

## **FINAL REPORT – May 2013**

### **Project Title:**

Assessing the potential for *Mecinus janthinus* (*ex Linaria vulgaris*) to improve the efficacy and increase the implementation of yellow toadflax biological control.

### **Principal Investigator:**

Sharlene E. Sing, USDA Forest Service Rocky Mountain Research Station - Weed Biocontrol Program, 1648 S. 7<sup>th</sup> Avenue, Bozeman, MT 59717-2780; phone: (406) 994-5143; fax: (406) 994-5916; [ssing@fs.fed.us](mailto:ssing@fs.fed.us)

### **Principal Collaborator:**

Dan Bean, CO Department of Agriculture, Palisade, CO; 970.464.7916; [dan.bean@ag.state.co.us](mailto:dan.bean@ag.state.co.us)

### **Initial FHP Project Technical Representative:**

Tom McClure, USFS R2 Forest Health Protection; Golden, CO; 303.275.5100; [tmclure@fs.fed.us](mailto:tmclure@fs.fed.us)

### **Project Background:**

In spring 2009 weed biocontrol researchers affiliated with Montana State University - Bozeman and the USDA Forest Service - Rocky Mountain Research Station discovered small but apparently viable populations of *Mecinus* stem mining weevils on yellow (common) toadflax infestations at multiple sites in Powell County, MT. Local toadflax biocontrol efforts, initiated by area ranchers participating in the Blackfoot Challenge and supported by former MSU entomologist Dr. Robert Nowierski, began on several ranches in the Ovando area in 1986. *Mecinus* weevils, originally released there in 2001, were thought to have successfully overwintered on one ranch that had participated in early releases of several different species of toadflax biocontrol agents. An actively feeding population of *Mecinus* weevils was confirmed there in late May 2009, several years since the last site evaluation.

Adult weevils were found feeding on a second residual patch of yellow toadflax growing near a marker recording where the species had been originally released in the late 1990s. The discovery of these two sustained populations suggested that perhaps *Mecinus* had established across an even wider area. Subsequent scouting on public lands (Lolo NF; Montana DNRC) in the vicinity of the two established populations confirmed that the weevils have now effectively spread to and established at multiple locations in the Blackfoot drainage. The distribution of the weevil in Powell County is currently estimated to cover an area greater than 200 square miles. Actively feeding adult weevils have been consistently found on randomly selected yellow toadflax infested sites evaluated during local surveys. It is evident that the weevils have successfully overwintered and emerged from the previous year's yellow toadflax stems at each evaluated Powell County site.

These findings are very encouraging because although *Mecinus janthinus* is known to reduce Dalmatian toadflax populations, it had typically failed to establish on or impact yellow toadflax infestations in North America. *Mecinus janthinus*' failure to suppress yellow toadflax as effectively as Dalmatian toadflax was particularly frustrating because the original individuals

released in North America are thought to have been directly collected from or the progeny of adults collected from European yellow toadflax.

The first naturally occurring hybridization of yellow and Dalmatian toadflax in North America was reported by RMRS and Colorado State University researchers in 2009. This discovery necessitated molecular diagnostics to confirm that the plants in the Blackfoot drainage that were supporting the established *Mecinus* populations were in fact yellow toadflax and not toadflax hybrids.

Morphologically based evaluations confirmed that the weevil species collected from yellow toadflax is *Mecinus janthinus* Germar. Subsequently, molecular techniques have also been used to confirm that the weevils collected originate from a *Mecinus janthinus* population specifically attacking yellow toadflax in Europe. The willing and rapid participation of scientists from Colorado, Canada, and Serbia have made it possible to confirm the identity of the established stem-mining weevils that were feeding on yellow toadflax in Montana. However, the initial recognition of the importance of biological control in management of yellow toadflax by landowners in the Blackfoot Challenge was essential in creating the scenario for the establishment of these beneficial insects.

### **Project Goals:**

- **Goal 1:** deliver a safe, sustainable, effective and predictable biocontrol tool for operational integrated management of yellow toadflax, an invasive weed that is currently expanding unchecked due to a lack of effective biological and chemical management tools
- **Goal 2:** facilitate FHP program delivery by developing and disseminating effective and accessible mass-rearing protocols for *Mecinus janthinus* (*ex Linaria vulgaris*)
  - weevils were field collected in Montana and shipped to the Colorado Department of Agriculture's Palisades Insectary used to start insectaries
  - overwintering survival of F1 weevils has been confirmed from tent cages where adult weevils had been released in 2009
  - Palisades Insectary efforts are being supported through a Joint Venture Agreement with RMRS funded by a grant received through USFS Forest Health Protection's Technology Development Proposals for Biological Control of Invasive Native and Non-Native Plants program
    - mass rearing protocols for the yellow toadflax sourced *M. janthinus* are being developed by collaborators at the Palisades Insectary and Colorado State University using weevils shipped from Montana in 2009-2011; efforts by CSU are being funded by APHIS PPQ in Fort Collins, CO
    - Palisades Insectary release sites in Colorado were established and are annually monitored at Oak Ridge Wildlife Area; Upper Burro Mountain; Minturn; Burro Mountain (lower); Vail - North Trail; Crested Butte #1; Crested Butte #2; Telluride - Priest Lake; Milk Run

@ Telluride Ski Resort; Pagosa Springs; Gunnison River; and 25 Mesa Ranger Station

- successful establishment of the agent has been confirmed at some of the CO release sites; unfortunately, CO's extreme wildfire season in 2012 destroyed many of these; re-releases of *Mecinus* on yellow toadflax are planned for 2013 from an established weevil population maintained by APHIS PPQ in Fort Collins, CO that was established from adults shipped from Montana in 2009
- impacts of wildfire in Colorado in 2012 highlighted the importance of establishing insectaries with this agent at multiple locations throughout the U.S.
- APHIS PPQ in Fort Collins, CO will reportedly supply weevils to West Virginia and Minnesota for the first time this year (2013)

### **Project Objectives:**

- **Objective 1:** supply agents to establish insectaries in MT, CO and other U.S. locations where yellow toadflax is a pervasive management problem
  - **2010:** an estimated total of 8,550 adult weevils were field collected in Montana, sorted into release densities, packaged and express shipped to cooperators in MT, CO, UT and ID
    - prolonged cool and wet spring and early summer in 2010 necessitated multiple trips to the collection site (3+ hours from Bozeman) and made agent collection slow and difficult
  - **2011:** an estimated total of 9800 adult weevils from yellow toadflax were field collected in Montana, sorted into release densities, packaged and express shipped to cooperators in MT, CO, UT and ID
  - **2012:** approximately 5000 weevils were supplied to MT, CO, UT, ID, ND, SD, WY
  - **2013:** 4025 adult weevils were supplied to MT, CO, UT, ID, ND, SD, WA, WY, WV and MN
- **Objective 2:** assess biocontrol releases to better understand environmental limitations on, and ways to optimize, successful establishment of this agent
  - **2009-13:** continued monitoring transects set up throughout area where *M. janthinus* was **already established** on yellow toadflax at:
    - Scotty Brown: Chamberlain Creek – Lolo NF
    - Scotty Brown: bridge – Lolo NF
    - Monture: Dale's Draw – Lolo NF
    - Monture: hawk – Lolo NF
    - Monture: swamp – Lolo NF
    - Boyd House - Clearwater Game Range

- Ducks Unlimited #1 – Brown’s Lake
  - Ducks Unlimited #2 – Brown’s Lake
- **2009-13:** continued monitoring transects set up on yellow toadflax where *M. janthinus* was **released but not previously established** at:
  - Fort Ellis #1 – MSU sheep farm outside Bozeman, MT
  - Fort Ellis #2 – MSU sheep farm outside Bozeman, MT
  - Fort Ellis #3 – MSU sheep farm outside Bozeman, MT
  - West Yellowstone #1 – Gallatin NF
  - West Yellowstone #2 – Gallatin NF
  - West Yellowstone #3 – Gallatin NF
  - West Yellowstone #4 – Gallatin NF
- **Objective 3:** using standardized protocols monitor biocontrol releases to determine the efficacy of *M. janthinus* (*ex Linaria vulgaris*) under a range of MT and CO field conditions
  - **2010-13:** established, permanently marked and annually assessed 0.88 hectare macroplots at:
    - Gold Creek – Pintler RD, Beaverhead-Deerlodge NF
    - Madison Arm – Hebgen Lake RD, Gallatin NF
    - Ground Zero – Hebgen Lake RD, Gallatin NF
    - APHIS Weather Station – Hebgen Lake RD, Gallatin NF
    - Indian Meadows – Lincoln RD, Helena NF
  - macroplots, centered over an agent release point (ARP), consisted of:
    - a release of 200 adult *M. janthinus* collected from yellow toadflax near Ovando, MT
    - sixteen 1m<sup>2</sup> vegetation sampling subplots
    - four 5m<sup>2</sup> agent sampling subplots
    - six 50m vegetation and agent nested frequency transects
    - sampling for *M. janthinus* presence and abundance was not conducted in 2010 because this was the first year that agents were released
    - vegetation was sampled to report toadflax demographics and percent cover by life form
- **Objective 4:** provide regional tech transfer guidance to increase successful implementation of yellow toadflax biocontrol
  - **2010:** Led a 5-hour field trip at the request of the Seeley Lake RD, Lolo NF in the North Fork of the Blackfoot/Lake Creek area to show stakeholders how to evaluate plants for *M. janthinus* damage/presence and how to survey the area to determine the extent of the weevil’s establishment.
  - **2012:** Presented an in-depth review of the current knowledge on *Mecinus janthinus* as a biological control agent for yellow toadflax to ~20 participants during the annual fall meeting – Montana interagency weed biocontrol

working group (APHIS PPQ; BLM; BOR; BIA; ARS; Montana Department of Agriculture; Montana State University research and extension; USFS; Montana county weed coordinators), including an opportunity for attendees to dissect infested yellow toadflax and to compare and contrast injury on yellow toadflax to typical *Mecinus* injury on Dalmatian toadflax

- **2012:** Awarded funds from RMRS to produce a fact sheet for the Station's "science you can use" technology transfer program to disseminate research results on this *Mecinus* - yellow toadflax project.