How Well Do Parks Protect Fish Species At Risk In Ontario?

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Abstract

In Ontario, national and provincial parks and conservation lands have been established for a variety of reasons including to provide recreational opportunities and to preserve areas of scientific, cultural or historical significance. Few, if any, parks and conservation areas have been established specifically to preserve aquatic biodiversity; however, as a result of their location and management practices, they may actually protect aquatic biodiversity. Over 165 fish species have been collected in Ontario. Of these species, 32 are listed as “Extinct,” “Extirpated,” “Endangered,” “Threatened,” or “Special Concern” by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). For each COSEWIC-listed fish species, we conducted analyses to determine the percentage of populations found within parks and conservation areas, and the degree to which these areas actually protected the species. In general, parks and conservation areas offer limited protection to fish species at risk but may provide opportunities for better protection.

**Keywords:** protected areas, conservation areas, fish species at risk, protection, recovery

Introduction

National, provincial, and municipal parks, lands, and protected areas (e.g., national wildlife areas) have been established in Ontario for a variety of reasons ranging from providing recreational opportunities to preserving cultural heritage to protecting natural heritage. In Ontario, there are eight na-
tional parks (including two national waterways and a national marine park) (Parks Canada, 2005), 10 national wildlife areas (NWAs; Canadian Wildlife Service, 2005), more than 300 provincial parks and conservation preserves (OMNR, 2005), and more than 2,300 parcels of land (totaling more than 117,000 ha) owned by 36 conservation authorities (Conservation Ontario, 2005). Few, if any, parks or protected areas in Ontario have been developed primarily to protect aquatic biodiversity (excluding waterfowl), including rare species.

Thirty-two fish species in Ontario have been given a conservation rank of “Special Concern” or higher by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). In addition, eight mussel species in Ontario have been listed as Endangered by COSEWIC (COSEWIC, 2005). In fact, the watersheds of southwestern Ontario contain the highest numbers of aquatic species at risk (SAR) in Canada (see Figure 1; Staton and Mandrak, 2005). However, the watersheds also contain the greatest threats to aquatic SAR – habitat alteration and invasive species (Chu et al. 2003; Dextrase and Mandrak 2005; Staton and Mandrak 2005).

Figure 1. Fish SAR richness by watershed in Canada.
Although few parks and protected lands have been established to specifically protect aquatic biodiversity, some might do so by chance, or might provide the opportunity to better manage for the survival of aquatic SAR found within the parks. The objectives of this paper are: 1) to determine the extent to which populations of fish SAR are found in parks and protected areas in Ontario; and, 2) to identify existing parks which are de facto protecting fish SAR and may better protect them through relatively minor changes to their management. Examples of the first objective are presented for several fish species, and three examples of the second objective are presented – one for each of a national, provincial and conservation authority park or protected area.

**Methods**

Distribution data for fish SAR were obtained from an unpublished database (N.E. Mandrak, unpubl. data). The database contains records (where one record represents the capture of a single species at a specific location on a specific date) primarily from sampling conducted by various museums between the 1920s and 1990s, the OMNR lake and stream inventories conducted in the 1970s, and extensive Fisheries and Oceans Canada (DFO) sampling conducted since 2002. The museum and OMNR sampling generally represented surveys of the whole fish community, whereas the DFO sampling often targeted fish SAR.

The distribution data were spatially joined to GIS layers representing: 1) national parks and wildlife areas (Figures 2 and 3); 2) provincial parks and conservation reserves (Figure 4); and, 3) conservation authority lands (a layer was only available for 10 of 36 conservation authorities; therefore, this analysis was limited largely to the watersheds of Lakes Erie and Ontario) (Figure 5). Based on this spatial join, the number and composition of fish SAR were listed for each park and protected area; thereby, allowing the identification of parks and protected areas containing fish SAR. This information also allowed the identification of fish SAR that were, and were not, found in parks and protected areas.

**Results**

At least one population of 24 of the 32 fish SAR in Ontario was found in a national or provincial park; however, most populations of these species (and all populations of eight species) are found outside of parks (Figure 6; Table 1). Of the fish SAR with at least one population in a park, five species have all of their Ontario populations in a park, five species have 50-99% of their...
Figure 2. National parks, waterways and canals in Ontario, managed by Parks Canada.

Figure 3. National wildlife areas in Ontario, managed by Canadian Wildlife Services.
Figure 4. Provincial parks and conservation reserves in Ontario.

Figure 5. Conservation authority lands in Ontario used in this study. (Only a subset of conservation authority lands was available for this study.)
Table 1. Fish SAR found in Ontario and number of parks where they are found.

**Conservation status**: SC – Special Concern; THR – Threatened; END – Endangered; XT – Extirpated; EXT – Extinct.

**COSEWIC** - COSEWIC conservation status: SC – Special Concern; THR – Threatened; END – Endangered; XT – Extirpated.

**Total** – total number of populations (after Mandrak and Crossman 1992 and COSEWIC reports for each species).

**Parks** – number of populations found in parks.  **%Parks** – percentage of populations found in parks.

**National** – number of populations found in national parks.  **NWA** – number of populations found in national wildlife areas.

**Provincial** – number of populations found in provincial parks.  Common and scientific names according to Nelson *et al.* (2004).

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populations at least partially in a park, and 14 species have less than 50% of their populations at least partially in a park (Figure 6).

A total of 16 fish SAR were present in seven of the eight Parks Canada holdings in Ontario, with the highest number of fish SAR (six species) being found in each of Fathom Five, Lake Superior, and Point Pelee National Parks (Figure 7). Six fish SAR were present in four of ten national wildlife areas in Ontario (Figure 8). Big Creek NWA, on Lake Erie, had the highest fish SAR richness (4) of all NWAs (Figure 8). Nineteen fish SAR were present in 15 of the over 290 provincial parks and none of the provincial conservation reserves in Ontario (Figure 9). The highest number of fish SAR (five) was found in each of Lake Superior, Michipicoten, Rondeau, and Sleeping Giant Provincial Parks (Figure 9). The high number of species found in the national and provincial parks of Lakes Huron and Superior were primarily the cisco species (*Coregonus* spp.) endemic to the deep waters of the Great Lakes (Scott and Crossman 1973), whereas the species in the parks of Lake Erie were a variety of wetland species.

Thirteen fish SAR were found on conservation lands managed by the ten

**Figure 6.** Percentage of populations of fish SAR found inside parks in Ontario by conservation status: SC – Special Concern; THR – Threatened; END – Endangered; XT – Extirpated.
Figure 7. The number of fish SAR found in Parks Canada holdings by COSEWIC conservation status: SC – Special Concern; THR – Threatened; END – Endangered; XT – Extirpated.

Figure 8. The number of fish SAR found in national wildlife areas by COSEWIC conservation status: SC – Special Concern; THR – Threatened; END – Endangered; XT – Extirpated.
Fish conservation authorities included in this study (Figure 2). The highest number of fish SAR (seven) was found on lands managed by the St. Clair Region Conservation Authority. Populations of two species (blackstripe topminnow and orangespotted sunfish) were found on conservation authority lands, but not in national or provincial parks. The total number and proportion of populations of fish SAR on conservation lands was not calculated due to the incomplete conservation authority lands layer. For example, lands managed by the Lower Thames River Conservation Authority were not on the available map layer, but this watershed is rich in fish SAR (Thames River Recovery Team, 2004).

Discussion

About 70% of the fish SAR in Ontario are found in national parks, provincial parks, conservation authority lands, and other protected areas and, in most cases, only a small proportion of the populations of each fish SAR are found in parks. This is due, in large part, to the largely non-overlapping distributions of fish SAR and parks in Ontario. In Ontario, the highest number of fish SAR is found in southwestern Ontario; whereas, most parks,
particularly provincial parks, are generally found in central and northern Ontario. Conservation authority lands are an exception as most conservation authorities are found in southern Ontario. It is not surprising that lands managed by the St. Clair Region Conservation Authority have the highest number of fish SAR of all conservation authorities as the Sydenham River drainage within it has the highest fish SAR richness in Canada (Figure 1; Staton and Mandrak, 2005).

Several fish SAR are largely found in parks and protected areas. All known extant populations of the spotted gar (see Table 1 for scientific names and conservation status of fish SAR) and warmouth are found in Big Creek National Wildlife Area, Rondeau Provincial Park and Point Pelee National Park (Mandrak and Cudmore, 2004a,b). Five of seven known extant populations of the lake chubsucker, and five of seven known extant populations of the pugnose shiner, are found in national parks and wildlife areas, or provincial parks (Holm and Mandrak, 2002; Mandrak et al., 2005). In addition, all populations of four other species (bridle shiner, deepwater cisco, shortnose cisco, and silver chub) are found, at least partially, within a park.

Two types of fish SAR are typically found in parks. Members of the endemic cisco species flock of the Great Lakes (Scott and Crossman, 1973) are found in the deeper waters (>50 m) of the national and provincial parks in lakes Huron and Erie. Fish SAR that prefer wetlands are found in national parks, provincial parks, conservation authority lands, and protected areas along the coasts of lakes Erie and Huron. In some cases, these parks provide barriers, in the form of dykes (e.g., national wildlife areas) or dams (e.g., The Pinery Provincial Park), that isolate their waters from the impacts found in the Great Lakes themselves, such as invasive species and degraded water quality. In addition, these parks typically protect wetland habitats, essential to many fish SAR, which have been largely degraded or destroyed by humans outside of the parks. Although some riverine fish SAR are found in parks (e.g., Komoka Provincial Park on the Thames River), such species are typically found in southwestern Ontario where there is a paucity of parks and protected areas.

Of the six fish SAR not found in any parks (Table 1), the blue pike, endemic to lakes Erie and Ontario and the Niagara River (Scott and Crossman 1973), is “Extinct,” and the paddlefish, infrequently found in the Great Lakes and large tributaries prior to 1900 (Parker, 1988), is “Extirpated.” Of the remaining four species, two (Lake Simcoe lake whitefish and northern madtom) have very limited distributions in Canada, and two are very difficult
to identify (chestnut lamprey and black buffalo) resulting in few confirmed records in Ontario.

How can parks better protect fish SAR? New national and provincial parks strategically placed in southwestern Ontario, which has the highest number of fish SAR in Canada, would protect additional populations. For example, wetlands in the Big Creek (Essex County), Canard River (Detroit River), and Walpole Island (Lake St. Clair) areas are all occupied by several fish SAR. Parks in these areas could be managed to minimize any additional wetland losses and could also minimize the impacts of invasive species and poor water quality by maintaining existing dykes (e.g., Canard River, Walpole Island), or creating new ones. Controlling and minimizing the threats to riverine fish SAR is much more difficult due to the impact of upstream influences at any given location within the watershed (Dextrase et al., 2003). Therefore, parks established to protect fish SAR must either be placed in headwaters, or in areas where local impacts (e.g., bait harvesting) could be mitigated. The watersheds with the highest fish and mussel SAR in Canada (Staton and Mandrak, 2005), the Grand, Sydenham and Thames watersheds, have only one national or provincial park among them (Komoka Provincial Park on the Thames River). Additional parks could be strategically placed in these watersheds to further protect aquatic SAR.

In addition to creating new parks and protected areas, management practices in existing parks with fish SAR could be modified to protect fish SAR. For example, commercial fisheries for food (e.g., ciscoes in the Great Lakes) and bait (e.g., small fishes in wetlands and rivers), and recreational angling could be prohibited to prevent incidental catches of fish SAR. Prohibiting angling, or the use of live bait, would also reduce the risk of introducing invasive species that might negatively impact fish SAR. Invasive species could be more effectively managed by prevention strategies ranging from education to physical barriers or eradication, which might be more readily applied to parks than to other public and private lands. Parks could also actively maintain existing habitat for fish SAR and rehabilitate degraded habitat. In some cases, parks would protect and rehabilitate “recovery habitat”, defined in the Canadian Species at Risk Act as habitat once occupied by a now extirpated species (e.g., pugnose shiner habitat in Point Pelee National Park) that may be reintroduced in the future.

Point Pelee National Park has six fish SAR. Of these six species, five are wetland species and one (silver chub) is a lake species only incidentally caught in the past within the park. One of the five wetland species (pug-
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nose shiner) is no longer found in the park, one species (lake chubsucker) is found in only very low abundance, and populations of the remaining three species (bigmouth buffalo, spotted gar, and warmouth) appear to be stable (H. Surette, University of Guelph, unpubl. data). The pugnose shiner and lake chubsucker are particularly intolerant of high turbidity (Holm and Mandrak, 2002; Mandrak et al., 2005), and this is likely the primary threat to fish SAR in Point Pelee National Park. Introduced species (e.g., round goby (*Neogobius melanostomus*)) are likely a secondary threat to fish species at risk. Although the cause of the increased turbidity is unknown, the wetlands of Point Pelee National Park are usually isolated from the Lake Erie by a barrier beach and the resulting decreased flushing rate of the wetlands may be the cause of the increased turbidity. If this barrier is determined to be the cause, the connectivity of the wetlands to the lake could be engineered to increase the flushing rate; however, the potential impact on the SAR of other taxa (e.g., waterfowl) and the risk of colonization by introduced species must be considered. This trade-off is an example of how management actions, which may not be readily accepted on public or private lands due to socio-economic reasons (e.g., maintaining water levels for recreational purposes), may be more easily implemented in parks.

The Pinery Provincial Park has three fish SAR. Its main watercourse, the Old Ausable Channel, measures approximately 14 km in length and is unusual in that, as a result of human engineering, its source is local groundwater and its water level is maintained by a downstream dam (Ausable River Recovery Team, 2005). As a result of this unusual configuration and surficial geology of sand, the waters of the Old Ausable Channel are very clear and heavily vegetated, and are isolated from downstream waters. This habitat is ideal for two (pugnose shiner and lake chubsucker) of the three fish SAR, which are intolerant of high turbidity (Holm and Mandrak 2002; Mandrak et al., 2005). The third species, bigmouth buffalo, prefers high turbidity and is found only in the more turbid waters below the dam. The primary threat to the pugnose shiner and lake chubsucker is increased turbidity as a result of urban development upstream of the park and the common carp (*Cyprinus carpio*) that is present in low numbers (Ausable River Recovery Team, 2005). Again, management practices benefiting these fish SAR, which may not be practical on public or private lands, may be more easily implemented. For example, permanent silt traps (e.g., artificial wetlands) could be installed upstream to buffer the effect of urban development. Recovery habitat could be created downstream by moving the dam to the downstream edge of the park. Common carp could be eradicated from the Old Ausable Channel by
simply relocating all individuals caught to below the dam. There appears to be no immediate threats to the bigmouth buffalo.

Although Big Bend Conservation Area on the lower Thames River, managed by the Lower Thames Valley Conservation Authority, was not included in the current analysis, it provides an example of how conservation authority lands could be managed to better protect fish SAR. Two fish SAR (eastern sand darter and northern madtom) are known from the Thames River, immediately adjacent to the conservation area, and three other SAR (bigmouth buffalo, river redhorse, and spotted sucker) are known from the Thames River, in the vicinity of the conservation area. A variety of threats may impact these species, including poor water quality, siltation, habitat fragmentation, and commercial baitfish harvesting (Holm and Mandrak, 1996; Holm and Mandrak, 1997; Mandrak and Cudmore, 2005; Reid and Mandrak, 2004a; Reid and Mandrak, 2004b). Although many of these are landscape-level threats that could not be mitigated by site-level management actions, the potential impact of commercial baitfish harvesting could be minimized by prohibiting access to the river through the conservation area. In general, the potential to carry out management actions to benefit fish SAR in conservation areas may be limited by the lack of legislative mandates provided to national and provincial parks through various acts.

**Conclusion**

In conclusion, few, if any, parks and protected areas in Ontario were established specifically to protect aquatic biodiversity, including rare species. However, some populations of about 70% of fish SAR in Ontario occur, at least partially, in parks or protected areas. This is due, in large part, to the largely non-overlapping distributions of fish SAR and parks in Ontario. The highest number of fish SAR is found in southwestern Ontario, whereas most parks, particularly provincial, are generally found in central and northern Ontario. Fish SAR could be better protected in southwestern Ontario by the development of new national and provincial parks with a primary goal of protecting aquatic biodiversity. In addition, parks in which populations of fish SAR are currently found provide an opportunity to better protect these species if management actions that minimize the threats to these species are adopted.

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Fish


