

Biological Control for Musk Thistle in Oklahoma.

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ENTOMOLOGY AND
PLANT PATHOLOGY

Bio-control of musk thistles in Oklahoma: Outline

Introduction and biology of Musk thistle

Impact of musk thistle to Oklahoma agriculture

Introduction and establishment of musk thistle weevils in Oklahoma

Extension efforts to control musk thistle and impact.



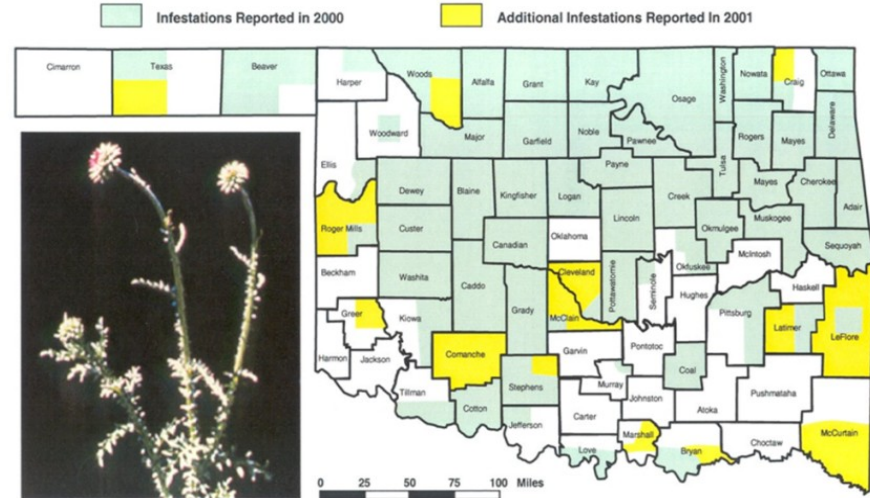
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Bio-control of musk thistles in Oklahoma: Outline

Musk thistle arrived in the US in 1853 and was first detected in Oklahoma in the 1940s

As an introduced thistle, it was introduced without natural enemies

Since then, it has spread to cover most of the state



(Map from Roduner, 2001)



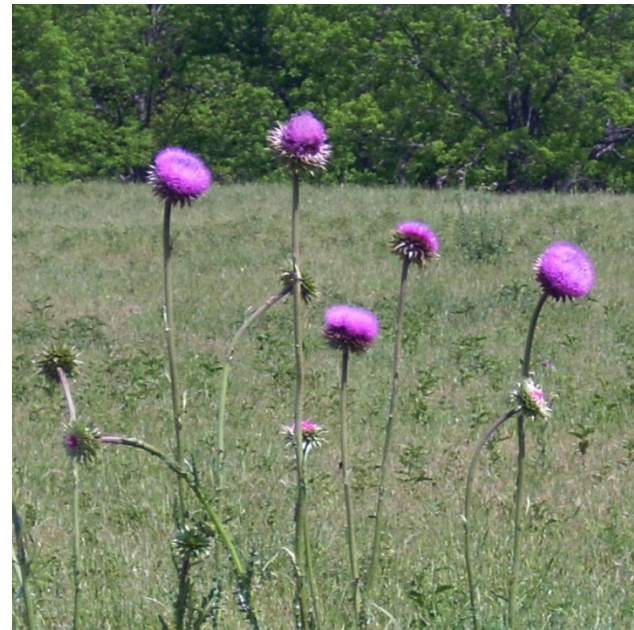
Musk thistle Biology

Typically biennial, but can act as an annual weed

Rosette



Bolted and flowering



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Musk thistle Biology

- Biennial

- Biennial:
- Seeds germinate in the spring, grow as flat rosettes over the summer, overwinters as a rosette
- Bolting and flowering then occurs during the second spring; these plants are multi-stemmed

Annual:

- Seeds germinate in the fall
- Plant overwinters as a rosette
- Bolts and flowers in the spring; this plant usually has one stem (though can have many branches)



Musk thistle in Oklahoma

- Soon after the flower opens, it will be able to set seed even if the flower head is cut off
- Each plant can produce more than 10,000 seeds which are distributed by wind, water, equipment, baled hay
- Seeds in the soil can continue to germinate for the next 5 years



Musk thistle in Oklahoma

Musk thistle reduces the value of pasture
1 plant/5 ft² can reduce pasture yield by
23%

Direct yield loss by competition with forage
plants in terms of light, water, and nutrients

Additional yield loss from displacement of
edible forage



Musk thistle in Oklahoma

“Oklahoma Thistle Law” (1st law in 1994 with several amendments since) requires:

- * All landowners to prevent seed production of musk, Scotch, and Canada thistles on their land
- * Possible penalty could be \$1000 per day for each field
- * Annual thistle survey by Oklahoma Department of Agriculture, Food, and Forestry
- * **Extension to provide control recommendations**



Control of Musk Thistle with Weevils

The Musk Thistle Head
Weevil (*Rhinocyllus conicus*)
imported from Italy in 1960s



The Rosette Weevil
(*Trichosirocalus horridus*)
Imported from Italy in 1960s



Control of Musk Thistle with Weevils

The Musk Thistle Head Weevil

- Adults emerge in early May
- Lay eggs on undersides of flower bracts (200+ eggs/female)
- Weevils spend their immature life inside one thistle bloom; larvae pupate, then new adults “hibernate” until the next spring

Musk Thistle Head Weevil



Head Weevil Damage

Mature larva



Damage to head receptacle and seeds



Weevil exit holes on back of a seed head



Head Weevils at Work

Head weevils do not outright “kill” the plants, instead, they reduce thistle seed production, which reduces populations over time

- 4-5 larvae/head = 55% viable seed reduction
- 9 larvae/head = 98% viable seed reduction



Rosette Weevil

The Rosette Weevil

(*Trichosirocalus horridus*)

- Adults emerge in early May, feeding on thistles throughout spring & summer
- In the fall, females lay eggs (2000+ eggs/female) on underside of rosette leaf midrib
- Larvae feed in rosette center, destroying the growing point



Plant damage from Rosette Weevils



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Rosette Weevils

NORMAL PLANT HEIGHT 5 FT.



RESULTS IN
SHORT,
WEAK,
MULTISTEM
PLANTS

~ 2 FT.

ROSETTE WEEVIL DAMAGE



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Do Weevils Work?

ABANDONED COAL MINE SITE IN
CRAIG COUNTY, OK



SAME SITE AFTER 7 YEARS OF
WEEVIL ACTIVITY



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Obtaining Weevils

Typically not available for purchase, because they will feed on native, endangered thistles

Annual “Weevil Round-Up” conducted by Extension, usually in first 2 weeks of May

Landowners and Extension educators go to areas with

- Thistle infestations
- Weevil infestations

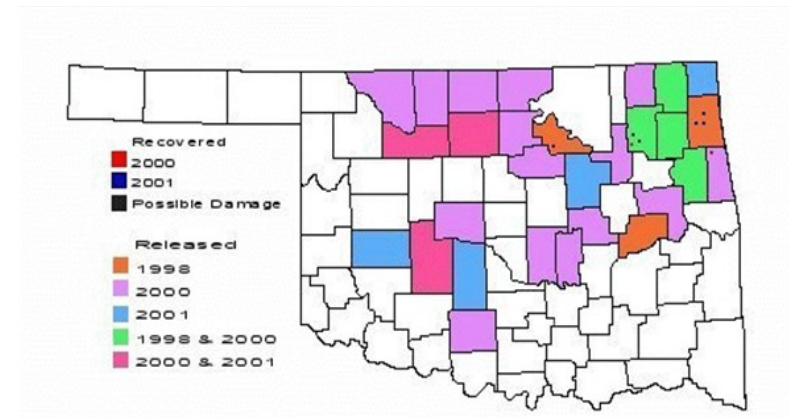
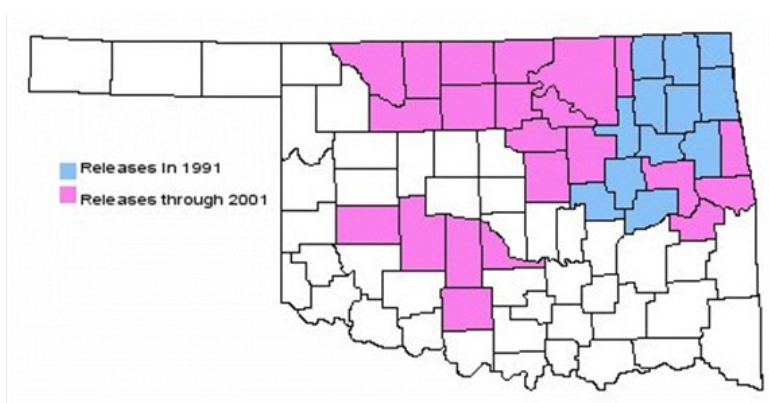
Receive training on proper care and release

Collect and redistribute the adult weevils



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Head weevil releases (left) and Rosette weevil releases (right) Through 2001 (probably even more counties now) (from Roduner, 2001)



Impact!

- More than 940,000 musk thistle head weevils and 48,000 rosette weevils have been collected and re-distributed throughout Oklahoma.
- Landowners in NE Oklahoma noted an 80% to 95% decrease in the number of musk thistle plants where they used an integrated approach that includes the musk thistle.
- If the typical land owner applies 1 lb. active ingredient of herbicide per acre/year, these weevils have contributed to a reduction of active ingredient applied to the environment by 7.1 million lbs per year.



Integrated Pest Management

To Win Against Invasive Thistles You Must:

- Prevent invasive thistles from growing on your land
- Recognize musk thistle and not confuse it with Scotch, Canadian, or native thistles
- Thistle weevils work only on musk thistles, not on Scotch or Canadian thistle.
- If you already have musk thistle, use **Integrated Weed Management**
- Release musk thistle head and rosette weevils in protected areas (fence rows, right-of-way, etc.)
- Plant cover in fall and winter to provide competition
- Mow at appropriate time to reduce seed production, but preserve musk thistle weevils
- Spray musk thistle rosettes for 3-4 years before plants bolt and form flower head to stop seed production without interfering with weevil activity
- Monitor weevil activity and shift away from spraying and mowing once thistles heads get eggs deposited on them



Integrated Pest Management

OSU Publications:

EPP-7318 Integrated Management of Invasive Thistles in Oklahoma.

PSS-2776 Thistle Identification

L-308 Musk Thistle Management Action List

- (Includes calendar for management actions)

