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Wetlands

Development of a Functional Matrix

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Agenda

- Introduction
- Purpose
- Regulations
- Development
- Example wetland assessment
- Application

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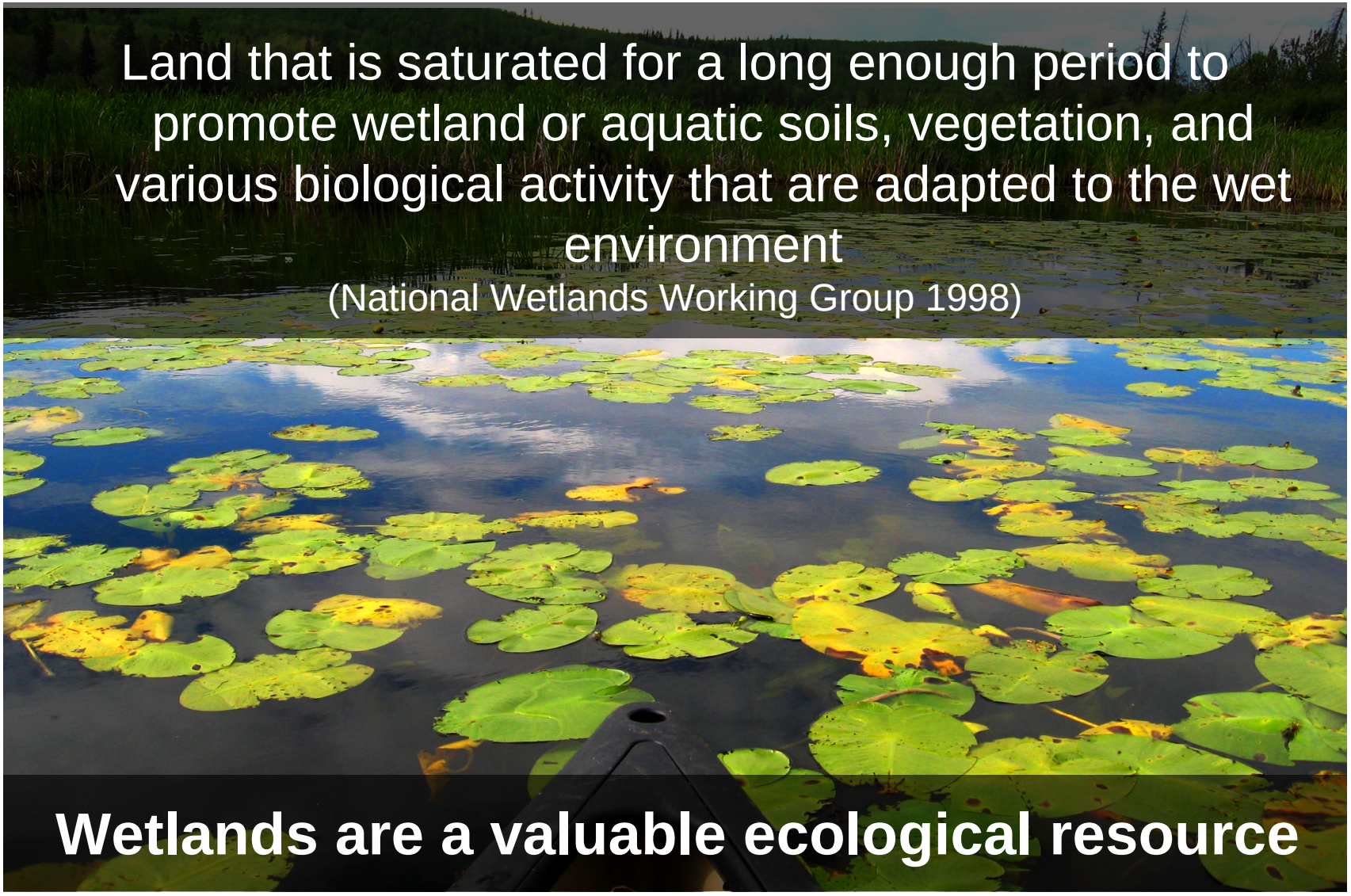
Introduction



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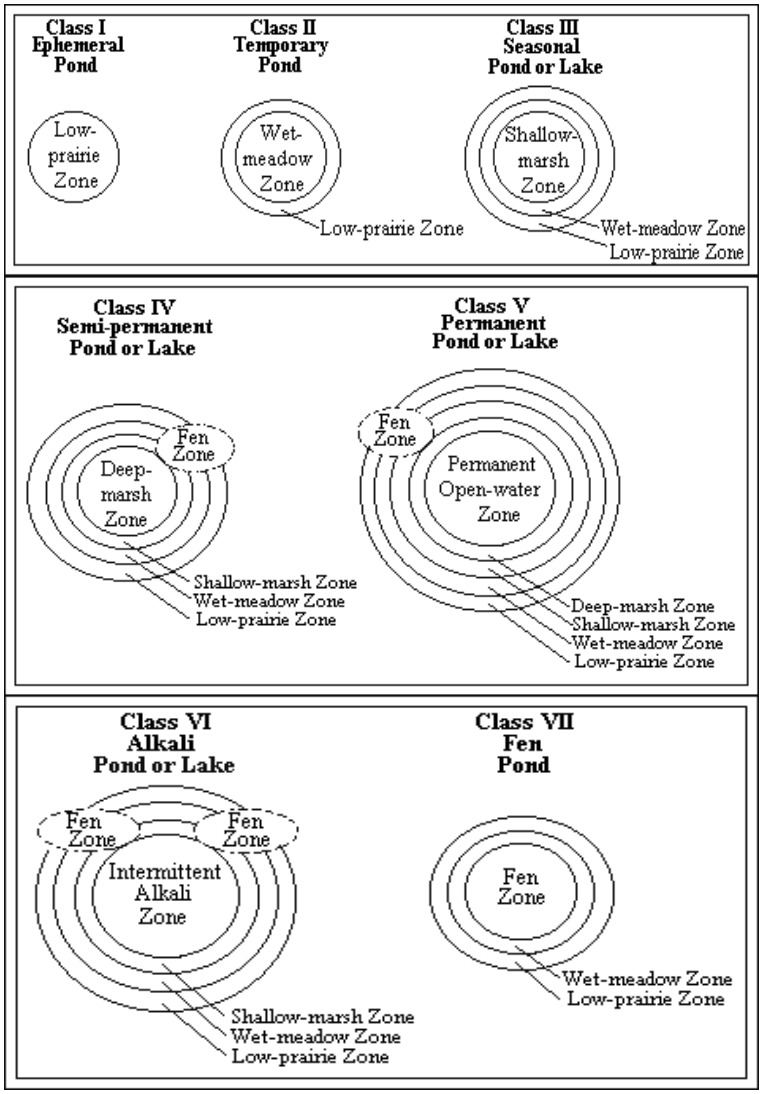
Wetland Classification

Classification of natural ponds and lakes in the glaciated prairie region

(Stewart and Kantrud 1971)

- Wetland Classes
  - Class I - Ephemeral Wetlands
  - Class II - Temporary Wetlands
  - Class III - Seasonal Ponds and Lakes
  - Class IV - Semi-permanent Ponds and Lakes
  - Class V - Permanent Ponds and Lakes
  - Class VI - Alkali Ponds and Lakes
  - Class VII - Fen Ponds



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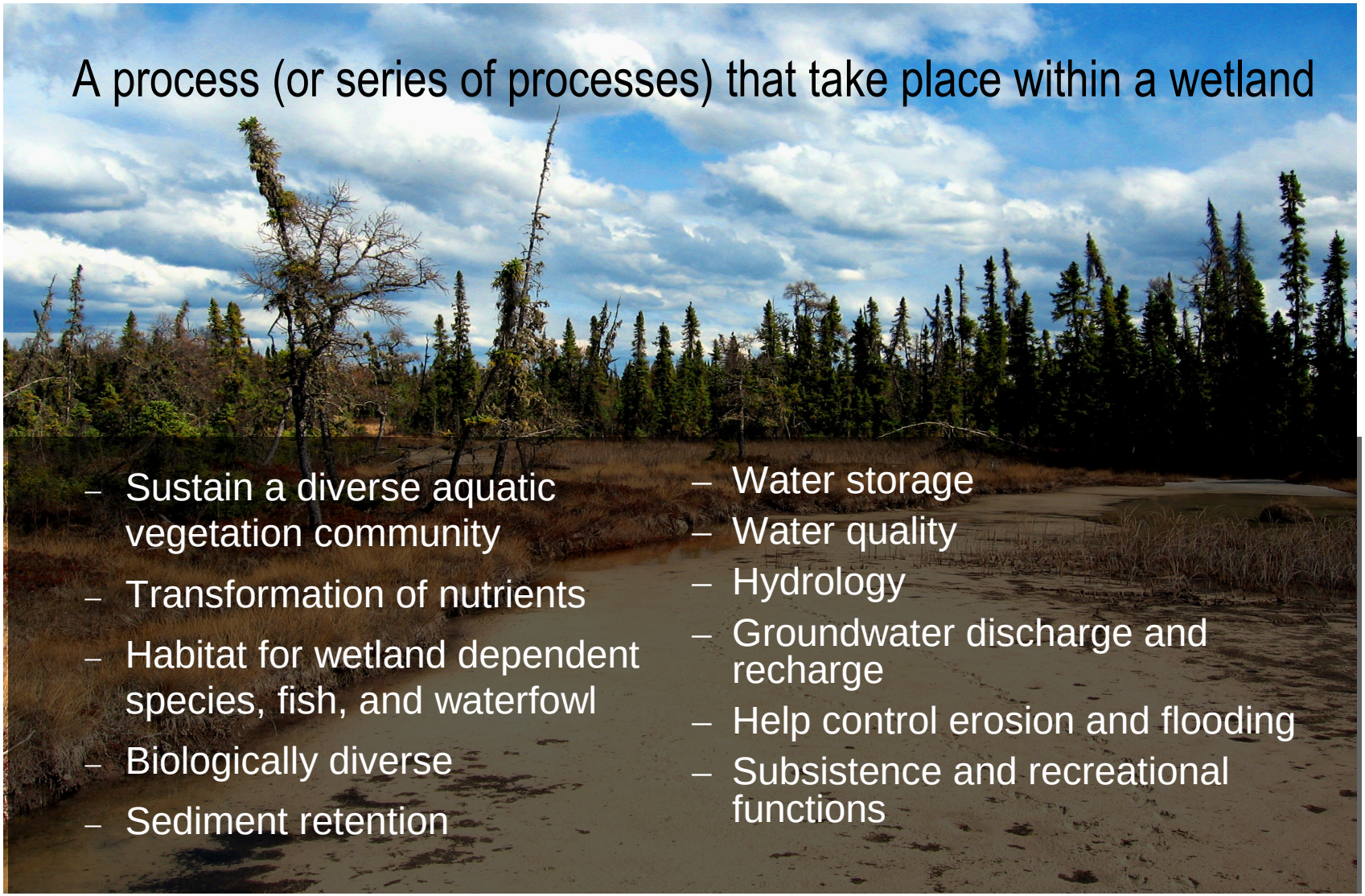
What is a wetland function?



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Evaluating Function

- Evaluating function is difficult
  - How do you put a number value on a function?
  - Are some functions more important then others?
  - How do you evaluate or rank the function?
  - Not all wetlands serve all functions, nor do they perform them equally well

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Purpose

- Wetland Functional Matrix - Developed to evaluate function
  1. Define wetland functions
  2. Developed a way to measure
  3. Rank each function on a numerical scale
- An effective assessment tool to determine:
  - what functions the wetland is providing;
  - how well; and
  - if there are any deficiencies effecting functional ability
- Why we developed our Matrix
  - Government and agencies need a tool to assess wetland function
  - Evaluating function is a critical step in understanding why wetlands are so important to the ecosystem
  - Shift from compensating for Area lost towards Function lost
  - City of Calgary Wetland Conservation Plan (2004) Biophysical Impact Assessment requirement (2010)
    - Functionally evaluate wetlands
    - Required to compensate for wetland loss of function

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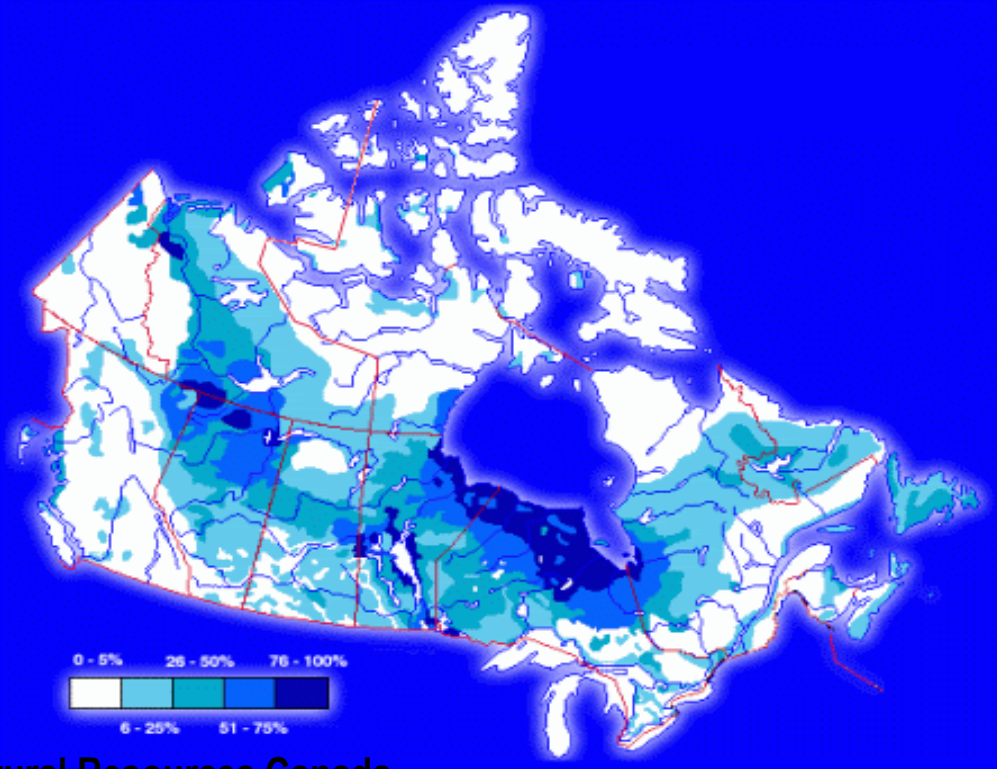
Wetland Regulations

~ 14% of Canada and ~ 21% of Alberta is covered by wetlands



Natural Resources Canada

Ramsar Convention on Wetlands
(1981)

Environment Act
Federal Policy On Wetland Conservation (1991)

Fisheries Act
Policy for Management of Fish Habitat (1986)

Canada

Regulatory

- Water Act
  - Framework for Water Management Planning (2000)
- Wetland management in the settled area of Alberta
  - Interim Policy (white zone, 1993)
- Draft policy for managing Alberta's peatlands and Non-settled areas wetlands (green zone, 1993)
- Water for Life: Alberta's Strategy for Sustainability (2003)
- Alberta Wetlands: A Law and Policy Guide (Kwasniak 2002)
- Guidelines for Wetland Establishment on Reclaimed Oil Sands (2007)
- The Provincial Wetland Restoration/Compensation Guide (2007)
- Provincial wetland policy being developed

Alberta

Regulatory


No Net Loss
Restoration
Enhancement
or Creation
Compensate for **loss of function**
City of Calgary
Wetland Conservation Plan (2004)

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Wetland Assessments

- **Many evaluation methods**
  - **Not all evaluate function**
- **Function Based**
  - **Wetland Evaluation Technique (**Adamus 1983; Adamus and Stockwell 1983; revised in 1987**)**
  - **Environmental Monitoring Assessment Program-Wetlands** (EMAP-Wetlands 1988)
  - **Functional Assessment Hydrogeomorphic (HGM) Approach** (U.S. Army Corps of Engineers 1990)

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Wetland Functional Matrix

- Defined all the functions a wetland is capable of performing
- Scientific evaluation of optimal conditions
- Qualified discipline specialists provide quantitative effectiveness ranking
- Quantitative and Qualitative
  - comparisons and professional judgment
  - where required and appropriate

How we developed our Matrix

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Wetland Functions

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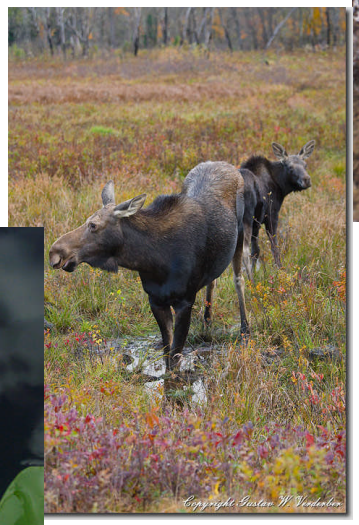
Wetland Functions - Biological

- Vegetation Community
- Fish and Aquatics
- Wildlife mammals and amphibians
- Water fowl and water birds
- Species at Risk in Alberta
- Biodiversity



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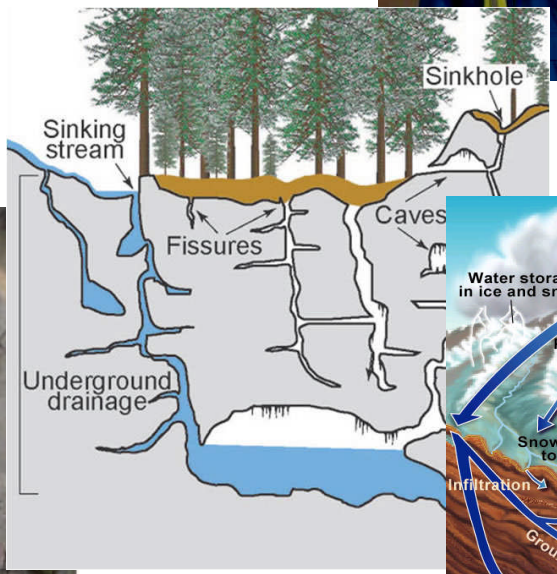
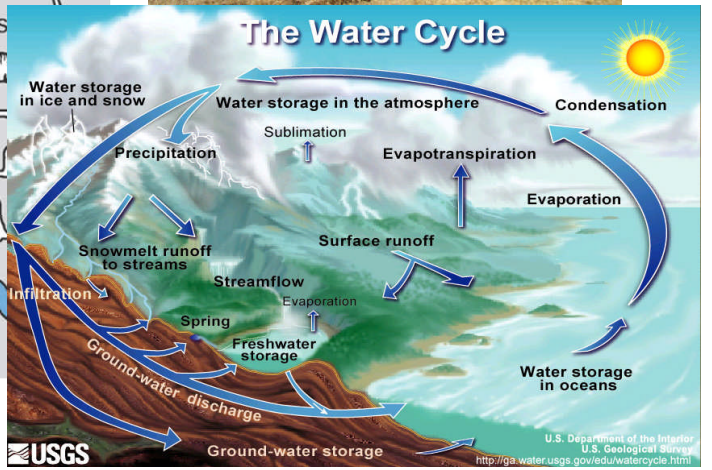
Wetland Functions - Hydrological

- Sediment retention
- Water Quality
- Surface water
- Groundwater
- Flood control
- Hydrologic cycle





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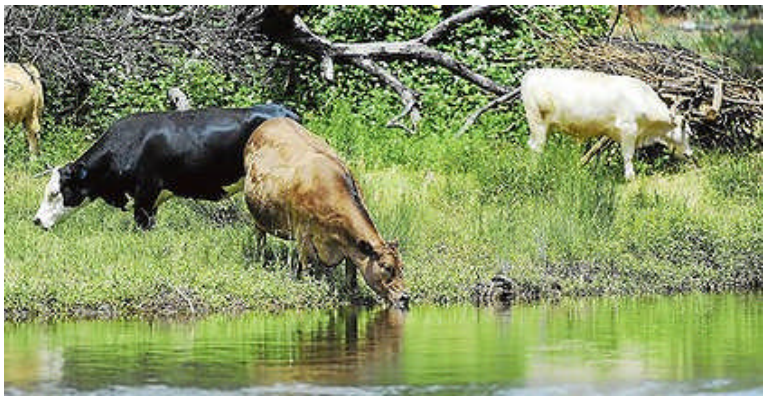
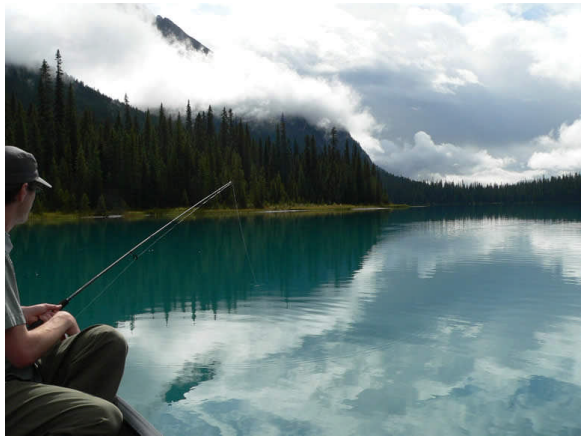
Wetland Functions – Socio-Economic

- Consumptive
- Non-consumptive





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Wetland Functional Assessment Matrix

1. Existing wetland areas were classified and delineated
2. Functionally evaluated using a Functional Assessment Matrix
3. Assigned Functional Points
4. Multiplied by wetland size to give Functional Unit

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Compare similar wetlands

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Example Matrix Condensed

Functional Category	Primary Descriptor	Secondary Descriptor	Evaluation Indices	A or N/A	Functional Point	Rank	Out of
Biological Functions							
Vegetation Community	Non-native and invasive species presence	Indicative of wetland health as non-native and invasive species establish in disturbed areas and can quickly degrade the ecosystem and native plant communities. Refer to the Alberta Weed Control Act and the Native Plant Revegetation Guidelines for Alberta. .	Percent cover	A	No invasive species = 4 1% cover invasive species = 3 1-15% cover invasive species = 2 > 15% cover invasive species = 0	2	4
Fish and Aquatics	Habitat corridors	Habitat corridors or channels that link to other aquatic habitats sustaining the successive life stages. Includes fish migration corridors or streams and flooding events from spring freshet or periods of high precipitation	Habitat assessment of key site characteristics	NA	Yes, corridors = 4 Yes, flooding events = 2 No, isolated = 0	NA	NA
Water fowl and water birds	Habitat for waterfowl migration	Resting and staging	Habitat assessment of key site characteristics Presence / absence Waterfowl present	NA	Yes = 4 No = 0	NA	NA
Species at Risk in Alberta	Documented/observed use by any species listed by ANHIC		Desktop study Presence / absence	A	Globally Rare (G1, G2, G3)= 4 Provincially Rare (S1, S2, S2S3) = 3 Provincial Watch List (S3) = 2 No Listing = 0	0	4
Biodiversity	Sustains a species rich avian community		Number of species Assessed by a wildlife specialist	A	Numerous species (>20) = 4 Moderate numbers (20-10) = 3 Few species (<10) = 2 No birds observed = 0	2	4

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Example Matrix Condensed

Functional Category	Primary Descriptor	Secondary Descriptor	Evaluation Indices	A or N/A	Functional Point	Rank	Out of
Hydrological Functions							
Sediment retention	Soil conservation through water filtration	The sediments from runoff is filtered, trapped and stored by riparian vegetation. This improves water quality and clarity, builds soil bank which stores moisture and provides areas for plant growth	Percent of wetland surrounded by riparian area 100% riparian	A	100% = 4 99 - 50% = 3 49 - 25% = 2 <25%= 1 None = 0	4	4
Water Quality	Absorbs nutrients	Excessive nutrients in runoff (like phosphorus and nitrogen) are filtered and absorbed by plants and microorganisms in riparian areas. This prevents build-up which can cause algal blooms	Area of high nutrients in close proximity Percent of wetland surrounded by source Cropland surrounding	A	100% = 4 99 - 50% = 3 49 - 25% = 2 <25%= 1 None = 0	4	4
Hydrology	Water storage	Provides surface water for humans and wildlife. Permanence of wetland throughout the seasons increases the quantity of water available as surface water	Permanence of wetland Seasonal wetland	A	Permanent = 4 Semi-permanent = 3 Seasonal = 2 Temporary= 1 Ephemeral = 0	2	4
Groundwater Recharge	Recharge aquifers	Wetlands trapping spring and snowmelt flood waters and release them replenish groundwater supplies	Determine if the wetland is connected to a groundwater through water quality and hydrology data No sampling done	NA	Likely contributing = 4 Unlikely contributing = 0	NA	NA
Groundwater Discharge	Groundwater discharge to the surface into the wetland	Groundwater seeps to the surface through discharge areas such as wetlands. Helps maintains surface water levels throughout the seasons and during drought	Determine if the wetland is connected to a groundwater through water quality and hydrology data No sampling done	NA	Likely contributing = 4 Unlikely contributing = 0	NA	NA

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Example Matrix Condensed

Functional Category	Primary Descriptor	Secondary Descriptor	Evaluation Indices	A or N/A	Functional Point	Rank	Out of
Flood control	Moderate the impacts of floods	Plants and soil slow down and capture of flood waters preventing flood erosion and damage	Permanence of wetland Seasonal wetland	A	Permanent = 4 Semi-permanent = 3 Seasonal = 2 Temporary= 1 Ephemeral = 0	2	4
Hydrologic cycle	Influences local weather through evaporation, precipitation, transpiration and condensation	Wetlands warm and cool at reduced rates compares to terrestrial areas. This helps to moderate local temperature extremes. Evaporation of wetland water through evaporation also provides more local precipitation, benefitting agriculture	Permanence of wetland Seasonal wetland	A	Permanent = 4 Semi-permanent = 3 Seasonal = 2 Temporary= 1 Ephemeral = 0	2	4
Socio-Economic Functions							
Consumptive	Salinity control in cropland	Wetlands accumulate salts, if disturbed, these salts will spread into adjacent croplands	Percent of wetland surrounded by cropland	A	100% = 4 99 - 50% = 3 49 - 25% = 2 <25%= 1 None = 0	4	4
Non-consumptive	Wetland used for educational training or tours, or scientific research		Desktop study	A	Yes = 4 No = 0	0	4

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Wetland 1

Totals	Unit	Rank
Total Functional Points	Fp	18/36
Total Functional Ratio	Fp/Fp available	0.50
Total Existing Wetland Acreage	Ha	13.25
Functional Units	Fp ha	6.88

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Species at Risk in Alberta	Documented/observed use by any species listed by ANHIC		Desktop study Presence / absence *Nymphaea tetragona* (White water-lily) S1G5	A	Globally Rare (G1, G2, G3)= 4 Provincially Rare (S1, S2, S2S3) = 3 Provincial Watch List (S3) = 2 No Listing = 0	3	4
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Water Quality	Absorbs nutrients	Excessive nutrients in runoff (like phosphorus and nitrogen) are filtered and absorbed by plants and microorganisms in riparian areas. This prevents build-up which can cause algal blooms	Area of high nutrients in close proximity Percent of wetland surrounded by source Isolated wetland surrounded by forest	NA	100% = 4 99 - 50% = 3 49 - 25% = 2 <25%= 1 None = 0	NA	NA
Hydrology	Water storage	Provides surface water for humans and wildlife. Permanence of wetland throughout the seasons increases the quantity of water available as surface water	Permanence of wetland Permanent wetland	A	Permanent = 4 Semi-permanent = 3 Seasonal = 2 Temporary= 1 Ephemeral = 0	4	4
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Non-consumptive	Wetland used for educational training or tours, or scientific research		Desktop study Reference wetland for a monitoring project	A		4	4

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Comparing wetlands

Totals	Unit	Rank – W01	Rank – W02
Total Functional Points	Fp	18/36	45/48
Total Functional Ratio	Fp/Fp available	0.50	0.94
Total Existing Wetland Acreage	Ha	13.25	4.50
Functional Units	Fp ha	6.88	4.22

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- Application of the Matrix
  - Determine what functions the wetland serves
  - Baseline functional ability
  - Compare similar or different wetlands
  - Monitoring programs
    - Long-term trends
  - Restoration projects
    - Restoring certain functions that have been disturbed
    - Enhance functional ability
  - Compensate for wetland functions lost vs. area lost
    - What functions were lost, what should be restored

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- Suggestions for improvements
  - More trials this season
  - Refine assessment descriptors or indices
  - Incorporate statistical analysis
  - Consider a weighting scale for more “valuable” functions

- Contact us for further information

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