New England Plant Conservation Program

Oxytropis campestris (L.) DC. var. *johannensis* Fern.
St. John River Oxytrope

Conservation and Research Plan for New England

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SUMMARY

Saint John River oxytrope (*Oxytropis campestris* var. *johannensis*) is a deep-rooted perennial herb that occurs on ice scoured river beaches and rock outcrops. In New England, it occurs only on the St. John River in northern Maine. This species currently possesses a state rank of S1. Saint John River oxytrope is known from a total of 14 stations since 1861, including a questionable occurrence on the Aroostook River. Three of these stations are new and were discovered during literature surveys for this Conservation Plan. Formerly found over approximately 118 km of river shore in north-western, north-central, and north-eastern Aroostook County, it is presently limited to *ca*. 28 km of river shore in north-central Aroostook County. Six extant locations are known. Two sites are believed to have been extirpated. Associated species include dwarf sand-cherry (*Prunus pumila* var. *depressa*), tufted hairgrass (*Deschampsia cespitosa*), and alpine milk-vetch (*Astragalus alpinus*). Damming and river shore disturbance are two primary threats to this species.

The overall conservation objectives are to study, protect, and maintain St. John River oxytrope and the associated natural communities in New England. It is recommended that land owner contact, field surveys, securing long-term protection, demographic study, plant reintroduction, and biosystematic study be performed to achieve the conservation objectives. The success of this Conservation Plan can be monitored through a goal of possessing ten C-ranked or better populations in New England. Because much of the historic range of St. John River oxytrope occurs over sections of river not highly altered by hydroelectric projects or urban encroachment, field surveys and demographic monitoring will be instrumental in understanding why this species has declined in New England. Restoration of the former range of St. John River oxytrope on the St. John River is advocated through plant reintroduction.

No biosystematic study of the yellow locoweed complex (*Oxytropis campestris*) has been performed and reasons exist to expand the concept of St. John River oxytrope to include Wisconsin and Labrador populations. If this should occur, it would reduce the necessity of conservation action (from a global perspective). Valuable information for protecting this species in New England (e.g., aspects of reproductive biology) would be gathered from a detailed biosystematic study.

PREFACE

This document is an excerpt of a New England Plant Conservation Program (NEPCoP) Conservation and Research Plan. Full plans with complete and sensitive information are made available to conservation organizations, government agencies, and individuals with responsibility for rare plant conservation. This excerpt contains general information on the species biology, ecology, and distribution of rare plant species in New England.

The New England Plant Conservation Program (NEPCoP) is a voluntary association of private organizations and government agencies in each of the six states of New England, interested in working together to protect from extirpation, and promote the recovery of the endangered flora of the region.

In 1996, NEPCoP published "*Flora Conservanda*: New England," which listed the plants in need of conservation in the region. NEPCoP regional plant Conservation Plans recommend actions that should lead to the conservation of Flora Conservanda species. These recommendations derive from a voluntary collaboration of planning partners, and their implementation is contingent on the commitment of federal, state, local, and private conservation organizations.

NEPCoP Conservation Plans do not necessarily represent the official position or approval of all state task forces or NEPCoP member organizations; they do, however, represent a consensus of NEPCoP's Regional Advisory Council. NEPCoP Conservation Plans are subject to modification as dictated by new findings, changes in species status, and the accomplishment of conservation actions.

Completion of the NEPCoP Conservation and Research Plans was made possible by generous funding from an anonymous source, and data were provided by state Natural Heritage Programs. NEPCoP gratefully acknowledges the permission and cooperation of many private and public landowners who granted access to their land for plant monitoring and data collection.

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I. BACKGROUND

INTRODUCTION

The St. John River oxytrope (*Oxytropis campestris* (L.) DC. var. *johannensis* Fern. is an acaulescent, perennial herb of the Fabaceae (legume family). It is also known as St. John River locoweed, as some members of its genus contain poisonous alkaloids that cause nervous system impairment when ingested by livestock (Munro 1996). In New England, this plant is currently known from only the St. John River in northern Maine.

The St. John River oxytrope is ranked S1 (critically imperiled because of extreme rarity) in Maine with a state status of Threatened. Though the species is widespread, abundant, and globally secure, the variety is restricted to northeastern North America and is ranked G5T4 (The Nature Conservancy and The Association for Biodiversity Information 1999) and Division 1 by Brumback and Mehrhoff et al. (1996). In the last decade, it has been observed at only four sites in New England.

This Conservation Plan summarizes existing information on the ecology, taxonomy, and conservation biology of St. John River oxytrope. Included are threats to its survival and recommended actions for study and conservation of this species in New England.

DESCRIPTION

Saint John River oxytrope is a perennial herb, 4.0-55.0 cm tall, that arises from a caudex at the summit of a deep-seated taproot. It is more or less an acaulescent plant, and therefore its leaves and flowering stems appear basal. It has pinnately compound leaves with (7-)15-31(-45) narrow leaflets that are pubescent on each surface. The terminal leaflet is present and unmodified (in some legume genera, the terminal leaflet is absent or modified into a tendril). At the base of each petiole is a pair of lanceolate to ovate appendages, called stipules. Its flowers are borne on leafless stems and are aggregated in a dense raceme 1.5-4.0 cm long (the raceme elongating up to 9.0 cm in fruit). Saint John River oxytrope has papilionaceous flowers typical of its family (i.e., an upper banner petal, two lateral wing petals, and a lower keel petal formed from fusion of two petals). The flowers, borne 7-14 together, are usually purple, but on rare occasions white, and measure 12.0-18.5 mm long. The sepals are united at the base and have free lobes 2.0-3.0 mm long. The stamens of the St. John River oxytrope, similar to many members of the Fabaceae, are described as diadelphous. This portrays a condition in which the ten stamens occur in two groups—nine are fused together and one is distinct. Fruits of this species are legumes, also called pods, and measure 14.0-27.0 mm long (Isely 1998; Welsh, in preparation).

On the St. John River, only two other species are likely to occur and possibly be confused with the St. John River oxytrope: alpine milk-vetch (*Astragalus alpinus*) and alpine sweetbroom (*Hedysarum alpinum*). Both of these species, unlike the St. John River oxytrope, possess short, above-ground stems from which the leaves and flowering peduncles arise. Additionally, alpine milk-vetch has an obtusely pointed keel petal. The St. John River oxytrope, on the other hand, possesses an abruptly pointed keel petal. Alpine sweetbroom has secund flowering racemes (i.e., flowers oriented in one direction) and loment fruits, which are indehiscent and break up into 1-seeded segments. Fruits of the St. John River oxytrope are dehiscent and do not break into smaller segments.

TAXONOMIC RELATIONSHIPS, HISTORY, AND SYNONYMY

The first collection of St. John River oxytrope was from Isle d'Orleans near Quebec in the early 1800s. Hooker, as well as Torrey and Gray, considered these plants to represent eastern occurrences of purple locoweed (*Oxytropis lambertii*) (Fernald 1899). Professor Goodale made the first collections of oxytrope plants from the St. John River in 1861. These specimens were determined to be yellow locoweed by Gray. In 1884, Gray further defined the Maine and Quebec plants and referred to them as *O. campestris* var. *caerulea*, a European variety (Fernald 1899). The St. John River oxytrope was first described as a separate taxon by Fernald (1899), under the name *Oxytropis campestris* var. *johannensis*. *Oxytropis campestris* was chosen to include plants from the St. John River due to the prevailing view that North American oxytropes of this complex were conspecific with their Eurasian counterparts. This theory was supported by the early American botanists Gray and Watson (Isely 1998). However, later workers began to consider North American and Eurasian plants as separate taxa. Greene, Nelson, and Fernald created a number of new names by elevating North American varieties of yellow locoweed to specific status (Fernald 1928, Barneby 1952). Fernald (1928) created the name *O. johannensis*, and considered it to represent plants from Newfoundland, south to northern Maine. The return to a large and variable *O. campestris* was initiated by Barneby (1952) when he demonstrated the lack of supporting evidence to define separate Old and New world oxytropes of this complex (Isely 1998). This view is followed by most taxonomists and has given rise to the modern day concept of the St. John River oxytrope (*Oxytropis campestris* var. *johannensis*) as a distinct variety.

The genera *Oxytropis* and *Astragalus* are very similar, and separated on a world-scale by only the formation of an abrupt point at the apex of the keel petal in *Oxytropis*. The lack of several defining morphological characters has led some researchers to combine species of *Oxytropis* in earlier names. Around the turn of the century, several taxonomists, including Heller, Greene, and Nelson, made many new combinations under the genus *Aragallus* (Britton and Brown 1913, Barneby 1952). However, these published names, specifically *Aragallus campestris* Heller, were invalid. As the genus *Aragallus* was not conserved, it is replaced in modern day usage by *Astragalus*. Tidestrom produced many new locoweed names under the genus *Astragalus*, and the name *Astragalus campestris* var. *johannensis* was created (Crow

1982, Welsh, in preparation). Usage of this name has been abandoned, as most legume taxonomists consider *Oxytropis* and *Astragalus* to be separate genera.

Yellow locoweed in North America is considered by Welsh (in preparation) to consist of 12 infraspecific entities. To clarify the taxonomy of this polymorphic species, a short description of the morphology and distribution follows for each variety.

1. *Oxytropis campestris* var. *varians* (Rydberg) Barneby
This variety occurs in western Canada and Alaska. It is found in a wide variety of habitats including gravel bars, rock outcrops, heathlands, roadsides, and alpine meadows. These small- to medium-statured plants (5-55 cm tall) possess 10 to many-flowered inflorescences with yellow- to white-petaled flowers. *Oxytropis campestris* var. *varians* has leaves with 15-45 leaflets that are sometimes fasciculate (i.e., three or more borne at a node along the rachis). Its stipules are unusual in that, in addition to cilia, they are also provided with clavate-shaped processes along the margin.

2. *Oxytropis campestris* var. *jordalii* (Porsild) Welsh
This variety occurs in western Canada and Alaska. It is found primarily in alpine tundra and heathland habitats. Plants of this variety are very short, normally less than 12 cm tall. It possesses relatively few-flowered inflorescences (2-9 flowers) and normally has white to yellow flowers. The leaves have 9-19 leaflets.

3. *Oxytropis campestris* var. *roaldii* (Ostenfeld) Welsh
This variety occurs in western Canada and Alaska. It is found growing in alpine and arctic tundra habitats. These small plants (4-16 cm tall) have lavender to pink-purple flowers borne in 3- to 12-flowered inflorescences. The leaves possess 11-21 leaflets.

4. *Oxytropis campestris* var. *spicata* Hooker
This variety occurs in northwestern United States and western Canada. It grows in prairies, meadows, and woodlands. It is a small- to medium-statured plant (8-40 cm tall) with white to yellow flowers borne in 10- to 30-flowered inflorescences. It normally possesses leaves with 17-33 leaflets, relatively more than its close relatives (varieties 5 and 8).

5. *Oxytropis campestris* var. *cusickii* (Greenman) Barneby
This variety occurs in northwestern United States and Canada. It grows primarily above tree line on talus slopes and ridge crests and in alpine prairies. It is a small- to medium-statured plant (less than 21 cm tall) with white to yellow flowers borne in 3- to 15-flowered inflorescences. The keel petal of this species is concolorous. It normally possesses leaves with 7-15 leaflets. This taxon is closely related to *O. campestris* var. *columbiana*.

6. *Oxytropis campestris* var. *dispar* (A. Nelson) Barneby
This variety occurs in North Dakota and Manitoba. It is found in open grass and shrub dominated communities. It is a small- to medium-statured plant (15-30 cm tall) with

polychrome flowers (i.e., populations will have individuals with white, yellow, pink, blue, and purple flowers). The flowers are borne in 8- to 15-flowered inflorescences. It normally possesses leaves with 17-25 leaflets. This taxon is hypothesized to be derived from hybridization events involving pale-flowered *O. campestris* var. *spicata* and purple-flowered *O. campestris* varieties *davisii* and *johannensis*.

7. *Oxytropis campestris* var. *davisii* Welsh

This variety occurs in western Canada. It grows on gravelly sites within boreal forests. It is a small- to medium-statured plant (9-45 cm tall) with polychrome flowers borne in 10- to many-flowered inflorescences. It normally possesses leaves with 25-39 leaflets that are sometimes borne in fascicles.

8. *Oxytropis campestris* var. *columbiana* (St. John) Barneby

This variety has a restricted geographic range and occurs on the Columbia River in northeastern Washington and in the vicinity of Flathead Lake in Montana. It grows along gravel bars, stream banks, and lake shores. It is a medium-statured plant (mostly 19-30 cm tall) with white to yellow flowers borne in a 10- to 28-flowered inflorescence. The keel petal of this species is spotted with purple-blue color. It normally possesses leaves with 11-17 leaflets. This taxon is closely related to *O. campestris* var. *cusickii*.

9. *Oxytropis campestris* var. *wanapum* Joyal

This variety is a narrow endemic of Grant County, Washington. It grows on xeric, basalt talus. It is a small-statured plant (mostly 13-21 cm tall) with pale lavender flowers borne in a 6- to 12-flowered inflorescence. It normally possesses leaves with 19-25, often involute-margined, leaflets. This variety is quite distinct in that no other western North American species has purple flowers, nor does any purple-flowered variety possess the odd, narrow, involute leaflets of *Oxytropis campestris* var. *wanapum*.

10. *Oxytropis campestris* var. *minor* (Hooker) Welsh

This variety occurs in northeastern North America in Labrador and Newfoundland. It is found in growing on tundra near the coast. These small-statured plants (mostly less than 20 cm tall) possess 3- to 9-flowered inflorescences with purple petaled-flowers. Its leaves normally possess 11-23 leaflets. Specimens of *O. campestris* var. *minor* from northern Ungava are sometimes difficult to identify, possessing many-flowered forms resembling *O. campestris* var. *johanennsis* and white-flowered forms resembling *O. campestris* var. *varians*. Gervais and Blondeau (1999) consider var. *minor* to merely represent a northern, dwarf form of var. johannensis (variety 11).

11. *Oxytropis campestris* var. *johannensis* Fern.

This variety occurs in northeastern United States and Canada. It is found growing on gravel, cobble, and ledge of river shores, islands, and rock outcrops. These small- to medium-statured plants (4-86 cm tall) possess 7- to 14-flowered inflorescences with purple (or rarely white) petaled-flowers. It typically has leaves with 15-31 leaflets. *Oxytropis campestris* var.

johannensis is very similar to the next variety (variety 12) and is separated by its sparser, more appressed pubescence and longer legumes (1.4-2.7 cm long). However, some specimens from Ontario demonstrate short legumes and are difficult to assign to variety.

12. *Oxytropis campestris* var. *chartacea* (Fassett) Barneby

This variety is a narrow endemic, known only from central and northwestern Wisconsin. It is found growing on sand lakeshores. These small- to medium-statured plants are very similar to *O. campestris* var. *johannensis* (variety 11) in most respects, but generally have denser, more spreading pubescence and shorter legumes (0.8-1.5 cm long). As previously noted, intermediate material between this variety and *O. campestris* var. *johannensis* does occur, leading to speculation concerning the validity of recognizing *O. campestris* var. *chartacea* as a distinct variety.

Both morphology (Barneby 1952, Isely 1998) and DNA (Chung 2001) show St. John River oxytrope is mostly closely related to Fassett's locoweed (*Oxytropis campestris* var. *chartacea*). Fassett's locoweed is tetraploid ($2n=32$), while St. John River oxytrope is hexaploid ($2n=48$). The two varieties are primarily separated on the basis of legume length (longer in St. John River oxytrope). This morphological pattern is consistent with the gigas effect -- larger morphological structures in plants with higher ploidy level (Stebbins 1971). The ploidy level difference between these two species indicates a possible progenitor-derivative relationship, with Fassett's locoweed potentially taking part in the origin of St. John River oxytrope (Chung 2001). Within St. John River oxytrope, plants from the eastern coast of North America (Maine, Newfoundland, Labrador) appear more closely related to each other than to Ontario populations (Chung 2001).

Chung (2001) used Amplified Fragment Length Polymorphisms (AFLPs) to study the genetic variation of Fassett's locoweed in order to assess this plants distinctiveness and taxonomic validity. Her research compared Wisconsin plants (i.e., Fassett's locoweed) with several other varieties of yellow locoweed, including three populations of St. John River oxytrope. Chung found that Fassett's locoweed was genetically distinct from all other taxa sampled. Her genetic research, unfortunately, did not include samples from western Ontario, where plants intermediate between St. John River oxytrope and Fassett's locoweed have been collected. She did, however, include specimens from this region during a morphological analysis. That study showed that populations of St. John River oxytrope from western Ontario could not always be separated from Fassett's locoweed. These results suggest further work is needed that must include intermediate plants from Ontario.

SPECIES BIOLOGY

Little information is available for this species regarding phenology or pollination biology. Based on observations of the closely related Fassett's locoweed (*Oxytropis campestris* var. *chartacea*), St. John River oxytrope is likely pollinated by large bees (Order Hymenoptera;

United States Fish and Wildlife Service 1991). Pollination studies of Fassett's locoweed showed that self-fertilization is rare (Chung 2001). Yurtsev (1997) also reported that all taxa of *Oxytropis* section *Arctobia* in Berengia (the unglaciated area surrounding the Bering land bridge in Alaska, Yukon, and Siberia) were self-incompatible.

In Maine, St. John River oxytrope flowers in June and July. Fruits begin to develop on some plants by late July. Reproduction was studied at one site for two years where 58% and 66% of the population, respectively, produced flowers (Maine Natural Areas Program database).

Hybridization between yellow locoweed and other North American oxytropes has been inferred through morphological intermediacy. Purple locoweed, boreal oxytrope (*O. borealis*), and showy oxytrope (*O. splendens*) are all reported to have been involved in hybridization events with yellow locoweed (Isely 1998). No laboratory study has investigated the accuracy of these reports.

HABITAT/ECOLOGY

The St. John River oxytrope is a species of rock outcrops and river shores. It and its close relatives (both *Astragalus* and *Oxytropis*) tend to be found where continuous plant cover is absent due to disturbance, erosion, and inhospitable soils (Barneby 1964). In New England, St. John River oxytrope favors circumneutral river shore outcrops (usually calcareous slate) and gravel/cobble river beaches. These communities are the result of cyclical ice scour during spring flood events. It is likely that this type of river shore disturbance is very important in maintaining open river habitats for this species, as in the case for Furbish's lousewort (*Pedicularis furbishiae*; Gawler et al. 1987). Saint John River oxytrope appears to be well suited to this habitat, as it possesses long taproots that aid in holding the plants in place during spring flood events (Hal Hinds (now deceased), University of New Brunswick, personal communication). Current and historic populations on the St. John River in New England spanned nearly 118 km of river shore, ranging in elevation from approximately 160 to 190 meters. Associated plants include dwarf sand cherry (*Prunus pumila* var. *depressa*), tufted hairgrass (*Deschampsia cespitosa*), alpine milk-vetch (*Astragalus alpinus* var. *brunetianus*), Lake Huron tansy (*Tanacetum bipinnatum* ssp. *huronense*), cut-leaved anemone (*Anemone multifida*), chives (*Allium schoenoprasum*), northern meadow groundsel (*Senecio pauperculus*), and alpine sweetbroom (*Hedysarum alpinum* var. *americanum*).

The St. John River in Maine possesses all known extant populations of St. John River oxytrope in New England. Due to the overwhelming importance of this feature, a brief discussion of it follows. The St. John River begins in northern Maine and reaches the Atlantic Ocean in southern New Brunswick. It is arguably one of the most pristine major rivers in New England, flowing over 320 km before reaching an impoundment (Grand Falls, New Brunswick). The St. John River drains 54,682 km^2 of Maine, Quebec, and New Brunswick (New England

River Basins Commission 1981, St. John River Board 1973). Thirty-six percent of this watershed is found in Maine. Spring flows account for 66% of the annual precipitation reaching the watershed (New England River Basins Commission 1981). River flow in May is four times that in February or August (St. John River Board 1973). Further, the orientation of St. John River watershed contributes to the severity of ice scour. Significant portions of the headwaters in Maine and Quebec are south and southwest of the main stem St. John River. The headwaters, therefore, undergo ice-out prior to the downstream portion. Spring headwater flows meet the still frozen main stem and plow ice downstream, causing tremendous ice scour damage to islands and shoreline areas. These spring phenomena (i.e., flooding and ice movement) scour extensive reaches of shoreline, creating open river beaches. This combined with limestone bedrock and calcareous glacial tills creates a relatively unique natural community in New England. In Maine, only one other geographic feature, Katahdin in Baxter State Park, harbors more state-listed plants than the St. John River.

THREATS TO TAXON

Dams

The most serious threats to St. John River oxytrope in New England are potential hydro-electric power projects. Damming of river channels to create headwater for electrical power production can cause local extirpations through the inundation of plants. Dams also regulate river flow, thereby minimizing shoreline disturbance normally produced during spring ice scour events. Saint John River oxytrope grows, in part, on gravel and cobble river beaches. This habitat is created and dynamically maintained by unaltered river flow. For example, the only known station of Anticosti aster (*Symphyotrichum anticostense*) in the United States prior to 1998 was eliminated in the early 1900's by a water level rise for the Tinker Dam in New Brunswick (Haines 2000). In Somerville, New Brunswick, hydro-electric dams are believed to be the cause of declines observed in Anticosti aster (Labrecque and Brouillet 1990). This species is similar to the St. John River oxytrope in that cyclical disturbance of river shores is likely necessary to maintain open habitat. In Somerville, the river flows have been modified and spring river shore disturbance minimized. The few remaining Anticosti aster individuals are failing to compete with aggressive weeds that have colonized the area since dam construction.

River Shore Disturbance

Anthropogenic river shore disturbances, such as vehicle traffic and gravel mining, also threaten the security of St. John River oxytrope in New England. In New Brunswick, illegal gravel mining has caused serious declines in habitat quality and loss of St. John River oxytrope (Hal Hinds, personal communication). In St. John Plantation, Maine, farm vehicle traffic has created a wide roadbed across a channel of the St. John River to Hunnewell Island, a known station for St. John River oxytrope and other state listed plants. It is not known if vehicle traffic

has impacted any rare occurrences. However, the roadbed was essentially devoid of vegetation in 1998.

Non-native Plants

Non-native plants are prevalent along some stretches of the St. John River. Both frequent natural disturbance and abundant propagule source (agricultural lands in eastern Aroostook County, Maine, and eastern Quebec, at the headwaters of the St. John River) create a situation in which native plants may experience declines through competition. Reed canary-grass, cow vetch (*Vicia cracca*), European hawkweed (*Hieracium lachenalii*), common St. Johnswort (*Hypericum perforatum*), Japanese knotweed (*Fallopia japonica*), and white sweet-clover (*Melilotus albus*) are common non-native species on the St. John River.

DISTRIBUTION AND STATUS

General status

Yellow locoweed (*Oxytropis campestris*), the name given to the species that encompasses Saint John River oxytrope, is a circumboreal plant, extending south in North America to Maine, Wisconsin, Colorado, and Oregon. The St. John River oxytrope is endemic to northeastern North America, and occurs in Newfoundland, Ontario, New Brunswick, Nova Scotia, Quebec, and Maine (Table 1, Figure 1). In Maine, this taxon is restricted to the St. John River (Figures 2 and 3). In the adjacent Province of New Brunswick, St. John River oxytrope is historically known from the St. John River, Aroostook River, Restigouche River, and Nepisiguit River (Fernald 1928). In addition to its special status in Maine, St. John River oxytrope is listed as S1 in Nova Scotia and is likely to be listed as S2 in New Brunswick in coming revisions of the rare species tracking list (Sean Blaney, Atlantic Canada Conservation Data Centre, personal communication).

Table 1. Occurrence and status of *Oxytropis campestris* var. *johannensis* in the United States and Canada based on information from Natural Heritage Programs.

OCCURS & LISTED (AS S1, S2, OR T &E)	OCCURS & NOT LISTED (AS S1, S2, OR T & E)	OCCURRENCE REPORTED OR UNVERIFIED	HISTORIC (LIKELY EXTIRPATED)
Maine (S1, T): 6 current and 8 historic occurrences	Ontario (S4)	Newfoundland (SR)	Not applicable
Nova Scotia (S1S2)	Quebec (S3)	Labrador (SR)	
New Brunswick (S2)		Nunavut (SR)	

Status of all New England occurrences -- current and historical

Based on literature and herbarium records, St. John River oxytrope inhabited approximately 118 km of river shore on the St. John River and appears to have occupied a single site on the Aroostook River (Table 2) near the turn of the century. Element Occurrence (EO) ranks are included in the following site descriptions to provide a general indication of site quality. The EO rank is an average of four individual ranks: EO quality (size and productivity); EO condition (pristineness and ability to recover from impacts); EO viability (long-term existence prospects); and EO defensibility (how protectable the occurrence is). The EO rank is a relative rating system based on range-wide observations. It primarily utilizes four classes of ranks: A (excellent); B (good); C (marginal); and D (poor). Detailed definitions for EO ranks based on population size, community quality, *etc*. are not yet established for St. John River oxytrope. A ranking of E is provided for element occurrences that are extant, but information is inadequate to provide a qualitative score. An EO rank of H is provided for sites for which no observations have made for more than 20 years. An X rank is utilized for sites that are known to be extirpated.

Figure 1. Occurrences of *Oxytropis campestris* var. *johannensis* in North America. States and provinces shaded in gray have at one to five confirmed, extant occurrences of the variety, while the state shaded in black (Maine) has more than five extant occurrences. Stippling indicates areas (Newfoundland, Labrador, and Nunavut) where the taxon is ranked "SR" ("Status Reported," with no other information available; see Appendix for explanation of Natureserve ranks).

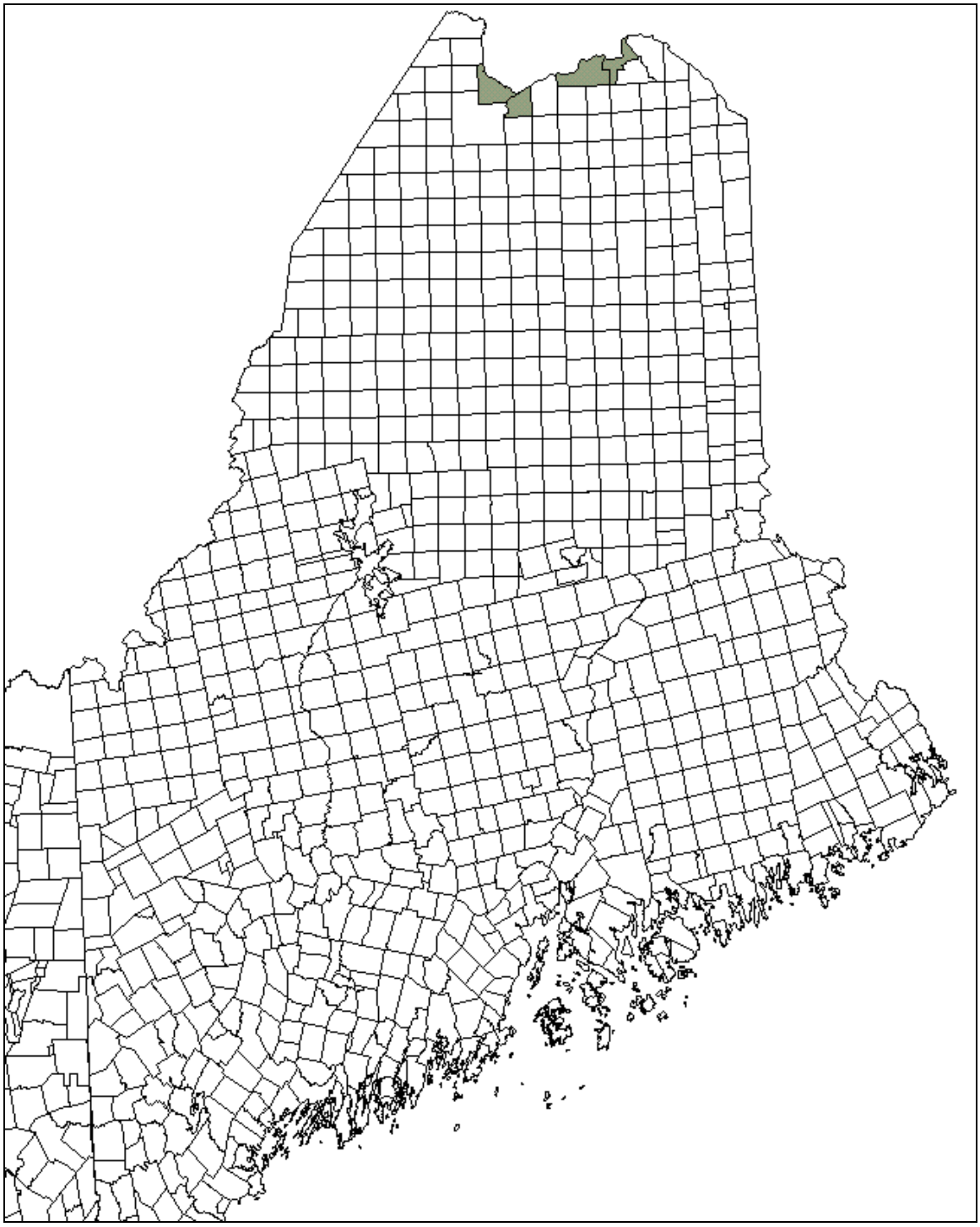

Figure 2. Extant occurrences of *Oxytropis campestris* var. *johannensis* in New England. Town boundaries for Maine are shown. Towns shaded in gray have one to five confirmed, extant occurrences of the taxon.

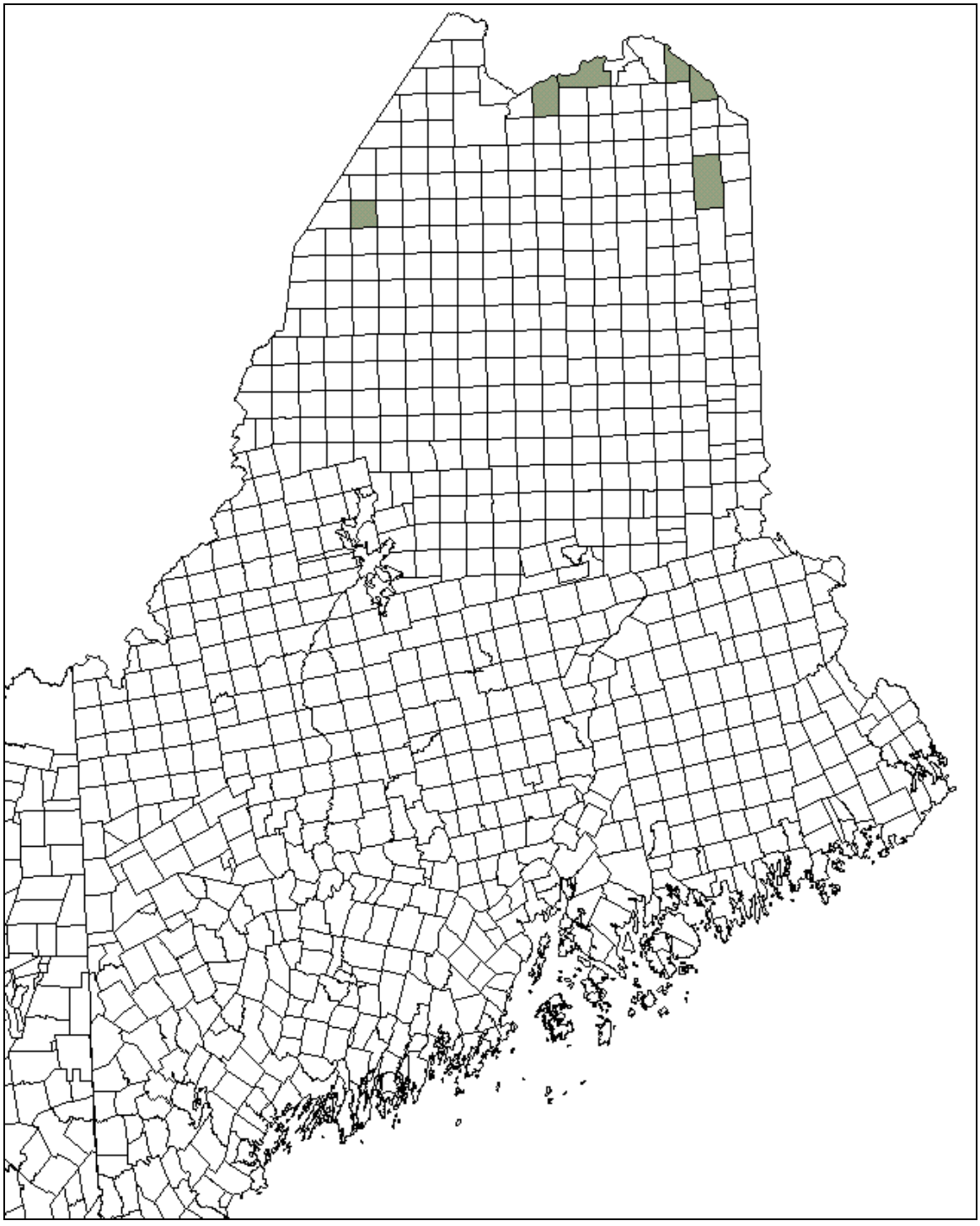

Figure 3. Historic occurrences of *Oxytropis campestris* var. *johannensis* in New England. Towns shaded in gray have one to five historic records of the taxon.

Table 2. New England occurrence records for *Oxytropis campestris* var. *johannensis.* Shaded occurrences are considered extant.

State	EO #	County	Town
ME	.001	Aroostook	Saint John Plantation
ME	**.002**	**Aroostook**	**Saint Francis**
ME	**.003**	**Aroostook**	**T18 R10 WELS**
ME	**.004**	**Aroostook**	**Frenchville**
ME	**.005**	**Aroostook**	**Saint Francis**
ME	.006	Aroostook	Van Buren
ME	.007	Aroostook	Saint John Plantation
ME	**.008**	**Aroostook**	**Fort Kent**
ME	.009	Aroostook	Fort Kent
ME	**.010**	**Aroostook**	**Saint Francis**
ME	.011	Aroostook	Grand Isle
ME	.012	Aroostook	Fort Kent
ME	.013	Aroostook	T13 R15 WELS
ME	.014	Aroostook	Caribou

II. CONSERVATION

Saint John River oxytrope is a rare species of New England, currently found on a single river in northern Maine. Globally, this taxon is considered apparently secure, but with cause for long-term concern (G5T4). The primary goals for conservation of St. John River oxytrope are to study, protect, and maintain the species and the associated natural communities. The success of this Conservation Plan can be monitored through a goal of possessing ten C-ranked populations in New England. This objective will be accomplished through land owner contact, field surveys, securing long-term protection, demographic study, plant reintroduction, and biosystematic study.

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IV. APPENDICES

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1. An explanation of conservation ranks used by The Nature Conservancy and Natureserve

1. An explanation of conservation ranks used by The Nature Conservancy and Natureserve

The conservation rank of an element known or assumed to exist within a jurisdiction is designated by a whole number from 1 to 5, preceded by a G (Global), N (National), or S (Subnational) as appropriate. The numbers have the following meaning:

1 = critically imperiled
2 = imperiled
3 = vulnerable to extirpation or extinction
4 = apparently secure
5 = demonstrably widespread, abundant, and secure.

G1, for example, indicates critical imperilment on a range-wide basis -- that is, a great risk of extinction. S1 indicates critical imperilment within a particular state, province, or other subnational jurisdiction -- i.e., a great risk of extirpation of the element from that subnation, regardless of its status elsewhere. Species known in an area only from historical records are ranked as either H (possibly extirpated/possibly extinct) or X (presumed extirpated/presumed extinct). Certain other codes, rank variants, and qualifiers are also allowed in order to add information about the element or indicate uncertainty.

Elements that are imperiled or vulnerable everywhere they occur will have a global rank of G1, G2, or G3 and equally high or higher national and subnational ranks (the lower the number, the "higher" the rank, and therefore the conservation priority). On the other hand, it is possible for an element to be rarer or more vulnerable in a given nation or subnation than it is range-wide. In that case, it might be ranked N1, N2, or N3, or S1, S2, or S3 even though its global rank is G4 or G5. The three levels of the ranking system give a more complete picture of the conservation status of a species or community than either a range-wide or local rank by itself. They also make it easier to set appropriate conservation priorities in different places and at different geographic levels. In an effort to balance global and local conservation concerns, global as well as national and subnational (provincial or state) ranks are used to select the elements that should receive priority for research and conservation in a jurisdiction.

Use of standard ranking criteria and definitions makes Natural Heritage ranks comparable across element groups; thus, G1 has the same basic meaning whether applied to a salamander, a moss, or a forest community. Standardization also makes ranks comparable across jurisdictions, which in turn allows scientists to use the national and subnational ranks assigned by local data centers to determine and refine or reaffirm global ranks.

Ranking is a qualitative process: it takes into account several factors, including total number, range, and condition of element occurrences, population size, range extent and area of occupancy, short- and long-term trends in the foregoing factors, threats, environmental specificity, and fragility. These factors function as guidelines rather than arithmetic rules, and the relative weight given to the factors may differ among taxa. In some states, the taxon may receive a rank of SR (where the element is reported but has not yet been reviewed locally) or SRF (where a false, erroneous report exists and persists in the literature). A rank of S? denotes an uncertain or inexact numeric rank for the taxon at the state level.

Within states, individual occurrences of a taxon are sometimes assigned element occurrence ranks. Element occurrence (EO) ranks, which are an average of four separate evaluations of quality (size and productivity), condition, viability, and defensibility, are included in site descriptions to provide a general indication of site quality. Ranks range from: A (excellent) to D (poor); a rank of E is provided for element occurrences that are extant, but for which information is inadequate to provide a qualitative score. An EO rank of H is provided for sites for which no observations have made for more than 20 years. An X rank is utilized for sites that are known to be extirpated. Not all EOs have received such ranks in all states, and ranks are not necessarily consistent among states as yet.