The Importance of Wetlands to Waterbirds in the Boreal Forest of Ontario

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Introduction

The Boreal Forest is the largest biome in Canada and covers 35% of the total land area and 77% of the total forested area in the country (NRC 2004a). In Ontario, the Boreal Forest is the largest forest region, covering 59% of the province's land area (OMNR 2002). Within these northern forests of Black Spruce (*Picea mariana*) and Jack Pine (*Pinus banksiana*), countless wetlands form an integral component of the forested landscape. On average, 20% of the Boreal region is covered with wetlands (NRC 2004b). These wetlands are important breeding grounds for many species of waterbirds, defined in this paper as including shorebirds, herons, rails, gulls, terns, cranes, waterfowl and their allies. Being naturally dynamic, the Boreal Forest has evolved with large disturbances such as fire and insect outbreaks (McCarthy 2001). In recent decades, however, anthropogenic disturbances such as timber harvesting have increased throughout the Boreal Forest. The Ontario Ministry of Natural Resources (OMNR) policy statements, "Direction '90s" (OMNR 1991a), "Direction '90s – Moving Ahead 1995" (OMNR 1995), and "Beyond 2000" (OMNR 2000) called for an ecosystem-based approach to natural resource management (e.g., forest management). Given that wetlands in Canada's Boreal Forest are the biggest wetland area of any ecosystem in the world (Song and Hannah 2004), they clearly are an important, if not critical, segment of the forest's flora and fauna and, ultimately, its ecology. The boundaries between forests and wetlands are not always easily discernable. Furthermore, these two habitats are often synonymous, with sections of wetlands having forest cover. Therefore, effects of forest management activities on wetland ecosystems and waterbirds are an important consideration when managing forests using an ecosystem approach. Indeed, although several research projects have focused on the effects of forest management on Boreal Forest landbirds in Ontario (e.g., Thompson et al. 2003, Zimmerling 2005), none, to our knowledge, have focused on waterbirds and their wetland habitats.

Wetlands in Boreal Ontario

Wetlands cover nearly one third of the province's total land area, representing 6% of the world's total wetland area (Jones et al. 2000). The

Figure 1: Fens and other wetlands cover nearly one-third of the province's land area and are important habitat for many species of waterbirds. Photo by *Michael Runtz*.

majority of these wetlands are found in the Boreal and Hudson Bay Transitional Forests of northern Ontario (NRC 2004b). Boreal Forest wetlands are primarily treed bogs, open bogs, and fens (OMNR 1999) and are also referred to as peatlands. To a lesser degree, swamps (particularly in the south), shallow open water (e.g., beaver ponds, river edges), and marshes are also an important component of these northern forests (NRC 2004b). The formation of bogs and fens is controlled by topography, hydrology, climate, and the chemistry of the soil. Open or treeless bogs have very low levels of mineral or salt nutrients and favour plants such as the sphagnum mosses. As mineral levels increase, trees and shrubs become established, and some herbaceous plants move in (Hains and Telford 2004). In the Boreal Forest, these bogs often have summits of forest (Moore 2001), which are generally dominated by Black Spruce.

Waterbirds in Boreal Wetlands

Blancher and Wells (2005) demonstrated the importance of the Boreal Forest region of Canada as nesting habitat for many species of birds, including waterbirds. This report showed that the Boreal Forest encompasses more than 25% of the breeding population of 55 waterbird species, including 11 species with over 80% of their population breeding in the Boreal Forest. Of the 55 species listed in the report, 44 breed in Ontario (OFO 2006).

Although shorebirds are generally considered birds of coastal mudflats, prairie ponds, and remote tundra (Johnston 2003), some shorebirds use the Boreal Forest for breeding. Huge areas of fens and bogs are scattered throughout the Boreal Forest of Ontario, which provides extensive habitat for certain shorebird species (Ross et al. 2003). In Ontario, some shorebirds are Boreal Forest obligates: Greater Yellowlegs (*Tringa melanoleuca*), Lesser Yellowlegs (*T. flavipes*), Solitary Sandpiper (*T. solitaria*), and Short-billed Dowitcher (*Limnodromus griseus*), all of which are among the least known shorebirds on the continent (Johnston 2003). Another widespread Boreal nester is the Wilson's Snipe (*Gallinago delicata*). This cryptic species breeds in a variety of wet habitats throughout the Boreal Forest region. The *Canadian Shorebird Conservation Plan* (Donaldson et al. 2000) categorized these five shorebird species as high priority in the Boreal region. In addition, two gull species, Bonaparte's Gull (*Larus philadelphia*) and Herring Gull (*L. argentatus*), have over 80% of their breeding population in Canada's Boreal Forest (Blancher and Wells 2005). Herring Gulls usually breed on rocky islands in open water (Pierotti and Good 1994), but the Bonaparte's has the unusual habit of nesting in trees in or adjacent to Boreal wetlands (Burger and Gochfeld 2002).

Other Boreal wetland breeders include rails and herons, which are usually thought of as components of large marsh ecosystems. A few of these species, such as American Bittern (*Botaurus lentiginosus*), Great Blue Heron (*Ardea herodias)* and Sora (*Porzana carolina*), are found throughout Boreal wetlands (Cadman et al. 1987). The Yellow Rail (*Coturnicops noveboracensis*) is listed as a "species of special concern" under the Canadian Species at Risk Act (DJC 2002). Its breeding range includes all of the Boreal Forest of Ontario (Godfrey 1986). Robert et al. (2004) and the second Ontario Breeding Bird Atlas (unpubl. data) showed that this bird is common along the James and Hudson Bay Coasts, and found to a lesser extent in northern Great Lakes marshes. Although the presence of Yellow Rails within its breeding range is localized (Bookhout 1995), there is suitable habitat throughout the Boreal Forest region of Ontario where this elusive species could potentially be found.

The importance of the Boreal Forest to waterfowl in the western provinces has been well documented (e.g., Portman 2005). More than 50% of North American waterfowl have at least part of their breeding range in the Boreal Forest region (Blancher and Wells 2005). In Ontario, Ducks Unlimited Canada (DUC 2005) estimated that 50% of Ontario's fall flight, or about 4 million birds, is produced in the province's Boreal Forest. Ontario's Boreal Forest is particularly impor-

tant as breeding habitat for the American Black Duck (*Anas rubripes*; CWS 2005). Species such as Common Goldeneye (*Bucephala clangula*), and Ring-necked Duck (*Aythya collaris*) commonly nest in the Eastern Boreal Forest also.

Undoubtedly, many waterbird species are dependent upon both forested and non-forested Boreal wetlands. In contrast to southern Ontario, where 70% of all wetlands have been lost (Wiken et al. 2003, FON 2004), Boreal Forest wetlands are relatively intact (Wilkinson 2004). This provides an excellent opportunity to examine and understand these ecosystems. James (1985) suggested that in northern Ontario there was relatively little human activity that could threaten the habitats of wetland bird species, with the exception of forestry. Although forest management has the potential to have large scale impact on wetlands, other anthropogenic activities could also affect wetlands in Boreal Ontario, including mining, hydroelectric production (CWS 2005), and peat harvesting (Hains and Telford 2004).

Currently, there is little information that documents how forest management in the province may affect Boreal waterbirds, but any effect will likely be linked to changes in their wetland breeding habitats. The development and functioning of wetlands is directly related to the dynamics of water supply and loss (Maltby 1991). The physical and chemical characteristics of wetlands are influenced by hydrology, and changes in these parameters can have major implications for ecosystem dynamics, as well as local wildlife (Maltby 1991), including waterbirds. According to Moore (2001), fragmentation around Boreal Forest bogs is not an important consideration since bogs are, by their very nature, "island" habitats. Research in the Boreal Forest has shown that basin stream flow can be altered by forest management activities, with total runoff increasing directly with the magnitude of disturbance (Buttle and Metcalfe 2000). This can result in changes in wetland water levels farther down the watershed, and in fact, a rise in the water table is reported to be a common hydrological change after timber harvesting (OMNR 1997a, Brooks and Stoneman 1997). In addition to increased water flows, silt and nutrient inputs also occur following forest harvesting activities (Nicolson 1975). These physical changes have the potential to alter the structure of wetlands, thus changing the availability of suitable habitat for some waterbirds. For example, a bog with scattered small ponds and hummocky moss-covered ground provides ideal habitat for nesting Greater Yellowlegs (Elphick and Tibbitts 1998). With rising water levels, these areas may become completely submerged. Higher water combined with a significant increase in available nutrients from erosion and sedimentation could

Figure 2: Greater Yellowlegs commonly nest on hummocks in bogs in the Boreal Forest of Ontario. Photo by *Michael Runtz*.

lead to the increased growth of emergent plants such as cattails (*Typha* spp.). The resulting marsh-like conditions will no longer provide suitable nesting sites for peatland ground-nesters such as Greater Yellowlegs. On the other hand, the Sora, which builds its nest in emergent vegetation above water (Melvin and Gibbs 1996), may utilize this newly created habitat. James (1985) suggested that, given the dynamic nature of wetlands, waterbirds may be particularly adapted to fluctuations in water levels (natural or otherwise). Further research in Boreal wetland ecosystems is needed, however, to test this hypothesis.

Another possible effect of forest management on hydrology is the rutting, trenching, and soil compaction caused by the equipment used, which in turn can lead to "ponding", and water-logging (OMNR 1997a). This can initiate wetland succession (Moore 2001), consequently creating new wetlands or altering already existing wetlands. For instance, unpublished data from Zimmerling (2005) showed that timber harvesting in lowland spruce forests often results in the creation of open wet areas and standing water where Speckled Alder (*Alnus rugosa*) and other wetland plants thrive. Moreover, species such as the Wilson's Snipe commonly nest in these newly formed open wetlands. While evidence suggests that harvested forested wetlands will eventually return to Black Spruce domi-

nance, it may take decades depending on the magnitude of the disturbance (Carleton 2000).

Although changes in wetland structure, chemistry, and hydrology may have the greatest effects on waterbirds, some species such as American Black Duck, Bufflehead (*Bucephala albeola*), and Common Goldeneye (Hickie 1985), as well as Solitary Sandpiper (Moskoff 1995), and Bonaparte's Gull (Burger and Gochfeld 2002), use forested areas adjacent to wetlands for nesting. These species often nest in upland habitats, but use wetlands to feed and to raise their broods. Given that little research exists, there is a possibility that harvesting forested wetlands or upland forests adjacent to open wetlands could affect these species, at least in the short-term, through a loss of suitable nesting habitat.

Forest Management Guidelines

To achieve the goal of ecological sustainability through forest management, the OMNR developed several policies and guidelines, some of which relate to wetland protection. The "Code of Practice for Timber Management in Riparian Areas" (OMNR 1991b) was developed to minimize soil and site disturbance, and protect water quality. In accordance with this code (page 7), forest managers are required to leave a minimum three-metre strip of undisturbed vegetation in riparian areas (OMNR 1991b). This 3-m buffer is applied to non-permanent water courses/bodies (Derrick Romain, pers. comm.). Larger, more permanent, bodies of water are covered under the "Timber Management Guidelines for the Protection of Fish Habitat" (OMNR 1988), which was developed to protect fish habitat and water quality. Buffers required under this guideline vary from 30 to 90 m, depending on slope. Forestry companies such as Abitibi-Consolidated Company of Canada often leave from 30 m to 120 m intact around water bodies such as rivers and lakes, depending upon the slope and the value that needs to be protected (Derrick Romain, pers. comm., 9 January 2006).

The forest industry tends to avoid harvesting in the more characteristic wetland areas such as open bogs and fens because trees are often stunted and not merchantable, and the terrain is hazardous to machinery and workers (i.e., deep peat deposits and sinkholes; Derrick Romain, pers. comm.). When managing a merchantable lowland spruce forest (including treed peatlands), some forest managers have adapted different silvicultural techniques such as Harvest with Regeneration Protection (HARP). Such techniques were developed to best emulate the natural processes in wet forested areas (OMNR 1997b). Under the Crown Forest Sustainability Act, forest managers are required to emulate natural disturbances such as fire (OMNR 2001). Given the complex nature of

Boreal fire regimes, this is not easily accomplished, particularly in relation to wetlands. For instance, wetlands that are part of pyrophilic ecosystems such as Jack Pine dominated forests will burn more often than similar wetlands embedded within mesophilic aspen (*Populus* spp.) and birch (*Betula* spp.) forests (Dickmann and Cleland 2002). In addition, there is considerable variation in the disturbance by fires around water bodies; some will burn up to the water's edge, whereas others may leap over these barriers (Hunter 1992). Thus, if emulating natural disturbances such as fires, it may be necessary to leave buffers of variable sizes, including no buffers at all, depending on the characteristics of the wetland. The current policies and guidelines developed by the OMNR and individual companies do offer some protection to wetlands in the Boreal Forest, but they do not apply to all wetlands, nor do they necessarily take into consideration the needs of waterbirds.

Conclusion

There is very limited published research on the effects of forest management on wetlands in the Boreal Forest and very little, if any, has documented the impact on waterbirds in Ontario. Some forest management practices have the potential to alter the structure of Boreal wetlands and, therefore, will positively affect some species and negatively impact others that rely upon these ecosystems. We believe that more specific research is required to better understand how present day forest management practices affect Boreal Forest waterbirds and their wetland habitats, as well as to test if current guidelines are sufficiently protecting this diverse and under-studied group of birds.

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