

**RECOVERY STRATEGY AND ACTION PLAN  
FOR**

**THE MARITIME RINGLET  
(*COENONYMPHA NIPISQUIT*)**

**IN  
NEW BRUNSWICK**

**2005**



(Disponible en français)

New  Nouveau  
**Brunswick**  
C A N A D A

**NATURAL RESOURCES**

## Context

The Maritime ringlet butterfly has been listed as Endangered under the New Brunswick Endangered Species Act since 1996. In 1997, the Committee on the Status of Wildlife in Canada (COSEWIC) assessed this species as Endangered, and with the coming into force of the Federal Species at Risk Act in 2002, the Maritime Ringlet received federal Endangered status. In 2002, the New Brunswick Minister of Natural Resources appointed a recovery team comprised of scientific experts, government biologists, stakeholders, and municipalities to develop a recovery plan to address the steps necessary to protect and maintain the species in New Brunswick. In 2005, the recovery team completed its mandate by submitting this recovery strategy and action plan to the Director of the Fish and Wildlife Branch, New Brunswick Department of Natural Resources.

### Recovery Strategy and Action Plan Acceptance

The Recovery Strategy and Action Plan for the Maritime Ringlet (*Coenonympha nipisiquit*) in New Brunswick has been accepted as the best current advice on the measures needed to recover the Maritime Ringlet Butterfly in New Brunswick.



Mr. Mike Sullivan  
Director, Fish and Wildlife Branch  
Department of Natural Resources  
Government of New Brunswick

Date: February 15, 2006

## **Disclaimer**

The Recovery Strategy and Action Plan for the Maritime Ringlet was prepared by members of the New Brunswick Maritime Ringlet Recovery Team. It defines the recovery goals, approaches, objectives, and action plan that are deemed necessary to protect and recover the species. It does not necessarily represent the views of all individual members of the recovery team, or the official positions of the organizations with which the individual team members are associated. 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. Implementation of the plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

**RECOVERY STRATEGY AND ACTION PLAN FOR  
THE MARITIME RINGLET (*COENONYMPHA NIPISQUIT*)  
IN NEW BRUNSWICK**



**Submitted to the Director of Fish and Wildlife Branch,  
New Brunswick Department of Natural Resources**

*May 20, 2005*

*By the New Brunswick Maritime Ringlet Recovery Team*

(Disponible en français)

**Citation:** New Brunswick Maritime Ringlet Recovery Team. 2005. Recovery Strategy and Action Plan for the Maritime Ringlet (*Coenonympha nipisiquit*) in New Brunswick. New Brunswick Department of Natural Resources. Fredericton, New Brunswick.

**Team Members:**

Mona Boudreau, Ville de Beresford  
Paul Chamberland, Environment Canada  
Kevin Connor, New Brunswick Department of Natural Resources  
Marcel David, Village de Bas-Caraquet  
Gilles Godin (chair), New Brunswick Department of Natural Resources  
Gabriel LeBreton, Village Historique Acadien  
Keith Loupelle, City of Bathurst  
Dr. Dan Quiring, Entomologist, University of New Brunswick  
Dwayne Sabine, New Brunswick Department of Natural Resources  
Dr. Reginald Webster, Entomologist

**Disclaimer:**

This Recovery Strategy and Action Plan was prepared for the New Brunswick Department of Natural Resources as advice on a comprehensive approach to the conservation of the Maritime ringlet butterfly. It is recognized that implementation of the recommendations will depend on availability of resources and expertise.

**Acknowledgements:**

We wish to thank the many people who have contributed to the knowledge and conservation of the Maritime ringlet over the years, as well as the agencies who have funded and supported their work. Production of this strategy would have been impossible without their enormous contributions. We hope that the ideas presented in this document will help build upon that legacy.

**Message from the Chair:**

Many thanks to all members for their comments and participation. A special thank you to Dwayne Sabine who had the task of taking notes during the meetings and who wrote most of this document.



**TABLE OF CONTENTS**

**Executive summary**.....3

**Part I: Recovery strategy** .....5

1.0 Species status .....5

1.1 Species description.....5

1.2 Recovery feasibility .....5

1.3 Goal and objectives.....6

    1.3.1 Goal .....6

        1.3.1.1 Rationale for goal.....6

    1.3.2 Objectives .....6

        1.3.2.1 Monitoring and assessment.....6

        1.3.2.2 Stewardship and education .....7

        1.3.2.3 Protection .....8

        1.3.2.4 Research.....9

**Part II: Action plan**.....10

2.0 Recovery activities.....10

2.1 Ecological And socio-economic considerations .....13

2.2 Accomplishments to date.....16

**Part III: Background information** .....17

3.0 Introduction.....17

3.1 Distribution and abundance .....17

    3.1.1 Current distribution.....17

    3.1.2 Former (historic) distribution.....17

    3.1.3 Current abundance .....19

    3.1.4 Former (historic) abundance .....19

3.2 Habitat requirements .....20

    3.2.1 Habitat description.....20

    3.2.2 Current (occupied) habitat .....22

    3.2.3 Former (historic) habitat .....23

    3.2.4 Habitat availability.....23

3.3 Ecology .....25

    3.3.1 Life cycle .....25

    3.3.2 Movement patterns.....27

    3.3.3 Survival .....27

4.0 Threats and other barriers to recovery .....27

4.1 Natural factors .....27

    4.1.1 Limited distribution .....27

    4.1.2. Habitat fragmentation .....28

## ***New Brunswick Maritime Ringlet Recovery Strategy***

---

4.1.3. Ice scouring .....	29
4.2 Human-caused factors .....	29
4.2.1 Marsh infilling .....	29
4.2.2 Pollution: residential pesticides .....	30
4.2.3 Pollution: residential sewage .....	30
4.2.4 Pollution: industrial effluent .....	31
4.2.5 Oil spills .....	31
4.2.6 Specimen collection .....	32
4.2.7 Insect control programs .....	32
4.2.8 Recreational vehicles .....	32
4.2.9 Tourism projects .....	32

<b>5.0 Literature Cited .....</b>	<b>34</b>
-----------------------------------	-----------

### **Appendices**

Appendix I: New Brunswick sites where searches have been conducted for Maritime ringlet butterflies .....	36
Appendix II: Profiles of Maritime ringlet sites in New Brunswick .....	37

### **List of Figures**

Figure 1. Location of Maritime ringlet, <i>Coenonympha nipisiquit</i> , populations. ....	18
Figure 2. Salt marsh at Peters River, New Brunswick, 26 August 2004. ....	20
Figure 3. Sea-lavender ( <i>Limonium nashii</i> ) in bloom. ....	21
Figure 4. Previously dyked (red) and undyked (green) salt marshes in New Brunswick. ....	24
Figure 5. Maritime ringlet: a) adult, b) egg, c) larva, and d) pupa .....	26

### **List of Tables**

Table 1. Action Plan for recovery of the Maritime ringlet in New Brunswick. ....	11
Table 2. Costs and benefits of proposed recovery actions for Maritime ringlets in New Brunswick. ....	14
Table 3. Population estimates at Maritime ringlet sites in New Brunswick. ....	19
Table 4. Area of potential habitat (salt marsh vegetation) present at Maritime ringlet sites in New Brunswick. ....	22
Table 5. Area and number of salt marshes in coastal New Brunswick. ....	25
Table 6. Listing of the factors known or thought to represent a threat to Maritime ringlet populations or habitat in New Brunswick. ....	33



### EXECUTIVE SUMMARY

The Maritime ringlet (*Coenonympha nipisiquit* McDunnough, 1939) is one of only two butterfly species in Canada that is entirely limited to salt marsh habitats. This species was first discovered and described from salt marshes near Bathurst, New Brunswick by J. McDunnough in 1939. Since its' discovery, the Maritime ringlet has been found to have a very restricted distribution. It is known from only 10 salt marshes along Chaleur Bay in northern New Brunswick and along the southern coast of the Gaspé Peninsula in Québec. The six salt marshes where the Maritime ringlet is found in NB have a combined area of only 350 ha, and the total population in the province is conservatively estimated at 15,000.

The Maritime ringlet was listed as *Endangered* under the New Brunswick Endangered Species Act in 1996, and as *Endangered* by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 1997. The primary factor resulting in the listing of the Maritime ringlet as Endangered was its very limited geographic distribution. This factor, together with the low number of sites and somewhat restricted and fragmented habitat, are the basis for recovery planning for the species in New Brunswick.

There is no historic evidence that the species was ever widespread in the region, and it is not known to have disappeared from any sites. Thus, preservation of the few sites where Maritime ringlets currently occur is crucial in maintaining their existence, rather than “recovery” in the sense of bringing the population or distribution of the species back to some historic level. The goal of this strategy is to ensure the persistence of the Maritime ringlet at all existing sites in New Brunswick. To achieve this goal, the current status of the Maritime ringlet must be determined and all threats to known sites should be removed or mitigated. Specific objectives of the plan can be organized into the following categories:

1. Monitoring and Assessment
2. Stewardship and Education
3. Protection
4. Research

A thorough assessment of the current distribution and abundance of the Maritime ringlet in NB is an essential starting point for recovery efforts. Ongoing monitoring of population status will allow the success of recovery actions to be evaluated. Most Maritime ringlet populations occur on privately-owned lands, so education and stewardship activities will be a crucial component of recovery efforts. A number of legislative tools are available to protect the species and its habitat if needed. Scientific research to address knowledge gaps will help guide future recovery efforts.

Potential socioeconomic impacts of proposed recovery actions appear to be minimal. Mitigation of threats to Maritime ringlet populations should have minor impacts to land owners, as the nature of the salt marsh habitat itself limits the type and amount of development possible, and there are a number of existing regulatory mechanisms that limit development on these lands.

A great deal of work has been conducted on the Maritime ringlet in recent years. Previous efforts have provided much knowledge on the distribution and ecology of the species, while

## ***New Brunswick Maritime Ringlet Recovery Strategy***

---

current efforts center largely on ongoing monitoring programs and on stewardship activities. This body of knowledge was invaluable in preparing the recovery strategy, and it provides an excellent base upon which to build our future recovery efforts.

## **PART I: RECOVERY STRATEGY**

### **1.0 SPECIES STATUS**

- 1. Scientific Name:** *Coenonympha nipisiquit* McDunnough, 1939
- 2. Common Name:** Maritime ringlet
- 3. Current New Brunswick Status & Year of Designation:** Endangered (1996)
- 4. Current COSEWIC Status & Year of Designation:** Endangered (1997, last reviewed in 2000)
- 5. Status in the United States:** N/A
- 6. Global range:** Eastern Canada
- 7. Range in Canada:** Chaleur Bay: northern New Brunswick and the Gaspé peninsula of Québec
- 8. Rationale for COSEWIC Status:** “This butterfly has an extremely restricted range and a relatively low population size. It is threatened by loss and degradation of habitat.”

### **1.1 SPECIES DESCRIPTION**

The Maritime ringlet is a small orange-coloured butterfly that is one of only two butterflies in Canada that is entirely limited to salt marsh habitats. This species was first discovered and described by J. McDunnough in 1939, from salt marshes near Bathurst, New Brunswick (McDunnough 1939). A member of the family Nymphalidae, or Brush-footed Butterflies, the Maritime ringlet flies in late July and August.

The Maritime ringlet has a very restricted global distribution, and since its discovery it has been found at only a few additional sites. These are all within a relatively small area near Chaleur Bay in northern New Brunswick and along the southern coast of the Gaspé Peninsula in Québec.

Because the Maritime ringlet was discovered so recently, it is difficult to determine the historic distribution and abundance of the species in New Brunswick. The Maritime ringlet is currently known from six sites in the province. Four of these sites are located at Nepisiguit Bay, in or near Bathurst Harbour, within only a 10 km radius: Peters River (Beresford), Daly Point, Carron Point, and Bass River. The two remaining known sites in New Brunswick are introduced populations at Bas Caraquet and Rivière du Nord, approximately 45 km northeast of Bathurst Harbour. The total area of salt marsh habitat occupied by the species is approximately 350 ha. The population size of Maritime ringlet in New Brunswick has been conservatively estimated at 15,000 adults.

The primary factor resulting in the listing of the Maritime ringlet as Endangered was its very limited geographic distribution. This factor, together with the low number of sites and somewhat restricted and fragmented habitat, are the basis for recovery planning for the species in New Brunswick.

### **1.2 RECOVERY FEASIBILITY**

Maintenance of the existing distribution and population of Maritime ringlets, with the aim of minimizing the risk of extirpation of local populations, is certainly a feasible goal. The habitat of

## ***New Brunswick Maritime Ringlet Recovery Strategy***

---

the species is largely intact and undeveloped, and the threats discussed in the Background section all appear to be possible to address. This strategy recommends maintaining the existing populations through site management and protection, and through stewardship and education.

Given the complete lack of historic data for the Maritime ringlet, ‘recovery’ in the sense of returning population distribution or abundance to previous levels through a ‘reintroduction’ program is not feasible given that historic target levels would be impossible to formulate. Increasing distribution and population size in the absence of knowledge of historic levels may be feasible. However, this could have potential ecological and/or socio-economic impacts and would require prior study.

### **1.3 GOAL AND OBJECTIVES**

**1.3.1 Goal:** *To ensure the persistence of the Maritime ringlet at all existing sites in New Brunswick.*

#### **1.3.1.1 Rationale for goal**

The primary factor resulting in the listing of the Maritime ringlet as *Endangered* was its very limited geographic distribution. Preservation of the few sites where Maritime ringlets currently occur is crucial in maintaining their existence here, and is the focus of this strategy. As discussed above, reintroduction is not a possible goal due to lack of historic data. Wide-scale introductions in the absence of this data, to increase distribution and abundance, require further study but might be an appropriate future goal.

#### **1.3.2 Objectives**

To achieve the recovery goal of ensuring the persistence of the Maritime ringlet at all existing sites in the province, the current status of the Maritime ringlet must be determined and all threats to known sites should be removed or mitigated. Please refer to the Background section (page 17) for additional detail on presumed threats to the Maritime ringlet.

Specific objectives of the plan can be organized into the following categories:

##### ***1.3.2.1 Monitoring and Assessment***

A comprehensive assessment of the current distribution and abundance of the Maritime ringlet in New Brunswick is an essential starting point for recovery efforts. While there have been several surveys for Maritime ringlets in northern NB in the past, it is now difficult to determine which salt marshes were surveyed unsuccessfully or not surveyed at all. Furthermore, the appearance of the species at Bass River within the past decade despite surveys indicating its absence there in 1970 indicates that there is potential for Maritime ringlets to have occupied additional sites since earlier surveys. A complete survey of potential habitat in northern New Brunswick is required for a conclusive assessment of the species’ distribution in the province.

## ***New Brunswick Maritime Ringlet Recovery Strategy***

---

Population status at the known sites has been monitored since the mid-1990s: these efforts should continue so that the success of future recovery actions can be evaluated.

A number of factors have been proposed as potential threats to the continued existence of the Maritime ringlet. Data collection programs should be developed to assess the impact of these factors and assist in the design of appropriate mitigation measures.

### 1. Monitoring objectives:

1.1 Conduct a comprehensive survey for Maritime ringlets in all potential habitat in northern New Brunswick.

1.2 Monitor population abundance at existing Maritime ringlet sites on an ongoing basis.

1.3 Initiate discussion with departments or agencies involved in mosquito control programs (particularly in relation to West Nile Virus concerns) in northern New Brunswick to determine control methodology and protocols.

1.4 Assess potential risks of mosquito control methods to the various life history stages of Maritime ringlets.

1.5 Gather data on presence of residential pesticides and of wetting agents arising from residential and industrial effluent in the salt marshes where Maritime ringlets occur.

1.6 Assess the potential impact of residential pesticides and of wetting agents arising from residential and industrial effluent on the various life stages of the Maritime ringlet.

### ***1.3.2.2 Stewardship and Education***

The cooperation of landowners will be crucial to successful management of the Maritime ringlet in New Brunswick. Respect for the values and needs of landowners when devising means to eliminate threats to the existence of the species will be key to the implementation and acceptance of recovery actions. Informing landowners of the presence of the Maritime ringlet on their properties, and of the ramifications of that presence, is an important first step. Subsequent steps could include targeted education programs, whereby landowners could be informed of land management practices beneficial to the Maritime ringlet, and be informed of potential conservations options (such as conservation easements, land donations to conservation groups, etc). A broader-scale stewardship approach, aimed at educating the general public, will aid in fostering sound land use practices in the area and will hopefully serve to generate support for recovery activities.

### 2. Stewardship and education objectives:

2.1 Ensure that landowners at Maritime ringlet sites are made aware of the presence of the species on their property, and are provided access to information on the species and on related management or recovery issues.

2.2 Ensure landowners are aware of any opportunities for participation in conservation programs.

2.3 Establish and/or support education programs to promote land use practices beneficial to the Maritime ringlet.

2.4 Encourage participation and partnerships among community and conservation organizations so that long-term stewardship programs might be established and sustained.

2.5 Establish and/or support education measures to raise awareness regarding species at risk.

### ***1.3.2.3 Protection***

The Maritime ringlet is protected under Regulation 96-26 of the New Brunswick Endangered Species Act. This legislation protects individual butterflies, their residence, and the habitat that is critical to survival of any individual of the population. Thus, no individual or organization may possess, sell, harm or attempt to harm any individual butterfly or harm or attempt to harm its habitat. Exceptions for research or education require a permit, which may be issued by the Minister of the New Brunswick Department of Natural Resources.

Watercourse and Wetland Alteration Regulations (Clean Water Act) and planning requirements (e.g. Environmental Impact Assessment Regulations, Clean Environment Act) offer additional protection to the habitat of the Maritime ringlet. It is important that the regulatory agencies have access to current information and that they identify how habitat protection will be implemented in a consistent and fair way.

All existing sites may be regarded as important to the long-term survival of the Maritime ringlet in New Brunswick. Activities at these sites should be limited to those activities required for monitoring or for targeted education.

### **3. Protection objectives:**

3.1 Develop protection policy that includes the Department of Natural Resources, the Department of Environment and Local Government and other regulatory agencies, such as the Rural Planning Commissions, in order to promote consistent implementation of regulations across project screening.

3.2 Ensure appropriate level of staff training within regulatory agencies.

3.3 Establish/support education measures to raise awareness of existing protection through the Endangered Species Act, Clean Water Act, Water Course and Wetland Alteration Regulation or other measures.

***1.3.2.4 Research***

Research on the Maritime ringlet in New Brunswick should be based on identified gaps in knowledge that are directly related to management issues. Questions should be such that the answers are likely to be clear and are equally likely to have an impact on management decisions. Much research has already been conducted to determine the basic life history of the Maritime ringlet. Major questions remaining that might influence recovery efforts involve the limited distribution of the species, specifically the implications of this limited distribution for the survival of the species, and the implications of potential measures to increase the distribution (for this species and for other species occupying potential introduction sites).

4. Knowledge gaps and potential research questions:

4.1 Population viability and probability of species persistence, assuming that the known distribution represents the total distribution of the species.

4.2 Potential ecological and socioeconomic impacts of mitigation of the species' limited distribution through large-scale introductions to new sites.

**PART II: ACTION PLAN**

**2.0 RECOVERY ACTIVITIES**

The specific actions required to attain the goal and objectives of the recovery strategy are outlined below in Table 1: objectives outlined in the recovery strategy are prioritized. Given that this is an endangered species, it might be argued that all actions are of a high priority. However, we have attempted to provide a relative rank or priority that reflects degree of threat or the immediacy of a need for information. Time frames for commencement of actions are also recommended: ‘ongoing’ are actions currently underway; immediate = 6 months to 1 year; short term = 1 to 3 years; and long term = 3 to 10 years. The potential roles of government, stakeholders and/or other partners are identified. It should be noted that this document does not assign roles, but rather suggests or recommends where primary leadership for a given step might be expected. There is no attempt to commit stakeholders or individuals to specific actions.

Measures of success are listed for each action. These are general guides to how success might be assessed, and may assist in any future proposals to further refine and conduct these activities. Probability of success is also indicated: this is a relative index of the difficulty of conducting the activity.



## *New Brunswick Maritime Ringlet Recovery Strategy*

Table 1. Action Plan for recovery of the Maritime ringlet in New Brunswick.

<b>Activity</b>	<b>Priority</b>	<b>Time Frame</b>	<b>Potential lead and partners</b>	<b>Measure of Success</b>	<b>Probability of Success</b>
<b>1.0 Monitoring &amp; Assessment</b>					
1.1 Comprehensive survey of potential habitat	High	Immediate	DNR, stakeholders and advisors	Proportion of potential sites surveyed	High
1.2 Monitoring of abundance at existing sites	High	Ongoing	DNR, stakeholders and advisors	Consistency; timely completion; quality of data	High
1.3 Investigate mosquito control program protocols	High	Immediate	DNR and other regulatory agencies	Confirmation of current or planned control actions	High
1.4 Assess risks of mosquito control to Maritime ringlets	High	Immediate	DNR and advisors	Knowledge of likelihood of population effects	unknown
1.5 Assess presence of pesticides and wetting agents at ringlet sites	Medium	Short-term	DNR and stakeholders	Confirmation of presence/absence of potentially hazardous substances	High
1.6 Assess impact of pesticides and wetting agents to Maritime ringlets	Medium	Short-term	DNR and advisors	Knowledge of likelihood of population effects	unknown
<b>2.0 Stewardship and Education</b>					
2.1 Landowner awareness	Medium	Immediate; Undertaken at Beresford 2002-2005	Stakeholders, DNR, EC	Proportion of landowners contacted	High
2.2 Conservation opportunities	Medium	Immediate; Undertaken at Beresford 2002-2005	Stakeholders, NGOs, DNR, EC	Proportion of landowners contacted	High
2.3 Education: land use & Maritime ringlets	Medium	Immediate; Undertaken at Beresford 2002-2005	Stakeholders, DNR, EC	Proportion of target audience contacted	High
2.4 Partnerships & long-term stewardship programs	Medium	Long-term	Stakeholders, NGOs, DNR, EC	Long-term existence of programs	High
2.5 Education: general Species at Risk issues	Medium	Ongoing	DNR, EC, NGOs	Proportion of target audience contacted	Medium

## ***New Brunswick Maritime Ringlet Recovery Strategy***

Table 1. Action Plan for recovery of the Maritime ringlet in New Brunswick (continued).

<b>Activity</b>	<b>Priority</b>	<b>Time Frame</b>	<b>Potential lead and partners</b>	<b>Measure of Success</b>	<b>Probability of Success</b>
<b>3.0 Protection</b>					
3.1 Protection policies	Medium	Short-term	DNR and other regulatory agencies	Establishment and acceptance of policies.	Medium
3.2 Staff training within regulatory agencies	Medium	Short-term	DNR and other regulatory agencies	Proportion of relevant staff attending sessions	High
3.3 Measures to raise awareness of existing laws and regulations	Medium	Immediate	DNR and stakeholders	Lack of violations	Medium
<b>4.0 Research</b>					
4.1 Population viability analysis	Medium	Ongoing	Scientific expertise	Ability to quantify model parameters	Medium
4.2 Assessment of ecological and socioeconomic impacts of introductions	Low	Future; long-term	DNR, advisors and stakeholders		Medium

## **2.1 ECOLOGICAL AND SOCIO-ECONOMIC CONSIDERATIONS**

The obvious benefits and costs of the tasks identified for each objective are presented in Table 2. This analysis is not intended as an in-depth cost/benefit study, but rather as an outline of the estimates of the relative costs in time and other resources that may be anticipated in completing the recommended measures. Potential socioeconomic and ecological impacts of activities are also highlighted where applicable. The potential gains - the benefits of the activities to the species and to the recovery effort, are also identified.

Direct costs of conducting activities are difficult to quantify with accuracy. Relative descriptions of expected costs are provided: 'low' indicates a cost expected to be 1 month or less in time and/or less than \$2000; moderate = 1 to 3 months and/or \$2000-\$6000; and high =  $\geq$  3 months and/or \$6000. Frequency/duration of direct costs are also estimated (e.g. one-time vs annual, or occurring over several years, etc.)

Potential socioeconomic impacts appear minor. Overall, mitigation of threats to Maritime ringlet populations should have minor impacts to land owners, as the nature of the salt marsh habitat itself limits the type and amount of development possible, and there are a number of existing regulatory mechanisms that limit development on these lands.

There are no apparent ecological costs inherent in proposed recovery actions, but rather a likelihood that other species will instead benefit.

## ***New Brunswick Maritime Ringlet Recovery Strategy***

Table 2. Costs and benefits of proposed recovery actions for Maritime ringlets in New Brunswick.

<b>Activity</b>	<b>Potential Gain</b>	<b>Direct cost</b>	<b>Potential Socioeconomic Impact</b>	<b>Potential Ecological Impact</b>
<b>1.0 Monitoring &amp; Assessment</b>				
1.1 Comprehensive survey of potential habitat	Detection of previously unknown sites	Moderate; once	Potential negative impact on land owner activities at new sites	-
1.2 Monitoring of abundance at existing sites	Essential data: measure of success of recovery strategy	Moderate; annual	-	-
1.3 Investigate mosquito control program protocols	Clarification of existence of potential threat	Low; once	-	May benefit other rare invertebrates
1.4 Assess risks of mosquito control to Maritime ringlets	Identification of impact and extent of threat	Low; once	-	May benefit other rare invertebrates
1.5 Assess presence of pesticides and wetting agents at ringlet sites	Clarification of existence of potential threat	Moderate; once	-	May benefit other rare invertebrates
1.6 Assess impact of pesticides and wetting agents to Maritime ringlets	Identification of impact and extent of threat	Low – moderate; once	Potential cost to improve waste treatment practices if threat exists	May benefit other rare invertebrates
<b>2.0 Stewardship and Education</b>				
2.1 Landowner awareness	Stewardship potential	High; several years	-	-
2.2 Conservation opportunities	Stewardship potential	Moderate, several years	-	May benefit other salt marsh species
2.3 Education: land use & Maritime ringlets	Habitat protection; threat mitigation	Moderate, several years	-	May benefit other salt marsh species
2.4 Partnerships & long-term stewardship programs	Habitat protection; threat mitigation	Moderate, several years	-	May benefit other salt marsh species
2.5 Education: general Species at Risk issues	Public support for recovery and stewardship initiatives	Low; ongoing	-	May benefit other species at risk

## *New Brunswick Maritime Ringlet Recovery Strategy*

Table 2. Costs and benefits of proposed recovery actions for Maritime ringlets in New Brunswick (continued).

<b>Activity</b>	<b>Potential Gain</b>	<b>Direct cost</b>	<b>Potential Socioeconomic Impact</b>	<b>Potential Ecological Impact</b>
<b>3.0 Protection</b>				
3.1 Enforcement policies	Habitat protection; threat mitigation	Low; several years	-	May benefit other species at risk
3.2 Staff training within regulatory agencies	Habitat protection; threat mitigation	Moderate; several years	-	May benefit other species at risk
3.3 Measures to raise awareness of existing laws and regulations	Reduction in conflicts between land use and regulations	Moderate; several years	-	May benefit other species at risk
<b>4.0 Research</b>				
4.1 Population viability analysis	Assessment of probability of long-term success of recovery strategy	High; several years	-	-
4.2 Assessment of ecological and socioeconomic impacts of introductions	Assistance in determining future recovery goals	High; long-term	-	May provide insights of value to other recovery strategies

### **2.2 ACCOMPLISHMENTS TO DATE**

A great deal of work has been conducted on the Maritime ringlet in recent years, which were invaluable in preparing this recovery strategy and which will provide an excellent base to build upon for future recovery efforts. Previous efforts have provided much knowledge on the distribution and ecology of the species, while current efforts center largely on ongoing monitoring programs and on stewardship activities.

1. The extensive research on components of Maritime ringlet ecology (life history, population parameters, vegetation classification, etc) conducted by R. Webster between 1993 and 2002 has been relied upon heavily in this plan.
2. A 1991 stewardship agreement between the previous owner of Daly Point and part of Point Carron (Noranda Mining and Exploration Inc.) and the NB Department of Natural Resources protected Maritime ringlet habitat at those sites and resulted in construction of a boardwalk system and interpretation center that has educated the public on issues surrounding the species.
3. Past surveys of salt marshes in northern NB by D. Christie and A. Thomas contributed much of our knowledge on the distribution of the Maritime ringlet in NB.
4. Genetics work by J. Loo and R. Webster (unpublished) clarified the distinction between the Maritime ringlet and closely-related inornate ringlet.
5. Makiri Sei (University of Massachusetts) has undertaken research on a number of components of Maritime ringlet ecology at Daly Point (larval survivorship by microhabitat type, adult movements and habitat use, predator communities, larval submergence mortality, adult female oviposition behaviour and fecundity), with the eventual goal of development of a spatially explicit population model.
6. The town of Beresford, with funding from the federal Habitat Stewardship Program and support from DNR, has undertaken a stewardship program at the Peters River marsh that is scheduled to finish in March 2005.
7. Surveys of the relative abundance of Maritime ringlets have been undertaken annually at Daly Point, Peters River, Bas Caraquet, and Rivière du Nord populations (R. Webster, NB Wildlife Trust Fund and DNR).

## **PART III: BACKGROUND INFORMATION**

### **3.0 INTRODUCTION**

The Maritime ringlet (*Coenonympha nipisiquit* McDunnough, 1939) is one of only two butterflies in Canada that is entirely limited to salt marsh habitats. This species was first discovered and described by J. McDunnough in 1939, from salt marshes near Bathurst, New Brunswick (McDunnough 1939). The Maritime ringlet has a very restricted global distribution, and since its discovery it has been found at only a few additional sites. These are all within a relatively small area near Chaleur Bay in northern New Brunswick and along the southern coast of the Gaspé Peninsula in Québec.

The Maritime ringlet is listed as *Endangered* by the Endangered Species Act of New Brunswick (listed 1996). It is also listed as *Endangered* by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (listed 1997, re-examined and confirmed *Endangered* in 2000). The species has no legal status in Québec.

### **3.1 DISTRIBUTION AND ABUNDANCE**

#### **3.1.1 Current distribution**

Globally, the Maritime ringlet is restricted to the Chaleur Bay area of New Brunswick and Québec (Figure 1). In Québec it is known from four sites: Miguasha, St-Omer, St-Siméon-de-Bonaventure and Forillon National Park. In New Brunswick the Maritime ringlet is known from six sites. Four of these are located at Nepisiguit Bay, in or near Bathurst Harbour: Peters River (Beresford), Daly Point, Carron Point, and Bass River. The two remaining known sites in New Brunswick are introduced populations at Bas-Caraquet and Rivière du Nord (Historical Acadian Village).

Although the New Brunswick and Québec populations are relatively widely separated (by 70-160km), within each province the known sites are clustered (Figure 1). Three of the Québec sites are within 13km of each other, although the population at Parc Forillon is located 160km to the northeast of those sites. The New Brunswick sites (excluding the 2 introduced populations) occur within 10km of each other. Reasons for this limited and clustered distribution pattern are unclear.

#### **3.1.2 Former (historic) distribution**

There is very little information available on the past distribution of the Maritime ringlet in New Brunswick. This creates obvious difficulties in assessing any distribution changes that may have occurred. The surveys of northeastern New Brunswick in 1939, during which the species was initially described, reported it only from “the salt marshes a few miles north of Bathurst” (McDunnough 1939). This was almost certainly the Peters River site. Subsequent surveys of salt marshes in northern and eastern New Brunswick (Christie 1970, Thomas 1980, Webster 1994a) and parts of the Gaspé region of Québec (Thomas 1980) found the species only at salt





## ***New Brunswick Maritime Ringlet Recovery Strategy***

marshes it now occupies in New Brunswick. Recent surveys of several salt marshes in eastern New Brunswick failed to find additional populations of Maritime ringlets (Godbout 2000). However, the occurrence of this species at three sites in the Gaspé region has only recently (1986-1992) been established (Webster 1997). Furthermore, the Bass River population in New Brunswick was only recently discovered (1995). This may represent a newly-colonized population, as Maritime ringlets were not found there during two days of searches during peak flight season in 1970 (David Christie, pers. comm.). A list of all of the sites known to have been investigated for the presence of Maritime ringlet is provided in Appendix I.

### **3.1.3 Current abundance**

It is difficult to estimate the overall abundance of Maritime ringlets, as rigorous population estimates are not available for all sites. Furthermore, those sites for which population estimates are available were not surveyed in simultaneous years.

Population estimates are available for four of the six New Brunswick sites (Table 3). Based on the site estimates, the total population size of the species in New Brunswick could be conservatively estimated at 15,000 adults, although it is probably higher. As of 2002 there were no estimates available for the Québec populations, but they were all thought to be very small (Environment Canada 2002). Subsequent studies have indicated that some populations (e.g. Miguasha) may be significant (A. Gouge pers. comm.)

Table 3. Population estimates at Maritime ringlet sites in New Brunswick.

Site	Most Recent Population Estimate	Year of Estimate	Notes
Peters River	6500	1995	Estimate is for the southern 25% of the marsh complex. The total population at the site is likely considerably higher.
Daly Point	9500	1994	Population apparently declined considerably in 1996, and has partially recovered since. However, no population estimates are available since the 1994 estimate.
Point Carron	<i>hundreds?</i>	1996	Individuals counted during a 2-hour survey: 15 in 1996, ~500 in 1994.
Bass River	<i>hundreds?</i>	2002	A total of 40 individuals were counted along a 175m transect on August 15, 2002.
Rivière du Nord	<i>hundreds?</i>	2000	A total of 46 individuals were counted along a 1015m transect on July 31, 2000.
Bas Caraquet	635	1999	Estimate may be low because of poor weather conditions during surveys. Population estimate during previous year (1998): 950.

### **3.1.4 Former (historic) abundance**

Because population estimates have been undertaken only in recent years, it is impossible to determine whether the abundance of Maritime ringlets has changed from historic levels. All of

## ***New Brunswick Maritime Ringlet Recovery Strategy***

---

the sites discovered since the species was described are still in existence, so there has been no known decline through loss of entire sites.

Surveys to monitor changes in relative abundance at the New Brunswick sites (except for the Bass River site) have been undertaken since 1996 (Webster 1999, Environment Canada 2002). These surveys, as well as anecdotal evidence from repeated site visits, indicate the population at Peters River remained stable until several years ago, when it appears to have begun slowly declining. The populations at Daly Point and Point Carron declined substantially in 1996, apparently because of a severe winter storm in December 1995. These populations have gradually increased since then, but do not appear to have reached their pre-1996 levels. The populations at Bas Caraquet and Rivière du Nord have increased steadily in the relatively few years since their introductions.

### **3.2 HABITAT REQUIREMENTS**

#### **3.2.1 Habitat Description**

The habitat requirements of the Maritime ringlet are well-studied (Webster 1994b, 1995, 1996). The species is limited to salt marshes (Figure 2), aside from occasional and brief use of neighbouring habitats as described below. The most common plants in sections of marshes occupied by Maritime ringlets are Salt-meadow Grass (*Spartina patens*), Salt-water Cord Grass (*S. alternifolia*), Seaside Plantain (*Plantago maritima*), Sea-milkwort (*Glaux maritima*), Sea-lavender (*Limonium nashii*), Seaside Goldenrod (*Solidago sempervirens*), and Eged's Silverweed (*Potentilla egedii*).



Figure 2. Salt marsh at Peters River, New Brunswick, 26 August 2004.

Salt marsh plant species utilized as nectar resources by adult Maritime ringlets, in descending order of preference, are Sea-lavender, Seaside Goldenrod, Sea-milkwort, and Silverweed.

Adults have also been observed nectaring in plant species bordering the salt marsh, including Yarrow (*Achillea millefolium*) and Sow-thistle (*Sonchus* sp.). However, Sea-lavender is the primary nectar source, accounting for approximately 90% of available nectar sources during the adult flight season and for 96% of all flower visitations (Figure 3).



Figure 3. Sea-lavender (*Limonium nashii*) in bloom.

The primary host plant for larval Maritime ringlets is Salt-meadow Grass. Larvae will complete development under laboratory conditions on Red Fescue (*Festuca rubra*), another grass species found in salt marshes. However, Red Fescue is uncommon in salt marshes, females have not been observed ovipositing on it, and larvae have not been observed on it.

Adult densities show a strong positive association with abundance of Salt-meadow Grass and Sea-lavender. Prime habitat consists of Salt-meadow Grass plants between 20-30 cm in height, with a stem density of 90-95%, and with 50-100 Sea-lavender flower heads per 100m<sup>2</sup> (Webster 1997). All portions of salt marshes occupied by Maritime ringlets are subject to periodic inundation by salt water during the tide. However, the lower, wetter portions of a marsh tend to support lower densities of Salt-meadow Grass and Sea-lavender, and hence, lower densities of Maritime ringlets. This pattern holds for the upper, drier sections of salt marsh as well. Aside from the presence of the critical larval host and adult nectar plant species, it has been suggested that the diversity and/or spatial pattern of microhabitats within a salt marsh system may influence Maritime ringlet abundance and distribution (Webster 1996).

Vegetation mapping at the Peters River (Webster 1996, 2001a) and Daly Point (Webster 1995) sites has been completed. Surveys of relative abundance of adult Maritime ringlets among these vegetation types have also been conducted. These studies of adult abundance have provided the descriptions of habitat associations described above. Further studies of habitat associations of larvae, and particularly of larval survival among vegetation types, have been undertaken (Sei and Porter 2003).

## ***New Brunswick Maritime Ringlet Recovery Strategy***

---

Although Maritime ringlets are largely restricted to their salt marsh habitat, this habitat type is not isolated from the landscape surrounding it. Habitat disturbances occurring on land adjacent to the marshes may influence the marsh ecosystem. However, it is difficult to quantify the area, or buffer, around salt marshes that might be considered part of the ‘habitat’ for Maritime ringlets, as the distances at which disturbances impact the marsh ecosystem are dependent on the nature of the activities.

### **3.2.2 Current (Occupied) Habitat**

The habitat currently occupied by Maritime ringlets is mapped in Appendix II. The total area of habitat (classified as salt marsh vegetation) available to the species at the four non-introduced sites is 259.8 ha (Table 4). The largest of these sites, Peters River, comprises 60% of this total. The addition of the two introduction sites brings the total habitat currently occupied by Maritime ringlets to 348.3 ha, of which the Peters River site comprises nearly half (44.9%).

Table 4. Area of potential habitat (salt marsh vegetation) present at Maritime ringlet sites in New Brunswick.

Site	Habitat Area (ha) <sup>a</sup>	% of Total
Peters River	156.4	44.9
Daly Point	29.4	8.4
Point Carron	41.3	11.9
Bass River	32.7	9.4
Bas Caraquet	25.1	7.2
Rivière du Nord <sup>b</sup>	63.4	18.2
Total	348.3	100.0

<sup>a</sup>Includes only area of salt marsh vegetation, i.e. excludes mud flats, channels, and open water. Data from the New Brunswick Coastal features database.

<sup>b</sup>Includes only the marsh area known to be used by Maritime ringlets.

It should be understood that there are distinct vegetation (or microhabitat) units within salt marshes, and the density of Maritime ringlets differs among them (Webster 1995, 1996, 2001a). These vegetation patterns within salt marshes can be very complex, with patches of highly-utilized microhabitats and/or non-utilized areas occurring as narrow bands or patches adjacent to each other.

Moreover, disturbances that result in the release of dilutable or suspendable substances into part of a marsh system will impact the entire system as tide waters wash through the marsh. Influences in part of a salt marsh have a high potential to affect other areas of the marsh due to the periodic flooding by tides. Therefore, even though some areas or microhabitats of a salt marsh are not occupied by Maritime ringlets, to effectively manage the species it is important to consider the entire salt marsh as a single management unit.

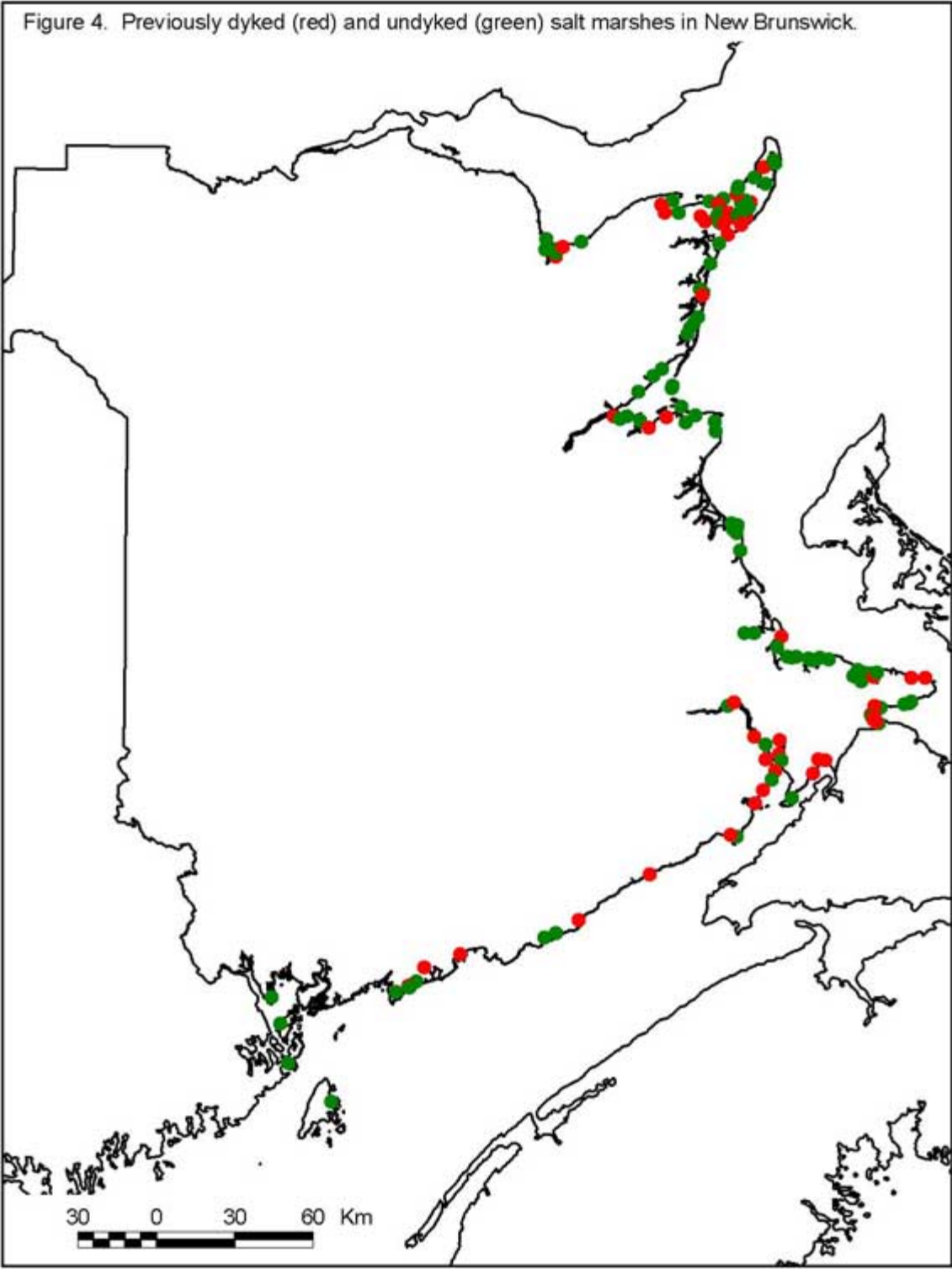
### **3.2.3 Former (Historic) Habitat**

It seems possible that the limited distribution of the Maritime ringlet is a relict of past geologic events (Webster 1997). However, because the species was discovered and described relatively recently (1939), there is no information on historic distribution, and it is impossible to state whether any habitat formerly used by the species has been lost through human intervention. Salt marshes along much of New Brunswick's coastline were dyked and converted to agricultural lands in the past (Figure 4). Many salt marshes that were not dyked were nonetheless fenced and used as pasture. These practices would have rendered a marsh unsuitable for Maritime ringlets. Several salt marshes in northeastern New Brunswick show evidence of previous conversion to agriculture, but have since reverted to salt marsh (e.g. Rivière du Nord). It is possible that there have been Maritime ringlet sites, and thus habitat, lost to these conversions.

There is only one other species of butterfly in Canada known to be limited to salt marshes: the Salt-marsh Copper (*Lycaena dospassosi*). This species uses the same primary nectar source as the Maritime ringlet (Sea-lavender). However, the Salt-marsh Copper uses a different larval host plant (Eged's Silverweed, *Potentilla egedii*, rather than Salt-meadow Grass). Unlike the Maritime ringlet, the Salt-marsh Copper is more widespread in its distribution, occurring throughout northern and eastern New Brunswick. Unless the Salt-marsh Copper has a much greater capacity for dispersal, and is better able to re-colonize the formerly-dyked salt marshes, it seems unlikely that the past loss of salt marsh habitat through agricultural use has caused the currently reduced distribution of the Maritime ringlet in New Brunswick. Recent evidence that Salt-marsh Coppers appear to be spreading southward along New Brunswick's east coast may indicate that they do possess a greater capacity for dispersal, but it is also possible that increased search effort has contributed to this apparent increase.

### **3.2.4 Habitat Availability**

There seems to be no reason why Maritime ringlets might not potentially occur throughout all coastal areas of New Brunswick. Salt marshes occur along the entire coastline, although they are less common along the lower Bay of Fundy and upper Chaleur Bay (Figure 4). It is unlikely that all of these salt marshes provide suitable habitat for Maritime ringlets, but some portions of them presumably do, as indicated by the successful introduction of this species to two new sites in northeastern New Brunswick. Both the primary adult nectar source (Sea-lavender) and the larval host plant (Salt-meadow Grass) occur in all coastal areas of the province (Hinds 2000). It is possible that the Bay of Fundy Marshes are less suitable or unsuitable for Maritime ringlets, compared to those of the eastern and northern coast of the province. There are at least three gross differences in salt marshes among these areas: the Bay of Fundy has a markedly higher tidal range, its summer water temperatures are much lower, and it does not freeze during winter as do the northern and eastern shores. Because Maritime ringlet larvae overwinter in the litter layer, this last factor (freezing) may be of crucial importance. A lack of consistent snow and ice cover in winter, and its resultant insulation against temperature extremes, may limit larval survival.



## ***New Brunswick Maritime Ringlet Recovery Strategy***

A report on the status of Salt Marsh habitat in New Brunswick identified and surveyed salt marshes larger than 8.0 ha (including non-vegetated marsh area, such as mud flats and channels) (Roberts 1993). There are 138 salt marshes of this size, containing 8192.7 ha of potential habitat (vegetated area) (Table 5). There is a relatively large area of potential habitat in the Bay of Chaleur region, although most of it is concentrated northeast in the Shippegan, Lameque Island, and Miscou Island area, which is widely separated from the known Maritime ringlet populations in Nepisiguit Bay (Figure 4).

Table 5. Area and number of salt marshes in coastal New Brunswick.

Coast	No. of Marshes	No. of Prev.-dyked Marshes	Mean Area <sup>a</sup> (ha)	SD <sup>b</sup>	Minimum Area (ha)	Maximum Area (ha)	Total Area (ha)
Bay of Chaleur	38	15	41.1	45.7	4.2	181.2	1564.0
Gulf of St. Lawrence	67	15	59.7	77.8	4.6	470.9	4000.4
Bay of Fundy	33	17	79.6	96.2	2.2	387.1	2628.3
Overall	138	47	59.3	76.4	2.2	387.1	8192.7

<sup>a</sup>Area includes only vegetated portions of salt marsh (i.e. excludes channels and mud flats).

<sup>b</sup>Standard deviation

### **3.3 ECOLOGY**

The ecology of the Maritime ringlet is described in detail by Webster (1994a; 1998a). A brief summary follows:

#### **3.3.1 Life Cycle**

The flight season for adult Maritime ringlets (Figure 5a) occurs during mid July to late August. The timing of the flight season is dependent on spring and summer temperatures, with warm temperatures advancing the adult emergence period. Females mate soon after emergence, and oviposit on dead blades of Salt-meadow Grass, near the litter zone close to the base of living stems of Salt-meadow Grass (Figure 5b). Oviposition occurs in a variety of microhabitats or plant communities within the salt marsh, but always on Salt-meadow Grass, even where this species comprises a small proportion of the plant community. Eggs hatch in 10-14 days.

Larvae (Figure 5c) feed on the tips of young shoots of Salt-meadow Grass that are within or near the litter region, at the base of mature grass stems. They molt to second instar in early to mid September, and then cease feeding and enter diapause in mid to late October.

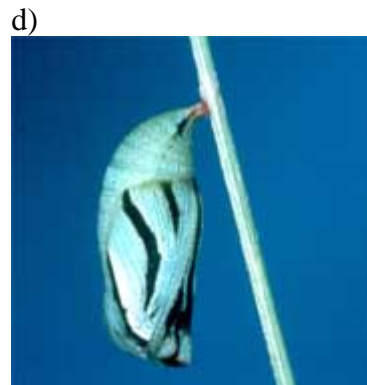
During winter, diapausing larvae rest on the undersides of dead grass stems within the litter layer but above the water saturated soil surface. They resume feeding on developing shoots of Salt-

## ***New Brunswick Maritime Ringlet Recovery Strategy***

---

meadow Grass during early to late May, and molt several times until they reach their fifth and final instar during mid June to early July. During the final two instars, the larvae feed near the top of the grass canopy rather than near the litter region. Pupation occurs during late June to early August, depending on microclimate conditions at the feeding site (Figure 5d).

Figure 5. Maritime ringlet: a) adult, b) egg, c) larva, and d) pupa. Photos: A.W. Thomas.



Most larvae pupate near the base of grass stems within the grass canopy. The pupal stage lasts 9-11 days. Adult emergence occurs during mid July to late August.



Adult, larval, and pupal Maritime ringlets are all subject to daily inundation and submergence by tidal waters.

### **3.3.2 Movement Patterns**

Adult male Maritime ringlets spend much of the day patrolling the salt march in search of receptive females. Adult female movements are probably related to the selection of oviposition sites and to nectaring behaviour. Adult activity is concentrated between 0900-1900 hours on warm, sunny days. Winds greater than 20 km/h, cloud cover, and rain deter or prevent adult activity.

Mark-recapture data indicate a mean total travel distance of approximately 120 m for both sexes, with a maximum travel distance of 1076 m. Mean home range size was 1.8 ha for both sexes, while maximum home range size was 5.75 ha. Maritime ringlets do not defend a territory, and there is considerable overlap between their home ranges. The species seldom moves outside of its preferred habitat. Dispersal capacity is probably very limited.

### **3.3.3 Survival**

Mark-recapture data of adult Maritime ringlets indicate a mean life span of 6 days for females and 7 days for males. Maximum life span is of 14 days for females and 12 days for males. Mean daily residency (survival) rates were 0.868 for adult males and 0.845 for adult females at Peters River marsh in 1995 (Webster 1996). Estimated daily death rates of Maritime ringlet larvae in five salt marsh vegetation types at Daly Point in 1999 ranged from 0.0867 – 0.1904 (Sei and Porter 2003).

Quantitative data regarding mortality rates from specific factors is unavailable. Parasitized Maritime ringlet larvae have been infrequently observed (R. Webster pers. comm.). Evidence of bird predation of adults has been observed on rare occasions. Adult Maritime ringlets have been found trapped in spider webs, and an observation of predation by a robber fly has been reported (Webster 1997).

## **4.0 THREATS AND OTHER BARRIERS TO RECOVERY**

A number of factors that may constitute a potential threat or barrier to recovery of the Maritime ringlet have been listed in the COSEWIC status report (Webster 1997) or discussed during recovery team meetings. These factors are discussed below: their potential impact, probability of occurrence, and action priority are summarized in Table 6 (page 33).

### **4.1 NATURAL FACTORS:**

#### **4.1.1 Limited distribution:**

The Maritime ringlet occurs at a low number of sites over a relatively limited area. This factor probably results in a high inherent probability of extirpation or extinction. A reduction in

## ***New Brunswick Maritime Ringlet Recovery Strategy***

---

distribution caused by loss of habitat or of the population at a site could have a significant impact on the overall population in at least three ways:

- a) direct loss of the segment of the overall population in question,
- b) reduced probability of survival of the remaining populations\*, and/or
- c) reduced genetic variability of the overall population\*\*.

\*Assuming that there *is* movement by individual Maritime ringlets among the populations. If there is movement between populations, then it is possible that the abundance of Maritime ringlets at some sites might be enhanced by ringlets moving in from other sites. If true, the loss of a population at one site might then have a negative effect on other sites.

\*\*Assuming there *is no* movement among Maritime ringlet populations. If there is no movement (i.e. no genetic exchange), then each population might be unique. The loss of one of these unique populations would therefore reduce the overall genetic variability, which might then negatively affect the ability of the species to adapt to any future environmental changes.

The limited distribution of the Maritime ringlet appears to be the most significant factor affecting the status of this species and its probability of persistence or recovery. It obviously impacts the entire population, and given the number of surveys that have failed to document the presence of the species in other areas of the province, could be considered a confirmed factor.

The sole potential mitigation strategy for this factor is expansion of the known distribution. This could be achieved in two ways: passively through the discovery of previously unknown populations (should any exist), or actively through the introduction of the species to new sites. Because its limited distribution is so crucial to the status of the species, at a minimum the protection or maintenance of the known distribution would be a key component of a recovery strategy. However, introductions might have potential ecological and/or socio-economic impacts, and thus merit prior study before being attempted on a large-scale. The experimental introductions undertaken at Bas Caraquet in 1994 and at Rivière du Nord in 1997 should be monitored to assess their long-term viability.

### **4.1.2. Habitat Fragmentation**

***Natural Fragmentation:*** The distribution of the salt marsh habitat in New Brunswick is fragmentary, occurring in disjunct patches along the coast (Figure 4). The Nepisiquit Bay salt marsh patches occupied by Maritime ringlets are particularly isolated. The long distance dispersal ability of Maritime ringlets is unknown, but is probably limited. Anecdotal evidence indicates that they rarely move outside of their salt marsh habitat, even by tens of metres (R. Webster, pers. comm.). Historic distribution patterns of Maritime ringlets are unknown, but it seems possible that the isolation of the Nepisiquit Bay salt marshes from those on the northeastern coast of the province may have limited the ability of the species to colonize salt marshes beyond Nepisiquit Bay.

***Anthropogenic Fragmentation:*** Human-caused habitat fragmentation may also be a factor influencing the potential for movement by Maritime ringlets among their currently occupied sites on Nepisiquit Bay. Residential development has altered most of the shore between the Peters River marshes and Bathurst Harbour, where the Daly Point and Point Carron sites are located.

However, it is not known whether this alteration limits movement by Maritime ringlets along the coastline, and thus limits genetic exchange among the occupied sites. However, it does seem plausible that the existence of scattered small patches of ‘salt marsh’ vegetation, with their associated nectar resources, along the shore between salt marshes might allow for the movement of adults ringlets among those marshes. If true, the elimination or degradation of shoreline vegetation through human activities might conceivably isolate populations in those marshes by amplifying the natural level of fragmentation of salt marsh habitat.

The sole potential mitigation strategy for the naturally fragmented distribution of salt marsh habitat is the facilitation of dispersal through direct introduction of Maritime ringlets to suitable sites located beyond their natural abilities of dispersal. Mitigation of human-caused fragmentation caused by alteration of the coastal environment between suitable salt marsh sites might be achieved through stewardship, policy or legislation. However, the existence or impact of this factor is unknown at present: mitigation may not be required.

### **4.1.3. Ice scouring**

Ice scouring of the substrate sometimes occurs during winter storms in salt marshes that are not protected by barrier beaches. Thus, this factor is significant for only a portion of the overall population. Ice scouring events have the potential to directly reduce the population of Maritime ringlets through mortality to diapausing larvae at an affected site. Depending on the severity of scouring, it could also impact habitat suitability, at least in the short-term. This could be considered a confirmed factor, as an intense winter storm in December 1995 that washed a large volume of ice over Daly Point marsh appears to have been responsible for a drastic population reduction there and at neighbouring Point Carron in 1996. It does not represent a chronic threat, but rather, occurs on a periodic or episodic basis.

This factor appears to be unmitigable. Maritime ringlets have presumably been exposed to the effects of periodic ice scouring throughout their existence at these sites. Thus, ice scouring may cause a periodic, short-term perturbation in population size at these sites, but probably does not represent a threat to the continued existence of the species, either at a site or overall. There may be a possibility that future climate changes may alter the probability and frequency of occurrence of ice scouring. However, the threat would remain largely unmitigable.

## **4.2 HUMAN-CAUSED FACTORS**

### **4.2.1 Marsh infilling**

The three main Maritime ringlet colonies are located in urban areas. Two of these colonies, Daly Point and Point Carron, are owned by relatively few landowners and have been covered by stewardship agreements for most of the past decade. The area surrounding the marsh with the largest sub-population, Peters River, is owned by numerous landowners and is under constant development pressure. Small-scale infilling of marsh area has occurred. This has resulted in direct loss of Maritime ringlet habitat, although the cumulative impact to date has been small.

The future loss of Maritime ringlet habitat through marsh infilling is mitigable through monitoring and enforcement of existing regulations concerning activities in watercourses and wetlands, including coastal marshes (Clean Water Act, Watercourse Alteration Regulation; Clean Environment Act, Environmental Impact Assessment Regulation). In addition, DNR and DELG are currently working on legislative changes in order to implement the New Brunswick Wetland Conservation Policy and Coastal Areas Protection Policy more effectively. Education and stewardship will assist in reducing the future risk of salt marsh infilling on private properties. Mitigation of previous losses could be achieved through removal of previous infilling and restoration of salt marsh habitat.

### **4.2.2 Pollution: Residential pesticides**

The potential threat of residential pesticide pollution is related in large part to urban development. All life stages of the Maritime ringlet are subject to periodic flooding. As a result, there is a possibility that pesticide run-off from adjacent lands may impact the species. There is also a possibility that the species, and particularly the adults, could be affected by wind-drift of aerially-applied pesticides. Currently there are no data available on pesticide use in residential areas near Maritime ringlet sites, or on the prevalence of these substances in the salt marsh systems. Should this factor be a valid concern, the greatest degree of threat likely occurs at Peters River, where residential development is occurring adjacent to much of the marsh system. However, the Daly Point and Point Carron populations, while not immediately affected by adjacent development, are located in Bathurst Harbour, which is surrounded by developed, urban areas. The Bas Caraquet salt marsh is also located adjacent to residential area.

Mitigation proposals for this factor may be premature, as it is considered probable rather than confirmed. Nonetheless, because of the high potential exposure of the species to water-borne substances due to its life history, the potential existence and impact of the factor should be further explored. In the meantime, education and stewardship may help to minimize the use of pesticides on properties immediately adjacent to the marsh systems where Maritime ringlets occur.

### **4.2.3 Pollution: Residential Sewage**

The potential threat of sewage pollution is also related to urban development. Because the various life stages of the Maritime ringlet are subject to periodic flooding, the presence of wetting agents such as detergents or oils in the water has a high likelihood of influencing mortality rates of during periods of submergence. It is also possible that increased nutrient levels in the marsh system may influence plant growth and alter Maritime ringlet habitat. There are no data currently available on wetting agent concentrations in marsh systems inhabited by Maritime ringlets, nor on the effect of these substances on mortality rates. Likewise, data on nutrient concentrations and subsequent habitat changes are lacking. Should sewage pollution be a valid concern, the greatest degree of threat likely occurs at the Daly Point and Point Carron populations in Bathurst Harbour, and at Peters River, because of the degree of urban development in the surrounding areas.

As with residential pesticides, the existence or extent of impact of residential sewage on Maritime ringlet populations requires confirmation. Thus, although mitigation proposals are premature, the potential effects of sewage-borne substances should be further explored.

#### **4.2.4 Pollution: Industrial effluent**

Two of the Maritime ringlet populations are located in Bathurst Harbour, where a number of heavy industries are located. As with residential sewage sources, it is possible that industrial effluent contains wetting agents or other substances that might affect Maritime ringlet mortality rates. However, there are currently no data available on concentrations or impacts of such substances.

This is not a confirmed factor, hence, proposal of mitigation measures is premature. However, because of the high potential exposure of the species to water-borne substances, the potential existence and impact of the factor should be further explored.

#### **4.2.5 Oil spills**

The occurrence of an oil spill would directly impact a Maritime ringlet sub-population through mortality to larvae and/or adults, and would also cause habitat degradation. Although there has been no spill known to affect Maritime ringlet populations to date, small-scale oil spills could be considered a probable threat. Two of the sub-populations occur within Bathurst Harbour, which receives boat traffic. This traffic is largely by small, recreational boats, so the probable extent of a spill in the harbour would be very limited. Most of the remaining sub-populations occur adjacent to roads, which creates a hypothetical risk of truck-transport-based oil spills. This hypothetical risk might be of greater probability during high tides, when water levels more closely approach the roads. This could create a situation where the spill could disseminate throughout a marsh before clean-up operations could be initiated, although even at low tide the window for such activities before high tide would be very brief. If an oil spill did occur, at most it could affect only a proportion of the population. However, two of the sub-populations, Daly Point and Point Carron, occur within close proximity to one another in Bathurst Harbour and could conceivably be affected simultaneously.

A large-scale oil spill is also a hypothetical threat due to the traffic of large tanker ships through Chaleurs Bay to the Belledune Port northwest of Bathurst. The potential threat is reduced somewhat by the relatively narrow inlets to both Bathurst Harbour and the Peters River estuary, which would enable booms to more easily block offshore oil slicks from entering the salt marsh systems occupied by Maritime ringlets.

Oil spills- would be difficult to prevent or mitigate. Furthermore, while the potential impact would be very high, the probability of occurrence at a given location would be very low. Nonetheless, the potential risk of oil spills should be assessed by examining any available data on sea and land-based shipping patterns of oil products in the areas where Maritime ringlets occur.

### **4.2.6 Specimen collection**

There have been incidents of specimen collection in previous years, prior to the listing of the Maritime ringlet by the NB Endangered Species Act (Webster 1997). Under the Act, collecting the species is now illegal in the absence of a permit. Illegal collecting may remain a hypothetical threat, although a minor one given the large size of the adult population (relative to the number of specimens that might be collected). However, persons working with the species visit most Maritime ringlet sites regularly throughout the season. Consequently, illegal collection seems unlikely to go unnoticed, particularly if it occurred at levels sufficiently intensive to be detrimental to the long-term persistence of the species. Mitigation measures, beyond enforcement of existing regulations, are not required.

### **4.2.7 Insect control programs**

Use of insecticides to control mosquitoes or other insects in salt marshes adjacent to developed areas has been suggested as a possible threat to this species (Christie 1970). The likelihood of this potential threat is difficult to quantify. Some municipalities within the province currently engage in spray programs to control mosquito populations (eg. Oromocto), and the potential use of the biological agent *Bacillus thuringiensis* var. *israelensis* to control mosquitoes in Bathurst was a media issue in 2002. Furthermore, a West Nile Virus Working Group was recently established within NB government to explore options to manage any possible outbreak of the disease, primarily through mosquito control. It seems possible that such a program might impact Maritime ringlet populations, depending on the agent(s) used. The potential risk of this program should be examined by determining which agents will be used, and investigating their potential impact on Maritime ringlet populations.

### **4.2.8 Recreational Vehicles**

Use of recreational vehicles on salt marshes has the potential to negatively impact Maritime ringlet habitat. These activities are illegal on private properties under the Trespass Act. However, the Trespass Act does not apply to incorporated areas, and the major Maritime ringlet populations occur within municipal boundaries. Municipal bylaws would be a potential regulatory tool in incorporated areas. In any case, the prohibitions on use of recreational vehicles on salt marshes are difficult to enforce: education would be a valuable complementary component of any attempt to reduce the impact of this threat.

### **4.2.9 Tourism projects**

Projects to attract ecotourists to Maritime ringlet sites (e.g. boardwalks) may have potential to cause degradation of habitat, depending on the extent and siting of the structures involved. However, this is balanced in part by their educational value. Any such proposals should be evaluated on a case-by-case basis to minimize degradation of habitat. Most of these proposals would be subject to evaluation under the Environmental Impact Assessment process.

***New Brunswick Maritime Ringlet Recovery Strategy***

Table 6. Listing of the factors known or thought to represent a threat to Maritime ringlet populations or habitat in New Brunswick.

Threat	Hazard <sup>a</sup>	Probability of Occurrence	Action Priority
Natural Factors:			
Limited Distribution	high	n/a	none-high <sup>b</sup>
Habitat Fragmentation	high	unknown	low <sup>b</sup>
Ice Scouring	low-high	low	none
Human-caused Factors:			
Salt marsh infilling	low	high	moderate
Pollution: Residential pesticides	moderate	moderate	moderate
Pollution: Residential sewage	moderate	unknown	moderate
Pollution: Industrial effluent	unknown	low-moderate	moderate
Pollution: Small-scale oil spills	low-moderate	low	low
Pollution: large-scale oil spills	moderate-extreme	very low	low
Specimen collection	low	low	low
Insect control (esp. mosquitoes)	moderate	high	high
Recreational vehicles	low	low	low
Tourism	low	low	low

<sup>a</sup>Hazard: potential impact to species

<sup>b</sup>Limited distribution and possible fragmentation of habitat were assigned no or low priority for action as they appear to be natural factors. However, a comprehensive assessment of the current distribution, with a search for heretofore unknown sites, is listed as a high priority action.

**5.0 LITERATURE CITED**

- Christie, D. 1970. Bathurst's Butterflies. New Brunswick Museum Memo 2: 9-11.
- Environment Canada. 2002. Species at Risk: Maritime Ringlet (accessed April 5, 2005). [http://www.speciesatrisk.gc.ca/search/speciesDetails\\_e.cfm?SpeciesID=304](http://www.speciesatrisk.gc.ca/search/speciesDetails_e.cfm?SpeciesID=304)
- Hinds, H. 2000. Flora of New Brunswick. University of New Brunswick. 699pp.
- McDunnough, J. 1939. A new *Coenonympha* race from northeast New Brunswick. Can. Entomol. 71: 266.
- Roberts, L. 1993. Report on the status of salt marsh habitat in New Brunswick. NB Department of Natural Resources, unpublished report. 31pp.
- Sei, M., and A. H. Porter. 2003. Microhabitat-specific early larval survival of the Maritime ringlet (*Coenonympha tullia nipisiquit*, Nymphalidae, Lepidoptera). Animal Conservation 6: 55-61.
- Thomas, A.W. 1980. New locality records for the salt marsh copper, *Epidemia dorcas dospassosi* (Lycaenidae). J. Lepidop. Soc. 34: 315.
- Webster, R.P. 1994a. Ecological studies required for a recovery and management plan for the Maritime Ringlet Butterfly, *Coenonympha inornata nipisiquit* in Bathurst, New Brunswick. An application for funding to the Endangered Species Recovery Fund, World Wildlife Fund, Canada, and the New Brunswick Department of Natural Resources and Energy, Fish and Wildlife Branch. Unpublished. 10 pp + app.
- Webster, R.P. 1994b. The life history and ecology of the Maritime Ringlet Butterfly, *Coenonympha inornata nipisiquit* McDunnough. A report prepared for the Endangered Species Recovery Fund, World Wildlife Fund, Canada, and the New Brunswick Department of Natural Resources and Energy, Fish and Wildlife Branch. Unpublished. 18 pp.
- Webster, R.P. 1994c. Maritime Ringlet in New Brunswick. Chickadee Notes, A Series on the Natural History of New Brunswick, No. 12. New Brunswick Museum. 3 pp.
- Webster, R.P. 1995. Ecological studies required for a recovery and management plan for the Maritime Ringlet Butterfly, *Coenonympha inornata nipisiquit* in Bathurst, New Brunswick. A report prepared for the Endangered Species Recovery Fund, World Wildlife Fund, Canada, and the New Brunswick Department of Natural Resources and Energy, Fish and Wildlife Branch. Unpublished. 27 pp.
- Webster, R.P. 1996. Ecological studies required for a recovery and management plan for the Maritime Ringlet Butterfly, *Coenonympha inornata nipisiquit* in Bathurst, New Brunswick: Peters River Study, 1995. A report prepared for the New Brunswick



## New Brunswick Maritime Ringlet Recovery Strategy

- Department of Natural Resources and Energy, Fish and Wildlife Branch. Unpublished. 32 pp.
- Webster, R.P. 1997. Status report on the Maritime Ringlet Butterfly, *Coenonympha tullia nipisiquit* (McDunnough). Committee on the Status of Endangered Wildlife in Canada, Ottawa, Ontario, Canada. 30 pp.
- Webster, R.P. 1998a. The Life History of the Maritime Ringlet, *Coenonympha tullia nipisiquit* (Satyridae). J. Lepidop. Soc. 52: 345-355.
- Webster, R.P. 1998b. The establishment of new populations of the Maritime Ringlet, *Coenonympha tullia nipisiquit* in New Brunswick. 1998 interim report to the New Brunswick Wildlife Council Trust Fund Committee. Unpublished. 9 pp.
- Webster, R.P. 1999. Update on Maritime Ringlet, *Coenonympha tullia nipisiquit* (McDunnough) New Brunswick populations. Unpublished report. 2 pp.
- Webster, R.P. 2000. The establishment of new populations of the Maritime Ringlet, *Coenonympha nipisiquit* in New Brunswick. 2000 interim report to the New Brunswick Wildlife Council Trust Fund Committee. Unpublished. 10 pp.
- Webster, R.P. 2001a. Ecological studies required for a recovery and management plan for the Maritime Ringlet Butterfly, *Coenonympha nipisiquit* in Bathurst, New Brunswick: Peters River Study, 1999. A report prepared for the New Brunswick Department of Natural Resources and Energy, Fish and Wildlife Branch. Unpublished. 24 pp.
- Webster, R.P. 2001b. The establishment of new populations of the Maritime Ringlet, *Coenonympha nipisiquit* in New Brunswick. 2001 interim report to the New Brunswick Wildlife Council Trust Fund Committee. Unpublished. 13 pp.

## ***New Brunswick Maritime Ringlet Recovery Strategy***

---

### **Appendix I. New Brunswick sites where searches have been conducted for Maritime ringlet butterflies.**

Location	Date	Maritime ringlets	Reference
Mouth of Jacquet River, Restigouche Co.	August 4, 1970	no	Christie 1970
Belledune Point, Gloucester Co.	August 4, 1970	no	Christie 1970
Mouth of Elmtree River, Petit-Rocher-Nord, Gloucester Co.	August 4, 1970	no	Christie 1970
Beresford, Gloucester Co.	August 4, 1970	no	Christie 1970
Beresford, Gloucester Co.	July 27-28, 1979	no	Thomas 1980
Peters River, Gloucester Co.	August 3, 1970	yes	Christie 1970
Peters River, Gloucester Co.	July 27, 1979	yes	Thomas 1980
Mouth of Tetagouche River, Bathurst, Gloucester Co.	August 4, 1970	no	Christie 1970
East Bathurst, mouth of Nepisiguit River, Gloucester Co.	July 28, 1979	no	Thomas 1980
Carron Point, Gloucester Co.	August 4-5, 1970	yes	Christie 1970
Carron Point, Bathurst, Gloucester Co.	August 1, 1979	yes	Thomas 1980
Mouth of Bass River, Gloucester Co.	August 4-5, 1970	no	Christie 1970
Village-des-Poirier, Gloucester Co.	August 2, 1979	no	Thomas 1980
Maisonnette Dune, Gloucester Co.	August 5, 1970	no	Christie 1970
Wishart Point, Northumberland Co.	July 31, 1979	no	Thomas 1980
Hay Island, Neguac, Northumberland Co.	July 30, 1979	no	Thomas 1980

**Appendix II. Profiles of Maritime ringlet sites in New Brunswick.**

**Peters River**

Location: Beresford & Bathurst, Gloucester County

Area of potential habitat (salt marsh): 156.4 hectares

Number of properties within or adjacent to marsh habitat: 425 (315 owners)

The Peters River site is composed of an extensive system of salt marshes located at the estuaries of a number of small streams or rivers flowing into Nepisiguit Bay north of Bathurst Harbour. (Figure I). The marsh system is approximately 6 km long, bounded by the Millstream River in the north and Peters River in the south, and is located behind a barrier beach system (Beresford and Youghall Beaches).

Most of the marsh system is within the town limits of Beresford; a part of the southern fringe of Peters River estuary is within the city limits of Bathurst. Property ownership is almost entirely small private holdings, and the northern half of the marsh is largely bounded by residential development.

Studies of the Maritime ringlet at the Peters River salt marshes have contributed much of the baseline ecological data collected for the species. This marsh probably contains the largest existing population of Maritime ringlet. The estimated total adult seasonal population in 1995, for a section of the marsh that comprised approximately 25% of the entire marsh, was 6500 individuals. Population estimates are not available for subsequent years, although site visits indicate no significant apparent declines as of 1999.

A study in 1995 (Webster 1996) classified and mapped vegetation communities for approximately 25% of the Peters River marsh. Relative densities of all adults, and of freshly-emerged adults, were also mapped for this same section. Vegetation mapping of the remainder of the marsh, as well as line transect counts of Maritime ringlet for the entire marsh, are detailed in Webster 2001a.

The town of Beresford undertook a stewardship project in 2002-2005 to contact owners of salt marsh properties and provide information on land use practices beneficial to the Maritime ringlet.

References: Webster 1996, 1998a, 1999, 2001a, 2001b



## **Daly Point**

Location: Bathurst, Gloucester County

Area of potential habitat (salt marsh): 29.4 hectares

Number of properties within or adjacent to marsh habitat: 11 (1 owner)

The Daly Point site is a small salt marsh located on the east side of Bathurst Harbour, near Sand Hill (Figure II). Although it is exposed to the harbour, it is somewhat sheltered from the waters of Nepisiguit Bay by the barrier beach at Point Carron, located 1 km north of the marsh.

The site is entirely within the city limits of Bathurst. The marsh, as well as much of the property surrounding it, is owned by the city. The lands adjacent to the marsh are undeveloped. A stewardship agreement between the former owner of the property (Brunswick Mining and Smelting Corp. Ltd.) and the New Brunswick Department of Natural Resources and Energy in 1991 created Daly Point Reserve. An interpretation center and boardwalk systems were constructed, and are still maintained today. The agreement terminated in 2002 when the properties were transferred to the City of Bathurst. The City of Bathurst is interested in continuing stewardship activities Daly Point, and is currently investigating partnerships to pursue that goal.

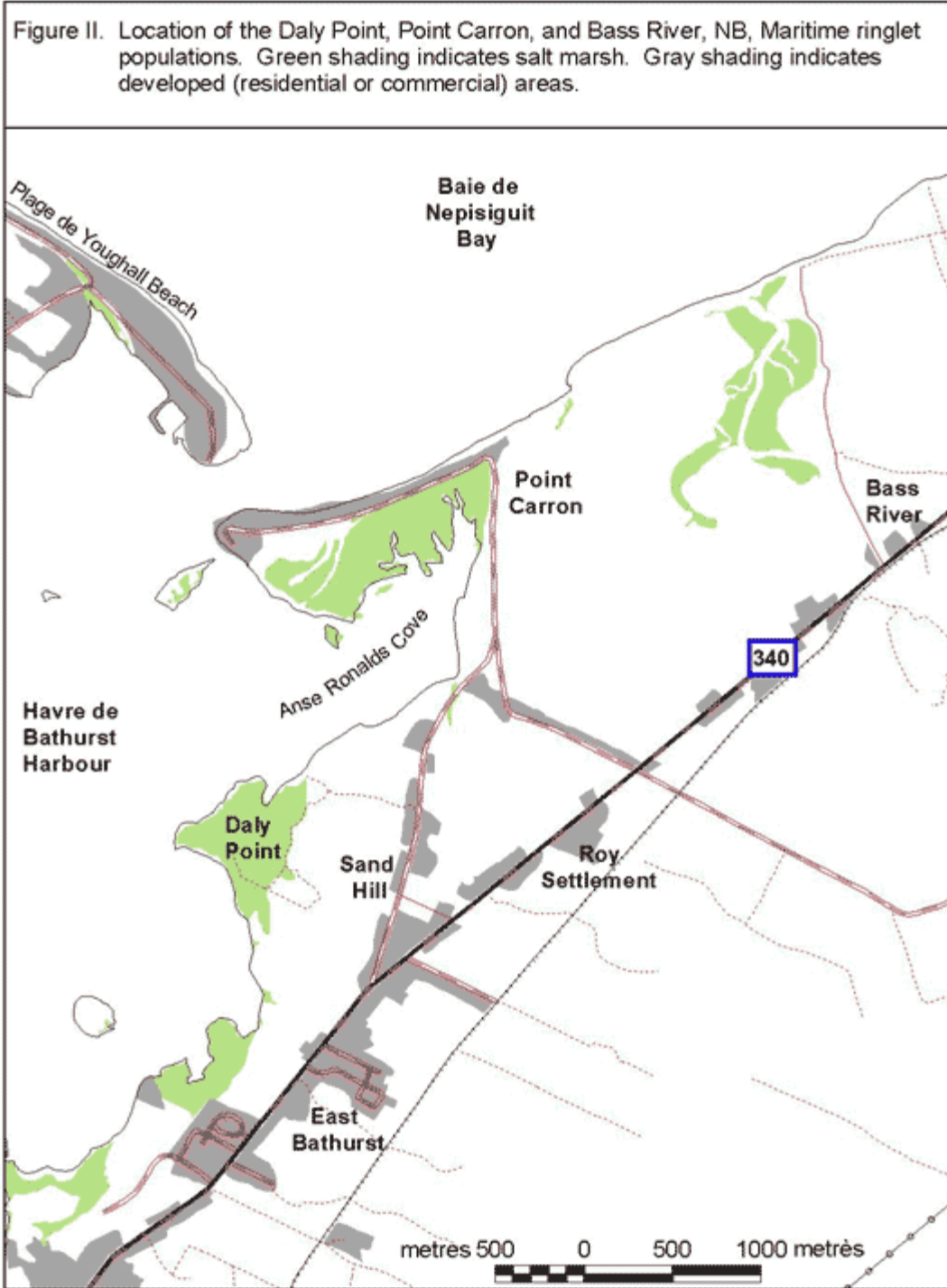
Studies of the Maritime ringlet at the Daly Point salt marsh have contributed much of the baseline ecological data for the species. The ringlet population there is second only to that of Peters River. The estimated total adult seasonal population at Daly Point was 9500 individuals in 1994. Site visits in 1996 indicated a severe reduction in population. The suggested cause for this decline was a storm in December 1995, which may have resulted in ice scouring in the marsh, reducing survival of over-wintering larvae. The population appears to have gradually increased since then, although numbers are still below those of 1994.

A study in 1994 (Webster 1995) classified and mapped vegetation communities at Daly Point. Relative densities of all adults, and of freshly-emerged adults, were also mapped.

References: Webster 1995, 1998a, 1999

# New Brunswick Maritime Ringlet Recovery Strategy

## Appendix II: Maritime ringlet site profiles



**Point Carron**

Location: Bathurst, Gloucester County

Area of potential habitat (salt marsh, not including mud flats and channels): 41.3 hectares

Number of properties within or adjacent to marsh habitat: 5 (3 owners)

The Point Carron site is a small salt marsh located on the northeast side of Bathurst Harbour, near its entrance (Figure II). Although exposed to the harbour on the west and south, it is protected from the waters of Nepisiguit Bay by a barrier beach.

The site is entirely within the city limits of Bathurst. Over half of the marsh is owned by Ducks Unlimited Canada. The barrier beach along the northern edge of the marsh is bisected by a road, and the northern side of the road is extensively developed (residential). A stewardship agreement that was signed between the former owner of much of the Point Carron marsh (Brunswick Mining and Smelting Corp. Ltd.) and the New Brunswick Department of Natural Resources and Energy in 1991 included the Point Carron property as part of Daly Point Reserve. Although this agreement terminated in 2002 when the property was sold, the current owner - Ducks Unlimited Canada - is a conservation and stewardship organization.

Quantitative estimates of the population size of *C. nipisiquit* are not available for this site. However, the population is considered relatively small but stable. Carron Point has not been the subject of detailed study, as have Daly Point and Peters River.

References: Webster 1998a, 1999

**Bass River**

Location: Bathurst, Gloucester County

Area of potential habitat (salt marsh, not including mud flats and channels): 32.7 hectares

Number of properties within or adjacent to marsh habitat: 8 (8 owners)

The Bass River site is a small salt marsh located on the estuaries of Bass river, on Nepisiguit Bay approximately 3 km east of the entrance to Bathurst Harbour (Figure II). The marsh is located behind a narrow barrier beach. Property ownership consists of small private holdings, and is largely undeveloped.

Very little is known about the Bass River site. The Maritime ringlet was absent there in 1970, when it was surveyed over two days during peak flight season (David Christie, pers. comm., 2002). However, a visit there in 1995 indicated that “many hundreds” were present (Jim Goltz, pers. comm., 2002). A subsequent visit on August 15, 2002, near the end of the flight season, found 28 males and 12 females on a 175 m transect (Gilles Godin, pers. comm., 2002) indicating a population probably in the hundreds.

Additional information on this site is needed. It seems unlikely that the species was missed during the 1970 visits, which were conducted with the specific intent of finding new Maritime ringlet populations. It is more likely that the species established itself there sometime between 1970 and 1995. The Bass River salt marsh is quite close to the Point Carron population: 1.0 km east at its nearest point, through a wooded area, and 1.6 km east along the coastline. It is possible that this represents a re-establishment of the species at Bass River, as the marshes there were dyked for agriculture in the past, but have now reverted to salt marsh. However, it is impossible to be certain of this in the absence of historical distributional data on Maritime ringlets in New Brunswick.



**Bas Caraquet**

Location: Bas Caraquet, Gloucester County

Area of potential habitat (salt marsh, not including mud flats and channels): 25.1 hectares

Number of properties within or adjacent to marsh habitat: 42 (33 owners)

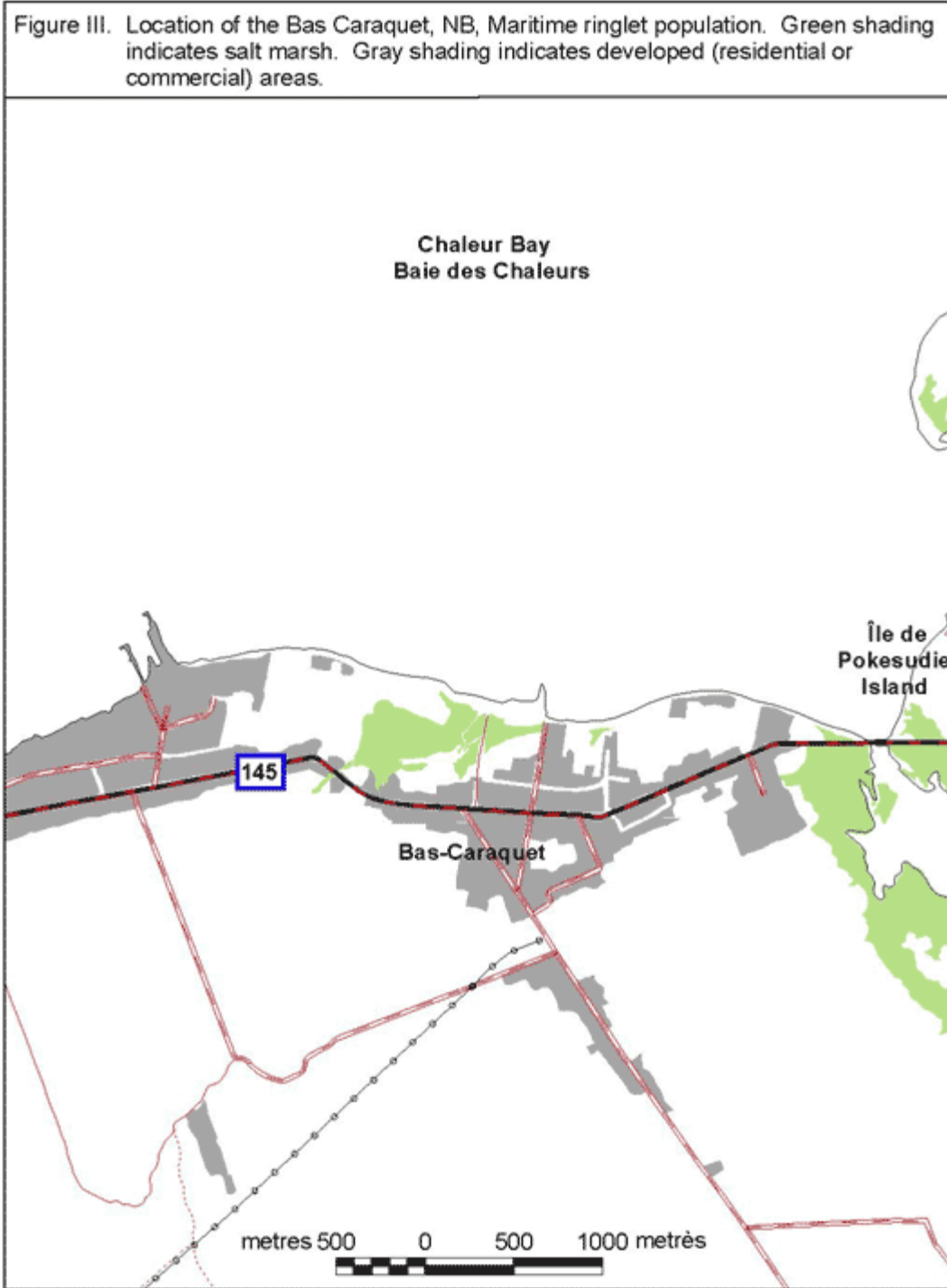
The Bas Caraquet site is a small salt marsh located on the south shore of Chaleur Bay, 7.5 km east of Caraquet (Figure III). The marsh is located behind a narrow barrier beach. Property ownership consists of small private holdings, and residential development extends along the southern fringe of the marsh.

This is an introduced population: in 1994, 45 female Maritime ringlets were captured Daly Point and Peters River and released at a salt marsh near Bas Caraquet. A visit to the site on July 30, 1997, indicated a colony had become successfully established. Subsequent surveys estimated daily population numbers during the peak flight period, and extrapolated total estimated seasonal population numbers using a relationship derived from data collected at Peters River (Webster 1996). Line transects to determine annual relative abundance were established in 2000. Results of surveys are presented in Table I.

Table I. Population estimates of Maritime ringlet for the Bas Caraquet site, 1997-1999.

Year	Date	Population Estimate	Variance	Total Seasonal Population Estimate	Comments
1997		198	309	500	
1998	August 1	401	1659	950	
	August 4	252	855		
1999	July 23	252	1216	635	Estimate affected by poor weather and unusual emergence pattern; probably low estimate.
2000	July 31	*14.5/100m			*No estimate due to poor weather. Line transect counts indicate population is "still doing well"
	August 6	6.4/100m			

References: Webster 1998b, 1999, 2000, 2001b



**Rivière du Nord**

Location: Caraquet Bay, Gloucester County

Area of potential habitat (salt marsh, not including mud flats and channels): 63.4 ha

Number of properties within or adjacent to marsh habitat: 1 (1 owners)

The Rivière du Nord site is a relatively large salt marsh located on the northwestern shore of Caraquet Bay on the estuary of Rivière du Nord (Figure IV). Much of the marsh was previously dyked for agricultural use but has since reverted to salt marsh. The site is entirely owned by the provincial government, and is within the boundaries of Village Historique Acadien. There is a large area of salt marsh extending north along Caraquet bay that is continuous with the site, but is not known to harbour Maritime ringlets. There are also areas on salt marsh located 1.5 km away along the south shore of Caraquet Bay.

This is also an introduced population. Following the success of the Bas Caraquet introduction, transfers of Maritime ringlets were made from the Peters River site to a salt marsh near the mouth of Rivière du Nord. A total of 100 adult female and 25 adult males were transferred on August 7, 1997. Surveys on July 27 and August 1, 1998 found a small number of adult Maritime ringlets scattered throughout the marsh, indicating that the species is able to complete its life cycle at the site. Subsequently, another 138 females and 65 males were released between August 1 and August 8, 1998, and 75 females on July 22 and 28, 1999.

Population estimates of Maritime ringlet are not available for the Rivière du Nord site, as little time has elapsed since the initial releases. However, line transects to determine annual relative abundance were established in 1999, and indicate that the species is widely dispersed at low densities throughout the marsh. Results of surveys are presented in Table II.

Table II. Line transect counts of Maritime ringlets for the Rivière du Nord site, 1999-2000.

Year	Date	Transect Count (#/100m)
1999	July 16	0.4
	July 19	0.8
	July 22	0.8
	July 24	0.6
2000	July 31	4.6
	August 6	1.7

References: Webster1998b, 1999, 2000, 2001b



**References**

Webster, R.P. 1995. Ecological studies required for a recovery and management plan for the Maritime Ringlet Butterfly, *Coenonympha inornata nipisiquit* in Bathurst, New Brunswick. A report prepared for the Endangered Species Recovery Fund, World Wildlife Fund, Canada, and the New Brunswick Department of Natural Resources and Energy, Fish and Wildlife Branch. Unpublished. 27 pp.

*Results of a study conducted at Daly Point in 1994. Two major components: a Mark-Release-Recapture study, and vegetation classification for the site. The study quantified or reported on the following parameters (all for adult C. nipisiquit): population numbers (daily and total), survival rate and life expectancy, age/wing wear relationship, density, vagility, standard area of activity, microhabitat use, activity patterns, nectar resources, flight season, and predator and parasitoid complex. Recommendations of conservation actions for C. nipisiquit are presented.*

Webster, R.P. 1996. Ecological studies required for a recovery and management plan for the Maritime Ringlet Butterfly, *Coenonympha inornata nipisiquit* in Bathurst, New Brunswick: Peters River Study, 1995. A report prepared for the New Brunswick Department of Natural Resources and Energy, Fish and Wildlife Branch. Unpublished. 32 pp.

*Results of a study conducted at Peters River in 1995, covering approximately 25% of the area of marsh known to contain C. nipisiquit. Two major components: a Mark-Release-Recapture study, and vegetation classification for the site. The study quantified or reported on the following parameters (all for adult C. nipisiquit): population numbers (daily and total), survival rate and life expectancy, fecundity, density, vagility, movement patterns, standard area of activity, microhabitat use, activity patterns, nectar resources, mating behaviour, flight season, and predator and parasitoid complex.*

Webster, R.P. 1998a. The Life History of the Maritime Ringlet, *Coenonympha tullia nipisiquit* (Satyridae). J. Lepidop. Soc. 52: 345-355.

*The immature life stages of C. nipisiquit are described, and an account of their behaviour is provided. Compiled from data collected at Peters River, Daly Point and Point Carron.*

Webster, R.P. 1998b. The establishment of new populations of the Maritime Ringlet, *Coenonympha tullia nipisiquit* in New Brunswick. 1998 interim report to the New Brunswick Wildlife Council Trust Fund Committee. Unpublished. 9 pp.

*An outline of methods used and initial results of experimental introductions of C. nipisiquit to two sites: Bas Caraquet and Rivière du Nord.*

## ***New Brunswick Maritime Ringlet Recovery Strategy***

---

### ***Appendix II: Maritime ringlet site profiles***

Webster, R.P. 1999. Update on Maritime Ringlet, *Coenonympha tullia nipisiquit* (McDunnough) New Brunswick populations. Unpublished report. 2 pp.

*Population status information for Daly Point, Carron Point, Peters River, Bas Caraquet, and Rivière du Nord.*

Webster, R.P. 2000. 1999. Update on Maritime Ringlet, *Coenonympha tullia nipisiquit* (McDunnough) New Brunswick populations. 2000 interim report to the New Brunswick Wildlife Council Trust Fund Committee. Unpublished. 10 pp.

*Further information on methods used and results of experimental introductions of C. nipisiquit to the Bas Caraquet and Rivière du Nord sites.*

Webster, R.P. 2001a. Ecological studies required for a recovery and management plan for the Maritime Ringlet Butterfly, *Coenonympha nipisiquit* in Bathurst, New Brunswick: Peters River Study, 1999. A report prepared for the New Brunswick Department of Natural Resources and Energy, Fish and Wildlife Branch. Unpublished. 24 pp.

*Results of a population survey conducted at Peters River in 1999, covering areas of the marsh north of those surveyed in 1995. Line-transects were used, rather than the more intensive Mark-Release-Recapture method. Previous surveys had been concentrated in the southern end of the Peters River Marsh complex; this survey quantified C. nipisiquit distribution over the entire marsh complex. Maps of transect results, and of vegetation distribution, are included.*

Webster, R.P. 2001b. The establishment of new populations of the Maritime Ringlet, *Coenonympha nipisiquit* in New Brunswick. 2001 interim report to the New Brunswick Wildlife Council Trust Fund Committee. Unpublished. 13 pp.

*Further information on results of experimental introductions of C. nipisiquit to the Bas Caraquet and Rivière du Nord sites. Maps of these sites are included. Also included is documentation of a population decline at Peters River, possibly caused by abnormally high tides.*