Ips typographus</i>
	Mediterranean Pine Engraver	<i>Orthotomicus erosus</i>
	Sixtoothed spruce bark beetle	<i>Pityogenes chalcographus</i>

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

	Proposed	Actual
Sites (Locations):	20	20
Traps:	240	240

Number of Counties:	10
Counties:	Adams, Arapahoe, Boulder, Delta, Denver, Douglas, Jefferson, Mesa, Montrose and Weld

Survey dates:

	Proposed	Actual
Survey Dates:	Install May and June, remove October	Installed June 11 to July 3, removed October

Benefits and results of 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	240	240

4. Database submissions:

All data was submitted was submitted to the NAPIS database in the appropriate time frame.

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

All objectives were met

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

Not applicable

Year:	2014
State:	Colorado
Cooperative Agreement Name:	Vegetable Survey
Cooperative Agreement Number:	14-8508-0013-CA
Project Funding Period:	March 1, 2014 – April 30, 2015
Project Report:	CAPS Survey Report
Project Document Date:	July 30, 2015
Cooperators Project Coordinator:	Jeanne Ring



(Trapping location: Potato field, San Luis Valley 2014)

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 survey for 5 moth species that are pests of Solanaceous crops (see table below for pests). The proposal planned to place one trap for each of the 5 species at 70 sites (potato fields) for a total of 350 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-22 sites, Rio Grande-20 sites, Saguache-18 sites, Costilla-6 sites and Conejos- 2 site.

The first round of funding arrived on February 18th 2014 (29%) and the remaining amount (71%) was received on April 22nd 2014. A seasonal technician was hired on May 12th and trap set up began on May 21st. Traps were serviced per CAPS approved methods throughout the season and trap removal was completed in October.

Funding Amount	Total Number of Traps	Cost Per Unit
Proposed = \$17,020	Proposed = 350	Proposed= \$40.63
Actual =\$17,020	Actual = 335	Actual = \$50.80

Survey methodology (trapping protocol):

Sites were selected by visually confirming the presence of potato fields. At each site, 5 traps were installed 20 meters apart with the appropriate trap and lure combinations (see table 1). Trap data was collected at the time of set up and lure changes occurred per CAPS approved methods. Samples were collected during lure changes and later delivered to Dr. Boris Kondratieff at Colorado State University for screening.

Table 1			
Target(s)	Lure	Trap Type	Change lure
<i>Helicoverpa armigera</i>	Z11-16Ald Z9-16Ald butylated hydroxytoluene	Plastic Bucket Trap	Every 28 days
<i>Spodoptera litura</i>	Z9E11-14Ac Z9E12-14Ac	Plastic Bucket Trap	Every 84 days
<i>Spodoptera littoralis</i>	Z9E11-14Ac	Plastic Bucket Trap	Every 84 days

	Z9E12-14Ac		
<i>Tuta absoluta</i>	E3Z8Z11-14Ac E3Z8-14Ac	Large Plastic Delta Trap	Every 28 days
<i>Tecia solanivora</i>	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):	70	67
Traps:	350	335

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

Survey dates:

	Proposed	Actual
Survey Dates:	Install traps May and June, remove traps in October	Installed traps May and June, removed traps in October

Benefits and results of 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	335	335

Database submissions:

Data for each species was submitted into the NAPIS database in the appropriate time frame.

If appropriate, explain why objectives were not met.*

The surveyor reported that there are 67 actual sites compared to the 70 purposed. At one site the surveyor could not find the traps when he returned to service them. The remaining 2 planned sites were unsuitable due to crop availability and survey protocols.

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

Not applicable

Year:	2014
State:	Colorado
Cooperative Agreement Name:	Emerald Ash Borer Survey
Cooperative Agreement Number:	14-8508-0013-CA
Project Funding Period:	March 1, 2014 to April, 30 2015
Project Report:	Emerald Ash Borer Survey

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 objective of this project was to conduct an early detection trapping survey of emerald ash borer in high risk areas of Colorado. Working collaboratively with Colorado PPQ traps and cell locations as identified by the U.S. Forest Service's Forest Health Technology Enterprise Team (FHTET) Survey Sampling Design 2014 cells were divided up. The Colorado Department of Agriculture selected 24 cells for trapping. All traps were set and serviced according to National EAB trapping protocols.

Funding Amount	Total Number of Traps	Cost Per Unit
Proposed = \$1,980	Proposed = 24	Proposed= \$82
Actual = \$1,980	Actual = 25	Actual = \$79

Survey methodology (trapping protocol):



(CDA Inspector installing purple prism EAB trap)

Purple prism traps and lure (Manuka 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 (FHTET) and the APHIS EAB Program. Traps were installed May 20th and through June 10th and serviced once in July. Trap removal occurred in September. No suspect insects were found on the 25 traps.

	Common Name	Scientific Name
Pest:	Emerald Ash Borer	<i>Agrilus planipennis</i>

	Proposed	Actual
Sites (Locations):	24	25
Traps:	24	25

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

Survey dates:

	Proposed	Actual
Survey Dates:	Install May-June, Replaced Lure July, Remove in September	Installed May 20 -June 10th, replaced lure in July, Removed in September

Benefits and results of survey:

Emerald Ash Borer was detected in Boulder, Colorado in September 2013. Since that time a Federal quarantine has been established and a delimitation survey has been performed to identify areas where the insect is present. Currently the only confirmed detections are in the City of Boulder, however the likelihood of future spread into new areas warrants further survey activities. Early detection of the Emerald Ash Borer, prior to or early in its establishment in new areas, would provide regulators and land managers more options for eradication, control and management.

	Positive	Negative	Total Number
Traps	0	25	25

Database submissions:

Data for EAB trapping has been entered into the IPHIS database in the appropriate timeframe.

If appropriate, explain why objectives were not met.

A surveyor technician on the western slope reported that a trap was stolen or removed from a park where he had installed it. A new trap was sent and installed the week of July 17th.

APHIS PPQ provided 24 grid cells where traps were to be placed according to the FHTET model. After visiting each grid site, we found that only 9 had the correct site conditions and accessibility. The remaining 15 traps were placed as near to original grid locations as possible with suitable conditions.

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

There are no unobligated funds associated with this survey.

Year:	2014
State:	Colorado
Cooperative Agreement Name:	EAB Coordinated Response
Cooperative Agreement Number:	14-8508-0013-CA
Project Funding Period:	March 1, 2014 to April 30, 2015
Project Report:	Mid-year report
Project Document Date:	June 1, 2015
Cooperators Project Coordinator:	CAPS Coordinator / State Survey Coordinator
Name:	Jeanne Ring
Agency:	Colorado Department of Agriculture
Address:	305 Interlocken Parkway
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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.

Funding for the Emerald Ash Borer (EAB) Coordinated Response project was used to hire a temporary employee through the Colorado Department of Agriculture. This employee was responsible for coordinating meetings, working with various agencies in creating messaging and facilitating training events associated with EAB detection surveys (branch sampling). In addition, this individual also assisted in inspecting entities under compliance agreement in the quarantine area of Boulder County . The EAB coordinator did not assist in the National EAB survey and did not participate in actual trapping activities. This is due to the timing of funding as trapping activities began before we received money to fill the position. In addition, this position did not participate in creating a plant health monitoring tool. This need was filled through the Colorado Tree Coalition and Plan it Geo.

Survey methodology (trapping protocol):

Not applicable

Survey dates:

Not applicable

Benefits and results of survey:

Not applicable

Database submissions:

Not applicable

If appropriate, explain why objectives were not met.*

All objectives were met.

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

There are no unobligated funds associated with this project.

Year:	2014
State:	Colorado
Cooperative Agreement Name:	Small Grains and Corn Bundled Survey
Cooperative Agreement Number:	14-8508-0013-CA
Project Funding Period:	March 1, 2014 to April 30, 2015
Project Report:	Final Report Small Grains and Corn Bundled Survey
Project Document Date:	June 1, 2015
Cooperators Project Coordinator:	Jeanne Ring

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.

Per CAPS trapping protocols, pheromone traps were set at wheat and cornfields in 2014 to survey for the moth species listed below. 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, and Washington counties. Traps were also set for the same moth species at cornfields in Larimer and Weld counties for a total of 25 wheat/corn sites. At cornfields, visual surveys were made while plants are blooming (tassels and silks) to survey for the cucurbit beetle and cotton seed bug (*Oxycarenus hyalipennis*). No 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 retained, frozen and genitalic dissections performed in the laboratory. A total of 675 moths were dissected, none of which proved to be *H. armigera*.

Interestingly, for the first time since we've been trapping for it, a moth resembling *Spodoptera littoralis* was captured in a *S. littoralis* pheromone trap. The specimen was submitted to Dr. Boris Kondratieff and Dr. Paul Opler at the C.P. Gillette Museum of Arthropod Diversity at Colorado State University. They identified it as the yellowstriped armyworm, *S. ornithogalli*. The specimen was added to the collection and constitutes only the second recorded occurrence of this species in Larimer County.



Spodoptera ornithogalli

Funding Amount	Total Number of Traps	Cost Per Unit
Proposed = \$17,031	Proposed = 100	Proposed=
Actual = \$17,031	Actual = 100	Actual =

Survey methodology (trapping protocol):

	Common Name	Scientific Name
Pest:	Old World Bollworm	<i>Helicoverpa armigera</i>
Pest:	Egyptian Cottonworm	<i>Spodoptera littoralis</i>
Pest:	Cotton Cutworm	<i>Spodoptera litura</i>
Pest:	False Codling Moth	<i>Thaumatotibia leucotreta</i>
Pest:	Cucurbit Beetle	<i>Diabrotica speciosa</i>
Pest:	New Zealand Wheat Bug	<i>Nysius huttoni</i>
Pest:	Cotton Seed Bug	<i>Oxycarenus hyalipennis</i>

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

Number of Counties:	5
Counties:	Kit Carson, Larimer, Washington, Weld, Yuma

Survey dates:

	Proposed	Actual
Survey Dates:	May-October	June-October

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.

	Positive	Negative	Total Number
Traps	0	100	100

Database submissions:

Sweep surveys of wheat fields and visual surveys of corn 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 they were serviced, with the exception of those from the *Helicoverpa* traps. Genitalic dissections of those moths were performed to be certain that no *H. armigera* were captured. All data have been submitted to the Project Coordinator and entered into a CAPS-approved database.

If appropriate, explain why objectives were not met.*

All objectives were met.

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

All funds have been obligated.

Year:	2014
State:	Colorado
Cooperative Agreement Name:	Karnal Bunt
Cooperative Agreement Number:	14-8508-0013-CA
Project Funding Period:	March 1, 2014 to February 28, 2015
Project Report:	Mid-Year Report Karnal Bunt Survey
Project Document Date:	June 30, 2014
Cooperators Project Coordinator:	Jeanne Ring
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

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.

Funding for this survey had not arrived during the reporting period March 1- June 30th. No work was completed during that time.

Funding Amount	Total Number of Traps	Cost Per Unit
Proposed = \$4,164	Proposed = 10 elevators	Proposed= \$416.00
Actual = \$4,164	Actual =10	Actual =10

Survey methodology (trapping protocol)

	Common Name	Scientific Name
Pest:	Karnal Bunt	<i>Tilletia indica</i>

	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 samples also came from Lincoln and Logan counties in Colorado.

2. **Survey dates:**

	Proposed	Actual
Survey Dates:	During wheat harvest, when wheat being received at elevators	During wheat harvest, when wheat being received at elevators

Benefits and results of survey:

	Positive	Negative	Total Number
Traps	0	40	40

Database submissions:

Not applicable

If appropriate, explain why objectives were not met.*

Not applicable

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

Not applicable

Year:	2014
State:	Colorado
Cooperative Agreement Name:	Stone Fruit Commodity-Based Survey
Cooperative Agreement Number:	14-8508-1745-CA
Project Funding Period:	May 1, 2014 to April 30, 2015
Project Report:	Survey Report
Project Document Date:	October 2014
Cooperators Project Coordinator:	Jeanne Ring
Name:	Lou Bjostad, Janet Hardin
Agency:	Colorado State University
Address:	Dept. of Bioagricultural Sciences and Pest Management
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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).

As proposed, all survey work was conducted on the West Slope of Colorado at 3 sites in Mesa County, 2 in Delta County and one in Montrose County, the prime growing areas for stone fruits in the state. Sites selected for the survey were associated with known and suspected pathways of introduction for the targeted pest species. In May (following full leaf extension until average daily temperature reached 95°F), trees in peach, cherry, plum, apricot and nectarine orchards were inspected visually and the leaves of trees that displayed symptoms perhaps indicative of PPV were sampled. A total of 28 samples from 10 orchards were submitted to Tamla Blunt, diagnostician at the Plant Diagnostic Clinic at CSU for analysis. None proved to be infected with PPV.

Pheromone traps for the 3 moth species listed below (in section A1) were set up at each site according to protocol described in the national Stone Fruit Commodity Survey. Delta traps were set for Summer Fruit Tortrix (*Adoxophyes orana*) and wing traps for False Codling Moth (*Thaumatotibia leucotreta*) and Plum Fruit Moth (*Grapholita funebrana*). Traps were inspected monthly and serviced at appropriate intervals according to recommendations for each specific lure. Vinegar traps for Spotted Wing Drosophila (SWD) were also set up at each site and serviced every 1-4 weeks. None of the target moth species was found in the traps, nor were any SWD flies found in those traps. Interestingly, however, SWD was captured for the first time on the Colorado West Slope in traps set at raspberry fields.

Visual surveys for any and all insect pest species, including Japanese Wax Scale, were also conducted at each site. Visual surveys were also conducted for Asiatic brown rot (*Monilia polystroma*) and brown rot (*Monilinia fructigena*). None of the target species (or evidence of them) were found at any of the orchard sites.

Funding Amount	Total Number of Traps	Cost Per Unit
Proposed = \$ 9,500	Proposed = 24	Proposed= \$395.83
Actual = \$ 9,500	Actual = 24	Actual =\$395.83

Survey methodology (trapping protocol):

	Common Name	Scientific Name
Pest:	Summer Fruit Tortrix	<i>Adoxophyes orana</i>
Pest:	False Codling Moth	<i>Thaumatotibia leucotreta</i>
Pest:	Plum Fruit Moth	<i>Grapholita (Cydia) funebrana</i>
Pest:	Spotted Wing Drosophila	<i>Drosophila suzukii</i>
	Visual Surveys:	
Pest:	Japanese Wax Scale	<i>Ceroplastes japonicus</i>
Pest:	Asiatic Brown Rot	<i>Monilia polystroma</i>
Pest:	Brown Rot	<i>Monilinia fructigena</i>

	Proposed	Actual
Sites (Locations):	6	6
Traps:	24	24

Number of Counties:	3
Counties:	Delta, Mesa, Montrose

We set out 4 traps at each of 6 sites (the 3 moth species, plus Spotted Wing Drosophila). Visual surveys of trees were conducted at the same orchards.

Survey dates:

	Proposed	Actual
Survey Dates:	May/June – October 2014	May-October 2014

Benefits and results of survey:

	Positive	Negative	Total Number
Traps	0	24	24

Database submissions:

If appropriate, explain why objectives were not met.*

All objectives were met.

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

All funds have been obligated.

Year:	2014
State:	Colorado
Cooperative Agreement Name:	Grape Commodity Survey
Cooperative Agreement Number:	14-8505-1659-CA
Project Funding Period:	May 1, 2014 to April 30, 2015
Project Report:	Farm Bill Survey Report
Project Document Date:	October 2014
Cooperators Project Coordinator:	Jeanne Ring
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

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.

Per CAPS protocols, pheromone traps were set for the 5 moth species listed in Section A1 (below) at vineyards in Mesa, Delta, Montrose and Montezuma counties. Visual surveys for wax scale, cotton seed bug and cucurbit beetle were also conducted at the same vineyard locations. While conducting visual surveys for the three non-lepidopteran insect pests, foliage was examined for symptoms of infection by two phytoplasmas -- Australian grapevine yellows (*Candidatus Phytoplasma australiense*) and Flavescence doree (*Candidatus Phytoplasma vitis*) -- as well as one fungus (rotbrenner, *Pseudopezicula tracheiphila*). To date, no target species have been observed in any traps or during visual surveys.

Funding Amount	Total Number of Traps	Cost Per Unit
Proposed = \$9,000	Proposed = 45	Proposed= \$200.00
Actual = \$9,000	Actual = 45	Actual = \$200.00

Survey methodology (trapping protocol):

	Common Name	Scientific Name
Pest:	European grapevine moth	<i>Lobesia botrana</i>
Pest:	cotton cutworm	<i>Spodoptera litura</i>
Pest:	Egyptian cottonworm	<i>Spodoptera littoralis</i>
Pest:	honeydew moth	<i>Cryptoblabes gnidiella</i>
Pest:	false codling moth	<i>Thaumatotibia leucotreta</i>
	Visual Surveys:	
Pest:	wax scale	<i>Ceroplastes japonicus</i>
Pest:	cotton seed bug	<i>Oxycarenus hyalinipennis</i>
Pest:	cucurbit beetle	<i>Diabrotica speciosa</i>

	Proposed	Actual
Sites (Locations):	9	9
Traps:	45	45

Number of Counties:	3
Counties:	Delta, Mesa, Montrose

Survey dates:

	Proposed	Actual
Survey Dates:	May – September 2014	June – October 2014

Benefits and results of survey:

	Positive	Negative	Total Number
Traps	0		

Database submissions:

If appropriate, explain why objectives were not met.*

All objectives were met.

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

All funds have been obligated.

Year:	2014
State:	Colorado
Cooperative Agreement Name:	Biological Control of Russian knapweed and yellow toadflax
Cooperative Agreement Number:	14-8508-0013-CA
Project Funding Period:	March 1, 2014 to April 30, 2015
Project Report:	Mid-Year Report Biological Control of Russian knapweed and yellow toadflax
Project Document Date:	April 14, 2015
Cooperators Project Coordinator:	Dan Bean and John Kaltenbach
Name:	Jeanne Ring
Agency:	Colorado Department of Agriculture
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Telephone:	303-869-9076
E-mail:	jeanne.ring@state.co.us

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.

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 200 gall-containing plants when field season began. We put out whole potted plants for these releases of greenhouse material. Over 2000 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 this year in the Palisade insectary gardens on May 6, 2014. 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 1,397 galls collected from the garden. We surveyed areas in and around Palisade for the occurrence of gall midges. Last season we had located a farm where gall midges had colonized a knapweed patch enabling us to harvest over 2,000 galls. This season the farmer accidentally sprayed the patch destroying it as a collection site, at least for this season. We located another site for collections and were able to collect 625 galls in the fall of 2014.

We reared our first batch of the Russian knapweed gall wasp, *Aulacidea acroptilonica*, which originally came through R. Hansen (USDA APHIS). We released approximately 50 wasps into cages in the greenhouse and have produced about 75 galls for future use. We are experimenting with holding conditions and how to break diapause.

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). We will provide a map of release sites in the final report.

Agent	Target	# of Releases	Total Agents
<i>Jaapiella ivannikovi</i>	Russian Knapweed	40	3,397 galls
<i>Aulacidea acroptilonica</i>	Russian Knapweed	1	50

Yellow Toadflax

Stems containing yellow toadflax weevils, *Mecinus janthinus*, were received from our cooperators in Montana. We recovered 1,481 weevils from the stems and released at six monitoring sites. We also reared 394 weevils in our greenhouse and that number will be higher as the project is ongoing.

Early season surveys of our existing release sites showed overwinter establishment at four out of 13 sites. Of those four 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 collected infested stems from the site and will use those to produce beetles for our winter rearing project in the greenhouse.

2. Monitoring establishment and impact of *M. janthinus* and *J. ivannikovi*. *M. janthinus* have been released at 11 sites and we recovered weevils at four 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 six out of 11 monitoring sites. At some sites recovery was noted away from the original release point.

3. Monitoring changes in vegetation composition at biocontrol sites. We monitored 13 sites (yellow toadflax) and 19 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. Data will appear in the final report. We will continue to add monitoring sites for Russian knapweed.

4. Providing biocontrol agents for establishment in other states. We collected and shipped 68 releases of the bindweed mite, *Aceria malherbae*, for release in other states and most of these releases were done at the request of USDA APHIS officials. We also shipped the bindweed moth, *Tyta luctuosa*, to six states.

Agent	Target	Stage	Location	# Releases	Total Agents
<i>Aceria malherbae</i>	Field Bindweed	Gall	Kansas	2	2000
<i>Aceria malherbae</i>	Field Bindweed	Gall	Nebraska	63	63,000
<i>Aceria malherbae</i>	Field Bindweed	Gall	Utah	3	3,000

<i>Tyta luctuosa</i>	Field Bindweed	Larvae	Utah	1	100
<i>Tyta luctuosa</i>	Field Bindweed	Larvae	Missouri	1	1000
<i>Tyta luctuosa</i>	Field Bindweed	Larvae	Nebraska	4	1228
<i>Tyta luctuosa</i>	Field Bindweed	Larvae	Kansas	1	200
<i>Tyta luctuosa</i>	Field Bindweed	Larvae	Oregon	1	750
<i>Tyta luctuosa</i>	Field Bindweed	Larvae	Washington	2	900

The Palisade Insectary 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.

Agent	Target	Stage	Location	Total Agents
<i>Hylobius transversovittatus</i>	Purple loosestrife	Adult	Washington	600
<i>Hylobius transversovittatus</i>	Purple loosestrife	Adult	Oregon	300
<i>Hylobius transversovittatus</i>	Purple loosestrife	Adult	Idaho	600
<i>Hylobius transversovittatus</i>	Purple loosestrife	Adult	Kansas	200

Biological Control in Wildfire Recovery

In 2013 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 (about 90,000 acres) area 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. In 2013, 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. Another 2,077 were released in June and July of 2014. Over the two years a total of 8,527 weevils have been released in the Hewlett Gulch burn area. Below is a map of the area with our release and monitoring sites marked. This project will continue for at least two more years and we will continue to release *M. janthiniformis* and monitor the impact on Dalmatian toadflax. In 2014 we monitored toadflax densities and vegetation composition at the four monitoring sites. We also surveyed toadflax adjacent to the monitoring sites and found *Mecinus* present. Although toadflax had not declined at the monitoring sites weevils were

present and feeding which may bring about future decline.

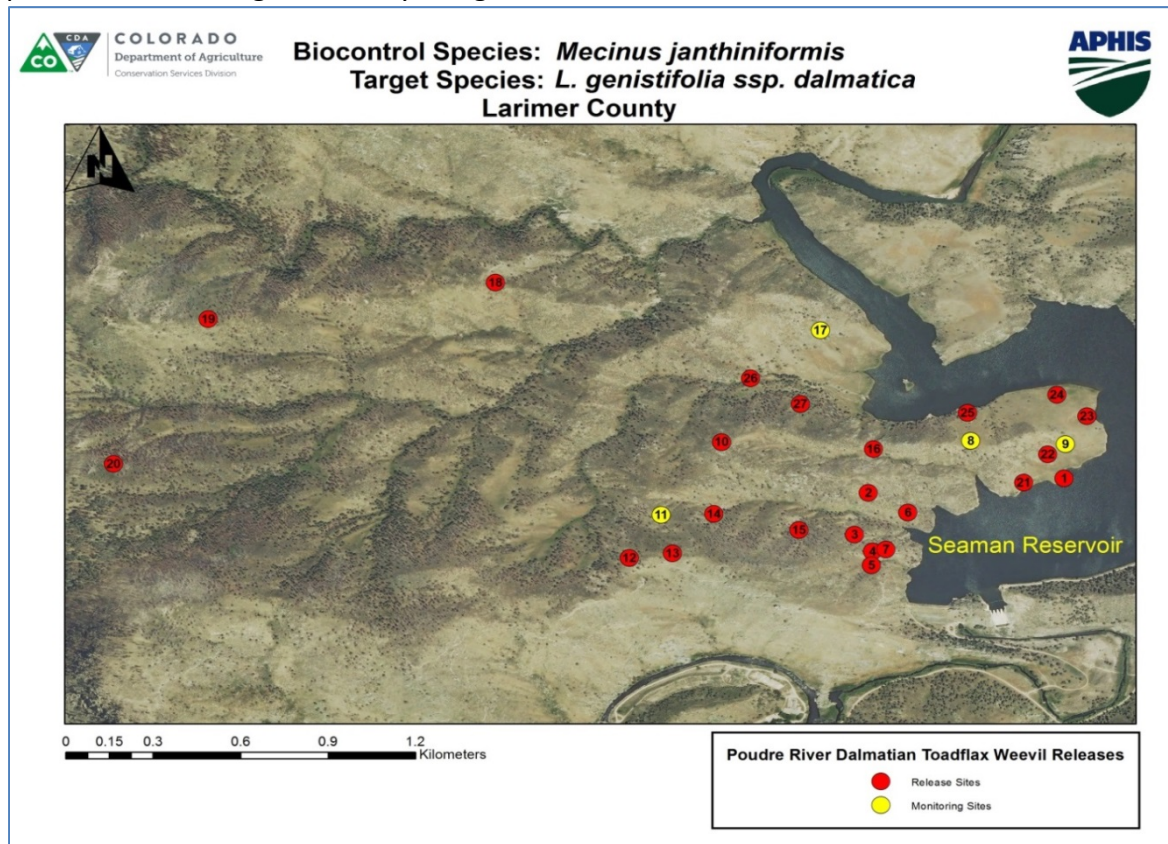


Figure 1. Release sites for *M. janthiniformis* in areas burned by the Hewlett Gulch fire of 2012.

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 15 locations (overwinter establishment). We have also released *Aulacidea acroptilonica* at two sites but have not yet recovered wasps. We also have them in continuous culture in the greenhouse. We are planning to establish field nursery sites that will enable us to make large scale releases in Colorado.

We have released the yellow toadflax stem boring weevil, *M. janthinus* at 15 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 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.

If appropriate, explain why objectives were not met.

We met all of our objectives for 2014.

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

We had no cost overruns all funds were obligated.

Year:	2014
State:	Colorado
Cooperative Agreement Name:	Collection and redistribution of biological control insects for the control of invasive leafy spurge (<i>Euphorbia esula</i>) and toadflaxes (<i>Linaria</i> spp.)
Cooperative Agreement Number:	14-8508-0013-CA
Project Funding Period:	March 1, 2014 to February 28, 2015
Project Report:	Accomplishment Report Collection and Redistribution of Biological Control Insects
Project Document Date:	July 30, 2014
Cooperators Project Coordinator:	Jeanne Ring
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

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 *Aphthona* flea beetles and *Oberea erythrocephala* from established populations in Colorado and determine the relative abundance of each *Aphthona* species at each site.

We sampled biocontrol insects at two sites in Larimer County and have retained a subsample of the *Aphthona* spp. for later dissection in the laboratory. Some species of *Aphthona* appear very similar externally and genitalic dissection is required to ascertain which species are actually present. Sampling at spurge sites will continue August – September 2014.

Objective 2: Release *Aphthona* spp. and *Oberea erythrocephala* into new populations of *Euphorbia esula* in Colorado.

In July we received over 11,000 *Aphthona* spp. flea beetles from USDA-APHIS-PPQ in North Dakota. In collaboration with the Larimer County Weed District, beetles were subsequently released at six locations in Larimer County. In spite of its wide distribution, we have yet to find locations where the populations of *Oberea erythrocephala* could be deemed to be collectable.

Objective 3: Assess the attributes of leafy spurge infestations (stem densities, heights, site characteristics) and specific agents (*Aphthona* spp.) present at sites where current populations of agents exist, in order to determine the relationship between environmental conditions, biocontrol agents present and leafy spurge reduction.

In conjunction with another project we have established monitoring plots at a heavily infested leafy spurge site where biocontrols currently exist. Assessments at spurge sites will continue August – September 2014.

Objective 4: Redistribute *Mecinus* spp. onto appropriate populations of *Linaria* spp.

In June we collected over 2,500 *Mecinus janthiniformis* from established populations and released them onto Dalmatian toadflax (*Linaria dalmatica*) at 13 new locations in Larimer County. Five of these locations were on lands managed by The Nature Conservancy, the first time biological controls have been used on any weed species on those lands. We also visited a *L. vulgaris* site in Douglas County where *M. janthinus* was released 3 years ago and determined that the weevil is indeed on the site, although the population remains very small and is not yet having demonstrable impact on yellow toadflax.

Summary: We have sampled existing populations of insects used as biological controls of leafy spurge and released *Aphthona* spp. flea beetles to new infestations of spurge, focusing on areas

affected by wildfire in Larimer County. We have also successfully collected and redistributed *Mecinus* weevils at appropriate toadflax infestations in Colorado. Assessments of leafy spurge sites and the composition of leafy spurge biological control species are ongoing.

Benefits and results of work:

In the course of collecting and distributing these biological control agents we have worked in cooperation with USDA-APHIS-PPQ, personnel at the Colorado Department of Agriculture insectary, the Larimer County Weed District, Larimer County Open Space Program, The Nature Conservancy, City of Fort Collins, a research colleague at the University of Colorado, and the CSU Environmental Learning Center. In addition, we are developing presentations and a monitoring protocol for the CSU Environmental Learning Center that will engage grade school children in the concepts of biological control of weeds, especially of leafy spurge.

Funding Amount
Proposed = \$16,595
Actual = \$16,595

	Proposed	Actual
Sites (Locations):	Not enumerated	NA

If appropriate, explain why objectives were not met.*

All objectives were met.

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

All funds are obligated.