

BACKGROUND

Spotted Knapweed spreads rapidly and displaces the native grasses and forbs that are crucial to British Columbia's grasslands. Traditional weed management focuses on killing weeds rather than addressing the fundamental ecological processes that allows the invasion and population buildup of knapweed. The processes we are interested in are:

Soil chemical properties: High nitrogen availability increases the performance of introduced species relative to indigenous species. There is evidence that spotted knapweed requires a soil nitrate concentration 10 times greater than what native bluebunch wheatgrass requires to maintain its biomass.

Allelopathy: Knapweed releases an allelopathic chemical called catechin from its roots which inhibits the growth of native grasses surrounding it. It is thought that activated carbon may neutralize the effects of this allelopathy.

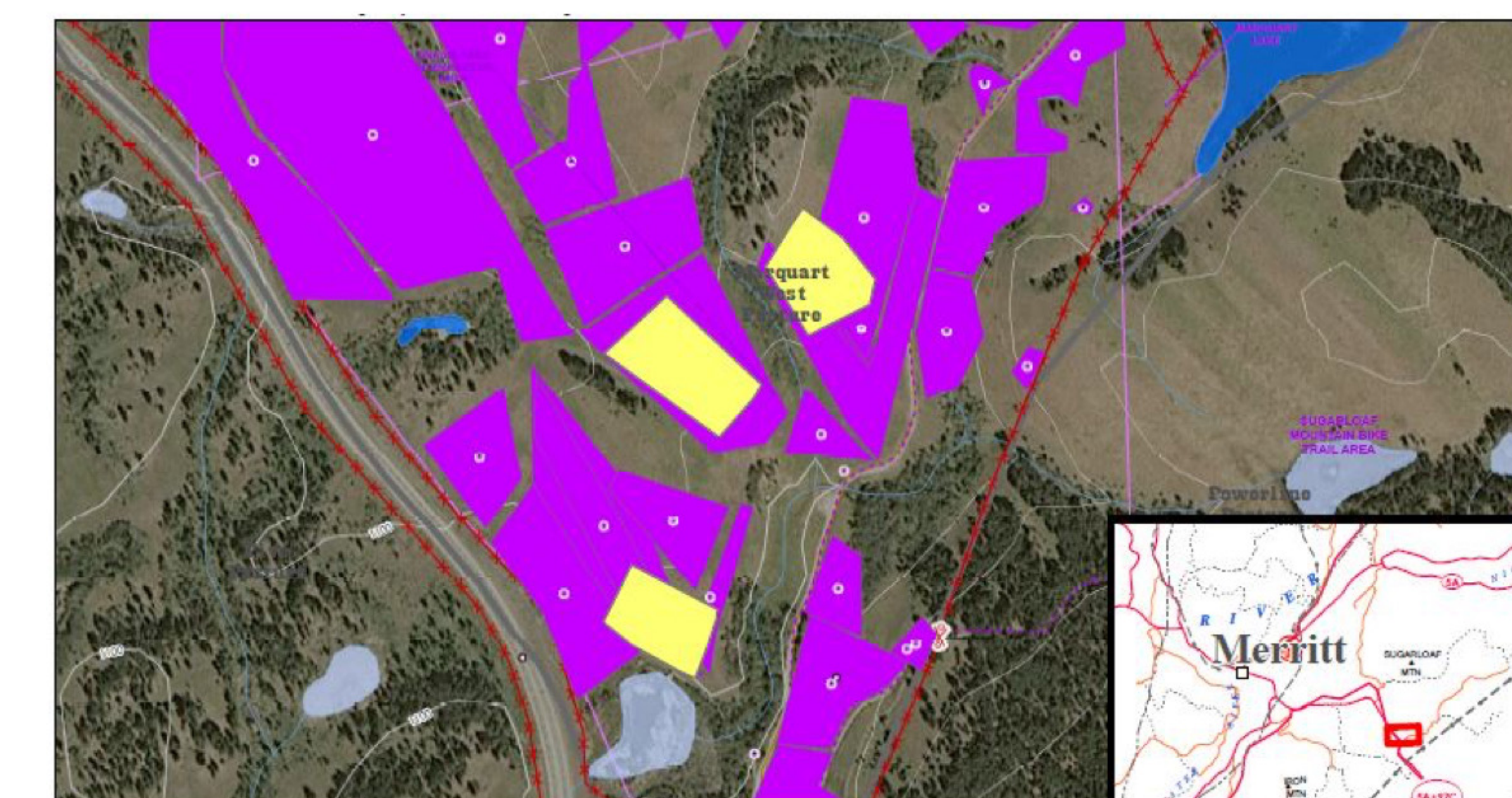
Lack of desirable species in seed bed: When invasions persist for 20 or more years, it is likely that the knapweed seedbank will outcompete any remaining desirable species.



Cyphocleonus achates is a species of weevil known as the knapweed root eating weevil. This species was released as a biocontrol agent to help reduce knapweed populations in British Columbia.

STUDY LOCATION

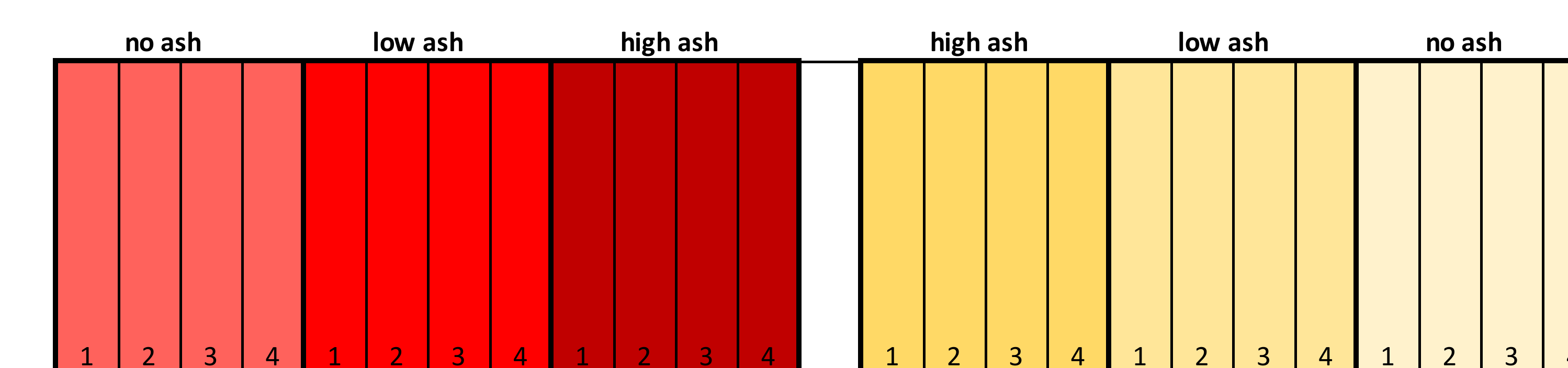
This research is located in the Laurie Guichon Memorial Grasslands Interpretative Site (LGMGIS). There are three replicates of the experiment. Replicate 1 can be seen from the viewing platform at the pond. Please respect the research by staying outside of the plots.



Spotted knapweed infestation Replicates of experiment

SPLIT-PLOT EXPERIMENTAL DESIGN

Replicated at 3 locations



RESEARCH QUESTIONS

HERBICIDE EFFECTS

Herbicide is the most commonly used weed control method and is often used without any other methods. There are concerns that removal of knapweed may allow invasion of secondary weeds such as cheatgrass. The objective of this study is to measure herbicide effectiveness, and assess the threat of secondary weed invasions, to guide future knapweed management strategies in grasslands.

SEED MIXES

As spotted knapweed has been prevalent at this site for almost 20 years. We hypothesize that adding seed of a desirable species will help achieve our objectives. The seeding treatments included: 1) crested wheatgrass, 2) intermediate wheatgrass and 3) a mixture of bluebunch wheatgrass and Sandberg's bluegrass. Broadcast hand seeding was done in the fall.

SOIL AMENDMENT

Previous research has shown that activated charcoal may be effectively neutralizing the allelopathic chemical that knapweed produces. Wood ash may have similar properties, but is much more cost effective. Knapweed thrives in a high nitrogen environment and native grasses are adapted to low nitrogen environments. Consequently the addition of a carbon amendment may lower the amount of nitrogen in the soil and therefore help native plants be more competitive against the knapweed.

SEEDBANK GERMINATION

Several biocontrol agents have been introduced at the site to prey on knapweed seeds and roots to reduce the seed production and plant vigor respectively. A greenhouse study is underway to assess the quantity of viable knapweed seed following the various treatments.



Application of soil ash amendment in October 2018

PRELIMINARY RESULTS

The herbicide killed almost 100 percent of the knapweed.

There was a large increase in cheatgrass where the herbicide was used.

There were very high soil nitrate levels in the herbicide treated plots, likely due to the decomposition of the dead knapweed. Carbon amendments appeared to have an effect on immobilizing nitrogen.

Poor establishment of seeded grass species occurred due to fall seeding and an atypically warm winter.



Seedbank sampling September 2019



View of Replicate 2, September 2019

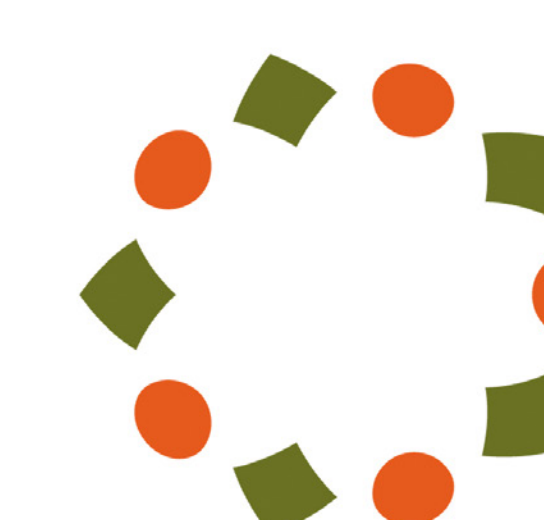
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