

Peatlands and Creatures Great and Small:

Part I – Vertebrates

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Introduction

This article is Part I of a two-part series on peatland creatures. In this installment I'll provide background information on the five wetland classes in Canada and the associated creatures there, and then focus on peatlands and vertebrates, from mammals to fish. Part II will focus on peatlands and invertebrates, including insects and amoebae, then outline wetlands from the perspective of conservation and animals. A table including all of the creatures discussed in both installments will be provided with Part II.

Canadian wetlands are important to a great number of creatures, from the largest moose to the smallest protozoan. Of the five wetland classes in Canada, shallow water wetland, marsh, swamp, fen, and bog (NWWG 1997), wildlife use is best known in marshes and shallow water wetlands. Found in coastal and inland areas, marshes and shallow water wetlands are the poster 'children' for wildlife, especially birds. These habitats provide feeding, breeding, nesting, and wintering habitat for tens of thousands of migratory birds, including waterfowl, cranes, coots and grebes, many shorebird species, some passerines, and birds of prey (Atlas of Canada 2003). Marshes and shallow water wetlands also provide critical habitat for many amphibians, some reptiles, and mammals like moose, beaver, and muskrat. Coastal estuaries are important habitats for harbour seals, sea lions, and sea otters, and are also critical for the spawning, feeding, cover, and provision of nursery areas many species of shellfish, finfish, crustaceans and other invertebrates. Non-marine fish and invertebrates are also dependent on freshwater wetlands (NWWG 1988, Atlas of Canada 2003).

Riparian areas surrounding wetlands and watercourses are often shrub-dominated swamps that provide vital habitat to passerines, amphibians, and ungulates that often feed there. In addition, many invertebrates, especially insects, breed or thrive in marshes, shallow water wetlands, and swamps, providing large biomass of food for birds and other species higher up in the food chain, both within and adjacent to the wetlands (Atlas of Canada 2003).

Canadian marshes and shallow water wetlands are not only important at the continental scale for conservation (NAWMP 2003), but also at the international scale (RAMSAR 2003). However, these wetlands are not the dominant types in Canada. In fact, the largest ecozone in Canada, the boreal region, has very little shallow water wetland and marsh. Peatlands, wetlands that accumulate greater than 40cm of organic matter, are the dominant wetland type in the boreal region, and ironically, much less is known about the animals in peatlands.

Peatlands and animals

Approximately 16% of Canada is covered with wetlands, of which 12% are peatlands. Most of these are peatland complexes consisting of bogs in a matrix of various fen types and black spruce swamps (NWWG 1988). Bogs are isolated from ground and surface waters, receiving their water and nutrients entirely from precipitation, whereas fens and black spruce swamps are connected to varying degrees to ground and surface waters. These hydrological differences, which are often great within sites as much as between, promote great vegetational heterogeneity, which in turn supports a wider variety of wildlife than is generally known (Keiser and Hendry 1982, Damman and French 1987, Finnamore 1994, Calmé and Desrochers 2000). However, most of our knowledge of peatland animals is restricted to eastern North American peatlands.

A wide range of animals are found in peatlands, but most do not complete their entire life cycles there; few vertebrates and invertebrates are obligate peatland species, i.e., 100% peatland dependent (Damman and French 1987). Water availability distinguishes obligate aquatic animals from those that only tolerate wet or require not fully aquatic conditions. The only other conditions that influence animal taxa in peatlands are the presence of humic acids and water acidity, large temperature fluctuations, and low nutrient concentrations (Heathwaite *et al.* 1993). Fens are affected by these factors to a lesser extent than bogs. Organisms that require calcium and other minerals, like most molluscs and crustaceans, are not often found in acid peatlands like bogs (Charmin 2002), although there are some exceptions.

In general, birds and mammals often encountered in peatlands are there due to a secondary dependence on invertebrates for food or habitat characteristics associated with specific life cycle components. However, although the effects of water logging, poor nutrients, and high toxicity (e.g., due to reduced forms of iron, manganese, or sulfur) are not as significant to animals as they are to plants, many animal taxa respond in a fashion similar to plants and there are some specialist peatland fauna (Charmin 2002).

Mammals

'Charismatic' megafauna like moose, white-tailed deer, black bear (Damman and French 1987), and woodland caribou (Rettie and Messier 2000) probably spend more time in peatlands than most other large mammals. However, many large mammals move across peatlands, using them for escape cover, breeding, and for feeding. Aquatic habitats associated with peatland complexes are used extensively in the summer by moose foraging on aquatic plants (Damman and French 1987). In addition, caribou are very dependent on peatlands, especially wooded bogs, preferring them and some black spruce forests to other habitats for food (slow-growing arboreal and ground lichens) and protection from predators, including wolves (Rettie and Messier 2000). In many western Canadian wooded peatlands, it is not uncommon to come across the remains of deer and moose killed by wolves. The kill sites are often associated with the extensive networks of trails made primarily by ungulates, but used by many mammals, large and small. While there is a paucity of research in this area, ungulate faeces deposited along these trails are often sources of important nutrients and provide microsites for a greater diversity of bryophyte and some vascular plant species (D.A. Locky, pers. obs.). Peatlands are also important to wood bison, with sedge meadows being a critical component of their winter forage habitats in the Northwest Territories peatland complexes (Matthews 1991).

Other megafauna found in peatlands include beaver, muskrat, mice, voles, water shrews, weasels, mink, raccoons, rabbits and hares (NWWG 1988). Not many small mammals are peatland specialists, but the northern bog lemming, southern bog lemming, and Arctic shrew, prefer peatland over other habitats (Banfield 1977). Other species use bogs, but are often associated with edge habitats and disturbed areas (e.g., surface-mined peatlands). The rodents using these areas include meadow vole, red-backed vole, meadow jumping mouse, deer mouse, meadow jumping mouse, red squirrel, and the insectivores include masked shrew, pygmy shrew, short-tailed shrew, American water shrew, smoky shrew, and star-nosed mole (Banfield 1977, Damman and French 1987, Mazorelle *et al.* 2001). American marten can also be found in wooded peatlands (D.A. Locky, pers. obs.) and where palatable trees and shrubs are present, porcupines can also be encountered (Kricher 1988). See Table 1 in the forthcoming installment of this series, Part II, for a list of North American mammals that frequent peatlands.

There are accounts of moose, elk, and woodland caribou found grazing in the 'bog' and meadowlands at Wagner Natural Area before Edmonton's settlement moved west (Keiser and Hendry 1982). While moose and potentially elk could still be found there, the black bear and wolf have disappeared and mule deer has been displaced by white-tailed deer. Lynx have been found at the Natural Area, but the carnivores one would likely see in the peatland complex today are coyotes, red fox, mink, and ermine and least weasels. Rodents that make their home at the Wagner Natural Area peatlands include red and northern flying squirrels, meadow and red-backed voles, deer and meadow jumping mice, muskrat, and porcupine. Insectivorous mammals include water and masked shrews. Snowshoe hares can be found year round and little brown, big brown, and silver-haired bats frequent the Wagner Natural Area during the summer (Keiser and Hendry 1982, Wagner Natural Area Society 2001). For a full list of extirpated and present mammals at Wagner Natural Area see Wagner Natural Area Society (2001).

Birds

While there are few birds that would be found exclusively in peatlands, a number of species, especially passerines, obtain high densities there. Species common to black spruce bogs include spruce grouse, yellow-bellied fly-catcher, palm warbler, Connecticut warbler, northern waterthrush, and Lincoln's sparrow (Breining 1992, Calmé and Desrochers 2000). Many other species are found in peatlands, especially wooded types, including a great variety of warblers such as Nashville warblers, black-and-white warblers, Cape May warblers, bay-breasted warblers, magnolia warblers, yellow-rumped warblers, and common yellowthroats. Sparrow species include chipping sparrows, white-throated sparrows, and swamp sparrows (Dansereau and Segadas-Vianna 1952, Dawson 1979, Damman and French 1987). In southern Quebec, of the 102 species detected on peatlands, 17 were found more significantly on peatlands than the surrounding landscapes. These species included American bittern, red-tailed hawk, ring-billed gull, great black-backed gull, common nighthawk, yellow-bellied flycatcher, golden-crowned kinglet, ruby-crowned kinglet, hermit thrush, Nashville warbler, magnolia warbler, palm warbler, common yellowthroat, northern cardinal, savannah sparrow, Lincoln's sparrow, and white-winged crossbill (Calmé *et al.* 2002).

In Alberta and northern Canada, some waterbirds will breed and nest in areas associated with peatlands, especially ring-necked ducks and rednecked phalaropes. Also found on open peatlands and sedge meadows are sandhill and whooping cranes, greater yellowlegs, solitary sandpipers, and short-billed dowitchers (Semenchuk 1992).

Much of the variation in bird assemblages is associated with the peatland vegetation structure (Stockwell 1994, Calmé and Desrochers 1999, Calmé and Desrochers 2000, Calmé *et al.* 2002), and this may be unique on the landscape if the landscape is fragmented. Peatlands in southern Quebec could be considered islands of boreal

vegetation in an Appalachian-Saint Lawrence Lowlands region, as the boreal species there are considered rare (Calmé *et al.* 2002). The size of peatland is also an important determinant in avian diversity. Upland sandpipers and palm warblers have been found to negatively correlated with isolated or small peatland patches (Calmé and Desrochers 2000) and Savannah sparrows have been positively associated with larger peatlands (Calmé and Desrochers 1999). This is important, as some species, including the palm warbler, are peatland specialists during the breeding season and most of the world's population breeds in Canada's peatlands (Wilson 1996). Peatland type is also a consideration. Swamp sparrows are more likely to be found in mineral rich fens than ombrotrophic peatlands (Calmé and Desrochers 1999, Calmé and Desrochers 2000). Large peatlands with poor fen habitat in eastern Canada are likely to provide habitat for upland sandpiper and common snipe (Calmé and Haddad 1996) and peatlands dominated by tamarack (rich fens) often have birds associated with shrubby habitat, including the great gray owl. In eastern Canada, white cedar-dominated swamps often have high densities of breeding northern parula and black-throated green warblers (Dawson 1979). In Germany, peatland bird species richness dramatically increased along the bog - fen gradient (Boelscher 1988). Perhaps even more interesting is that Finnish fens with flarks (patterned fens), which are more common in the north than the south, exhibit a reverse latitudinal gradient of species diversity; there are actually more bird species to the north than the south in these systems (Jaervinen *et al.* 1987)! See Table 1 in the next installment of this series, Part II, for a list of North American birds that have been found to frequent peatlands.

A large number of the species discussed above (within their ranges) and others such as LeConte's sparrow and some waterfowl can still be found at the Wagner Natural Area, despite declines in the number of birds due to the construction of Hwy. 16 and encroaching residential and industrial developments (Thormin 1982). Wagner is somewhat of an island of boreal vegetation that acts as a refuge for many species generally found a little further north. For a full list of birds at Wagner Natural Area see Wagner Natural Area Society (2001).

Amphibians and Reptiles

Although many amphibians and reptiles are found in peatlands, very few would be considered obligate peatland species. In ombrotrophic peatlands (bogs), low pH makes unsuitable habitat for some species, especially amphibians that have very absorbent skins.

Amphibians commonly found in eastern Canadian bogs include American toads, green frogs, northern leopard frogs, mink frog, wood frogs, mole salamanders (Mazorelle 2003), and eastern North American peatlands, blue-spotted salamanders (Damman and French 1987), and four-toed salamanders (Reschke 1990). In western Canadian fens, one would most likely find boreal chorus frogs (both green and copper-coloured) often in good populations, wood frogs, and perhaps a wayward leopard frog (D.A. Locky, pers. obs.).

Low pH and temperatures in peatlands means generally a low diversity of reptiles, without any endemic species. However, especially in southeastern Canadian peatlands, a number of species can be found, including bog and spotted turtles, and eastern garter snakes (Damman and French 1987). In Canada, there is one snake that is often found in non-forested fens and transitional peatlands. The eastern massasauga rattlesnake commonly occurs in open weakly minerotrophic fens with shrubs in eastern North America (Johnson and Leopold 1998). In southern Ontario, much of this habitat can be found along the Bruce Peninsula, which separates Lake Huron from Georgian Bay. These snakes overwinter in spaces beneath shrub hummocks and tussock vegetation and require open-canopy areas from thermoregulation of gestation and digestion (Johnson 1995). Currently the eastern massasauga rattlesnake is a threatened species in Canada (Atlas of Canada 2003). Refer to Table 1 in the next installment of this series, Part II, for a list of North American amphibians and reptiles that may be found in peatlands.

At Wagner Natural Area, one could expect to find tiger salamanders, western (boreal) toads, boreal chorus frogs, wood frogs, red-sided and wandering garter snakes (Wagner Natural Area Society 2001).

Fish

Many peatland complexes contain shallow water wetlands and ponds. Most freshwater fish spawn in only shallow water, and this includes shallow water wetlands (particularly for warmer water fish) (Reppert *et al.* 1979). Smaller fishes, including minnows and sticklebacks, are often found in ponds and shallow water bodies in Alberta, (including peatland complexes), but may not survive winters due to low oxygen levels and a thickening ceiling of ice. This is referred to as winterkill and occurs during cyclic low water conditions (Danylchuck and Tonn 2003).

The marl pool in the Wagner Natural area has a population of fathead minnows. These minnows sometimes make their way into the networks of channels and water-filled hollows the wooded peatland surrounding the marl pond during high water levels. Remarkably, they survive in large groups in pools no bigger than large bowls, probably feeding on the rich assemblage of insects in the area well into the fall (D.A. Locky, pers. obs.). Presumably

they will succumb to winterkill with the onset of ice and lowered water table in winter. Other fish that may be found at the Wagner Natural Area include northern pike and brook stickleback (Wagner Natural Area Society 2001).

The final installment of this two-part series on peatland creatures will cover peatlands and invertebrates and will arrive in the next issue with a table listing the creatures in both parts.

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