DIFFERENTIATING CRESTED WHEATGRASS EFFECTIVELY USING REMOTE SENSING

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TRANSBOUNDARY GRASSLAND PARTNERSHIP WORKSHOP AND NATIVE PRAIRIE RESTORATION/RECLAMATION WORKSHOP

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SOME COMMON INVASIVE SPECIES IN CANADIAN PRAIRIES

Canada thistle

Source: https://bcinvasives.ca/invasive-species/identify/invasive-plants/canada-thistle

Crested wheatgrass

Source: https://www.usu.edu/weeds/plant_species/exotic_rest_species/crestedwheatgrass.html

Kentucky bluegrass

Source: https://www.ndsu.edu/pubweb/chiwonlee/plsc211/student%20papers/articles05/nieuwsma,%20kyle/knwebpage/page.htm

Smooth brome

Source: https://www.anpc.ab.ca/wiki/index.php/Bromus_inermis

Leafy spurge

Source: https://www.minnesotawildflowers.info/flower/leafy-spurge

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Ongoing project

DEVELOPMENT OF GRASSLAND MANAGEMENT PLAN FOR SASKATCHEWAN LANDING PROVINCIAL PARK

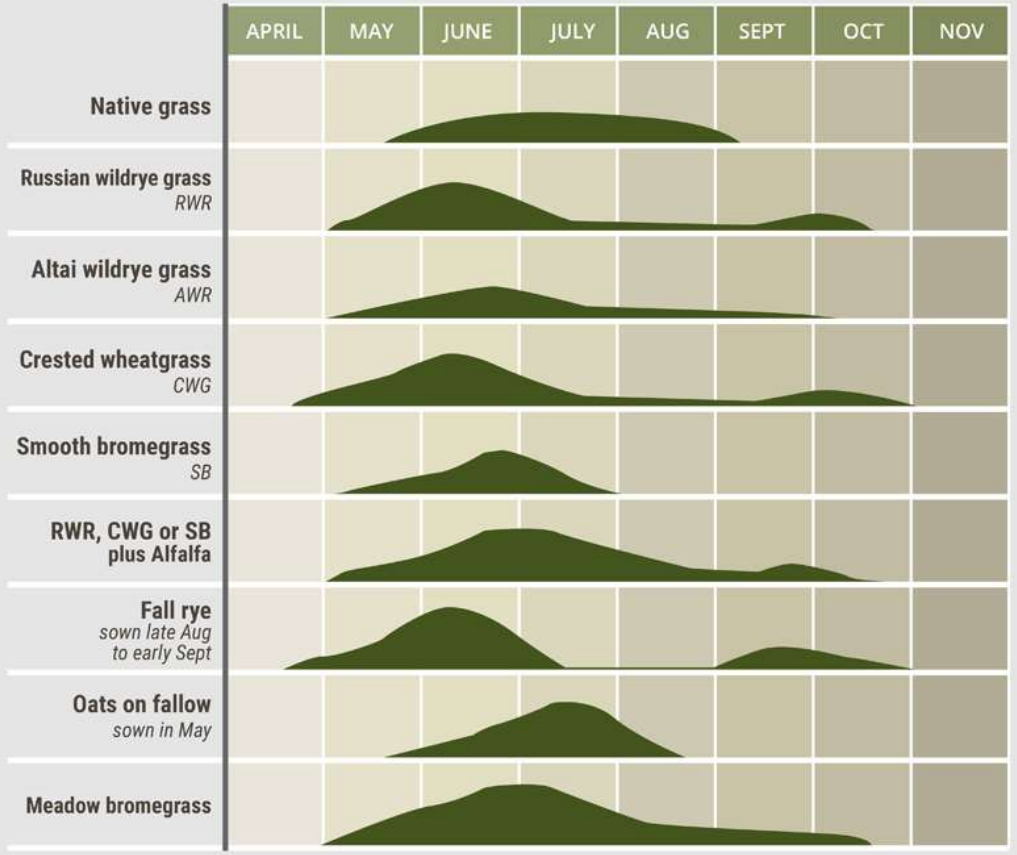
Purposes:

- Evaluate the impacts of current grazing practices on vegetation ecosystem;
- Estimate spatial grazing capacity for park area;
- Investigate the invasiveness of non-native grass species and noxious weeds;
- Interpret critical habitat and threats to plant and animal species at risks;
- Assess the wildfire risk and soil erosion;
- Evaluate the impacts of climate change on vegetation ecosystem.

Source: https://lh5.googleusercontent.com/p/AF1QipObn5N3Xg2NXQ6JSDjibEHvj9QB0NGh-0tI-Qk=w107-h108-n-k-no

Relative Yield / Period of Growth of Native Grass and Seeded Pastures

These curves are averages for Saskatchewan.
Growth patterns may differ, according to weather and soil zones.



Adapted from: Saskatchewan Agriculture, *Forage Crop Production Guide*

BEEFRESEARCH.CA

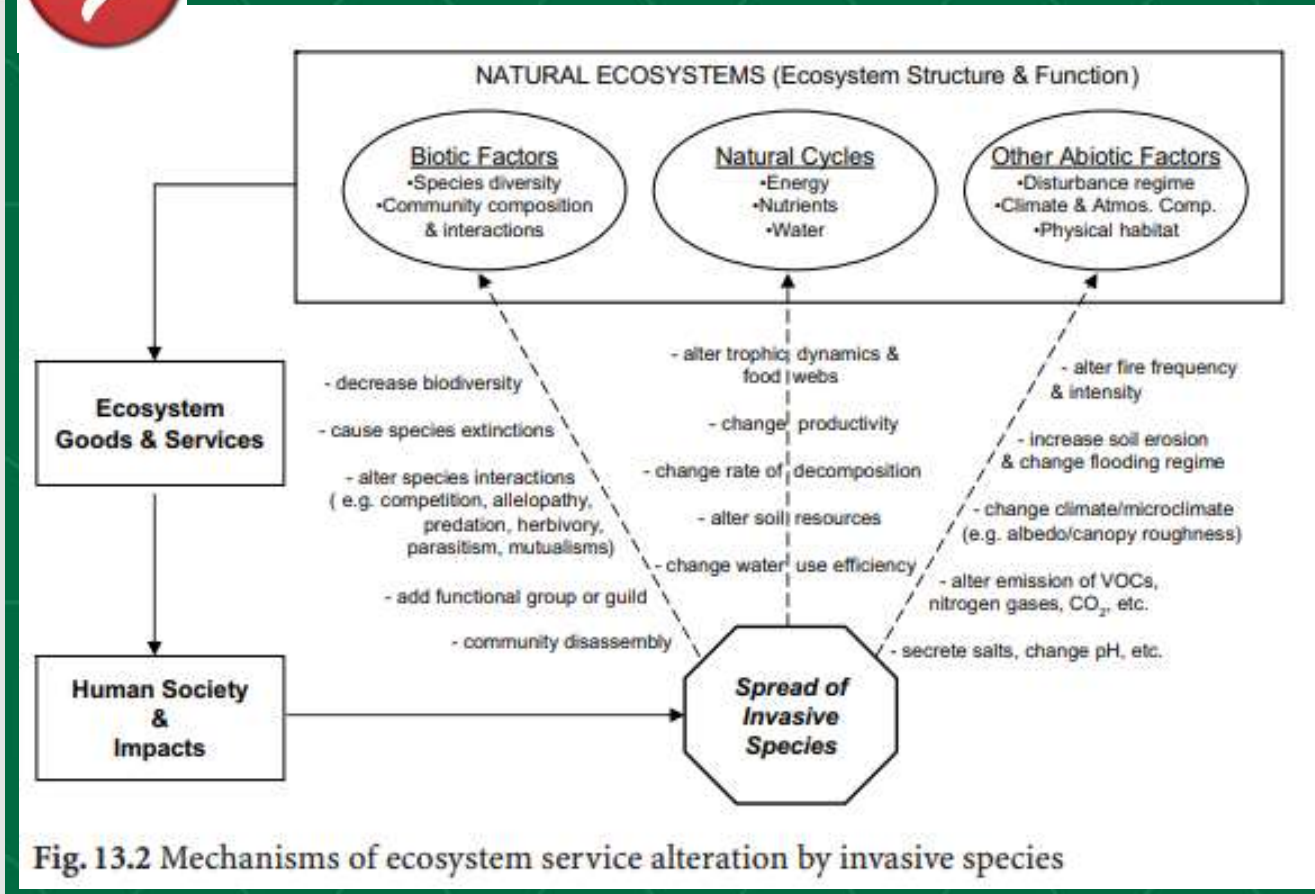


Fig. 13.2 Mechanisms of ecosystem service alteration by invasive species

Charles and Dukes, 2006

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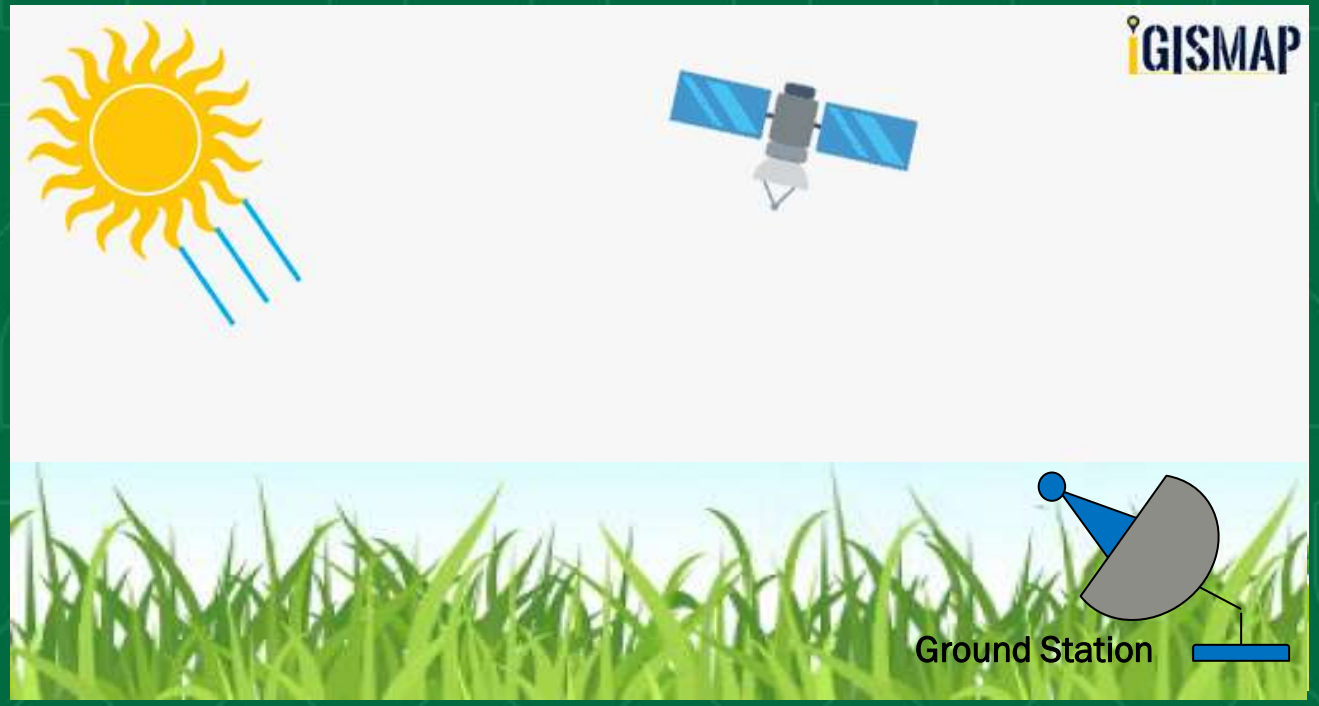
REMOTE SENSING and INVASIVE SPECIES DETECTION

Remote sensing is the science of obtaining information about objects or areas from a distance, typically from aircraft or satellites (NOAA, 2018).



The reflectance signal from remote sensing sensors is generally determined by biological and biophysical characteristics of the plant (Ustin & Gamon, 2010).

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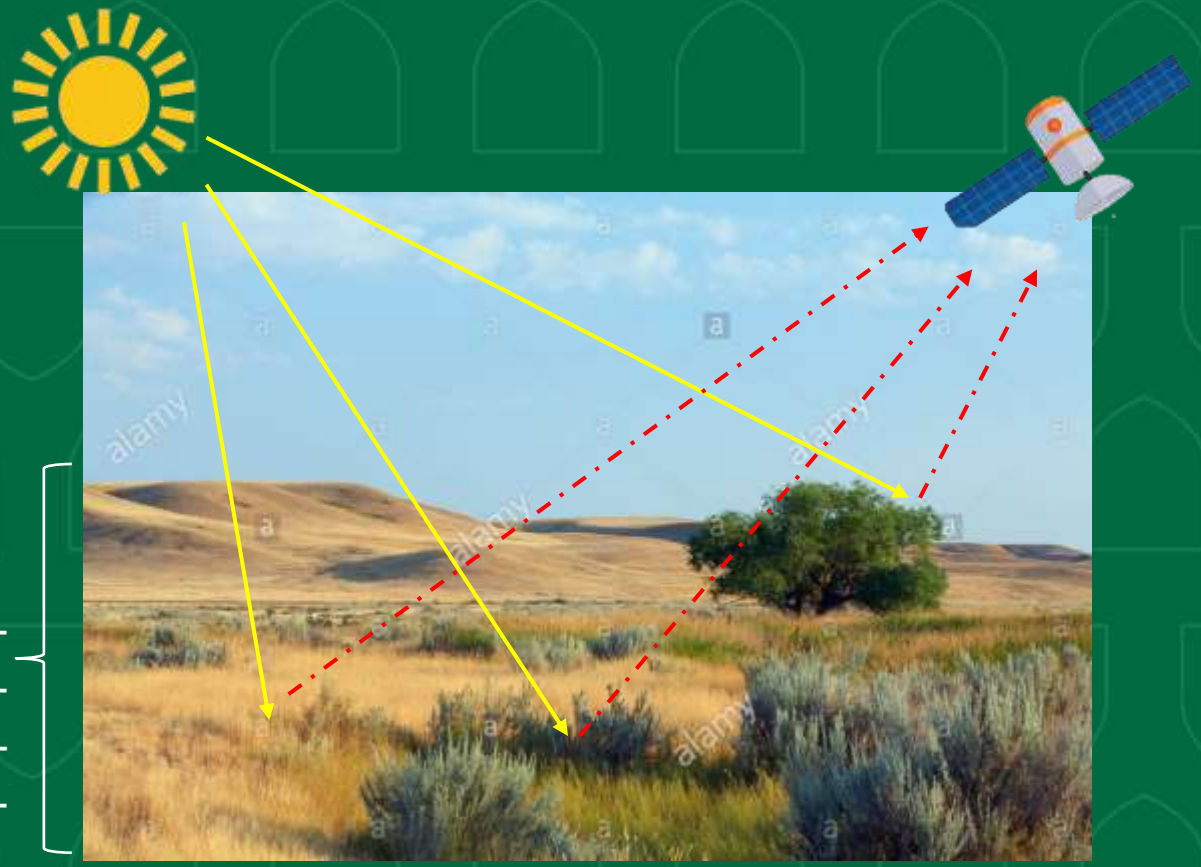
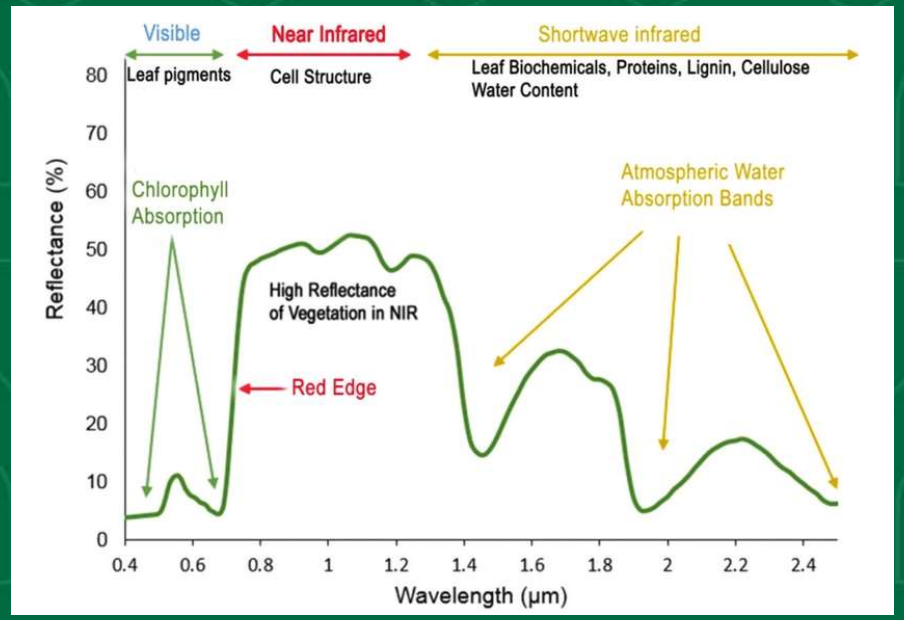
REMOTE SENSING and INVASIVE SPECIES DETECTION



Spectral traits (ST)
e.g. biochemical ST
biophysical ST
morphological ST
functional ST
structural ST

Photo taken in Grasslands National Park
Credit to: John E Marriott



(Roman & Ursu, 2016)

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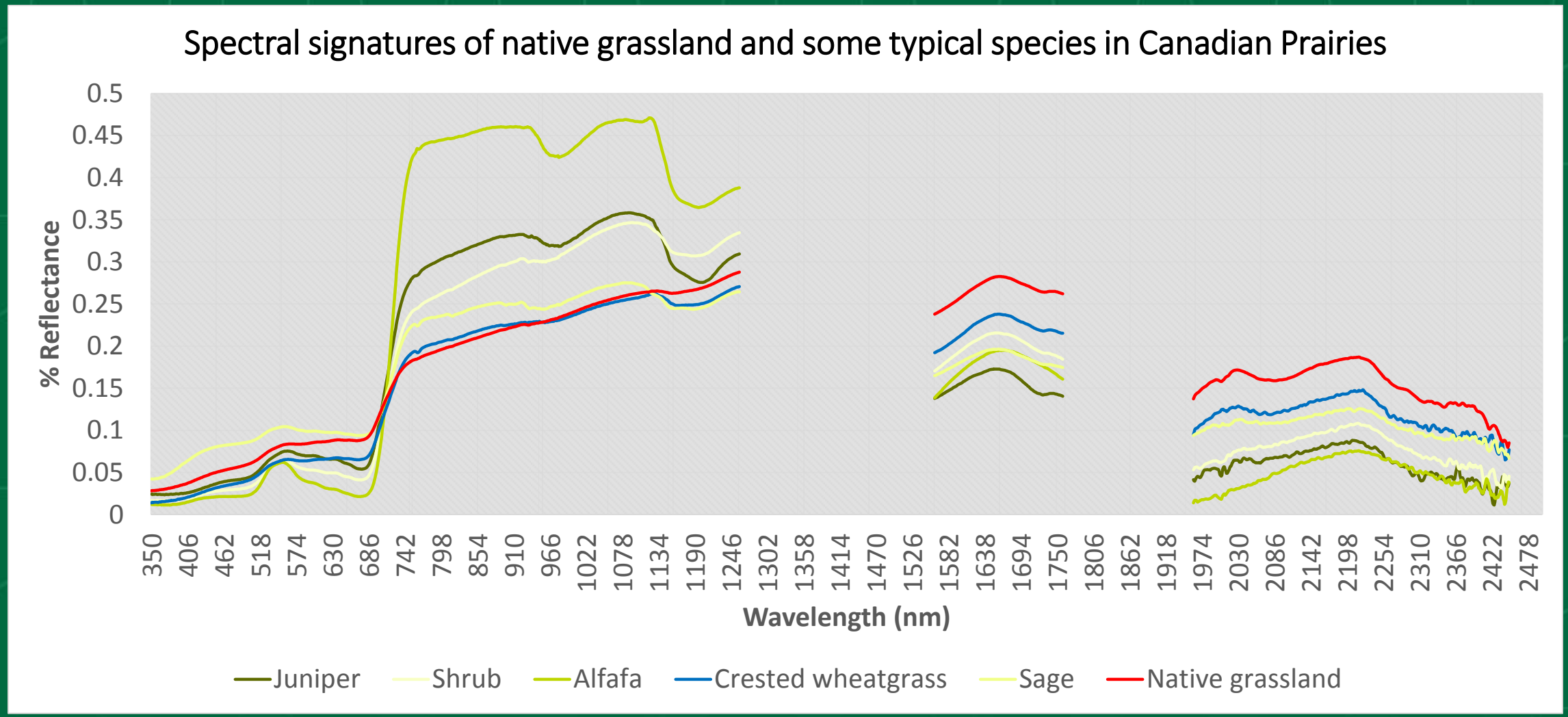
REMOTE SENSING and INVASIVE SPECIES DETECTION



Data collected by Dr. Guo's research group in Alberta and Saskatchewan, July-August 2019

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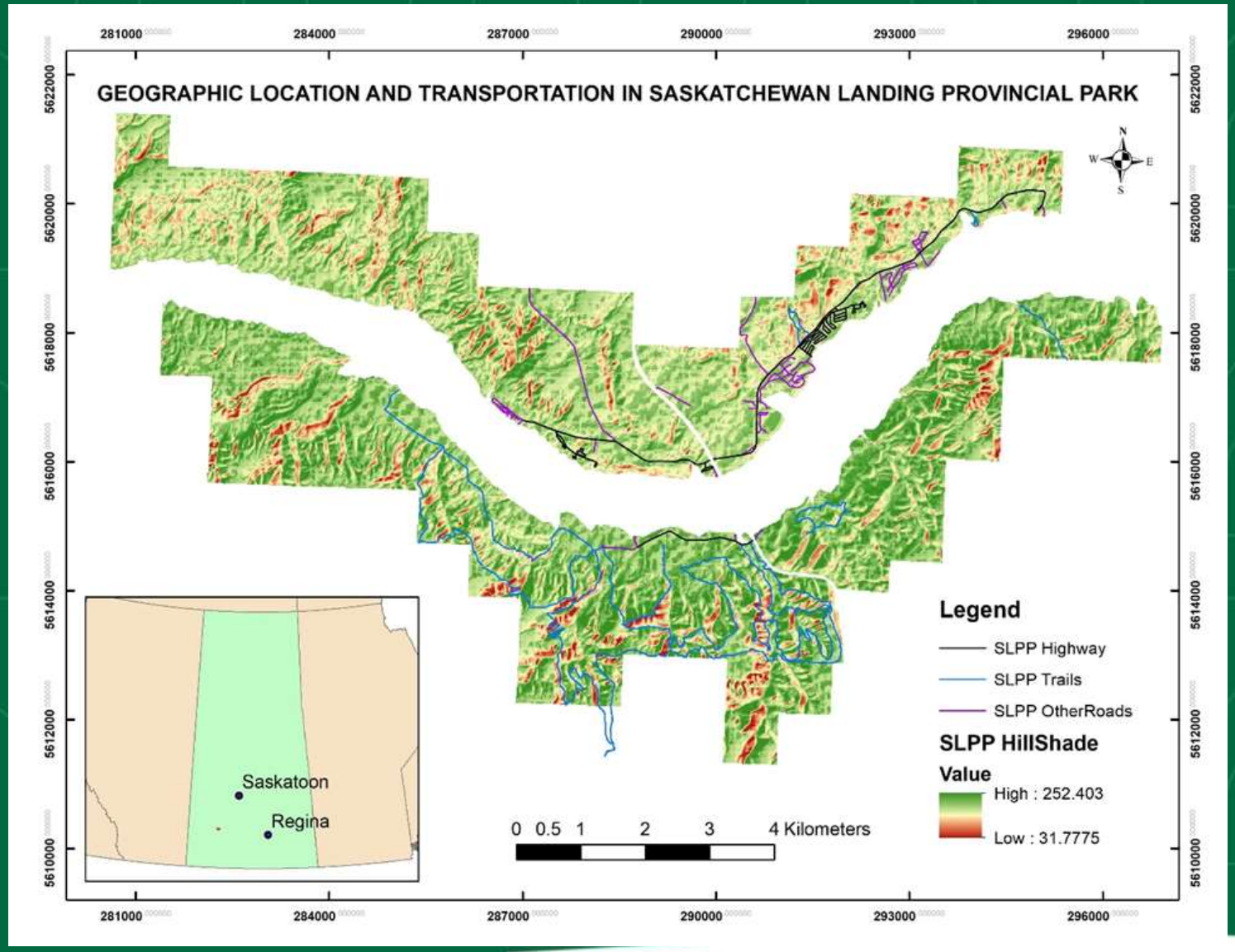

Credit to: Xulin Guo

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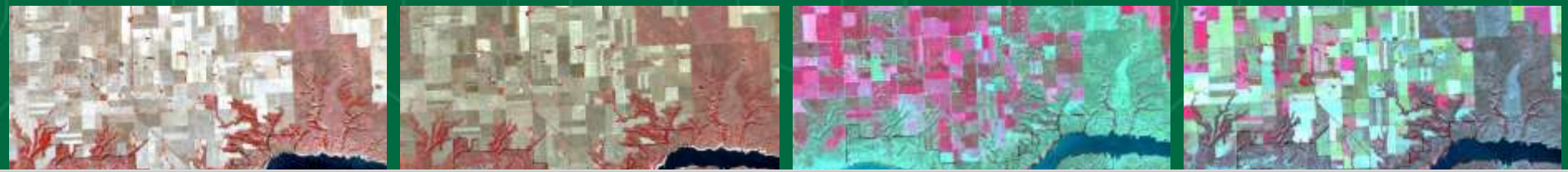

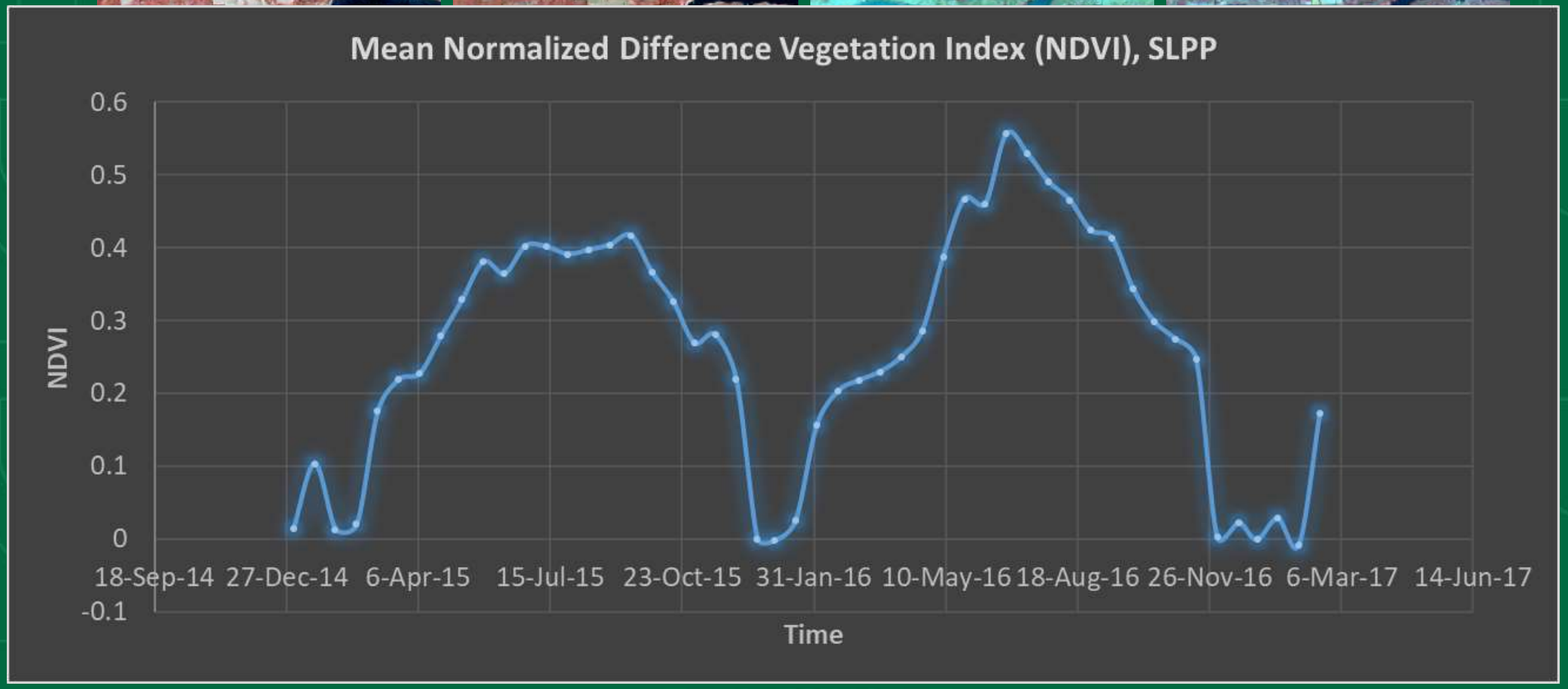

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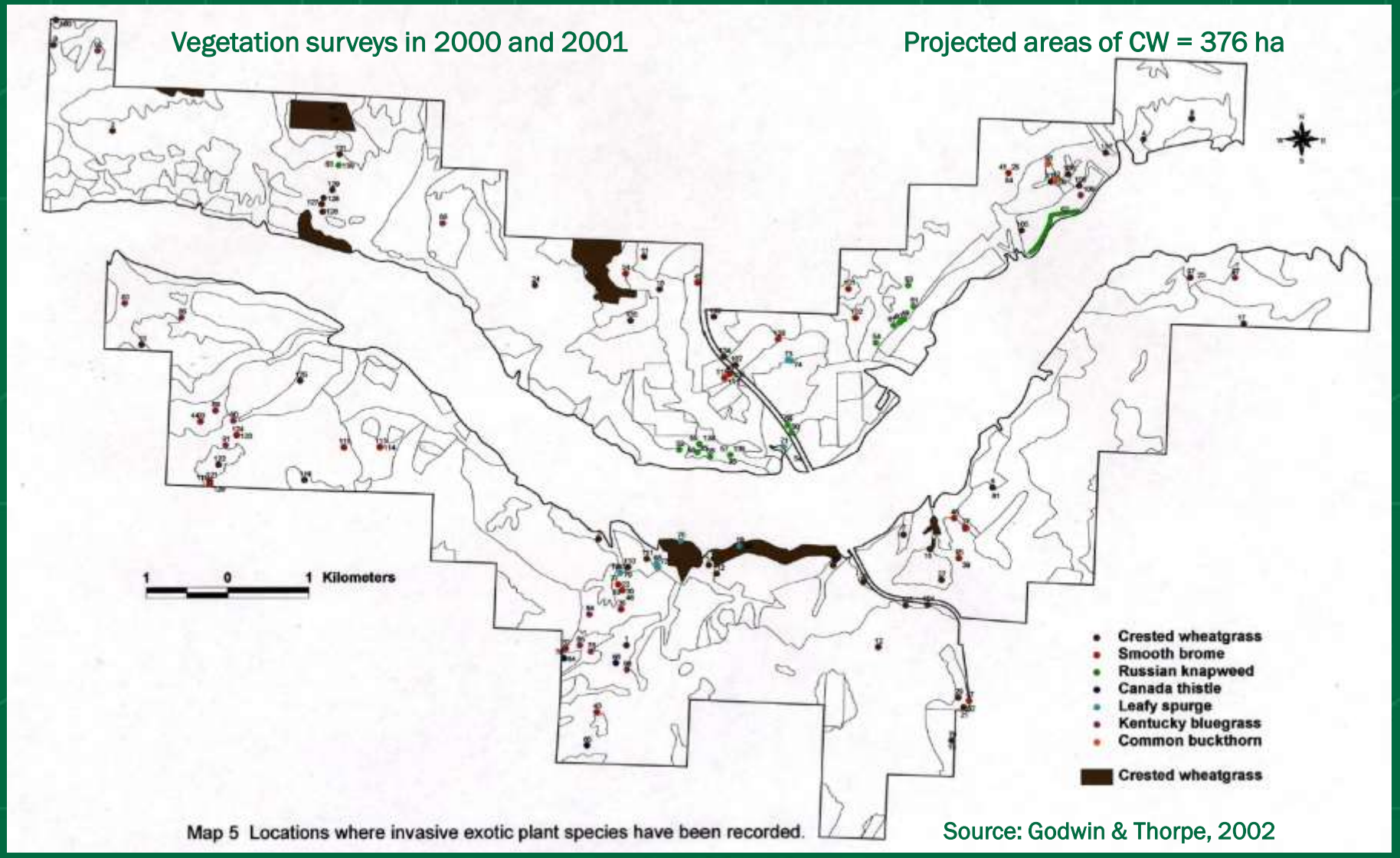
DIFFERENTIATING CRESTED WHEATGRASS USING REMOTE SENSING

Vegetation surveys in 2000 and 2001

Projected areas of CW = 376 ha



Map 5 Locations where invasive exotic plant species have been recorded.

Source: Godwin & Thorpe, 2002

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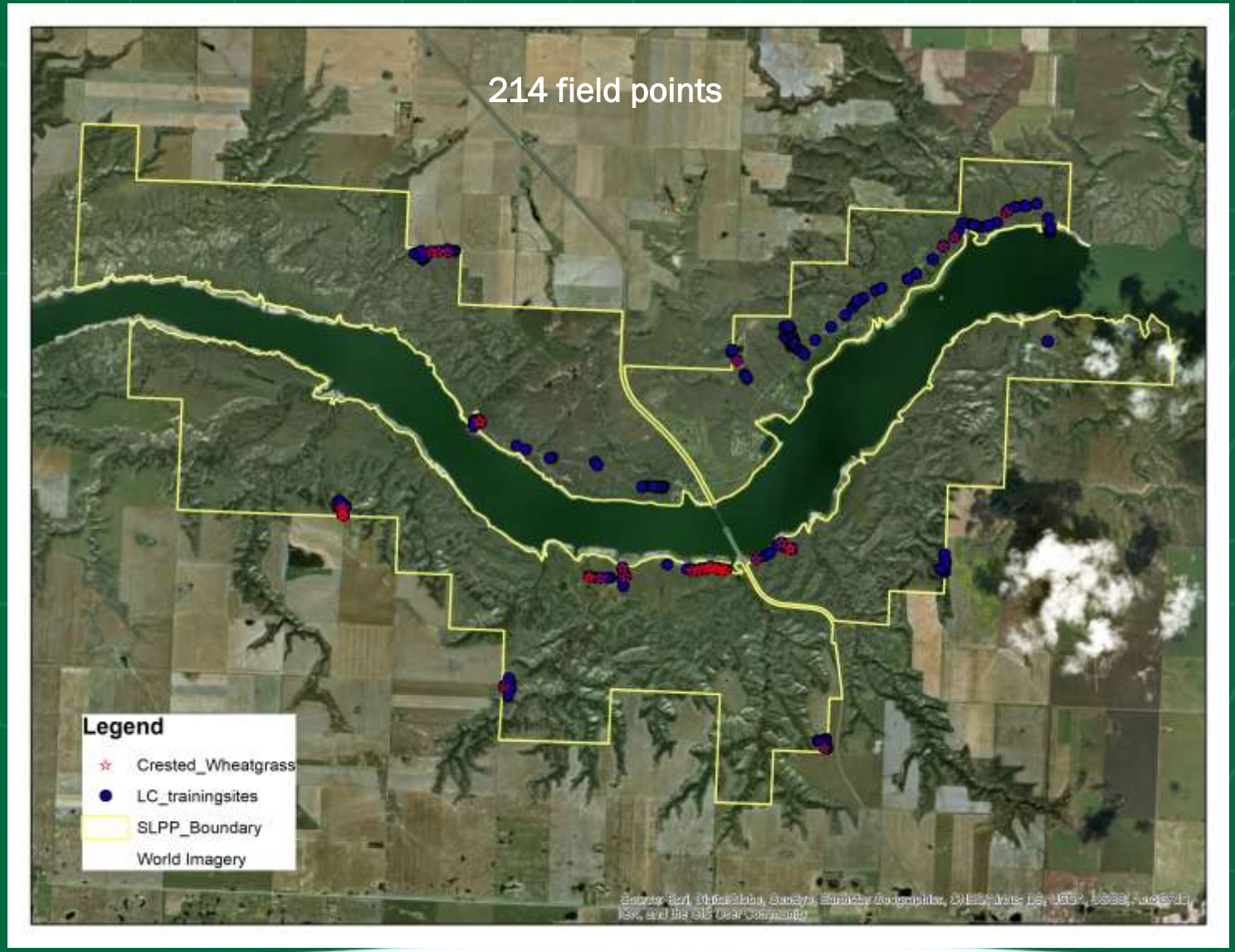

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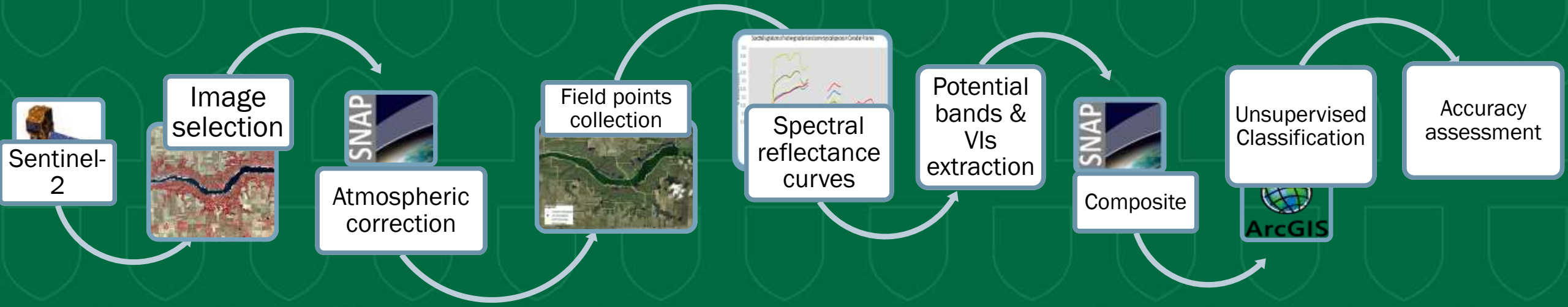
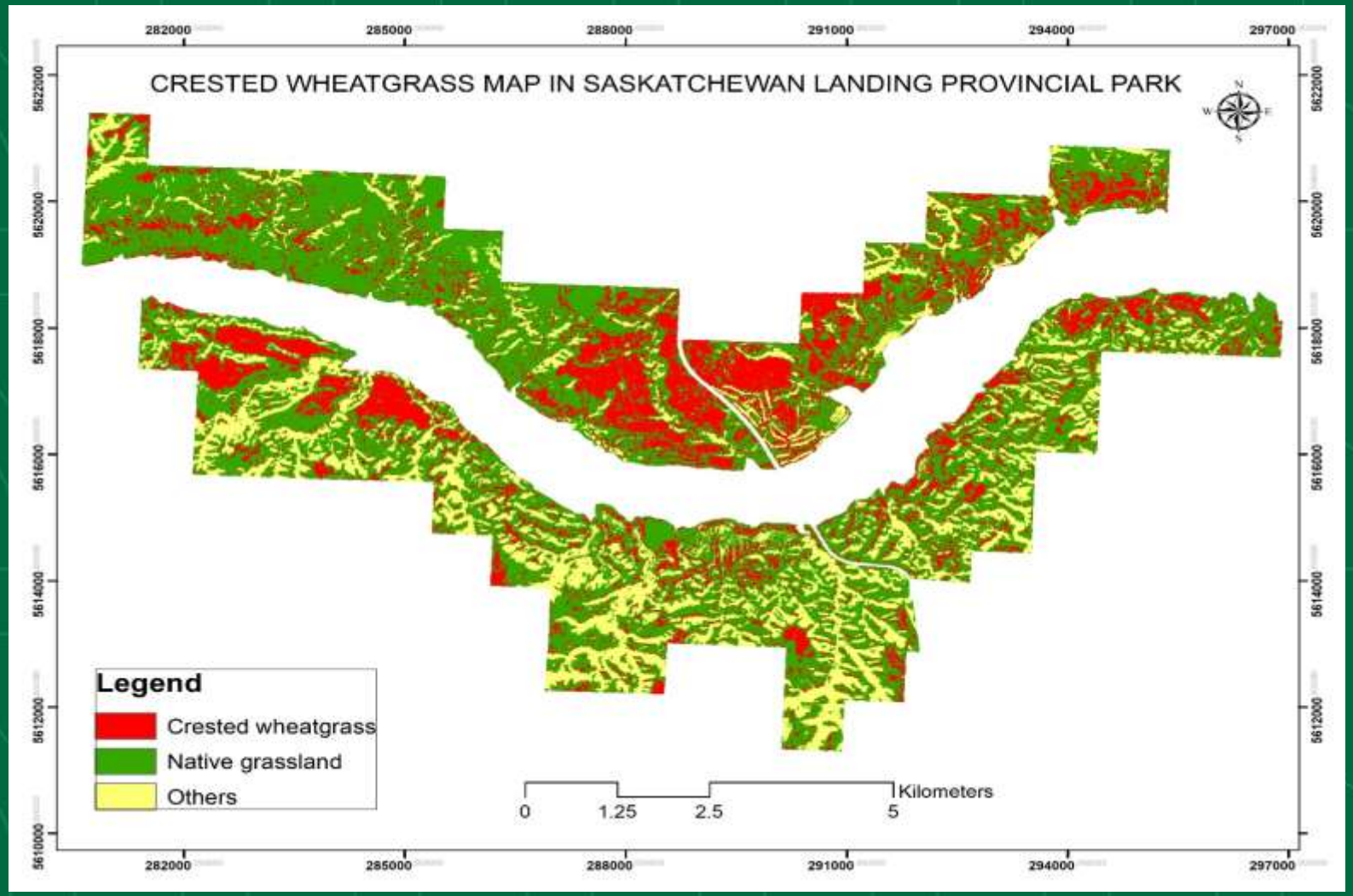
DIFFERENTIATING CRESTED WHEATGRASS USING REMOTE SENSING

SUMMARY OF METHODOLOGY



Overall accuracy = 68.5%

Approximate total extent = 1300 ha



After 20 years, crested wheatgrass extent has increased about 300%.

LIMITATIONS

- Spatial resolution of remote sensor (10m) in contrast with wide extent of crested wheatgrass
- Limited collected field points
- Temporal difference between fieldwork season (August) and peak of crested wheatgrass growing season (May)


CW close to fences


CW close to road


A small CW patch

Credit to: Xulin Guo & Thuy Doan

CHALLENGES OF MANAGEMENT

Credit to: Thuy Doan

- High tolerance towards harsh conditions (*drought, repeated defoliation, temperature extremes, and diseases*)
- High competition with native species (*morphological and phenological characteristics*)
- Quick establishment through seed production

Source: https://www.usu.edu/weeds/plant_species/exotic_rest_species/crestedwheatgrass.html

Management and control options of crested wheatgrass

- Establishing single native species in crested wheatgrass stands

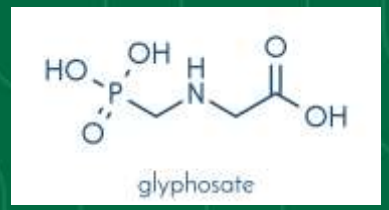
Blue grama

Source: https://www.everwilde.com/store/Bouteloua-gracilis-Seed.html

Native sagebrush

Source: https://www.mtpr.org/post/story-behind-sagebrush-icon-west

- Controlling crested wheatgrass in early crested wheatgrass growing season & in early detected small patches



Source: https://mdc.mo.gov/blogs/more-quail/spring-strip-disking-quail

- Flexible management practices depending on environmental condition

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ACKNOWLEDGMENTS

- Funding: Ministry of Parks, Culture and Sport
- Fieldwork support: Mr. Yunpei Lu
- Logistic suggestion: Jeff Harder, Thiago Frank, Irini Soubry, Xiaolei Yu


QUESTIONS & SUGGESTIONS

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