

Parkland County Wetland Inventory & Historical Loss Assessment

Final Presentation
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Project Goal & Objectives:

GOAL: To provide a thorough assessment of the current and historical status of wetlands in Parkland County

OBJECTIVES:

1. Create an accurate and up-to-date wetland inventory
2. Assess the condition of each wetland using a scientifically valid framework that aligns with the provincial relative wetland value assessment
3. Determine the historical distribution of wetlands and calculate the number and area of wetlands that have been lost



What is a **wetland** ?



What is a

wetland ?

bog

pond

muskeg

marsh

pothole

fen

swamp

slough



What is a **wetland** ?

1. Water at or near the ground surface (<2 m deep)



What is a **wetland** ?

1. Water at or near the ground surface (<2 m deep)
2. Low oxygen soil conditions

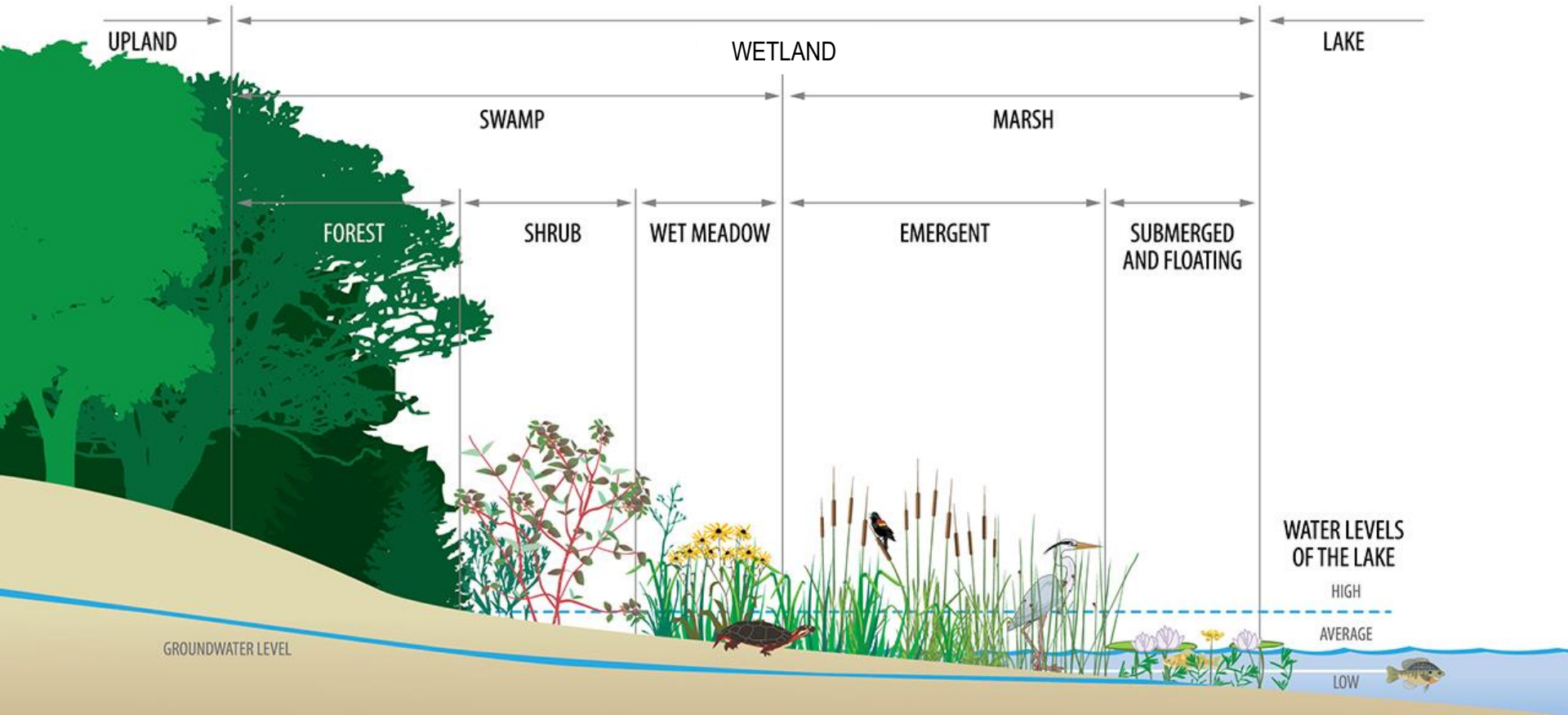


What is a **wetland** ?

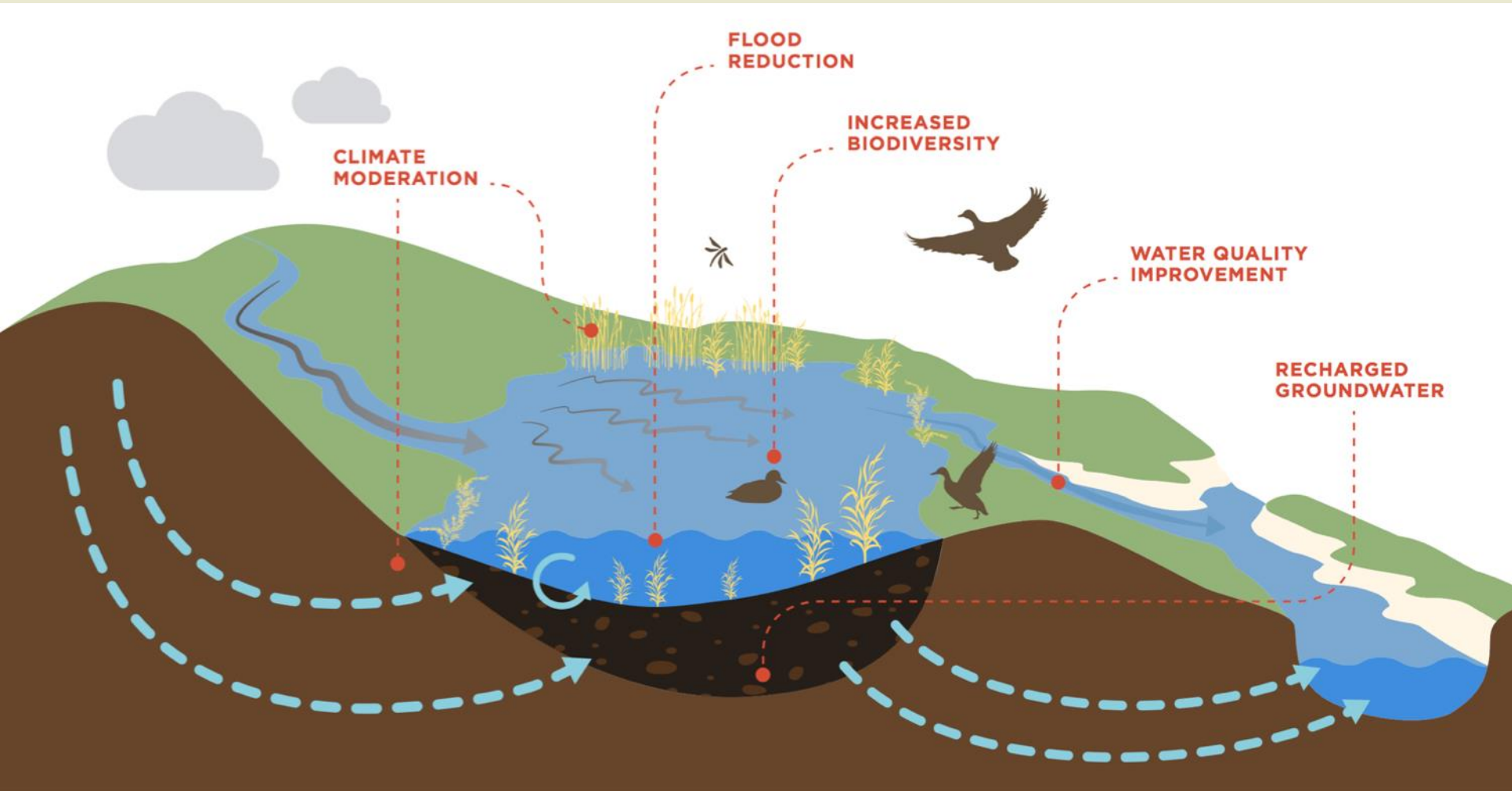
1. Water at or near the ground surface (<2 m deep)
2. Low oxygen soil conditions
3. Plants & animals adapted to low oxygen conditions



Wetlands are Transitional Habitats



The Importance of Wetlands: Ecosystem Services



Wetland Loss in Alberta

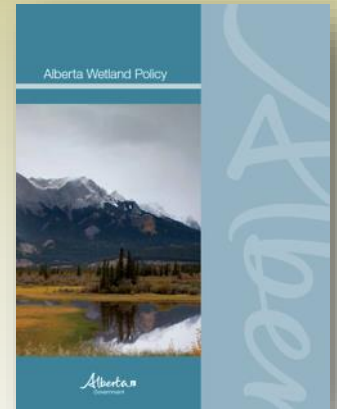


- It is estimated that between 40 and 70% of the marsh wetlands in the settled areas of Alberta have been lost since European settlement

Alberta Wetland Policy (2013)

Policy Goal:

To conserve, restore, protect, and manage Alberta's wetlands to sustain the benefits they provide to the environment, society, and economy.



Policy Outcomes:

1. Wetlands of the highest value are protected for the long-term benefit of all Albertans
2. Wetlands and their benefits are conserved and restored in areas where losses have been high
3. Wetlands are managed by avoiding, minimizing, and if necessary, compensating for impacts
4. Wetland management considers regional context

Provincial Tools & Municipal Land Use Planning

Provincial tools are not the most effective for land planning and wetland management within municipalities due to:

1. Scale
2. Data Resolution
3. Data Accuracy



Developing a Wetland Inventory for Parkland County

- Considering wetland value at smaller scales allows for:
 - Refinement of the current wetland inventory to improve accuracy
 - Refinement of indicators used to score wetlands to account for unique conditions
 - The use of more detailed and finer scale data to refine wetland scores
 - Wetland scoring that is relative to the County, rather than provincial Wetland Value Assessment Units



Classifying Wetlands

- There are many different types of wetlands
- Classification systems typically characterize wetlands by:
 - Form or type
 - Presence and abundance of different vegetation species
 - Water permanence



Alberta Wetland Classification System

wetland

peatland

>40 cm of peat

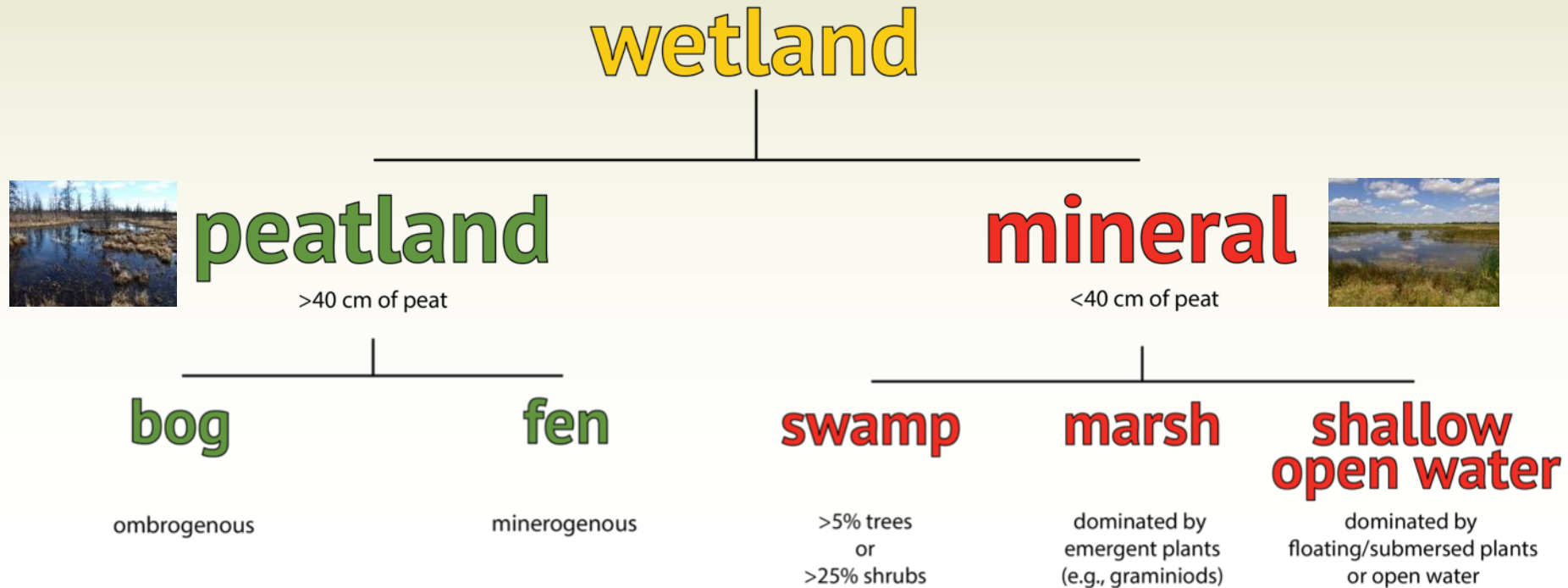


mineral

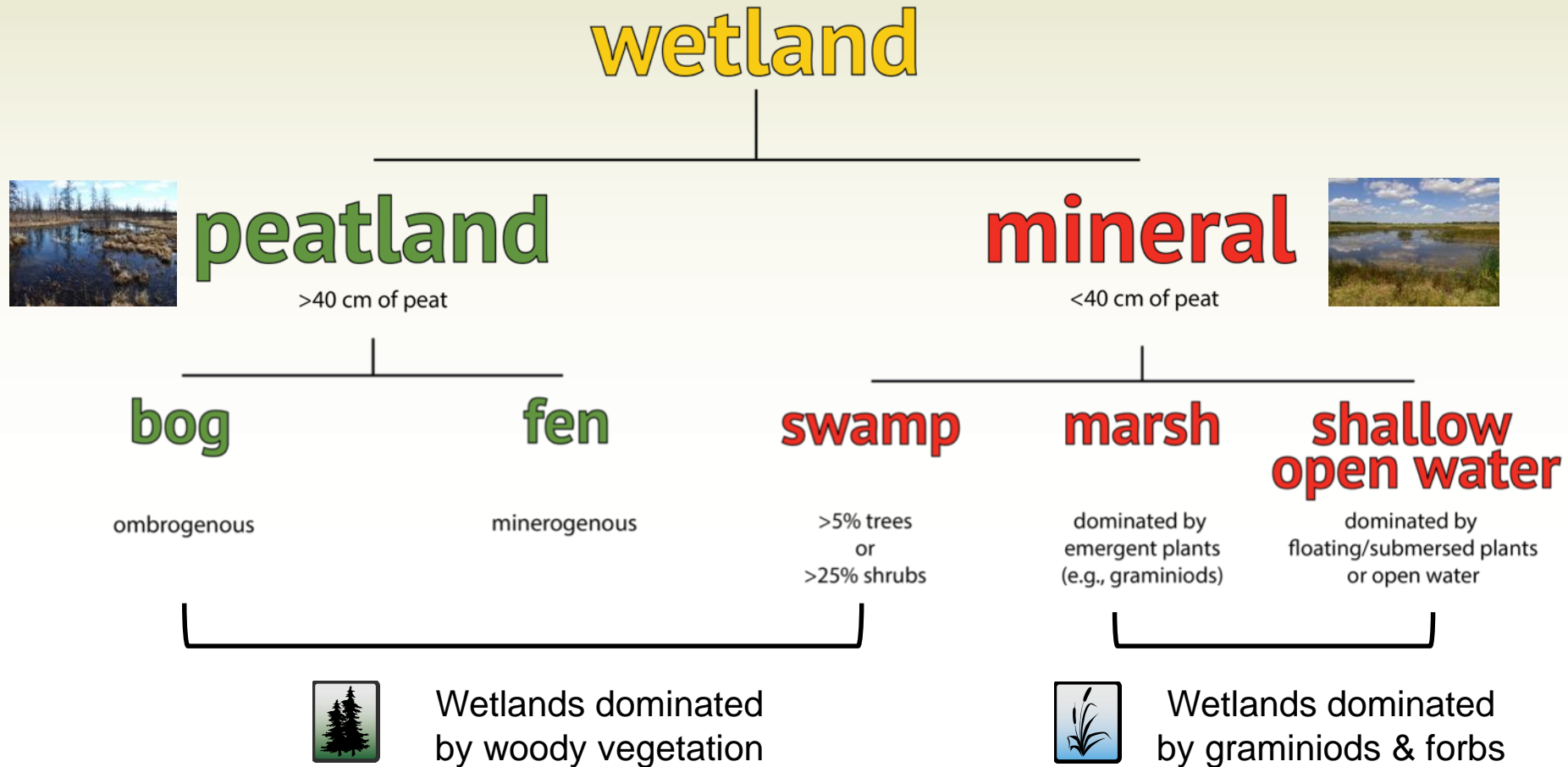
<40 cm of peat



Alberta Wetland Classification System



Alberta Wetland Classification System



Parkland County Wetlands Study

This study included four major steps:

- 1) Create a current wetland inventory
- 2) Assign ecological value to wetlands in the current inventory
- 3) Create a historic wetland inventory
- 4) Calculate historic wetland loss



STEP 1: Create a Current Wetland Inventory

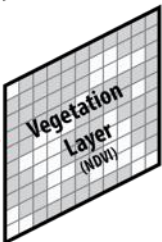
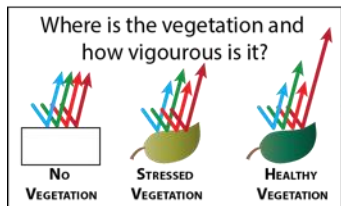
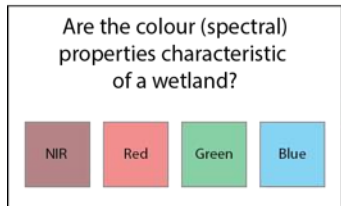
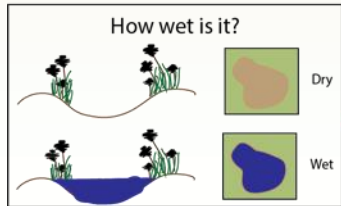
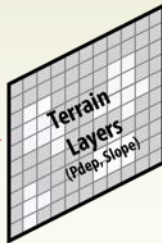
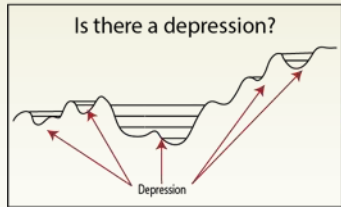
- Imagery from 2013 was used to create the current inventory
- The inventory was created using numerous data layers that were combined using standard remote sensing methods



STEP 1: Create a Current Wetland Inventory

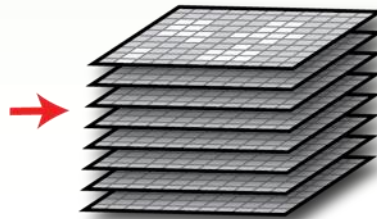
Terrain Analysis & Image Processing

Derived Datasets



Layer Stacking

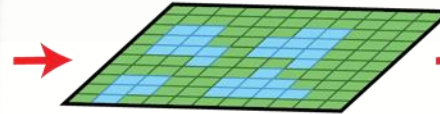
Combine all derived datasets together



Object Based Image Analysis & Wetland Classification

Where are the wetlands?

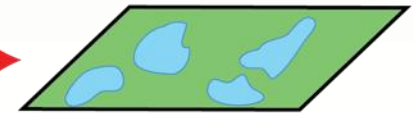
Map boundaries & identify areas with wetland properties



Assign Wetland Class

What is the class of the wetland?

Assign wetland type as per the Alberta Wetland Classification System

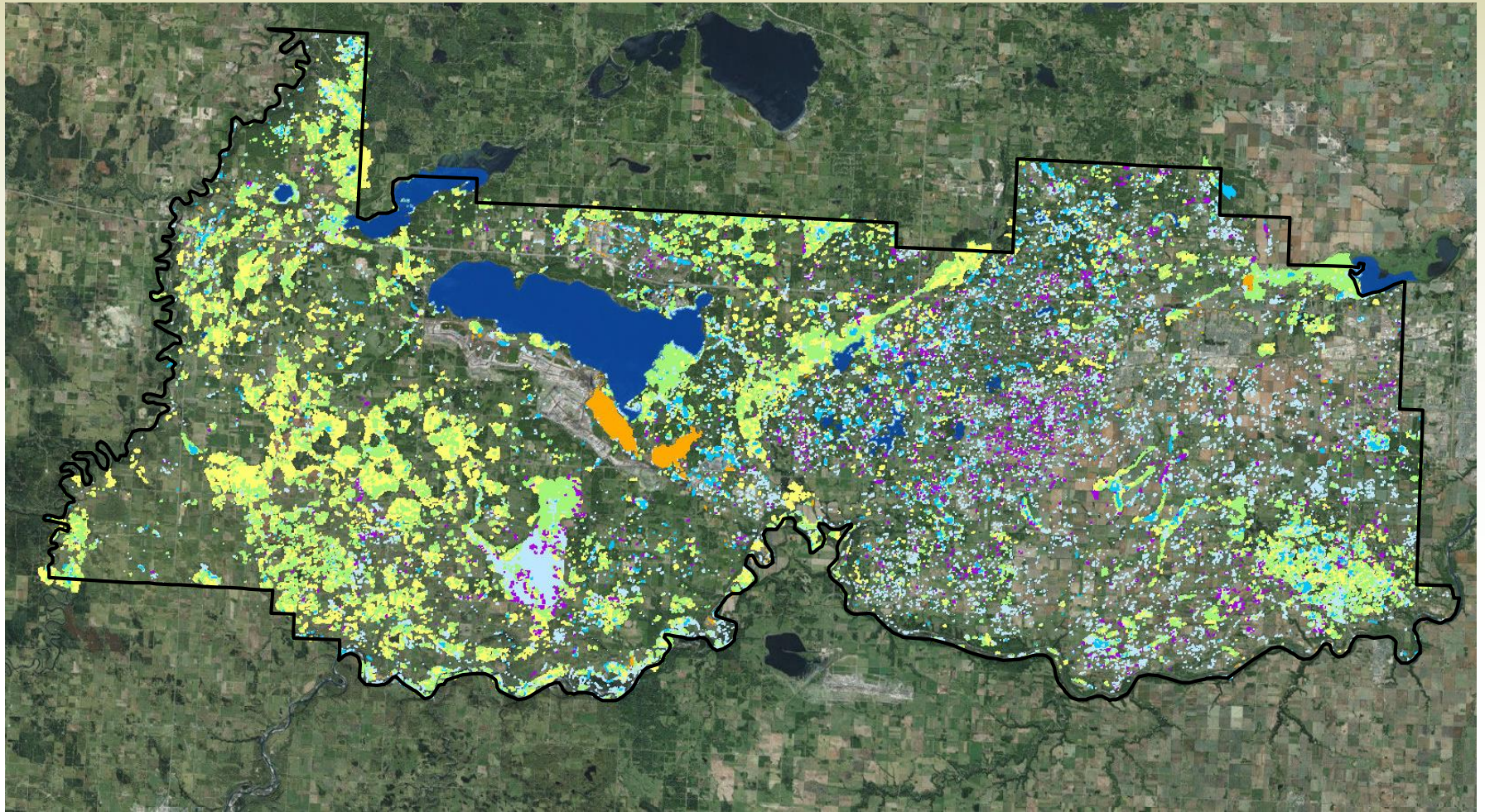


RESULTS: Current Wetland Inventory



- The current (2013) area of wetlands within Parkland County is estimated to be 35,406 ha
- This includes the area of wetlands that intersect the county boundary, such that a portion of the area may fall outside the county
- The majority of current wetland area is composed of treed wetlands (bogs/fens/swamps)

RESULTS: Current Wetland Inventory



2013 Wetland Invenotry - Parkland County

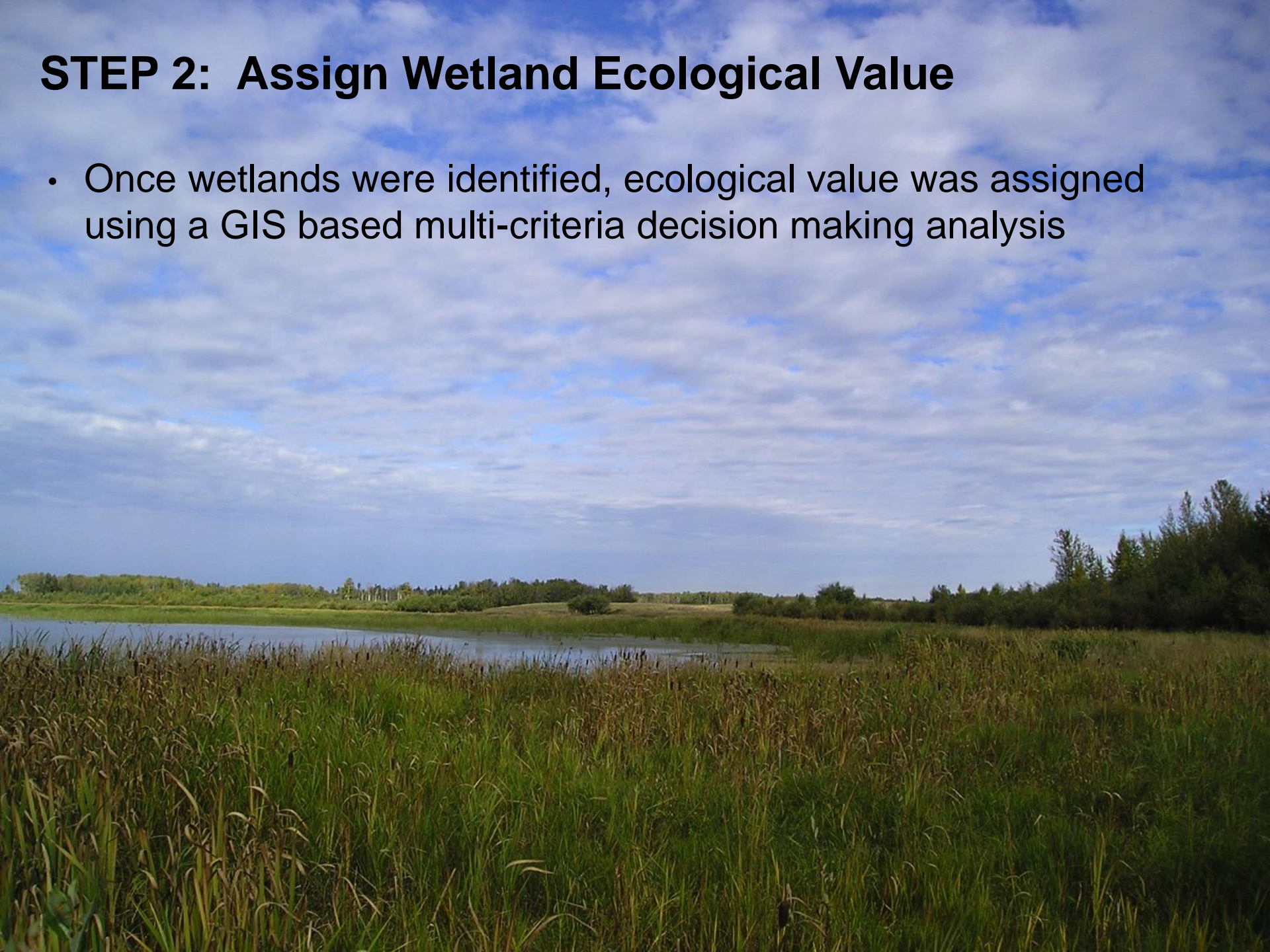


0 2.25 4.5 9 13.5 18 KM



STEP 2: Assign Wetland Ecological Value

- Once wetlands were identified, ecological value was assigned using a GIS based multi-criteria decision making analysis



STEP 2: Assign Wetland Ecological Value

- Key criteria for identifying ecologically important wetlands were identified and organized into a hierarchy of sub-criteria and indicators
- The criteria and indicators used to assess ecological value were:
 1. Reflective of local and regional environmental, social, and economic conditions
 2. Consistent with, and comparable to, those used by the GoA to assess relative wetland value at the provincial scale



Wetland Ecological Value

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graph TD; A[Wetland Ecological Value] --> B[CRITERION 1: Biodiversity Value]; A --> C[CRITERION 2: Ecological Function]; A --> D[CRITERION 3: Hydrologic Function & Water Quality Improvement]; B --> E[Wetlands that provide suitable habitat for: Fish, Birds, Amphibians, Rare or Threatened Species]; C --> F[Wetlands with a high degree of ecological function: Minimal disturbance within & near the wetland, Close to other undisturbed natural areas, Close to other wetlands]; D --> G[Wetlands with a high degree of hydrologic function: Wetlands that store water and reduce flooding, Wetlands that are hydrologically connected to other aquatic habitats, Wetlands that intercept sediment & nutrients];
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CRITERION 1: Biodiversity Value

Wetlands that provide suitable habitat for:

- Fish
- Birds
- Amphibians
- Rare or Threatened Species

CRITERION 2: Ecological Function

Wetlands with a high degree of ecological function:

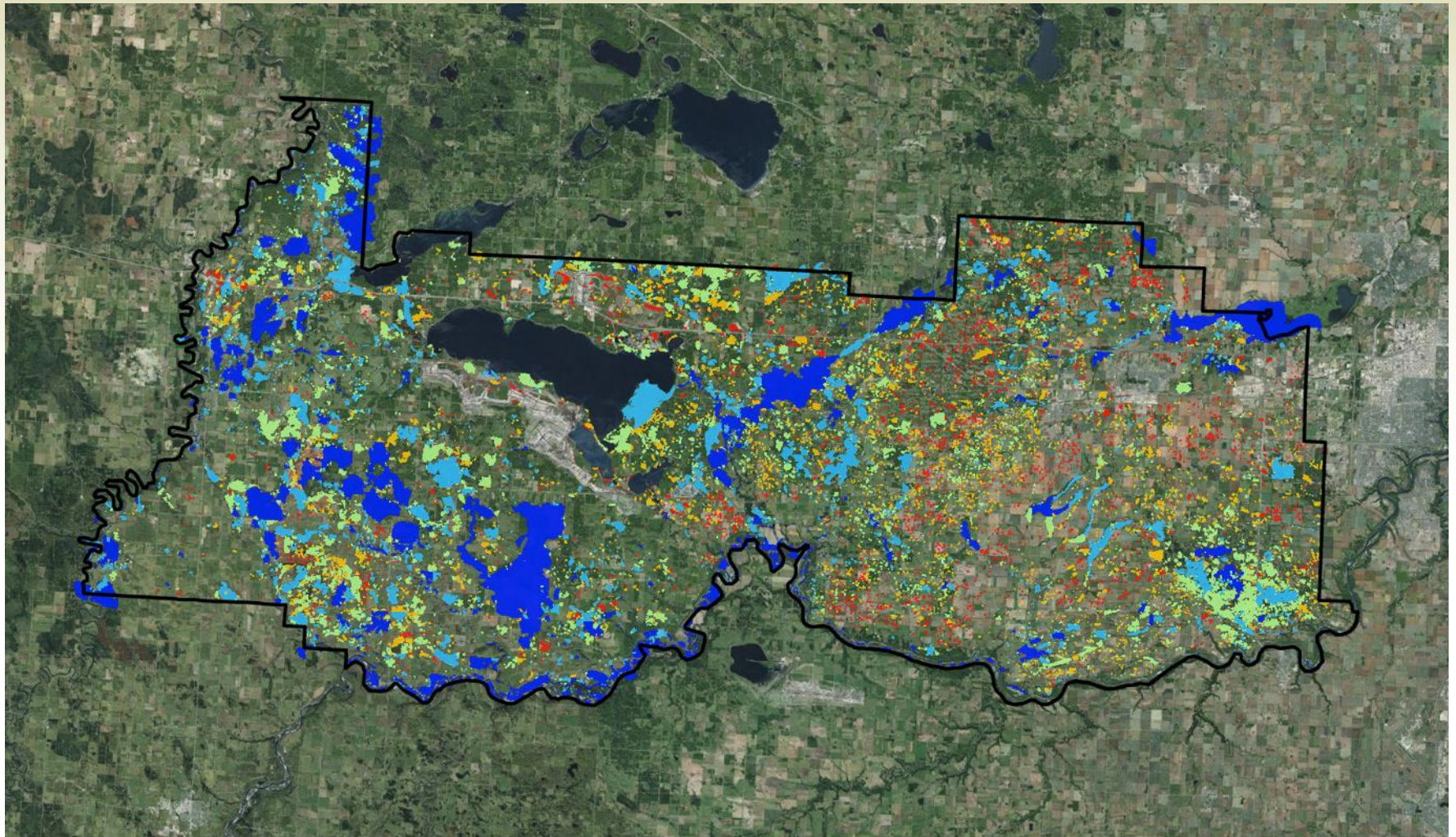
- Minimal disturbance within & near the wetland
- Close to other undisturbed natural areas
- Close to other wetlands

CRITERION 3: Hydrologic Function & Water Quality Improvement

Wetlands with a high degree of hydrologic function:

- Wetlands that store water and reduce flooding
- Wetlands that are hydrologically connected to other aquatic habitats
- Wetlands that intercept sediment & nutrients

RESULTS: Wetland Ecological Value



Parkland County: Wetland Ecological Value
FINAL AGGREGATED SCORE



0 2.5 5 10 15 20 KM

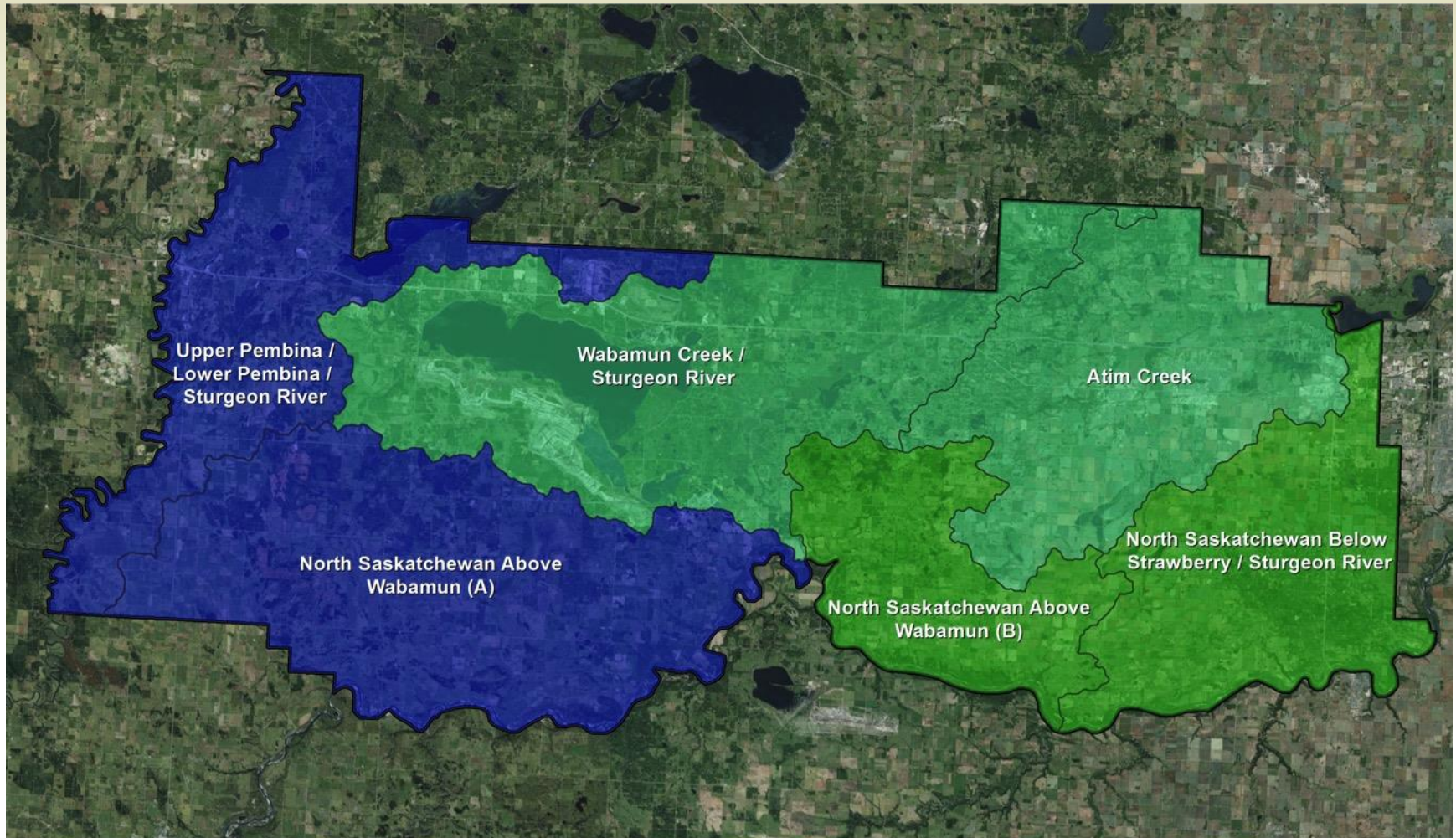


RESULTS: Wetland Ecological Value

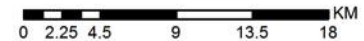
- Within Parkland County 6% of wetlands assessed for ecological condition were “Excellent”
- 57% of all wetlands within Parkland County were assigned either “Poor” or “Moderate” scores
- Watershed units in the western portion of the County had a higher proportion of Excellent wetlands



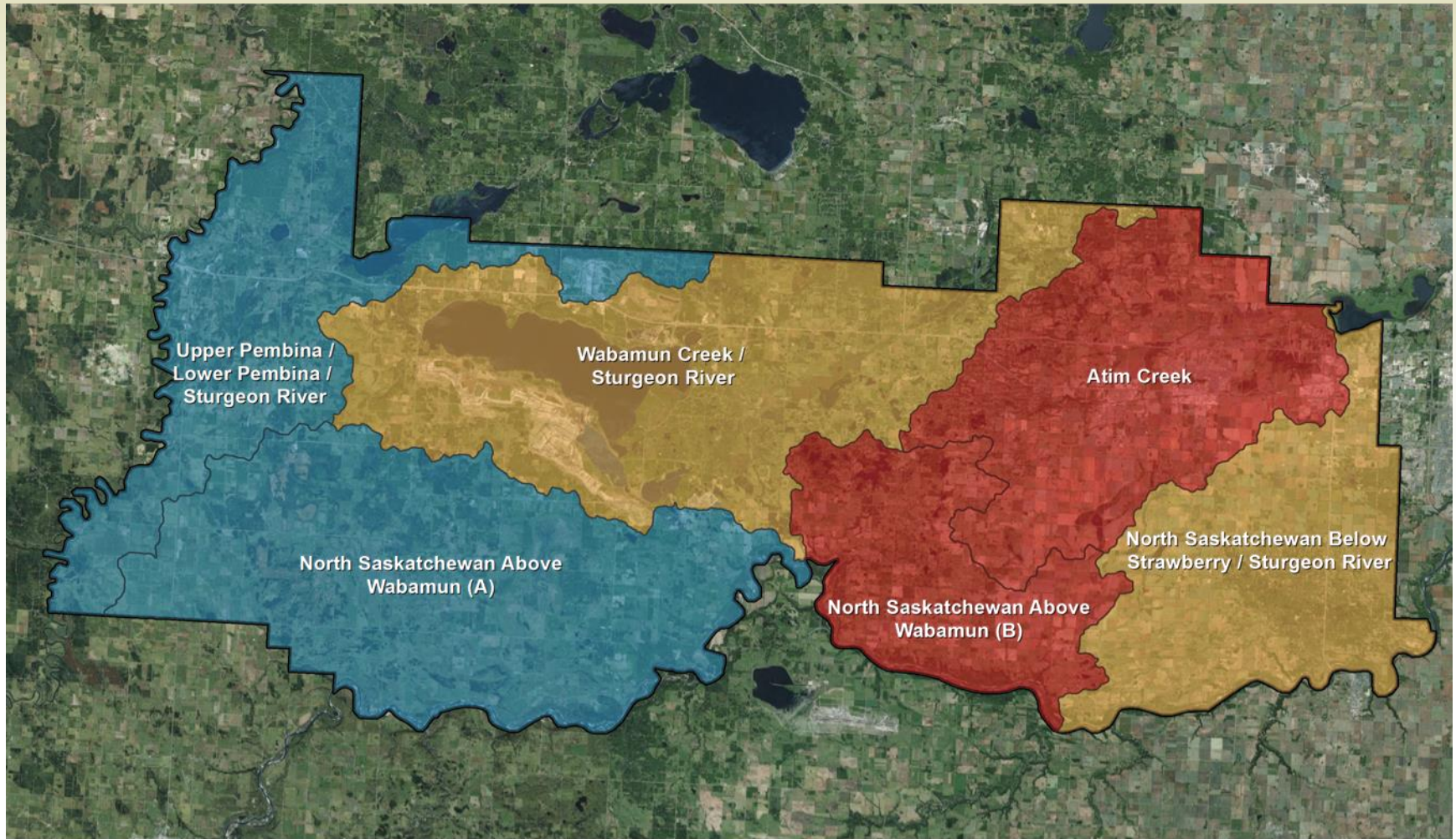
RESULTS: Wetland Ecological Value



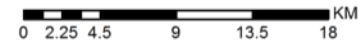
Proportion of Excellent, Very Good & Good Wetlands by Wetland Area (%)



RESULTS: Wetland Ecological Value



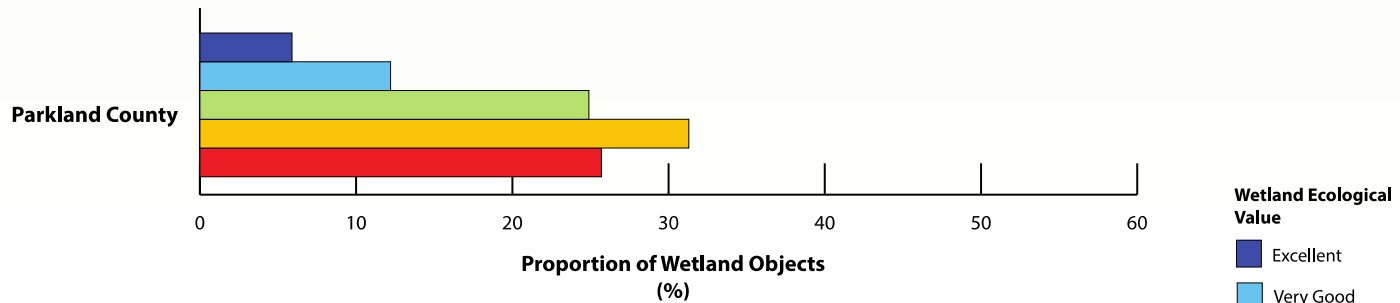
Proportion of Poor and Moderate wetlands by Wetland Area (%)



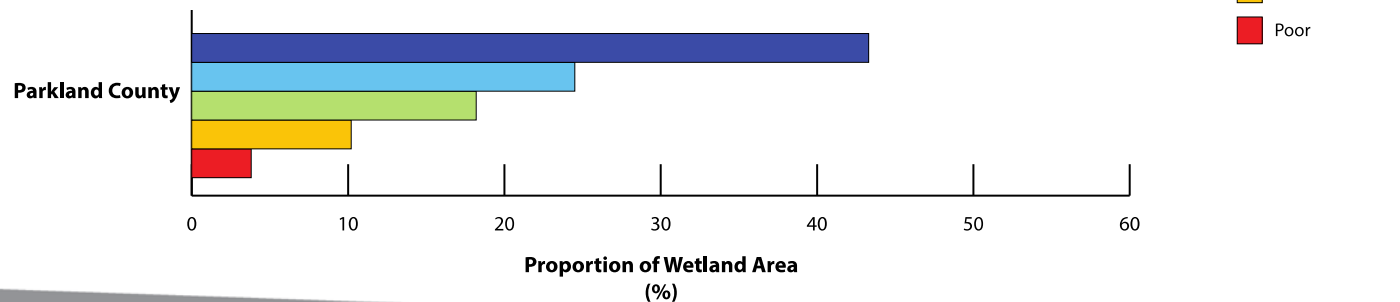
RESULTS: Wetland Ecological Value

- There is a size bias, with larger wetlands generally scoring higher than smaller wetlands
- When ecological condition is summarized by wetland area, 43% of the total wetland area was scored as “Excellent”

Number of Wetlands



Area of Wetlands



STEP 3: Create a Historical Wetland Inventory

Knowing the historical distribution of wetlands is the first step in assessing wetland loss over time

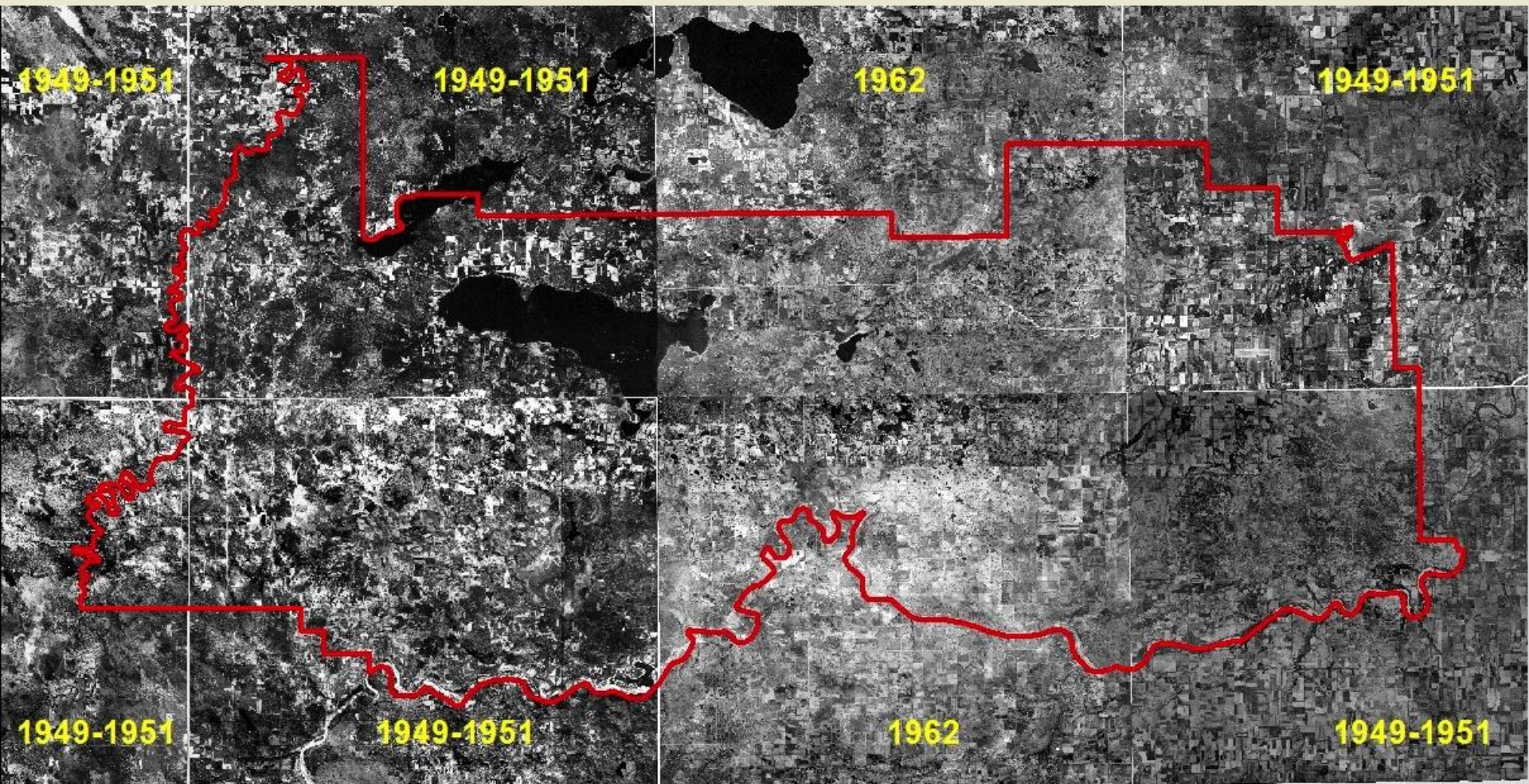


STEP 3: Methods

- Remote sensing techniques were used to automatically identify wetland boundaries from the Alberta Biodiversity Monitoring Institute (ABMI) Historical Orthophoto
- Once boundaries were created, wetlands were identified and extracted by air photo analysts



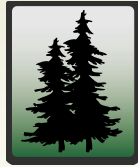
ABMI Historical Orthophoto



RESULTS: Historic Wetland Inventory

circa 1950 Wetland Area

44,514 ha
(62%)



Bog/Fen/Swamp

72,323 ha

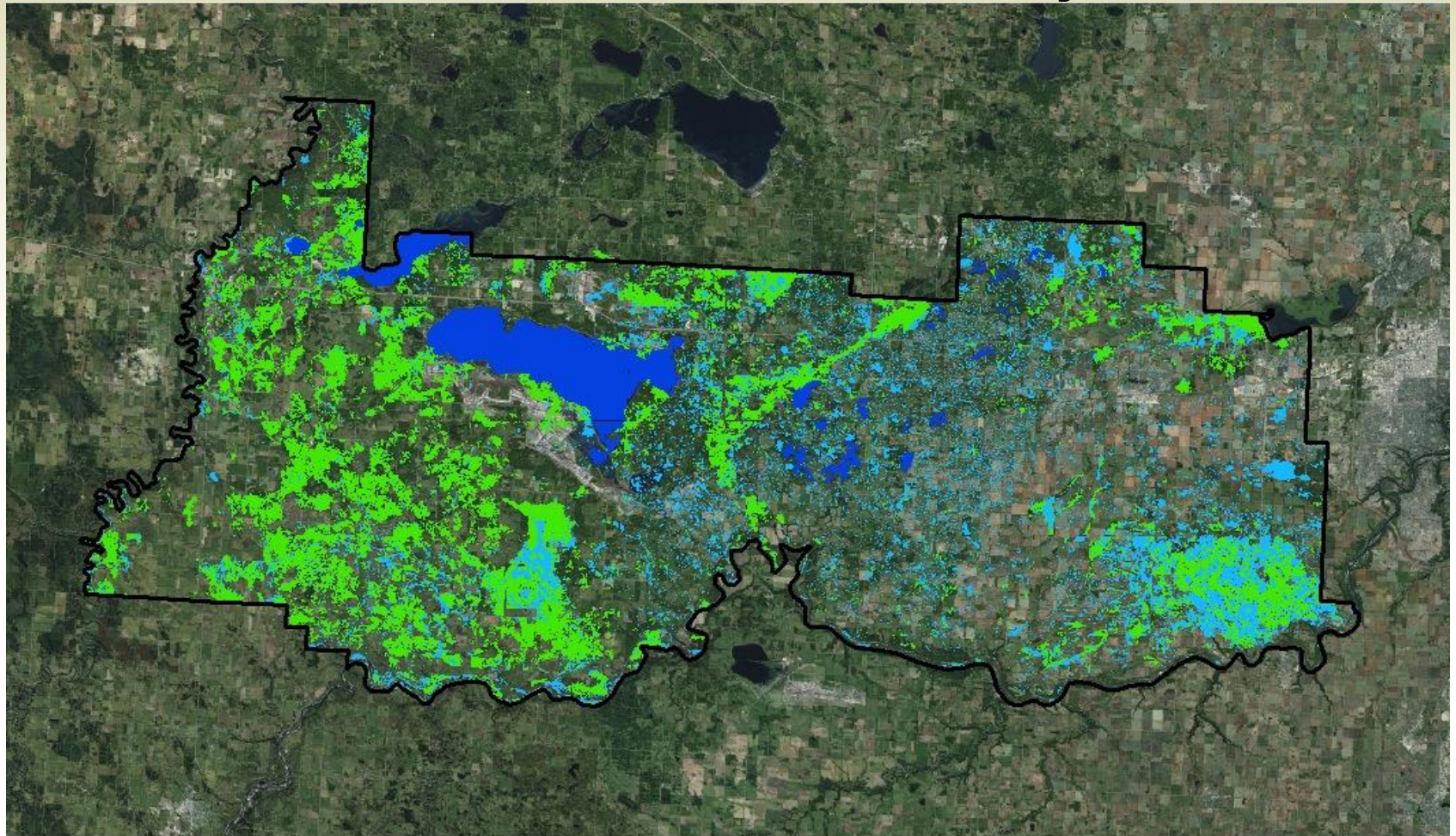


Marsh/Open Water

27,809 ha
(38%)


- The historical extent of wetlands in Parkland County circa 1950 is estimated to be 72,323 ha
- This includes only the area of wetlands that fall completely within Parkland County
- The majority of historic wetlands (62%) were treed wetlands


RESULTS: Historic Wetland Inventory




Parkland County Historic Wetland Inventory

Historic (circa 1950) Wetland Extent

 Bog/Fen

 Marsh/Open Water

 Named Lake

0 2.5 5 10 15 20 KM



STEP 4: Quantify Historic Wetland Loss

Understanding historical loss is critical for:

1. Informing contemporary approaches to wetland management
2. Providing insights into what land uses or activities drive loss in Parkland County
3. Identifying potential locations for wetland restoration

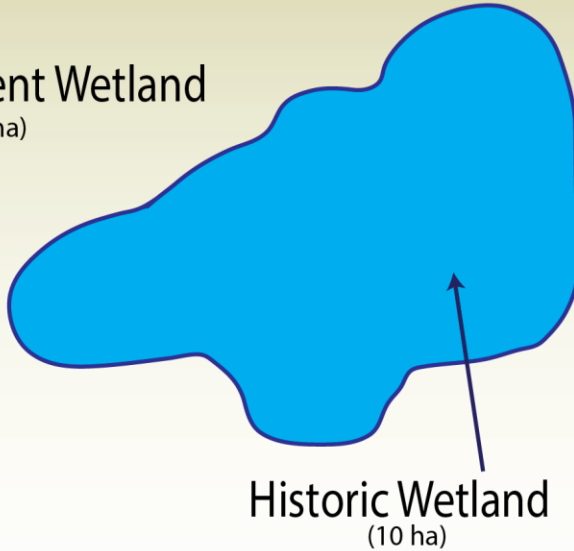
STEP 4: Methods

- Wetland loss within Parkland County was quantified by comparing the *Current* Inventory to the *Historic* Inventory
- Any areas where there was a change in area $>40\%$ was identified and used in the calculation of historic loss
- Change was characterized as either complete or partial loss, and summarized by wetland type



A) Complete Loss

No Current Wetland
(0 ha)



Loss Calculation:

Current (0 ha) - Historic (10 ha)

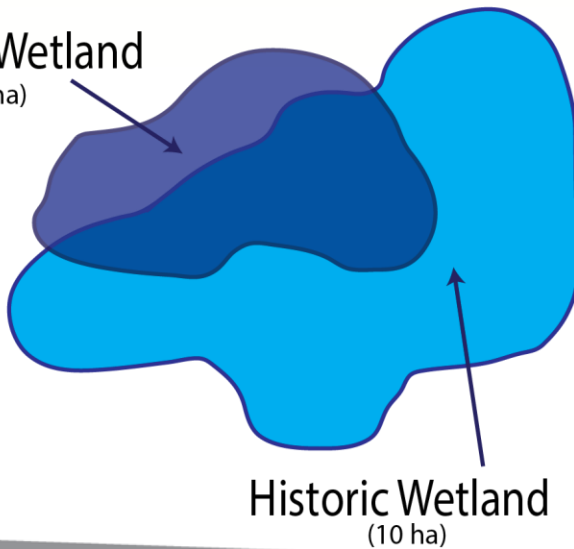
Complete Area Loss: 10 ha

Proportion of Loss: 100%



B) Partial Loss

Current Wetland
(2 ha)

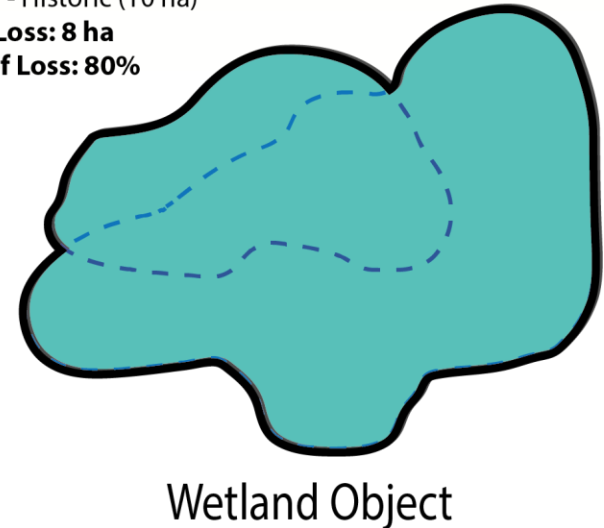


Loss Calculation:

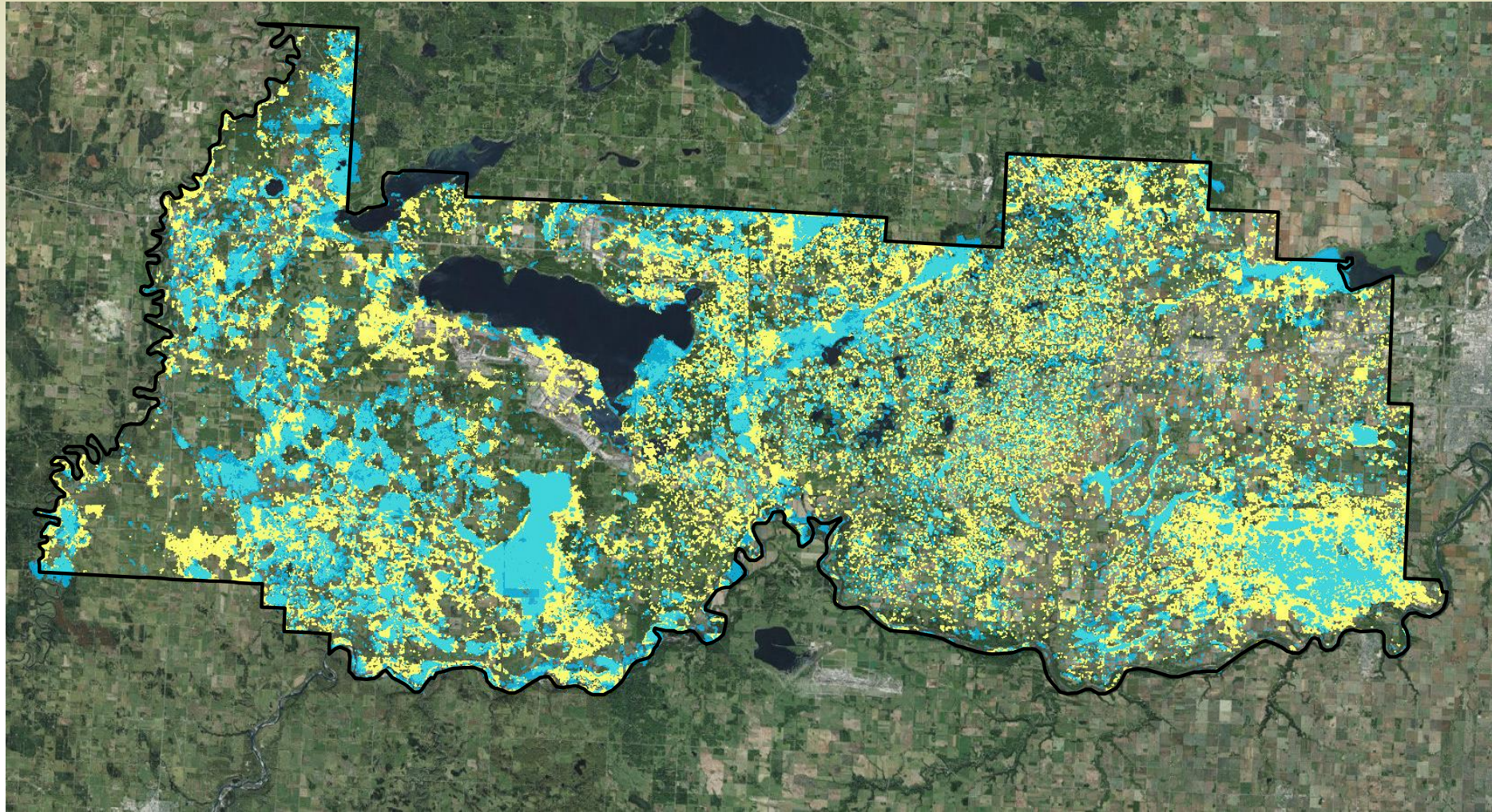
Current (2 ha) - Historic (10 ha)

Partial Area Loss: 8 ha

Proportion of Loss: 80%




RESULTS: Historic Wetland Loss Assessment



Comparison of Historic & Current Wetland Extent

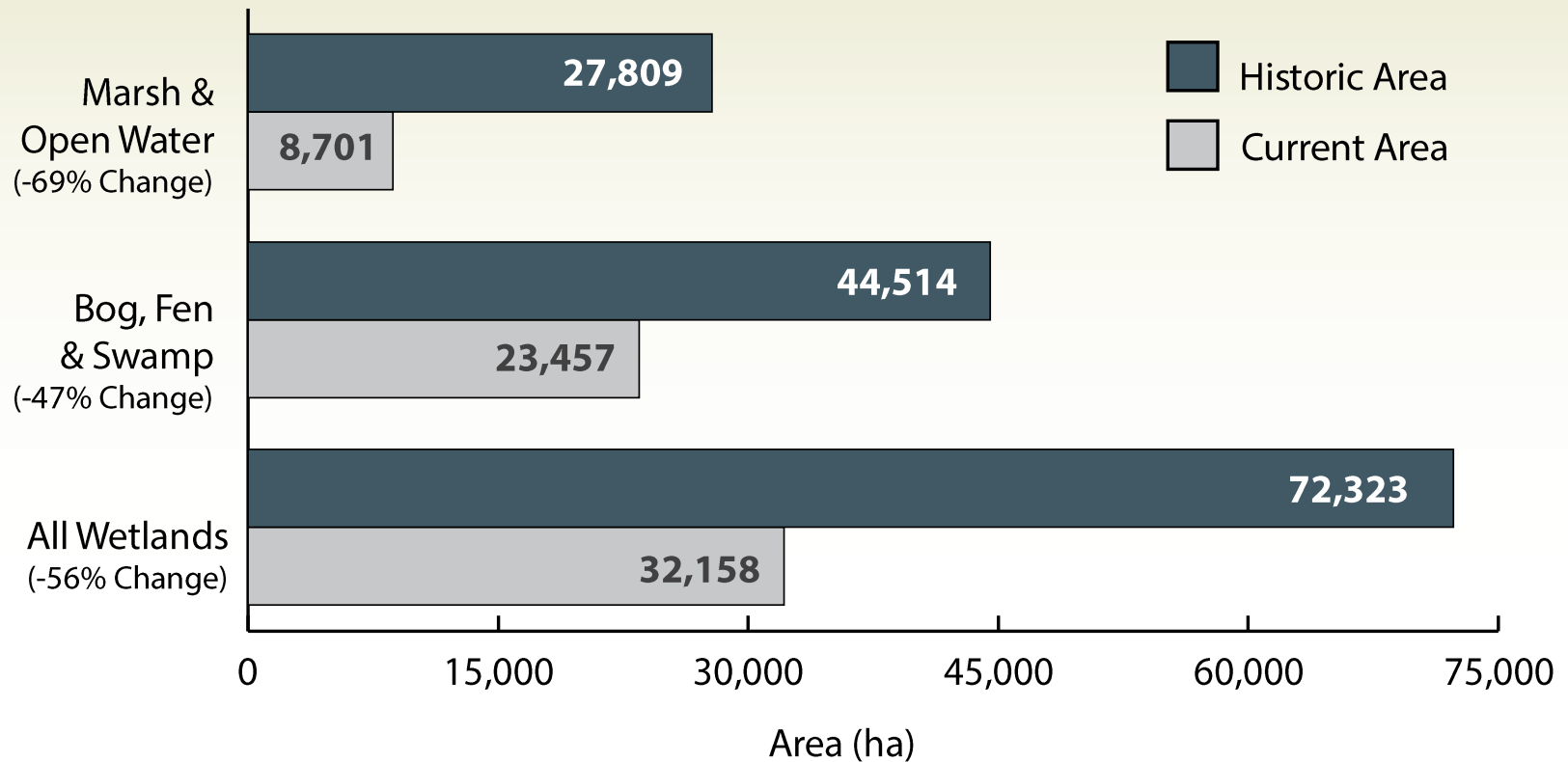
 Current (2013) Wetland Extent

 Historic (circa 1950) Wetland Extent

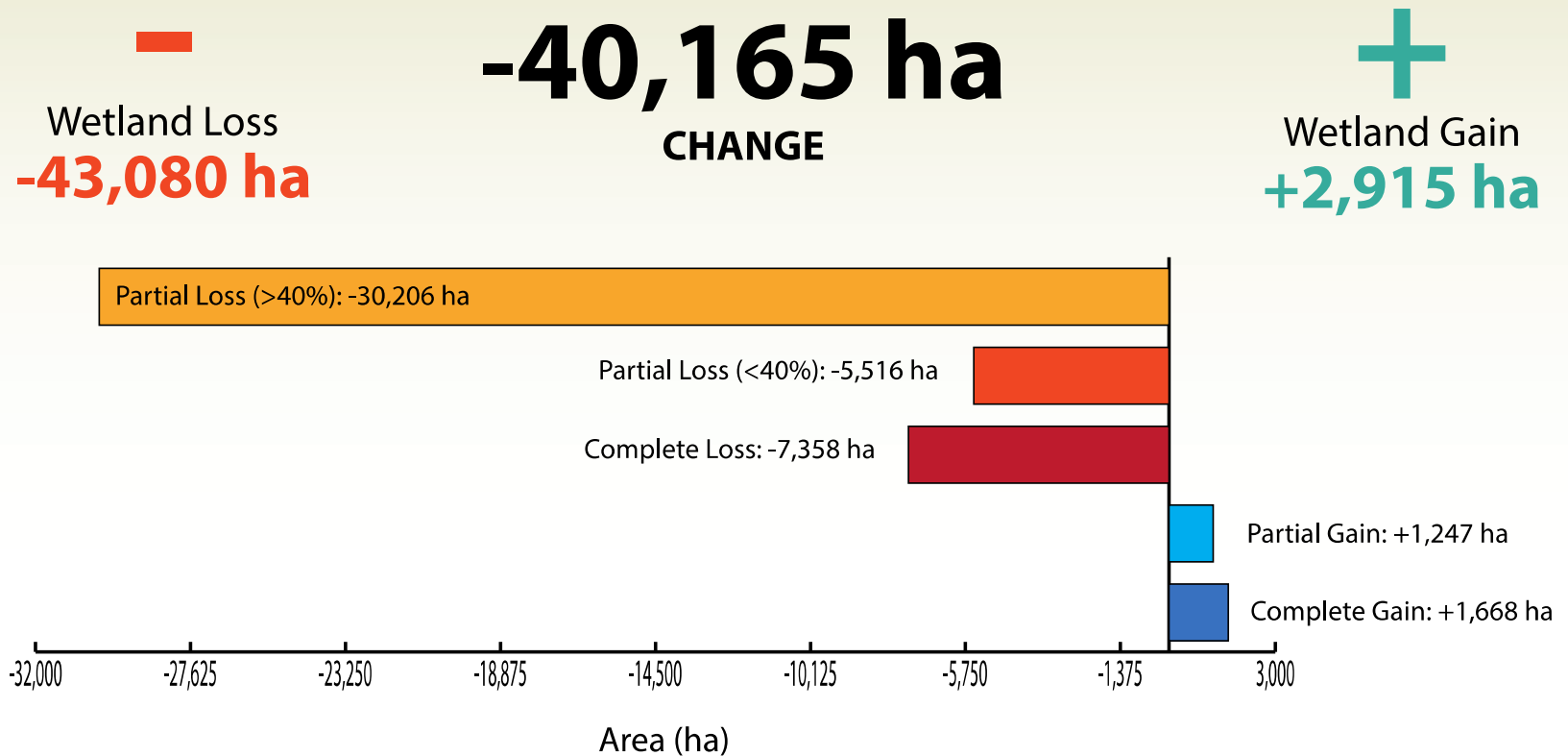
0 2.25 4.5 9 13.5 18 KM



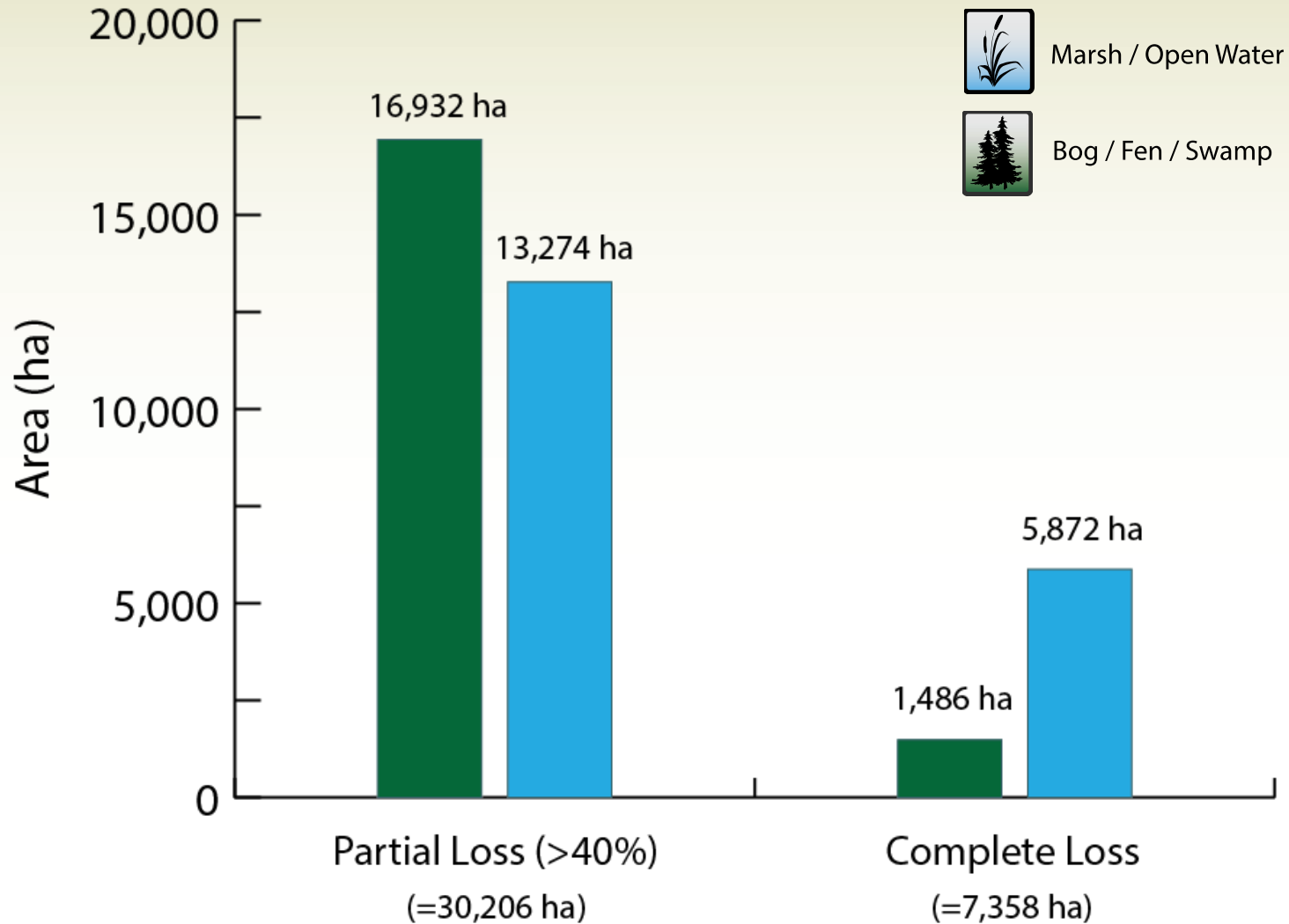
RESULTS: Historic Wetland Loss Assessment



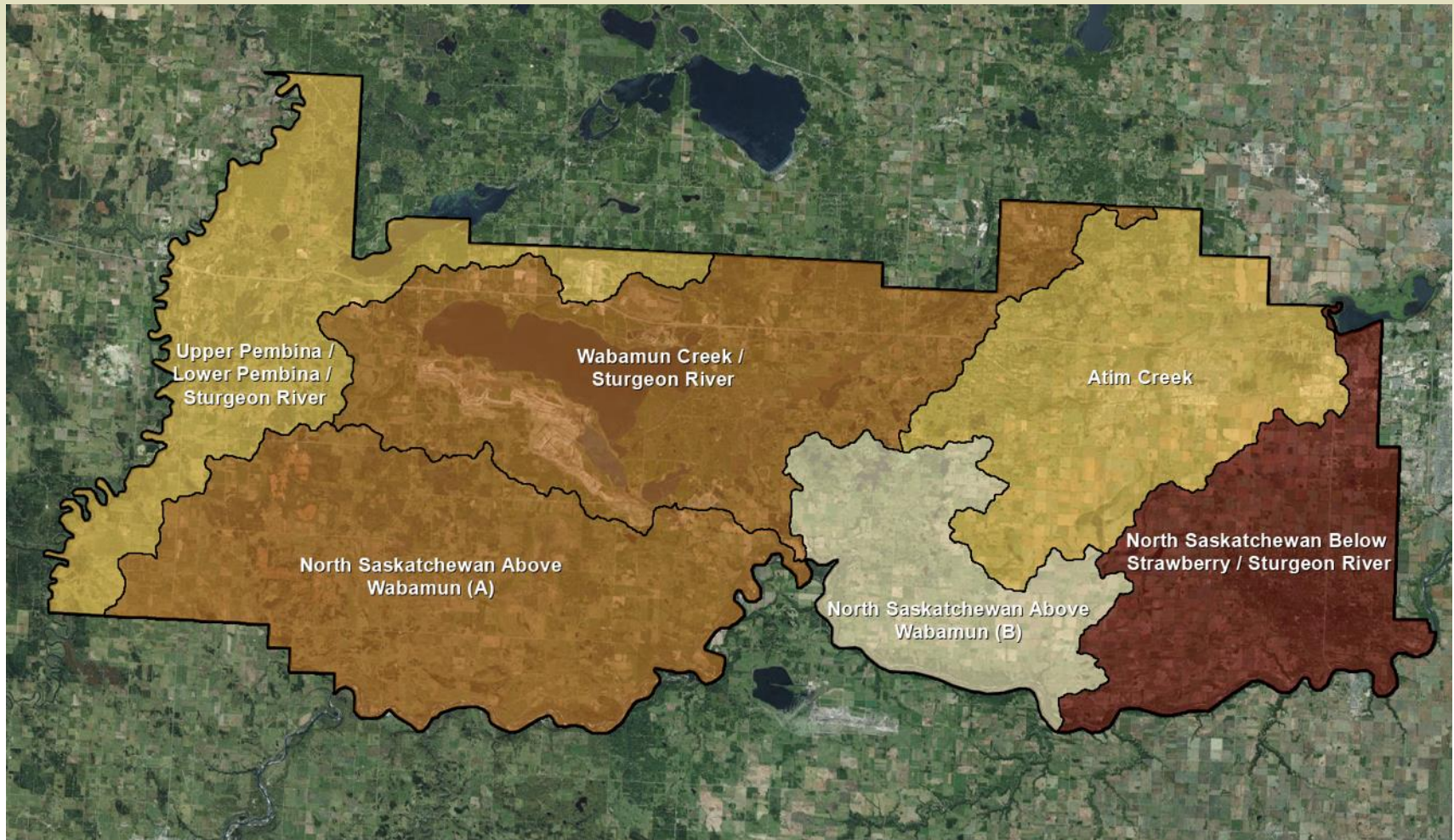
RESULTS: Historic Wetland Loss Assessment



RESULTS: Historic Wetland Loss Assessment



RESULTS: Historic Wetland Loss Assessment

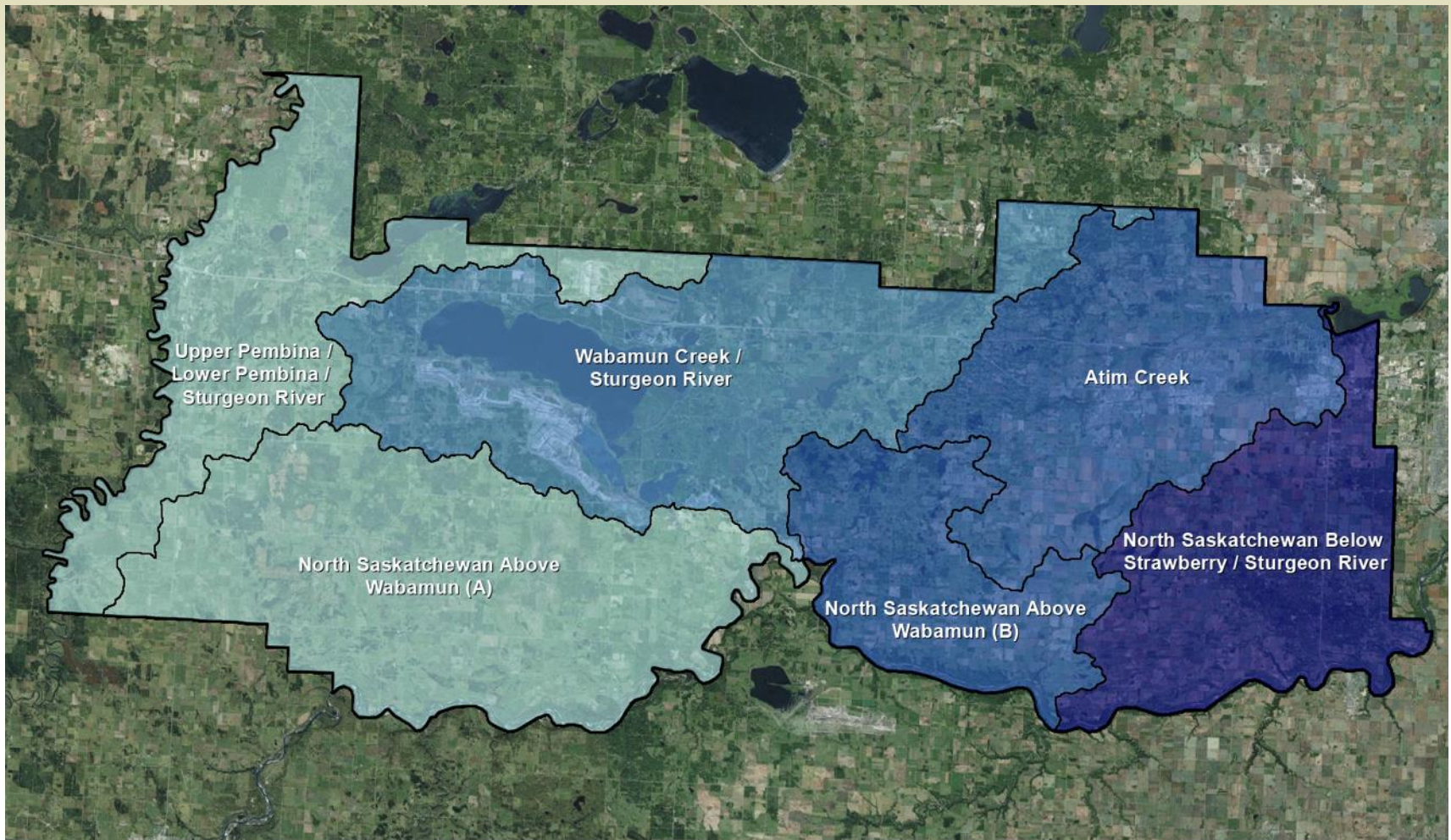


Complete and Partial (>40%) Wetland Loss by Watershed Unit
(Loss/ha)

0 2.25 4.5 9 13.5 18 KM



RESULTS: Historic Wetland Loss Assessment



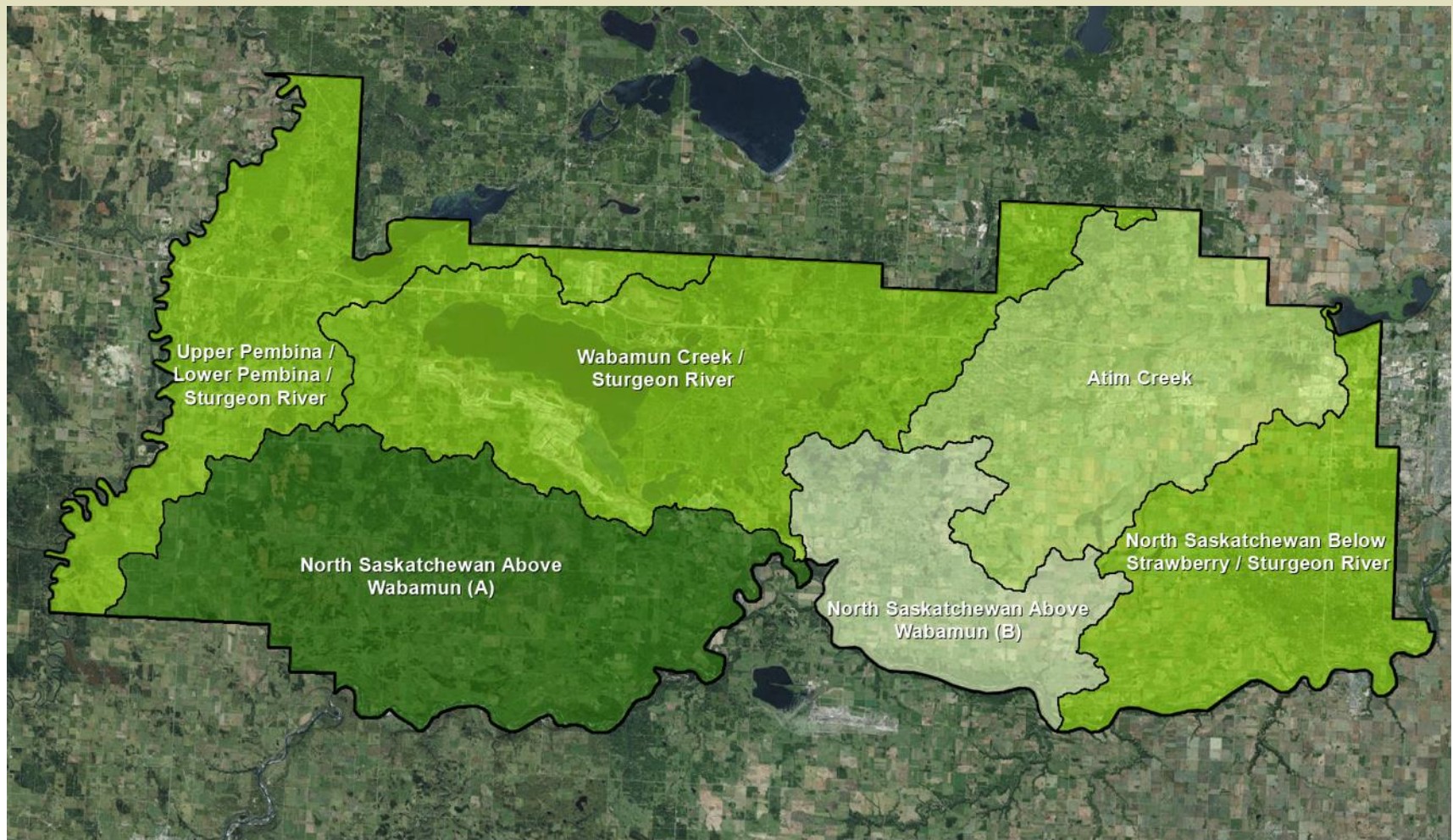
Complete & Partial (>40%) Loss of Marsh & Open Water Wetlands by Watershed Unit
(Loss/ha)



0 2.25 4.5 9 13.5 18 KM



RESULTS: Historic Wetland Loss Assessment



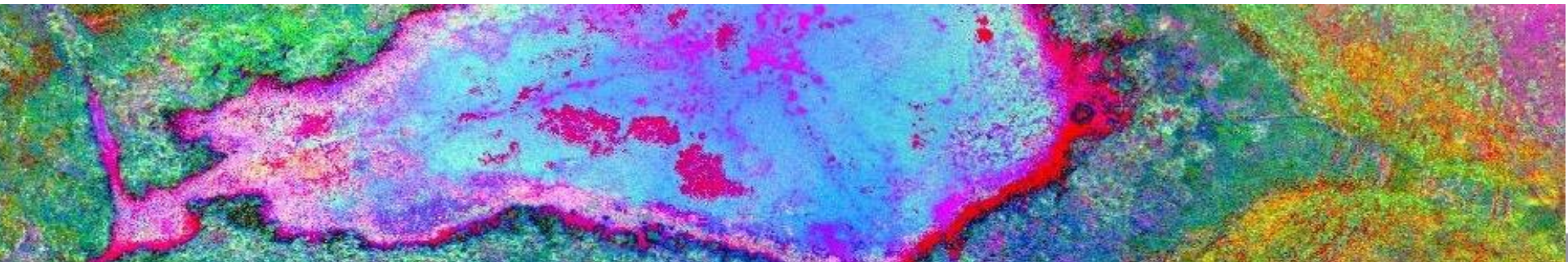
Complete and Partial (>40%) Loss of Bog, Fen & Swamp Wetlands by Watershed Unit
(Loss/ha)

0 2.25 4.5 9 13.5 18 KM



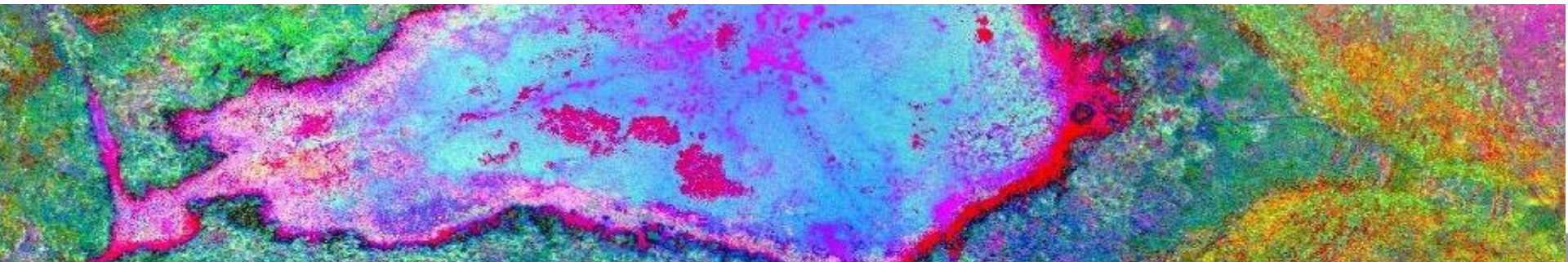
CONSIDERATIONS

- There was no field work associated with this study, and as a result, there was no verification of results
- Consequently, it is important that future work include verification and ground truthing to ensure that wetland locations, boundaries and ecological value scores are accurate



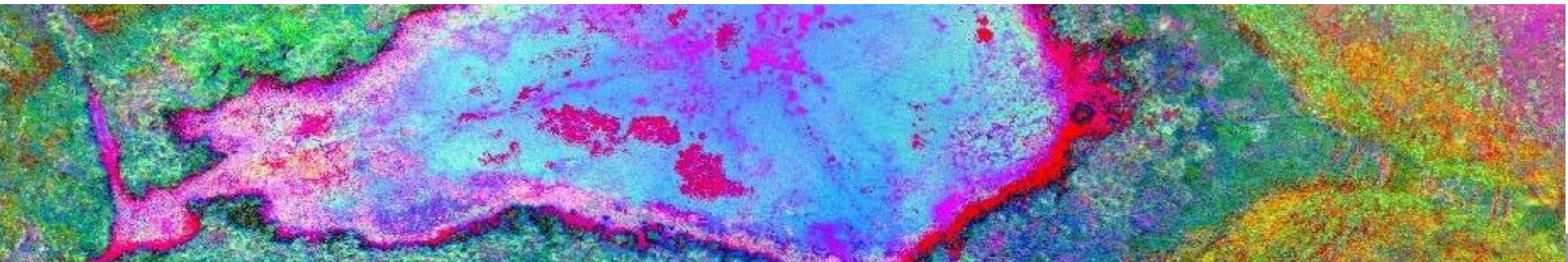
CONCLUSIONS

- There has been an estimated 56% change in wetland area in Parkland County between circa 1950 and 2013
- Wetland losses have been primarily driven by partial losses of treed wetlands and complete losses of marsh and open water wetlands
- Wetlands classified as “Excellent” or “Good” Ecological Value are good candidates for conservation
- Wetlands classified as “Poor” or “Moderate” are good candidates for restoration
- Improving the condition of remaining wetlands, and restoring wetlands that have been lost, will ultimately improve the overall ecological and hydrological condition of the watersheds within the County



NEXT STEPS

- **This study provides information about the location, extent and magnitude of wetland loss in Parkland County that can be used for land management decisions**
- Prioritize areas for conservation through:
 - Integrated Community Sustainability Plan development
 - Municipal Development Plan development
- Target restoration efforts through:
 - Alternative Land Use Services Program
 - Green Acreages Program
- Wetland Policy development
- Provide important baseline information that can be used to track change in wetland area and value into the future



Questions?



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