

# Amended Recovery Strategy for the Roseate Tern (*Sterna dougallii*) in Canada

## Roseate Tern



2010



Environment  
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## 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 SARA 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/approach/act/default\\_e.cfm](http://www.sararegistry.gc.ca/approach/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 initially 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 a 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 Species at Risk (SAR) Public Registry ([www.sararegistry.gc.ca](http://www.sararegistry.gc.ca)).

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## DECLARATION

This recovery strategy has been prepared in cooperation with the jurisdictions responsible for the Roseate Tern. Environment Canada has reviewed and accepts this document as its recovery strategy for the Roseate Tern, 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 Roseate Tern and Canadian society as a whole.

## RESPONSIBLE JURISDICTIONS

Environment Canada (Atlantic Region)  
Government of New Brunswick  
Government of Nova Scotia  
Government of Québec

## AUTHORS

The Strategy was prepared by Andrew G. Horn and Andrew W. Boyne.

## ACKNOWLEDGMENTS

We would like to acknowledge the significant effort of the members of the Canadian Roseate Tern Recovery Team:

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- J. Sherman Boates, Nova Scotia Department of Natural Resources
- Ted C. D'Eon, Local steward, Pubnico, Nova Scotia
- Marty L. Leonard, Dalhousie University
- François Shaffer, Environment Canada, Canadian Wildlife Service, Québec Region
- Rebecca M. Whittam, Bird Studies Canada

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## 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 Roseate Tern. 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: Potential management impacts on other species, Species information, Ecological role, and Recommended approach / scale for recovery.

## 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* [Section 2(1)].

Residence descriptions, or the rationale for why the residence concept does not apply to a given species, are posted on the SAR Public Registry:

[www.sararegistry.gc.ca/sar/recovery/residence\\_e.cfm](http://www.sararegistry.gc.ca/sar/recovery/residence_e.cfm)

## PREFACE

The Roseate Tern is a migratory bird covered under the *Migratory Birds Convention Act, 1994* and is under the 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 Roseate Tern was listed as Endangered under SARA in June 2003. Canadian Wildlife Service – Atlantic Region, Environment Canada led the development of this *Recovery Strategy*. All other responsible jurisdictions reviewed and approved the strategy (Nova Scotia, New Brunswick and Québec). The strategy meets SARA requirements in terms of content and process (Sections 39-41). It was developed in cooperation or consultation with:

- All provincial jurisdictions in which the species occurs - New Brunswick, Nova Scotia and Québec
- Aboriginal groups - the Nova Scotia Native Council, the Acadia First Nation, the Confederacy of Mainland Mi'kmaq
- Environmental non-government groups - the Sable Island Preservation Trust, the Nova Scotia Bird Society, the Mahone Islands Conservation Association, Association québécoise des groupes d'ornithologues, Comité ZIP des Îles-de-la-Madeleine, Attention Fragiles, and
- Industry stakeholders - Guysborough County Regional Development Authority, Aquaculture Association of Nova Scotia, Canada-Nova Scotia Offshore Petroleum Board
- Landowners - Private landowners, Department of Fisheries and Oceans, and the Nova Scotia Department of Natural Resources.

This first recovery strategy for a migratory bird posted on the SARA Public Registry identifies what is now understood as nesting critical habitat under SARA.

The *Recovery Strategy for the Roseate Tern (Sterna dougallii) in Canada* (Environment Canada, 2006) was posted on the Species at Risk Public Registry in October 2006. This recovery strategy was amended for the purpose of:

- Clarifying the language used in the critical habitat identification section.
- Clarifying the description of activities likely to result in destruction of critical habitat.
- Clarifying Environment Canada's approach to and timing of the action plan for Roseate Tern.
- Deleting *Appendix C: Implications of critical habitat identification* as being outdated.

## EXECUTIVE SUMMARY

The Roseate Tern, *Sterna dougallii*, is listed as Endangered in Canada and the northeastern population is listed as Endangered in the United States. There are about 4000 pairs in the northeastern United States and 120-150 pairs in Atlantic Canada, mostly in one or two colonies. Its reproductive rate is limited by delayed maturity to age of first breeding (typically at age 3 [Spendelow et al. 2002]), small clutch size (typically two eggs for first clutches of older, experienced pairs, and one egg for first-time breeders), low annual adult survival for a seabird (83% [Spendelow et al. 1995] to 85% [Lebreton et al. 2003]) and relatively low survival to first breeding (usually 33-40%). Threats to its survival include habitat displacement; predation by *Larus* gulls and other predators (e.g., owls, night herons, and mink); possible market hunting on the wintering grounds; and, at least in some United States colonies, a shortage of males. The population's restricted distribution makes it vulnerable to localized threats such as human development, catastrophic weather events such as hurricanes (Nisbet and Spendelow 1999; Lebreton et al. 2003), pollution and disease.

Since the publication of the first Canadian Recovery Plan for the Roseate Tern (Lock et al. 1993), new information on the species' biology, its distribution in Canada, and methods for colony restoration have yielded novel approaches for its recovery. This new Recovery Strategy is completely revised to take advantage of this new information and to complement the recently updated United States Recovery Plan (USFWS 1998). It sets goals and objectives for Canada that will contribute to recovery of the Roseate Tern on both sides of the border and was prepared in response to the legislative requirements outlined in the *Species at Risk Act* (SARA) for the development of recovery strategies for Endangered species (Sections 37-46).

Together with the US Recovery Plan, this Canadian strategy aims not only to maintain and enhance breeding productivity, but also to restore the population's range across broadly distributed colonies. Roseate Terns preferentially nest in larger colonies of other species of tern, so this goal requires the establishment of large, healthy colonies of other species within their range, especially Common Tern (*S. hirundo*) and Arctic Tern (*S. paradisaea*).

The long-term goal (10 years; present to 2015) of the strategy is to have no fewer than 150 pairs of Roseate Terns nesting in at least three colonies in Canada. Less than 5% of the northeastern North American population of Roseate Terns nests in Canada, therefore recovery of the entire population relies heavily on the recovery of the portion of the population nesting in the US. The US Recovery Plan (USFWS 1998) recommends reclassification to *Threatened* once the northeastern population reaches 5000 pairs, and that de-listing would be warranted once the species reaches historic population levels observed in the 1930's (8500 pairs). In the short term (five years; present - 2010), the objectives are to:

1. Maintain high numbers of breeding pairs at Country Island, Nova Scotia (>40 pairs) and The Brothers, NS (>80 pairs),
2. Enhance productivity at managed colonies to high levels (i.e., 1.1 fledgling per pair; Nisbet and Spendelow 1999),
3. Restore a broader distribution by establishing at least one more managed colony,
4. Remove or reduce threats to Roseate Terns and their habitat, and
5. Maintain small peripheral colonies of Roseate Terns nesting on Sable Island, NS and the Magdalen Islands, QC.

These objectives will be achieved primarily by:

1. Monitoring population size, distribution, movement, and productivity
2. Enhancing nesting habitat
3. Managing additional colonies
4. Identifying critical habitat
5. Protecting habitat
6. Identifying limiting factors at managed colonies
7. Monitoring threats
8. Improving decision making and planning

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## SPECIES ASSESSMENT INFORMATION FROM COSEWIC

**Date of Assessment:** October 1999

**Common Name:** Tern, Roseate

**Scientific Name:** *Sterna dougallii*

**COSEWIC Status:** Endangered

**Reason for Designation:** The number of mature individuals in Canada is fewer than 250; rescue through immigration of United States birds is unlikely since the species is also endangered in New England. The primary factor that limits the population is predation of eggs and hatchlings, and, to a lesser extent, adult birds.

**Canadian Occurrence:** Québec, New Brunswick, Nova Scotia

**COSEWIC Status History:** Designated Threatened in April 1986. Status re-examined and designated Endangered in April 1999. Endangered status re-examined and confirmed in October 1999. Last assessment based on an existing status report.

## 1. RECOVERY

The recovery goals and objectives, and the strategies for achieving them, are substantially revised from those published in the first Canadian Recovery Plan for the Roseate Tern (Lock et al. 1993). Since that previous plan was produced, aerial and ground surveys have provided better information on the distribution of Roseate Terns in Canada. Over the same period, restoration programs in the United States and Canada have yielded new models for recovery, while intensive research at several large United States colonies has yielded much new information on the biology of the species (Nisbet and Spindel 1999). This new information was integrated into the United States Fish and Wildlife Service's (USFWS) updated Roseate Tern Recovery Plan (US Recovery Plan, USFWS 1998) and its comprehensive handbook on tern management (Kress and Hall 2004). These documents provide key information in support of the approaches in this strategy.

The Recovery Strategy for Roseate Terns in Canada takes advantage of this new information and complements the updated US Recovery Plan. It sets goals and objectives for Canada that will contribute to recovery of the Roseate Tern on both sides of the border and was prepared in response to the legislative requirements outlined in the *Species at Risk Act* (SARA) for the development of recovery strategies for Endangered species (Sections 37-46).

## 1.1 Recovery goal

The overall goal is to prevent the Canadian population of Roseate Terns from declining.

**Specifically, the goal of the strategy is to have no fewer than 150 pairs of Roseate Terns nesting in at least three colonies in Canada by 2014.** None of the three colonies should support fewer than 15 pairs of Roseate Terns (>10% of the Canadian population). This goal is based on a) the maximum number of Roseate Terns nesting in Canada in one year, since the original status report was prepared in 1986 (149 pairs; 1999), and b) the largest number of colonies to support more than 15 pairs of terns in one year (Canadian Wildlife Service, unpublished data). The first comprehensive surveys for the species in Canada occurred in 1970-1971 when it was estimated that 200 pairs nested in the country (Lock 1971). There is some speculation that this may have been an overestimate because extrapolations were made on Sable Island NS based on species ratios of terns trapped after the nesting season (Lock 1971). When the first status report was prepared in 1986 it was estimated that 100-121 pairs of Roseate Terns nested in the country (Kirkham and Nettleship 1986), and in 1999 when the status report was updated the population was estimated to be 87-137 pairs (Whittam 1999). From 1999-2003, the mean number of Roseate Terns nesting in Canada was 134 pair (Leonard et al. 2004). Thus, it is difficult to set an appropriate recovery goal since the Canadian population has remained relatively stable over the last 30 years, and there is no evidence that the population was much larger than it is currently. However, based on population growth observed in the United States portion of the population since 1988 (4.6-5.8% annual growth; see 2.3 Population sizes and trends), it is possible that the Canadian population could increase to over 200 pairs by 2015.

Less than 5% of the northeastern North American population of Roseate Terns nests in Canada, therefore recovery of the entire population relies heavily on the recovery of the portion of the population nesting in the US. The US Recovery Plan (USFWS 1998) recommends that the population be reclassified as Threatened once the northeastern population reaches 5000 pairs, and that de-listing would be warranted once the species reaches historic population levels observed in the 1930's (8500 pairs). It recommends that the 5000 pairs needed to reclassify to Threatened should include at least six colonies with 200 or more nesting pairs in each. In 2002, the northeastern North American Roseate Tern population was about 3600 pairs.

## 1.2 Recovery objectives

By 2010, the short-term objectives of the Recovery Strategy for Roseate Terns in Canada are to:

1. Maintain high numbers of breeding pairs at Country Island, NS (45° 06.096'N, 61° 32.544'W; >40 pairs) and The Brothers, NS (North Brother [43° 38.191'N, 65° 49.406'W]; South Brother [43° 37.798'N, 65° 49.530'W]; >80 pairs).
2. Enhance productivity at managed colonies to high levels (i.e., 1.1 fledgling per pair; Nisbet and Spendelow 1999).
3. Restore a broader distribution by establishing at least one more managed colony.
4. Remove or reduce threats to Roseate Terns and their habitat.

5. Maintain small peripheral colonies of Roseate Terns nesting on Sable Island, NS (43° 55.839'N, 59° 54.467'W) and the Magdalen Islands, QC (Paquet Island [47° 24.492'N, 61° 50.162'W]; Deuxième Îlet [47° 30.153'N, 61° 43.837'W]; and Chenal Island [47° 33.927'N, 61° 32.847'W]).

### **1.3 Approaches to meet recovery objectives**

The recovery approaches described in the following sections (summarized in Table 1) are premised largely on two points:

1. Roseate Terns in Canada are threatened by low productivity at specific sites, often due to predation, and by the concentration of their distribution into fewer colonies that, at least in Canada, may frequently change location from year to year.
2. Roseate Terns preferentially nest in larger colonies of Common and Arctic Terns, which are more abundant than Roseate Terns but exposed to similar threats. Thus, restoration of Roseate Tern colonies requires the establishment and maintenance of large (>100 pairs), healthy colonies of these other species.

#### **1.3.1 Monitor population size, distribution, movement, and productivity**

In the previous Recovery Plan (Lock et al. 1993), the distribution and productivity of Roseate Terns in Canada were poorly known. Only one complete aerial and ground survey had been done and no information on productivity had been published. Since then, three aerial surveys, more thorough ground surveys, and productivity data have provided information that is invaluable for designing and evaluating recovery actions outlined in this Strategy (Whittam 1999, Leonard et al. 2004).

##### *Actions completed or underway*

Colony sites of all species of tern on the Nova Scotian coast were aerially surveyed in 1995, 1999 and 2003 (Leonard et al. 2004). The surveys included ground visits to colonies with over 100 Common or Arctic Terns and to a few smaller colonies where Roseate Terns were expected to occur (Leonard et al. 2004). These surveys have yielded essential information on population size and distribution (see 2.3 Population sizes and trends), and should be continued.

Nest numbers, clutch size, and fledging success have been consistently monitored at only one colony, Country Island, since the mid-1990s (Whittam 1999). Despite the many years of work at Country Island, we still do not have an accurate estimate of productivity for Roseate Terns because of difficulties following chicks to fledging. Nest numbers have been monitored at The Brothers since 1990 and efforts are being made to get a qualitative estimate of productivity. Three areas with ongoing research programs on terns, but with fewer than five pairs of Roseate Terns each (Sable, Machias Seal, and Magdalen Islands), have been surveyed yearly for Roseate Terns since at least the mid-1990s (ACTWoG 2000), although reproductive success was rarely measured and breeding was not always confirmed. Naturalists have collected yearly information on nesting locations in some areas (e.g., D'Eon 2001).

**Table 1. Tabular summary of recovery approaches. Each strategy addresses all objectives except as noted. Priorities defined as: Urgent = top priority action, without which population will decline; Necessary = needed to evaluate and guide recovery actions; Secondary = beneficial if urgent actions are already underway.**

Recovery Approach	Priority	Objective No.	Specific Steps	Effect
Monitor population size, distribution, movement, and productivity	Necessary	All	<ul style="list-style-type: none"> <li>Count adults, measure productivity</li> <li>Implement banding and recapturing/re-sighting program</li> </ul>	Enables evaluation of success of recovery efforts
Enhance nesting habitat	Urgent	1,2,4,5	<ul style="list-style-type: none"> <li>Conduct population census</li> <li>Manage predators</li> <li>Enhance nesting habitat</li> </ul>	Maintains and enhances productivity
Manage additional colonies	Urgent	3	<ul style="list-style-type: none"> <li>Establish additional predator-free colonies</li> </ul>	Restores distribution
Identify critical habitat	Necessary	All	<ul style="list-style-type: none"> <li>Identify breeding, foraging, and transit and resting habitat</li> <li>Designate critical habitat</li> </ul>	Guides enhancement, restoration, and protection of habitat
Protect habitat	Necessary	All	<ul style="list-style-type: none"> <li>Designate and secure sites</li> <li>Protect sites from human disturbance</li> <li>Enforce protective regulations</li> <li>Conduct research at managed sites</li> </ul>	Maintains and enhances productivity
Identify limiting factors at managed colonies	Secondary	All	<ul style="list-style-type: none"> <li>Conduct research at managed sites</li> </ul>	Guides recovery actions
Monitor threats	Secondary	All	<p>Monitor:</p> <ul style="list-style-type: none"> <li>Winter mortality</li> <li>Gull population</li> <li>Recreation</li> <li>Food sources</li> <li>Singular events</li> </ul>	Guides recovery actions
Improve decision-making and planning	Secondary	All	<ul style="list-style-type: none"> <li>Adopt precautionary approach to development</li> <li>Identify decision and planning processes that may affect terns</li> <li>Engage Recovery Team in those processes</li> </ul>	Identifies recovery actions
Develop and maintain linkages	Necessary	All	<p>Encourage and promote:</p> <ul style="list-style-type: none"> <li>International cooperation regarding breeding sites</li> <li>International cooperation regarding wintering sites</li> <li>Coastal and marine conservation management plans and programs</li> </ul>	Orients actions to whole population
Address sociopolitical issues	Necessary	All	<p>Implement programs addressing:</p> <ul style="list-style-type: none"> <li>Stewardship</li> <li>Education and awareness</li> </ul>	Motivates and coordinates recovery actions

Efforts to assemble, integrate, and disseminate such information (e.g., the Coastal Islands Project, in Mahone Bay, NS; Boyne 1999) show great promise and should be encouraged. Several other colonies have been visited in some years by naturalists or by Nova Scotia Department of Natural Resources or Canadian Wildlife Service personnel. In all cases, reproductive success was judged mainly upon whether colonies were abandoned part way through the breeding season.

Prior to 2002, Country Island was the only Canadian site with a banding program, and even this program was reduced in some years to limit disturbance. In 2002 and 2003, a greater effort was placed on banding at Country Island and The Brothers. Banding and systematic re-sighting of birds with field-readable bands are essential (Nisbet and Spendelow 1999, Spendelow et al. 2002), especially for tracking movements of adults among colony sites and for determining whether changes in census numbers represent changes in the size or distribution of the population (Leonard et al. 2004).

### *Actions to be initiated*

#### Count breeding terns and measure their productivity

At intensively managed colonies (currently Country Island and The Brothers), the number of breeding pairs and their productivity (ideally, the number of fledglings produced) will be measured throughout the breeding season. All species of tern should be included where possible, to increase sample sizes and sensitivity, although potential species differences should be considered in analysis and interpretation. Measurement of growth rates is recommended for assessing productivity (Nisbet et al. 1999), and efforts to band adults and young should be continued and expanded to track recruitment and movements among colonies. In years when adults from Country Island appear to have relocated to nearby islands, efforts to find their whereabouts and measure their reproductive success have been only partly successful. Searches are problematic because they compete with management activities at the original colony sites and because they require expensive transportation by boat or air. Additional funds should be targeted to support these efforts. Investigator disturbance is not a concern as long as investigators are experienced and have taken steps to gradually habituate the terns to their activities (Nisbet 2000). Protocols should be developed and reviewed annually for work at these colonies (e.g., Boyne 1998a).

At less intensively studied colonies (e.g., those now monitored with occasional visits by Canadian Wildlife Service personnel or local naturalists), adults of all species of breeding terns should be counted during late incubation using consistent methods. Ideally, these counts should be done every year, however regular monitoring may need to rely on the surveys described next, which, realistically, can be done only every five years.

#### Complete population censuses

In Atlantic Canada, because terns change colony sites frequently, the whole coastline (including Nova Scotia, New Brunswick, Prince Edward Island, Québec, and Newfoundland) should be aerially surveyed at least once every five years. Each aerial survey should be followed by

ground searches for Roseate Terns at colonies where they have nested in the past, as well as at all colonies within the existing Roseate Tern range with more than 100 Common or Arctic Terns (Leonard et al. 2004). Even though Roseate Terns nest mainly in Nova Scotia, they are currently known to nest in Québec and New Brunswick (Whittam 1999). Researchers at all tern colonies in these provinces should be encouraged to check carefully for the presence of Roseate Terns, since promising sites for restoration may exist and the birds could easily be overlooked. Ideally, whether or not each colony succeeded in producing at least some young terns should also be determined, since colony failure may help both to explain shifts in distribution and to select sites for restoration. The sensitivity of methods used for detecting population change should be determined regularly, and methods revised accordingly (Kress and Hall 2004).

### **1.3.2 Enhance nesting habitat**

#### *Actions completed or underway*

New knowledge about the specialized habitat requirements of Roseate Terns led to this strategy's greater emphasis on habitat enhancement, both to maintain and enhance productivity at currently managed sites and to increase the likelihood of successful restoration. Habitat enhancement has occurred mainly through predator management and placement of nest shelters.

Local gull management has occurred at Country Island and The Brothers. Management at Country Island is described under 1.3.3 Manage additional colonies. Destruction of nests occasionally built by gulls at The Brothers appears to have prevented significant gull predation there (D'Eon 2003). Predation by crows at The Brothers in 1998 was stopped by lethal control and has not recurred (D'Eon 2003). Non-lethal discouragement of crows at Country Island in 1999 was unsuccessful, but so were attempts at lethal control (Paquet et al. 1999). Mink have also been a problem, causing adult mortality at Mash Island, NS in 1999 (A. W. Boyne pers. comm.) and adult and chick mortality at The Brothers in 2003 (D'Eon 2003). In both cases attempts were made to trap the predator; unsuccessfully in 1999 and successfully in 2003. Other predators include Peregrine Falcons (*Falco peregrinus*), large owls, cats, dogs, foxes, and other mammals (depredating adults and young), and ants, Black-crowned Night Herons (*Nycticorax nycticorax*), and corvids (depredating eggs and young) (a complete list of predators is available in Kress and Hall 2004). In the United States, nocturnal predators such as mink, owls, and night-herons probably have a greater impact than diurnal predation by gulls.

Nest shelters have been placed at several colony sites where Roseate Terns have been known to nest (e.g., Grassy, Country and Westhaver Islands, NS; Paquet Island, Deuxième Îlet and Chenal Island, Québec), but have been used by the birds and consistently maintained only at The Brothers (Whittam 1999, D'Eon 2001). Enhancement of nesting habitat is successful only in conjunction with discouragement of gulls and uncontrolled public visitation near colonies.

## *Actions to be initiated*

### Predator management

*Gulls.* Experience in Canada and the United States shows that some form of gull control is an important step in the recovery of Roseate Terns (Leonard et al. 2004). Discouragement of gulls will probably be successful only at managed colonies (currently Country Island and The Brothers), because it requires human presence throughout the breeding season. On islands selected for restoration where gulls occur, colony sites and surrounding areas must be patrolled daily throughout the breeding season, beginning before the terns arrive. Gulls should be discouraged from taking up residence on colonies with noise makers and should they still attempt to nest, their nests should be destroyed. Lethal control should be considered for individual gulls that persist in depredate terns, despite non-lethal efforts. Non-lethal gull control requires a concentrated and sustained effort. Fewer gulls return in subsequent years, reducing the effort required, but gull discouragement might need to continue for several years before large numbers of terns return to sites (Kress 1997, Leonard et al. 2004). Ideally, gull discouragement programs should include surveys to determine whether displaced gulls continue to prey on terns at the focal site and/or prey on terns at other colonies, thereby shifting the problem rather than rectifying it.

Long-term actions that may decrease gull populations near tern colonies should be encouraged, e.g., closure of landfills, control of refuse at fish plants and on fishing boats, and discouraging people from feeding gulls.

*Other predators.* Larger mammalian predators (e.g., feral pets, foxes) can be kept out of small colonies by electric fencing (F. Shaffer pers. comm.). Otherwise, predators should be live-trapped and removed, where possible, or, alternatively killed (specific predator removal methods are available in Kress and Hall 2004). Personnel at each managed colony should hold active permits for predator removal to ensure immediate action should there be a need. A single predator can quickly destroy a colony (Nisbet and Spindel 1999).

### Enhance nesting habitat

Roseate Terns prefer more sheltered locations for nest sites than do other species of terns, and this shelter appears to protect their eggs and chicks more effectively from predation (Whittam 1999). Vegetation preferred by Roseate Terns at specific sites should be maintained and extended if possible without unduly reducing habitat for Common or Arctic Terns. Roseate Terns often nest in artificial nest shelters where these have been provided, and those that do have higher nesting success (Whittam 1999). The utility of nest shelter designs that have proven useful at other sites should be assessed and implemented where appropriate (e.g., Spindel 1996).

### 1.3.3 Manage additional colonies

#### *Actions completed or underway*

The previous Recovery Plan focused largely on restoration of Roseate Terns to one site, Sable Island, NS (Lock et al. 1993). Restoration was not attempted on Sable Island and since then, only one or two pairs of Roseate Terns have nested there each year, and the costs of conducting field work at the site have increased, making it less attractive for restoration. More importantly, successful non-lethal gull control programs in the United States and Canada (Leonard et al. 2004) have offered alternatives to the large-scale cull of gulls that the Sable Island restoration project would have required.

A non-lethal program of gull discouragement, started on Country Island in 1998, restored Roseate Tern numbers and reproductive success there after gull predation decimated the colony in 1996 and 1997 (Leonard et al. 2004). However, only one pair of Roseate Terns bred there in 2001, possibly because a predator or storm disrupted settlement (Boyne et al. 2001a), but such setbacks are typical of restoration programs (e.g., Kress 1997). In 2003, 43 pairs of Roseate Terns nested on Country Island, approaching the historic high of 53 pairs in 2000 (Chisholm et al. 2002). Several other attempts to restore tern colonies, by providing nest shelters or by using nylon wires or automated noise makers to deter gulls, failed (e.g., Boyne 1998b, Gregoire 2000, D. Currie pers. comm.).

The failure of these latter attempts and the success of the Country Island program emphasize that constant human presence throughout the breeding season, year after year, is needed to effectively deter gulls and successfully restore colony sites (Kress and Hall 2004).

#### *Actions to be initiated*

##### Establish at least one additional predator-free colony

In 2003, the tern colonies on Country Island, NS and The Brothers, NS, both of which have predator management programs, supported 129 of the 130 pairs of Roseate Terns nesting in Canada (Leonard et al. 2004). The congregation of Roseate Terns into two sites makes the population extremely vulnerable to disease, major weather events, oil spills, and other stochastic events. To buffer the population from these threats it is necessary to provide at least one more secure site for nesting Roseate Terns in Canada. Efforts to restore Roseate Terns to formerly occupied colonies have often been slow to produce results, but, in a few cases, appear to have been successful (Nisbet and Spendelow 1999). Given the effort involved, sites for restoration must be selected carefully, not only in relation to their suitability and practicality, but also so that they do not draw terns from secure colonies to areas where breeding is riskier. For example, based on these criteria, the Mahone Bay/ St. Margarets Bay area of Nova Scotia, which is hundreds of kilometres away from the nearest secure colony and where Roseate Terns have persistently tried to breed (Whittam 1999), may be a promising area for a restoration program. Once possible sites are identified, they should be ranked based on their suitability for terns and on their practicality as possible sites for restoration. Draft habitat criteria from the US Recovery Team (see Appendix A) provide interim measures of suitability and a basis for drafting criteria

suitable for Canadian sites. Further revisions should be made cooperatively with the US Recovery Team. Techniques for restoration are outlined in Kress (1997), Leonard et al. (2004), and Kress and Hall (2004).

An alternative to establishing new tern colonies may be to attract more Roseate Terns to large colonies of Common and/or Arctic Terns that are already free of gulls and have small or historic numbers of nesting Roseate Terns. This might be attempted using Roseate Tern decoys and playback of Roseate Tern calls. Appropriate colonies may include Machias Seal Island and the colony at East Light on Sable Island. On one hand, large numbers of other tern species at these sites have already failed to attract Roseate Terns, so it seems unlikely that artificial attractants will do any better, particularly since Roseate Terns do not usually join offshore colonies (J.A. Spendelow, pers. comm.). On the other hand, if these alternative methods did succeed, they would constitute a cost-effective route to restoration.

Restoration efforts, including financial and logistic support, must be maintained for several years before Roseate Terns settle to breed, and active on-site protection of the colony must be sustained thereafter (Kress 1997; Leonard et al. 2004).

### **1.3.4 Identify critical habitat<sup>1</sup>**

In the pre-SARA Canadian Roseate Tern Recovery Plan, suitable breeding habitat was presumed to be unlimited (Lock et al. 1993). However, research has shown that Roseate Terns actually have specific habitat requirements that are not met by most apparently suitable coastal habitat in the United States (Nisbet and Spendelow 1999). Roseate Terns may be more limited by the location of foraging habitat than by the suitability of nesting habitat. In Canada, recent survey data suggest that Roseate Terns have used only a small, varying subset of coastal islands where terns nest (Leonard et al. 2004).

Roseate Terns generally forage in shallow areas close to shore, near shoals and tidal rips (Gochfeld et al. 1998), although little is known about their foraging ecology in Canada. After fledging in early August, juvenile Roseate Terns from the northeastern population disperse with their parents to staging areas. There is also little known about staging habitat for Canadian birds, although in 2002 two Roseate Terns that had been banded as chicks on The Brothers, NS were sighted within a month of fledging at Great Gull Island, New York (H. Hays, pers. comm.) and 13 of 14 chicks banded on Country Island in 2009 were sighted from August to October of that year staging at sites in Cape Cod, Massachusetts (J. Spendelow, pers. comm.). Roseate Terns migrate south in late August and early September. They arrive in South America by October, where they have been recovered and recaptured along the north coast from western Colombia to eastern Brazil, between 11°S and 18°S (Hays et al. 1997).

#### *Identification of critical nesting habitat*

The federal *Species at Risk Act* (SARA) (Government of Canada 2002) defines critical habitat as “...*the habitat that is necessary for the survival or recovery of a listed wildlife species and that*

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<sup>1</sup> amended September 2010.

*is identified as the species' critical habitat in the recovery strategy or in an action plan for the species."*

Survival of the current population requires, at a minimum, maintenance of the existing managed colonies at The Brothers, NS (North Brother [43°38.191'N, 65°49.406'W]; South Brother [43°37.798'N, 65°49.530'W]; >80 pairs) and Country Island, NS (45°06.096'N, 61°32.544'W; >40 pairs).

To meet the recovery goal outlined in this strategy, several widely dispersed island colonies with sheltered nest habitat (vegetation, rocks, or artificial nest shelters) that are free of gulls, mammalian predators and human disturbance, and have access to good foraging areas are required. Roseate Terns formerly nested at many colony sites now occupied by gulls, which could be restored for recovery through active management. Habitat may also be available for additional nests at existing colony sites, although this possibility has not been thoroughly studied.

The criteria used to identify critical habitat are:

1. Sites that currently<sup>2</sup> support more than 15 pairs of Roseate Terns (>10% of the Canadian population);
  - **The Brothers, NS (North Brother [43° 38.191'N, 65° 49.406'W]; South Brother [43° 37.798'N, 65° 49.530'W])** – the entire terrestrial habitat of both islands, as well as aquatic habitat extending 200 m seaward from the mean high tide line of each island.
  - **Country Island, NS (45° 06.096'N, 61° 32.544'W)** - the entire terrestrial habitat of the island, as well as aquatic habitat extending 200 m seaward from the mean high tide line.
2. Tern<sup>3</sup> colonies in areas that have supported small but persistent numbers of nesting Roseate Terns for over 30 years;
  - **Sable Island, NS (43° 55.839'N, 59° 54.467'W)** – the polygons encompassing entire individual nesting tern colonies on the island and the habitat extending 200 m beyond each polygon.
  - **Magdalen Islands, QC (Paquet Island [47° 24.492'N, 61° 50.162'W]; Deuxième Îlet [47° 30.153'N, 61° 43.837'W]; and Chenal Island [47° 33.927'N, 61° 32.847'W])** – the entire terrestrial habitat of each island, as well as the aquatic habitat extending 200 m offshore as measured from the mean high tide line of each island. Aquatic critical habitat associated with Paquet Island is identified only as that which occurs within Lagune du Havre-aux-Maisons and excludes aquatic habitat located south of île-du-Havre-aux-Maisons. Similarly, the area

<sup>2</sup> As of October 25, 2006, the date the Recovery Strategy for the Roseate Tern was published on the SAR Public Registry.

<sup>3</sup> The term 'tern' refers to all tern species that comprise the colonies in which Roseate Terns nest. Since Roseate Terns nest only in large colonies comprised of a mixture of tern species, any activities that adversely impact terns within the colony, or the ability of terns to use habitat within or surrounding the colony, may also result in the destruction of Roseate Tern critical habitat

comprising the marina and all anthropogenic structures within the aquatic critical habitat surrounding Paquet Island are excluded from this identification of critical habitat for Roseate Tern.

The 200 m distance is based on the following research. In a review of the effects of human disturbance on nesting colonial waterbirds, Carney and Sydeman (1999) recommended that to reduce human disturbance a distance of 100-400 m be established around Common Tern colonies. Based on flush responses of Common Terns, specific studies have recommended distances of 100 m (Burger 1998), 180 m (Rodgers and Smith 1995) and 200 m (Erwin 1989) be established around colonies to reduce the impacts of human disturbance. There have been no published studies specifically on Roseate Terns; however Roseate Terns virtually always nest within colonies of Common Terns. Recognizing the variability of responses to disturbance depending on the colony and the circumstance, it was felt that inclusion of a distance of 200 m distance around tern colonies in which Roseate Terns nest is critical to providing adequate protection to Roseate Tern nesting habitat.

If any of the sites described above are not occupied by breeding Roseate Terns for three consecutive years, they will be re-assessed in terms of their identification as critical habitat. Additional/new sites where Roseate Terns have nested for three consecutive years may be identified as critical habitat under criterion 1. If a new breeding site is established that meets criterion 1 (supports >10% of the national population) the critical habitat identification will be revisited to consider identifying the new colony specifically as critical habitat. Any Roseate Tern nest, located either within or outside of critical habitat, is protected under the *Migratory Birds Convention Act, 1994* and as a residence under SARA (a description of the Roseate Tern's nest residence can be found at [http://www.sararegistry.gc.ca/document/default\\_e.cfm?documentID=597](http://www.sararegistry.gc.ca/document/default_e.cfm?documentID=597)). SARA also protects all Roseate Terns from being killed, harmed, or harassed.

The critical habitat described herein supported 139 pairs of Roseate Terns in 2002 and 129 pairs in 2003 (Leonard et al. 2004) although only 72 in 2009 (Environment Canada, unpublished data). Efforts to establish a third predator-free colony of Roseate Terns (see 1.3.3 Manage additional colonies), if successful, would provide sufficient critical habitat to meet the recovery goal of no fewer than 150 pairs nesting in at least three colonies in Canada.

### **1.3.5 Examples of activities likely to result in destruction of critical habitat<sup>4</sup>**

Examples of activities likely to result in destruction of critical habitat for the Roseate Tern include, but are not limited to:

#### *Modification of the surface of the islands*

The topography of the islands on which terns nest and the maintenance of the characteristics of the soil surface are necessary elements for successful breeding by Roseate Terns. Removing material (e.g. debris, rocks, nesting structures), as well as adding material (e.g. sand, gravel, rocks) or the installation of anthropogenic structures are likely to result in the destruction of critical habitat.

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<sup>4</sup> amended September 2010.

*Modification of the vegetation cover*

Vegetation cover is a necessary attribute for reproduction and camouflage of individual birds. Partially or completely removing the vegetation used by Roseate Terns and/or other terns<sup>2</sup>, whether manually, mechanically (e.g. by machine) or chemically (e.g. by herbicides) or through activities connected with constructing, maintaining or operating anthropogenic structures, as well as intentionally adding vegetation, are likely to result in the destruction of critical habitat.

*Modification of hydrological characteristics*

Aquatic habitat is a necessary element for reproduction and feeding by Roseate Terns. Releasing substances that are likely to increase turbidity or change the chemical composition of surface waters, inland waters, marine waters or the water table, is an activity that is likely to result in the destruction of critical habitat. The same is true of the installation of anthropogenic structures in the aquatic environment.

Further human activities or outcomes of such activities that would disturb the birds in critical habitat to the extent that they are not able to successfully perform their biological activities (i.e. mating, egg laying, brood rearing, coming in and out of the colony, foraging, or even simply resting) are prohibited under sections 32 and 33 of SARA.

**1.3.6 Schedule of studies to identify remaining critical habitat***Identify key characteristics that make potential nesting sites attractive to Roseate Terns*

It is widely accepted that the key habitat feature for breeding Roseate Terns is the presence of breeding Common Terns (Gochfeld et al. 1998). Therefore, the health of colonies of Common Terns (and, in eastern Canada, Arctic Terns) is key to the recovery of Roseate Terns. Characteristics of colonies where Roseate Terns have bred in the past, particularly as they relate to the size and distribution of colonies of other species of terns, may help determine which sites could support Roseate Terns in the future. This would help identify potential sites for restoration and sites where Roseate Terns could relocate should existing Roseate Tern colonies be impacted by events such as predation or erosion. If the number of suitable sites is limited then they may warrant identification as critical habitat.

- Studies to investigate the relationship between Roseate Tern nesting and the size and distribution of colonies of other species of terns will be completed before 2007.

*Identify foraging habitat at secure colonies*

At several colonies in the US, Roseate Terns forage at only a few sites. More than one colony may share a single foraging site; for example, 20-25 % of the US population forages at one shallow water site (Nisbet and Spendelov 1999). The foraging sites of Roseate Terns at Canadian colonies may also be localized and thus vulnerable, but their locations are unknown. Work on foraging habitat was initiated by the Canadian Wildlife Service and Dalhousie University in 2003 (A.W. Boyne pers. comm.). If consistent foraging areas are found, the features that distinguish them from similar, but unused, areas should be determined, to see whether foraging sites are limited and whether any management, especially protection, is possible or required.

- Studies to investigate Roseate Tern foraging habitat were initiated in 2003. An evaluation of the need to identify foraging areas as critical habitat will be completed by 2009.

*Identify transit and resting habitat beyond colonies*

Other important aspects of habitat use away from colonies are still poorly understood, particularly the location of transit, roosting and foraging areas used by non-breeding birds. Due to the small Canadian population it is not currently feasible to implement directed studies on transit or resting habitats for Roseate Terns, however if additional information is collected the necessity of designating critical habitat at these sites will be evaluated. Sightings of Roseate Terns away from known colonies should be recorded in a single database that includes information such as the number, behaviour, and age of birds, together with time of year, time of day, and time of tide cycle. Teams can then revisit these sites to confirm the presence of the species and nature of the use of the habitat. If areas are located, the features that distinguish them from similar, but unused, areas should be determined, to see whether they are limited and whether management can or should be attempted.

- Due to the small Canadian population, it is not currently feasible to implement directed studies on transit or resting habitats for Roseate Terns.

### 1.3.7 Protect habitat

#### *Actions completed or underway*

Since the last Recovery Plan was written, there have been rapid expansions in recreational and commercial use of coastal habitat. Thus, special efforts are needed to maintain the safety of existing colonies and to ensure that all necessary habitats, especially restored colonies, are undisturbed.

As per section 58(5) of SARA, within 180 days after posting the final version of this recovery strategy, the Minister of the Environment will make an order to protect critical habitat on Country Island, now administered by the Department of Fisheries and Oceans. The key colony on The Brothers Islands has been acquired by the Nova Scotia Department of Natural Resources and will be designated a Wildlife Management Area. As per section 58(2) of SARA, within 90 days after posting the final version of this recovery strategy, the Minister of the Environment will publish in the *Canada Gazette* a description of the critical habitat that is on Sable Islands, a Migratory Bird Sanctuary. Ninety days after that description is published, prohibitions on critical habitat destruction will apply to that critical habitat.

Several other nesting locations have or will soon have some form of designation, for example as Migratory Bird Sanctuaries (e.g., Machias Seal Island, NB), Wildlife Management Areas (e.g., Grassy Island, NS [candidate area] and Pearl Island, NS), or Important Bird Areas (e.g., The Brothers, NS).

The Roseate Tern is currently protected under the *Migratory Birds Convention Act, 1994*, the Nova Scotia Endangered Species Act (1996), and the federal *Species at Risk Act* (2002). The Québec Advisory Committee on Threatened or Endangered Species recommended in November 2002 that the Roseate Tern be designated as Threatened (equivalent to Endangered by COSEWIC) under the « *Loi sur les espèces menacées ou vulnérables* ». As a result the Roseate Tern should be officially designated in Québec in 2006. The Roseate Tern currently appears on the « *Liste des espèces de la faune vertébrée susceptibles d'être désignées menacées ou vulnérables* ».

#### *Actions to be initiated*

##### Designate and secure colony sites

Colony sites should, wherever possible, be acquired and designated appropriately as Migratory Bird Sanctuaries, National Wildlife Areas, Wildlife Management Areas (Nova Scotia) or Wildlife Habitat (Québec). The Important Bird Areas program can be used to formalize public recognition of the value of particular sites, although this first step must be followed up with designations that provide legal protection. Tern colonies may shift location from year to year, so designation should encompass several alternative nesting sites nearby where the terns may relocate (e.g., not just an individual island, but also its surrounding archipelago).

### Develop local site-specific plans for protection from human disturbance

Terns can habituate to regularly repeated diurnal visits to colonies, as happens at colonies with ongoing research programs (Nisbet 2000). Well-managed, systematic visits by researchers and guardians may have a positive impact on Roseate Terns, as these visits may deter gulls from nesting in the colony and promote habituation to human presence, which could mitigate unforeseen disturbances and provide an environment conducive to research. However, uncontrolled, infrequent visits to colonies by humans or pets flush adult terns from their nests, which can cause nest failure because of cooling or predation of eggs and young. Such disturbance can also cause abandonment of the colony, especially early in the nesting period (Gochfeld et al. 1998). Activities may not be directed at the terns and may be inadvertent, but if prolonged could possibly be devastating. Legislation on interference with nesting birds (e.g., on Wildlife Management Areas and Migratory Bird Sanctuaries) does not necessarily offer adequate protection against such disturbance, unless there is adequate enforcement.

For all colonies, site-specific plans to discourage disturbance should be formalized in writing and reviewed annually, in consultation with landowners and local residents, whenever possible. All these plans must include provision for some form of on-site staff (these could be in the form of researchers or local stewards) and education (e.g., information boards, pamphlets). Signage and 'symbolic' fencing may be useful where it would not be resented or attract vandals. Policies should take into account that actions taken against traditional uses of particular islands (e.g., camping or picnicking) may be resented and counter-productive if they are not part of an integrated plan that includes landowner and community participation.

Although no formal protection is yet in place under the *Species at Risk Act*, the marine components of the critical habitats identified within this strategy are currently managed or subject to management practices which benefit the protection and recovery of Roseate Terns. For instance, the oil and gas industry has established a moratorium on oil and gas exploration and development on or within one kilometre of Sable Island. Traditional fishing practices undertaken in the vicinity of Country and the Brothers Islands have not been observed to affect Roseate Terns but plans for reviewing changes to these activities in terms of their impacts on Roseate Terns will need to be developed.

### Enforcement

Site-specific plans for protection from human disturbance should be supported where possible by enforcement. Despite protective legislation, obtaining the information needed to enforce the legislation is difficult. Management agencies should provide the stewards of every colony with the information and actions that are needed to collect evidence required for successful prosecution of infringements of legislation protecting terns. Appropriate enforcement agencies near each colony should be prepared to act quickly in case of such infringements.

### **1.3.8 Identify limiting factors at managed colonies**

#### *Actions to be initiated*

The factors that limit productivity at colonies free of predation are not clear, but must be understood if reproductive success is to be enhanced. Nisbet and Spendelov (1999) make the point that the integration of research and management actions should occur at the outset of a project because it takes time for research to provide the results that are necessary to implement an appropriate management program. Researchers also act as de facto stewards and guardians. Factors to consider include parental quality, foraging opportunities, sex ratio, nest site availability, overcrowding, competition for nest sites or foraging areas with Common or Arctic Terns, and the effect of winter mortality on the return rates of adults (Gochfeld et al. 1998).

### **1.3.9 Monitor threats**

Rapid natural and anthropogenic changes, especially in coastal regions, may place all recovery objectives at risk if they are not monitored. Potential threats include poaching in the wintering areas, displacement and predation by gulls, recreation activities, changes in food abundance, and currently unforeseen events.

#### *Actions completed or underway*

#### Monitor gull population and distribution

Gull numbers and distribution around Country Island were mapped in 1998-2000, and some gulls were marked to trace their movements (Smith et al. 2000). Gull surveys were conducted for Nova Scotia and the Magdalen Islands in 2002. This work should continue and similar projects should be started at other colonies, especially where gull discouragement programs are planned or underway.

#### Monitor recreational use of existing and potential colony sites

The Bluenose Atlantic Coastal Action Program is assembling these data for the islands in Mahone Bay (Boyne 1999); similar efforts should be undertaken elsewhere.

#### Monitor changes in food sources

Foraging watches at Country Island have assessed the diet of Arctic and Common Terns but the data for Roseate Terns are poor (e.g., Boyne et al. 2001a). More detailed observations occurred on Country Island in 2003 and will be continued (J. Rock, pers. comm.). Preliminary foraging observations started at The Brothers in 2001 (D'Eon 2001) should continue and be quantified if possible. No attempt has been made to integrate information on food distribution and abundance with habitat use or reproduction by Roseate Terns.

### Determine risk of singular events and devise contingency plans

Risks to seabirds from shipping lanes and petroleum activities have been mapped (A.R. Lock pers. comm.) but need to be integrated with information on tern habitat use as it becomes available. Ring-billed (*Larus delawarensis*) and Laughing Gulls (*L. atricilla*) may be extending their breeding range into this region (Boyne et al. 2001b; Boyne and Hudson 2002; Taylor et al. 2002) and their spread should be watched carefully for its effect on tern colonies.

### Mortality on wintering grounds

Canadian research and management efforts have, so far, been limited to Canadian breeding sites.

### *Actions to be initiated*

#### Monitor gull population and distribution

The increase and spread in Herring (*L. argentatus*) and Great Black-backed Gull (*L. marinus*) populations throughout the northeastern North American Atlantic coast in the early 20th century have been attributed partly to increased refuse from fisheries and landfills (Kadlec and Drury 1968). Conversely, a significant decline in number and reproductive success of Herring Gulls, and a possible decline in Great Black-backed Gulls, late in the century may be attributable to a decline in fisheries and to improved landfill practices (Mawhinney et al. 1999; Boyne and Hudson 2002). If these declines are real, then recovery of tern populations may ensue, especially in areas where these changes in practices are proceeding particularly quickly.

However, concomitant with declines in larger gull species is an increase in smaller gulls. Ring-billed Gulls are expanding in the Gulf of St. Lawrence (Lock 1988; Boyne et al. 2001b; Boyne and Hudson 2002), and Laughing Gulls have nested at two sites in eastern Canada for the first time in over a half century (Taylor et al. 2002). In Maine, where the species has increased dramatically at several sites, Laughing Gulls are having a negative effect on tern colonies through both predation and displacement from breeding habitat (Kress and Hall 2004). If these populations continue to increase the impact could be significant. The expansion and associated predation on terns by Ring-billed Gulls and Laughing Gulls should be monitored.

On a broad scale, historic seabird census data should be compared to data on fish plant and landfill practices to see whether there is any correlation between changes in these practices and changes in gull and tern distribution. At selected field sites, especially those near key colonies, more data should be collected on resource use, home range size, and determinants of reproductive success of gulls, with the specific aim of identifying places where changes in land use practices would reduce the number of gulls at tern colonies. If actions are implemented that affect a local gull population, efforts should be made to determine the pathway through which the gulls are impacted, and whether they move and become a problem elsewhere.

### Monitor recreational use of existing and potential colony sites

Recreational use of coastal habitats probably is increasing, but is poorly monitored and managed. Available data on recreational use of islands (e.g., from recreational groups, tourism bureaus, tour companies) should be assembled and compared to the distribution and tenure of colonies. Attitudes towards control of recreational use near colonies should be assessed and incorporated in local management plans.

### Monitor changes in food sources

For Roseate Tern colonies that are free of heavy predation, reproductive success probably is limited by food abundance and availability. The foraging ecology of Roseate Terns in Canada is poorly understood and should be monitored wherever possible. Information on distribution of the small fish most likely taken by the terns should be included in analyses of tern foraging areas. Potential conflicts with fishing or commercial developments (e.g., aquaculture, pipelines) can then be better assessed. Note that effects of declines in adult fish, for example due to fishing, seals, or climate change, may originate in areas far removed from tern colonies, and may take a few years to trickle down to the younger cohorts of fish that terns prey upon (Amey 1998). Where possible, these more distant events should also be monitored, even though the precise spatial and temporal scales that are relevant to the terns are difficult to define in advance.

### Determine risk of singular events and devise contingency plans

Sudden, unexpected threats to terns may include severe storms (Hatch et al. 1997; Spendelow et al. 2002; Lebreton et al. 2003), disease, spills of petroleum or other toxins, unanticipated declines in prey species, or range expansions of new predators. Little can be done to prevent some of these events, but the likelihood that they will occur in any given area can be mapped and then used in selecting sites for restoring colonies and in formulating contingency plans for each colony site. Use of the oceans in the Maritime Provinces is changing rapidly, so these risk assessments should be updated regularly.

### Mortality on wintering grounds

Most annual adult mortality occurs on the wintering grounds, but distribution and ecology in wintering areas are poorly understood (Nisbet and Spendelow 1999). Adult mortality is a key threat, so efforts to reduce it contribute directly to recovery of the Canadian population. The Canadian Recovery Team should explore possibilities for international collaborations that will identify and eliminate threats to wintering terns.

### 1.3.10 Improve decision-making and planning

#### *Actions completed or underway*

Planning and decision-making which influences human activities in the coastal zone can have significant implications for the health and recovery of the Roseate Tern. The review of project proposals should always consider the potential for interactions with the Roseate Tern, especially along the east coast of Nova Scotia, the Bay of Fundy and the Magdalen Islands. Examples of project types typically proposed and reviewed in these coastal regions are marinas, ports, docks, wharves, boat launches, small craft harbours, wastewater treatment plants and outfalls, trails, aquaculture, wind turbines, and oil and gas exploration and development. Related activities include infilling, drilling, dredging, disposal at sea, vessel traffic, waste disposal, and human presence.

Particular attention is required in reviewing project proposals that include, or can lead to, any activities that directly or indirectly impact critical habitat. Review processes, which make provision for early attention to potential impacts on the Roseate Tern, can help secure and advance the recovery goal and objectives. For example, through application of, and involvement in, federal or provincial environmental assessment processes, project alternatives can be identified, potential impacts avoided or minimized, uncertainties investigated, recovery initiatives supported, impact predictions verified and mitigation effectiveness tested.

Initiation of three major commercial projects near key colony sites in the last decade underscores the importance of strongly advocating precautionary approaches and sensitive monitoring programs.

1. Concerns were raised during public review of the Sable Offshore Energy Project, an offshore gas extraction project, that laying pipeline 5 km from Country Island would negatively affect Roseate Terns nesting there (Joint Public Review Panel 1997). Assurances that pipe laying would not occur during the breeding season were not met, so a monitoring program was conducted that did not detect any ill effects (Paquet et al. 1999).
2. The same project review was assured that support flights for offshore rigs near Sable Island would avoid disturbing terns and other wildlife on the island, and this assurance has been met (Horn and Shepherd 1998).
3. The Recovery Team was unable to influence the placement of an aquaculture project 250 m from The Brothers. The project apparently did not attract gulls or otherwise disturb the terns, as some members of the public had expected (T.C. D'Eon pers. comm.). However, its effects may have been mitigated, both because a steward (T.C. D'Eon) was attending the colony and because the project was small in scale and was dismantled in 1999 after only a few years of operation. The rate at which aquaculture operations are being established in the Atlantic region is still a concern.

*Actions to be initiated***Ensure a precautionary approach to commercial development near important habitat**

Activities in the coastal zone, including development of marine resources, are intensifying in Atlantic Canada, and the effects on Roseate Terns may be difficult to foresee. For example, aquaculture or pipeline trenching may pose significant threats, even if they do not affect local fish populations overall, but only reduce them in areas where the terns forage. Also, multiple projects and activities may have cumulative effects that are undetectable in the short term. Therefore, it is important that decisions on proposed projects that could interact with Roseate Terns and their habitats be informed by application of the precautionary principle, a consideration of potential contributions to cumulative effects and a consideration of mitigation measures that could be taken to avoid or minimize adverse effects including alternative means of carrying out the project. After considering such factors, any approval that may be granted so as to allow a project to proceed should be accompanied by the requirement for an effects monitoring or follow-up program that is undertaken by personnel experienced with the Roseate Tern, and is sensitive enough to detect subtle cumulative effects.

**1.3.11 Develop and maintain linkages***Actions completed or underway*

The Canadian Roseate Tern Recovery Team should coordinate its efforts with those of the US recovery team and with the Gulf of Maine Seabird Working Group (GOMSWG). The Atlantic Canada Tern Working Group (ACTWoG) was reactivated after a hiatus of several years, and has met yearly since 1998. Its chair also attends meetings of the GOMSWG and coordinates the activities of the two groups. The Canadian Roseate Tern Recovery Team has met more irregularly; yearly meetings are essential. The team also met with the US Roseate Tern Recovery Team in 2001, and plans to continue to do so on a regular basis. A member of the Canadian Recovery Team spent three weeks working with Brazilian and American biologists on the wintering grounds in Brazil in 2003 (A. W. Boyne pers. comm.). Further coordination with conservation efforts on the wintering grounds should be explored, especially since this is where most mortality limiting the population probably occurs (Nisbet and Spindel 1999). Regional efforts within Canada should be coordinated through yearly meetings of the Canadian recovery team and ACTWoG. In turn, both of these organizations should, where possible, coordinate their efforts with any coastal and marine conservation management plans and programs that are relevant to tern habitat (e.g., those listed under 1.4 Existing management opportunities, below), as well as with stakeholders from industry and other interest groups.

**1.3.12 Address sociopolitical issues***Actions completed or underway*

Public support for tern recovery, enforcement of habitat protection, and coordination of recovery partners are all critical to the success of the Recovery Strategy.

New funding for collaborative approaches to tern restoration is being used to support new tern research and/or management programs at several sites, for example, Sable Island (Atlantic Coastal Action Program (ACAP) Science Linkages), Mahone Bay (Bluenose ACAP), The Brothers (IBA) and Country Island (IBA, World Wildlife Fund Endangered Species Recovery Fund).

Interpretive signs have been set up near Paquet Island, Québec, The Brothers, NS, and near Westhaver Island, NS, a former colony site (Gregoire 2000; D'Eon 2001; F. Shaffer pers. comm.). The Canadian Wildlife Service and researchers at Dalhousie University have also conducted periodic radio interviews and public lectures, and the Canadian Wildlife Service produced a booklet and video ("Hinterland Who's Who") about Roseate Terns. On the Magdalen Islands, the non-government group Attention Fragîles has informed the public about terns through various means, including posters, post cards, mascots, and school programs.

Public education and consultation on lethal gull control at Sable Island were initiated by the Canadian Wildlife Service in 1993. The control program nevertheless met some public resistance and as a result was cancelled (Whittam 1999). This experience, and similar experiences in the US (Nisbet and Spendelow 1999), should be used in planning future gull control.

*Actions to be initiated*

### Stewardship

Full advantage should be taken of these new opportunities for local conservation management (see 1.4 Existing management opportunities, below) by advertising and explaining these opportunities, by encouraging active participation, and by offering financial and logistic support.

### Education and awareness

Public support for tern conservation should be enhanced, not only to encourage compliance with protective policies, but also to engage the public in stewardship. Public talks, web postings, pamphlets, and feature articles should be used to increase public pride and interest in Roseate Terns, encourage political and financial support of conservation efforts, advertise protective policies, and solicit information on tern sightings and potential threats to conservation.

The fishing industry, particularly fishermen operating near Roseate Terns, would be a key target audience.

## **1.4 Existing management opportunities**

A handbook of tern management techniques was prepared by the National Audubon Society for USFWS, with Canadian input (Kress and Hall 2004), and terns are included in the North American Waterbird Conservation Plan (Kushlan et al. 2002) and Wings Over Water: Canada's Waterbird Conservation Plan (Milko et al. 2003).

Many new organizations and funding sources have appeared in Atlantic Canada since the previous recovery plan was written. Full use should be made of these new opportunities, especially those that encourage collaborative efforts among private, public, and government

stakeholders to conserve terns. Examples include federal funding that promotes habitat stewardship (Species at Risk Habitat Stewardship Program) and non-profit groups that acquire lands (e.g., Nova Scotia Nature Trust) or aid inventory and monitoring (e.g., Bird Studies Canada, Atlantic Canada Conservation Data Centre) for conservation.

## 1.5 Potential management impacts on other species

Roseate Terns preferentially settle in large colonies of other species of terns, so any management options that increase the number and size of tern colonies in general are likely to be beneficial for all species of terns, and perhaps also for other co-habiting species such as Leach's Storm-petrels (*Oceanodroma leucorhoa*), Least Sandpipers (*Calidris minutilla*), Common Eiders (*Somateria mollissima*), Black Guillemots (*Cepphus grylle*) and Atlantic Puffins (*Fratercula arctica*). Roseate Terns are far outnumbered by Common Terns, however, enhancement of the denser nest sites that Roseate Terns prefer, if it is done where Common Terns normally nest, may reduce nesting area for Common Terns.

Discouragement of gulls in the vicinity of tern colonies may reduce their reproductive success locally, but, given their abundance and wide distribution, is unlikely to affect gull populations overall.

## 1.6 Development of Action Plans<sup>5</sup>

Roseate Terns currently nest in only two provinces in Canada (Québec and Nova Scotia), with sporadic nesting records from New Brunswick. Over 95% of the Canadian population nests in Nova Scotia. As a result the Canadian Roseate Tern Recovery Team is small, with only six members. It is felt that the Team as it currently exists can oversee the implementation of the recovery strategy and, as such, Recovery Implementation Groups (RIGs) are not needed. A single action plan for the Roseate Tern will be completed and posted on the SAR Public Registry by March, 2011.

A draft of the Action Plan has been prepared and a summary was posted on the Species at Risk Public Registry in September 2009 (Environment Canada). Finalization of the Action Plan has been delayed pending completion of this amendment to the Recovery Strategy for Roseate Tern. In addition to facilitating protection of the critical habitat, the clarification of the identification of critical habitat for Roseate Terns will ensure a more accurate evaluation of socio-economic costs of the action plan and benefits to be derived from its implementation (Section 49 (1) (e)).

The second Action Plan with respect to environmental assessment originally recommended in the Recovery Strategy is now considered to be a technical guidance document and not an action plan.

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<sup>5</sup> amended September 2010.

## 2. BACKGROUND

### 2.1 Species information

**Status:** Assessed by COSEWIC as Endangered in Canada in 1999 (COSEWIC 2003), reclassified from its previous (1986) listing of Threatened. Also Endangered as of 2000 under the Nova Scotia Endangered Species Act (*Endangered Species Act 1998, c. 11, s. 1.*) and the northeastern population is listed as Endangered in the United States (USFWS 1987).

**Reason for status:** The shift in status resulted from reevaluating the population's size and distribution according to revisions to criteria made between the latest (1999) and previous (1986) status reports. During that time, the population remained small and was mainly concentrated at three colonies, only one of which had been stable in that period. One of these colonies (Grassy Island) has since been abandoned (Leonard et al. 2004). Predation and disturbance result in poor productivity and recruitment.

**Occurrence:** Mainly Nova Scotia, with a few pairs in Québec and New Brunswick.

### 2.2 Distribution

**Global range:** Breeds worldwide, usually on marine islands (see map in Appendix B). In North America, a northeastern population breeds from the Gulf of St. Lawrence (Magdalen Islands) to New York; a disjunct Caribbean population breeds from Florida and the Bahamas to the Lesser Antilles.

**Canadian range:** Since 1982, have bred at about 28 sites, most of which are coastal islands in Nova Scotia, and of which 12 or fewer sites are occupied in any given year (see map in Appendix B). The location of colonies changes unpredictably among years, and may not always be known even with extensive searches. Only three colonies are known to have had more than 20 pairs in the last 10 years: The Brothers (33-86 pairs), Grassy Island (0-30 pairs), and Country Island (0-53 pairs). In some years, have bred at a variable subset of other sites, including three of the Magdalen Islands, Québec, Machias Seal Island, NB, and about 21 other sites in Nova Scotia (Whittam 1999, Leonard et al. 2004; Appendix B).

**Percentage of global distribution in Canada:** Pairs breeding in Canada constitute 3-4% of the northwestern Atlantic population, and less than 1% of the (poorly) estimated world population (Gochfeld et al. 1998).

### 2.3 Population sizes and trends

Population estimates are imprecise, but from 1982-1985 to 1999, the number of breeding pairs was probably roughly stable at about 100 pairs (100-121 in 1982-1985 [Kirkham and Nettleship 1986] to 123-149 in 1999 [Whittam 1999]), although their distribution was certainly variable. In 2000, only Country Island and The Brothers were surveyed, but together these sites contained the equivalent of at least 95 % of the suspected breeding population of <149 breeding pairs (Leonard et al. 2004). Between 1988 and 1991 the northeastern population in the US increased from 2743

to 3430 pairs (USFWS 1998) which corresponds to an annual population growth of 4.6%. After a decline of about 17% between 1991 and 1992, which was attributed to Hurricane Bob (Nisbet and Spendelov 1999; Lebreton et al. 2003), the population increased from 2743 to 4310 pairs between 1992 and 2000 (USFWS 1998; B. Blodget pers. comm.), which is a mean population growth of 5.8% per year. This increase appears to have been achieved both by intensive management of existing colonies and by restoration of additional colonies (Nisbet and Spendelov 1999). However, the population had declined to about 3500 pairs by 2002.

## **2.4 Biologically limiting factors**

Roseate Terns have a low annual adult survival rate for a seabird (83 %), lay one small clutch per year (mean clutch size = 1.7 eggs/ pair), and usually do not breed until their third year (Spendelov et al. 2002). Even when reproductive output is high (> 1.1 young per year), as in some US colonies, survival to first breeding is low (about 37% to age 3 [Lebreton et al. 2003]). Colony sites may also be limited, even without displacement by gulls (see below), by their need for specific foraging sites, i.e., shoals free of competition from Common Terns (Nisbet and Spendelov 1999).

## **2.5 Threats**

Predation at breeding colonies by Herring and Great Black-backed Gulls was certainly the main factor limiting productivity at one Canadian colony (Country Island), and displacement and predation by these gulls are thought to be the main factor limiting distribution in Canada (Lock et al. 1993; Whittam 1999). Especially at sites near the mainland, other predators (e.g., foxes on the Magdalen Islands) are also a threat. Recent research in the United States and United Kingdom has shown that high post-fledging mortality, and a shortage of males threaten recovery even after predators are controlled (Nisbet and Spendelov 1999).

## **2.6 Habitat requirements**

### **2.6.1 Habitat use**

Roseate Terns in Canada nest in colonies almost exclusively on small islands with low vegetation, but will occasionally nest on mainland spits (Whittam 1999). They generally select nest sites with vegetated cover but will also nest under beach debris and driftwood (T.C. D'Eon, pers. comm.), and in tires and nest boxes if provided (Spendelov 1982). The most important habitat feature in northeastern North America for breeding Roseate Terns appears to be the presence of breeding Common Terns (Gochfeld et al. 1998), as they have not been known to nest at sites without them. Terns require colony sites that are relatively free from predators, and will abandon a colony after a season of heavy predation (Nisbet 1981; Whittam 1997). Roseate Terns breeding in North America are limited by the number of available predator-free (or predator-controlled) colony sites that are also in close proximity to good foraging sites.

Roseate Terns generally forage in shallow areas close to shore, near shoals and tide rips (Gochfeld et al. 1998), although little is known about their foraging ecology in Canada. After fledging in early August, juvenile Roseate Terns from the northeastern population disperse with

their parents to staging areas. There is also little known about staging habitat for Canadian birds, although in 2002 two Roseate Terns banded as chicks on The Brothers were sighted at Great Gull Island, New York within a month of fledging (H. Hays, pers. comm.). Roseate Terns migrate south in late August and early September. They arrive in South America by October, where they have been recovered and recaptured along the north coast from western Colombia to eastern Brazil, between 11°S and 18°S (Hays et al. 1997).

### **2.6.2 Habitat trends**

Since the early 1900s, tern colonies across the northeastern US and Canada have been abandoned, apparently displaced by the spread of large *Larus* gulls throughout the region (Kress et al. 1983) and possibly deterred by nocturnal predation by owls (Nisbet and Welton 1984). Recent apparent declines in gull populations, suggest that this trend may have stopped or is being reversed (Boyne et al. 2001b; Boyne and Hudson 2002). No apparent effect on the availability of habitat has been detected, however (Whittam 1999).

## **2.7 Ecological role**

In Canada, Roseate Terns are predators of young fish, mostly sand lance (*Ammodytes* spp.), herring (*Clupea* spp.), and white hake (*Urophycis tenuis*; Whittam 1999). Given their sparse distribution in Canada, their impact on these fish populations is negligible.

Roseate Terns are preyed upon by various species, especially by Great Horned Owls (*Bubo virginianus*) and other birds of prey, large gulls, corvids, and mammals which prey on eggs and chicks (Gochfeld et al. 1998). Again, given their rarity, the importance of Roseate Terns to any of these predator populations is negligible.

## **2.8 Importance to people**

The socio-economic value of the Roseate Tern is principally derived from its aesthetics rather than its ecology, but is nevertheless important. Historically, it was valued for the millinery trade, which accounted for precipitous declines in terns in general in the 19th century. Recently, it has become an icon for conservation efforts; for example, it is the emblem of Bird Life International, the Association of Field Ornithologists, and the Atlantic Canada Conservation Data Centre. Sightings of Roseate Terns are prized by ecotourists and birdwatchers. Next to the Piping Plover (*Charadrius melodus*), it is probably the second best known coastal rarity in Atlantic Canada. As such, it serves as a focus of coastal conservation efforts and a source of local pride in those efforts.

## **2.9 Anticipated conflicts or challenges**

The main challenges to recovery are: 1) the expense of keeping wardens on colony sites for the duration of breeding, 2) nourishing sustained partnerships between government and public stewards, when government funding can be irregular and public involvement relies on enthusiastic individuals, 3) at some sites, conflict between recreational use of islands and the need for protecting colonies, 4) the importance of mortality at wintering sites, which, from

Canada, can be addressed only indirectly, and 5) the ethical and public relations challenges of predator control.

## **2.10 Knowledge gaps**

Research conducted in the United States, especially by the Roseate Tern Metapopulation Project, has made the Roseate Tern into one of the best studied bird species in North America (Nisbet and Spendelow 1999). Knowledge specific to Canadian sites is poor, partly because sample sizes are inevitably low, but partly also because a sustained, systematic effort has been lacking. This closing section highlights the most important gaps in our knowledge about the Canadian population.

### **2.10.1 Survey requirements**

Thanks largely to recent aerial surveys, overall data on where Roseate Terns have bred in Canada are good and could yield useful data on their habitat requirements and selection of sites for recovery. Several improvements to surveys are critical:

1. set schedule for surveys, ensuring they are conducted at regular intervals and are complete
2. include scheduled revisits on the ground to confirm breeding and judge success
3. determine adult movements among colony sites and across the US border (requires banding and recapture/ re-sighting efforts);
4. determine sensitivity of surveys for analysis of population trends

### **2.10.2 Biological/ecological research requirements**

The most important research questions are:

1. what are the limiting factors in colonies free of predation?
2. what do Roseate Terns at each colony eat and where do they forage, both for their chicks' and their own food?
3. what factors account for colony abandonment and tenure?

### **2.10.3 Threat clarification**

Trends in threats to Roseate Terns are poorly understood. The most important questions for Canadian research are:

1. what is the distribution of gulls near Roseate Tern colonies?
2. are gulls increasing or decreasing, and what factors account for the trend?
3. what is the impact of other predators (e.g., mink, owls)?
4. what is the pattern of recreational use on islands used by Roseate Terns?
5. to what extent do Common Terns displace or out compete Roseate Terns at different foraging sites?

## **2.11 Ecological and technical feasibility of species recovery**

The Roseate Tern has demographics that dictate a slow recovery and breeds at colony sites that frequently change with no apparent reason. Restoration requires a sustained effort against displacement and predation by gulls and other predators, which are adaptable and well established over a wide area and require a constant and sustained human presence to deter. Post-fledging mortality, most of which occurs away from the breeding colonies and much of which probably occurs well south of Canada, may be the most important factor limiting recovery.

On the positive side, breeding occurs at small, well circumscribed islands, allowing an effective focus of management efforts. Adults are long-lived, and thus are likely to remember successful management efforts and reward them by returning to breed (Spendelov et al. 1995, Nisbet and Spendelov 1999). In the absence of predation and irregular or intense human disturbance, productivity is particularly high for a seabird.

Thus, if sustained presence of experienced personnel can be maintained at suitable breeding colonies, recovery is likely.

## **2.12 Recommended approach / scale for recovery**

Conservation of Roseate Terns will simultaneously enhance conservation of Arctic and Common Terns, although a multi-species recovery strategy is not appropriate because the latter two species are not currently listed as at risk. Roseate Tern recovery will be implemented using a single-species approach but it is understood that the conservation of the Roseate Tern relies on, and will enhance, the conservation of Common and Arctic tern populations.

## REFERENCES CITED<sup>6</sup>

- ACTWoG (Atlantic Canada Tern Working Group). 2000. Fall meeting 2000. Unpublished minutes, Canadian Wildlife Service, Sackville, NB.
- Amey, K.D.D. 1998. Seabirds as indicators of changes in availability and commercial weir landings of herring. Unpublished M.Sc. thesis, University of New Brunswick, Fredericton, New Brunswick.
- Boyne, A.W. 1998a. Tern restoration plan for Country Island, Nova Scotia. Unpublished Canadian Wildlife Service proposal, Environment Canada, Atlantic Region.
- Boyne, A.W. 1998b. Status of Roseate Tern recovery effort: Annual report. Unpublished report, Canadian Wildlife Service, Sackville, NB.
- Boyne, A.W. 1999. Status of Roseate Tern recovery effort: Annual report. Unpublished report, Canadian Wildlife Service, Sackville, NB.
- Boyne, A.W., S.E. Chisolm, and T.E. Smith. 2001. Country Island Tern Restoration Project annual report 2001 - Year 4. Unpublished report, Canadian Wildlife Service, Sackville, NB.
- Boyne, A.W., D. Grecian, and J. Hudson. 2001. Census of terns and other colonial waterbirds in Prince Edward Island - 1999. Technical Report Series No. 372. Canadian Wildlife Service, Atlantic Region. 22 pp.
- Boyne, A.W., and J. Hudson. 2002. Census of terns and other colonial waterbirds along the Gulf of St. Lawrence coast of New Brunswick - 2000. Technical Report Series No. 397. Canadian Wildlife Service, Atlantic Region. 29 pp.
- Burger, J. 1998. Effects of motorboats and personal watercraft on flight behaviour over a colony of Common Terns. *The Condor* 100: 528-534.
- Carney, K.M. and Sydeman, W.J. 1999. A review of human disturbance effects on nesting colonial waterbirds. *Waterbirds* 22: 68-79.
- Chisholm, S.E., A.W. Boyne, and M. Charrete. 2002. Country Island Tern Restoration Project annual report 2002 - Year 5. Unpublished report, Canadian Wildlife Service, Sackville, NB.
- COSEWIC. 2003. Canadian Species at Risk, November 2003. Committee on the Status of Endangered Wildlife in Canada. 44 pp.
- D'Eon, T.C. 2001. Tern report 2001: Lobster Bay - Southwest Nova Scotia. Available at <http://fox.nstn.ca/~deonted/tern01.html>.
- D'Eon, T.C. 2003. Tern report 2003: Lobster Bay - Southwest Nova Scotia. Available at <http://fox.nstn.ca/~deonted/tern03.html>.
- Environment Canada. 2004. Federal Policy Discussion Paper on Critical Habitat. February 2004. *Species at Risk Act* Public Registry. Available at [http://www.sararegistry.gc.ca/policies/showDocument\\_e.cfm?id=271](http://www.sararegistry.gc.ca/policies/showDocument_e.cfm?id=271)
- Environment Canada. 2006. Recovery Strategy for the Roseate Tern (*Sterna dougallii*) in Canada. *Species at Risk Act* Recovery Strategy Series. Environment Canada. Ottawa. vii + 37 pp.

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<sup>6</sup> amended September 2010.

- Environment Canada. 2009. Summary of the Action Plan for the Roseate Tern (*Sterna dougallii*) in Canada. Environment Canada. Ottawa. 2 pp.
- Erskine, A. J. 1992. Atlas of breeding birds of the Maritime Provinces. Nimbus Publishing Limited and the Nova Scotia Museum of Natural History. Halifax, NS. 270 pp.
- Erwin, R.M. 1989. Responses to human intruders by birds nesting in colonies: Experimental results and management guidelines. *Colonial Waterbirds* 12: 104-108.
- Gochfeld, M., Burger, J. and Nisbet, I.C.T. 1998. Roseate Tern (*Sterna dougallii*). *In* The Birds of North America. No. 370 (A. Poole and F. Gill, eds.). The Birds of North America, Inc. Philadelphia, PA.
- Government of Canada. 2002. Bill C-5: An Act respecting the protection of wildlife species at risk in Canada, *Species at Risk Act* (SARA). Public Works and Government Services Canada — Publishing, Ottawa, Canada. 97 pp.
- Gregoire, K. 2000. Sanctuary and Scholarship Trust Fund annual report. *Nova Scotia Birds* 43: 32.
- Hatch, J.J., J.A. Spendelow, J.D. Nichols, and J.E. Hines. 1997. Recent numerical changes in North American Roseate Terns and their conjectured cause. Pages 19-20 *in* L.R. Monteiro, editor. Proceedings of the 7<sup>th</sup> Roseate Tern Workshop, Horta, Azores, Portugal, April 1997.
- Hays, H., J. DiCostanzo, G. Cormons, P. de Tarso Zuquim Antas, J. L. Xavier do Nascimento, I. de Lima Serrano do Nascimento, and R. E. Bremer. 1997. Recoveries of Roseate and Common Terns in South America. *Journal of Field Ornithology* 68:79-90.
- Horn, A.G. and P. Shepherd. 1998. Sable Island Tern Project - 1998 final report. Unpublished report for Sable Offshore Energy, Inc.
- Joint Public Review Panel. 1997. The joint public review panel report, Sable Gas Projects.
- Kadlec, J.A. and W.H. Drury. 1968. Structure of the New England herring gull population. *Ecology* 49: 644-675.
- Kirkham, I.R. and D. N. Nettleship. 1986. Status of the Roseate Tern *Sterna dougallii* (Montagu) in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, Ont.
- Kress, S.W. 1997. Using animal behavior for conservation: case studies in seabird restoration from the Maine Coast, USA. *Journal of the Yamashina Institute of Ornithology* 29: 1-26.
- Kress, S.W. and C.S. Hall. 2004. Tern Management Handbook: Coastal Northeastern United States and Atlantic Canada. U.S. Department of the Interior, Fish and Wildlife Service, Hadley, Massachusetts. 164 pp.
- Kress, S.W., E. H. Weinstein, and I.C.T. Nisbet. 1983. The status of tern populations in northeastern United States and adjacent Canada. *Colonial Waterbirds* 6: 84-106.
- Kushlan, J. A., M.J. Steinkamp, K.C. Parsons, J. Capp, M. Acosta Cruz, M. Coulter, I. Davidson, L. Dickson, N. Edelson, R. Elliot, R. M. Erwin, S. Hatch, S. Kress, R. Milko, S. Miller, K. Mills, R. Paul, R. Phillips, J. E. Saliva, B. Sydeman, J. Trapp, J. Wheeler, and K. Wohl. 2002. Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1. Waterbird Conservation for the Americas. Washington, DC, U.S.A.
- Lebreton, J.D. , Hines, J.E., Pradel, R., Nichols, J.D. and Spendelow, J.A. 2003. Estimation by capture-recapture of recruitment and dispersal over several sites. *Oikos* 101: 253-264.
- Leonard, M.L., A.W. Boyne, and J.S. Boates. 2004. Status and recovery of Roseate Terns (*Sterna dougallii*) in Nova Scotia. *Proceedings of the Nova Scotia Institute of Science*. 42: 253-262.

- Lock, A.R. 1971. Census of seabirds nesting in Nova Scotia, May 18 to June 30, 1971. Unpublished report, Canadian Wildlife Service, Dartmouth, N.S.
- Lock, A.R. 1988. Recent increases in the breeding population of ring-billed Gulls *Larus delawarensis*, in Atlantic Canada. *Canadian Field-Naturalist* 102: 627-633.
- Lock, A.R., Boates, S., Cohrs, S., D'Eon, T. C., Johnson, B. and LaPorte, P. 1993. Canadian Roseate Tern recovery plan. Recovery of Nationally Endangered Wildlife Report No. 4. Canadian Wildlife Federation, Ottawa.
- Mawhinney, K., Diamond, T., Kehoe, P. and Benjamin, N. 1999. Status and productivity of Common Eiders in relation to the status of Great Black-backed Gulls and Herring Gulls in the southern Bay of Fundy and northern Gulf of Maine. *Waterbirds* 22: 253-262.
- Milko, R., L. Dickson, R. Elliot, and G. Donaldson. 2003. Wings Over Water: Canada's Waterbird Conservation Plan. Canadian Wildlife Service, Environment Canada. Ottawa, Ontario. 28 pp.
- Nisbet, I.C.T. 1981. Biological characteristics of the roseate tern *Sterna dougallii*. Unpublished report prepared for the U. S. Fish and Wildlife Service; Newton Corner, Massachusetts.
- Nisbet, I.C.T. 2000. Disturbance, habituation, and management of waterbird colonies. *Waterbirds* 23: 312-332.
- Nisbet, I.C.T., J.S. Hatfield, W.A. Link, and J.A. Spendelow. 1999. Predicting chick survival and productivity of Roseate Terns from data on early growth. *Waterbirds* 22: 90-97.
- Nisbet, I.C.T. and J.A. Spendelow. 1999. Contribution of research to management and recovery of the Roseate Tern: review of a twelve-year project. *Waterbirds* 22: 239-252.
- Nisbet, I.C.T. and M.J. Welton. 1984. Seasonal variations in breeding success of Common Terns: consequences of predation. *Condor* 86: 53-60.
- Olsen, K.M. and H. Larsson. 1995. Terns of Europe and North America. Princeton Univ. Press, Princeton, N.J.
- Paquet, J., T. Gibson, and S.L. Seward. 1999. Non-lethal predator control as a method for restoring tern colonies and other research conducted on Country Island: Country Island Tern Restoration Project final report. Unpublished report, Canadian Wildlife Service, Sackville, N.B.
- Rodgers, J.A. and H.T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. *Conservation Biology* 9: 89-99.
- Smith, T.E., M.L. Leonard, M. Jensen, and A.W. Boyne 2000. Restoration of Roseate Terns (*Sterna dougallii*) to Country Island, Nova Scotia. Unpublished report to the Endangered Species Recovery Fund, World Wildlife Fund Canada.
- Spendelow, J.A. 1982. An analysis of temporal variation in and the effects of habitat modification on the reproductive success of Roseate Terns. *Colonial Waterbirds* 5: 19-31.
- Spendelow, J.A. 1996. Comparisons of nesting habitat modification techniques for Roseate Terns at Falkner Island, Connecticut. Pages 18-21 in N. Ratcliffe, editor. Proceedings of the Roseate Tern Workshop, Glasgow University, Scotland, March 1995.
- Spendelow, J.A., J.D. Nichols, G.D. Cormons, J. Burger, C. Safina, J.E. Hines, M. Gochfeld, I.C.T. Nisbet, I.C.T. 1995. Estimating annual survival and movement rates of adults within a metapopulation of Roseate Terns. *Ecology* 76: 2415-2428.
- Spendelow, J.A., J.D. Nichols, J.E. Hines, J.-D. Lebreton, and R. Pradel. 2002. Modelling postfledging survival and age-specific breeding probabilities in species with delayed maturity: a case study of Roseate Terns at Falkner Island, Connecticut. Pages 385-405 in

- B. J. T. Morgan and D. L. Thomson, editors. Statistical Analysis of Data from Marked Bird Populations, *Journal of Applied Statistics* 29.
- Taylor, S., I. McLaren, and K. Dillon. 2002. Return of breeding Laughing Gulls to Atlantic Canada. *Birders Journal* 11: 58-60.
- USFWS (United States Fish and Wildlife Service). 1987. Endangered and threatened wildlife and plants; determination: two populations of the Roseate Tern and *Bonamia grandiflora* (Florida bonamia), Final Rules. *US Federal Register* 52: 211: 42064-42071.
- USFWS (United States Fish and Wildlife Service). 1998. Roseate Tern Recovery Plan - Northeastern Population, First Update. Hadley, MA.
- Whittam, R.M. 1997. The effects of predation on the breeding biology and behaviour of Roseate, Arctic and Common Terns nesting on Country Island, Nova Scotia. Unpublished M.Sc. thesis, Dalhousie University, Halifax, Nova Scotia.
- Whittam, R.M. 1999. Updated COSEWIC status report on the Roseate Tern, *Sterna dougallii*. Committee on the Status of Endangered Wildlife in Canada, Ottawa, Ont.

## APPENDIX A.

### Biological Suitability Criteria (BSC) developed by the US Roseate Tern Recovery Team for choosing colony restoration sites.

	Score		
	5	3	1
1) If known, distance from potential colony site to nearest regularly-used important foraging area	<5 km	5-15 km	>15 km
2a) Presence of known 'mainland-based' predators (Great Horned Owl, corvids, coyote, fox, mink, feral cats, rats) OR	none	at least 1 species reported	2 or more species reported
2b) Distance of potential colony site to mainland or to closest large (>50 ha) island that could serve as a source of important 'mainland-based' predators	>5 km	1-5 km	<1 km
3a) Historical or recent occurrence of predation by Black-crowned Night-Herons OR	none reported by BCNH	infrequent predation by BCNH	frequent or 'heavy' predation
3b) Distance of potential tern colony site to colony site of Black-crowned Night-Herons	>20 km	5-20 km	<5 km
4a) Historical or recent occurrence of predation by large gulls such as Great Black-backed or Herring Gulls OR	none reported by gulls	infrequent predation by gulls	frequent or 'heavy' predation
4b) Distance of potential tern colony site to colony site of Great Black-backed or Herring Gulls	>10 km	3-10 km	<3 km
5a) If known, most recent 5-yr mean productivity for peak-nesting Roseate Terns (fledglings/pair) OR	>1.2	1.0-1.2	<1.0
5b) Subjective evaluation of historical use and productivity by Roseate Terns (or Common Terns)	regular use & high productivity	infrequent use and/or unknown productivity	no use or use & low productivity
6) Island Size	>2 ha	1-2 ha	<1 ha
7) Susceptibility to flooding	low	medium	high
8) Long-term stability	high	medium	low
9) Vegetation/substrate <sup>a</sup>	appropriate	intermediate	unsuitable

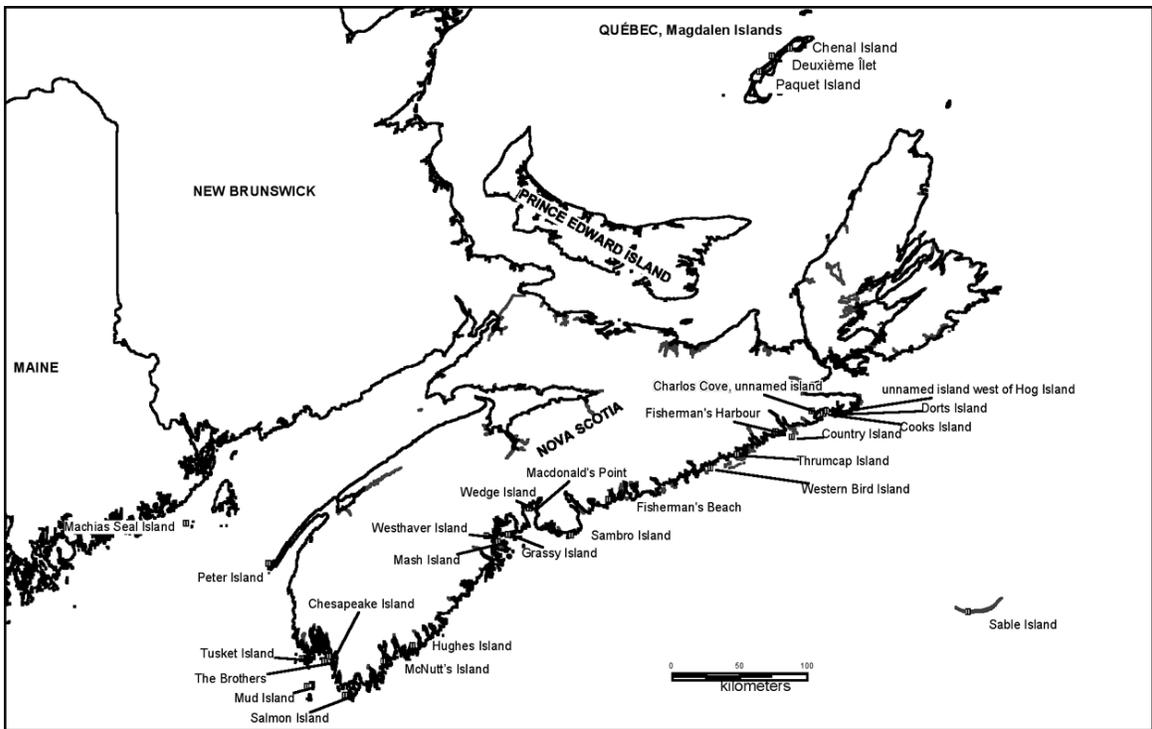
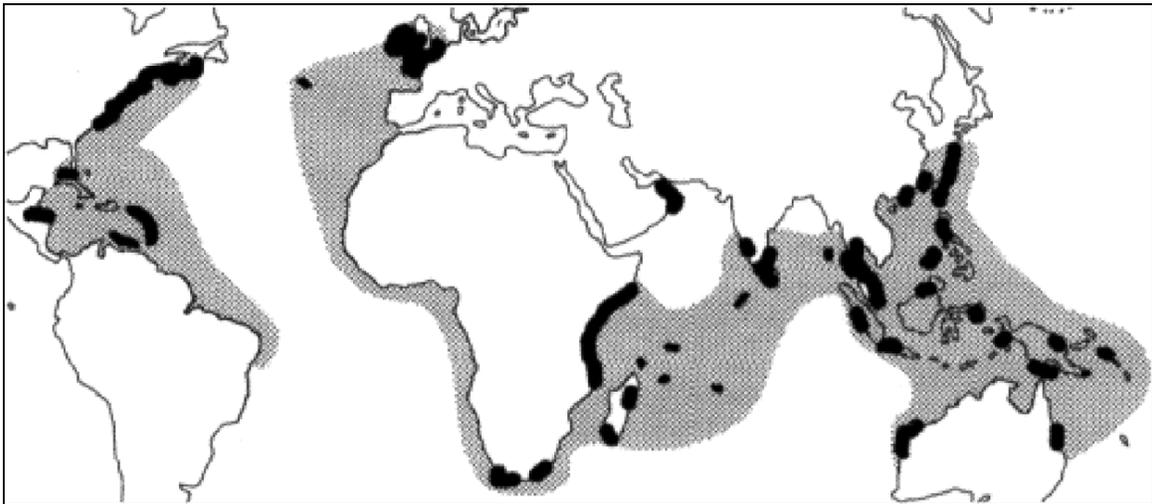
<sup>a</sup> Vegetation/substrate suitability to be based on professional judgment:  
 appropriate = mix of semi-open substrate with patches of cover  
 intermediate = vegetation somewhat too dense for Common Terns: no trees  
 unsuitable = too open for Roseate Terns or too dense for Common Terns

## Logistic Practicality Criteria (LPC) developed by the US Roseate Tern Recovery Team for choosing colony restoration sites.

	Score		
	2	1	0
1) Ownership/Management Commitment (Supportive attitude of current owner towards tern management)	Government wildlife agency or conservation organization	Other government agency	Privately owned or managed
2) Ease of rescue/evacuation	<5 km to marina	5-10 km to marina	>10 km to marina
3) Usable buildings/facilities for overnight stays for wardens	Existing buildings can be used by wardens	Camping possible	Day visits only due to no area for camping
4) Accessibility for boat landing	Harbor/dock	Sheltered landing	No sheltered landing
5) Number of gulls to be removed	<50 pairs	50-500 pairs	>500 pairs
6) Size of area to be managed	<5 ha	5-15 ha	>15 ha
7) Public visit/disturbance potential	Low	Medium	High
8) Other potential concerns such as compatibility of management for terns with existing island use/activities?	None	Minor concerns	Major concerns
9) Public education potential	High	Medium	Low

## APPENDIX B.

Global range of Roseate Tern (black = breeding, grey = non-breeding; from Olsen and Larsson 1995) and sites where the species is known to have bred in Canada since 1982 (from Leonard et al. 2004).



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