Long-term efficacy of glyphosate for smooth brome control in native prairie

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March 6, 2017
Current Status of Native Prairie

- Estimated that roughly 26.6% of mixed grass prairie and less than 5% of fescue prairie remain in Saskatchewan (Thorpe and Godwin, 2009 and Grilz and Romo, 1994)

- Invasive species, including invasive forage grasses, pose a threat to native prairie diversity

- Control methods for invasive species are needed to maintain the health and functioning of grassland ecosystems
Smooth Brome (*Bromus inermis* Leyss.)

- Initially introduced to Canada as a tame forage grass
- Aggressive below-and-above-ground competitor
  - Extensive underground root system
  - Prolific seed producer
- Species of national concern and a serious invader of grasslands (Haber, 1996)
Herbicide Usage

- Glyphosate (N-(Phosphonomethyl)glycine) is commonly used for grassland management

- Rapid translocation through plant tissue, low mobility in soil, low toxicity for wildlife

- Broad-spectrum, non-target
Objectives

1. Assess the long-term effectiveness of spot-spraying glyphosate as a control method for smooth brome control in native prairie

2. Evaluate subsequent recovery of native prairie plant species at Kernen Prairie
Study Site
Current Management Strategies

- Occasional controlled burns
- Annual light grazing since 2009

Photo: Amanda Guy
Experimental Design

- Between 1999 and 2000, 40 patches of smooth brome were selected and monitored for 17 years.

- Selected patches were 6-8m in diameter and percent cover was estimated to be between 85-95%.

- Smooth brome patches were spot sprayed with a 10% glyphosate solution.
Data Collection

- Three permanent parallel transects were placed across each patch
- A 20x50cm quadrat was placed at 1m intervals to assess species composition
Data Analysis

- R statistical package was used to examine how plant abundance and plant community structure changed with time post glyphosate treatment.

- Models were fit using the generalized additive model (GAM) function in the mgvc library of R (Wood, 2006).
Results: Smooth Brome

Bromus inermis Cover

Years Since Treatment
Results: Native Species Richness

Native Species Richness

Years Since Treatment
Results: Invasive Abundance and Invasive Proportion of Community

![Graph showing invasive abundance over years since treatment](image)

![Graph showing invasive proportion of community over years since treatment](image)
Results: Invasive Species of Concern

Canada Thistle

http://www.saskwildflower.ca/nat_Cirsium%20arvense.html
Results: Invasive Species of Concern

Kentucky Bluegrass

(Leighton and Harms, 2014)
Results: Native Species of Concern

Rough Bent-grass

(Leighton and Harms, 2014)
Results: Native Species of Concern

Slender Wheatgrass

(Elymus trachycaulus)

(Leighton and Harms, 2014)
Results: Native Species of Concern

Plains Rough Fescue

(Festuca hallii) (Leighton and Harms, 2014)
Conclusions

1. Spot application of glyphosate is an effective control method for reducing smooth brome in native prairie
2. Short – medium time scale community recovery occurred
3. Long-term native prairie recovery may depend on external factors such as invasive species

Photo: Amanda Guy
Recommendations for Management

- Continuous follow-up monitoring should take place.

- An increase in the abundance of smooth brome following initial treatment should be addressed with subsequent suppression treatments (Grilz and Romo, 1995)

Photo: Amanda Guy
References

Questions?

Acknowledgements:
Thesis assistance provided by supervisor Dr. Eric Lamb
Study design and initiation by Jim Romo.
Field data collection led by Bohdan Pylypec and Jacey Bell

Photo: Jacey Bell

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