Integrated Weed Control Project
- Biological Control-

Jennifer Andreas
Integrated Weed Control Project Director
jennifer.andreas@kingcounty.gov
(206) 205-3135
What is Biocontrol?

The intentional use of one living organism to control/suppress another organism, such as **WEEDS**

- **Nematodes**
- **Insects**
- **Mammals**
- **Pathogens**
Integrated Weed Management

- Decision-making process
- Strategy for effective weed suppression
- Ecologically-based
- Combination of weed control methods
  - physical, cultural, chemical, biological
Advantages

• Safe – USDA APHIS approves biological control agents before introduction into U.S.

• Ecologically desirable – herbicide alternative

• Insects are mobile

• Long-term solution

• Cost effective
Limitations

- Long time to make impact
- Subject to predators
- May not establish at some sites
- Very slow approval of new agents
- No eradication
When to use biocontrol?

- Established weed infestations
- Remote, inaccessible, less disturbed areas
- Areas not controlled by other means
- Environmentally sensitive sites
When **NOT** to use biocontrol?

- Small or new infestations
- Highly disturbed areas
- Roads or traveled paths
- Areas unfavorable for insect
- On weeds with no approved agents
Knapweeds

**Spotted knapweed**
*(Centaurea stoebe spp. micranthos)*
- spread by seed
- ↑ soil erosion
- ↓ biodiversity
- ↓ quality forage

**Diffuse knapweed**
*(Centaurea diffusa)*

**Meadow knapweed**
*(Centaurea pratensis)*

WSU Extension
Knapweed Biocontrol Agents

**Larinus obtusus**
- seed-head feeding weevil
- attacks spotted, meadow & diffuse
- currently best agent for meadow
- ↓ seed production

**Larinus minutus**
- seed-head feeding weevil
- attacks diffuse, spotted & meadow
- strong impact on diffuse in eastern WA
- adults can defoliate plants
- ↓ seed production
Success with *Larinus minutus*!

- diffuse knapweed reduced dramatically

Before biocontrol agent release

After biocontrol agent release

WSU Extension
Knapweed Biocontrol Agents

Cyphocleonus achates
- root-feeding weevil
- attacks spotted & diffuse
- ↓ biomass & density
- can kill plants
- good success in Montana with L. minutus & root weevil
### Additional Knapweed Agents

#### Seed-feeders

**Bangasternus fausti**
- seed-feeding weevil
- attacks diffuse & spotted
- prefers hot, dry environments

**Chaetorellia acrolophi & Terellia virens**
- seed-feeding flies
- attacks spotted & diffuse
- prefers cool, wet sites

**Agapeta zoegana**
- root-feeding moth
- attacks spotted & diffuse
- impact unknown

#### Root-feeders

**Sphenoptera jugoslavica**
- root-feeding beetle
- attacks diffuse, maybe spotted
- prefers hot, dry environments
Purple loosestrife

*Lythrum salicaria*

- herbaceous perennial
- aquatic, wetland sites
- displace native vegetation
- degrades wildlife habitat & hunting/ fishing areas
- ↓ water flow
Purple Loosestrife Biocontrol

**Galerucella calmariensis / G. pusilla**
- foliage-feeding beetles
- highly effective
- larvae & adults devour foliage
- do not like tidal-influenced waters
**Hylobius transversovittatus**
- root-feeding weevil
- best combined with leaf beetles
- kills small roots in 2 years with several larvae
- difficult to collect

**Nanophyes marmoratus**
- bud/flower-feeding weevil
- outcompeted by leaf beetles
- ↓ seed production
Scotch Broom

*Cytisus scoparius*
- perennial shrub
- displace forage & native species
- impacts timber, rangeland

*Exapion fuscirostre*
- seed-feeding weevil
- widespread
- ↓ seed production

*Bruchidius villosus*
- seed-feeding bruchid
- ↓ seed production up to 90%
**Tansy Ragwort**

*Senecio jacobaea*
- biennial, unless mowed/cut
- toxic to cattle & horses
**Tansy Ragwort Biocontrol**

*Longitarsus jacobaeae*
- root-feeding flea beetle
- excellent agent
- widespread
- Italian & Swiss strains
Tansy Ragwort Biocontrol

Tyria jacobaeae (cinnabar moth)
- foliage-feeding moth
- effective in large numbers but plants are often able to flower
- non-target concerns

Botanophila seneciella
- seed-feeding fly
- widespread

Larvae consuming foliage

Larva consuming seeds
St. Johnswort

*Hypericum perforatum*
- perennial, rhizomatous
- causes sensitivity to sun
- poster child for biocontrol success
- now considered mainly a roadside or wasteland weed

• 1 million hectares in northern California infested in 1944
St. Johnswort Biocontrol

Chrysolina spp.
- foliage-feeding beetle
- poster child for biocontrol success!

Monument to beetle (and researchers) in California, celebrating success
St. Johnswort Biocontrol

**Aplocera plagiata**
- foliage-feeding moth
- success unknown
- difficult to collect in large numbers

**Agrilus hyperici**
- root-boring beetle
- success unknown
- difficult to collect in large numbers
Rush Skeletonweed

**Chondrilla juncea**

- long-lived herbaceous perennial
- spread by seed & vegetative regrowth
- over 404,000 ha in Washington
- competes with crop plants
- latex hinders crop production
- displaces desirable forage
Rush Skeletonweed Biocontrol

**Eriophyes chondrillae**
- gall-forming mite
- most effective agent
- ↓ plant vigor / stunts plants
- ↓ seed production
- kills seedlings

**Puccinia chondrillina**
- rust fungus
- effective
- ↓ seed production
- ↓ plant vigor
- can kill seedlings
Rush Skeletonweed Biocontrol

**Cystiphora schmidti**
- gall midge (fly)
- effective
- can kill rosettes and stems
- ↓ plant vigor
- ↓ seed weight & viability

**Bradyrrhoa gilveolella**
- root-mining moth
- can kill above-ground tissue
- establishment questionable
- may be available for trials

Piper, WSU; bugwood.org

USFS
Canada Thistle

**Cirsium arvense**
- creeping perennial
- ↓ forage
- competes with crops

**Urophora cardui**
- stem-galling fly
- ↓ plant vigor
- works in conjunction with plant competition
Bull Thistle

*Cirsium vulgare*

- biennial
- prevalent in heavily disturbed sites

*Urophora stylata*
- seed-feeding fly
- ↓ seed production

Larvae consume developing seeds

Adult

WSU Extension

Shepard, USFS, bugwood.org

Harris, AAFC, bugwood.org
Additional Biocontrol

• Biocontrol agents may be available in your area for:
  – gorse
  – bindweed
  – puncturevine
  – saltcedar
  – Mediterranean sage
  • Class A – must be controlled in Washington
WSU Extension’s Role

- State-wide program
- Provide biocontrol agents free of charge to land managers
- Education to land managers
- Expertise and on-site recommendations