PROPOSED

Species at Risk Act
Recovery Strategy Series

Recovery Strategy for the Prothonotary Warbler (*Protonotaria citrea*) in Canada

Prothonotary Warbler

July 2007

Environment Canada Environnement Canada

Canada

About the *Species at Risk Act* Recovery Strategy Series

What is the *Species at Risk Act* (SARA)?

SARA is the Act developed by the federal government as a key contribution to the common national effort to protect and conserve species at risk in Canada. SARA came into force in 2003, and one of its purposes is *"to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity."*

What is recovery?

In the context of species at risk conservation, **recovery** is the process by which the decline of an endangered, threatened or extirpated species is arrested or reversed, and threats are removed or reduced to improve the likelihood of the species' persistence in the wild. A species will be considered **recovered** when its long-term persistence in the wild has been secured.

What is a recovery strategy?

A recovery strategy is a planning document that identifies what needs to be done to arrest or reverse the decline of a species. It sets goals and objectives and identifies the main areas of activities to be undertaken. Detailed planning is done at the action plan stage.

Recovery strategy development is a commitment of all provinces and territories and of three federal agencies — Environment Canada, Parks Canada Agency, and Fisheries and Oceans Canada — under the Accord for the Protection of Species at Risk. Sections 37–46 of SARA (www.sararegistry.gc.ca/the_act/default_e.cfm) outline both the required content and the process for developing recovery strategies published in this series.

Depending on the status of the species and when it was assessed, a recovery strategy has to be developed within one to two years after the species is added to the List of Wildlife Species at Risk. Three to four years is allowed for those species that were automatically listed when SARA came into force.

What's next?

In most cases, one or more action plans will be developed to define and guide implementation of the recovery strategy. Nevertheless, directions set in the recovery strategy are sufficient to begin involving communities, land users, and conservationists in recovery implementation. Cost-effective measures to prevent the reduction or loss of the species should not be postponed for lack of full scientific certainty.

The series

This series presents the recovery strategies prepared or adopted by the federal government under SARA. New documents will be added regularly as species get listed and as strategies are updated.

To learn more

To learn more about the *Species at Risk Act* and recovery initiatives, please consult the SARA Public Registry (www.sararegistry.gc.ca/) and the Web site of the Recovery Secretariat (www.speciesatrisk.gc.ca/recovery/).

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July 2007

Recommended citation:

Environment Canada. 2007. Recovery Strategy for the Prothonotary Warbler (*Protonotaria citrea*) in Canada [Proposed]. *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa. vi + 25 pp.

Additional copies:

Additional copies can be downloaded from the SARA Public Registry (www.sararegistry.gc.ca/).

Cover illustration: Judie Shore

Également disponible en français sous le titre
« Programme de rétablissement de la Paruline orangée (*Protonotaria citrea*) au Canada [Proposition] »

ISBN To come
Catalogue no. To come

DECLARATION

This recovery strategy has been prepared in cooperation with the jurisdictions responsible for the Prothonotary Warbler. Environment Canada has reviewed and accepts this document as its recovery strategy for the Prothonotary Warbler, as required under the *Species at Risk Act*. This recovery strategy also constitutes advice to other jurisdictions and organizations that may be involved in recovering the species.

The goals, objectives and recovery approaches identified in the strategy are based on the best existing knowledge and are subject to modifications resulting from new findings and revised objectives.

This recovery strategy will be the basis for one or more action plans that will provide details on specific recovery measures to be taken to support conservation and recovery of the species. The Minister of the Environment will report on progress within five years.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Environment Canada or any other jurisdiction alone. In the spirit of the Accord for the Protection of Species at Risk, the Minister of the Environment invites all responsible jurisdictions and Canadians to join Environment Canada in supporting and implementing this strategy for the benefit of the Prothonotary Warbler and Canadian society as a whole.

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ACKNOWLEDGMENTS

The recovery strategy benefited from comments and suggestions provided by Environment Canada (Madeline Austen, Martin Damus, Robert Décarie, Wendy Dunford, Maggie Galloway, Kate Hayes, Rick Pratt, Ken Tuininga, Mary Vallianatos, and Christine Vance) and the Ontario Ministry of Natural Resources (Bill Crins, Brian Huis, Kate MacIntyre, Tim Marchand, Chris Risley, and Sue Russell). Funding for the strategy's development was provided by the Canadian Wildlife Service – Ontario Region, with support from Bird Studies Canada, Essex Region Conservation Authority, and the Ontario Ministry of Natural Resources. Thanks are extended to Judie Shore for the cover drawing.

STRATEGIC ENVIRONMENTAL ASSESSMENT

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts on non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below.

This recovery strategy will clearly benefit the environment by promoting the recovery of the Prothonotary Warbler. The potential for the strategy to inadvertently lead to adverse effects on other species was considered. The SEA concluded that this strategy will clearly benefit the environment and will not entail any significant adverse effects. The reader should refer to the following sections of the document in particular: Recovery Goal; Recovery Objectives; Broad Approaches and Strategies Recommended to Meet Recovery Objectives; and Effects on Other Species.

RESIDENCE

SARA defines residence as: *a dwelling-place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating* **[Subsection 2(1)]**.

Residence descriptions, or the rationale for why the residence concept does not apply to a given species, are posted on the SARA public registry: www.sararegistry.gc.ca/plans/residence_e.cfm

PREFACE

The Prothonotary Warbler is a migratory bird covered under the *Migratory Birds Convention Act*, 1994 and is under management jurisdiction of the federal government. The *Species at Risk Act* (SARA, Section 37) requires the competent minister to prepare recovery strategies for listed extirpated, endangered or threatened species. The Prothonotary Warbler was listed as Endangered under SARA in June 2003.

Canadian Wildlife Service – Ontario Region, Environment Canada, led the development of this recovery strategy in cooperation with Parks Canada Agency, the province of Ontario (Ministry of Natural Resources) and Bird Studies Canada. All responsible jurisdictions reviewed and acknowledged receipt of the strategy. The strategy meets SARA requirements in terms of content and process (Sections 39-41).

EXECUTIVE SUMMARY

In Canada, the Prothonotary Warbler's breeding range is restricted entirely to the Carolinian forest zone, and almost entirely to sites located on the north shore of Lake Erie. The Prothonotary Warbler has been assessed as an endangered species in Canada by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and designated as such under Ontario's *Endangered Species Act* and the federal *Species at Risk Act*. Its population has declined continentally at an average annual rate of 1.5% since 1966. In Canada, the population declined from an estimated 40+ pairs in the 1980s to fewer than 20 pairs in 2005.

Degradation and loss of swamp forest nesting habitat and mangrove forest wintering habitat have been identified as key threats and limiting factors. These impacts are compounded by a high level of competition from other species for nest sites, high levels of nest predation and brood parasitism, encroachment of invasive plants, and emerging issues related to climate change and exotic insect infestations.

Based upon a habitat viability analysis and other attributes, the Prothonotary Warbler population in Canada is believed to be recoverable to a level that existed during the 1980s (about 40 pairs). The long-term recovery goal is to increase the population over the next 20 years to 40 breeding pairs spread among at least six geographically distinct nesting areas separated by at least 20 km. The short-term goal is to increase the current population over the next five years to at least 25 pairs, spread among at least five geographically distinct nesting areas.

Over the next five years, the recovery goal will be achieved by meeting the following recovery objectives:

1. protecting identified critical habitat and monitoring its condition;
2. enhancing, creating, and restoring habitat at appropriate sites;
3. increasing the number of nesting opportunities through maintenance of at least 200 nest boxes annually;
4. increasing nesting success to an average of at least 60% annually;
5. formulating an appropriate management strategy for occupied sites in response to the current and expanding range of the emerald ash borer;
6. formulating and implementing appropriate management strategies for occupied sites in response to invasive plants;
7. ensuring that at least five geographically distinct nesting areas are available annually in order to mitigate potential effects from catastrophic weather;
8. protecting occupied habitat from application of insecticides;
9. establishing a dialogue and relationship with agencies and organizations that are interested in recovery efforts in New York, Michigan, Pennsylvania, and Ohio; and
10. producing a detailed description of important wintering habitat and evaluating its protection status, in cooperation with other species management initiatives.

Critical habitat will be identified by June 2010 within an action plan for the species. This recovery strategy provides direction for the next five years. The strategy will then be reviewed and, if necessary, revised to reflect conditions at that time.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. BACKGROUND

1.1 Species Assessment Information from COSEWIC

Date of Assessment: May 2000

Common Name: Prothonotary Warbler

Scientific Name: *Protonotaria citrea*

COSEWIC Status: Endangered

Reason for Designation: This species is facing a significant range-wide decline primarily due to habitat loss and degradation. It has undergone a drastic decline in Ontario where it is estimated that there are currently only 13 pairs at two sites.

Canadian Occurrence: ON

COSEWIC Status History: Designated Special Concern in April 1984. Status re-examined and designated Endangered in April 1996. Status re-examined and confirmed in May 2000. Last assessment based on an existing status report.

1.2 Description

The Prothonotary Warbler is one of North America's most dazzling songbirds. Males and females look alike, but males are decidedly more brightly coloured. Both have golden yellow heads and breasts, olive-green backs, and azure blue wings and tails. Prothonotary Warblers do not have wing bars, but white tail spots are quite prominent. Although rather large for a warbler, Prothonotary Warblers are small birds, weighing about 14 g and measuring about 14 cm in length. The male's territorial song is a loud, ringing "*tsweeet-tsweet-tsweet-tsweet*," uttered emphatically in groups of four to six.

1.3 Populations and Distribution

The continental population of the Prothonotary Warbler is estimated to consist of about 900 000 pairs[1] (Rich *et al*. 2004), over 99% of which reside in the United States. Globally and in the United States, the species is considered secure (NatureServe 2006), but has sub-national conservation ranks varying from critically imperilled to secure (Table 1). According to results from the Breeding Bird Survey (Sauer *et al*. 2005), the continental population has experienced a significant decline, averaging −1.5% annually during the period 1966–2004, or about 44% overall.

[1] The continental estimate provided by Rich *et al.* (2004) was based on roadside counts and not surveys in suitable habitat, so it may be an overestimate.

Less than 1% of the Prothonotary Warbler's global population occurs in Canada. The Canadian population is ranked critically imperilled to imperilled (NatureServe 2006). Canada currently supports fewer than 20 pairs, down from an estimated 40+ pairs during the mid-1980s.

Table 1. Sub-national conservation ranks (S-ranks) in Canada and the United States for the Prothonotary Warbler (NatureServe 2006)

United States	Alabama (S5B), Arizona (S1M), Arkansas (S4B), Colorado (SNA), Connecticut (SNA), Delaware (S4B), District of Columbia (S1B), Florida (SNRB), Georgia (S5), Illinois (S5), Indiana (S4B), Iowa (S3B,S3N), Kansas (S3B), Kentucky (S5B), Louisiana (S5B), Maryland (S4B), Massachusetts (S3), Michigan (S3), Minnesota (SNRB), Mississippi (S5B), Missouri (S4), Nebraska (S2), New Jersey (S4B), New Mexico (S4N), New York (S2), North Carolina (S5B), Ohio (S3), Oklahoma (S4B), Pennsylvania (S2S3B), Rhode Island (S1B,S1N), South Carolina (S3B), South Dakota (SNA), Tennessee (S4), Texas (S3B), Virginia (S4), West Virginia (S2B), Wisconsin (S3B)
Canada	Ontario (S1S2B)

S1 – critically imperilled; S2 – imperilled; S1S2 – critically imperilled to imperilled; S2S3 – imperilled to vulnerable; S3 – vulnerable; S4 – apparently secure; S5 – secure; SNR – unranked; B – breeding population; N – non-breeding population; M – migrant/transient population; SNA – conservation status not applicable because the species is not a suitable target for conservation activities

The Prothonotary Warbler breeds throughout the eastern United States and north to southwestern Ontario (Figure 1). It is most abundant in the southeastern United States and up the Mississippi River. Its wintering range extends from southern Mexico through Central America and northern South America. Its centres of abundance are reported to include northern Venezuela, Colombia (Bent 1953; Lefebvre *et al*. 1992, 1994), and coastal Panama (Lefebvre and Poulin 1996). However, extensive quantitative surveys of wintering populations in different regions have not been conducted.

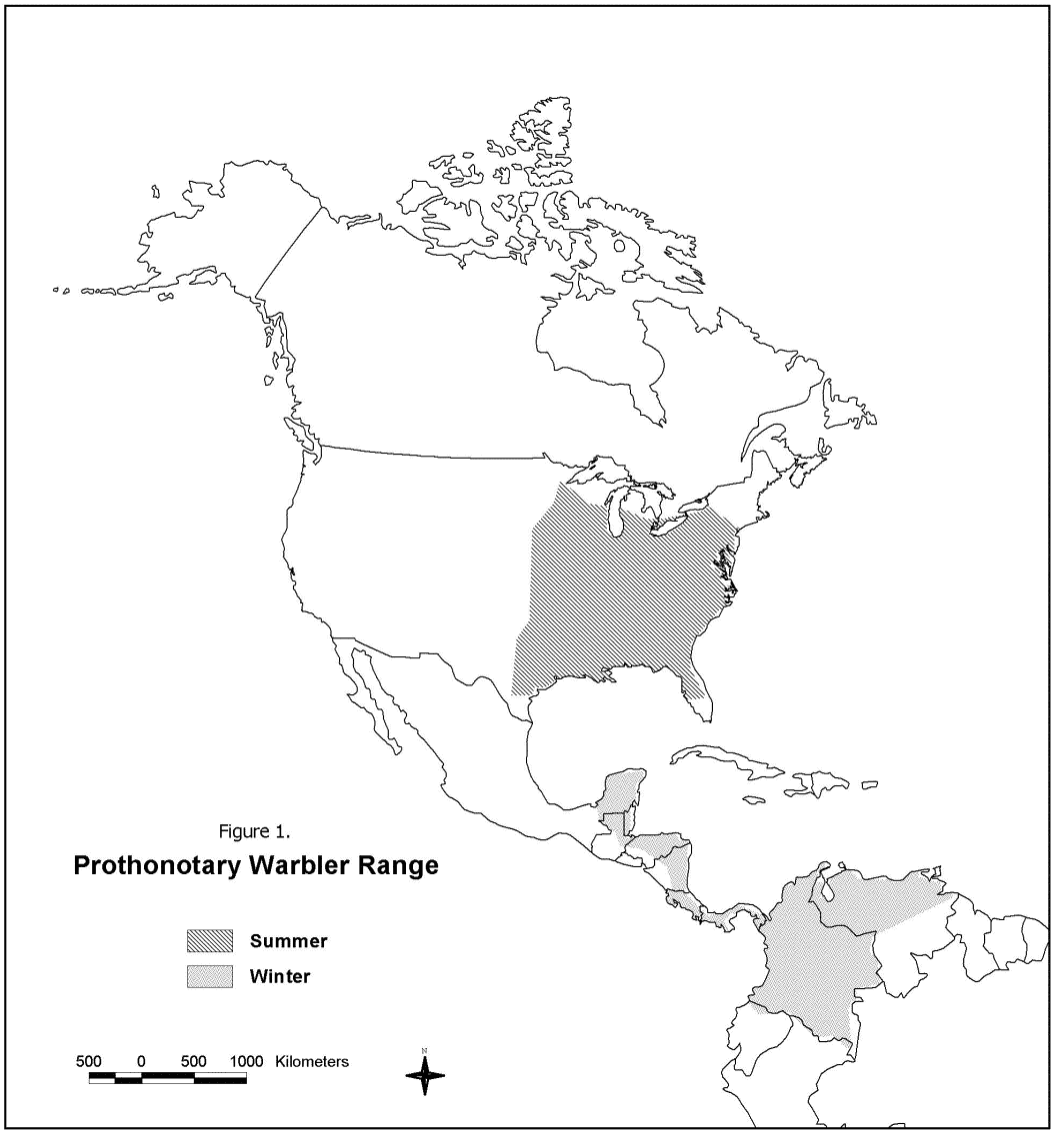

Figure 1. Breeding and wintering range of the Prothonotary Warbler

Being at the northern edge of its range in southwestern Ontario, the Prothonotary Warbler has been found primarily along and adjacent to the Lake Erie shoreline (e.g. Holiday Beach, Pelee Island, Point Pelee National Park, Wheatley Provincial Park, Rondeau Provincial Park, Long Point, and formerly Point Abino; Figure 2). Nesting has occurred regularly at one site along the Lake Ontario shoreline (Hamilton) and rarely at one site along the Lake Huron shoreline (Pinery Provincial Park). The Prothonotary Warbler also occasionally nests in some inland sites in southwestern Ontario. It formerly nested at Turkey Point, near London (at Lobo), and near Orwell and Copenhagen.

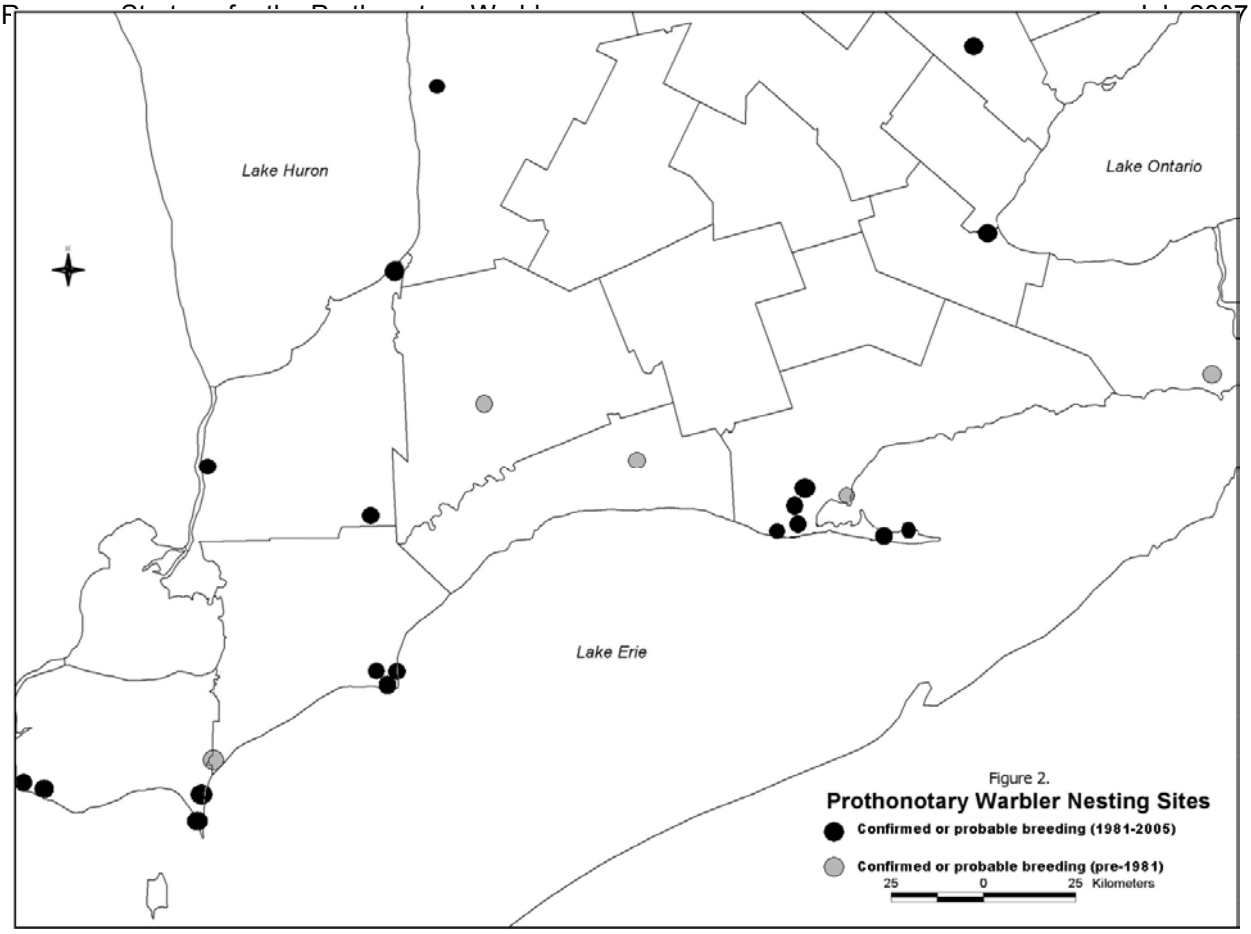

Figure 2. Current and historical breeding occurrences of Prothonotary Warblers in Canada

1.4 Description of the Species' Needs

1.4.1 Biological needs, habitat needs, ecological role, and limiting factors

Prothonotary Warblers return to Ontario from wintering areas in the first week of May; females typically arrive about two weeks later than males, and older birds of both sexes usually precede younger birds. The entire adult population is usually on its nesting grounds by the first week in June. By the time the females are back, the males have already established their territories and begun to select potential nest sites for the females to inspect. The Prothonotary Warbler is the only warbler in eastern North America that builds its nests in tree cavities. The species is a secondary cavity nester, meaning that it does not excavate its own cavities, but instead uses cavities that were created naturally or by primary cavity nesters. Most commonly, they occupy cavities that have been excavated by chickadees (*Poecile* sp.) and Downy Woodpeckers (*Picoides pubescens*). Males often build one or more incomplete "dummy" nests (Bent 1953; Petit 1989; Blem and Blem 1992). Dummy nests are non-functional nests whose quantity and quality are potentially important influences on pair formation (Petit 1999). The female often selects one of these dummy nests to complete, but may also build an entirely new nest on her own. Clutch size is usually about six eggs, but is often eight, and the female will lay only one egg per day. She alone incubates the eggs for approximately 12 days, while the male tends to her with food. Both parents feed the nestlings for about 10–12 days. On their first flight, fledglings risk drowning in water that is usually under the nest while attempting to make it to the closest

shrub. Throughout the breeding season, adults and juveniles depend on a wide variety of insects and molluscs (snails); the bulk of food taken includes larvae of butterflies and moths, flies, beetles, spiders, and mayflies (Petit 1999). By mid-August, nearly all birds will have begun their migration south for the winter.

Availability of nesting sites is a known limiting factor for this species. The Prothonotary Warbler is not a serious competitor for cavity nest sites in Canada. Owing to its very small population size in Canada, this species does not likely fill any major ecological role here. More details of specific habitat elements are provided below.

Presence of standing or slowly flowing water – Typically, territories are almost entirely covered with standing water (e.g. permanent and semi-permanent pools of open water in swamp forests along the shore of, or inland from, the Great Lakes) or slowly flowing water (e.g. as found in wide, slow-moving, warm-water forested creeks draining into the Great Lakes). During the nesting season, optimal water depth near nests ranges from 0.5 to 1.5 m, and the surface area of water represents between 70% and 100% of the territory. Pools in these territories may be 1 ha or more in size, although sites containing smaller pools will also be occupied if several pools are in close proximity. Nests are nearly always situated over or within 5 m of standing water or in low-lying, easily flooded areas (Petit 1999). The most productive territories are inundated year-round, but the warbler will nest in seasonal sloughs that may dry up entirely by mid- or late summer. Water cover that is sustained from May through at least mid-June is important.

Swamp forest – In Ontario, Prothonotary Warblers occupy mature and semi-mature deciduous swamp forest and riparian floodplains. Tree cover is typically dominated by silver maple (*Acer saccharinum*), ash (*Fraxinus* spp.), yellow birch (*Betula alleghaniensis*), and willows (*Salix* sp.) (McCracken and Dobbyn 1997). The extent of canopy cover depends on water depth and duration of flooding, but ranges from 20% to 90%, averaging slightly more than 50%, and is usually extensive enough to limit the development of a herbaceous and shrubby plant understorey. Nest sites are usually shaded for at least part of the day (Blem and Blem 1991, 1992; Best and Fondrk 1995). The shrub layer of the swamp forest is usually poorly developed because of low light levels and deep water, although some shrubs or saplings are usually in the immediate vicinity of the nest. In more open, deep-water habitats, mature buttonbush (*Cephalanthus occidentalis*) often dominates. A shrub or sapling located within a few metres of a nest provides immediate refuge for fledglings.

Open swamps with extensive emergent herbaceous vegetation are generally avoided by Prothonotary Warblers. Occasional scattered patches of cattails (*Typha* sp.), common reed (*Phragmites australis*), grasses, and sedges will frequently occur in the territory, but are not usually dominant cover types, particularly early in the nesting season (May to mid-June). Emergent vegetation around nest sites is usually sparse (open water is generally a dominant feature).

Forest size – Little information is available about the effects of woodland size or forest fragmentation on Prothonotary Warblers. The Prothonotary Warbler was described as an area-sensitive species by Keller *et al.* (1993), Petit (1999), and Thompson *et al*. (1993), but not by Robbins *et al.* (1989) or Hodges and Krementz (1996). In riparian forests in the southeastern United States, populations of Prothonotary Warblers and other forest wetland birds can probably be conserved if a 100-m-wide corridor of suitable habitat is protected (Hodges and Krementz 1996), whereas Kilgo *et al.* (1998) found that the probability of occurrence for Prothonotary Warbler was greatest in forests that were at least 500 m wide. In Canada, nearly all known breeding sites occur within forest tracts that are at least 25 ha.

Dead or dying trees with cavities – As noted above, cavities chosen by Prothonotary Warblers are almost always directly above water. Several suitable cavities appear to be required in each territory, in order to accommodate both the functional nest plus one or more "dummy" nests. The number of cavities within 25 m of a nest ranges widely, from 1 to 10 (mean = 2.3) (McCracken and Dobbyn 1997). When tree cavities are used, they are small and shallow (a volume of about 1.0–1.5 litres) and located 0.5–2.5 m above the water.

Suitably designed artificial nest structures (e.g. wooden nest boxes) are readily accepted by the species and perhaps even preferred (e.g. Best and Fondrk 1995; McCracken and Wood 2005). Prothonotary Warblers have also occasionally been known to nest in such unusual situations as a coffee can, tin pail, glass jar, an old hornet's nest, and a mailbox (Bent 1953).

Availability of nest material – Green mosses and dead leaves, as well as fine rootlets, lichens, and grasses, are used for building and lining both incomplete and functional nests. Habitats with plentiful moss are clearly favoured. Mosses are typically most abundant in swamps that have a long history of flooding, especially where canopy cover provides shade sufficient for moss growth. Moss is considered a limiting factor, but there is no information on whether a particular species of moss is favoured.

Post-fledging habitat – No published studies are available concerning the characteristics of the Prothonotary Warbler's habitat needs once the young have left the nest. Nevertheless, there is evidence that fledged young range widely, often occupying the upper tree canopy within 300 m or more of the nest site for at least one month, regardless of the presence of standing water (J.D. McCracken, pers. obs.). Hence, once the young fledge, the species can and will occur anywhere within a forest tract, including dry upland portions. By and large, the species appears to become a bird of the upper canopy during this period, probably favouring trees that are at least 15 m in height (J.D. McCracken, pers. obs.).

Wintering habitat – The Prothonotary Warbler's key wintering habitat is coastal mangrove forest in Central America and northern South America (Lefebvre *et al.* 1992, 1994; Petit *et al.* 1995; Lefebvre and Poulin 1996). It also winters in swamps and wet woodlands and occasionally in drier woodlands (including pine forest), mainly below an elevation of 1300 m (Bent 1953; Arendt 1992; Curson 1994). The habitat preferences (e.g. structure, species composition, spatial characteristics, stand age, moisture regimes) of wintering Prothonotary Warblers have not been quantitatively described, although black mangrove (*Avicennia germinans*) forest is a primary habitat type in Venezuela and Panama (Lefebvre *et al.* 1994; Lefebvre and Poulin 1996).

1.5 Threats

The following is a list and description of the known and perceived threats that the Prothonotary Warbler faces. Threats to the survival of the species* or its habitat** are presented in order of significance:

*i) Loss/degradation of breeding habitat***

The decline of Prothonotary Warbler populations in the United States is attributable to losses in wetland habitat (Petit 1999). In the contiguous United States, only 10% of the original bottomland forest habitat remains (Dickson *et al*. 1995). In the southeastern United States, forested wetlands are being lost at a very high rate (Winger 1986; Hefner *et al.* 1994). Losses have been particularly high in coastal Louisiana and the Carolinas (U.S. Department of the Interior 1994), which are two of the Prothonotary Warbler's core breeding regions. A similar pattern of habitat loss has occurred in the Prothonotary Warbler breeding range in Canada, where nearly all deciduous swamp forests have been drained to varying degrees or cut over. In southern Ontario, Snell (1987) estimated that wetlands had been reduced by about 1.5 million hectares (61%) from the time of European settlement to 1982. Between 1967 and 1982, wetlands in southern Ontario were reduced by about 39 000 ha, mostly due to agricultural activities (Snell 1987). Since 86% of the wetlands remaining in southern Ontario were forested swamps (Snell 1987), most of the loss is assumed to have involved this type of habitat. While there is no updated information on the extent of wetland loss in southern Ontario since the 1980s, sites continue to be drained (e.g. by ongoing activity of municipal drains).

In Canada, drainage of swamp forests, whether through ditching, agricultural tiling, municipal drains, or irrigation, depletes the water table and removes standing water. This is one of the most significant, widespread, and ongoing threats facing Prothonotary Warblers in this country.

Development activities can also contribute to the loss of habitat. One regularly occupied nesting site (Turkey Point) was destroyed when it was developed into a marina/trailer park (McCracken 1981). Because some jurisdictions in southern Ontario do not have tree-cutting bylaws, some forms of development are also likely to involve removal of large swaths of forest and infilling of swamps. For example, attempts were recently made to develop a large swamp forest in Essex County ("Marshfield Woods"), which was believed to support one or more Prothonotary Warblers, into a golf course (McCracken and Mackenzie 2003). In addition, residential/estate development adjacent to swamp forests is likely to artificially increase local populations of nest predators (e.g. raccoons [*Procyon lotor*]) and/or competitors (e.g. House Wrens [*Troglodytes aedon*]).

Logging disturbances that take place in important habitat create forest openings and edge habitat that can reduce the amount of open water cover in swamp forests through heightened evaporation. The increased light penetration can also result in rapid encroachment of invasive plants (e.g. common reed; European alder [*Alnus glutinosa*]). In addition, removal of standing dead timber (e.g. for firewood) results in loss of nesting cavities.

*ii) Loss of wintering habitat***

Coastal mangrove forest in Latin America is highly threatened by deforestation for building supplies, charcoal production, and resort development (Terborgh 1989; Petit *et al.* 1995). Mangrove habitat is also under increasingly intense pressure from commercial shrimp farmers (e.g. Arendt 1992). Loss and degradation of wintering habitat are believed to have a strong effect on wintering Prothonotary Warblers (Lefebvre *et al.* 1994; McCracken 1998) and are likely contributing to the species' decline continentally.

There is little information on the degree of year-to-year site fidelity to wintering sites, but what data exist (McNeil 1982; Faaborg and Arendt 1984; Lefebvre *et al.* 1994; Woodcock *et al.* 2004) suggest that the Prothonotary Warbler is quite site faithful. This attribute may increase the species' sensitivity to habitat loss and disturbance (e.g. Holmes and Sherry 1992; Warkentin and Hernandez 1996).

*iii) Threats that increase nest site competition and reduce breeding productivity**

Several alterations to habitat (e.g. loss or reduction of forest cover through logging, increased forest fragmentation) result in declines in breeding success of Prothonotary Warblers, due to increased levels of nest competitors, nest predators, and brood parasites.

In regions where it is common, the House Wren is the most serious (and damaging) competitor for cavity nest sites (Walkinshaw 1941, 1953; Bent 1953; Best and Fondrk 1995; Flaspohler 1996; Knutson and Klaas 1997). Wrens prefer forest edges and fragmented forests and are a major problem at several sites that are important to Prothonotary Warblers in Canada (McCracken and Wood 2005). Not only do wrens directly attack ("vandalize") the eggs and young of Prothonotary Warblers, they also build many "dummy" nests, often filling every available cavity in their territory with sticks. This directly displaces nesting Prothonotary Warblers and indirectly reduces cavity availability, thereby further increasing competition for nest sites. Moreover, the sticks are liable to persist in the cavities for many years, effectively rendering them unsuitable for all other species but wrens. Lastly, House Wrens produce at least two broods per year, which means that their impacts extend throughout the duration of the Prothonotary Warbler's nesting season.

In more open areas, Tree Swallows (*Tachycineta bicolor*) can also be serious competitors for nest sites (McCracken 1981; Best and Fondrk 1995). However, because Tree Swallows nest relatively early and are typically single-brooded, competition for nest sites begins to decline at the end of June, and they are not considered as serious a competitor as House Wrens. Moreover, unlike wrens, swallows do not aggressively destroy the eggs of competitors, nor do they usurp other cavities by building "dummy" nests.

Some protection from potential nest predators is probably conferred because Prothonotary Warbler nests are situated in cavities and are usually over open water (e.g. Nice 1957). Including artificial nest sites, nest predation rates reported in the literature are highly variable: 2.6–53.3% in Tennessee (Petit *et al.* 1987; Petit 1989, 1991; Petit and Petit 1996); 15.5% in Virginia (Blem

and Blem 1992); 27.6% in Wisconsin (Flaspohler 1996); 41% in Tennessee/Michigan (Walkinshaw 1941); and 22% in Ontario (J.D. McCracken, unpubl. data).

Loss of Prothonotary Warbler young and eggs is attributed to snakes, raccoons, mice (*Peromyscus* spp.), weasels (*Mustela* spp.), and squirrels (e.g. *Glaucomys* spp.) (Walkinshaw 1938; Bent 1953; Guillory 1987; Petit 1989; Blem and Blem 1992; Flaspohler 1996; Petit and Petit 1996). Walkinshaw (1941) largely blamed House Wrens for the poor nesting success of Prothonotary Warblers in Michigan, noting that wrens were absent from the warbler's breeding habitat in Tennessee, where Prothonotary Warbler nest success was much greater. Flaspohler (1996) and Knutson and Klaas (1997) likewise suspected that House Wrens played a major role in nest failure in their Wisconsin studies, again in regions where House Wrens were common. Wrens were also regarded as a problem in one Ohio study (Best and Fondrk 1995). In Canada, House Wrens figure prominently in the destruction of Prothonotary Warbler nests in sites that do not have extensive forest and canopy cover (McCracken 2004).

Predation of nests by raccoons in natural cavities (or in unprotected boxes that are affixed to trees rather than on slippery steel poles) also figures prominently, especially in human-modified landscapes. It is generally believed that birds (including Prothonotary Warblers) using nest boxes benefit from reduced rates of predation (e.g. Nilsson 1986; Moller 1989; Blem *et al*. 1999; Mitrus 2003; McCracken and Wood 2005) compared with birds using nests in natural cavities, because of protection afforded by overhanging rooftops, the controlled diameter of entrance holes, and the use of metal poles and protective guards.

Brood parasitism from Brown-headed Cowbirds (*Molothrus ater*) may limit population size and contribute to population declines by reducing the productivity of Prothonotary Warblers (McCracken 1981; Flaspohler 1996). Many Prothonotary Warbler breeding studies are based on artificial nest structures, which usually confer protection against parasitism (Walkinshaw 1991; Best and Fondrk 1995; Flaspohler 1996), because nest hole diameter is smaller than in natural situations. An exception was Twedt and Henne-Kerr (2001), who recorded a surprisingly high level of parasitism (45%) in their nest boxes, although they did not report nest hole diameter. In any case, for Prothonotary Warbler natural cavity nests, cowbird parasitism rates are surprisingly high: 21% in Tennessee (Petit 1989, 1991); 25.7% in Iowa (based upon data in Bent 1953); 26.9% in Wisconsin (Flaspohler 1996); and 27.1% in Ontario (Peck and James 1998). It is likely that land use patterns and regional forest fragmentation determine the regional abundance of cowbirds (Flaspohler 1996), perhaps explaining the extremely low incidence of parasitism (0.01%) found in Virginia (cited in Flaspohler 1996). Distance from the historical heartland of the cowbird's range may also be a factor (Hoover and Brittingham 1993).

*iv) Invasive forest insects***

Forest insect infestations have the potential to kill large numbers of trees. While this could benefit Prothonotary Warblers in the short term through the creation of more nesting habitat (in the form of dead stubs), the long-term impact is expected to be severe if the affected trees make up a large proportion of the canopy. Anything that significantly opens the tree canopy is likely to result in significant degradation in habitat quality, whether it is through encroachment of invasive plants or increased numbers of wrens and cowbirds.

The emerald ash borer (*Agrilus planipennis*) is of increasing concern in southern Ontario, since ash is a frequent subdominant tree in swamp forests here. In the slough forests at Rondeau Provincial Park, a recent study found that ash makes up 47% of the tree cover (McCracken *et al*. 2006). In addition to direct loss of tree cover by the insect itself, aggressive attempts to curb or contain the invasion of the emerald ash borer can result in the loss of substantial tree cover. For example, across Essex County, many of the ash have already succumbed to the insect, while there are programs planned or in place to remove ash from large areas of the Chatham-Kent region (S. Dobbyn, pers. obs.).

The Asian longhorned beetle (*Anoplophora glabripennis*) is also an emerging issue of great concern, depending upon its ability to spread beyond its present area of containment and its affinity for silver maple.

*v) Invasive plants***

Two invasive species of plants — the common reed and European black alder — can significantly degrade Prothonotary Warbler breeding habitat, particularly when water levels are low or canopy cover is reduced.

Within the last decade at Rondeau Provincial Park, the common reed has expanded dramatically through many of the slough forests, especially in the larger and more open sloughs and in areas where canopy closure has been reduced (due to windthrow). Because the Prothonotary Warbler requires expanses of open water, this invasive emergent effectively fills in the open pools of water, rendering the site unsuitable.

Likewise, European black alder is a highly invasive shrub that can also significantly degrade Prothonotary Warbler nesting habitat in open swamp forest conditions. It is already abundant in at least one primary nesting location (Hahn Woods) and is a major problem at several sites undergoing restoration in Norfolk County.

*vi) Catastrophic weather events**

The intensity and frequency of storms (including hurricanes) on both the wintering and breeding grounds are anticipated to increase as a result of climate change. Owing to the Prothonotary Warbler's clumped and restricted distribution in Canada, disasters associated with catastrophic weather events along the north shore of Lake Erie pose a serious threat to this species. Ensuring that the population is spread out across a number of geographically separated breeding sites will buffer Canadian populations against local disasters.

*vii) Toxic chemicals and other pollution**

On the Prothonotary Warbler's breeding grounds in Canada, mosquito control programs (e.g. in response to West Nile virus) have the potential to impact Prothonotary Warblers, particularly if adulticides are used in occupied habitats, either through direct poisoning of the birds or through reduction in food supply.

Detrimental effects from insecticides are of greatest concern on the Latin American wintering grounds, where DDT is still used widely for malaria control (Arendt 1992). As well, various kinds of water pollution associated with shrimp aquaculture seriously jeopardize mangrove forest (Olson *et al.* 1996). A major oil spill could also seriously damage wintering habitat (Arendt 1992).

1.6 Actions Already Completed or Under Way

The following is a brief synopsis of recovery activities that have been undertaken on behalf of Prothonotary Warblers in Canada since 1997:

- A multi-agency recovery team was created in 1997, and a draft recovery plan was produced in 1998. Most of the current recovery team members have been involved since the team's inception.
- A nest box program has been in operation in southwestern Ontario since 1998. The program now includes nearly 300 nest boxes distributed across nearly 20 sites. Side projects have tested various experimental nest box designs and configurations with regard to their effectiveness for dissuading occupancy by House Wrens.
- Population and nest productivity surveys have been conducted annually since 1998.
- A colour banding program (mostly focused on adults) has been conducted annually in Ontario since 1998 in order to study demographics and site fidelity.
- Detailed quantitative habitat assessments were conducted at two of the most important breeding sites in 2005. Less detailed habitat assessments were conducted at all occupied sites in 1998.
- A population viability analysis and a landscape-scale habitat modelling analysis have been conducted.
- About 80 potential candidate sites have been assessed and scored for their restoration potential. Working with a number of partner agencies and organizations, a variety of habitat restoration activities have been conducted at about 10 of the most promising sites to date, with more in the planning stages.
- The recovery team provided input to the Ontario Ministry of Natural Resources, leading to the designation of the species under Ontario's *Endangered Species Act*.
- Communications have been initiated with recovery practitioners at two sites in Ohio.
- Field investigations (involving intensive banding and habitat assessments) have been conducted at several mangrove sites in Costa Rica for four full winters (December through March). Information related to winter site fidelity and demographics is being collected. In addition, a study was conducted on isotopes from a sample of tail feathers from the winter study sites to see whether the local wintering population originated from across the species' breeding range or had a more restricted geographic origin.
- A web page was launched by the recovery team in 1999, which led to the production of an information pamphlet on the species. Over 10 000 pamphlets have been distributed, and the web page is still one of the top-visited Internet pages for people looking for reference information on Prothonotary Warblers.
- Detailed annual reports on all recovery activities have been produced for project partners since 1998.

1.7 Knowledge Gaps

In addition to information gaps related to the identification of critical habitat (Section 2.5), there is currently inadequate information available on:

- effective techniques to control common reed and European black alder;
- effective techniques to reduce impacts associated with House Wrens;
- the potential impact of forest insect infestations (emerald ash borer and Asian longhorned beetle) on the quality of critical habitat;
- the types and amounts of logging activities that Prothonotary Warblers may tolerate in their habitat before they abandon a site;
- sources of the birds that immigrate into Ontario from the United States; and
- wintering habitat needs in Latin America, including information on wintering site fidelity.

2. RECOVERY

2.1 Rationale for Recovery Feasibility

Recovery of this species is considered technically and biologically feasible, since:

- individuals capable of reproduction are currently available;
- sufficient habitat is available or can be made available to support the species;
- significant threats can be avoided or mitigated; and
- recovery techniques exist and are effective.

Based on Tischendorf's (2003) population viability analysis, immigration from the United States is necessary to maintain the species in Canada. Hence, its recovery here will depend on population trends and recovery activities in the adjacent Great Lakes states. If these and other limiting factors and threats are adequately addressed (e.g. through habitat restoration, nest box provisioning, control of invasive species), recovery is a realistic goal.

2.2 Recovery Goal

The long-term goal of this recovery strategy is to recover the Canadian population of the Prothonotary Warbler to what is believed to be its historical population size and distribution in 1980. As such, the long-term goal is to increase the Canadian population over the next 20 years to at least 40 breeding pairs spread among at least six geographically distinct nesting areas, separated by at least 20 km. The short-term goal is to increase the current population over the next five years to at least 25 pairs, spread among at least five geographically distinct nesting areas.

2.3 Recovery Objectives

Over the next five years, the recovery goal will be achieved by:

1. protecting identified critical habitat and monitoring its condition;
2. enhancing, creating, and restoring habitat at appropriate sites;
3. increasing the number of nesting opportunities through maintenance of at least 200 nest boxes annually;
4. increasing nesting success to an average of at least 60% annually;
5. formulating an appropriate management strategy for occupied sites in response to the current and expanding range of the emerald ash borer;
6. formulating and implementing appropriate management strategies for occupied sites in response to invasive plants;
7. ensuring that at least five geographically distinct nesting areas are available annually in order to mitigate potential effects from catastrophic weather;
8. protecting occupied habitat from application of insecticides;
9. establishing a dialogue and relationship with agencies and organizations that are interested in recovery efforts in New York, Michigan, Pennsylvania, and Ohio; and
10. producing a detailed description of important wintering habitat and evaluating its protection status, in cooperation with other species management initiatives.

2.4 Broad Approaches and Strategies Recommended to Meet Recovery Objectives

The broad approaches and strategies that are recommended to meet recovery objectives emphasize a combination of public outreach, stewardship, research, inventory, and monitoring efforts. Table 2 outlines specific steps necessary to address threats, with reference to the pertinent recovery objective.

Table 2. Broad approaches and strategies necessary for recovery of the Prothonotary Warbler

Obj. No.	Priority	Broad approach/ strategy	Threat addressed	General steps	Outcomes or deliverables
1.	High	Habitat protection/ stewardship	Loss/degradation of breeding habitat	Identify and, where appropriate, map critical habitat. Prioritize sites that are in most urgent need of protection. Identify landowners at high-priority sites. Determine ideal protection strategies for each high-priority site (tax relief, easement, covenant, acquisition, stewardship).	Candidate sites for securement are identified and prioritized. Protection strategies are identified and implemented.
1.	High	Habitat protection/ stewardship	Loss/degradation of breeding habitat	Develop guidelines/ information for allowable forestry activities at Prothonotary Warbler-occupied sites.	Guidelines and information are utilized by forest management practitioners and land managers.
1.	High	Public outreach	Loss/degradation of breeding habitat	Identify relevant landowners and land managers, and support the development of appropriate outreach materials.	Information materials are provided to landowners and land managers on a schedule that is consistent with messages and planned outcomes. Guidelines and map habitat are developed for Ontario's Conservation Land Tax Incentive Program.
1.	High	Inventory and monitoring	Loss/degradation of breeding habitat	Develop and implement protocol to monitor and mitigate threats to habitat in occupied sites.	Database maintained; results reported; strategies for dealing with negative changes are developed and implemented.

Obj. No.	Priority	Broad approach/ strategy	Threat addressed	General steps	Outcomes or deliverables
2.	High	Habitat restoration	Loss/degradation of breeding habitat	Develop criteria for the prioritization of sites that would most clearly benefit from strategic restoration activities. Develop appropriate restoration and management tools to restore breeding habitat at each site.	Suitable habitat is created/restored where cost-effective and appropriate, with a priority on projects that are likely to have the most impact. Measures that protect or restore the integrity of the water table are implemented.
3. 4.	High	Habitat restoration/ stewardship	Loss/degradation of breeding habitat and breeding productivity	Refine nest box provisioning program, and establish site-based criteria to screen sites that are being considered for box deployment.	At least 200 nest boxes are deployed annually; at least 60% nest success is achieved annually.
4.	High	Research/ monitoring	Breeding productivity	Investigate techniques to reduce nest failures attributable to House Wrens.	Control techniques are implemented and evaluated; at least 60% nest success is achieved annually.
4.	Low	Public outreach	Breeding productivity	Minimize public disturbance of nest sites during the breeding season through outreach and extension. Do not disclose nesting locations to the general public?	Responsible practices are promoted to birders and photographers, and no lapses in ethical judgement are made. Where necessary, public access to nesting areas is curtailed.
5.	High	Research	Invasive forest insects	Quantify and map areas of occupied habitat that are vulnerable to forest insect infestations, and assess the potential impact of these insects for each site.	Appropriate management strategies are formulated in response to outbreaks of exotic insects, and advice/input is provided into any proposed control measures that impact critical habitat.
6.	High	Research/ habitat restoration	Invasive plants	Determine the present extent of invasive plant species within each area containing critical habitat. Research methods to control invasive species.	Management guidelines are developed, and, where appropriate, invasive plant species are controlled.

Obj. No.	Priority	Broad approach/ strategy	Threat addressed	General steps	Outcomes or deliverables
7.	High	Inventory and monitoring	N/A	Monitor annual population trend, productivity, and survivorship in Canada in relation to predation, brood parasitism, and nest competition.	Annual reports are produced, and a georeferenced database of survey results is maintained.
7.	Medium	Research and monitoring	Catastrophic weather events	Assess/evaluate potential impacts of future catastrophic events on critical habitat.	Impacts are evaluated and reported on.
8.	Low	Research	Toxic chemicals and other pollutants	Investigate potential for mosquito control programs to directly or indirectly impact the species during the breeding season in Canada. Investigate the extent to which DDT is currently being sprayed in important wintering habitat, and provide a risk assessment.	Findings are communicated, and, if necessary, critical habitat in Canada is exempted from mosquito control. Findings of research are communicated; if necessary, the use of DDT alternatives is investigated and promoted.
9.	Medium	Habitat protection	Loss/degradation of breeding habitat (United States)	Identify potential U.S. partners/collaborators in Great Lakes states that likely provide source populations to Canada.	Communication and liaison with U.S. partners to address conservation needs in relevant Great Lakes states.
10.	High	Research	Loss of wintering habitat	In cooperation with other researchers and agencies, quantitatively describe wintering habitat and define important wintering habitat components; determine winter site fidelity; determine how much wintering habitat remains and its protection status.	Findings are published, and recommendations are made.

2.5 Critical Habitat

2.5.1 Identification of the species' critical habitat

Identification of critical habitat for the Prothonotary Warbler will be completed following the activities and timelines outlined in the schedule of studies (Table 3) and will be included in the action plan. Critical habitat has been identified within the Hahn Unit of Big Creek National Wildlife Area in an addendum to this recovery strategy.

Swamp forests with a history of confirmed nesting will be considered as an initial approach for identifying critical habitat. Detailed boundary information is lacking, and further cooperation is required to gather this information for identifying critical habitat. For example, it is anticipated that an entire swamp forest may not be identified as critical habitat because it may contain portions of unsuitable habitat. Additional field data, ground-truthing, and better delineation of boundaries will allow clearer understanding of critical habitat areas for affected landowners.

2.5.2 Schedule of studies

The schedule of studies (Table 3) outlines steps necessary to identify critical habitat for the Prothonotary Warbler. Based upon results, the definition of critical habitat should be refined as often as necessary.

Table 3. Schedule of studies detailing activities required to identify critical habitat for the Prothonotary Warbler in Canada

Detailed description of research activity	Completion date
Use best available knowledge to delineate site-specific critical habitat on maps within swamp forest areas that have a history of confirmed nesting.	June 2010
Obtain information on post-fledging movement and dispersal and the habitat needs of fledglings. Incorporate knowledge into an updated identification of critical habitat.	June 2010
Monitor sites that have evidence of Prothonotary Warbler use (e.g. sites with inconclusive historical information or sites used for migration). Consider these areas for additional critical habitat.	June 2010
A preliminary habitat viability analysis for the Canadian population of the Prothonotary Warbler was conducted using broad-scale geographic information system (GIS) modelling (Flaxman and Lindsay 2004). These analyses should be further refined to include detailed GIS landscape and elevation layers that clearly distinguish flooded areas of deciduous swamp forest (i.e. potentially high-quality nesting habitat). Follow-up field surveys should be conducted at newly identified areas of potentially high-quality habitat to ground-truth the GIS predictive models and better inform the recovery potential of the species.	June 2012

2.6 Performance Measures

The recovery strategy and action plan must follow the adaptive management approach, whereby new information feeds back into the plan on a regular basis in order to take advantage of new tools, knowledge, challenges, and opportunities. A five-year evaluation of the recovery strategy will be based upon the performance measures listed in Table 4, using 2007 as the benchmark year.

Table 4. Performance measures that will be used to evaluate if recovery objectives have been met by 2012

Recovery objective	Performance measure(s)
1. Protecting identified critical habitat and monitoring its condition	Change in proportion of habitat protected from 2007 levels, and conditions of critical habitat known
2. Enhancing, creating, and restoring habitat at appropriate sites	Habitat enhanced and restored within sites containing critical habitat, and new habitat created, where appropriate. Numbers of sites and hectares that are enhanced and/or restored increased over 2007 levels.
3. Increasing the number of nesting opportunities through maintenance of at least 200 nest boxes annually	200 nest boxes functioning annually in Ontario. A steady increase in size of breeding population and numbers of nests over 2007 levels.
4. Increasing nesting success to an average of at least 60% annually	Change in nesting success and overall productivity within the Canadian population.
5. Formulating an appropriate management strategy for occupied sites in response to the current and expanding range of the emerald ash borer	Management strategies are formulated and then distributed to, and adopted by, landowners.
6. Formulating and implementing appropriate management strategies for occupied sites in response to invasive plants	Management strategies are formulated and then distributed to, and adopted by, landowners.
7. Ensuring that at least five geographically distinct nesting areas are available annually in order to mitigate potential effects from catastrophic weather events	Number of geographically distinct nesting areas that are occupied is no less than five in any given year.
8. Protecting occupied habitat from application of insecticides	Number of municipalities implementing measures that inhibit the application of insecticides in occupied habitat is increased over 2007 levels.
9. Establishing a dialogue and relationship with agencies and organizations that are interested in recovery efforts in New York, Michigan, Pennsylvania, and Ohio	Number of new recovery projects established in the United States and number of joint meetings/site visits that are held between U.S. and Canadian collaborators.
10. Producing a detailed description of important wintering habitat and evaluating its protection status, in cooperation with other species management initiatives	Characteristics of important wintering habitat are defined; important wintering areas are broadly mapped; and a threat assessment is conducted and reported on.

2.7 Effects on Other Species

Recovery efforts that are focused on Prothonotary Warblers — especially efforts that are designed to protect, restore, or create swamp forest habitats — will benefit a great variety of species. No species of conservation concern are expected to be detrimentally affected. All species at risk listed in Table 5 utilize deciduous swamp forests and are known to occur in one or more sites occupied by Prothonotary Warblers in Canada. Several sites support multiple species at risk.

Table 5. List of COSEWIC species at risk that are expected to benefit from recovery activities directed at the Prothonotary Warbler

Common name	Latin name	COSEWIC status
Acadian Flycatcher	*Empidonax virescens*	Endangered
Louisiana Waterthrush	*Seiurus motacilla*	Special Concern
Cerulean Warbler	*Dendroica cerulea*	Special Concern
Red-shouldered Hawk	*Buteo lineatus*	Special Concern
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Special Concern
Spotted turtle	*Clemmys guttata*	Endangered
Blanding's turtle	*Emydoidea blandingii*	Threatened
Eastern foxsnake	*Elaphe gloydi*	Threatened
Eastern ribbonsnake	*Thamnophis sauritus*	Special Concern
Eastern hog-nosed snake	*Heterodon platirhinos*	Threatened
Jefferson salamander	*Ambystoma jeffersonianum*	Threatened
Swamp rose-mallow	*Hibiscus moscheutos*	Special Concern

2.8 Statement of When One or More Action Plans in Relation to the Recovery Strategy Will Be Completed

A Prothonotary Warbler action plan should be completed by June 2010. To address most threats and further delineate critical habitat, a single, overarching action plan is envisaged for this species. Separate action plans should be prepared to address threats posed by invasive plants and forest insect pests, in close consultation with the newly formed Carolinian Woodlands Recovery Team and others. The overarching action plan will identify the need for, and roles of, any recovery implementation groups.

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ADDENDUM TO THE RECOVERY STRATEGY FOR THE PROTHONOTARY WARBLER (*PROTONOTARIA CITREA*) IN CANADA

IDENTIFICATION OF CRITICAL HABITAT ON FEDERAL LANDS

JUNE 11, 2007

INTRODUCTION

This addendum has been prepared to augment the recovery strategy for Prothonotary Warbler (*Protonotaria citrea)* in Canada (hereinafter referred to as the "Prothonotary Warbler Recovery Strategy"). Section 41(1)(c) of SARA requires that recovery strategies include an identification of a species' critical habitat, to the extent possible, and examples of activities that are likely to result in its destruction. SARA also states in Section 45(1) that recovery strategies may be amended at any time, and that copies of the amendments must be included in the SARA Public Registry.

New information has been evaluated regarding critical habitat for Prothonotary Warbler since the Prothonotary Warbler Recovery Strategy received support from the cooperating jurisdictions. This addendum outlines the proposed criteria for critical habitat identification throughout the Prothonotary Warbler's Canadian range (Section 1), and applies these criteria to federal lands using information currently available (Section 2). This addendum identifies critical habitat at one location– the Hahn Unit of Big Creek National Wildlife Area (NWA) and identifies activities that are likely to result in the destruction of critical habitat within or in the vicinity of this NWA (Section 3).

The criteria used to identify critical habitat (Section 1) will be further evaluated, in consultation with migratory bird experts and cooperating jurisdictions, to better inform additional identification of critical habitat for the Prothonotary Warbler throughout its Canadian range. Consultations on these criteria, along with the approaches used to delineate critical habitat boundaries for this species, are still in progress.

1.0 CRITERIA USED TO IDENTIFY CRITICAL HABITAT

SARA defines critical habitat as "…the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species."

For Prothonotary Warblers, critical habitat is characterized as, where individuals of the species carry out essential aspects of their breeding cycle (courtship, territory defence, feeding, nesting, and post-fledgling) in Canada. For Prothonotary Warbler, sites[2] where critical habitat is identified must meet two basic criteria regarding breeding evidence and site occupancy:

[2] For the purposes of this addendum, a 'site' is the 10 x 10 km UTM grid square with two or more observations during the breeding season.

1) Basic Criterion of Breeding Evidence:

Confirmed breeding evidence for a minimum of one year

There must be observations of a functional nest[3] with confirmed breeding evidence (containing eggs and/or young, and/or adults carrying food, and/or adults carrying faecal sacs, and/or fledged young, and/or sightings of both an adult male and an adult female entering the same cavity in circumstances that strongly suggest that the pair nested) from reliable sources.

Natural nests or nest boxes where data are inconclusive to substantiate confirmed breeding do not meet the criteria for critical habitat identification. In accordance with the description of "residence" for Prothonotary Warbler in Canada, nests that are built in nest boxes specifically erected to attract the species (with landowner permission) are afforded the same level of protection as natural nest sites. As such, this criterion can apply to sites at which nest boxes have been occupied by the target species.

AND

2) Basic Criterion of Site Occupancy:

The site has been occupied by Prothonotary Warblers for at least 2 years during the breeding season since 1997.

Prothonotary Warblers will occasionally occupy small, isolated pockets of habitat for only one year and never return. Pairs that occupy sites for more than one year, however, indicate that the site is sufficiently suitable to warrant critical habitat identification. The benchmark year of 1997 was chosen because it coincides with the first year of systematic, annual surveys of the species in Canada.

Criteria for identifying critical habitat for areas where habitat creation, restoration and enhancement will take place (e.g. recovery habitat) will be developed through the schedule of studies. Criteria which will be considered to further delineate critical habitat at given locations in Canada include, but are not limited to, factors such as area delimitations around functional confirmed nests; habitats used by juveniles following fledging; and vegetation communities where the functional, confirmed nest location occurs (e.g., *Community Series* level within the Ontario Ecological Land Classification (ELC) Framework of Lee et al. (1998). It is expected that certain features will also be excluded from critical habitat (e.g. buildings and other human-made structures).

[3]A functional nest is a natural (e.g. a stump) or artificial (e.g. a nest box) location where there is confirmed breeding evidence for Prothonotary Warblers. 'Dummy nests' are not considered to be functional nests.

2.0 APPLICATION OF THE BASIC CRITERIA AND IDENTIFICATION OF CRITICAL HABITAT ON FEDERAL LAND

Based on the Basic Criteria above, it is possible to identify critical habitat on only one federal property within the range of the Canadian population of Prothonotary Warbler – the Hahn Unit of Big Creek National Wildlife Area (NWA).

As required by SARA, the description of critical habitat will be published in the *Canada Gazette* within 90 days of posting of the final addendum to the SARA public registry. The boundaries of critical habitat are contained within the boundaries of the Hahn Unit of Big Creek National Wildlife Area (legally described as: being all that parcel of land, in the regional municipality of Haldimand-Norfolk, in the township of Norfolk, formerly in the geographic township of South Walsingham, County of Norfolk, shown as Part 1 on a plan of survey deposited in the Land Registry Office for the Registry Division of Norfolk (Number 37) as Plan 37R 264, together with a right-of-way over Part 2 shown on said plan, said Part 1 containing 402.19 acres, more or less and said Part 2 containing 0.14 acres, more or less.).

No other federal lands meet the two Basic Criteria necessary for critical habitat identification. Additional critical habitat will be identified within sites across the range of the Canadian Prothonotary Warbler population that meet the Basic Criteria as additional information (e.g., habitat data, vegetation mapping and scientific analysis) is gathered.

The Action Plan, expected to be posted on the SARA Public Registry in June 2010, will identify additional critical habitat and outline monitoring methods proposed for the recovery of Prothonotary Warblers in Canada.

3.0 EXAMPLES OF ACTIVITIES WITHIN OR IN THE VICINITY OF BIG CREEK NATIONAL WILDLIFE AREA THAT ARE LIKELY TO RESULT IN THE DESTRUCTION OF CRITICAL HABITAT

Activities within or in the vicinity of identified critical habitat that are likely to result in the destruction of critical habitat include: radical or lasting alterations to normal hydrological regimes (e.g. wetland drainage, construction of dams, infilling of swampy lowlands and associated marshes); any reduction in the total areal extent of forest cover due to commercial forest practices or land clearing; expansion of existing residential developments; and industrial development.

Water level manipulation through diking and pumping for the purpose of maintaining wildlife habitat has occurred in Big Creek National Wildlife Area – Big Creek Unit since 1985. This activity does not result in the destruction of critical habitat at the Hahn Unit, as evidenced by the birds returning and successfully breeding at this location regularly since the late 1970's. Monitoring of Prothonotary Warblers will continue on the NWA to ensure the protection of critical habitat for Prothonotary Warblers.

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