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Wetland restoration and policy: Challenges and Opportunities

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Mighty Peace Watershed Alliance

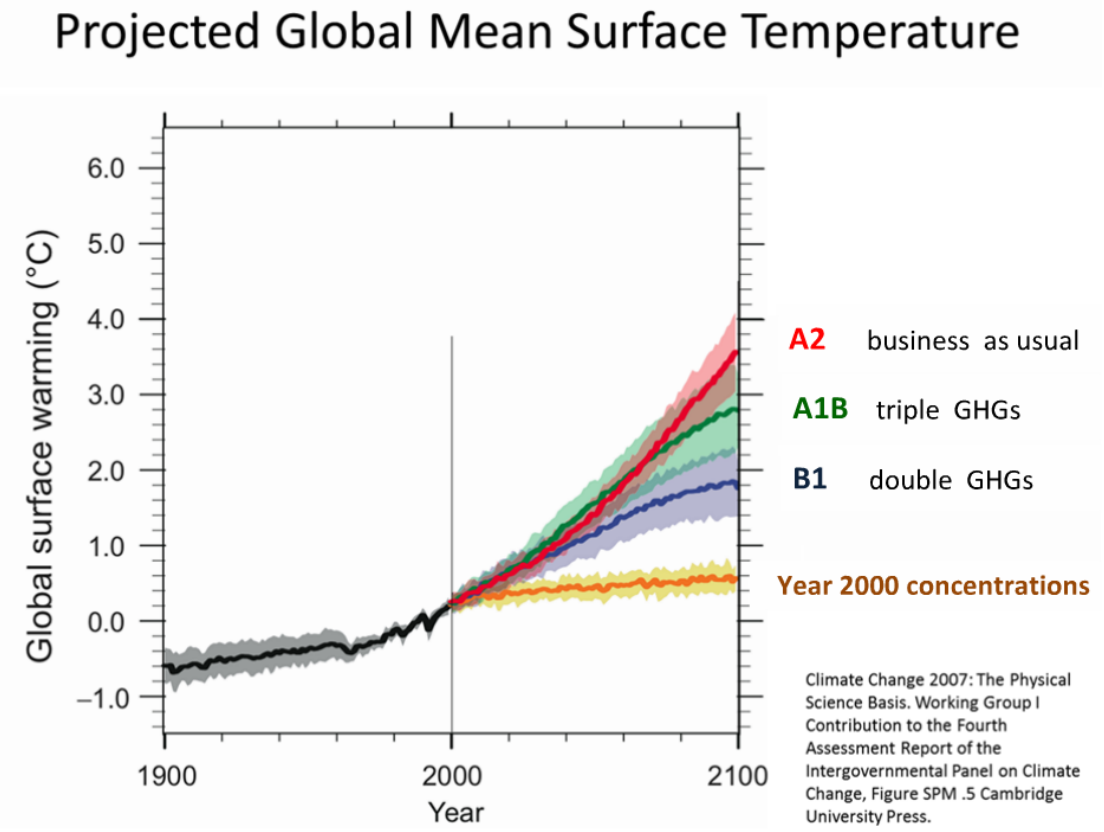
March 19, 2019

Outline

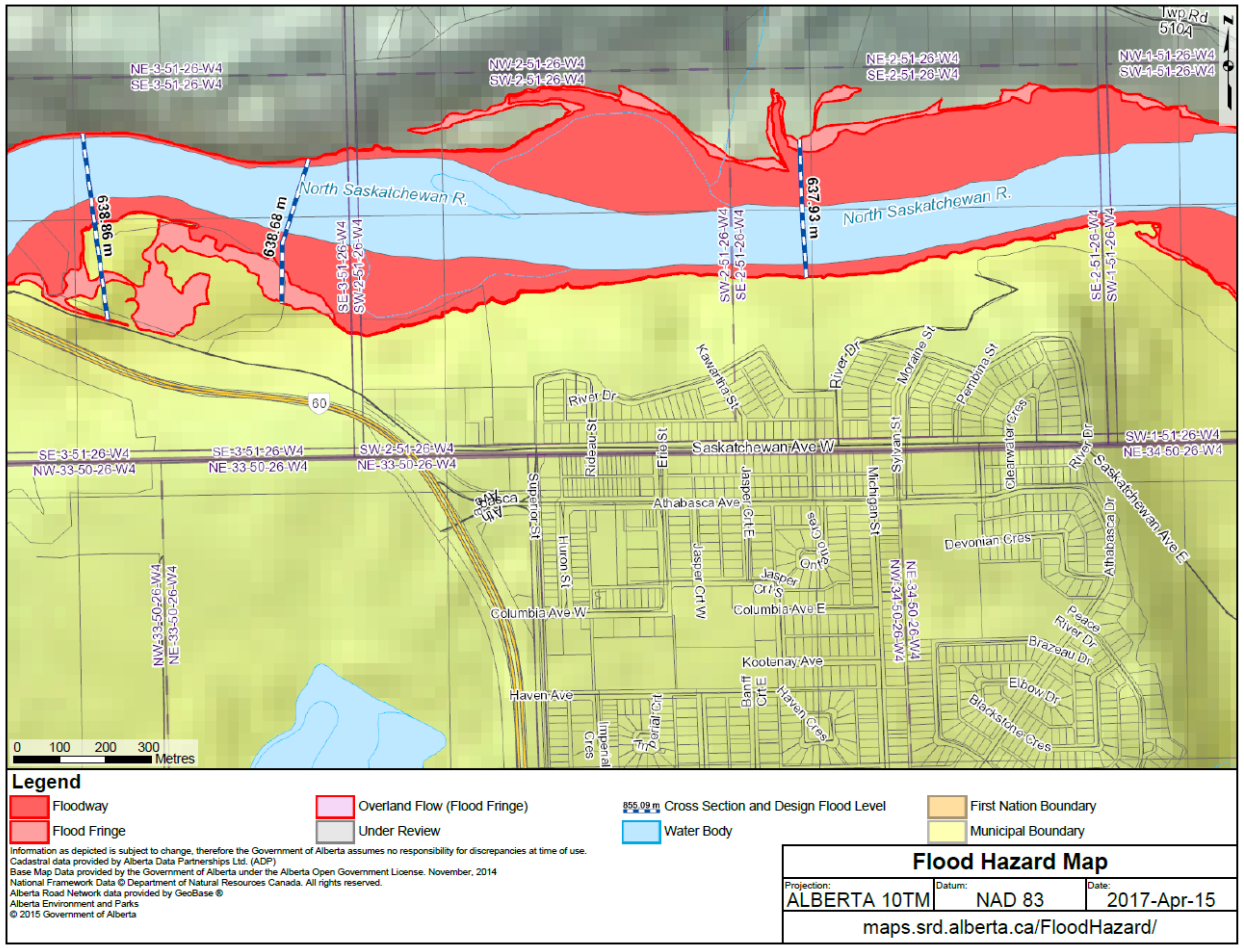
- Restoration and watershed resilience
- Wetland ecosystem services in water management
- Restoration opportunities and challenges
  - Wetland Construction
  - Soil Bioengineering

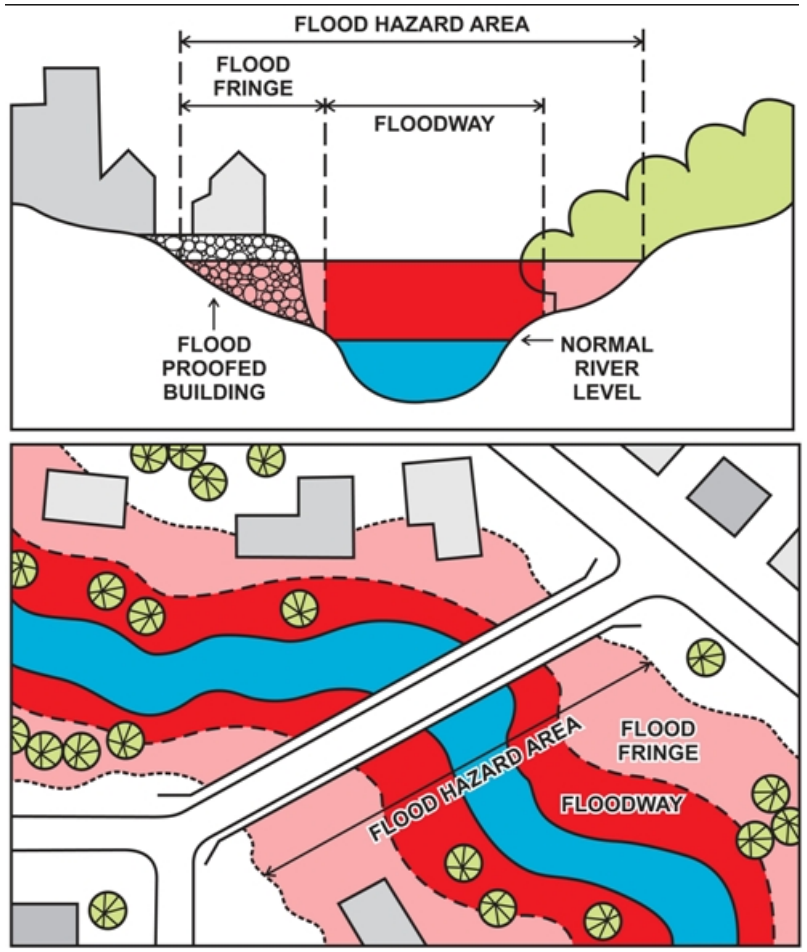
Climate change adaptation and resilience

Droughts and Deluges



Flood Hazard Areas



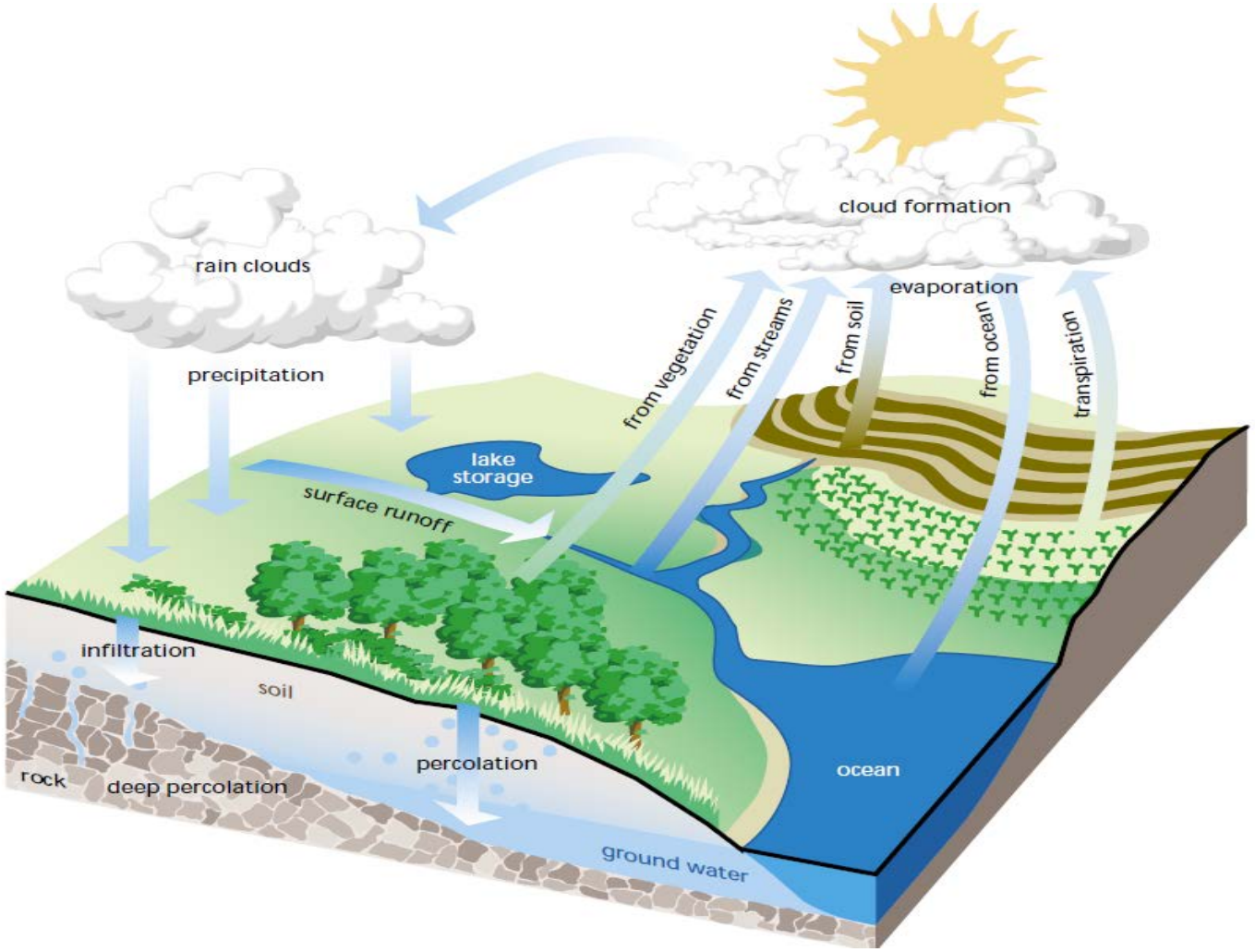


http://aep.alberta.ca/water/programs-and-services/flood-hazard-identification-program/flood-hazard-mapping.aspx

Watershed Health

https://www.mightypeacewatershedalliance.org/about-1/the-watershed/

Hydrologic Cycle



NRCS Stream Restoration: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1044574.pdf

Adaptation Key Components

- Adaptive Capacity
  - Flexibility in the face of unexpected and predicted hazards
- Mitigation
  - An adaptive act to reduce root causes
- Resilience
  - A kind of adaptation that secures desired function in the face of change

Wetland Definition

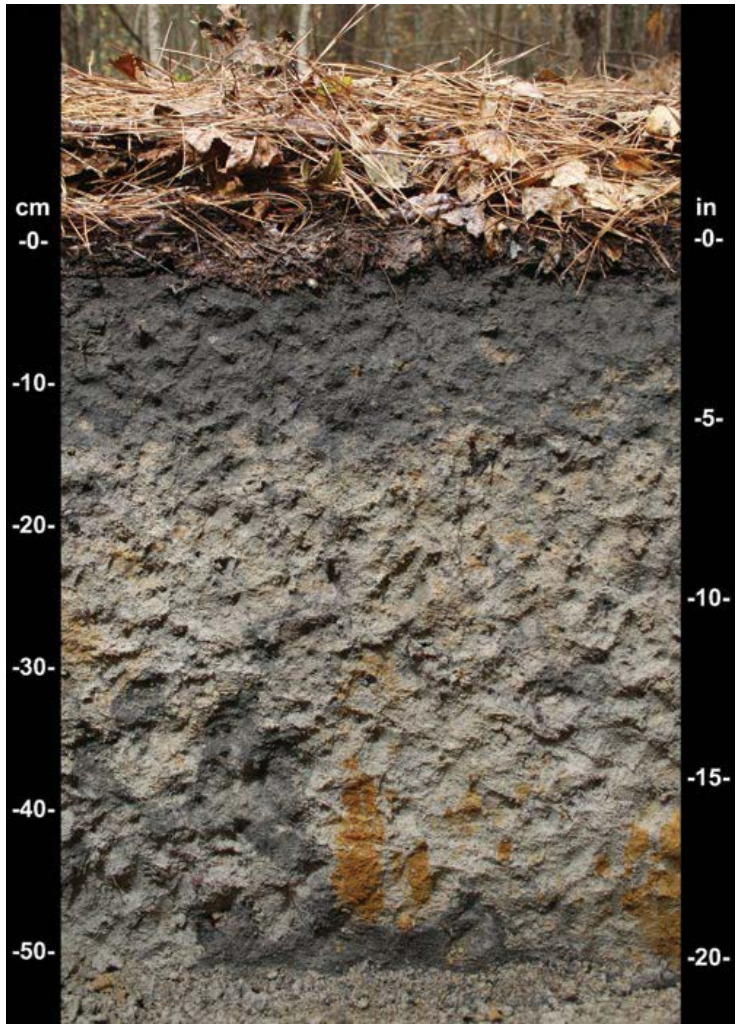
Land saturated with water long enough to promote formation of water altered soils, growth of water tolerant vegetation, and various kinds of biological activity that are adapted to the wet environment

(Alberta Wetland Policy 2013)

http://www.waterforlife.alberta.ca/documents/Alberta_Wetland_Policy.pdf

Hydrophytic Vegetation

Hydric Soil



United States Department of Agriculture, Natural Resources Conservation Service. 2010. Field Indicators of Hydric Soils in the United States, Version 7.0. L.M. Vasilas, G.W. Hurt, and C.V. Noble (eds.). (Fair Dealing)

Hydrology Indicators

U.S. Army Corps of Engineers. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (Version 2.0), ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-10-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center. (Fair Dealing)

Classification and Relative Value

Wetland Functions and Values

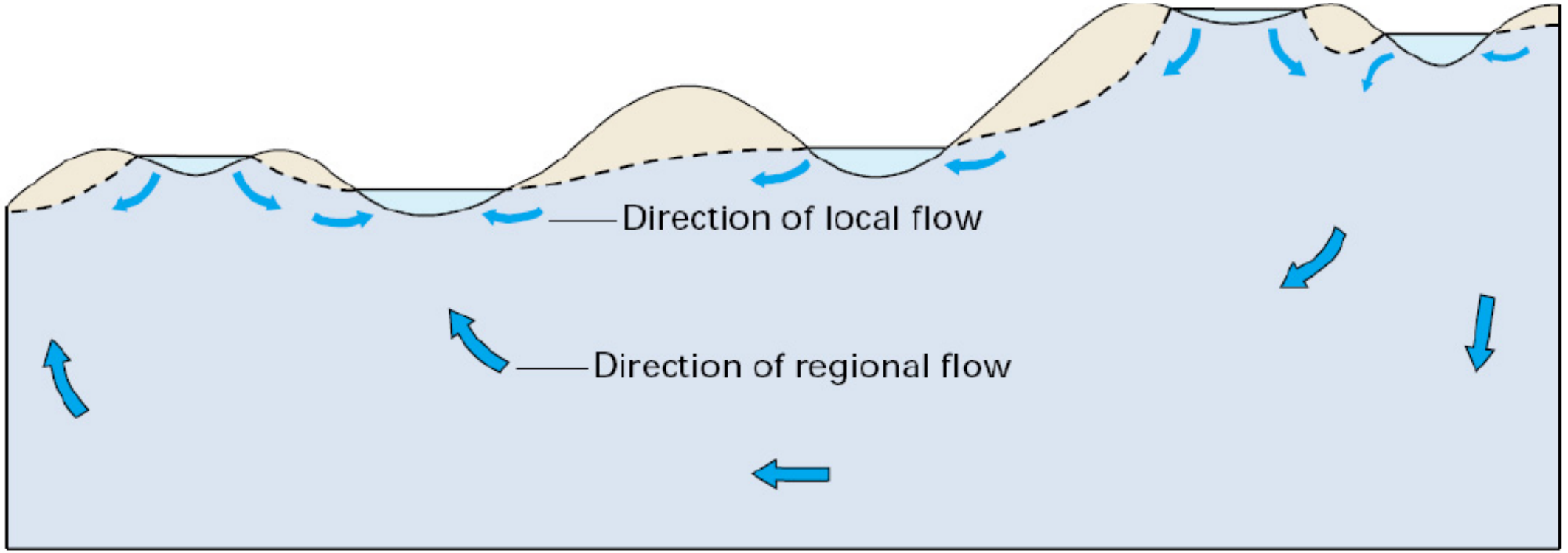
- Water quality improvement
- Groundwater replenishment
- Flood mitigation
- Carbon Sequestration
- Biodiversity and critical habitat
- Shoreline protection
- Human use (cultural, education, recreation)

Water Quality

- Sediment Trapping
- Nutrient Removal
- Chemical Detoxification

Photo courtesy Dr. Lee Foote

Groundwater Recharge



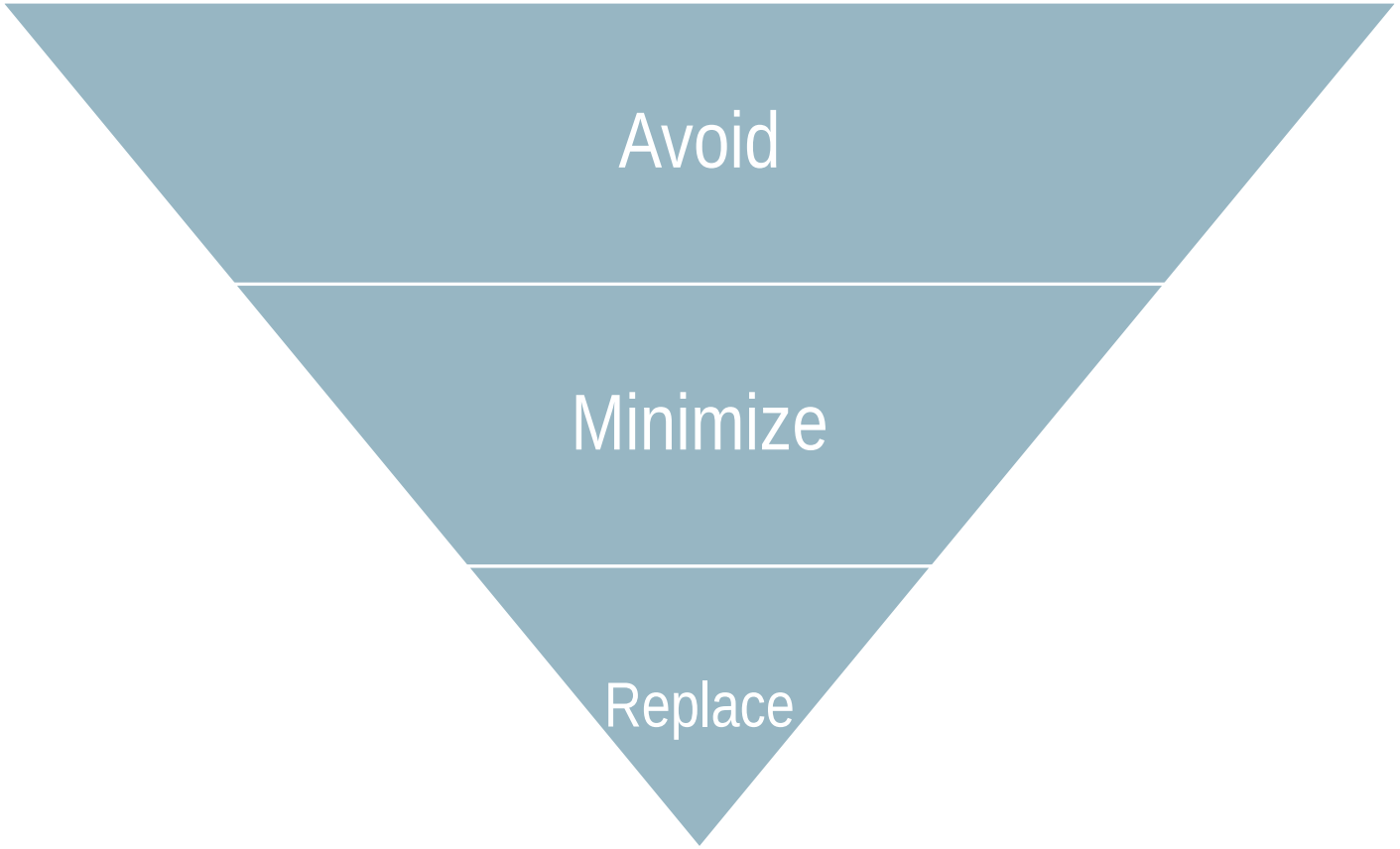
(Winter et al., USGS, 1998)

Ecosystem Goods and Services

Goods and services provided by natural functions that contribute to human well-being

(Constanza et al., 2011)

Wetland Mitigation Hierarchy



Wetland Replacement Concepts

- Watershed perspective
- In-kind mitigation (replace what is lost)
- Replacement ratios

Value of Lost Wetland	Value of Replacement Wetland: D	C	B	A
A	8:1	4:1	2:1	1:1
B	4:1	2:1	1:1	0.5:1
C	2:1	1:1	0.5:1	0.25:1
D	1:1	0.5:1	0.25:1	0.125:1

*Ratios are expressed as hectares of wetland

(Alberta Wetland Policy 2013)

Wetland Replacement Options

- Undertaken by Permittee
- In-Lieu Fee Program
- Wetland Mitigation Bank

Wetland Replacement Options

- Restoration
- Construction / Creation
- Non-restorative (research, monitoring, education, securement, etc.)

Updates in December 2018

- Directive for Permittee-Responsible Wetland Construction
- Alberta Guide to Wetland Construction in Stormwater Management Facilities
- Wetland Replacement Fees to GoA

Wetland Replacement Concepts

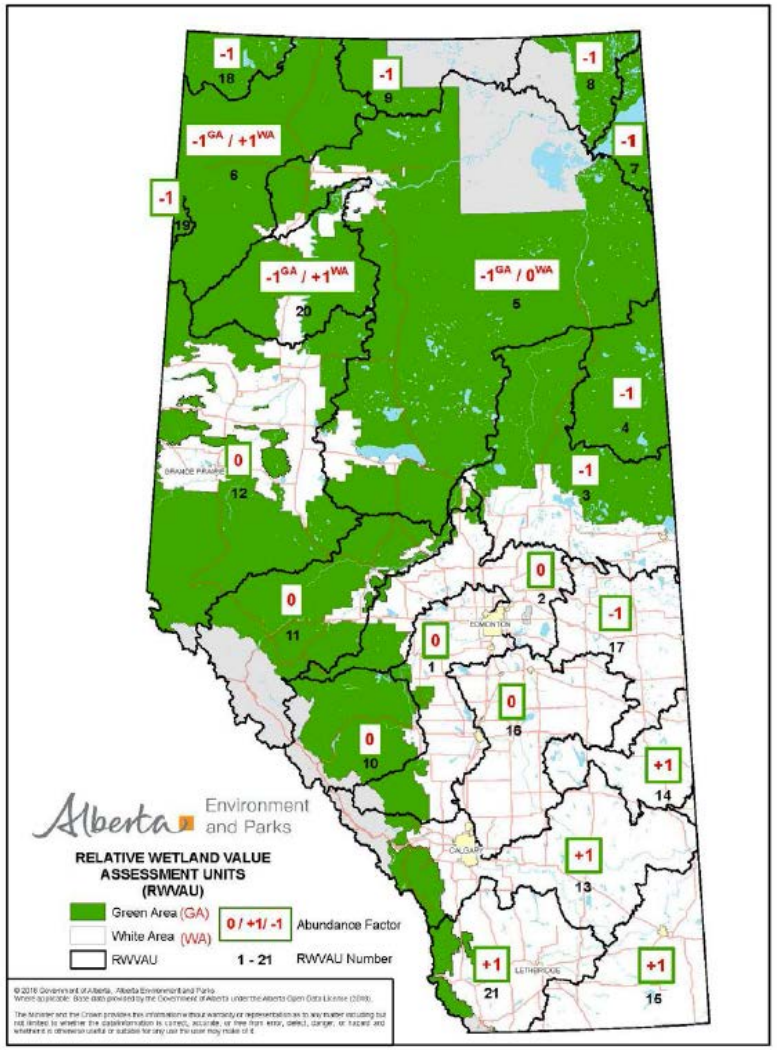
- The relative value of a constructed wetland is adjusted on the basis of two factors:

- The creation of an upland buffer
- Regional wetland abundance and historical loss

Abundance Modifier	Buffer	Relative Value of Constructed Wetland	Replacement Credit
-1	No	D	1
-1	Yes	C	2
0	No	C	2
0	Yes	C+	3
+1	No	C+	3
+1	Yes	B	4

Directive for Permittee-Responsible Wetland Construction in Alberta (AEP 2018)

Calculating Replacement Area



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Past and Future

Aerial Photo from by AESRD Photo Distribution Library
Project 11-ERJOI 83H / G1105004-16-134

Tree Removal and Stormwater

Rill and Gully Erosion

Building resilience into watersheds

Erosion Processes – Undercutting at the Outside Bend

Erosion Processes – Riparian Vegetation Removal

Lack of woody vegetation, undercutting and excess moisture

Soil Bioengineering

- Use of plants to perform an engineering function
- Live cuttings of willows, poplars and dogwood
- Root systems provide root strength and root zone diversity
- Woody vegetation removes excess soil moisture
- Self healing and self sustaining
- Other benefits include biodiversity, carbon sequestration, habitat and aesthetics

Willows on the bank stabilize the slope

Snowmelt runoff saturates the unstable banks

Snowmelt runoff saturates the unstable banks

Grande Prairie Course – Muskoseepi Park

Grande Prairie Course – Muskoseepi Park

Muskoseepi Park Bioengineering Crew

Dense live staking along the shore and two rows of wattle fence to address the scarp

April 26, 2018

Slope at Reservoir– May 15, 2018

Slope at Reservoir– May 24, 2018

Slope at Reservoir– May 24, 2018

Slope at Reservoir– May 24, 2018

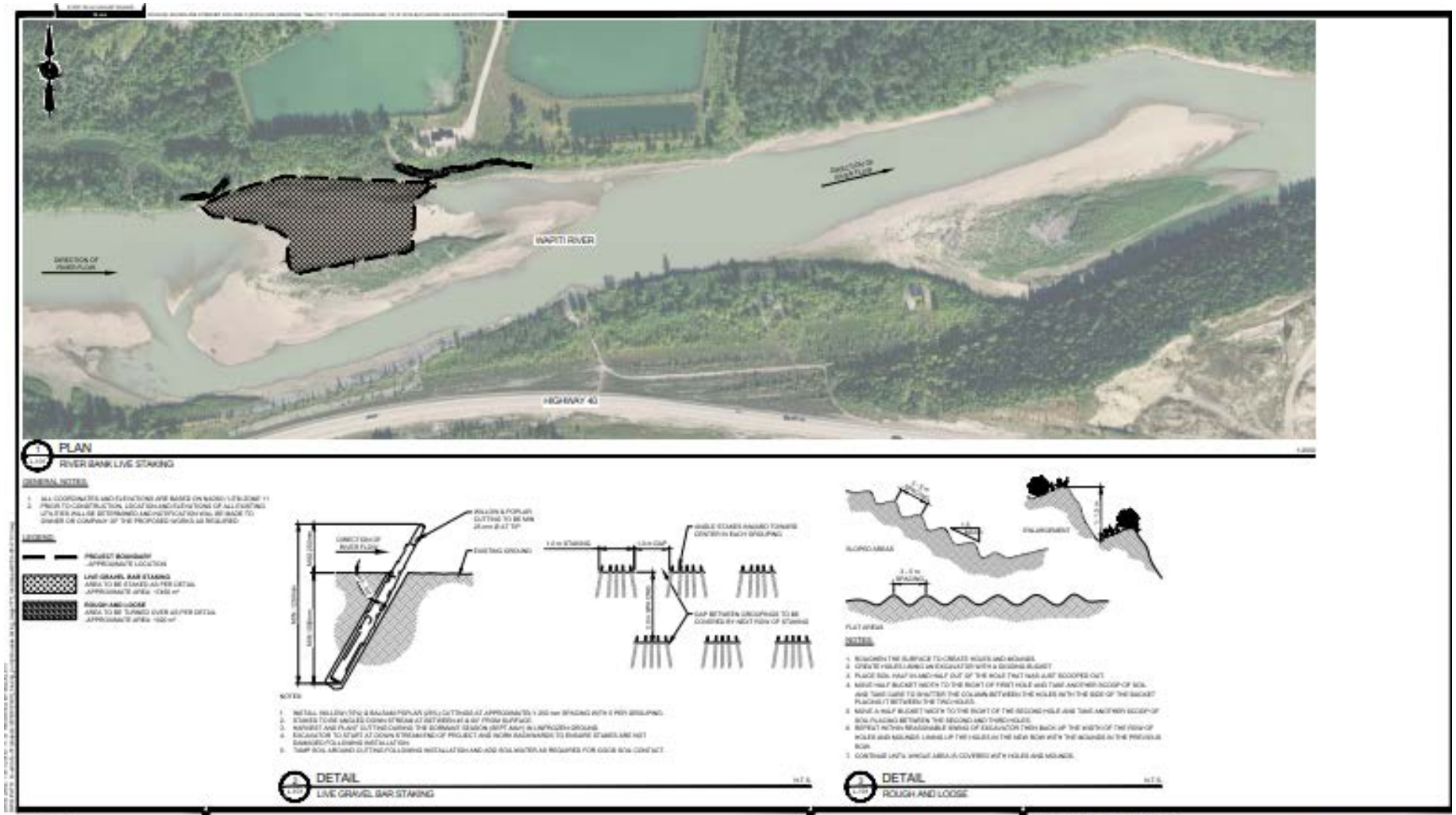
Live Silt Fence– May 24, 2018

Live Silt Fence– June 18, 2018

Live Silt Fence– June 18, 2018

Wapiti River Erosion at Pumphouse July 2018

Gravel Bar Staking



Wapiti River Erosion at Pumphouse July 2018

Failing Slope – Using Plants for Stability Functions

Polster Environmental

November 2014

Polster Environmental

August 2017

This site is sequestering 20 to 25 tonnes/ha of CO2 annually

Polster Environmental

Rooting along entire length of the cutting

Transportation Research Board National Cooperative Highway Program Project 24-19; CRP-CD-58: Environmentally Sensitive Channel & Bank Protection

Grants and Community Workshops

Town of Devon Workshop

Town of Devon Workshop

Questions?