

**COSEWIC**  
**Assessment and Update Status Report**

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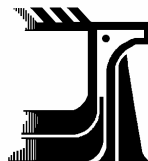
**Victorin's Water-hemlock**  
*Cicuta maculata* var. *victorinii*

in Canada



**SPECIAL CONCERN**  
**2004**

**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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Legault, A. 1987. Status report on Victorin's water-hemlock, *Cicuta maculata* var. *victorinii*, in Canada. Committee on the Status of Endangered Wildlife in Canada. 46 pp.

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## COSEWIC Assessment Summary

### Assessment Summary – May 2004

**Common name**

Victorin's water-hemlock

**Scientific name**

*Cicuta maculata* var. *victorii*

**Status**

Special Concern

**Reason for designation**

A geographically highly restricted perennial that is endemic to the freshwater or slightly brackish shoreline areas of the St. Lawrence River estuary in Québec. It is present at about 33 localities but in very small localized habitats where it is at risk from a wide range of impacts. These impacts include: actual destruction of plants due to ATV traffic and human trampling, and mowing of shoreline vegetation; losses of suitable potential shoreline habitat also occurs through shoreline in-filling and development and potential loss of plants may occur due to confusion with the common variant of the species that is considered a noxious weed. Oil spills may also pose a potential risk.

**Occurrence**

Quebec

**Status history**

Designated Special Concern in April 1987 and in May 2004. Last assessment based on an update status report.



**COSEWIC**  
**Executive Summary**

**Victorin's Water-hemlock**  
*Cicuta maculata* var. *victorinii*

**Species information**

Victorin's water-hemlock (*Cicuta maculata* var. *victorinii*) is a perennial plant of the parsnip family (Apiaceae). The taxon has undergone few taxonomic changes since it was described by Fernald. Boivin (1966) considers it to be a variety of *Cicuta maculata*, a view that has been accepted by all subsequent authors, except Gleason and Cronquist (1991), who do not accept the validity of the taxon. Variety *victorinii* is distinguished from var. *maculata* by its reniform to ovoid-cordate fruit with prominent lateral ribs and obscure dorsal ribs and its linear-lanceolate leaflets. Although the writer has noted that gradation occurs in the form of fruits between Victorin's water hemlock and the typical variety (var. *maculata*), the distinctness of Victorin's water-hemlock as a unique endemic of the intertidal zone of the St. Lawrence R. estuary is here recognized on the basis of the study by Mulligan (1980). The study by Mulligan (1980), based in part on plants grown from seed, stressed the importance of ripe fruits in identifying the varieties of *Cicuta maculata*.

**Distribution**

Victorin's water-hemlock is confined to Canada and is considered endemic to the upper St. Lawrence estuary. It occurs only in the freshwater and slightly brackish intertidal zones. To date, the plant is known from 39 localities. The southwest limit of its range is at Sainte-Anne-de-la-Pérade and the northeast limit is at Saint-Jean-Port-Joli. A disjunct population at Chandler (in the Gaspé) was inventoried by the author during the revision of water hemlock specimens, but the locality remains to be confirmed.

**Habitat**

Victorin's water-hemlock occurs in tall, dense, prairie cordgrass beds in the mid- and upper intertidal zones. It prefers thick surface deposits (over 15 cm) of fine or mixed texture (never coarse), with highly variable stoniness, ranging from no stones to very stony. Plant densities are much lower in sectors covered by gravel and pebbles. In several localities, the water pH ranges from 8.0 to 8.5, and the surface deposits consist

of fragmented schist and watery silt, with a pH of 7.5. In the mid-littoral zone or on thin substrate, Victorin's water-hemlock sometimes grows in open, short grass beds.

## **Biology**

Victorin's water-hemlock is a herbaceous perennial that flowers from June to early September. Fruiting begins in August and continues until September. The seeds are surrounded by a spongy fruit coat that keeps the fruits buoyant until they are thoroughly saturated with water. This aids in the dissemination of fruits by water. The umbels and fruit are sometimes covered with hundreds of aphids, the impact of which is unknown.

## **Population sizes and trends**

Since Legault's report (1986), 30 new populations have been discovered and the species is currently known from 33 extant localities. The localities are classified as follows: four localities with a site quality index A (>100 plants and little disturbance), 10 localities with a site quality index B (51-100 plants and slight habitat disturbance or >100 and significant disturbance), six localities with a site quality index C (10-50 plants and little disturbance or 51-100 with significant disturbance), 13 localities with a site quality index D (<10 plants with little disturbance or 10-50 plants with significant disturbance), two extirpated populations and four historic localities.

## **Limiting factors and threats**

There are several actual or potential threats to Victorin's water-hemlock: its limited habitat prevents it from colonizing other sites outside the freshwater and slightly brackish intertidal zone; fruit predation can adversely affect recruitment; the mowing of the grass beds and flower picking prevents reproduction; ice scouring and the spring ice break-up tear up plants and parts of the river bank, fluctuating water levels can cause river bank erosion; poor water quality can result in plant mortality; the *Agricultural Abuses Act* requires property owners to tear up all water hemlocks growing on their property, regardless of variety status; and filling of the river banks results in habitat loss and could destroy populations. However, the most serious threats to the species are human trampling and recreational vehicle traffic (ATVs).

## **Special significance of the species**

Victorin's water-hemlock is of interest to scientists because of what they can learn from it about the origin of the endemic flora of the estuarine beaches of the St. Lawrence River. In addition, some water-hemlocks have recognized medicinal properties (cicutoxin), but no studies have yet been conducted on Victorin's water-hemlock.

## Existing protection or other status designations

Victorin's water-hemlock was designated a species of special concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 1987. The organization *NatureServe* has assigned it a global rank of G5T2 (species globally widespread and secure with the subspecies being imperiled), a Canadian rank of N2 (imperiled nationally) and imperiled (S2) in Quebec (NatureServe 2001).

The populations of Saint-Michel-de-Bellechasse (Anse Saint-Vallier), L'Islet, and Saint-Jean-Port-Joli (Anse de Trois-Saumons) are protected because they are located in the Saint-Vallier, L'Islet and Trois-Saumons migratory bird sanctuaries. The Grosse Île population is also protected because it is located in the Grosse Île and the Irish Memorial National Historic Site. In addition, the organization *Conservation de la nature Québec* owns part of the site on which the Saint-Vallier population occurs.

In Quebec, Victorin's water-hemlock was designated "threatened" in February 2001 and is now protected under the *Act Respecting Threatened or Vulnerable Species*. However, water-hemlock (*Cicuta maculata*) is considered a weed under the *Agricultural Abuses Act* (R.S.Q. A-2). Its habitat is protected against the most serious threat to its survival by the *Regulation Respecting Motor Vehicle Traffic in Certain Fragile Environments* (R.S.Q., c. Q-2, r. 2.2). Further, the Quebec policy respecting the protection of lakeshores, riverbanks, littoral zones and floodplains seeks to maintain and improve water quality by ensuring a minimum adequate level of riverbank protection.



## 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. On June 5, 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 and include 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 organizations (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biosystematic Partnership, chaired by the Canadian Museum of Nature), three nonjurisdictional members and the co-chairs of the species specialist and the Aboriginal Traditional Knowledge subcommittees. The committee meets to consider status reports on candidate species.

## DEFINITIONS (AFTER MAY 2004)

Species	Any indigenous species, subspecies, variety, or geographically or genetically distinct population of wild fauna and flora.
Extinct (X)	A species that no longer exists.
Extirpated (XT)	A species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A species facing imminent extirpation or extinction.
Threatened (T)	A species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A species that has been evaluated and found to be not at risk.
Data Deficient (DD)***	A species for which there is insufficient scientific information to support status designation.

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

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

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



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

**Update  
COSEWIC Status Report**

on the

**Victorin's Water-hemlock**  
*Cicuta maculata* var. *victorinii*

in Canada

2004



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## SPECIES INFORMATION

### Name and classification

Scientific name: *Cicuta maculata* Linnaeus var. *victorinii* (Fernald) Boivin  
Relevant synonyms: *Cicuta victorinii* Fernald  
French names: ciculaire de Victorin, ciculaire maculée variété de Victorin  
English names: Victorin's water-hemlock, Spotted water hemlock  
Family: Apiaceae (parsnip family)

The treatment of this variant of *Cicuta* has been problematic for a number of authors. Victorin's water-hemlock (*Cicuta victorinii*) was first described by Fernald in 1939 on the basis of specimens collected on intertidal beaches at Cap-Rouge and Saint-Laurent on Île d'Orléans by Brother Marie-Victorin (August 9 and 16, 1922). Mathias and Constance (1942) retain this taxon in their synopsis of the American species of *Cicuta*. Boivin (1966) considers it to be a variety of *Cicuta maculata*, a position accepted by Scoggan (1978) and Mulligan (1980). The latter treats the *Cicuta maculata* complex and retains the variety on the basis of its fruit with small ribs and swollen intercostal regions. Gleason and Cronquist (1991) do not recognize the variety *victorinii* and are of the view that only the variety *maculata* exists in Eastern North America. Kartesz (1994) recognized the taxa proposed by Mulligan (1980). The position taken in this report is to adopt the classification of Mulligan (1980). In his studies, in part with plants grown from seed, Mulligan (1980) recognized two distinct varieties; he also noted that some gradation occurs between the endemic var. *victorinii* and the typical var. *maculata* and that ripe fruits are required to readily distinguish between them.

### Description

Herbaceous perennial (Figure 1), glabrous, 0.5–2 m high, from a short rootstock. A bundle of 5–10 oblong tubers grows from the base of the rootstock. Stem erect, often streaked with purple, hollow except at nodes with leaf stalk clasping the stem and fully encircling it. Leaves lanceolate to ovate lanceolate, alternate, 10–80 cm long and 4–8 cm wide, each leaf divided into 3 parts composed of leaflets, leaflets linear-lanceolate, finely toothed. Inflorescence composed of umbels with unequal pedicels; flowers white, small and pedicelled. Fruits: a double achene, light to dark brown (purplish in the field), 3.5–4 mm long, separating when mature into two seeds, each seed with corky ribs, lateral ribs more prominent than dorsal ribs, which are sometimes absent. A yellowish, oily liquid smelling like parsnips exudes from cut stems and roots. All plant parts are toxic (Coursol, 2001).



Figure 1. Victorin's water hemlock; illustration by Réjean Roy.

There are three known varieties of water-hemlock in Canada (*var. victorinii*, *var. maculata* and *var. angustifolia*). According to Legault (1986), *var. victorinii* is the only variety that occurs in estuarine habitats. In actual fact, however, the two varieties present in Quebec (*var. victorinii* and *var. maculata*) occupy the intertidal zone of the St. Lawrence River. They can be differentiated on the basis of at least two criteria (Fernald, 1950; Mulligan, 1980; Mulligan and Munro, 1981).

- 1) The fruits of *var. victorinii* are reniform to ovoid-cordate with prominent lateral ribs and obscure dorsal ribs, whereas the fruits of *var. maculata* are ellipsoid, ovoid or subglobose with light prominent dorsal and lateral ribs alternating with dark ridges.
- 2) The leaflets are linear lanceolate in *var. victorinii* and lanceolate to ovate oblong in *var. maculata*.

The second criterion is generally unusable, particularly when the two varieties occur together in the estuarine environment. The only character that can be used to identify *var. victorinii* with certainty is the mature fruit in early September. When herbarium specimens harvested before September are dried, the obscure dorsal ribs of the newly collected fruit are sometimes transformed into prominent dorsal ribs after drying. The herbarium specimens of *var. victorinii* never have prominent dorsal ribs.

Since the provincial report on the status of Victorin's water-hemlock was prepared (Coursol, 1999), there has been growing uncertainty regarding the taxonomic validity of Victorin's water-hemlock. In 2002, the author observed, in individuals from Cap-Saint-

Ignace, some fruits with well-developed dorsal ribs and others with obscure dorsal ribs on the same umbel. Hybridization of the two varieties must be common in some populations. In the 1996 and 1997 inventories, the author observed that the two varieties often grow in proximity to each other and that individuals occurring at the limit of the upper littoral tend to exhibit characters of var. *maculata*, whereas individuals submerged for longer periods exhibit characters of var. *victorinii*. Detailed studies are required to provide further clarification.

## DISTRIBUTION

### Global range

Victorin's water-hemlock is confined to Canada (Figure 2). It is considered endemic to the upper St. Lawrence estuary (Labrecque and Lavoie, 2002).

### Canadian range

In Canada, Victorin's water-hemlock occurs only in the freshwater and slightly brackish intertidal zones of the St. Lawrence River. To date, the plant has been counted in 39 localities (Table 1). The southwest limit of its range is at Sainte-Anne-de-la-Pérade and the northeast limit is at Saint-Jean-Port-Joli and Sainte-Anne-de-Beaupré (Figure 3). The former southwest limit of Batiscan (Legault, 1986) is based on a specimen in full flower, the identification of which is questionable.

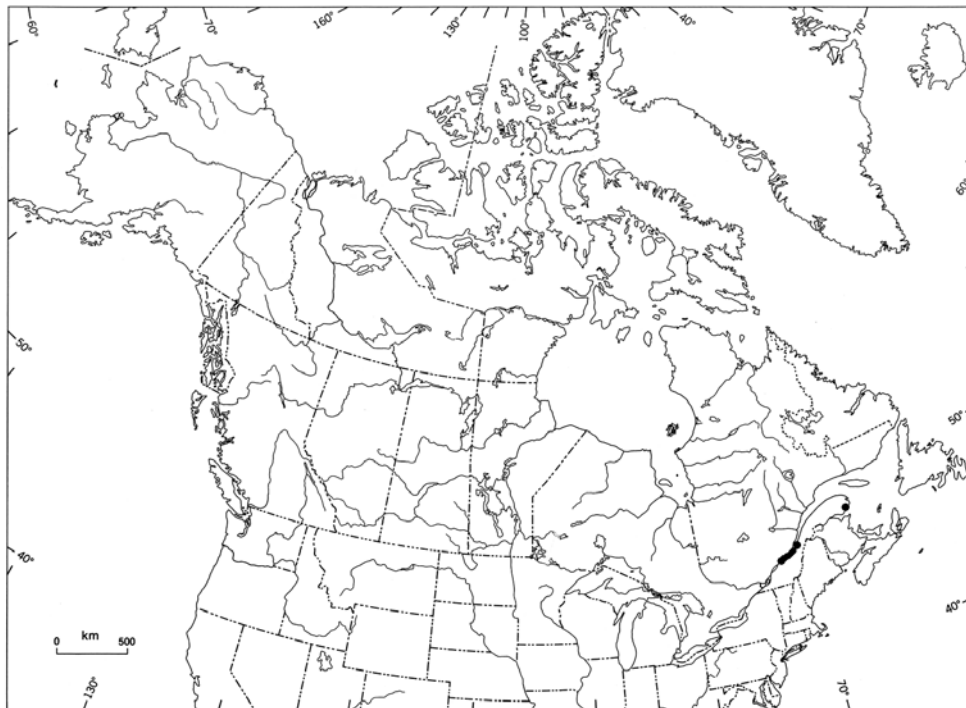


Figure 2. Global range of Victorin's water hemlock.

**Table 1. List of Victorin's water-hemlock populations with their site quality index in 2002.**

Localities	Population size	Disturbance	Site quality index <sup>1</sup>	Latest observation
Berthier-sur-Mer, anse de Berthier	115-1,060	none	A	13/09/1995
Île aux Grues, La Grande Rivière	100-250	none	A	04/09/1996
Lévis, pointe Martinière	250	low	A	04/09/1996
Saint-Laurent-d'Orléans, anse aux Frères	200-500	low	A	02/09/1997
L'Islet, Rocher Panet	200-500	high	B	05/09/1996
Saint-Jean, Pointe Dauphine	155-310	high	B	29/08/1995
Cap-Rouge, anse du Cap-Rouge	100-1,000	high	B	17/08/1995
Grosse-Île	50-100	low	B	20/07/1993
Saint-Augustin-de-Desmaures	15-60	low	B	29/08/2002
Sainte-Pétronille, pointe chez Royer	200-500	high	B	02/09/1997
Sainte-Pétronille, Anse à Porteous	50-75	low	B	10/08/2002
Saint-Jean-Port-Joli, anse de Trois-Saumons	100-1,000	none	B**	05/09/1996
Saint-Michel-de-Bellechasse, point to the east of the wharf	55-120	high	B	12/09/1995
Saint-Vallier, pointe de Saint-Vallier	50-70	low	B	10/08/2002
Beaupré	11-50	none	C	09/09/1995
Grondines	11-50	low	C	20/09/1996
Neuville	30-50	low	C	08/09/2002
Saint-Étienne-de-Beaumont, anse de Vincennes	11-50	none	C	24/08/1995
Saint-Jean-Port-Joli	30-120	high and none	C	05/09/1996
Saint-Michel-de-Bellechasse, anse Saint-Vallier	11-50	none	C	11/09/1995
Berthier-sur-Mer, trou de Berthier	2-10	moderate	D	13/09/1995
Île aux Grues, wharf	11-50	low	D	04/09/1996
L'Islet-sur-Mer, cove to the east of the wharf	1	low	D	27/08/1995
Pointe-aux-Trembles-Ouest, pointe à Alain	2-10	low	D	19/09/1995
Sainte-Anne-de-la-Pérade.	3-10	low	D	08/09/2001
Sainte-Croix, pointe au Platon	3	low	D	20/09/1996
Saint-François	1	none	D	02/09/1997
Saint-Jean, Rivière Lafleur	2-10	high	D	28/08/1995
Saint-Jean-de-Boischatel	1	low	D	24/08/1995
Saint-Laurent, Village-des-Anglais	2-10	moderate	D	20/09/1995
Saint-Nicolas, anse Ross	2-10	low	D	05/09/1991
Saint-Nicolas, pointe Saint-Nicolas	2-10	low	D	18/09/1995
Saint-Romuald	11-50	high	D	26/08/1995
Chandler	-	no date	H	06/08/1931
L'Ange-Gardien	-	low	H	23/08/1942
Lotbinière	-	high	H	28/08/1943
Sainte-Anne-de-Beaupré	-	moderate	H	25/08/1962
Beauport	0	high	X	19/08/1913
Saint-Nicolas, pointe à Basile	0	low	X	14/07/1950
Total:	1,787- 6,341	Average: 4,064		

1 - See Table 2 for the meaning of classes A-D. The site quality index X (extirpated) indicates that Victorin's water hemlock and/or its habitat are extirpated from this location, despite sampling efforts in recent years. The site quality index H (historic) indicates that the observation of the population dates back more than 25 years.

\*\* Saint-Jean-Port-Joli, anse de Trois-Saumons site is classified as B due to the difficulty of distinguishing var. *victorinii* from var. *maculata* due to their intermixing at the site.

**Table 2. Definition of quality indices of Victorin's water-hemlock.**

Site quality index	Meaning of index
A	Population of over 100 individuals in a habitat that is only slightly or not disturbed by human activity.
B	Population of 51-100 individuals in a habitat that is only slightly or not disturbed by human activity or population of 100 individuals disturbed by filling or pedestrian or vehicle traffic.
C	Population of 10-50 individuals in a habitat that is only slightly or not disturbed by human activity or population of 51-100 individuals disturbed by filling or pedestrian or vehicle traffic.
D	Population of less than 10 individuals in a habitat that is only slightly or not disturbed by human activity or population of 10-50 individuals disturbed by filling operations, human trampling or vehicle traffic.

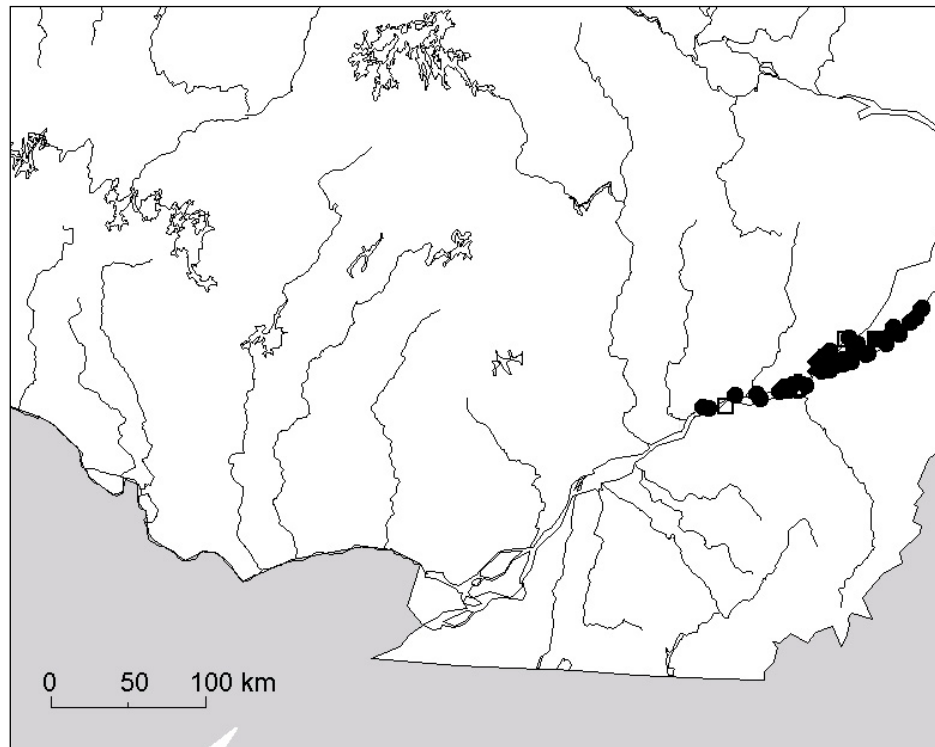


Figure 3. Canadian range of Victorin's water hemlock (adapted from Labrecque and Lavoie, 2002), excluding the locality of Chandler (in the Gaspé).

One specimen of water-hemlock at the Marie-Victorin herbarium (No. 44 394) raises many questions. It was collected by E. Jacques and Brothers Marie-Victorin and Rolland-Germain on August 6, 1931, and corresponds to the description of Victorin's water-hemlock, except for its location: Baie-des-Chaleurs, Chandler, Gaspé county; wetlands along the seashore. The validity of this locality should be verified, because it is possible that Victorin's water-hemlock seeds were transported by currents to this location. The Pabos River estuary is one of the largest in the Gaspé and the presence of freshwater tides

is possible there. The example of *Zizania aquatica* var. *brevis* (endemic to the upper St. Lawrence estuary) and of several other estuarine species in the Miramichi River estuary in New Brunswick would indicate that the phenomenon is possible.

The specimens collected by Brouillet *et al.* (1996) from the mouth of Rivière du Sud at Montmagny, Château-Richer, L'Islet at Saint-Pierre and Les Fonds at Saint-Antoine-de-Tilly were referred to var. *maculata*. Although the revision of these specimens was conducted during the preparation of the provincial status report (Coursol, 1999), the database of the Quebec Natural Heritage Information Centre (CDPNQ) had not yet been corrected in 2002. Lastly, a specimen from Cap-Saint-Ignace collected by the author during the study by Brouillet *et al.* (1996) was referred to var. *maculata* in 2002. A number of achenes had characters of var. *victorinii*, but others showed clear signs that they were of the variety *maculata*.

## HABITAT

### Habitat requirements

Victorin's water-hemlock prefers thick surface deposits (over 15 cm) of fine or mixed texture (never coarse), with highly variable stoniness, from no stones to very stony. Plant densities are much lower in sectors covered by gravel and pebbles (Robert, 1993). In some localities, the water pH ranges from 8.5 (Anse Saint-Vallier) to 8.0 (Anse de Berthier and L'Islet) (Rousseau, 1930, 1932). Surface deposits consist of fragmented schist and watery silt (Legault, 1986), with a pH of 7.5 (Rousseau, 1930).

Victorin's water-hemlock occurs in tall, dense prairie cordgrass beds in the mid- and upper intertidal zones (Robert, 1993; Brouillet *et al.*, 1996). In the mid-littoral zone or on thin substrate, it sometimes grows in open, short grass beds. This zone is covered by water for two to three hours a day during equinoctial high tides, but is seldom reached by low high tides. Brouillet *et al.* (1996) observed Victorin's water hemlock in 43 segments (8.88 per cent) of their 34 sampling sites. Of that number, 32 segments (74.42 per cent) were in the upper littoral, the preferred habitat of Victorin's water-hemlock. In 11 segments (25.58 per cent), several isolated individuals were counted in the upper part of the mid-littoral zone, which is submerged at mean high water. However, these individuals were smaller than those in the upper littoral (Robert, 1993).

Two species designated as species of special concern by COSEWIC share the same habitat as Victorin's water hemlock. One population of Provancher's fleabane and most populations of Victorin's gentian grow in proximity to Victorin's water hemlock.

### Trends

Legault (1986) reports that Victorin's water-hemlock was known from 10 localities (9 localities without the revised population of Batiscan). Since his report, several new populations have been discovered and, in the summer of 2002, the Quebec Natural

Heritage Information Centre (CDPNQ) sent information on 42 occurrences of the plant. Several of the localities present in the database are erroneous, despite the fact that Coursol (1999) reported that a number of specimens of Brouillet et al. (1996) were referred to var. *maculata*. After verification, the CDPNQ also created two occurrences at Saint-Jean-Port-Joli for a single locality, although these two sub-populations are less than 100 metres apart. The revision of two herbarium specimens (Batiscan and Cap Saint-Ignace for var. *maculata* and Chandler for var. *victorinii*) also results in changes. The CDPNQ has been advised of these problems and the data will soon be corrected to give a total of 39 occurrences.

There has been a significant loss of potential Victorin's water-hemlock habitat in a number of places such as in the Quebec City metropolitan area. Road and railroad construction on the tidal flats of the St. Lawrence River has almost completely destroyed the mid- and upper littoral zones of potential habitats between Boischâtel and Cap-Rouge. Habitat quality has been seriously affected by the filling of the upper littoral and the construction of retaining walls for many homes in Lévis, Saint-Romuald and several other residential sectors bordering the St. Lawrence River near areas where populations have been documented.

The introduction of tighter environmental legislation seems to have halted or slowed this trend. The major sampling effort by Brouillet *et al.* (1996) has advanced the state of knowledge of estuarine taxa and their distribution. Since the status report by Legault (1986), 30 new populations have been discovered, and certain localities, such as Île aux Grues, Pointe Martinière at Lévis, L'Islet and Pointe Dauphine at Saint-Jean, now have large populations, accounting for between 20 and 40 per cent of the total number of Victorin's water hemlock plants. Since the report by Brouillet *et al.* (1996), the general trend appears to be stable, but there are still a number of threats that could alter this trend.

### **Protection/ownership**

Two localities (Anse Saint-Vallier and Grosse Île) are located within the boundaries of protected areas: the Saint-Vallier Migratory Bird Sanctuary and the Grosse Île and the Irish Memorial National Historic Site. Other ill-defined historic populations may occur within the boundaries of other protected areas, i.e., the L'Islet and Trois-Saumons migratory bird sanctuaries. In addition, the organization *Nature Conservation de la nature Québec* owns part of the site on which the Saint-Vallier population occurs.

Most Quebec localities of Victorin's water-hemlock do not have conservation status and ownership is therefore unclear. Victorin's water hemlock habitat is found on public lands under the jurisdiction of the Quebec government. However, occurrences in the RCM of Cote-de-Beaupré (Boischâtel and Ange-Gardien) may be on private land and may extend to the low water mark, at low tide. Official boundary surveys (Cadastral surveys) are needed to identify these sites.

The *Regulation Respecting Motor Vehicle Traffic in Certain Fragile Environments* (R.S.Q., c. Q-2, r. 2.2) protects Victorin's water-hemlock habitat by prohibiting access to



the tidal flats of the St. Lawrence River by motor vehicles. The application and enforcement of this regulation could put an end to the problem of ATV traffic at Saint-Augustin-de-Desmaures.

## BIOLOGY

### General

Victorin's water hemlock is a herbaceous perennial 0.5 to 2 m high. It flowers from June to September, and fruiting begins in August and continues until September (October according to Legault, 1986). Water hemlock seeds are surrounded by a spongy fruit coat that keeps the fruits buoyant until they are thoroughly saturated with water. This aids in the dissemination of fruits by water (Mulligan and Munro, 1981).

### Reproduction

Victorin's water-hemlock is a herbaceous perennial with a short rootstock. A bundle of 5 to 10 tubers grows from the base of the rootstock. Despite the large number of tubers that make up the rootstock, no signs of vegetative reproduction have been observed. Reproduction appears therefore to be by seed production.

Victorin's water-hemlock requires vernalization (cold treatment) to induce flowering, which occurs between June and September (Legault, 1986). The flowers are considered to be generalist entomophilous, meaning that they are not specifically adapted to a particular insect (Bell, 1971). Pollen is spread by insects crawling over the inflorescences. The stylopodium has nectar-secreting glands and is brightly coloured (Heywood, 1971), likely attracting feeding insects. Mulligan and Munro (1981) observed the development of an umbel of *Cicuta maculata* var. *maculata*. The flowers on the outside of the umbel opened first. Their stylopodium did not exude nectar and the stamens did not dehisce immediately. The stigma consisted of two rudimentary knobs at that time. The five stamens unrolled one at a time and spread out from the flower. Individual anthers dehisced on the side away from the centre of the flower. The whitish-green stylopodium began to exude nectar as the first anther dehisced and the bilobed stigma elongated until all stamens matured. The percentage of fruiting varies from umbel to umbel and from plant to plant and depends partly on the activity of unspecialized pollinators. A succession of inflorescences are formed over the growing period, but those that are formed last produce the least fruit (Mulligan and Munro, 1981).

### Survival

No data available is available on the factors affecting the species' survival. The main cause of mortality in Victorin's water-hemlock is currently the use of all-terrain vehicles in the mid- and upper littoral zones.

In a number of the localities visited in 1997 and 2002, the umbels and fruits of the plants were covered with hundreds of aphids. The impact of these invasions is

unknown at this time, but maturation of the fruits has to be affected. This phenomenon was not observed in the sampling sites in 1995 or 1996. Victorin's water hemlock may be a host to the fungal pathogens *Puccinia cicutae* and *Uromyces lineolatus*, which were discovered on spotted water hemlock by Ginns (1986).

## **Physiology**

Victorin's water-hemlock is a herbaceous perennial that forms rosettes the first year from seed. During the growing season, new rootstocks and storage roots form around the old rootstock. In the fall, the old rootstock, leaves and stem die and only the new rootstocks and storage organs overwinter; these produce new shoots the following year. The rootstocks form mainly underground. Despite the large number of tubers that make up the rootstock, no signs of vegetative reproduction have been observed. Reproduction therefore appears to be by seed production.

Victorin's water-hemlock requires vernalization to induce flowering, which occurs between June and September (October according to Legault, 1986). Fruiting begins in August and continues until September (October according to Legault, 1986). Water-hemlock seeds are surrounded by a spongy fruit coat that keeps the fruits buoyant until they are thoroughly saturated with water. This aids in the dissemination of fruits by water (Mulligan and Munro, 1981).

## **Movements/dispersal**

No detailed studies have been conducted on population dynamics in Victorin's water-hemlock. Caldwell and Crow (1992) studied the dynamics of estuarine environments and found three factors that contribute significantly to plant community structure. The duration of flooding by tides is the most important factor, followed by the life forms present and physical disturbances caused by ice boulders. The plants that are the most successful in such fluctuating environments are annuals and highly rhizomatous perennials, such as Victorin's water hemlock. A large number of rootstocks allow these plants to maintain an equilibrium between sedimentation and constant erosion and to store nutrient reserves in order to emerge and grow quickly. Abundant seed production in late summer or early fall are the principal means of reproduction in water hemlocks (Lynn et al., 1988). The seeds generally fall near the parents and are protected in the marsh surface microrelief, where they can be dispersed by various means (Kingsbury, 1964; Muenscher, 1975; Lynn et al., 1988): anemochory (wind), hydrochory (water) and endozoochory (within animal bodies). In addition, ice boulders stir up sediments and even parts of the vegetation cover, which can be carried over large distances and redeposited along the River, thus contributing to their dispersal.

## **Behaviour/adaptability**

Germination tests by Mulligan (1980) using seeds collected at Cap-Rouge and Saint-Augustin-de-Desmaures revealed that they did not germinate if they were over two years old. Younger seeds germinated only after a special treatment that consisted

in soaking them overnight and removing the seed coat. They were then immersed in water on petri dishes and subjected to alternating temperatures (2°C to 21°C) every 12 hours for two weeks. The seeds were then exposed to a constant temperature of 21°C and germination began within two weeks.

## **POPULATION SIZES AND TRENDS**

Legault (1986) reports that Victorin's water-hemlock was known from 10 localities in 1985 (9 localities without the revised population of Batiscan) and that he visited four of them. He states that the populations of Lotbinière and Saint-Vallier were well preserved and that the populations of Cap-Rouge and Saint-Romuald had been reduced by road construction. The habitat of these populations has been stable since that time, except for that of the Lotbinière population, which is at risk of disappearing due to the repeated passage of ATVs over a wide swath of the upper littoral. A plant count was not conducted at the populations visited by Legault (1986).

Several new localities were discovered in the inventory by Brouillet *et al.* (1996). In the 2002 inventory, some historic populations could not be found, but a new population was discovered. Victorin's water hemlock has been documented from 39 localities but only 33 are now extant. The localities are classified as follows: four occurrences with a site quality index of A, 10 occurrences with a site quality index of B, six occurrences with a site quality index of C, 13 occurrences with a site quality index of D, two eradicated populations (X) and four historic occurrences (H). See Tables 1 and 2.

The discovery of several new populations results in a significant increase in the number of known individuals since 1986. Other new populations may still be discovered along the shores of the St. Lawrence River. The inventories of the summer of 2002 at several localities resulted in the discovery of two new populations (Sainte-Pétronille, Anse à Porteous and Neuville) and made it possible to update the demographic data on other populations (Saint-Vallier and Saint-Augustin-de-Desmaures). Despite many efforts to rediscover it, the species is probably extirpated from the historic localities, but recolonization is possible because suitable habitat continues to exist.

## **LIMITING FACTORS AND THREATS**

### **Predation**

The umbels and fruits of the plants at the localities visited in 1997 and 2002 were covered with hundreds of aphids. This phenomenon had not been observed at the sampling sites in 1995 or 1996.

Spotted water-hemlock is a host to the fungal pathogens *Puccinia cicutae* and *Uromyces lineolatus* (Ginns, 1986). Victorin's water hemlock may also be a host to these pathogens.

## **Mowing**

Mowing of the littoral zone by property owners has been observed at some localities. Mowing prevents the formation of flower stalks and therefore deprives the plants of their only means of reproduction. This could result in its extirpation from certain localities where this has occurred.

## **Limited habitat**

Victorin's water-hemlock is confined to the freshwater and slightly brackish intertidal zone. Its habitat in Quebec is restricted by the small amplitude tides upstream from Sainte-Anne-de-la-Pérade and the higher water salinity in the Saint-Jean-Port-Joli region downstream.

## **Ice scouring**

Some plants may be torn up by ice scouring of the rocks and river banks during the daily tides and by the spring ice break-up.

## **Water quality and level**

Although the water quality of the St. Lawrence River is improving, it is still polluted. Riverbank erosion caused by waves generated by ships and recreational watercraft could adversely affect the species. As in the case of Provancher's fleabane and Victorin's gentian (Sabourin and Paquette, 1991; Coursol, 1998), riparian colonies of Victorin's water-hemlock along the St. Lawrence could be adversely affected by an oil spill.

## **Filling**

Filling of the riverbank for the construction of homes, roads, railways and marinas has resulted in the loss of habitat of several species along the River. For example, the construction of Champlain Boulevard and the Dufferin Highway at Quebec City has destroyed virtually the entire natural river bank between Sainte-Foy and Boischatel, thereby preventing potential recolonization by Victorin's water-hemlock. The same is true with respect to the filling of the upper littoral and the construction of retaining walls for many homes in Lévis, Saint-Romuald and several other residential sectors along the River.

## **Human trampling**

Victorin's water-hemlock populations are highly exposed to human trampling and/or ATV traffic. ATV traffic in the intertidal zone poses a significant threat. ATVs not only cause plant mortality, but also significantly alter the fragile balance of its habitat. Thus, the Victorin's water-hemlock population at Lotbinière is probably extirpated due to the repeated passage of ATVs in the upper littoral zone, where they disturb a swath

from two to sometimes 10 metres wide. The report by Legault (1986) reported this problem for this locality. ATV activity has also been noted at the Saint Augustin-de-Desmaures site. In general, ATV activity is scattered along the St. Lawrence R. but the impact is particularly noticeable at the Lotbinière site.

### **Agricultural Abuses Act**

Under the *Agricultural Abuses Act* (R.S.Q. A-2), water hemlock (*Cicuta maculata*) is considered a weed when it grows along roads and highways, railways, electric power transmission lines and in ditches on agricultural land, other land and vacant lots. Owners are required to destroy weeds by government order, before the seeds mature. Given that varieties of water hemlock are identified primarily on the basis of their seeds, it is possible that Victorin's water-hemlock may be torn up unintentionally. The lack of provisions in the Act regarding the variety of water-hemlock creates confusion among the public and among inspectors of the Quebec Department of Agriculture, Fisheries and Food. No specific losses have been documented resulting from the enforcement of this Act but the lack of clarity in the Act could potentially result in populations being impacted.

### **SPECIAL SIGNIFICANCE OF THE SPECIES**

The species is of interest to scientists because it draws attention to the issue of the origin and diversification of the endemic flora of the estuarine shores of the St. Lawrence River (Marie Victorin, 1995). The intertidal zone is also the specialized habitat for the following species (Bouchard et al., 1983): Victorin's water hemlock and the following species: *Bidens eatonii*, *Epilobium ciliatum* var. *ecomosum*, *Eriogon philadelphicus* var. *provancheri*, *Eriocaulon parkeri*, *Gentianopsis procera* subsp. *macounii* var. *victorinii* (sub *Gentianella crinita* subsp. *victorinii*), *Gratiola neglecta* var. *glaberrima*, *Lycopus americanus* var. *laurentianus*, *Physostegia virginiana* var. *granulosa*, *Polygonum punctatum* var. *parvum* and *Zizania aquatica* var. *brevis*.

Some water-hemlocks have recognized medicinal properties, but no studies have yet been conducted on Victorin's water hemlock. Cicutoxin exhibits antileukemic activity and is probably an anticarcinogen (Harborne and Baxter, 1993). Some American Aboriginal peoples used water-hemlock for medicinal or prophylactic purposes (Heywood, 1971). No information has been found on the use of Victorin's water-hemlock by Aboriginal peoples in Canada.

### **EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS**

Victorin's water-hemlock was designated a species of special concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 1987. The organization *NatureServe* has assigned it a global rank of G5T2, a Canadian rank of N2 and a Quebec rank of S2 (NatureServe 2001). Argus and Pryer (1990) consider it rare in Canada and assign it a Canadian priority rating of 2.

The populations of Saint-Michel-de-Bellechasse (anse Saint-Vallier), L'Islet, and Saint-Jean-Port-Joli (Anse de Trois-Saumons) are protected because they are located in the Saint-Vallier, L'Islet and Trois-Saumons migratory bird sanctuaries. The Grosse-Île population is also protected because it is located in the Grosse-Île and the Irish Memorial National Historic Site. In addition, the organization *Conservation de la nature Québec* owns part of the site on which the Saint-Vallier population occurs.

In Quebec, Victorin's water-hemlock was designated "threatened" in February 2001 and is now protected under the *Act Respecting Threatened or Vulnerable Species*. However, *Cicuta maculata* is considered a weed under the *Agricultural Abuses Act* (R.S.Q. A-2). The lack of provisions in the Act regarding the variety of water hemlock creates confusion among the public and among inspectors of the Quebec Department of Agriculture, Fisheries and Food.

Its habitat is protected against the most serious threat to its survival by the *Regulation Respecting Motor Vehicle Traffic in Certain Fragile Environments* (R.S.Q., c. Q-2, r. 2.2). Further, the Quebec policy respecting the protection of lakeshores, riverbanks, littoral zones and floodplains seeks to maintain and improve water quality by ensuring a minimum adequate level of riverbank protection. However, current threats from ATV activity in Victorin's water-hemlock habitat clearly indicates that these regulations alone without adequate enforcement are inadequate to protect the taxon.

## TECHNICAL SUMMARY

### *Cicuta maculata* var. *victorinii*

#### Victorin's water-hemlock

Range of Occurrence in Canada: Quebec

### Cicutaire de Victorin

<b>Extent and Area Information</b>	
<i>Extent of occurrence (EO)(km<sup>2</sup>)</i> (Based on GIS calculation of a polygon in which all points at outer limits of range are included)	~ 171 km <sup>2</sup>
<ul style="list-style-type: none"> <li>• <i>Specify trend in EO</i></li> </ul>	Increasing due to more intense search effort
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in EO?</i></li> </ul>	No
<ul style="list-style-type: none"> <li>• <i>Area of occupancy (AO) (km<sup>2</sup>)</i> (determined as an approximation of shoreline areas at the sites documented)</li> </ul>	perhaps 2 km <sup>2</sup>
<ul style="list-style-type: none"> <li>• <i>Specify trend in AO</i></li> </ul>	Unknown
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in AO?</i></li> </ul>	No
<ul style="list-style-type: none"> <li>• <i>Number of known or inferred current locations</i></li> </ul>	33
<ul style="list-style-type: none"> <li>• <i>Specify trend in #</i></li> </ul>	Unknown (increased number known due to greater search effort)
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in number of locations?</i></li> </ul>	No
<ul style="list-style-type: none"> <li>• <i>Specify trend in area, extent or quality of habitat</i></li> </ul>	Decline in habitat quality based on various impacts
<b>Population Information</b>	
<ul style="list-style-type: none"> <li>• <i>Generation time (average age of parents in the population)</i></li> </ul>	Unknown (perennial, perhaps several years )
<ul style="list-style-type: none"> <li>• <i>Number of mature individuals</i></li> </ul>	Estimated between about 1,800 and 6,300
<ul style="list-style-type: none"> <li>• <i>Total population trend:</i></li> </ul>	Stable
<ul style="list-style-type: none"> <li>• <i>% decline over the last/next 10 years or 3 generations.</i></li> </ul>	Not Applicable
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in number of mature individuals?</i></li> </ul>	No
<ul style="list-style-type: none"> <li>• <i>Is the total population severely fragmented?</i></li> </ul>	No
<ul style="list-style-type: none"> <li>• <i>Specify trend in number of populations</i></li> </ul>	Likely stable (increasing number known due to increased search effort)
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in number of populations?</i></li> </ul>	No
<ul style="list-style-type: none"> <li>• List populations with number of mature individuals in each:</li> </ul> <p>Beaupré: 11-50            Berthier-sur-Mer, Anse de Berthier: 115-1060            Berthier-sur-Mer, Trou de Berthier: 2-10            Cap-Rouge, Anse du Cap-Rouge: 100-1000            Grondines: 11-50            Grosse-Île: 50-100            Île aux Grues, La Grande Rivière: 100-250            Île aux Grues, wharf: 11-50            Lévis, Pointe Martinière: 250            L'Islet, Rocher Panet: 200-500            L'Islet-sur-Mer, cove to the east of the wharf: 1            Neuville: 30-50            Pointe-aux-Trembles-Ouest, pointe à Alain: 2-10            Saint-Augustin-de-Desmaures: 15-60            Sainte-Anne-de-la-Pérade: 3-10            Sainte-Croix, Pointe au Platon: 3            Saint-Étienne-de-Beaumont, Anse de Vincennes: 11-50            Saint-François: 1            Saint-Jean, Pointe Dauphine: 155-310            Saint-Jean, Rivière Lafleur: 2-10            Saint-Jean-de-Boischatel: 1            Saint-Jean-Port-Joli, Anse de Trois-Saumons: 100-1000            Saint-Jean-Port-Joli: 30-120            Saint-Laurent, Village-des-Anglais: 2-10            Saint-Laurent-d'Orléans, Anse aux Frères: 200-500</p>	

<b>Threats (actual or imminent threats to populations or habitats)</b>	
Actual threats: - human trampling/ATV use - mowing of grass beds - ice scouring (questionably a threat since it is a natural occurrence; causes some changes in population sizes) - water quality and level (likely of limited impact) Potential threats - suitable habitat becoming limited due to filling - <i>Agricultural Abuses Act</i> (control of widespread <i>Cicuta maculata</i> var. <i>maculata</i> with which var. <i>victorinii</i> can be confused) - oil spills	
<b>Rescue Effect (immigration from an outside source)</b>	None
<ul style="list-style-type: none"> <li>• <i>Status of outside population(s)?</i>  <b>USA: none; this is a Canadian endemic</b></li> </ul>	
<ul style="list-style-type: none"> <li>• <i>Is immigration known or possible?</i></li> </ul>	Not Applicable
<ul style="list-style-type: none"> <li>• <i>Would immigrants be adapted to survive in Canada?</i></li> </ul>	Not Applicable
<ul style="list-style-type: none"> <li>• <i>Is there sufficient habitat for immigrants in Canada?</i></li> </ul>	Not Applicable
<ul style="list-style-type: none"> <li>• <i>Is rescue from outside populations likely?</i></li> </ul>	Not Applicable
<b>Quantitative Analysis</b>	
<b>Other Status</b>	
<b>COSEWIC: Special Concern (1987)</b> <b>Quebec: Menacée</b>	

#### Status and Reasons for Designation

<b>Status:</b> Special Concern	<b>Alpha-numeric code:</b> Not applicable
<b>Reasons for Designation:</b> A geographically highly restricted perennial that is endemic to the freshwater or slightly brackish shoreline areas of the St. Lawrence River estuary in Quebec. It is present at about 33 localities but in very small localized habitats where it is at risk from a wide range of impacts. These impacts include: actual destruction of plants due to ATV traffic and human trampling, and mowing of shoreline vegetation; losses of suitable potential shoreline habitat also occurs through shoreline in-filling and development and potential loss of plants may occur due to confusion with the common variant of the species that is considered a noxious weed. Oil spills may also pose a potential risk.	

<b>Applicability of Criteria</b>
<b>Criterion A</b> (Declining Total Population): Not Applicable: No overall declines documented but a significant increase in number of localities (30 new sites) due to increased search effort.
<b>Criterion B</b> (Small Distribution, and Decline or Fluctuation): Not Applicable: Extent of occurrence and area of occupancy are small but the taxon is not fragmented, populations do not fluctuate and the taxon occurs at 33 sites.
<b>Criterion C</b> (Small Total Population Size and Decline): Not Applicable: Total population estimate is <10,000 and possibly even less than 2500 but significant future decline of population size cannot reasonably be inferred in spite of various existing threats; some populations may contain >1000 plants; no population contains at least 95% of mature individuals and no extreme fluctuations are known.
<b>Criterion D</b> (Very Small Population or Restricted Distribution): Does not meet the criterion because this endemic variety consisting of about 33 extant populations with an AO of < 20 km <sup>2</sup> , likely will not become highly endangered over a very short period of time and new populations may still be found.
<b>Criterion E</b> (Quantitative Analysis): Not Applicable



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## BIOGRAPHICAL SUMMARY OF THE REPORT WRITER

Frédéric Coursol graduated in biological sciences from the University of Montreal in 1992. He is the author of several reports, the two most recent being “*Inventaire des plantes menacées ou vulnérables ou susceptibles d'être ainsi sur les lots intramunicipaux de la MRC de la Vallée-de-la-Gatineau*” and “*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*, *Onosmodium molle* var. *hispidissimum*, *Cicuta maculata* var. *victorinii*, *Gentianopsis victorinii* and *Eriocaulon parkeri*) and collaborated with Jacques Labrecque and Luc Brouillet on the update COSEWIC status report on Anticosti aster (*Symphyotrichum anticostense*). Mr. Coursol has familiarized himself with estuarine taxa through field work carried out in 1995 for the 2001 report by L. Brouillet, D. Bouchard and F. Coursol on threatened or vulnerable plants and other rare plant species of the upper St. Lawrence estuary between Grondines and Saint-Jean-Port-Joli.

## COLLECTIONS EXAMINED

The only herbarium collection consulted to compare specimens of Victorin's water hemlock was that of the Marie-Victorin Herbarium, located at University of Montreal's plant biology research institute [*Institut de recherche en biologie végétale*] in Montreal.

The fieldwork was carried out in the summer of 2002, on August 10 at the Saint-Vallier and Anse chez Porteous populations, on August 29 at the Saint-Augustin-de-Desmaures population, on August 30 and 31 at the Saint-Nicolas population, and on September 8 at the Neuville, Montmagny and Saint-Jean-Port-Joli populations. Efforts to rediscover the historic populations of Sainte-Anne-de-Beaupré and Ange-Gardien were made on September 7, 2002.