

Idaho Invasive Species Council December 12th, 2018



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BLM



Overview

- Why biological control?
- Agent selection process
 - Hoary cress/White top (*Lepidium draba*)
 - Yellow toadflax (*Linaria vulgaris*)
 - Russian knapweed (*Rhaponticum repens*)
 - Canada thistle (*Cirsium arvense*)
 - Yellow toadflax (*Linaria vulgaris*)
 - Rush skeletonweed (*Chondrilla juncea*)
 - Houndstongue (*Cynoglossum officinale*)
- Standard Impact Monitoring Protocol (SIMP)
- BLM/ISDA's webpage



Classical Biocontrol

– Focuses on simple plant-herbivore interactions

- Advantages:

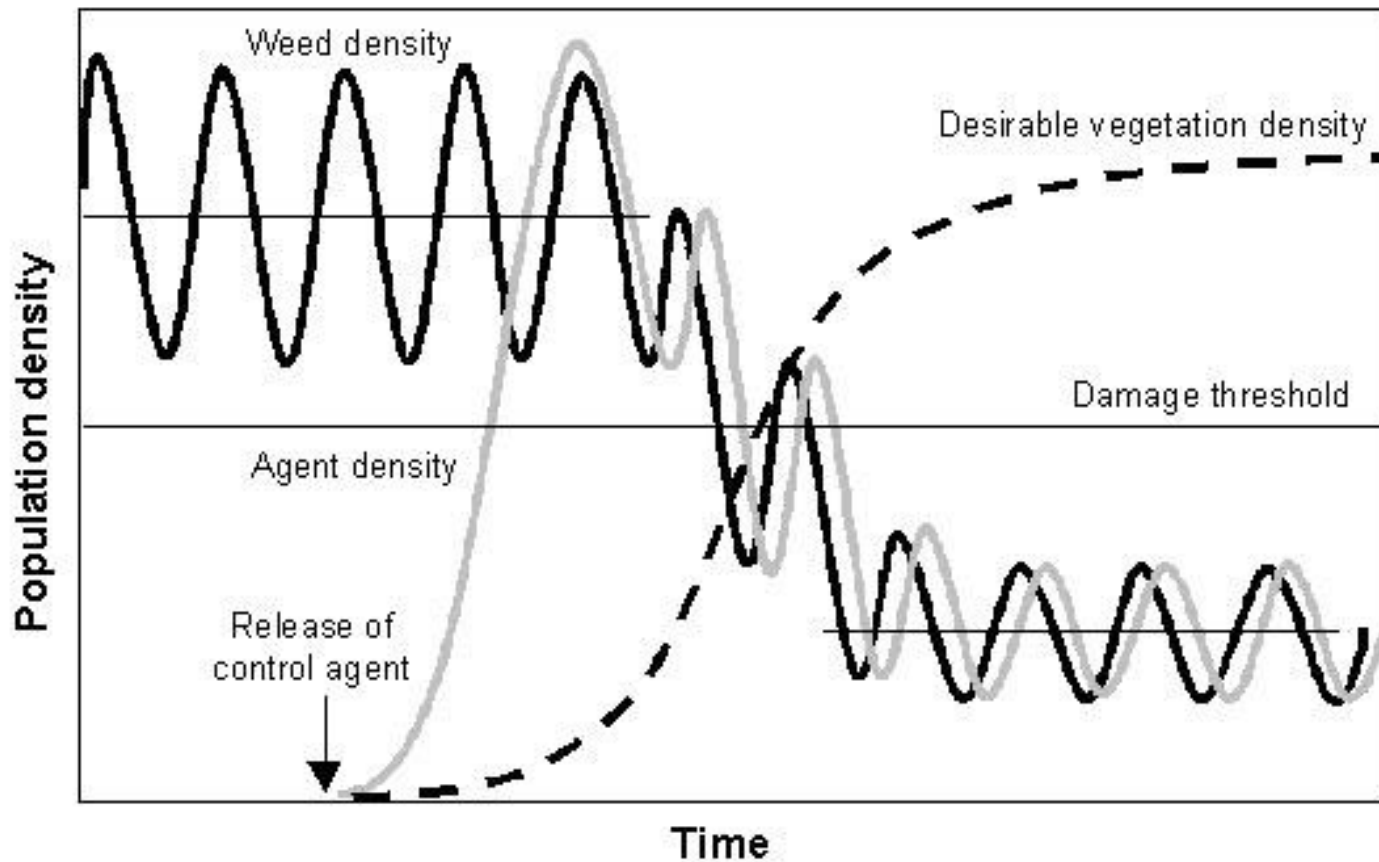
- Target specificity
- Continuous action
- Long – term cost effective
- Gradual in effect
- Generally environmentally benign
- Self dispersing, even into difficult terrain

- Disadvantages:

- Protracted time until impact is likely or visible
- Uncertainty over ultimate scale of impact
- Uncertain “non-target” effects in the ecosystem
- Irreversible
- Not all exotic weeds are appropriate targets
- Will not work on every weed in every setting



Ideal Biocontrol Results



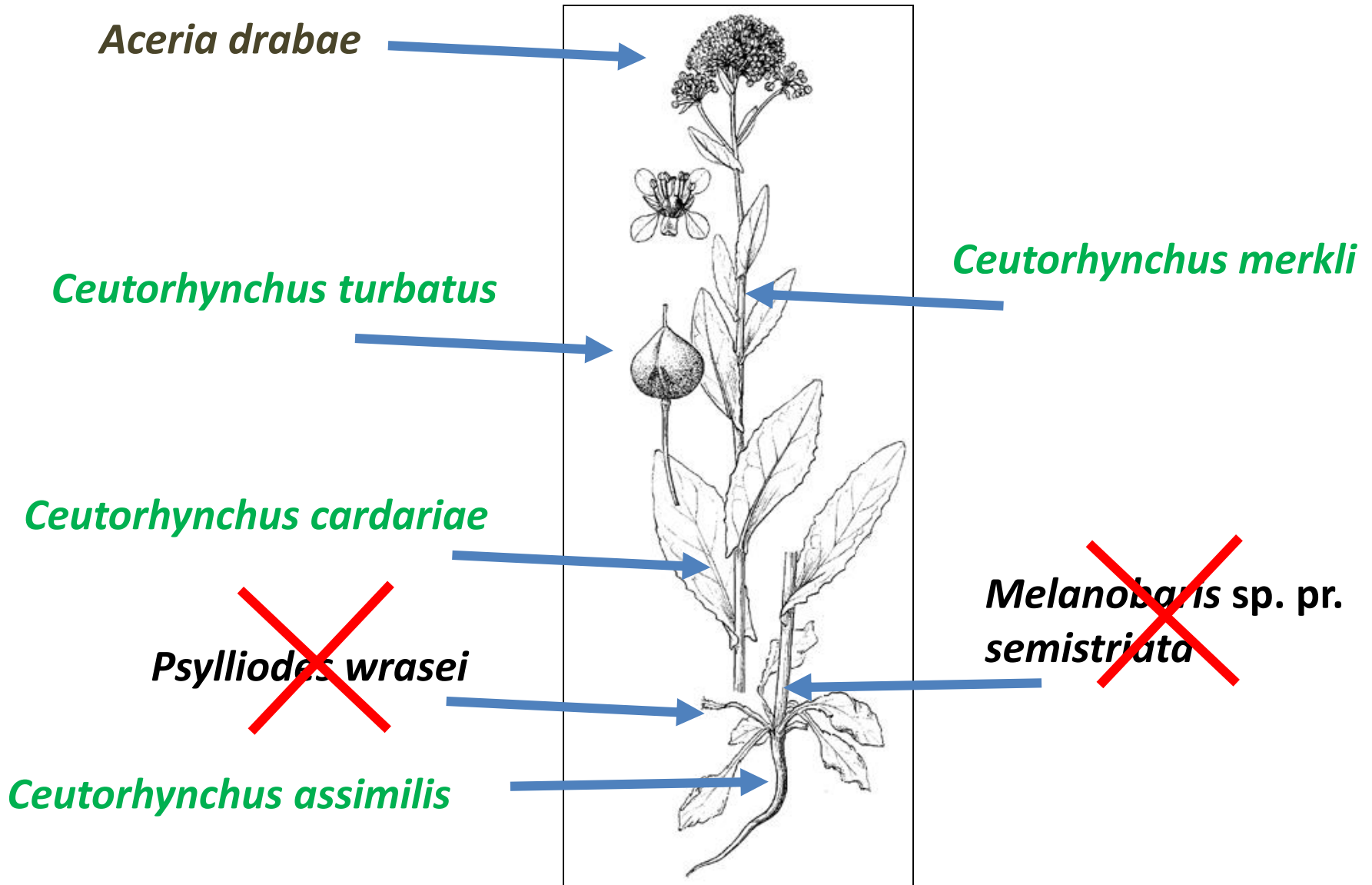
Agent Selection Process

- Foreign exploration for natural enemies
 - Establish target
 - Thorough literature survey
 - Climate matching (CLIMEX)
 - Rainfall, degree days, temp., moisture, drought
 - Field collections
 - Laboratory processing
 - Rearing
 - Petitions & paperwork





Potential biocontrol agents for hoary cress



Ceutorhynchus cardariae petiole weevil

Host-range testing 2003-2017

No-choice tests with 117 test plant species and varieties

(62 native to North America; 4 US FWS listed threatened/endangered species)

- gall formation on 18 test species

- adult emergence from 14 species

(9 of which native NA; none from T/E species)

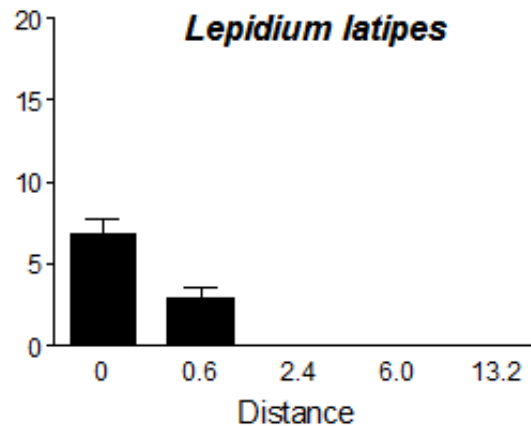
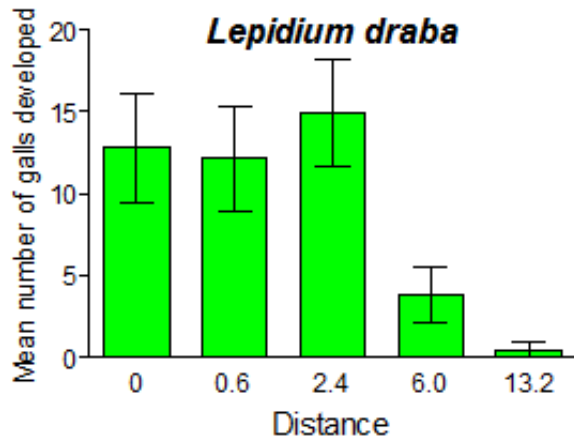
In series of **multiple-choice** tests only the native NA *Lepidium latipes* consistently attacked



Open-field test with *L. latipes* in 2011-17

Exposed *L. latipes* and the target, *L. draba*, in increasing distances from a central release point (0, 0.6, 2.4, 6.0, 13.2m)

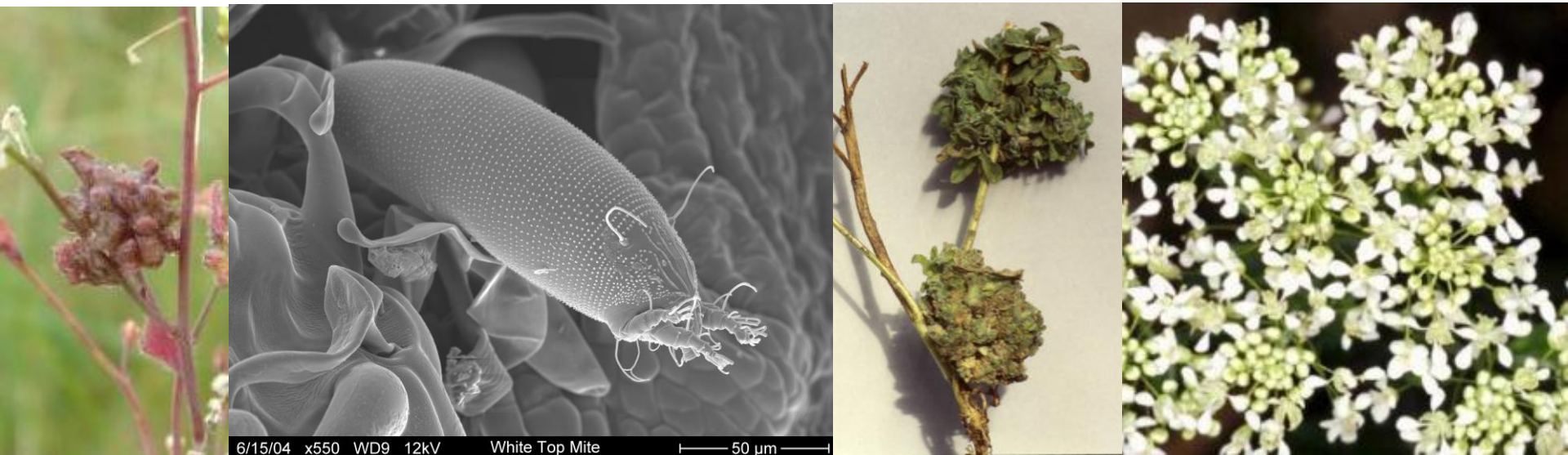
Weevils were marked with fluorescent powder to follow their movement



Additional agent: stem, flower gall mite

Aceria drabae

- Work on host range testing completed
- Petition for field release submitted by Dr. Jeff Littlefield (MSU) in March 2012
- Positive reviews from TAG recommended for release
- Gall mite is very host-specific
- Has good impact potential
- Just received word this has been approved two months ago



Yellow Toadflax

- *Mecinus janthinus* on *Linaria vulgaris*
- Many biological control agents released with minimal success
- Hybrid toadflax issues
- Now have insectaries in Idaho and Montana
 - YT is receding rapidly



Yellow Toadflax

- *Rhinusa pilosa*
- Recently approved
 - 1 of 4 approved releases in 2018
- Galls are formed on the stems of yellow toadflax
- Dramatically reduce plant vigor
- FS Research/MSU quarantine

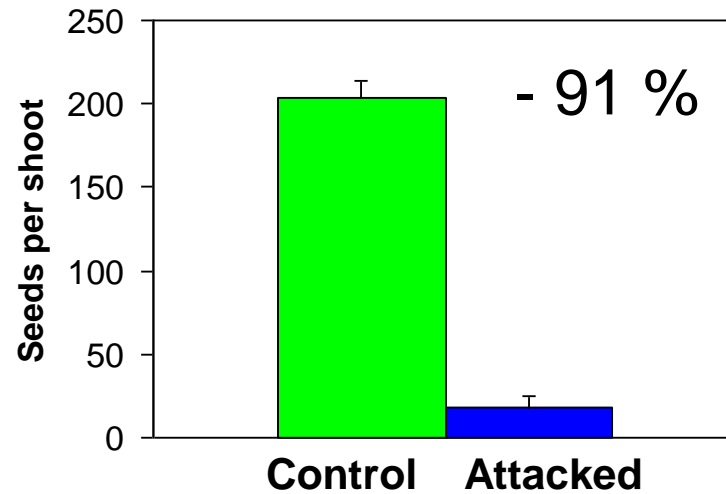
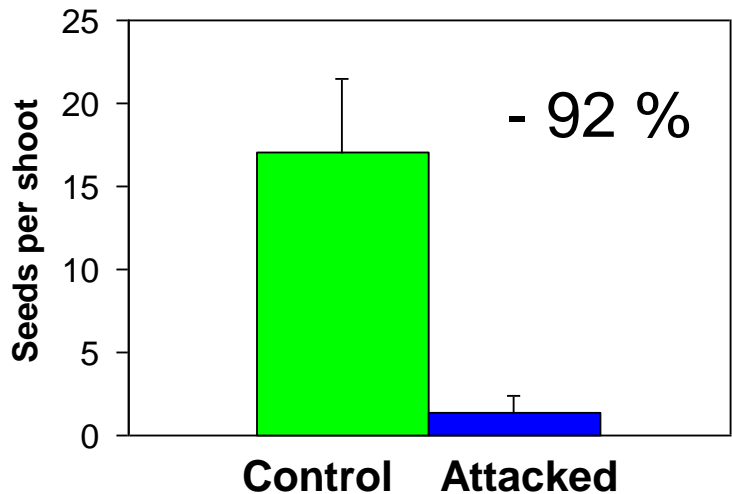
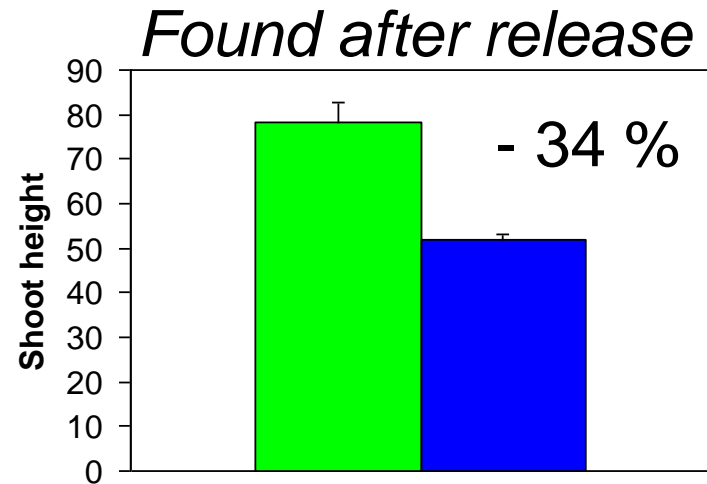
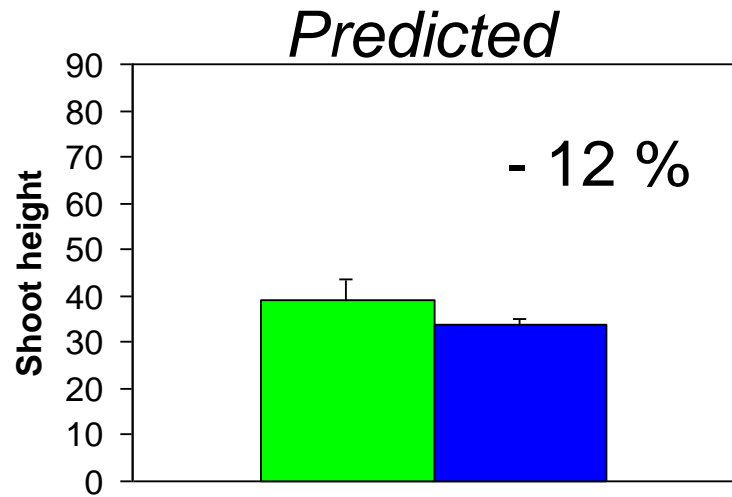


Russian Knapweed

- Gall midge *Jaapiella ivannikovi* for control of Russian knapweed
 - Operational
 - Lab-reared
 - Field collections
- Established in Alberta, Wyoming, Oregon, Washington, and now Idaho
- Recent release of the gall wasp, *Aulacidea acroptilonica*



Impact of *Jaapiella ivannikovi* on Russian knapweed



Canada Thistle

- Subject of a 2014 University of Idaho MS
 - Two established agents
 - *Hadroplontus litura*, *Urophora cardui*
 - Concluded that Canada thistle is not negatively affected by the biocontrol agents
 - Intra-specific competition and interspecific competition by perennial grasses had significant but weak effects
- Colorado Dept. of Ag. is studying *Puccinia punctiformis* as a biocontrol agent
 - Adventive released with Canada thistle in the 1800's
 - Not much is known
 - Will be deployed in 2018



Rush Skeletonweed

- The Rush Skeletonweed Consortium
- New FHTET publication available
- *Bradyrrhoa gilveolella*
- Permit for release in 2002 (Dr. George Markin, USFS)
- Rearing moth at University of Idaho and Nez Perce Biocontrol Center since 2006
- Field releases using cages, caged plants and open releases of larvae and adults
- Established in Idaho and Oregon since 2010, 2011 respectively
- Redistribution ongoing



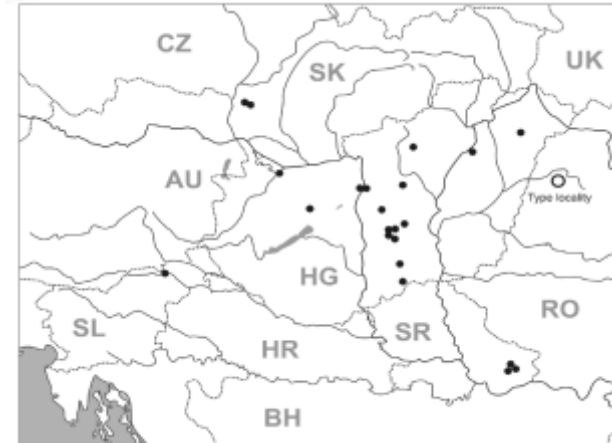
Rush Skeletonweed

- Biological control research 2004-2016
- Emphasis on plant resistance, impact and establishment of *Bradyrrhoa gilveolella*
- Not overly optimistic about *Bradyrrhoa gilveolella*
 - 14 larvae on a single plant
- Have *Bradyrrhoa gilveolella* established at four locations
- Difficult to collect in the field
 - Sex ratios
 - Biology of the moth



Oporopsamma wertheimsteini: root crown moth

- Dr. Jeff Littlefield (MSU) and Dr. Justin Runyan (USFS)
- Very damaging root crown mining caterpillar
- Currently studied at Montana State University for biology, host-specificity
- Work will continue in 2017



Sphenoptera faveola: stem mining buprestid beetle

- Very rare insect
- Acquired in 2016
- Buprestid requires larger plants for development
- Populations identified in Kazakhstan and Russia
- University of Idaho, BLM, Collaborators in Italy and Russia will study biology and propagation techniques
- Host-specificity testing next





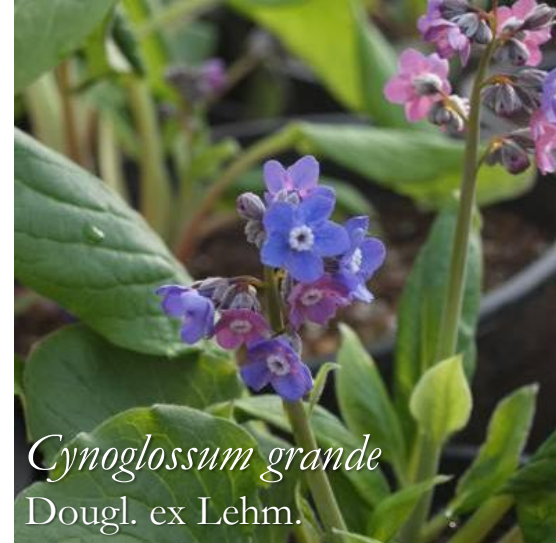
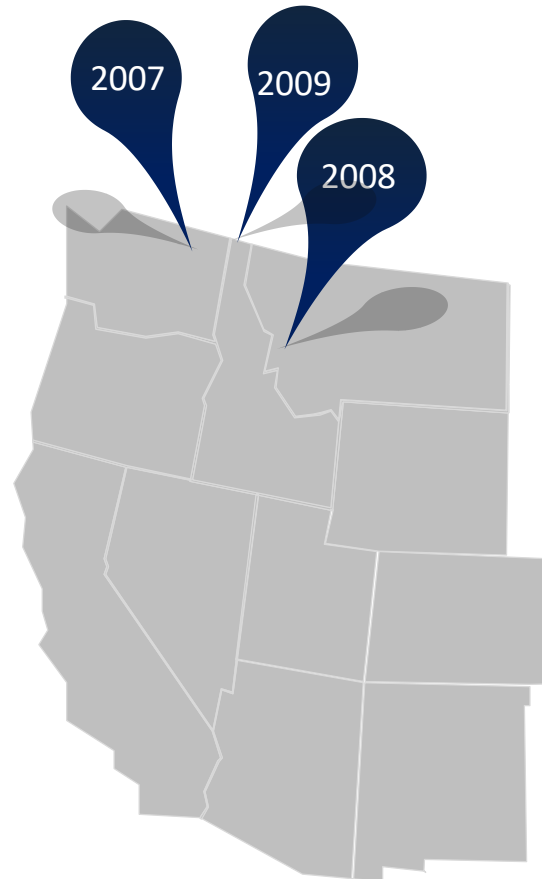
Houndstongue

- Foreign exploration since 1988
- Harriet Hinz & CABI Switzerland Team, Ikju Park, Laken Cooper, Jacob Natseway, Jennifer Andreas, Bradley Harmon and Marijka Haverhals
- Funding: (2012): Wyoming Biological Control Steering Committee, USDA APHIS CPHST, USDI BLM Oregon and Idaho



Mogulones crucifer Pallas (formerly *Mogulones cruciger* Herbst)

- Adults feed on foliage, larvae mine roots
- Prefers larger, bolting plants for oviposition
- 1997: First releases in Canada
- Same year U.S. FWS Memorandum with concerns for T&E listed *Cryptantha crassipes*
- 2002: USDA APHIS PPQ denies petition for introduction in U.S.



USDA APHIS PPQ issues Pest Alert for *Mogulones cruciger* in 2010

Pest Alert

Plant Protection and Quarantine
March 2010

Mogulones Cruciger

Mogulones cruciger (Coleoptera: Curculionidae) is a European, root-feeding weevil that is not native to the United States. It has gained notoriety in North America over the past 20 years as a biological control agent because it feeds on and destroys houndstongue (*Cynoglossum officinale* L.)—a highly invasive weed that is a serious nuisance for Western ranchers and nature enthusiasts. Houndstongue is highly toxic to cattle and horses, and it prevents desirable plant species from becoming established by capturing soil resources with its deep, well-anchored taproots.

In its battle against houndstongue, Canada began releasing *Mogulones cruciger* as a biological control agent in 1997. The weevils have since diminished houndstongue in the provinces of Alberta and British Columbia, which has led some ranchers in the United States to push for their release in this country. However, because these weevils feed on federally protected and non-targeted plants in environmentally sensitive areas of the United States, releasing them here could have serious ecological repercussions. The U.S. Department of Agriculture's



Figure 1. Dorsal view of an adult *Mogulones cruciger*. The species name *cruciger* refers to the cross-shaped white marking on the dorsal surface of the insect.



Figure 2. Lateral view of an adult *Mogulones cruciger*.

(USDA) Animal and Plant Health Inspection Service (APHIS) is therefore committed to preventing *Mogulones cruciger* from being introduced into the environment through any non-natural means.

Description

Mogulones cruciger eggs are pale yellow ovals. One by one, they are deposited into

cavities chewed by ovipositing females in various locations on houndstongue plants—such as within the stalks of rosette leaves and of stem leaves nearest the crown; inside the shoot base; and in the root crown. At 82 degrees Fahrenheit, the eggs hatch in approximately 7 days. The larvae are white with a light brown head. They feed on houndstongue plants year-round, eating the root and foliage. Mature larvae leave the roots to construct chambers in the soil, where they develop into pupae. Adults emerge from the soil in April and May, feed on houndstongue leaves, and start mating within 14 days. Adult *Mogulones cruciger* weevils are black and oval-shaped, growing to approximately 3 to 4 mm in length. They have a white cross on the center top of their wing covers and can live as long as 12 to 14 months. *Mogulones cruciger* adults are capable of dispersing up to 0.3 miles annually.

Hosts

As mentioned above, the primary host for *Mogulones cruciger* is houndstongue, a biennial plant native to Eurasia. Houndstongue grows most often on rangeland, heavily grazed

pastures, logged woodland, and other natural areas that have been disturbed. Its seeds stick to clothing and animals, which enables the plant to spread long distances. Since its accidental introduction into the United States and Canada more than a century ago, houndstongue is now established in 45 States and every Canadian province. While this exotic weed is difficult to control, it is a problem primarily in dry areas of the Northwestern United States and western Canada.

Houndstongue is a member of the Boraginaceae family of shrubs, trees, and herbs, most of which are distinguished by hairy leaves. A number of common plants belong to this family, including forget-me-not, heliotrope, and comfrey. There are 2,000 species in the Boraginaceae plant family—many of which are listed as threatened or endangered. *Mogulones cruciger* weevils feed on a broad range of these plants.

Potential Impact

Research indicates that releasing the *Mogulones cruciger* weevil in the United States will pose risks to native Boraginaceae species—including rare and endangered species, as well as the areas or habitats that are critical to those species' survival. Although *Mogulones cruciger* spread naturally into the United

States from releases made in Canada in the late 1990s, APHIS remains committed to preventing this pest from entering the United States by human-assisted means. APHIS will not issue permits for the field release or interstate movement of *Mogulones cruciger* within the United States. APHIS only allows the weevils to be imported into a U.S. quarantine facility.

Although the insect appears to provide some level of control for houndstongue, this benefit does not outweigh the potential negative environmental impacts it could have on endangered plant species. Unauthorized collection, transportation, and release of *Mogulones cruciger* as a biological control agent against houndstongue in the United States is a criminal violation of the Endangered Species Act, with penalties for punishable offenses ranging from a maximum fine of up to \$50,000 or imprisonment for 1 year, or both, and civil penalties of up to \$25,000 per violation. These actions are also a violation of the Plant Protection Act, with fines of up to \$250,000 per count for noncompliance, or up to \$1 million per adjudication if the violation is willful.

How You Can Help

To report a possible *Mogulones cruciger* finding, please contact your State plant health director.

A State-by-State listing of these contacts is available on the APHIS Web site at www.aphis.usda.gov/services/report_pest_disease/report_pest_disease.shtml.

Additional Information

For additional information, please contact APHIS Plant Protection and Quarantine's permit services office. The toll-free telephone number is (866) 524-5421, the local number is (301) 734-0841, and the e-mail address is Pest.Permits@aphis.usda.gov. Contact information is also listed online at www.aphis.usda.gov/contact_us/ppq.shtml.

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United States Department of Agriculture
Animal and Plant Health Inspection Service

APHIS 81-35-014
Issued March 2010



Houndstongue

- *Mogulones borraginis*
 - Seed feeder
 - Very host specific
- Will be petitioned for release in 2018
- Houndstongue is seed limited
- Hard to test
 - New testing methods



Idaho's Strategic Plan

- Mission statement:
 - “To facilitate the meaningful incorporation of biological control into long term integrated weed management throughout the state of Idaho.”
- Goal 1 – Coordination
- Goal 2 – Technology Development
- Goal 3 – Education and Outreach
- Goal 4 – Capacity Building
- Goal 5 – Evaluation and Assessment





Common tansy (left) and tansy ragwort (right) flowers



- *Alliaria petiolata*, Garlic Mustard
- *Hieracium* spp., Hawkweeds
- *Isatis tinctoria*, Dyer's woad
- *Phragmites australis*, Common Reed
- *Potentilla recta*, Sulphur Cinquefoil
- *Rhamnus cathartica*, Buckthorn
- *Senecio jacobaea*, Tansy Ragwort
- *Tanacetum vulgare*, Common Tansy
- *Vincetoxicum* spp., Swallow-worts
- *Convolvulus arvensis*, Field Bindweed
- *Butomus umbellatus*, Flowering Rush
- *Fallopia japonica*, Japanese Knotweed

Web Page

- There's an app
 - Survey 123/SIMP
- There's a website
 - iBiocontrol
- BLM/ISDA's website:
 - Biocontrol do's and don'ts
 - Idaho's Strategic Plan for Biological Control of Noxious and Invasive Weeds
 - All 2-pagers, monitoring forms
 - Agent-specific information regarding collecting, impacts, and optimal release habitats
 - Google "BLM Biological control"
 - <http://invasivespecies.idaho.gov/biological-control>



A photograph of a moth perched on a green plant stem in a field. The moth is light brown with white wings. The background is a blurred green field with hills in the distance under a blue sky.

Questions?

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