

Fen

# Boreal Wetlands

- \* 85 per cent of Canada's wetlands are located in the boreal forest.
- \* Canada's boreal forest is water dominated. More than two-thirds is covered by aquatic systems including wetlands, lakes, rivers and deltas.

## **What are Boreal Wetlands?**

- \* Areas that are seasonally or permanently waterlogged, up to 2 meters in depth
- \* Plants and trees adapted to wet conditions
- \* May be covered with trees, shrubs, grass, sedge, moss & lichen
- \* Often highly connected aquatic systems moving water and nutrients over long distances, making them vulnerable to developments that blocks their natural flow

***"Land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation and various kinds of biological activity which are adapted to a wet environment."***

*(official definition: Canadian Wetland Classification System, National Wetlands Working Group (1987)).*

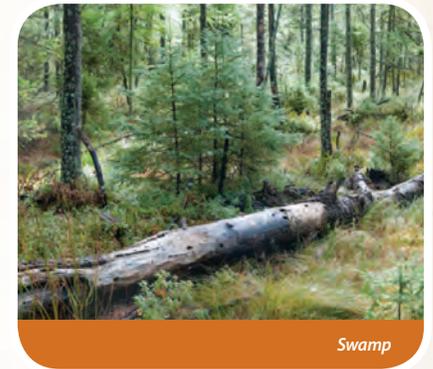
## **Types of Boreal Wetlands**

### **Organic wetlands (bogs, fens)**

- \* Deep organic deposits (> 40cm)
- \* Known as peatlands and sometimes called muskeg
- \* Vegetation characteristics: open (no woody vegetation), shrubby (dwarf shrubs) or treed (stunted trees)
- \* Most common wetlands in Canada's boreal forest

### **Mineral wetlands (swamps, marshes, open water)**

- \* Shallow organic deposits (<40cm)
- \* Contain nutrient-rich soils and water
- \* Vegetation characteristics: ranges from robust submerged plants and emergent reeds to tall shrubs and trees



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## BOREAL WETLANDS

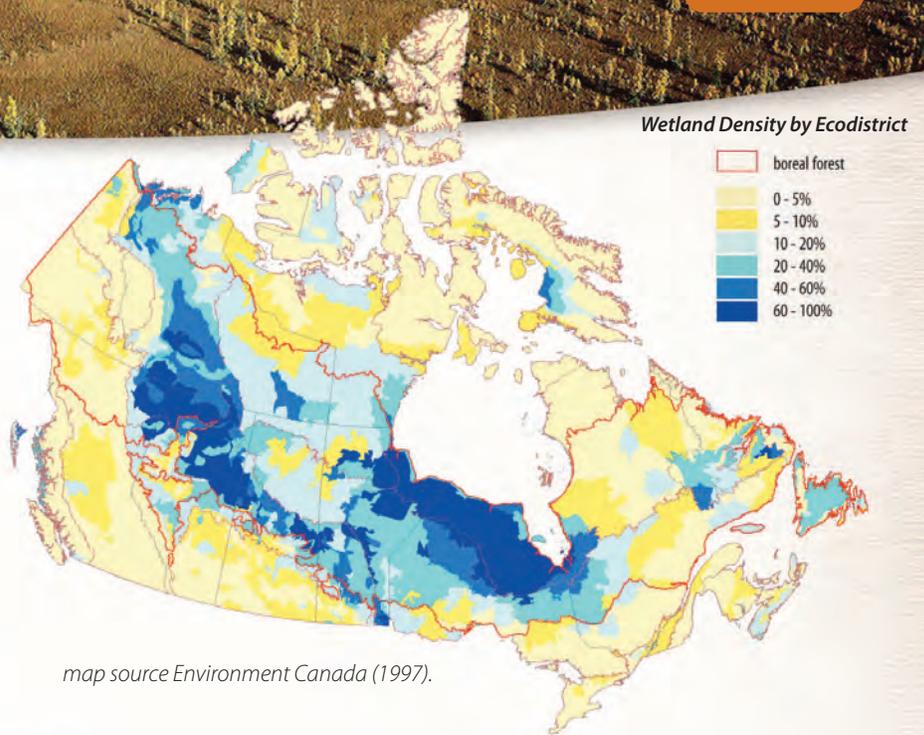
Patterned fen

### Water Movement

- \* Wetlands are often connected with each other
- \* Water levels and flows may fluctuate
- \* Water may flow laterally across the landscape between wetlands, at or below the surface
- \* Water tables may rise and fall seasonally or after precipitation
- \* Infrastructure such as roads may block the movement of water, damming it upstream while impacting road grades and drying downstream wetlands

### Environmental & Social Benefits

- \* Vital habitat to thousands of species of Canadian wildlife, such as ducks, songbirds, beaver and the threatened woodland caribou
- \* Store large amounts of carbon and help moderate climate change
- \* Minimize soil erosion
- \* Filter, store and transport large amounts of water and nutrients
- \* Act like sponges
  - \* Absorb precipitation and run-off to help prevent flooding
  - \* Release water during droughts
- \* Important areas for hunting, fishing and other cultural activities
- \* Offer tremendous learning opportunities for people of all ages



### Resources

- \* Ducks Unlimited Canada *Natural Values* factsheet series ([ducks.ca/naturalvalues](https://ducks.ca/naturalvalues))
- \* Field Guide to the Wetlands of the Boreal Plains Ecozone of Canada ([ducks.ca/boreal-field-guide](https://ducks.ca/boreal-field-guide))
- \* Fact Sheets for Swamp, Marsh, Fen, Bog and Open Water wetlands are available at [borealforest.ca](https://borealforest.ca)



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# Bogs

Bogs are peatlands that have deep deposits (>40 cm) of poorly decomposed organic material (referred to as peat). They are elevated above the surrounding terrain and receive water and most nutrients from precipitation. Bogs are the most nutrient-poor wetlands in the western boreal forest.

## Ecological Benefits

- \* Due to deep organic deposits, bogs store large amounts of carbon and help to moderate climate change
- \* Important habitat for the threatened woodland caribou
- \* Important water storage/recharge areas on the landscape that release water in dry periods and store water in wet periods

## Types of Bogs

- \* *Treed Bog*: Sparsely vegetated and stunted (<10 m) black spruce with sphagnum moss and low-lying shrubs
- \* *Shrubby Bog*: Low-lying shrubs and sphagnum moss
- \* *Open Bog*: sphagnum moss dominated with sparse non-woody vegetation



*Treed Bog*



*Shrubby Bog*



*Open Bog*



Treed Bog (note >25-60% canopy closure)



Sphagnum Moss

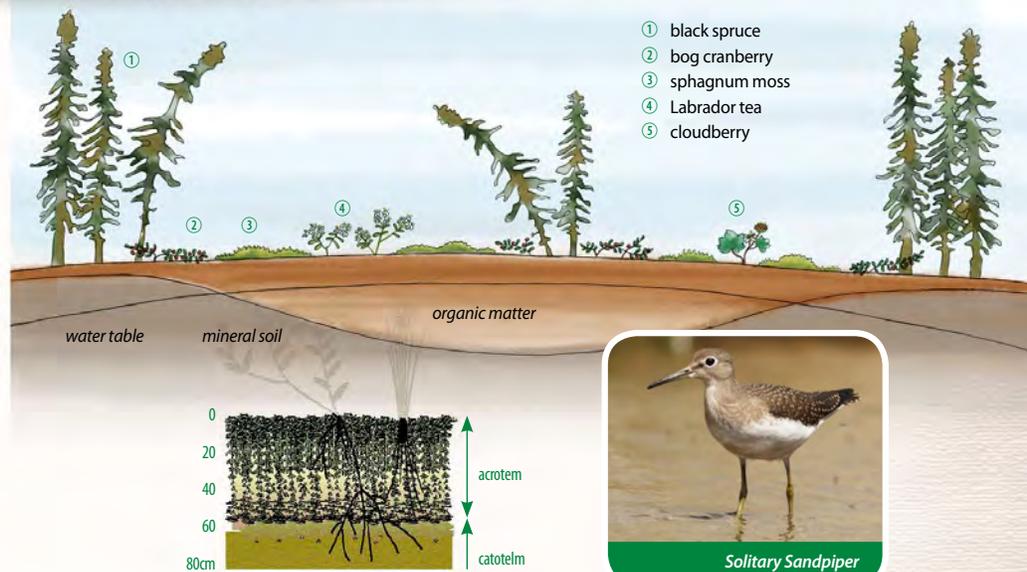
## Identifying Characteristics

### Vegetation

- \* Low plant diversity due to lack of nutrients
- \* Tree and ground lichens can be abundant
- \* *Treed Bog*: stunted black spruce (25- 60% canopy closure) with sphagnum moss ground cover (>20%)
- \* *Shrubby Bog*: low-lying shrubs (e.g. Labrador tea, bog cranberry >25%) with sphagnum moss (>20%) tree cover <25%
- \* *Open Bog*: sphagnum moss dominated with scattered herbs/forbs, such as cotton grass and sedges; tree and shrub cover <25%

### Hydrology

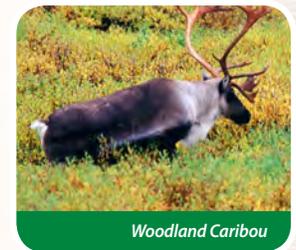
- \* *Water source*: precipitation from snow and rain
- \* Stagnant, non-flowing systems isolated from surface run-off and groundwater/nutrients
- \* Capillary action of sphagnum moss maintains the water table at or below the ground surface



- ① black spruce
- ② bog cranberry
- ③ sphagnum moss
- ④ Labrador tea
- ⑤ cloudberry



Solitary Sandpiper



Woodland Caribou

### Soil

- \* Peat deposits (> 40 cm) accumulating over long periods of time because decomposition is very slow in the wet, cool, anoxic (oxygen deprived) environment
- \* Two distinct peat layers (*above*):
  - Acrotem - living top layer (30-50 cm)
  - Catotelm - lower, non-living layer



## Resources

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Fen Complex

# Fens

Fens are peatlands with deep organic (peat) deposits (>40 cm) and are influenced by slow, lateral water movement. Water sources have been in contact with nutrient-rich surface and/or groundwater making fens more productive and biologically diverse than bogs. Fens can be treed, shrubby or open. Often referred to as “muskeg,” fens are the most extensive wetlands in the western boreal forest.

## Ecological Benefits

- \* Known as the “green rivers” of the boreal, fens transport large volumes of water and nutrients across the landscape; help to regulate water flow
- \* Help prevent downstream flooding by absorbing precipitation and run-off
- \* Due to deep organic deposits, fens store large amounts of carbon and help to moderate climate change
- \* Provide important habitat for the threatened woodland caribou

## Types of Fens

- \* *Treed fens*: Sparsely vegetated and stunted (<10 m) tamarack, sometimes mixed with black spruce, shrubs, sedges and mosses
- \* *Shrubby fens*: sparse to medium density; short (<2 m) shrubs (e.g. bog birch and willow) mixed with sedges and mosses
- \* *Graminoid (open) fens*: dominated with sedges, mosses and herbs (e.g. buckbean) often interspersed with open water



Treed Fen



Shrubby Fen



Graminoid Fen



Patterned Fen complex with  
treed, shrubby and open  
graminoid components

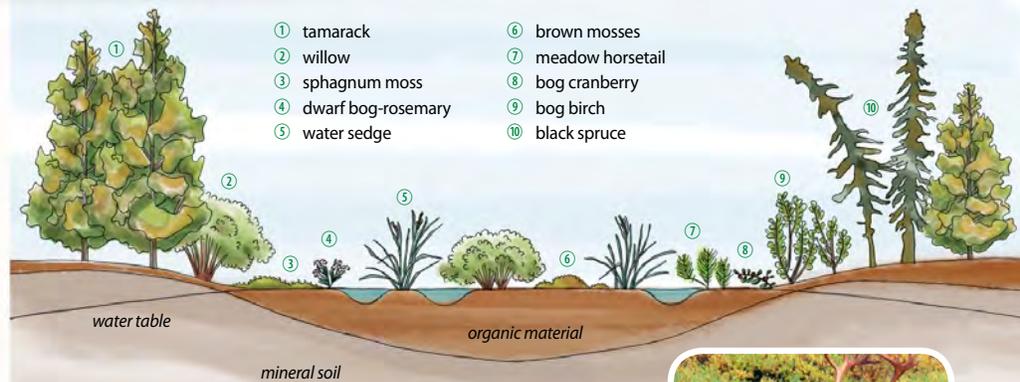
## Identifying Characteristics

### Vegetation

- \* Plant species reflect nutrient and moisture gradients
- \* The plant communities of nutrient-poor fens more closely resemble those of bogs, while rich fens have more diverse and robust vegetation
- \* **Treed Fens:**
  - trees (<10 m) make up 25-60% of surface area
  - dominated by tamarack although black spruce can occur
- \* **Shrubby Fens:**
  - shrubs (<2 m) dominate (>25%) with less than 25% tree cover
  - common species are bog birch, willow and sweet gale
- \* **Graminoid (open) fens:**
  - dominated by sedges, mosses and buckbean

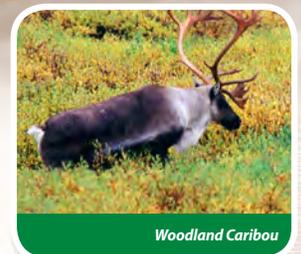
### Hydrology

- \* Complex hydrology with surface, sub-surface and groundwater interactions
- \* High water table (at or slightly below the surface) with lateral water flow often connecting wetland systems over vast distances



### Soil

- \* Deep peat deposits (>40 cm)
- \* Similar to bogs but with greater composition of sedge peat
- \* Decomposition is slow due to the wet, cool, anoxic (oxygen-deprived) environment, resulting in the accumulation of deep organic deposits
- \* Depending on water sources and nutrient availability, fens can be either nutrient rich or nutrient poor
- \* Two distinct layers (*right*):
  - *Acrotem*: the living layer, top 30-50 cm
  - *Catotelm*: the lower, non-living layer



## Resources

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Treed (Hardwood) Swamp

Treed (Conifer) Swamp Fringe

Treed (Tamarack) Swamp

Treed (Mixed Wood) Swamp

Shrub Swamp

# Swamps

Swamps are a common, diverse group of wetlands occurring in a variety of landscapes. Soils are predominantly mineral based although the presence of peat can occur in some settings. They are often transition areas between upland forest and other wetland areas and typically have hummocky ground that may contain pools of water. Most commonly recognized as shoreline areas of streams, lakes and floodplains, swamps are either treed or shrubby.

## Ecological Benefits

- \* Moderate floods by slowing water flow
- \* Fertile soils support a diversity of trees, shrubs and other plants
- \* Vegetation protects shoreline areas from erosion and sedimentation
- \* The variety of swamp wetlands provide a high diversity of habitat for many species of wildlife

## Types of Swamps

- \* *Treed swamp:*
  - dense (>75% canopy closure) tall trees (>10 m)
  - may be conifer dominated, hardwood dominated or mixed wood
- \* *Shrub swamp:* dominated by tall shrubs (>2 m) such as willow and alder



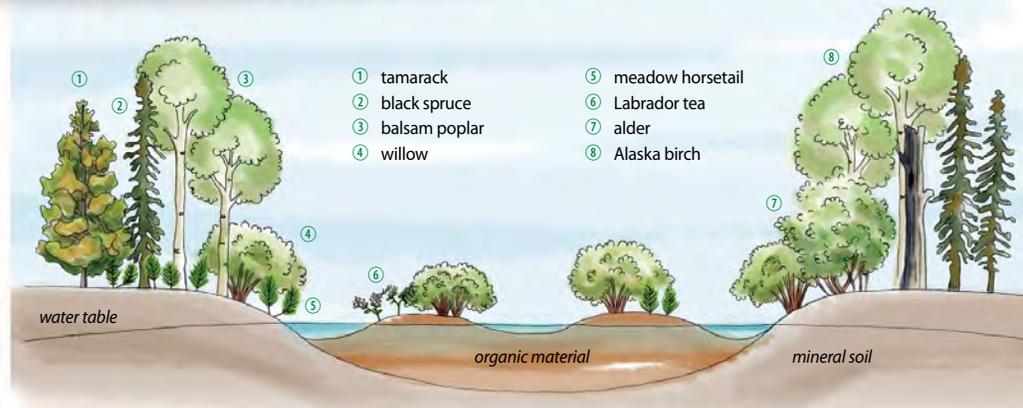
## Identifying Characteristics

### Vegetation

- \* *Treed swamp species*: black spruce and tamarack (conifer swamps), white birch, balsam poplar (hardwood swamps) or combinations of conifer and hardwood species (mixed wood swamps)
- \* *Shrub swamp species*: willow, redosier dogwood and speckled alder with sedges and grasses

### Soil

- \* *Nutrient levels*: range from poor to rich, with conifer swamps being poor to medium and other swamps ranging from medium to rich
- \* Typically, less than 40 cm of peat; primarily composed of decaying shrubs and trees (unlike sphagnum-dominated peat in bogs and fens)
- \* Most soil is aerated, but water availability is still high in lower portions of the root zone
- \* Typically gleysols with mottling (signs of temporary flooding) in the upper horizons and gleying (signs of permanent saturation) in the lower horizons



### Hydrology

- \* *Water source*: run-off, precipitation, groundwater and flooding from adjacent wetlands
- \* Seasonally flooded, fluctuating water levels
- \* Hummocky terrain with pools of water



### Resources

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Meadow Marsh



Green-winged Teal



Muskrat



Tundra Swan

# Marshes

Marshes in the western boreal forest are often found as a transition between open water and shorelines.

Water levels fluctuate seasonally and water sources come from precipitation and associated run-off, groundwater and stream inflow.

## Ecological Benefits

- \* Most biologically diverse but the least common boreal wetland
- \* Marshes moderate flooding and minimize soil erosion
- \* Filter and trap nutrients and neutralize a number of contaminants
- \* Vital habitat for many wildlife such as waterfowl, moose, beaver and muskrat

## Type of Marshes

- \* *Emergent marshes*: dominated by flood tolerant cattail and rushes; located between deeper open water and meadow marshes
- \* *Meadow marshes*: dominated by sedges and grasses; less flood tolerant and occupy shallow water areas





Cattail

Identifying Characteristics

Vegetation

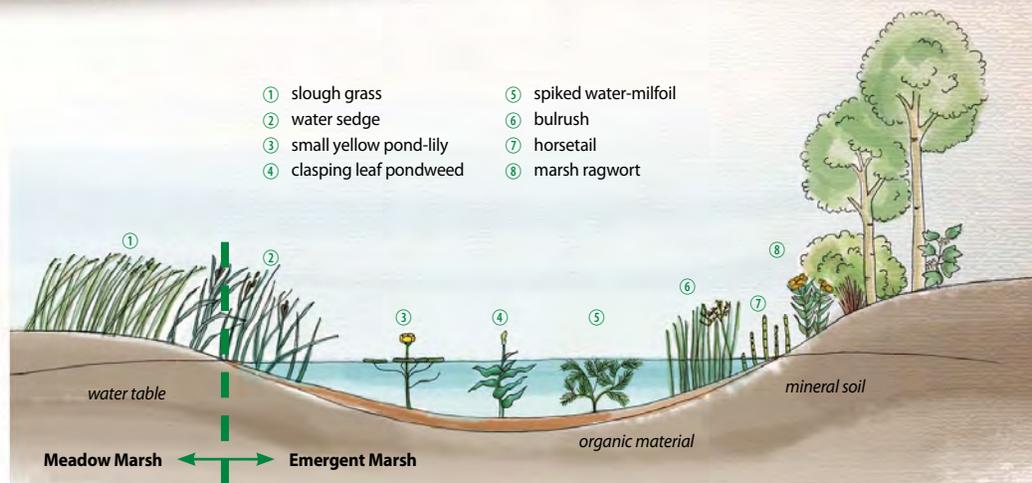
- \* Emergent vegetation (e.g. cattail, bulrush and sedges) occupies more than 25% of the area interspersed with open water
- \* Floating vegetation (e.g. pondweeds and milfoil) occupies open water

Hydrology

- \* *Water levels:* fluctuate seasonally and can periodically dry out
- \* *Water sources:* precipitation, run-off, groundwater and streams

Soil

- \* Mineral based soils with shallow organic deposits (< 40 cm)
- \* Nutrient rich soils resulting from periodic drying out and exposure to oxygen



Hard-stem Bulrush



Sedge



Resources

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Aquatic Bed



Open Water

# Shallow Open Water

Open Water wetlands have water depths less than two metres, yet are too deep for emergent marsh vegetation to establish. Visually, these wetlands appear to be shallow lakes, although floating-leaved and submerged aquatic vegetation are common in more nutrient-rich settings.

## Ecological Benefits

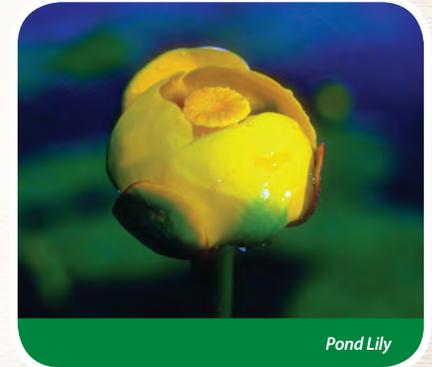
- \* Retain and store water helping to moderate flooding, recharge groundwater and maintain stream flows
- \* Productive for many plants and animals in nutrient-rich environments

## Types of Open Water Wetlands

- \* *Open water*: <25% aquatic vegetation on the water
- \* *Aquatic bed*: >25% aquatic vegetation on the water
- \* *Mudflat*: a temporary condition when water levels are low (drawdown)



White-winged Scoter



Pond Lily



## Identifying Characteristics

### Vegetation

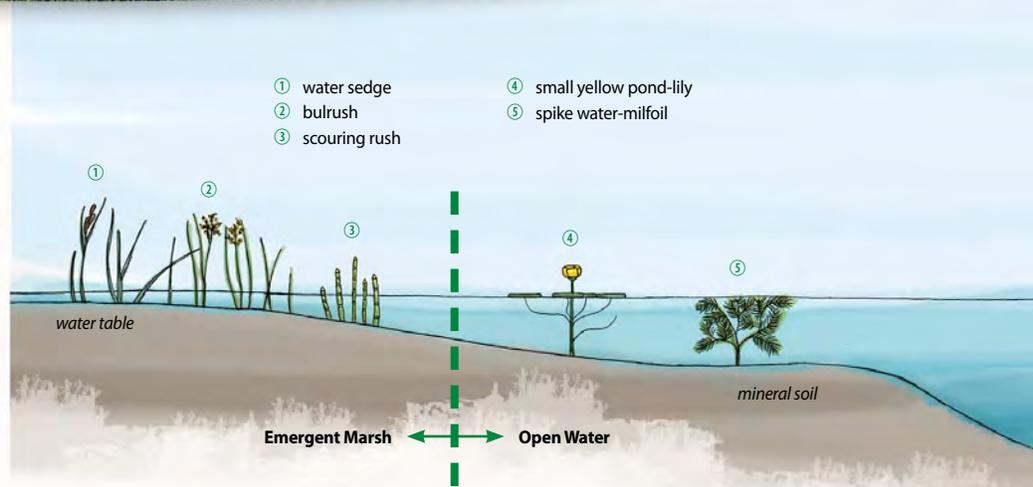
- \* Submerged aquatic (e.g. water-milfoil) and floating vegetation (e.g. pond lily)
- \* Too deep for emergent plants like cattails and rushes to establish

### Hydrology

- \* *Water sources:* precipitation, run-off, groundwater and streams
- \* *Water levels:* generally permanent but may fluctuate seasonally, exposing mudflats

### Soil

- \* Soil is poorly developed because of high water levels and lack of oxygen
- \* *Substrate:* silt, gravel or combinations of organic deposits



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