



# Rapids Clubtail

(*Gomphus quadricolor*) in Ontario

## Ontario Recovery Strategy Series

Recovery strategy prepared under the *Endangered Species Act, 2007*

September 2010

*Natural. Valued. Protected.*

# About the Ontario Recovery Strategy Series

This series presents the collection of recovery strategies that are prepared or adopted as advice to the Province of Ontario on the recommended approach to recover species at risk. The Province ensures the preparation of recovery strategies to meet its commitments to recover species at risk under the Endangered Species Act, 2007 (ESA, 2007) and the Accord for the Protection of Species at Risk in Canada.

## What is recovery?

Recovery of species at risk is the process by which the decline of an endangered, threatened, or extirpated species is arrested or reversed, and threats are removed or reduced to improve the likelihood of a species' persistence in the wild.

## What is a recovery strategy?

Under the ESA, 2007, a recovery strategy provides the best available scientific knowledge on what is required to achieve recovery of a species. A recovery strategy outlines the habitat needs and the threats to the survival and recovery of the species. It also makes recommendations on the objectives for protection and recovery, the approaches to achieve those objectives, and the area that should be considered in the development of a habitat regulation. Sections 11 to 15 of the ESA, 2007 outline the required content and timelines for developing recovery strategies published in this series.

Recovery strategies are required to be prepared for endangered and threatened species within one or two years respectively of the species being added to the Species at Risk in Ontario list. There is a transition period of five years (until June 30, 2013) to develop recovery strategies for those species listed as endangered or threatened in the schedules of the ESA, 2007. Recovery strategies are required to be prepared for extirpated species only if reintroduction is considered feasible.

## What's next?

Nine months after the completion of a recovery strategy a government response statement will be published which summarizes the actions that the Government of Ontario intends to take in response to the strategy. The implementation of recovery strategies depends on the continued cooperation and actions of government agencies, individuals, communities, land users, and conservationists.

## For more information

To learn more about species at risk recovery in Ontario, please visit the Ministry of Natural Resources Species at Risk webpage at: [www.ontario.ca/speciesatrisk](http://www.ontario.ca/speciesatrisk)

## RECOMMENDED CITATION

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*Cette publication hautement spécialisée Recovery strategies prepared under the Endangered Species Act, 2007, n'est disponible qu'en Anglais en vertu du Règlement 411/97 qui en exempte l'application de la Loi sur les services en français. Pour obtenir de l'aide en français, veuillez communiquer avec Pamela Wesley au ministère des Richesses naturelles au 705-755-1661.*

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## **DECLARATION**

The Ontario Ministry of Natural Resources has led the development of this recovery strategy for the Rapids Clubtail in accordance with the requirements of the *Endangered Species Act, 2007* (ESA 2007). This recovery strategy has been prepared as advice to the Government of Ontario, other responsible jurisdictions and the many different constituencies that may be involved in recovering the species.

The recovery strategy does not necessarily represent the views of all of the individuals who provided advice or contributed to its preparation, or the official positions of the organizations with which the individuals are associated.

The goals, objectives and recovery approaches identified in the strategy are based on the best available knowledge and are subject to revision as new information becomes available. Implementation of this strategy is subject to appropriations, priorities and budgetary constraints of the participating jurisdictions and organizations.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy.

## **RESPONSIBLE JURISDICTIONS**

Ontario Ministry of Natural Resources  
Fisheries and Oceans Canada  
Environment Canada, Canadian Wildlife Service - Ontario

## EXECUTIVE SUMMARY

The Rapids Clubtail is a small, brightly coloured dragonfly which lives in clear, cool, medium to large rivers with wooded shorelines, gravel shallows, and muddy pools. Adult males perch on exposed rocks in the rapids. Adult females inhabit shoreline forests, moving to the rapids when ready to mate. Eggs are laid over the rapids and the nymphs live in quiet, muddy, downstream pools.

This species is a globally rare to uncommon dragonfly found throughout Eastern North America, in a range extending from Maine to Minnesota, including southern Ontario. In Ontario it has been found in only four rivers: the Credit, the Thames, the Humber and the Mississippi. The population in the Credit River may be extirpated. The species is listed as endangered on the Species at Risk in Ontario (SARO) List under the *Endangered Species Act, 2007*.

Threats to survival and recovery include dam construction, shoreline alteration, pollution, removal of shoreline forests, exotic predatory species, roadkill and climate change. Limiting factors include low population numbers, limited distribution and apparent sensitivity to specific habitat features. Knowledge gaps include a lack of understanding of the reasons for its limited distribution and for its habitat sensitivity.

The recovery goal is to ensure the long-term survival of Rapids Clubtail in the province by protecting existing populations and by restoring populations in appropriate habitat where feasible.

The recovery objectives are to:

1. protect, maintain and improve habitat in the four rivers in Ontario where Rapids Clubtail has been found;
2. implement a monitoring program for the locations where Rapids Clubtail is known to exist;
3. conduct additional inventory for Rapids Clubtail in suitable habitat; and,
4. initiate research to address knowledge gaps for Rapids Clubtail.

It is important to ensure adequate protection of habitat and water quality for the species' survival and recovery.

The locations where the species has been found in the Credit, Thames, Humber and Mississippi Rivers should all be prescribed as habitat in a habitat regulation. At each location, the area prescribed as habitat should include the section of the river containing the rapids and the pools below the rapids, plus the wooded shores on either side extending inland to include any forest which is within 800 metres of the shoreline.

## TABLE OF CONTENTS

RECOMMENDED CITATION.....	i
AUTHOR .....	ii
ACKNOWLEDGMENTS.....	ii
DECLARATION.....	iii
RESPONSIBLE JURISDICTIONS .....	iii
EXECUTIVE SUMMARY.....	iv
1.0 BACKGROUND INFORMATION.....	1
1.1 Species Assessment and Classification.....	1
1.2 Species Description and Biology.....	1
1.3 Distribution, Abundance and Population Trends.....	2
1.4 Habitat Needs .....	4
1.5 Limiting Factors.....	4
1.6 Threats to Survival and Recovery .....	5
1.7 Knowledge Gaps.....	5
1.8 Recovery Actions Completed or Underway.....	6
2.0 RECOVERY .....	7
2.1 Recovery Goal .....	7
2.2 Protection and Recovery Objectives .....	7
2.3 Approaches to Recovery.....	8
2.4 Area for Consideration in Developing a Habitat Regulation .....	10
GLOSSARY .....	11
REFERENCES.....	13
APPENDIX 1. COMPONENTS OF AN INVENTORY PROTOCOL FOR RAPIDS CLUBTAIL .....	15

## LIST OF FIGURES

Figure 1. Distribution of Rapids Clubtail in North America.....	2
Figure 2. Historical and current distribution of Rapids Clubtail in Ontario.....	3
Figure 3. Rapids Clubtail male larva.....	15

## LIST OF TABLES

Table 1. Protection and recovery objectives.....	7
Table 2. Approaches to recovery of the Rapids Clubtail in Ontario .....	8

# Recovery strategy for the Rapids Clubtail in Ontario



## 1.0 BACKGROUND INFORMATION

### 1.1 Species Assessment and Classification

COMMON NAME: Rapids Clubtail
SCIENTIFIC NAME: <i>Gomphus quadricolor</i>
SARO List Classification: Endangered
SARO List History: Endangered (2009)
COSEWIC Assessment History: Endangered (2008)
SARA Schedule 1: N/A
CONSERVATION STATUS RANKINGS: GRANK: G3G4                      NRANK: N1                      SRANK: S1

The glossary provides definitions for the abbreviations above.

### 1.2 Species Description and Biology

#### Species Description

The Rapids Clubtail is a small (42 to 45 mm long), brightly coloured dragonfly in the family Gomphidae. The widely separated eyes are bluish-green on a light yellowish-green face that is striped with two dark lines. The legs are entirely black. The thorax has a contrasting pattern of dark and light coloured stripes. The wings span 25 to 27 millimetres and are transparent. The abdomen is slender, but in males is slightly expanded at the tip (Dunkle 2000, Needham et al. 2000).

#### Species Biology

The Rapids Clubtail lives in clear, cool, medium to large rivers with wooded shorelines, gravel shallows and muddy pools. Adult males perch on exposed rocks in the rapids, from which they make territorial flights to drive away competitors, mating flights to find females and predatory flights to catch aerial insects. Adult females inhabit shoreline forests, moving to the rapids when ready to mate. Eggs are laid in the water over the rapids and are carried downstream where they are deposited in pools (Walker 1958).

The nymphs live in these quiet, muddy, downstream pools where they spend most of their time buried just below the surface of the sediment in the bottom of the pool, breathing through the tip of the abdomen raised above the sediment. They ambush prey (invertebrates, small fish and tadpoles) from the sediment using the prehensile labium (Walker 1958).

Adults live about three to four weeks, emerging and flying from mid-May to mid-July, while larvae may live two or more years (Walker 1958).

### 1.3 Distribution, Abundance and Population Trends

The Rapids Clubtail is a globally rare to uncommon dragonfly found throughout eastern North America, with large areas of unsuitable habitat within this range where it does not occur. Most populations are located in the U.S. Midwest, with the range extending from Maine to Minnesota, including southern Ontario (Donnelly 2004).

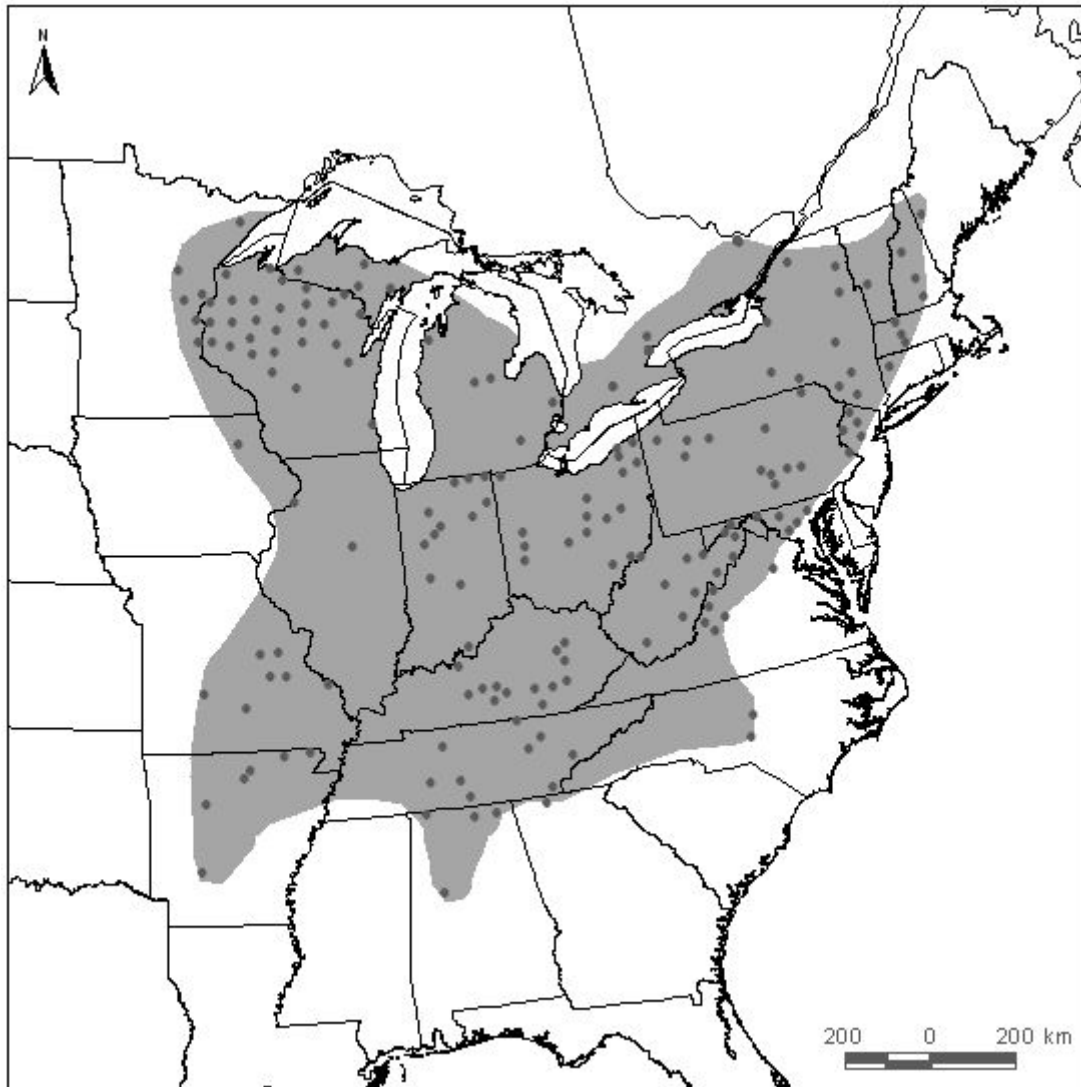


Figure 1. Distribution of Rapids Clubtail in North America (COSEWIC 2008, from Donnelly 2004)

## Recovery strategy for the Rapids Clubtail in Ontario

In Ontario the species has been found in only four rivers:

- the Credit River near Erindale, not seen since 1939 (Walker 1958);
- the Thames River near Putnam, not seen since 1989 (P. Pratt pers. comm. 2009);
- the Humber River near Kleinburg, found in 1939 (Walker 1958) and again in 2005 (Harris and Foster 2006); and,
- the Mississippi River at Pakenham and at Blakeney, seen from 2001 to 2005 (P. Catling pers. comm. 2009, Catling and Brownell 2002) and at Almonte in 2010 (C. Lewis, pers. comm. 2010).

The population at the Credit River site may be extirpated (Harris and Foster 2006) due to shoreline alteration and water pollution (D. Sutherland pers. comm. 2009). The Thames River population may persist, undetected since 1989 (P. Pratt pers. comm. 2009).

No studies have been done to estimate population size or general abundance at the Ontario sites. Although work has been done to search for the species across a large part of Ontario by various experts (as listed in Harris and Foster 2006 and COSEWIC 2008), it is possible that the species exists in other rivers in Ontario where it has not yet been discovered.

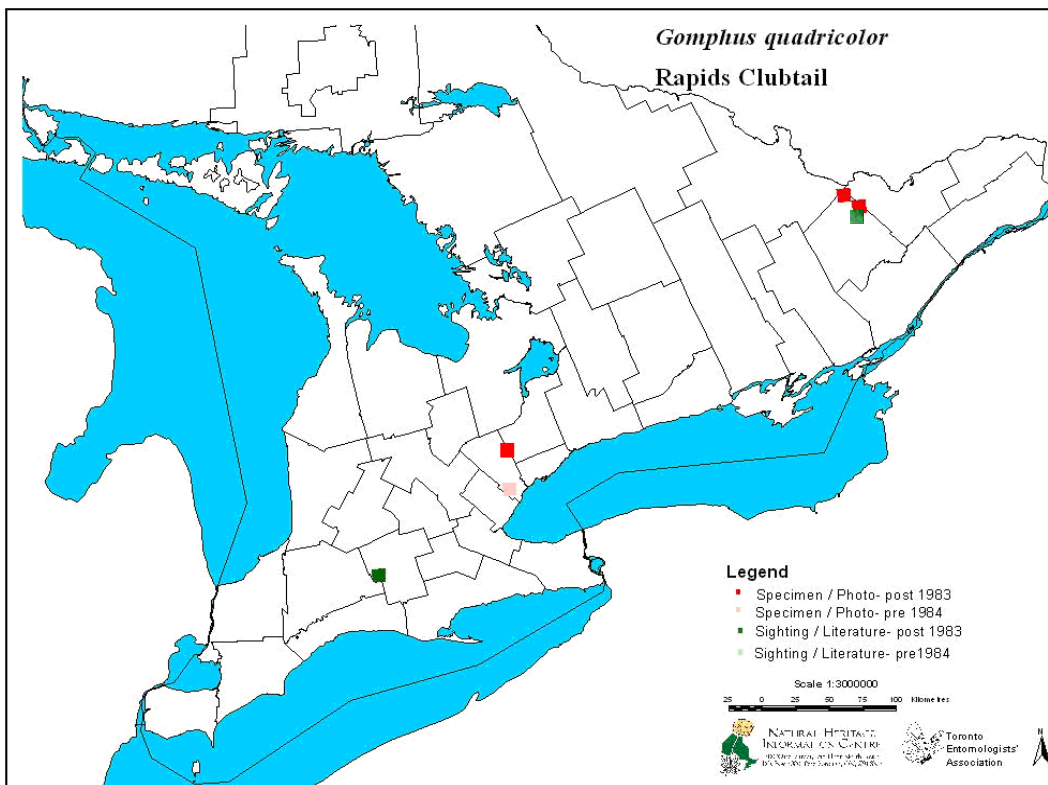


Figure 2. Historical and current distribution of Rapids Clubtail in Ontario (modified from OMNR, NHIC website)

## 1.4 Habitat Needs

The Rapids Clubtail requires the natural, unpolluted, unaltered habitat of a medium to large, swift-flowing river: clear cool water, wooded shorelines, gravel and cobble riffles and projecting boulders interspersed with muddy pools (Cuthrell 2000). Each of these components is critical to the survival of the species, as follows:

- Adult males use rocks and other projections in the rapids as perches from which they make short territorial, mating and foraging flights over the riffle.
- Adult females live in shoreline forests (deciduous or mixed mature stands; P. Catling pers. comm. 2010), sheltering among leaves and branches, up to 800 metres inland from the river (Walker 1958).
- Eggs are laid in the water over the rapids where they drift downstream to quiet pools.
- Nymphs spend most of their time buried in the muddy bottom.
- Newly-emerged adults disperse inland to the safety of the forest to avoid predation until the exoskeleton has hardened and they can fly strongly (Massachusetts Division of Fisheries and Wildlife 2008).

A suitable river with rapids and good water quality is not sufficient for the species if the shoreline forest is not protected. Evidence suggests that long-term assured shoreline protection is necessary to ensure the continued existence of the shoreline forest needed by the Rapids Clubtail.

## 1.5 Limiting Factors

Characteristics of the species make natural recovery by dispersal unlikely. Although capable of strong flight, the Rapids Clubtail lives in relatively stable habitats where the requirement for dispersal is low. Their flight behaviour of remaining close to the river surface or in forest cover makes them less capable of passive dispersal by wind compared to some other odonates which habitually swarm above the canopy (COSEWIC 2008).

The restricted distribution of the species in Ontario and its apparent small population sizes, mean that it is vulnerable to local extirpation due to the potential for one weather-related event or one human-caused incident to eliminate an entire population. These factors could also mean limited genetic variability in Ontario, leading to less resilient populations.

Although the riffle/rapid habitat preferred by the Rapids Clubtail may be locally distributed on river systems, odonate surveys indicate that a number of other rivers in southern Ontario appear to provide suitable habitat. Examples include the Ausable, Bayfield, Beaver, Bighead, Black, Boyne, Clyde, Crowe, Eramosa, Fall, Gananoque, Ganaraska, Grand, Indian, Mad, Madawaska, Maitland, Moira, Napanee, Nith, North Saugeen, Nottawasaga, Ottawa, Petawawa, Rideau, Rocky Saugeen, Salmon, Skootamatta, Speed, Sydenham, Tay, Trent and Indian Creek (as reported by Harris

and Foster in COSEWIC 2008, from various sources). However, as the species has so far not been found in these rivers, there is an apparent but unknown sensitivity to specific habitat features.

The lack of understanding of the reasons for the limited distribution, small populations and habitat sensitivity of the Rapids Clubtail is a serious limiting factor to protection and management.

### **1.6 Threats to Survival and Recovery**

Human activities which are altering the natural river and forest habitat required by this species are a threat to its survival. Such activities include: dam construction, which eliminates rapids; shoreline alteration; pollution from industrial, residential, agricultural or road-salting activities; removal of shoreline forests for agriculture or urban development; introduction of exotic species such as predatory fish; road development or more and faster traffic, which increases roadkill; and climate change, which produces warmer or altered levels of river waters (Massachusetts Division of Fisheries and Wildlife 2008). All of these threats are imminent or ongoing in the species' southern Ontario range, where development is ubiquitous and where shoreline management is largely conducted by private landowners.

The promotion and development of hydro-electric projects which dam rivers could have major negative impacts on the habitat required by this species. Similarly, the loss of natural shoreline habitat across southern Ontario, and forests in general, is a serious impediment to the recovery of the species.

Current conditions at three of the four sites where the Rapids Clubtail was found will make survival or recovery there a challenge. Habitat degradation due to rapid urbanization including pollution, sedimentation, impoundment and loss of shoreline forest has been most serious in the Credit and Thames watersheds, where the species has not been seen recently (Harris and Foster 2006), but is also an issue in the Humber watershed (D. Sutherland pers. comm. 2009). The Credit River watershed is highly urbanized, with the majority of the forest cover removed and water quality impaired by surrounding development. The South Thames River watershed has only 11 percent forest cover remaining and the Humber River watershed has just 17 percent (COSEWIC 2008). The Mississippi River sites are surrounded by good forest cover. Lowered water quality is a probable factor in explaining the apparent disappearance of the species at the Credit River site (D. Sutherland pers. comm. 2009).

### **1.7 Knowledge Gaps**

Over half of the rivers with potentially suitable habitat in southern Ontario have been visited at the appropriate time of year (June) by odonatists (COSEWIC, 2008). While other Gomphid dragonflies have been found, the Rapids Clubtail, which can be easily

## Recovery strategy for the Rapids Clubtail in Ontario

detected by experienced surveyors, has not been observed. The complete distribution pattern of the species in Ontario, and the reasons for this pattern, are therefore obvious knowledge gaps. More inventory work might find more locations, but the species is obviously not widespread in Ontario, suggesting a habitat specialization which is not clearly understood (Cuthrell 2000).

Given the small and inconspicuous nature of the species, the knowledge required in finding and identifying it, and the relatively small (but growing) number of persons in Ontario who make a practice of recording odonates, there are major knowledge gaps in the distribution of the Rapids Clubtail in even the four rivers where it has been found.

Specific details about the biology of the species, such as main prey, length of time spent as adult and as nymph and post-emergence dispersal are lacking (Massachusetts Division of Fisheries and Wildlife 2008).

Surveying for the Rapids Clubtail by non-experts is hampered by the lack of an inventory protocol for the species.

### **1.8 Recovery Actions Completed or Underway**

No specific recovery efforts for the Rapids Clubtail have been reported to date. However, ongoing work by conservation authorities and municipalities across the province to improve and maintain water quality/quantity will help to protect the habitat needed by this species and will be integral to any natural or assisted recovery. Such projects include water quality/quantity sampling and monitoring, shoreline protection and erosion prevention, benthos sampling and monitoring and landowner stewardship programs.

Similarly, the landscape analysis to identify areas for protection being done by municipalities and conservation groups, and the designation of significant wildlife habitat and significant woodlands under the Provincial Policy Statement by municipalities will help recovery of the Rapids Clubtail.

Legislation to restrict cosmetic pesticide use in Ontario may also improve the situation for the Rapids Clubtail and other insects.

Basic distribution patterns of the Rapids Clubtail in Ontario were deduced by various observers, including Paul Pratt on the Thames River, Paul Catling on the Mississippi River, and Allan Harris and Robert Foster in a 2005 inventory of various rivers done for the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessment and status report. Other odonatists make regular outings and provide records to the Atlas of Ontario Odonata database maintained by the Natural Heritage Information Centre (NHIC), OMNR, Peterborough. Their work helps to determine the distribution of the species.

## 2.0 RECOVERY

### 2.1 Recovery Goal

The recovery goal is to ensure the long-term survival of Rapids Clubtail in the province by protecting existing populations and by restoring populations in appropriate habitat where feasible.

### 2.2 Protection and Recovery Objectives

Table 1. Protection and recovery objectives

No.	Protection or Recovery Objective
1	Protect, maintain and improve habitat in the four rivers in Ontario where Rapids Clubtail has been found.
2	Implement a monitoring program for the locations where Rapids Clubtail is known to exist.
3	Conduct additional inventory for Rapids Clubtail in suitable habitat.
4	Initiate research to address knowledge gaps for Rapids Clubtail.

## Recovery strategy for the Rapids Clubtail in Ontario

### 2.3 Approaches to Recovery

Table 2. Approaches to recovery of the Rapids Clubtail in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
<b>1. Protect, maintain and improve habitat in the four rivers in Ontario where Rapids Clubtail has been found.</b>				
critical	short-term	Protection	<b>1.1</b> Develop a habitat regulation to protect the habitat at the known locations of the species	<ul style="list-style-type: none"> <li>• habitat loss and degradation at the identified locations</li> </ul>
necessary	short-term	Assessment, Stewardship, Education and Outreach, Communications	<b>1.2</b> For the lands surrounding the known sites: <ul style="list-style-type: none"> <li>– determine land ownership and review current management plans and practices</li> <li>– review development proposals for adjacent and nearby lands</li> <li>– develop and implement supportive education, awareness and stewardship programs</li> </ul>	<ul style="list-style-type: none"> <li>• habitat loss and degradation at the identified locations</li> </ul>
necessary	ongoing	Protection	<b>1.3</b> In order to mitigate negative impacts at the known locations: <ul style="list-style-type: none"> <li>– work with municipalities to mitigate impacts from land use change</li> <li>– work with municipal road maintenance departments regarding salting, road construction, sedimentation mitigation, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• habitat loss and degradation at the identified locations</li> </ul>
<b>2. Implement a monitoring program for the locations where Rapids Clubtail is known to exist.</b>				
critical	ongoing	Monitoring and Assessment	<b>2.1</b> Develop and implement a Rapids Clubtail monitoring program to be conducted by qualified personnel at the known locations (see Appendix 1 for an outline of such a program)	<ul style="list-style-type: none"> <li>• all threats</li> </ul>



## Recovery strategy for the Rapids Clubtail in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
<b>3. Conduct additional inventory for Rapids Clubtail in suitable habitat.</b>				
necessary	ongoing	Inventory	<b>3.1</b> Conduct an inventory program for Rapids Clubtail prioritized by historic locations, other sites on the known rivers, and other suitable rivers	<ul style="list-style-type: none"> <li>• Unknown current distribution</li> </ul>
necessary	ongoing	Inventory	<b>3.2</b> Include information on Rapids Clubtail in ongoing benthic inventory programs in rivers across the province	<ul style="list-style-type: none"> <li>• Unknown current distribution</li> </ul>
necessary	ongoing	Inventory	<b>3.3</b> Engage dragonfly volunteers to undertake surveys (e.g., field naturalist clubs)	<ul style="list-style-type: none"> <li>• Unknown current distribution</li> </ul>
<b>4. Initiate research to address knowledge gaps for Rapids Clubtail.</b>				
necessary	long-term	Research	<b>4.1</b> Determine why Rapids Clubtail appears to occur naturally in only a few of the many apparently suitable rivers in Ontario	<ul style="list-style-type: none"> <li>• Lack of understanding of current distribution</li> </ul>
critical	long-term	Research	<b>4.2</b> Investigate the sensitivity of Rapids Clubtail to various habitat features to determine which are critical for survival and to prioritize threats	<ul style="list-style-type: none"> <li>• Lack of understanding of habitat specialization and sensitivity</li> </ul>
necessary	long-term	Research	<b>4.3</b> Carry out research on basic biology, such as prey, duration of life stages and post-emergence dispersal	<ul style="list-style-type: none"> <li>• Lack of information on basic biology</li> </ul>
critical	short-term	Inventory, Monitoring and Assessment	<b>4.4</b> Develop protocols for inventory and monitoring of Rapids Clubtail populations (see Appendix 1 for suggested protocol components)	<ul style="list-style-type: none"> <li>• Lack of inventory and monitoring protocols</li> </ul>

## 2.4 Area for Consideration in Developing a Habitat Regulation

*Under the ESA 2007, a recovery strategy must include a recommendation to the Minister of Natural Resources on the area that should be considered in developing a habitat regulation. A habitat regulation is a legal instrument that prescribes an area that will be protected as the habitat of the species. The recommendation provided below by the recovery strategy author will be one of many sources considered by the Minister when developing the habitat regulation for this species.*

Due to the limited known distribution of the Rapids Clubtail in Ontario, and until such time as we can determine if, in fact, the species is restricted to just four rivers, it is recommended that the area prescribed as habitat in the habitat regulation include only the locations where the species has been found in the four rivers. Although there have been no sightings at two of these locations for several years, the Thames River population could persist undetected (P. Pratt pers. comm. 2009). The Credit River location should also be included for the future possibility that potential limiting factors such as water quality and quantity, exotic predators and riparian habitat changes in the river will improve. At such time the Rapids Clubtail population may re-establish itself or could be re-introduced to this location.

Each location is described below:

1. Credit River: Between Dundas Street West and Burnhamthorpe Road West in Mississauga;
2. Thames River: On the 17<sup>th</sup> Line north of Putnam, from the bridge 800 metres in either direction;
3. Humber River: Between Nashville Road at Kleinburg and King Road West at Bolton;
- 4a. Mississippi River at Pakenham: From the ball diamond at the south end of town north to include two sets of rapids and quiet water north of the Pakenham Bridge on Kinburn Sideroad;
- 4b. Mississippi River at Blakeney: From Blakeney Road at the bridge, north to include the rapids plus quiet water below the rapids.
- 4c. Mississippi River at Almonte: From Main Street West at the bridge, downstream including the rapids and the quiet waters below the rapids.

At each location, the area prescribed as habitat should include the section of the river containing the rapids, the pools below the rapids, plus the wooded shores on either side, extending inland to include any forest which is within 800 metres of the shoreline. It has been observed that Rapids Clubtail females' range extends up to 800 metres into the forest adjoining the river (Walker 1958). For the purposes of this recommendation, a forest is a deciduous or mixed, mature forest stand (P. Catling pers. comm. 2010, see Glossary for definition).

In addition, if the Rapids Clubtail is discovered at any new locations, the habitat regulation should be revised to extend protection to these sites.

## GLOSSARY

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): The committee responsible for assessing and classifying species at risk in Canada.

Committee on the Status of Species at Risk in Ontario (COSSARO): The committee established under section 3 of the *Endangered Species Act, 2007* that is responsible for assessing and classifying species at risk in Ontario.

Conservation status rank: A rank assigned to a species or ecological community that primarily conveys the degree of rarity of the species or community at the global (G), national (N) or subnational (S) level. These ranks, termed G-rank, N-rank and S-rank, are not legal designations. The conservation status of a species or ecosystem is designated by a number from 1 to 5, preceded by the letter G, N or S reflecting the appropriate geographic scale of the assessment. The numbers mean the following:

- 1 = critically imperilled
- 2 = imperilled
- 3 = vulnerable
- 4 = apparently secure
- 5 = secure

*Endangered Species Act, 2007* (ESA 2007): The provincial legislation that provides protection to species at risk in Ontario.

Extirpated: Eliminated from a portion of its range.

Forest: A community with tree cover greater than 60 percent.

Gomphid: Belonging to the dragonfly Family Gomphidae.

Mature forest: A forest dominated by species which are replacing themselves and which are likely to remain an important component of the community if it remains undisturbed.

Odonate: A member of the Order Odonata (Dragonflies and Damselflies).

Odonatist: An expert or enthusiast of odonates.

*Species at Risk Act* (SARA): The federal legislation that provides protection to species at risk in Canada. This act establishes Schedule 1 as the legal list of wildlife species at risk to which the SARA provisions apply. Schedules 2 and 3 contain lists of species that at the time the act came into force needed to be reassessed. After species on Schedule 2 and 3 are reassessed and found to be at risk, they undergo the SARA listing process to be included in Schedule 1.

## Recovery strategy for the Rapids Clubtail in Ontario

Species at Risk in Ontario (SARO) List: The regulation made under section 7 of the *Endangered Species Act, 2007* that provides the official status classification of species at risk in Ontario. This list was first published in 2004 as a policy and became a regulation in 2008.

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## Recovery strategy for the Rapids Clubtail in Ontario

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Walker. E.M. 1958. The Odonata of Canada and Alaska. Volume 2. University of Toronto Press.

### Authorities consulted:

Paul Catling, Research Scientist and Curator, Biodiversity, Agriculture and Agri-food Canada

Robert Foster, Northern Bioscience

Allan Harris, Northern Bioscience

Colin Jones, Project Zoologist, Natural Heritage Information Centre, OMNR

Paul Pratt, Head Naturalist, Ojibway Nature Centre

Don Sutherland, Zoologist, Natural Heritage Information Centre, OMNR

## APPENDIX 1. COMPONENTS OF AN INVENTORY PROTOCOL FOR RAPIDS CLUBTAIL

### Scope

In southern Ontario, inventories should target clear, cool, medium to large rivers with wooded shorelines, gravel shallows and muddy pools, particularly rivers where Rapids Clubtail has previously been recorded. A list of rivers and specific locations where the species might occur should be developed.

### Timing

Searches should occur on warm, sunny, low-wind days between mid-May and mid-July.

### Location and Method

It is recommended to search with binoculars for adults perched on rocks in the rapids. Shoreline rocks and vegetation should be searched for exuviae of nymphs (P. Catling pers. comm. 2009). Searches for Rapids Clubtail nymphs in benthic sampling programs should be included.

### Protection

At sites where Rapids Clubtail is known or suspected, nymphs which are buried in the bottom of muddy pools should not be disturbed. Benthic sampling in muddy pools at these locations should not be undertaken (P. Catling pers. comm. 2009).

### Identification

Clubtails are unique among the dragonflies in having eyes that are separated from each other. As the name suggests, Clubtails have an enlarged tip on the end of the abdomen, giving it a club-like appearance. Adult Rapids Clubtails may be distinguished from other similar species by the following characteristics: More prominent club, less yellow on the abdomen and completely black legs. Females have more yellow spotting on the abdomen (Massachusetts Division of Fisheries and Wildlife 2008, New York Natural Heritage Program 2009).

Confirmation of identification requires capture and in-hand examination. Adults can be identified using the keys in Walker (1958) and by the illustrations in Jones et al. (2008). Nymphs can be identified by using characteristics of the labium as per the keys in Walker (1958) and Soltesz (1996).

Contact the MNR to determine if a permit is required under the *Endangered Species Act, 2007* to conduct sampling and identification protocols.



Figure 3. Rapids Clubtail male larva (COSEWIC 2008, from Walker 1932)