



# Use of Biological Controls at McDonald Project

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# Presentation Outline

- Background
- Project Site
- Specific Knapweed Situation
- Biological Control Research
- Biological Research and Collaboration
- Site Specific Recommended Controls
- 2009 program
- 2010 program
- Monitoring Biological Control Performance
- Successful Program Description

# Biologic Controls Background

- ❑ First biological programs in the United States and Canada were initiated in the 1960's.
- ❑ Initiated with two seed head flies from Eurasia.
- ❑ An additional eight seed head feeders and five root borers have been released in North America after further research and biological and genetic testing of biological agents.
- ❑ The 10 seed head feeders and 5 root borers have been established in the Western States.

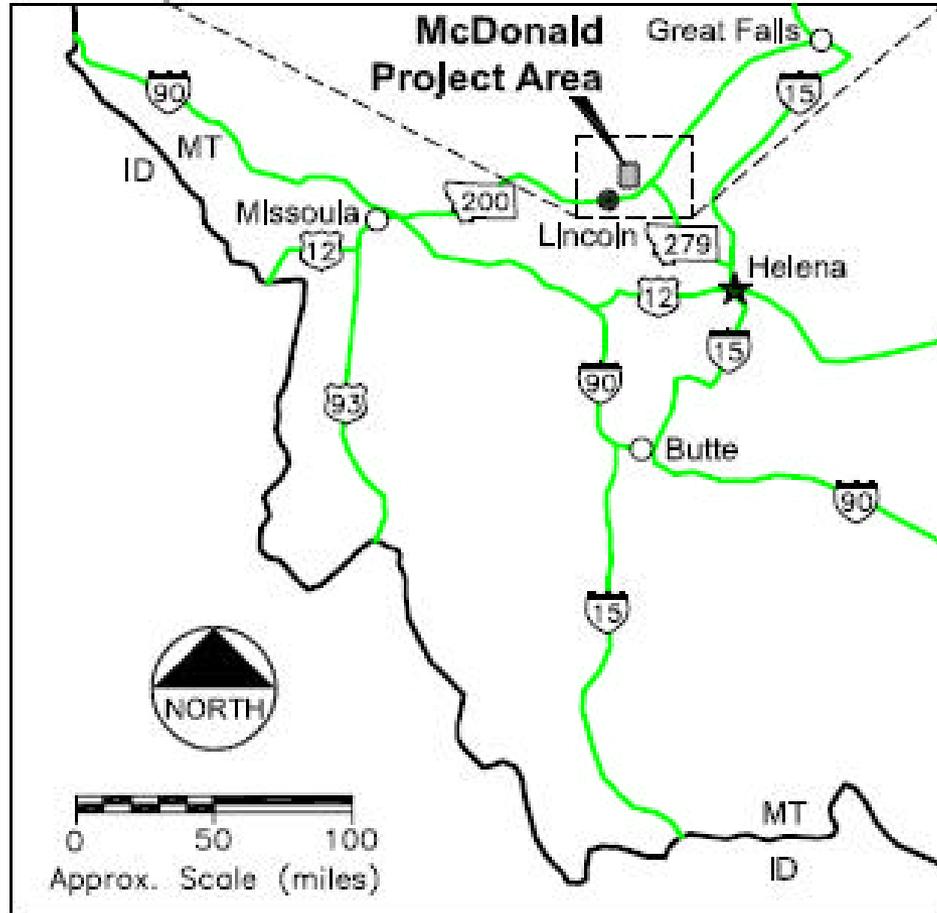
## NOTE:

- ❑ Potential bio-control insects undergo strict testing for a period of 5 to 10 years by the United States Department of Agriculture APHIS Department to ensure host specificity of introduced insects.

## Introduction into North America of the proposed insects for Newmont

- ❑ 1988, *Cyphocleonus achates* (root-boring weevil)
- ❑ 1991, *Larinus minutus* (Lesser flower [seed head] weevil)

# McDonald Project Site



# Spotted Knapweed (*Centaurea maculosa*)



## Spotted Knapweed Bio:

- ❖ Originally from Central Asia
- ❖ In USA for over 120 years
- ❖ Competes with plants for soil moisture and nutrients
- ❖ Evidence of chemical release inhibits germination and growth of surrounding vegetation
  - Lowers plant diversity
  - Reduces forage for livestock and wildlife
  - Increases surface water runoff and soil sedimentation
- ❖ Noxious weed per Lewis and County Weed Board

# Specific Knapweed 'Crop' Situation

- ❑ Large field of spotted knapweed.
- ❑ Specific seed source is a combination of wildlife, lease grazing, hunters, carried in the wind, past surface disturbances, etc.
- ❑ Not easily accessible for vehicle spraying and requires intensive backpack spraying.
- ❑ Twice yearly application of chemical controls (Tordon 22K, Weedar 2-4-D and Milestone). Places additional chemicals in the environment and requires cost / time to apply chemicals.
- ❑ Cost benefit of self propagating insects is great compared to cost of chemicals and application of chemicals

***Wouldn't it be nifty if this area could be self sustaining through biological controls versus chemicals?***

# Biological Control Research

- ❑ **Pilot program supported by MDEQ, MDNRC, and Sieben Ranch Co.**
- ❑ **Pilot project with biological control is based on collaborative information that may / may not apply to this location.**
- ❑ **First known pilot program for Newmont North America Exploration.**
- ❑ **Two known instances of insect releases in the past several years in the Lincoln vicinity.**
  - **No information on insect species**
  - **No monitoring information collected**
- ❑ **This may be the first major pilot instance in the upper Blackfoot Valley**
  - ✓ **Pilot can provide valuable data regarding the adaptability of the two species to a harsh environment.**
  - ✓ **If one or both of the species are not successful, that in itself has value.**

**The survival of the colony through the winter will determine if the weevils can adapt to the climate of this specific locale.**

# General Research and Release Steps

1. **Identify the target weed**
  - a. Have a certified weed expert confirm the identify of the target weed.
  - b. Confirm the density of the weed in the target location.
2. **Collaborate with experts on insect species to introduce**
  - a. Confirm target reference
  - b. Describe location of target site (sun, tree cover, terrain, etc).
  - c. Determine elevation / location
3. **Identify how to acquire insects**
  - a. Consult with public agencies, insectaries, and wholesale/retail sales
4. **Preparation of target release site**
  - a. Confirm last chemical application
  - b. Confirm access to the land when the insects are to be introduced
  - c. Place a marker indicating center of release site.
5. **Insect shipment and release**
  - a. Confirm shipping method and release details
6. **Preparation for an ongoing monitoring program**
  - a. Ability to have qualified personnel to monitor the release site
  - b. Initiate a photographic record of release site and surrounding area.

# MT Biological Research and Collaboration

- ❑ **Public Agencies**
  - Lewis & Clark County Weed Board, Helena**
  - Montana Department of Agriculture, Helena**
  - Montana DNRC, Helena**
  - MSU Extension Coordinator, Helena**
  - USDA APHIS Department, Helena**
  - Western Ag Research Center, Corvallis**
  
- ❑ **High School Insectaries**
  - Augusta High School, Augusta**
  - Whitehall High School, Whitehall**
  
- ❑ **Wholesale and Retail Sales**
  - Planet Natural, Bozeman**
  - Weedbusters Biocontrol, Missoula**
  
- ❑ **Private Landowner**
  - Sieben Ranch Co., Helena**
  - Sunnyside Grazing Association, Lincoln**

# Biological Control Recommendation

Recommendation was to introduce 2 species of insects for the specific spotted knapweed. The species and the process by which they will destroy the host plants is:

- ❑ Lesser flower (seed head) weevil (*Larinus minutus*)
  - ✓ Adults emerge for 10 weeks to mate and feed on the rosette leaves, stems and flowers
  - ✓ Eggs are deposited on the seed head and hatch after 5 days
  - ✓ Larvae feed on the seeds in the flower heads for 3-4 weeks
  - ✓ New adults emerge, finish the seeds and winter in the soil duff
  
- ❑ Root boring weevil (*Cyphlocleonus achates*)
  - ✓ Adults emerge for 10 weeks to mate and feed on the leaves and to seek a mate. Eggs are deposited on the root crown and hatch after 10-12 days
  - ✓ Larvae begin feeding on the root and winter in the root
  - ✓ New adults emerge in the late summer after destroying the root

# Specific Site Biological Control Program

- 1. Site preparation**
  - a. Last chemical application, August 2008**
  - b. Specifically no spring 2009 chemical application and avoidance of overspray in adjacent areas**
  - c. Confirm access to the land when the insects to be introduced are adults (July, August, September)**
  - d. Marker indicating center of release site.**
  
- 2. Insect requirements**
  - a. A minimum of 500 of each specie. Recommended by USDA-APHIS, Helena.**
  - b. Insects selected fit the site conditions of high density spotted knapweed, south facing hillside, open with some scattered pine trees, some intermingled grasses/forbs/sage brush.**
  - c. Compatible with the elevation of 5,000' in the upper Blackfoot Valley**

# Specific Program Cont'd

- 3. Locating insects**
  - a. On wait lists to assist in harvesting insects**
  - b. Frequent communication with insectaries and MSU extension agent**
  - c. Close contact with local weed board**
  
- 4. Release of insects**
  - a. Pick up insects in chilled cooler**
  - b. Receipt of insects from FedEx**
  - c. Instant release in marked area**
  
- 5. Preparation for an ongoing monitoring program**
  - a. Maintain the marked spot**
  - b. Layout transects if permanent**
  - c. Construct PVC quadrant frame**
  - d. Determine window to sample when adults are out (10 week window)**

# 2009 Program

- ❑ Receiving location prepped with no chemical application.
- ❑ A total of 1,233 root boring weevils were released.
- ❑ All insects (adults) were shipped in a hibernated condition. Insects were released the same day and at the same site.

<b>Date</b>	<b>Number</b>	<b>Source</b>
<b>August 27</b>	<b>300</b>	<b>Augusta High School Insectary</b>
<b>September 3</b>	<b>308</b>	<b>United States Department of Agriculture (USDA) APHIS Department, Helena</b>
<b>September 16</b>	<b>625</b>	<b>USDA, APHIS Department, Corvallis</b>

# 2009 Program Cont'd

## ☐ Inspections

- ✓ Random to verify survival
- ✓ Random to ascertain any migration from the release site
- ✓ Inconclusive results (too early to tell) and early sub-zero temperatures arrived with snowfall.

## ☐ Lessons learned

- ✓ Clear communication is critical with suppliers
- ✓ Timing / availability around adult species is critical
- ✓ Availability of species when 'needed' is not guaranteed

# Spotted Knapweed Root Boring Weevil (*Cyphocleonus achates*)



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Image by Eric Coombs, Oregon Department of Agriculture

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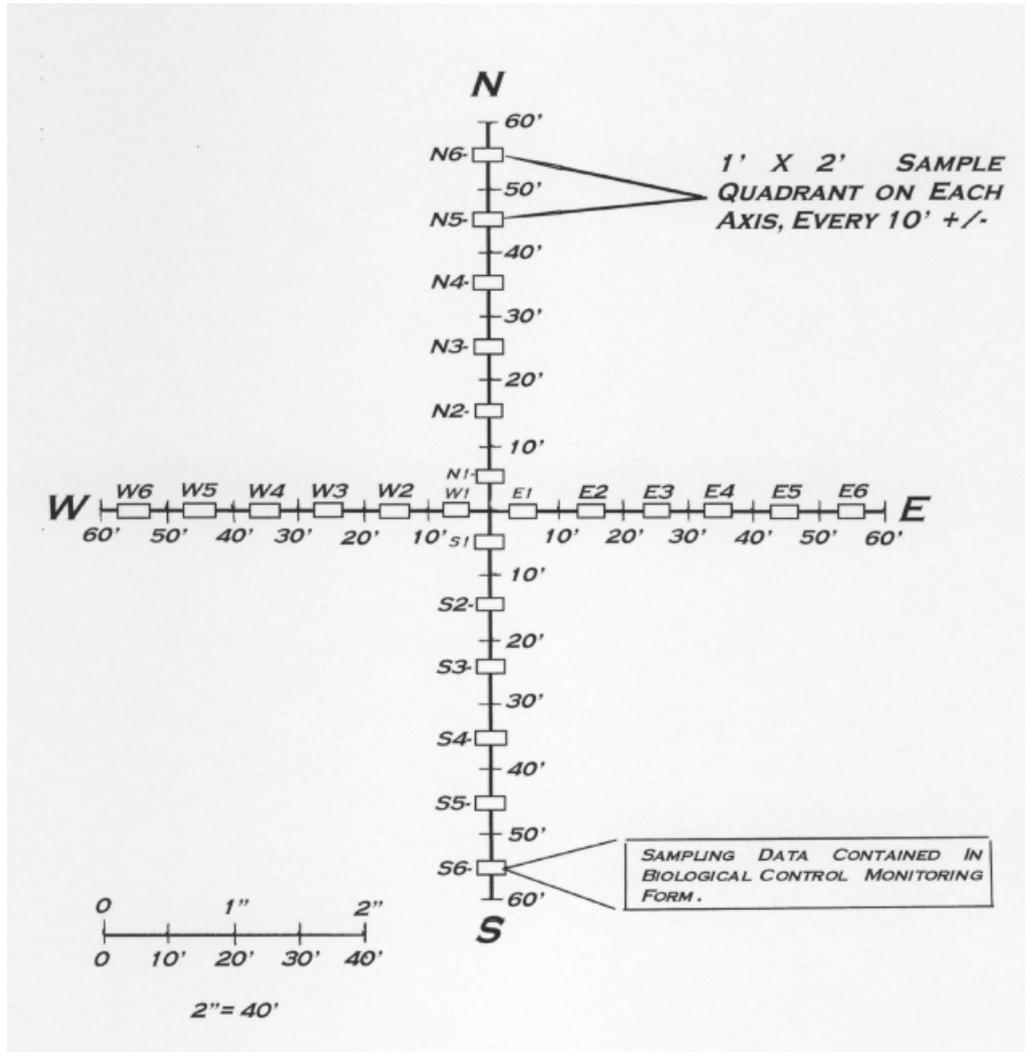


Image by Eric Coombs, Oregon Department of Agriculture

# 2010 Program

1. Inspect the survival of the root boring weevil over the 2009-2010 winter
2. Monitor the root boring weevil and measure its impact on the knapweed
  - ✓ Set up four 60' transects
  - ✓ Measure within a 1'x2' area zone
    - ✓ # adults
    - ✓ Condition of knapweed
    - ✓ Number of knapweed plants
    - ✓ Number of forbs, grasses, shrubs, etc in zone
  - ✓ Aim to monitor twice in July and twice in August/September

# Sampling per Transects



# Biological Control Monitoring Form

**Biological Control Monitoring Form**

Site \_\_\_\_\_ County \_\_\_\_\_ Date \_\_\_\_\_

Sampling Personnel \_\_\_\_\_

GPS: N \_\_\_\_\_ W \_\_\_\_\_ Elevation \_\_\_\_\_

Time \_\_\_\_\_ Temperature \_\_\_\_\_ Weather \_\_\_\_\_

Weed Stage Present: Seedling \_\_\_ Rosette \_\_\_ Bolting \_\_\_ Flowering \_\_\_\_\_

Quadrant ID	Bio Species	Quantity	Grasses	Forbs	Shrubs	Spotted Knapweed
N-1						
N-2						
N-3						
N-4						
N-5						
N-6						
S-1						
S-2						
S-3						
S-4						
S-5						
S-6						
E-1						
E-2						
E-3						
E-4						
E-5						
E-6						
W-1						
W-2						
W-3						
W-4						
W-5						
W-6						

Bio Species : Ca = *Cyphocleonus achates* , Lm = *Larinus minutus*

# 2010 Program Cont'd

3. Introduce the seed head weevil
  - ✓ Early to late summer
  - ✓ Minimum of 1,000 planned for release
  - ✓ Release to be adjacent to the root weevil site
  - ✓ Insects will be introduced on healthy, mature spotted knapweed plants
  - ✓ Inspect their survival before winter
  
4. Monitoring results will be included in the annual field season report and submitted to the appropriate regulatory agencies and stakeholders. Following submittal, the data can be made available to any interested parties or researchers.

# Newmont 2010 Pilot Program Objectives

## Objective #1

Determine the survivability and sustainability of a host specific beneficial insect within the project boundaries.

## Objective #2

Reduce dependency of chemical usage through the introduction of an environmentally beneficial integrated control program.

# Overall Biological Control Performance

- ❑ The information collected during the pilot project will support research on both types of weevils to understand if the population is expanding; or if the population will remain the same and migrate to the food sources.
- ❑ Biological controls need three to five (to 10+) years for weed management.
- ❑ Need high population weevil densities to realize an impact on a high density of weeds for effective weed management.

# 2009 Root Boring Weevil Release

