

COSEWIC
Assessment and Status Report

on the

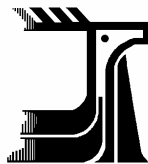
Green-scaled willow
Salix chlorolepis

in Canada



THREATENED
2006

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA



COSEPAC
COMITÉ SUR LA SITUATION
DES ESPÈCES EN PÉRIL
AU CANADA

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

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COSEWIC would like to acknowledge Frédéric Coursol for writing the status report on the green-scaled willow *Salix chlorolepis* in Canada, prepared under contract with Environment Canada, overseen and edited by Erich Haber, Co-chair (Vascular Plants), COSEWIC Plants and Lichens Species Specialist Subcommittee.

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COSEWIC Assessment Summary

Assessment Summary – April 2006

Common name

Green-scaled willow

Scientific name

Salix chlorolepis

Status

Threatened

Reason for designation

An endemic shrub restricted to the serpentine outcrops of Mount Albert in Gaspésie Provincial Park, Quebec. The low numbers of the shrub located on a single mountain top are at risk from stochastic events, potential impact of the exotic tussock moth, and limited impact from hikers along the Appalachian Trail.

Occurrence

Quebec

Status history

Designated threatened in April 2006. Assessment based on a new status report.



COSEWIC
Executive Summary

Green-scaled willow
Salix chlorolepis

Species information

Green-scaled willow (*Salix chlorolepis*) is a branched dwarf shrub, typically under 30 cm tall, with erect branchlets. The simple leaves are short-stalked and are initially covered with a whitish-waxy coating on both surfaces, with the upper surface subsequently turning green; they are up to 25 mm long, entire, egg-shaped, and widest at the apex, becoming hairless with age. The catkin bracts are hairless, olive green in colour and persist through to the maturation of the capsule. The catkins are short-stalked and measure 5 to 13 mm in length. The staminate flowers (on male plants) have two glands near the base. The pistillate flowers (on female plants) have a style with a bifid stigma consisting of two elongate, divergent lobes. The fruit is a short-stalked, hairless capsule 4 mm long.

Distribution

Green-scaled willow occurs exclusively on the alpine-type serpentine outcrops of Mount Albert, Quebec. Given its limited distribution, green-scaled willow is considered to be an endemic species.

Habitat

The species occurs in poorly vegetated habitats on rocky, stabilized slopes of alpine serpentine between pebbles and gravels or on thin dry or moderately moist soils exposed to full sunlight. Historical collections mention the presence of the green-scaled willow in bog areas on the summit plateau. The species' habitat is strongly associated with elevation, which ranges from 825 m to 1,050 m.

Biology

As in all willows, the species is dioecious, having separate male and female plants. It flowers from early July to mid-August, after leaf development. Fruiting begins in the last of week of July and continues until the first frosts (early September). It is generally insect- and wind-pollinated. This would explain the relatively high frequency of the hybrid (*Salix x gaspeensis*) between green-scaled willow and short-fruit willow (*Salix brachycarpa*). The seeds have a tuft of silky hairs that facilitates wind dispersal.

Population sizes and trends

It is estimated that approximately 300 individuals grow on Mount Albert. While most sites generally have only one or two individuals, one site has roughly 200. Not all of the glacial cirques of Mount Albert have been explored, but it is believed that the total number of individuals would probably not exceed 1,000 individuals. A number of botanists have tried, unsuccessfully, to find green-scaled willow. In 1994, the species was found in four glacial cirques in Mount Albert's Vallée du Diable. In the 2004 inventory, six new sites were discovered on Mount Albert, several outside Vallée du Diable. Approximately 45 hours of fieldwork were carried out on Mount Albert to locate the new sites.

Limiting factors and threats

The most important site for the green-scaled willow population is in the westernmost part of Vallée du Diable where it is adjacent to the International Appalachian trail on Mount Albert. The site is highly exposed to human foot traffic, because some hikers take shortcuts around obstacles thereby coming in contact with the willow. The managers of Gaspésie Provincial Park attempt to reduce such widening of the trail by hikers. All other sites are inaccessible and no human impacts are anticipated.

Hybridization between green-scaled willow and short-fruit willow is frequent on Mount Albert. Although a number of hybrids have been observed, the risk of introgression with short-fruit willow requires further study.

Special significance of the species

Serpentine soils alter both plant appearance and functions. These alterations, combined with the isolation characteristic of serpentine habitats, favour the formation of new species. That is why these environments are generally known for their concentration of endemic species with small ranges. The co-occurrence of serpentine and an alpine-tundra habitat is quite rare in northeastern North America, and the green-scaled willow is the evolutionary result of this type of environment.

Existing protection

NatureServe has assigned the green-scaled willow a rank of critically imperiled at the global, national, and subnational (provincial) level, namely G1, N1, S1. Argus and Pryer consider it rare in Canada and assign it, on the basis of another evaluation system, a Canadian priority rating of 2.

Green-scaled willow is now protected in Quebec under the *Act Respecting Threatened or Vulnerable Species* and has been designed "threatened" since 1995. At present, the only occurrence of the species is located within a protected area, Gaspésie Provincial Park.



COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5th 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS (2006)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and it is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

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

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

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.



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

COSEWIC Status Report

on the

Green-scaled willow

Salix chlorolepis

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2006

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SPECIES INFORMATION

Name and classification

Scientific name: *Salix chlorolepis* Fernald in *Rhodora* 7:186. 1905.
Relevant synonyms: none
French name: saule à bractées vertes
English name: green-scaled willow
Family name: Salicaceae (Willow Family)

Green-scaled willow is a member of the genus *Salix*, which includes approximately 450 species, 103 of which occur in North America (Argus, 1997). A number of taxonomists have divided the genus into several subgenera and sections. The green-scaled willow is classified in the subgenus *Chamaetia* (Dumortier) Nasarov and, more specifically, in the section *Myrtilloides* (Borrer) Andersson (Argus 1997, 1999, 2004). The taxonomic status of green-scaled willow is controversial: Dorn (1976) believes that it is a hybrid between *Salix brachycarpa* and *Salix pedicellaris*, whereas Argus (1965, 1997) believes that it may be a glabrous form of *Salix brachycarpa*. Nevertheless, Argus (1965, 1997, 1999, 2004) continues to recognize the green-scaled willow as a distinct species.

Morphological description

Green-scaled willow is a branched dwarf shrub with erect branchlets (Figures 1 and 2). It typically reaches 10 to 30 cm in height, but sometimes up to 100 cm (Fernald, 1905). The leaves are short-stalked and initially glaucous (covered with a whitish-waxy coating) on both surfaces, with the upper surface subsequently turning green. The leaves are entire, becoming hairless, lanceolate or elliptical-oblong, obovate at the apex and measure 10 to 25 mm in length and 4 to 14 mm in width. The herbaceous catkin bracts are glabrous (hairless), olive green in colour and retuse (Figure 3). They measure 2 to 3 mm in length and are persistent during maturation of the capsule. The catkins are short-stalked, ovoid or cylindrical measuring 5 to 13 mm in length. The staminate flowers have two glands near the base. The filament is pale, hairless and 5 mm long, with the two anthers each 0.7 mm long. The pistillate flowers have styles 0.5 to 1.3 mm long and bifid stigmata that are narrow, elongated and divergent. The fruit (Figure 1) is a short-stalked hairless capsule 4 mm long (Argus, 1965; Coursol, 2001). The chromosome number is $2n=38$ (Gervais, 1995). A more detailed description of a number of the morphological characters of the green-scaled willow is available in Argus (1965, 2004).



Figure 1. Illustration of the green-scaled willow (drawing by Réjean Roy): growth form (X0.75) and single pistil (X10).



Figure 2. Female green-scaled willow.



Figure 3. Fruit of the green-scaled willow.

The green colour of the bract, which had been believed to be one of the two distinctive traits of the green-scaled willow, along with hairless capsules (Fernald, 1905, 1950), is instead correlated with the ontogenetic development stage and is not limited to this species. A comparative analysis of the short-fruit willow (*Salix brachycarpa*) and the green-scaled willow shows a striking correlation between flower development and the colour of the bracts (Argus, 1965). The catkins have primarily green bracts at anthesis (time when flowers open and pollen is shed) and yellow to buff bracts after anthesis. There is a continuous sequence of intermediate colours if the ontogenetic processes and the various differences between individuals are taken into account. The high frequency of green bracts during flowering of the short-fruit willow calls into question the validity of the use of bract colour to differentiate the green-scaled willow (Argus, 1965).

It is difficult to distinguish green-scaled willow from short-fruit willow. The main differences, according to Schneider (1918), are the glabrous filament on the green-scaled willow, which is more or less pilose in the short-fruit willow, and the presence of a large number of stomata on the upper leaf surface in the green-scaled willow, whereas there are no stomata on the upper leaf surface in the short-fruit willow. However, Argus (1965) reaches different conclusions and counts nine specimens with stomata on the upper surface and 10 specimens of short-fruit willow without stomata on the upper leaf surface. Here again, the presence of stomata on the upper leaf surface cannot be used to distinguish the green-scaled willow from the short-fruit willow.

Argus (1965) uses the following seven criteria to distinguish the green-scaled willow from the short-fruit willow:

Green-scaled willow (<i>Salix chlorolepis</i>)	Short-fruit willow (<i>Salix brachycarpa</i>)
branchlets and buds hairless or pruinose	branchlets and buds non-pruinose and densely hairy
leaves hairless except for a marginal fringe in some specimens	leaves densely hairy
catkin with few flowers	catkin with many flowers
bracts hairless and pruinose (with a surface bloom)	bracts not pruinose and hairy
ovaries and capsules hairless	ovaries and capsules densely hairy
style long and undivided	style short and divided
filament hairless	filament hairy

DISTRIBUTION

Global range

Green-scaled willow occurs exclusively on the alpine-type serpentine outcrops of Gaspésie Provincial Park, Quebec (Figure 4). It has been inventoried to date on the sides of 10 glacial cirques of Mount Albert representing, perhaps, only 4 or 5 distinct localities. This species has not been found in any other serpentine areas of North America. Given its very limited distribution, the green-scaled willow is considered endemic to the Gaspé region of eastern Canada (Labrecque and Lavoie, 2002).

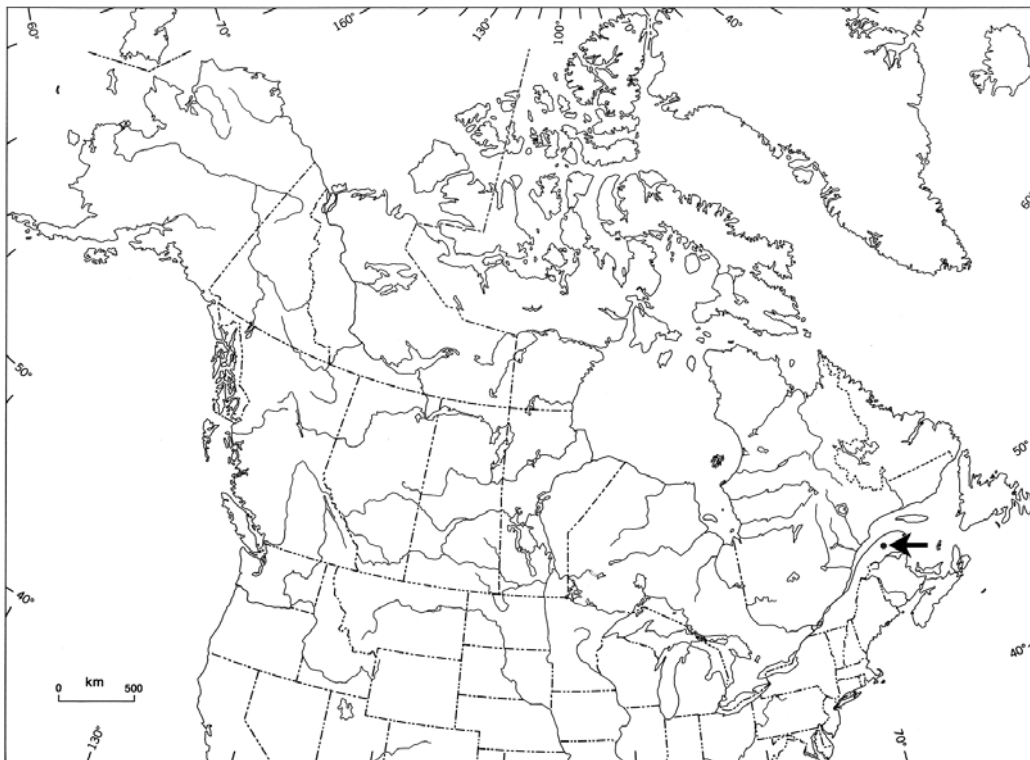


Figure 4. Global distribution of the green-scaled willow.

HABITAT

Habitat requirements

Green-scaled willow occurs in poorly vegetated habitats on the rocky stabilized slopes of alpine-type serpentine between pebbles and gravel or in thin dry or moderately moist soils exposed to full sunlight (Lavoie and Fleurbec, 1995; Coursol, 2001). Several specimens were found in 2004 on slightly emergent serpentine boulders in the middle of an intermittent stream. Historical collections indicate the presence of the green-scaled willow in bog areas on the plateau of the summit (Lavoie and Fleurbec, 1995), but no individuals have been located despite several kilometres of transects on the plateau in 2004 (Figure 5). The habitat of the green-scaled willow is strongly associated with elevation, which ranges from 825 m and 1,050 m, with a strong concentration of individuals between 925 and 950 m (Figures 5 and 6).

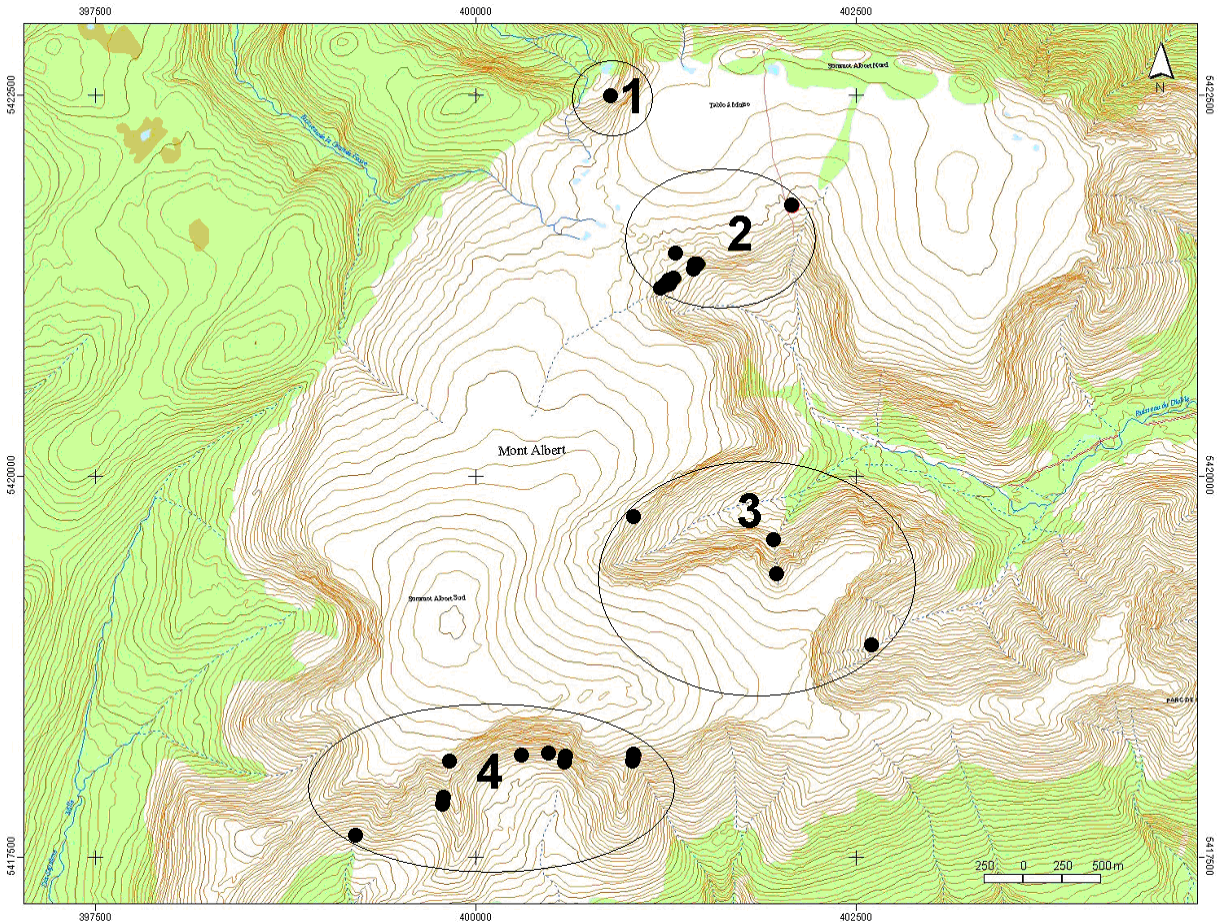


Figure 5. Records of green-scaled willow on Mount Albert grouped into four potential populations based on 2-dimensional separations of at least 1 km between nearest plants in adjacent populations.



Figure 6. Green-scaled willow habitat in the cirque of Lake Plaqué Malade.

Mountain holly-fern (*Polystichum scopulinum*) and serpentine stitchwort (*Minuartia marcescens*) are two species considered threatened in Quebec (*Act Respecting Threatened or Vulnerable Species*) that sometimes share the same habitat as the green-scaled willow on Mount Albert. A number of species likely to be designated threatened or vulnerable in Quebec (Tardif *et al.* 2005), such as Aleutian maidenhair (*Adiantum aleuticum*), Indian's dream (*Aspidotis densa*), swamp thistle (*Cirsium muticum* var. *monticolum*), rough fescue (*Festuca altaica*) and dwarf Arctic groundsel (*Solidago simplex* subsp. *simplex* var. *chlorolepis*), also share the habitat of the green-scaled willow.

Habitat trends

The green-scaled willow is protected throughout its range. In Quebec, all sites of the Mount Albert population are located in Gaspésie Provincial Park. This section of the park is designated a "maximum preservation zone". No human activity is authorized, except for hiking on two trails. The most significant disturbances are limited to the trampling of individuals that occur alongside the International Appalachian Trail on Mount Albert. No other long-term threats are anticipated, unless off-trail downhill skiing becomes developed in other sectors of Mount Albert; in this case the significance of disturbances that could be caused to green-scaled willow habitat by avalanches would have to be studied, but these appear to be low to nil.

A number of alpine serpericolous species, such as the serpentine stitchwort, occur on Mont du Sud, which is located 12 km southwest of Mount Albert in Gaspésie Provincial Park. A brief site visit in 2004 had been planned on the basis of preliminary reports of the Quebec Natural Heritage Data Centre (CDPNQ) indicating a low surface

area of serpentine (300 m long), but the potential area is at least 1.5 km long. A number of short-fruit willow specimens were observed at the top of a talus slope at an altitude of 650 m, which is much lower than the populations of Mount Albert. Given the length of the visit in 2004, no green-scaled willows were found, but the site has very high potential, despite an elevation of approximately 800 m (Figure 5).

A number of serpenticolous species also occur on Mount Olivine, which is also located in Gaspésie Provincial Park, 2 km east of Mount Albert. However, a visit to the mountain in 2002 did not turn up any specimens of green-scaled willow (Figure 5). The site measures 1.7 km long by 600 m wide on the summit and east side of the mountain. It is unlikely that green-scaled willow occur at the site because it is located at an elevation of approximately 670 m and the mountainside is less exposed to the prevailing winds.

Habitat protection/ownership

The Quebec site is currently located within a protected area: Gaspésie Provincial Park.

BIOLOGY

Green-scaled willow is a perennial dioecious (having male and female plants) shrub that flowers, after leaf development, from early July to mid-August. Fruiting begins in the last week of July and continues until the first frosts (early September). Few studies have been conducted on the green-scaled willow and most observations come from Argus (1965) and the 2004 summer survey by the author. The lifespan of this shrub is unknown.

Life cycle and reproduction

The general biology of willows is relatively well documented. The green-scaled willow is a dioecious shrub. The number of males seems to be much lower than the number of females. Studies of the genus *Salix* show that the sex ratio can be as high as 4:1 (USDA, 2004).

The species generally depends on insect-pollination, and the presence of nectaries (nectar-producing organs) suggests non-specific pollination by insects (Argus, 1965), including bees. However, wind also plays a role in pollination because considerable quantities of pollen can be transported by the wind (Argus, 1965), especially on bare parts of Mount Albert. This would explain the relatively high frequency of hybridization between willow species.

The hybrid between green-scaled willow and short-fruit willow, named *Salix x gaspeensis* by Schneider (1922), is frequent on Mount Albert. An experimental cross between the short-fruit willow (*Salix brachycarpa*) (Argus 106-59, staminate individual)

and the green-scaled willow (Argus 84-59, pistillate individual) resulted in the production of a few seeds, although the ovary was somewhat abnormal (Argus 1965). The ovaries of the green-scaled willow developed very slowly after fertilization, did not open at maturity and remained closed and twisted at the apex. The seeds were removed towards the end of the summer and, although some had begun to dry out, they germinated. Three young plants developed very slowly and died quickly. Their mortality is not necessarily an indication of their vitality because they had begun to dry out prior to extraction from the capsule, and the possibility that the growing conditions may not have been ideal must be considered. However, their mortality suggests that the pistillate flowers of the green-scaled willow are not highly effective and that a partial reproductive barrier may prevent rapid introgression of the rarer species (Argus, 1965). A number of hybrids were observed during the 2004 inventory, but it is difficult to determine whether the green-scaled willow is affected by hybridization (Lavoie and Fleurbec 1995). Since the species is a local endemic, its relative rarity is not surprising and is not in itself an indication of introgression (Argus, 1965). Further studies on this phenomenon will certainly provide answers, because the risk of introgression into short-fruit willow may not be as high as believed (Argus, 1965).

Physiology

The green-scaled willow, like other plant species associated with serpentine, is adapted to ultrabasic soils with high heavy metal concentrations, particularly magnesium. In serpentine rock formations, the heavy metal concentrations reach toxic levels for most plants. In such conditions, sparse non-diverse vegetation becomes established, composed of a specific mix of species. This loss of diversity is exacerbated at higher altitudes by the freeze-thaw cycle (congeliturbation). Congeliturbation stirs and churns the soil, limiting the establishment of vegetation by means of a strictly mechanical effect (Sirois, 1984). This effect combines with the increased toxicity caused by the rise of heavy metals to the surface. Plants associated with serpentine are poor competitors that take advantage of regularly disturbed, recently evolved substrates in which other plants do not succeed in establishing (Sirois, 1984).

The small leaf area and the distribution of stomata on the green-scaled willow are probably physiological adaptations, because these characters are modified by environmental factors. Argus (1965) indicates that, in specimens collected at Mount Albert, stomata are distributed either over the entire underside and on the upper side at the apex or on the entire surface, whereas in cultivated specimens, stomata occur only at the apex on the upper side. The differences observed are not well understood and are of little or no taxonomic value (Argus, 1965). The leaf area is multiplied fivefold in cultivated species, from an average of 128 mm² to 612 mm². There is no significant change in the length of the stomata, which measured 21.5 microns (± 3.2 microns) on specimens from Mount Albert, and an average of 18.5 microns (± 2.4 microns) on cultivated specimens (Argus, 1965).

Dispersal/migration

The seeds have a tuft of silky hairs that facilitates wind dispersal. They are believed to germinate shortly after dispersal, i.e., 12 to 24 hours (Argus 1997), and remain viable for 9 to 10 months (Argus 1997). According to Toepffer (1915) and Sugaya (1956), the seeds of the genus *Salix* can overwinter and germinate the following spring.

Adaptability

Since 1994, a specimen of the green-scaled willow has been under authorized cultivation in a serpentine-based soil mixture in a private garden. This specimen is vigorous, maintains its short size, and shows no signs of disease, despite a more favourable climate (Gaudreau, 2005).

Cuttings of male and female plants were taken during the 2004 inventory and provided to an amateur gardener, for propagation. A coarse mixture of peat and crushed serpentine was used to propagate the cuttings. The individuals quickly lost their leaves, as is the case in cutting propagation in willows, but the buds were still alive.

POPULATION SIZES AND TRENDS

The 2004 inventory was carried out in 10 glacial cirques in response to the lack of data on certain sectors of Mount Albert and the potential of discovering new occurrences of green-scaled willow. It provided data on the abundance and preferred habitat of this species. The positions of most specimens were recorded using GPS in order to determine their distribution. Approximately 45 hours of fieldwork were carried out on Mount Albert to locate new occurrences.

An estimated 300 individuals occur on Mount Albert. Each occurrence typically comprises only one or two individuals, but some sites consist of five or six. According to CDPNQ, one site in the glacial cirque of the westernmost part of Vallée du Diable comprises approximately 200 individuals. At that location, 60 individuals were counted in the 2004 inventory by following a fixed elevation. No individuals were counted at lower elevations.

Not all of the glacial cirques of Mount Albert have been explored. Figure 5 indicates the recorded sightings that have been reported (some overlapping is present and does not show up at the map scale provided). These sightings have been grouped into four discrete populations (or Element Occurrences) based on a minimum separation of about 1 km between the closest sightings in adjacent populations. The southernmost sighting in population 3 could possibly be considered as part of a separate population from the three northern sightings, but is here maintained as part of population 3. The writer recognized the fact that the 3-dimensional distances are somewhat greater between sightings than can be calculated on a 2-dimensional map. The total number of individuals on Mount Albert, even with an extremely optimistic extrapolation, would likely not exceed 1,000 plants.

Since it is a perennial, green-scaled willow does not appear to be affected by changes in population size or density. A number of botanists have tried to locate it, but have been thwarted by bad luck. For example, it took until 1981 to find a male specimen, whereas several were observed in the 2004 inventory. The CDPNQ knew of the occurrence of the green-scaled willow in four glacial cirques in Mount Albert's Vallée du Diable in 1994. Following the 2004 summer inventory, the number of sites of this population is now 10 and the green-scaled willow has been found at several locations outside Vallée du Diable, including four glacial cirques on the south side of southern Mount Albert and in the side of the glacial cirque of Plaqué Malade Lake. Green-scaled willow had already been reported on the plateau of Mount Albert, but despite several kilometres of transects between northern and southern Mount Albert, none were found in the 2004 inventory (Figure 5).

LIMITING FACTORS AND THREATS

Most plants are generally inaccessible and no human threats are anticipated, except at the site of the largest population in the westernmost part of Vallée du Diable. This site, where CDPNQ estimates there are 200 specimens of the willow, is adjacent to the International Appalachian Trail on Mount Albert and is very exposed to human foot traffic. The author took the shortcuts taken by some hikers to get around obstacles in the trail. In the long term, such diversions from the trail cause it to be widened resulting in damage or destruction of adjacent specimens. At most, perhaps 10-20 specimens could be impacted by hiker foot traffic. The managers of Gaspésie Provincial Park are attempting to control the widening of the trail.

Off-trail downhill skiing is a sport that is gaining in popularity and skiers may eventually want to use other sectors of Mount Albert. At that time, the significance of the potential disturbances to green-scaled willow habitat caused by avalanches would have to be studied, but the threat appears to be minimal, if not non-existent.

Herbivores

During the 2004 inventory, the rusty tussock moth (*Orgyia antiqua* (Linnaeus, 1758)) of the family *Lymantriidae* (*Lepidoptera*), was observed on several occasions on green-scaled willow and short-fruit willow (Figure 7). The foliage of some individuals of green-scaled willow was severely affected. At present, it is impossible to know the impact of herbivory by rusty tussock moth on the green-scaled willow population; however, it is likely relatively limited (pers. comm., McIntosh, 2006). Dr. McIntosh, an insect and disease specialist, has indicated that based on the known behaviour of this moth and the ability of willows to sucker and survive even severe herbivory, the moth, by itself, would be unlikely to kill individual willow plants. This moth is also prone to a rapid population crash after an outbreak due to the fast buildup of fatal viruses (pers. comm., McIntosh, 2006).



Figure 7. Rusty tussock moth caterpillar on a green-scaled willow.

An unidentified gall (Figure 8) was observed a number of times on the green-scaled willow and short-fruit willow (*Salix brachycarpa*). The galls are irregular and are likely caused by mites or aphids (Goulet, 2005). Its impact on green-scaled willow is unknown, but Sacchi *et al.* (1988) report that flower bud production is reduced by 43% by comparison with intact stems and that seed production per individual is reduced by between 10% and 50% in the case of *Salix lasiolepis*.



Figure 8. Galls on green-scaled willow.

On the specimen cultivated in the private garden, aphids were observed during the first year of planting (1994), but no other infestations have since been observed. No observations of this type were made on individuals from Mount Albert.

SPECIAL SIGNIFICANCE OF THE SPECIES

Serpentine soils alter both the appearance and functioning of plants. These alterations, combined with the isolation characteristic of serpentine habitats, favour the formation of new species. That is why these environments are generally known for their concentration of rare endemics with small ranges. The co-occurrence of serpentine and an “alpine tundra” habitat is relatively rare in northeastern North America and the green-scaled willow is the evolutionary result of this type of environment.

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

Green-scaled willow is now protected in Quebec under the *Act Respecting Threatened or Vulnerable Species* and has been designated threatened since 1995. At present, the only occurrence of the green-scaled willow is located within a protected area: Gaspésie Provincial Park, Quebec.

NatureServe has assigned the green-scaled willow a global rank of G1, a Canadian rank of N1 and a provincial rank of S1 in Quebec. All of these imply that the species is critically imperiled. Argus and Pryer (1990) consider it rare in Canada and assign it, on the basis of another evaluation system, a Canadian priority rating of 2.

TECHNICAL SUMMARY

Salix chlorolepis

green-scaled willow

saule à bractées vertes

Range of occurrence in Canada: Quebec

Extent and Area Information	
<ul style="list-style-type: none"> • <i>Extent of occurrence (EO) (km²)</i> SoftMap Plus software, version 4.5, polygonal area enclosing all sightings 	7.5 km ²
<ul style="list-style-type: none"> • <i>Specify trend in EO</i> 	Stable
<ul style="list-style-type: none"> • <i>Are there extreme fluctuations in EO?</i> 	No
<ul style="list-style-type: none"> • <i>Area of occupancy (AO) (km²)</i> SoftMap Plus software, version 4.5, polygonal area around sightings 	0.05 km ²
<ul style="list-style-type: none"> • <i>Specify trend in AO</i> 	Stable
<ul style="list-style-type: none"> • <i>Are there extreme fluctuations in AO?</i> 	No
<ul style="list-style-type: none"> • <i>Number of known or inferred current locations</i> 	4 populations on 1 mountain top
<ul style="list-style-type: none"> • <i>Specify trend in #</i> 	Stable
<ul style="list-style-type: none"> • <i>Are there extreme fluctuations in number of locations?</i> 	No
<ul style="list-style-type: none"> • <i>Specify trend in area, extent or quality of habitat</i> 	Stable; new sites found in the Mount Albert population following more intensive inventory efforts
Population Information	
<ul style="list-style-type: none"> • <i>Generation time (average age of parents in the population)</i> 	Unknown but likely several years to flowering
<ul style="list-style-type: none"> • <i>Number of mature individuals</i> 	Approximately 300
<ul style="list-style-type: none"> • <i>Total population trend:</i> 	Stable
<ul style="list-style-type: none"> • <i>% decline over the last/next 10 years or 3 generations</i> 	
<ul style="list-style-type: none"> • <i>Are there extreme fluctuations in number of mature individuals?</i> 	No
<ul style="list-style-type: none"> • <i>Is the total population severely fragmented?</i> 	No
<ul style="list-style-type: none"> • <i>Specify trend in number of populations</i> 	Stable
<ul style="list-style-type: none"> • <i>Are there extreme fluctuations in number of populations?</i> 	No
<ul style="list-style-type: none"> • <i>List populations with number of mature individuals in each:</i> • <i>Mount Albert: approximately 300 individuals</i> 	
Threats (actual or imminent threats to populations or habitats)	
Actual and potential threats: Trampling of some individuals as the result of the widening of trails by users of the International Appalachian Trail. Limited herbivory by rusty tussock moth larvae	
Rescue Effect (immigration from an outside source)	
<ul style="list-style-type: none"> • <i>Status of outside population(s)?</i> 	No other world population
<ul style="list-style-type: none"> • <i>Is immigration known or possible?</i> 	Not applicable
<ul style="list-style-type: none"> • <i>Would immigrants be adapted to survive in Canada?</i> 	Not applicable
<ul style="list-style-type: none"> • <i>Is there sufficient habitat in Canada?</i> 	Not applicable
<ul style="list-style-type: none"> • <i>Is rescue from outside populations likely?</i> 	No
Quantitative Analysis	
None	

Current Status:

Threatened in Quebec since 1995 (Quebec Act Respecting Threatened or Vulnerable Species)
COSEWIC: Threatened (2006)

Status and Reasons for Designation

Status: Threatened	Alpha-numeric Code: D1
<p>Reasons for Designation:</p> <p>An endemic shrub restricted to the serpentine outcrops of Mount Albert in Gaspésie Provincial Park, Quebec. The low numbers of the shrub located on a single mountain top are at risk from stochastic events, potential impact of the exotic tussock moth, and limited impact from hikers along the Appalachian Trail.</p>	
<p>Applicability of Criteria</p>	
<p>Criterion A: (Declining Total Population): Not applicable. Inferred declines are not sufficiently large to warrant using this criterion.</p>	
<p>Criterion B: (Small Distribution, and Decline or Fluctuation): Not applicable. Although having a small extent of occurrence and area of occupancy and < 5 populations at a single locality, a continuing decline of any significance cannot readily be inferred.</p>	
<p>Criterion C: (Small Total Population Size and Decline): Not applicable. Population size is well below 2500 individuals but a continuing decline of a significant nature cannot readily be inferred.</p>	
<p>Criterion D: (Very Small Population or Restricted Distribution): Meets Threatened D1 based on a population size of <1000.</p>	
<p>Criterion E: (Quantitative Analysis): None available.</p>	

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BIOGRAPHICAL SUMMARY OF REPORT WRITER

Frédéric Coursol received a degree in biological sciences from the University of Montreal in 1992. He has authored several publications, the most recent of which is entitled “Inventaire des plantes susceptibles d’être désignées menacées ou vulnérables dans les îles des rapides de Lachine”. He has also written five status reports on threatened or vulnerable species in Quebec—*Saururus cernuus* and *Onosmodium molle* var. *hispidissimum*, *Cicuta maculata* var. *victorinii*, *Gentianopsis victorinii* and *Eriocaulon parkeri*—and has participated in the updates of COSEWIC status reports on four species: Anticosti aster (*Symphyotrichum anticostense*) in collaboration with Jacques Labrecque and Luc Brouillet and of *Gentianopsis victorinii*, *Cicuta maculata* var. *victorinii*, *Erigeron philadelphicus* subsp. *provancheri*. On the basis of fieldwork carried out in 2004 to prepare this report, the author was able to update data on the threatened or vulnerable plant species of Mount Albert and to considerably increase the number of known occurrences and sites.

COLLECTIONS EXAMINED

The only collection examined to compare green-scaled willow specimens was that of the Marie-Victorin Herbarium at the University of Montreal’s Plant Biology Research Institute.

The fieldwork was carried out in the summer of 2004, from August 13 to 20.