Initiating the Use of Canada Thistle Rust Fungus (*Puccinia suaveolens*) as a Biocontrol Agent for Canada Thistle (*Cirsium arvense*) in Elk Island National Park

Marissa Lynds
Marissa.Lynds@pc.gc.ca

Parks Canada Parcs Canada

Canada

Introduction:

Canada thistle (*Cirsium arvense*) is an abundant and well-established noxious weed in Alberta. Control using herbicide is becoming increasingly unfeasible with the scale of invasions and can have detrimental impacts to local biodiversity if used extensively. In Elk Island National Park (EINP), thistle is managed using chemical and mechanical methods with varying success and extensive staff time and effort required.

Canada thistle rust fungus (*Puccinia suaveolens*) is a complex fungal pathogen that is **host specific to Canada thistle and naturalized in North America**. Thistle rust was first observed in EINP in June 2022. Infections can cause etiolation, necrosis, and prevent flowering of Canada thistle plants.

What are we doing?

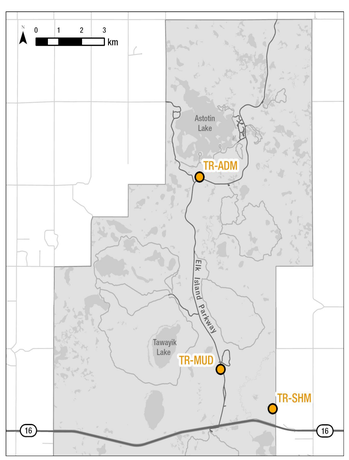
Biocontrol trials are being conducted (2023-2024) to determine the success of inoculations and assess whether spreading thistle rust is a feasible method of Canada thistle control in EINP.

Trials consist of transect monitoring and inoculations. Both monitoring and inoculation methods were derived from protocols developed by the Colorado Department of Agriculture, Palisade Insectary (2014).

Action	Details	Date
Site setup and monitoring	Install transects/plots; determine stem density	July 11th-13th, 2023
Clip inoculation test sites	Clip plots to stimulate rosette growth	August 10th, 2023
Teliospore collection	Collect and dry telia-bearing leaves	September 7th- 15th, 2023
Inoculations	Process and spread teliospores at inoculation test sites	September 22nd, 2023

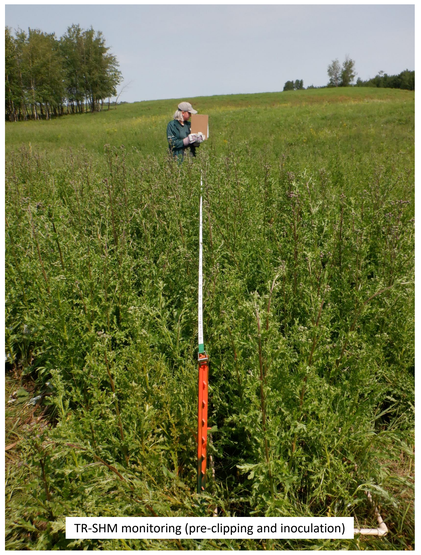
Sites:

- **Mud Lake** (TR-MUD) – naturally occurring thistle rust patch, considered a "teliospore farm" for the collection of teliospores.
- **Admin** (TR-ADM) – inoculation test site; small grassland pocket surrounded by aspen trees
- **South Hay Meadows** (TR-SHM) – inoculation test site; open grassland with site bordering a lowland.



Monitoring:

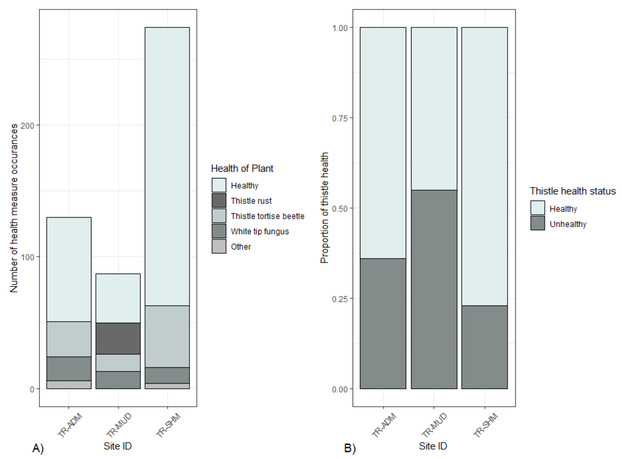
- Two transects at each site, each with six 0.5 x 0.5m plots.
- Inspected each plot for **number of thistle and health of plant**, including presence of thistle tortoise beetle (*Cassida rubiginosa*) and white-tip fungus (*Phoma macrostoma*).
- **Clipped uninfected plots 6 weeks prior to inoculations to stimulate rosette growth for inoculations.**


TR-SHM monitoring (pre-clipping and inoculation)

What we have found (pre-inoculation):

Thistle density was determined at each site, and infected thistle density at Mud Lake (teliospore farm).

Site ID	Thistle density (stems/m²)	Infected thistle density (stems/m²)
TR-MUD	27.7	8.0
TR-ADM	41.0	X
TR-SHM	91.3	X



Thistle rust was the dominant unhealthy measure at TR-MUD

Healthy stems > unhealthy stems occurrences at both inoculation test sites

Identification of thistle rust:

Aeciospores (spring and summer)

- Plant is lighter green-coloured, frail, and emits a sweet floral scent.
- Orange or yellow spores on the underside of leaves or along the stem of plant.


Aeciospores

Urediniospores (summer) and teliospores (fall)

- Brown spores typically on the underside of leaves and along stems; severe infections may have teliospores covering the leaves.


Urediniospores/teliospores

Inoculations:

Teliospores collected from TR-MUD (teliospore farm) were ground to a flake material and used to **inoculate rosettes within transect plots at inoculation test sites**.

Aimed to inoculate 4 rosettes/plot; **total inoculated at inoculation test sites were 92 rosettes**.

Next Steps:

- Check inoculation test sites for symptoms of infection (spring 2024).
- Monitor all sites to see short-term changes in thistle densities (summer 2024).
- If inoculations are successful, additional areas of the park can be targeted where chemical control cannot be used (ex. patches adjacent to lowlands or trees).

Help monitor for thistle rust in Alberta! iNaturalist project for thistle rust observations – only 5 recordings in Alberta!

Canada Thistle Rust Fungus - Alberta