PROPOSED

Species at Risk Act
Recovery Strategy Series

Recovery Strategy for the Dwarf Lake Iris (*Iris lacustris*) in Canada

Dwarf Lake Iris

September 2010

Parks Canada Parcs 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/approach/act/default_e.cfm) outline both the required content and the process for developing recovery strategies published in this series.

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

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September 2010

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RECOMMENDATION AND APPROVAL STATEMENT

Recovery Strategy for the Dwarf Lake Iris (*Iris lacustris*) in Canada

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Date:

DECLARATION

Under the *Accord for the Protection of Species at Risk* (1996), the federal, provincial, and territorial governments agreed to work together on legislation, programs, and policies to protect wildlife species at risk throughout Canada. The *Species at Risk Act* (S.C. 2002, c.29) (SARA) requires that federal competent ministers prepare recovery strategies for listed Extirpated, Endangered and Threatened species.

The Minister of the Environment presents this document as the recovery strategy for the Dwarf Lake Iris as required under SARA. It has been prepared in cooperation with the jurisdictions responsible for the species, as described in the Preface. The Minister invites other jurisdictions and organizations that may be involved in recovering the species to use this recovery strategy as advice to guide their actions.

The goals, objectives and recovery approaches identified in the strategy are based on the best existing knowledge and are subject to modifications resulting from new findings and revised objectives.

This recovery strategy will be the basis for one or more action plans that will provide further details regarding measures to be taken to support protection and recovery of the species. Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the actions identified in this strategy. In the spirit of the *Accord for the Protection of Species at Risk*, all Canadians are invited to join in supporting and implementing this strategy for the benefit of the species and of Canadian society as a whole. The Minister of the Environment will report on progress within five years.

ACKNOWLEDGMENTS

Parks Canada Agency led the development of this recovery strategy. The information, concepts and ideas presented in this recovery strategy were developed by the Bruce Peninsula and Manitoulin Island Alvar Recovery Team. Jarmo Jalava wrote the document with contributions from Judith Jones (Winter Spider Eco-consulting), Kim Borg and John Haselmayer (Parks Canada Agency).

Gratitude is expressed to the following individuals who provided information or assistance in the preparation of this recovery strategy: Kirsten Querbach, Frank Burrows, Jeff Truscott (Parks Canada Agency), Philip Wilson, and Dr. John K. Morton (University of Waterloo). The following individuals are thanked for reviewing a draft of this document: Sue Crispin (Director, Montana Heritage Program); Madeline Austen, Angela McConnell, Patricia Mohr, Wendy Dunford and Marie-Jose Ribeyron (Environment Canada); Michele Rodrick, Richard Pither and Kara Vlasman (Parks Canada Agency); and Ontario Ministry of Natural Resources staff: Rhonda Donley, Kate Lillicrap, Chris Risley, Bree Walpole, Anita Imrie, Laura Bjorgan, Pamela Wesley Ed Morris, Bill Crins, Wasyl Bakowsky, Deb Jacobs, Jodi Benvenuti, Suzanne Robinson, Sandy Dobbyn and Norah Toth.

STRATEGIC ENVIRONMENTAL ASSESSMENT STATEMENT

In accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals* (2004), a strategic environmental assessment (SEA) is conducted on all *Species at Risk Act* recovery strategies. 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 their intended benefits. Environmental effects, including impacts to non-target species and the environment, were considered during recovery planning. The SEA is incorporated directly into the strategy and also summarized below.

The purpose of the proposed strategies in this recovery strategy is to benefit the environment by promoting the recovery of the Dwarf Lake Iris. Proposed activities will have a positive effect on Dwarf Lake Iris and the surrounding habitats. These effects include:

- Education, outreach and communication and fostering of stewardship initiatives will benefit the Dwarf Lake Iris, in addition to other SAR species associated with alvar habitats, such as the Juniper Sedge and Hills Thistle.
- Protection and management of Dwarf Lake Iris habitat will directly benefit those species occupying those habitats
- The conducting of research to increase the knowledge base on habitat requirements, population trends and viability as well as filling the knowledge gaps in Dwarf Lake Iris biology, ecology and threats to the species will result in a better understanding of the species and its requirements and will contribute to its protection. It may also allow for the discovery of previously unknown populations
- Coordination with other recovery efforts for overlapping recovery strategies and associated recovery teams will ensure a positive effect for all associated species and will provide a broader view of potential cumulative effects
- Research on appropriate habitat management tools such as controlled burns and canopy thinning will benefit those species in early successional habitats and restore the ecological integrity of those sites, although further research and follow-up and monitoring of these activities would be required to verify these effects. Monitoring will allow for adaptive management techniques.

The potential for the strategy to inadvertently lead to adverse effects on other species was considered. One potential negative effect is trampling of nearby vegetation due to Dwarf Lake Iris research activities. To reduce this impact Dwarf Lake Iris research and survey efforts should be coordinated to minimize the effects of trampling on other plant species.

The SEA concluded that this strategy will clearly benefit the environment and other species through conservation, management, stewardship and research, and will not entail any significant adverse effects. Please refer to Appendix A for more information.

RESIDENCE

SARA defines residence as: *a dwelling-place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating* **[Subsection 2(1)]**.

Residence descriptions, or the rationale for why the residence concept does not apply to a given species, are posted on the SARA public registry: http://www.sararegistry.gc.ca/sar/recovery/residence_e.cfm.

PREFACE

This Recovery Strategy addresses the recovery of Dwarf Lake Iris. In Canada, this species is found only in the Bruce County and on Manitoulin Island, Ontario.

The Parks Canada Agency, the Ontario Ministry of Natural Resources, and Environment Canada worked in cooperation to develop this recovery strategy. All responsible jurisdictions reviewed and acknowledged receipt of the strategy. The proposed strategy meets SARA requirements in terms of content and process (Sections 39-41) and fulfills commitments of all jurisdictions for recovery planning under the *Accord for the Protection of Species at Risk* in Canada.

EXECUTIVE SUMMARY

Dwarf Lake Iris is a globally rare plant endemic to the Great Lakes region. It is restricted in Canada to semi-shaded habitats with calcium-rich soils near the Lake Huron coast of Bruce County and on Manitoulin Island, Ontario. In 2004, it was designated as Threatened by the Committee on the Status of Wildlife in Canada (COSEWIC) due to restricted geographic range, low number of populations, declines and loss of some populations, and potential threats to additional populations. Dwarf Lake Iris is on Schedule 1 of the *Species at Risk Act*. It is also listed as Threatened under Ontario's *Endangered Species Act, 2007*.

Dwarf Lake Iris grows in open woodlands and woodland edges, usually near lake shores, on sandy or gravelly beach ridges, and along the wooded edges of alvars. It is most frequent at the transition from shoreline to woodland; large populations also occur at inland locations that were perhaps formerly post-glacial lake shorelines. Dwarf Lake Iris may also occur in moist habitats, such as along the fringes of fens.

The main threats to the Canadian populations of Dwarf Lake Iris are fire suppression and residential development within its habitat. Other threats to its habitat include: road construction; heavy machinery; all-terrain vehicles (ATVs); trampling; herbicides and road salt. Collecting for horticulture is also a possible threat. Landowners and land managers are often unaware of the significance, locations, biological needs, sensitivity, and legal status of this species, which is a significant underlying cause for many of these threats.

Recent Dwarf Lake Iris surveys and a more comprehensive evaluation of existing data have resulted in much larger population totals than previously documented. Current estimates of the Ontario Dwarf Lake Iris population total at least 50,000,000 shoots, or at least 50 times more than previously reported. An updated COSEWIC Status Report on Dwarf Lake Iris has been contracted by Parks Canada and submitted to COSEWIC for species re-assessment at an upcoming COSEWIC Wildlife Species Assessment Meeting in 2010.

Recovery is considered feasible for Dwarf Lake Iris. The goal is to maintain long-term self-sustaining, viable populations of the species in its current range in Ontario by meeting population and distribution objectives targeted to recover the species to Special Concern status, or lower. Recovery approaches to achieve the population and distribution objectives for Dwarf Lake Iris are focused on habitat protection and management, information sharing, research and monitoring, and public outreach, stewardship and communication. Because the majority of populations on Manitoulin Island and the northern Bruce Peninsula are either protected or do not face imminent threats, the emphasis of initial recovery efforts and activities is on southern Bruce County populations.

Critical habitat, as described by SARA, is identified commensurate with the population and distribution objectives for Dwarf Lake Iris. In total, 30 critical habitat parcels are identified on the Bruce Peninsula. Critical habitat identified in this strategy occurs mainly within Bruce Peninsula National Park, and important populations that occur on private lands are also included.

One or more action plans will be completed by September 2015.

RECOVERY FEASIBILITY SUMMARY

The recovery of Dwarf Lake Iris in Canada is considered feasible based on the criteria outlined by the Government of Canada (2009):

1) Individuals of the wildlife species that are capable of reproduction are available now or in the foreseeable future to sustain the population or improve its abundance.
The population of Dwarf Lake Iris in Ontario is estimated to be over 50,000,000 ramets covering approximately 25 km^2 at more than 40 sites. The presence of a number of large, natural populations in large tracts of suitable habitat suggests that individuals are capable of reproducing at a rate sufficient to maintain and improve population sizes.

2) Sufficient suitable habitat is available to support the species or could be made available through habitat management or restoration.
Based on the extent of currently occupied habitat, extensive areas of suitable habitat remain within the species' range in Canada and a large proportion of this habitat is either in protected areas or is not under immediate threat.

3) The primary threats to the species or its habitat (including threats outside Canada) can be avoided or mitigated.
Approximately 37% of Canada's Dwarf Lake Iris occurrences, and up to 90% of the total number of ramets, occur within protected areas such as national parks, provincial parks, Crown land managed as a provincial park and non-government nature reserves (Jones and Jalava 2009). Most threats to these populations and their habitats can be successfully addressed through park and protected area management activities. Threats can also be avoided or mitigated through public outreach, information sharing, stewardship and communication programs.

4) Recovery techniques exist to achieve the population and distribution objectives or can be expected to be developed within a reasonable timeframe.
There is some evidence that with management light-suppressed colonies of Dwarf Lake Iris would likely expand and that the species may even be capable of establishing new colonies in suitable habitat where the canopy has been opened. The most extensive populations are in open woodlands that were subject to extensive wildfires in the late 1800's and early 1900's.

TABLE OF CONTENTS

1. BACKGROUND

1.1 COSEWIC Species Assessment Information

Date of Assessment: November 2004

Common Name (population): Dwarf Lake Iris

Scientific Name: *Iris lacustris* Nutt.

COSEWIC Status: Threatened

Reason for Designation: Dwarf Lake Iris is a globally rare Great Lakes endemic plant, restricted in Canada to semi-shaded calcareous areas of Ontario's Bruce Peninsula and Manitoulin Island. It is currently known from about 40 Canadian sites and faces habitat loss and degradation at some sites. Some of the largest populations occur on Crown and national park lands. Several sites have been lost to development.

Canadian Occurrence: Ontario

COSEWIC Status History: Designated Threatened in November 2004. Assessment based on a new status report.

1.2 Species Status Information

Dwarf Lake Iris is endemic to the Great Lakes region. In Canada, it is listed as a Threatened species under the federal *Species at Risk Act* and Threatened under Ontario's *Endangered Species Act,* 2007. The Canadian population makes up to 30% of the global distribution of this species.

Conservation Status Ranks (NatureServe 2009)

Global:	G3	Vulnerable
National (USA):	N3	Vulnerable
National (Canada):	N3	Vulnerable
Sub-national (Ontario):	S3	Vulnerable

(Also see Population and Distribution Context – section 2.1.1).

1.3 Description of the Species and its Needs

1.3.1 Species Description

Dwarf Lake Iris (*Iris lacustris*) is a small plant in the iris family. It is about 10 cm tall with broadly linear, somewhat curved leaves. Its flowers are 3-5 cm wide with three showy petals,

three petaloid sepals[1], and orange bearded crests that lie partly beneath the small petaloid style branches. The flowers are usually blue, but a variety, *albiflora,* has white flowers. Dwarf Lake Iris spreads vegetatively by elongation of slender creeping rhizomes that give rise to enlarged nodes from which terminal sheaths of leaves grow. The result is a network of individual shoots called "ramets," which remain interconnected for many years, often forming extensive colonies (COSEWIC 2004). Its limited geographic distribution, endemism and low levels of genetic variation have elicited interest among evolutionary biologists.

1.3.2 Species Needs

Habitat

Dwarf Lake Iris grows in calcium-rich soils in open woodlands and woodland edges, usually near lake shores, and often on sandy or gravelly beach ridges, as well as along the wooded edges of alvars. It is most frequent at the transition from shoreline to forest, although large populations also occur at inland locations that were perhaps formerly postglacial lakeshores. Dwarf Lake Iris may also occur in moist habitats, such as the fringes of fens.

Dwarf Lake Iris tends to be abundant where it occurs, growing in dense patches (Planisek 1983), and can colonize disturbed sites (Trick and Fewless 1984). It is usually found in forests dominated by Eastern White Cedar (*Thuja occidentalis*) or Balsam Fir (*Abies balsamea*), yet may also be found under Trembling Aspen (*Populus tremuloides*), Red Pine (*Pinus resinosa*), Jack Pine (*P. banksiana*), White Pine (*P. strobus*) and White Spruce (*Picea glauca*) (Van Kley and Wujek 1993). Common ground associates are Bearberry (*Arctostaphylos uva-ursi*), Creeping Juniper, Fringed Polygala (*Polygala paucifolia*), False Asphodel (*Tofieldia glutinosa*). Habitat also may occur in alvar dominated by Little Bluestem (*Schizachyrium scoparium*), Scirpus-like Sedge (*Carex scirpoidea*), Creeping Juniper (*Juniperus horizontalis*), or Common Juniper (*Juniperus communis*); or at the transition from alvar to fen. The abundance of Dwarf Lake Iris in open Jack Pine and Red Pine woodlands, both of them largely fire-dependent tree species, in inland areas of the northern Bruce Peninsula suggests that wildfire may play an important role in creating habitat for Dwarf Lake Iris (Figure 1).

[1] The outermost whorl of flower parts. Though usually plain and green, they may sometimes be ornate.

Figure 1. Dwarf Lake Iris carpets the floor of this fire-successional Jack Pine – White Cedar woodland on the Bruce Peninsula

Dwarf Lake Iris can tolerate a wide range of microclimates, soil types, and pH range (Van Kley and Wujek 1993), but grows and reproduces optimally on thin, well-drained soils that are semi-shaded. Overall, bloom and fruit production was found to be highest at Michigan sites with intermediate light levels, young soils, and a water table below the surface (Van Kley and Wujek 1993). These Michigan findings are consistent with habitat conditions of documented Ontario populations, and are supported by the work of Engelken (2003), who found that reproductive success was highest among populations with relatively open tree canopies.

Why Dwarf Lake Iris has such a restricted range and does not grow in apparently suitable habitat elsewhere is not clear. Reduced dispersal ability and associated slow colonization after glaciation are possible factors. Local climate may also play a role. Makkay notes that at several of the sites where field observations were made in 2003, a cool fine mist could be seen blowing off Lake Huron by prevailing westerly winds (COSEWIC 2004). However, this would not seem to be a significant factor at the large inland populations on the northern Bruce Peninsula.

Biology

The perennial Dwarf Lake Iris is believed to have evolved following the last glaciation, approximately 11,000 years ago, from Dwarf Crested Iris (*Iris cristata*) (Hannan and Orick 2000), a close relative found in the southeastern United States. Dwarf Lake Iris is genetically depauperate, which indicates that it evolved from a single founding population (Hannan and Orick 2000, Simonich and Morgan 1994). The strong tendency of Dwarf Lake Iris to reproduce vegetatively with new plants being established from rhizomes, results in colonies of genetically identical individuals, perpetuating the low overall genetic diversity.

Age at sexual maturity has been estimated to be at least seven years (Planisek 1983). Dwarf Lake Iris blooms from mid-May to early June, with flowers normally being open for about three days.

Flowers are capable of self-pollinating. In one experiment, self-pollination was found to be more common than cross-pollination and self-pollinated flowers had a higher fruit set (Planisek 1983). Dispersal of pollen on insects is likely, but the extent and distance of this dispersal, and its effect on the population, is unknown. Halictid bees (*Augochlorella striata*) (Larson 1998), bumblebees (*Bombus* spp), and a clear-wing moth (*Hemaris affinis*) (Engelken 2003) have been observed as potential pollinators of Dwarf Lake Iris. The importance of these insects, and the role of rove beetles also noted in Dwarf Lake Iris flowers (Engelken 2003), remains to be determined.

The number of flowers produced by Dwarf Lake Iris appears to correlate to the number of shoots, but fruit set is not a function of flower density (COSEWIC 2004). Seed set is about half that of available ovules.[2] Seed capsules ripen from mid-June to mid-August. Ant species and a centipede have been observed dispersing Dwarf Lake Iris seeds (Planisek 1983). The typical distance of dispersal is unknown; however, it appears that ants are most likely to collect seeds close to their nest (COSEWIC 2004). Longevity of seeds in water is unknown (COSEWIC 2004). Seeds only germinate sporadically after long periods of dormancy (Hannan and Orick 2000, Makholm 1986, COSEWIC 2004). Plants die back in autumn leaving the rhizome to over-winter (Planisek 1983). New growth from the rhizomes occurs in spring. The locations of past years' shoots can be detected from the swollen nodes on the rhizome.

Ecological Role

The ecological role of Dwarf Lake Iris is not well known. Little information was found by Makkay (COSEWIC 2004) regarding herbivory. Field observations by Jalava (2005, 2006a-d, 2007, 2008a-b) and Jones (2006, 2007, 2008) have shown little evidence of grazing upon this species. Insect larvae and chipmunks have been observed consuming the capsules (Makholm 1986). The persistence of Dwarf Lake Iris is not entirely dependent on the presence of pollinators or seed-dispersing insects since the species also reproduces vegetatively (COSEWIC 2004). No other facultative associations appear to have been documented (COSEWIC 2004).

Limiting Factors

Dwarf Lake Iris can tolerate a large range of microclimate habitats and is most sensitive to light, with optimal levels being semi-shade of about 3800 foot-candles (Van Kley and Wujek 1993). It can tolerate lower light levels, but will produce fewer flowers and fruit. On the other hand, intolerance of Dwarf Lake Iris to high levels of sunlight may be related to drought susceptibility. Dieback due to drought was observed during the particularly hot summer of 1988 (COSEWIC 2004) and has been observed by Jalava (2006a-d, 2007, 2008b). Dwarf Lake Iris can tolerate a wide range of soil types, including sand, gravel, and loess over limestone, but has not been observed in soil with pH below 5.4 or above 7.5 (Van Kley and Wujek 1993).

Engelken (2003) found that hand-pollinated flowers showed a much higher fruit set than insect-pollinated flowers. The study concluded that sexual reproduction is highly limited by pollen dispersal and more precisely by the lack of adequate pollen vectors. The Bruce Peninsula study suggested that Dwarf Lake Iris is not attractive to its potential pollinators and that differences in robustness of fruit set may be linked to differences in pollinator fauna.

[2] An ovule is the structure that gives rise to and contains the female reproductive cells.

The combination of low genetic diversity, low dispersal ability and disjunct populations due to natural barriers (*e.g.*, Lake Huron), increases the potential for loss of individual populations from disease and environmental changes because of an insufficient pool of resistant individuals to draw from to survive such impacts. Once individual populations are lost, re-establishment is considered unlikely due to the poor dispersal and colonization abilities. This highlights the need for protecting and managing existing populations.

1.4 Threat Identification

Threats to Dwarf Lake Iris in Ontario are separated into three categories based on how severely the threat is impacting the species.

1) High Severity Threats to Dwarf Lake Iris:

Fire Suppression
Extent: widespread
Occurrence: current
Causal Certainty: high
Open woodland habitat was more common 100 to 150 years ago after wildfires swept across large areas of Manitoulin Island and the Bruce Peninsula (Jones and Reschke 2005). The largest populations of Dwarf Lake Iris, at least on the Bruce Peninsula, occur in these burned areas (Parks Canada 2010). Subsequent natural succession has reduced light levels and increased competition for water and nutrients, and may affect seedling establishment. Further succession to closed canopy forest may reduce population sizes and extent, and further exacerbate geographic isolation of populations (COSEWIC 2010).

Residential Development
Extent: localized
Occurrence: current
Causal Certainty: high
The ongoing development of cottages along the Lake Huron shoreline undoubtedly has impacted, and will continue to impact, Dwarf Lake Iris populations through direct loss of habitat (COSEIWC 2010). Direct damage to plants and the shallow soils in which they grow are to be expected, as land is cleared and housing is constructed. Loss of Dwarf Lake Iris habitat also occurs through planting and grooming of lawns.

In spite of the large impact that residential development has on Dwarf Lake Iris populations, landowners that keep their property in a relatively natural state and have Dwarf Lake Iris on their property can create favorable conditions for the species. For example, clearing away of duff may restore habitat (Jones and Jalava 2009; Jalava 2008b) and occasional mowing does not appear to harm plants (Jalava 2008b). In addition, some clearing of trees may actually create canopy gaps that improve Dwarf Lake Iris habitat (COSEWIC 2004).

2) Medium Severity Threats to Dwarf Lake Iris:

Landowners and land managers are often unaware of the significance, locations, biological needs, sensitivity and legal status of Dwarf Lake Iris. This lack of awareness is considered a significant underlying cause for many of the direct threats to populations listed below, since much of the destruction of plants and their habitat is probably inadvertent.

Road Construction

Extent: localized
Occurrence: anticipated
Causal Certainty: medium

Road and driveway construction may directly impact, damage and destroy Dwarf Lake Iris plants and their habitat. Heavily traveled, wide and improved roads are unsuitable for the persistence of this species (COSEWIC 2010). However, Dwarf Lake Iris can thrive along lightly traveled driveways and trails, no doubt largely due to the partial opening of the tree canopy.

Heavy Machinery for Logging Operations

Extent: localized
Occurrence: anticipated
Causal Certainty: medium

The semi-open habitat in which Dwarf Lake Iris thrives is often used by heavy equipment to access logging sites, and may be used for storage and preparation of harvested timber. These activities can destroy individual plants, displace shallow soils, causing rutting, and introducing competing non-native species into Dwarf Lake Iris habitat (COSEWIC 2010).

All-Terrain Vehicles (ATVs)

Extent: localized
Occurrence: anticipated
Causal Certainty: medium

In some cases, light use of ATVs can benefit Dwarf Lake Iris when it keeps trails open in habitat that would otherwise be too shaded and overgrown (Jones and Jalava 2009). However, ATVs may cause damage similar to that of heavy machinery—trampling, displacement of soil, ruts, and introduction of weeds. Moreover, ATVs can access more remote sites than larger vehicles, and thus can cause more widespread habitat damage (Jones 2007).

Heavy Trampling by Pedestrians and Cyclists

Extent: localized
Occurrence: anticipated
Causal Certainty: medium

Some Dwarf Lake Iris populations occur along trails used by pedestrians and cyclists. In most cases impacts are minor, but damage to plants and their habitat may occur with heavy trail use.[3]

[3] Moderate levels of trail use do not appear to be significantly impacting on the populations (Toth pers. comm. 2005).

3) Potential Threats to Dwarf Lake Iris:

The following threats are of unknown severity, but have the potential to impact Dwarf Lake Iris populations.

Herbicides, Road Salt

Extent: localized
Occurrence: unknown
Causal Certainty: low

Most of Ontario's Dwarf Lake Iris populations are situated away from major roads and are therefore not subject to impacts associated with road maintenance, such as mowing, application of herbicides and winter road salt. These are cited as threats for United States populations (COSEWIC 2004), and could affect Canadian populations if existing roads near populations are expanded or if road maintenance practices are altered.

Horticultural Collecting

Extent: localized
Occurrence: unknown
Causal Certainty: unknown

Although no evidence has been found of Dwarf Lake Iris being taken from the wild in Ontario for horticultural purposes, collection of this showy plant has likely occurred. Dwarf Lake Iris has been promoted by nurseries as a suitable perennial for woodland gardens, with several companies advertising seeds commercially via the Internet (COSEWIC 2004). The source of plants and seed being used for commercial purposes is unknown. At present, impacts of such practice are undoubtedly low. On the other hand, the attractiveness of this plant may assist in promoting public support for its preservation.

Loss of Insect Pollinators

Extent: widespread
Occurrence: unknown
Causal Certainty: unknown

A number of recent studies have documented declines in bees, bumblebees and other important insect pollinators (*e.g.*, CSPNA 2006). As Halictid bees (*Augochlorella striata*) (Larson 1998) and bumblebees (*Bombus* spp) have been observed as potential pollinators of Dwarf Lake Iris, loss of these species would inhibit the ability of the species to reproduce sexually, further reducing genetic diversity, adaptability, and resistance of populations to disease.

2. RECOVERY

2.1 Population and Distribution

2.1.1 Population and Distribution Context

Dwarf Lake Iris is found only near the northern shores of Lake Michigan and Lake Huron and is therefore endemic to a very restricted area in the Great Lakes basin (Figure 2). In the United States, it is known from 80 sites in Michigan (MNFI, 2007) and 15 in Wisconsin (U.S. Fish and

Wildlife Service 1988) and considered as vulnerable in both states. In Canada, Dwarf Lake Iris is found in Bruce County and Manitoulin Island, Ontario, where it can be locally abundant.

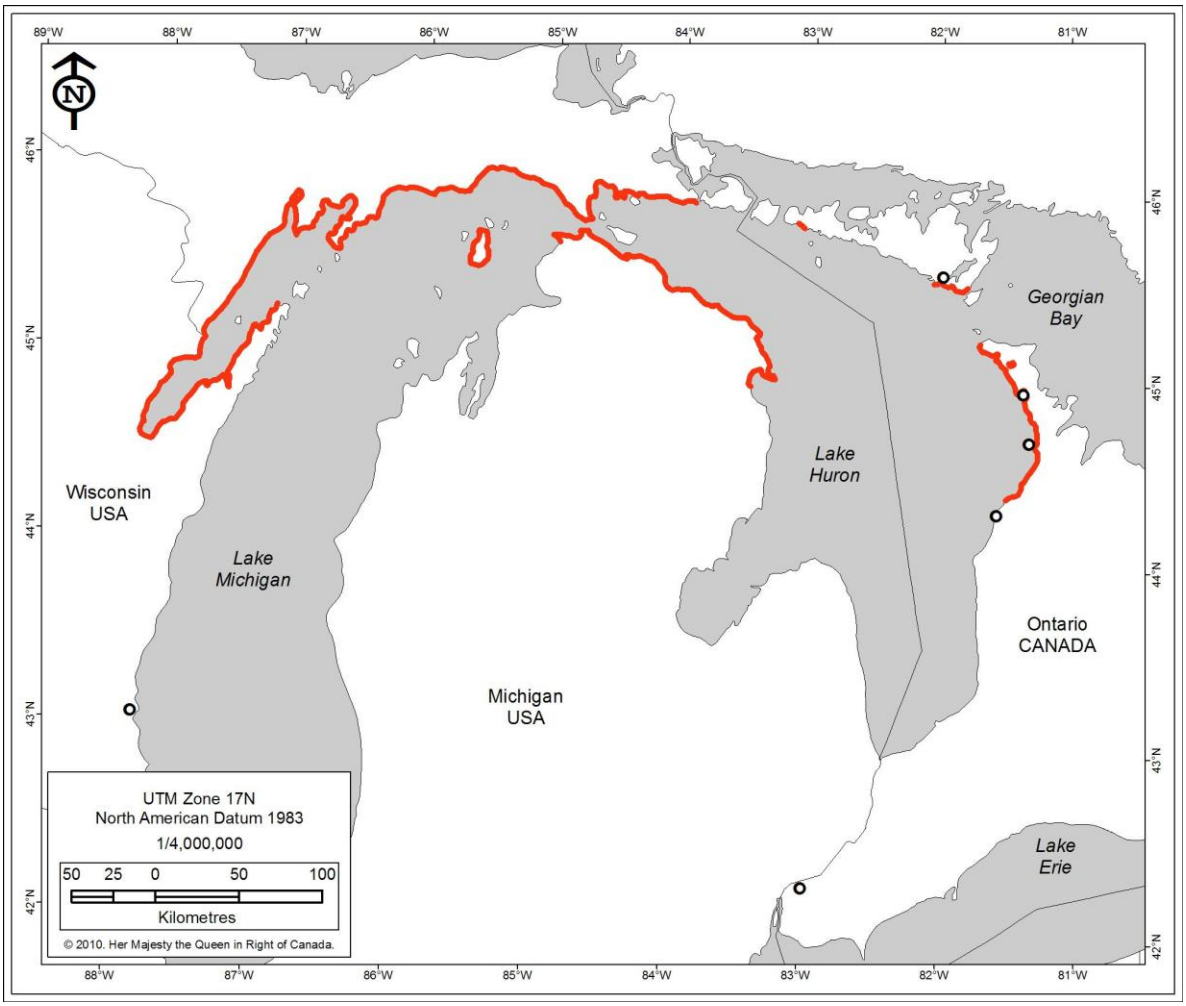

Figure 2. Global Range of Dwarf Lake Iris. Red lines indicate the range of extant populations. Open circles represent historic populations.

The Canadian population of Dwarf Lake Iris constitutes up to 30% of the global distribution (Jones and Jalava 2009). Dwarf Lake Iris is known from approximately 40 locations within 2 km of the Lake Huron shore, extending along a 160 km strip along the western coast of Bruce County south to near Inverhuron (Figure 3). However, the largest concentration of the species in Canada occurs several kilometers inland from the Lake Huron shoreline on the north-central Bruce Peninsula. On southeastern Manitoulin Island, Dwarf Lake Iris is found at several sites from the Hungerford Point area to approximately 5 km west of South Baymouth. The species also occurs at Carter Bay to the west and then reappears at the western end of Manitoulin Island in the Belanger Bay area.

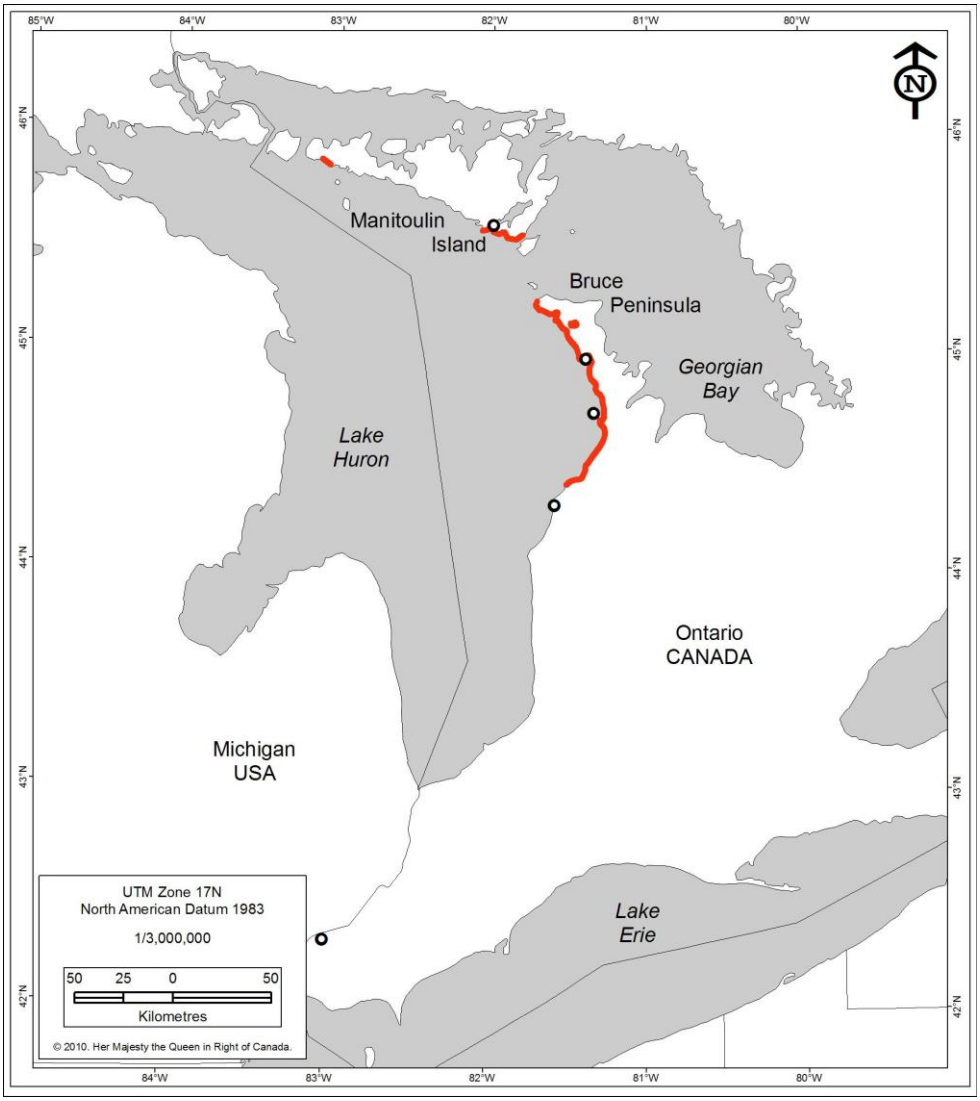

Figure 3. Current Ontario Distribution of Dwarf Lake Iris. Red lines indicate the range of extant populations. Open circles represent historic populations.

Dwarf Lake Iris populations that are considered extirpated include one confirmed specimen collected in 1901 at Sandwich, Ontario, which is now in the City of Windsor, where suitable habitat is almost certainly no longer present. The record indicates that the historical range of the Dwarf Lake Iris extended farther south than its current distribution, but it was likely uncommon south of Bruce County, since no other reports for the area exist (COSEWIC 2004)[4]. The loss of several historic populations suggests some declines, mainly in the southern portions of the range (Sandwich, Fishing Islands) and in areas subject to fairly intensive residential development (Stokes Bay, South Bay); see Figure 3. Most of the Lake Huron shoreline in Bruce County between Chief's Point and Inverhuron Provincial Park has been heavily subdivided for cottage and residential development, so little survey work has been possible there. However, there is the

[4] A report of a collection by Krotkov in 1933 from Big Bay, on the Georgian Bay side of the Bruce Peninsula was treated by Argus *et al.* (1982-1987) as an error since the site was not mentioned in Krotkov's (1940) description of the peninsula (COSEWIC 2004). The collection is believed to have been from Dorcas Bay (NHIC 2008).

potential for remnant patches of suitable habitat and small extant populations in this area. It is unknown whether there have been declines in Dwarf Lake Iris for reasons other than loss of habitat (COSEWIC 2004).

COSEWIC (2004) estimated the extent of occurrence[5] of Dwarf Lake Iris in Ontario to be 382 km^2, the area of occupancy[6](AO) to be $<<1\ km^2$, and the population to be about 959,200 shoots. As such, the species was designated as Threatened because it met the COSEWIC criterion D2– a very small population or restricted distribution. Recent surveys (Jalava 2007, 2008a-b; Jones 2006, 2007; Jalava *et al.* 2009) and a more comprehensive evaluation of existing data have resulted in much larger population totals for the sites documented by COSEWIC (2004) and new populations have been discovered.

New population information indicates the largest documented population, consisting of >45,000,000 ramets, is found near Highway 6 on the Bruce Peninsula in the vicinity of Dyer's Bay Road and Johnson's Harbour Road (Jalava 2007). This site was previously documented as being 4 separate populations with a total of approximately 100,000 ramets (COSEWIC 2004). Other very large, new populations were recently discovered at the Wikwemikong Unceded First Nation on eastern Manitoulin Island (Jones 2007). Currently, Dwarf Lake Iris populations are grouped into approximately 40 separate occurrences and range in size from small patches of a few ramets to colonies of many square kilometers (Parks Canada 2010).

Based on the recent surveys and a revised calculation, the extent of occurrence for Dwarf Lake Iris in Ontario is 8,232 km^2 and the index of area of occupancy[7] (IAO) is 139 km^2 (Parks Canada 2010). The IAO calculation that is currently used for assessment purposes is not directly comparable to the method used by COSEWIC in 2004 to calculate AO. The recent fieldwork by experts has resulted in a revised calculation of AO to total approximately 25 km^2 (Parks Canada 2010), providing the updated value of COSEWIC's previous $<<1km^2$ estimate. Current quantifications of the Ontario Dwarf Lake Iris population total at least 50,000,000 shoots, or approximately 50 times more than previously reported (Parks Canada 2010).

The new population information indicates that the Threatened designation for Dwarf Lake Iris in the 2004 COSEWIC Assessment and Status Report may no longer apply. Population numbers no longer fall below the threshold COSEWIC uses to classify a species as Threatened when there is no continuing population decline or extreme fluctuations. As such, it is likely that the species could be downlisted to Special Concern, or lower. An updated COSEWIC Status Report on Dwarf Lake Iris has been contracted by Parks Canada and submitted to COSEWIC for species re-assessment at an upcoming COSEWIC Wildlife Species Assessment Meeting in 2010.

[5] Extent of occurrence is the area included in a polygon without concave angles that encompasses the geographic distribution of all known populations of a wildlife species (COSEWIC 2009).
[6] Area of occupancy (AO) is the area within 'extent of occurrence' that is occupied by a taxon (COSEWIC 2009).
[7] Index of area of occupancy (IAO) is an estimate of the number of 1x1 km grid squares occupied by extant populations (COSEWIC 2009).

2.1.2. Population and Distribution Objectives

The goal of this recovery strategy is to maintain long-term, self-sustaining, viable populations of Dwarf Lake Iris in its current range in Ontario. Specifically, recovery of Dwarf Lake Iris is interpreted as achieving a recovered state for this species such that the COSEWIC status is revised from its current Threatened designation to Special Concern, or lower. The population and distribution objectives for Dwarf Lake Iris are as follows:

1. Maintain an index of area of occupancy >20 km^2.
2. Prevent an overall, continuous decline in the current extent of occurrence (8,232 km^2) and number of populations (40) across the range.

It should be noted Dwarf Lake Iris occupies a restricted and naturally rare habitat type; therefore, even if threats are reduced or mitigated, it will probably always be rare and localized in Ontario, and globally.

Rationale:
The objectives listed above are based on criteria that are used by COSEWIC when assessing a wildlife species' risk of extinction (COSEWIC 2009). By meeting these objectives the recovery goal of long-term persistence of this species throughout its current range can be achieved.

Objective 1: As noted in the Population and Distribution Context section, the new population estimates for Dwarf Lake Iris are approximately 50 times greater than what was known when the species was assessed by COSEWIC in 2004. The status of Dwarf Lake Iris will be re-evaluated at a COSEWIC species assessment meeting in the fall of 2010. While it is likely that Dwarf Lake Iris will be down-listed to Special Concern, or lower, Objective 1 is targeted towards addressing the reason why Dwarf Lake Iris was originally designated as Threatened, as defined in the 2004 COSEWIC status assessment. Dwarf Lake Iris was designated as Threatened because of a very restricted index of area of occupancy (< 20 km^2). For Dwarf Lake Iris to be recovered to Special Concern, or lower, the index of area of occupancy must remain above the COSEWIC threshold index area of occupancy of >20 km^2. Because the new population estimates of Dwarf Lake Iris are approximately 50 times greater than what was known when the species was assessed by COSEWIC in 2004, only a small proportion of the currently occupied area is required to achieve recovery as defined by COSEWIC down-listing.

Objective 2: While meeting the first population and distribution objective could place Dwarf Lake Iris out of the current Threatened category, Objective 2 aims to address a second COSEWIC category that may also apply to Dwarf Lake Iris; the criteria that address species that have a small distribution range and have demonstrated population declines or fluctuations. Dwarf Lake Iris is not currently listed under this category, but by preventing continuous declines in extent of occurrence and number of populations, a precautionary approach is taken to ensure that Dwarf Lake Iris populations persist through its current range, thus preventing the species from being listed under this COSEWIC category in future Dwarf Lake Iris species assessments.

2.2 Broad Strategies and Approaches to Recovery

Broad approaches to recovery of Dwarf Lake Iris are based on the categorized threats (Section 1.4). The high severity threats can be mitigated through specific actions: habitat protection, habitat management, and information sharing. Medium severity threats can be mitigated mainly through communication and public outreach and stewardship. Potential threats require further research and monitoring. Table 1 lists the strategies and approaches recommended to address the threats and achieve the population and distribution objectives for Dwarf Lake Iris.

Table 1. Broad strategies and approaches needed to achieve the population and distribution objectives for the Dwarf Lake Iris

Priority	Threat(s) addressed	Broad strategies to address threat(s)	Recommended approaches
Necessary	All	Protect and Manage Habitat	• Implement habitat protection measures on various land tenures • Prioritize sites for management activities • Conduct site-specific threat assessments • Develop and implement site-specific management plans
Necessary	Residential development, road construction, heavy machinery, ATVs, herbicides / road salts	Information Sharing	• Provide current habitat data to relevant land managers (municipalities, OMNR, etc) for consideration in land use planning, road maintenance and shoreline management activities • Encourage land managers to incorporate recovery needs, mitigation and other best management practices into their management plans
Necessary	Residential development, all medium severity threats	Public Outreach, Stewardship, Communication	• Prepare and implement a communication strategy • Develop outreach initiatives that increase understanding of threats and foster voluntary stewardship with landowners and stakeholders • Engage stewardship councils and other local groups in recovery activities • Develop Bruce Peninsula-Manitoulin Island Alvar Recovery web presence • Post signage at key locations
Necessary / Beneficial	Fire suppression, collecting for horticulture, loss of insect pollinators	Research and Monitoring	• Study appropriate habitat management tools (e.g.: controlled burns[8], canopy thinning) to determine most appropriate habitat management techniques **(Necessary)** • Determine population trends and viability (offspring survival, plant longevity, generation time, population age structure, reproductive and recruitment rates) **(Necessary)** • Design and implement a monitoring program **(Beneficial)** • Gain a better understanding of priority and nature of threats **(Beneficial)** • Determine the role of insect pollination, natural seed dispersal and genetic exchange between populations **(Beneficial)**
Beneficial	All	Co-ordination of activities with overlapping recovery teams	• Work collaboratively and coordinate recovery efforts for SAR within the region (e.g.: Massasauga and Alvar recovery teams)

[8] A permit from the relevant land manager may be required to undertake burns which might harm individual Dwarf Lake Iris.

Because the majority of populations on Manitoulin Island and the northern Bruce Peninsula are either protected or do not face imminent threats, the emphasis of the broad strategies listed above is on southern Bruce County populations.

2.3 Critical Habitat

Critical habitat is defined in section 2(1) of the Species at Risk Act (2002) as "the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species".

Critical habitat identified in this recovery strategy is commensurate with the first population and distribution objective for Dwarf Lake Iris and contributes to the targets outlined in objective 2 (Section 2.1.2). In total, 30 critical habitat parcels are identified on the northern Bruce Peninsula, covering an index of area of occupancy of more than 26 km^2. Other recovery tools in addition to the critical habitat identified here will be used to meet objective 2. This will be achieved through implementation of the broad strategies and approaches listed above in Table 1.

Information used to identify critical habitat locations and attributes

Critical habitat is identified using confirmed Dwarf Lake Iris records within northern Bruce Peninsula. Northern Bruce Peninsula is the core area that supports the largest Dwarf Lake Iris populations in Ontario (approx. 80% of the total population). Parcels of critical habitat are focused primarily within Bruce Peninsula National Park, but also include other important populations on private land, including the largest known population of Dwarf Lake Iris in Canada. By identifying critical habitat mainly within the national park, we take a pragmatic approach to securing the long term viability of the species while avoiding any potential confusion with the public that could ensue if the species is down-listed this fall to Special Concern, or lower, and critical habitat is no longer necessary.

Occurrence records for Dwarf Lake Iris were gathered from all available sources (especially Ontario Natural Heritage Information Centre, Bruce Peninsula National Park databases, and Jalava 2008). Only records with GPS coordinates or records plotted in the field on aerial photos were considered accurate enough to be used to map critical habitat. Many older, pre-GPS records had poor or vague location information and could not be mapped with confidence.

Critical habitat for Dwarf Lake Iris is found in several kinds of situations and within several vegetation types. On the Bruce Peninsula, critical habitat for Dwarf Lake Iris may include some or all of the following biophysical attributes:

- Habitat patches within 15 km of Lake Huron or Georgian Bay;
- Shallow soil over dolostone bedrock or sand;
- Overstory species are predominantly conifers, with habitat in coniferous woodland, sparse coniferous forest, or openings in denser coniferous forest;
- Overstory species may include Eastern White Cedar (*Thuja occidentalis*), Balsam Fir

(*Abies balsamea*), Trembling Aspen (*Populus tremuloides*), Red Pine (*Pinus resinosa*), Jack Pine (*P. banksiana*), White Pine (*P. strobus*), White Spruce (*Picea glauca*), or Tamarack (*Larix laricina*);
- Common ground associates are Bearberry (*Arctostaphylos uva-ursi*), Creeping Juniper, Fringed Polygala (*Polygala paucifolia*), False Asphodel (*Tofieldia glutinosa*);
- Habitat also may occur in alvar dominated by Little Bluestem (*Schizachyrium scoparium*), Scirpus-like Sedge (*Carex scirpoidea*), Creeping Juniper (*Juniperus horizontalis*), or Common Juniper (*Juniperus communis*); or at the transition from alvar to fen;
- Often there is a history of fire in the area 50 years or more ago.

Critical Habitat Identification

All known locations of Dwarf Lake Iris in Bruce Peninsula National Park and surrounding areas were plotted digitally on 2006 ortho photography with 30 cm resolution (South Western Ontario Orthorectification Project 2006). Critical habitat is identified and mapped as a 30 m radius circle around the known locations. This 30 m distance was derived in the field in 2009 by a core group of the Alvar Recovery Team as the distance required to mitigate direct impacts to Dwarf Lake Iris from nearby activities. In most cases, the 30 m critical habitat boundary is larger than the occupied habitat thus allowing for population dispersal. Where known locations are close together, such as points along a trail, the 30 m radius circle is applied to each point and adjacent circles are merged together to incorporate intervening habitat. In cases where locations are defined by the boundary points of a large population, the 30 m radius is applied to each boundary point and adjacent points are joined together to form a critical habitat polygon that includes all intervening, suitable habitat. Where clearly unsuitable habitat (such as deciduous forest or paved roads) falls within the critical habitat polygon, the critical habitat boundary is modified to exclude such habitat.

In total, 30 critical habitat parcels are identified on the northern Bruce Peninsula, covering an index of area of occupancy of more than 26 km^2. The general locations of critical habitat parcels are shown in Figure 4 followed by detailed maps showing the extent of each critical habitat parcel (Figures 5-19). GIS shapefiles of all the critical habitat parcels are maintained by Parks Canada.

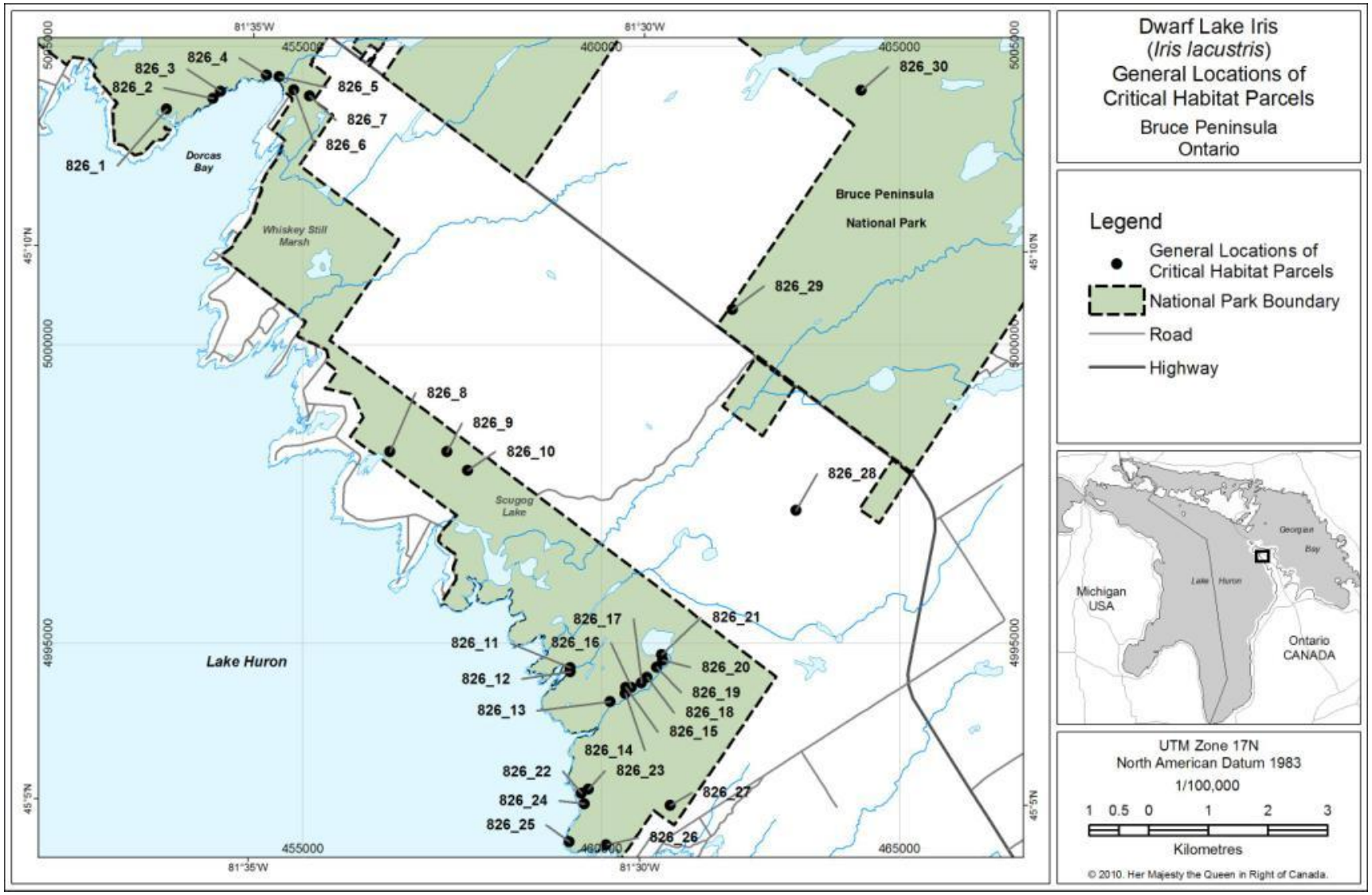

Figure 4. General locations of critical habitat parcels in northern Bruce Peninsula. Dotted line represents Bruce Peninsula National Park Boundary.

Figure 5. Fine-scale map of Dwarf Lake Iris critical habitat parcel 1 on the northern Bruce Peninsula.

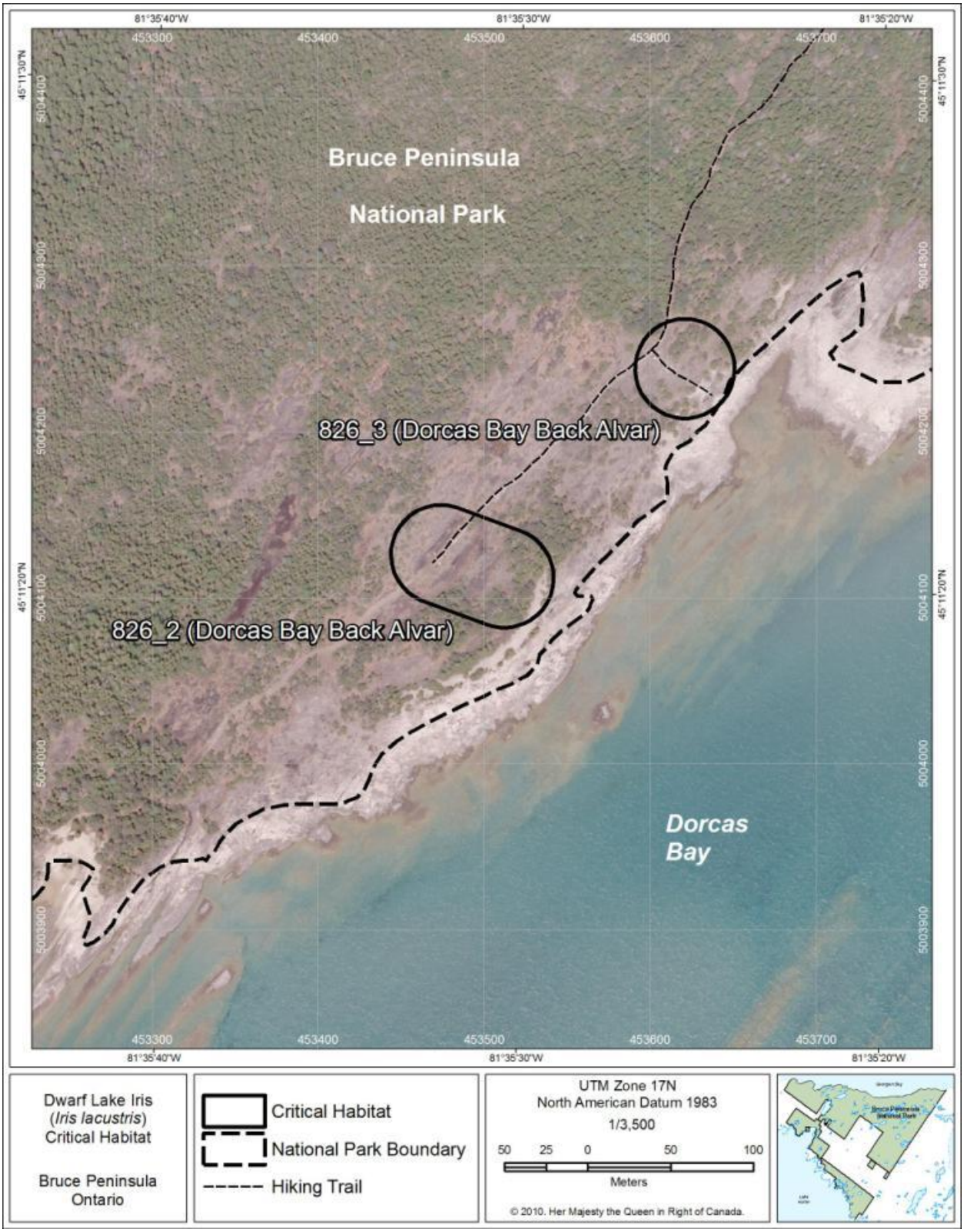

Figure 6. Fine-scale map of Dwarf Lake Iris critical habitat parcels 2 and 3 on the northern Bruce Peninsula.

Figure 7. Fine-scale map of Dwarf Lake Iris critical habitat parcels 4 and 5 on the northern Bruce Peninsula.

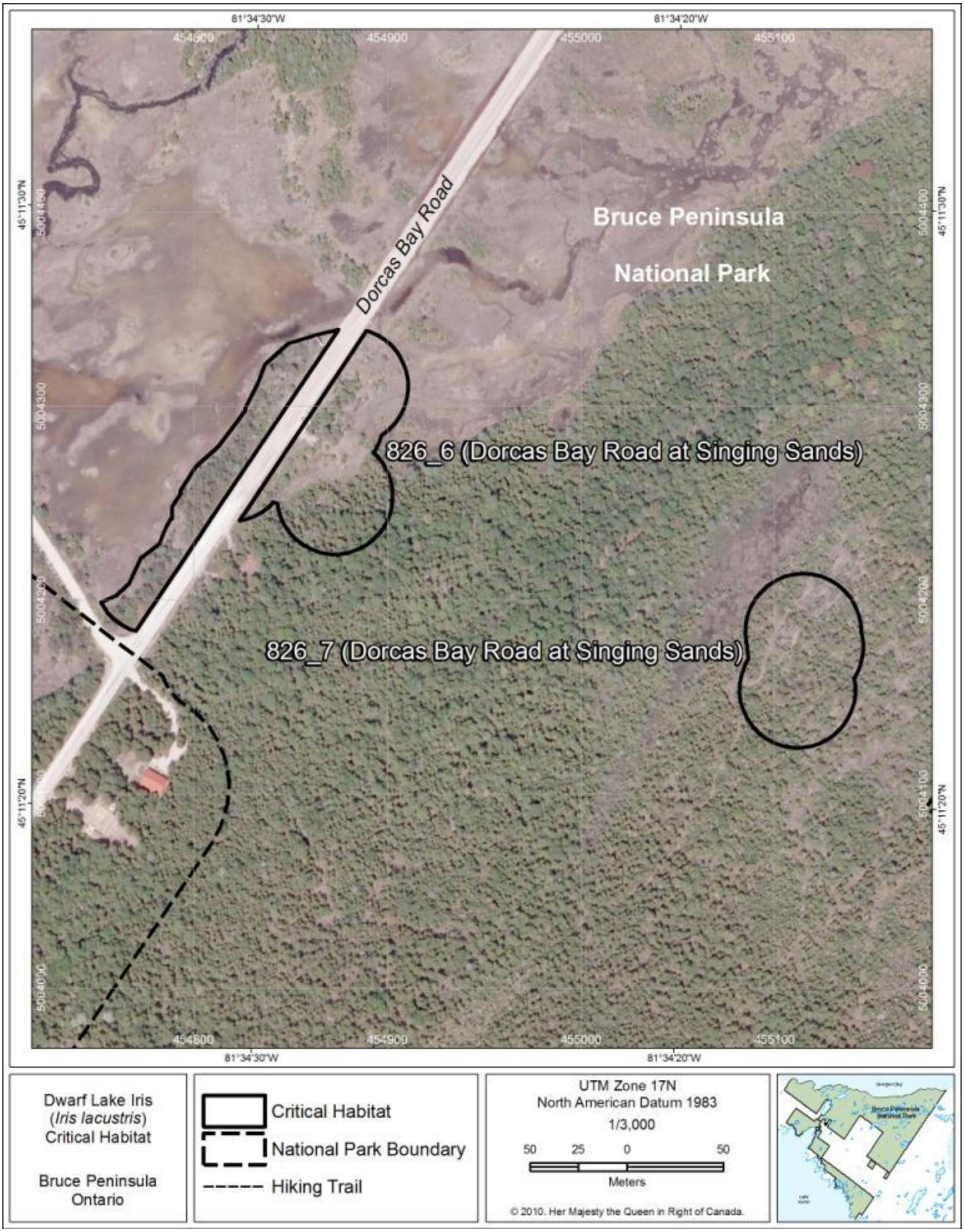

Figure 8. Fine-scale map of Dwarf Lake Iris critical habitat parcels 6 and 7 on the northern Bruce Peninsula.

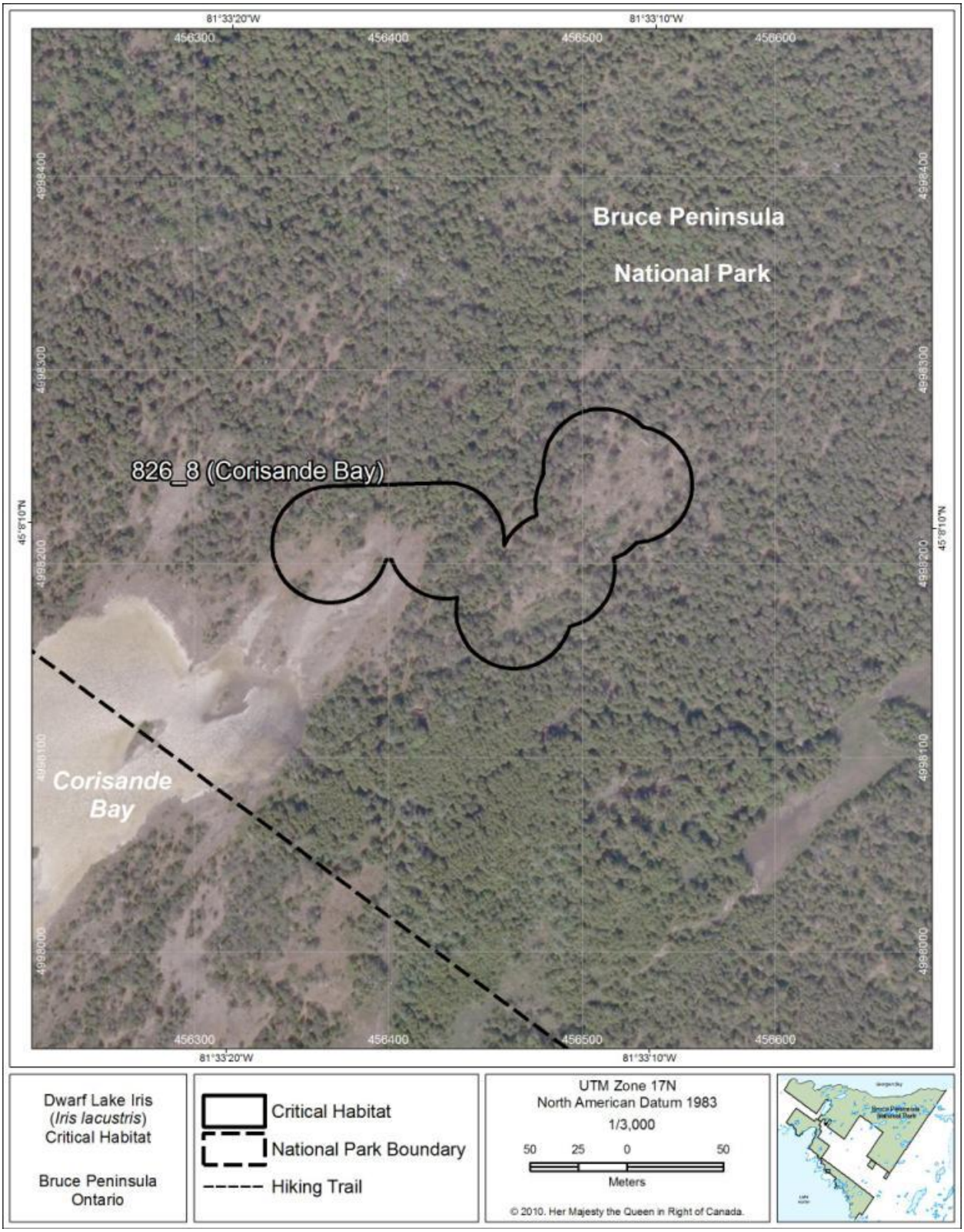

Figure 9. Fine-scale map of Dwarf Lake Iris critical habitat parcel 8 on the northern Bruce Peninsula.

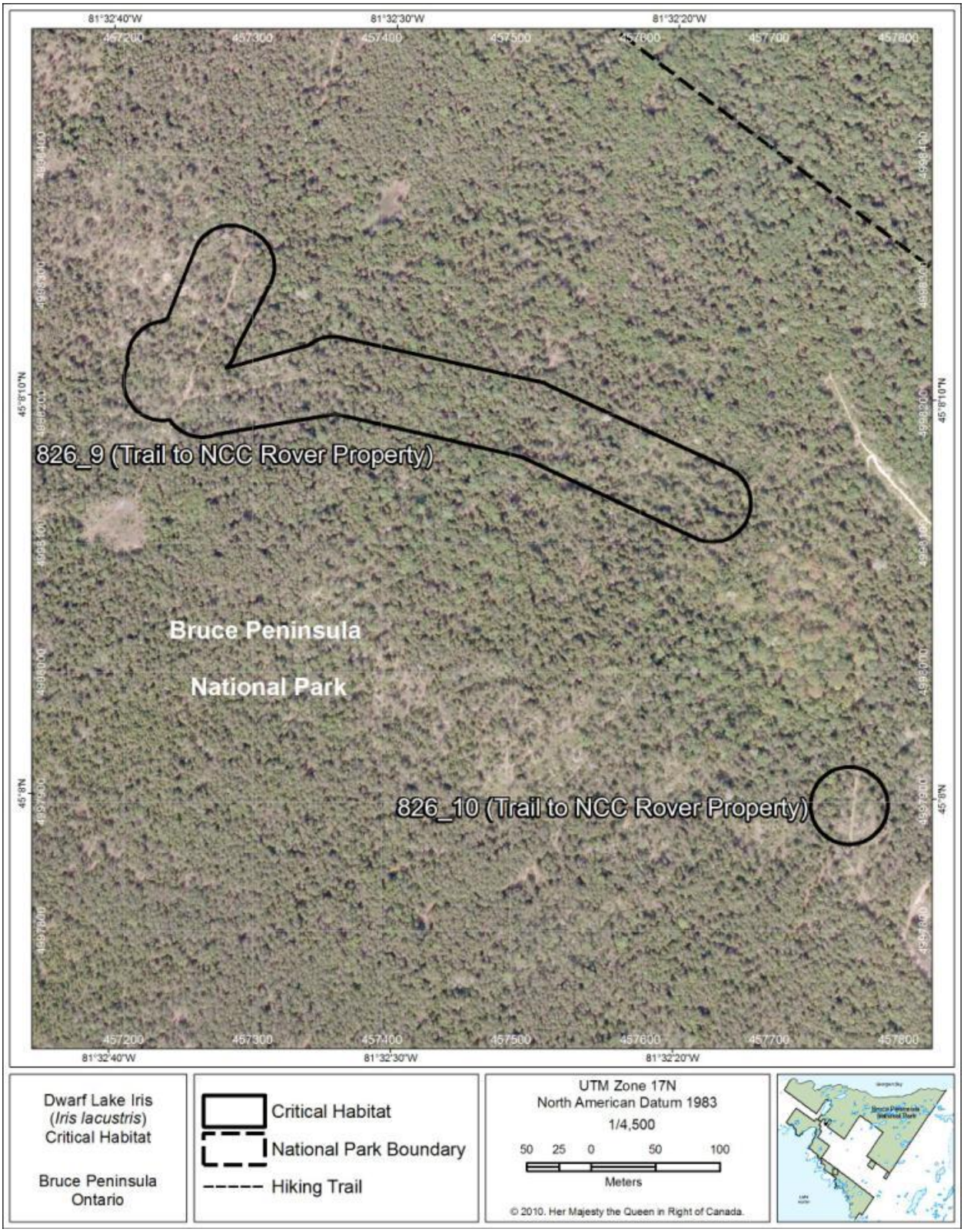

Figure 10. Fine-scale map of Dwarf Lake Iris critical habitat parcels 9 and 10 on the northern Bruce Peninsula.

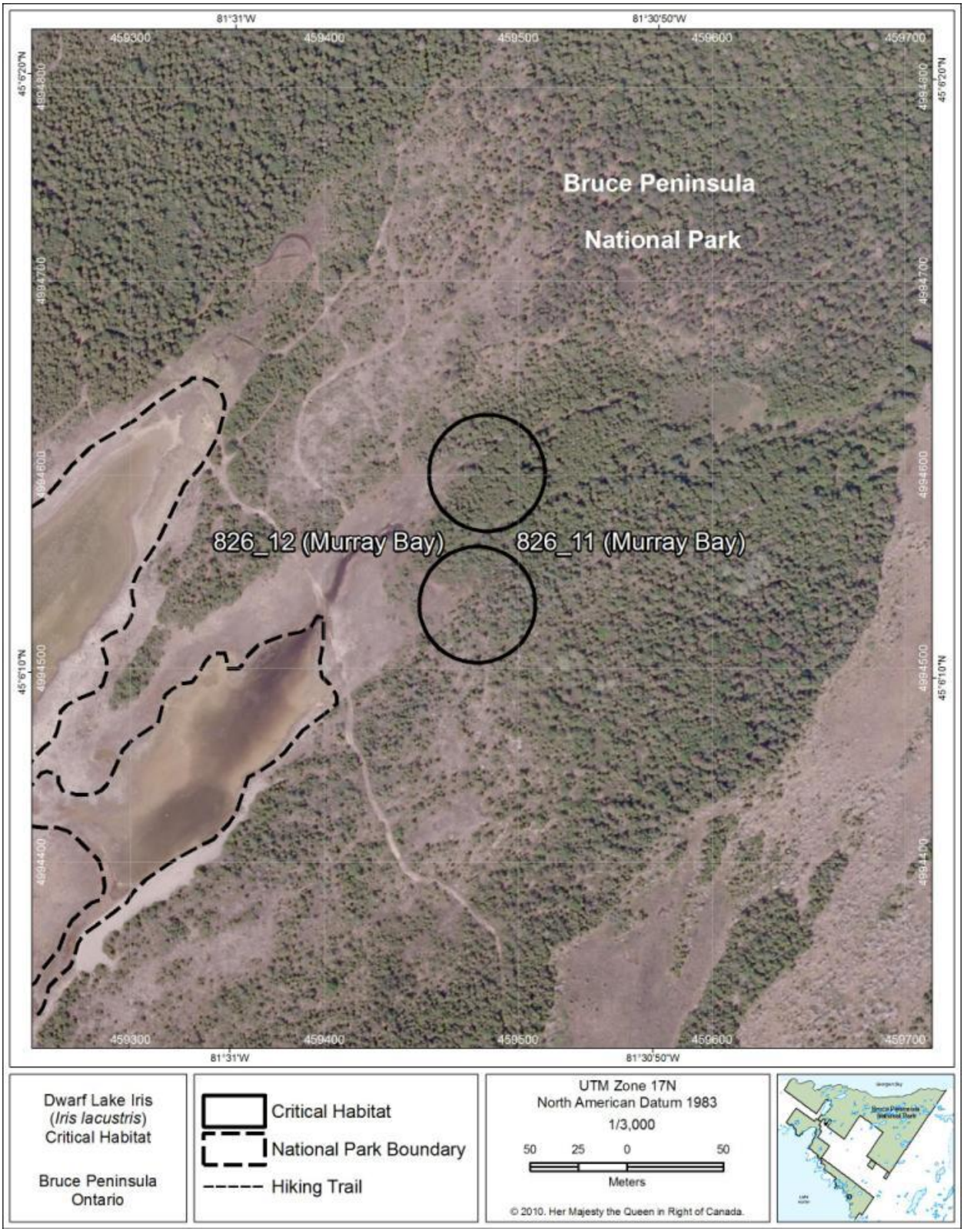

Figure 11. Fine-scale map of Dwarf Lake Iris critical habitat parcels 11 and 12 on the northern Bruce Peninsula.

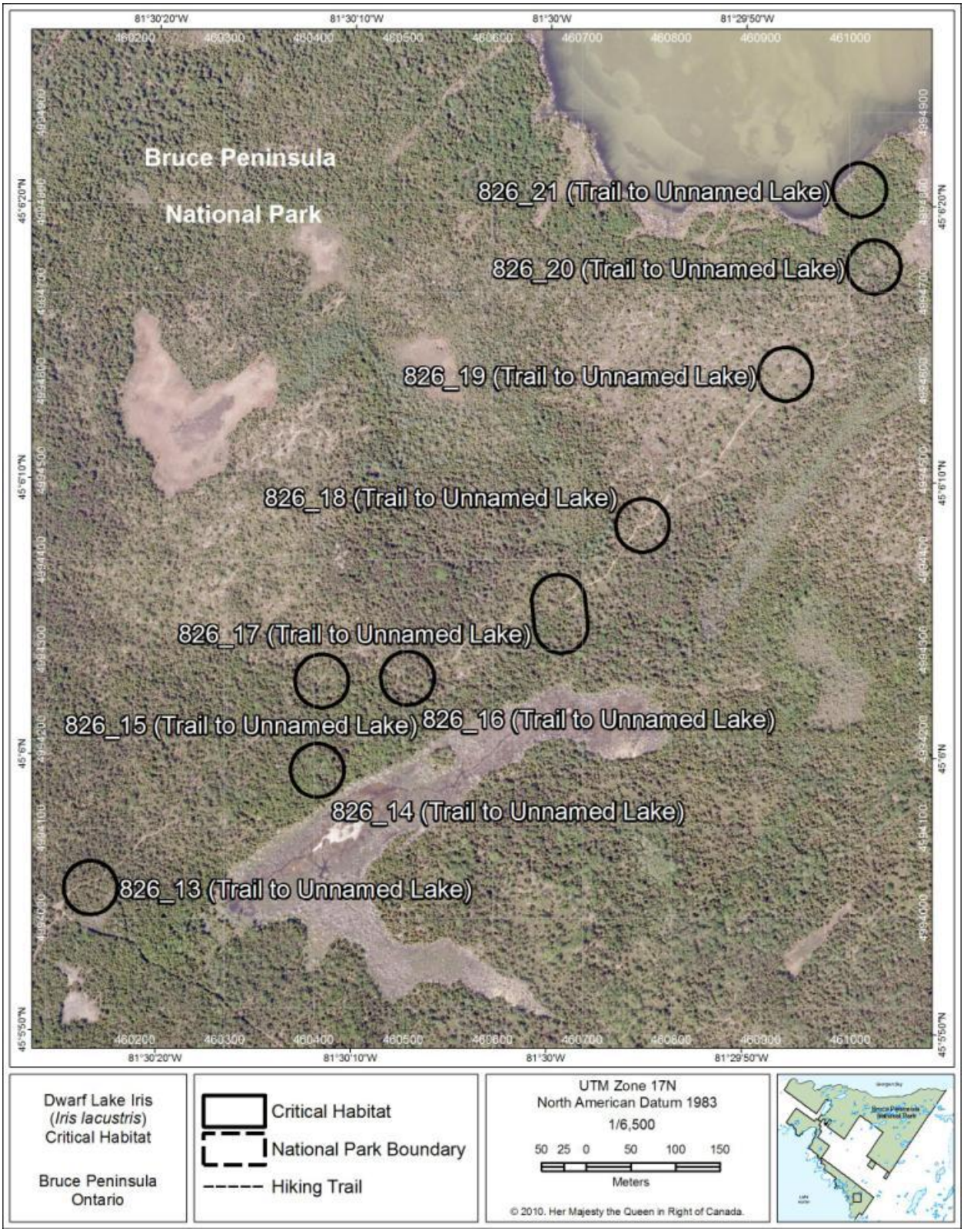

Figure 12. Fine-scale map of Dwarf Lake Iris critical habitat parcels 13-21 on the northern Bruce Peninsula.

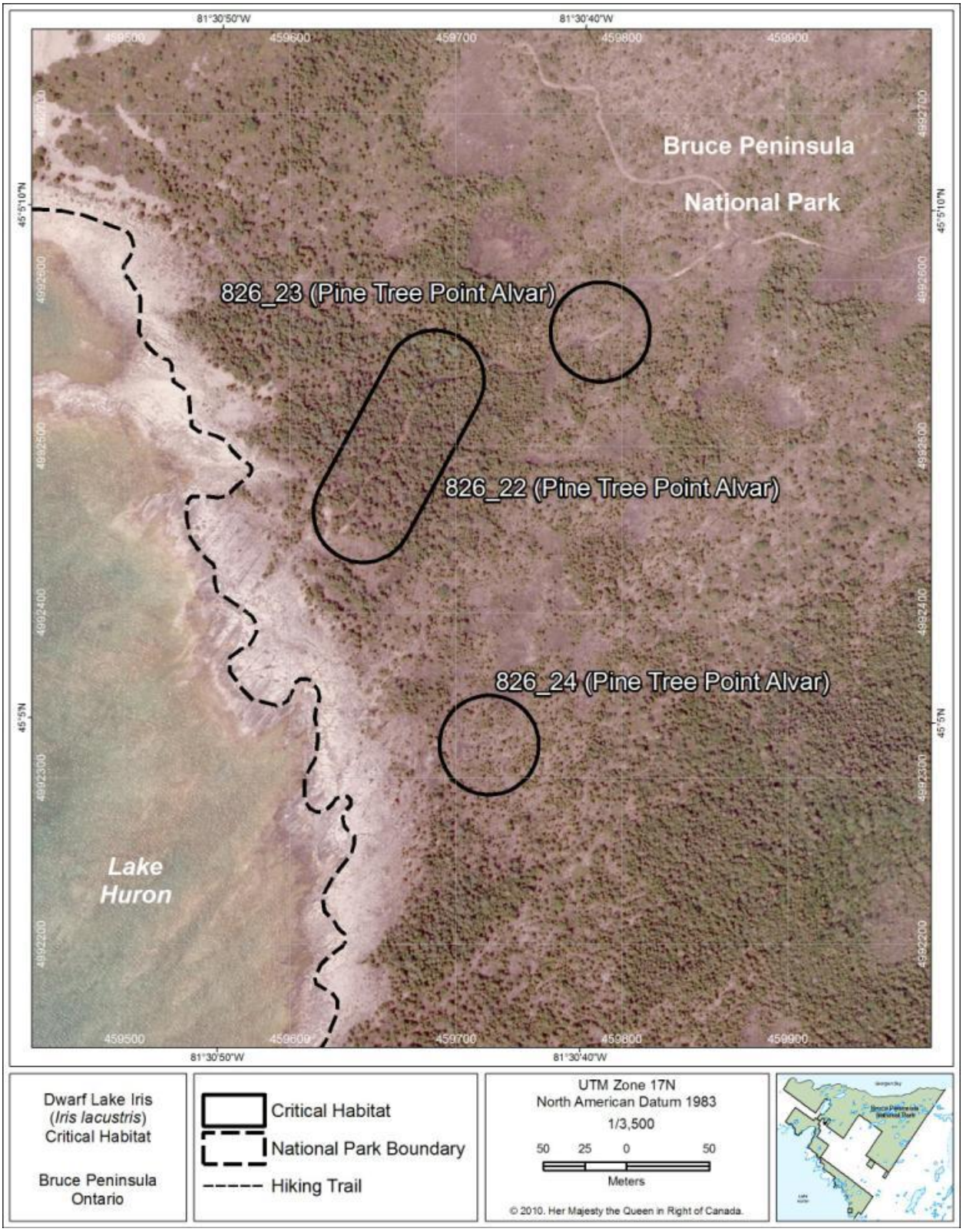

Figure 13. Fine-scale map of Dwarf Lake Iris critical habitat parcels 22-24 on the northern Bruce Peninsula.

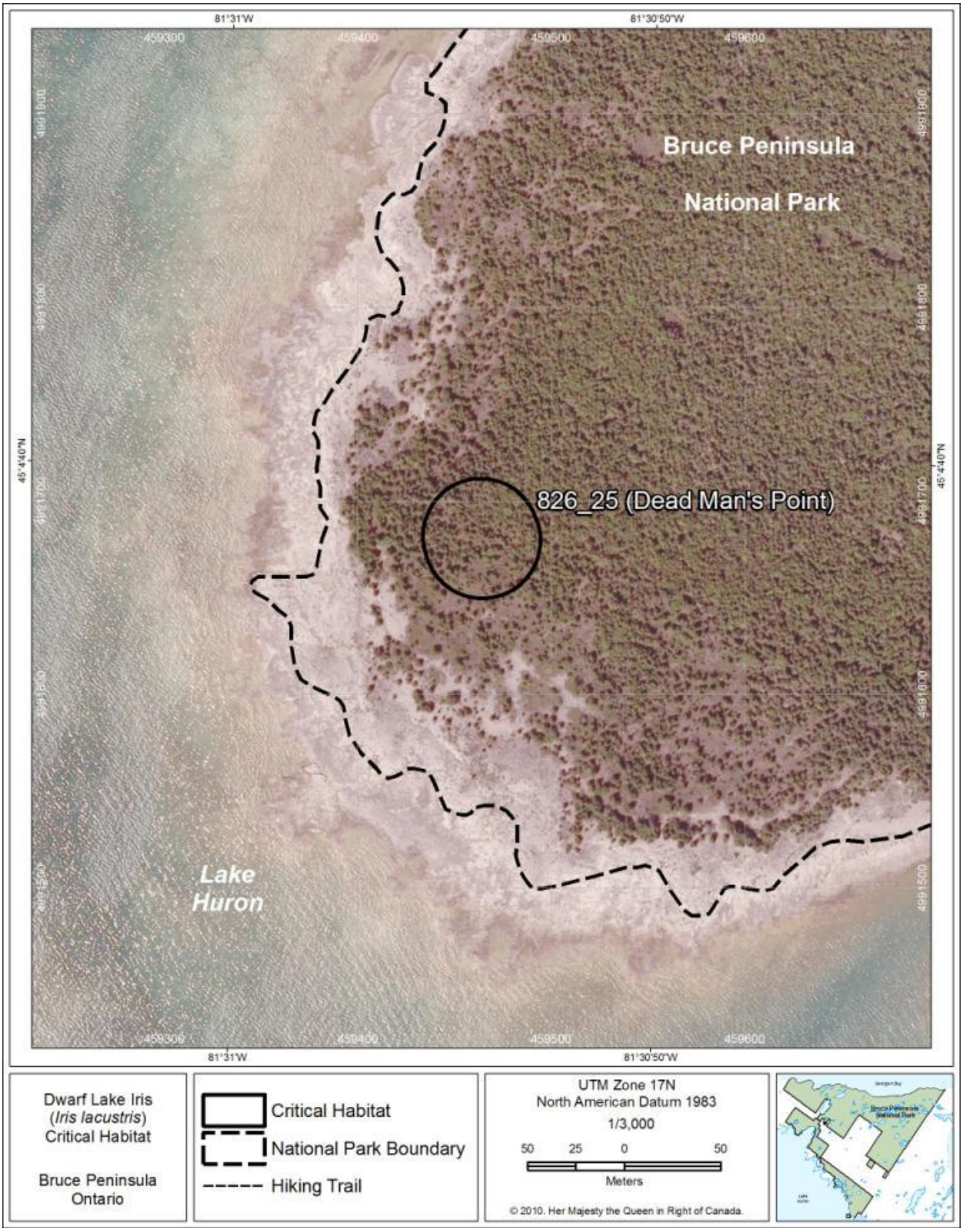

Figure 14. Fine-scale map of Dwarf Lake Iris critical habitat parcel 25 on the northern Bruce Peninsula.

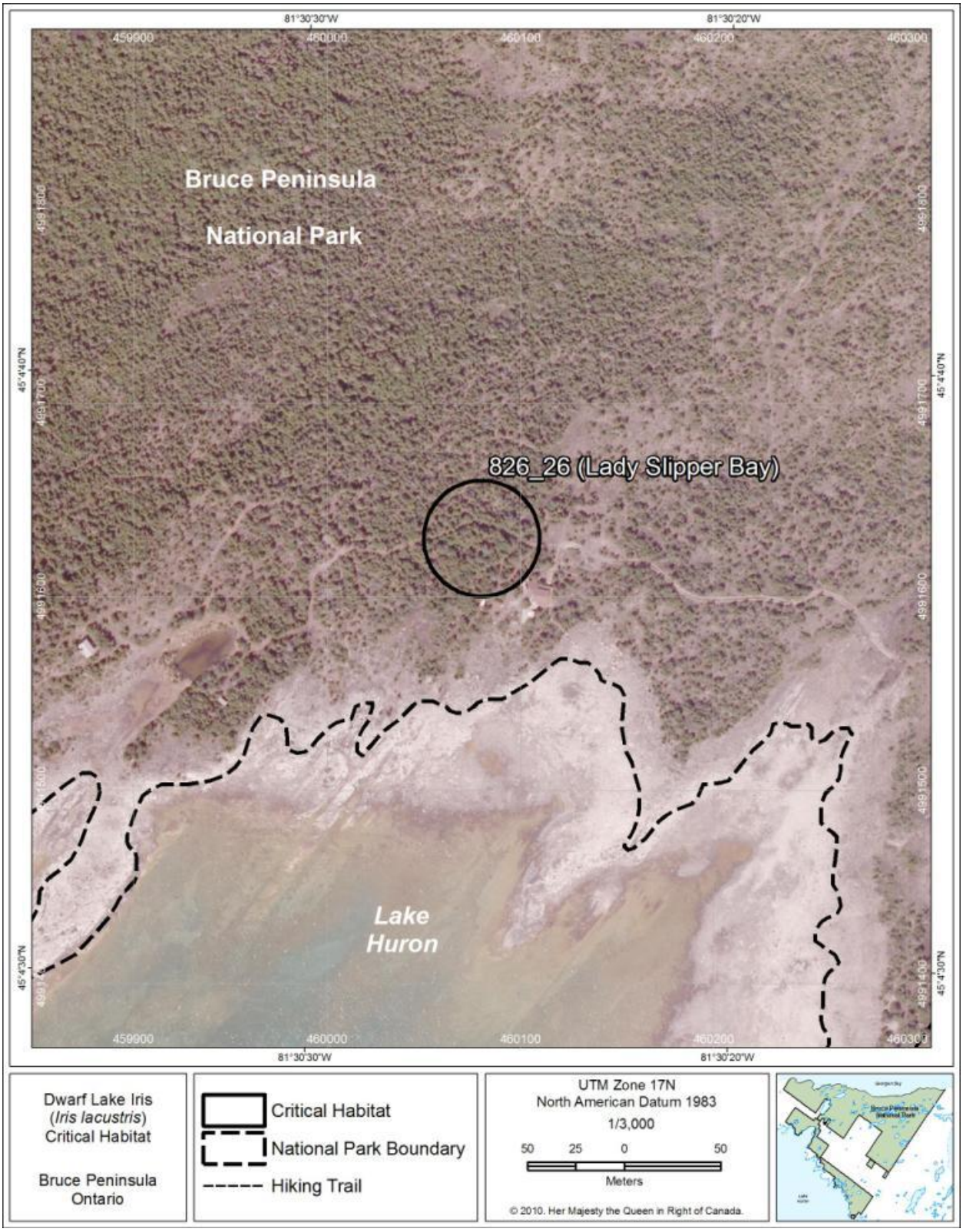

Figure 15. Fine-scale map of Dwarf Lake Iris critical habitat parcel 26 on the northern Bruce Peninsula.

Figure 16. Fine-scale map of Dwarf Lake Iris critical habitat parcel 27 on the northern Bruce Peninsula.

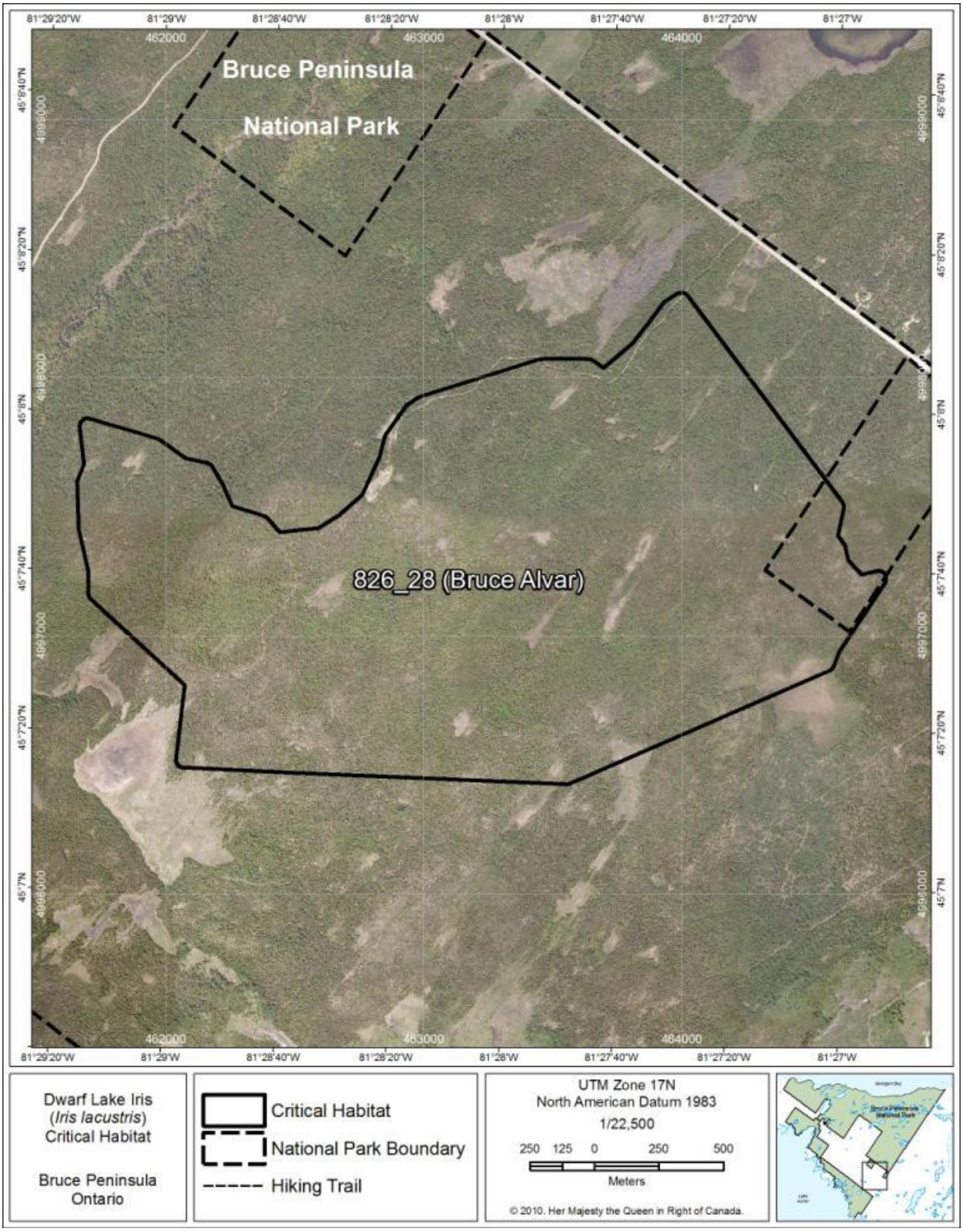

Figure 17. Fine-scale map of Dwarf Lake Iris critical habitat parcel 28 on the northern Bruce Peninsula.

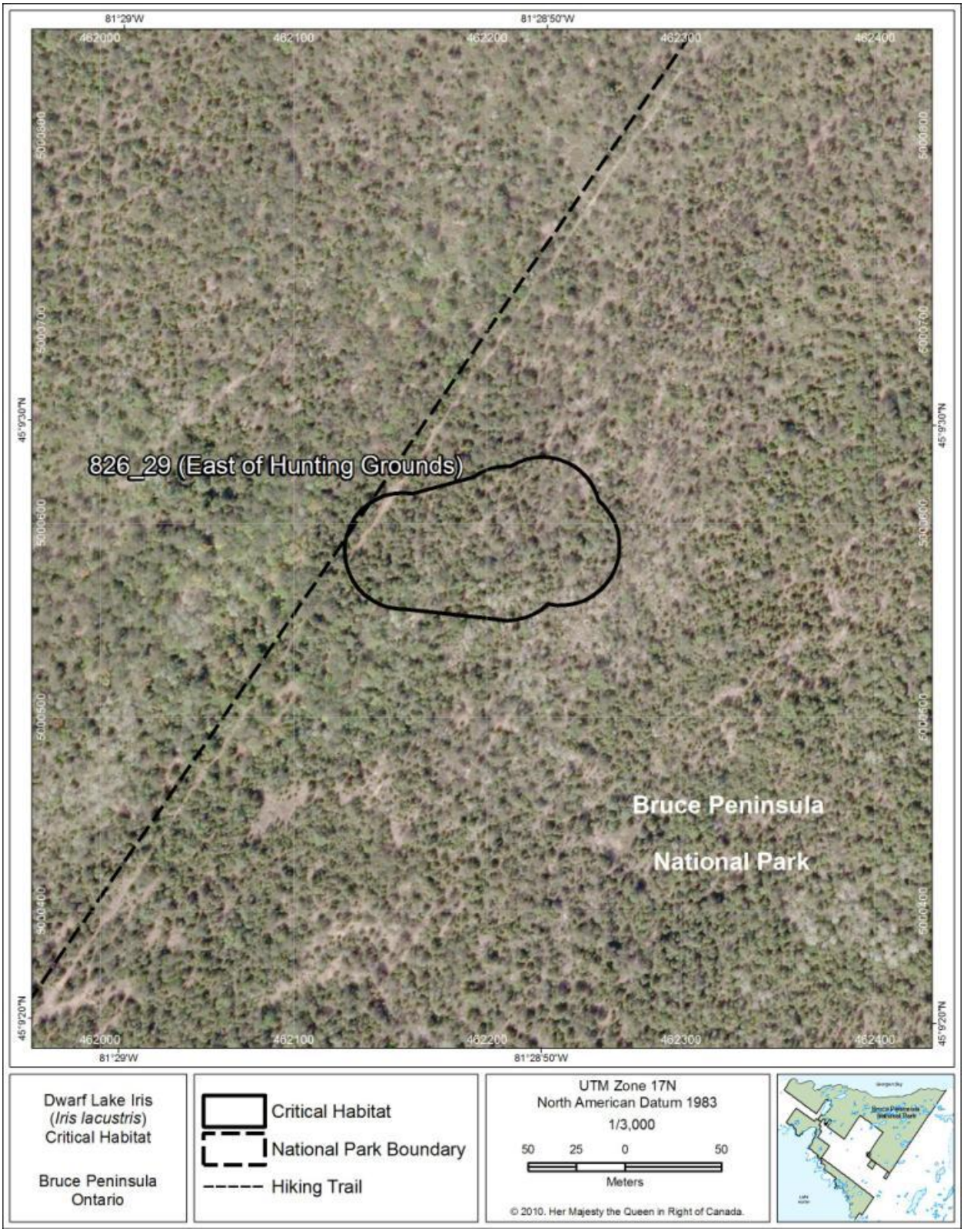

Figure 18. Fine-scale map of Dwarf Lake Iris critical habitat parcel 29 on the northern Bruce Peninsula.

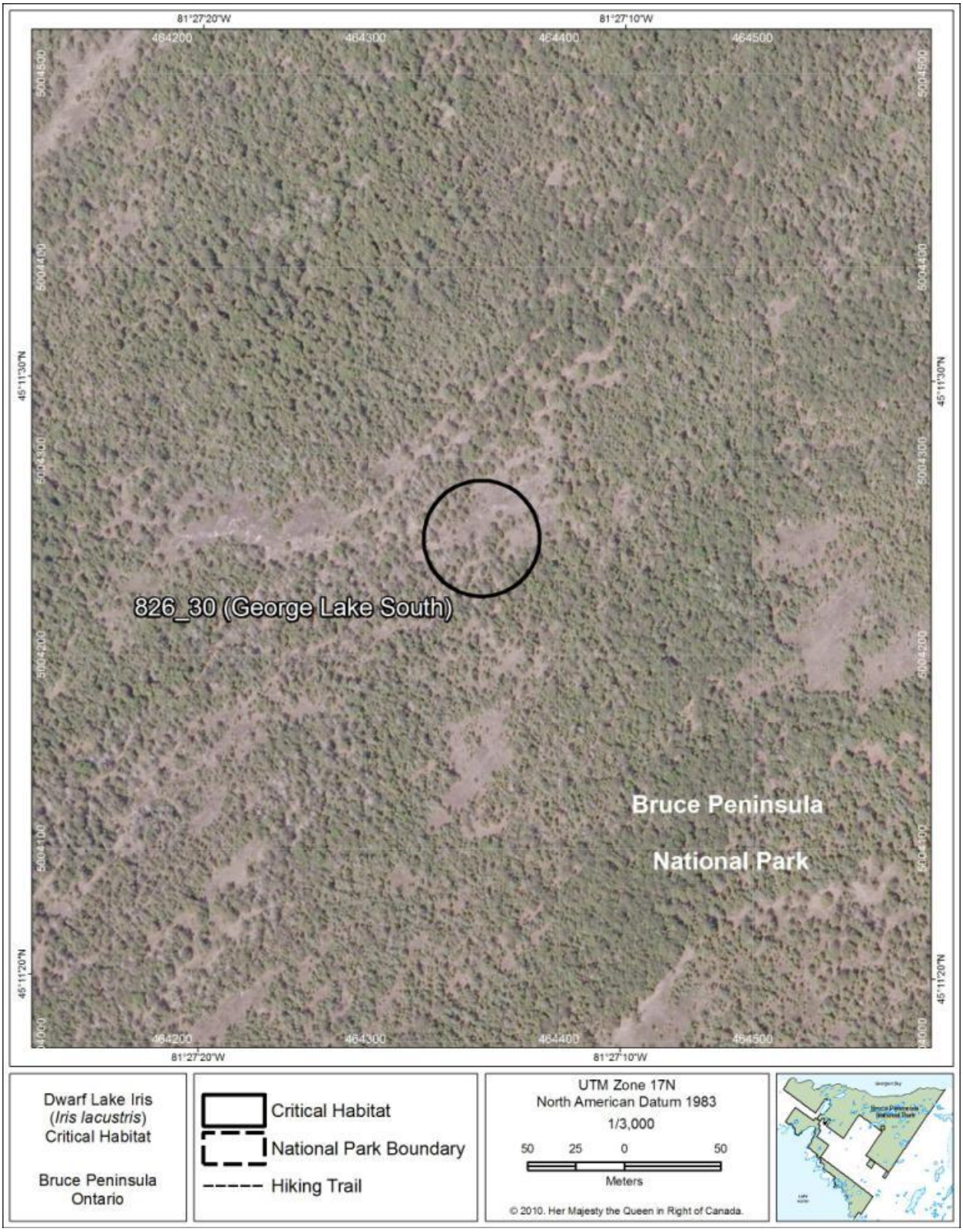

Figure 19. Fine-scale map of Dwarf Lake Iris critical habitat parcel 30 on the northern Bruce Peninsula.

In the absence of forest fire or disturbance associated with human activity, sites where Dwarf Lake Iris populations occur may grow in due to succession. Therefore, it is recommended that the critical habitat boundaries identified here should be evaluated on a 10 year basis to coincide with the cycle of COSEWIC evaluation of the species.

2.4 Activities Likely to Result in the Destruction of Critical Habitat

Destruction of critical habitat would result if any part of the critical habitat were degraded, either permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from single or multiple activities at one point in time or from the cumulative effects of one or more activities over time.

Examples of activities that are likely to result in the destruction of critical habitat include, but are not limited to, the following:

Activities that remove surrounding ground vegetation and soils:
- Building cottages, houses, and driveways over critical habitat
- Building roads across critical habitat
- Clearing of ground and removal of surface material including boulders
- Using critical habitat as landing areas or roads during the logging of adjacent forests
- Placing dumpsters, outhouses, or other semi-permanent structures in critical habitat

Activities that disturb the shallow soil:
- Driving or parking heavy machinery on critical habitat
- Heavy off-trail ATV use or increased ATV use of existing trails through critical habitat

Activities that reduce native species presence and introduce exotic and potentially invasive species:
- Trucking-in fill dirt and gravel into critical habitat
- Seeding lawns or planting non-native species within critical habitat
- Planting trees within critical habitat

Activities that trample and damage vegetation and soil:
- Heavy off-trail usage by hikers that destroys or seriously tramples vegetation
- Camping activities such as placing a tent, fire pit, or latrine on top of critical habitat
- Use of critical habitat by large groups, such as for events
- Development of new public recreational trails

Threshold tolerance levels and cumulative effects for the above activities have not been determined and require further assessment. It is intended here that recreational activities such as off-trail hiking may continue at low levels where the level of activity does not result in destruction of Dwarf Lake Iris critical habitat. In parks some management planning at the site level may be required to determine thresholds and prevent impacts.

2.5 Schedule of Studies to Identify Critical Habitat

Critical habitat has been identified for Dwarf Lake Iris commensurate with the population and distribution objective required to recover the species from Threatened status to Special Concern or lower. Further studies to identify critical habitat are not required at this time.

2.6 Additional Information Requirements about the Species

Knowledge gaps that require addressing to inform recovery activities are summarized in Table 2.

Table 2. Summary of Knowledge Gaps

Urgency	Need to know:	In order to show:
High	Impacts of controlled burning on Dwarf Lake Iris populations considered to be declining as a result of advanced succession of woody plants[9]	If controlled burns can be used to improve or maintain habitat
High	Better understanding of priority and nature of threats (throughout Canadian range and at individual sites)	Improved ability to prioritize and design actions to reduce or mitigate threats
Moderate	The seed dispersal mechanisms of Dwarf Lake Iris and the insect species that are important to pollination and their conservation status[10]	Whether declines in pollinators or limitations in dispersal mechanisms may be affecting reproduction of Dwarf Lake Iris, and if management for pollinator or dispersal species is necessary
Moderate	Offspring survival, plant longevity, generation time, population age structure, and reproductive and recruitment rates (COSEWIC 2004)	Better understanding of biological limitations and population viability to assist with action planning
Moderate	Nature and degree of impacts of cottage development; projected impacts in areas zoned for development	Necessary measures for improved protection of Dwarf Lake Iris through land use planning, landowner education and stewardship
Moderate	Impacts of cutting and clearing of woody species on Dwarf Lake Iris populations considered to be declining due to advanced succession of woody plants	Whether this method can maintain suitable habitat in the absence of fire.
Low	If exotic species affect habitat suitability or compete with Dwarf Lake Iris	Whether the presence of exotic species contributes to a decline in Dwarf Lake Iris
Low	Sources of plants and seeds being sold commercially	If sources are wild populations, legal enforcement measures may be taken

[9] A permit from the relevant land manager may be required to undertake burns which might harm individual Dwarf Lake Iris.

[10] The importance of bumblebees and other possible pollinators to the biology of Dwarf Lake Iris, as well as the possible effects of declines in pollinators, needs further study. Seed dispersal by insects requires further study. The role of rove beetles documented in Dwarf Lake Iris flowers (Engelken 2003) remains to be determined. Whether seeds are ever dispersed by water or other means warrants further investigation.

2.7 Habitat Conservation

At least 15 of 40 known Dwarf Lake iris populations are found in protected areas.

Queen Elizabeth-Queen Mother M'nidoo M'nissing Provincial Park (Belanger Bay)
Fathom Five National Marine Park (not recently verified)
Bruce Peninsula National Park (Dorcas Bay area, George Lake South)
Ontario Heritage Trust (Clarke) property in the Baptist Harbour area
Escarpment Biosphere Conservancy property near Baptist Harbour
Escarpment Biosphere Conservancy properties in the Hopkins Bay – Barney Lake area
Ontario Nature Bruce Alvar Nature Reserve
Johnston Harbour - Pine Tree Point (Crown and provincial park land managed by Parks Canada)
Lyal Island Nature Reserve (Ontario Nature) and Provincial Nature Reserve (Ontario Parks)
Black Creek Provincial Park
Grey Sauble Conservation Authority Managed Forest (Sucker Creek)
Ontario Nature Petrel Point Nature Reserve
Walker's Woods Nature Reserve
MacGregor Point Provincial Park

Based on Jones (2008), the two western Manitoulin populations are protected in a provincial park or occur on the adjacent OMNR-managed municipal shoreline allowance in Robertson and Dawson (unorganized) townships. Populations in the eastern Manitoulin area make up almost 20% of the total Canadian population. The majority of these are found on the Wikwemikong First Nation. Other large populations occur on private land and the municipal shoreline allowance of the Township of Tehkummah.

The management plan for Bruce Peninsula National Park and the provincial parks includes managing for the protection of the habitat of SAR. Conservation authorities and non-government conservation organizations place a high priority on SAR protection in the management of their lands. Jalava (2007) estimated that 98-99% of the total population of ramets on the northern Bruce Peninsula (Bruce Peninsula National Park Greater Park Ecosystem, or GPE) is found on lands protected by federal or provincial agencies, or non-government conservation organizations (Table 3). Since the northern Bruce Peninsula contains approximately 80% of the known population, this amounts to almost 80% of the Canadian population receiving some form of protection within a protected area.

Table 3. Breakdown of Dwarf Lake Iris Populations on Greater Park Ecosystem (GPE) of the Bruce Peninsula National Park Based on Land Tenure

Land Ownership	Estimated Population Size (in thousands)	% of overall GPE population
Private	71	0.15
NGO nature reserves	138	0.31
First Nations	100s	?
National Park	702	1.52
Crown land* / provincial parks	45,215	98.02

* most Crown (provincial) land in the GPE is managed by Bruce Peninsula National Park

The southern Bruce region has less than 2% of the known overall population. Most occurrences are on private land, although large populations (up to 50% of the southern Bruce region) are protected at MacGregor Point Provincial Park. Smaller populations are under the jurisdiction of the Saugeen First Nation, municipalities and conservation authorities.

2.8 Measuring Progress

The criteria indicated in Table 4 will be used to evaluate the progress of the overall recovery strategy for Dwarf Lake Iris. Each of the criteria is directly linked to one or more of the key objectives of this recovery strategy, as indicated.

Table 4. Performance Measures Criteria

Criterion	Links to Objective #	Evaluation Timeframe (years after final posting of RS*)
1. Priority sites identified. Threats assessment and management plans at priority sites completed	1,2	1
2. Relevant land managers have the most recent information on distribution of the species for land management decisions	1,2	1
3. Communications strategy developed	1,2	2
4. Monitoring program in place at priority sites	1,2	2
5. Research into appropriate habitat management initiated (eg: experimental burns)	1,2	2
6. Index of area of occupancy maintained above 20 km^2	1	Measured at five-year intervals
7. No continuous decline in extent of occurrence	2	Measured at five-year intervals
8. Population sizes maintained or increased at priority sites and no local extirpations (no loss of occupied sites) based on monitoring data	2	Measured at five-year intervals

* RS – Recovery Strategy

2.9 Statement on Action Plans

One or more action plans will be completed by September, 2015.

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APPENDIX A

Effects on the Environment and Other Species

Recovery efforts for Dwarf Lake Iris are not expected to have negative effects on other species. Management for Dwarf Lake Iris, particularly opening of tree canopy in situations where fire suppression is believed to be causing population declines, would also benefit Hill's Thistle, which is often found in the same or nearby habitats. The use of controlled burning as a habitat improvement tool requires further study to determine its potential effectiveness and risks. Other recovery steps deal mostly with education and policy and are likely to help other species by protecting habitat and educating landowners.

APPENDIX B

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