



Ducks Unlimited  
Canada

A wide-angle landscape photograph showing a herd of black and white cows grazing in a lush green field. In the foreground, there is a body of water with tall green reeds. The background features a prominent, flat-topped mountain under a blue sky with scattered white clouds.

# **AGRICULTURE AND GRASSLANDS: PARTNERS IN CONSERVATION**



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PART ONE

# GRASSLAND ECOSYSTEMS





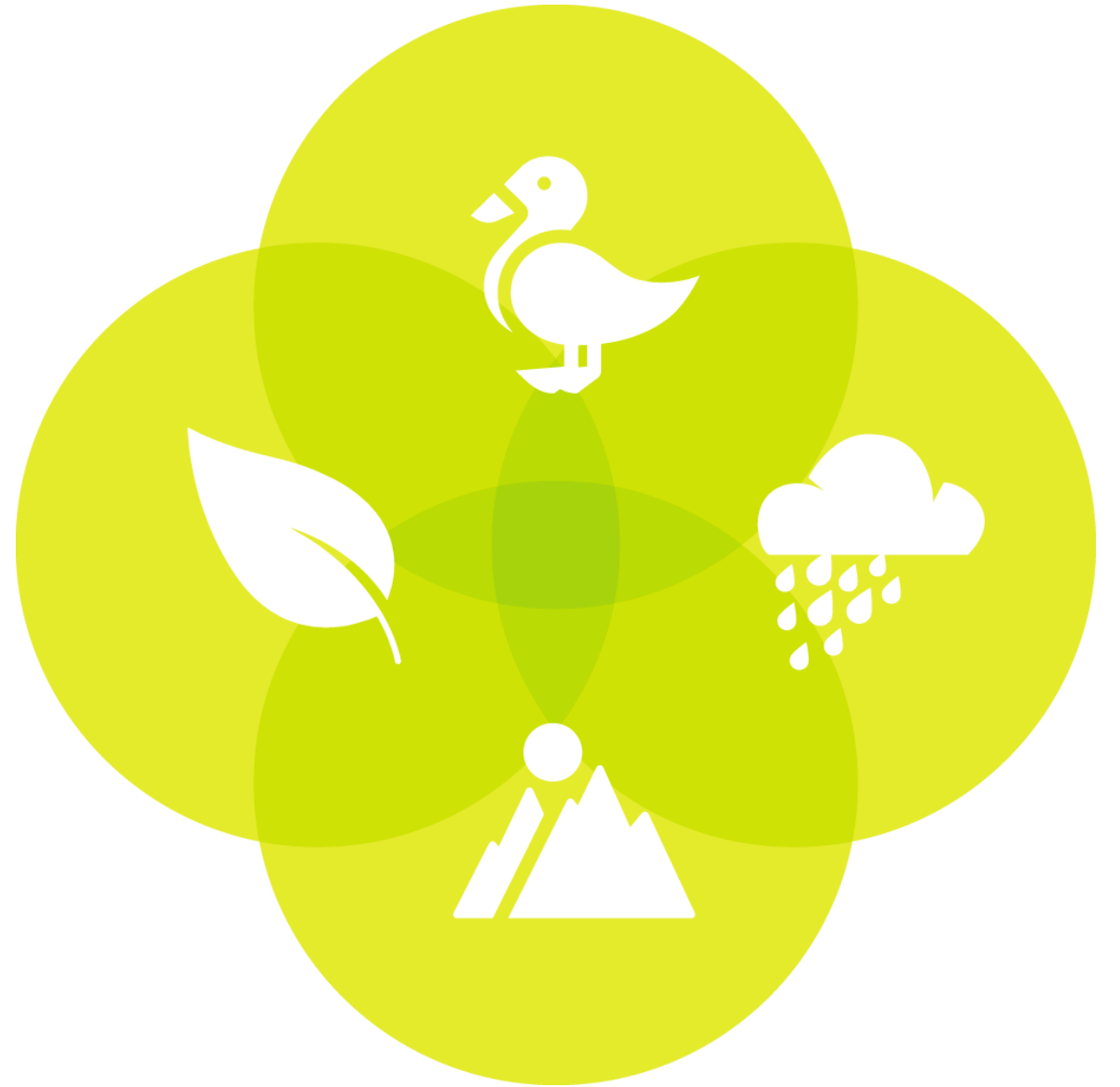
What does a tide pool on the Nova Scotia coast have in common with the alpine tundra in British Columbia?

**THEY ARE BOTH ECOSYSTEMS!**



# WHAT IS AN ECOSYSTEM?

An **ecosystem** has both a **biotic** (*living*) and **abiotic** (*non-living*) component to it creating a bubble of life where plants, animals, organisms, weather and landscapes work and interact together.



# TIDAL POOLS

Rocky  
Shoreline

Sunlight

Consumers

Tides

Plants

Predators

Salinity

# ALPINE TUNDRA

High  
Elevation

Snow

Wildlife

Small  
Shrubs

Cold  
Temps

Thin Air

Grasses



# ECOSYSTEM SERVICES



**An endangered ecosystem is an ecosystem which is at risk of disappearing due to human activity**

**When you think of some the world's most endangered ecosystems, what comes to mind?**





# ENDANGERED ECOSYSTEMS



**CORAL  
REEFS**



**THE  
ARCTIC**



**AMAZON  
RAINFOREST**





The most endangered ecosystem is in our own backyard.

**TEMPERATE  
GRASSLANDS**



# TYPES OF GRASSLANDS



**TROPICAL  
SAVANNAH**



**TEMPERATE  
GRASSLAND**

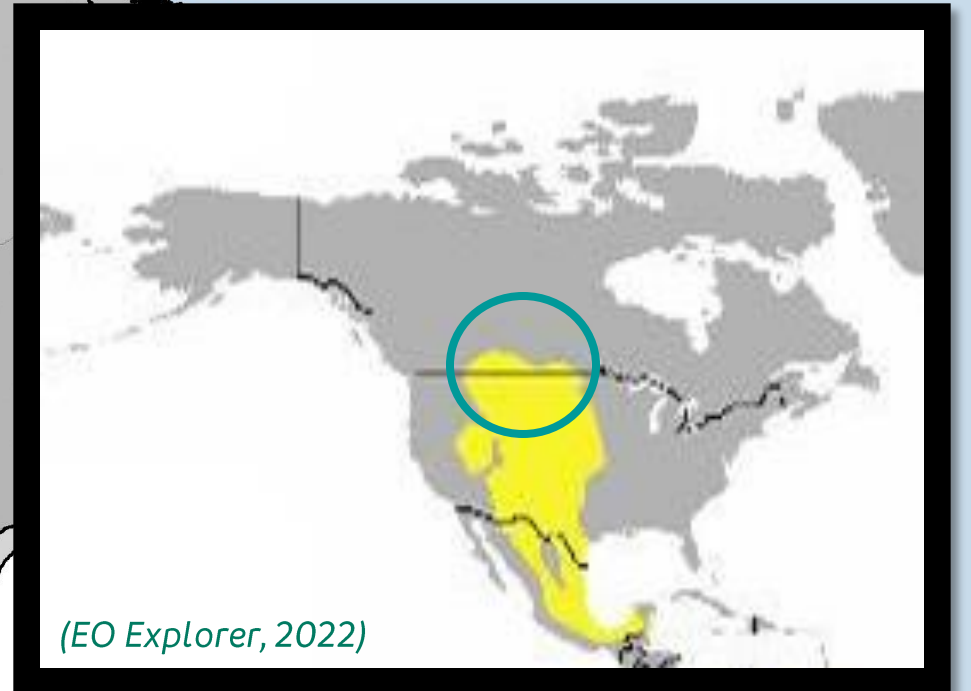
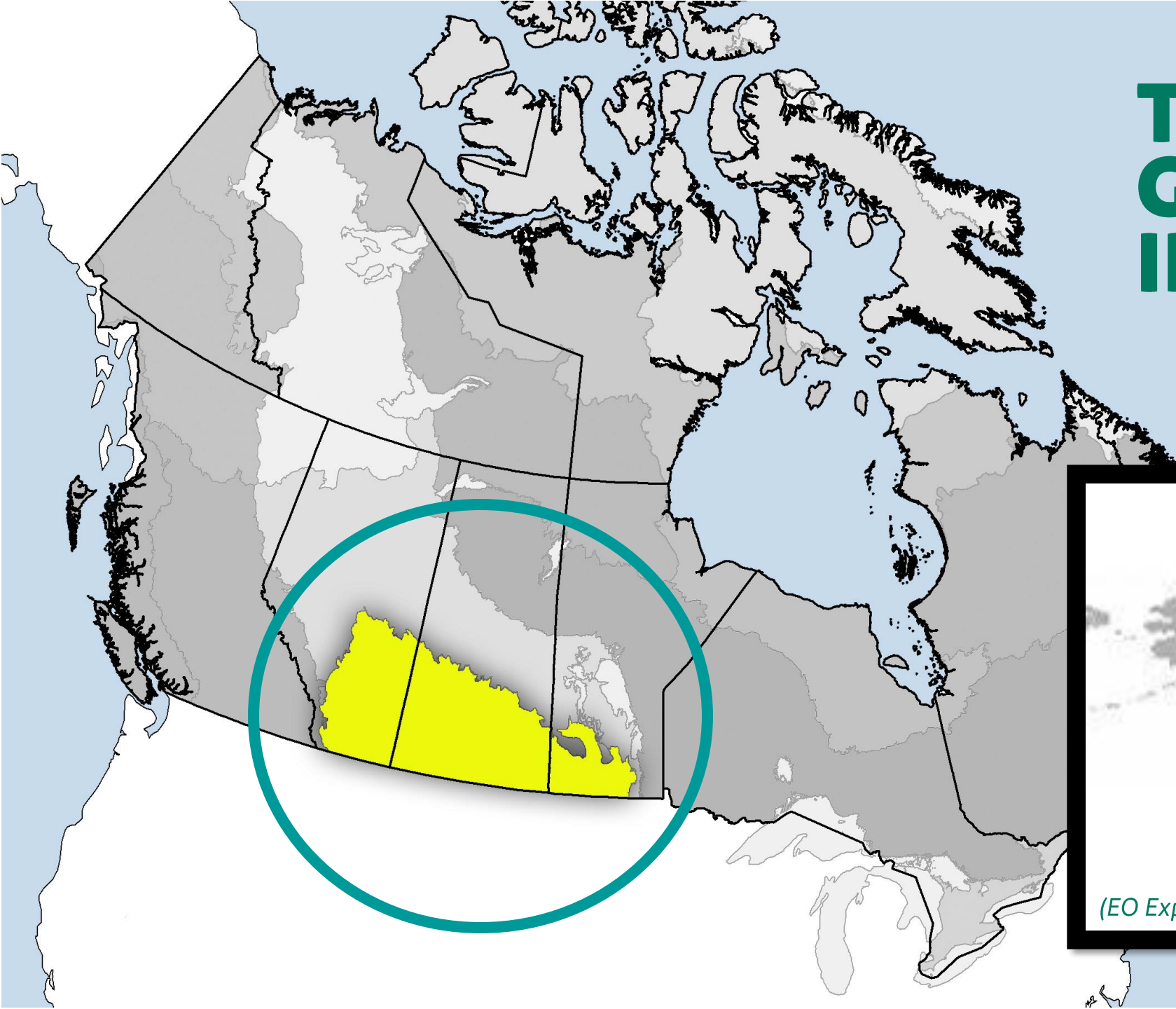
**ENDANGERED**



**When you think of these spaces,  
what do you imagine? What species  
would you expect to find here?**



# TEMPERATE GRASSLANDS IN CANADA



# The Canadian Prairies, aka the Prairie Pothole Region



A map of North America with the Prairie Pothole Region highlighted in green. The region covers parts of the United States (North Dakota, South Dakota, Nebraska, Minnesota, Iowa, Missouri, Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania, New York) and southern Canada (Alberta, Saskatchewan, Manitoba, Ontario, Quebec). The map is overlaid on a background image of a grassland landscape with numerous small, irregularly shaped wetlands.

**PRAIRIE  
POTHOLE  
REGION**

**GRASSLANDS**

**WETLANDS**





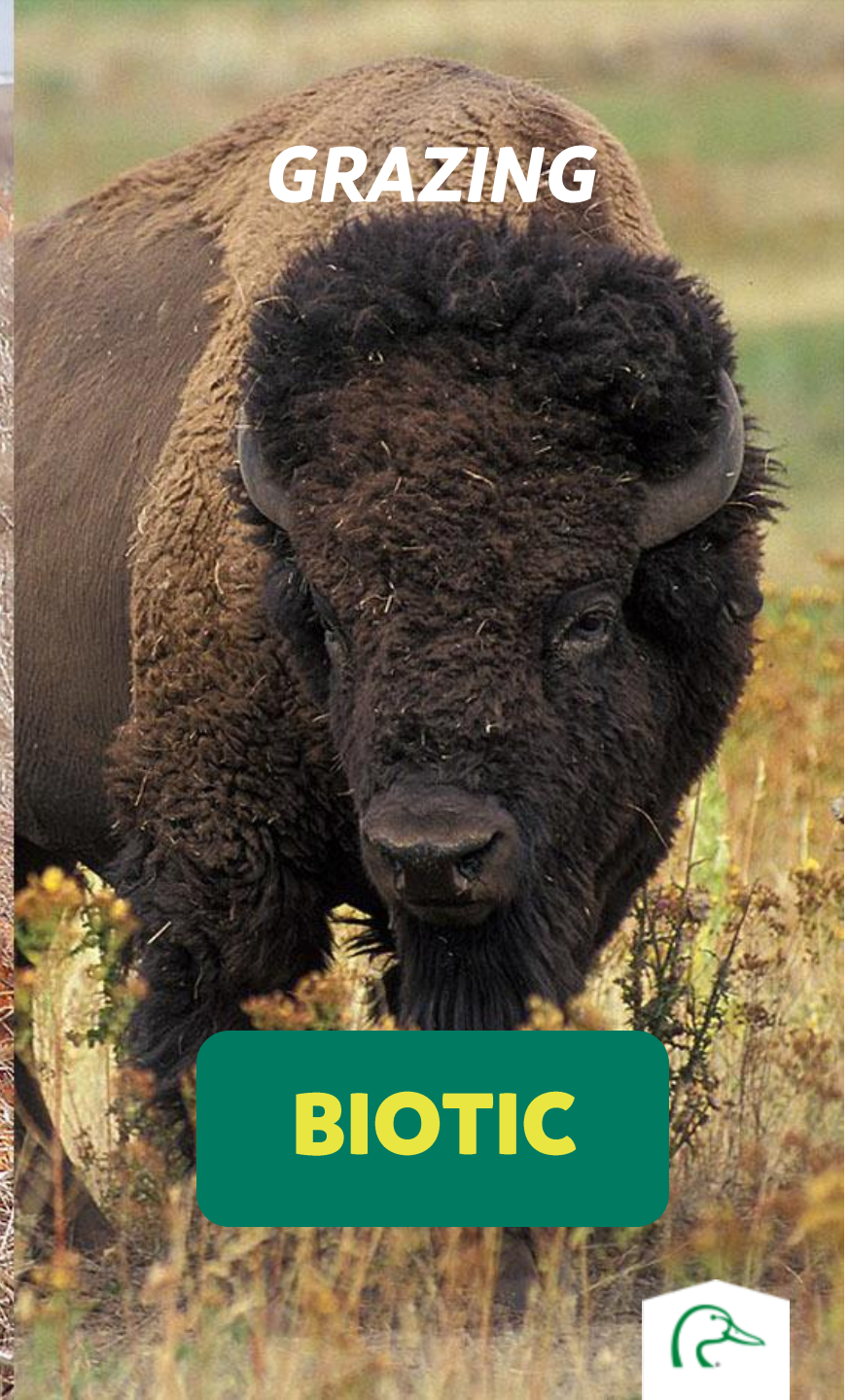
**CLIMATE**

**ABIOTIC**



**FIRE**

**ABIOTIC**



**GRAZING**

**BIOTIC**



**A **keystone species** is a species which the ecosystem depends on. The loss of this species would drastically change the ecosystem.**

Bison once played such a key role in shaping the grassland ecosystem through their grazing and today cattle fill this role.







**Keystone species comes from the word 'keystone', the central stone in an arch that holds it together**



# ECOSYSTEM ENGINEERS



# Why do we care about grassland ecosystems?

**#1**

**BIODIVERSITY  
HOTSPOTS**

**#2**

**ECOSYSTEM  
SERVICES**

**#3**

**CLIMATE  
CHANGE**



WHY DO WE CARE ABOUT GRASSLAND ECOSYSTEMS?

**#1 GRASSLANDS ARE  
BIODIVERSITY HOTSPOTS**



# BIODIVERSITY HOTSPOTS

**Biodiversity** is the variety of life on earth and includes:

- Genetic diversity
- Species diversity
- Ecosystem diversity

**Biodiversity hotspots** contain high levels of biodiversity and are rich with life.



*Grasslands Hillside Grass* – by Geoff Phillips



# NATIVE SPECIES



**BLACK-FOOTED FERRET**  
*Extirpated*



**LONG-BILLED CURLEW**  
*Special Concern*



**PLAINS BISON**  
*Threatened*



**BURROWING OWL**  
*Endangered*



# NATIVE PLANTS



**WESTERN PRAIRIE FRINGED ORCHID**  
*Platanthera praeclara*



**PASTURE SAGE**  
*Artemisia frigid*



**BLUE GRAMA GRASS**  
*Bouteloua gracilis*



**SILVER SAGE BRUSH**  
*Artemisia cana*



WHY DO WE CARE ABOUT GRASSLAND ECOSYSTEMS?

**#2 GRASSLANDS PROVIDE  
ECOSYSTEM SERVICES**





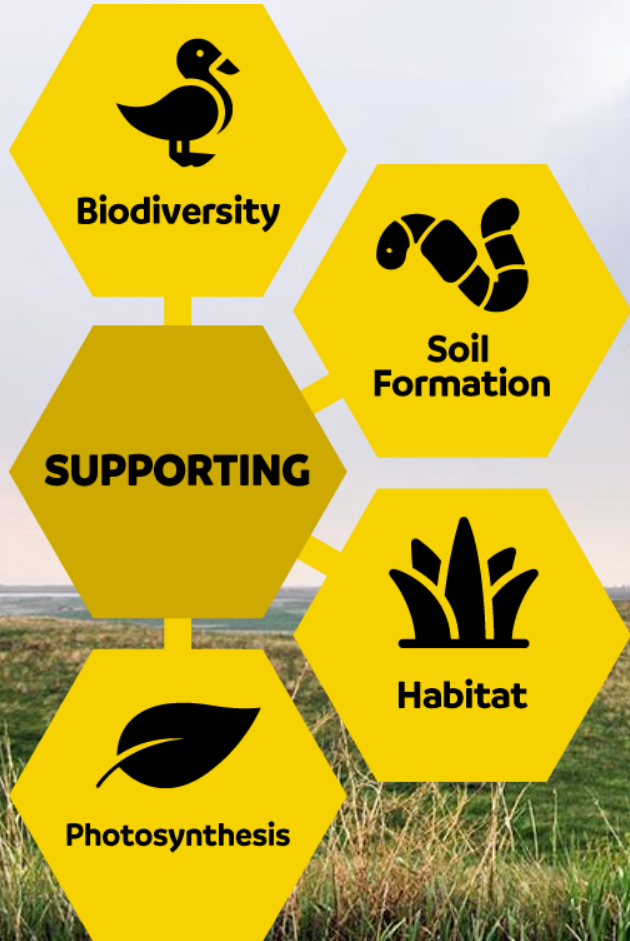


**“Two-eyed seeing** refers to learning to see from one eye with the strengths of **Indigenous ways** of knowing and from the other eye with the strengths of **Western ways** of knowing and to using both of these eyes together.”

*(Bartlett, Marshall, & Marshall, 2012, p. 335)*



# HABITAT AND BIODIVERSITY



**BOBOLINK**  
*Songbird*



**SWIFT FOX**  
*Predator*



**PRONGHORN**  
*Grazing species*



**NORTHERN PINTAIL**  
*Nesting waterfowl*





# ENVIRONMENTAL SPACES AND CULTURAL PRACTICES

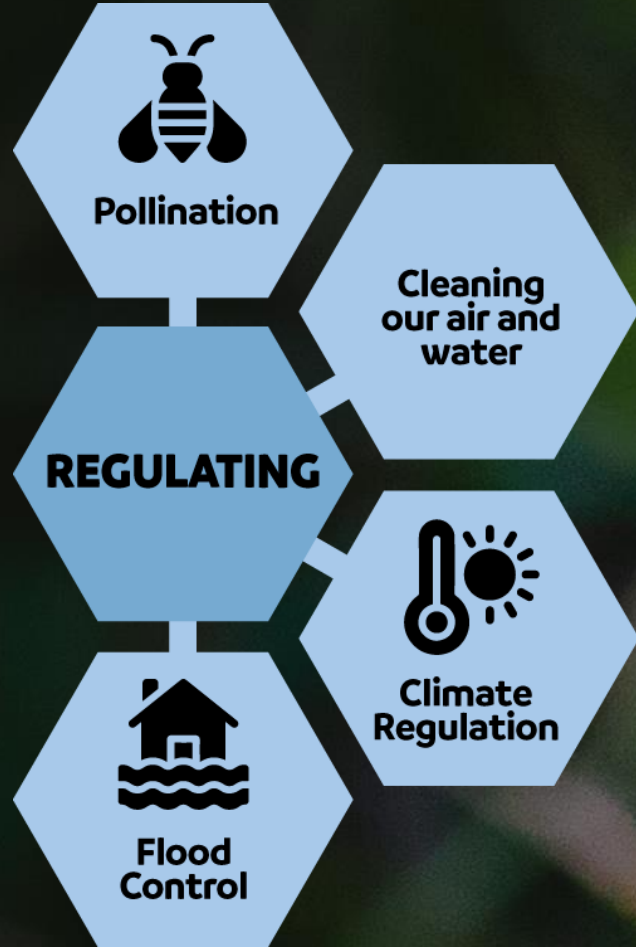




# FOOD AND RESOURCES



# NO BEES = NO FOOD

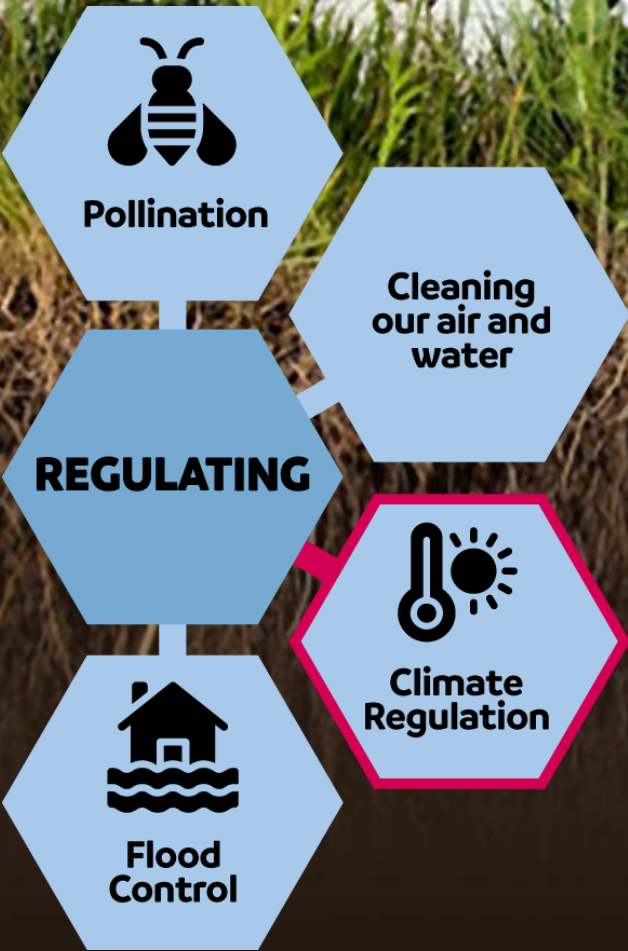


WHY DO WE CARE ABOUT GRASSLAND ECOSYSTEMS?

**#3**

**GRASSLANDS CAN HELP  
LESSEN THE IMPACT OF  
CLIMATE CHANGE**





# CARBON STORAGE

**Grasslands are carbon sinks.**

They absorb more carbon than they release.

**LIVING BIOMASS**

**DEAD BIOMASS**

**SOIL**



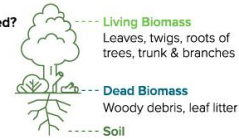
# Carbon Storage in Earth's Ecosystems

Achieving net-zero by 2050 depends on the Earth's natural carbon sinks.

Forests play a critical role in regulating the global climate. They absorb carbon from the atmosphere and then store it, acting as natural carbon sinks.

## Where is Carbon Stored?

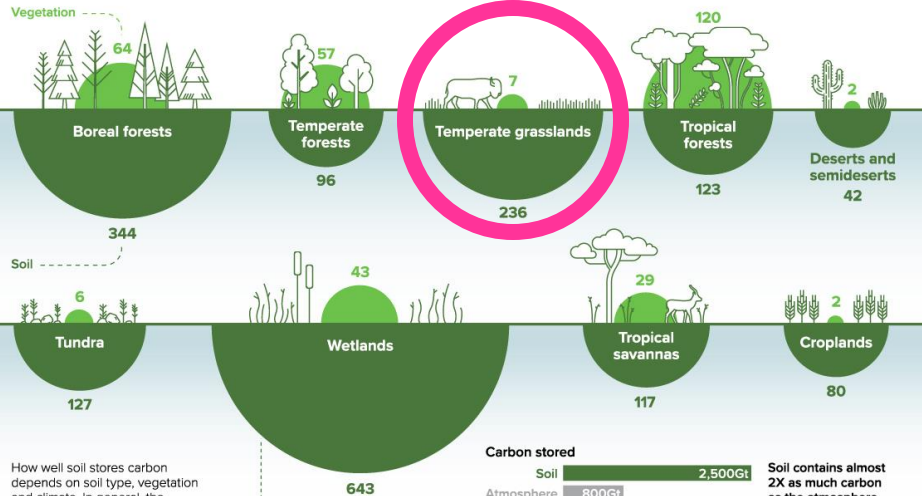
There are various carbon pools in a forest ecosystem.



## Carbon Storage Tonnes of Carbon

The world's forests absorb around **15.6 gigatonnes** of CO<sub>2</sub> each year. That's around 3X the annual CO<sub>2</sub> emissions of the United States.

However, around **8.1 gigatonnes of CO<sub>2</sub>** leaks back into the atmosphere due to deforestation, fires and other disturbances.



How well soil stores carbon depends on soil type, vegetation and climate. In general, the **wetter and colder**, the better.

### Carbon stored



Soil contains almost **2X** as much carbon as the atmosphere and living flora and animals combined.

Average stored carbon in tonnes per hectare at a ground depth of one meter  
Sources: IPCC, NASA

**Carbon Streaming** is protecting the Earth's natural carbon sinks with carbon credit streams across the following REDD+ projects:



**Rimba Raya**  
Borneo, Indonesia  
~47,000 hectares



**Cerrado Biome**  
Brazil  
~11,000 hectares



**Magdalena Bay Blue Carbon**  
Baja California Sur, Mexico  
~22,000 hectares

# GRASSLANDS: A POWERFUL CARBON SINK



Learn more at  
[CARBONSTREAMING.COM](https://carbonstreaming.com)

NEO: **NETZ**  
OTCQB: **OFSTF**  
FSE: **M2Q**



[/visualcapitalist](https://www.facebook.com/visualcapitalist) [@visualcap](https://www.instagram.com/visualcap) [visualcapitalist.com](https://www.youtube.com/visualcapitalist)

(Visual Capitalist, 2022)







**PRAIRIE  
WHEATGRASS**



**BIG  
BLUESTEM**



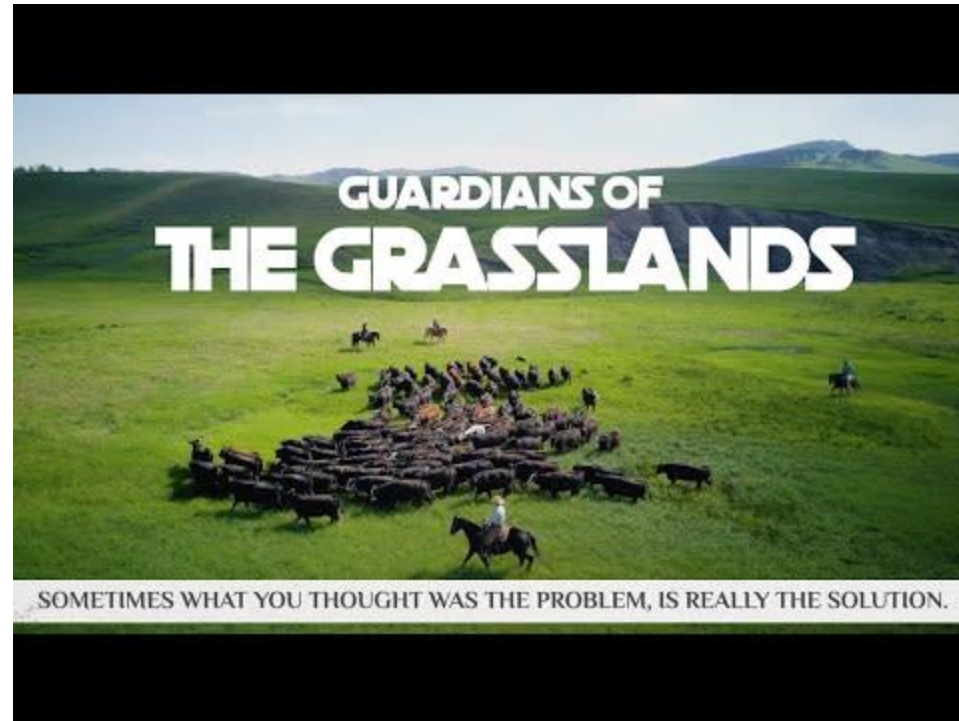
**PRAIRIE  
GRASS**

# **ROOTS ARE THE POWERHOUSE OF CARBON STORAGE.**

*Photo(s): Jim Richardson, National Geographic*



# ROOTS ARE THE POWERHOUSE OF CARBON STORAGE.

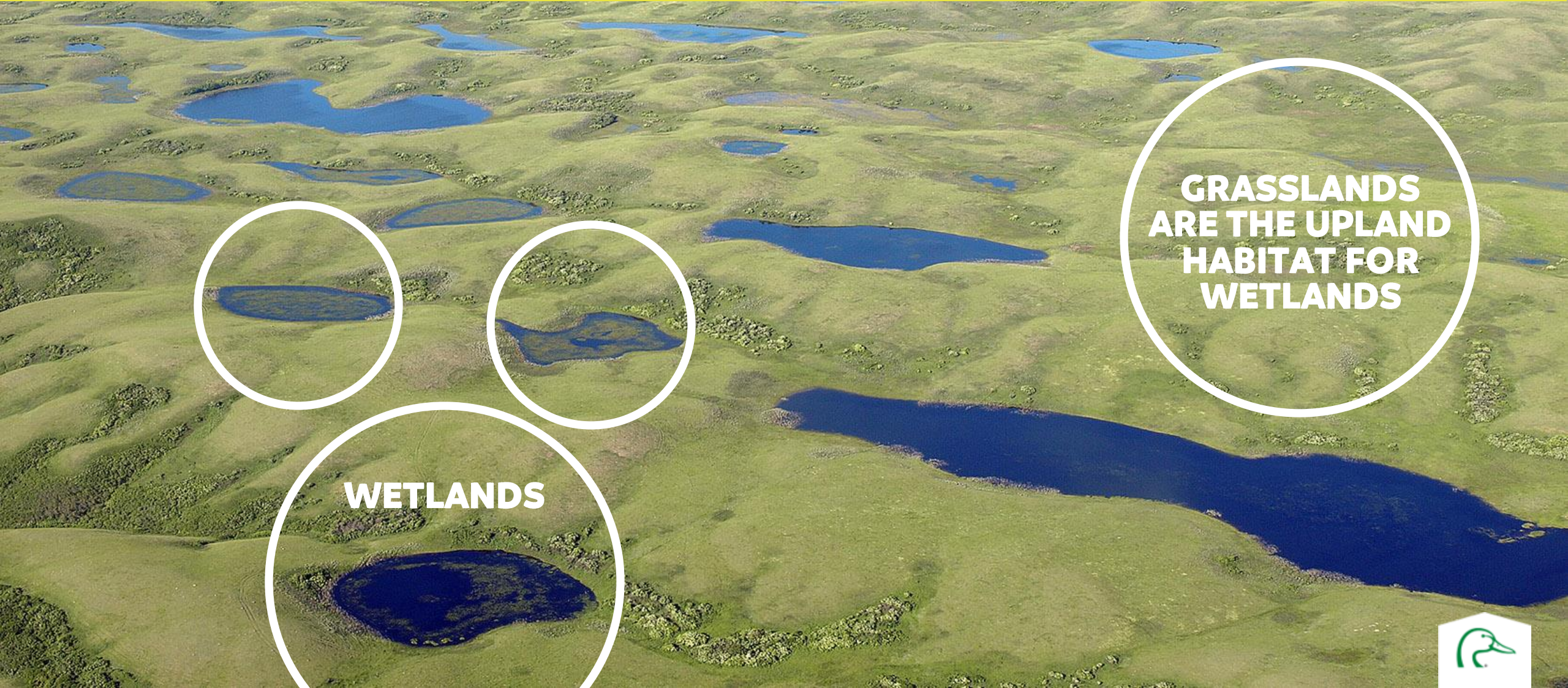


# “CARBON UP IN SMOKE”<sup>1</sup>

Grasslands may be more reliable carbon sinks than our forests in areas that are prone to wildfires!



# THE DYNAMIC DUO



**GRASSLANDS  
ARE THE UPLAND  
HABITAT FOR  
WETLANDS**

**WETLANDS**



# What is a wetland?

**Wetlands** are areas of land that are covered or saturated in surface or ground water for part or most of the year.



# THE BENEFITS OF WETLANDS



**SOURCE  
OF WATER!**

**STORES  
CARBON!**

**BIODIVERSITY!**

**STORES  
WATER!**

**COOLING  
EFFECT!**





**GRASSLANDS AND WETLANDS  
ARE AT RISK**



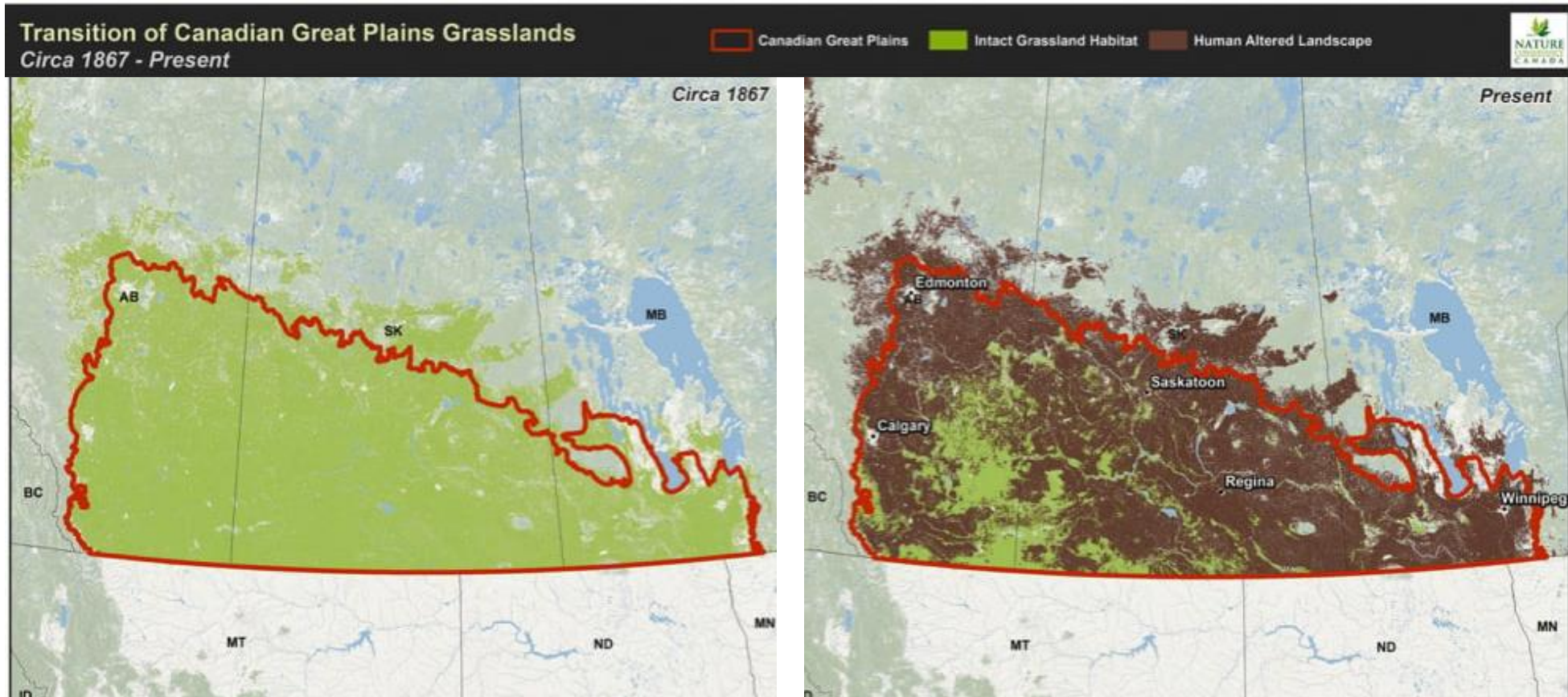
# Between 75-90% of grasslands have been lost.

Map: Alicia Carvalho / The Narwhal





# Between 75-90% of grasslands have been lost.



Map from the Nature Conservancy of Canada



An aerial photograph of the Prairie Pothole Region, showing a vast landscape of interconnected wetlands and grasslands. The terrain is characterized by numerous small, irregularly shaped water bodies (potholes) scattered across a green and brownish landscape. In the foreground, there are large, rectangular agricultural fields, some of which are dark brown, indicating they have been converted from natural habitats. The text is overlaid on the lower portion of the image.

The biggest threat to grasslands in the Prairie Pothole Region is **land conversion** for the use of crop production and development.

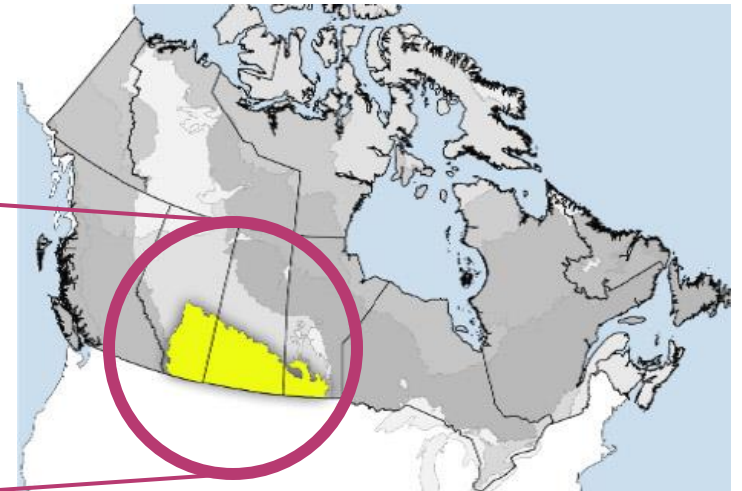
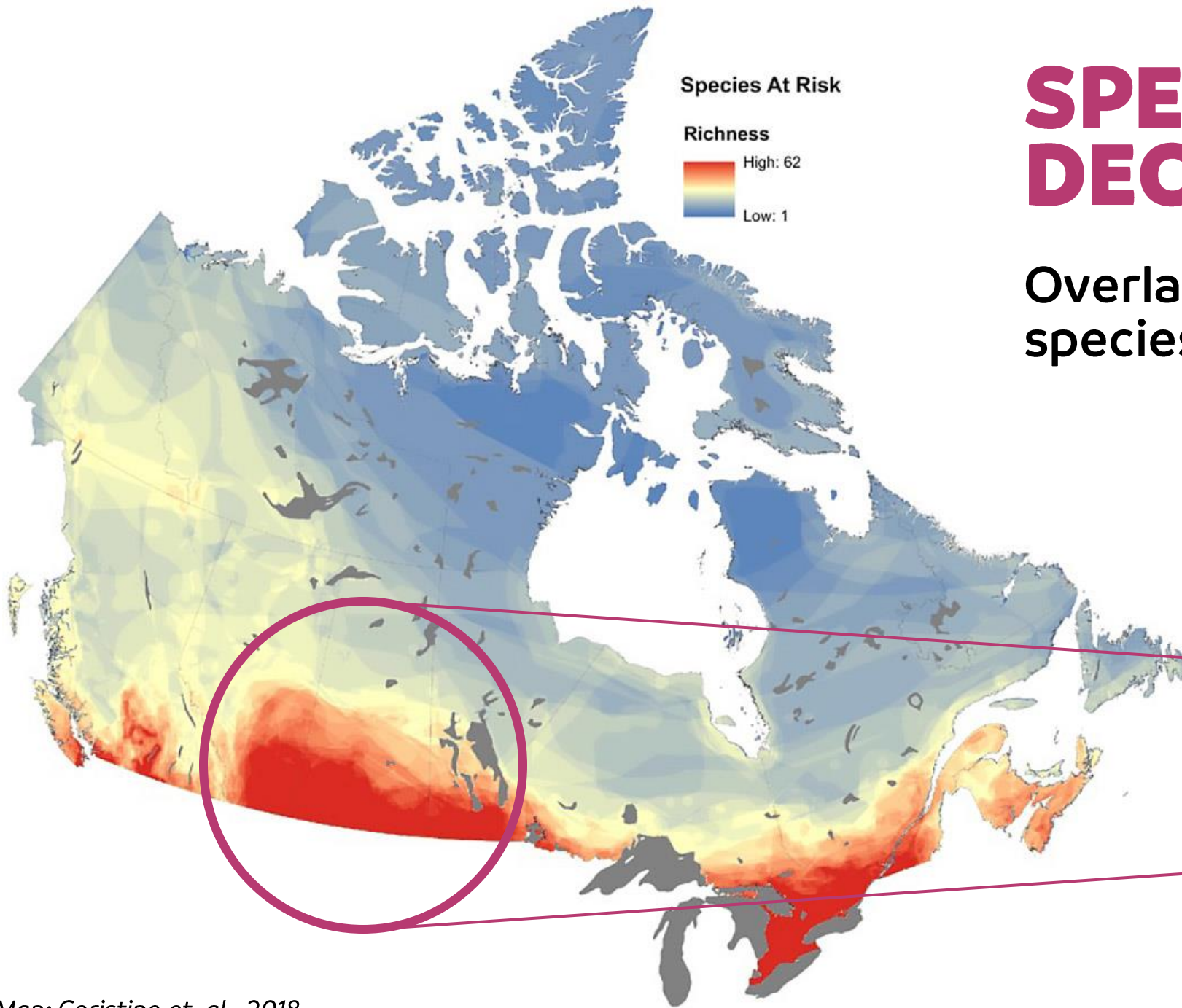


**WHY IS THIS  
A PROBLEM?**



# SPECIES DECLINE!

Overlapping areas of species at risk in Canada



EXTENT OF CANADA'S TEMPERATE GRASSLANDS



# SPECIES DECLINE: GRASSLAND BIRDS

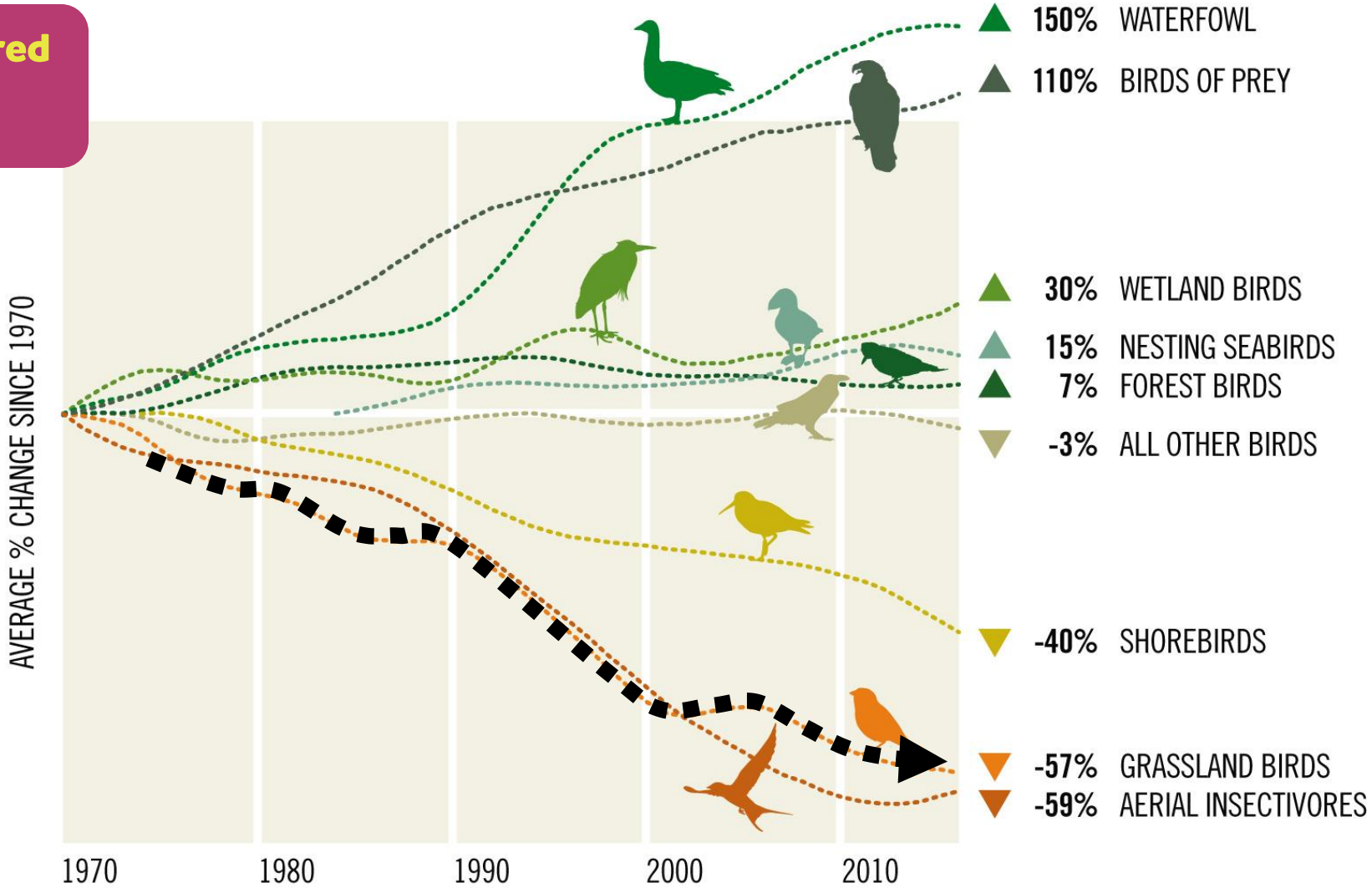


**Chestnut-collared Longspur**  
Photo: Dan Arndt

**Baird's sparrow**  
Photo: Christian Artuso



**Bobolink**  
Photo: May Haga



(North American Bird Conservation Initiative Canada, 2019)



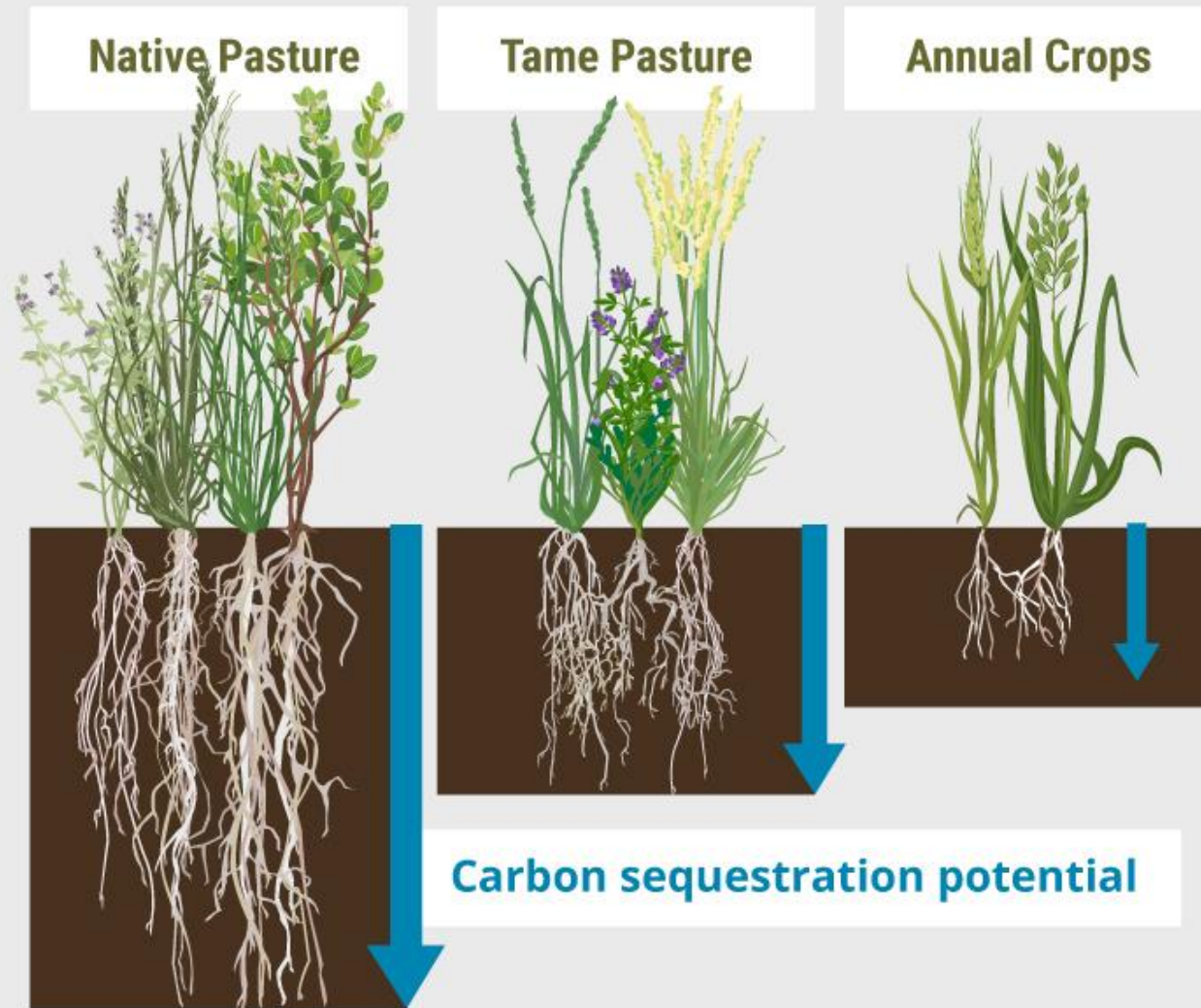
# BIODIVERSITY AND ECOSYSTEM SERVICES DISAPPEAR

**Over the last 200 years, Canada's prairie landscape has changed from grasslands to agriculture.**

*Transformations* – by Mai Ly



## Ability of Roots to Sequester Carbon



**NOT ALL  
CARBON  
SINKS ARE  
EQUAL**

When grasslands are converted in to crops, they lose half of the carbon they have stored in the soil!



# WETLANDS ARE AT RISK







# MODULE 3: THE FUTURE OF CONSERVATION

*GRASSLANDS AND SUSTAINABLE AGRICULTURE*

# MODULE 2: A BRIEF HISTORY

*AGRICULTURE AND GRASSLANDS ACROSS TIME*

