Wetland Mapping:
A Tool for Better Understanding the Impacts of Wetland Disturbance

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DUC & Boreal Wetlands

Ducks Unlimited Canada (DUC) has led wetland conservation efforts in Canada for the past 79 years, taking a science based approach and completing over 10,366 wetland conservation projects, conserving over 64.3 million hectares of habitat. DUC has produced a complete enhanced wetland inventory for the boreal region of Alberta, with the exception of Wood Buffalo National Park (see Figure 1 for inventory availability).

Boreal wetland systems are poorly understood, thus inventory is a key tool for conservation. DUC has developed an ecologically-based Boreal Wetland Classification System. Vegetation communities found in different wetland types are a result of the underlying factors forming them, including: geology, hydrology, nutrient availability, climate, position in the landscape etc. These communities can be mapped using freely-available satellite imagery.

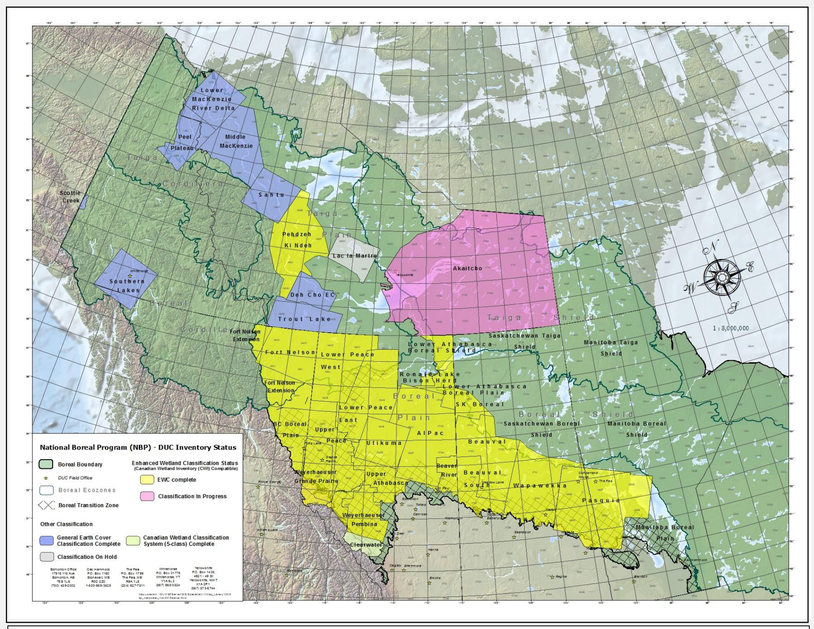

Figure 1: DUC's boreal wetland inventory. Blue corresponds to completed Earth Cover (EC) projects mapped using the Viereck et al. (1992) classification system, yellow to DUC's EWC system, and pink is currently in progress.

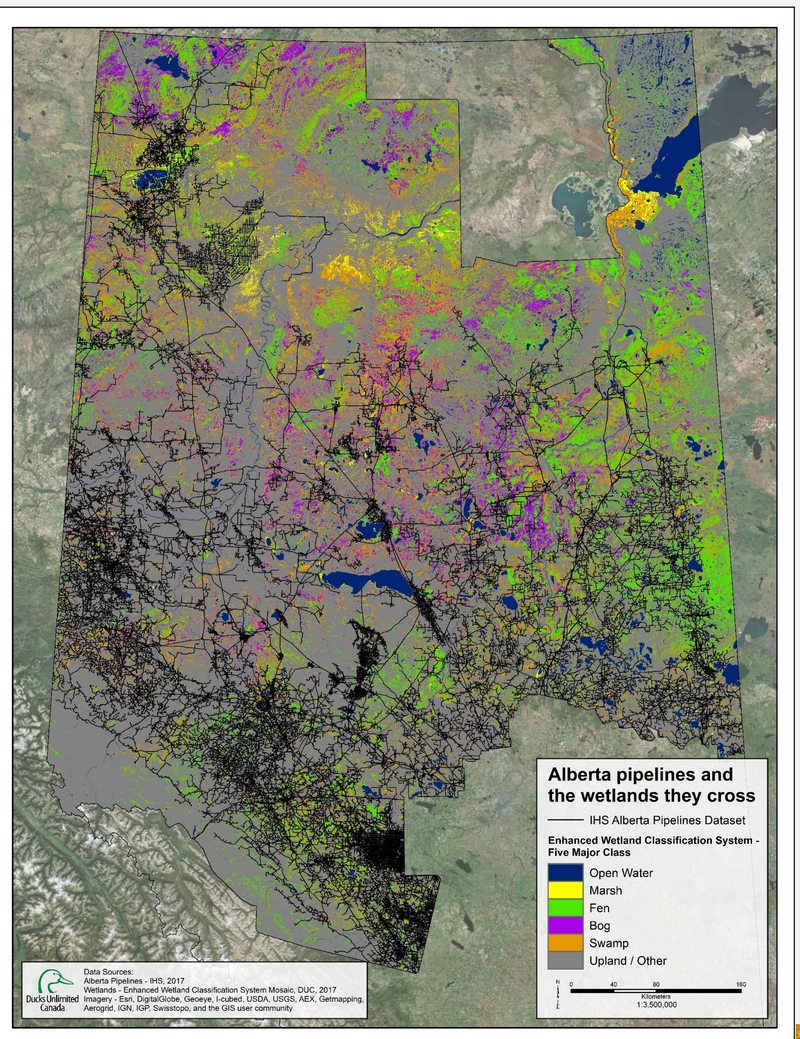

Figure 2: Pipelines in Alberta identified by the IHS dataset overlaid on DUC's EWC Five Major Class (corresponding to the CWCS) wetland inventory.

Enhanced Wetland Mapping

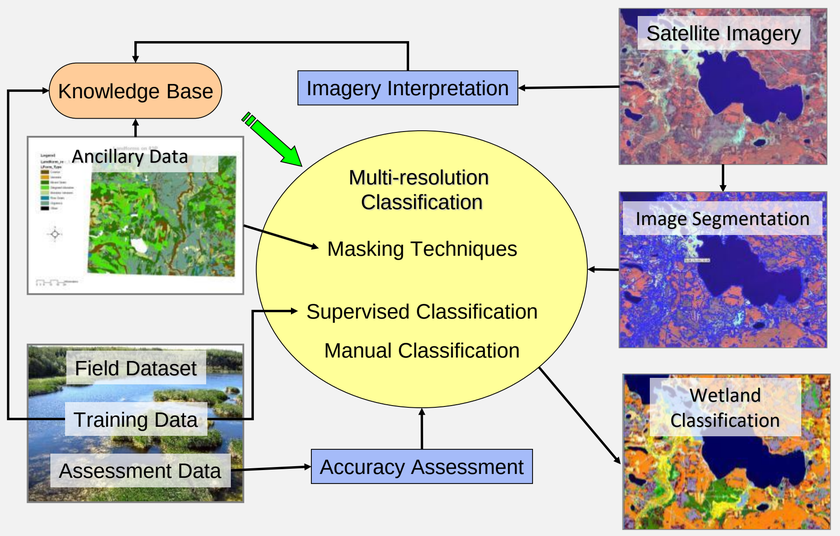

Figure 3: The Enhanced Wetland Classification (EWC) methodology used to develop DUC's boreal wetland inventory.

The Enhanced Wetland Inventory (EWC) is based on multispectral satellite imagery as well as field data collected for each project. The ongoing Akaitcho project additionally includes 3-season L-Band SAR imagery. Imagery is preprocessed, mosaicked and classified using a supervised, object-based approach. Ancillary data, such as fires and anthropogenic features, are additionally used to aid in the classification. The final result is a raster dataset detailing 19 boreal wetland classes. The EWC can be cross-walked to the Canadian Wetland Classification System (CWCS) and Alberta Wetland Classification System (AWCS) (see Table 1).

Table 1: The cross-walks between the EWC , CWCS, and AWCS.

EWC/CWCS/AWCS Major Class[1, 2, 3]	AWCS Form[3]	EWC Minor Class[1]
National (n = 5)	**Provincial (n = 13)**	**Ecozone (n = 19)**
Shallow Open Water	Submersed and/or Floating Aquatic Vegetation	Aquatic Bed
	Bare Shallow Open Water	Open Water
		Mudflats
Marsh	Graminoid Marsh	Emergent Marsh
		Meadow Marsh
Swamp	Wooded, Coniferous Swamp	Tamarack Swamp
		Conifer Swamp
	Wooded, Deciduous Swamp	Hardwood Swamp
	Wooded, Mixedwood Swamp	Mixedwood Swamp
	Shrubby Swamp	Shrub Swamp
Fen	Wooded, Coniferous Fen	Treed Rich Fen
		Treed Poor Fen
	Shrubby Fen	Shrubby Rich Fen
		Shrubby Poor Fen
	Graminoid Fen	Graminoid Rich Fen
		Graminoid Poor Fen
Bog	Wooded, Coniferous Bog	Treed Bog
	Shrubby Bog	Shrubby Bog
	Graminoid Bog	Open Bog

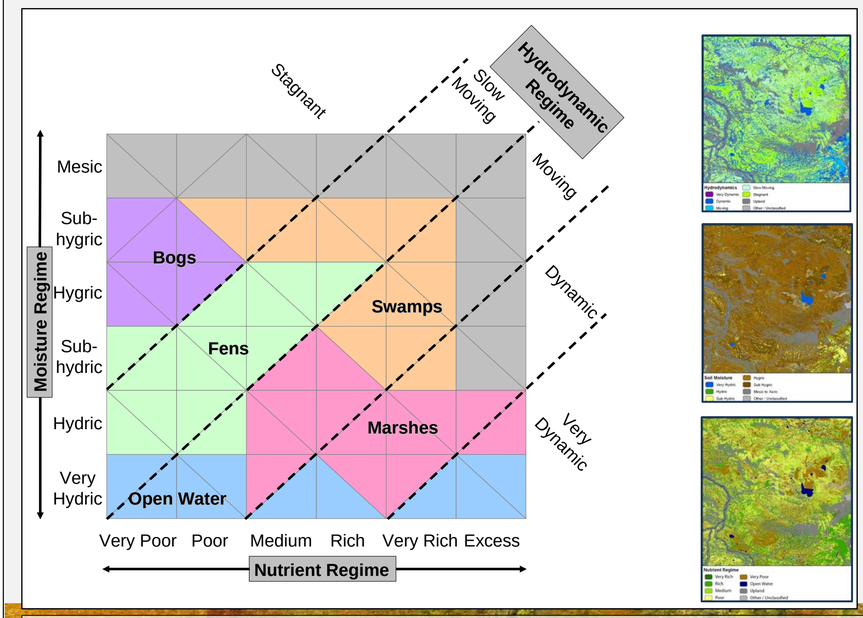

Figure 4: Beyond baseline data, DUC's wetland maps can also be used to create various inferred products (such as relative nutrient regime, relative soil moisture regime, and relative hydrodynamic regime) based on general groupings of the wetland types. This figure is DUC's edatopic grid showing the distribution of wetland classes in relation to inferred regimes.

Linear Features & Disturbance

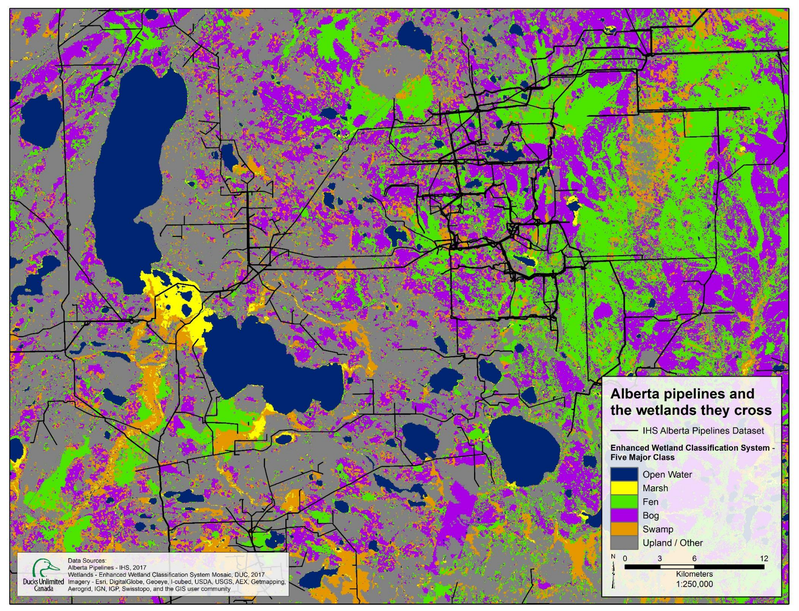

Figure 5: A subset of an area impacted by pipelines overlaid by DUC's five major wetland class inventory.

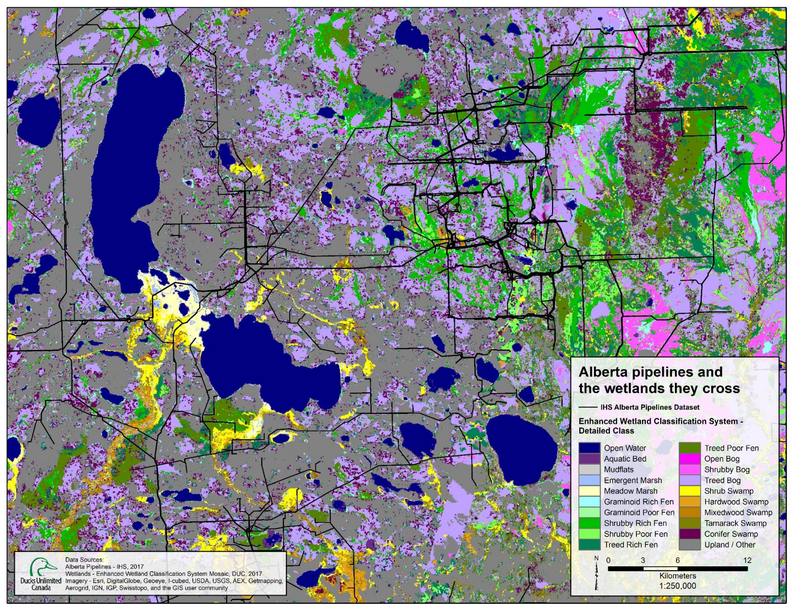

Figure 6: A subset of an area impacted by pipelines overlaid by DUC's 19 wetland class (EWC) inventory.

The EWC profiles wetland type, connectivity and distribution. Combined with the edatopic grid (Figure 4) additional inferred products can be developed, such as soil moisture, nutrient and hydrodynamic regimes, biodiversity, subsurface wetland carbon volume estimates, and caribou habitat assessment. This information, combined with future research will improve risk assessment and best management practices for wetland crossings.

Table 2: Summary of the total kilometres of IHS pipelines through wetlands identified in the EWC (five major class).

	EWC		Pipelines		
Major Class	**Hectares**	**Percent**	**Kilometers**	**Percent**	**km pipe / 1000 ha**
Open Water	1,645,605	4.0%	701	0.3%	0.43
Marsh	567,462	1.4%	1,097	0.5%	1.93
Fen	5,651,923	13.6%	19,864	9.1%	3.51
Bog	2,970,237	7.2%	7,313	3.3%	2.46
Swamp	4,538,141	10.9%	14,754	6.7%	3.25
Upland	23,040,344	55.5%	160,914	73.4%	6.98
Other / Unclassified	3,105,214	7.5%	14,679	6.7%	4.73

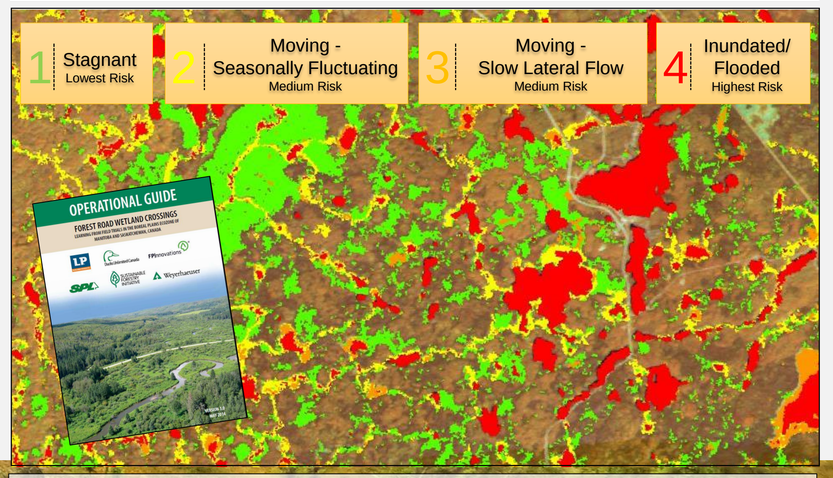

Figure 7: Based on the information inferred from DUC's edatopic grid (see Figure 4), a level of risk can be assessed for the construction of a road across a wetland. For example, a stagnant bog may be less hydrologically impacted than a flowing system.