

PROPOSED

Species at Risk Act
Recovery Strategy Series

Recovery Strategy for Forked Three-awned Grass (*Aristida basiramea*) in Canada

Forked Three-awned Grass



November 2006



Parks
Canada

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Canada

Canada

About the *Species at Risk Act* Recovery Strategy Series

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

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

What is recovery?

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

What is a recovery strategy?

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

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

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

What’s next?

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

The series

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

To learn more

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

**Recovery Strategy for Forked Three-awned Grass
(*Aristida basiramea*) in Canada (Proposed)**

November 2006

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Additional copies:

You can download additional copies from the SARA Public Registry (<http://www.sararegistry.gc.ca/>)

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RESPONSIBLE AUTHORITIES

Development of the recovery strategy for Forked Three-awned Grass was led by the Parks Canada Agency on behalf of the competent minister (the Minister of the Environment). Forked Three-awned Grass occurs in Québec and Ontario, and the following governments and Aboriginal group cooperated in the production of this recovery strategy:

- Beausoleil First Nation
- Province of Québec
- Province of Ontario
- Canadian Wildlife Service (Ontario and Québec)

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PREFACE

The *Species at Risk Act* (SARA, Section 37) requires the competent minister to prepare recovery strategies for listed extirpated, endangered or threatened species. The Forked Three-awned Grass was listed as Endangered under SARA in January 2005. The Parks Canada Agency led the development of this *Recovery Strategy*. All other responsible jurisdictions reviewed and acknowledged receipt of the strategy (Beausoleil First Nation, the Canadian Wildlife Service, the Province of Québec, and the Province of Ontario). The proposed strategy meets SARA requirements in terms of content and process (Sections 39-41). It was developed in cooperation and consultation with the Canadian Wildlife Service (Ontario and Québec) and the Beausoleil First Nation.

STRATEGIC ENVIRONMENTAL ASSESSMENT

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

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits.

Overall, this strategy will have positive effects not only on the target species but also on the environment as a whole. Establishing protected areas where *Aristida basiramea* is found will help protect most other species found on those lands. Increased education and awareness of landowners may also have an overall positive effect on the environment by increasing stewardship activities.

While this recovery strategy will clearly benefit the environment, several potentially adverse effects were also considered. The adverse environmental effects include:

- Damage and/or destruction of non-target plant species, during research and monitoring as a result of trampling. For example, the white-tinge sedge (*Carex albicans* var. *albicans* (= *C. artitecta*)), a species listed as S2 in Ontario (6 to 20 occurrences) and noted in 2003 in close proximity to the Forked three-awned grass at GBI) (Parks Canada Biotics, 2005);
- Damage and/or destruction of nesting sites, residences, or habitat of animal species including species at risk, during research and monitoring as a result of trampling. For example, spotted turtle (*Clemmys guttata*) (Endangered), although not recorded since 1974 in GBI NP, could nest in the habitat where *A. basiramea* occurs);
- Disturbance of animal and bird species during monitoring by presence of researchers in area; and

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- Damage and/or destruction of non-target species and habitat during prescribed burning, especially invertebrates.

The potential adverse environmental effects on non-target species during research and monitoring can be mitigated by determining exactly what other species are in the area and ensuring that any research and monitoring is done at times or in locations that will avoid or minimize disturbance to other sensitive species or their habitats. Annual burning could have adverse effects if conducted in areas where there are species sensitive to fire. If the habitat of the Christian Island population is to continue to be burned annually, then a determination of the other species occurring in this area should be completed to make certain that other non-target species are not adversely affected. Follow-up monitoring is recommended for any burning that is done to enhance forked three-awned grass habitat.

The majority of the known populations of Forked Three-awned Grass in Canada occur on Beausoleil First Nation lands. Concern has been expressed by Beausoleil First Nation regarding the amount of responsibility that will be placed on them to protect the species. The adverse socio-economic effects and appropriate level of responsibility will be examined in more detail at the action plan stage.

EXECUTIVE SUMMARY

The Endangered Forked Three-awned Grass, also called Ice Age Grass, (*Aristida basiramea*) is an annual grass found in dry, open, acidic sand barrens, but the species will exploit weedy habitats associated with these sites, such as roadside ditches and old fields. It is highly intolerant of shading and competition from other plants.

Less than 1% of the global population of *A. basiramea* occurs in Canada, with the core range in the Midwestern United States. In Canada, *A. basiramea* is currently known from five naturally occurring sites: Cazaville in southwestern Québec; and Christian Island, Beausoleil Island, Anten Mills, and Macey Lake, all in the southern Georgian Bay area of Ontario. Total number of plants in Canada is estimated to be >150,000; most of the population occurs at only four sites and total occupancy (all sites) is about 20 km². The largest population is that at Christian Island, where it was documented in 2005 as occurring in 15 sub-populations totaling over 100,000 individuals.

Habitat availability and associated ecological processes are the most important limiting factors for the species in Canada. Threats include limited habitat, sand extraction, succession and absence of ecological processes, development, planting of conifers, invasive species, ATV use, agricultural practices, and garbage dumping. Given the current state of our knowledge, critical habitat for the species cannot be defined precisely enough at this time without further studies. A summary of available knowledge is presented including the types of habitat where the species has been found so far. Unoccupied patches of open sandy soil in the vicinity of occupied ones are considered important habitat. The recovery goal is to maintain self-sustaining populations of *Aristida basiramea* at all the sites where the species is of native origin in Canada, as part of Canada's natural heritage, and as a fulfillment of the government of Canada's commitments to protect biodiversity. The recommended approach is to protect habitats, on a site-by-site basis, as follows:

- Georgian Bay Islands National Park, Beausoleil Island: park management and zoning.
- Macey Lake: cooperative work with private landowners and the municipality on stewardship.
- Anten Mills: cooperative stewardship and exploration of other tools.
- Christian Island: 1) cooperative work with Beausoleil First Nation on stewardship and 2) outreach and dialogue with owners of Certificate of Possession lands.
- Cazaville: 1) consideration to make a designation such as *Habitat Floristique* or natural reserve on private lands under the Québec's legislation ; 2) education and outreach to private landowners on stewardship actions..

Knowledge Gaps are:

- 1) Locations of other potential populations in the Southern Georgian Bay region.
- 2) Population dynamics, trends and viability, the importance of the soil seed bank.
- 3) Factors which maintain critical habitat in sand barrens: the role of fire and other processes which clear ground. This study is needed to define critical habitat.

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- 4) Traditional Native knowledge about the history of Ice Age Grass.

Action plans will be prepared within four responsibility areas: Province of Ontario, Province of Québec, Parks Canada Agency, and Beausoleil First Nation. Many starting points for the development of action plans are listed in the strategy. Actions already underway or completed are listed in Appendix 1.

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1. SPECIES INFORMATION

Common Name: Forked Three-awned Grass

Scientific Name: *Aristida basiramea*

Assessments Summary:

COSEWIC Status: Endangered

Reason for Designation: Few disjunct and fragmented populations found in very small habitats within populated areas subject to further habitat disruption and loss through activities such as sand extraction, recreational use and urban development.

Canadian Occurrence: Ontario and Québec

COSEWIC Status history: Designated Endangered in November 2002. Assessment based on a new status report.

1.1 Background

1.1.1 Species Information

Forked Three-awned Grass, or Ice Age Grass (*Aristida basiramea*) is an annual grass that grows in tufts. It has extremely narrow leaves (1 mm wide) which often have the margins curled inward, and wiry stems which reach 30-60 cm in height. Plants branch at the base and only sparingly above. The inflorescence is 10-20 cm long, borne at the end of erect stems. The glumes (two tiny bracts around at the base of the spikelets) each have a single vein and are unequal in length with the second being the longer. One of the bracts (i.e. lemma) subtending individual fruits has three awns: two relatively short lateral ones which are erect, and a longer middle awn which is coiled at the base and which sticks out at a divergent angle (Gleason and Cronquist, 1991). The species is late-developing, with flowering and fruit-set occurring from late August through October (COSEWIC, 2002).

1.1.2 Global Distribution and Canadian Range

The disjunct distribution of Canadian populations of *A. basiramea* is believed to be a relict of past climates. There is also the suggestion that the distribution of the species may be associated with the migration of Aboriginal peoples. The core range of the species is in the Midwestern United States, and less than 1% of the global population of *A. basiramea* occurs in Canada (Figure 1). The species has never been known to be more common in Canada. Only five sites have been discovered in Southern Ontario and Southern Québec since 1975.

A. basiramea is currently known from five naturally occurring sites: one in southwestern Québec and four others in Ontario in the southern Georgian Bay area (Table 1). A population

discovered in 2001 in the Rainy River District of Ontario (COSEWIC 2002), believed to be introduced in gravel brought in to repave the road, did not persist (Wasył Bakowsky, pers. comm. 2005, 2006), and no typical natural habitat is present in the environs (Michael Oldham, pers. comm., 2005).

The species currently has the following conservation rankings¹:

- G5 globally (NatureServe 2005).
- N4 in the United States (NatureServe 2005)
- N1 in Canada (NatureServe 2005)
- S1 in Ontario (Oldham 1999)
- S1 Québec (NatureServe 2005; Barbeau and Brisson, 2004)

It has been designated as “Endangered (not regulated)” on the Species at Risk in Ontario list, and is recommended for designation as “menacée” (threatened), the highest level of concern under Québec provincial legislation.

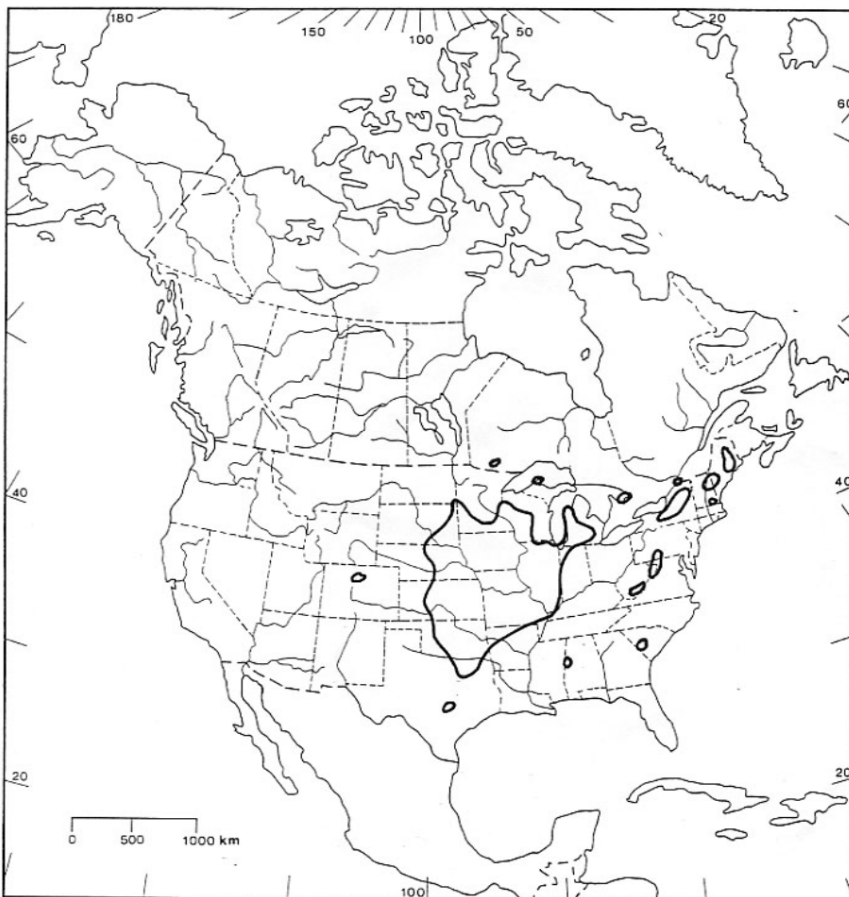


Figure 1. Global range of *A. basiramea* (from COSEWIC, 2002)

¹ N1—Critically imperiled at the national level; N4—uncommon to locally common apparently secure nationally; S1—Critically imperiled at the provincial level; G5—stable, not at risk. See NHIC, 2005 for details.

1.1.3 Population Size and Trend

As of fall 2005, the total number of plants in Canada is estimated to be in excess of 100,000, likely between 150,000 and 300,000. Most of the population occurs at only four sites and total occupancy (all sites) is about 20 km² (Table 1, COSEWIC, 2002, Jones 2005). The largest population is that at Christian Island, where it was documented in 2005 as occurring in 15 sub-populations totaling over 100,000 individuals (Jones 2005). Because the majority of sites have only been known since 2001, it is not yet possible to determine if change is occurring in population size or geographical distribution. Also, because the species is an annual, the size of its populations have large yearly fluctuations.

Table 1. Characteristics of *A. basiramea* occurrences in Canada.

Site name (Province)	Land ownership	Number of subpopulations and area of occupancy ¹	Total number of plants (2005) ²
Anten Mills (Ontario)	Privately owned by 2 or 3 owners, but one subpopulation under a conservation easement since 2004	1 population in 4 patches in 2002; not known how many still remain	< 100
Beausoleil Island (Ontario)	Georgian Bay Islands National Park	1 population; area of occupancy 100 x 50 m.	> 1500
Macey Lake (Ontario)	Privately owned by more than one owner; part is designated a provincial area of natural and scientific interest (ANSI)	>1 subpopulation; total area unknown	>10,000
Cazaville (Québec)	Privately owned by many owners; two lots in municipal control	6 subpopulations within 15 km ²	> 10,000
Christian Island (Ontario)	Beausoleil First Nation: community-owned land, as well as Certificate of Possession lands	At least 15 subpopulations within about 4 km ²	> 100,000

¹ A subpopulation at Cazaville is equivalent to an element occurrence (EO) (See Barbeau and Brisson (2004) for a definition), while those at other sites aggregate to form one EO at each.

² Numbers in COSEWIC (2002) were updated in 2005.

1.1.4 Biologically Limiting Factors

A. basiramea is a very late-maturing annual, flowering in late August-September and setting fruit in September-October. It has been suggested that reproduction is naturally limited by the arrival of the end of the growing season, and that this climatic factor may also determine how far north the species is able to grow (COSEWIC, 2002). It has been speculated that climate is a limiting factor for *A. basiramea* in Québec since there is some suitable habitat north of the existing population of Cazaville (Line Couillard, pers. comm. 2005). Interference with the ecological processes required by the species to maintain populations or to colonize new areas may also be limiting factors. Availability of suitable habitat is considered the number one limiting factor for this species in Canada. See next section as well as 1.1.9 Threats.

1.1.5 Habitat Requirements

A. basiramea requires areas of sandy, open ground. It appears to be highly intolerant of shading and competition from other plants (COSEWIC, 2002). Barbeau and Brisson (2004) report that the species prefers areas where there is an average of 33% bare ground, and little other woody or herbaceous vegetation in the immediate surroundings. The species is found in open sand barrens, sandy forest openings and sandy fallow fields, as well as on the sandy edges of roads and trails. The pH of the substrate is presumably acidic.

All five of the Canadian sites with *A. basiramea* are on sand barrens on relict post-glacial shorelines or dunes. Barbeau and Brisson (2004) infer that the Cazaville area was originally a woodland of white pine (*Pinus strobus*) where a fire regime kept patches of ground in an open state, up until colonization, when the white pines were cut and the area cleared.

In Michigan the species is known from dry, open sandy ground (Voss, 1972), specifically sandy open areas in oak woodlands or oak barrens (Penskar, pers. com. 2005). In the Great Plains region it is reported from “roadsides, pastures and waste ground” (McGregor, et al., 1986). These differing reports show a presence in both natural habitats and habitats altered by human use.

Natural disturbance processes are important for this species. Ecological processes that maintain sandy habitat in an open, barren state are considered habitat requirements. Fire may be required to create and maintain open, barren ground to sustain *A. basiramea* at some of the sites. For example, Beausoleil First Nation has conducted annual prescribed burns for years at one of their main sub-populations, as part of the maintenance of a baseball field. This low-intensity burning has successfully maintained a high quality sand barren in which *A. basiramea* thrives. At Georgian Bay Islands National Park there has been a historic role of fire in the ecosystem, but that role is not clearly understood yet (Quenneville, pers. comm. 2006). Drought and wind-throw of trees may also be naturally-occurring processes which help maintain open ground. Shoreline processes such as ice scours and changing lake levels may also play the same role.

Many sites on Christian Island where *A. basiramea* now grows were once ploughed fields. Whether or not a similar disturbance today would be able to create suitable habitat is unknown, as other species have been introduced that may prevent *A. basiramea* from early colonization of newly disturbed ground.

Historically, *A. basiramea*'s habitat may not necessarily have been maintained at any one spot by fire or other disturbances, but rather was maintained by being present within the overall landscape. Suitable habitat is an early successional vegetation type which once grew on naturally disturbed sites, colonizing when there was disturbance, gradually disappearing with the filling in of vegetation, and then reappearing somewhere else in the landscape after a new disturbance. This kind of regime has been documented for bur oak savanna on Manitoulin Island, Ontario (Jones, 2000). Since we may no longer have the natural dynamics that created suitable habitat on a landscape scale, recovery must look at maintaining the habitat that currently exists.

1.1.6 Residence Description

Damaging or destroying the location of individual plants of *A. basiramea* will automatically damage or destroy the individuals, so there is no need for a description of residence for this species to enforce the general prohibitions of the *Species at Risk Act*.

1.1.7 Ecological Roles

The ecological role of the species has not been studied. Allred (2001) reports that quail and small mammals eat small amounts of the seed. Presumably *A. basiramea* could provide late season food or cover for insects preparing to over winter. As well, it may have some role in colonization or stabilization of dry, open substrates of coarse texture.

1.1.8 Importance to People

A. basiramea occurs at two locations where people of Beausoleil First Nation have lived (Christian and Beausoleil Islands). The possibility of a cultural link should be investigated as it may shed light on the origin or maintenance of key populations of the species in Canada. In addition, *Aristida basiramea* occurs at several sites of cultural significance to Beausoleil First Nation.

A. basiramea is not known to have any economic significance.

1.1.9 Threats

Habitat availability is considered the most important limiting factor for the species in Ontario. Nearly all threats to *A. basiramea* (Table 2) are threats to habitat, and with only five known sites, any habitat loss is extremely serious.

In addition to the threats to habitat described below, it is not known whether global climate change would affect this species. *A. basiramea* grows in high light and heat conditions, in dry substrate, with lots of exposure. As well, other species present in the habitat (especially *Danthonia spicata*) are similarly adapted. Therefore, it is difficult to speculate whether climate change would hinder or help *A. basiramea* until more is known about future conditions.

Table 2. Threats to *A. basiramea* populations and habitat, and their severity at individual sites

Threat	Anten Mills	Beausoleil Island	Cazaville	Christian Island	Macey Lake
Limited habitat	High	High	Low	Low	High
Sand extraction	None	None	High	None	None
Succession & absence of ecological processes	High	Low	Low	Low	Medium
Development	High	None	None	Medium	None
Planting of conifers	High	None	Low	Low	None
Invasive species	Low	Low	Low	High	Medium
ATV use	Low	None	Medium	Low	Medium
Agricultural practices	None	None	Low	None	None
Garbage Dumping	High	None	High	Medium	High

Sources: Jones 2005, Barbeau and Brisson 2004, COSEWIC, 2002; and personal observations of Recovery Team members.

Limited Habitat

There is very little habitat currently available which fulfills the open, barren, sandy requirements of the species in Ontario. Sand barren vegetation communities in Ontario are critically imperiled and ranked S1 or S2 by Ontario's Natural Heritage Information Centre (NHIC) (Bakowsky, 1996). In Québec, the Cazaville site is the only large sand opening in Southwestern Québec (Barbeau and Brisson, 2004). Further loss of suitable open sandy habitat continues to occur through fire suppression, changing shoreline processes, succession, and several other threats, explained below.

Sand Extraction

Open sandy areas are often suitable places for commercial extraction of sand. Sand extraction destroys both habitat and plants, although the disturbed open ground created by the process can be suitable habitat for the species after the fact (COSEWIC, 2002). Sand extraction is currently occurring at two of six Cazaville subpopulations (Barbeau and Brisson, 2004).

Successional Changes and Absence of Ecological Processes

Plant succession and eventual formation of forest canopy causes naturally open areas to become unsuitable for the species. The habitat of *A. basiramea* would normally be only early successional vegetation, although open habitat can be maintained for many years by fire, drought, shoreline processes such as ice scours and changing lake levels, or other natural

disturbance. In the absence of these ecological processes, habitat becomes too densely vegetated and unsuitable. Successional changes are visible at all sites.

Development

While some human disturbance has proved beneficial to the species by creating new open substrate, development damages and destroys habitat. Building and driveway construction eliminate open ground. Landscaping may cover barren patches and introduce invasive species. Human occupation of sandy areas also results in an increased need for fire suppression. Subdivision development (2003-2004) caused the loss of the majority of the Anten Mills population. Subdivision development may threaten other recovery habitat in the Simcoe County, Ontario area due to the rapid expansion of the nearby communities of Barrie and Wasaga Beach. Residential construction may threaten one subpopulation at the Macey Lake site. Results from a recent survey of the species on Christian Island (Jones 2005) indicate a moderate level of threat to the species from development or associated activities, especially where *A. basiramea* occurs in open spaces in and adjacent to the village.

Planting of Conifers

Since the 1920s many programs have sought to stabilize soils that are highly susceptible to wind erosion and improve barren ground. Plantations of conifers, ultimately becoming closed canopy stands, have eliminated previously suitable habitat at Anten Mills and at Cazaville (occurrence #2). Efforts to plant conifers continue to be a threat at Cazaville while at Anten Mills the continuing growth and closing-in of the forest canopy is further reducing the amount of open ground (COSEWIC 2002; Barbeau and Brisson, 2004).

Invasive species

Several invasive species have been reported in the habitat of *A. basiramea* including:

- Glossy Buckthorn (*Rhamnus frangula*)
- Scot's Pine (*Pinus sylvestris*)
- Spotted Knapweed (*Centaurea maculosa*)
- White Sweet Clover (*Melilotus alba*)
- Mouse-Ear Hawkweed (*Hieracium pilosella*)
- Sheep Sorrel (*Rumex acetosella*)

These species have the potential to quickly take over and vegetate the open ground that *A. basiramea* requires. Scot's Pine in particular was noted to be spreading quickly at the Macey Lake and Anten Mills sites (COSEWIC, 2002). Spotted Knapweed is a dominant now on the periphery of the Macey Lake population (Gary Allen, pers. comm. 2005) and White Sweet Clover is spreading on Christian Island (Gary Allen, pers. comm. 2005). Mouse-ear hawkweed blankets the ground in open spaces between grass tufts (prime spots for *A. basiramea* growth), destroying the suitability of much habitat on Christian Island (Jones, 2005). Based on current knowledge, the threat of invasive species may be a key issue in habitat suitability. Studying the use of burning and other tools to mitigate the effects of invasive species on *A. basiramea* will be addressed in Action Plans.

All Terrain Vehicle (ATV) Use

Light use of ATVs may keep sandy habitats open and provide suitable habitat for the species; however, ATVs also trample plants and damage vegetation. At Cazaville, four out of six subpopulations have ATV trails through them. The increase in use and the number people riding off-trail threatens both plants and their habitats. (Barbeau and Brisson, 2004). The degree of ATV use at other sites is not known.

Agricultural Practices

Most of the Cazaville site is surrounded by agricultural operations, and some of the Cazaville subpopulations are on fallow fields, testimony to agricultural use in the past. An area of formerly suitable habitat was leveled and worked up in 2003 for planting in 2004 (Barbeau and Brisson, 2004). The area of one of the main populations at Christian Island was used both for crops and pasture in the past. None of the known *A. basiramea* sites is currently used as pasture, however, grazing by livestock sometimes causes introduction of weeds, reductions of native species presence, and is considered a threat to other naturally open habitats (Jones and Jalava, 2005; Reschke et al. 1999). Although some protection for the Macey Lake site is given in the Tiny Township Official Plan, agricultural use is not excluded (The Planning Partnership, 2000).

Dumping of Garbage

Natural barren lands often carry the misconception that they are waste land where indiscriminate usage does not matter. People do not see sand barrens as having the same beauty as a forest. This misconception can spur human-caused damage and destruction. In particular, barren grounds often become places for clandestine dumping of garbage.

1.1.10 Knowledge Gaps

1. Recent discoveries of the species in the vicinity of Awenda Provincial Park (Fall 2005) are sub-populations of the Macey Lake site. However, these discoveries suggest there may be other sites in the Southern Georgian Bay area of Ontario, especially on other sandy islands and small sandy patches occurring randomly in the landscape. In spite of the fact that the region has historically been relatively well botanized, the species develops late in the growing season and does not fruit until late September, a time when comparatively less botanical work happens. A survey needs to be conducted for *A. basiramea*, in suitable habitat, at the time when it is most easily detected.
2. Little is known about the species' population dynamics, trends and viability, particularly the role of the soil seed bank. Several sites were only discovered in 2001, and most populations have not been re-surveyed since that time, so new data needs to be collected. This will be addressed by a monitoring program.
3. There is a need for better understanding of ecological processes involved in maintaining habitat availability for the species. What is needed to maintain good quality habitat? Is controlled burning needed? What is the fire history and what were natural fire cycles like

at these sites? Will other, more mechanical (anthropogenic) methods of clearing ground be sufficient? Monitoring the removal and reintroduction site at Christian Island will only begin to fill this knowledge gap.

4. Is there traditional Native knowledge or history about this species? It could be important to know if there is a link between Native land use (historical and current) and the current distribution of *A. basiramea*, because it may show how the species came to be where it is, as well as whether some land use practices are beneficial to maintenance of the species.

2. RECOVERY

2.1 Recovery feasibility

Recovery of *A. basiramea* in Canada is determined to be feasible because the species meets all four necessary conditions (Environment Canada 2005), as described below.

- 1) The presence of dense growth of *A. basiramea* in localized areas suggests that individuals are capable of reproducing at a rate sufficient to improve population sizes and potentially, population growth rate. Furthermore, the presence of adventive populations in the eastern United States indicates that the species is able to grow and survive even if the seeds arrive in only marginal dry, open terrain.
- 2) The species' habitat in Canada has been described as "dry open sand barrens, on low, sand ridges or dunes, located on post-glacial shorelines" (COSEWIC 2002). The availability of that type of habitat can be limited by overgrowth of vegetation and is assumed to be maintained by recurrent fires or drought. More habitat can be made suitable by creating open ground in sandy areas adjacent to existing populations.
- 3) Significant threats to the species such as sand extraction, changes brought by vegetation succession, permanent habitat losses (through development), conifer plantations, and invasive species (COSEWIC 2002) can be effectively avoided or mitigated through (1) the use of management and stewardship actions to protect and improve habitat; and (2) research and monitoring to support conservation and management decisions.
- 4) Many techniques exist that can contribute to the recovery of this species. While these techniques have not yet been tested on *A. basiramea*, they have proven effective in conservation of other annual plant species in similar habitats (see for example Pavlik 1993).

2.2 Recovery goal

Considerations:

- 1) The few populations of *Aristida basiramea* occurring in Canada form the northern limit of the species' distribution in southern Ontario and Québec. The species is widely distributed in the United States where its status is secure in most states. However, in some of the U.S 'outliers', i.e. New York and New Hampshire, it is considered as S1 or S2 (Oldham 2002).
- 2) There is no evidence that the distribution of the species has diminished or that the number of populations has declined in Canada due to direct or indirect human activities in recent history. However, at least one population has been greatly reduced by housing development in the past few years, and is on the verge of extirpation. Also, the species occurs in Canada as naturally disjunct populations believed to be relicts of past climates,

or possibly related to migration of aboriginal peoples. This makes the species of conservation, cultural, and scientific interest.

- 3) The species has shown an ability to colonize disturbed sites.
- 4) There is no specific knowledge about the dynamics of the species' populations, especially of the soil seed bank, so their long-term viability cannot be assessed.

The conditions stated above do not warrant actively extending its distribution range in Canada, but augmenting local populations may be needed.

The recovery goal for the species is therefore:

*“To maintain self-sustaining populations of *Aristida basiramea* at all the sites where the species is of native origin in Canada.”*

Even with good potential for mitigating threats, because habitat for *A. basiramea* is naturally extremely rare and fragmented, the species may still meet COSEWIC criteria for endangered or threatened species in 2012 when its status will be reassessed. However, it is hoped that the species will be downlisted to “special concern,” if there is evidence that recovery factors have combined to ensure the species' security. Criteria for this assessment could include recovery measures implemented with success, no significant loss in area of occupancy, and ideally, discoveries of a significant number of new occurrences. See 2.7 Evaluation, below.

2.3 Recovery Objectives

- I. *A. basiramea* persists in its natural habitat at the five known sites where the species is thought to be of natural origin², with population sizes remaining viable for the next 10 years and beyond.
- II. Measures necessary to avoid and mitigate threats to the species and its habitat are identified and mitigation has begun by 2007. These would include a range of tools for consideration.
- III. Research and monitoring of a high scientific standard to document and assess habitat requirements, population trends and viability have started in at least two populations by 2007.
- IV. Educational material necessary to foster good stewardship of the species and its habitat are prepared and distributed to target audience(s) by 2007.

² Possibly including ancient introductions by Aboriginal people.

2.4 Approaches to Meet Recovery Objectives

The recommended approach to address threats to the species in Canada is to protect habitats, with site-specific protection measures. The range of tools to be considered include protective park zoning, acquisition, cooperative stewardship with private landowners, conservation easements, *Habitat Floristique* designation, and educational communications (Appendix 1).

2.4.1 Beausoleil Island Population

The Beausoleil Island site in Georgian Bay Islands National Park is the only site with legal protection. Park management is currently (December, 2005) discussing the type of protective zoning and management to be put in place for the site to increase the protection for the species, and a proposal to rezone will be made through the Parks Canada Agency park management planning process. This rezoning will require public consultation (Andrew Promaine, pers. comm. 2005). A detailed census and maps of the population and supporting vegetation communities were completed in October 2005 and will serve as a benchmark for monitoring. Given the apparent slow pace of vegetation succession occurring on the site, this population of *A. basiramea* is likely to remain stable for the next 10 years without any intervention.

2.4.2 Macey Lake Population

The Macey Lake site contains privately owned land as well as land in municipal jurisdiction. Part of the site is within a provincially significant Area of Natural and Scientific Interest (ANSI), the Macey Lake Bog ANSI, and is within 120 m of the Macey Lake Bog Provincially Significant Wetland (PSW) (COSEWIC, 2002, Hanna, 1984). The official plan for Tiny Township treats provincially significant ANSIs, PSWs, and the 120 metres adjacent to PSWs, as “Environmental Protection One.” Permitted uses on lands with this designation are limited to conservation and passive recreational uses. No buildings, structures, or any site alteration are permitted in this designation. The habitat of species designated Threatened or Endangered by COSEWIC and OMNR is also treated as Environmental Protection One. However agricultural use is not excluded (The Planning Partnership, 2000).

Cooperative work with the private landowners and the municipality to develop stewardship plans is the preferred option for this site.

2.4.3 Anten Mills Population

At Anten Mills, one of the three subpopulations is under a conservation easement held by the Nottawasaga Valley Conservation Authority (NVCA). The landowner is a co-signatory of the Conservation Easement Agreement on the property.

The easement prohibits subdivision of land, placement or construction of buildings or structures of any kind, placement or dumping of fill or refuse, grading or altering the land, or harvesting or removal of vegetation except by NVCA in consultation with MNR (David Featherstone, pers. comm. 2005). The landowner is aware of the easement, but there has been little contact between NVCA and the landowner. The easement covers part of an open area between the subdivision

and a municipally-owned recreational trail. It is uncertain whether the easement adequately protects the immediate habitat of the sub-population, which may be used by anyone in the subdivision and possibly by users of the adjacent trail. The recommended approach for this sub-population is active stewardship, including informative signage.

From a site inspection in October 2005, it is believed that the other two subpopulations at Anten Mills (which occurred in the area that was degraded during construction) are almost certainly extirpated (Allen and Nantel 2005). In the case that there is any habitat intact, the recommended approach is cooperative stewardship and possibly conservation easements with private landowners under the direction of NVCA. Reintroduction of the species to other proximal areas should also be considered.

2.4.4 Christian Island Population

Christian Island is part of the Beausoleil First Nation reserve. The accomplishment of the Beausoleil First Nation in protecting and preserving the natural values of their lands should be recognized since their three islands support some of the best remaining examples of natural habitat on the southern Georgian Bay coast (Sharp and Associates Inc. 2003).

In Spring 2005, Beausoleil First Nation Chief and Band Council enacted a Band Council Resolution to protect the parts of the *A. basiramea* population which are on community-owned land (Melvin King, pers. comm. 2005). On May 9th 2006 Chief and Council enacted another Band Council Resolution approving this Recovery Strategy. They also have planned a complete biodiversity inventory of all reserve land (King 2005).

A detailed survey of *A. basiramea* on the island was completed in September 2005 (Jones 2005). It indicates that the main threats to the species on Christian Island are the successional closure of its open habitat, and the filling-in of the gaps between grass tufts with other species, especially the weeds mouse-ear hawkweed (*Hieracium pilosella*) and sheep sorrel (*Rumex acetosella*). There is probably some level of threat to the patches of the species that are around some houses and in some open spaces in the village. The species is not found at many houses or driveways, but the open areas where it is found are places that people may want to use in the future for activities such as construction, storage of vehicles, boats, stacking of firewood. Since *A. basiramea* remains present in the village despite years of human use, this threat currently seems low, and it will be difficult to separate the level of activity which is a threat, from the disturbance level which benefits the dispersal and growth of the species.

In the past, the site of one subpopulation at Christian Island was burned annually when band members cleaned up the baseball diamond in the spring. If band members are agreeable to burning, a stewardship plan which continues the annual burning in the surrounding habitat is recommended, especially as this would allow further research on the use of burning as a management tool. Areas for burns may need to be rotated to ensure that other species are not adversely impacted over the long term (e.g., insects, reptiles,).

The recommended approaches at Christian Island are:

- 1) To continue to work cooperatively with Beausoleil First Nation Chief and Council on stewardship that makes sense for both the species and the community members.
- 2) To foster stewardship by owners of Certificate of Possession lands, through outreach and dialogue.
- 3) To respect any culturally sensitive sites when conducting field surveys or monitoring.

2.4.5 Cazaville Population

At Cazaville, two approaches are recommended. One is to give the site a designation (such as *Habitat Floristique*, under Québec's provincial legislation) which would give the habitat some protection in the official land use plans of the three municipalities in the area. The second approach is to provide educational information to private landowners, and later to work with landowners on stewardship actions, including erecting barriers to ATVs and installing interpretive signage.

2.5 Mitigation Measures

On Christian Island, a translocation experiment was done at the site of the new recreation centre. In May 2005, sod containing a known patch of *A. basiramea* that would have been lost was translocated about 150 metres away. During the summer, the translocated sod (with associated seed bank) sustained a large number of plants of *A. basiramea* that developed well, and were bearing seeds by September. The species' adaptation to soil disturbance makes removal and reintroduction an appropriate mitigation measure when no other alternative exists and done at a small scale. The translocated patch at Christian Island will continue to be monitored.

Because the species grows on sand, the effort needed to maintain soil integrity for each plant during transportation, and the risk of decreasing survival rates, makes transplantation of individual seedlings and larger plants less appropriate. However, seed collection and seeding at another location would be a reasonable alternative to translocating sod and soil in emergency cases. (It should be stressed that translocation is for "emergency situations" only, and that recovery objectives for *A. basiramea* work towards persistence in its natural sand barren habitat, and protection and management of such communities.)

Finally, creating open, bare, sandy ground adjacent to current populations may work as an emergency measure to promote species growth. On Christian Island, *A. basiramea* was more abundant in the newly disturbed ground next to the translocation than it was in the translocated plot itself.

2.6 Critical Habitat

Although some of the environmental characteristics of *A. basiramea*'s habitat are well documented, critical habitat for the species cannot be defined precisely enough at this time without further studies.

Habitat that is known to be occupied can be mapped relatively easily. However, because no habitat model for the species exists, it is currently impossible to accurately predict where suitable 'potential habitat' and 'apparently unoccupied habitat' (i.e., suitable sites that contain viable seed bank) might occur. Moreover, because the number of individuals that constitute a viable population is not known, the size and spatial configuration of habitat patches which could support such populations cannot be determined. Because of such important knowledge gaps, it is recommended that the species' critical habitat be identified and delineated in future action plans, after the appropriate studies have been conducted.

In the interim, recovery planning for the species in Canada could consider the available knowledge summarized below.

The types of habitat where the species has been found so far are:

- Sandy barrens on relict dunes and shorelines from post-glacial lake/sea levels;
- Dry, open, un-shaded sandy areas with patches of bare ground exposed;
- Patches of sand and sandy verges of roads and trails through openings in woodlands and conifer plantations; and
- Sandy fallow fields and abandoned sand pits.

These habitats are usually dominated by poverty grass (*Danthonia spicata*), often with panic grass (*Panicum acuminatum* var. *implicatum*), ensheathed dropseed (*Sporobolus cryptandrus*) and sheep sorrel (*Rumex acetosella*).

Processes which maintain the openness of the area and the patches of bare ground are considered essential. A burning regime may be needed to clear debris and maintain prime sand barren conditions. Yearly burning has proven to be beneficial at Christian Island. However, it should be noted that very little is understood about the fire history, fire cycle, and the general dynamics of ecological processes in *A. basiramea* habitat. Until further study is done, the precise need for fire and other ecological processes cannot be defined.

In the absence of fire or other natural disturbance, anthropogenic intervention may be needed to maintain critical habitat. In some cases, human disturbance that clears ground and provides new bare sand has proved beneficial to this species. In parts of the Macey Lake site, plants have colonized disturbed ground adjacent to natural habitat, and at Cazaville, plants have colonized old sand quarries. At Anten Mills the species is present along margins of old tote roads and trails.

Unoccupied but suitable habitat patches are also important for population maintenance for several reasons. First, *A. basiramea* is an annual, and population sizes and even presence/absence may fluctuate from year to year. Consideration should be given to sand barrens where the species may disperse, or where it may be present in the ground as seed bank, even if there are no living plants. Second, the species' preferred micro-habitat is an open sand substrate which can shift and blow, causing some natural movement of colonies (including loss and re-colonization) over a period of time. This means the species may move in and out of an area as conditions allow, but may not be present all the time. Finally, adjacent sandy habitat which may be overly vegetated

(presently unsuitable) could be considered as potential habitat because it may become suitable through disturbance which creates bare ground (fire, blow-downs, etc.).

Therefore, critical habitat for recovery should include unoccupied sandy openings adjacent to current populations/sub populations and sandy areas with somewhat grown-in vegetation adjacent to current populations. Areas which are not included in the definition of Critical Habitat could become Critical Habitat if *A. basiramea* moves into them after a new disturbance.

Critical Habitat will be identified after completion of the schedules of studies below. Results of these studies will be shared with each jurisdiction responsible to produce an Action Plan as described under section 47 of the *Species at Risk Act*. The identification of Critical Habitat for *Aristida* in no way implies that such areas become “no touch” zones, where human use is not encouraged. Rather, some human activities may be entirely appropriate in the habitat, and in fact, in some cases, may be deemed necessary to perpetuate the desired site conditions.

2.6.1 Schedule of Studies Needed to Determine Critical Habitat

Fall 2006	Beausoleil Island. Study and characterize habitat and vegetation community type (which differs from the other <i>Aristida</i> sites by being dominated by <i>A. basiramea</i> and <i>Cladonia</i> lichens (Gary Allen, pers comm. 2005)) Survey newly discovered part of site. (Largely completed; full completion expected Fall 2006)
2006/2007:	Analyze previously mapped relict shorelines in Simcoe County, Ontario to locate areas where additional populations and potential habitat could exist.
2006/2007:	Identify and map suitable / potential habitat around Macey Lake. Pending landowner permission, survey locations for other subpopulations.
2007/2008:	Survey areas identified from analysis to see if other populations (including seed banks) and/or suitable habitat are present. In particular, investigate colonization of disturbed sites and old sand quarries. This will improve understanding of habitat requirement.
Once <i>A. basiramea</i> is officially listed in Québec (2008?):	Map suitable but apparently unoccupied habitat at Cazaville: Analyze previously mapped relict shorelines in SW Québec to locate areas where additional populations and potential habitat could exist; Survey these areas.

Studies on the role of fire and other ecological processes which maintain the openness of habitat will be part of future action plans.

2.6.2 Description of Activities to Meet Objectives

Table 3 lists the recommended steps to achieve the recovery objectives.

Table 3. Steps to Address Threats and Effect Recovery

#	Priority	Obj. #	Broad Approach	Threats Addressed	Specific Steps	Anticipated Results
1	Urgent	II, I	Analysis	All	Assess threats and level of urgency at all sites	Action plans can target most urgent threats first
2	Urgent	III	Monitoring	All	Design and implement a monitoring program for all sites	Changes in populations are trackable; emergency intervention is possible
3	Urgent	III	Research	All	Complete studies to determine critical habitat	Establish legal protection for species and habitat
4	Urgent	IV	Protection	Limited habitat, Dumping of Garbage	Inform Municipality of Tiny Township of species presence	Maintain population
5	Urgent	I, II	Protect, Conserve and Recover Populations	All	Assess best options for protection, conservation and recovery of individuals and habitats for <i>A. basiramea</i> on a site by site (or subpopulation) basis	Appropriate agreements and protocols can be planned
6	Urgent	II, I	Protect, Conserve and Recover Populations	All	Evaluate how best to address concerns and mitigate threats at culturally significant sites, potential development sites, or sites with other identified threats	Site-appropriate solutions can be worked out
7	Urgent	II, I	Protect, Conserve and Recover Populations	All	Establish any necessary agreements, SARA permits or protocols to address these concerns	Necessary agreements and protocols in place for protection and recovery of the species
8	Urgent	I	Policy	Succession	Apply protective park zoning to Beausoleil Island site	Enhanced management attention possible
9	Urgent	III, IV	Define target audience for stewardship discussion	All	Look up contact information for all Cazaville landowners	Contact with landowners becomes possible

#	Priority	Obj. #	Broad Approach	Threats Addressed	Specific Steps	Anticipated Results
10	Urgent	IV	Stewardship	Development Sand Extraction Dumping of Garbage ATV use Conifers Agriculture	Prepare informative materials for Cazaville landowners	Increased awareness of species and habitat; landowners become interested in stewardship
11	Urgent	II, I, IV	Stewardship	ATV use	Work with private landowners to erect barriers to ATV use by trespassers	Maintain habitat quality
12	Urgent	II	Policy and Legislation	Development Sand Extraction Conifers Agriculture	Designate the species as threatened in Québec	Legal protection for species; Steps 13 and 14 become possible
13	Urgent	I	Policy	Development Sand Extraction ATVs Dumping of Garbage Agriculture	In consultation with appropriate stakeholders, consider using an appropriate designation for Cazaville site such as <i>Habitat Floristique</i> or <i>Natural Reserve on Private Land</i>	Protection during the land use planning process
14	Urgent	IV, I	Policy	Development Sand Extraction Dumping of Garbage Agriculture	Consult and liaise with municipalities at Cazaville to assure protection of the species in official plans	Protection during the land use planning process
15	Urgent	IV	Stewardship	ATVs Dumping of Garbage Conifers Invasive spp.	Meet with landowner about stewardship of Anten Mills easement	Active stewardship visible to surrounding community
16	Urgent	III	Stewardship	ATVs Dumping of Garbage Conifers Invasive spp.	Assess whether any other subpopulations still exist at Anten Mills	Cooperative stewardship can be put in place
17	Urgent	I, III	Research, Knowledge gaps	Limited Habitat, Development (habitat loss)	Analyze mapped relict shoreline areas and survey these areas for other potential populations of <i>A. basiramea</i>	Distribution of <i>A. basiramea</i> and critical habitat better understood

#	Priority	Obj. #	Broad Approach	Threats Addressed	Specific Steps	Anticipated Results
18	Urgent	IV	Stewardship	ATV's, Dumping of Garbage	Contact utility companies about <i>A.</i> <i>basiramea</i> presence in corridors on Christian Island	Appropriate management can be put in place
19	Necessary	I	Management	Succession	Prepare management plans for Beausoleil Island site	Site managed to maintain habitat
20	Necessary	II, I	Policy and Legislation	Development Sand Extraction Conifers	Legally regulate <i>A.</i> <i>basiramea</i> under <i>Endangered Species</i> <i>Act</i> in Ontario	Legal protection for species and habitat
21	Necessary	III, I	Research and Management	Limited Habitat Succession	Study fire history of sites and controlled burning as possible habitat improvement tool	Determine if burning may be needed
22	Necessary	III, I	Research, Evaluation	All	Use monitoring data to determine if size of populations are changing	Results of recovery efforts known
23	Beneficial	III, II	Management	Conifer Plantations	Assess age of conifer plantations for possible harvest	Increased open habitat available

2.7 Evaluation

- 1) Once a monitoring program is in place (Objective III), a measurable criterion of recovery will be no significant decline in population size and no local extirpation (Objective I).
- 2) Some policy-oriented forms of protection will be in place by 2008 (Objective I), including any of the following: legal regulation or listing of the species by the provinces of Québec and Ontario, recognition of species and supporting habitat in municipal level planning approvals, protective park zoning, *Habitat Floristique* or *Natural Reserve on Private Land* status for the Cazaville site (under Québec's legislation), etc.
- 3) Definition of critical habitat should be completed by 2008 (Objective III).
- 4) There should have been some direct contact with all private landowners and at least the presence of the species and its habitat should be known to them, by 2007 (Objective IV).
- 5) Threats to the populations and habitats have begun to be addressed in 2006 (Objective II).
- 6) Research initiated and development, testing, and monitoring of draft protocols for high priority protection and recovery begun by 2008 (Objective III).

2.8 Development of Action Plans

Because there are several jurisdictions involved, with different species at risk legislation, regulations, policies, and priorities, it is recommended that each jurisdiction prepare the following action plans under its respective legislation or program by June 2009, subject to the availability of funding or other required resources:

Table 4. Responsibility for Action Plans

Action Plan	Jurisdiction	Targeted Population(s) or Site(s)
1	Province of Ontario (Ministry of Natural Resources), Nottawasaga Valley Conservation Authority, Municipality of Tiny Township	Anten Mills Macey Lake
2	Province of Québec (Ministère du Développement durable, de l'Environnement et des Parcs)	Cazaville
3	Parks Canada Agency	Beausoleil Island
4	Beausoleil First Nation Environment Canada	Christian Island

Recovery Implementation Groups (RIGs) could be formed and given the task of implementing action plans, with the *Aristida* Recovery Team playing an advisory role and providing a forum for sharing knowledge and experience.

Recovery actions already underway or completed are listed in Appendix 1.

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APPENDIX 1. ACTIONS ALREADY COMPLETED OR UNDERWAY

- 2001
- Ontario sites surveyed and documented by Ontario Ministry of Natural Resources (OMNR)
- 2002
- Status report compiled for COSEWIC recommended Endangered
 - Species designated Endangered by COSEWIC, November 2002
 - Conservation easement put in place for part of Anten Mills population
- 2003
- Cazaville site surveyed and documented for Québec Ministry of Environment
 - *A. basiramea* added to the Species at Risk in Ontario (SARO) List as Endangered
- 2004
- Report on status of the species in Québec compiled for Québec Ministry of Environment; S1 ranking recommended
 - The species recommended for listing as *menacée* (highest status) by Québec Advisory Committee on Endangered Flora
- 2005
- *Aristida basiramea* listed “Endangered” in Schedule 1 of SARA (January 12th)
 - Christian Island population reexamined by Environment Canada (EC), OMNR, and Beausoleil First Nation (BFN); additional subpopulations noted in proximity to former ball diamond population
 - Environment Canada began working with Beausoleil First Nation to address concerns regarding *Aristida basiramea* and its occurrence on or adjacent to culturally significant sites.
 - BFN Band Council resolution designated two band-owned *Aristida* sites for conservation
 - Draft Federal Recovery Strategy prepared
 - Consultation with Anten Mills site owners and one Macey Lake owner in preparation for regulation of the species as Endangered in Ontario
 - Discussions in progress for zonation of Beausoleil Island population within Georgian Bay Island National Park
 - Christian Island habitat documented and surveyed for further subpopulations. Vegetation community type, extent, quality also mapped (September 2005)
 - Vegetation community documented at Beausoleil Island site; monitoring of populations begun (October 2005)
 - Consultation begun with Beausoleil First Nation (October 2005)
- 2006
- Habitat Stewardship Program funded project to begin the protection of the Cazaville population

- Anten Mills landowners contacted in preparation for regulation of the species as Endangered in Ontario
- Beausoleil First Nation enacts Band Council Resolution approving Forked Three-awned Grass Recovery Strategy.

APPENDIX 2: JURISDICTION RESPONSES



**Acknowledgement of Receipt of the Proposed
Recovery Strategy for the Forked Three-awned Grass (June 2006)
by the Ontario Ministry of Natural Resources
on behalf of the Province of Ontario**

This proposed Recovery Strategy for the Forked Three-awned Grass has been prepared in cooperation with the members of the Forked Three-awned Grass Recovery Team, Beausoliel Island First Nation, Canadian Wildlife Service, Ministère du Développement durable, de l'Environnement et des Parcs (Québec) Ontario Ministry of Natural Resources (OMNR) and led by Parks Canada Agency. It represents advice to the OMNR on the recovery goals, approaches and objectives that are recommended 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 committee 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

Received by:

Cameron Mack

Director, Fish and Wildlife Branch
Natural Resource Management Division
Ontario Ministry of Natural Resources

On behalf of the Province of Ontario

Date: August 10, 2006

Species at risk – act today so they have tomorrow