

COSEWIC
Assessment and Status Report

on the

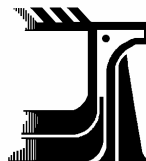
Forked Three-awned Grass
Aristida basiramea

in Canada



ENDANGERED
2002

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA



COSEPAC
COMITÉ SUR LA SITUATION
DES ESPÈCES EN PÉRIL
AU CANADA

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

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Cover illustration:
Forked three-awned grass — Provided by the author from Mohlenbrock, 1973.

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COSEWIC Assessment Summary

Assessment Summary – November 2002

Common name

Forked three-awned grass

Scientific name

Aristida basiramea

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.

Occurrence

Ontario and Quebec

Status history

Designated Endangered in November 2002. Assessment based on a new status report.



COSEWIC
Executive Summary

Forked Three-awned Grass
Aristida basiramea

Species information

This tufted, wiry-stemmed annual grass grows erect to 30 to 60 cm. It has very narrow leaves (1 mm wide), and terminal fruiting clusters 5-10 cm long that feature long bristly awns. The glumes (lowest bracts around the spikelet) have a single vein and they are unequal in length, the second being longer than the first. It characteristically branches freely at the base, sparingly so above.

Distribution

The species is endemic to North America, with a range that is primarily mid-western, with outliers west to Colorado, south to Texas, east to Maine, and north as far as the Upper Peninsula of Michigan. The Canadian range is restricted to southern Ontario and southern Quebec, where it is known from five extant naturally-occurring sites. In addition, it is known from one adventive station in northwestern Ontario, near Fort Frances, Rainy River District.

Habitat

In the US the species occurs in rare habitats such as pine barrens, but can also tend to more weedy habitats, such as roadsides, pastures and waste ground. In Canada, native populations appear to be restricted to dry, open, acidic sand barrens, but the species will exploit weedy habitats associated with these sites, such as roadside ditches and old fields. The five native Canadian populations occur on low, sand ridges or dunes, associated with post-glacial shorelines of Algonquin or Nipissing age (12,000 and 5,000 years B.P. respectively).

Biology

The *Aristida* genus is chiefly of subtropical and warm temperate climates in both hemispheres, where the more than 300 species prefer dry, sterile, or sandy soil. In North America the genus is most abundant in the arid regions. Although apparently the hardiest member of its genus, habitat and soils may be limiting *Aristida basiramea* in Canada, since the dry, open sand barrens habitat used by the species in Ontario and Quebec is limited, and in Ontario at least does not occur commonly in the Georgian Bay

area north of the known locations. *A. basiramea* is not currently known natively north of the northern Upper Peninsula of Michigan (approximately 48 degrees latitude).

Population sizes and trends

Forked Three-awned Grass appears to be a species that has always been extremely rare in Canada, at least in recent times. Through this long history of botanical exploration, a total of only five naturally-occurring stations have been discovered for the species, all in two of the most intensively botanized regions of the country, southern Ontario and southern Quebec. Other populations may yet be discovered. The species is difficult to find because of its inconspicuous nature, its very late flowering and seed set, and because its habitat can be hidden in small sites 'off the beaten track'.

For this species it is impossible to provide population trend data, given that three of the stations were only discovered in 2001, the Christian Island station was only known from a now-extirpated sub-population when last observed in 1981, and the Macey Lake population experienced an explosion in numbers in the last six years through exploiting newly created habitat. The species was never known from any other historical stations, thus offering up no clues to declines.

The total number of plants for the five stations is in excess of 20,000, with the bulk of these at two sites, and the total area of occupancy is less than 3 sq kms. The total extent of occurrence for the five populations is 502 sq kms, and this sand barren habitat is in very short supply, and continues to be shifted to other uses and community types.

The species is rare in three US states, but the number where it is secure is unknown, as no states have ranked it as S4 or S5.

Limiting factors and threats

The species is subject to several limiting factors, the most important of which are the fact that its sand barren habitat is very restricted, fragmented, and in decline; and what little remains is quickly being lost to succession in the absence of natural disturbance regimes, in particular fire, which served to maintain the open character of these barrens.

Special significance of the species

Forked Three-awned Grass is a very low profile species, with no reason to date to be of interest to the public, and for which there is no known special significance.



COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) determines the national status of wild species, subspecies, varieties, and nationally significant populations that are considered to be at risk in Canada. Designations are made on all native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fish, lepidopterans, molluscs, vascular plants, lichens, and mosses.

COSEWIC MEMBERSHIP

COSEWIC comprises representatives from each provincial and territorial government wildlife agency, four federal agencies (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biosystematic Partnership), three nonjurisdictional members and the co-chairs of the species specialist groups. The committee meets to consider status reports on candidate species.

DEFINITIONS

Species	Any indigenous species, subspecies, variety, or geographically defined population of wild fauna and flora.
Extinct (X)	A species that no longer exists.
Extirpated (XT)	A species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A species facing imminent extirpation or extinction.
Threatened (T)	A species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
Not at Risk (NAR)**	A species that has been evaluated and found to be not at risk.
Data Deficient (DD)***	A species for which there is insufficient scientific information to support status designation.

* Formerly described as “Vulnerable” from 1990 to 1999, or “Rare” prior to 1990.

** Formerly described as “Not In Any Category”, or “No Designation Required.”

*** Formerly described as “Indeterminate” from 1994 to 1999 or “ISIBD” (insufficient scientific information on which to base a designation) prior to 1994.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list.



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The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

COSEWIC Status Report

on the

Forked Three-awned Grass

Aristida basiramea

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SPECIES INFORMATION

Name and Classification

Aristida basiramea Engelm. ex. Vasey. The type specimen was collected near Minneapolis, Minnesota by W. Upham in 1883 and published in the Botanical Gazette the following year. *A. basiramea* Englemann var. *curtissii* (A. Gray) was recognized by Shinnery in 1940. Previously it had been described as *A. dichotoma* var. *curtissii* by Asa Gray in 1890, and subsequently as *A. curtissii* by Nash in 1901 (Shinnery, 1940; Vaughn, 1981; The New York Botanical Garden, 2001). In the draft Flora of North America (FNA) treatment by Allred (2001) it is again recognized as *A. dichotoma* var. *curtissii*. In the FNA *Aristida basiramea* is accorded full species status, with a cautionary note from Allred that further study may show that *A. basiramea* and *A. dichotoma* should in fact also be treated as conspecific varieties.

All Canadian collections are referable to the nominate variety, matching the 'long lateral awn' character of *A. basiramea*, and are clearly distinct from *A. dichotoma*. The collection from Cazaville was verified by Stuart Hay; the collection from Rainy River District was verified by M.J. Oldham; that from Anten Mills by M.J. Oldham; the Beausoleil Island collection was determined by Dr. J. Goltz; and the stations at Macey Lake and Christian Island have previously been determined as distinctly *A. basiramea* (Reznicek, 1984).

English common names include: Three-awn, Forked Aristida, Tufted Triple-awn, Forktip Three-awn, Arrowfeather Threeawn, and Branching Needle-grass. The French common name is Aristide.

Description

The generic name is from the Latin *arista*, which means "an awn", while the specific epithet *basiramea* means "branching from base". The species is an annual, usually freely branching at the base, sparingly so above, and reaches 30 to 50 cm in height (Figures 1,4). The culms are wiry and often rough, and grow in tufts or dense clumps. Leaves are flat, 5 to 15 cm long and very narrow (about 1 mm) wide, with rolled-in margins at the tip. The panicle is slender, to 10 cm long, more or less loose, the lower included in the sheaths, which can be smooth or rough. The glumes are prolonged into a very acute point, are 1-nerved and unequal, the second being 1.2 to 1.5 cm long, the first about 2/3 as long. The lemma is rough on the keel and about 1 cm long, excluding the awns. The lateral awns are 5 to 13 mm long, and are erect or spreading, and delicate; while the central awn is divergent, coiled at the base in 2 to 3 loose spirals, 1 to 1.5 cm long, and is often loosely spiraling when dry. The anthers are very reduced and difficult to observe, but when rarely detected are 2.6 to 3.1 mm long and purplish-brown.

In his 1972 key, Voss uses the length of the lemma, the middle and lateral awns, and the length of the glume to differentiate *A. basiramea* from other *Aristida* species.

He notes that the glumes are clearly unequal, the first usually equalling or shorter than the body of the lemma. Allred (2001) differentiates from the very similar *A. dichotoma* on the basis of the length of the lateral awns, with *dichotoma* being 1-4 mm long, and *basiramea* 5-13 mm long.

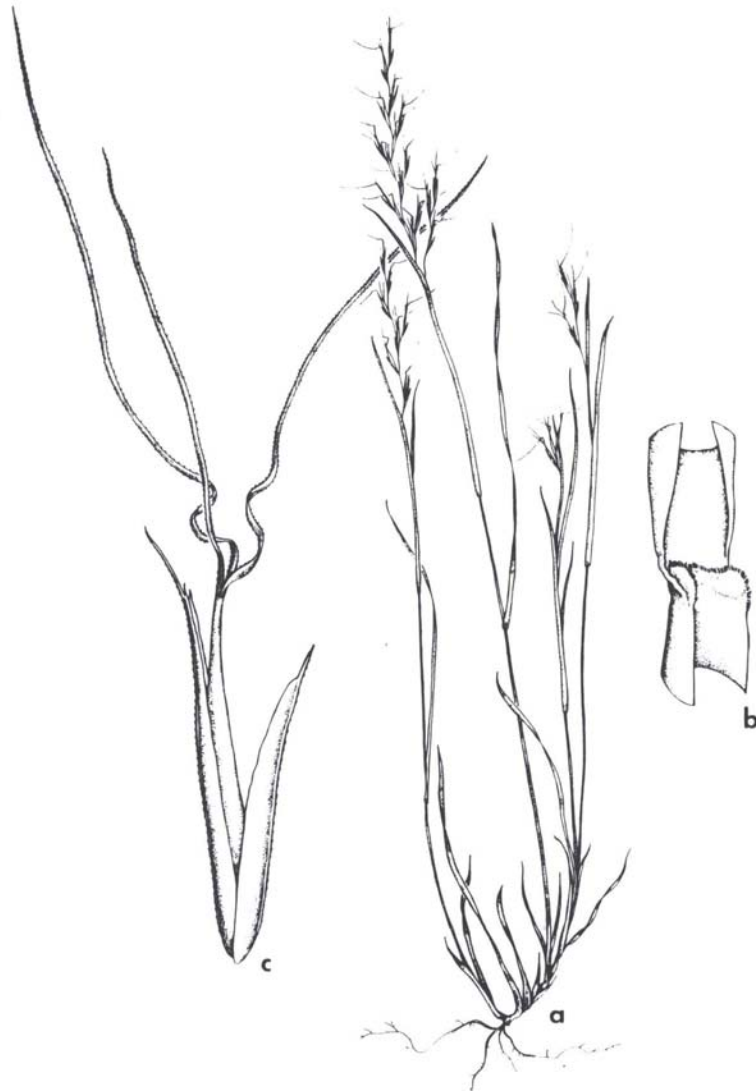


Figure 1. *Aristida basiramea* a. Habit. b. Sheath, with ligule. c. Spikelet. (from Mohlenbrock, 1973).

DISTRIBUTION

Global Range

Aristida is a tropical to warm-temperate genus of 250-300 species. It grows mostly in dry grasslands and savannahs, sandy woodlands, pine barrens; also on rocky hills and highlands, rocky slopes and mesas, and in the mountains to elevations of 3500 metres; in arid deserts, and in open weedy habitats (Henrard, 1929; Allred, 2001).

Aristida basiramea is endemic to North America, with a range that is primarily mid-western, with outliers west to Colorado, south to Texas, east to Maine, and north as far as the Upper Peninsula of Michigan (see Figure 2). In North America it grows in open, sandy, often barren ground (Allred, 2001). Its global rank is G5, defined as “Secure – Common, widespread, and abundant (although it may be rare in parts of its range, particularly on the periphery). Not vulnerable in most of its range. Typically with considerably more than 100 occurrences and more than 10,000 individuals.” (NatureServe, 2001).

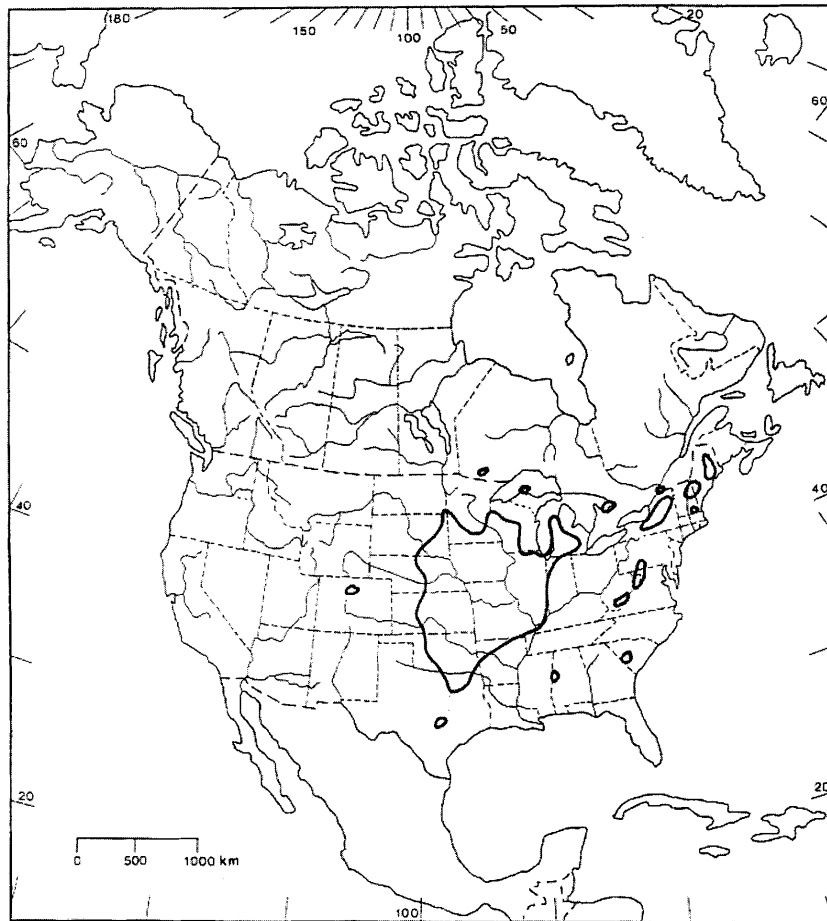


Figure 2. Global distribution of *Aristida basiramea* (updated from Reznicek, 1984).

Canadian Range

The native Canadian range is restricted to southern Ontario and southern Quebec, where *A. basiramea* is known from a total of five extant native populations (Figure 3). One of the Ontario populations supported a sub-population that is now believed extirpated. No historical stations are known for the species, since the 1862 and 1954 records from Ontario, and the 1888 and 1927 reports from Manitoba, have been deemed to be erroneous (see Erroneous Reports).

The extent of occurrence in Canada totals 502 sq kms. The trend in extent of occurrence is unknown since 1975, with insufficient comparative data for the five extant populations, three new populations discovered in 2001, and with one of these soon to be heavily developed.

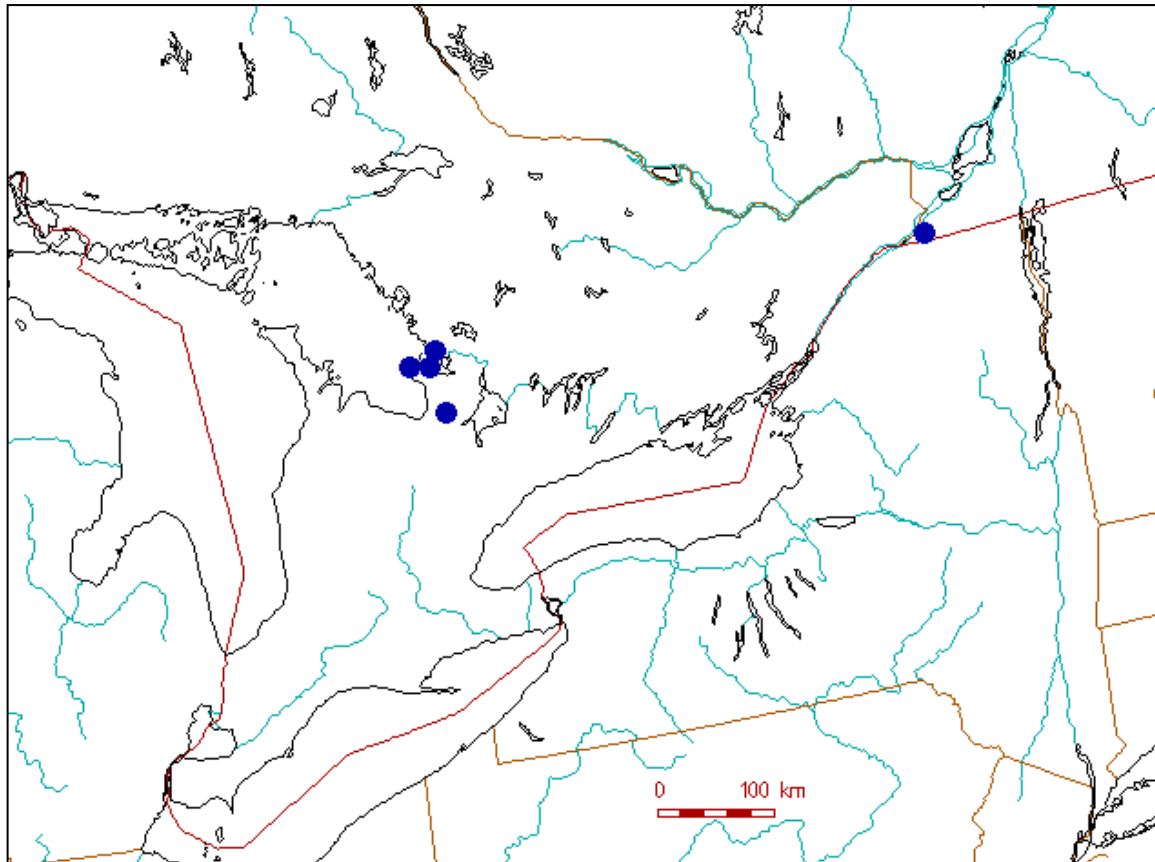


Figure 3. Native Canadian distribution of *Aristida basiramea* (adventive Rainy River District site not mapped).

Extant Populations

Fieldwork was conducted on the Ontario and Quebec sites in 2001 and 2002. In addition, searches were carried out unsuccessfully in Ontario by the author on 16 August 2001 in suitable habitat in the area east of Awenda Provincial Park, from

Toanche, through to Marygrove, and northwest along the sand road to Sawlog Bay. Habitat certainly appeared to be suitable at a couple of sand barren sites in this area, with *Danthonia spicata* dominant. As well, unsuccessful searches were carried out for this report in sand barrens in Oro-Medonte Township and in Springwater Township. Habitats similar to the Cazaville station exist in two other areas in Quebec, Oka and Mirabel, but these areas are located further north, and the Oka site has been intensively botanized over the last ten years. The probability of finding new populations is thus believed to be quite low (Coursol, pers. comm. 2003).



Figure 4. Close-up of *Aristida basiramea* at Cazaville. October 2001 (photo by Frédéric Coursol).



Figure 5. *Aristida basiramea* habitat on the Montée Cazaville. October 2001 (photo by Frédéric Coursol).

Ontario

Macey Lake – Tiny Township, Simcoe County. Discovered by A.A. Reznicek on 20 August 1975, north of Penetanguishene in “dry, bare sand in full sun in a sandy barren area between road and young pine plantation with *Carex rugosperma*, *Panicum depauperatum* and *Sporobolus cryptandrus*”. It was noted as being “Widely scattered and sometimes frequent in the most open areas”. This population was observed in 1995 by A.A. Reznicek, M.J. Oldham, D.A. Sutherland, and G.M. Allen, and was noted by Oldham as “locally abundant”.

Surveyed on 16 August 2001 by G.M. Allen and T. Tully. Main population on level disturbed, dry, loose fine to coarse sand along south shoreline of lake at base of old shoreline Lake Algonquin dunes in association with *Danthonia spicata*, *Panicum implicatum*, *Carex merritt-fernaldii*, *Setaria viridis*, *Agrostis gigantea*, *Plantago lanceolata*, *Echium vulgare*, *Rubus allegheniensis*, *Centaurea maculosa*, and *Polytrichum* sp. On a previous observation in 1995 the species was restricted to the slopes of the old shoreline (Reznicek et al.), but since then the species has moved to the areas disturbed by a peat mining operation, which ceased in 1995. Thousands of plants in a 200 X 60 metre area, with densities in places of a couple of hundred per square metre. Collected (TRTE) and photographed by G.M. Allen (Figures 6,7). Privately owned.



Figure 6. *Aristida basiramea* core population at Macey Lake on disturbed shoreline. 16 August 2001.



Figure 7. *Aristida basiramea* habitat on old shoreline at Macey Lake. 16 August 2001.

Christian Island – Village of Christian Island, Beausoleil First Nation, Tiny Township, Simcoe County. Discovered by A.A. Reznicek on 26 August 1981 on Christian Island First Nations Reserve in “dry, open sand barrens with *Sporobolus cryptandrus* and *Cyperus filiculmis*” (the latter is now called *Cyperus lupulinus*), and was noted as “frequent (60 to 80 plants?), locally a dominant in areas of more or less bare sand”.

The above station, which had been identified precisely on a topographic map by A.A. Reznicek and filed at the ONHIC, was searched for unsuccessfully 9 September 2001 by G.M. Allen, T. Tully, B. Bowles & J. Goltz, and is believed to be extirpated due to either infilling of single family dwellings, succession of the “small area of bare sand”, or both. The investigators continued their search to the northwest of Reznicek’s station and found *Aristida basiramea* only 500 metres distant. In correspondence with Reznicek, it is believed that the colony observed by Reznicek in 1981 was likely larger in extent and more scattered than he had realized, and he did not search the barrens associated with the baseball diamond, which was present in 1978, as observed in air photos.

Village of Christian Island, Beausoleil First Nation, Tiny Township, Simcoe County. Surveyed on 9 September 2001 by G.M. Allen, T. Tully, B. Bowles & J. Goltz. Tens of thousands of plants in open sand over 200 X 50 metre area, and most common in open areas with little competition. Dominant associates are *Danthonia spicata*, *Rumex acetosella*, *Poa compressa*, *Panicum linearifolium*, *Carex muhlenbergia*, *Rudbeckia hirta*, *Solidago nemoralis*, *Carex merritt-fernaldii*, *Agrostis gigantea*, and *Polytrichum* sp.

The site is believed to be located on the post-glacial Nipissing shoreline. Site succeeding to old field with *Rhus typhina* at edges. Collected (TRTE) and photographed by G.M. Allen (Figure 8). Ownership by Beausoleil First Nation.



Figure 8. *Aristida basiramea* station at Christian Island, 9 September 2001.

Beausoleil Island – Georgian Bay Islands National Park, Georgian Bay Township, Muskoka District.

Discovered by Allan Sinclair and Jim Goltz on September 12, 2001. Over 500 plants of *Aristida basiramea* in an open sandy field on Beausoleil Island. The plants were mostly found in two main concentrations but occasional plants were found elsewhere. The plants were found growing in dry open sandy areas with *Panicum* sp., *Rumex acetosella*, *Polytrichum* sp., *Asclepias syriaca*, *Solidago nemoralis*, *Lechea intermedia* and *Cladonia* sp., and grew best where there was little or no competition. The plants were found at two different levels of the old beach shoreline, which is believed to be of Nipissing age, i.e. 4,000 to 6,000 YBP. Collected by J. Goltz (TRT, MICH) and photographed by A. Sinclair. Ownership by Parks Canada.

Anten Mills – Northwest of Barrie in the Village of Anten Mills, Springwater Township, Simcoe County. Discovered 7 October 2001 by G.M. Allen south of the village of Anten Mills where *A. basiramea* was very occasional along edge of the Algonquin Shoreline. Primary population consists of ca. 500 plants in remnant *Danthonia spicata* sand barren community occupying 10 metres X 3 metres. Other prevalent associates are *Panicum implicatum*, *Rumex acetosella*, *Pteridium aquilinum*, *Sporobolus cryptandrus*, *Poa compressa*, *Agrostis gigantea*, *Cyperus lupulinus*, *Asclepias syriaca*, *Verbascum thapsus*, *Hypericum perforatum*, *Carex brevior*. Site is quickly succeeding in with *Rubus strigosus*, *Pinus sylvestris*, and *Rhus typhina*, and *Aristida basiramea* is restricted to open, lightly used tote roads and verges. Two additional sub-populations of a few hundred plants each, and another sub-population of approximately 100 plants were. These sub-populations are quite proximal to the main population, with none more than 0.5 kms distant. Collected (TRTE) and photographed by G.M. Allen (Figure 9). Privately owned.



Figure 9. *Aristida basiramea* remnant habitat amongst conifer plantations on Algonquin Shoreline at Anten Mills. 8 October 2001.

Rainy River District – Discovered on 18 August 2001 by M.J. Oldham and W.D. Bakowsky ca. East of Fort Frances, near Swell Bay, Rainy Lake. Locally common for ca. 50 m along sandy/gravelly roadside. Noted by Oldham as probably adventive at this site, as plants only on roadside. Collected by M.J. Oldham (MICH, DAO, and NHIC).

Quebec

Cazaville (Near the Town of) - Discovered for Quebec by Dr. Jacques Brisson on 20 September 2001 from a sand plain near the Town of Cazaville, municipality of Saint-Anicet, Le Haut-Saint-Laurent M.R.C., close to the USA border. In October 2001, Frédéric Coursol, accompanied by A. Meilleur, visited the site and surrounding area. They documented 6 sub-populations around Cazaville in an area of less than 1 km². In October 2002, Coursol again visited the area, concluding that there were 11 sub-populations supported, totalling an estimate of more than 10,000 plants. This population seems to be indigenous since a good part of it occupies a natural sand barrens environment, located on a post-glacial shoreline, where other provincially rare plants are found. The *Aristida* has also invaded disturbed sandy openings on the periphery of the site, including old fields and roadside ditches. *Danthonia spicata* was prevalent at the station, with prevalent associates being *Poa compressa*, *Agropyron repens*, *Rubus alleghaniensis*, *Cyperus houghtonii*, *Cyperus lupulinus* subsp. *macilentus*. Collected by F. Coursol and deposited at MT. Verified by Stuart Hay. Photographed by F. Coursol (Figures 4,5). Private ownership by hundreds of different people.

Population counts/estimates for 6 of the 11 sub-populations at Cazaville, as recorded by F. Coursol October 2001, are as follows:

Montée Cazaville	>1000 plants
Montée Smith	<100
Ridge Road	>1000
Montée Currie	300
Montée Currie	200
Montée Cazaville	500 to 1000
	Approximate total estimate for all 11 sub-populations: >10,000

Erroneous Reports

There is a report on file at the Ontario Natural Heritage Information Centre (ONHIC) indicating an 1862 collection of *A. basiramea* from Hamilton. The information is based upon label data taken from an Ontario Ministry of Natural Resources (OMNR) Central Region Rare Species Mapping Project Data Sheet (Riley et al., 1992), which states “Hamilton, at the beach” and “in water at beach”. There was no abundance or exact locational data noted with the record, and the population is believed by the ONHIC to be erroneous (pers. comm. M.J. Oldham 2001). Such a herbarium sheet was never observed by A.A. Reznicek, when preparing the map for Argus & Keddy (1984).

The record made in 1954 by J.M. Cruise from Long Point, “in dry beach dune 2.7 km west of the lighthouse”, was rejected based on “label error” by Reznicek in 1984 when compiling the Rare Plant Atlas, and by Reznicek and Catling in their Flora of Long Point (1989). It was reported by Cruise at the time under the name *Aristida intermedia* (Cruise, 1969), and was the only collection ‘known’ from Ontario until Reznicek’s discovery north of Penetang in 1975. Cruise’s record never seems to have been observed post-1954.

Aristida basiramea has been reported from Manitoba (Macoun in 1888, Shimek in 1927); however, both the Flora of Manitoba (Scoggan, 1957) and the Flora of Canada (Scoggan, 1978-1979) exclude the species from the Manitoba flora. Given the age of the reports, the likelihood of misidentification, and the fact that they have never been confirmed, the Manitoba Conservation Data Centre will be updating their species rank from SU (status unknown) to SRF (reported falsely) (Greenall, pers. comm. 2003).

HABITAT

Habitat Requirements

In the US, the species occurs in rare habitats such as pine barrens, but can also tend to more weedy habitats, e.g. its citation in the Flora of the Great Plains (McGregor et al., 1986) as “roadsides, pastures and waste ground”. Allred (2001) notes that the

presence of *Aristida* frequently indicates soil disturbance or abuse. In Ontario and Quebec it appears to be restricted to dry, open sand barrens, which occur on low, sand ridges or dunes, located on post-glacial shorelines. The fact that the four Ontario populations are all located in north Simcoe County and adjacent Beausoleil Island, is probably a result of the preponderance of intact old shorelines through this area. Reznicek (pers. comm. 2001) has concluded that *A. basiramea* “seems certain to be a hypsithermal relict of post-glacial lake stages.” The pH of all four sites would be acidic, although actual analyses of soil samples does not appear to have been done.

The habitat for *A. basiramea* would be termed as early successional, although with disturbance, i.e. fire or drought, it would be maintained over long periods of time. However, with suppression of fire and urban development throughout southern Ontario and southern Quebec over the past one hundred years, this sand barren habitat has been greatly reduced, and exists today in very small, highly fragmented remnants. Large tracts of natural land on the north end of the Penetang Peninsula east of Awenda Provincial Park for example are dominated by closed canopy forests, with sandy openings being extremely rare.

The predominant species at the Ontario and Quebec stations is *Danthonia spicata*, with other prevalent associates being: *Rumex acetosella*, *Agrostis gigantea*, *Polytrichum* sp., *Panicum implicatum*, *Poa compressa*, *Solidago nemoralis*, *Carex merritt-fernaldii*, *Rubus alleghaniensis*, *Agropyron repens*, *Cyperus houghtonii*, and *Cyperus lupulinus* subsp. *macilentus*.

The Christian Island and Cazaville populations are the most populous of the five stations, both supporting greater than ten thousand plants, and are likely critical to the long-term survival of the species. To the south and west of this station there appears to be potential habitat for the species. There could very well be high quality sand barrens elsewhere on the island that the author did not have time to survey for the current report. With respect to the Cazaville station, the site has been visited three times in the past two years, and the surveyors do not expect to find many other subpopulations (Coursol, pers. comm. 2002).

Trends

The Macey Lake population was noted by Reznicek in 1975 as “widely scattered & sometimes frequent in the most open areas”, while the Christian Island population was noted in 1981, also by Reznicek, as “frequent (60 – 80? plants), locally a dominant in areas of more or less bare sand”.

While the north end of the Penetang peninsula is developing rather quickly, similar sand barren communities still exist at Christian Island, as well as sites on the mainland east of Awenda Provincial Park.

There has been a significant reduction in these sand barren communities in southern Ontario and southern Quebec over the past 100 years, the result of forest

succession and concurrent suppression of natural periodic fire, clearing of land for agriculture, large scale establishment of conifer plantations, increasing use of open shoreline areas (old & new) for housing and recreation (including ATVs), and extraction of sand for commercial uses.

This rate of change has accelerated in Simcoe County in the past few years, with Barrie (110,000 pop.) consistently being accorded status as “the fastest growing municipality in the Country”, often followed by Wasaga Beach (16,000 pop.). Outside of these two towns, estate sprawl is very common in north Simcoe County, and Great Lakes shorelines are rapidly developing. Most sand barren habitats in Simcoe County are not protected, and the current level of habitat protection is inadequate to ensure the long-term survival of *Aristida basiramea*.

Protection/ownership

Of the five stations, only one, Beausoleil Island, is currently offered any significant level of protection. However, at the National Park the species is not captured within protective-level zoning.

Christian Island – The population of *A. basiramea* is on the Beausoleil First Nations Reserve, on land retained in ownership by the Band Council. The Band is contemplating development opportunities for this site (Kopagog, pers comm. 2001).

Christian Island is a regionally significant ANSI. These are presently not accorded status under the Planning Act in Ontario, and land use decisions regarding significant natural areas on Reserve lands, lie of course, with the individual Band Councils.

Macey Lake – The population is located on a privately owned site where for several years the previous owner operated a small commercial peat extraction operation, using the south end of the bog, with the adjacent shoreline flats and sand hills serving as his land base for processing and shipping. The population of *A. basiramea* appears to be thriving in the areas of the site disturbed by the peat operation, where work was discontinued in 1995.

The private property on which the *Aristida basiramea* occurs is very proximal to Awenda Provincial Park. The presence of provincial ANSI, provincial wetland, and occurrence of an S1 species on site, combined with the ability to acquire and ‘add’ the property to Awenda Provincial Park, has prompted interest in possible acquisition for conservation purposes. The site was identified as high priority for purchase in the 1990 Park Management Plan and in fact it was included in the original park boundary for the Awenda in the 1970s (Tully pers. comm. 2001), prior to any peat mining having occurred. The effort at that time to expropriate by the Ministry was believed to actually expedite the peat mining. In the early 1990s the Park was approached by the owners to explore possible purchase, but the asking price was deemed too high. In 1998 Tim Tully approached the Nature Conservancy of Canada, but the property was not on the market at that time so NCC did not pursue. Macey Lake is the #2 priority identified by

Awenda Park for acquisition and north Tiny Township is now on the NCC's priority list for acquisition. Macey Lake remains a highly favourable site for conservation acquisition, and lends itself well to a joint NCC/OMNR initiative, with Awenda Provincial Park assuming management responsibilities.

The population of *A. basiramea* is adjacent to, but within the Macey Lake Bog Provincial Area of Natural and Scientific Interest (ANSI), the boundary of which encompasses the wetland. This *Aristida basiramea* station is also within 120 metres of the Macey Lake Bog Provincially Significant Wetland, and such wetlands are also treated as Environmental Protection One in the official plan. The Tiny Township Official Plan states that no development shall be permitted on these 120 metre adjacent lands unless an Environmental Impact Study is completed in accordance with Section C6 of the official plan and approved by Council, subject to comments of the appropriate agencies.

Also of note is the fact that the Tiny Township Official Plan recognizes Threatened and Endangered species as designated by COSEWIC and OMNR, and accords the significant portions of the habitat of such species as Environmental Protection One as well. This is the highest level of protection within the official plan. Permitted uses on lands designated Environmental Protection are limited to conservation and passive recreational uses. No buildings or structures are permitted, nor is any site alteration permitted in this designation. Golf courses are not considered to be passive recreational use; however, nothing in the official plan is intended to limit the ability of agricultural uses to continue on lands designated as Environmental Protection One (The Planning Partnership, 2000).

Beausoleil Island – The station for *A. basiramea* at Beausoleil Island is not within a protective zone of the National Park, but rather is located in a recreational or administrative zone. The Park has no immediate plans to change anything at this site, and the Park Superintendent and Park Ecologist have been alerted to the fact that they have an extremely rare plant behind their Visitor Centre. They have also expressed willingness to manage for the species if required, including prescribed burning (pers. comm. Upton, 2001).

Anten Mills – The entire lot within which the *A. basiramea* is supported was sold in 2001 by the owner to a developer who has obtained the necessary approvals to develop an 87-lot subdivision. The majority of the population occurs along the crest of the Algonquin shoreline, where single family lots will be created. Fortunately, some of the *Aristida* population will be contained within a passive natural parkland to be retained by the developer, as requested by Springwater Township. The Township Planner has been informed of the significance and locations of the *A. basiramea* by the author of this report, and the author has been on-site with consultant for the developer, but the best case scenario in the face of this fully approved subdivision is likely a salvage operation. The author has proposed this to the developer and will be supervising a backhoe operator this spring to move plants from the main population at the top of bank, downslope and proximal to the subpopulations along the base of the shoreline.

Cazaville – All lands at this station are private, with likely more than one hundred owners over the extent of the occurrence. No landowner contact has been conducted. No industrial development is envisaged in this sector (Coursol, pers. comm. 2002).

BIOLOGY

Reproduction

Aristida basiramea is an annual, flowering and setting seed very late in the season. Mohlenbrock (1973) notes that the species flowers from August to early October in Illinois. In Maine it has been noted as fruiting from August to October (Maine Department of Conservation, 1999). From field observations in Ontario in 2001, it was striking how late flowering *A. basiramea* is. The majority of the plants were not yet exert (floral organs not yet visible) at Macey Lake on August 16th, and plants were still observed on October 7th as not exerted. Reznicek (pers. comm. 2001) notes that in Michigan, the plant “just keeps fruiting until the weather stops it.” Catling *et al.* (1977) note, with respect to *A. longispica*, that “Like other species of *Aristida*, this one begins to flower late in August, and does not develop fruit until September or October. Even then it may be relatively inconspicuous.”

Survival

The species appears to be very intolerant of competition, seems unable to compete in denser areas of herbaceous cover, and succumbs readily to succession and shading. It will be accorded the highest level of protection within the Tiny Township Official Plan — Environmental Protection One. Permitted uses on lands designated Environmental Protection are limited to conservation and passive recreational uses. No buildings or structures are permitted, nor is any site alteration permitted in this designation. Golf courses are not considered to be passive recreational use; however, nothing in the official plan is intended to limit the ability of agricultural uses to continue on lands designated as Environmental Protection One (The Planning Partnership, 2000).

Physiology

The *Aristida* genus is chiefly of subtropical and warm temperate climates in both hemispheres, where the more than 300 species prefer dry, sterile, or sandy soil. In North America the genus is most abundant in the arid regions (Gleason, 1952).

Catling *et al.* (1977) noted that the Macey Lake station of *A. basiramea* was 245 kms farther north than any other *Aristida* record in Ontario and is the only occurrence of a species of the genus north of the Carolinian zone. They also noted a similar situation for Michigan, with *A. basiramea* being the only member of the genus to be found north of the “tension” zone in that state, citing Voss (1972). Since that time *Aristida dichotoma* has been discovered as a native species in Ontario in Lennox &

Addington County (Brownell *et al.*, 1996), at approximately the same latitude as the native Ontario *A. basiramea* stations. Although apparently the hardiest member of its genus, habitat and soils may be limiting *Aristida basiramea* in Canada, since the dry, open sand barrens habitat used by the species in Ontario and Quebec is limited and does not occur commonly in the Georgian Bay area north of the known locations. *A. basiramea* is not currently known natively north of the northern Upper Peninsula of Michigan (approximately 48 degrees latitude).

Its northern distribution is likely restricted at least in part to the fact that it doesn't even begin flowering until mid to late August, and individual plants are shut down by the advancing cold winter in the fall, prior to seed set.

Movements/dispersal

The divergent awns in *Aristida* aid in wind and animal transportation of the florets, and by holding the florets and the caryopses they contain, at an angle to the ground, in establishment (Allred, 2001).

At the Macey Lake station, the species certainly seems to be responsive enough to occupy newly created habitat in great numbers.

Nutrition and Interspecific Interactions

Although generally poor forage grasses, and despite the callus, which is potentially harmful to grazing animals, some species of *Aristida* are an important source of spring forage on western rangelands. Quail and small mammals eat small amounts of the seed (Allred, 2001).

Behaviour/adaptability

The species is adventive along sandy roadsides in some US states, e.g. Maine, where road management appears to be compatible with the species.

Wright *et al.* (1978) note that *Aristida* spp. are readily harmed by fire because their root crowns are close to or above the soil surface, while Lemon (1949) and Parrott (1967) have documented that *Aristida stricta* is a fire-adapted species, and dominates fire-maintained southeastern grasslands and savannahs. Its meristems are located about 3 cm below the soil surface, where they are insulated from the heat of fire. It can persist in the shade of invading hardwoods for 20 to 40 years, but is eliminated if fire does not occur after that time (Clewell, 1989).

POPULATION SIZES AND TRENDS

From the botanical history of the last 200 years, *A. basiramea* appears to be a species which has always been extremely rare in Canada. Through this long history of

botanical exploration, a total of only five naturally-occurring stations have been discovered for the species, all in two of the most intensively botanized regions of the country, southern Ontario and southern Quebec. Other populations may yet be discovered, owing to its habitat in sand barrens which can easily be localized in small sites 'off the beaten track', and by the inconspicuous nature of *A. basiramea*, which requires a fair level of botanical competency by the observer to note and identify it.

For this species it is impossible to provide population trend data at native Canadian sites, given that three of the stations were only discovered in 2001, the Christian Island station was only known from a now-extirpated sub-population when last observed in 1981, and the Macey Lake population experienced an explosion in numbers in the last six years through exploiting newly created habitat. The species was never known from any other historical stations, thus offering up no clues to declines.

Population numbers for the species in 2001 were as follows:

Anten Mills: ca. 800 plants
Beausoleil Island: >500 plants
Macey Lake: 1000s of plants
Christian Island: tens of 1000s of plants
Cazaville: >10,000 plants

Total number of plants is estimated as well in excess of 20,000, but the bulk of these are at two sites, and the total area of occupancy is less than 3 sq kms. The total extent of occurrence for the five populations is 502 sq kms, and this sand barren habitat is in very short supply, and continues to be shifted to other uses and community types. There have been discussions by the Beausoleil First Nation regarding development on the Christian Island site where the *A. basiramea* occurs, and the station at Anten Mills will largely be lost through subdivision development, where construction commenced in 2002.

The species is rare in three US states, but the number where it is secure is unknown, as no states have ranked it as S4 or S5 (NatureServe, 2001).

LIMITING FACTORS AND THREATS

Limited Habitat

The species appears to be restricted to acidic, open sand barrens, associated with post-glacial shorelines. While not seemingly over restrictive, this habitat is in actually in very short supply in southern Ontario and southern Quebec. Undoubtedly more abundant at different times in history, such as during the hypsithermal (7,000 years BP) and more recently in Simcoe County during the period of large scale clearing of the forests from 1860 to 1880, these sand barrens have now been greatly reduced in quality and extent by development, planting of conifers to stabilize soils, and natural succession in the absence of periodic fire.

Sand Extraction

These Algonquin and Nipissing Shorelines where the sand barren habitat is supported are often utilized as wayside pits for sand extraction, both in southern Ontario and southern Quebec.

Successional Changes

The populations of *A. basiramea* in Ontario have been retained mainly through some sort of human disturbance which has set back the successional trend. At Christian Island, the placement of a baseball diamond, with relatively low levels of use, has helped to perpetuate tens of thousands of plants by preventing closure of the open habitat by invading shrubs. The Anten Mills station is virtually lost in the midst of conifers planted along the rim of the Algonquin Bluff. Fire was likely a factor, along with intense droughts, in maintaining the open character of these sand barrens, but fire suppression has been quite effective over the last one hundred years in Simcoe County, and many of these sand barrens would have been lost due to lack of the natural disturbance regimes.

Human Impacts

While the species obviously is threatened by permanent forms of development such as new subdivisions, it also owes its fragile existence to recent forms of light disturbance on its habitat, otherwise it succumbs to more competitive and shade tolerant species. At Beausoleil Island it grows today on the site of an old settlement; at Macey Lake it opportunistically moved to occupy prime habitat created by the activities associated with a peat mining operation; and at Christian Island it thrives in the tens of thousands across a baseball diamond. Only at the Anten Mills station and at Cazaville was any evidence of ATV or trail bike use noted. At Cazaville, ATVs pose a principal threat to *A. basiramea*, while at Anten Mills, ATV use is occurring at such low usage, that it may in fact be assisting the perpetuation of the species. In the absence of any intentional management for the species in Ontario, various types of human-induced disturbance seem to be compatible with or conducive to *Aristida basiramea* occurrences. On the other hand, the ATV use at Cazaville appears to be negatively impacting the population of *A. basiramea*.

Planting of Conifers

Many of the abandoned shorelines in Simcoe County have been planted in conifers, the result of very ambitious programs since the 1920s to stabilize and enhance these identified "wastelands". Many of these today are dense canopy stands of Red and Scot's Pine, totally unsuitable for an open sand barren species such as *A. basiramea*. Conifer plantations are a principal threat at the Cazaville station as well (Coursol, pers. comm. 2003).

Invasive Species

During fieldwork in 2001 the following invasive species were observed in the sand barren habitat of *Aristida basiramea*: Glossy Buckthorn (*Rhamnus frangula*), Spotted Knapweed (*Centaurea maculosa*), White Sweet Clover (*Melilotus albus*), and Scot's Pine (*Pinus sylvestris*). In the dry, sandy habitat, especially with successive and severe drought years, only the latter species was noted as actually out-competing the *Aristida*, and it is quite common through the population at Macey Lake, and of course at Anten Mills.

Subdivision Development

This factor will certainly limit, if not eliminate entirely, the remnant habitat supporting the species at Anten Mills, and to some extent characterizes the type of subdivision development which is especially harmful to *A. basiramea* and other species which are relicts associated with post-glacial shorelines. That is the priority accorded such properties with striking vistas, as ideal for estate housing. New homes along the crest of the Algonquin Bluff in Anten Mills for example, will be afforded spectacular views of the Niagara Escarpment, 30 km to the west. The trend toward this location for new estates is on the rise, especially with the housing boom continuing unabated in Simcoe County.

SPECIAL SIGNIFICANCE OF THE SPECIES

A. basiramea is a very low profile species, with no reason to date to be of interest to the public, and for which there is no known special significance.

EVALUATION AND PROPOSED STATUS

Existing Protection or Other Status

Global Rank: G5; Secure – Common, widespread, and abundant (although it may be rare in parts of its range, particularly on the periphery). Not vulnerable in most of its range. Typically with considerably more than 100 occurrences and more than 10,000 individuals (assigned 1984) (NatureServe, 2001).

National Rank (US): N2N4 (A range of uncertainty about the exact status of the element, from N2 (Imperiled in the nation because of rarity or because of some factor(s) making it very vulnerable to extirpation from the nation or subnation. Typically 6 to 20 occurrences or few remaining individuals (1,000 to 3,000) to N4 (Apparently Secure, uncommon but not rare, and usually widespread in the nation or subnation. Possible cause of long-term concern. Usually more than 100 occurrences and more than 10,000 individuals) (assigned 1998) (NatureServe, 2001).

US State Ranks: SR (Reported – often indicates species not yet reviewed locally) in Alabama, Florida, Indiana, Kansas, Massachusetts, Minnesota, Mississippi, Missouri, Nebraska, New Hampshire, North Dakota, Oklahoma, Tennessee, Texas, Vermont, and Wisconsin; S1 (Critically imperiled) in Colorado; S1/S2 (Critically imperiled) in Maine; S3 (Vulnerable) in Iowa; S3? (Vulnerable, but with some degree of uncertainty) in Illinois; S? (Rank not yet assessed) in Michigan; SE (Exotic) in New York (NatureServe, 2001).

National Rank (Canada): N1 (Critically imperiled – Critically imperiled in the nation because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation. Typically 5 or fewer occurrences or very few remaining individuals (<1,000) (assigned 1989) (ONHIC, 2001).

Ontario Rank: S1 (Extremely Rare – Extremely rare in Ontario; usually 5 or fewer occurrences in the province or very few remaining individuals; often especially vulnerable to extirpation (assigned 1994) (ONHIC, 2001).

Quebec Rank: Considered indigenous to Quebec by Jacques Cayouette and Jacques Brisson. “It will be added to our list of threatened/vulnerable plants in the near future with an S1 rank for Quebec.” (Jacques Labreque, pers. comm 2000, cited in Oldham 2002).

Manitoba Rank: SRF (reported falsely) (Given the age of the reports, the likelihood of misidentification, and the fact that they have never been confirmed. Greenall, pers. comm. 2003.)

OMNR Designation: None

COSEWIC Designation: Endangered

Ontario General Status: May Be At Risk (assigned 2000) (ONHIC, 2001)

TECHNICAL SUMMARY

***Aristida basiramea* Engelm.**

Forked Three-awned Grass

Aristide à rameaux basilaires

Range of Occurrence in Canada: Ontario & Quebec

Extent and Area information	
<ul style="list-style-type: none"> • extent of occurrence (EO)(km²) 	30 sq km at Cazaville, 472 for the 4 Ontario stations total = 502
<ul style="list-style-type: none"> • specify trend (decline, stable, increasing, unknown) 	unknown
<ul style="list-style-type: none"> • are there extreme fluctuations in EO (> 1 order of magnitude)? 	no
<ul style="list-style-type: none"> • area of occupancy (AO) (km²) 	A total of <3 (ON & QC) with 2 sq km at Cazaville and <1 sq km in Ontario (12,000 sq m at Macey, 10,000 sq m at Christian, 950 sq m at Beausoleil, & 50 sq m at Anten Mills)
<ul style="list-style-type: none"> • specify trend (decline, stable, increasing, unknown) 	Unknown
<ul style="list-style-type: none"> • are there extreme fluctuations in AO (> 1 order magnitude)? 	No
<ul style="list-style-type: none"> • number of extant locations 	5
<ul style="list-style-type: none"> • specify trend in # locations (decline, stable, increasing, unknown) 	Was stable since discovery of the 2 pops 20 & 25 years ago, & then doubled in 2001. One population soon to be heavily developed
<ul style="list-style-type: none"> • are there extreme fluctuations in # locations (>1 order of magnitude)? 	No
<ul style="list-style-type: none"> • habitat trend: specify declining, stable, increasing or unknown trend in area, extent or quality of habitat 	Declining
Population information	
<ul style="list-style-type: none"> • generation time (average age of parents in the population) (indicate years, months, days, etc.) 	Annual
<ul style="list-style-type: none"> • number of mature individuals (capable of reproduction) in the Canadian population (or, specify a range of plausible values) 	>20,000 in total (>10,000 in ON >10,000 in QC)
<ul style="list-style-type: none"> • total population trend: specify declining, stable, increasing or unknown trend in number of mature individuals 	Unknown
<ul style="list-style-type: none"> • if decline, % decline over the last/next 10 years or 3 generations, whichever is greater (or specify if for shorter time period) 	
<ul style="list-style-type: none"> • are there extreme fluctuations in number of mature individuals (> 1 order of magnitude)? 	No
<ul style="list-style-type: none"> • is the total population severely fragmented (most individuals found within small and relatively isolated (geographically or otherwise) populations between which there is little exchange, i.e., < 1 successful migrant / year)? 	Yes, its barren sand habitat is very localized and extremely fragmented in Ontario & Quebec, occurring as small remnants
<ul style="list-style-type: none"> • list each population and the number of mature individuals in each 	Ontario Macey Lake – 1000s Christian Is. – >10,000 Beausoleil Is. – >500 Anten Mills – ca. 800 Quebec >10,000

<ul style="list-style-type: none"> • <i>specify trend in number of populations (decline, stable, increasing, unknown)</i> 	Increased search effort in 2001 & 2002 yielded 2 new sites in ON and 1 in QC
<ul style="list-style-type: none"> • <i>are there extreme fluctuations in number of populations (>1 order of magnitude)?</i> 	No
Threats (actual or imminent threats to populations or habitats)	
1) Limited habitat, restricted to sand barrens 2) Sand extraction 3) Successional changes 4) Planting of conifers 5) ATVs and trail bikes 6) Subdivision development 7) urban expansion/development	
Rescue Effect (immigration from an outside source)	
<ul style="list-style-type: none"> • <i>does species exist elsewhere (in Canada or outside)?</i> 	Exists in number of US states
<ul style="list-style-type: none"> • <i>status of the outside population(s)?</i> 	Rare in US states but unknown number where it is secure (no states have ranked it S4 or S5)
<ul style="list-style-type: none"> • <i>is immigration known or possible?</i> 	unlikely
<ul style="list-style-type: none"> • <i>would immigrants be adapted to survive here?</i> 	Yes
<ul style="list-style-type: none"> • <i>is there sufficient habitat for immigrants here?</i> 	Very little
Quantitative Analysis	

ACKNOWLEDGEMENTS

Several individuals were most helpful in the preparation of this status report. Mike Oldham graciously provided all data on file and in the Element Occurrence Database for *Aristida basiramea* at the ONHIC, as well a copy of the draft treatment on *Aristida basiramea* from the Flora of North America. Mike also verified our *A. basiramea* collections from Macey Lake, Christian Island, and Anten Mills, and verified or determined plants collected as associates. Tim Tully obtained permission to access the Beausoleil Island First Nation station and the privately owned station at Macey Lake, and also provided the recent history on conservation efforts at Macey Lake. Ms. Jennifer Kopagog, Lands Manager for the Beausoleil Band, Chief Valerie Monague, and Mr. David Bonang are thanked for allowing us to conduct the fieldwork required to help designate this species. Ms. Kopagog is thanked for information provided on the *Aristida* station at Christian Island, and Darlene Upton, Park Ecologist at Beausoleil Island, is thanked for providing the same information for that station. The discussions with Wasyl Bakowsky about sand barrens were most helpful, as was the information provided on their status. We also thank Bill Fitzgerald, a Geologist based in Simcoe County, for his insights into the relationship between *Aristida basiramea* and the Algonquin and Nipissing Shorelines that support the species. Linda Chafin, Senior Botanist at the Florida Natural Areas Inventory, and Dr. Bruce Hansen, Curator of the Herbarium at University of South Florida, are thanked for their help in ferreting out the status of the citation for *A. basiramea* for Florida in the USDA web site. Jason Greenall, Coordinator/Ecologist at the Manitoba Conservation Data Centre, is thanked for his prompt decision to revise the rank for *A. basiramea* in that province. Permission to use the line drawing of *Aristida basiramea* from Dr. Robert Mohlenbrock's 1973 Flora of Illinois was kindly granted by Mona Ross, Permissions Manager at the Southern Illinois University Press.

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Gary Allen received an Honours B.E.S. in 1979 and an M.A. in Regional Planning and Resource Development in 1984, both from the University of Waterloo. From 1981 to 1984, he worked as an Interpretive Naturalist at Point Pelee National Park, and from 1984 to the present he has worked for the Ontario Ministry of Natural Resources, always in the Natural Heritage Program, with postings in Toronto, Chatham, Richmond Hill, Simcoe, and currently, Midhurst. His responsibilities as Natural Areas Ecologist in Midhurst District are primarily Areas of Natural and Scientific Interest (ANSIs), Species at Risk, and Wetlands, and he is a member of the Provincial Wetlands Committee (WETT). He has prepared COSEWIC status reports on *Liatris spicata* (1986) and *Liparis liliifolia* (1989), and an update on *Liatris spicata* (2000).

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COLLECTIONS EXAMINED

The only herbarium collection of *Aristida basiramea* consulted for this report was that at the Natural Heritage Information Centre, Peterborough, collected by M.J. Oldham from the Macey Lake station. However, the species file at the ONHIC contains xerox copies of Reznicek's herbarium labels from the two original collections, as well as supplementary information from Reznicek and Oldham entered into the Element Occurrence Database. The comments on the erroneous 1862 Hamilton Harbour and 1954 Long Point collections were also invaluable.