



Managing Crested Wheatgrass in Native Grassland



Crested Wheatgrass

INVASIVE
SPECIES

Introduction

Since the 1930s, crested wheatgrass (*Agropyron cristatum*) has been seeded on about 161,900 hectares (400,000 acres) across western Canada. It has saved thousands of acres of abandoned farmland and eroded areas from blowing away. Used as early spring forage, it has helped to conserve native grassland by allowing grazing to be delayed and grazing pressure to be reduced.

Crested wheatgrass is native to the desert regions of southern Siberia and has proven to be very well adapted to the dry Canadian prairies. Stable stands have remained productive for more than fifty years. However, the ability of crested wheatgrass to invade native prairie and its effect on soil quality are becoming environmental concerns.

The Problem

Native prairie is a part of our natural heritage and is important as a grazing resource, wildlife habitat, and for soil and water conservation. With few natural controls in the Canadian prairies, many introduced or exotic species have the ability to invade natural habitats and out-compete the native species. Threats like the invasion of exotic species can degrade our prairie ecosystem by excluding native species, which reduces biodiversity, carrying capacity, habitat and the aesthetics of our prairie ecosystem.

Crested wheatgrass has been selected and bred for productivity, seed production, easy establishment and adaptation to local conditions. Perhaps the adaptability and competitiveness of crested wheatgrass is best illustrated

by fields that have remained productive with minimal invasion by other plants over several decades. The same characteristics that have made crested wheatgrass so desirable also allow it to invade native habitats and out-compete native species. These characteristics are:

- **Early spring growth:** It generally begins growth in late April and flowers in mid-June. Due to its early growth pattern crested wheatgrass out competes native species for soil moisture and available nutrients.
- **Wolf plants:** Crested wheatgrass can produce very stemmy, unpalatable bunches which are referred to as wolf plants. When ungrazed, wolf plants become even more competitive for moisture and nutrients.



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- **Competitiveness:**
Due to the competitive nature of crested wheatgrass, it exploits any available moisture in drought situations and recovers from drought faster than many native species.

- **Prolific seed production:**
Seeds remain viable in the soil for up to five years, which allows the number of seeds in the soil to accumulate. Crested wheatgrass stands in southeastern Alberta that were 29 to 38 years old, contained 100 to 410 seeds/ m² in the surface soil.

- **Good seedling establishment:**
Seedlings are vigorous and develop in 8 to 12 days under favourable conditions.

- **Long-lived plants which suppress establishment of new seedlings:**
After 15 to 20 years, individual plants die, reducing competition so that seedlings of crested wheatgrass or other species may become established. Even in 35 year old pastures, native plants seldom make up more than one in ten of the plants present.

Crested wheatgrass is a bunch grass that reproduces mainly by seed, although they do have short rhizomes. Therefore, management that allows crested wheatgrass to produce seed will allow it to spread. Although the rate of spread can be slower than smooth brome (depending on site conditions), it will invade native prairie and gradually form solid stands. The greatest rate of spread is downwind of the prevailing winds, however, crested wheatgrass has been observed to move in all directions. Livestock, birds,

small mammals and vehicles may also transport seed.

Crested wheatgrass invasion is greatest following a drought year. During a severe drought, crested wheatgrass will take advantage of any available moisture and out-compete many native species.

Crested wheatgrass seeds establish themselves on bare ground associated with overgrazed native prairie pastures. If native species are overgrazed and crested wheatgrass is ungrazed, the crested wheatgrass will remain unpalatable and continue to grow stronger. During wet years, crested wheatgrass patches may not spread depending on the condition of the surrounding vegetation. Where pastures are in poor condition and native species are weakened and unable to compete, crested wheatgrass can spread anytime. After a drought year, crested wheatgrass will spread again. Over time, the invaded area may become almost solid crested wheatgrass.

Effect on the Soil

The high forage productivity of crested wheatgrass comes at a cost to the soil: it does not produce as many roots as native grasses. As a result, crested wheatgrass releases less total energy into the soil than native grassland plants. Less energy flow into the soil decreases the energy available to produce stable organic matter.

Crested wheatgrass ecosystems have a higher accumulation of above ground dead material. The quality of the litter in crested wheatgrass is lower than that of native species and

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decomposes at a slower rate. Slower decomposition means there is a slower turnaround time for nutrients from the surface material to be returned to the soil.

Controlling Crested Wheatgrass

The decision whether to control or eliminate crested wheatgrass is largely determined by site size, plant species, available resources and overall management objectives. Eliminating crested wheatgrass that has invaded native grassland is generally a labour-intensive process and in many cases, effort should be concentrated on containing it and preventing it from being spread further.

1. Prevention

The key to managing crested wheatgrass in native prairie is to prevent seed production. This stops the spread of crested wheatgrass and the addition of new crested wheatgrass seeds to the soil.

A single well timed, mowing, burning or grazing will reduce seed production. As well, taking a few precautions where crested wheatgrass is seeded and how it is used can also help prevent native rangeland from being invaded:

- Do not seed crested wheatgrass in native prairie such as on pipeline or oil well disturbances.
- Do not seed crested wheatgrass adjacent to native grassland unless the crested wheatgrass will be thoroughly grazed each spring to prevent seed set.
- Do not seed crested wheatgrass on road allowances adjacent to native prairie.
- Do not interseed crested wheatgrass in native prairie.
- If crested wheatgrass has produced seed, allow time for cattle to pass seed before transferring cattle from crested wheatgrass to native range.

2. Stress crested wheatgrass more than native plants

Control of crested wheatgrass in native grassland is extremely difficult since many of the possible control options could negatively impact the desired native species. Spot application of herbicide and digging of individual plants are highly selective methods whereas mowing, grazing and burning impact most if not all plants on the prairie. The objective is to design treatments to stress crested wheatgrass more than the native species. For this reason, repeated mowing or grazing during the growing season may not be

recommended because the impact on the native plants may be more detrimental than the impact on the crested wheatgrass.

Management Techniques

To be effective, crested wheatgrass must be at the appropriate growth stage when management techniques are applied. It is the growth stage, not the calendar date, that determines when a control should be implemented. Calendar dates cannot be used because rate of plant growth depends on precipitation and temperature as well as location. Treatments in mid-summer after seed set will not affect crested wheatgrass since it is dormant then.

Grazing and mowing are the most common means of controlling seed production. At least five years of preventing seed production is recommended prior to beginning an elimination program with herbicide.

Grazing

In native range with invading crested wheatgrass, manage the pasture as native grassland and focus control strategies on the crested wheatgrass patches (For example, set stocking rates or defer grazing until June 1st). Depending on the patch site and size, proper utilization of these patches may require temporary fencing or herding to separate them from the native pasture. Grazing should be conducted at the elongation stage (mid-season, when the plant is lengthening or growing) to prevent crested wheatgrass from going to seed and to

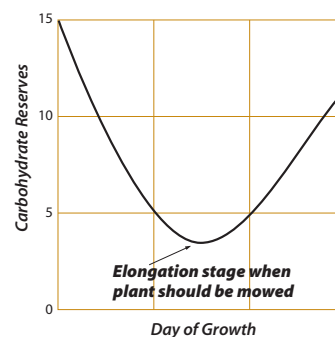
reduce re-growth. Grazing crested wheatgrass in mid-season rather than earlier or later in the year interrupts growth. This in turn contributes to a decrease in biomass production.

Native grasses generally withstand less grazing pressure than introduced species. Only 40-50 percent of native plant growth should be removed and 20 percent of the seed stalks be left, whereas 70 percent use is recommended to maximize the productivity of crested wheatgrass. Where you are trying to eliminate crested wheatgrass from a native pasture, 100 percent utilization of patches is recommended.

Mowing

Mowing is an alternative to grazing especially for small areas. To deplete the maximum energy reserves of the wheatgrass, mow when the plant is in the elongation stage. At this stage carbohydrate reserves are not only being drawn on for growth but also for the reproductive structures (Figure 1). If re-growth is minimal following defoliation then the carbohydrates are not replenished and the plant goes into winter in an

Figure 1. Root reserves of a crested wheatgrass plant throughout its growth cycle.



Crested wheatgrass, is native to the desert regions of southern Siberia and has proven to be very well adapted to the dry Canadian prairies.

energy deprived state. Mowing height should be five cm or lower. Mowing may not be possible where the terrain or soil surface is rough or rocky.

Burning

Burning alone is generally not considered to be effective in controlling crested wheatgrass. Burning between flowering and seed set (approximately mid-June) will stress the plants and result in minimal re-growth because their energy reserves are low. However, it will also adversely affect native grasses.

Burning must be done before seed set and before crested wheatgrass goes dormant. Re-growth may be grazed but the impact would likely be more detrimental to native species.

Chemical Control

Herbicide may be spot applied with a hand sprayer or wiper since crested wheatgrass is generally distinct in size and growth form. Because of its competitiveness and early growth, crested wheatgrass is usually larger than the native grasses it has invaded.

A hand held wiper, often in the shape of a hollow hockey stick, delivers herbicide only to the plant material it contacts.

A concentrated solution of Glyphosate is generally used for spot spraying or wicking. It must be applied when the plants are growing and prior to seed formation. Several years of spot application will be required to eliminate crested wheatgrass plants. Herbicide application is most effective when most of the plants are flowering, but before they go to seed. This is the stage when there is the greatest movement of energy and herbicide into the roots which provides a greater chance of killing the entire plant rather than just burning off the top growth. It is essential that the plants do not go to seed. Glyphosate is most effective when crested wheatgrass plants are eight to fifteen cm tall.

Digging out Plants

Digging individual crested wheatgrass plants may be done on a very small scale; however, it is likely that the soil disturbance would stimulate germination of crested wheatgrass or other weed seeds.

Using Combinations of Management Techniques

Grazing and Burning

Early spring burning can be used in combination with grazing to control crested wheatgrass. Burning will remove old growth allowing wheatgrass to green up which will in turn attract livestock.

Burning and Chemical Control

Early spring burning stimulates spring growth, increases the height difference between crested wheatgrass and native species. This difference in height allows for easier wiper application of herbicides.

Monitoring

Control of crested wheatgrass is a long-term process and it is very useful to record your management actions (timing, location, intensity, plant stage) as well as weather conditions and changes in the plant community. This monitoring allows you to track your progress.

Permanent markers installed at the edge of the crested wheatgrass invasion is one way to determine if expansion is being controlled or even reduced. Landscape and ground cover photographs, as well as plant counts may also be used to monitor long-term changes in the plant community.

Summary

Crested wheatgrass is an extremely competitive grass species that has the ability to out compete many of our native grass species, and as such is threatening the biodiversity of our prairie ecosystem. Management of crested wheatgrass must be site specific and may require the use of two or more management techniques. Management regimes must be persistent, and regularly monitored and adapted to prevent crested wheatgrass spread.

For Further Information

A bibliography of the resources used to prepare this factsheet is available from the Saskatchewan Watershed Authority. Factsheets on other species and topics are also available.

