

A Comprehensive Approach To Wetland Assessment:

Edmonton's Muskaskoski Natural Area Case Study

ALMS Workshop 2011

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- 2008 - 2010, conducted under EBA Consulting.
- Contract with the City of Edmonton

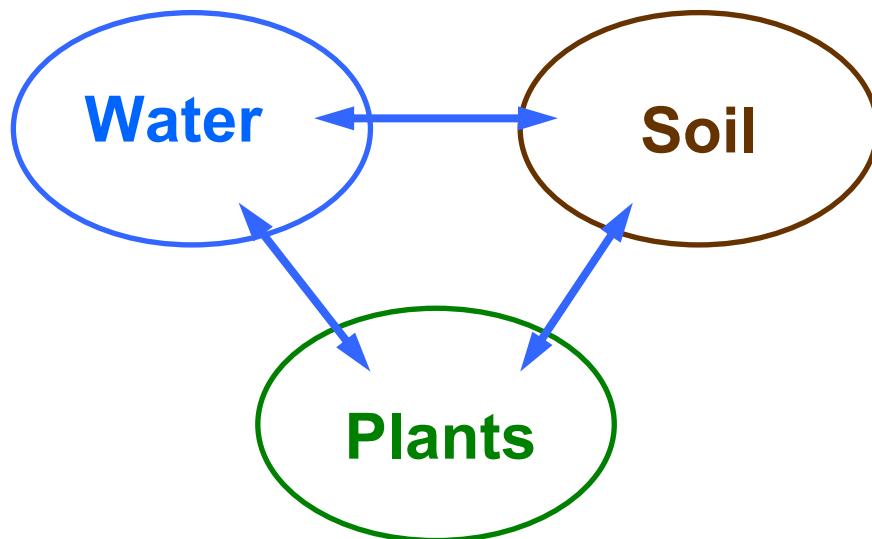
Outline

- Methods: Purpose
- Classify And Assess Wetlands
- Adopted Methods
- Summary

Purpose

- Provide Best Service (3-leg stool)
- End service often requires Habitat Mitig/Comp Plan (Enhance, Restore or Create)
- Success depends on accurate fundamental data & info

Dynamic relationship



Wetland Assessment

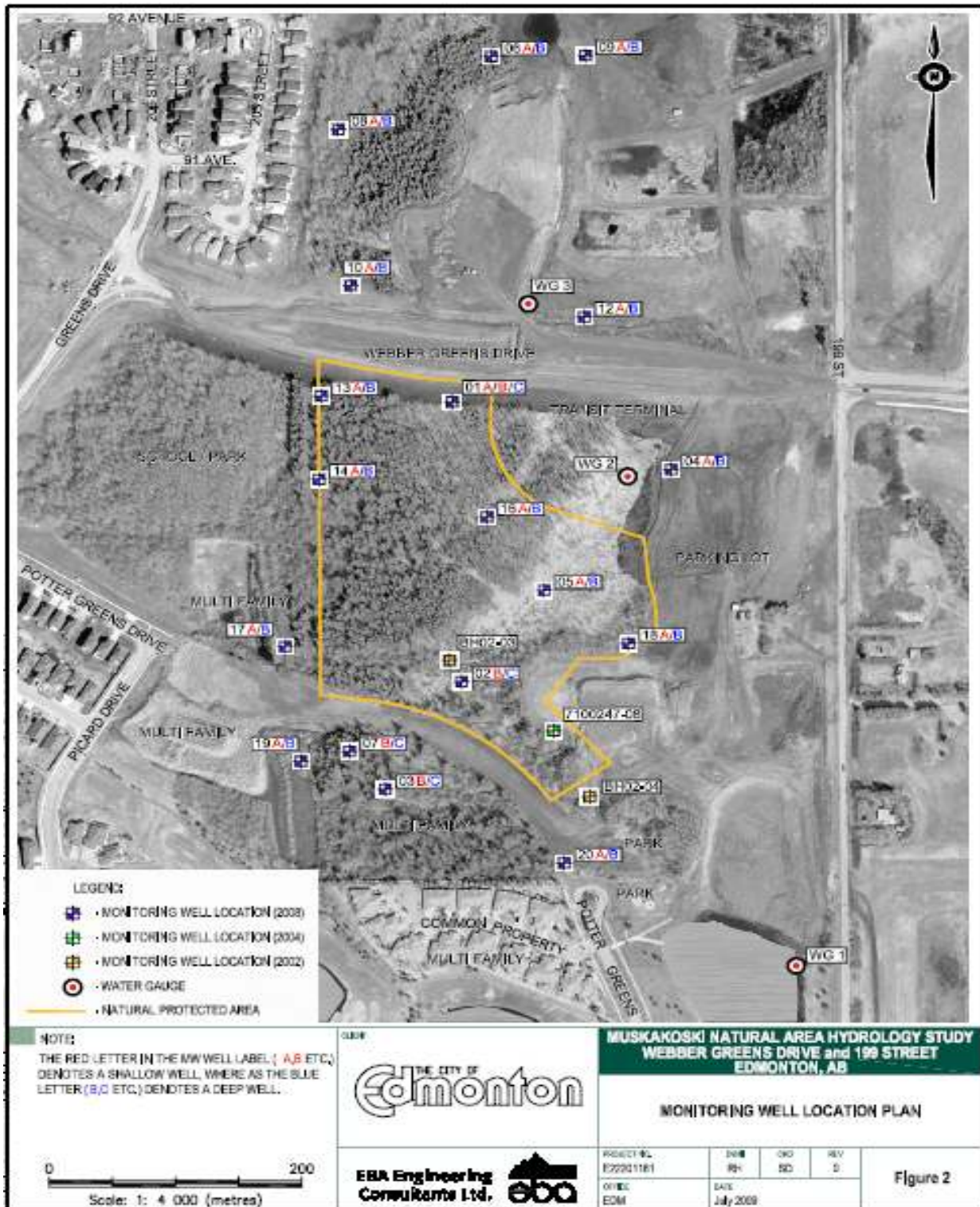
- No silver bullet
- Classify first using an appropriate scheme:
 - Global (RAMSAR); National (Cowardin *et al.*, 1979; Warner & Rubec, 1979); Provincial (MacKenzie & Morgan, 2004; Stewart & Kantrud, 1971; Cows & Fish; var years).
- Fit the breadth and depth of the level of detail for the assessment to the drivers for the work:
 - Spatial scales will likely vary with temporal scales
 - Accuracy versus Precision (you always need to be accurate but precision will likely vary along a gradient)

Adopted Methods

- Address your **purpose** and **objectives**:
 - Stereo Air Photographs, Land Use and Boundary Conditions
 - Ground Water Data
 - Soils Data (Organic + Mineral)
 - Climate Data
 - Water Balance
 - Vegetation and Water Chemistry

Background

Study Area & Piezometer Locations



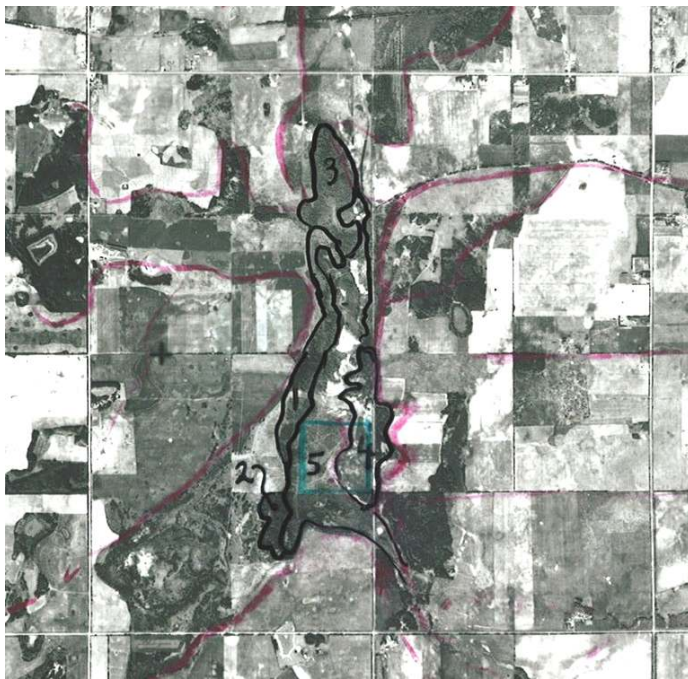
Adopted Methods

Stereo Air Photographs, Land Use & Boundary Conditions

- Chronosequence: **1949**, 1969, **1977**, 1981, **2007**

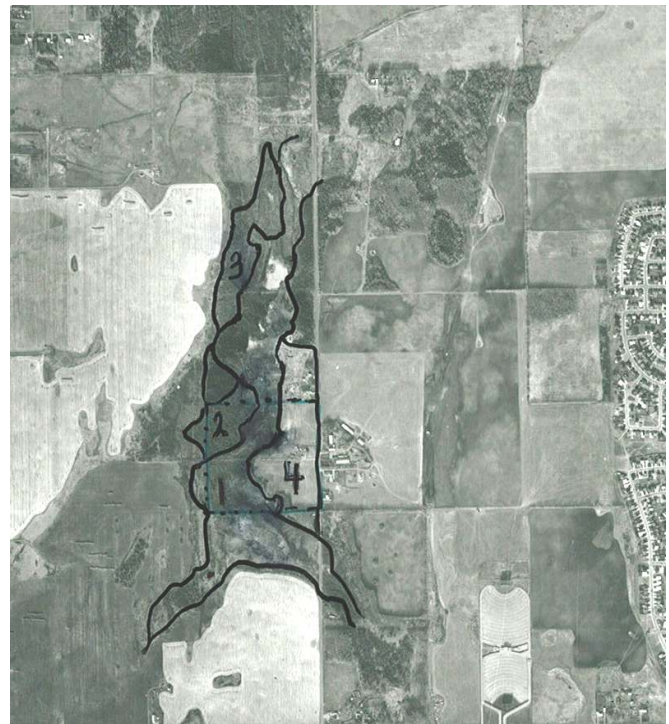
Mapping:

- Terrain (drainage)
- Vegetation (soils)
- Land use



1949

1977



2007

Note:

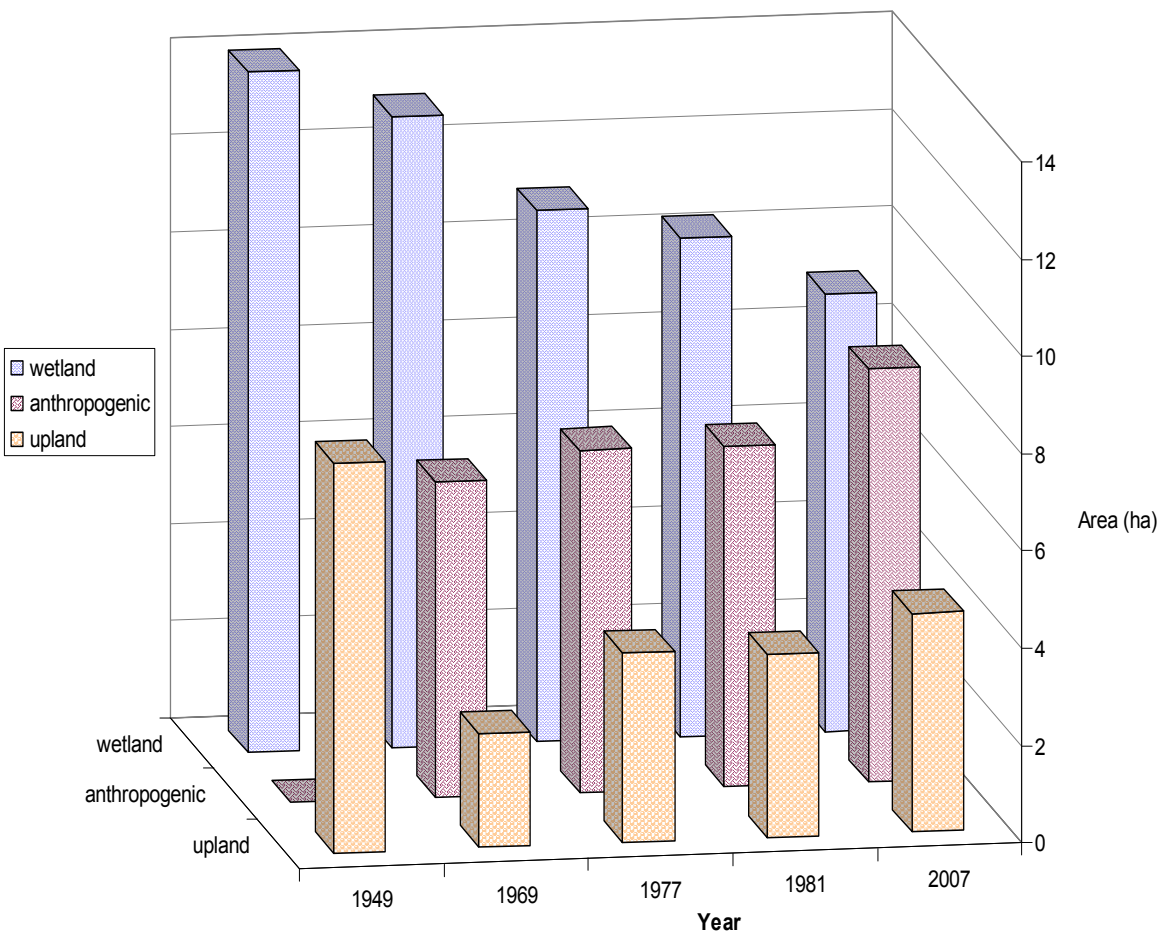
- Changes in scale
- Photo quality
- Accuracy / Precision

Adopted Methods

Land Use Changes

- General Land Type Area Changes, 1949 - 2007
- Approx 35 % decline of surface area of both wetland and upland

Figure 3. Land (wetland) area changes 1949 - 2007

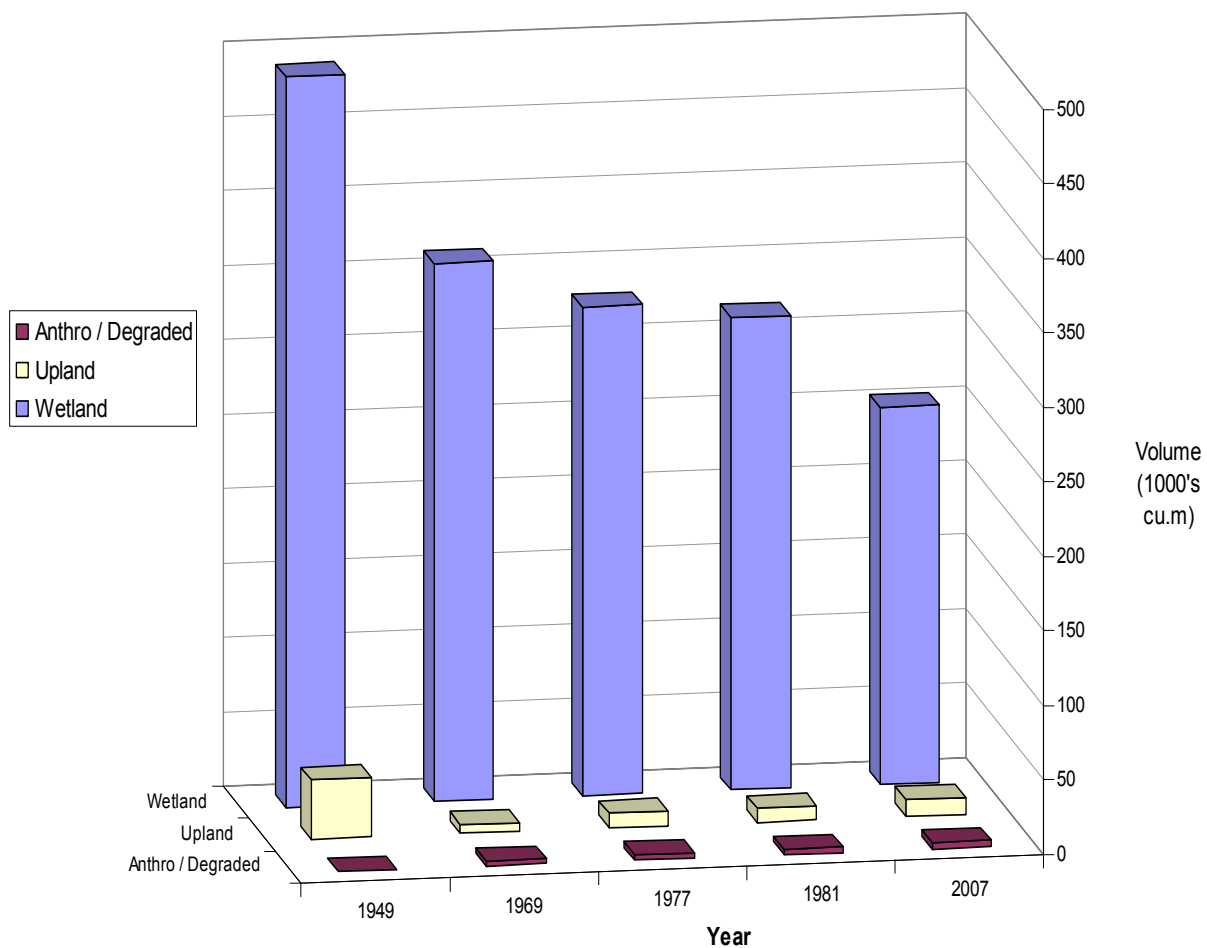


Adopted Methods

Land Use & Boundaries

- Changes In Peat Volumes, 1949 - 2007
- Approx. 50% decline in organic soils

Figure 4. Peat (wetland) volume changes 1949 - 2007



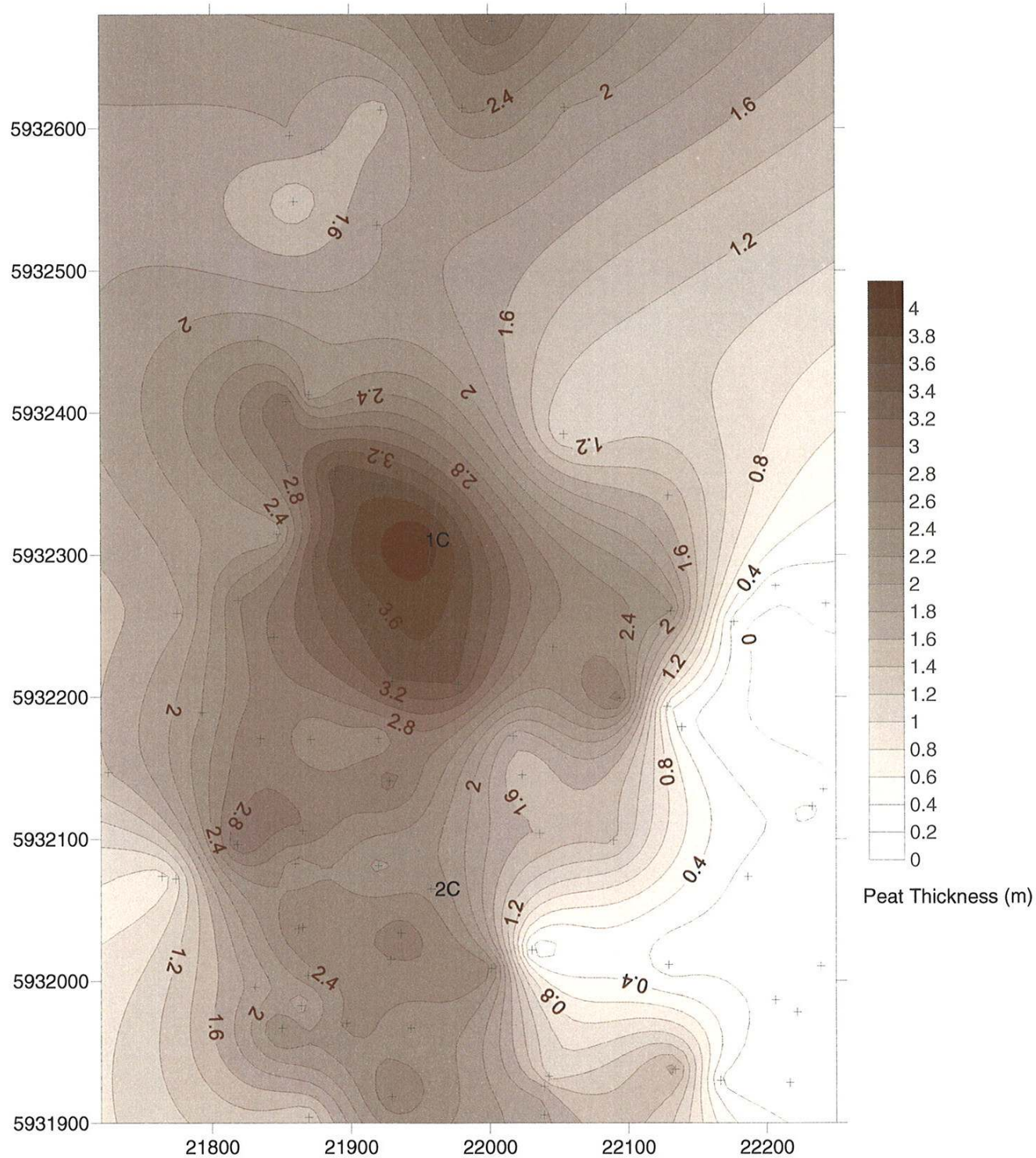
Adopted Methods

Ground Water Data

- Piezometers installed at 18 locations (network design)
- Three boreholes used from previous studies by others (QA/QC; single depth)
- Three surface water level stages installed
- One manual rain guage installed
- Mapped Peat Distribution

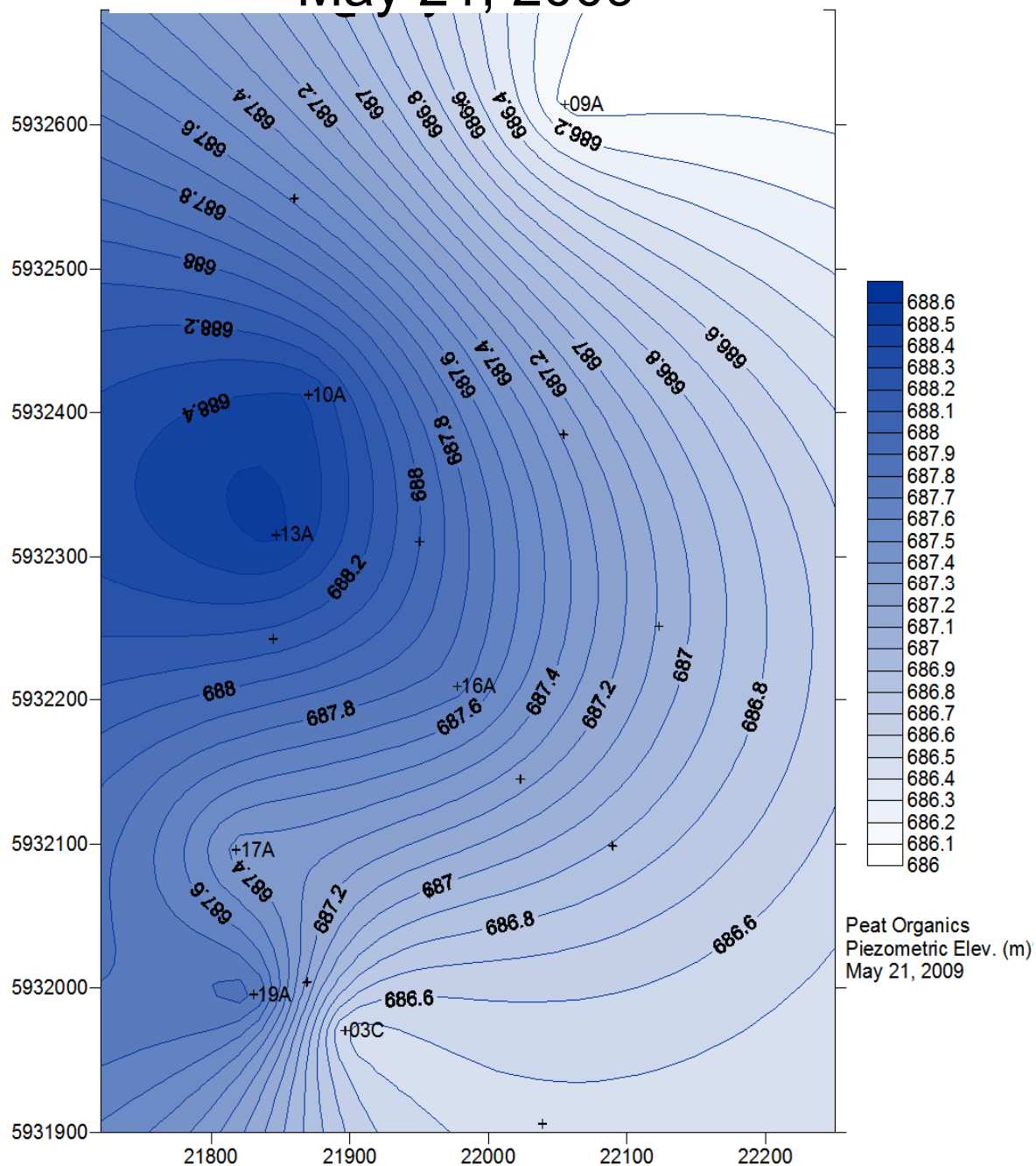
Adopted Methods

Peat Distribution, 2008



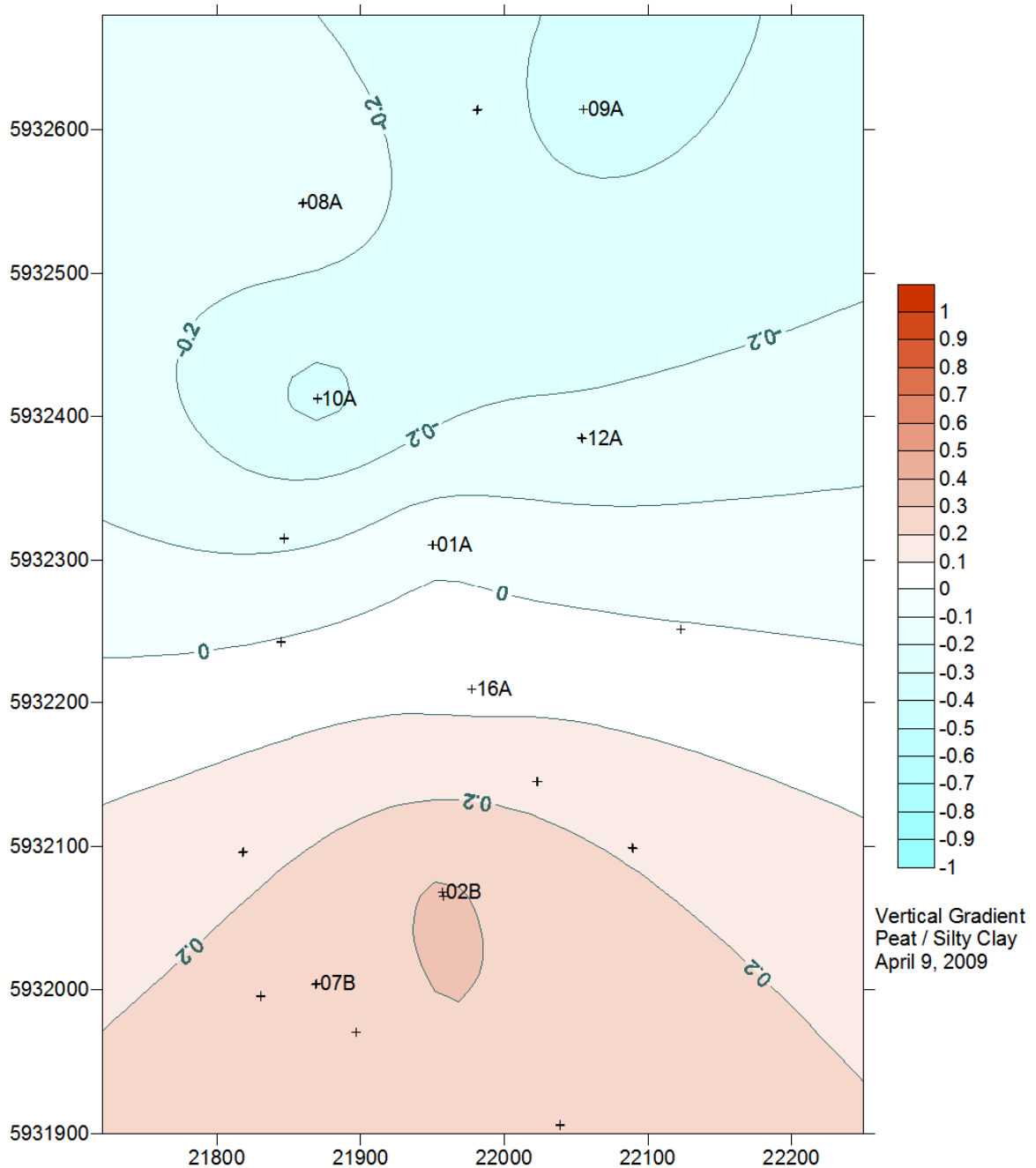
Adopted Methods Ground Water Data Contours and Direction

May 21, 2009



Adopted Methods Ground Water Data Vertical Gradients

April 2009

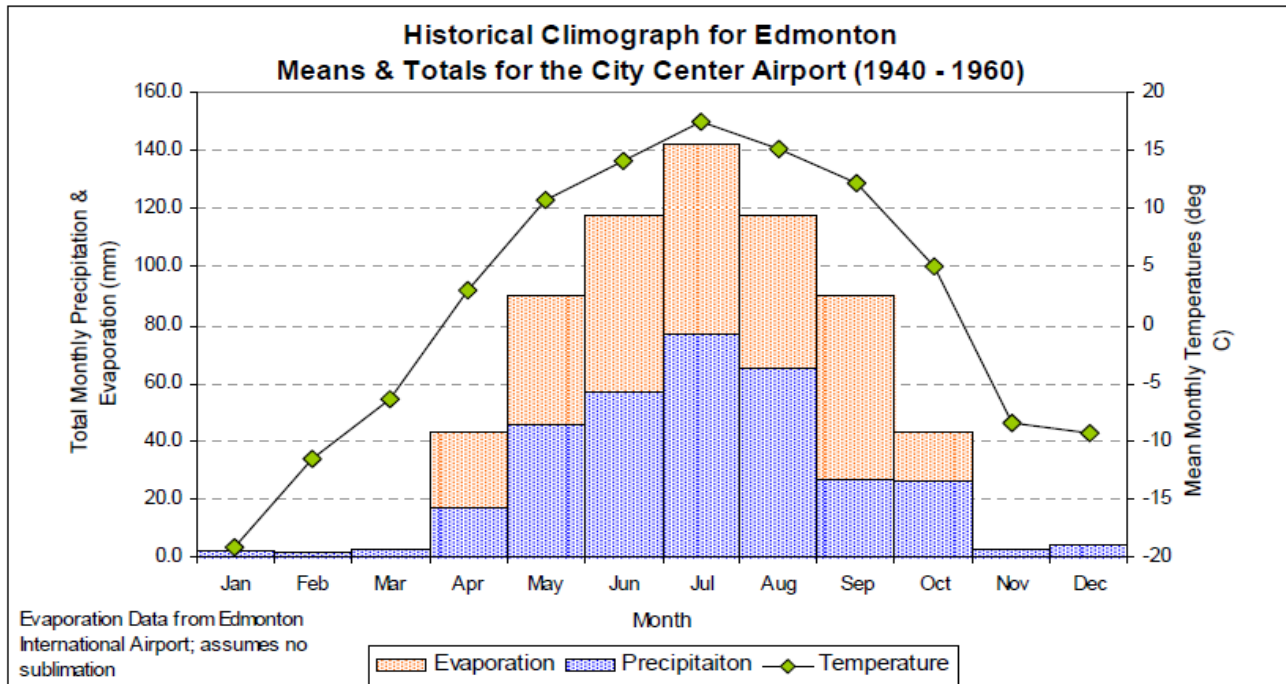


Adopted Methods

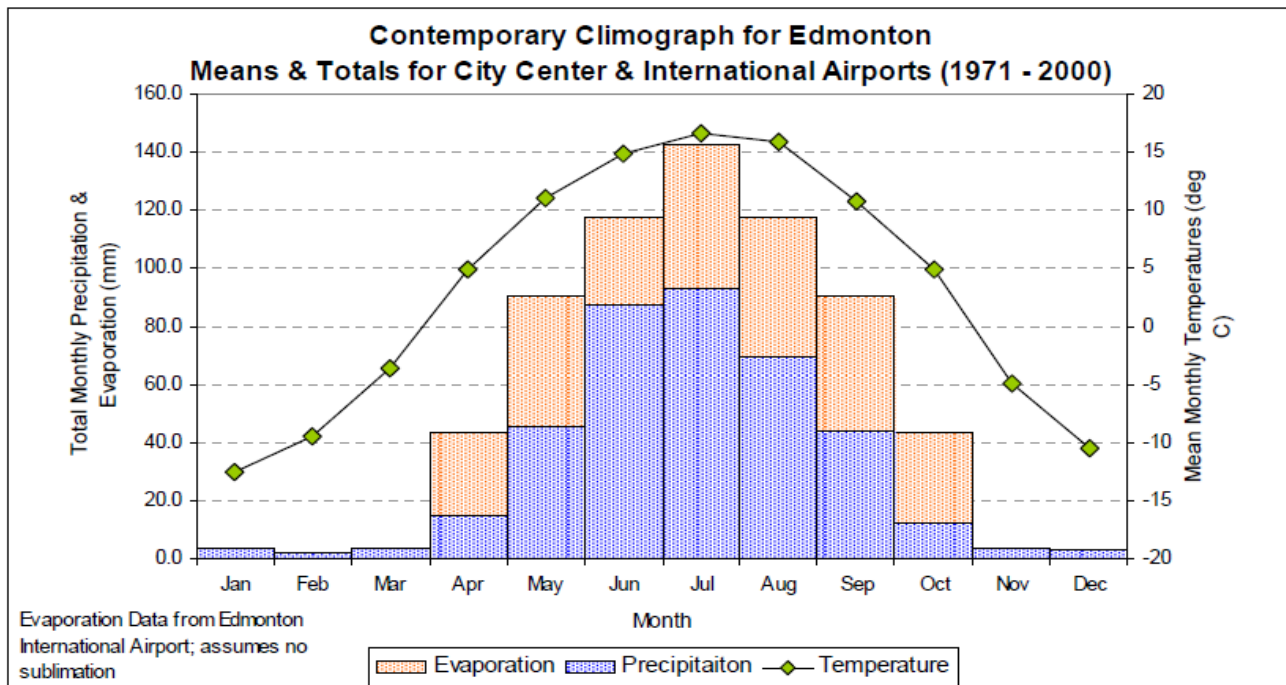
Climate Records & Water Balance

- Climate Normals, Meteorological Services, Env. Can.
- Numerous Water Balance Methods: e.g., Thornthwaite & Mather, 1955.
- Sublimation & Evaporation estimates.
- Precip (highly variable) correlate with site data, possible need for weighting raw data.

Adopted Methods Climate Records ... : Historical & Contemporary Climographs



Historical Climograph for Edmonton

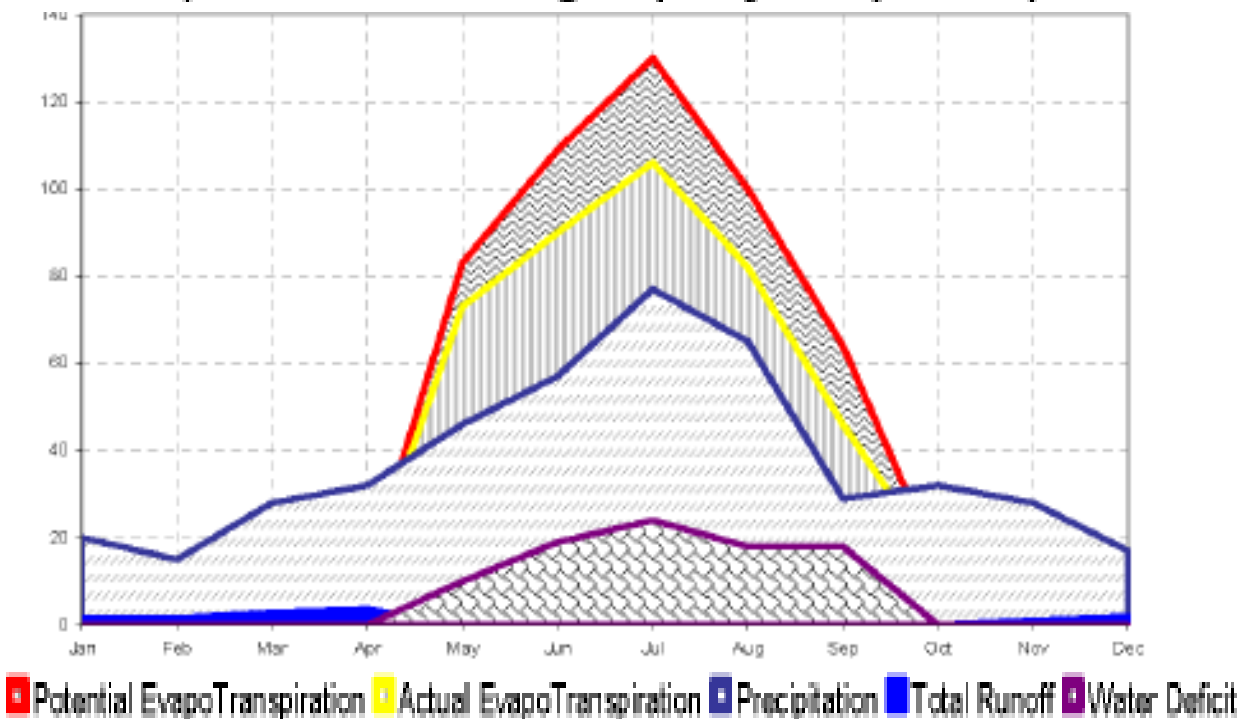


Contemporary Climograph for Edmonton

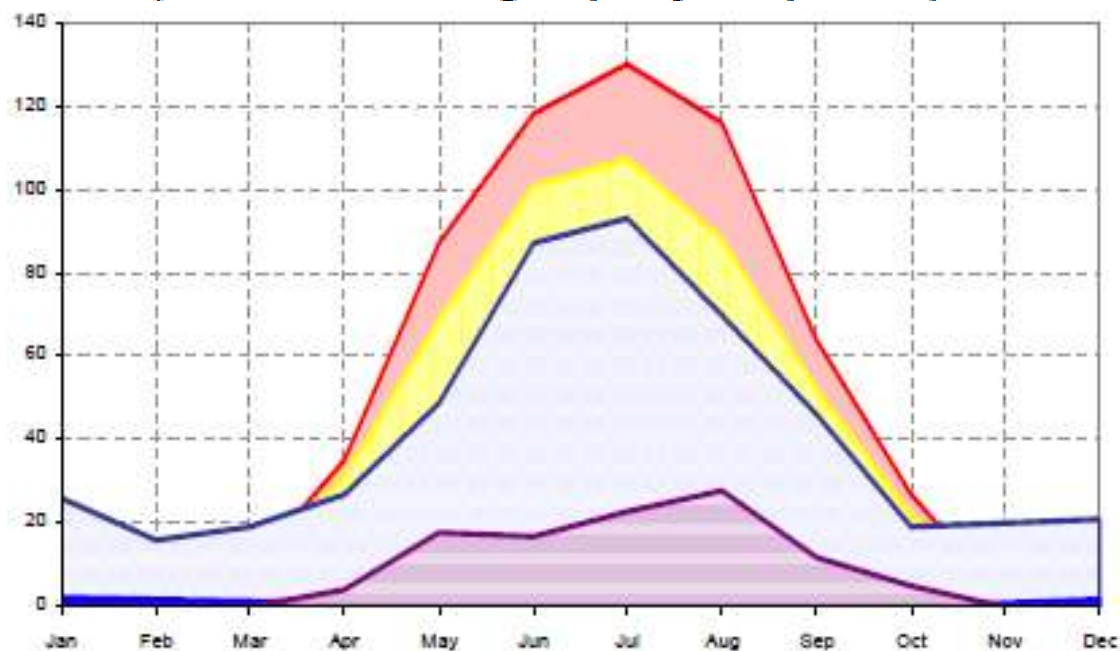
POLYMATH
ENVIRONMENTAL

Adopted Methods ... Water Balance: Historical & Contemporary Water Balance

**Historical (1940 - 1960) Water Balance - Wetland Soils
(400 mm water storage capacity for a peat soil)**



**Contemporary (1970 - 2000) Water Balance - Wetland Soils
(400 mm water storage capacity for a peat soil)**



Adopted Methods

Soils: Organic (peat)

Peat from BH 9 typical of peat conditions found in many of the boreholes showing changes in humification with changes in depth.



Vegetation & Water Chemistry

- Vegetation health in decline over a number of years (Patsy Cotterill; Fiera Consulting)
- IRB & SRB populations indicate a moderate mix of aerobic & anaerobic bacteria in surface waters
- Water chemistry (EC & pH) of deep wells similar to shallow wells
- Ongoing development activities confound analysis & interpretation of eco-hydrology

Summary

- Methods:
 - Using many techniques provides complimentary & supplementary evidence
 - Data/Info can be used to develop successful wetland mitigation plans
 - 2 years preferable > 1.5 years; 1 year (4 seasons) a minimum
 - Dendrochronology would likely provide further evidence
- Study Results:
 - Wetland water source is 1° meteoric
 - Wetland experienced wet/dry Holocene oscillations
 - Land development pirates water from wetland
 - Wetland will continue to decline during the Anthropocene without a focused management plan

The End

Muskakoski Natural Area Lewis Estates Transit Centre

The wetland study commenced in July 2008 and the findings will be reported to the City of Edmonton in mid-2009.



STUDY SITE LOCATION



Tamarack



WHY STUDY THE WETLAND?

The McDonagh Peatland (NW7009) was categorized by the Inventory of Environmentally Sensitive and Significant Natural Areas report dated November, 1993 as an "environmentally sensitive area". This Natural Area has been identified on the Development Concept Map to provide for consideration of this natural area as part of future neighbourhood planning.



Tamarack & White Spruce

WHAT WILL BE DONE TO ASSESS THE WETLAND?

- Compile background information and data
- Identify what information is missing and design a plan to collect this data
- Initiate a Field Data Collection Program
- Install a network of groundwater monitoring wells
- Install a rain gauge in the vicinity
- Generate a water balance model
- Review historical aerial photographs to understand the wetland's history
- Interpret field data collection to understand how the study area functions eco-hydrologically
- Report findings to the City of Edmonton