Species at Risk Act
Management Plan Series

Management Plan for the Dwarf Lake Iris (*Iris lacustris*) in Canada

Dwarf Lake Iris

2023

Government of Canada
Gouvernement du Canada

Canada

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Cover illustration: Photo courtesy of Judith Jones

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[1] www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html

Preface

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996)[2] agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of management plans for listed species of special concern and are required to report on progress five years after the publication of the final document on the Species at risk public registry.

The Minister of Environment and Climate Change and Minister responsible for the Parks Canada Agency is the competent minister under SARA for the Dwarf Lake Iris and has prepared this management plan, as per section 65 of SARA. To the extent possible, it has been prepared in cooperation with the Province of Ontario, as per section 66(1) of SARA.

Success in the conservation of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this plan and will not be achieved by Environment and Climate Change Canada and the Parks Canada Agency, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this plan for the benefit of the Dwarf Lake Iris and Canadian society as a whole.

Implementation of this management plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

[2] www.canada.ca/en/environment-climate-change/services/species-risk-act-accord-funding.html#2

Acknowledgments

This management plan was drafted by Karolyne Pickett (Environment and Climate Change Canada, Canadian Wildlife Service – Ontario (CWS-ON)). The management plan was informed by the *Recovery Strategy for the Dwarf Lake Iris* (Iris lacustris) *in Canada* (2011) prepared by the Parks Canada Agency, and the 2010 *COSEWIC Assessment and Status Report on the Dwarf Lake Iris* Iris lacustris *in Canada*, prepared by Judith Jones and Jarmo Jalava. The management plan benefited from input, review, and suggestions from the following individuals: Thomas Calteau, Judith Girard, Krista Holmes, Burke Korol, Kate O'Donoghue, Christina Rohe, and Lee Voisin (Environment and Climate Change Canada), Kim Borg (Parks Canada Agency); and Carling Dewar, Leanne Jennings and Eric Snyder (Ontario Ministry of the Environment, Conservation and Parks).

The conservation measures outlined in this management plan were developed based on an assessment of threats to the species. This threats assessment was conducted by a multi-jurisdictional group of individuals that included: David Fraser, Judith Jones and Jarmo Jalava (consultants); Miptoon Chegahno (Chippewas of Nawash); Cavan Harpur, Tricia Robins (Parks Canada Agency); Jenni Kaija, Edward Morris (Ontario Parks); Eric Snyder (Ontario Ministry of the Environment, Conservation and Parks); Bob Barnett (Escarpment Biosphere Conservancy); Esme Batten (Nature Conservancy of Canada); Andy Sorensen, Elaine VanDenKieboom (Grey Sauble Valley Conservation Authority); and Karolyne Pickett (CWS-ON). Acknowledgement and thanks are given to the individuals and respective organizations that participated in the threats assessment.

Executive Summary

Dwarf Lake Iris is a rare plant that is restricted to the shores of Lake Huron and Lake Michigan in North America. It is a small perennial plant with flat, narrow, blade-like leaves. The plants can form large colonies as a result of spreading by rhizomes (underground stems). Flowers are blue or purple and each petal has an orange, bearded crest in the middle.

In Canada, Dwarf Lake Iris is restricted to Bruce County and Manitoulin Island, in the province of Ontario. The species generally occurs in partial shade on thin soils near the Lake Huron shoreline. Optimal habitat includes woodland canopy openings, woodland edges, treed alvar edges, and sandy or gravelly beaches and ridges. It is most frequently found at the transition from shoreline to woodland, though some large subpopulations occur inland.

Dwarf Lake Iris was listed as Threatened on Schedule 1 of the federal *Species at Risk Act* (SARA) in 2006. Subsequent survey efforts found that some subpopulations were larger than previously reported, and several additional subpopulations were discovered. As of 2010 there were 40 extant subpopulations in Canada. The population size in Canada is estimated at over 50 million ramets (stems). As a result, COSEWIC re-assessed the species as Special Concern in November 2010, and the species status under SARA was changed accordingly in 2017. In Ontario, the species is listed as Special Concern under the *Endangered Species Act, 2007* (ESA 2007).

The main threats to the Canadian population of Dwarf Lake Iris are wildfire suppression, residential (shoreline) development, and crushing of plants from recreational cycling, hiking and use of all-terrain vehicles. Though shoreline development was identified as the major threat in the 2010 COSEWIC status report, the threats assessment conducted in 2019 in preparation for this management plan identified wildfire suppression as the threat with the highest impact on the population.

The management objective for Dwarf Lake Iris in Canada is to prevent the population from becoming Threatened or Endangered by maintaining the current distribution and number of subpopulations of Dwarf Lake Iris, and by maintaining or increasing the extent of habitat occupied by the species.

Broad strategies to achieve this management objective include habitat management (of canopy cover and invasive plant species), information sharing with land-use planning authorities, population monitoring, research related to threats from pollinator declines and climate change, and public outreach.

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1. COSEWIC* Species Assessment Information

Date of Assessment: November 2010

Common name: Dwarf Lake Iris

Scientific name: *Iris lacustris*

COSEWIC Status: Special Concern

Reason for designation: This globally vulnerable Great Lakes endemic is a small clonal perennial iris restricted in Canada to areas near the shore of Lake Huron in Ontario. Of 40 extant Canadian populations consisting of over 50 million stems, two thirds occur outside of protected areas and are susceptible to shoreline development. This species is also sensitive to road construction, trampling, and fire suppression. However, recent survey efforts, which greatly increased the known number of populations and number of plants, have reduced the level of risk for this species.

Canadian Occurrence: Ontario

COSEWIC Status history: Designated Threatened in November 2004. Status re-examined and designated Special Concern in November 2010.

* COSEWIC – Committee on the Status of Endangered Wildlife in Canada

2. Species Status Information

Dwarf Lake Iris (*Iris lacustris*) is endemic to the Great Lakes basin and is only found in one Canadian province and two American states. The species is ranked as Vulnerable[3] by NatureServe at all jurisdictional levels (Table 1).

Table 1. Conservation Status Ranks for the Dwarf Lake Iris in Canada and the United States, last reviewed in 2014 (NatureServe 2021).

Global (G) Rank	National (N) Rank	Subnational (S) Rank
G3	Canada (N3)	Ontario (S3)
	United States (N3)	Michigan (S3) Wisconsin (S3)

[3] Vulnerable (G3/N3/S3): At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

Dwarf Lake Iris is listed as Special Concern[4] under Schedule 1 of the federal *Species at Risk Act* (SARA). It is also listed as Special Concern[5] under Ontario's *Endangered Species Act, 2007* (ESA).

3. Species Information

3.1. Species Description

Dwarf Lake Iris is a small perennial plant, with blade-like leaves 6-18 cm long and 0.5-1 cm wide (COSEWIC 2010). The flowers are 3-5 cm wide and consist of three petals and three sepals which are normally all bluish-purple, though one variety has white petals (Cruise and Catling 1972). An orange, bearded crest lies atop each petal. The flowering stem is at most 15 cm tall, but usually less than 10 cm (Voss and Reznicek 2012).

Dwarf Lake Iris reproduces primarily by growing horizontal, underground stems called rhizomes; each new plant grows out of an enlarged node that forms where a rhizome surfaces from the ground. Plants die back in autumn leaving the rhizome to over-winter (Planisek 1983). New growth from the rhizomes occurs in spring; locations of past years' shoots can be detected from the swollen nodes on the rhizome. This type of vegetative reproduction results in large clumps of genetically identical plants called "ramets", which remain interconnected for many years, often forming extensive colonies (COSEWIC 2004).

The Dwarf Lake Iris flower resembles the flower of another native iris, the Blue Flag Iris (*Iris versicolor*); however Blue Flag Iris is a much taller plant (30-80 cm) and occurs in much wetter areas.

When not in flower, Dwarf Lake Iris may be confused with Sticky False Asphodel (*Triantha glutinosa),* which often grows in the same habitats and can also form large colonies (COSEWIC 2010). Furthermore, the leaf arrangement of both species is equitant (meaning that the base of the leaves overlap). Although the leaves of Sticky False Asphodel tend to be fleshier, narrower, and darker green, it is nevertheless recommended that surveys for Dwarf Lake Iris be conducted either in early June when it is in flower, or in mid-July to mid-August when the vertical sticky stems, white flowers and/or reddish fruits of Sticky False Asphodel are visible.

3.2. Species Population and Distribution

Dwarf Lake Iris occurs in Canada and the U.S., on the northern shores of Lake Michigan and the northern shores of Lake Huron (Figure 1). In the U.S., it is found in the

[4] A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
[5] A species that lives in the wild in Ontario, is not endangered or threatened, but may become threatened or endangered because of a combination of biological characteristics and identified threats.

states of Michigan and Wisconsin, and in Canada the species only occurs in the province of Ontario (NatureServe 2021).

COSEWIC (2010) reported the presence of 80 subpopulations in Michigan and 15 in Wisconsin; these numbers have since increased to 92 in Michigan (MNFI 2021) and to possibly 30 in Wisconsin (NatureServe 2021). As of 2010, there were 40 extant (still existing) subpopulations[6] in Canada (COSEWIC 2010). Based on these numbers, approximately 25% of all subpopulations are found in Canada (40 out of a total 162).

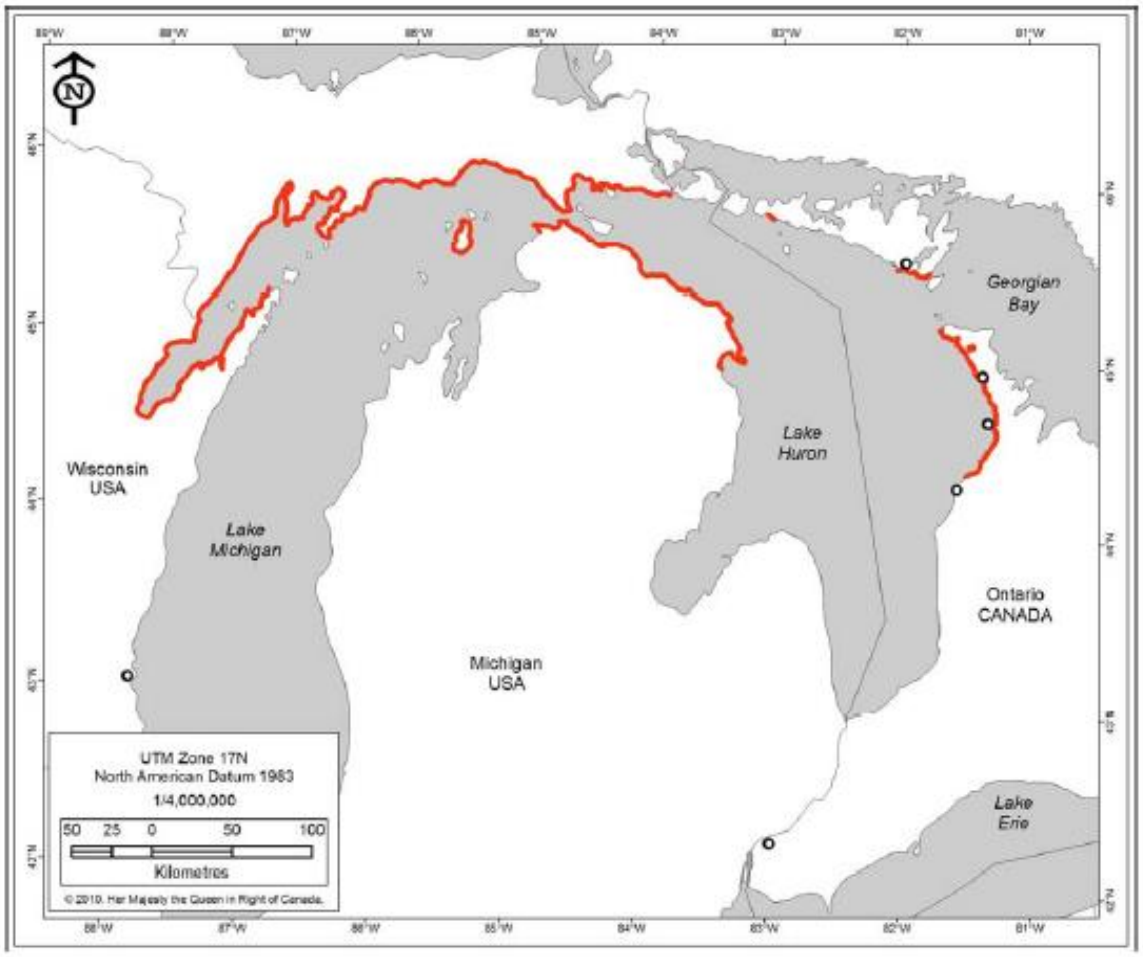

Figure 1. Global range of Dwarf Lake Iris, represented by the red line. Line is slightly wider than actual range. Actual distribution is not continuous within the range. Open circles represent extirpated (no longer in existence) subpopulations in Canada (figure from COSEWIC 2010).

[6] To be consistent with COSEWIC's definition of 'population' which refers to the total number of individuals of a taxon in Canada, the term 'subpopulation' is used when referring to geographically defined groups of the taxon between which there is little demographic or genetic exchange (typically one successful migrant individual or gamete per year or less) (COSEWIC 2021a).

In Ontario, Dwarf Lake Iris is found in northwestern Bruce County and on the southern shore of Manitoulin Island (Figure 2). In Bruce County, the species' range extends from the tip of the Bruce Peninsula south to near Inverhuron, along a 160 km strip on the peninsula's western shore. On 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. The vast majority of subpopulations occur on or within a few kilometres of the Lake Huron shoreline. However, the largest subpopulations in Canada occur several kilometers inland from the shoreline, in the north-central area of Bruce Peninsula.

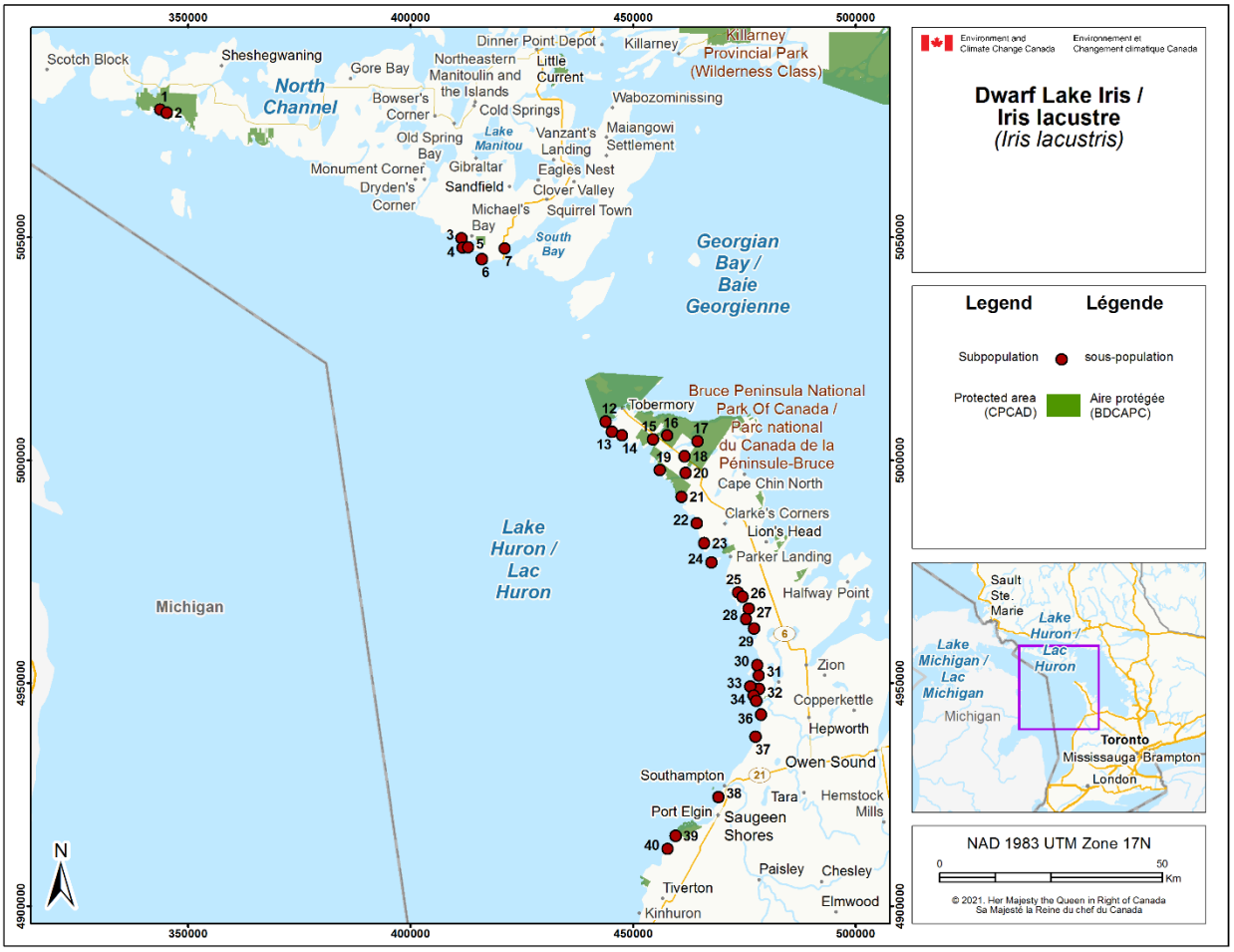

Figure 2. Extant subpopulations of Dwarf Lake Iris in Canada. Red circles represent extant subpopulations # 1-40, excluding subpopulations # 8-11 (locations not available for publication). See Appendix B for subpopulation names. Data sources: Jones & Jalava 2009, ECCC 2021.

Twelve subpopulations have a status of Unknown, Historical[7] or Extirpated (Tables 1 and 2 in COSEWIC 2010). Twenty-nine subpopulations were confirmed extant during the lead-up to the 2010 status report, including ten new subpopulations that were discovered after 2004 (Table 2). The persistence of another 11 subpopulations was not confirmed in 2010, nevertheless they are considered extant because they did not meet the criteria to be ranked as Historical as of 2010. In summary, there are 40 subpopulations of Dwarf Lake Iris considered extant in Canada (see Appendix B for details).

Table 2. Survey results of Dwarf Lake Iris subpopulations documented in the 2004 and the 2010 COSEWIC status reports that are considered extant.

2004 \ 2010	Found	Not Visited	Not Found	Total
Found	10	4	1	15
Not Visited	3	2	0	5
Not Found	6	0	0	6
Not Reported	10	3	1	14
Total	29	9	2	40

The Canadian subpopulations range in size from small clumps of less than 100 ramets to colonies of several million ramets covering many square kilometers, though most subpopulations number in the thousands and tens of thousands (see Table 1 in COSEWIC 2010). The total number of ramets in Canada is estimated at more than 50 million.

3.3. Biological Needs

3.3.1. Habitat

In Ontario, most Dwarf Lake Iris subpopulations are found along woodland edges within 500 m of the Lake Huron shoreline, where the plants grow on alvars, dolostone bedrock, and sand or gravel beaches. The largest subpopulations, however, occur inland, where the species grows on calcareous soils within coniferous woodland canopy openings. There are large extents of suitable habitat on the shores of Lake Huron that are not occupied by the species (COSEWIC 2010).

Catling (1995) categorized Dwarf Lake Iris as a species with a moderate level of confinement to alvars (defined as plant species for which 50-70% of occurrences included in the Ontario study were on alvars); the remainder of the occurrences were located in either woodland or dune habitat. However on Manitoulin Island, Dwarf Lake Iris subpopulations were not found on alvars (Catling & Brownell 1995).

[7] NatureServe recommends assigning a status of Historical to an occurrence that has not been confirmed for 20 or more years, even if suitable habitat for the species is still present (NatureServe 2002). In the case of Dwarf Lake Iris, the subpopulations in question were confirmed extant in 1991 or earlier.

For the wooded sites, Dwarf Lake Iris is usually found in woodlands 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*), Eastern White Pine (*P. strobus*) and White Spruce (*Picea glauca*). In inland areas of the northern Bruce Peninsula, the presence of Dwarf Lake Iris in canopy openings in Jack Pine and Red Pine woodlands, both of which are largely fire-dependent species, suggests that wildfire may play an important role in creating habitat for Dwarf Lake Iris at some sites.

As a result of reproducing primarily via rhizomes (see section 3.1), Dwarf Lake Iris tends to be abundant where it occurs, growing in dense clumps (Planisek 1983). Dwarf Lake Iris can tolerate a wide range of microsites but typically, those with intermediate light levels (3800 fc[8]), a thin layer of organic litter, and where the water table is more than 25 cm below the surface have the highest densities of shoots, blooms and fruit (Van Kley and Wujek 1993). These findings are consistent with habitat conditions documented in Ontario subpopulations, and are supported by the work of Engelken (2003), who found that reproductive success was highest among subpopulations at sites with relatively open tree canopies.

3.3.2. Pollination and Dispersal

Dwarf Lake Iris mostly spreads by vegetative reproduction, however sexual reproduction (pollen transfer) is thought to occur, at least to some degree, via insect pollinators.

Age of the plant 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. The rate of sexual reproduction is naturally low: Planisek (1983) found that only 13% of growing tips produced flowers, and only 3% produced fruit.

Pollen transfer by insects is likely, but the extent and distance of this transfer is unknown. Halictid bees (*Augochlorella striata*) (Larson 1998), as well as bumblebees (*Bombus* spp.), the Honeysuckle Bee Hawkmoth (*Hemaris affinis*), and rove beetles (family Staphylinidae) (Engelken 2003) have been observed as potential pollinators of Dwarf Lake Iris, though their relative importance remains to be determined.

Flowers are also capable of self-pollination. 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).

Seed capsules ripen from mid-June to mid-August. Through experimental trials, Planisek (1983) concluded that Dwarf Lake Iris seeds are dispersed by ants, including *Myrmica* spp. Based on the average body length of worker ants from this genus (4-5 mm), and the maximum seed dispersal distance reported for various ant species of that

[8] A foot-candle (fc) is a unit of measurement for light intensity, defined as 1 lumen per square foot.

size (reviewed in Ness et al. 2004), the maximum dispersal distance of Dwarf Lake Iris seeds carried by ants is likely in the 2-meter range, and probably 6 m at the most[9]. Dispersal by water is probably infrequent, if it occurs at all, since plants normally grow above the high water mark; furthermore, longevity of seeds in water is unknown (COSEWIC 2004). Seeds germinate sporadically only after long periods of dormancy (Hannan and Orick 2000).

4. Threats

4.1. Threat assessment

Threats to the Canadian population of Dwarf Lake Iris were assessed by a group of species experts during the development of this Management Plan (ECCC 2019), according to the methodology described in *Guidance for completing the Threats Classification and Assessment Calculator and Determining the number of "Locations"* (COSEWIC 2012). The latter is based on the International Union for Conservation of Nature (IUCN) and the Conservation Measures Partnership unified threats classification system.

For the purposes of this assessment, threats are defined as the proximate activities or processes that are causing, or may in the future cause the destruction, degradation, and/or impairment of all or of a portion of the Canadian population of Dwarf Lake Iris. Under this threat assessment methodology, only current and future threats are considered. Historical threats and limiting factors are not considered during this assessment process.

Threats to Dwarf Lake Iris are summarized in Table 3.

The main threats to the Canadian population of Dwarf Lake Iris are wildfire suppression, residential (shoreline) development, and crushing of plants from recreational cycling, hiking and use of all-terrain vehicles. Though shoreline development was identified as the major threat in the 2010 COSEWIC status report, the threats assessment conducted in 2019 in preparation for this management plan identified wildfire suppression as the threat with the highest impact on the population.

[9] Ness et al. (2004) also established, and characterized the slope of, the positive relationship between worker and body length and seed dispersal distance, on which seed weight had little influence.

Table 3. Threats assessment summary for Dwarf Lake Iris in Canada.

Threat #	Threat category	Description	Impact[a]	Scope[b]	Severity[c]	Timing[d]
1.	Residential & commercial development		Low	Small	Moderate-Serious	High
1.1	Housing & urban areas	New housing construction	Low	Small (1-10%)	Moderate-Serious (11-70%)	High
4.	Transportation & service corridors		Negligible	Negligible	Moderate	High
4.1	Roads & railroads	Road maintenance & upgrades	Negligible	Negligible (<1%)	Moderate (11-30%)	High
5.	Biological resource use		Negligible	Negligible	Negligible	Negligible
5.2	Gathering terrestrial plants	Plant collecting	Negligible	Negligible (<1%)	Negligible (<1%)	Negligible
5.3	Logging & wood harvesting	Selective cut	Not a threat	Small (1-10%)	Neutral or Potential Benefit	Negligible
6.	Human intrusions & disturbance		Low	Small	Slight	High
6.1	Recreational activities	ATVs/ cycling/ Hiking	Low	Small (1-10%)	Slight (1-10%)	High
7.	Natural system modifications		Medium-Low	Large	Moderate-Slight	High
7.1	Fire & fire suppression	Fire suppression	Medium-Low	Large (31-70%)	Moderate-Slight (1-30%)	High
7.3	Other ecosystem modifications	Insect decline	Unknown	Small (1-10%)	Unknown	Unknown
8.	Invasive & other problematic species & genes		Negligible	Small	Negligible	High
8.1	Invasive non-native/alien species	Non-native plants	Negligible	Small (1-10%)	Negligible (<1%)	High
11.	Climate change & severe weather		Unknown	Pervasive	Unknown	Moderate
11.2	Droughts	Droughts	Unknown	Pervasive (71-100%)	Unknown	Moderate
11.4	Storms & flooding	Flooding	Unknown	Small (1-10%)	Unknown	Moderate

[a] **Impact** – The degree to which a species is observed, inferred, or suspected to be directly or indirectly threatened in the area of interest. The impact of each threat is based on Severity and Scope rating and considers only present and future threats. Threat impact reflects a reduction of a species population or decline/degradation of the area of an ecosystem. The median rate of population reduction or area decline for each combination of scope and severity corresponds to the following classes of threat impact: Very High (75% declines), High (40%), Medium (15%), and Low (3%). Unknown: used when impact cannot be determined (e.g., if values for either scope or severity are unknown); Not Calculated: impact not calculated as threat is outside the assessment timeframe (e.g., timing is insignificant/negligible or low as threat is only considered to be in the past); Negligible: when scope or severity is negligible; Not a Threat: when severity is scored as neutral or potential benefit.

[b] **Scope** – Proportion of the species that can reasonably be expected to be affected by the threat within 10 years. Usually measured as a proportion of the species' population in the area of interest. (Pervasive = 71–100%; Large = 31–70%; Restricted = 11–30%; Small = 1–10%; Negligible < 1%).

[c] **Severity** – Within the scope, the level of damage to the species from the threat that can reasonably be expected to be affected by the threat within a 10-year or three-generation timeframe. Usually measured as the degree of reduction of the species' population. (Extreme = 71–100%; Serious = 31–70%; Moderate = 11–30%; Slight = 1–10%; Negligible < 1%; Neutral or Potential Benefit ≥ 0%).

[d] **Timing** – High = continuing; Moderate = only in the future (could happen in the short term [< 10 years or 3 generations]) or now suspended (could come back in the short term); Low = only in the future (could happen in the long term) or now suspended (could come back in the long term); Insignificant/Negligible = only in the past and unlikely to return, or no direct effect but limiting.

4.2. Threat descriptions

Threat 1. Residential & commercial development

Threat 1.1 Housing & urban areas –Impact: Low

- Construction of residential structures

Ongoing residential development along the Lake Huron shoreline is a threat to Dwarf Lake Iris because new construction projects would kill individual plants and eliminate all habitat located within a project's direct footprint. The Oliphant, Sauble Beach-Walker's Woods and Pike Bay subpopulations are particularly vulnerable to this threat (ECCC 2019). However, the overall impact of residential development is tempered by: a) the generally small footprint of residential structures relative to the total size of residential lots; and b) the openings in the canopy created by a construction project, which can benefit individual plants located in the area outside the project's direct footprint, though only if the soil and vegetation in that area remain in their natural state (ECCC 2019). Consequently, although shoreline development was identified as the major threat in the 2010 COSEWIC status report, the threats assessment conducted in 2019 in preparation for this management plan identified wildfire suppression as the threat with the highest impact on the population (see Threat 7.1 below).

Threat 4. Transportation & service corridors

Threat 4.1 Roads & railroads – Impact: Negligible

- Road maintenance and upgrades

Roadside subpopulations of Dwarf Lake Iris may be negatively affected by non-targeted road salt application and routine road right-of-ways maintenance activities such as ditch clearing, herbicide spraying and mowing. Road improvement projects such as road resurfacing and culvert replacement may also have negative effects, because these activities and the use of associated machinery could kill or damage individual plants located within the project's direct and indirect footprint. However, these road maintenance and improvement activities do not permanently eliminate habitat, and it is therefore likely that individuals of the species are able to re-establish themselves once the activities have ceased, though perhaps not to their original extent. The scope of this threat is negligible because most Dwarf Lake Iris subpopulations do not occur in the proximity of roads (ECCC 2019).

Threat 5. Biological resource use

Threat 5.2 Gathering terrestrial plants – Impact: Negligible

- Plant harvesting

There is no evidence of species harvesting for horticultural purposes.

Threat 5.3 Logging & wood harvesting – Impact: Not a threat

- Logging machinery

Logging is suspected to be occurring in the vicinity of some Dwarf Lake Iris subpopulations on Manitoulin Island (ECCC 2019). This activity can be a threat to the species if its presence is not taken into consideration when logging occurs. For example, heavy machinery used in logging operations compacts the soil, and may also crush individuals of Dwarf Lake Iris. Consistent with these impacts is the observed lower density of Dwarf Lake Iris on sites that have been logged in the last 10 years compared to those logged in the more distant past (ECCC 2019). On the other hand, the removal of trees for lumber production likely benefits the species in the medium to long-term (10+ years) if undertaken according to selective logging protocols and best forest management practices, because thinning of the tree canopy increases the amount of light that reaches the forest floor.

Threat 6. Human intrusions & disturbance

Threat 6.1 Recreational activities – Impact: Low

- ATV, cycling and hiking

Off-trail cycling, pedestrian activity and ATV use can crush individual plants and damage microhabitat by causing soil compaction and erosion. At Oliphant, trampling of plants from off-trail ATV use on the shoreline is more prevalent when low Lake Huron water levels make it possible to drive to the nearby coastal islands (ECCC 2019). In woodland-type habitat however, the presence of trails may benefit the species by maintaining openings in the canopy cover (see 5.3). Given the relative small proportion of any subpopulation actually subject to crushing and trampling, the overall impact to the species from recreational activities is considered low.

Threat 7. Natural system modifications

Threat 7.1 Fire & fire suppression – Impact: Medium-Low

- Fire suppression

The prevention of wildfires enables the natural process of vegetation succession, whereby shrubs and trees gradually colonize open areas. As woody vegetation density increases, the amount of sunlight reaching the ground decreases. Under reduced light levels, Dwarf Lake Iris flowers less frequently and therefore produces fewer fruit (Engelken 2003). Fire suppression is therefore a threat to Dwarf Lake Iris because it prevents the creation of openings in the canopy that would normally provide light levels conducive to the production of seed by the species. Woody vegetation succession rates likely differ across Dwarf Lake Iris subpopulations depending on their location: fire suppression has a greater impact on subpopulations occurring in small canopy openings located inland — where periodic fire would normally create canopy openings — than on shoreline subpopulations where wave action and ice scour are the principal mechanisms that slow vegetation succession (ECCC 2019). Some subpopulations are also more vulnerable to fire suppression because of the type of habitat within which they occur: subpopulations that occur in fire-dependent habitats — such as alvar savannas, alvar woodlands, and Jack Pine woodlands on sandy soils — will be more vulnerable to fire suppression than subpopulations that occur in alvar

grasslands and pavement[10], the latter being habitats where an open canopy is maintained by shallow soils and periodic droughts and flooding more so than by fire (Catling & Brownell 1995, Jones & Reschke 2005). The scope of this threat is based on an estimate that approximately 36% (at minimum) of the Canadian population occurs in fire-dependent habitat.

Threat 7.3 Other ecosystem modification – Impact: Unknown

- Decline in insect abundance

Although Dwarf Lake Iris mostly spreads by vegetative reproduction, a small proportion of plants does produce flowers, and pollen transfer is thought to occur to some degree via insect pollinators (see section 3.3.2). Recently, a growing number of studies are reporting significant declines in insect abundance and biomass (see Didham *et al.* 2020 and references therein). Assuming that the rate of sexual reproduction estimated by Planisek (1983) accurately represents the species' natural rate of sexual reproduction (i.e., pre-insect decline), this potential threat would affect 3% of the Canadian population of Dwarf Lake Iris. Though small in scope, it is important to consider that colonization of new locations, and re-colonization of extirpated locations, would be dependent on the small sexually reproducing proportion of the population. At this time, it is unknown whether the global insect decline will affect the proportion and success rate of sexually reproducing individuals of Dwarf Lake Iris and whether it will have longer term impacts on the Canadian population's genetic diversity and seed dispersal capability.

Threat 8. Invasive & other problematic species & genes

Threat 8.1 Invasive non-native/alien species – Impact: Negligible

- Non-native plants

Competition for habitat from the non-native European Reed (*Phragmites australis* subsp. *australis*), can be a threat to Dwarf Lake Iris subpopulations that occur in small woodland clearings where the treeline is very close to a shallow, rocky shoreline. European Reed colonizes the shallow water areas first and gradually creeps up the shore. European Reed can also grow in the same small crevices and spaces between boulders that are used by Dwarf Lake Iris on the shores themselves. The threat from European Reed to the subpopulations occurring on Manitoulin Island has now been significantly reduced as a result of a local eradication program, though on-going management will likely be necessary to prevent it from re-colonizing the shoreline (ECCC 2019).

Dwarf Lake Iris may be vulnerable to Spotted Knapweed (*Centaurea stoebe*), which is present at the Krug Forest, Corisande Bay and Cape Hurd subpopulations (ECCC 2019).

[10] Pavement is a type of alvar where soil depth is less than 2 cm (Catling & Brownell 1995).

Dwarf Lake Iris may also be vulnerable to colonization by European Swallowwort (*Vincetoxicum rossicum*), also known as Dog-strangling Vine, should it become established in the vicinity of Dwarf Lake Iris subpopulations (ECCC 2019).

Threat 11. Climate Change

Dwarf Lake Iris has been assessed as 'Moderately Vulnerable'[11] to climate change under the Climate Change Vulnerability Index, in part due to the following four intrinsic characteristics of the species: its predicted sensitivity to changes in temperature, its highly restricted dispersal capability, and to a lesser degree, its low genetic variation and moderate dependence on an uncommon geological feature (alvars) (Brinker *et al.* 2018). Specific threats associated with climate change are discussed below.

Threat 11.2 Droughts –Impact: Unknown

Recent climate models for the Great Lakes Basin predict, on average, an increase of 7 to 15% in the annual amount of over-land precipitation, and an increase of 2.4 to 5.0 ^{o}C in annual mean temperature, between 2035 and 2094 relative to the period from 1951 to 2005 (Shrestha et al. 2022). These predictions hold for the Ontario range of Dwarf Lake Iris more specifically, although changes in precipitation on Manitoulin Island may consist of a modest increase or decrease, depending on the scenario. Predicted changes to monthly rainfall amounts are of particular relevance to the species because they are likely to lead to drier conditions overall: 1) the predicted increase in precipitation specifically during the spring months may have no benefit to the species during its growing and blooming seasons if it ends up as run-off due to an already-saturated soil, and 2) the predicted decrease in precipitation (up to 6%) during the month of August has the potential to result in soil moisture deficits and consequent water stress conditions during seed development. On the other hand, drought has the potential to slow vegetation succession by killing off shrubs & trees, thus maintaining canopy openings that would be favourable to the subpopulations located within woodlands.

Threat 11.4 Storms & flooding –Impact: Unknown

- Flooding due to increased water levels in the Great Lakes

Recent modelling of future Great Lakes water levels projects, on average, an increase in total over-lake precipitation and an increase in overall water levels in response to the warming climate (Seglenieks & Temgoua 2022). Such a scenario is likely to affect the Canadian population of Dwarf Lake Iris given that the majority of subpopulations in Ontario occur within 500 m of the Lake Huron shoreline (COSEWIC 2010). On the one hand, sustained high lake water levels risk flooding subpopulations located near the shoreline. However, models also project that the greater the increases in global temperatures, the wider the range of future water level values (i.e. both extreme highs and extreme lows compared to pre-2020 measured data are projected). Under a scenario of periodic long-term flooding, high water levels will slow woody vegetation

[11] Moderately vulnerable: Abundance and/or range extent within geographical area assessed likely to decrease by 2050. (Brinker *et al.* 2018).

succession along the shoreline, and this would benefit subpopulations that occur in near-shore habitat. Under a scenario of highly fluctuating water levels, ensuing disturbance to the shoreline from wave action and winter ice build up/ice scour may likewise help maintain suitable habitat for the species, though these disturbances could also lead to the loss of subpopulations depending on their severity and frequency.

5. Management Objective

The management objective for Dwarf Lake Iris in Canada is to prevent the population from becoming Threatened or Endangered by:

- Maintaining the population's extent of occurrence (EOO)[12];
- Maintaining or increasing the population's index of area of occupancy (IAO)[13]; and
- Maintaining the current number of subpopulations of Dwarf Lake Iris.

The population's EOO, currently estimated to be 8,232 km^2, is below the threshold for Threatened status (20,000 km^2), and the IAO, currently estimated to be 348 km^2, is below the threshold for Endangered status (500 km^2) (species values from COSEWIC 2010, threshold values from COSEWIC 2021b). According to the criteria used to assess a species status, those two parameters must not experience any decline in order to reduce the risk of the species becoming Threatened in Canada (COSEWIC 2021b). The EOO cannot reasonably be increased because the single extirpated subpopulation that occurred outside the species' current Canadian distribution was located in Windsor, in an area where habitat has been destroyed (COSEWIC 2010). Because it is not feasible to re-introduce the species at this extirpated location, an increase in the EOO cannot be achieved while respecting the historical distribution of the species in Canada. Maintaining all currently extant subpopulations (40) and preventing a decline in the IAO are important because if one or the other is allowed to occur, it may result in the population becoming severely fragmented. The occurrence of this series of events may result in the population meeting all of the criteria required to be assessed as Threatened (see COSEWIC 2021b).

6. Broad Strategies and Conservation Measures

6.1. Actions Already Completed or Currently Underway

The following conservation measures have been completed or are currently underway:

[12] EOO: Extent Of Occurrence. The area included in a polygon without concave angles that encompasses the geographic distribution of all known populations of a wildlife species (COSEWIC 2021a).
[13] IAO: Index of Area of Occupancy. For the Dwarf Lake Iris, it is the area within the Extent Of Occurrence that is occupied by the species in Canada based on a grid with a cell size of 2 km X 2 km (COSEWIC 2009).

- The south shore of Manitoulin Island has been surveyed for the presence of Dwarf Lake Iris almost in its entirety, as part of several projects mapping alvars and species at risk (e.g. Reschke et al. 1999, Jones 2006, 2007, 2008, Jones and Jalava 2006). Several surveys have also taken place on the Bruce Peninsula and in southern Bruce County (e.g. Jalava 2007, 2008). A full list of inventories can be found in COSEWIC (2004) and COSEWIC (2010).

- In 2016, the Parks Canada Agency published the Multi-species Action Plan for Bruce Peninsula National Park and Fathom Five National Marine Park of Canada on the Species at Risk public registry. The action plan includes measures pertaining to Dwarf Lake Iris.

- In 2019, the Lake Huron Centre for Coastal Conservation, a non-government charitable organization, published the Coastal Action Plan for the Southeastern Shores of Lake Huron. The plan identifies management strategies to address threats to natural features and species within the Lake Huron shoreline from Sarnia to Tobermory. The document's geographic scope encompasses the entire Canadian range of the Dwarf Lake Iris, and specifically mentions the species.

The following projects were undertaken with financial support from the federal government's Habitat Stewardship Program for Species at Risk:

- In 2009, the Wikwemikong Department of Lands and Natural Resources conducted a project to collect comprehensive occurrence data for Dwarf Lake Iris and other species at risk on their land. The areas where Dwarf Lake Iris occurs were then identified for protection in a land use plan. This project was also supported by the Province of Ontario's Species at Risk Stewardship Program.

- In 2009, the Nature Conservancy of Canada mapped landscape features in several of their conservation priority areas, including the Bruce Peninsula, to help identify priorities and plan recovery activities relating to Dwarf Lake Iris and other species at risk.

- In 2011, the Bruce Resource Stewardship Network developed communication materials that were distributed to the Oliphant community, to increase awareness of species at risk, including Dwarf Lake Iris, and the value of coastal wetlands, the threats they face, and their conservation needs. The municipal council was engaged regarding the need to prevent uncontrolled vehicle use on the beach and shorelines of the Oliphant coastal wetland, and to restrict pedestrian beach access to designated paths to prevent habitat degradation.

- In 2013, as part of their project to address the threat of coastal wetland degradation due to recreational activities and invasive species, the Lake Huron Centre for Coastal Conservation collected records of Dwarf Lake Iris observations and erected road signs in Oliphant to raise awareness about the local sensitive coastal wetland.

- In 2014, the Nature Conservancy of Canada acquired for conservation purposes an 821 ha property located within the Johnston's Harbour – Pine Tree Point Area of Natural and Scientific Interest on the Northern Bruce Peninsula, within which a Dwarf Lake Iris subpopulation occurs.

- Over four field seasons from 2016 to 2019, a Manitoulin Island-wide European Reed control project led by Winter Spider Eco-Consulting assessed the extent of the invasive plant at four sites where a Dwarf Lake Iris subpopulation occurs. Three of the sites were treated and the removal of European Reed has been successful. One large area remains to be treated at the fourth site. The project has also been very successful in raising public and partner awareness of the threat from this invasive species (Jones 2020). This project was also supported by the Province of Ontario's Species at Risk Stewardship Program.

6.2. Broad Strategies

In order to achieve the management objective for Dwarf Lake Iris, conservation measures are organized under the following five broad strategies:

- Site stewardship, to promote open/thinned canopy cover that is appropriate for subpopulation survival and reproduction;

- Outreach and communications, to raise public awareness regarding the threat posed by off-trail use of ATVs and to encourage stewardship of Dwarf Lake Iris habitat;

- Land-use zoning and regulations by municipalities and land-use planning authorities, to reduce and mitigate threats from new residential development and road construction projects;

- Research and status monitoring, to assess abundance and areal extent of subpopulations and detect new threats early;

- Alliance and partnership development, to coordinate conservation action implementation and to share knowledge with land managers.

Because the majority of subpopulations on Manitoulin Island and the northern Bruce Peninsula are either protected or do not face imminent threats, the implementation of conservation measures should first focus on the southern Bruce County subpopulations.

6.3. Conservation Measures

Measures to conserve the species in Canada are listed in Table 4. The conservation measures intend to counter the threats to the species in order to achieve the management objective identified in Section 5 above. The conservation measures have

been categorized according to the Conservation Actions Classification system developed by the Conservation Measures Partnership (CMP 2016).

The first category of conservation measures pertains to site management. The measures focus on the implementation of plans to: control woody vegetation in order to increase the amount of sunlight reaching the ground; control the spread of European Reed in order to minimize encroachment into Dwarf Lake Iris habitat; mitigate impacts of roadwork on road-side subpopulations; and, eliminate trampling from recreational activities in order to avoid direct mortality of individuals and soil compaction and erosion.

The second category of measures relates to human behavioural change. It includes outreach measures targeting private landowners and municipal governments in order to promote and implement beneficial habitat stewardship and management practices, as well as raising community awareness and improving and/or increasing enforcement of recreational trail use regulations.

The third category of conservation measures relates to planning and research activities that will enable the successful implementation of the management and outreach activities described above, the prevention of further negative impacts to the species, and the monitoring of emerging and potential threats. The measures include developing the site management plans described above, using municipal land-use planning processes to avoid impacts on subpopulations, conducting research on the pollination biology of the species, gaining a better understanding of potential impacts of climate change on the population, and conducting abundance surveys to evaluate the effectiveness of management action implementation.

Measures targeting the most significant threat to the species (fire suppression, Threat 7.1), and those that can prevent impacts to the species from occurring in the first place have been identified as high priority measures. Most of the conservation measures addressing threats currently assessed as having a negligible impact on the species have been identified as low priority measures. One notable exception is the monitoring of invasive plant species, which has been assigned a high priority because expansion of these species can happen rapidly once they colonize an area. It is important to halt their encroachment on Dwarf Lake Iris habitat as soon as they are detected because they become much more difficult and costly to manage once established in large numbers.

It is also important to determine the actual level of impact of threats of unknown severity (pollinator decline (Threat 7.3) and climate change (Threats 11.2, 11.4)), because if their impact is found to be high, these threats will need to be addressed in order to meet the management objective.

Table 4. Conservation Measures

Category		Targeted threats	Priority[a]
A. Target Restoration/ Stress Reduction Actions			
1. Land/ Water Management			
1.1 Site/ Area Stewardship			
1.1.1 Mechanical actions	Implement site-level canopy cover control plans (removal of shrubs and trees) that create and maintain semi-shaded habitat (intermediate light levels)	7.1	High
	Implement site-level invasive species control plans (removal of invasive plants) to minimize encroachment into Dwarf Lake Iris habitat	8.1	Low
1.1.2 Chemical actions	Implement site-level invasive species control plans (herbicide application)	8.1	Low
1.1.5 Separation/ border actions	Continue to implement measures to mitigate impacts to individual plants from road improvement projects and routine road maintenance	4.1	Low
1.1.6 Ecological management	Implement site-level plans to manage woody vegetation (e.g., prescribed burns)	7.1	High
1.1.8 Visitor management	Implement site-level plans to eliminate damage to the species and its habitat from recreational trail use (e.g., fencing; re-routing of trails).	6.1	Medium
B. Behavioural Change/ Threat reduction			
3. Awareness Raising			
3.1 Outreach & Communications			
3.1.7 Person-to-person engagement	Promote habitat stewardship on private land (e.g. retaining soil and native plants as ground cover, shoreline naturalization)	1.1	Medium
	Raise awareness about the importance of staying on trails while driving ATVs and hiking to prevent trampling of plants and soil compaction or erosion	6.1	Medium
	Inform the public about the ecological benefits of prescribed burns and the safety measures that are taken when carried out	7.1	High

Category		Targeted threats	Priority[a]
4. Law Enforcement and Prosecution			
4.3 Non-Criminal Legal Action			
4.3.2 Agency enforcement	Enforce rules prohibiting off-trail use of ATVs	6.1	Medium
5. Livelihood, Economic & Moral Incentives			
5.2 Better Products & Management Practices			
5.2.2 Promoting better products & practices	Promote better management practices related to residential property maintenance, shoreline maintenance and gardening	1.1	Medium
	Promote selective logging and best forest management practices to the forestry sector	Proactive measure	Low
	Continue to promote measures that mitigate impacts from road maintenance activities (e.g. mowing, road salt and herbicide application)	4.1	Low
C. Enabling Conditions			
6. Conservation Designation & Planning			
6.3 Land/Water Use Zoning & Designation			
6.3.1 Land-use zoning	Include areas where Dwarf Lake Iris occurs in municipal official plans to minimize instances where species occurrence coincides with the footprint of new housing construction and road projects	1.1 4.1	High
6.4 Conservation Planning			
6.4.2 Sites/ protected areas	Develop site-level canopy cover management plans (woody vegetation control) for each subpopulation that occurs in fire-dependent habitat and that is under threat from fire suppression	7.1	High
	Develop site-level invasive plant species control plans for each subpopulation where this threat emerges	8.1	Medium
	Prioritize sites for conservation measures by taking into account predicted impact of climate change on lake levels, precipitation and temperature	11.2 11.4	Medium
6.4.4 Thematic projects and programs	Determine the need, and preferred measures, to mitigate trampling related to ATV use and pedestrian traffic in recreational areas	6.1	Medium
	Develop a road-salt application reduction plan	4.1	Low

Category		Targeted threats	Priority[a]
7. Legal & Policy Frameworks			
7.1 Laws, Regulations & Codes			
7.1.4 Municipal law or regulations	Include conditions in building permits that require reduction and mitigation of impacts to Dwarf Lake Iris individuals	1.1	High
8. Research & Monitoring			
8.1 Basic Research & Status Monitoring			
8.1.1 Biological targets	Collect data on abundance and area of occupancy for all subpopulations at least once every 10 years.	Required to measure progress	High
	Identify the subpopulations that occur in fire-maintained ecosystems	7.1	High
	Identify the species' pollinators	7.3	Low
	Determine the proportion of sexually reproducing individuals for a representative subset of Dwarf Lake Iris subpopulations	7.3	Low
	Determine seed dispersal distance and vectors	Proactive measure to enable IAO increase	Low
8.1.3 Threats/ biophysical factors	Continue to monitor for the presence/arrival of invasive plant species (e.g., European Reed, European Swallowwort) where Dwarf Lake Iris occurs	8.1	High
	Survey roadside ditches for species presence during the flowering period, while in the planning phase of road improvement projects so that mitigation measures can be implemented	4.1	Low
	Assess abundance of the species' pollinators for a select subset of subpopulations	7.3	Low
	Determine the impact of climate change on Lake Huron water levels and on the frequency and severity of droughts, floods and ice scour where the species occurs	11.2 11.4	Medium
	Relate subpopulation abundance, area of occupancy and sexual reproduction rate to pollinator abundance and environmental variables (e.g. Lake Huron water levels, seasonal temperatures and precipitation)	7.3 11.2 11.4	Low

Category		Targeted threats	Priority[a]
8.2 Evaluation, Effectiveness Measures & Learning			
8.2.1 Specific projects	Evaluate effectiveness of European Reed control on Dwarf Lake Iris abundance	8.1	Medium
	Evaluate effectiveness of canopy cover management techniques (e.g. prescribed burns, manual canopy thinning)	7.1	High
10. Institutional development			
10.3 Alliance & Partnership Development			
10.3.1 Coordinating conservation implementation	Coordinate surveys, monitoring and threat mitigation activities with those for other at-risk plant species located within the region	To increase efficiencies	Medium
	Support initiatives by Indigenous communities to conserve Dwarf Lake Iris	All threats	Medium
10.3.2 Knowledge generation & sharing	Provide locations of Dwarf Lake Iris subpopulations to municipal and land-use planning authorities to inform land-use zoning decisions and minimize instances where species occurrence coincides within the footprint of new housing and infrastructure projects	1.1 4.1	High
	Support the gathering and sharing of Traditional Ecological Knowledge	All threats	Medium
	Provide subpopulation locations to road maintenance departments and inform them on measures to avoid impacts to the species	4.1	Low
	Encourage land managers/owners to incorporate mitigation measures and better management practices into their property management plans	1.1 4.1 6.1 7.1 8.1	Medium
	Encourage the submission of Dwarf Lake Iris observations to the Ontario Natural Heritage Information Centre	All threats	Low

[a] *"Priority" reflects the degree to which the measure contributes directly to the conservation of the species or is an essential precursor to a measure that contributes to the conservation of the species. High priority measures are considered those most likely to have an immediate and/or direct influence on attaining the management objective for the species. Medium priority measures may have a less immediate or less direct influence on reaching the management objective, but are still important for the management of the population. Low priority conservation measures will likely have an indirect or gradual influence on reaching the management objective, but are considered important contributions to the knowledge base and/or public involvement and acceptance of the species.*

7. Measuring Progress

Every ten years, success of the implementation of this management plan will be measured against the following performance indicators:

- EOO has been maintained;
- IAO has been maintained or increased;
- All subpopulations of Dwarf Lake Iris considered extant in 2010 (see Table B-1) have persisted.

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Appendix A: Effects on the Environment and Other Species

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*[14]. 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 and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or achievement of any of the Federal Sustainable Development Strategy's[15] (FSDS) goals and targets.

Conservation planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that implementation of management plans may inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the management plan itself, but are also summarized below in this statement.

Activities undertaken to conserve Dwarf Lake Iris and its habitat will also be beneficial to other species that use similar habitat. Stewardship of the Lake Huron shoreline, including alvars and beaches, will contribute to maintaining the rich biodiversity supported by those habitats. Consideration of Dwarf Lake Iris during the planning of residential development and road construction projects will also mitigate threats posed by these activities to other species. On the other hand, canopy cover management has the potential to have adverse effects on some individuals of other species. The risk of adverse effects is extremely low however when mechanical thinning of woody vegetation and chemical control of invasive species is carried out by professionals according to established protocols. Table A-1 presents examples of species that may benefit from conservation measures for the Dwarf Lake Iris in Canada.

[14] www.canada.ca/en/environmental-assessment-agency/programs/strategic-environmental-assessment/cabinet-directive-environmental-assessment-policy-plan-program-proposals.html
[15] www.fsds-sfdd.ca/index.html#/en/goals/

Table A-1. Some of the species at risk that may benefit from conservation and management of habitat in those areas where Dwarf Lake Iris occurs.

Common Name	Scientific Name	SARA Status
Blanding's Turtle (Great Lakes/ St. Lawrence population)	*Emydoidea blandingii*	Endangered
Common Nighthawk	*Chordeiles minor*	Special Concern
Eastern Milksnake	*Lampropeltis triangulum*	Special Concern
Eastern Ribbonsnake (Great Lakes population)	*Thamnophis sauritus*	Special Concern
Eastern Whip-poor-will	*Antrostomus vociferus*	Threatened
Hill's Thistle	*Cirsium hillii*	Threatened
Houghton's Goldenrod	*Solidago houghtonii*	Special Concern
Lake Huron Grasshopper	*Trimerotropis huroniana*	Threatened
Lakeside Daisy	*Tetraneuris herbacea*	Threatened (under consideration for status change)
Massasauga (Great Lakes/ St. Lawrence population)	*Sistrurus catenatus*	Threatened
Midland Painted Turtle	*Chrysemys picta marginata*	Special Concern
Pitcher's Thistle	*Cirsium pitcheri*	Special Concern
Snapping Turtle	*Chelydra serpentina*	Special Concern

Appendix B: Dwarf Lake Iris subpopulations in Canada

In accordance with COSEWIC standards regarding the delineation of subpopulations, some species records reported as separate subpopulations in the 2004 COSEWIC Status Report were collapsed into single subpopulations in the 2010 COSEWIC Status Report. Conversely, other records reported in 2004 were split into separate subpopulations in COSEWIC 2010. The changes in subpopulation delineations yielded a new total of 26 subpopulations that had been considered extant in 2004 (though only 15 had been visited and found).

Of these 26 subpopulations, the six subpopulations that had been reported as ‘not found’ in COSEWIC (2004) were visited and reported found in COSEWIC (2010). Out of the five subpopulations that were not visited during the preparation of COSEWIC (2004), three were visited and reported found in COSEWIC 2010 (see Table 2).

In addition to the original 26 extant subpopulations, COSEWIC (2010) also lists 14 subpopulations that were not reported in COSEWIC (2004). Of those, 10 are newly discovered subpopulations (five were discovered on Manitoulin Island and another five were discovered on the mainland). The other four subpopulations had been reported elsewhere prior to 2010 but not in COSEWIC 2004; only one of those four was visited during the preparation of the 2010 status report but the subpopulation was not found (see Table 2).

Regardless of their status as ‘found’, ‘not found’ or ‘not visited’, all 26 subpopulations reported in COSEWIC (2004) and all of the additional 14 reported in COSEWIC (2010) are considered extant because as of 2010, none met the criteria to be ranked as Historical. This brings the total of extant subpopulations of Dwarf Lake Iris in Canada to 40 (see Table B-1).

COSEWIC (2010) reports five subpopulations as being Extirpated, and another seven as Historical because they have not been observed since the 1980s despite searches conducted as recently as 2007 and 2008 by the COSEWIC (2010) authors.

Table B-1. List of extant Dwarf Lake Iris subpopulations in Canada. Data source: Jones & Jalava (2009).

Manitoulin Island	
1	Belanger Bay West
2	Belanger Bay East
3	Carter Bay East
4	Michael's Point Island
5	Michael's Peninsula
6	West of South Baymouth
7	South Baymouth at the Narrows
8	Not available #1
9	Not available #2
10	Not available #3
11	Not available #4
Bruce County mainland	
12	Cape Hurd
13	Baptist Harbour
14	Hopkins Bay
15	Dorcas Bay
16	McLander Marsh
17	George Lake South
18	Saugeen Hunting Grounds
19	Corisande Bay
20	Johnson Harbour- Krug Forest
21	Pine Tree Harbour
22	Bradley Harbour
23	Greenough Point
24	Lyal Island
25	Pike Bay Alvar
26	Pike Bay Shoreline
27	Sucker Creek Fen
28	Sucker Creek
29	Petrel Point
30	Oliphant Fen
31	Oliphant Centre
32	Chief's Point Wetland
33	Chief’s Point Alvar
34	Chief’s Point Centre
35	Chief’s Point South
36	Sauble Beach- Walker’s Woods
37	Frenchman Bay
38	Miramichi Bay
39	Macgregor Point
40	Scott Point