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ADDITIONS TO THE VASCULAR PLANT FLORA OF ST. LAWRENCE ISLAND, ALASKA: NEW RECORDS, RARE SPECIES, AND PHYTOGEOGRAPHIC PATTERNS

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ABSTRACT. St. Lawrence Island, in the northern Bering Sea, is an important biogeographic link between the flora of northeastern Asia and northwestern North America. A vascular plant inventory was conducted on St. Lawrence Island in the 1960s by Steven Young in which 250 taxa were documented. Since that time, very few collections have been made on the island. We conducted a vascular plant survey to improve our understanding of baseline floristics and identify populations of species of conservation concern. Of the 166 taxa we collected in late July 2012, a number of collections represent new or significant finds. *Eritrichium villosum*, a Siberian taxon not previously recognized from North America, was collected on north-central St. Lawrence Island. This taxon, however, had been collected under a different name by Young in the late 1960s. *Iris setosa* subsp. *setosa* is a new record for the island. *Iris setosa*, although common along the eastern Bering Sea coast from Kotzebue Sound south through the Aleutians, appears to be very restricted on St. Lawrence Island and has only been noted by residents in recent years. *Erigeron humilis* and *Moehringia lateriflora* are also new records for the island. New populations were located of the globally rare species: *Cardamine blaisdellii*, *Claytonia arctica*, *Micranthes nudicaulis* subsp. *nudicaulis*, *Papaver gorodkovii*, *Potentilla fragiformis*, *Ranunculus camissonis*, and *R. turneri* subsp. *turneri*. We have included an annotated species list of 281 taxa, illustrated under-sampled regions of the island, and described the biogeographic affinities of the flora to other high latitude regions. The island's flora has strong biogeographic affinities to

eastern Beringia (Alaska and western Yukon), particularly to the Seward Peninsula and less strongly to the Russian Far East. Numerous circumpolar arctic and alpine species were also present, with a minority of East-Asian species known from very few populations in extreme western Alaska.

Key Words: Arctic, Alaska, Beringia, biogeography, endemic, rare plants, St. Lawrence Island

St. Lawrence Island is a key biogeographic link between Asia and North America (Young 1971), yet the flora of the island is seldom referenced in the botanical literature (however see Kelso 1989, Murray 2015). This 464,000 ha island in the northern Bering Sea is located just 50 km east of Chukotka, Russia, and 150 km west of the Seward Peninsula, Alaska, and is a remnant of the Pleistocene landmass of Beringia (Hopkins 1967). The island received attention by early botanists, and thus provided some of the first collections in the region, by Chamisso and Eschscholtz in 1816 and 1817 near Southeast Cape, and Kjellmann in 1879 in the northwest portion of the island. Numerous collections were made around the island by the ethnographer Otto William Geist in 1931 and 1933. Steven Young conducted extensive floristic and ethnobotanical research, collecting 1100 specimens on the island, in the mid to late 1960s (Young 1971; Young and Hall 1969). Numerous examples of narrowly endemic Amphi-Beringian species and species with essentially Asiatic distributions were revealed by Young's research. Following this effort, only intermittent collecting (20 specimens, all from the village of Gambell and primarily by D.T. Mason) has occurred on the island.

Climate, physiognomy, and geology of St. Lawrence Island are thoroughly reviewed in Young (1971). Briefly, the climate of the island is maritime arctic and much cooler than its modest latitude of 63°N would suggest. This results in the tundra-dominated flora that lack tall shrub vegetation (Young 1971). The island is a relatively low plain, interspersed by a number of mountain ranges, and raised plateaus. Granitic mountains dominate the western and eastern sides of the island and an extensive volcanic shield, with numerous cinder cones and craters, forms the north-central portion of the island. The island has many beaches, lagoons, low-lying permafrost-associated wetlands, meadows, and barren mountains. Figure 1 is a map of the coarse landcover classes described for the island, based on the National Land Cover Database (NLCD), illustrating the high proportion of barren lichen tundra, low mesic tundra, and wetlands (Boggs et al. 2016; Homer et al. 2004).

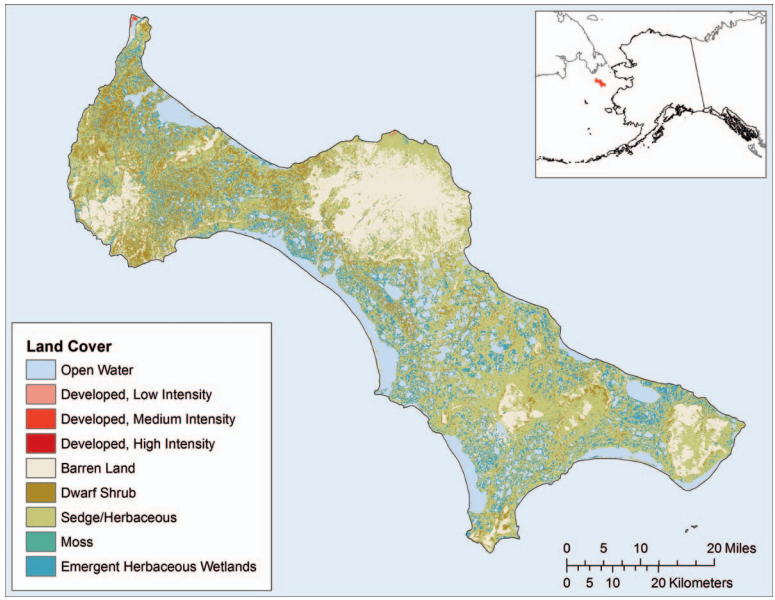

Figure 1. Landcover vegetation map for St. Lawrence Island. Inset map shows St. Lawrence Island (red) in relationship to mainland Alaska and the Russian Far East.

The island is located in what was the central area of the unglaciated territory of Beringia during the Pleistocene (Hultén 1937). Lower sea-levels during glacial maxima exposed the Bering Sea floor, connecting northeast Asia to northwest North America for thousands of years. The Bering Strait was not re-established until approximately 11,000 years ago with St. Lawrence Island representing the last link in the Bering Land Bridge (Creager and McManus 1967; Elias et al. 1996). By 10,500 years ago Anadyr Strait was flooded and the area of current St. Lawrence Island would have been cut off from the Chukotka Peninsula, but still connected to western Alaska; nearly complete inundation of the land-bridge occurred around 5000 years ago, isolating St. Lawrence Island from Alaska as the northern Bering shelf was flooded (Elias et al. 1996). St. Matthew, St. George, St. Paul, and Hall islands to the south of St. Lawrence Island are all smaller remnants of the central Beringian landscape. Not only did this region bridge the continents and facilitate species dispersal, but it also served as an important refugium for many northern species with populations otherwise overrun by extensive ice (Abbott and Brochmann 2003;

Hultén 1937). Prior to inundation, the paleo-vegetation of the region was characterized by dwarf birch-heath-graminoid tundra with numerous small ponds (Elias et al. 1996), apparently analogous to current vegetation communities in the region.

Overall species diversity and population genetic diversity remains higher in the former Beringia region relative to the neighboring territories that were glaciated and only more recently colonized following glacial retreat. Species richness, however, is significantly lower on the island relative to the mainland to either the east or the west (e.g., Kelso 1989). Many common species of the adjacent mainland, such as *Dasiphora fruticosa* (L.) Rydb. and *Spiraea stevenii* (C.K. Schneid.) Rydb. are apparently absent from the island. In addition, many widespread species, for example *Eriophorum vaginatum* L. and *Trientalis europaea* L. are only known from a single location, typically on the south side of the island (Young 1971). In addition to describing the distinctively arctic flora over a hundred years ago, Kjellman (1883) noted nearly equal contribution of plants on the island with distributions in Asia and in western North America. Young (1971) recognized a number of species, such as *Gentianella auriculata* (Pall.) J.M. Gillett and *Claytonia arctica* Adams, which reach their eastern range limits on St. Lawrence Island. The island therefore contributes to the biodiversity of Alaska and North America by harboring such species found nowhere else on the North American continent.

Floristic inventories are essential for management and evaluation of conservation significance of vegetation and floristic resources (Carlson et al. 2013; Cook and Roland 2002; Talbot et al. 2006). Discovery of areas of high species richness, particularly those that have seen few collections historically, is of interest for those with land management responsibilities (Araújo 1999; Cabeza et al. 2004; Prendergast et al. 1993). Additionally, baseline inventories inform our understanding of the ecological, climatological, and historic factors influencing the patterns of species distributions. For example, Young (1971) recognized that summer warmth was a primary factor limiting many plant species, not just on St. Lawrence Island but more broadly across the Arctic; he defined zones in which particular species were restricted based on July isotherms.

In an effort to update baseline information on species' occurrence, diversity and distribution, we conducted vascular plant inventories in the northwest and central portion of St. Lawrence Island (Figure 2). Plant collections occurred in concert with small mammal surveys on the island (Gotthardt and Walton 2014). Additionally, we reviewed available collection records, attempted to resolve nomenclatural

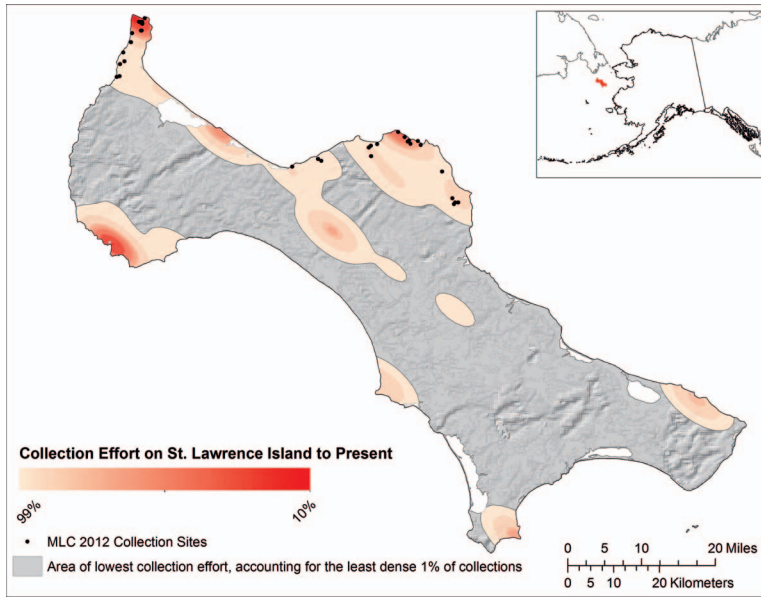

Figure 2. Map of St. Lawrence Island showing areas of high (red) to low (gray) collection intensity based on kernel density. Collection locations from our effort are shown as black dots.

discontinuities, and developed an updated checklist of vascular plants of the island. Collection records were also used to identify areas of high and low collection intensity.

Here, we present brief descriptions of the rare and otherwise notable taxa (Alaska Natural Heritage Program S1-S3 ranks; AKNHP 2016) from our collections as well as from previous collections. For these species, we have included synopses of the collection locations and habitats, as well as brief summaries of their conservation status. Given the prior description of similar contributions of taxa distributed in Asia and North America (Kjellman 1883), we also mapped ranges from the updated species list to illustrate biogeographic affinities associated with the flora of the island.

MATERIALS AND METHODS

We directed collection efforts toward areas that had high topographic, surficial geologic, and habitat diversity, and were accessible by all-terrain vehicles or by foot in areas around the villages of Gambell

and Savoonga. Sites ranged in elevation from sea level to over 300 m. Three and a half days were spent working out of each village. Collection effort around Gambell focused on beach habitats and Troutman Lake lagoon, mesic tundra and rocky outcrops of the western and southern portions of Sevoukuk Mountain, and low moist tundra south to Kavalghak Bay. We collected from intertidal and supratidal areas, low forb-graminoid meadows, and rocky barrens east of Savoonga to Punelok Bay and west of Savoonga to Koomlangeelkuk Bay, including small and isolated limestone outcrops. We also surveyed barren mountainous basalt lava flows and cinder cones in the Kookooligit Mountains and east to near Cape Kitnik.

In addition, collection databases were reviewed from the Consortium of Pacific Northwest Herbaria database (Consortium of Pacific Northwest Herbaria 2007-2013), University of Alaska Museum of the North (Arctos 2013), the Gray Herbarium (Harvard 2013), and GBIF (2013). Non-vascular plant taxa were removed from the list. Collection data from Young (1971) that were not available digitally, were entered from his manuscript. Latitude and longitude was assigned when the site names he provided could be located on the USGS 1:250,000 St. Lawrence Island topographic map (USGS 1970). Information from the collections in the 1800s is covered in Young (1971) but assigning specific locations to the collections of Chamisso (1816-1817) and Kjellman (1879) was not possible, given their descriptions (see Kjellman 1883). Hultén (1941-1950) was also reviewed, and additional collection records were included that were not otherwise accounted for in the electronic databases.

We used the Checklist of the Panarctic Flora (2011, version 1.0, http://gbif.no/paf) taxonomy and nomenclature to develop the species list and we included commonly encountered synonyms (e.g., from Hultén 1968). The Panarctic Flora taxonomy is most appropriate for high latitude regions and particularly for an area that bridges Asia and North America. Additionally, we have reported NatureServe (2015) global and subnational (Alaska) Conservation Status Ranks for relevant species (see NatureServe 2015 for definitions). Species determinations were completed by Matthew Carlson and Robert Lipkin, University of Alaska Anchorage, with assistance from Carolyn Parker and David Murray, at ALA. All collections are housed at UAAH with duplicates at ALA. Biogeographic associations of species were defined as in Kelso (1989): Circumpolar Arctic-Alpine distribution constitutes species that are well represented on all northern continents; Circumpolar Maritime constitutes coastal species that are well represented on all northern continents; Asiatic – North American

species are distributed widely on both continents; Beringian species are those with distributions limited to the area between Kolyma and Mackenzie rivers; Asiatic species are those with distributions primarily in Asia; and North American species are those with distributions primarily restricted to the North American Continent. For example, *Solidago multiradiata* Ait. is classified as "North American" as it occurs from Newfoundland, west through boreal North America to the Aleutian Islands and terminates in extreme eastern Chukotka, Russia. The extreme margins (roughly 5%) of each species range are therefore excluded from the classification of biogeographic zone.

Using the new taxa list for St. Lawrence Island, we computed collection effort (using all St. Lawrence Island records available to us) and species ranges (using global occurrence records available on GBIF). Occurrence points for all species with geocoded locations were downloaded, projected, and compiled into a geodatabase. We then calculated the Gaussian kernel density of all collections on St. Lawrence Island using Geospatial Modeling Environment v0.7.4 (Beyer 2016) with the plug-in bandwidth estimator and interpolated the results into percentiles using NumPy. The plug-in algorithm smooths kernels at a level that is unlikely to result in potentially erroneous, fine-scaled patterns associated with uncertainty in locations for historic collections, while providing a focused output that still identifies meaningful patterns across the landscape. Total species richness for St. Lawrence Island was estimated by creating a rarefaction curve for observed taxa richness relative to number of collections and extrapolating an asymptote for the rarefaction curve using methods developed by Chao et al. (2014) and Hsieh et al. (2016), and see Colwell et al. (2012).

Species range polygons were then generated using a concave hull algorithm. Species occurrences were aggregated using an aggregation distance calculated in NumPy as a base factor of eight multiplied with the 90th percentile value of distances to next closest occurrence beyond a minimum search distance of 1 km. The aggregated points were then buffered by a distance of 50 km to ensure that all aggregated occurrences were encompassed by the resulting range polygon, and the polygon was smoothed using Bezier interpolation. The concave hull algorithm thereby produced species ranges that identified contiguous ranges plus smaller, geographically-separated disjunct ranges at a continental to intercontinental scale. Finally, species ranges were summed to generate a spatially-explicit species richness dataset to illustrate biogeographic affinity (Harrison and Grace 2007).

Table 1. Phytogeographic distribution of the St. Lawrence Island Flora.

Distribution	No. of Taxa	Approx. %
Holarctic		
Arctic-Alpine	125	44
Maritime	9	3
Asiatic – N. American		
Arctic-Alpine	70	25
Maritime	9	3
Beringian		
Arctic-Alpine	57	20
Asiatic		
Arctic-Alpine	7	2
N. American		
Arctic-Alpine	4	1

RESULTS

We made 222 collections, encompassing 166 unique taxa. A few of these collections represented new records for the island and for North America. With just six days of effort, these collections represented over 10% of the total 2034 unique records known to us. Additionally, we made collections of a number of rare vascular plants.

A checklist of all 281 vascular plant taxa recorded on the island to date is included in the Appendix. Estimated total vascular plant richness for the island based on the accumulation of new taxa relative to number of collections is 307, with lower and upper 95% CI of 293 and 337, respectively, suggesting that additional surveys are likely to reveal a few dozen new records. The island's flora encompasses 50 families and 126 genera. The most well-represented families were Asteraceae (27 taxa), Poaceae (25 taxa), Cyperaceae (24 taxa), Saxifragaceae (20 taxa), Brassicaceae (19 taxa), and Ranunculaceae (18 taxa). Table 1 lists the number of taxa and percentage of the St. Lawrence Island flora relative to distribution pattern. The relative proportion of species by family remains very similar to values reported by Kjellman (1883) based on the 113 known taxa at that time. We discuss these notable collections below along with collections of rare plant species made by botanists who visited the island previously.

DISCUSSION

The list of species from St. Lawrence Island is illustrative of a distinctly Arctic flora, as has been well-documented previously (Kjellman 1883; Young 1971), with such iconic arctic species as *Coptidium*

pallasii (Schltdl.) Tzvelev, *Dupontia fisheri* R. Br., *Primula tschuktschorum* Kjellm., *Papaver gorodkovii* Tolm. & V.V. Petrovsky, and *Saxifraga cernua* L. The majority of species found on the island are circumpolar, and secondary are species with Asian-North American distributions (Table 1). In addition, a floristic element of the coastal Gulf of Alaska to the southern Bering Sea islands extends northward to St. Lawrence Island. This includes taxa such as *Angelica gmelinii* (DC.) Pimenov, *Carex glareosa* Wahlenb. subsp. *pribilovensis* (Macoun) Chater & Halliday, *Draba borealis* DC., and *Micranthes nelsoniana* subsp. *insularis* (Hultén) Elven & D.F. Murray. Distinctly Amphi-Beringian taxa on the island include *Artemisia globularia* Bess., *A. glomerata* Ledeb., *Douglasia ochotensis* (Willd.) Hultén, *Primula borealis* Duby, *Salix ovalifolia* Trautv., and *Rumex krausei* B.A. Jurtzev & V.V. Petrovsky. Interestingly, *Artemisia senjavinensis* Bess., which is a narrowly Amphi-Beringian endemic that can be abundant on the Seward Peninsula, and *Therorhodion glandulosum* Standley ex Small, are not known from St. Lawrence Island. Asiatic plant species on St. Lawrence that either do not extend to mainland Alaska, or only reach the western tip of the Seward Peninsula include: *Claytonia arctica* Adams, *Eritrichium villosum* (Ledeb.) Bunge, *Gentianella auriculata* (Pall.) J.M. Gillett, and *Tephroseris atropurpurea* (Ledeb.) Holub.

The island harbors numerous widespread circumpolar to circumboreal taxa, such as *Cassiope tetragona* (L.) D. Don, *Koenigia islandica* L., *Poa arctica* R. Br. subsp. *arctica*, *Saxifraga cernua* L., and *Vaccinium vitis-idaea* L. Additionally, there are some plant species that occur on St. Lawrence that have very broad distributions from Europe, Asia, and North America, but are rather uncommon elsewhere in Alaska. These include *Phyllodoce caerulea* (L.) Bab. and *Ranunculus camissonis* Schltdl.

It is noteworthy, but not surprising, that many taxa abundant on the adjacent mainland are either absent or very rare on the island. *Alnus viridis* (Chaix) DC. is apparently absent from St. Lawrence along with *Dasiphora fruticosa* (L.) Rydb., *Populus balsamifera* L., *Spiraea stevenii* (C.K. Schneid.) Rydb., *Salix alaxensis* (Anderss.) Cov., other tall willow species, and the widespread northern taxon, *Poa alpina* L. Two other species common to the mainland, *Vaccinium uliginosum* L., and *Chamerion angustifolium* (L.) Holub, have only been collected from two small areas, where they were not reproductive; *Trientalis europaea* L. has been collected from just a single location in the central portion of the island; and a single plant of *Veratrum oxysepalum* Turcz. has been observed (Young 1971). Young (1971) showed that these species were at their climatic limit, which is largely determined by summer warmth.

In addition, species that are highly reliant on pollinator service for fruit and seed production may face additional restrictions on population persistence due to low pollinator abundance and activity, particularly in coastal arctic environments (see Fulkerson et al. 2012; Kevan 1972). However, other taxa reliant on pollinator visitation, such as *Pedicularis capitata* Adams (Kevan 1972), are abundant on St. Lawrence Island. It is likely that dispersal does not represent a major limitation for propagules of most species arriving on the island from nearby Chukotka and the Seward Peninsula, although species with adaption to wind, water, and animal dispersal would be much more likely to arrive on St. Lawrence Island (see Alsos et al. 2015).

No non-native plant species have been collected from the island. The absence of non-native species in the villages on St. Lawrence Island, as well as communities on the Arctic Coastal Plain of Alaska, is likely due to insufficient summer warmth rather than lack of propagules (see Carlson et al. 2015). Reindeer were introduced in the early 1900s on the island and despite a high historic population in the north-central portion of the island, measurable impacts on the flora are not evident, unlike on St. Matthews Island to the south (see Klein 1968, 1987). Reindeer are harvested and populations are actively managed by the people of Savoonga.

The composition of the flora of St. Lawrence is similar to that of Cape Prince of Wales on the western terminus of the Seward Peninsula, Alaska (Kelso 1989). A total of 292 vascular plant species on Cape Prince of Wales was recorded by Kelso (1989), similar in richness to St. Lawrence Island. However, Keslo's collections were confined to a dramatically smaller area, just a 15 km^2 area versus a 4600 km^2 area on St. Lawrence Island. Both floras have strong alpine, Beringian, and Asiatic elements. Two species with primarily Asian distributions that are known from Cape Prince of Wales, *Oxygraphis glacialis* (Fischer) Bunge and *Puccinellia wrightii* (Scribner & Merr.) Tzvelev, have not been recorded on St. Lawrence Island; however, many other Asiatic taxa are shared. Both floras are characterized by the near absence of more continental-associated taxa, such as *Aconogonon alaskanum* (Wight ex Hultén) Soják, which may require greater summer warmth. A primary difference in the two floras is the rarity of calciphilic plants on St. Lawrence Island relative to Cape Prince of Wales. Species associated with carbonate substrates at Cape Prince of Wales that are not recorded from St. Lawrence Island include: *Androsace septentrionalis* L., *Aphragmus eschscholtzianus* Andrz. ex DC., *Artemisia senjavinensis* Bess., *Hulteniella integrifolia* (Richardson) Tzvelev, *Oxygraphis glacialis* (Fischer) Bunge, and *Papaver walpolei* A.E. Porsild.

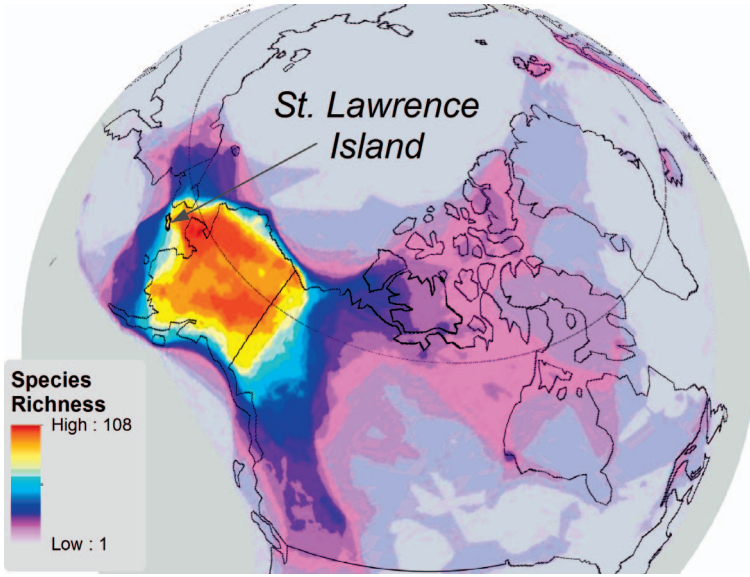

Figure 3. Map of overlap of St. Lawrence Island species ranges with specimen location data available from GBIF. The highest density of overlapping species are shown in dark red.

We collected from a small calcareous outcrop 18 km southwest of Savoonga near Kangee Camp and made collections of two new records for the island: *Erigeron humilis* Graham and *Moehringia lateriflora* (L.) Fenzl, species that are in fact not regarded as particularly calciphilic. Collections by Young (1971) around Tapphook included *Rumex krausei* B.A. Jurtzev & V.V. Petrovsky and *Ranunculus camissonis* Schltdl., which are often associated with calcareous substrates.

Although the updated taxa list includes 281 taxa found on the island, only 136 had georeferenced records in GBIF. When species richness is summed geographically, it ranges from one to 108, with the highest richness values on the Seward Peninsula in western Alaska (Figure 3). More generally, the distributions of vascular plant species found on St. Lawrence Island are strongly associated with alpine regions of Alaska to western Yukon, with a lower number of species ranging west to Chukotka, northeast to Banks and Victoria islands, and southeast along the British Columbia Rocky Mountains (Figure 3). Many taxa have their eastern distribution limits in western Yukon, roughly where Laurentide and Cordilleran Ice Sheets terminated in the Pleistocene. Relatively high species richness of St. Lawrence Island plants has also

been noted on Svalbard and alpine areas of mainland Norway, Sweden, and Iceland.

These results suggest that there is a stronger biogeographical affinity for species found on St. Lawrence Island to the North American side of Beringia, rather than eastern Siberia, despite the closer proximity of the island to Chukotka (see Kjellman 1883). St. Lawrence Island was initially cut off from Chukotka 10,500 y ago but remained connected to mainland Alaska for approximately 5000 y before the eastern side of the land-bridge flooded (Elias et al. 1996); this may account for some of the greater similarity with mainland Alaska. The apparent weakness in biogeographical affinity with the Russian Far East may be in part a result of sample bias due to fewer Russian collections shared with GBIF, as well as to dissimilar taxonomies. This possibility is corroborated by descriptions of ranges for a large number of species (e.g., Panarctic Flora 2011), which emphasize Asiatic-North American distribution. A high biogeographic affinity is apparent for St. Matthew and the Pribilof islands in the central and southern Bering Sea, but was relatively weak for the Aleutians, despite sharing a few uncommon species such as *Claytonia arctica* Adams.

New records. We collected *Eritrichium villosum* (Ledeb.) Bunge 2.1 km east of Savoonga; a plant not previously known from North America; however, a specimen collected by S.B. Young in 1967 at Boxer Bay and initially identified as *Eritrichium aretioides* (Cham.) DC. var. *aretioides* was recently determined as *E. villosum* (Murray 2015). We initially applied the name *Eritrichium aretioides* to our collection as well. The distribution of *E. villosum* ranges from Fennoscandia east to eastern Chukotka and it is not surprising that it also occurs on St. Lawrence Island. Our collection (*MLC 2012-141*, *UAAH-003702*) was made on 23 July 2012 in flower and early fruit, in a mesic meadow and dry creek bottom (Figure 4A). The substrate was rocky basalt and moist fines with 90% bare ground. The associated species were *Arctagrostis latifolia* (R. Br.) Griseb., *Artemisia tilesii* Ledeb., *Cardamine blaisdellii* Eastw., and *Ranunculus turneri* Greene subsp. *turneri*. We did not survey the area more widely to delineate the population extent. This plant is listed as "critically imperiled" within Alaska and has not been assessed globally (IUCN 2016; NatureServe 2015), but is likely secure (S1 GNR; AKNHP 2016).

Another new record for St. Lawrence Island was *Iris setosa* Pall. ex Link subsp. *setosa*, which was collected in a mesic graminoid-forb tundra meadow (Figure 4B), 5.9 km east of Savoonga (*MLC 2012-147*, *UAAH-003708*). Plants were in late bud at the time of collection on 23 July 2012. Local residents indicated that this plant was a new arrival to

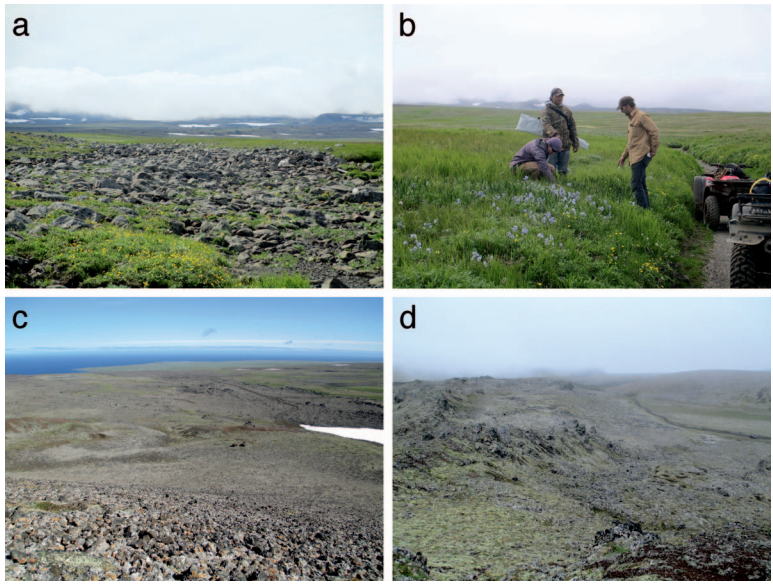

Figure 4. A. Upper-left panel, collection site of *Eritrichium villosum* (Ledeb.) Bunge, *Cardamine blaisdellii* Eastw., and *Ranunculus turneri* Greene subsp. *turneri* near Savoonga, St. Lawrence Island. B. Upper-right panel, collection site of *Iris setosa* Pall. ex Link near Savoonga, St. Lawrence Island. C. Lower-left panel, collection site of *Claytonia arctica* Adams southwest of Savoonga, St. Lawrence Island. D. Lower-right panel, collection site of *Papaver gorodkovii* Pall. ex Link southeast of Savoonga, St. Lawrence Island.

St. Lawrence Island and had only been observed in recent years. The population occupied an approximately 30×30 m area along an all-terrain-vehicle trail. The associated species were: *Carex podocarpa* R. Br. ex Richardson, *Artemisia tilesii* Ledeb., *Salix pulchra* Cham., *Polemonium acutiflorum* Willd., *Ranunculus turneri* Greene subsp. *turneri*, and *Equisetum arvense* L. *Iris setosa* is common along the eastern Bering Sea coast from Kotzebue Sound south to the Gulf of Alaska and west through the Aleutians to eastern Asia.

We made a collection of *Erigeron humilis* Graham from a plateau on a limestone outcrop in graminoid-dryas tundra, 18.1 km southwest of Savoonga, near Kangee Camp (*MLC2012-203, UAAH-003764*). This species had not been collected on the island before, but is common on Chukotka and the Seward Peninsula. It is not a great surprise to have found this species, but it must be quite rare on the island if it had not been observed or collected by previous botanists.

Moehringia lateriflora (L.) Fenzl. is a new record for St. Lawrence Island. We found this plant in a single location in graminoid-dryas tundra on a limestone outcrop near Kangee Camp (*MLC2012-2017*). This circumboreal plant is otherwise common in dry meadows and woodlands on the mainland to the east and west of the island.

We made two collections of what appears to be *Potentilla gorodkovii* Jurtsev, or potentially *Potentilla subgorodkovii* Jurtsev. Neither species has previously been recorded from St. Lawrence Island. However, earlier collections identified as "*P. uniflora* Ledeb." by S.B. Young and others may in fact be *P. gorodkovii* Jurtsev or *P. subgorodkovii* Jurtsev. *Potentilla uniflora* Ledeb. *sensu stricto* does not occur in North America and the names used in newer treatments (e.g., Elven et al. 2015) do not easily associate with previous treatments. The plants we collected have a combination of dense floccose hairs and longer spreading hairs on petioles and the undersides of leaves; stout, columnar caudices covered with persistent petioles; and epicalyx lobes approximately 2/3 the width of the sepals. One collection was from a backslope of a beach ridge near Troutman Lake, growing in sand with *Leymus mollis* (Trin.) Pilg. and other *Potentilla* species. The second collection was from the Kookooligit Mountains 6.2 km southwest of Savoonga in fellfield tundra on fractured basalt. *Potentilla gorodkovii* Jurtsev is known from the northern Russian Far East with an unclear eastern distribution limit, and *Potentilla subgorodkovii* Jurtsev is common across Alaska, Yukon, and the Russian Far East (see Elven and Murray 2008).

RARE SPECIES

BRASSICACEAE. *Cardamine blaisdellii* Eastw. (S3S4 G3G4) – NORTH-CENTRAL ST. LAWRENCE ISLAND: scattered on rocky basalt and moist fines, mesic tundra, meadow and creek bottom 2.1 km east of Savoonga (Fig. 4A). 37 m, 63.69° N 170.44° W, *M.L. Carlson 2012-136, UAAH-004660*, 23 July 2012; near Savoonga, wet tundra, 63.70° N 170.48° W, *S.B. Young 184*, 1966; Kookoolik, 63.69° N 170.35° W, *S.B. Young 1443*, 1967 (Young 1971). This species is a Beringian endemic, known from the Russian Far East to northwestern Alaska that can be locally common in moist tundra, particularly on the Seward Peninsula, Alaska. All collections on St. Lawrence Island are restricted to the north-central portion of the island. This taxon was merged with *Cardamine microphylla* Adams in Hultén (1968) and treated as a subspecies of *C. microphylla* by Murray and Kelso (1997), but *C. blaisdellii* Eastw. is a distinct Amphi-Beringian taxon with broadly

obovate leaflets with 3- to 5-toothed leaflet margins (see Jørgensen 2008; Nawrocki et al. 2013).

CYPERACEAE. *Carex glareosa* Wahlenb. subsp. *pribilovensis* (Macoun) Chater & Halliday (S2 G4G5T2T3) – NORTHWEST ST. LAWRENCE ISLAND: Gambell. 63.78° N 171.74° W, *Anderson 5175*, 1938 (Hultén 1941; Young 1971). This taxon is restricted to brackish habitats in the Aleutian and Pribilof islands with only a single record on St. Lawrence. Young (1971) noted that he never observed or collected this rather distinctive subspecies, and suggested that it must be very rare on the island. Additionally, he noted apparent hybrids between the related *Carex lachenalii* Schkuhr and *Carex glareosa* Wahlenb. subsp. *glareosa* on the island that may be responsible for wide-leaved forms that could appear as *Carex glareosa* Wahlenb. subsp. *pribilovensis* (Macoun) Chater & Halliday.

GENTIANACEAE. *Gentianella auriculata* (Pall.) J.M. Gillett (S1 GNR) – CENTRAL ST. LAWRENCE ISLAND: Gaedtuk. 63.47° N 170.65° W, *Young 1390*, 1967 (Young 1971). This taxon is known from North America from this record on St. Lawrence on a gravel bar and a collection on Attu and on Agattu islands (Hultén 1947; University of Alaska Museum of the North 2016; Young 1971); its range is more extensive in the Russian Far East. This species appears to be quite rare on St. Lawrence Island.

MONTIACEAE. *Claytonia arctica* Adams (S1S2 G3) – NORTH-CENTRAL ST. LAWRENCE ISLAND: scattered on a cinder cone slope of vesicular basalt gravel, Kookooligit Mountains 7.7 km southwest of Savoonga (Fig. 4C). 270 m, 63.64° N 170.57° W, *M.L. Carlson UAAH-003780*, 26 July 2012; Ataakas Camp, edge of Kookooligit Range, barren cinder cone, 63.61° N 170.14° W, *S.B. Young 1430*, 1967. This taxon occurs from the Noril Mountains of Siberia east through Chukotka, and to the central and eastern Bering Sea coast (Hultén 1943; Young 1971). Collections in Alaska are known from Agattu, Amchitka, and Atka in the Aleutians, the extreme western tip of the Seward Peninsula, and St. Lawrence Island (Nawrocki, et al. 2013). Our collection from the Kookooligit Mountains was on an approximately 30° side slope, with a northeastern aspect, and 60% bare ground and 30% lichen cover. We estimated approximately 2000 individual plants in a 200×200 m area. Approximately 20% of the plants were reproductive and in early flower.

PAPAVERACEAE. *Papaver gorodkovii* Tolm. & V.V. Petrovsky (S2S3 G3) – NORTH-CENTRAL ST. LAWRENCE ISLAND: rare on basalt talus and

outcrops, side slope of volcanic shield, Kookooligit Mountains 4.2 km west of Cape Kitnik (Fig. 4D). 208 m, 63.59° N 170.14° W, *M.L. Carlson UAAH-003728, UAAH-004631*, 24 July 2012; North of Mt. Atak, 63.5° N 170.5° W, *O.W. Geist UAM V29583*, 1933 (University of Alaska Museum of the North 2016). The population we observed was located on a side slope of a volcanic shield on barren basalt talus and outcrops with about 50% cover of lichens. This species is a rare taxon (S2S3 G3; Nawrocki et al. 2013), known from the Russian Far East, the Beaufort and Chukchi sea coasts, northeast into the Canadian Arctic Archipelago, and intermittently along the Bering Sea Coast to Nunivak Island. It has been collected in similar basalt talus cinder cone habitats (*UAAH-6889, UAAH-6905, UAAH-7657*).

POLYGONACEAE. *Rumex krausei* B.A. Jurtzev & V.V. Petrovsky (S2S3 G2) – NORTHWEST ST. LAWRENCE ISLAND: moist alpine slope at low elevation, Tapphook Mountain. 63.59° N 170.14° W, *S.B. Young* (*annotated by R. Elven 2003*) *GH-217732*, 30 June 1966. This species is narrowly Amphi-Beringian, with populations restricted from eastern Chukotka to the western Seward Peninsula, Kotzebue Sound, and Cape Lisburne in Alaska. *Rumex krausei* is restricted to calcareous, moist to mesic substrates (Nawrocki et al. 2013). Young's collection (1971) is the only one known from St. Lawrence Island. We surveyed a small and isolated calcareous outcrop west of Savoonga near Kangee Camp, but did not observe any *Rumex* species.

POTAMOGETONACEAE. *Potamogeton subsibiricus* Hagstr. (S3S4 G3G4) – CENTRAL ST. LAWRENCE ISLAND: Koozaata River near Gaedtuk. 63.48° N 170.65° W, *S.B. Young 1341*, 1967. Young (1971) observed non-reproductive plants in a single location. This aquatic plant is mostly known from interior Alaska to Northwest Territories, but is also found in widely scattered populations in Siberia as well as central and eastern Canada (GBIF 2013; Hultén 1968).

PRIMULACEAE. *Primula tschuktschorum* Kjellm. (S3 G2G3) – NORTHWEST ST. LAWRENCE ISLAND: Gambell, 63.78° N 171.74° W, *S.B. Young 803*, 1967. CENTRAL ST. LAWRENCE ISLAND: Gaedtuk. 63.48° N 170.65° W, *S.B. Young 583*, 1967. SOUTHWESTERN ST. LAWRENCE ISLAND: Boxer Bay. 63.34° N 171.57° W, *S.B. Young 610*, 1967. Young (1971) referred to this taxon as *P. nivalis* Pall. *Primula tschuktschorum* is a narrowly endemic Amphi-Beringian taxon with a range restricted to the Bering Strait region (Kelso 1987). The taxonomy of this species has caused some confusion (see Kelso 1987; Kjellman 1882; Young 1971) as its sister taxon, *Primula pumila* (Ledeb.) Pax (syn. = *Primula eximia* Greene), a larger, farinose, and homostylous species, occurs in the same

region, sometimes intermingled and with occasional hybridization between the two (Carlson et al. 2008; Kelso 1987). We did not observe *Primula tschuktschorum*, though we collected *Primula pumila* at Sevoukuk Mountain near Gambell and near Savoonga.

RANUNCULACEAE. *Ranunculus camissonis* Schltdl. (S3 GNR) – NORTHWEST ST. LAWRENCE ISLAND: rare on mesic tundra, side slope of Sevoukuk Mountain. 150 m, 63.78° N 171.70° W, *M.L. Carlson UAAH-003569, UAAH-004786, UAAH-004795*, 19 July 2012; Gambell, 63.78° N 171.74° W, *S.B. Young 804,* 1967; Tapphook. 63.61° N 171.24° W, *S.B. Young 63*, 1966. SOUTHWEST ST. LAWRENCE ISLAND: Southwest Cape, Northwest Shore. 63.66° N 171.5° W, *O.W. Geist UAM-V75071*, 1927; Boxer Bay. 63.34° N 171.57° W, *S.B. Young 615*, 1967. *Ranunculus camissonis* has a scattered distribution through interior Alaska, the Brooks Range, Seward Peninsula, and St. Lawrence Island to Chukotka, where it is typically associated with calcareous substrates. We collected this plant in only a small area, approximately 10×10 m, in a dwarf shrub-forb tundra among dioritic outcrops and frost boils. An estimated 40-50 plants were present at that location. The number and distribution of collections on St. Lawrence Island suggests that this species is not that uncommon.

Ranunculus turneri Greene subsp. *turneri* (S2 G5) – NORTH-CENTRAL ST. LAWRENCE ISLAND: scattered on rocky basalt and moist fines, in mesic tundra meadow 2.1 km east of Savoonga (Fig. 4A). 37 m, 63.69° N 170.44° W, *M.L. Carlson UAAH-004577*, 23 July 2012; Savoonga. 63.70° N 170.48° W, *Mason 6094*, 1931; mesic tundra, Savoonga. 63.70° N 170.48° W, *S.B. Young 244*, 1966. CENTRAL ST. LAWRENCE ISLAND: gravel bar, Gaedtuk. 63.47° N 170.65° W, *S.B. Young 1345*, 1967 (Young 1971). We observed this showy Amphi-Beringian plant scattered over an area of approximately 40×150 m along a rocky ephemeral stream, west of Kitnik River, in mesic forb-graminoid tundra. Plants were most abundant in the adjacent loamy tundra, but also were growing in fines among the basalt rocks in the dry creek bed. We estimated >5000 plants at this location. We also observed this species along the Kitnik River in similar habitat and estimated approximately 1000 plants present. This species has been collected on a number of occasions in the vicinity of Savoonga and once south of the Kookooligit Mountains (Gaedtuk) in mesic tundra.

ROSACEAE. *Potentilla fragiformis* Willd. ex Schltdl. (S1S2 G4) – NORTHWEST ST. LAWRENCE ISLAND: beach ridges and back slope, Troutman Lake, 3.1 km south of Gambell. 6 m, 63.75° N 171.73° W, *M.L. Carlson UAAH-003635*, 20 July 2012; Gambell. 63.78° N 171.75°

W, *R.L. Rausch UAM-V106580*, 1 June 1963; old beaches, Gambell Airstrip. 63.78° N 171.75° W, *D.T. Mason UAM ALAAC-92613*, 14 July 1976. *Potentilla fragiformis* was only recognized as occurring in North America in the last decade, through botanical surveys in Cape Kruzenstern National Monument, north of Kotzebue (Parker 2006). Subsequent review of collections at ALA, NY, and CAN by Parker revealed a number of *Potentilla fragiformis* specimens from the Alaska side of the Bering Strait region that were misidentified. These included the two collections from Gambell. Our collection was from an older beach ridge and back slope that transitioned from highly salt-tolerant and typical beach species such as *Leymus mollis*, *Senecio pseudo-arnica*, and *Honckenya peploides*, to *Artemisia tilesii*, *Polemonium acutiflorum*, *Potentilla hyparctica*, and *Empetrum nigrum*. *Potentilla fragiformis* plants were loosely scattered over a roughly 30×30 m area. We also collected a specimen provisionally identified as *Potentilla* cf. *hyparctica* Malte from the toe slope of Sevoukuk Mountain (63.77° N 171.70° W) in a mesic forb-graminoid habitat that resembles the more robust and coarse form of *Potentilla fragiformis*, but lacks the long-narrow styles typical of the species (*M.L. Carlson UAM-3625*).

SAXIFRAGACEAE. *Micranthes nelsoniana* subsp. *insularis* (Hultén) Elven & D.F. Murray (S2 GNRTNR) – NORTHWEST ST. LAWRENCE ISLAND: Gambell. 63.78° N 171.74° W, *J.P. Anderson LD-142646*, 29 June 1938. This taxon, which can be distinguished from other subspecies and closely related species by the absence of purple or brown stipitate-glandular hairs in the inflorescence and the presence of thick and succulent leaves, is primarily found in the Aleutian Islands and southwest to Hokkaido, Japan (Brouillet and Elvander 2009). Anderson's specimen warrants review, as this would represent a significant northern range extension for the taxon.

Micranthes nudicaulis (D. Don) Gornall & H. Ohba subsp. *nudicaulis* (S3 G3G4Q). NORTHWEST ST. LAWRENCE ISLAND: wet sedge tundra; Sevoukuk Mountain. 63.77° N 171.70° W, *MLC2012-023* 19 July 2012; wet sedge tundra, 13 km south of Gambell 63.66 ° N 171.72° W *MLC2012-094*; wet tundra, Tapphook 63.61° N 171.24° W, *Young 60*, *Young 116*; additional historic collections near Gambell. SOUTHWEST ST. LAWRENCE ISLAND: wet tundra; Boxer Bay 63.34° N 171.57° W, *Young 612*. NORTHEAST ST. LAWRENCE ISLAND: wet tundra; Northeast Cape 63.30° N 168.70° W, *Young 338* (Young 1971). This is a narrowly Beringian species, restricted from Chukotka to the Seward Peninsula. It can be locally abundant in moist, often sloping tundra, and common within its range.

Other collections of interest. A number of collections have been made on St. Lawrence Island with the name *Saxifraga rivularis* L. applied to them (e.g., two collections from Kjellman in 1879 [*S08-16880*, *S08-16915* SVH 2016], six collections from Young [1971]: *Young 25, 351, 472, 724, 776, 1413,* and Hultén [1944] references: *Mason 6870*, and *Anderson 3704, 5191*). Some confusion has followed the taxonomy of *S. rivularis* (see Jørgensen, et al. 2006), where one currently recognized subspecies, *S. rivularis* subsp. *arctolitoralis* (Jurtzev & V.V. Petrovsky) M.H. Jørgensen & Elven, is a rare taxon from the northern Yukon coast, west to the Seward Peninsula and eastern Chukotka (Nawrocki et al. 2013). Young (1971) notes that plants from non-alpine regions on St. Lawrence approached, or merged, with *S. bracteata* D. Don, whereas plants from alpine areas were pigmented and erect. We only observed *S. bracteata* in coastal areas of the island that indeed were quite small in stature. Thus, a thorough review of the previous collections of this group of plants is warranted as some are likely the rare *S. rivularis* subsp. *arctolitoralis*.

Recent reviews of *Tephroseris* specimens by R. Elven and D.F. Murray (2003) and T.M. Barkley (2004) have identified the Asian taxon, *Tephroseris atropurpurea* (Ledeb.) Holub., as occurring on St. Lawrence Island (Arctos 2013). This taxon was not included in the Flora of North America (Barkley and Murray 2006), as the annotations occurred after the volume was in press. The closely related taxa: *Tephroseris frigida* (Richardson) Holub, *T. kjellmanii* (A.E. Porsild) Holub, *T. tundricola* (Tolm.) Holub, and *T. yukonensis* (A.E. Porsild) Holub have also been documented on St. Lawrence Island. Murray (Emeritus University of Alaska Museum of the North Professor and Curator, pers. comm. 2014) noted that another species, *Tephroseris dentata* (Gray) Hultén, which is common in Chukotka and locally abundant at a few sites on the Seward Peninsula, may occur on St. Lawrence Island as well. Most of these taxa have distributions confined to Alaska and Yukon, or are narrowly Amphi-Beringian. The taxonomy of *Tephroseris* is not well-delineated and their nomenclature is complex (Barkley and Murray 2006); however, the presence of *Tephroseris atropurpurea* on St. Lawrence Island is noteworthy as a recently recognized component of the North American flora. The taxon is deserving of review and assignment of a subnational rarity rank.

Draba subcapitata Simmons is a high arctic circumpolar species that is rather restricted to the Beaufort Coastal Plain in Alaska and considered "imperiled" in the state (S1S2 G4), where it is typically associated with sandy or gravelly substrates (Nawrocki et al. 2013). A specimen, originally identified as *Draba macrocarpa* Adams, was

collected by Fay (*UBC V44622*) in 1954 in southwestern St. Lawrence Island and has since been annotated by C.R. Bjork in 2011 to *Draba subcapitata*. Fay's specimen is described from a "wet tundra pond" that is atypical for *Draba subcapitata*. Both B.A. Bennett and one of us (M.L.C.) reviewed a high resolution digital image of the specimen and believe it to more likely be *D. lactea* Adams, but could not be confident.

Conservation implications. St. Lawrence Island harbors numerous plant taxa of conservation significance, including narrow Beringian endemics and Asian species that reach their eastern margin of their ranges on the island. The diversity of habitats, substrates, and elevations offer some buffering to species of conservation concern in response to current and future environmental changes (see Beier and Brost 2010). However, the substantial increase in mean annual temperatures in recent decades in the arctic biome in particular (ACIA 2005) is likely to result in a range of direct and indirect impacts to the flora of St. Lawrence Island. Elsewhere in Alaska there have been numerous examples of shrub and tree expansion in arctic and alpine environments (Dial et al. 2007, Klein et al. 2005, Roland 2012, Tape et al. 2006); currently the flora of St. Lawrence Island is distinctly lacking in tall shrubs and thus any potential future establishment and growth of taller *Salix*, *Alnus*, or *Populus* species would represent a dramatic change in plant communities and ecology. St. Lawrence Island is described as being on the southern margin of the Arctic Flora Zone 3 by Young (1971), which is characterized by a somewhat depauperate and highly cold-tolerant flora. Zone 3 dips southward from margins of the Chukchi Sea coast in the Bering Sea to encompass St. Lawrence Island that is flanked by the less cold-tolerant, but much more species rich, Arctic Flora Zone 4 in the Chukotka and Seward peninsulas, and Bering Sea Islands to the south. Relatively small increases in summer warmth, are likely to substantially increase the number of species in nearby regions that would be able to establish. The population of *Iris setosa* that had not been observed by residents until recently may be an example of the expansion of the "subarctic" flora to the island. The cold climate of St. Lawrence Island is influenced substantially by winter sea ice; however, sea ice extent has been retreating in recent years (Eisenman et al. 2014) and broader effects of the reduction in sea ice are often non-linear (Holland et al. 2006). More broadly, habitat suitability of arctic Alaskan endemic plants was estimated to show substantial declines in the next century (Carlson and Cortés-Burns 2013) and the authors suggested that the rare flora of the Bering Strait could be at particular risk with expansion of larger, canopy forming shrubs. Some of the rare plants on St. Lawrence Island, such as *Claytonia arctica* and

Papaver gorodkovii, are associated with unstable tephra substrates that are unlikely to see establishment of competitors in the near future; others however are associated with mesic to moist substrates and along stream margins that would be more vulnerable to tall willow or alder establishment.

Collecting intensity. The vast majority of collection effort has focused near the permanent settlements of Gambell and Savoonga, as well as the Southwest Cape region (Figure 2). Despite our efforts, we were unfortunately not able to explore less well-known regions. Additional areas of significant collection effort include Northeast and Southeast capes and Siknik Camp on the central south coast of the island. These areas were botanized primarily by earlier collectors. Young (1971) was a prodigious collector across the island and addressed many of the more poorly known areas, such as Tapphook in the northwest and the central inland portion of the island, south of the Kookooligit Mountains at Gaedtuk and around Koozata River. These interior regions are in an area of high biodiversity for the island, with many aquatic species and other species that are known to occur only in this area. The southern portion of the island is distinctly warmer, with more lush vegetation and with numerous large lagoons that have not been well explored.

Because St. Lawrence Island is so important biogeographically and because it harbors a large number of rare species, greater collection effort is warranted. Additionally, a number of species that we include in the appendix (e.g., *Carex rotundata* Wahlenb.) are only known from published accounts of the early collectors Chamisso and Eschscholtz, and Kjellman (Chamisso and Schlechtendal 1826-1836; Kjellman 1883) and have not been observed since. Young (1971) noted that many of these early reports were based on specimens with incorrect location information or were misidentified. We recommend that particular effort be directed to the under-collected regions in the central, southern, and eastern portions of the island. In particular, the area between the Fossil and Tapisaghak rivers, as well as the large coastal lagoons on the southern coast, have had almost no botanical attention. Additionally, special attention should be directed at current settlements to monitor for potential introduction of non-native species.

Moreover, including the local people (St. Lawrence Island Yupik) in future efforts would be essential to success – in our surveys, local knowledge proved invaluable in logistics and travel, identifying geologically and botanically noteworthy areas, and leading us to species that were new to the island. Young and Hall (1969) and Young (1971) similarly note the assistance provided by the people of St.

Lawrence Island and their intimate knowledge of the plant life (and see Anderson 1939).

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APPENDIX

Annotated list of vascular plant taxa recorded from St. Lawrence Island. Taxonomy and nomenclature follows Panarctic Flora (Panarctic Flora 2011); Hultén (1968) synonyms are given in brackets. Subnational and global rarity ranks are given for rare taxa (see AKNHP 2016 for definitions). C = common, collected at four or more different locations on St. Lawrence Island; O = occasional, collected at two to three separate locations; R = rare on the island, collected once or twice in a geographically restricted region. Phytogeographic

distributions are based on Hultén (1968), Kelso (1989), and Panarctic Flora (2011).

APIACEAE

Angelica gmelinii (DC.) Pimenov. [= *Angelica lucida* L. in part, sensu Hultén]. Coastal mesic meadows and beaches. O. Beringian.

Conioselinum pacificum (S.Watson) J.M. Coult. & Rose. [= *Conioselinum chinense* (L.) BSP]. Beaches. O. Asiatic-N. American, maritime.

Podistera macounii (J.M. Coult. & Rose) Mathias & Constance. [= *Ligusticum mutellinoides* (Crantz) Willar subsp. *alpinum* (Ledeb.) Thell.]. Fellfield tundra. C. Beringian.

ASTERACEAE

Antennaria monocephala DC. subsp. *monocephala*. Fellfield tundra. O. Beringian.

Arctanthemum arcticum subsp. *polare* (Hultén) Tzvelev. [= *Chrysanthemum arcticum* L. subsp. *polare* Hultén]. Foredune, backdune, and lagoon margins. C. Asiatic-N. American, maritime.

Arnica lessingii (Torr. & A. Gray) Greene. Mesic tundra. C. Asiatic-N. American.

Artemisia arctica Less. Mesic tundra. C. A dominant plant over much of the island. Asiatic-N. American. Two subspecies of *Artemisia arctica* (subsp. *arctica* and subsp. *beringensis* (Hultén) Hultén) are noted from St. Lawrence Island (Hultén, 1968; Panarctic Flora, 2011).

Artemisia borealis Pall. Fellfield. R. Only a single specimen is known from Boxer Bay (Young, 1971). Holarctic.

Artemisia furcata Bieb. Rocky and mesic tundra. O. Asiatic-N. American.

Artemisia globularia Cham. ex Besser. Presumably the plants are of var. *globularia* rather than the rare var. *lutea* Hultén. Fellfield, rocky tundra. R. Beringian.

Artemisia glomerata Ledeb. Fellfield, rocky tundra. C. Beringian.

Artemisia tilesii Ledeb. subsp. *tilesii*. Backshores, old village sites, mesic tundra toeslopes. C. Asiatic-N. American.

Erigeron humilis Graham. Graminoid-dryas tundra. R. Only a single specimen is known from near Kangee Camp (*MLC2014-203, UAAH-003764*). Asiatic-N. American.

Eurybia sibirica (L.) G.L. Nesom. [= *Aster sibiricus* L.]. Gravel bar. R. Only a single specimen is known from near Gaedtuk (Young, 1971). Asiatic-N. American.

Packera heterophylla (Fisch.) E. Wiebe [= *Packera cymbalaria* (Pursh) W.A. Weber & Á. Löve, *Senecio resedifolius* Less.]. Fellfield tundra. O. Asiatic-N. American.

Petasites frigidus (L.) Fr. subsp. *frigidus*. Wet to mesic tundra. C. Holarctic.

Saussurea angustifolia var. *viscida* (Hultén) S.L. Welsh. [= *Saussurea viscida* var. *viscida* Hultén]. Mesic tundra. C. Beringian.

Saussurea angustifolia subsp. *yukonensis* (A.E. Porsild) Cody. [= *Saussurea viscida* Hultén var. *yukonensis* (A.E. Porsild) Hultén]. R. only a single specimen from the east side of Boxer Bay, collected by Fay in 1953 has had this name applied to it (*UBC V44660*). Beringian.

Senecio pseudoarnica Less. Beaches. C. Asiatic-N. American, maritime.

Solidago multiradiata Aiton. Rocky tundra-stream beds. O. Asiatic-N. American.

Taraxacum alaskanum Rydb. Mesic tundra. O. Asiatic-N. American.

Taraxacum ceratophorum (Ledeb.) DC. Beaches and old village sites. C. Holarctic.

Taraxacum lateritium Dahlstedt (aggregate). Mesic tundra. R. Holarctic.

Tephroseris atropurpurea (Ledeb.) Holub. [= *Senecio atropurpureus* subsp. *atropurpureus* (Ledeb.) Fedtsch.]. Mesic tundra. O. Asian.

Tephroseris frigida (Richardson) Holub. [= *Senecio atropurpureus* (Ledeb.) Fedtsch. subsp. *frigidus* (Richards.) Hultén]. Mesic tundra. C. Beringian.

Tephroseris kjellmanii (A.E. Porsild) Holub. [= *Senecio atropurpureus* (Ledeb.) Fedtsch. subsp. *tomentosus* (Kjellm.) Hultén]. Mesic tundra. R. Beringian.

Tephroseris palustris subsp. *congesta* (R. Br.) Holub. [= *Senecio congestus* (R. Br.) DC.]. Wet tundra, wet disturbed ground. C. Holarctic.

Tephroseris tundricola (Tolm.) Holub. Mesic tundra. R. Only a single specimen from Savoonga has been recorded. Asian.

Tephroseris yukonensis (A.E. Porsild) Holub. [= *Senecio yukonensis* A.E. Porsild]. Mesic tundra. R. Only two specimens are known from St. Lawrence Island with this name. Fay originally collected plants from Boxer Bay and Gambell in 1953, which were later annotated from "*Senecio atropurpureus* var. *tomentosus*" to "*Senecio kjellmanii*", and more recently to *Tephroseris yukonensis* by S. Sivertz in 2008 (*UBC V44649* and *V44667*). Beringian.

BETULACEAE

Betula nana L. subsp. *exilis* (Sukatschev) Hultén. Mesic tundra. O. Not often encountered though common on the mainland. Asiatic-N. American.

BORAGINACEAE

Eritrichium aretioides (Cham.) DC. var. *chamissonis* (DC.) V.V. Petrovsky. Rocky tundra. O. Beringian.

Eritrichium villosum (Ledeb.) Bunge. Rocky mesic tundra, meadow. R. Collected in only a couple of locations on St. Lawrence Island – the only records in N. America. The previous collection of *Eritrichium aretioides* (Cham.) DC. var. *aretioides* by Young (1971) was annotated as *Eritrichium villosum* and thus no record of *Eritrichium aretioides* var. *aretioides* is known for the island. **S1 G4G5**. Asian.

Mertensia maritima (L.) Gray. Beaches. C. N. American-European, maritime.

Myosotis alpestris F.W. Schmidt subsp. *asiatica* Vestergr. Mesic tundra. R. Asiatic-N. American.

BRASSICACEAE

Braya humilis (C.A. Mey.) B.L. Rob. Dry tundra-fellfield. R. Known from a single collection near the Fossil River (Young, 1911). Asiatic-N. American.

Cardamine bellidifolia L. Rocky tundra, boulder fields. C. Holarctic.

Cardamine blaisdellii Eastw. [= *Cardamine microphylla* Adams in part, sensu Hultén, and *Cardamine hyperborea* O.E. Schulz in part, sensu Hultén]. Mesic tundra. R. Restricted to the north-central portion of the island, but can be locally abundant. **S3S4 G3G4**. Beringian.

Cardamine polemonioides Rouy [= *Cardamine pratensis* L. var. *angustifolia* (Hook.) O.E. Schulz]. The presence of this taxon is questionable as it is only reported from two older collections (Kjellman 1883; and Chambers in 1938 cited in Hultén 1944) and had not been seen by others. Holarctic.

Cardamine purpurea Cham. & Schltdl. Moist alpine tundra. C. Beringian.

Cardamine umbellata Greene. Wet areas. Provisionally included as it is recorded from a single collection in 1927 from "St. Lawrence" (Haley, California Academy cited in Hultén 1944) and omitted by Young (1971). R. Asiatic-N. American.

Cochlearia groenlandica L. [= *Cochlearia officinalis* L. subsp. *arctica* (Schlecht.) Hultén in part, sensu Hultén, and *Cochlearia officinalis* L. subsp. *oblongifolia* (DC.) Hultén in part, sensu Hultén]. Beaches, lagoons. C. Holarctic, maritime.

Draba alpina L. (aggregate). The name *Draba alpina* has been used for numerous taxa in Alaska, but *Draba alpina* is an amphi-Atlantic taxon, with no representation in Alaska (Panarctic Flora, 2011). Thus, "*Draba alpina*" plants from St. Lawrence Island may be *Draba corymbosa* R. Br. ex DC., *Draba pilosa* DC., or *Draba macounii* O.E. Schulz. Careful review of specimens is required.

Draba borealis DC. Mesic meadows, low elevation. C. Asiatic-N. American, maritime.

Draba corymbosa R. Br. ex DC. [= *Draba macrocarpa* Adams]. Stoney tundra. R. Only known from a single collection near Boxer Bay by Young (1971). R. Holarctic.

Draba fladnizensis Wulfen. Rocky outcrops. Provisionally included: recorded from a single collection by Chambers (Hultén 1944) and not included in the island flora by Young (1971). R. Holarctic.

Draba glabella Pursh. [= *Draba hirta* L. in part, sensu Hultén]. Rocky outcrops, wet-mesic tundra, and old village sites. O. Holarctic.

Draba juvenilis Kom. [= *Draba hirta* L. in part, sensu Hultén]. Mesic tundra, mineral outcrops. O. Asiatic-N. American.

Draba lactea Adams. Rocky outcrops, moist gravel, mesic tundra. C. Holarctic.

Draba nivalis Liljebl. Dry streambank. R. Only known on St. Lawrence Island from a single specimen by Young (1971). Holarctic.

Draba stenopetala Trautv. Stoney tundra. R. Hultén (1968) indicates a collection of this taxon in the northwest part of the island, otherwise it is known only from a single collection on a cinder cone slope in Kookooligit Mountains (*MLC2014-221*). Beringian.

Draba subcapitata Simmons. Typically associated with mineral substrates. R. Known on St. Lawrence Island from a single specimen from 1954 that was originally identified as *Draba macrocarpa* Adams (*UBC V44622*); our review of a digital image suggests it may be *D. lactea* Adams. **S1S2 G4**. Circumpolar.

Eutrema edwardsii R. Br. Moist tundra. C. Holarctic.

Parrya nudicaulis (L.) Regel. Plants from St. Lawrence Island are glandular,

wide-leaved, strongly dentate and attributable to subsp. *nudicaulis*. Moist tundra, fellfield tundra. C. Asiatic-N. American.

CAMPANULACEAE

Campanula lasiocarpa Cham. Mesic and stony tundra. R. This taxon is only recorded from the south side of the island near Boxer Bay. Asiatic-N. American.

Campanula uniflora L. Mesic stony tundra. R. This species is known only from a single location at Gaedtuk (Young, 1971) and our collection near Kangee Camp on an isolated limestone outcrop (*MLC2012-202*). Holarctic.

CARYOPHYLLACEAE

Cerastium beeringianum Cham. & Schltdl. Mesic tundra, rocky outcrops, beach margins. C. Asiatic-N. American.

Honckenya peploides (L.) Ehrh. Foreshores, sand dunes, lagoons. C. Holarctic, maritime.

Minuartia arctica (Steven ex Ser.) Graebn. Stony tundra, fellfields. O. Asiatic-N. American.

Minuartia macrocarpa (Pursh) Ostenf. Stony tundra, fellfields. C. Asiatic-N. American.

Minuartia obtusiloba (Rydb.) House. Stony tundra, fellfields, cliffs. R. Asiatic-N. American.

Moehringia lateriflora (L.) Fenzl. Graminoid-dryas tundra. Known from a single collection on a limestone outcrop near Kangee Camp (*MLC2012-2017*); not previously known from the island. R. Holarctic.

Sagina nivalis (Lindblom) Fr. [= *Sagina intermedia* Fenzl]. Forb-graminoid tundra, upper beaches, eroding slopes, sand. C. Holarctic.

Silene acaulis (L.) Jacq. Fellfield, rocky ground. C. Holarctic.

Silene involucrata (Cham. & Schltdl.) Bocquet subsp. *furcata* (Raf.) V.V. Petrovsky & Elven. [= *Melandrium affine* J. Vahl in part, sensu Hultén]. Rocky mountain slopes. C. Holarctic.

Silene soczavana (Schischk.) Bocquet. [= *Melandrium macrospermum* A.E. Porsild]. Dry slopes. O. Beringian.

Silene uralensis subsp. *arctica* (Th. Fr.) Bocquet. [= *Melandrium apetalum* (L.) Fenzl subsp. *arcticum* (E. Fries) Hultén in part, sensu Hultén]. Moist tundra; recorded from a single collection by F.H. Fay in 1953 (UBC). R?. Holarctic.

Silene uralensis subsp. *uralensis* (Rupr.) Bocquet. [= *Melandrium apetalum* (L.) Fenzl subsp. *arcticum* (E. Fries) Hultén in part, sensu Hultén]. Mesic to wet tundra. O. Asiatic-N. American.

Stellaria crassifolia Ehrh. Moist tundra. R. Holarctic.

Stellaria humifusa Rottb. Seashores. C. Holarctic, maritime.

Stellaria longipes Goldie. Stony slopes, mesic tundra. C. Holarctic.

Wilhelmsia physodes (Fisch. ex Ser.) McNeill. Gravel streambanks. O. Asiatic-N. American.

CORNACEAE

Chamaepericlymenum suecicum (L.) Graebn. [= *Cornus suecica* L.]. Boulders in mesic tundra. C. Holarctic.

CRASSULACEAE

Rhodiola integrifolia subsp. *integrifolia* Raf. [= *Sedum rosea* (L.) Scop. subsp. *integrifolium* (Raf.) Hultén]. Rocky areas in mesic tundra. Boulders in mesic tundra. C. Asiatic-N. American.

CYPERACEAE

Carex aquatilis Wahlenb. Wet sedge tundra. Often a dominant plant in low, wet areas with permafrost. C. Holarctic.

Carex fuliginosa Schkuhr subsp. *misandra* (R. Br.) Nyman. [= *Carex misandra* R. Br.]. Mesic to dry tundra slopes. Only collected around Gambell. R. Holarctic.

Carex glareosa subsp. *glareosa* Wahlenb. Back dunes, lagoon margins, and estuaries. C. Holarctic, maritime.

Carex glareosa Wahlenb. subsp. *pribilovensis* (Macoun) Halliday & Chater. Brackish marshes. Only a single collection from Gambell of this subspecies. R. **S2 G4G5T2T3**. Aleutian/Beringian, maritime.

Carex lachenalii Schkuhr. Mesic tundra, snow beds. C. Holarctic.

Carex livida (Wahlenb.) Willd. Wet tundra. Only known from Boxer Bay and near Savoonga. R. Holarctic.

Carex membranacea Hook. N. American. Wet tundra. U. Asiatic-N. American.

Carex microchaeta subsp. *nesophila* (Holm) D.F. Murray. [= *Carex nesophila* Holm]. Mesic tundra. Often locally dominant. C. Beringian.

Carex micropoda C.A. Mey. Tundra pond margins, snow beds. South side of St. Lawrence. U. Asiatic-N. American.

Carex podocarpa R. Br. ex Richardson. Mesic tundra. Near Savoonga and Gaedtuk. R. Asiatic-N. American.

Carex ramenskii Kom. Brackish marshes. Known from Kookoolik and Northwest Cape. R. Asiatic-N. American, maritime.

Carex rariflora (Wahlenb.) J.E. Smith. Wet to mesic tundra. Collected from Kookoolik and Northwest Cape. R. Holarctic.

Carex rotundata Wahlenb. Saturated tundra, shallow tundra ponds. A single record from Chamisso and Eschscholtz from "St. Lawrence Island". Provisionally included, the location of this collection may in fact be St. Lawrence Bay, Chukotka. R. Holarctic.

Carex saxatilis L. Wet to mesic tundra. U. Holarctic.

Carex scirpoidea Michx. Mesic tundra. A single record from "St. Lawrence Island" (Hultén, 1943). R. Holarctic.

Carex stylosa C.A. Mey. Rocky stream bank. A single record is known from Gaedtuk (Young, 1971). R. N. American.

Carex subspathacea Wormsk. Brackish marshes, mud flats. U. Holarctic, maritime.

Eriophorum angustifolium Honck. Wet tundra. C. Holarctic.

Eriophorum callitrix Cham. ex C.A. Mey. Tundra flats, snow patches. Few collections on St. Lawrence Island, all located around Southwest Cape. R. Asiatic-N. American.

Eriophorum russeolum Fr. ex Hartm. subsp. *leiocarpum*. [= *Eriophorum*

russeolum E. Fries subsp. *albidum* Nyl. sensu Hultén]. M.S. Novos. Wet tundra, often dominant. C. Asiatic-N. American.

Eriophorum scheuchzeri Hoppe. Wet tundra. Known from two sites on the southern side of the island. R. Holarctic.

Eriophorum triste (Th. Fr.) Hadac & Á. Löve. [= *Eriophorum angustifolium* Honck. subsp. *triste* (T. Fries) Hultén]. Wet tundra. C. Holarctic.

Eriophorum vaginatum L. Mesic to dry tundra. Only known on St. Lawrence Island from two collections (this is a dominant plant on the mainland). R. Holarctic.

Kobresia simpliciuscula (Wahlenb.) Mackenzie. Calcareous rocky slopes, collected from a single location at a freshwater lagoon at Tapphook. R. Holarctic.

DIAPENSIACEAE

Diapensia obovata (F. Schmidt) Nakai. [= *Diapensia lapponica* L. subsp. *obovata* (F. Schm.) Hultén]. Fellfield tundra. C. Asiatic-N. American.

DRYOPTERIDACEAE

Dryopteris fragrans (L.) Schott. Basalt boulders and crevices, central portion of the island. R. Holarctic.

EQUISETACEAE

Equisetum arvense L. Tundra, snowbeds. C. Holarctic.

Equisetum palustre L. Wet tundra, ponds. Small and sterile specimens are known only from a single collection along a muddy bank of the Koozaata River (Young, 1971). R. Holarctic.

Equisetum scirpoides Michx. Moist, gravel, tundra. C. Holarctic.

ERICACEAE

Andromeda polifolia L. Wet tundra. Northeast Cape. R. Holarctic.

Arctous alpina (L.) Nied. [= *Arctostaphylos alpina* (L.) Spreng.]. Boulders and fellfield tundra. C. Holarctic.

Cassiope tetragona (L.) D. Don. Mesic and fellfield tundra, often locally dominant. C. Holarctic.

Empetrum nigrum L. Upper beaches and mesic tundra, never as dominant as on the mainland. C. Holarctic.

Kalmia procumbens (L.) Gift et al. ex Galasso, Banfi & F.Conti. [= *Loiseleuria procumbens* (L.) Desv.]. Fellfield tundra. C. Holarctic.

Phyllodoce caerulea (L.) Bab. Rocky tundra in Kookooligit Mountains. R. Holarctic.

Pyrola grandiflora Radius. Alpine tundra, only a single specimen has been found near Kialegak. R. Holarctic.

Rhododendron tomentosum subsp. *decumbens* (Aiton) Elven & D.F. Murray. [= *Ledum palustre* L. subsp. *decumbens* (Ait.) Hultén]. Fellfields, hummocks. U. Asiatic-N. American.

Vaccinium uliginosum L. Dry tundra, only collected at Ataakas Camp and Kialegak. Plants were reported as non-reproductive (Young, 1971). We have

not seen these specimens and it is not clear if they represent subsp. *vulcanorum* (Kom.) Alsos & Elven, subsp. *microphyllum* (Lange) Tolm. or subsp. *pedris* (Harshb.) S.B. Young. R. Holarctic.

Vaccinium vitis-idaea L. Mesic tundra. C. Holarctic.

FABACEAE

Astragalus alpinus L. Moist rocky tundra and dry creek margins, near Savoonga (only two records for the island). R. Holarctic.

Astragalus umbellatus Bunge. Mesic tundra. C. Asiatic-N. American.

Hedysarum americanum (Michx.) Britton. [= *Hedysarum alpinum* L. subsp. *americanum* (Michx.) Fedtsch.]. Dry tundra at low elevations. U. Asiatic-N. American.

Hedysarum hedysaroides (L.) Schinz & Thell. subsp. *tschuktschorum* Jurtzev. Dry tundra at low elevations. U. Beringian.

Lathyrus japonicus Willd. [= *Lathyrus maritimus* L.]. Sandy beaches. C. Holarctic (absent from central Asia), maritime.

Oxytropis bryophila (Greene) Jurtz. [= *Oxytropis nigrescens* (Pall.) Fisch. subsp. *bryophila* (Greene) Hultén and *Oxytropis glaberrima* Hultén]. Fellfield tundra. C. Beringian.

Oxytropis gorodkovii Jurtzev. [= *Oxytropis nigrescens* (Pall.) Fisch. subsp. *pygmaea* (Pall.) Hultén]. Fellfield tundra, only recorded on St. Lawrence Island at Boxer Bay. R. Beringian.

Oxytropis maydelliana Trautv. Mesic graminoid, rocky tundra near Kookooligit Mountains. R. Asiatic-N. American.

FUMARIACEAE

Corydalis arctica Popov [= *Corydalis pauciflora* auct., non (Willd.) Pers.]. Moist tundra slopes. U. Asiatic-N. American.

GENTIANACEAE

Gentiana algida Pall. Moist, rocky tundra. U. Asiatic-N. American.

Gentiana glauca Pall. Mesic tundra. C. Asiatic-N. American.

Gentianella auriculata (Pall.) J.M. Gillett. [= *Gentiana auriculata* Pall.]. Gravel bar near Gaedtuk (single collection). R. **S1 G4G5**. Asiatic.

IRIDACEAE

Iris setosa subsp. *setosa* Pall. ex Link. Mesic gramioid-forb tundra near Savoonga (single collection), R. Asiatic-N. American, maritime.

JUNCACEAE

Juncus biglumis L. Wet tundra. C. Holarctic.

Juncus leucochlamys V.J. Zinger ex V.I. Krecz. [= *Juncus castaneus* Sm. subsp. *leucochlamys* (Zing. ex Krecz.) Hultén]. Wet tundra. U. Holarctic.

Juncus mertensianus Bong. Lake shores, wetlands at Boxer Bay Lake (single location on St. Lawrence). R. N. American.

Luzula arcuata (Wahlenb.) Sw. Dry tundra, fellfield tundra. C. Holarctic.

Luzula confusa Lindeb. Mesic to dry tundra. C. Holarctic.

Luzula kjellmaniana Miyabe & Kudô (= *L. tundricola* Gorodk.). Mesic to dry tundra. C. Asiatic-N. American.

Luzula multiflora (Ehrh.) Lej. subsp. *frigida* (Buchenau) V.I. Krecz. Mesic tundra, known from Boxer Bay, Gaedtuk, and near Savoonga. R. Holarctic.

Luzula nivalis (Laest.) Spreng. [= *L. arctica* Blytt]. Wet tundra, snowbeds, only known from two collections around Gambell (Young, 1971). R. Holarctic.

Luzula wahlenbergii Rupr. Moist tundra. C. Holarctic.

JUNCAGINACEAE

Triglochin palustris L. Wet muddy banks of Koozaata River (single, non-reproductive collection). R. Holarctic.

LILIACEAE

Lloydia serotina (L.) Rchb. Mesic tundra. C. Holarctic.

LINNAEACEAE

Linnaea borealis L. Mesic tundra, only known from Gaedtuk and Kialegak (plants not reproductive). R. Holarctic.

LYCOPODIACEAE

Diphasiastrum alpinum (L.) Holub. [= *Lycopodium alpinum* L.]. Mesic tundra. C. Holarctic.

Huperzia arctica (Grossh. ex Tolm.) Sipliv. [= *Lycopodium selago* L. subsp. *appressum* (Desv.) Hultén in part, sensu Hultén] Rocky mesic tundra. C. Holarctic.

Lycopodium clavatum L. Rocky mesic tundra. C. Holarctic.

MELANTHIACEAE

Veratrum oxysepalum Turcz. [= *Veratrum album* L. subsp. *oxysepalum* (Turcz.) Hultén]. Mesic tundra; only a single plant has been observed near Koozaata River on St. Lawrence Island (Young, 1971). Asiatic.

MONTIACEAE

Claytonia arctica Adams. Barren, rocky, loose slopes; two locations known in the Kookooligit Mountains. R. **S1S2 G3**. Asiatic.

Claytonia eschscholtzii Cham. [= *Claytonia acutifolia* Pall. subsp. *graminifolia* Hultén]. Moist tundra. C. Beringian.

Claytonia sarmentosa C.A. Mey. Mesic tundra. C. Beringian.

Claytonia tuberosa Pall. ex. Willd. Wet to moist tundra. Provisionally included: recorded from a single collection by Haley in 1926 (Hultén 1943) and not included in the island flora by Young (1971). R. Asiatic-N. American.

Montia fontana L. subsp. *fontana*. R. Wet meadows, muddy areas, pools. C. Holarctic.

MYRSINACEAE

Trientalis europaea L. Hummocks in wet tundra, mesic tundra; known only from a single location at Gaedtuk. R. Holarctic.

ONAGRACEAE

Chamerion angustifolium (L.) Holub. [= *Epilobium angustifolium* L.]. Low meadows (not reproductive). R. Holarctic.

Chamerion latifolium (L.) Holub. [= *Epilobium latifolium* L.]. Back dunes, creek beds. C. Holarctic.

Epilobium anagallidifolium Lam. Mesic tundra, stream margins. C. Holarctic.

Epilobium palustre L. Wet tundra; southeast of Gambell and southern side of the island. R. Holarctic.

OROBANCHACEAE

Pedicularis albolabiata (Hultén) Kozhevn. [= *Pedicularis sudetica* Willd. subsp. *albolabiata* Hultén]. Moist tundra (Kialegak). R. Asiatic-N. American.

Pedicularis capitata Adams. Mesic tundra, fellfield tundra. C. Asiatic-N. American.

Pedicularis interior (Hultén) Molau & D.F. Murray. [= *Pedicularis sudetica* Willd. subsp. *interior* Hultén and *Pedicularis sudetica* Willd. subsp. *interioides* Hultén]. Moist tundra. C. Asiatic-N. American.

Pedicularis lanata Willd. ex Cham. & Schltdl. [= *Pedicularis kanei* subsp. *kanei* Durand]. Fellfield tundra. C. Asiatic-N. American.

Pedicularis langsdorffii Fisch. ex Steven. subsp. *langsdorffii*. Mesic tundra. C. Beringian.

Pedicularis oederi Vahl. Mesic tundra. C. Holarctic.

Pedicularis pacifica (Hultén) Kozhevn. [= *Pedicularis sudetica* Willd. subsp. *pacifica* Hultén]. Moist tundra. O. Beringian.

Pedicularis pennellii Hultén. [= *Pedicularis parviflora* J.E. Sm. subsp. *pennellii* (Hultén) Hultén]. Wet tundra. C. Asiatic-N. American.

Pedicularis verticillata L. Backshores and mesic tundra toeslopes. C. Asiatic-N. American.

PAPAVERACEAE

Papaver gorodkovii Tolm. & V.V. Petrovsky. Rocky slopes; Kookooligit Mountains (two collections are known from St. Lawrence Island). R. **S2S3 G3**. Beringian.

Papaver hultenii Knaben. Rocky tundra. C. Beringian.

Papaver keelei A.E. Porsild. [= *Papaver macounii* Greene in part, sensu Hultén]. Rocky slopes, fellfield tundra. C. Beringian.

Papaver macounii Greene. Elven et al. (2011) and see Kiger and Murray (1997) recognize this as a taxon distinct from subsp. *discolor*, which is here treated as *Papaver keelei*. *Papaver macounii* is restricted to the Pribolof Islands and small areas of western Alaska. It is unclear if *Papaver macounii* s. stricto occurs on St. Lawrence as well. American Beringian.

PARNASSIACEAE

Parnassia kotzebuei Cham. ex Spreng. Mesic tundra and meadows. C. Asiatic-N. American.

PLANTAGINACEAE

Callitriche palustris L. [= *C. verna* L.]. Shallow pond margins, near Savoonga. R. Holarctic.

Hippuris lanceolata Retz. Tundra ponds. C. Holarctic.

Hippuris vulgaris L. Tundra ponds. C?. Material from St. Lawrence Island should be reviewed to confirm that both *H. lanceolata* and *H. vulgaris* occurs, as some taxonomic confusion of persists (see Elven et al. 2011). Holarctic.

Lagotis glauca Gaertn. Mesic tundra slopes. C. Asiatic-N. American.

PLUMBAGINACEAE

Armeria scabra Pall. ex Roem. & Schult. [= *Armeria maritima* (Mill.) Willd. subsp. *arctica* (Cham.) Hultén]. Provisionally accepted as a member of the flora of St. Lawrence, known from a single collection by O.W. Geist in 1933 (under the name *Armeria maritima*) and reported in Hultén (1948); the location may be mislabeled on the specimen as no plants have been observed since (Young, 1971). Tundra. R. Holarctic.

POACEAE

Alopecurus magellanicus Lam. [= *Alopecurus alpinus* subsp. *alpinus* Sm., *Alopecurus alpinus* Sm. subsp. *glaucus* (Less.) Hultén, and *Alopecurus alpinus* Sm. subsp. *stejnegeri* (Vasey) Hultén]. Mesic tundra. U. Holarctic.

Arctagrostis latifolia (R.Br.) Griseb. Mesic tundra; often dominant. C. Holarctic.

Arctophila fulva (Trin.) Andersson. Wet tundra and shallow ponds; locally dominant. C. Holarctic.

Arctopoa eminens (C. Presl) Prob. [= *Poa eminens* C. Presl]. Dunes, estuaries; Kangee Camp, Northeast Cape, and near Savoonga. R. Asiatic-N. American, maritime.

Calamagrostis canadensis (Michx.) Beauv. Mesic tundra; locally abundant in the southern portion of the island (Young, 1971). U. Holarctic.

Calamagrostis deschampsioides Trin. Shores, estuaries. R. Holarctic, maritime.

Calamagrostis neglecta (Ehrh.) Gaertn., Mey. & Schreb. subsp. *neglecta*. [= *Calamagrostis stricta* (Timm) Koeler]. Wet tundra, pond margins. U. Holarctic.

Deschampsia anadyrensis N.V. Vassil. [= *Deschampsia cespitosa* (L.) P. Beauv. subsp. *glauca* Hartm.]. Most collections from St. Lawrence Island are identified as *D. cespitosa* (L.) P. Beauv., a taxon that is regarded as not native to Alaska (Elven et al., 2011), and the plants from St. Lawrence appear to be *Deschampsia anadyrensis* and *Deschampsia sukatschewii* (Popl.) Roshev. Shores, moist gravel, slopes. U. Asiatic-N. American.

Deschampsia sukatschewii (Popl.) Roshev. subsp. *orientalis* (Hultén) Tzvelev. [= *Deschampsia cespitosa* (L.) P. Beauv. subsp. *orientalis* Hultén]. Dry to moist areas in tundra, rocky slopes. C. American Beringian.

Dupontia fisheri R. Br. Plants from St. Lawrence appear to include both "*fisheri*" and "*psilosantha*" forms. Wet tundra, pond margins. C. Holarctic.

Festuca altaica Trin. Dry stream beds, dry tundra; only collected twice (near Savoonga and Gaedtuk) on St. Lawrence. R. Asiatic-N. American.

Festuca brachyphylla Schult. Backshores, rocky alpine tundra. C. Holarctic.

Festuca rubra L. Well-drained substrates; collected by J.P. Anderson (1938) near Savoonga (Hultén 1941). R. Holarctic.

Hierochloë alpina (Sw.) Roem. & Schult. (Bigelow). Soreng. Mesic tundra slopes. C. Holarctic.

Hierochloë odorata (L.) Wahlenb. Meadows, rocky slopes; only known from St. Lawrence Island, from a single collection by O.W. Geist in 1933 (Arctos, 2013). R. Holarctic.

Hierochloë pauciflora R. Br. Moist tundra and pond margins. C. Asiatic-N. American.

Leymus mollis (Trin.) Pilg. subsp. *villosissimus* (Scribn.) Á. Löve. [= *Elymus arenarius* L. var. *villosissimus* (Scribn.) Hultén]. Foreshores, sandy beaches; locally abundant. C. Asiatic-N. American, maritime.

Phippsia algida (Sol.) R. Br. Bird cliffs, old village sites. C. Holarctic. The report of *Phippsia concinna* (Th. Fries) from a collection by Kjellman in 1879 on St. Lawrence Island (Hultén, 1950) is likely incorrect (see Young, 1971).

Poa arctica R. Br. subsp. *arctica*. Mesic tundra, alpine slopes. C. Holarctic.

Poa malacantha Kom. Rocky areas, mesic tundra. U. Beringian.

Poa paucispicula Scribn. & Merr. Dry tundra. C. Asiatic-N. American.

Poa pratensis L. subsp. *alpigena* (Lindm.) Hiitonen. [= *Poa alpigena* (E. Fries) Lindm.]. Well-watered slopes. U. Holarctic.

Puccinellia alaskana Scribn. & Merr. [= *Puccinellia langeana* (Berl.) Sørens. subsp. *alaskana* (Scribn. & Merr.) Sørens.]. Backshores, old village sites. U. Beringian.

Puccinellia tenella (Lange) Holmb. ex A.E. Porsild subsp. *tenella*. [= *Puccinellia langeana* (Berl.) Sørens. subsp. *asiatica* Sørens.]. Coastal meadows, estuaries, rocky areas. R. Asiatic-N. American.

Trisetum spicatum (L.) K. Richt. Rocky slopes, mesic and fellfield tundra. C. Holarctic.

POLEMONIACEAE

Polemonium acutiflorum Willd. Mesic tundra. C. Holarctic. Young (1971) reports only *Polemonium boreale* Adams as present on St. Lawrence Island, but notes taxonomic confusion and that this plant is equivalent to *P. acutiflorum* of Hultén.

POLYGONACEAE

Bistorta plumosa (Small) Greene. [= *Polygonum bistorta* L. subsp. *plumosum* (Small) Hultén.] Mesic tundra. R. Asiatic-N. American.

Bistorta vivipara (L.) Delarbre. [= *Polygonum viviparum* L.] Mesic tundra. C. Holarctic.

Koenigia islandica L. Pond edges, exposed mud. C. Holarctic.

Oxyria digyna (L.) Hill. Rocky, mesic tundra. C. Holarctic.

Rumex arcticus Trautv. Wet tundra. C. Holarctic.

Rumex krausei B. A. Jurtzev & V. V. Petrovsky. [= *R. graminifolius* Lamb. in

part, sensu Hultén.] A single collection on St. Lawrence Island from mesic tundra at Tapphok. R. **S2S3 G2**. Beringian.

Rumex pseudoxyria (Tolm.) [= *Rumex arcticus* Trautv. var. *perlatus* Hultén.] A few specimens have been collected around the upper Koozaata River and Savoonga. R. Asiatic-N. American.

POTAMOGETONACEAE

Potamogeton perfoliatus L. subsp. *richardsonii* (A. Benn.) Hultén. Ponds, and slow moving streams. Known from a single collection along the Koozaata River (Young, 1971). R. Holarctic.

Potamogeton subsibiricus Hagstr. Ponds, and slow moving streams. Known from a single collection of non-reproductive plants along the Koozaata River near Gaedtuk (Young, 1971). R. **S3S4 G3G4**. Asiatic-N. American.

Stuckenia vaginata (Turcz.) Holub. [= *Potamogeton vaginatus* Turcz.] Ponds, and slow moving streams. Known from a single collection along the Koozaata River near Gaedtuk (Young, 1971). R. Holarctic.

PRIMULACEAE

Androsace chamaejasme Wulfen subsp. *andersonii* (Hultén) Hultén. Mesic to dry and rocky tundra. C. Asiatic-N. American.

Douglasia ochotensis (Willd. ex Roem. & Schult.) Hultén. Rocky tundra, frost boils. C. Beringian.

Primula borealis Duby. Coastal meadows. C. Beringian, maritime.

Primula pumila (Ledeb.) Pax. [= *Primula tschuktschorum* Kjellm. var. *arctica* (Koidz.) Fern.] Wet tundra. C. Beringian.

Primula tschuktschorum Kjellm. [= *Primula tschuktschorum* Kjellm. var. *tschuktschorum*.] Wet tundra. U. **S3 G2G3**. Beringian.

RANUNCULACEAE

Aconitum delphinifolium DC. subsp. *delphinifolium* Mesic tundra, meadows. C. Asiatic-N. American.

Anemone sibirica L. [= *Anemone narcissiflora* L. subsp. *sibirica* (L.) Hultén]. Mesic tundra. C. Asiatic-N. American.

Anemone richardsonii Hook. Wet tundra, streambanks. C. Asiatic-N. American.

Caltha palustris L. subsp. *radicans* (T.F. Forst.) Syme. [= *Caltha palustris* L. subsp. *arctica* (R. Br.) Hultén.] Pond edges, streams, wet tundra. C. Holarctic.

Coptidium lapponicum (L.) Tzvelev. [= *Ranunculus lapponicus* L.] Moist tundra. R. Holarctic.

Coptidium pallasii (Schltdl.) Tzvelev. [= *Ranunculus pallasii* Schlect.] Shallow tundra ponds. U. Asiatic-N. American.

Delphinium chamissonis Pritz. ex Walp. [= *Delphinium brachycentrum* Ledeb.] Mesic tundra, rocky slopes; known from only a few collections: Kangee and Poovookpuk (Young, 1971). R. Asiatic-N. American.

Ranunculus arcticus Richardson [= *Ranunculus pedatifidus* Sm. subsp. *affinis* (R. Br.) Hultén]. Wet tundra; only known from one collection at Tapphok (Young, 1971). R. Holarctic.

Ranunculus camissonis Schltdl. [*Ranunculus glacialis* L. subsp. *chamissonis* (Schlect.) Hultén.] Mesic tundra slopes. U. **S3 GNR**. Beringian.

Ranunculus gmelinii DC. Mud, shallow ponds; only recorded from near Gaedtuk (Young, 1971). R. Holarctic.

Ranunculus hyperboreus Rottb. Mud, streams, shallow ponds. C. Holarctic.

Ranunculus nivalis L. Wet tundra slopes, stream banks. C. Holarctic.

Ranunculus pygmaeus Wahlenb. Snowbeds, moist exposed ground in tundra. C. Holarctic.

Ranunculus reptans L. Wet, muddy shores; known from a single collection at Gaedtuk (Young, 1971). R. Holarctic.

Ranunculus sulphureus Soland. Mesic, rocky slopes, snowbeds. U. Holarctic.

Ranunculus trichophyllus Chaix. Pools, lakes, slow-moving streams; on St. Lawrence this plant has been recorded from a single location (Gaedtuk) by Young (1971). R. Holarctic.

Ranunculus turneri Greene subsp. *turneri*. Mesic, rocky tundra, dry creek beds; only known from areas around Savoonga and Gaedtuk, but can be locally abundant. R. **S2 G5**. Beringian.

Thalictrum alpinum L. Mesic alpine tundra, streambanks. U. Holarctic.

ROSACEAE

Comarum palustre L. [= *Potentilla palustris* (L.) Scop.] Tundra ponds, wet tundra. U. Holarctic.

Dryas incisa Juz. [= *Dryas integrifolia* M. Vahl subsp. *integrifolia*.] Mesic tundra. C. Beringian.

Dryas integrifolia Vahl. Mesic to wet tundra. C. Asiatic-N. American.

Dryas punctata Juz. subsp. *alaskensis* (A.E. Porsild) Jurtz. [= *Dryas octopetala* L. subsp. *alaskensis* (Pors.) Hultén. Mesic tundra, snowbeds. U. Beringian.

Geum glaciale Adams ex Fisch. [= *Geum glaciale* Adams.] Moist alpine slopes, mesic tundra; common in Kookooligit Mountains. U. Asiatic-N. American.

Potentilla anserina L. subsp. *groenlandica* Tratt. [= *Potentilla egedii* Wormsk. subsp. *egedii* var. *groenlandica* (Tratt.) Polunin.] Tidal meadows, estuaries. U. Holarctic, maritime.

Potentilla elegans Cham. & Schltdl. Rocky, barren slopes; only recorded from near Boxer Bay (Young, 1971). R. Asiatic-N. American.

Potentilla fragiformis Willd. ex Schltdl. Backshores and coastal toeslope tundra; recorded from only around Gambell on St. Lawrence Island. R. **S1S2 G4**. Beringian.

Potentilla cf. gorodkovii Jurtsev.[= *Potentilla uniflora* Ledeb.] Specimens from St. Lawrence Island may conform to *Potentilla subgorodkovii* Jurtsev. Tundra slopes, fellfield tundra. U. Asiatic.

Potentilla hyparctica Malte. Tundra slopes, rocky outcrops, fellfield tundra. C. Holarctic.

Potentilla villosa Pall. ex Pursh. Backshores, mesic tundra slopes. C. Asiatic-N. American, maritime.

Rubus acaulis Michx. [= *Rubus arcticus* L. subsp. *acaulis* (Michx.) Focke.] Mesic tundra. C. N. American.

Rubus arcticus L. [= *Rubus arcticus* L. subsp. *arcticus*] Mesic tundra; locally abundant. C. Holarctic.

Rubus chamaemorus L. Moist peatland tundra; widely distributed on St. Lawrence, but never abundant. C. Holarctic.

Rubus stellatus Sm. [= *Rubus arcticus* L. subsp. *stellatus* (Sm.) Boiv. emend. Hultén.] Mesic tundra. C. Beringian.

RUBIACEAE

Galium trifidum L. subsp. *trifidum*. Known on St. Lawrence Island from a single collection in a muddy pool near Gaedtuk (Young, 1971). R. Holarctic.

SALICACEAE

Salix arctica Pall. Mesic tundra; locally dominant. C. Holarctic.

Salix chamissonis Andersson. Mesic tundra. U. Beringian.

Salix fuscescens Andersson. Wet tundra. C. Asiatic-N. American.

Salix ovalifolia Trautv. var. *cyclophylla* (Rydb.) C.R. Ball. [= *Salix cyclophylla* Rydb.] Backshores, sandy mesic tundra toeslopes. U. Beringian.

Salix ovalifolia Trautv. var. *ovalifolia*. Backshores, sandy mesic tundra toeslopes. C. Beringian.

Salix phlebophylla Andersson. Alpine tundra, fellfield tundra. C. Beringian.

Salix polaris Wahlenb. Mesic tundra, snowbeds. C. Holarctic.

Salix pulchra Cham. Wet tundra, stream margins. C. Asiatic-N. American.

Salix reticulata L. Mesic tundra slopes; locally dominant. C. Holarctic.

Salix rotundifolia Trautv. Mesic to fellfield tundra. C. Beringian.

SAXIFRAGACEAE

Chrysosplenium tetrandrum (N. Lund ex Malmgren) Th. Fr. Wet tundra, rivulets. C. Holarctic.

Chrysosplenium wrightii Franch. & Sav. Wet mineral soil in alpine tundra, calcareous substraits. U. Beringian.

Micranthes calycina (Sternb.) Gornall & H. Ohba. [= *Saxifraga unalaschcensis* Sternb.] Moist, gravel slopes, Kookooligit Mountains. U. Beringian.

Micranthes foliolosa (R. Br.) Gornall. [= *Saxifraga foliolosa* R. Br.] Wet tundra. U. Holarctic.

Micranthes hieraciifolia (Waldst. & Kit. ex Willd.) Haw. subsp. *longifolia* (Engl. & Irmsch.) Elven & D.F. Murray. [= *Saxifraga hieracifolia* Waldst. & Kit.] Moist tundra. C. Beringian.

Micranthes nelsoniana (D. Don) Small subsp. *insularis* (Hultén) Elven & D.F. Murray. [= *Saxifraga punctata* L. subsp. *insularis* Hultén.] Mesic meadows; recorded on St. Lawrence Island from a single specimen from Gambell. R. **S2 GNRTNR**. Beringian/Aleutian.

Micranthes nelsoniana (D. Don) Small subsp. *nelsoniana*. [= *Saxifraga punctata* L. subsp. *nelsoniana* (D. Don) Hultén.] Mesic tundra slopes, stream banks. C. Asiatic-N. American.

Micranthes nivalis (L.) Small. [= *Saxifraga nivlais* L.] Recorded from a single collection by Chambers from 1931 (Hultén, 1944); a questionable record. R? Holarctic.

Micranthes nudicaulis (D. Don) Gornall & H. Ohba. subsp. *nudicaulis*. [= *Saxifraga nudicaulus* D. Don. Wet tundra. C. **S3 G3G4Q**. Beringian.

Micranthes spicata (D. Don) Small. [= *Saxifraga spicata* D. Don.] Only known from an eroding lake shore near Kialegak on St. Lawrence Island (Young, 1971). R. American Beringian.

Micranthes unalaschensis (Sternb.) Gornall & H. Ohba. [= *Saxifraga unalaschcensis* Sternb.] Rocky slopes. R. Beringian.

Saxifraga bracteata D. Don. Cliffs, moist upper dunes. C. Beringian, maritime.

Saxifraga cernua L. Wet tundra. C. Holarctic.

Saxifraga cespitosa L. Only known from a single record of Chamisso (1826-1836) and attribution to subspecies (subsp. *cespitosa* or subsp. *monticola* (Small) A.E. Porsild) is not possible; the presence of this plant on St. Lawrence Island is questionable. Moist mineral soil in tundra. R? Holarctic.

Saxifraga eschscholtzii Sternb. Rock crevices. R. Beringian.

Saxifraga funstonii (Small) Fedde. *Saxifraga bronchialis* (L.) subsp. *funstonii* (Small) Hultén.] Rocky ground. C. Asiatic-N. American.

Saxifraga hirculus L. subsp. *propinqua* (R. Br.) Á. Löve & D. Löve. Wet tundra. C. Asiatic-N. American.

Saxifraga oppositifolia L. subsp. *smalliana* (Engl. & Irmsch.) Hultén. Talus slopes; recorded from only two locations in glacial cirques near Boxer Bay on St. Lawrence Island. R. Holarctic.

Saxifraga rivularis L. (presumably subsp. *arctolitoralis* (Jurtzev & V.V. Petrovsky) M.H. Jørgensen & Elven). Mesic tundra, moist mineral soil. U. **S2 G5T2T3**. N. American.

Saxifraga setigera Pursh. [= *Saxifraga flagellaris* Willd. subsp. *setigera* (Pursh) Tolm.] Wet tundra, frost boils, moist mineral soil; north central St. Lawrence Island. R. Asiatic-N. American.

SPARGANIACEAE

Sparganium hyperboreum Laest. ex Beurl. Shallow ponds, slow-moving streams. R. Holarctic.

VALERIANACEAE

Valeriana capitata Pall. ex Link. Mesic tundra meadows. C. Asiatic-N. American.

VIOLACEAE

Viola biflora L. subsp. *biflora*. Mesic tundra meadows, central areas of St. Lawrence Island. R. Holarctic (though its distribution is spotty in N. America east of Alaska).

Viola epipsila Ledeb. subsp. *repens* (Turcz. ex Trautv. & C.A. Mey.) W. Becker. Moist tundra, streambanks. R. Holarctic.

WOODSIACEAE

Cystopteris fragilis (L.) Bernh. Rocky outcrops, crevices; only known from two areas on St. Lawrence Island: a talus slope adjacent to the Boxer River and a limestone outcrop inland from Kangee Camp. R. Holarctic.