macphail ecological woods forestry project

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STEWARDING COASTAL KRUMMHOLZING HABITATS

A PEI Forested Landscape Priority Place Project

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Environment and Climate Change Canada
Environnement et Changement climatique Canada

Prince Edward Island CANADA

Canada

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The Krummholz Project began in the winter of 2021, and has been gradually growing in scope, scale and reach. There are many organizations and individuals, both near and far, who have provided an amazing amount of support for this project.

Thank you to both the Provincial Government of PEI and Federal Government of Canada, who's funding through the Forested Land Priority Places for Species at Risk Program made this project possible!

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Thank you to Lennox Island First Nation for their assistance and permission in visiting and exploring Pituamkek and Lennox Island. It was a magical experience each visit and such amazing sites to study.

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Thank you to my partner, Mille, for her patience and support with many long days of field and office work and a big thank you to my son, Henry, who helped on several field excursions.

THE KRUMMHOLZ PROJECT

Fieldwork along the Clearspring Cliffs

The Krummholz project was initially inspired by the aftermath of Hurricane Dorian, which landed on PEI September 7th, 2019. Macphail Woods co-director, Gary Schneider, was called to consult on the overwhelming blowdown amongst the aging white spruce at Cavendish campground. Upon assessment, Gary noticed that the gnarled wind-shaped spruce growing adjacent to the campground fared through the high-wind event with minimal damage. Our perspective on these unique **krummholz habitats** shifted, looking past their deformities to truly appreciate their integral and resilient role in our Island's ecological communities, protecting our shores and inland forests.

The first study, ***Exploring the Importance of Krummholz Forests***, took place between January-March 2021. With lots of long winter drives, this study focused on surveying shores across the Island in search of wind-blown coastal habitats. This resulted in the selection of eight sites for deeper study, as well as a host of other potential sites. A variety of data was collected across the study sites over the winter, and an ecological assessment rubric began to develop.

The second study, ***Increasing our Awareness of Krummholz Forests***, ran from March 2021-March 2022. It saw the addition of five new sites, including Pituamkek, for a total of 13 sites across the province. Sites were chosen to represent the diversity of coastal habitats found in PEI. From cliffs to dunes to salt marshes, our Provincial coastlines have been heavily shaped by a number of natural, historic and present-day forces, resulting in a large variance across these priority places. This study focused on understanding the floral and faunal communities that coalesce into the diverse array of krummholzing habitats found on our Island. It also included coastal species seed collection and propagation of a number of integral krummholzing native species.

The 2022-23 season of krummholz research, ***Continuing Krummholz Preservation and Restoration***, aimed to build off the previous studies, continuing a number of the same activities such as ecological assessment, biodiversity surveys and seed collection. Several new goals were added as well, which were focused on understanding natural krummholz succession and distribution, on-site restoration, and community outreach to raise awareness about these important habitats. In late August, there was a field trip to northern Cape Breton to investigate several krummholzing coastal sites. Hurricane Fiona arrived September 23rd, causing Island-wide damage resulting in power-loss, blocked roads, coastal flooding & erosion as well as large-scale blowdown in many Island forests. Although initially seen as a set-back, cancelling restoration plantings, Fiona was eventually viewed as an incredible learning opportunity. The results of this post-hurricane assessment were surprising. Most of the krummholz habitats, not only survived the storm, but came through with much less damage compared to more inland sites.

All past reports are available on the Macphail Woods website.

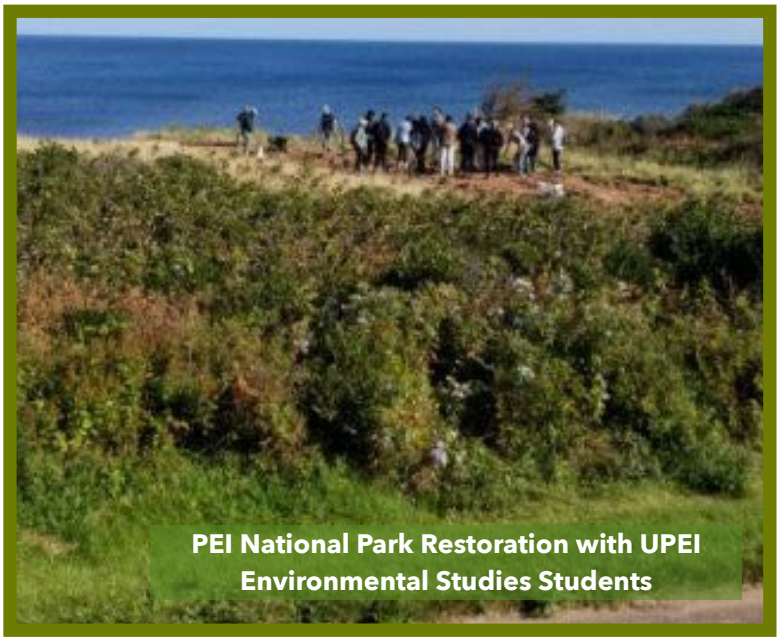
2023-24 SEASON

Staggered Krummholzing White Spruce, Oceanview, PEI National Park

The 2023-24 season of the project, **Stewarding Coastal Krummholzing Habitats**, was heavily focused on **ecological restoration**, partnering with the PEI National Parks and the INT to re-wild five sites with native krummholz species. The specimens used were grown at the Macphail Woods Native Plant Nursery, some from seeds and cuttings collected during previous seasons of the Krummholz Project. Restoration across the PEI National Park was focused on recently decommissioned sites, while the INT site, the Perret-Mackinnon Natural Area, was an old-field already developing into a krummholzing habitat. Due to a number of restoration initiatives, as well as growing regional need for native plant specimens, restoration activities were limited in stock and species selection, with no specimens available from the Provincial Nursery.

Education and outreach efforts about these unique and important Island habitats also continued. This year included a number of talks, walks, presentations, news media interviews, as well as volunteer opportunities incorporated into restorative aspects of the project. Classes from the UPEI Environmental Studies Department, Gulf Shore Consolidated School as well as INT Conservation Guardians, were all involved in restoration efforts, providing hands-on experiential learning as well as a great day outside!

Seed collection and krummholz species propagation continued this season, with a number of rare and native species collected, including seaside sand-mat, juniper cuttings, bayberry seed, and more. Due to the huge demand for native species for restoration, a greater focus was put on propagating more specimens for future site enhancements. Propagation and plant care was done by the staff at the Macphail Woods Native Plant Nursery, who nurtured many new specimens for future 2024-25 planting seasons.



PEI National Park Restoration with UPEI Environmental Studies Students

Although **research and assessment** were not an official component of this year's efforts, the previously developed, simple assessment template, facilitates easy and efficient data collection. New krummholz site data was collected at new relevant areas while collecting seed, surveying for other projects and during the lead researcher's family outings.

RESTORATION ACTIVITIES

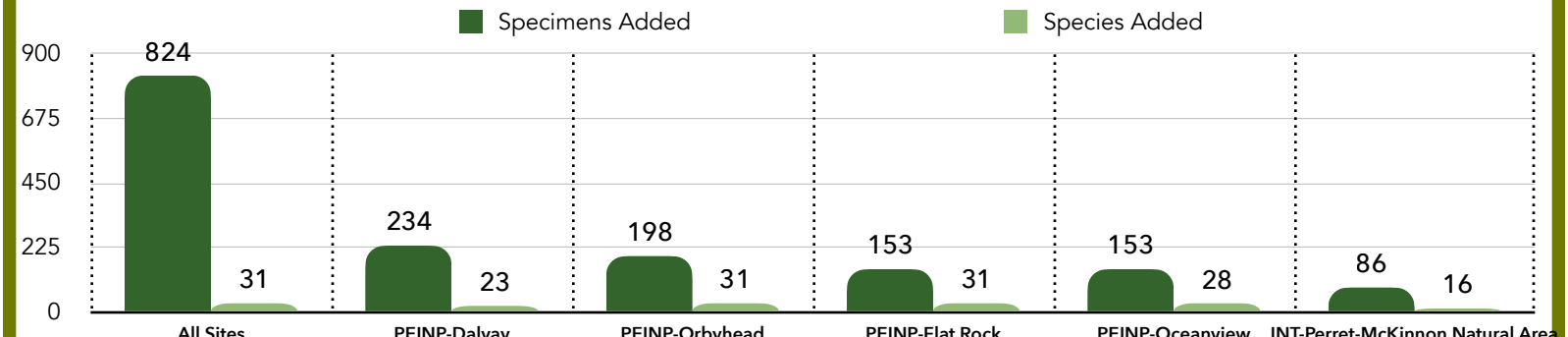
Oceanview Restoration Plantings, PEI National Park

PEI's shorelines are all prone to a number of strong coastal forces, particularly in areas along our windy krummholz zone. Many of PEI's diverse coastal habitats have seen substantial ecological disturbances over the last 200 years, including farming, harvesting, industry and tourism. This has left our coasts extremely vulnerable to storm events, as seen in the aftermath of Fiona. Many of our coastal areas also experience consistent and constant erosional issues due to strong winds and waves. Past and on-going coastal development has fragmented our coastal habitats, reducing their ecological resiliency to natural forces and high-wind events, both of which are intensifying due to climate change.

Restoration sites were chosen to address these threats and issues, as well as to learn more about restoring heavily damaged krummholz sites. After Fiona, the PEI National Parks decided to decommission a variety of cliff sites, establishing new krummholz and re-connecting fragmented habitats. The Island Nature Trust site provide the opportunity to learn more about enhancing a naturally recovering krummholz, as a number of typical species and specimens were already present despite the sites heavy agricultural history.

Several different restoration strategies were enacted across various sites so that results could be gathered through on-going monitoring; aiming to improve coastal restoration techniques. Sites were planted at different times during the year, at different levels of density and distribution, as well as with and without the addition of wind-barriers to protect specimens. A number of rare krummholzing species were added to all sites, as well as some trial species, not often associated with Island coasts, such as male fern, herb Robert and bush honeysuckle.

As mentioned, whenever possible, restoration efforts were used as outreach and educational events to allow students and the local community the chance to protect, learn and love these wonderful habitats.



OUTREACH & EDUCATION

Passport to Nature, Krummholz Walk at East Point, 2023

Over the course of the Krummholz project, the profile of these habitats has grown immensely. Starting with local CBC coverage in July of 2022, it was the famous Post-Tropical Storm Fiona in September of 2022 which truly ignited interest. This has resulted in numerous and on-going requests for presentations, courses, consultation, guided walks as well as more media coverage.

Media Coverage:

- CBC PEI (online, print, television) - ***https://www.cbc.ca/news/canada/prince-edward-island/pei-krummholz-research-coastal-shoreline-erosion-1.6514595***
- CBC National Radio Show - *What on Earth:* ***https://www.cbc.ca/radio/whatonearth/point-deroche-seawall-shoreline-erosion-1.6817307***
- PEI Museums Podcast - *The Hidden Island*, Co-host - *Season 4, Episode 4: Fiona, Climate Change, and Natural Disasters on PEI*

Continents in Miniature, Multimedia Installation, Art-in-the-Open, 2023

Education and Outreach

- Environmental Coalition of PEI, AGM - Guest Presenter
- Nature PEI, Monthly Meeting - Guest Presenter
- Souris Wildlife Federation, Guest Presenter
- Post-Fiona Conference - - Guest Presenter
- INT Passport to Nature - 2 Walks
- PEI Museums & Heritage Foundation, AGM - Guest Presenter
- Wheatley River Watershed, AGM - Guest Presenter
- Haviland Club, Weekly Speaker Series - Guest Presenter
- Three-Hour Class for UPEI Climate Lab Students
- Consultation with Local & Regional Parks Canada on Coastal Restoration & Krummholzing Habitat
- Consultation on Art Project for 2023 Art-in-the-Open
- Krummholz Presentation, Festival of Forests 2023
- Montague Community College - 1 class
- Consultation with numerous private land owners on shoreline restoration
- Consultation with PEI Provincial Parks on Coastal Ecology - 4 Parks
- Planned Coastal Restoration Course for PEI Watershed Alliance

Krummholz aren't a specific species of plant; they're more like a selection of trees and shrubs that grow on coastal, windswept areas like much of P.E.I.

Instead of deflecting erosion like a more traditional seawall would do, a natural, living shoreline made of *krummholz* can diffuse the wind, McRae said.

"They end up protecting both the shoreline erosion as well as the inland forest behind them," he said.

CBC National Radio, *What on Earth*, May 14, 2023

Daniel McRae with the Macphail Woods Ecological Forestry Project points to hardy plants known as krummholz. Instead of deflecting erosion, a natural, 'living shoreline' made of krummholz can diffuse the wind, he says. (Shane Hennessey/CBC)

Living shorelines happen naturally, but they can also be encouraged or helped along by humans. McRae said he thinks reforesting the shoreline near or around Point Deroche can help mitigate the erosion that's already occurred.

SEED COLLECTION & PROPAGATION


Greenhouse, Macphail Woods Native Plant Nursery

As mentioned, coastal native species seed collection and propagation has been an ongoing activity over the last two years of the krummholz project. In addition to gathering wild seed, other propagation strategies were used, such as cuttings, both root and stem, as well as transplanting. Stock was gathered responsibly and thoughtfully, with close attention to appropriate and sustainable methodologies to ensure causing harm or long-lasting effects to wild populations would be avoided.

Growing plants from seed can be a long and slow process, although Macphail Woods Nursery Manager, Becky Byrne, has been specializing in native species propagation for over 15 years. Many of our native coastal plants are species that the Macphail Woods nursery has been propagating for decades, using tried and tested methods with high-success rates. Many of the rarer and specialist coastal species are new additions at the nursery, often with little available information on reliable propagation methods. For these species, any available research, as well as Nursery staff expertise and experience was used to develop methodologies hypothesized to have the highest success rates. Depending on the species, differing strategies were employed including various methods of stratification, soil mixtures, watering routines and collection methods. Some species germinate easily and quickly, while other seeds have a longer or specialized process to weaken the seed coating. Some species have other needs, such as sandier soils or more water. Post-germination care was also strategized, with special consideration to specimen conditioning. The greenhouse at Macphail Woods was integral in speeding up propagation. However if these specimens were to survive in harsh coastal winds, then some time to condition and grow outside would be needed as well. Despite this typically being a multi-year process, from seed to restoration specimen, some young plants were used in restoration work to test how well these unconditioned specimens could adapt to windy coastal habitats.


Pink Crowberries

The species list on the following page includes all the krummholz and coastal forest species under propagation at the Macphail Woods Nursery. Additional native species were also collected, where appropriate, and transplanted into the Macphail Woods Arboretum. With no seed produced or found yet, these species are not included on the following list.

SPECIES UNDER PROPAGATION

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
CONIFEROUS TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Eastern White Cedar	*Cupressaceae*	*Thuja occidentalis*	S3S4
Balsam Fir	*Pinaceae*	*Abies balsamea*	S5
Tamarack	*Pinaceae*	*Larix laricina*	S5
White Spruce	*Pinaceae*	*Picea glauca*	S5
Black Spruce	*Pinaceae*	*Picea mariana*	S5
Red Pine	*Pinaceae*	*Pinus resinosa*	S2
Eastern White Pine	*Pinaceae*	*Pinus strobus*	S3S4
DECIDUOUS TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Paper Birch	*Betulaceae*	*Betula papyrifera*	S5
Gray Birch	*Betulaceae*	*Betula populifolia*	S5
Northern Red Oak	*Fagaceae*	*Quercus rubra*	S3S4
White Ash	*Oleaceae*	*Fraxinus americana*	S2S3
Pin Cherry	*Rosaceae*	*Prunus pensylvanica*	S5
American Mountain Ash	*Rosaceae*	*Sorbus americana*	S5
Balsam Poplar	*Salicaceae*	*Populus balsamifera*	S3
Trembling Aspen	*Salicaceae*	*Populus tremuloides*	S5
Red Maple	*Sapindaceae*	*Acer rubrum*	S5
Sugar Maple	*Sapindaceae*	*Acer saccharum*	S4
SHRUBS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Staghorn Sumac	*Anacardiaceae*	*Rhus typhina*	S3
Mountain Holly	*Aquifoliaceae*	*Ilex mucronata*	S5
Common Winterberry	*Aquifoliaceae*	*Ilex verticillata*	S5
Speckled Alder	*Betulaceae*	*Alnus incana*	S5
Beaked Hazel	*Betulaceae*	*Corylus cornuta*	S5
Canada Fly Honeysuckle	*Caprifoliaceae*	*Lonicera canadensis*	S5
Pinebarren Golden Heather	*Cistaceae*	*Hudsonia ericoides*	S2
Woolly Beach-heath	*Cistaceae*	*Hudsonia tomentosa*	S3
Alternate-leaved Dogwood	*Cornaceae*	*Cornus alternifolia*	S4
Red Osier Dogwood	*Cornaceae*	*Cornus sericea*	S5
Common Juniper	*Cupressaceae*	*Juniperus communis*	S3
Creeping Juniper	*Cupressaceae*	*Juniperus horizontalis*	S2S3
Common Bearberry	*Ericaceae*	*Arctostaphylos uva-ursi*	S3
Pink Crowberry	*Ericaceae*	*Empetrum eamesii*	S2S3
Black Crowberry	*Ericaceae*	*Empetrum nigrum*	S3
Black Huckleberry	*Ericaceae*	*Gaylussacia baccata*	S4S5
Skunk Currant	*Grossulariaceae*	*Ribes glandulosum*	S5
Smooth Gooseberry	*Grossulariaceae*	*Ribes hirtellum*	S5
Sweet-fern	*Myricaceae*	*Comptonia peregrina*	S4
Northern Bayberry	*Myricaceae*	*Morella pensylvanica*	S5
Sweet Gale	*Myricaceae*	*Myrica gale*	S5
Serviceberry	*Rosaceae*	*Amelanchier sp*	N/A
Black Chokeberry	*Rosaceae*	*Aronia melanocarpa*	S4S5
Chokecherry	*Rosaceae*	*Prunus virginiana*	S5

SPECIES UNDER PROPAGATION

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Virginia Rose	*Rosaceae*	*Rosa virginiana*	S5
Cloudberry	*Rosaceae*	*Rubus chamaemorus*	S3
White Meadowsweet	*Rosaceae*	*Spiraea alba*	S5
Willow	*Salicaceae*	*Salix spp.*	N/A
Canada Yew	*Taxaceae*	*Taxus canadensis*	S4
Red Elderberry	*Viburnaceae*	*Sambucus racemosa*	S5
Northern Wild Raisin	*Viburnaceae*	*Viburnum cassinoides*	S5
Highbush Cranberry	*Viburnaceae*	*Viburnum opulus*	S3
WILDFLOWERS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Wild Sarsaparilla	*Araliaceae*	*Aralia nudicaulis*	S5
Wild Lily-of-The-Valley	*Asparagaceae*	*Maianthemum canadense*	S5
Starry False Solomon's Seal	*Asparagaceae*	*Maianthemum stellatum*	S3
Common Ragweed	*Asteraceae*	*Ambrosia artemisiifolia*	S4
Pearly Everlasting	*Asteraceae*	*Anaphalis margaritacea*	S5
Grass-leaved Goldenrod	*Asteraceae*	*Euthamia graminifolia*	S5
Spotted Joe Pye Weed	*Asteraceae*	*Eutrochium maculatum*	S5
Cut-Leaved Coneflower	*Asteraceae*	*Rudbeckia laciniata*	S2
White Goldenrod	*Asteraceae*	*Solidago bicolor*	S4
Canada Goldenrod	*Asteraceae*	*Solidago canadensis*	S5
Rough-stemmed Goldenrod	*Asteraceae*	*Solidago rugosa*	S5
Seaside Goldenrod	*Asteraceae*	*Solidago sempervirens*	S4S5
Calico Aster	*Asteraceae*	*Symphyotrichum lateriflorum*	S5
New York Aster	*Asteraceae*	*Symphyotrichum novi-belgii*	S5
Rough Cocklebur	*Asteraceae*	*Xanthium strumarium*	S4
Spotted Jewelweed	*Balsaminaceae*	*Impatiens capensis*	S5
American Searocket	*Brassicaceae*	*Cakile edentula*	S4S5
Twinflower	*Caprifoliaceae*	*Linnaea borealis*	S5
Bunchberry	*Cornaceae*	*Cornus canadensis*	S5
Round-leaved Sundew	*Droseraceae*	*Drosera rotundifolia*	S4
Large Cranberry	*Ericaceae*	*Vaccinium macrocarpon*	S4S5
Mountain Cranberry	*Ericaceae*	*Vaccinium vitis-idaea*	S3
Seaside Spurge	*Euphorbiaceae*	*Euphorbia polygonifolia*	S2S3
Beach Pea	*Fabaceae*	*Lathyrus japonicus*	S4S5
Herb Robert	*Geraniaceae*	*Geranium robertianum*	S4
Harlequin Blue Flag	*Iridaceae*	*Iris versicolor*	S5
Mountain Blue-eyed-grass	*Iridaceae*	*Sisyrinchium montanum*	S5
Canada Germander	*Lamiaceae*	*Teucrium canadense*	S3S4
Yellow Bluebead Lily	*Liliaceae*	*Clintonia borealis*	S5
Small Enchanter's Nightshade	*Onagraceae*	*Circaea alpina*	S5
Seaside Plantain	*Plantaginaceae*	*Plantago maritima*	S4S5
Sea Lavender	*Plumbaginaceae*	*Limonium carolinianum*	S4S5
American Beach Grass	*Poaceae*	*Calamagrostis breviligulata*	S4S5
Smooth Cordgrass	*Poaceae*	*Sporobolus alterniflorus*	S4S5
Prairie Cordgrass	*Poaceae*	*Sporobolus michauxianus*	S5
Tierra del Fuego Dock	*Polygonaceae*	*Rumex fueginus*	S4
Northern Starflower	*Primulaceae*	*Lysimachia borealis*	S5

SPECIES UNDER PROPAGATION

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Red Baneberry	*Ranunculaceae*	*Actaea rubra*	S4
Yellow Marsh Marigold	*Ranunculaceae*	*Caltha palustris*	S4S5
Three-toothed Cinquefoil	*Rosaceae*	*Sibbaldia tridentata*	S3
Partridgeberry	*Rubiaceae*	*Mitchella repens*	S2S3
FERNS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Mountain Wood Fern	*Dryopteridaceae*	*Dryopteris campyloptera*	S4
Spinulose Wood Fern	*Dryopteridaceae*	*Dryopteris carthusiana*	S4S5
Crested Wood Fern	*Dryopteridaceae*	*Dryopteris cristata*	S5
Evergreen Wood Fern	*Dryopteridaceae*	*Dryopteris intermedia*	S5
Christmas Fern	*Dryopteridaceae*	*Polystichum acrostichoides*	S2S3
Ostrich Fern	*Onocleaceae*	*Matteuccia struthiopteris*	S4
Sensitive Fern	*Onocleaceae*	*Onoclea sensibilis*	S5
Interrupted Fern	*Osmundaceae*	*Claytosmunda claytoniana*	S5
Royal Fern	*Osmundaceae*	*Osmunda regalis var. spectabilis*	S4
Cinnamon Fern	*Osmundaceae*	*Osmundastrum cinnamomeum*	S5

Collecting Black Crowberries

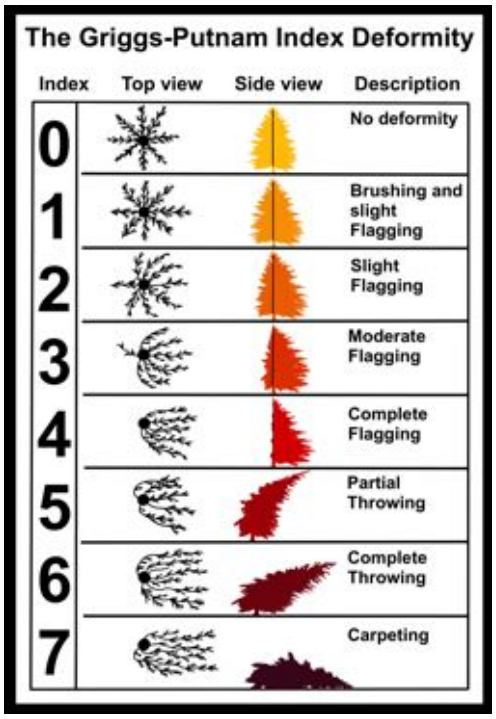
Juniper Berries are hard to propagate but this genus seems to respond well to stem (branch) cuttings.

a diversity of methods for a diversity of species!

ISLAND COASTAL FORESTED HABITATS

Wind-blown *"Carpeting"* White Spruce, Primary Krummholzing Cliff Coast-Top Zone, Crooked River

As discussed in previous reports, PEI is a windy province with coastlines under strong consistent winds as well as a history of high-wind events, worsening with climate change. The *krummholz-effect,* as displayed in the Griggs-Putnam index on the right, can be seen across the province. Forest edges exposed to open agricultural lands, urban trees which grow taller than adjacent roof tops, and many others areas can display minor krummholz deformation. Despite these wind-based effects, these inland habitats are not constantly defined by the wind's effects.



Our high-wind coastal areas display the greatest levels of krummholzing deformity, truly creating **Krummholzing habitats**. Due to interactions between local geology and coastal forces, PEI has a number of different types of coastlines, from dunes and salt marshes to cliffs and bluffs. Local wind and soil patterns as well as coastal exposure dictate the intensity of the krummholz effect. In more sheltered areas, often protected by krummholzing habitats, **Coastal Forests** grow, still heavily influenced by marine winds and other forces.

Although many areas of PEI have not been adequately explored and assessed, with many questions still to answer, a clearer picture of the types, varieties and distribution of our Coastal Forests and Krummholz is taking shape.

DEFINING COASTAL HABITATS

Riparian Zone in a Primary Krummholzing Cliff Coastal Forest Zone with Rare Cut-leaf Coneflower

The following proposed categories and analysis were created with the goals of improving the efficiency and effectiveness of current and future coastal restoration. Building upon assessment data and field observations from previous project seasons, the following ecological framework and techniques have been used in all restoration efforts across the Krummholz Project, as well as in a number of other ecological consulting, planning and restoration projects at Macphail Woods. Despite this, it is acknowledged that these are prototypes, in need of further study across more Island sites, continued monitoring of coastal restoration efforts, as well as consultation with local partners and experts.

While our windiest habitats, growing along our **Provincial Krummholz Zones**, endure exposed areas of high mean annual winds, display pronounced deformation, distributions and species compositions, other coastal and near-coastal sites are still poorly understood. To better describe and understand the severity of the krummholz effect across our coasts, as well as the resulting habitat qualities which can result, a **Krummholz Categorization system** was developed during the 2023 field season. It groups our habitats growing in coastal-influenced areas across five categories aimed at describing the severity of coastal effects.

Although there is still much to learn and some areas not yet visited, highly-krummholzing areas have been better studied over the course of this project, resulting in better results and understanding across these categories. Other coastal forests, growing in less exposed and/or windy areas (ex: interior to krummholzing areas, semi-exposed coasts, river estuaries, sandhill shielded coasts, calmer southern shores) are still poorly understood. Not only have they been less studied, but there are fewer healthy sites, as these areas were often prone to agriculture and development. Historical records, as well as the few lesser-disturbed field sites, such as the Pituamkek Forest and the Canavoy Oaks, suggest that our coastal forest habitats can support a surprising selection and variety of native flora and fauna.

It is likely that many sites categorized as *Tertiary Krummholz or Inland* could all be classified as Coastal Forests. Deciding on these kinds of definitions would require more study as well as consultation with local partners and experts. Despite these limitations, the krummholz categories have still proven to be a useful shorthand for assessment and restoration efforts.

KRUMMHOLZ CATEGORIES

Primary krummholz are the typical growth-form that comes to mind when the word krummholz is mentioned, or search for on the internet. These highly-exposed coasts are often found along our northern shores, growing along wind-blown cliffs or dunes. These areas are characterized by high levels of specimen deformity, they are the only category of krummholz that displays *carpeting* growth-patterns. The intense winds in these habitats can result in long swathes of krummholzing flora, creating gradually sloping forests for tens to hundreds of meters inland. This krummholz type is home to a number of rare and native specialist species and plays a crucial role in slowing erosion, protecting inland habitats and providing habitat to many migrating species.

Secondary krummholz can display the moderate to high levels of krummholz deformity, although never as dense and never *carpeting*, and often not growing very far inland. Although moderately high-wind areas, secondary krummholz growing conditions are often just as influenced by their soil properties as the wind, such as at Basinhead's famous dunes. With slower average winds than primary krummholz, it is often only highly-exposed specimens growing in close proximity to the coast which will showcase high levels of krummholz deformity. Trees located just tens of meters inland often grow more typically. The photo above is from Cedar Dunes Park, showcasing moderate deformity near shore, quickly giving way to minor deformation just inland.

Tertiary krummholz are harder to define. Although initially observed growing along calmer southern sites like those located in Enmore. These typically low-plain shore krummholz often grow along exposed areas with lower average winds, resulting in minor levels of krummholz formation. Other sites like Pituamkek Forest, displays predominantly large-scale shaping of the upper-canopy of typical Upland Hardwood species, despite growing in stronger winds. Despite these differences, tertiary krummholz are coastal-exposed forests that display minor to moderate deformation, only in close proximity to the shore. This type might also be connected to krummholz successional patterns as well as disturbance history. This group may be better categorized with Coastal Forests.

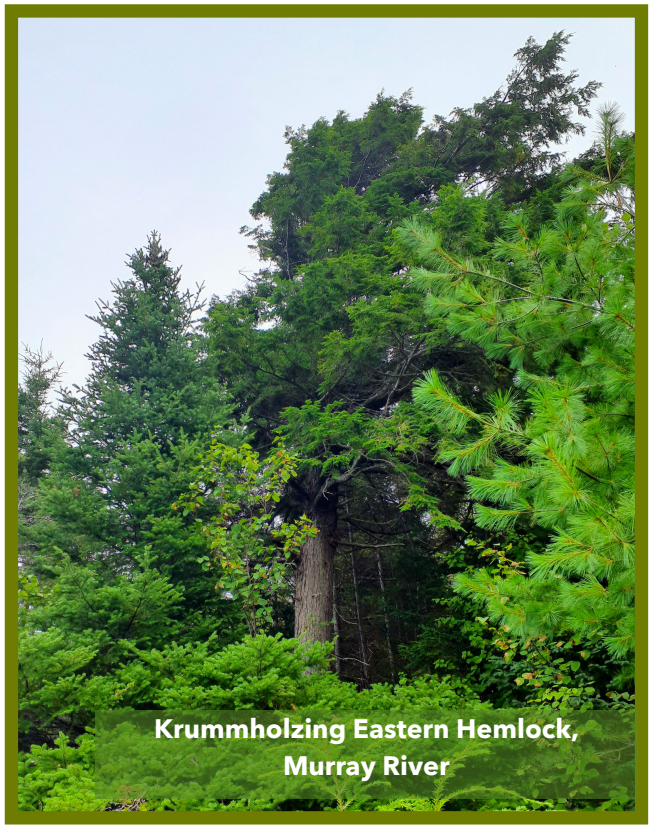
KRUMMHOLZ CATEGORIES

Poorly understood and studied, with few undisturbed sites left on PEI, this category is in need of further assessment and research across more sites. Our Coastal Forests can have incredible biodiversity, based on several studied sites as well as historical records, even growing species not often associated with close coastal proximity. This category is generally found growing just inland from high-wind coasts and able to diversify and grow more typically due to the wind-shadow of coast-side krummholzing habitats. Species composition, shaping and distribution in PEI's Coastal Forests are thought to be highly linked to maturity and ecological succession. Our coastal forests are able to grow biodiverse forests with many deciduous species, much closer to windy coasts then present commonly across our shores.

Sites categorized as Inland were not targeted as part of the project, but visited during other fieldwork. Whenever coastal-influence and minor krummholzing effects were seen across these sites, the simple assessment rubric and diversity data was gathered. Some surprising discoveries were found by accident in this manner, even a krummholzing eastern hemlock growing along the Murray River. Due to varying levels of wind-resistance amongst our native species, some can display krummholzing effects in very odd places, if local conditions are just right.

While exposed to some wind and most likely substantial salt, this category, while neither a krummholz or associated coastal forest, was nonetheless heavily influenced by marine forces. Many coastal species of native flora were found during fieldwork as well as some rare species. In particularly-cleared areas of the Province, even Inland sites can display heavier krummholzing effects, again relating to landscape ecology and natural succession.

These forests were separated from the previous category due to their place away from the worst coastal winds, despite obvious wind-based and coastal influence. Sites of this category can be found along our salty river estuaries and along exposed riparian sites, such as Brudenell Park.



Krummholzing Eastern Hemlock, Murray River

COASTAL TYPES

CLIFF & BLUFF KRUMMHOLZ

Our cliff and bluff coasts share a number of similarities when growing along high-wind areas. Often elevated above the waves, these sites are less prone to coastal flooding but are more exposed to stronger winds. These areas are the only krummholzing sites in which *carpeting* specimens have been found and have a high-association with primary krummholz. This coastal type shares the strongest resemblance to Cape Breton's coastal barrens and krummholz. It is also home to a number of krummholz specialist species such as our native crowberries and junipers. These sites tend to have vast krummholz, stretching far inland, especially when young. Vegetation along these coasts play a critical role in slowing erosion and protecting inland habitats. Our Island cliffs were often heavily farmed, removing the original coastal forests. Windy cliffs are often predominantly coniferous, although this is likely connected to local seed sources. Historical records suggest these areas once supported predominantly deciduous coastal forests shielded by impenetrable coniferous thicket.

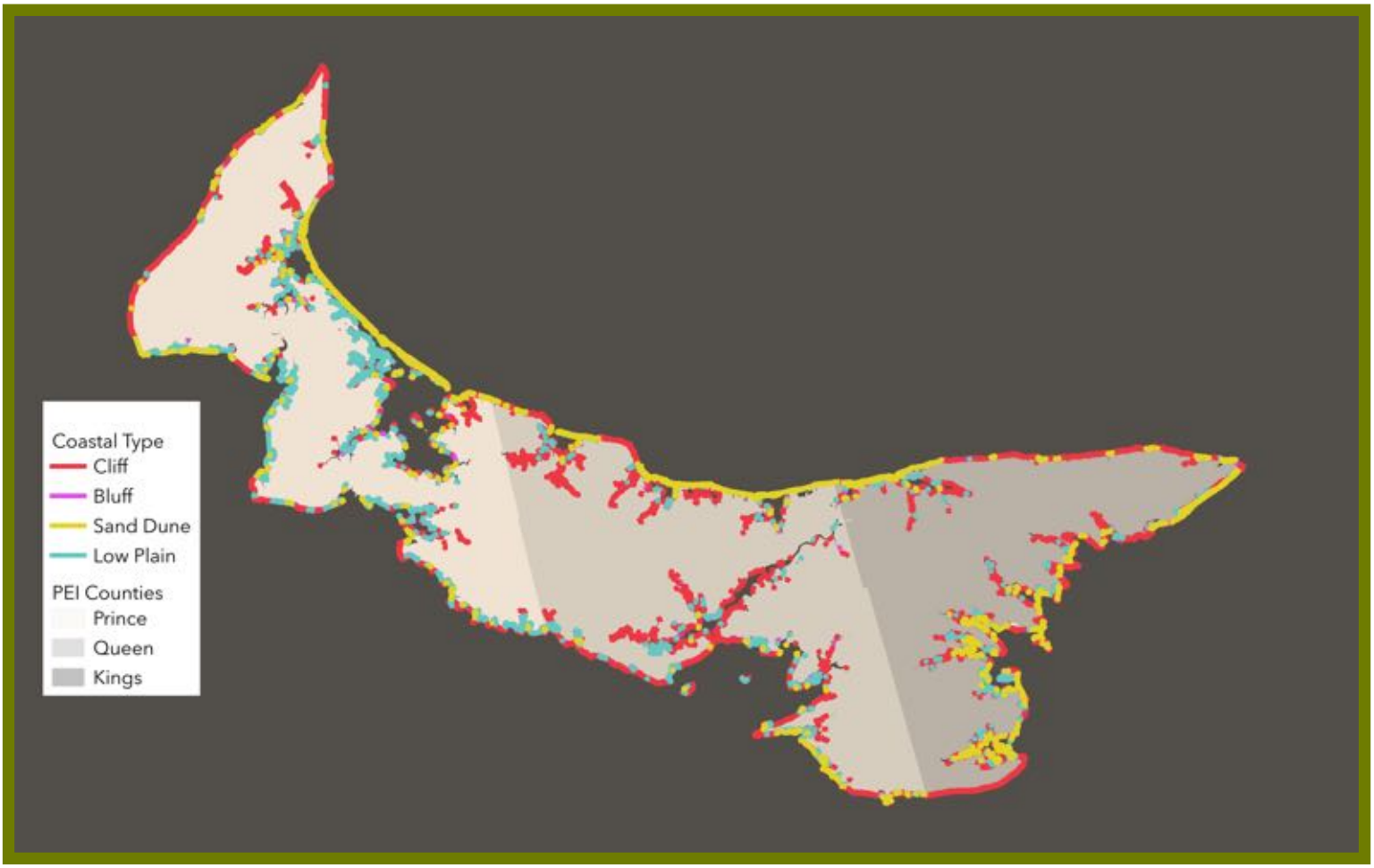
DUNE KRUMMHOLZ

Heavily studied both locally and regionally, many of our coastal dunes are also krummholzing habitats. Due to their unique soil composition, as well as dynamic disturbance regime, these sandy krummholz are home to many unique native dune specialists. In addition they still share a number of species with other coastal types. Dunes rarely display the undulating coastal distribution seen along our cliffs, but rather have concentric scattered krummholzing areas. Slower successional processes combined with greater rates of disturbances, disrupt coastal forest development more frequently, resulting in less linear distributions. Dune krummholz are unique and biodiverse habitats, critical for a number of rare species of flora and fauna. These are amongst the most vulnerable to coastal flooding and high-wind events, as well as human traffic and development.

LOW PLAIN & SALT MARSH KRUMMHOLZ

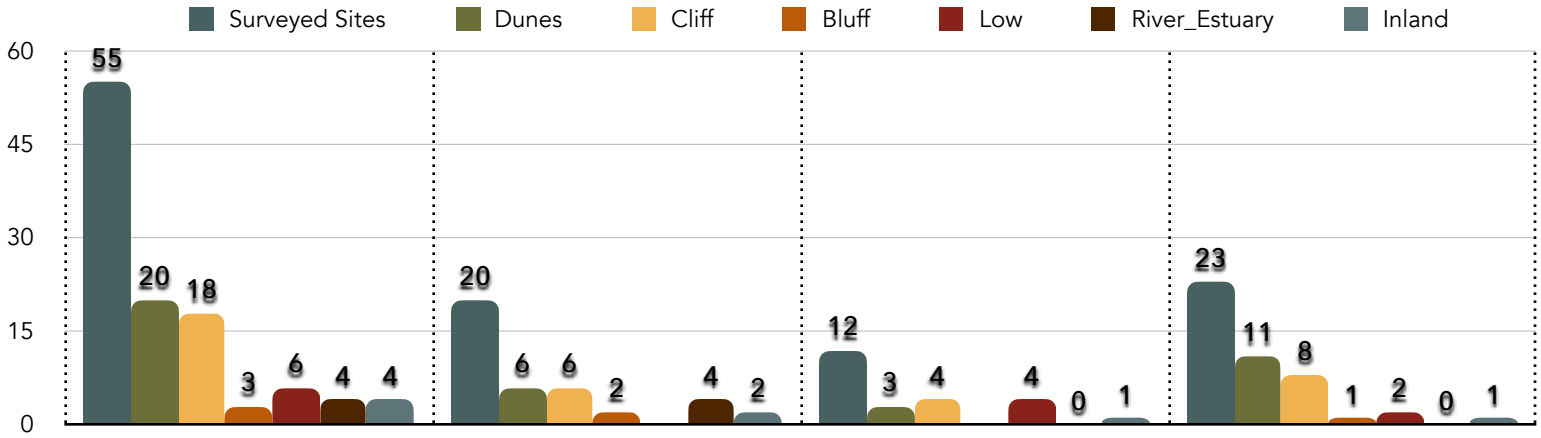
Low plain and salt marsh krummholz tend to grow in more sheltered and/or lower-wind locations, showcasing only minor krummholzing deformity, highly associated with tertiary krummholz. Often located along our south shore, these calmer coasts are generally as affected by salt water as coastal winds. These areas are prone to flooding, although with healthy salt marsh components and/or coastal bogs, they tend to have much more resilience to high-waters. Like dune systems, these areas can be especially vulnerable to road construction and other drainage changes, sometimes resulting in drastic effects on shoreline habitats.

KRUMMHOLZING COASTS

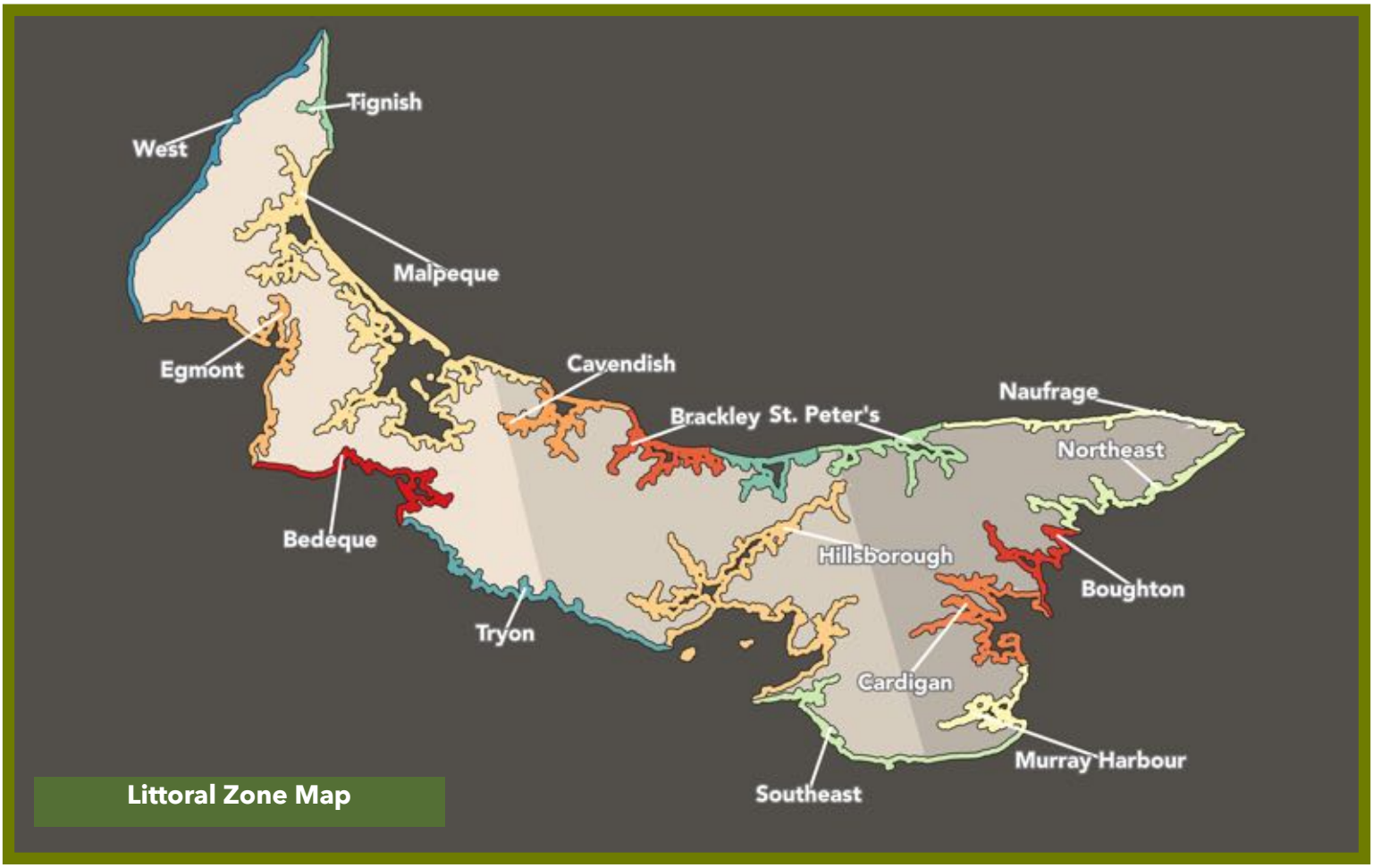


Coastal Krummholz can be found across all Island counties, although most primary krummholz generally grow along the north shore. Primary krummholz can also be found in areas of the western coastline, although that region has been under-surveyed. Secondary krummholz often develop in exposed areas with only moderately strong consistent winds. Sufficiently sheltered strong-wind areas, such as along the malpeque littoral cell, interior to the Pituamkek Sandhills, growth will also develop as secondary krummholz. Tertiary krummholz and coastal forest categories tend to be found in lower-wind areas like the south shore, or sheltered estuaries and bays.

The north shores of Kings and Queens county are likely where our most extreme examples of krummholz habitat can be found. While krummholz are found in Prince county, this area has had fewer study sites with much of the coast unexplored. It is very likely that a variety of krummholzing habitats can be found on the north-western coast, such as at the potential Black Marsh sites, selected back in 2021.



PROVINCIAL LITTORAL CELLS



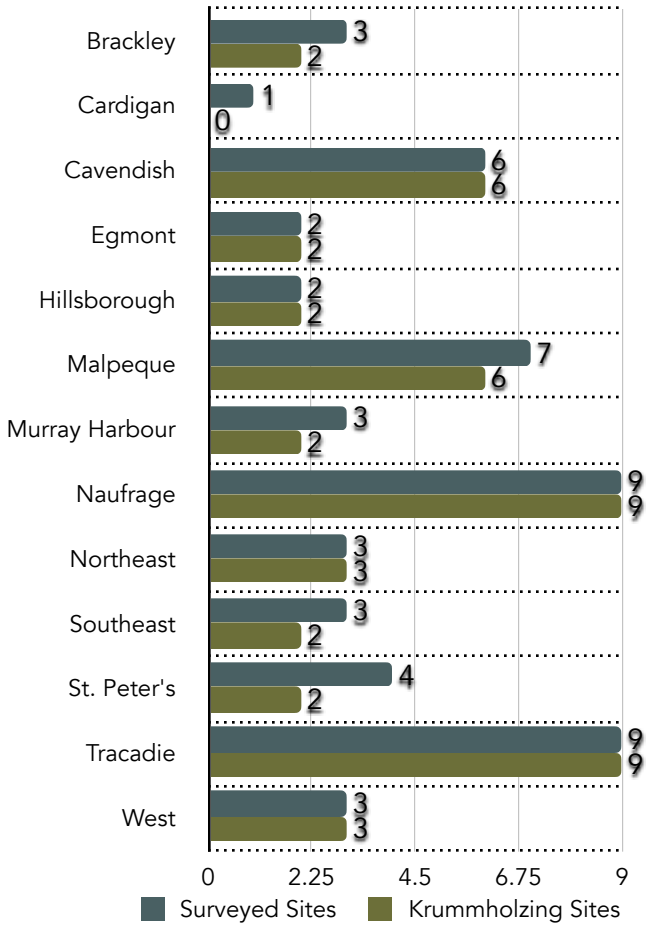
Littoral Zone Map

Our coastal littoral cells are relatively distinct areas of highly connected coastal processes and shared sediment transportation networks, much like our provincial watersheds.

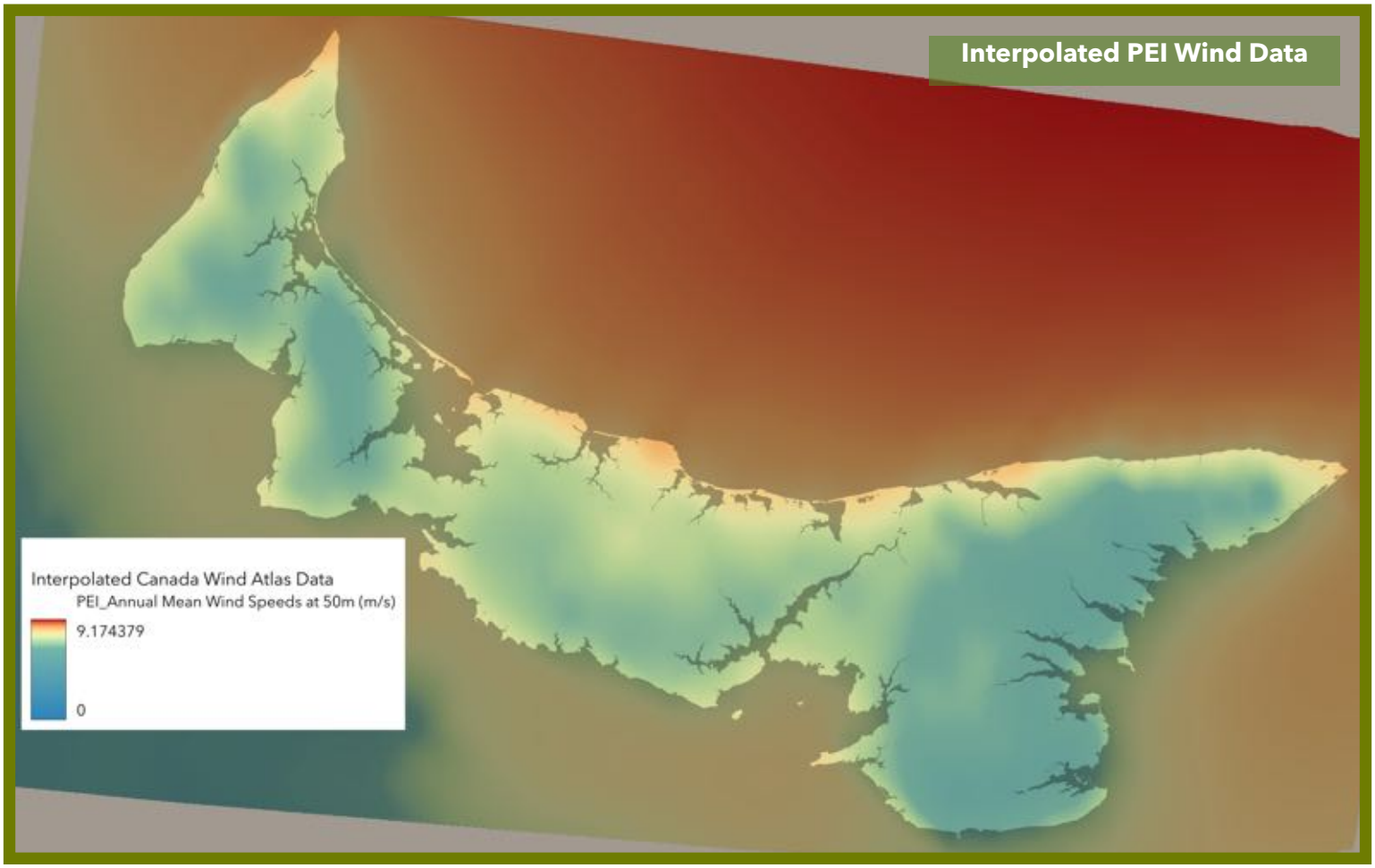
The map above shows our Provincial littoral cells clipped to a 500m shoreline buffer, a distance that covers all surveyed sites. In exposed high-wind areas, such as the Greenwich dunes or Clearspring cliffs, the krummholz effect can be seen ranging hundreds of meters inland. Weaker wind areas might only cause obvious krummholzing tens of meters inland, while the maximum reach of coastal effects, most likely typifying our poorly understood coastal forests, are still unknown.

Breaking our Island coastline up by littoral cells helps in understanding shared ecological traits across krummholzing sites and mapping PEI's krummholz extent. They also act as ecological stewardship units, to better address large-scale issues at a landscape ecology level and through targeted community planning and education.

The chart on the right shows the distribution of surveyed and krummholzing sites across Island littoral cells. While sites were visited across many cells, there are a number of cells left to be surveyed. A number of potential sites have already been selected across unexplored areas.

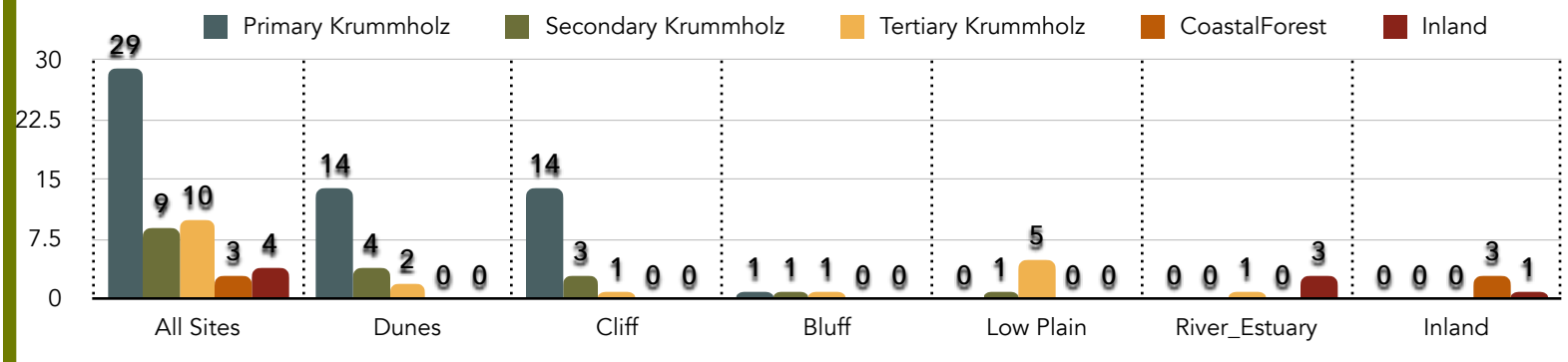


PROVINCIAL WINDS



As discussed in previous reports, the small-scale and long-term wind data needed to understand krummholz shaping and intensity is unavailable in PEI. Select sites, such as East Point, provide some long term data, however these sites are few and widespread, providing poor analysis when dealing with a chaotic and site-specific natural force like wind. Creating a coastal and species specific Griggs/Putnam-like index for PEI is a large-scale undertaking, beyond the scope of this project to date.

Despite being unable to precisely and quantifiably link annual/seasonal average wind speeds to krummholz deformation across the province, a 30m resolution Island wind map was created by interpolating Canada Wind Atlas data, originally a 16km resolution, using common GIS processes. The Island wind map, shown above, highlights areas of high-average winds which generally correspond with krummholzing survey sites. At a province-wide level, this data is useful for highlighting likely krummholzing areas and windy littoral cells. When compared to field data, there are a number of discrepancies which are likely due to a combination of data quality as well as our lack of understanding about how coastal forces create krummholzing habitats. For instance, the clearspring cliff sites display *carpeting krummholz* but have estimated wind speeds which should not allow for such deformity levels.



COASTAL WINDS

Primary Krummholzing Cliff Showcasing a Variety of Vegetative Wind Deformation

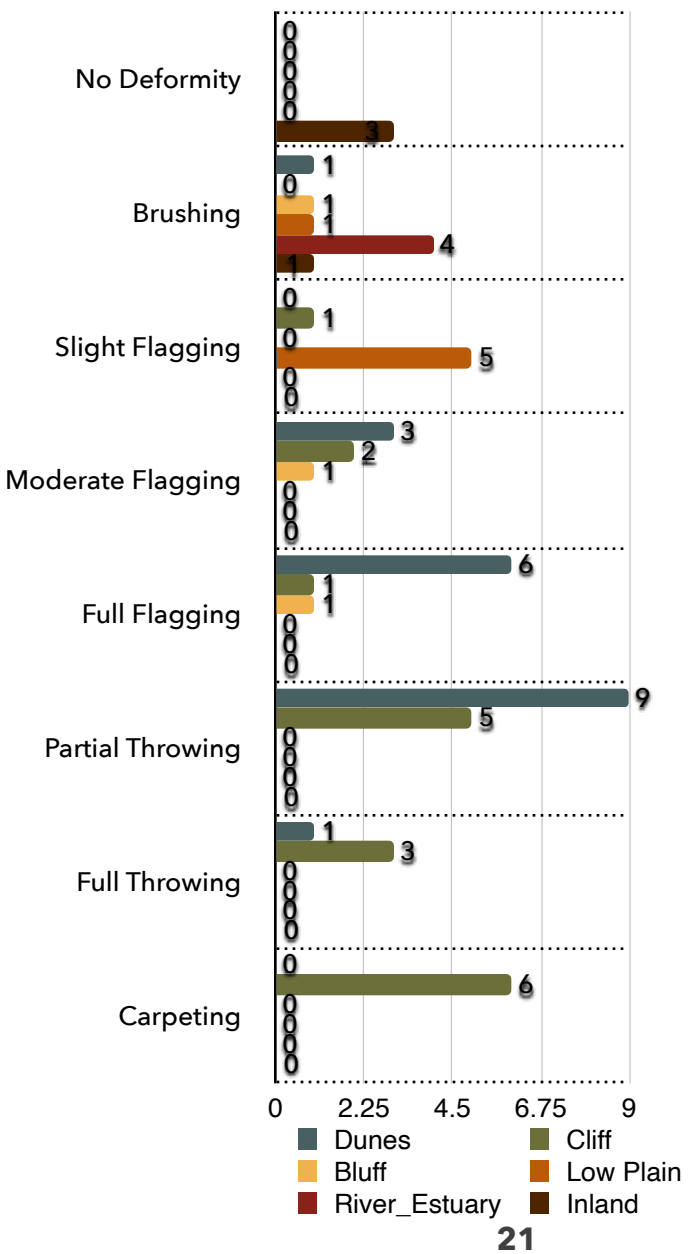
As has been previously described, PEI's krummholzing habitats develop along shores with high mean winds, which abrade and desiccate new growth and buds, often resulting in various forms of lateral growth.

While krummholz and wind have been better studied in alpine areas, our understanding of how coastal forces coalesce to create these habitats, locally or globally, is poor. Salt and sand are strong abrasives, not always found in alpine settings. Our native species of krummholzing woody flora have not been studied specifically in terms of wind deformation and resilience. The exact magnitude, seasonality and consistency of wind speed needed to form various intensities of krummholz across various soil types is still unknown.

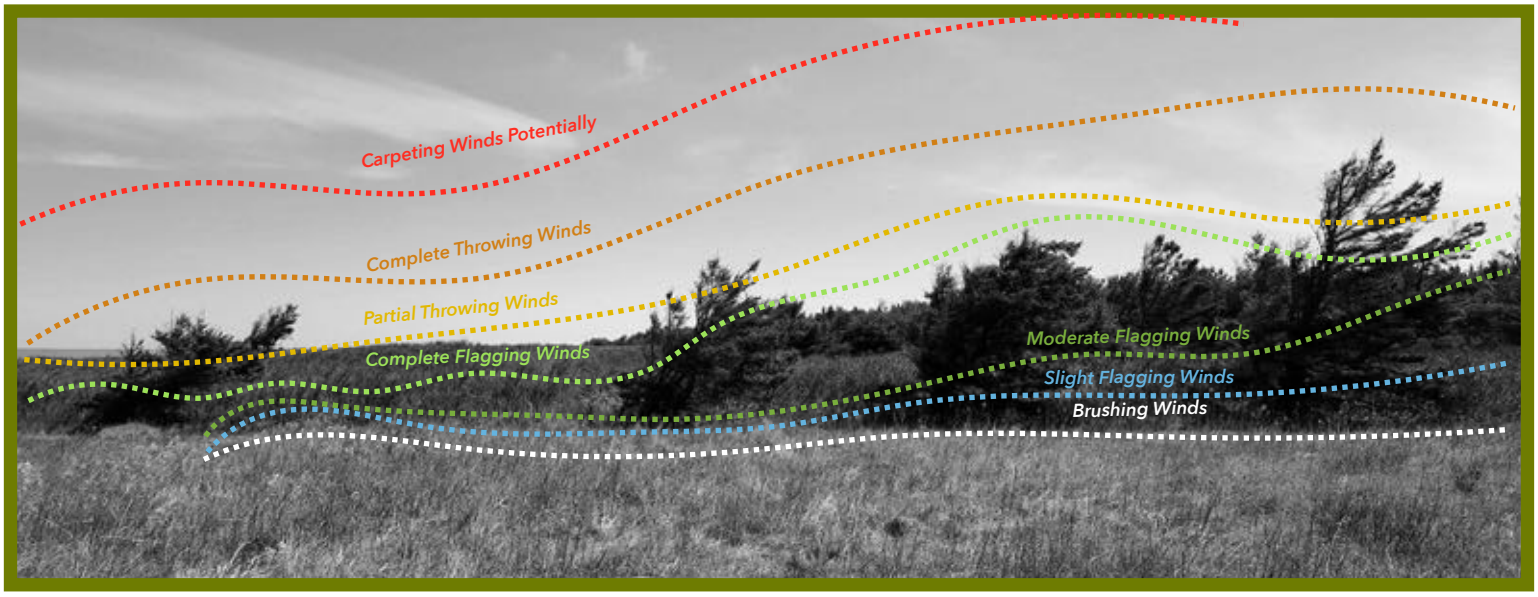
In addition, ecological succession and habitat development affect local winds, altering growing conditions, allowing for krummholz deformation intensities to shift over time in the same spot. With that in consideration, past/current land-use and present-day seed sources can have a huge effect on local winds and their effects over time.

Despite these challenges, various levels of krummholz deformity were observed during fieldwork, as well as distinct patterns of specimen and species distribution. While individual specimen deformity could be determined and mapped, categorizing sites could be more difficult due to the sheer variety of deformities on display. The chart to the right shows the number of sites by their maximum observed level of krummholz deformation as well as their coastal type. Our cliffs are the only locations surveyed which displayed the most extreme krummholzing growth forms, such as carpeting. Dunes generally had moderate to strong wind deformation, while low plains and more inland sites all displayed minimal krummholzing effects.

Sites by Coastal Type & Krummholz Deformation



KRUMMHOLZ EFFECT

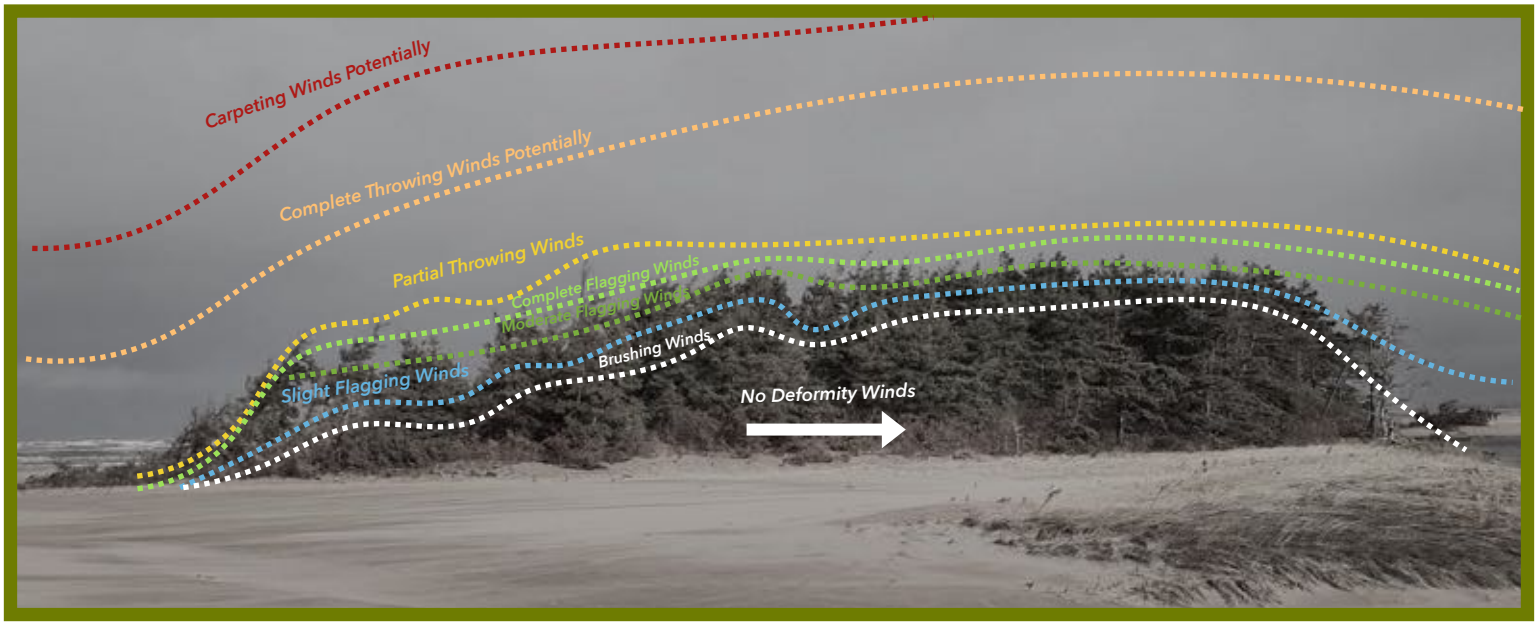


As krummholzing specimens and habitats develop, they shift local wind patterns, often improving nearby growing conditions. Due to surface friction, winds are slowed most, closest to the ground, with vegetation able to grow with less deformity where surface friction is highest. As vegetation increases in height, generating more and higher surface friction, many conifers species are particularly adapt at this, wind speeds gradually slow at taller and taller heights. This can allow specimens to grow taller and/or change their growing patterns lower down on the trunk. Where once exposed buds were killed or suppressed laterally, now they have enough shelter to grow relatively vertically. Illustrating the visible effects of these processes can be helpful in visualizing wind speeds and strength on-site. Often resulting in extremely chaotic sloping wind speed horizons.

The photo diagram above, while lacking anything near the true complexity of wind patterns in the local area, tries to visually show the vertical deformation patterns that were observed while on-site. Coastal specimens create shelter for adjacent inland ones, lessening the wind's krummholzing effect on developing flora as you move inland. As the faster-growing inland specimens over-top those nearer to the coast, their canopy is suddenly fully-exposed to unobstructed coastal winds. Effectively, growing conditions can severely change, vertically, across a single tree. This cumulatively results in sloping vegetative cover, higher winds causing more gradual sloping over longer distances.

Despite full exposure to coastal winds, only tens of meters behind highly-deforming trees, these exposed tops often have lower average levels of krummholz deformity. This is likely due to the cumulative effects of surface friction and turbulence, slowing winds gradually. The health and reserves of the tree specimen in question also play a role in its resilience to winds. More established trees with a greater proportion of sheltered foliage seem to have a higher tolerance to krummholz deformation than less healthy specimens.

KRUMMHOLZ EFFECT

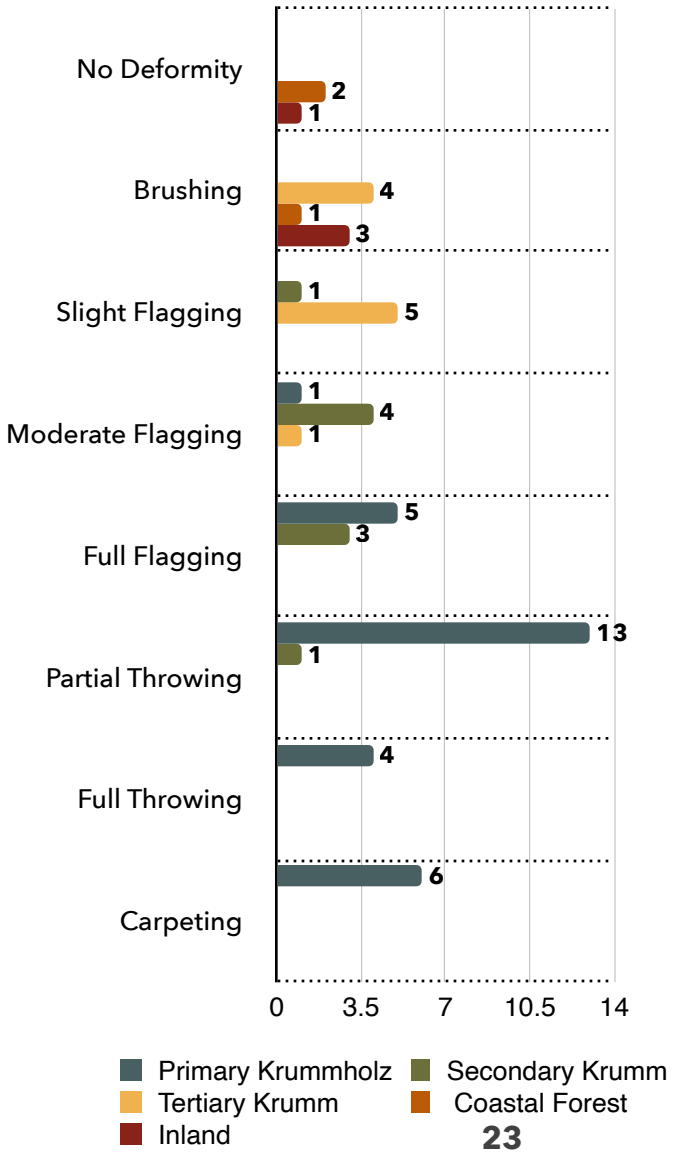


The krummholz photo diagram above, again visualizes the roughly horizontal sloped deformation banding, typical of coastal forests. Compared to the previous Oceanview Site, this dune site, Tracadie Island, has been undisturbed by direct farming or development. Successionally more advanced than the Oceanview site, the above krummholz demonstrates how cumulative layering of shelter changes conditions allowing a krummholzing forest to develop. Although battered by winds and waves and surveyed post-Fiona, this forest had healthy populations of bearberry, common juniper, mountain cranberry, twinflower, crowberry and many others. These were generally found growing in the "*non-deformity*" area. This dune site is highly exposed, a dynamic landscape often affected by storm events. The front of this krummholz and its compressed deformation zonation as well as many dead or struggling specimens coast-side, are likely linked to its high rate of disturbances.

The table to the right shows the high correlation between the prototype krummholz categories and the maximum level of krummholz deformity across all sites. Primary krummholzing sites all display high levels of deformity on average, while secondary krummholzing sites all range moderately. Tertiary and more inland sites all had low to no deformity observed during fieldwork.

The photo diagrams help to display both the cumulative interactions between local winds and vegetative friction and the successional development which continues to shift and change these dynamics. That is without considering local and landscape level ecological disturbances, natural, such as Fiona, but more often human-driven, such as tourist development, road-building and agriculture.

Sites by Krummholz Category & Wind Deformity



READING KRUMMHOLZ

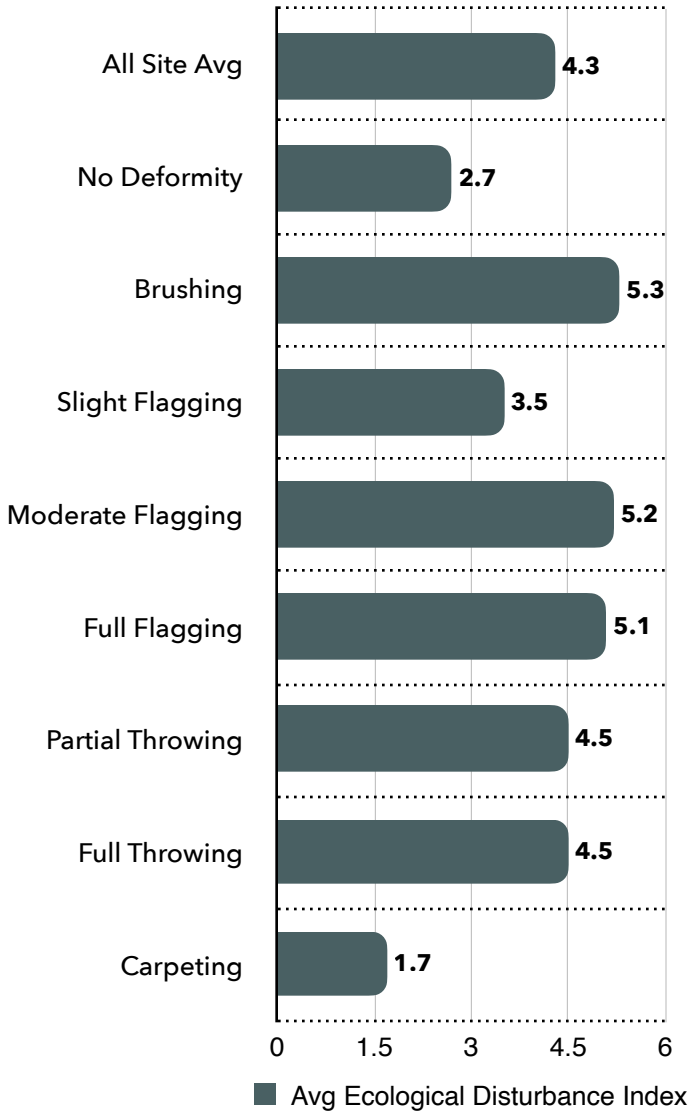
As mentioned, developing vegetation shifts wind speeds and growing conditions over time. This results in single specimens changing their growth-form as local conditions are modified over their lifetime. Luckily woody plants record much of their natural history in their growth form, allowing historic growing conditions to be "read", specimen by specimen in the field. The photo diagram above looks at several specimens at Oceanview in the PEI National Park. They were growing in a line along an old field edge, perpendicular to the shore.

The chart to the right shows the Ecological Disturbance Index (ED index) average across all sites in each category. The ED index was created and used during analysis of 2022 krummholz site data, and was improved and adapted upon for 2023 season data. It will be explained later when looking at the ecological threats of PEI's krummholzing habitats. Basically, the ED index is a simple count of human-caused disturbance types that have or are occurring at each site with a maximum potential rating of 11.

While almost all krummholzing sites have had some form of human-cause disturbance, high-wind *carpeting* sites have seen the least development. Moderately windy sites have higher than average ratings, often due to tourism or cottage infrastructure. As mentioned, many of our beautiful and popular dunes showcase moderate krummholz deformity.

While the ED index can provide some helpful analysis, it fails to encapsulate extent and severity of disturbances. So even sites with lower ratings can be more disturbed than one would imagine. A better index could be created through value weighting various disturbances to more accurately reflect their destructive effects.

Sites by Coastal Type & Wind Deformity



READING KRUMMHOLZ

Found at Blooming Point Beach, this small group of established krummholzing white spruce were growing behind the primary dunes. Taller and dense bayberry and wild rose, as well as some young establishing white spruce were growing where the larger spruce were providing shelter from coastal winds. The larger white spruce showed signs of initially growing in strong *partial throwing* conditions in their youth. As they matured, their reserves and wind resilience increased, allowing for more upright growth, resulting in taller specimens. The upper canopy of these stunted spruce, start to again show *throwing* deformities as they exposed themselves to stronger winds.

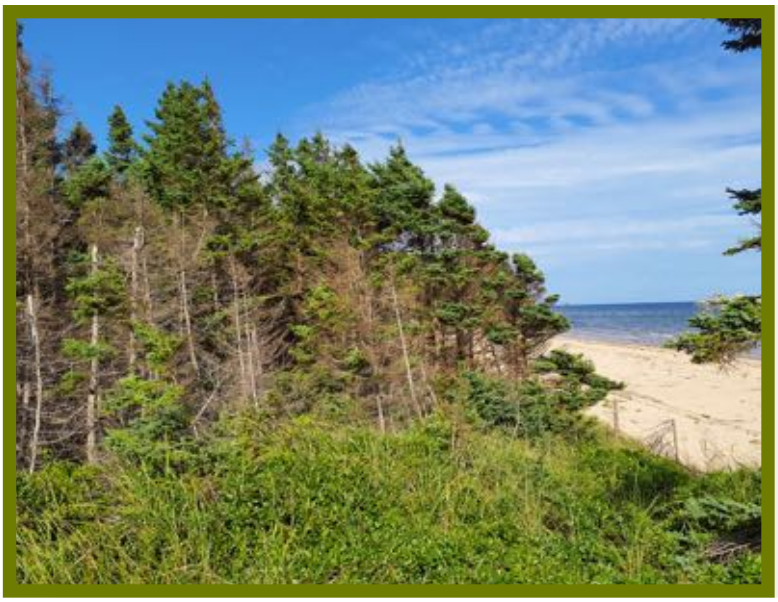
Another Blooming Point white spruce, this one was found growing solitarily in the dunes, which make-up the sand spit extending west across Tracadie Bay. Highly-exposed atop a dune ridge without much shelter beyond krummholzing shrubs, this specimen initially reacted to the strong winds by assuming an almost *complete throwing* form. While the windward buds struggled or died, more sheltered anterior buds could survive by growing relatively laterally in the wind-shadowed area. As this approximately 1.5 meter spruce matured, it could better resist winds, lessening its reactionary deformation, allowing for the new upright growth seen at the top of the specimen.

This scene from Crooked River along the Clearspring cliffs, showcases a variety of krummholzing forms. Although growing in a high-wind setting, the river has created a deep ravine (by PEI standards) with poor drainage soils. While the ridge-top spruce were displaying *carpeting* and less intense forms, the lone spruce in the forefront, growing in the ravine, shows strong *full-flagging to partial throwing* patterns of growth. This is likely due to the increased water availability as well as the orientation of the ravine. If the ravine was parallel with the average wind direction, it is hypothesized that this could create a wind funnelling effect, increasing wind speeds and turbulence. Despite the better growing conditions, this spruce still died, most likely due to saltwater from Fiona, as the clifftop spruce survived.

READING KRUMMHOLZ

This photo shows a *carpeting* spruce from the Crooked River site, growing along the ridge top in the *coast-top zone*. Despite growing only 12 meters from the ravine, the growing conditions along the cliff top are much harsher; stronger winds, less shelter, and less water available. The *coast-top* barren flora of junipers and crowberries are able to proliferate in these conditions, providing shelter and surface friction to slow wind only inches from the ground. This minuscule wind-shadow allows for sporadic germination of white spruce, which are quickly exposed to extreme winds once they over top the few inches of ground cover. As the spruce carpets, surface friction increases, allowing the leeward side of the spruce to grow gradually taller.

Down the cliffs from Crooked River, this dense krummholz was re-establishing after farming ceased by the 1960s. The photo shows the windward side of the *thicket zone*, fronted by shrubs of wild rose, bayberry, crowberry and junipers. The spruce are showing a dense *full-throwing* form, with dead desiccated branches still functioning as wind shelter. These primary krummholz are incredibly dense, although all kinds of wildlife signs can be found underneath these tangled trees. In these sheltered krummholz tunnels wind speeds drop dramatically. At the leeward side of this clump, conditions allowed for a spruce branch to grow almost vertically until hitting full winds and curving again.



Located north of Red Point Park, this secondary dune krummholz grows along a moderately windy area. The forest found growing here showed much less wind deformation than the clifftop examples previously mentioned. This site is a lovely example of a secondary krummholz, displaying mild to moderate deformation but still highly-influenced by coastal winds. The windward front and exposed edges of this krummholz display a *moderate throwing* form. A number of footpaths were found at this site, leading to various cottage properties nearby, these areas all had significantly less spruce coverage compared to less disturbed areas. Despite these incursions, fox kits were observed as well as many rare flora species.

READING KRUMMHOLZ

These spruce were found growing along the edge of an exposed agricultural field, approximately 250m inland along the Clearspring Cliffs area. Although these look like normal inland old field white spruce, they are actually under-going krummholz deformation. The windward side of the spruce which tops the rest of the forest canopy displays *slight to moderate flagging*. Despite growing inland, amongst a regenerating forest and sheltered by coast-ward krummholz, these spruce are still affected by coastal winds, as well as the salts and sands that they transport. These coastal forests and the shoreline's influences on their ecology are still poorly understood.

A dune-growing white spruce photographed at Cabot Beach Provincial Park. This tree perfectly displays a *full flagging* form, with branches only developing on the leeward side of the specimen. A number of other spruce in the area display similar flagging, although many were dead-standing, possibly due to Fiona. Spruce found growing in more exposed areas of the dunes exhibited *partial throwing* forms. Nearby bluffs also displayed more intense krummholzing forms, however often with eroded coast-top and shrub zone flora, slumping down to the backshore. This site has been heavily disturbed, both by humans and recent storms, however remnant rare species suggest that it was a highly biodiverse site.

Located at the Dalvay West site in the PEI National Park, this spruce was found growing in a small shrub alcove amongst a highly fragmented krummholz. Due to nearby infrastructure, this area of the park was heavily hit by Fiona, experiencing extreme levels of erosion. This heavily wind-burned spruce exhibits *partial to full throwing,* growing in harsh conditions its whole life. Despite its poor condition, this spruce is alive and still growing. Nearby spruce, growing more tightly, seen in the background, exhibit less krummholz deformity despite their proximity. This dense, almost colonial, form of distribution is an important survival adaptation at these harsh sites.

COASTAL DISTRIBUTION PATTERNS

"Undulating Front" Distribution on Primary Krummholz Cliff showing ordered ecological wind zonation

As mentioned in the 2023 report, a variety of distinct distribution patterns were observed during field surveys. These patterns continued to be observed at new sites visited in 2023. In fact, many of these patterns can be discerned from satellite imagery or cover height models.

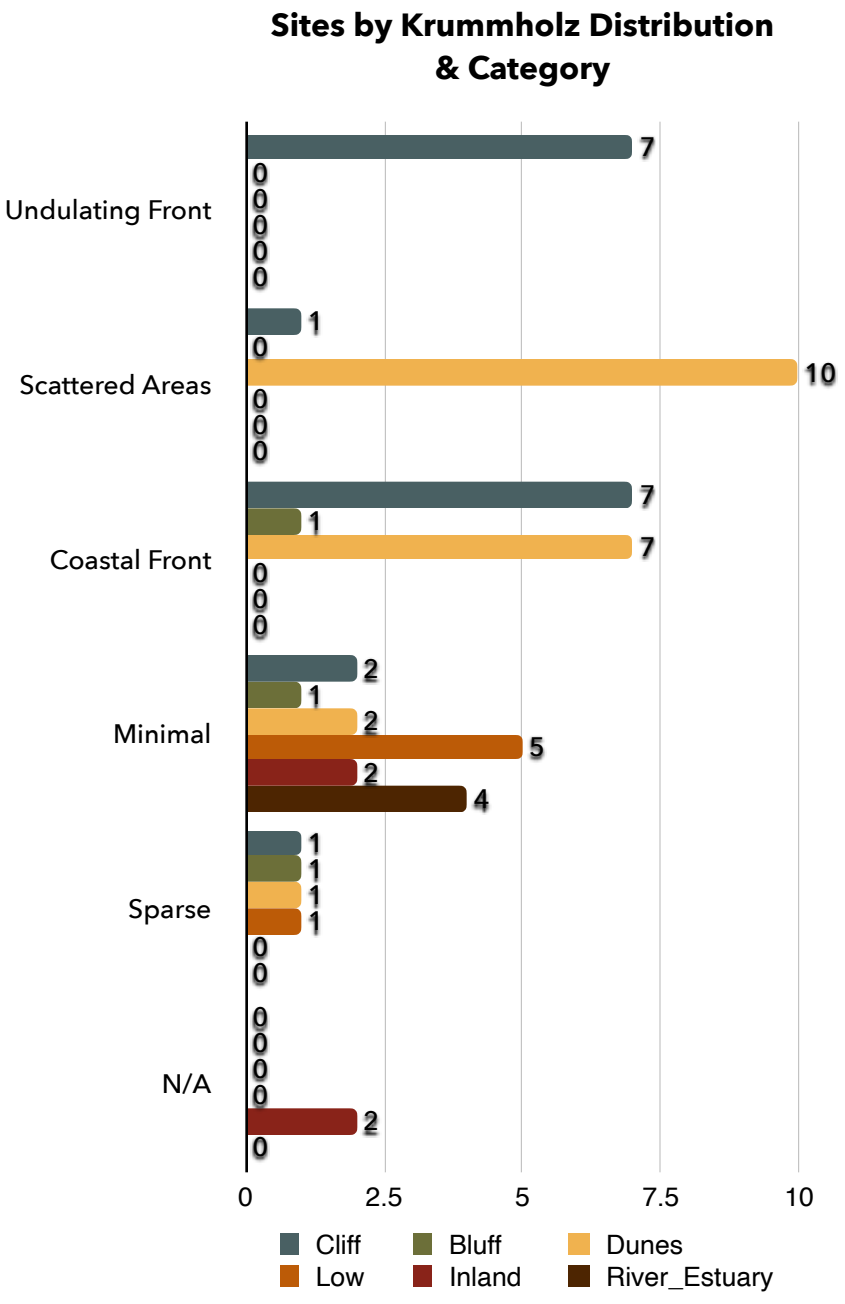
Despite their regularity across krummholzing sites, the origins of these various distributions are still poorly understood. The addition of more field sites has helped to survey areas with similar qualities at various stages of ecological succession, inspiring some potential hypotheses as to each type's significance and origin.

UNDULATING FRONTS

A proposed natural formation, these patterns are highly associated with our windblown cliffs. The undulating coastal front of these krummholz can be both wide and deep, gradually dispersing and diffusing high winds.

The undulating front pattern is effectively an aerodynamic vegetative adaptation to increase communal wind-resilience. Specimen distribution can mirror our coastlines, resulting in turbulent "bays" of shrubs between "headlands" of conifers.

It is also hypothesized that as these krummholz mature, the deep inland stretch of their sloping vegetation will compress towards the coast, allowing for new species to colonize closer to shore.



KRUMMHOLZ DISTRIBUTION PATTERNS

"Scattered Areas" Distribution in Primary Krummholz Dune with patchy ecological wind zonation.

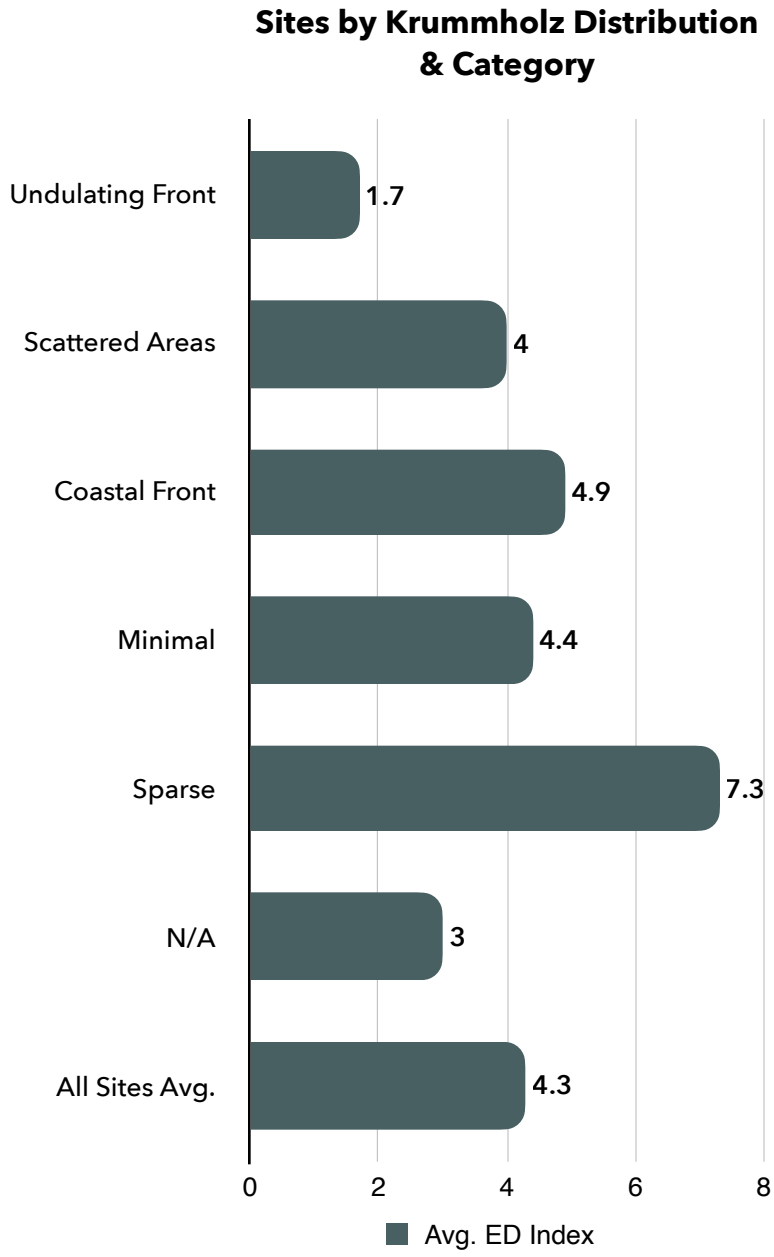
SCATTERED AREAS:

Scattered Areas distribution patterns are highly associated with our coastal dunes. It it hypothesized that in these turbulent habitats, this distribution pattern is a natural formation due to sandy soils and frequent natural disturbances.

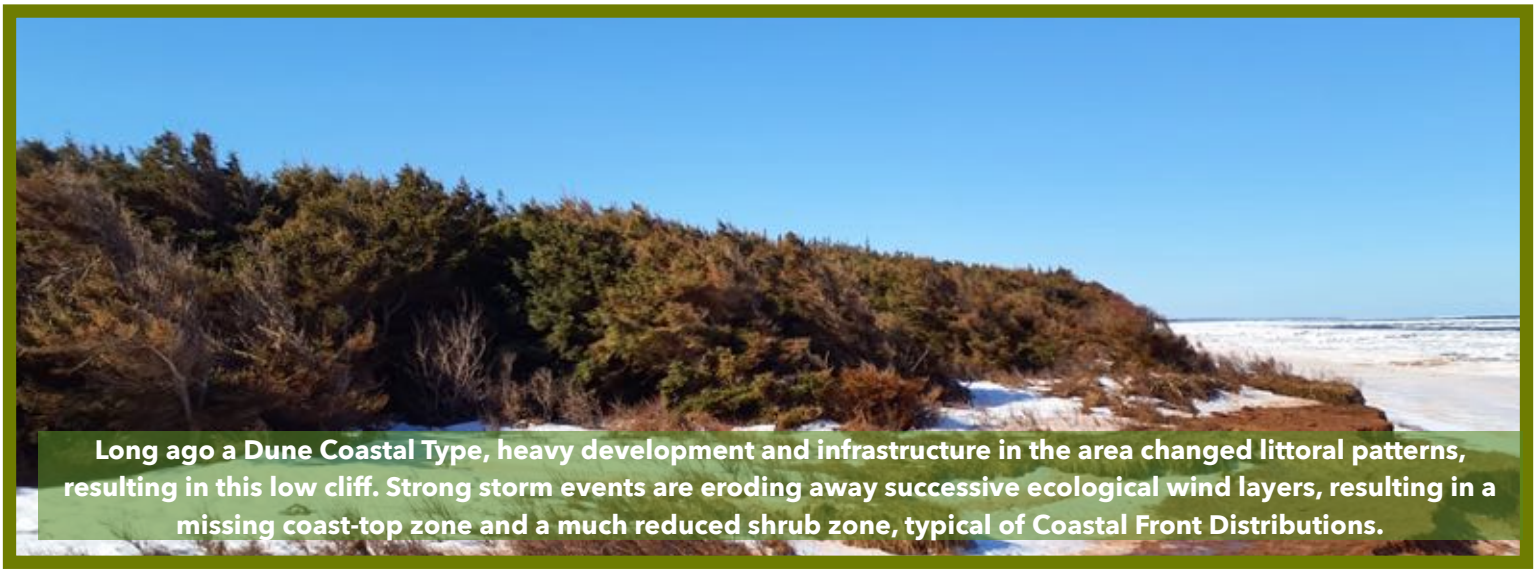
As dunes mature, coastal sands can be stabilized by native flora and fungi, improving a number of soil conditions, eventually allowing the development of krummholzing coastal dune forests. High-wind events frequently disturb these habitats. In addition to the damage received during these storms, they can also leave lasting affects, altering soil properties and topography.

These dynamic and frequent forces of creation and destruction cause our dune krummholz forests to grow in *scattered areas,* continually attempting to expand and connect but constantly disrupted by chaotic coastal forces.

While most likely a natural formation on dunes, when observed on less dynamic coastal types, such as cliffs, these distributions are most likely the results of recent ecological disturbances. The North Cape south site has large areas of dead krummholz due to wind farm development changing soil water patterns in localized areas. Resulting in a scattered distribution of living krummholz.



KRUMMHOLZ DISTRIBUTION PATTERNS



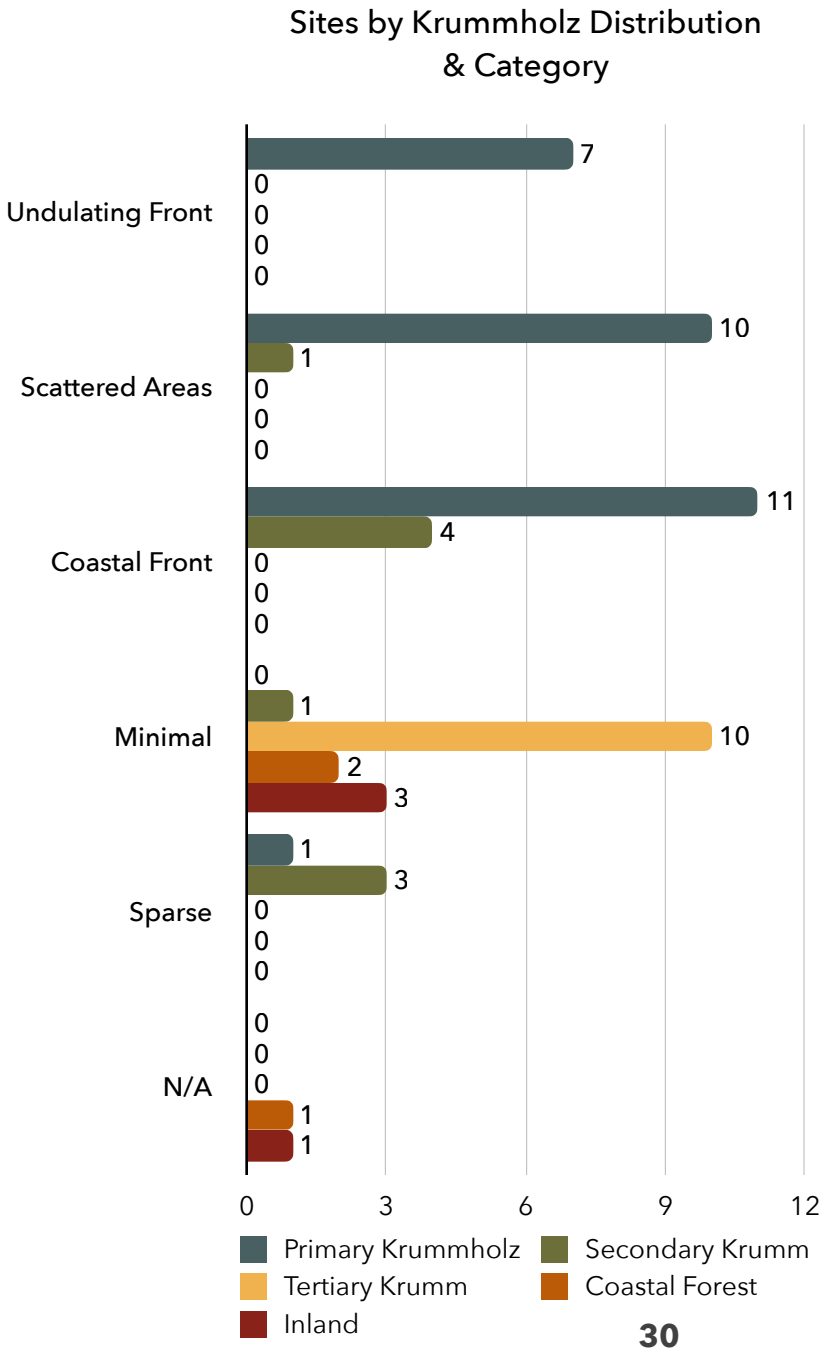
Long ago a Dune Coastal Type, heavy development and infrastructure in the area changed littoral patterns, resulting in this low cliff. Strong storm events are eroding away successive ecological wind layers, resulting in a missing coast-top zone and a much reduced shrub zone, typical of Coastal Front Distributions.

COASTAL FRONTS:

These distributions bear many similarities to undulating fronts, however can be found growing across a number of coastal types. It is hypothesized that this is another disturbance-based growing pattern along our shores. However, unlike *Scattered Areas, Coastal Fronts* are generally the results of more consistent disruptive forces such as erosion, affected less frequently and/or intensely by high-wind events.

Coastal Fronts are characterized by a wall of moderately to strongly deformed krummholz growing in close proximity to the shore. On cliff and bluff sites, this pattern appears to be linked with high rates of annual erosion coupled with storm events. Erosion causes the highly krummholzing front to collapse into the sea, resulting in more sheltered krummholz areas quickly becoming frontal specimens. This can result in sudden die-off of poor health specimens, especially in dune systems that have recently experienced coastal flooding. Sites like Stanhope in the National Park have a coastal front of dead spruce predominantly due to salt-water intrusion during Dorian and then Fiona.

While a natural distribution pattern on PEI, *Coastal Fronts* are highly associated with disturbances, gradual or sudden, natural or human-caused. Changing in shoreline armouring, harbour dredging patterns and more can alter littoral processes, increasing erosional forces, resulting in "unnatural" *coastal front* krummholz.



KRUMMHOLZ DISTRIBUTION PATTERNS

"Sparse Krummholz" - an old parking lot/agricultural field in very early succesion - very young white spruce regeneration found in wind-shadowed areas due to older krummholzing specimens beyond disturbance edge

MINIMAL:

Minimal krummholz distribution has a high-association with *tertiary krummholz* and can be found across any coastal type with consistent but lower average wind speeds. They are also associated with our calmer south shore as well as many low plain and salt marsh krummholz.

This group is characterized by weak krummholzing deformity, due to weaker winds, often resulting in trees growing in close proximity to the shore. This frontal distribution, while similar to the *coastal front* category, is due to weaker coastal forces rather than disturbances like erosion. These sites are often highly disturbed by humans if suitable for development or farming, boggy sites like those in Enmore can have low disturbance ratings.

SPARSE:

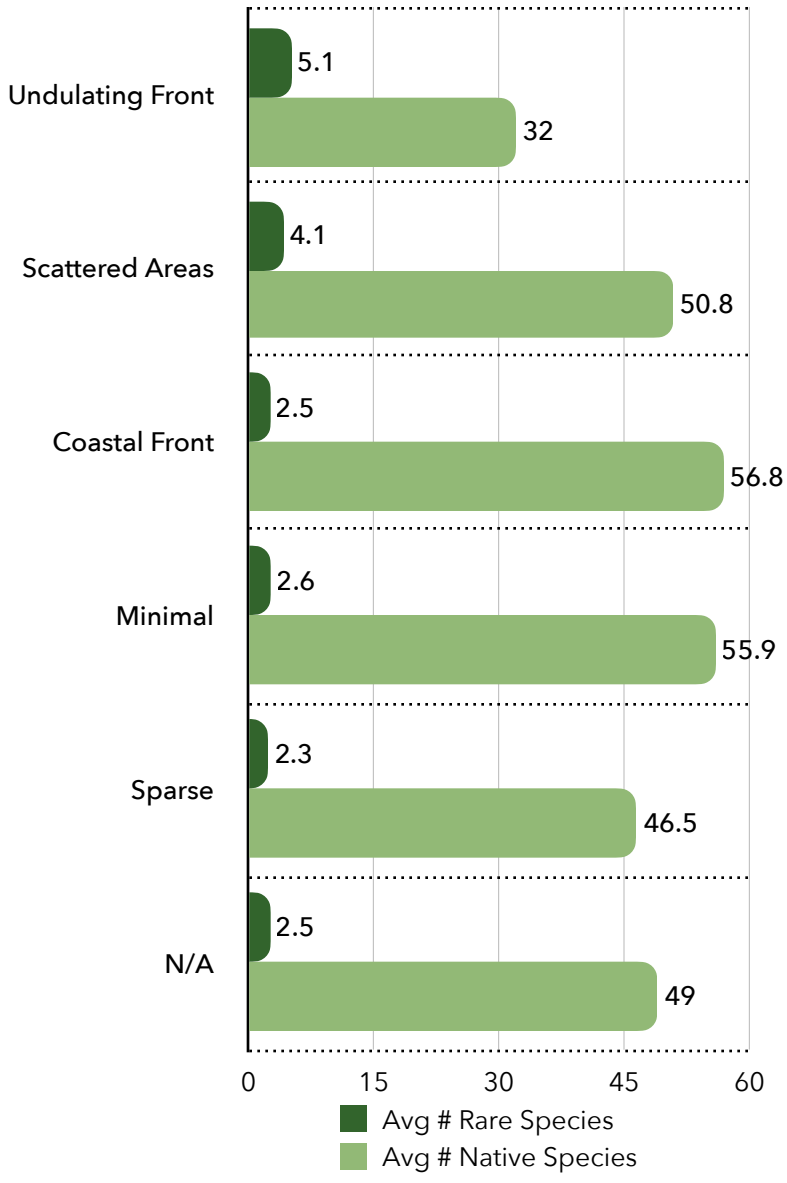
Perhaps the only wholly unnatural formation, this pattern is only seen at highly disturbed sites, often due to land clearing and/or mowing. Sparse designated sites were shores surveyed which had all the conditions for krummholz formation but were being kept as early-successional habitats through human action such as development or usage.

During Covid quarantine, many of these sites sprouted abundant rose, bayberry and spruce as soon as clearing/mowing was halted.

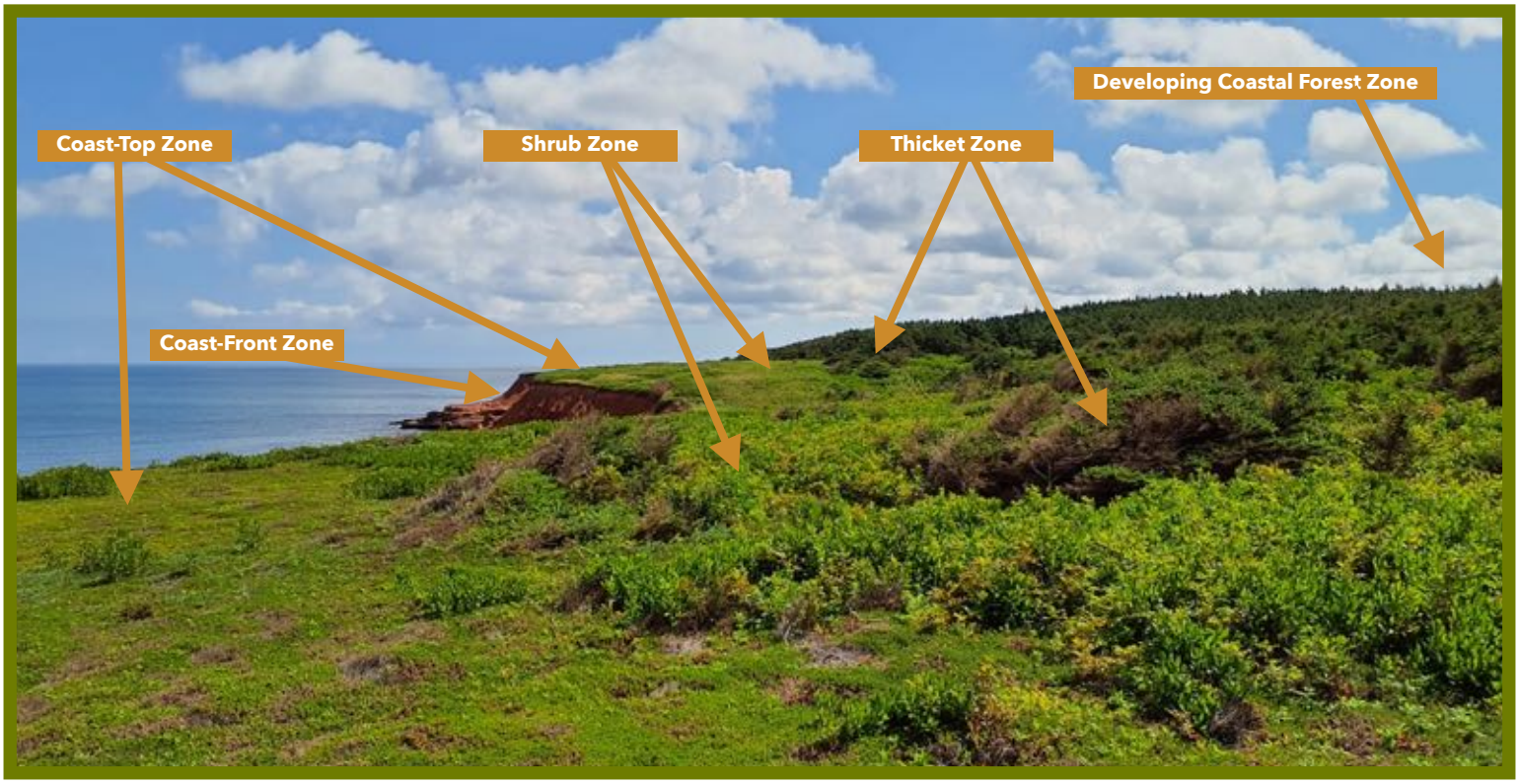
N/A:

Non-applicable sites were found inland, along estuaries and other non-krummholzing sheltered areas.

Biodiversity Indicators by Krummholz Distribution



ECOLOGICAL WIND ZONES



ECOLOGICAL WIND ZONE SUMMARIES:
(Further described in previous reports)

0-BACKSHORE or COAST-FRONT ZONE: is closest to the oncoming coastal winds. This zone is located where land and sea meet, whether vertically along a cliff-face or lying low among the tides in a salt marsh. The windy coast-front often faces other harsh conditions depending on coastal type such as shifting sands, erosion, and salt-intrusion. This zone is generally colonized by native specialist species, although some more common species from further inland zones can end up growing here due to erosional forces.

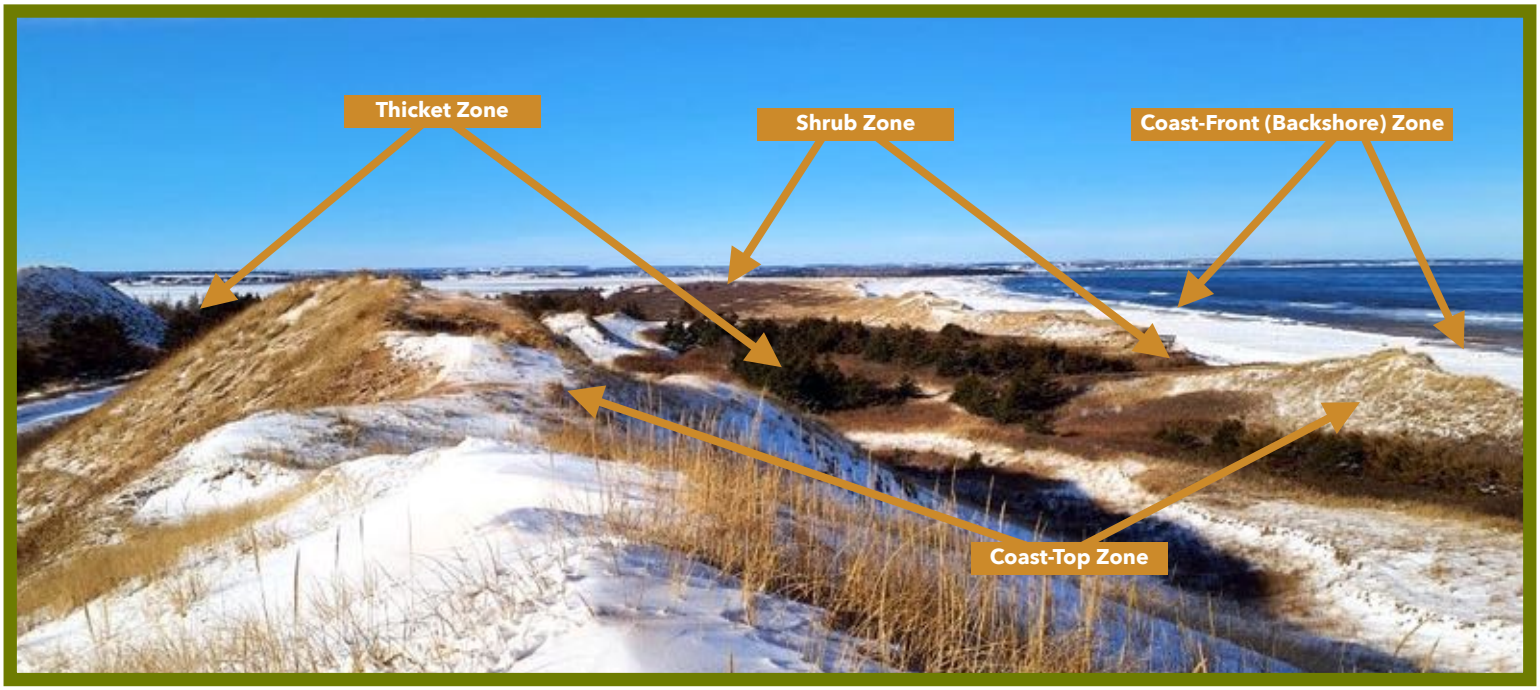
1-COAST-TOP ZONE: is located directly interior to the backshore. Still exposed to very strong winds, but often with lessening marine effects. These forces limit the height and propagation of native flora, limiting the number of species that can grow in this zone. Often taking on a "barrens" form along our windiest cliffs and secondary dunes or a "coastal meadow" form along our yellow dunes and low plain shores.

2-SHRUB ZONE: occurs once frictional forces along the preceding coast-top zone, primarily due to vegetative development, allow for substantially increased survival rates for woody flora, particularly shrubs. Sparse native tree species, especially conifers, tend to vary in deformity depending on coastal wind intensity and position amongst the shrubbery.

3-THICKET ZONE: is named after the historic nomenclature used to describe our coastal krummholzing habitats. The area is partially-sheltered from coastal winds by the preceding shrub zone. The protection created by this preceding zone increases the survival-rate of young conifer trees, often white spruce, resulting in the dense and tightly-packed thicket zone. Whenever seed sources are present, other tree species, some deciduous, can grow throughout this zone.

4-COASTAL FOREST ZONE: is an area that bears much more study. Pituamkek Forest showcases the potential for restoration work within this zone, with many typically inland species found growing near the coast. This zone begins as local tree-form becomes more typical, often with reduced canopy height but mild deformity. These canopy specimens can be well-spaced and this coastal forest system is clearly capable of supporting rare and native traditionally upland flora when mature.

ECOLOGICAL WIND ZONES



Even at a local level, coastal winds continue to be a strong control agent in flora propagation, distribution, health, shaping and succession. As described in 2023's report, these processes and interactions result in discernible and ordered *ecological wind zonation*. These zones have been observed across all sites as a sub-pattern of greater krummholz distribution, whether in the clear horizontal banding seen across *undulating fronts,* or more chaotically in roughly concentric *scattered areas* across our dunes. Ecological wind zonation was also seen along Cape Breton cliffs and across Iles-de-la-Madeleine's dunes, suggesting they occur regionally.

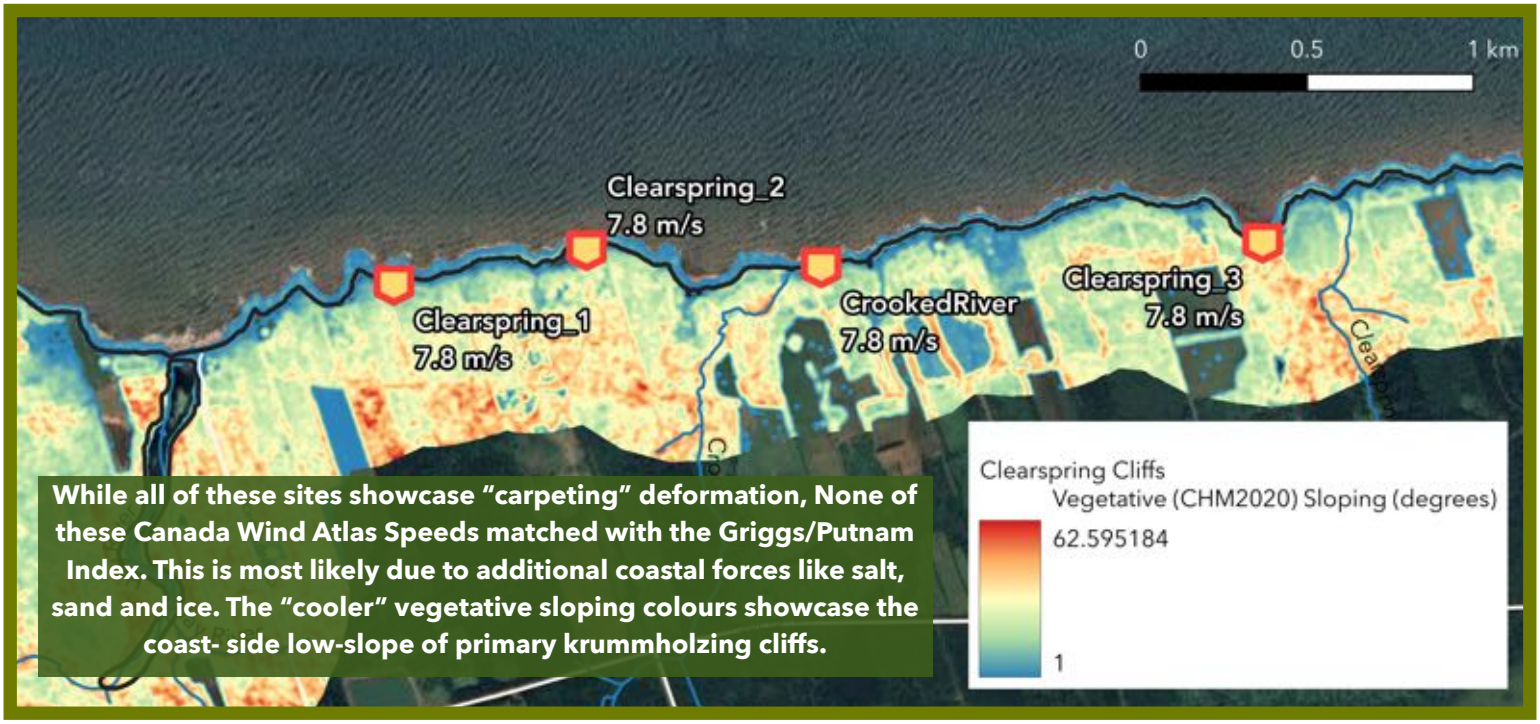
Krummzone	Min Cover Height (m)	Max Cover Height (m)
Backshore	0	0.05
Coast-Top	0.05	0.15
Shrub	0.15	0.75
Thicket	0.75	4
Coastal Forest 1	4	12
Coastal Forest 2	12	30

A landscape level effect of strong coastal winds, distinct ecological wind zonation has only been observed in primary and secondary krummholz habitats. Like carpeting specimens, vegetative cover can gain increasing height as one moves inland due to cumulative frictional effects, gradually slowing desiccating winds. Although chaotic on a smaller-scale, this can create forested landscaped with gradually ascending canopies.

During the 2023 field season, vegetation height measurements were taken across ecological wind zones at site visits. With this data, the average vegetative cover ranges for each wind zone were compiled. With these averages, Provincial cover height maps from 2020 could be processed revealing ecological wind zonation across both restoration and study sites. The map above shows two sites along the clearspring cliffs, a primary krummholzing area with disturbed but relatively intact krummholz and coastal forest habitat. While still in testing, computed zonation has matched well at comparison field sites. That being said, there are a number of errors relating to the quality of source data (note some incorrect areas of shrub zone beyond coast-top zone areas in the map above).

Categorizing and mapping sites by their ecological wind zones is incredibly helpful for restoration work. These distinct zones have a number of unique ecological challenges, species composition and functions, as well as useful restoration strategies for improving their health, resilience and biodiversity. As many important species specializing in these zones are rare across the Island, many sites would benefit from targeted additions of native seed source specimens.

MAPPING KRUMMHOLZ



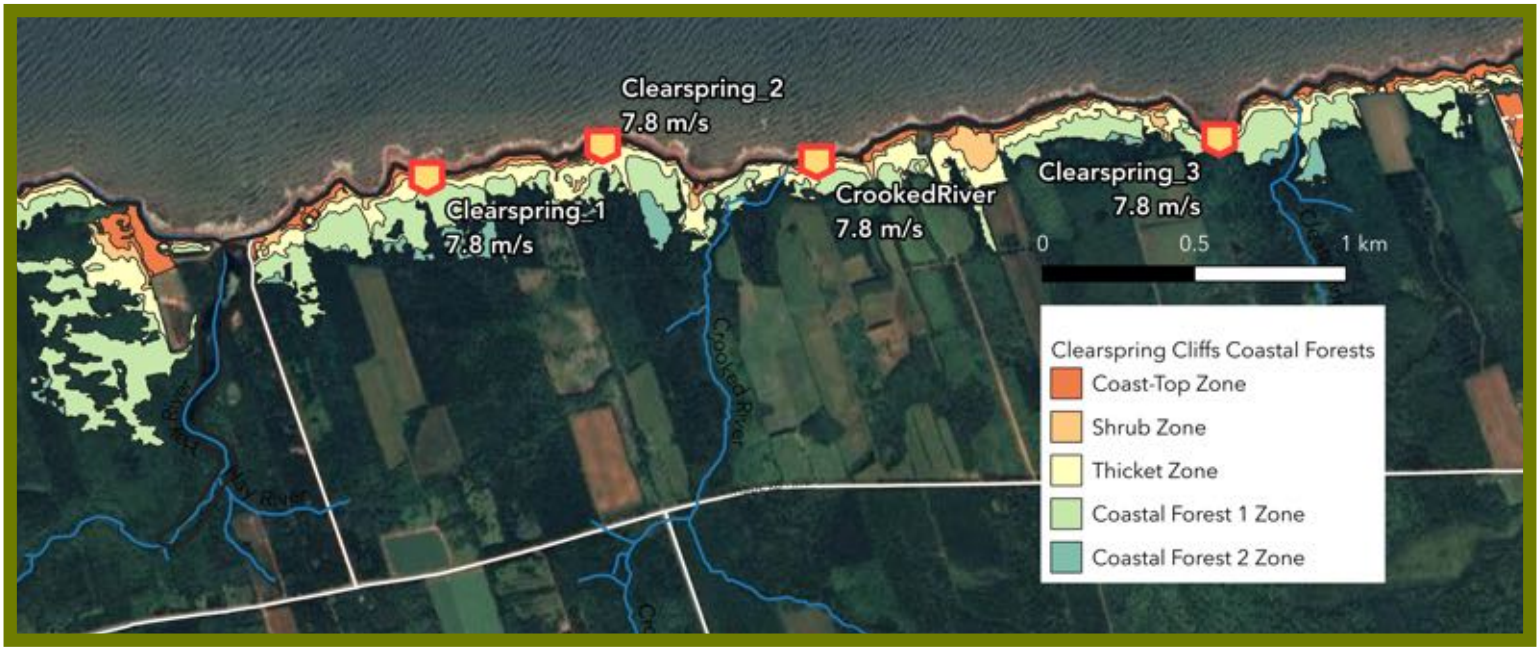
As part of the krummholz project, GIS mapping strategies are being explored to better understand the extent and distribution of PEI's coastal forests and krummholz. While substantial ecological information has been geo-referenced about these diverse habitats, this is limited to the small sampling of study sites. When trying to accurately map these windy habitats provincially, a number of other challenges arise. Even if we had better localized wind data, we do not understand the quantified relationship between coastal winds and our shoreline habitats. While wind is a primary ecological driver in many of these areas, without more expertise, better data, and much expense, it is an unreliable data source for precisely mapping coastal forests. Our provincial wind data is still useful for targeting coastal areas which are likely to be experiencing high mean annual winds.

Primary and secondary krummholz have a number of unique wind-related attributes, which are useful in virtual GIS identification. For instance, the winds which cause specimen deformation also act on a landscape level, creating gradually sloping forests. By running GIS slope and aspect processes on filtered cover height maps, vegetated areas of low-sloping canopies can be targeted. Although vegetative sloping intensity varies across krummholz sites, the average values that have proven useful have ranged between 0.5 - 30 degrees. By leaving out flat slopes (0 degrees), cleared lands and even-age forest stands are omitted. Originally a 45 degree cap was tested, but this proved to be less accurate. The final result was a *highly-sloped vegetative areas map,* processed and clipped by 500m littoral cell coastal buffers.

MAPPING KRUMMHOLZ

The next steps involve creating a mask using the 2020 corporate land-use inventory. Through field visits it was confirmed that many areas of krummholzing habitats are not classified as forested land in the current inventory. Many areas are considered wetlands, for example dunes and salt marshes. Other areas are listed as abandoned, cottage, residential or recreational. By creating a curated masking layer, the *highly-sloped vegetative areas map* can be clipped to only include "wild areas", further increasing its functionality. Despite some success targeting proper field sites as well as known but un-surveyed areas, the *highly-sloped vegetative areas map* fails to capture the true extent of these habitats in its current incarnation. Using processed ecological krummholz maps in conjunction with the *highly-sloped vegetative areas map,* highly-sloping shrub and thicket zones can be easy selected along high-wind coasts. By then adding in the other ecological wind zones by their adjacency to highly-sloping shrub and thicket zones, a more accurate and detailed krummholz extent map can be created. This can even potentially be used to target relevant coastal forest zone which may be exhibiting canopy level wind effects.

Consultation with GIS experts from the ACCDC has been scheduled for the spring/early summer of 2024, with the hope of improving this potential methodology as well as its potential uses in restoration and conservation.



COASTAL BIODIVERSITY


Rock Crowberry - *Empetrum eamesii - S2S3*

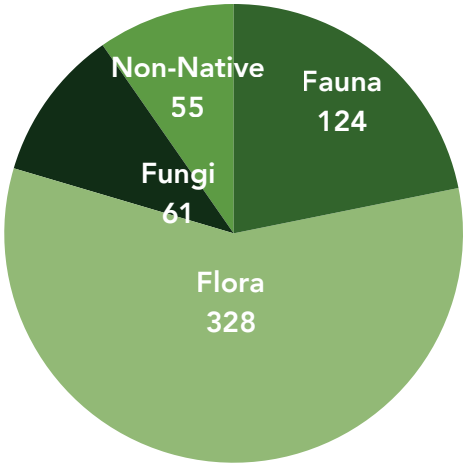
PEI's krummholz are diverse, unique and tightly-woven ecologies, resulting in a mosaic of habitats. Despite the harsh coastal winds, a large number of our native species can still be found growing in our krummholz. While many common native species can tolerate these sites, there are a number of specialists, rare provincially, which thrive in these harsh coastal conditions. Healthy krummholz tend to be biodiversity hotspots as well as important wildlife habitats, for both resident and migrating species.

The pie-chart to the right shows the total species count across the entire Krummholz Project, with over 550 species found across all 55 sites. Due to the project lead's skill-set, flora and lichen species tend to be the most represented, while mushroom and wildlife have much poorer quality data. That being said, wildlife cameras and audio recording units were used during the 2021 season of the project to gather much higher quality data at select sites.

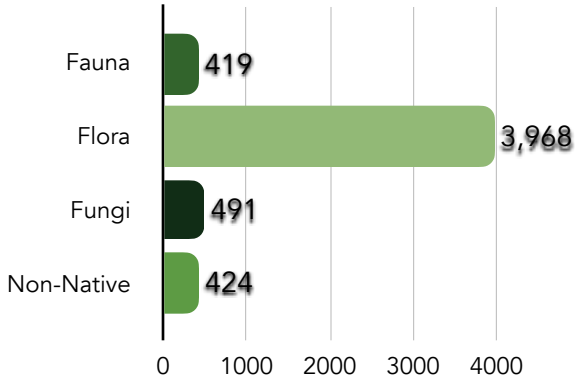
Biodiversity data gathered between sites is far from even, due to varying numbers and lengths of visits between the many sites. While much has been learned about krummholzing flora and fauna species, future research would benefit from more focused surveying across more sites with a wider geographical spread.

The graph below showcases the rare species count by littoral cell, highlighting geographic biodiverse shoreline units across the province. Higher wind and less disturbed cells seem to correlate to higher counts of rare native species.

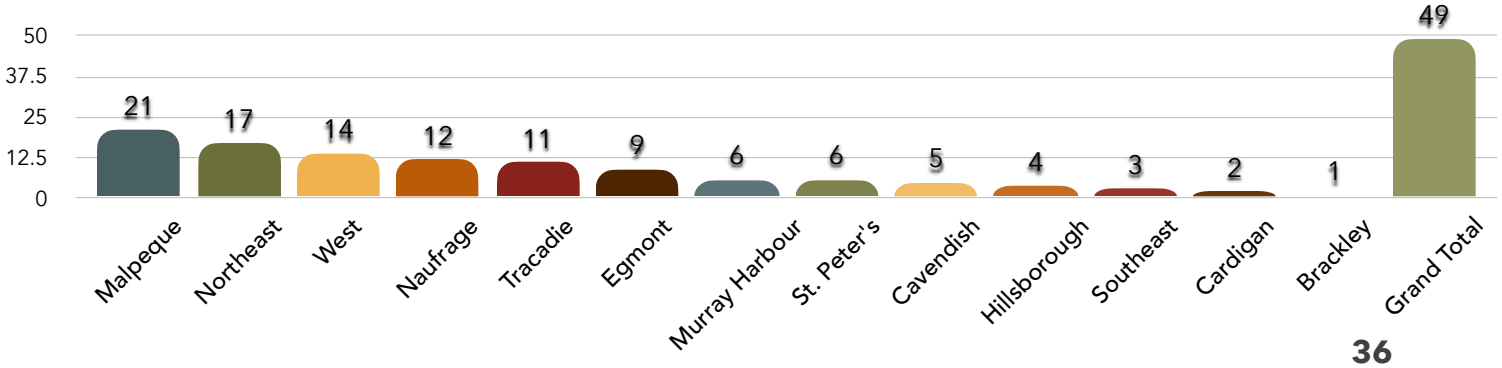
568 Species Documented



5302 Specimens Documented



Rare Flora & Fungi Species By Littoral Cell - Krummholzing Sites



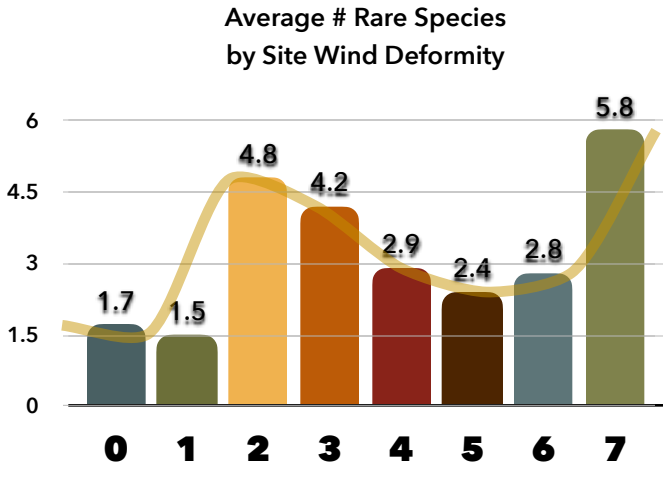
WIND TOLERANT SPECIES

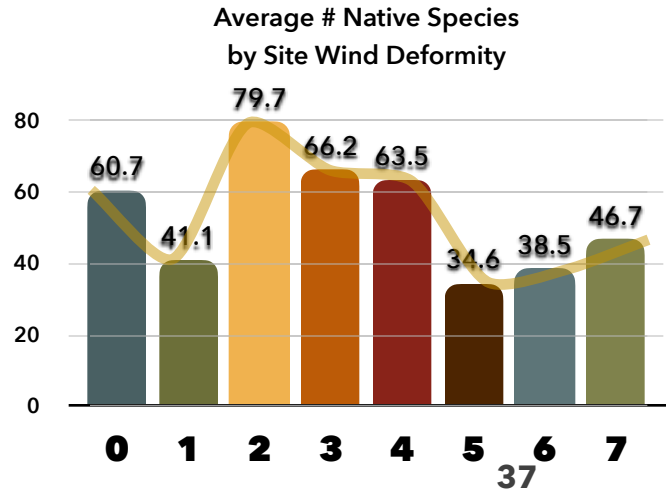
Creeping Juniper & Black Crowberry

As mentioned, the high-wind coastal habitats in which krummholz develop are home to a number of native species of flora and fungi. Many of these species can be found growing prolifically inland such as white spruce, bayberry, winterberry holly and wild rose. These pioneer species have a suite of adaptations for these open and harsh sites, traits shared by many of our coasts as well as old agricultural fields and clearcuts. Due to past land-use history as well as harsh coastal conditions, other native coast species, especially adapted to our windy shores and not often found inland, are presently determined to be uncommon to rare on PEI.

When it comes to restoration, these common and rare coastal-adapted species are critical for future plantings. As part of the Krummholz Project, seeds and cuttings of these species have been collected and are under germination and care at the Macphail Woods Native Plant Nursery. While large numbers of white spruce, bayberry, wild rose and marram grass are needed, there are many other species that would improve a number of ecological services across these habitats. By mimicking patterns of ecological wind zonation, specific species placement can be improved, resulting in better success rates as well as faster ecological integration.

The charts below show the average number of rare and native species by each class of krummholz deformity. Highly-deformed sites, under intense coastal conditions, had higher average levels of rare native species than all other sites, generally populated by these previously mentioned coastal specialists. The species chart on the right shows that these same sites had lower average numbers of native species, most likely due to the incredibly harsh conditions, limiting germination of less adapted species. As will be shown later, less windy sites tend to have greater frequency of human disturbance, resulting in lower rare species values, however the calmer conditions allowed more non-coastal native species to propagate and survive.





BIODIVERSITY BY TYPE

The two graphs below showcase the average number of rare and native species across coastal types and krummholz categories. It should be noted that more sites have been surveyed across more intensely krummholzing sites, with much more to learn in calmer or inland coastal forests.

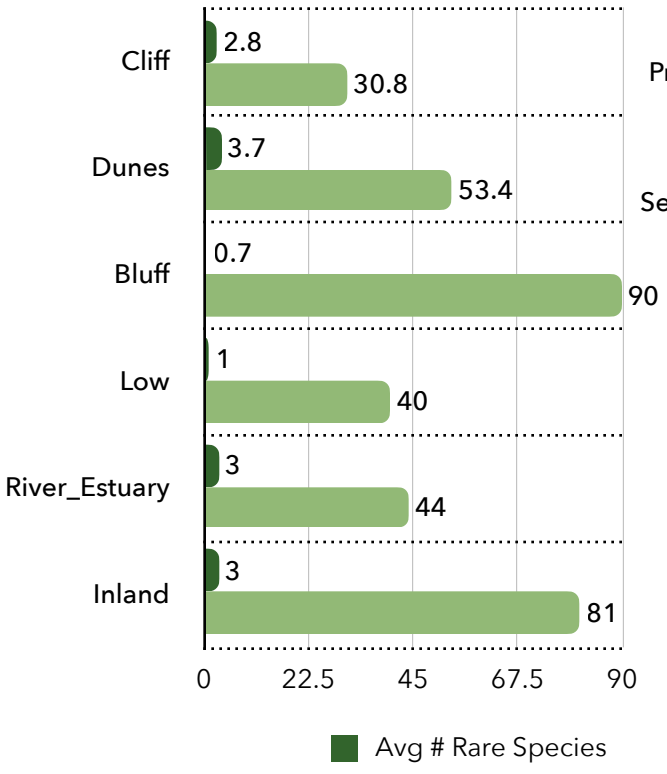
The graph on the left shows that cliff and dune sites have relatively high average rare species present. These are the many specialist species, adapted for high-winds, coastal salts and/or dune sands. The few river and inland sites visited also had high values, although far fewer of these sites were surveyed.


Creeping Juniper & Black Crowberry

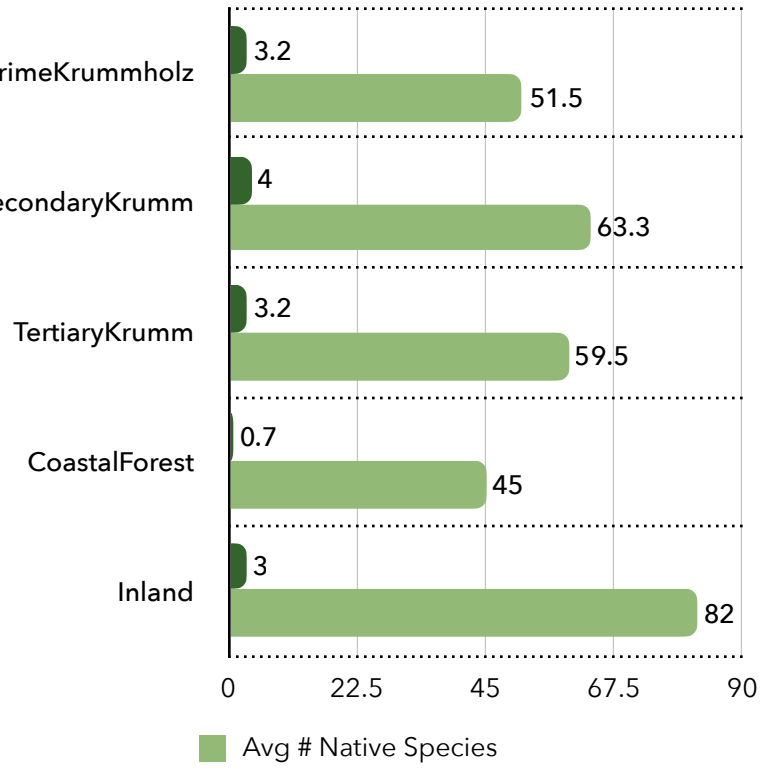
The graph on the right shows the same indicators by krummholz category. Again, it shows the higher than average presence of rare native species across our windy coastal habitats. That being said, discrepancies of ecological disturbances across site types have a large effect on these biodiversity indicators, which will be examined later.

Finally, it should be noted that many tertiary krummholz may be best considered coastal forests moving forward, which would adjust these averages. Coastal forests remain poorly studied with many sites often highly-disturbed, creating challenges in finding ideal study sites.

Biodiversity Indicators by Coast Type



Biodiversity Indicators by Krummholz Category



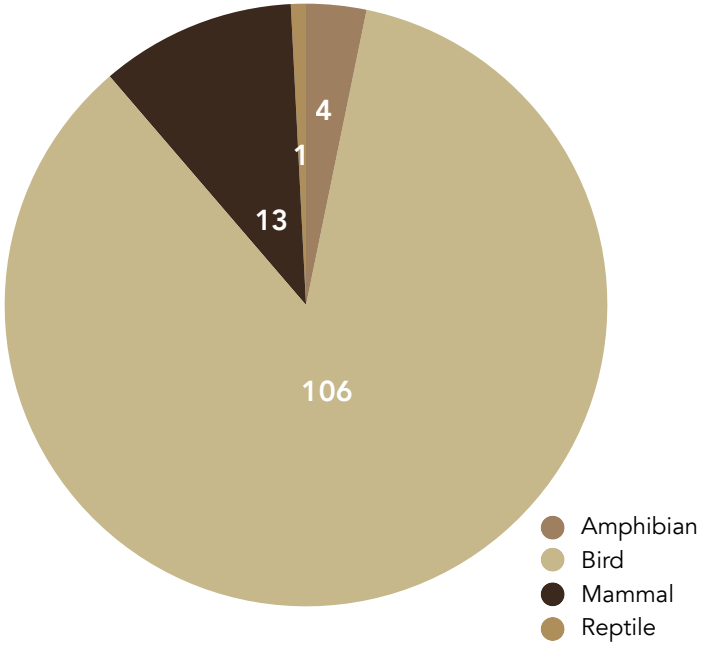
COASTAL FAUNA

Red Fox in Secondary Krummholzing Dunes

As mentioned, native fauna has been much less studied then other coastal forest denizens, with Audio Recording Units (ARU) and wildlife camera data limited to 2021. Although not the lead researchers speciality, field data on all animal signs and sightings were taken, although many were non-conclusive. This is an area that bears much further study, as the cross-section of native faunal use of these habitats is likely large. There are many species that use these windy habitats for feeding and/or nesting, such as the marsh hawk chicks and parent found in the Blooming Point Dunes. Bank swallows, cormorants, many calling and singing birds, shore species, not to mention marine creatures such as seals, molluscs and more, all call these areas home. The interdependence between these terrestrial and marine ecologies, especially along our high-wind coasts, is poorly understood. It is recommended that further ARU and wildlife cameras be incorporated into future research.

Northern Harrier Nest Amonst Starry False Soloman Seal in Blooming Point Dunes

124 Species Documented



Cormorant Colony Cavendish Cliffs

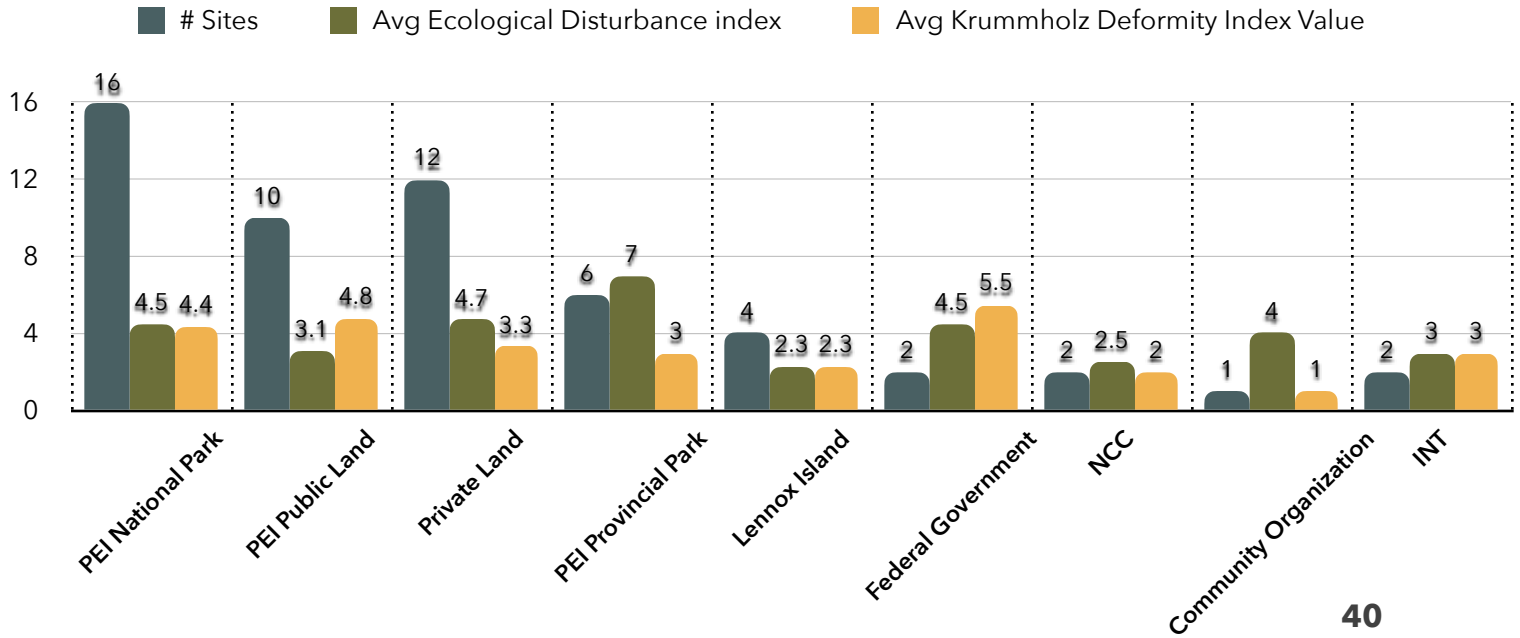
STEWARDING KRUMMHOLZ

Island Nature Trust Staff & Conservation Guardian Volunteers - Krummholz Tour

There are a number of excellent land stewards protecting the krummholz of PEI. From federal groups like the PEI National Park to our Provincial Forest, Fish and Wildlife departments to Indigenous stewards like the Lennox Island Conservation Guardians as well as non-governmental organizations like the INT and NCC. Despite these active groups, a large proportion of our shorelines are under private ownership. The proportion of protected lands versus private varies between littoral cells greatly, with some cells under almost complete protection, such as Brackley, while other areas, like Naufrage, are still predominantly privately owned.

While many areas are officially protected and stewarded, there are additional ecological threats and pressures along our coasts compared to inland properties. Our beautiful dunes draw huge crowds, while other shorelines are seen as high-tourism or cottage areas as well, often with development encroaching into coastal forest habitats. A large proportion of our coasts were heavily farmed, leaving lasting negative legacies on a number of ecological processes. There are many sites under conservation that would greatly benefit from restoration plantings to bring back missing species, create new seed sources, repair fragmentation, aid natural succession and improve wildlife habitat.

The graph below shows the average disturbance and deformity index values across various coastal stewards. Notably, the stewarded provincial park sites averaged the greatest disturbance rating, due to their primary function as a tourism destination, often inhibiting natural regeneration completely to the backshore. Despite stewardship status, poor coastal planning and treatment can have lasting effects to habitat resilience and ecosystem services, often resulting in expensive solutions that rarely come with the host of benefits that healthy habitats provide.



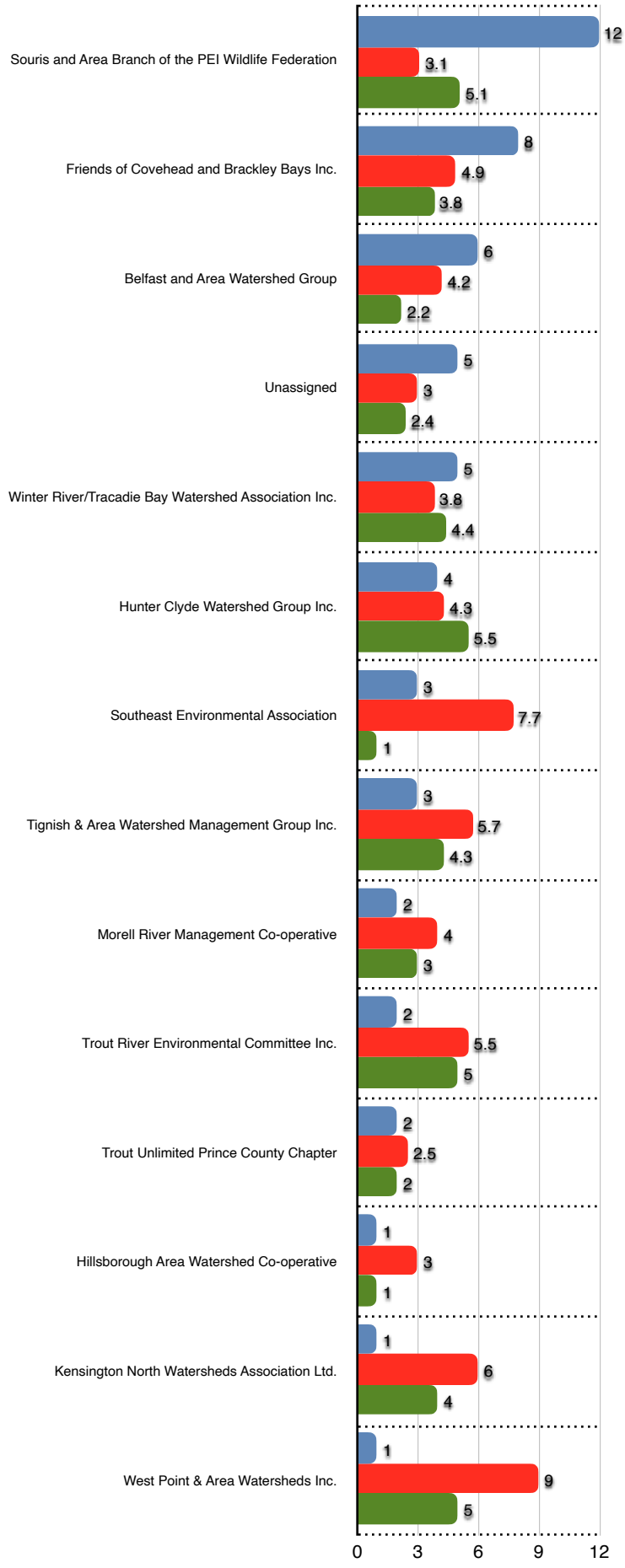
COASTAL WATERSHEDS


Crooked River Krummholz

Although PEI does not have provincial littoral cell groups, we have a health community of watershed groups stewarding our coastal rivers and wetland sites. While all coastal krummholz may not directly come under their purview, these community stewards still play a huge roll in helping our shoreline habitats. A number of sites such as Cow River and Crooked Creek have riparian areas running through the krummholz.

While all watershed groups have coastal areas within their boundaries, certain groups steward much greater extents of coastal krummholz habitat then others due to provincial wind patterns. Souris Wildlife Federation, Winter River, Covehead/Brackley and Tignish are but a few with predominantly high-wind shores.

The chart to the right shows both the disturbance and deformity index values by site across all relevant watershed groups. Several sites, generally on coastal islands, such as Lennox and Pituamkek, are officially unassigned, although the Lennox Island Conservation Guardians would most likely be considered the local watershed group. The disturbance values reflect land-use history much more than stewardship success, as most watershed groups have little actual control over land practices, with some areas heavily farmed and settled compared to others. The average krummholzing value helps to identify the watersheds with more coastal habitats growing under high winds.



ECOLOGICAL THREATS


Cliff-side Cottages

As previously mentioned, PEI has a long and strong history of ecological disturbances due to historic land-clearing and farming. Our Island's coasts are popular locations for cottages, tourism and industry, often cutting into our krummholzing coastal habitats.

While PEI's coasts are also disturbed by a number of natural events, such as post-tropical storm Fiona, these are not included within this ecological disturbance index. Created for 2022 data analysis, the ED index is a very simple presence-count of 11 human-cause disturbance types, whether recently, presently or historically. While this index could benefit from further value-weighting, it was purposely kept simplistic to avoid bias in analysis.

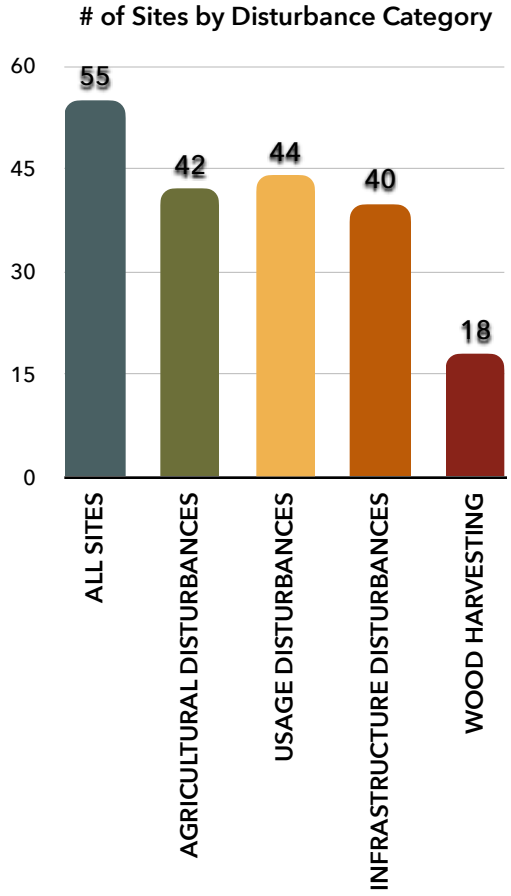
The 11 subcategories of disturbances are grouped into 4 larger categories.

Agricultural Disturbances: A category of one, field observation as well as historic data was used to populate this field.

Usage Disturbances: are related to tourism and other on-going non-industrial site usage, such as foot traffic and site popularity as well as cottage and tourism development.

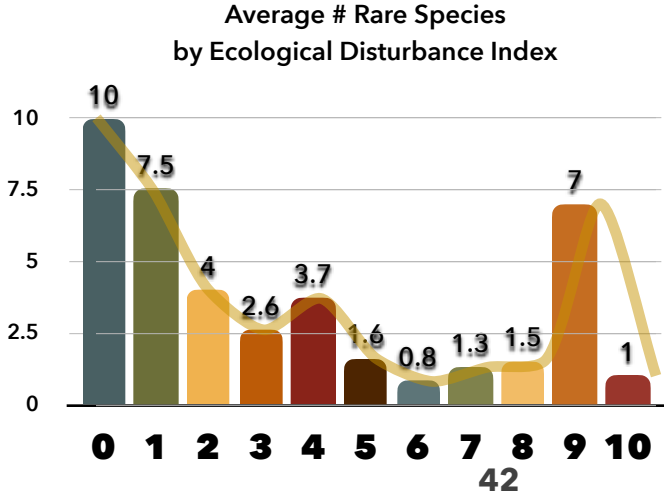
Infrastructure Disturbances: include historic or on-going industrial use of sites, for example harbours, waterway infrastructure or factories, as well as treatments that drastically alter local conditions, such as road-building, parking, or lighthouses.

Wood Harvesting: This category has three options, none, small-scale, and large-scale wood harvesting; but only adds a value of one to the ED index if any harvesting occurred.



The chart to the right shows the average number of rare species across sites by their ecological disturbance index rating. It should be noted that the small survey site sampling number has added some discrepancies in the data. Only one site at ED index nine was surveyed, Cedar Dunes Park, a highly biodiverse and unique location. This disturbed but diverse site explains the jump in rare species at that index level.

The general trend shows that rare species frequency drastically drops with even low disturbance values, although more and better data and analysis would reveal much more nuance to this story.

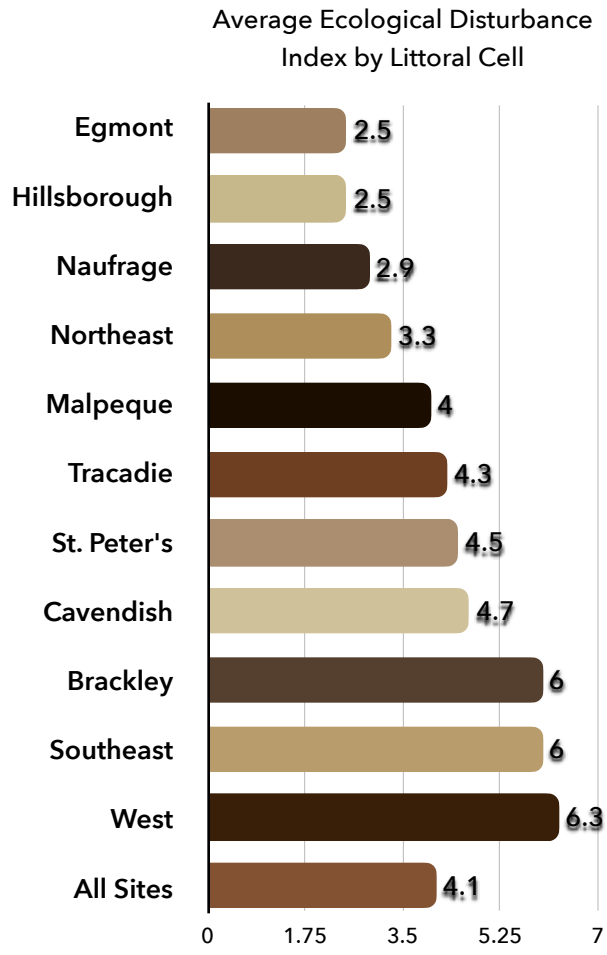


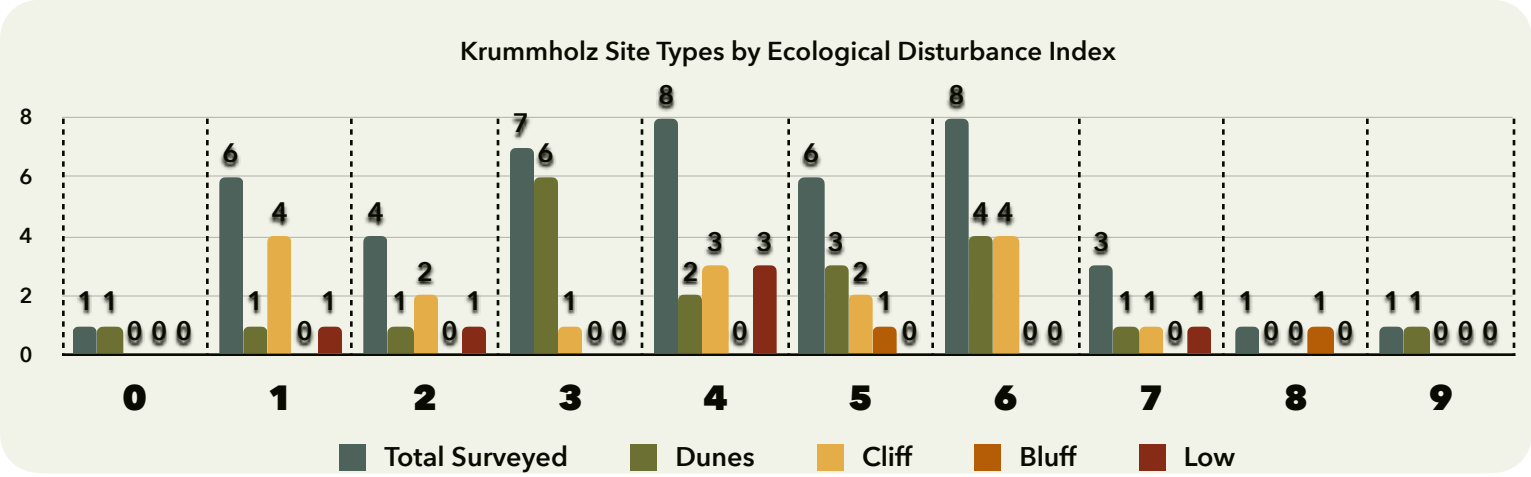
ECOLOGICAL THREATS BY GEOGRAPHY

Paved Road Cutting Directly Through Krummholzing Dunes, PEI National Park

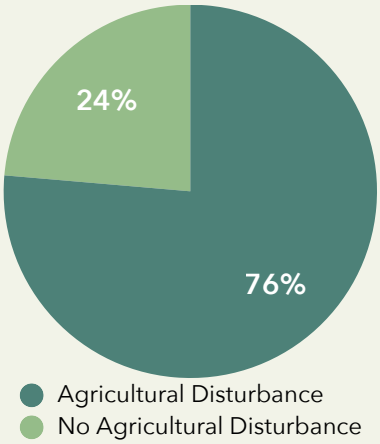
Using the simple ED index, we can begin to compare coastal areas of the province. Due to local patterns of settlement, development, stewardship, proximity to urban centres, and other variables, not all our coasts have seen the same levels of disturbance. Again, more sites across the province are needed to create a more accurate analysis. The chart to the right shows each littoral cell with surveyed sites by its average ED index rating, ordered from least disturbed to most. Generally cells further from urban centres and less developed for tourism have lower average ratings. The highest disturbed cells include many of our most popular beaches.

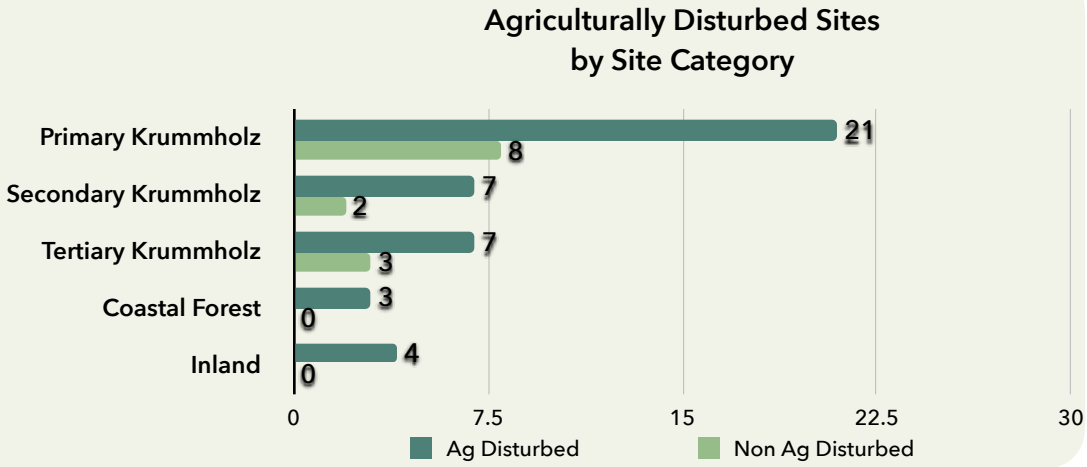
The graph below illuminates both the data collected across coastal types, as well categories of sites that have been under-surveyed. Cliff coasts tended to average a slightly lower rating then dunes, while bluffs and low plains were generally more disturbed. That being said, only one site was visited that had no disturbances listed, the Pituamkek Sandhills. Most coastal sites have approximately just under 50% of potential disturbances present. Inland and Estuary sites are not represented in this graph although ED index data was collected for these sites.





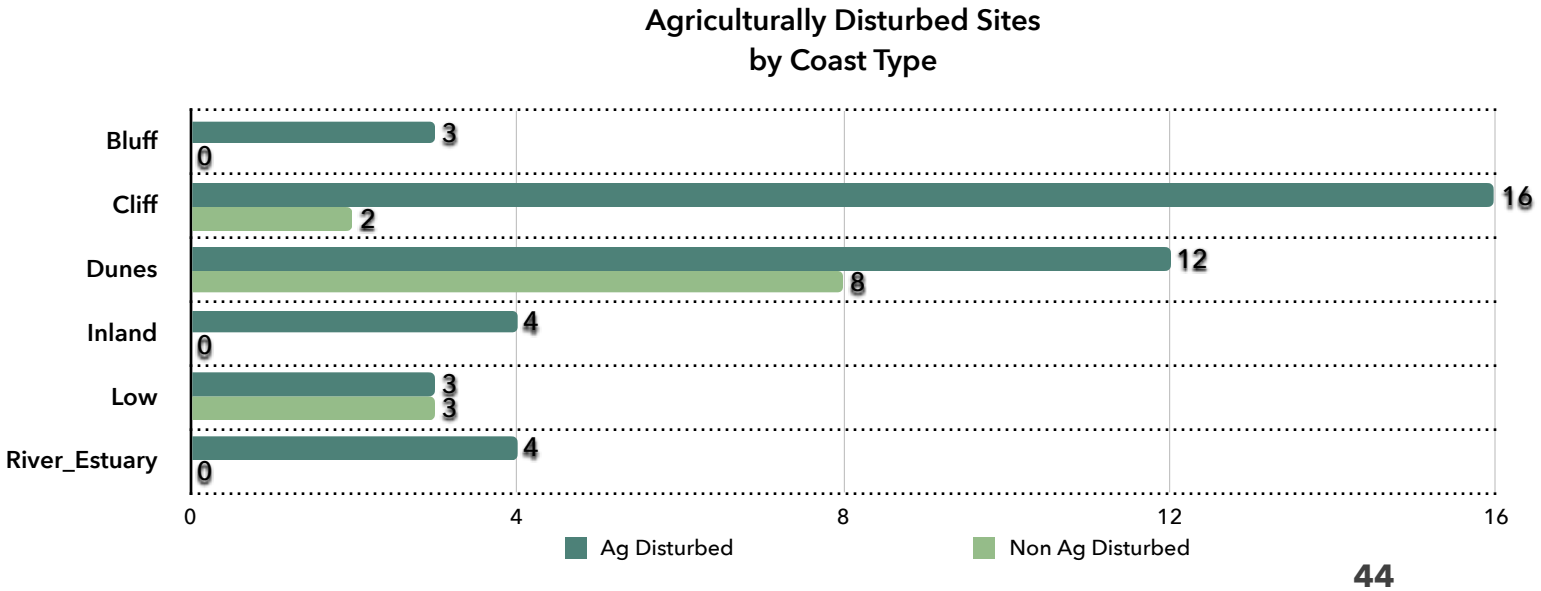
AGRICULTURAL DISTURBANCES





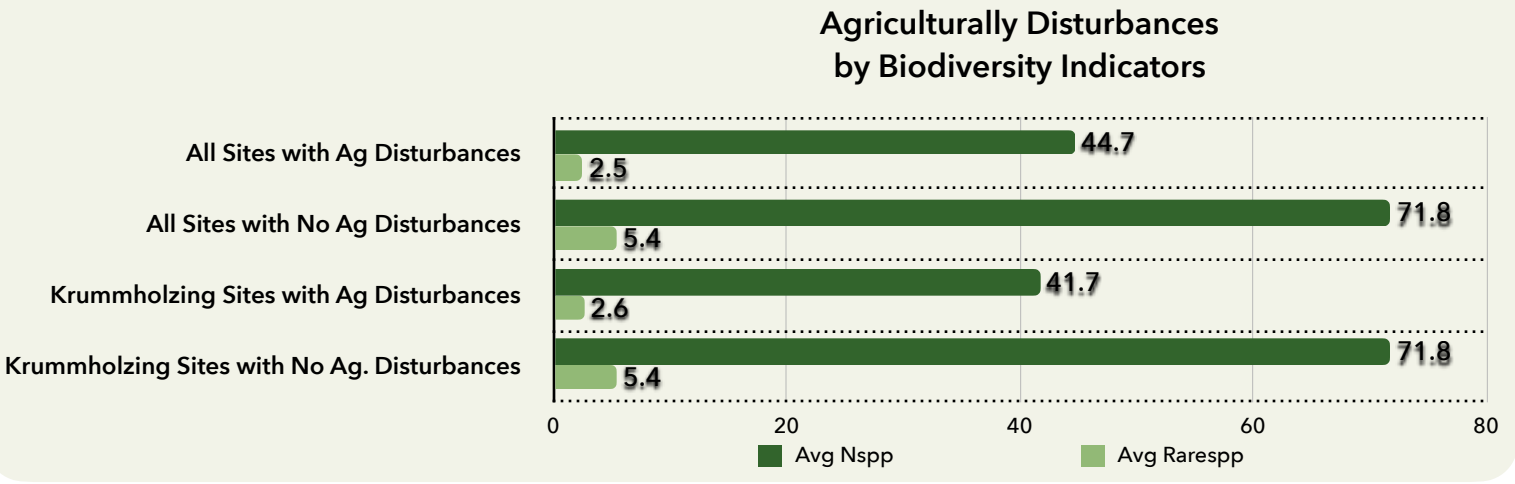
Just over three-quarters of sites surveyed had been affected by some form of agricultural production, although the intensity, extent and timing of these disturbances have not been taken into account with this index. Still, even this simple analysis shows that windier sites were more often not chosen for farming and that dunes have the highest true proportion of un-farmed sites. Most of the low plains surveyed were areas of wet soils, which may explain the low proportion of farming represented.

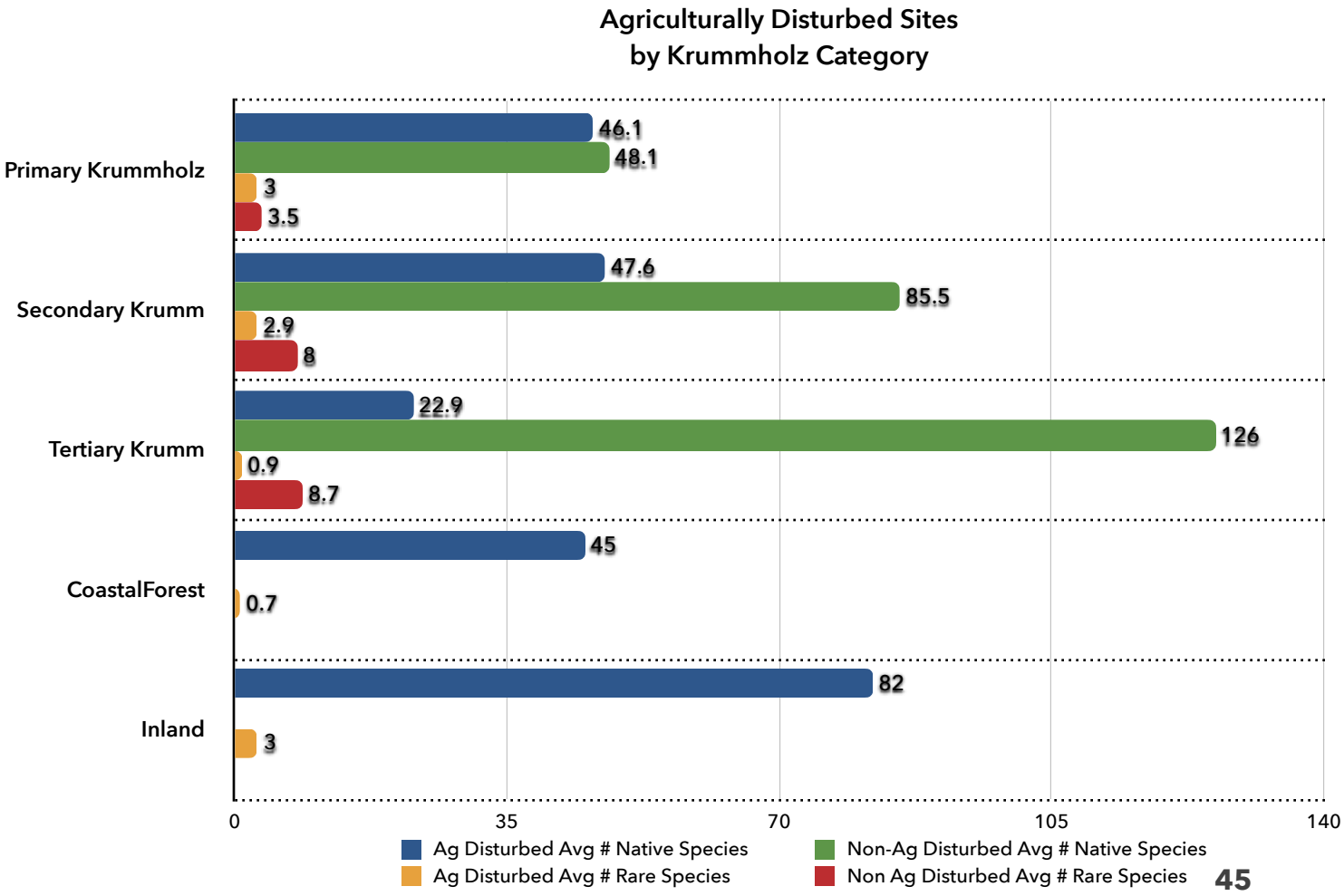
The first chart on the following page looks at biodiversity indicators by agricultural disturbances. Non-affected sites tended to have higher average numbers of rare and native species. The second graph compares these same indicators across krummholzing categories, showing similar results. Again, this index is simplistic, lacking nuance to properly take into account important details. Primary krummholz were often not completely farm, leaving pockets of rare and native seed sources to speed up natural succession.



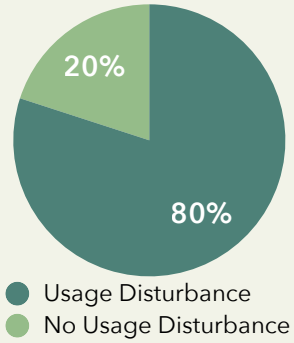
AGRICULTURAL DISTURBANCES

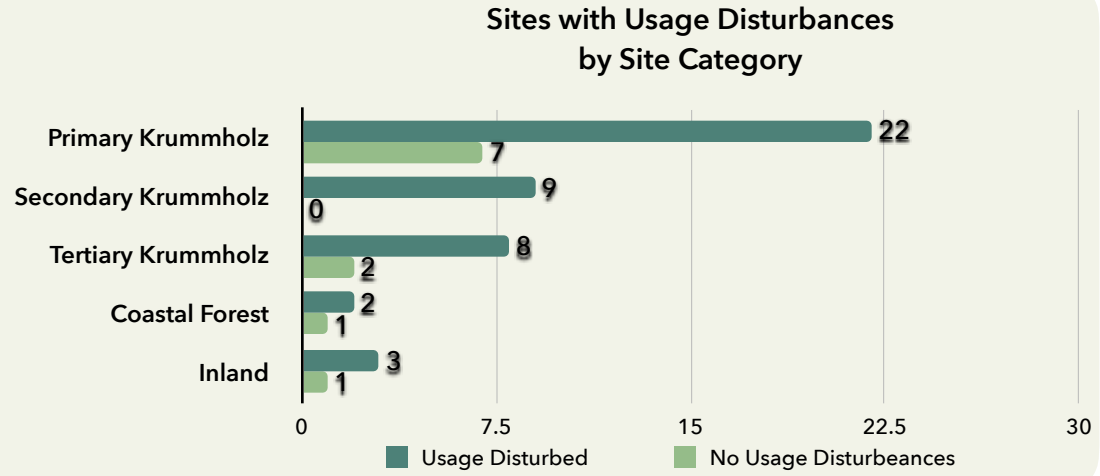
Previously Farmed Cameron Island Krummholz Post Fiona





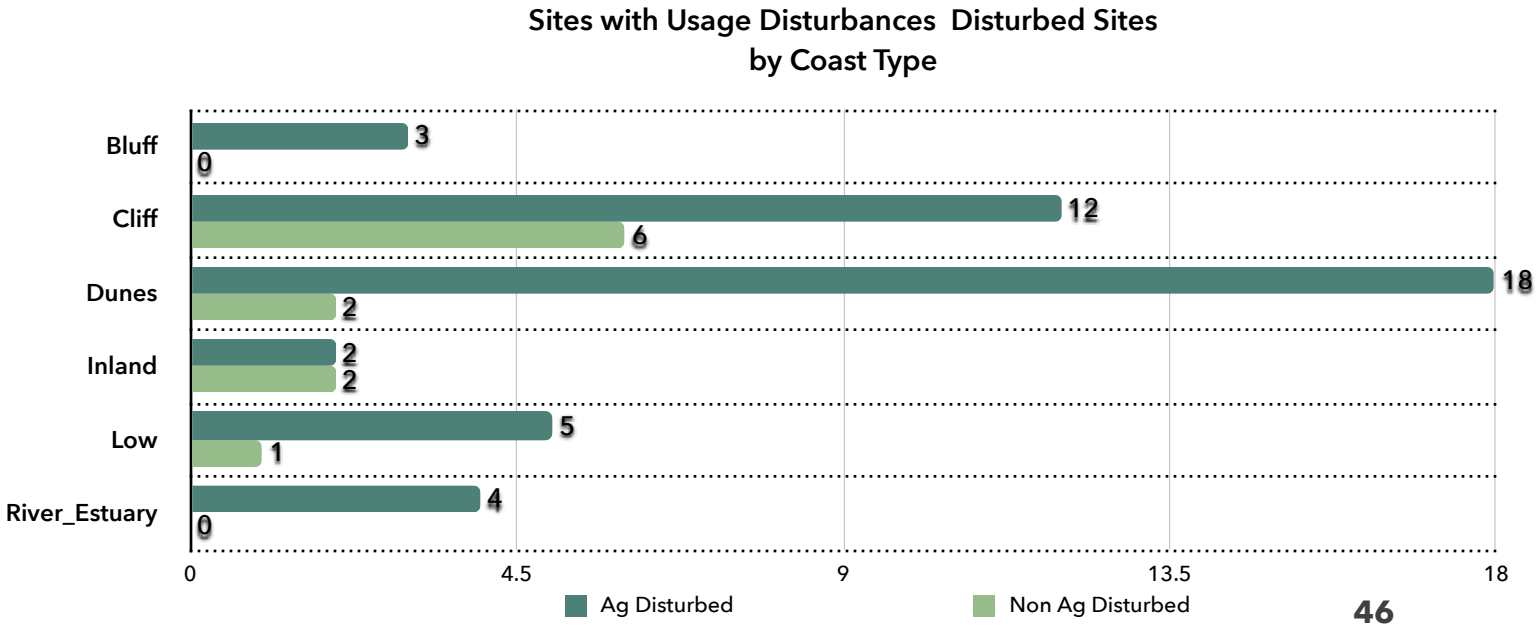
USAGE DISTURBANCES





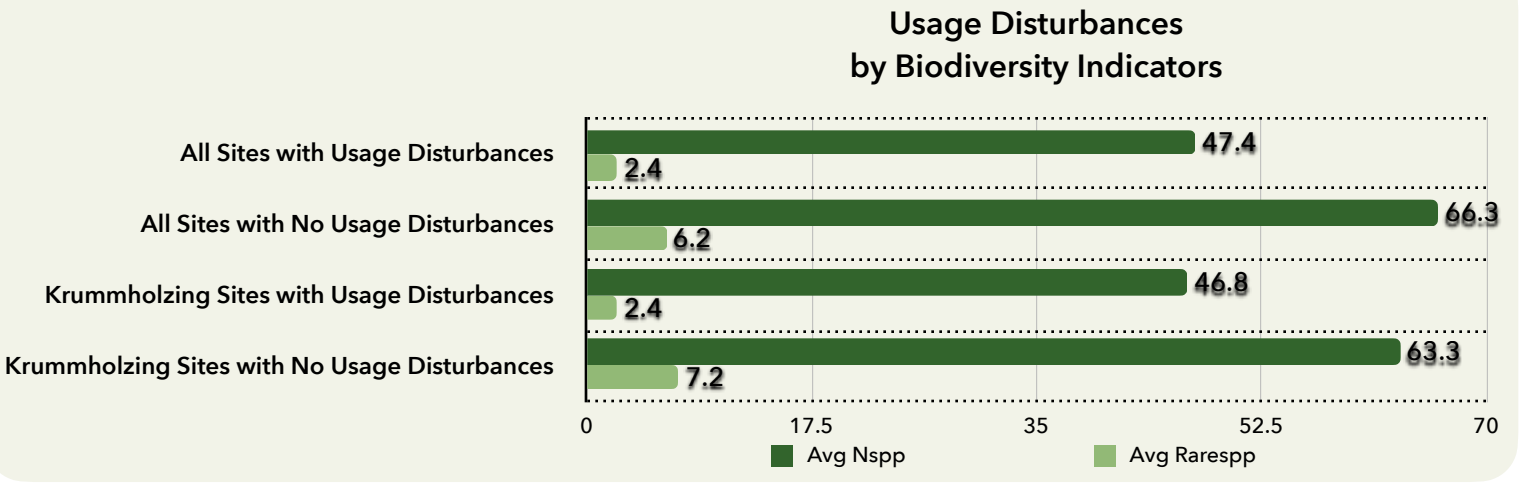
As mentioned, PEI's coasts are popular destinations, marketed globally for recreation and accommodation. Sites with usage disturbances were even more frequently found than those with agricultural history, unlike most inland properties. Almost all but our windiest coastlines have been opened up to some kind of on-going use, whether private hidden beaches, heavily cottaged areas, or park infrastructure and camping grounds. Conversely to agriculture, our dunes are some of the highest proportionally affected by usage disturbances.

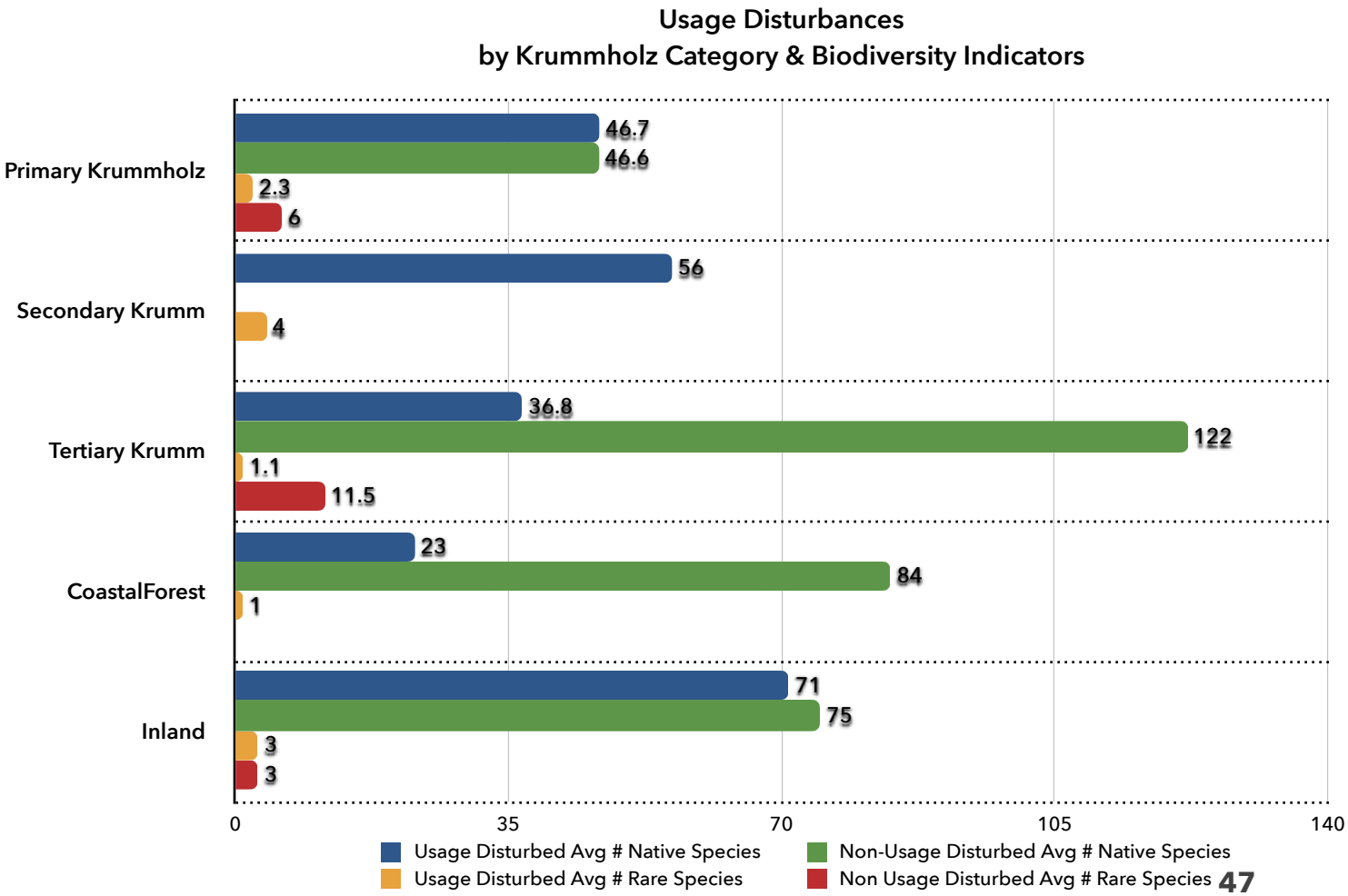
The charts on the following page indicate that ongoing tourism use has a greater affect on biodiversity indicators than past agricultural production, although many tourism sites were historically farmed. The final page of usage charts breaks down usage by sub-category. While all sub-categories seem to affect biodiversity indicators relatively harshly, access and popularity were the most wide-spread disturbances.



USAGE DISTURBANCES

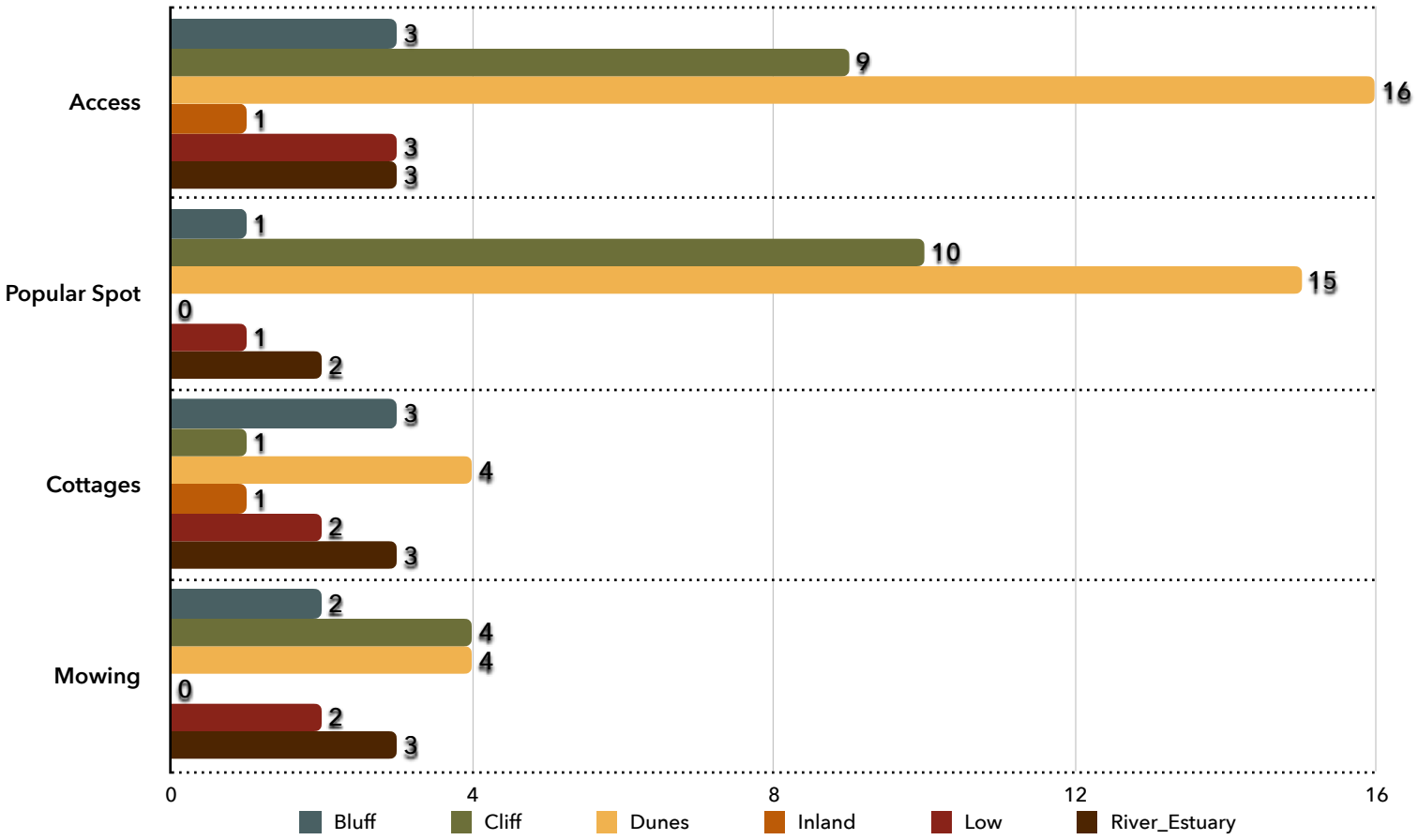

Heavy Tourism and Infrastructure at Provincial Parks



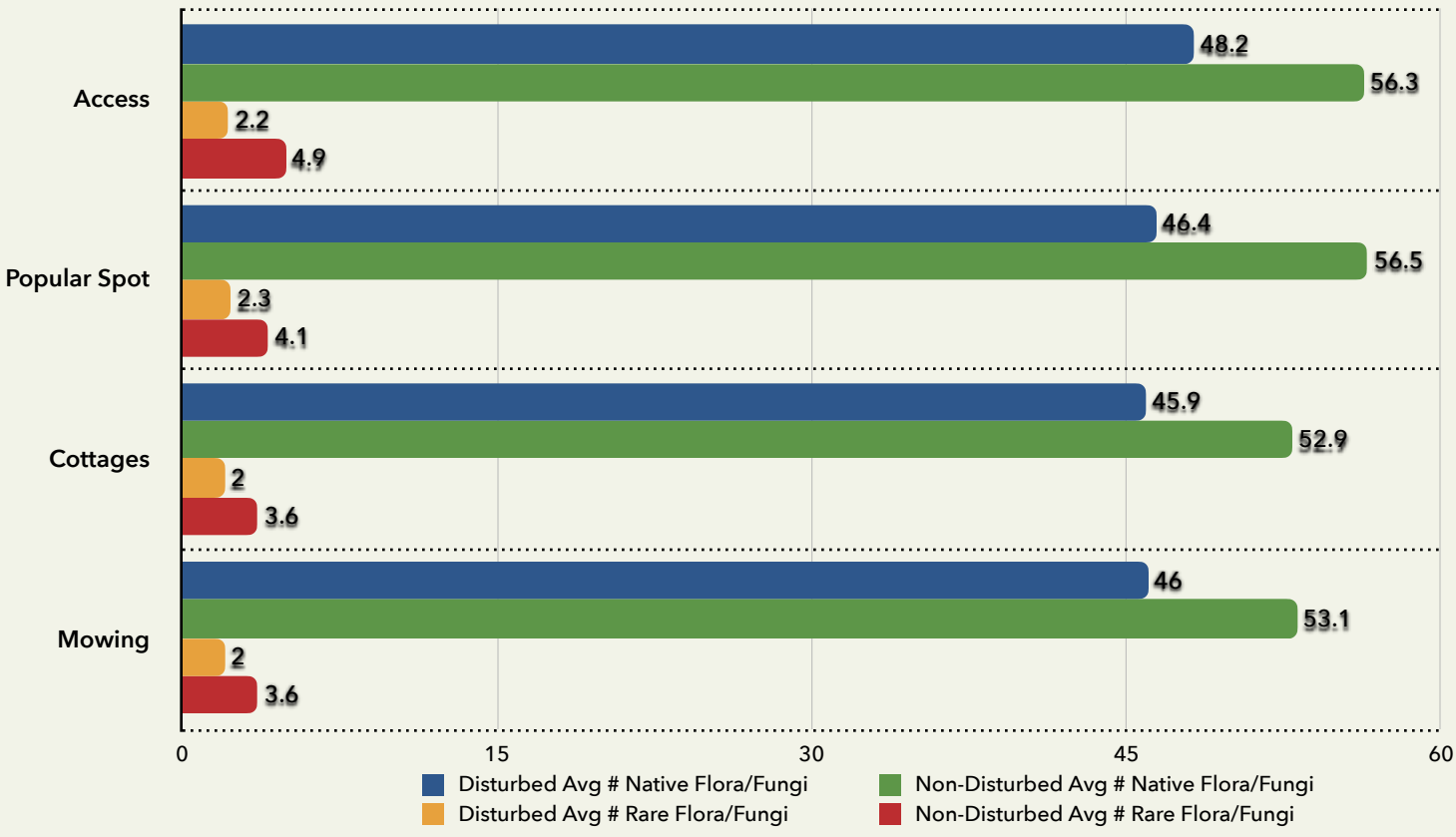


USAGE DISTURBANCES

Usage Disturbances Breakdown by Coastal Type

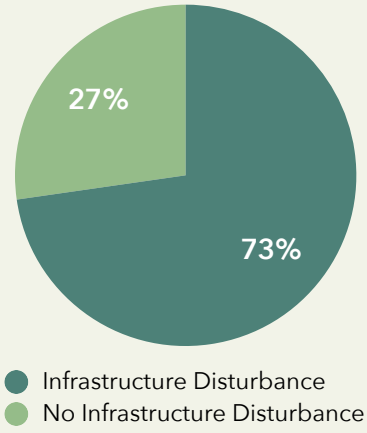


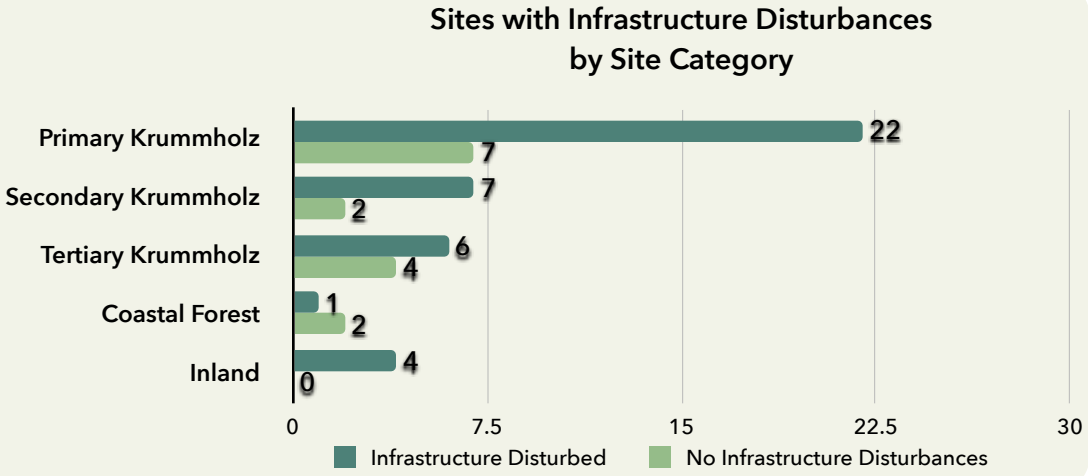
Usage Disturbance Breakdownby Biodiversity Indicators



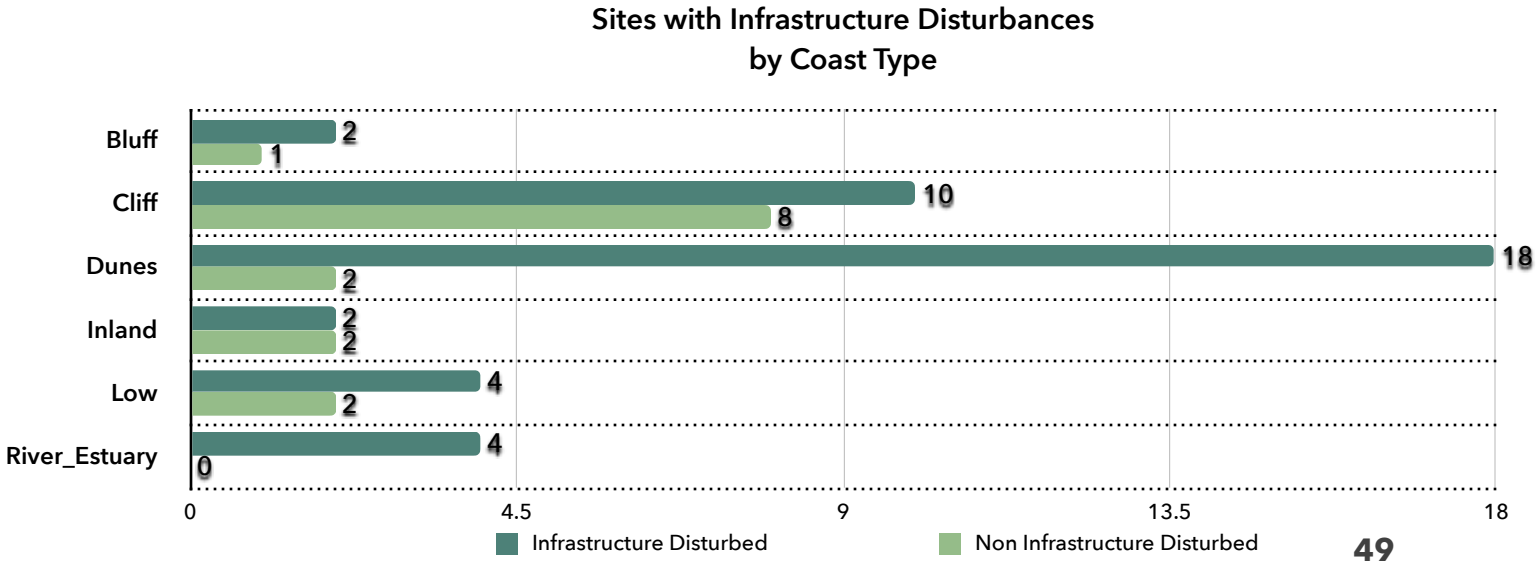
INFRASTRUCTURE DISTURBANCES


West Point Lighthouse





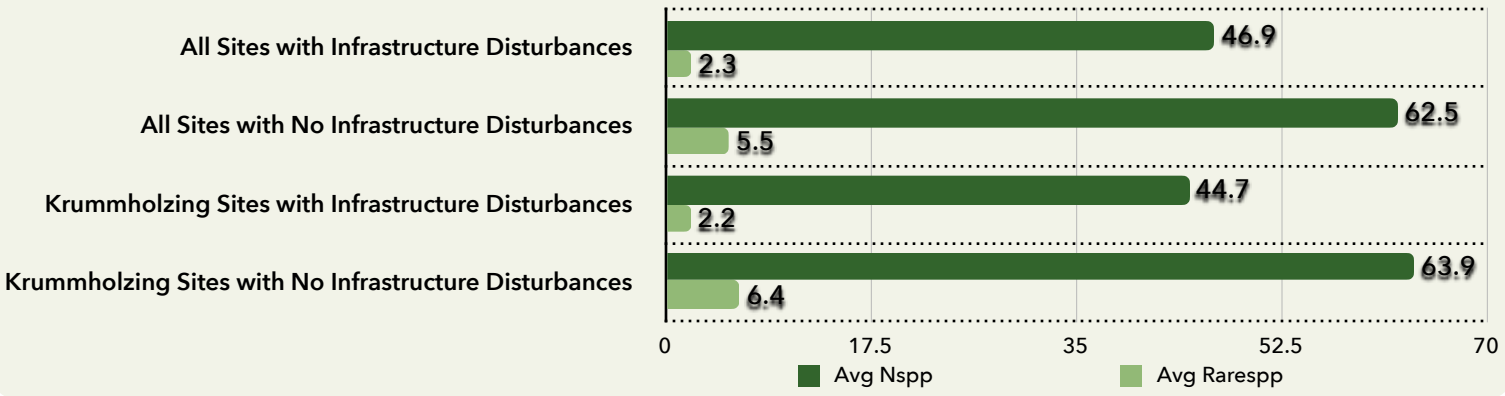
Again, this category could use better data collection and analysis, without looking into historic records, ascertaining past industrial-use along our coasts can be difficult. The interconnected nature of our coastal sediment cells can mean that industrial activity along the shore can affect areas much further away. Despite these challenges, the data collected suggests that a slightly lower proportion of our coastal areas have been affected by infrastructure disturbances than the preceding categories; cliffs are the lest affected amongst all coastal types. Most dunes had infrastructure, although usually in the form of road building to create access such as in the PEI National Park. Like the other disturbances categories, infrastructure development along our coasts seems to have an adverse reaction on biodiversity and rare species in our krummholzing habitats, road building particularly. Waterway and industry infrastructure are the only sub-categories which reverse the trend of biodiversity decline. Although a disturbance when constructed, proper waterway infrastructure can mitigate the effects of other on-going disturbances. Industry disturbances were most often historic, as well as infrequent.



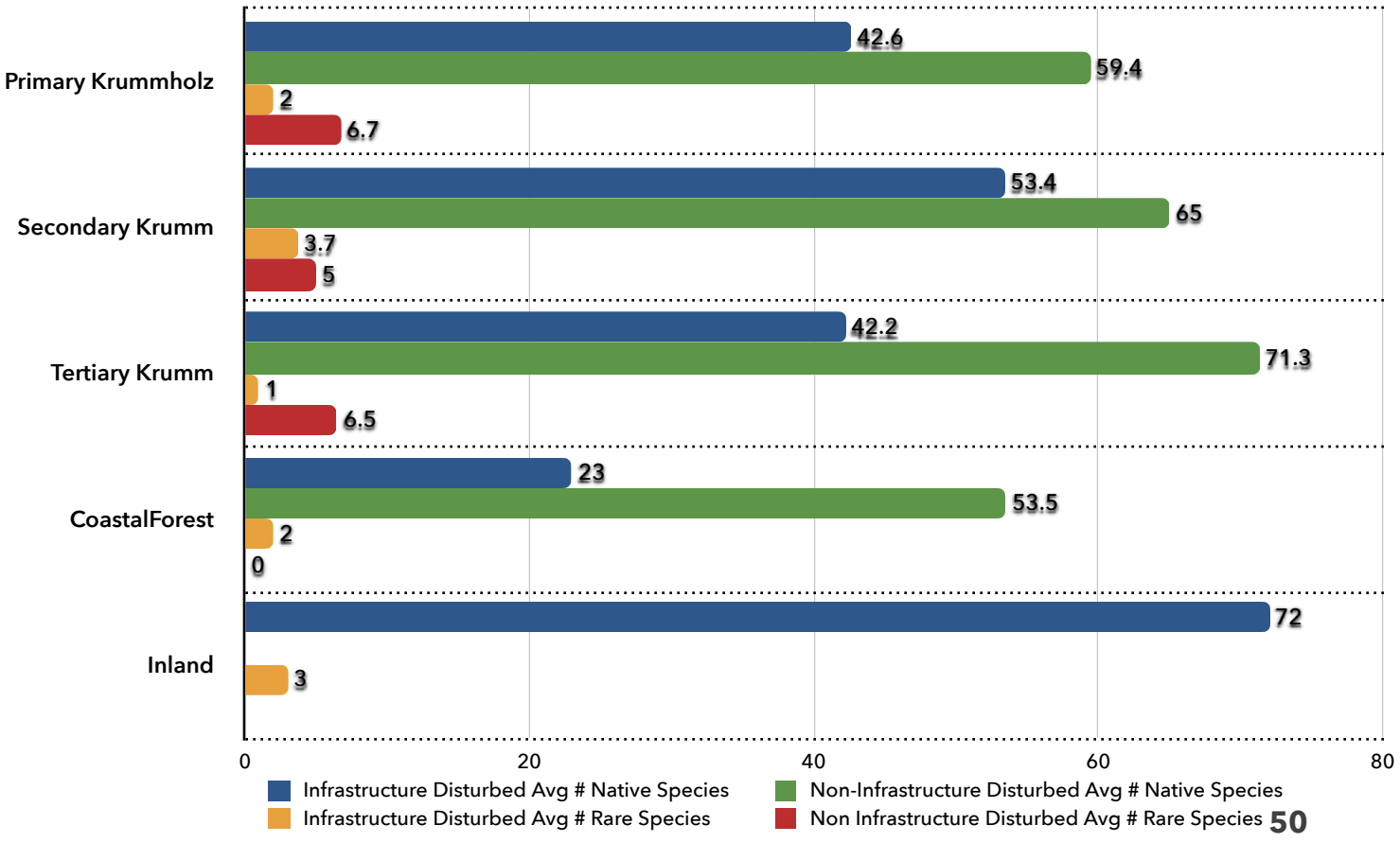
INFRASTRUCTURE DISTURBANCES

Coastal Roads can prevent coastal flood water from receding, inundating coastal forest roots, killing canopy trees, such as swathes of cedars at Cedar Dunes Park.

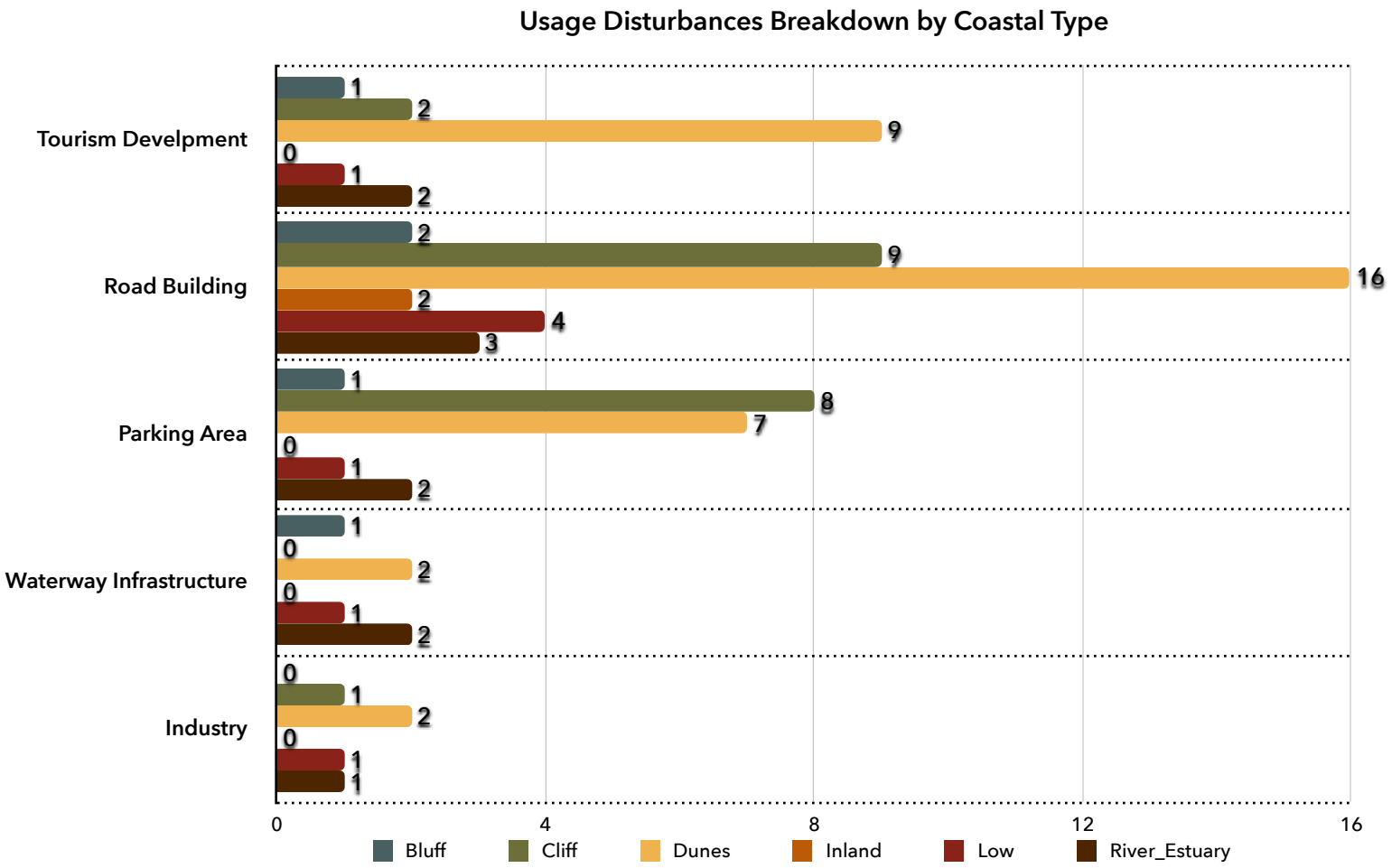
Infrastructure Disturbances by Biodiversity Indicators

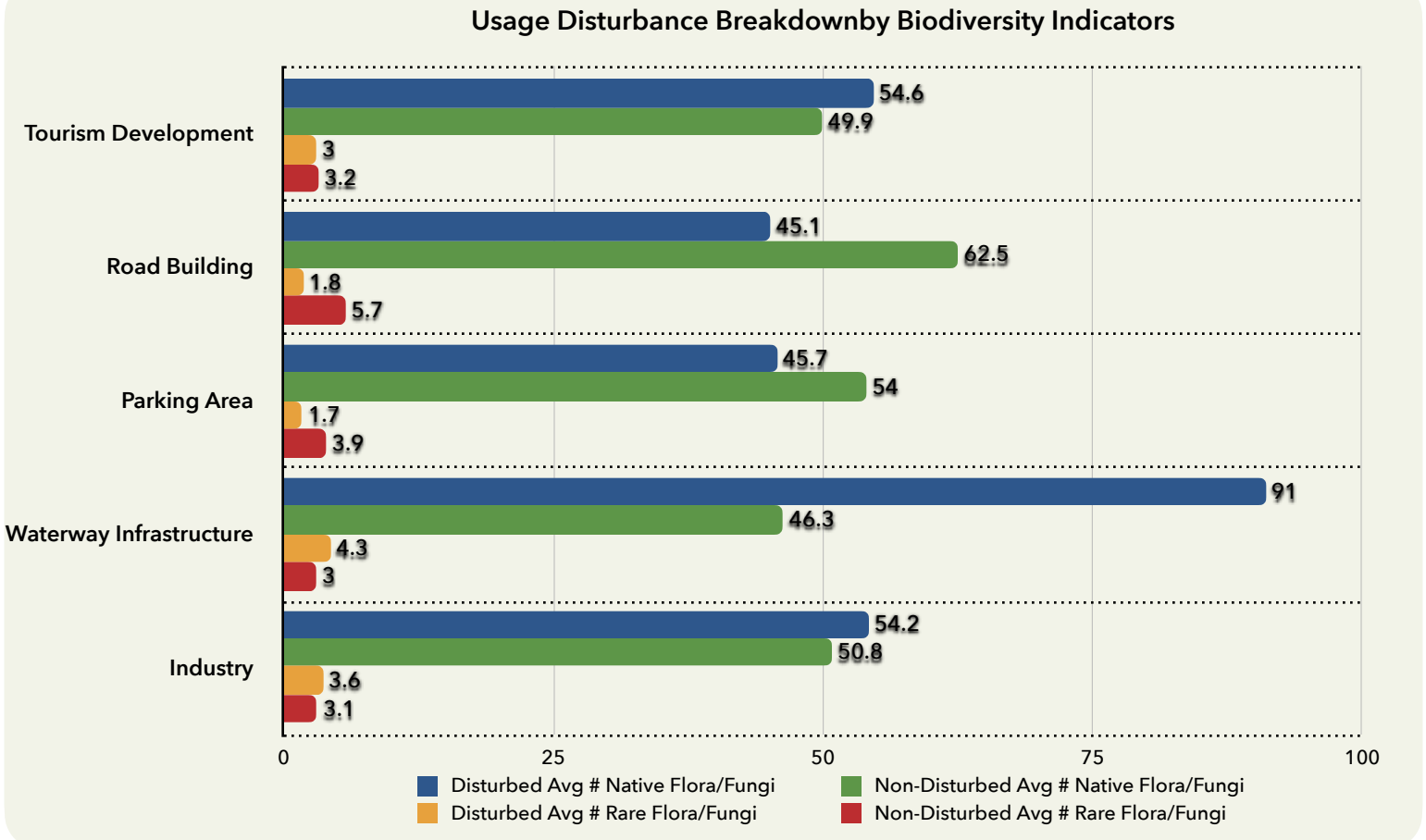


Infrastructure Disturbances by Krummholz Category & Biodiversity Indicators

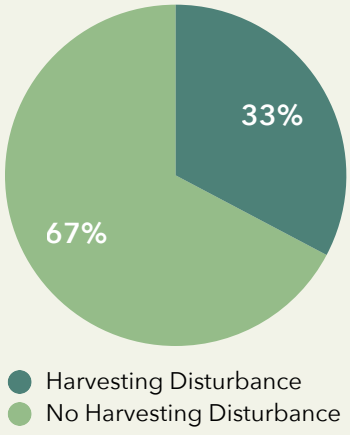


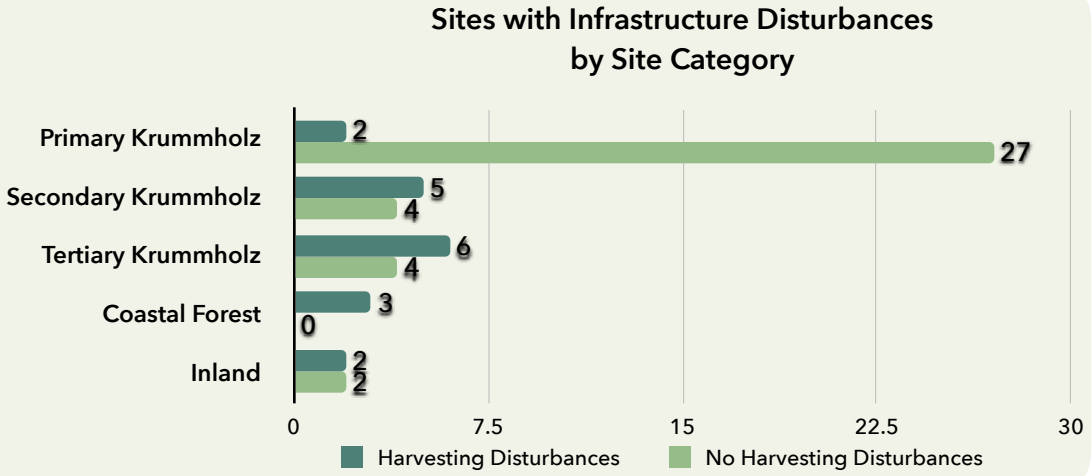
INFRASTRUCTURE DISTURBANCES



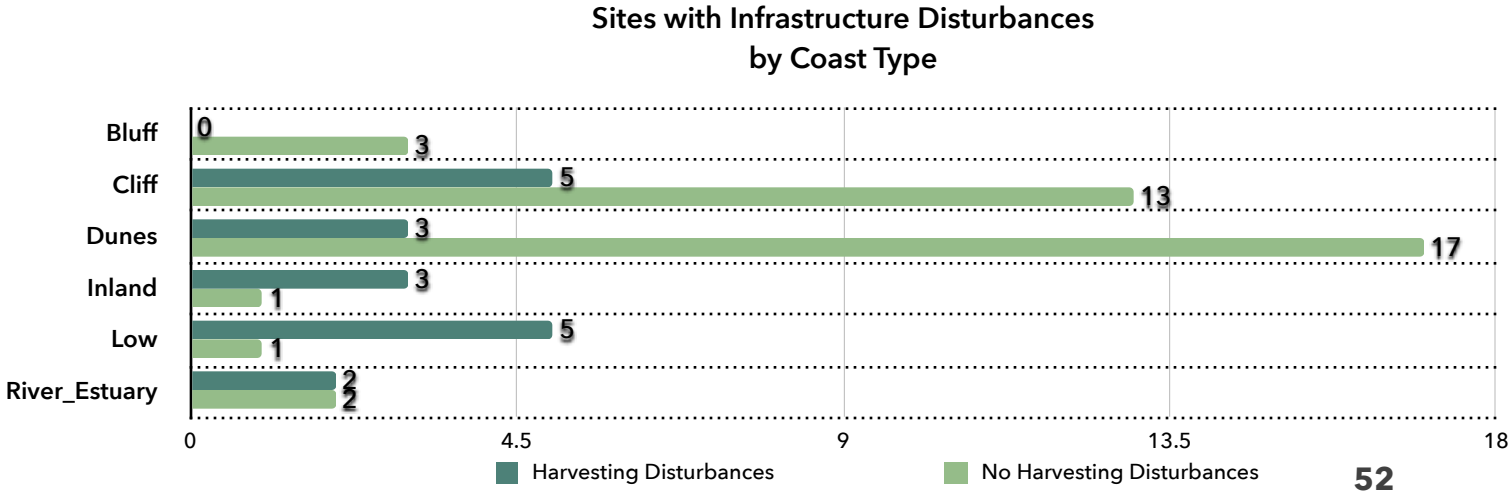


HARVESTING DISTURBANCES





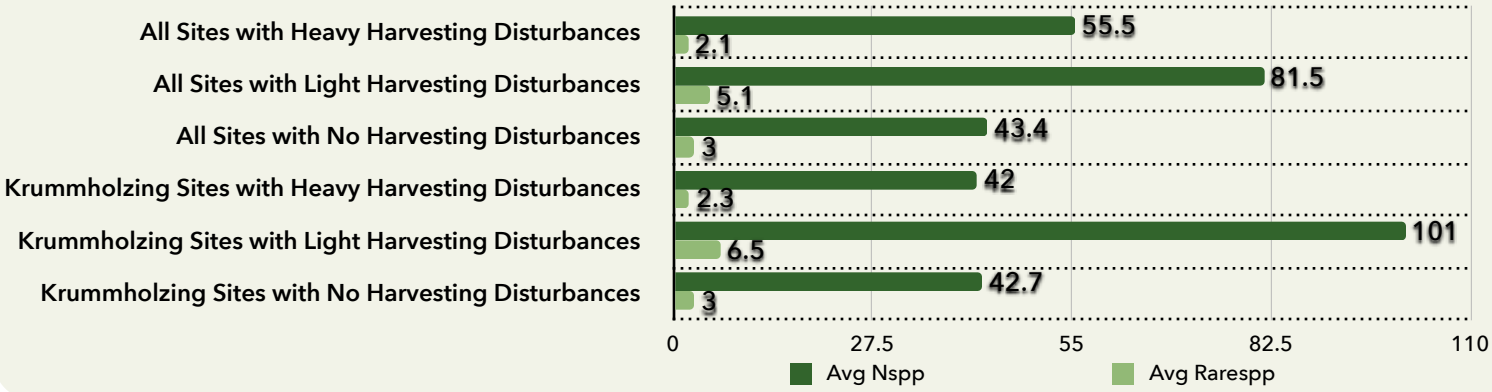
This is another category lacking proper nuance, not taking into account timing and extent of harvesting. Harvesting wood in these windy and coastal habitats is by far the least documented disturbance activity reported across all sites. This is perhaps explained by patterns in stewardship as well as the frequent and recent history of farming across many sites. Primary krummholz, those with deformed and wind-blown conifers, were the least proportionally harvested, luckily not seen as economic. In fact, sites that were small-scale harvested, although few, indicate that this can be positive on biodiversity values. This could be connected to harvest extent as well as how long ago they took place, often newly harvested areas can support a boom in new full-sun loving species if sheltered. It might also be that these areas were locked into forest habitat rather than cleared for agriculture. Despite some damage, much of the original biodiversity was simply maintained, like Pituamkek Forest. Areas where the coast-adjacent vegetative border was cut, generally showed more damaging after-effects from Fiona, suggesting a variable coastal-force based buffer zone would best address ecological restoring, improving needs, services, conservation and protection of coastal krummholzing habitats.



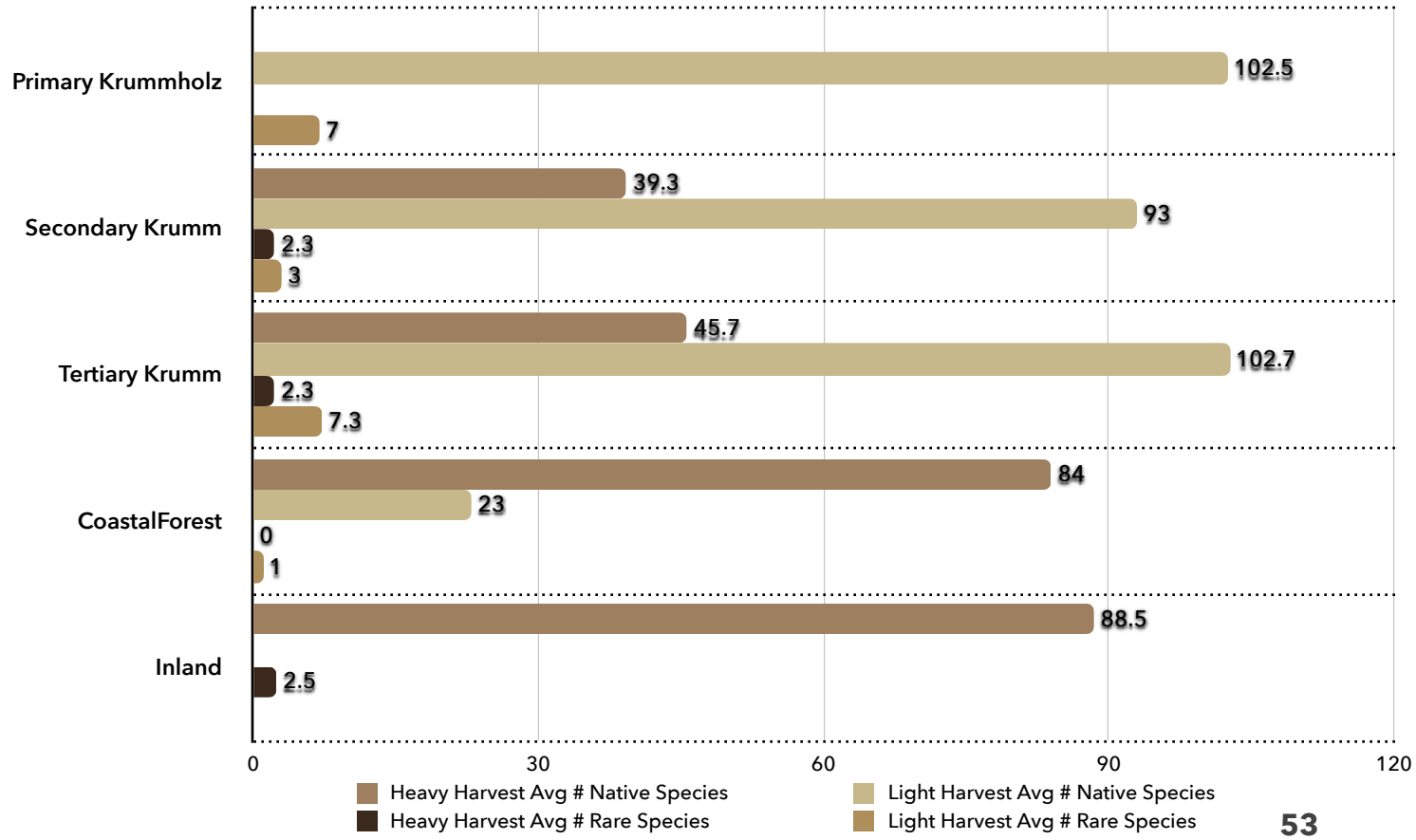
HARVESTING DISTURBANCES

Old Stump in Coastal Forest - South Enmore, NCC property

Harvesting Disturbances by Biodiversity Indicators



Harvesting Disturbances by Krummholz Category & Biodiversity Indicators



COASTAL RESTORATION

Recently De-commisioned and Highly Damaged Dalvay Restoration Site, PEI National Park

As demonstrated, our coastal krummholzing habitats have almost all been disturbed, whether through historic agricultural practice or present-day development and tourism. These shoreline forests are the first to be hit by our many recent and historic high-wind events, natural but still destructive. Many sites, such as Cedar Dunes Park and areas of the PEI National Park, are in heavy ecological decline, hit hard by recent storms due to poor site planning, over-use and infrastructure development. This decline in coastal habitat health across the province has resulted in lower resilience to natural coastal forces such as flooding and erosion, higher wind speeds penetrating inland areas due to krummholz and forest fragmentation, as well as much poorer habitats for the many resident and migratory animals that use them.

Provincial historical records suggest that many Island krummholz once protected multi-aged biodiverse forests, with a multitude of large diameter deciduous trees; a habitat only seen at Pituamkek Forest. The potentials for what our krummholz and coastal forests are capable of and the diversity of species, functions and benefits that may come from repairing them are still to be learned.

PEI's coastlines were once an almost unbroken and interconnected mosaic of krummholzing and coastal forest habitats, undulating inland depending on coastal intrusion of wind and salt. This Island-wide ecological buffer also helped to regulate sediment and nutrient transportation amongst our shallow coastal habitats, contributing to the bounty of shellfish and lobster once historically reported. Much like our riparian areas, actions along our coasts can have cumulative effects great distances away, which often demand a community-based solution, such as a landscape ecology approach. While coastal areas like those in the PEI National Park have a much more united stewardship plan, many other areas are fragmented in ownership, split across many private owners, often with differing desires for their coastal properties. Coastal armouring is an excellent example. When done across only one site in an area, coastal forces are then deflected rather than absorbed, often increasing erosion along adjacent properties. Ideally, coastal littoral cells groups, much like our wonderful watershed groups, could be tasked with uniting and educating local communities to change habits around shoreline development and restore these important coastal forests.

RESTORING COASTAL KRUMMHOLZ

Oceanview Restoration Site, PEI National Park

Although much improved in health and extent since the early 1900's, our krummholz and coastal forests are often fragmented and lacking important native seed sources. Restoration plantings can be hugely beneficial in re-connecting fragmented krummholz, adding rare and native seed sources, repairing structural habitat damage, diversifying inland coastal forests, improving wildlife habitat, increasing resilience against erosion and much more.

As described, a number of relatively easy-to-assess categories have been created to streamline restoration planning across Island krummholz and coastal forests. Appropriate native species are heavily determined by coastal type and local drainage, with species lists and recommendations provided later. Determining the krummholz category can aid in mimicking natural habitat patterning and species distribution. Although still a prototype, a GIS methodology for quickly estimating ecological wind zones is in development, used for all krummholz restoration to date. This allows for targeted placement of specific species, all while considering a landscape ecology perspective. As has been seen, krummholz forests growing in high-wind environments rely on community-cooperation to slow on-coming winds and improve growing conditions and survival rates. Once species lists are created for the site, and wind-zone recommendations are taken into account, species selection can be better matched to specific ecological needs and condition. Eco-wind zone mapping also allows for quick identification of missing but appropriate flora species and identifying key krummholzing areas to re-connect or specific zones that are in need of structural improvement. The ecological wind zone approach is aimed at Primary and Secondary Krummholz. Restoration at sites categorized as tertiary or weaker krummholz can generally forego wind zone planning, often more strongly influenced by other forces such tides. There are also a number of other coastal toolsets such as the Coastal Impacts Visualization Environment (CLIVE) and the Coastal Hazard Information Platform (CHIP) which can also inform these restoration efforts.

High-wind plantings have a number of different challenges than most traditional inland restoration sites. Other than species selection, there are other strategies that mimic natural patterns and help to ensure better survival rates.

- Higher density plantings in higher wind settings.
- Use natural or artificial barriers to block strong winds, such as logs, in highly exposed areas.
- Plant in spring to allow for a longer season of root growth and specimen establishment before winter winds.
- Add ample organic matter and mulch plantings heavily to counteract strong desiccating winds or poor soils.
- Utilize micro-habitats/climates appropriately for species placement and adding seed sources.

FLORAL FUNCTIONS

As described, high-wind coastal forests face a number of fierce and unique challenges, display relatively predictable zonation, and have a limited number of species tolerant enough to grow in the most exposed areas. The diverse array of adaptations seen across our coastal species allows them to provide a number of valuable ecological services and functions, important to consider in habitat restoration. Below are some categories of species functionality to consider when selecting for site restoration.

STRUCTURAL:

These species often have the highest tolerances to on-coming winds and salt, generally the most common across our krummholzing forests. Many of these flora have a particular ecological wind zone in which they seem to thrive, but many can be found across several or even all. White spruce is a great example, highly resilient to most coastal forces, this species is found across almost all of our krummholzing coasts. As it develops, it slows surrounding winds, improving local growing conditions. Non-woody species fulfill this role closer to the shore generally, such as marram or cord grasses. Though these floppy species do not create much friction, cumulatively large areas of them shelter establishing woody seedlings, which will eventually succeed, with luck, into a krummholzing forest.

Deadwood is an important aspect of krummholz structure, with dead standing and partially dead trees often seen across a variety of sites. Mortality is a more common process in these windy forests and similarly to inland habitats, deadwood is an important source of nutrients and critical for local water retention. In coastal high-wind habitats, they also function as a structural barrier, shielding and shading other flora from winds and sun. Deadwood is also heavily colonized by lichens in these habitats, as well as providing shelter for local wildlife.

In coast-top environments, such as cliff-top and dune barrens, lichens can even be structurally important for slowing winds and protecting developing flora. Often white or brightly coloured, our coastal lichens generally have high albedo-rating, reflecting sunlight and cooling sands and soils below. Many, such as reindeer lichens, can absorb ample water. Others, such as bottlebrush shield lichen, can help transport key nutrients from atmosphere to soil.

Ensuring structural species across all zones are present and intact will improve the success of other more niche species, who may be needing more shelter or other specific requirements. Ecological krummholz structure is even more important to consider when afforesting windy sites, as conditions can be extremely harsh.

FLORAL FUNCTIONS

DIVERSITY:

While limited to tolerant species, krummholz forests are tightly interconnected communities, with a variety of relatively unique species of native flora, often rare or infrequent along our coasts. As mentioned, taking note of missing species which grow well in the appropriate zone and coast type can be an efficient way to increase native floral biodiversity successfully. The roles and ecological interactions that these uncommon species play in our coastal forests are very poorly understood.

Beyond these rare or uncommon species, consider the diversity of food sources available for wildlife, as well as the seasons in which they are available. Coastal forest honeysuckle and red maple spring flowers give way to summer serviceberries and raspberries closer to the shore, while mountain ash and acorns aren't ready until fall. Are there nuts, catkins, seed, berries and flowers available throughout the year? Pollinators are important as well, with many wasps, ants, and beetles seen in these habitat during fieldwork. These important insect populations help support native birds such as the rare bank swallow.

SOIL:

As recommended, soil amendments of organic matter and mulching should be used for most coastal krummholz plantings. There are also a number of species which can improve soil fertility and stability.

Famously, alders, as well as bayberry, sweet gale and sweet fern, are nitrogen fixers, working with native bacteria to sequester nitrogen back into depleted soils. Beach pea, a legume, as well as marsh vetchling in wet areas, also help to fix nitrogen along our coasts.

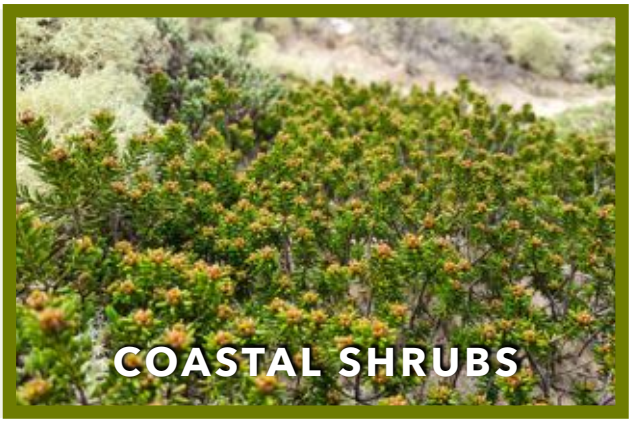
All of our flora species shed needles and leaves, eventually decomposing and adding a variety of nutrients. Planting a diversity of species in the right areas, helps to balance these diverse inputs.

Erosion is another soil concern, with a number of plants specialized for spreading and rooting. Marram grass, beach sedge and starry false Solomon's proliferate quickly in dune sands, while junipers and crowberry quickly protect the clifftop against erosion. Many shrubs, such as sumac and chokecherry can spread throughout an area quickly. Aspens colonially grow along many of our calmer southern shores and our provincial red oak's deep tap root makes it ideal for growing in coastal dune forests.

COASTAL FLORA

Native trees are an important component of our coastal forests. In primary and secondary krummholz, conifers, particularly spruce, tend to form the bulk of the thicket zone. In wetter areas, other species such as larch and cedar can be found growing closer to the shore. As one moves inland, deciduous species begin appearing in increasing numbers, health and typical growing form. At more mature sites, these can come to dominate the coastal forest zone with later-successional species such as sugar maple and white ash. Historically, our dune coastal forests may have had red oak, red pine, and maybe even white pine.

A type of flora, with a whole ecological wind zone dedicated to them, shrubs act as wind-breaks for the interior thicket zone. Across primary and secondary krummholz, shrub species are limited by winds and soils, with many dune, bog, marsh, and cliff specialists. Further inland, shrubs continue to play a role in the coastal forest zone understory, often with later successional species in more mature areas. A number of woody ground-shrubs, such as our junipers, bearberry and crowberries, grow prolifically in the coast-top zone, these high-wind specialists shelter seeds and aid germination of taller species.



Non-woody coastal wildflowers can proliferate quickly, often with clever adaptations for seeding and spreading in these harsh conditions. In primary krummholz, the windy coast-top zone often cannot support much woody plant growth, especially when combined with salty soils, salt marshes, or dry sands. Hugely important for pollinators and other wildlife, our coastal flowers also act communally, slowing winds through sheer cumulative coverage and sheltering establishing woody specimens for the worst of the sun and wind. With the addition of shelter or fresh water, species diversity generally jumps to include lots of surprising more traditionally inland species.

While their role in high-wind habitats appears limited, it is also poorly understood. Many coastal forests have prolific fern growth, despite salty winds and waters in close proximity. In Cape Breton, cinnamon fern and male fern can be found growing in the coast-front and coast-top zone quite often. Incredibly reliant on water and not often resistant to wind, a few species of native fern can be found along our cliffs and dunes where water availability allows. Low plain and weaker krummholz, tertiary and lower, often have much more fern diversity and abundance. Pituamkek Forest had many rare and typically inland species of ferns and wildflowers.

COASTAL CONIFERS

WHITE SPRUCE
Picea glauca - S5

Primary Coastal Types: All, except wettest areas

Primary Ecological Wind Zones: Thicket Zone but flexible

If coastal krummholz had a mascot tree, it'd likely be white spruce. Growing in all but the wettest ares, white spruce is resistant to coastal winds, salts, droughts, poor soils, and often dominates the windiest sites. Often dominating the thicket zone, this resilient species can be found in all zones and coastal types.

BLACK SPRUCE
Picea mariana - S5

Primary Coastal Types: All, Wet Areas, Secondary Dunes

Primary Ecological Wind Zones: Thicket but flexible

Black spruce grows where water availability prevents white spruce from dominating; low plains, secondary dunes and boggy areas, sometimes with larch as well. More commonly dominating in secondary krummholz, black spruce can form distinctive coastal forest zones covered in mountain cranberry, twinflower and more.

EASTER LARCH
Larix laricina - S5

Primary Coastal Types: Low Plain or Boggy Habitats

Primary Ecological Wind Zones: Thicket and Inland

Only found growing at the wettest sites, and rarely in dunes, eastern larch can resist high-winds only when water is ample. More often it is found along low plains sites of tertiary or weaker krummholz. The North Cape perched bog was the only site where larch was found at high levels of deformation and growing in the thicket zone on PEI.

EASTERN WHITE CEDAR
Picea glauca - S53S4

Primary Coastal Types: Cedar Dunes Site Specific

Primary Ecological Wind Zones: Coastal Forest

Another rare coastal species, only observed at Prince County sites. While not known for their resilience to salt or wind, cedar were found thriving in coastal forests along secondary and tertiary krummholz sites, although generally sheltered from the worst winds. At Cedar Dunes Park, coastal flooding seems to be the major cause of mortality for the cedars rather than winds. Road infrastructure, when breached, locks salty waters into the cedar dunes themselves.

COASTAL CONIFERS

BALSAM FIR
Abies balsamea - S5

Primary Coastal Types: All

Primary Ecological Wind Zones: Coastal Forest, although can be exposed to thicket zone due to erosion.

Not seen on many sites, balsam fir was found amongst the thicket zone at more mature primary and weaker krummholz. Field evidence suggest this species can survive high-winds once established but may struggle to germinate under such stresses.

JACK PINE
Pinus banksiana - S2S3

Primary Coastal Types: ???

Primary Ecological Wind Zones: Thicket but flexible?

A rarely seen species, Jack pine is known for its ability to survive in exposed conditions with poor or little soil. Observed krummholzing heavily in Cape Breton, this native pine may have much potential in future restoration, particularly at drier and sandier sites.

RED PINE
Pinus resinosa - S2

Primary Coastal Types: Dunes?

Primary Ecological Wind Zones: Coastal Forest?

While planted often for harvest on PEI, the natural distribution and habitat of our historic red pine is poorly understood. With a preference for sandy soils and a historic presence reported in a variety of littoral cells with dunes, it is very possible this species played some role in our sandy coastal forests. Likely growing in sheltered but sunny areas, most likely avoiding locations of highest winds. Red pines can be found growing in lakeside dunes forest elsewhere in Canada.

EASTERN WHITE PINE
Pinus strobus - S3S4

Primary Coastal Types: Dunes?

Primary Ecological Wind Zones: Coastal Forest?

A species not known for its resistance to salt or winds, it was nonetheless historically reported growing in sandy soils along many areas of the north shore. Likely growing in even more sheltered location than red pine, it may have been a late-stage component of the most inland portions of our sandy coastal forests.

COASTAL DECIDUOUS

RED MAPLE
Acer rubrum - S5

Primary Coastal Types: All

Primary Ecological Wind Zones: Thicket, though rarely in great numbers unless in wet habitat. Many more can be found in the Coastal Forest zone.

A singular but common enough find in the windiest areas, red maple can be a major component of the coastal forest zone, especially in wetlands. This flexible species tolerates a wide variety of conditions and boasts early spring flowers for pollinators.

RED OAK
Quercus rubra - S3S4

Primary Coastal Types: Dunes and more?

Primary Ecological Wind Zones: Coastal Forest

Our provincial tree is not commonly found growing wild, although older specimens were found dominating the sandy coastal forest zones of Canavoy and Tracadie as well as loamy Pituamkek Forest. Historical records indicate additional oak groves once grew in other high-wind areas, although likely predominantly in the coastal forest zones.

AMERICAN MOUNTAIN ASH
Sorbus americana - S5

Primary Coastal Types: Cliff and Low Plain

Primary Ecological Wind Zones: Coastal Forest

Found growing in a wide variety of wetland and coastal habitats, this fruit-bearing species is an important component of the coastal forest zone understory. It has been found growing in all krummholz types, although less commonly at younger primary krummholz.

BIRCHES

Primary Coastal Types: All

Primary Ecological Wind Zones: Similarly to red maple, birches can be present in the thicket zone, but are generally more numerous in the Coastal Forest zone. Grey birch fares better in higher winds, occasionally growing in the shrub zone.

Grey Birch
Betula populifolia - S5

White Birch
Betula papyrifera - S5

COASTAL DECIDUOUS

PIN CHERRY
Prunus pensylvanica - S5

Primary Coastal Types: Dunes and Cliffs

Primary Ecological Wind Zones: Coastal Forest Zone, although sporadically found in the thicket zone, seemingly associated with dryer sites.

It is unclear if pin cherry is a natural component of our coastal forests or more related to site disturbance history. It was primarily found growing in the coastal forest zones at sites with agricultural pasts.

WHITE ASH
Fraxinus americana - S2S3

Primary Coastal Types: Pituamkek Forest & Cape Breton Sites Specific

Primary Ecological Wind Zones: Coastal Forest

Although relatively rare on PEI, especially along our coasts, this could be due to historic wide-spread land-clearing. The healthy and robust specimens at Pituamkek Forest and Lennox Island, suggest that this species might be important in the later-succession of the Coastal Forest zone.

SUGAR MAPLE
Acer saccarhum - S4

Primary Coastal Types: Pituamkek Forest Specific

Primary Ecological Wind Zones: Coastal Forest

Similarly to white ash, this species was only found across a few, less disturbed sites, primarily Pituamkek Forest. Never present in windier krummholz or zones, this species likely plays a role in the late-successional stages of coastal forests.

ASPENS/POPLARS

Primary Coastal Types: All?

Primary Ecological Wind Zones: Trembling is seen more often at secondary krummholzing cliff sites in the coastal forest zone. Balsam polar has been observed growing in the coastal forest zone as well as exposed areas.

Balsam Poplar
Populus balsamifera - S3

Trembling Aspen
Populus tremuloides - S5

COASTAL SHRUBS

STAGHORN SUMAC
Rhus typhina - S3

Primary Coastal Types: Cliff and Dunes

Primary Ecological Wind Zones: Flexible, found growing in sunny and dry areas in the coast-top and thicket zones.

An aggressive native shrub when in calmer locations, sumac can be found growing in small clumps in sandy and dry soils. Its ability to spread through its roots makes this a useful plant to combat shoreline erosion, especially because of its tolerance to drought.

MOUNTAIN HOLLY
Ilex mucronata - S5

Primary Coastal Types: Low Plain and boggy habitats

Primary Ecological Wind Zones: Coastal Forest, although it can grow in thicket zones with ample soil water.

Generally only found at wet sites, particularly low plain coasts, it can also be a component of the coastal forest zone in late successional dune swales, or poorly drained cliff coasts. At the North Cape perched bog, mountain holly was seen krummholzing in shrub zone.

WINTERBERRY HOLLY
Ilex verticillata - S5

Primary Coastal Types: All

Primary Ecological Wind Zones: Thicket but flexible

An excellent coastal species across a number of site types, from primary krummzholz and weaker, as well as dunes, cliffs and low plains. Rarely a dominant component of any particularly zone, it can be found increasingly towards the coastal forest zone, sometimes forming alder like thickets in patches with more sun and poor drainage.

ALDERS

Primary Coastal Types: Any with wet areas

Primary Ecological Wind Zones: Often growing in sheltered wet areas in the Coastal Forest zone, alder has been found in the thicket zone where soil water allows.

Speckled Alder
Alnus incana

Green Alder
Alnus alnobetula

COASTAL SHRUBS

BEACH HEATHERS

Primary Coastal Types: Dunes

Primary Ecological Wind Zones: These are secondary dune coast-top specialists, currently undergoing germination at Macphail Woods Nursery.

Woolly Beach-heath
Hudsonia tomentosa - S3

Pinebarren Golden Heather
Hudsonia tomentosa - S3

JUNIPERS

Primary Coastal Types: Cliffs and Dunes

Primary Ecological Wind Zones: Coast-top zone specialists, both grow along our windiest cliff, often hanging over the edge. Common juniper can also grow on dunes, whether amongst marram or in the grey dunes.

Common Juniper
Juniperus communis - S3

Creeping Juniper
Juniperus horizontalis - S3

CROWBERRIES

Primary Coastal Types: Cliffs and Dunes

Primary Ecological Wind Zones: Coast-top Zone specialists, black crowberry grows prolifically along our windiest cliffs with sporadic pink crowberries too. Dunes can be home to all three species, often with less dense coverage from black, but more pink and broom.

Black Crowberry
Empetrum nigrum - S3

Pink Crowberry
Empetrum eamesii - S2S3

Broom Crowberry
Corema conradii - S2S3

HUCKLEBERRIES

Primary Coastal Types: Dunes and boggy areas

Primary Ecological Wind Zones: Dwarf huckleberry is a bog specialist, found in the coast-top zone in low plains and cliff top bogs. Black huckleberry grows in those locations but generally more in the shrub zone, it can also be found in dunes as well.

Black Huckleberry
Gaylussacia baccata - S4S5

Dwarf Huckleberry
Gaylussacia baccata - S3

COASTAL SHRUBS

BAYBERRY
Morella pensylvanica - S5

Primary Coastal Types: All, except wettest areas

Primary Ecological Wind Zones: Shrub zone but flexible

Like white spruce, this shrub ought to be another mascot for our windiest krummholz, especially areas with drier soils. Bayberry can be found growing across all site and krummholz types, often a dominant in the shrub zone, but even growing wind-clipped in the coast-top zone. It also helps fix nitrogen back into soils.

SWEET GALE
Myrica gale - S5

Primary Coastal Types: All, only wettest areas

Primary Ecological Wind Zones: Shrub zone

Like its cousin bayberry, this species can grow prolifically along our shores, as long as there is ample soil water. Found across all site types, sweet gale, another nitrogen fixer, forms dense shrubs zones surrounding brackish and fresh water areas.

SWEET FERN
Comptonia peregrina - S4

Primary Coastal Types: Dunes?

Primary Ecological Wind Zones: Coastal Forest

Although not often found, sweet fern is known for its association with red pine and sandy soils. Historical records indicate this species grew commonly in our open sandy soils along our northern coast, from Malpeque eastward. This is another species that could have been a component of our dune coastal forest zone.

OTHER *BERRIES* -

Red Raspberry
Rubus idaes

Alleghaney Blackberry
Rubus Allegheniensis

Wild Strawberry
Fragaria virginia

Skunk Currant
Ribes glandulosum

Smooth Gooseberry
ribes hirtellum

COASTAL SHRUBS

SERVICEBERRY
Amelanchier spp.

Primary Coastal Types: All

Primary Ecological Wind Zones: Coastal Forest but flexible

Never found in great numbers, this flexible genus is found across all site types, sometimes singly and wind-blown amongst the shrub or thicket zone, but more often sporadically in the coastal forest zone. Although fruit production appears to be lowered in high wind settings, flowers and berries have still be observed.

ROSES

Primary Coastal Types: All

Primary Ecological Wind Zones: Shrub zone

An important component of the shrub zone, virginiana tends to prefer dryer sites, while *nitida* grow primarily along wetter low plains coasts.

Virginiana Rose
Rosa virginiana

Shining Rose
Rosa nitida

SPIRAEA
Spiraea alba - S5

Primary Coastal Types: All

Primary Ecological Wind Zones: Coast-top or shrub zone

Another important member of the frontal zones of windy krummholz, this species can be found growing across all sites types. Never as large or prolific as bayberry or wild rose, this species is nonetheless interspersed amongst these species in the shrub zone in high numbers.

ARONIA
Aronia melanocarpa - S4S5
Aronia spp.

Primary Coastal Types: Cliffs and Dunes

Primary Ecological Wind Zones: Shrub or thicket zone

Perhaps not as tolerant of salty waters, this convoluted genus can be hard to identify down to the species. Most sites have been confirmed as black aronia, although it is possible that boggy sites have other hybrids or red aronia present. Never a dominant component, it is still present in many shrub zones.

COASTAL SHRUBS

CHOKECHERRY
Prunus virginiana

Primary Coastal Types: All

Primary Ecological Wind Zones: Coastal Forest but flexible

Another flexible, resilient and relatively aggressive species, chokecherry can be found growing across all site types. High winds appear to limit the speed of its natural spread, but it can still be found in isolated clumps amongst the shrub and thicket zone. Where conditions are right, it can be an understory component of patchy coastal forest zones.

BUSH HONEYSUCKLE
Diervilla Lonicera -

Primary Coastal Types: Cliffs

Primary Ecological Wind Zones: Shrub zone

Although not found growing in windy areas on PEI, this species was prolifically present amongst Cape Breton krummholz, even in the windblown coast-top and shrub zone. It has been planted at krummholz restoration sites to test its suitability for krummholzing habitats here on PEI. It is a great potential species for erosional control and native pollinators.

ALTERNATE LEAF DOGWOOD
Cornus alternifolia - S4

Primary Coastal Types: Cliffs

Primary Ecological Wind Zones: Coastal Forest Zone

Found at only a few less disturbed areas, this understory specialist might be an important component of later-successional coastal forests. It was often found growing with beaked hazelnut.

BEARBERRY
Arctodactylus uva-ursi - S4S5

Primary Coastal Types: Dunes and Sandy Soils

Primary Ecological Wind Zones: Shrub or thicket zone

Most often found growing prolifically in the coast-top zone of dunes, this species was occasionally found spreading into sandy dune-adjacent cliffs. This beautiful woody ground vine helps to stabilize dune soils, all while providing food for wildlife.

COASTAL WILDFLOWERS

ORACHES & ATRIPLEXES

Primary Coastal Types: Sandy Shores

Primary Ecological Wind Zones: Backshore Zone

Incredibly confusing genuses but important along our dune coast-front zones. These coast specialist species often dominant in these sandy back-shores, although can be much less prevalent where foot-traffic is high. Likely a useful group for restoration, much work would be needed to properly find, identify, collect and propagate only the native species, as a number of non-native varieties are growing across PEI's beaches.

SEASIDE ANGELICA
Angelica lucida

Primary Coastal Types: Cliffs and Dunes

Primary Ecological Wind Zones: Coast-top or Shrub Zone

Not commonly found, seemingly favouring sandier soils, this rare coastal specialist has large floral blooms, most likely important for local pollinators. Never prolific, this species tends to occur occasionally amongst grasses and shrubs in sandy coast-top and shrub zones.

SCOTS LOVAGE
Ligusticum scotium - S4

Primary Coastal Types: Cliffs or Dunes

Primary Ecological Wind Zones: Coast-top or Shrub Zone

A member of the carrot family, this species tends to grow in very similar areas as seaside angelica, although more commonly and in greater numbers. Never a dominant species, this thick leaved plant can be found growing across a variety of ecological wind zones, including frontal zones under moderate winds.

COMMON COW PARSNIP
Heracleum maximum - S4

Primary Coastal Types: Cliff

Primary Ecological Wind Zones: Thicket or Coastal Forest

Generally found growing singly, shelter near the transition from thicket to coastal forest zone. More exposed specimens of this large-leaved species were most often found in secondary krummholz and weaker.

COASTAL WILDFLOWERS

SEA-BLITE
Suaeda maritima - S4S5

Primary Coastal Types: Low Plains and Dunes

Primary Ecological Wind Zones: Backshore Zone

Commonly found along salty and sandy shores, it is a plant reliant of saltwater tides. While never a dominant species, it is nonetheless common across Island sites as well as throughout appropriate habitats. Its bushy structure aids in trapping sediments, an important role along our shores and in our salt marshes.

SAMPHIRE
Salicornia maritima - S4S5

Primary Coastal Types: Salt marshes

Primary Ecological Wind Zones: Coast-top Zone

A plant primarily found in salt marshes, this can be a dominant cover, growing over large areas of these wet and salty coast-top zones. Although common and edible, little information was found on its ecological functions and services. It is likely this is a pioneer species, important in stabilizing salt marshes soils, especially after destructive events.

SARSAPARILLAS

Primary Coastal Types: All

Primary Ecological Wind Zones: Wild sarsaparilla can be primarily found in the coastal forest zone, although it often wanders. Bristly has been found in dune coast-top zones in full-sun, although rarely exposed to full coastal winds.

Wild Sarsaparilla
Aralia nudicaulis - S5

Bristly Sarsaparilla
Aralia hispida - S4

PEARLY EVERLASTING
Anaphalis margaritacea - S5

Primary Coastal Types: All, except wettest areas

Primary Ecological Wind Zones: Sunny Areas

A common, but rather inconspicuous species, it can be found growing sporadically across most site types, save for soggy areas. This is an important species for insect pollinators and has small but showy flowers.

COASTAL WILDFLOWERS

BUNCHBERRY
Cornus canadensis - S5

Primary Coastal Types: All, except wettest areas

Primary Ecological Wind Zones: Coastal Forest Zone

Seemingly, this species always originates in the coastal forest zone, but can often spread into the nearby thicket zone. It can also persist after coastal harvesting or windfall, even when suddenly exposed to winds and sun. That being said, the specimens will be fewer and of poorer health. This common species is an important pollen and berry producer in shadier habitats.

WILD LILY OF THE VALLEY
Maia canadense - S5

Primary Coastal Types: All, except wettest areas

Primary Ecological Wind Zones: Coastal Forest Zone

Very similar to bunchberry, this common forest species is most numerous in the shelter and shade of the coastal forest zone. It can spread and survive outside of that zone, even into full-sun secondary dune coast-top zones. Again these specimens are more sparse and often burnt by wind, salt and/or sun. Another important species for insects and small mammals.

STARRY FALSE SOLOMONS SEAL
Maia stellatum - S3

Primary Coastal Types: Dunes

Primary Ecological Wind Zones: Coast-Top and Shrub Zones

Generally a sandy soil specialist, this species prefers sunny locations, often amongst marram grass or sparse shrubs. This species can spread through underground rhizomes, quickly colonizing sandy areas. At Blooming Point, a Northern Harrier nest with chicks was found nestled amongst a large patch of this showy species.

COMMON RAGWEED
Ambrosia artemisiifolia - S4

Primary Coastal Types: Low plains and Dunes

Primary Ecological Wind Zones: Coast-front Zone

Although ragweeds have a bad reputation, this fern-like flower grows commonly where salt waters can reach, but rarely inundate. Usually in high drainage primary dunes or elevated shore berms, it is much more commonly found in secondary krummholz and weaker.

COASTAL WILDFLOWERS

GOLDENRODS
A diverse and important group for insects, this genus has species adept at a variety of different site types.

Rough-stemmed Goldenrod
Solidago rugosa - S5

Downy Goldenrod
Solidago puberula - S5

Canada Goldenrod
Solidago canadensis - S5

White Goldenrod Goldenrod
Solidago bicolor - S4

SEASIDE GOLDENROD
Solidago sempervirens - S4S5

Primary Coastal Types: Dunes but all others too

Primary Ecological Wind Zones: Coast-Top to Shrub Zones

An important coastal species across all site types, it can most commonly be found in sandy soils, especially amongst our dunes. With huge blooms and succulent leaves, this showy coastal species is an important coastal habitat specialist for pollinators and wildlife. Easy to propagate, this species is great for restoration.

ASTERS

Another diverse and important group, this genus has species adept at a variety of different sites.

New York Aster
Symphyotrichum novi-belgii - S5

Calico Aster
Symphyotrichum lateriflorum - S5

Heart-leaved Aster
Symphyotrichum cordiflorum - S5

Gulf of St Lawrence Aster
Symphyotrichum laurentianum - S1

ROUGH COCKLEBUR
Xanthium strumarium - S4

Primary Coastal Types: Dunes and Low Plains

Primary Ecological Wind Zones: Coast-Front Zone

Growing generally in sandy soils, this large and rough-leaved species has multi-dispersal seeds, adept at transportation by waters, strong winds and fur. Never a dominant species, it is present sporadically, often with seabeach sandwort or common ragweed.

COASTAL WILDFLOWERS

AMERICAN SEAROCKET
Cakile edentula - S4S5

Primary Coastal Types: Dunes

Primary Ecological Wind Zones: Coast-front Zone

A common sandy coast-front specialist, this species is commonly found along the backshore of primary dunes. With a reliable dual local/long-distance seeding strategy, this is often a dominant species of harsh coast-side sands.

SEABEACH SANDWORT
Honckenya peploides - S3S4

Primary Coastal Types: Dunes

Primary Ecological Wind Zones: Coast-Front Zone

An uncommon but widespread sand specialist, this coast-front species can be found growing with little-to-no substrate at all. This tangled and sharp-leaved plant helps with sediment retention, able to emerge even after being buried by coastal storm events.

BEACH PINWEED
Lechea maritima - S2

Primary Coastal Types: Dunes

Primary Ecological Wind Zones: Coast-top Zone

A rare coastal species, not yet confirmed during fieldwork, although a species of this genus was found along the sandy shores of Pituamkek Forest. This has been a targeted species during fieldwork, with the hope of finding seed for propagation.

BEACH PEA
Lathyrus japonicus - S4S5

Primary Coastal Types: All, except wettest areas

Primary Ecological Wind Zones: Coast-top Zone but flexible

A common coastal species across all site types, it seems to grow most prolifically in sandy soils along our dunes and low plains. A native legume and nitrogen fixer, this plant is also important for native bumblebees, other pollinators and wildlife.

COASTAL WILDFLOWERS

HEDGE FALSE BINDWEED
Calystegia sepium - S5

Primary Coastal Types: Dunes and Low Plains

Primary Ecological Wind Zones: Coast-Top Zone

Often seen as a pesky weed, this native species commonly grows amongst marram grasses or salt marsh edges, providing nectar and pollen for a variety of species. Its aggressive nature allows for deep and far spread of its rhizomes, serving as a tangled wall, assisting in slowing winds.

SEASIDE SPURGE
Euphorbia polygonifolia - S2S3

Primary Coastal Types: Dunes

Primary Ecological Wind Zones: Coast-Front Zone

A sandy backshore specialist, this delicate and beautiful rare species has been more commonly found post-Fiona, possibly indicating its transportation from nearby sandy off-shore island reserves.

TIERRA DEL FUEGO DOCK
Rumex fueginus - S4

Primary Coastal Types: Low Plain and Dunes

Primary Ecological Wind Zones: Coast-Front Zone

One of our seaside docks, this species specializes in coast-front sandy back shores, although never dominant. More commonly found in secondary krummholz and weaker, this densely flowered quasi-succulent plant is likely used by a number of native pollinators.

COMMON SILVERWEED
Potentilla anserina - S5

Primary Coastal Types: Dunes and Low Plains

Primary Ecological Wind Zones: Coast-Front or Coast-Top Zone

Another spreading sandy-soil specialist, silverweed clumps are common across the province. Often found along salt marsh edges, coastal riparian areas, and wet sandy dunes, this brightly flowered species can grow in all manner of wind conditions.

COASTAL WILDFLOWERS

CORDGRASSES

Important to salt marshes but also in isolated areas of sandy but brackish sands, each species has various levels of salt-tolerance.

Smooth Cordgrass
Sporobolus alterniflorus - S4S5

Saltmeadow Cordgrass
Sporobolus pumilus - S4S5

Prairie Cordgrass
Sporobolus michauxianus - S5

MARRAM GRASS
Calamagrostis breviligulata - S4S5

Primary Coastal Types: Dunes

Primary Ecological Wind Zones: Coast-Top Zone

The mascot species for our primary and yellow dune coast-top zones, this rhizome-spreading species helps stabilize our dune sands. Often a dominant non-woody species, its coverage and extent still affect local winds and conditions, allowing dune successional processes to occur. Due to PEI's sandy soils, marram grass can be found growing sparsely on cliff-tops as well.

SEA LYME GRASS
Leymus mollis - S4

Primary Coastal Types: Dunes

Primary Ecological Wind Zones: Coast-Top

Another sand-specializing grass growing in clumps along windy coast-top zones near the high water line. Occasionally found at sandy cliff sites as well. With large grains, this showy grass helps to stabilize soils, add diversity and improve wild food sources in our krummholzing dune systems.

VIRGINIA WILD RYE
Elymus virginicus - S2S3

Primary Coastal Types: Low Plain?

Primary Ecological Wind Zones: Coast-Top Zone

Only found once in a tertiary krummholz saltmarsh at North Enmore, this rare native grass could be an excellent species for coastal estuary restoration.

COASTAL WILDFLOWERS

BEACH SEDGE
Carex silicea - S4

Primary Coastal Types: Dunes

Primary Ecological Wind Zones: Coast-Top Zone

An often overlooked dune specialist, never as prolific in density as marram grass, beach sedge still covers large areas of dune coast-top zones. It is likely an important species in dune habitats, contributing to soil stabilization, ecological succession and habitat health.

RUSHES

While there are surely many more rushes for coastal restoration, these two species were more commonly found and identified. Baltic rush was found growing at many coastal cliffs, while black-grass rush was more commonly found in salt marsh like sands.

Baltic Rush
Juncus balticus - S5

Black-Grass Rush
Juncus gerardi - S5

THREE-TOOTHED CINQUEFOIL -
Sibbaldia tridentata - S3

Primary Coastal Types: Cliff

Primary Ecological Wind Zones: Coast-Top Zone

An important cliff-top wildflower, growing amongst junipers and crowberries in primary krummholz. This thick-leaved, low-growing species is an important coastal pollinator plant. It is also able to grow with little soil, such as those seen growing on rocky Cape Breton Krummholz.

MOUNTAIN BLUE-EYED GRASS
Sisyrinchium montanum - S5

Primary Coastal Types: Cliff

Primary Ecological Wind Zones: Cliff-Top Zone

Not a true grass, this small but showy little flower is often found growing in small clumps amongst grasses and baltic rush along secondary krummholzing cliffs, although it was found at a few primary krummholz as well.

COASTAL WILDFLOWERS

IRISES

Blue-flag was found at numerous krummholz sites as long as soil water allowed. Hooker's has not yet been found on PEI, but was observed growing well in cliff coast-top zones in Cape Breton. It is targeted for propagation as it may be a useful species for restoration.

Blue-flag Iris
Iris versicolor - S5

Hooker's Iris
Iris hookeri - S2S3

CRANBERRIES

Large cranberry can be found across a wide-variety of krummholzing sites, from primary and weaker, as well as on moist cliffs or dune swales. Small cranberry was generally found only in boggy areas.

Large Cranberry
Vaccinium macrocarpon - S4S5

Small Cranberry
Vaccinium oxycoccos - S4

WINTERGREENS

This related group of wildflowers were found sporadically, with one-flowered wintergreen favouring dune coastal forest zones, often heavy in shade. Shinleaf was found growing amongst the coast-top zone of primary krummholz and weaker cliffs.

One-flowered Wintergreen
Moneses uniflora - S3

Shinleaf
Pyrola elliptica - S5

BASTARD'S TOADFLAX
Comandra umbellata - S3

Primary Coastal Types: Dunes

Primary Ecological Wind Zones: Coast-Top or Shrub

Another dune coast-top specialist, this species was found growing in isolated clumps across several sites. These clumps were found in a variety of wind conditions but always nestled amongst thick grasses or sparse shrubbery.

COASTAL WILDFLOWERS

TWINFLOWER
Linnaea borealis - S5

Primary Coastal Types: All

Primary Ecological Wind Zones: Coastal Forest Zone

This species was often found in coastal forest zones of all types of krummholz. It can even tolerate moist dune sands. This lovely ground-vine is a fast spreading ground cover in shady coastal forests, often growing amongst many other woodland wildflowers.

MOUNTAIN CRANBERRY
Vaccinium vitis-idaea -S3

Primary Coastal Types: All, except wettest areas

Primary Ecological Wind Zones: Thicket but flexible

A small but wide-spread species which was found across all types of krummholzing sites, never dominating but present throughout the windiest of coast-top zones. Usually nestled amongst crowberries, this species can also tolerate shaded coastal forest zones, growing with twinflower and bunchberry. While uncommon provincially, it thrives in windy areas.

SEASIDE PLANTAIN
Plantago maritima - S4S5

Primary Coastal Types: Cliffs

Primary Ecological Wind Zones: Coast-Front Zone

This is one the few native species able to grow practically vertically on sparsely soiled sandstone. Its tough succulent leaves resist the onslaught of coastal winds and abrasives. While likely important in slowing erosional forces, this species can be hard-hit by heavy erosion. More intact cliffs could sometimes have dense populations of this species, probably with quite a cumulatively powerful soil-holding strength.

CANADA GERMANDER
Teucrium canadense - S3

Primary Coastal Types: Low Plains and Dunes

Primary Ecological Wind Zones: Coast-Top Zone

A salt marsh specialist, this uncommon species can be found in salty and sandy soils across the province. It is most often found in secondary and weaker krummholz, nestled amongst cordgrasses and ragweed. It seems to prefer the higher and "dryer" parts of the marsh.

COASTAL WILDFLOWERS

BLUNTLEAF SANDWORT
Moehringia laterifolia - S5

Primary Coastal Types: All

Primary Ecological Wind Zones: Coast-Top Zone but Flexible

Unless flowering, this small and inconspicuous plant is easy to miss, however it seems to show up across all levels and types of krummholz, often as a prolific ground cover amongst marram grasses. It does seem to fare better in dryer and sandier soils, although it was still found in medium drainage cliff sites as well.

SEA MILKWORT
Lysimachia maritima - S4S5

Primary Coastal Types: Low Plain and Dunes

Primary Ecological Wind Zones: Coast-Top Zone

A salt marsh specialist, often growing amongst silverweed and samphire. This low-growing groundcover has showy blooms, but is otherwise relatively inconspicuous. Its densely-leaved form helps to trap estuary sediments, building up soils in sandy and salty wet areas.

SEA LAVENDER
Limonium carolinianum - S4S5

Primary Coastal Types: Low Plains and Dunes

Primary Ecological Wind Zones: Coast-Top Zone

A salt marsh specialist, this tumble-weed like species' inflorescence can break-off and blow across the coast-top zone. When in bloom, small but numerous purple flowers make it stand out, but much of the year, the basal leaves can be mistaken for young seaside goldenrod. While never dense, it grows widely in salty sands found in salt-marshes and calmer wet dune areas.

COASTAL FERNS

WOOD FERNS
Dryopteris spp.

Primary Coastal Types: Cliff and Low Plain

Primary Ecological Wind Zones: Coastal Forest Zone

Our three common wood ferns can be found in coastal forest zones, even sometimes on dunes. Mountain wood fern tends to occupy dryer sites, while spinulose wood fern prefers wetter areas and evergreen seems to be the most common and flexible.

CINNAMON FERN
Osmunda cinnamomeum - S5

Primary Coastal Types: Cliffs and Low Plains

Primary Ecological Wind Zones: Coast-Top to Coastal Forest

Cinnamon fern can be found growing in exposed high-wind areas, such as North Cape, as long as soil water levels allow. Seepy wet areas along the Naufrage cliffs also had cinnamon fern present. It is often found in a variety coastal forest zones as well, such as Enmore, Cameron Island and East Point.

INTERRUPTED FERN
Claytosmunda claytoniana - S5

Primary Coastal Types: Cliffs

Primary Ecological Wind Zones: Coastal Forest

This commonly landscaped species is also found at clifftop coastal forest zones, usually at dryer sites. Growing in scattered clumps, this fern seems to do well in patchy or dappled light with shelter from harsh winds.

MALE FERN
Dryopteris filix-mas - S1

Primary Coastal Types: Cliffs?

Primary Ecological Wind Zones: Coast-Top Zone?

Yet to be found growing in coastal habitats during fieldwork, this species was present in Cape Breton Krummholz. It was found growing along the exposed coast-top zones, often with wind-burnt fronds, sometimes even hanging almost vertically into the coast-front zone. While geological differences may be the key difference, differing land-use histories could contribute to its rarity on PEI. Trial specimens were planted during krummholz restoration.

SPECIES LIST

COAST TYPE:	Cliff
KRUMMHOLZING SITES	18
SURVEYOR:	Daniel McRae

BIODIVERSITY

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
CONIFEROUS TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Balsam Fir	*Pinaceae*	*Abies balsamea*	S5
Tamarack	*Pinaceae*	*Larix laricina*	S5
White Spruce	*Pinaceae*	*Picea glauca*	S5
Black Spruce	*Pinaceae*	*Picea mariana*	S5
Jack Pine	*Pinaceae*	*Pinus banksiana*	S2S3
DECIDUOUS TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Paper Birch	*Betulaceae*	*Betula papyrifera*	S5
Gray Birch	*Betulaceae*	*Betula populifolia*	S5
White Ash	*Oleaceae*	*Fraxinus americana*	S2S3
Pin Cherry	*Rosaceae*	*Prunus pensylvanica*	S5
American Mountain Ash	*Rosaceae*	*Sorbus americana*	S5
Trembling Aspen	*Salicaceae*	*Populus tremuloides*	S5
Red Maple	*Sapindaceae*	*Acer rubrum*	S5
SHRUBS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Staghorn Sumac	*Anacardiaceae*	*Rhus typhina*	S3
Western Poison Ivy	*Anacardiaceae*	*Toxicodendron radicans var. rydbergii*	S4
Spreading Dogbane	*Apocynaceae*	*Apocynum androsaemifolium*	S4
Mountain Holly	*Aquifoliaceae*	*Ilex mucronata*	S5
Common Winterberry	*Aquifoliaceae*	*Ilex verticillata*	S5
Beaked Hazel	*Betulaceae*	*Corylus cornuta*	S5
Alternate-leaved Dogwood	*Cornaceae*	*Cornus alternifolia*	S4
Red Osier Dogwood	*Cornaceae*	*Cornus sericea*	S5
Common Juniper	*Cupressaceae*	*Juniperus communis*	S3
Creeping Juniper	*Cupressaceae*	*Juniperus horizontalis*	S2S3
Leatherleaf	*Ericaceae*	*Chamaedaphne calyculata*	S4
Broom Crowberry	*Ericaceae*	*Corema conradii*	S2S3
Pink Crowberry	*Ericaceae*	*Empetrum eamesii*	S2S3
Black Crowberry	*Ericaceae*	*Empetrum nigrum*	S3
Black Huckleberry	*Ericaceae*	*Gaylussacia baccata*	S4S5
Dwarf Huckleberry	*Ericaceae*	*Gaylussacia bigeloviana*	S3
Sheep Laurel	*Ericaceae*	*Kalmia angustifolia*	S5
Pale Bog Laurel	*Ericaceae*	*Kalmia polifolia*	S4
Rhodora	*Ericaceae*	*Rhododendron canadense*	S5
Common Labrador Tea	*Ericaceae*	*Rhododendron groenlandicum*	S5
Late Lowbush Blueberry	*Ericaceae*	*Vaccinium angustifolium*	S5
Skunk Currant	*Grossulariaceae*	*Ribes glandulosum*	S5
Smooth Gooseberry	*Grossulariaceae*	*Ribes hirtellum*	S5
Northern Bayberry	*Myricaceae*	*Morella pensylvanica*	S5
Sweet Gale	*Myricaceae*	*Myrica gale*	S5
Serviceberry	*Rosaceae*	*Amelanchier sp*	N/A

APPENDIX I: CLIFF FLORA

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Black Chokeberry	*Rosaceae*	*Aronia melanocarpa*	S4S5
Aronia sp	*Rosaceae*	*Aronia sp*	N/A
Hawthorn	*Rosaceae*	*Crataegus spp.*	N/A
Chokecherry	*Rosaceae*	*Prunus virginiana*	S5
Shining Rose	*Rosaceae*	*Rosa nitida*	S4
Virginia Rose	*Rosaceae*	*Rosa virginiana*	S5
Alleghaney Blackberry	*Rosaceae*	*Rubus allegheniensis*	S4S5
Cloudberry	*Rosaceae*	*Rubus chamaemorus*	S3
Red Raspberry	*Rosaceae*	*Rubus idaeus*	S5
Dwarf Red Raspberry	*Rosaceae*	*Rubus pubescens*	S5
White Meadowsweet	*Rosaceae*	*Spiraea alba*	S5
Willow	*Salicaceae*	*Salix spp.*	N/A
Red Elderberry	*Viburnaceae*	*Sambucus racemosa*	S5
Northern Wild Raisin	*Viburnaceae*	*Viburnum cassinoides*	S5
Highbush Cranberry	*Viburnaceae*	*Viburnum opulus*	S3
NON-NATIVE TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
WILDFLOWERS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Thin-leaved Orache	*Amaranthaceae*	*Atriplex prostrata*	S4
Sea Glasswort	*Amaranthaceae*	*Salicornia maritima*	S4S5
White Sea-blite	*Amaranthaceae*	*Suaeda maritima*	S4S5
Seaside Angelica	*Apiaceae*	*Angelica lucida*	S2S3
Common Cow Parsnip	*Apiaceae*	*Heracleum maximum*	S4
Scotch Lovage	*Apiaceae*	*Ligusticum scoticum*	S4
Maryland Sanicle	*Apiaceae*	*Sanicula marilandica*	S3S4
Common Water Parsnip	*Apiaceae*	*Sium suave*	S5
Jack-in-the-pulpit	*Araceae*	*Arisaema triphyllum*	S4
Turion Duckweed	*Araceae*	*Lemna turionifera*	S4S5
Wild Sarsaparilla	*Araliaceae*	*Aralia nudicaulis*	S5
Wild Lily-of-The-Valley	*Asparagaceae*	*Maianthemum canadense*	S5
Large False Solomon's Seal	*Asparagaceae*	*Maianthemum racemosum*	S4
Starry False Solomon's Seal	*Asparagaceae*	*Maianthemum stellatum*	S3
Three-leaved False Soloman's Seal	*Asparagaceae*	*Maianthemum trifolium*	S4
Common Ragweed	*Asteraceae*	*Ambrosia artemisiifolia*	S4
Pearly Everlasting	*Asteraceae*	*Anaphalis margaritacea*	S5
Hairy Flat-top White Aster	*Asteraceae*	*Doellingeria umbellata*	S5
Grass-leaved Goldenrod	*Asteraceae*	*Euthamia graminifolia*	S5
Hawkweed spp.	*Asteraceae*	*Hieracium sp*	N/A
Three-leaved Rattlesnakeroot	*Asteraceae*	*Nabalus trifoliolatus*	S5
Whorled Wood Aster	*Asteraceae*	*Oclemena acuminata*	S5
Cut-Leaved Coneflower	*Asteraceae*	*Rudbeckia laciniata*	S2
Canada Goldenrod	*Asteraceae*	*Solidago canadensis*	S5
Downy Goldenrod	*Asteraceae*	*Solidago puberula*	S4S5
Rough-stemmed Goldenrod	*Asteraceae*	*Solidago rugosa*	S5
Seaside Goldenrod	*Asteraceae*	*Solidago sempervirens*	S4S5
Heart-leaved Aster	*Asteraceae*	*Symphyotrichum cordifolium*	S4
Calico Aster	*Asteraceae*	*Symphyotrichum lateriflorum*	S5
New York Aster	*Asteraceae*	*Symphyotrichum novi-belgii*	S5

APPENDIX I: CLIFF FLORA

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Aster spp.	*Asteraceae*	*Symphyotrichum sp*	N/A
Rough Cocklebur	*Asteraceae*	*Xanthium strumarium*	S4
Spotted Jewelweed	*Balsaminaceae*	*Impatiens capensis*	S5
Small Forget-Me-Not	*Boraginaceae*	*Myosotis laxa*	S4
American Searocket	*Brassicaceae*	*Cakile edentula*	S4S5
Large Toothwort	*Brassicaceae*	*Cardamine maxima*	S1
Twinflower	*Caprifoliaceae*	*Linnaea borealis*	S5
Seabeach Sandwort	*Caryophyllaceae*	*Honckenya peploides*	S3S4
Blunt-leaved Sandwort	*Caryophyllaceae*	*Moehringia lateriflora*	S5
Canada Sandspurrey	*Caryophyllaceae*	*Spergularia canadensis*	S4
Saltmarsh Sandspurrey	*Caryophyllaceae*	*Spergularia salina*	S4
Hedge False Bindweed	*Convolvulaceae*	*Calystegia sepium*	S5
Bunchberry	*Cornaceae*	*Cornus canadensis*	S5
Saltmarsh Bulrush	*Cyperaceae*	*Bolboschoenus maritimus*	S4
Round-leaved Sundew	*Droseraceae*	*Drosera rotundifolia*	S4
Eastern Teaberry	*Ericaceae*	*Gaultheria procumbens*	S4S5
One-flowered Wintergreen	*Ericaceae*	*Moneses uniflora*	S3
One-sided Wintergreen	*Ericaceae*	*Orthilia secunda*	S4S5
Large Cranberry	*Ericaceae*	*Vaccinium macrocarpon*	S4S5
Small Cranberry	*Ericaceae*	*Vaccinium oxycoccos*	S4
Mountain Cranberry	*Ericaceae*	*Vaccinium vitis-idaea*	S3
Clover spp.	*Fabaceae*	*Clover spp.*	N/A
Beach Pea	*Fabaceae*	*Lathyrus japonicus*	S4S5
Herb Robert	*Geraniaceae*	*Geranium robertianum*	S4
Fraser's St. John's-wort	*Hypericaceae*	*Hypericum fraseri*	S5
Harlequin Blue Flag	*Iridaceae*	*Iris versicolor*	S5
Mountain Blue-eyed-grass	*Iridaceae*	*Sisyrinchium montanum*	S5
Seaside Arrowgrass	*Juncaginaceae*	*Triglochin maritima*	S4S5
Canadian Mint	*Lamiaceae*	*Mentha canadensis*	S4S5
Common Self-heal	*Lamiaceae*	*Prunella vulgaris*	S5
Marsh Skullcap	*Lamiaceae*	*Scutellaria galericulata*	S4S5
Canada Germander	*Lamiaceae*	*Teucrium canadense*	S3S4
Yellow Bluebead Lily	*Liliaceae*	*Clintonia borealis*	S5
Cucumber Root	*Liliaceae*	*Medeola virginiana*	S3S4
Clasping-leaved Twisted-stalk	*Liliaceae*	*Streptopus amplexifolius*	S4
Rose Twisted-stalk	*Liliaceae*	*Streptopus lanceolatus*	S4
Small Enchanter's Nightshade	*Onagraceae*	*Circaea alpina*	S5
Broad-leaved Enchanter's Nightshade	*Onagraceae*	*Circaea canadensis*	S2S3
Northern Willowherb	*Onagraceae*	*Epilobium ciliatum*	S5
Common Evening Primrose	*Onagraceae*	*Oenothera biennis*	S5
Small-flowered Evening Primrose	*Onagraceae*	*Oenothera parviflora*	S4S5
Tuberous Grass Pink	*Orchidaceae*	*Calopogon tuberosus*	S3
Pink Lady's-Slipper	*Orchidaceae*	*Cypripedium acaule*	S5
Small Purple Fringed Orchid	*Orchidaceae*	*Platanthera psycodes*	S4
European Wood Sorrel	*Oxalidaceae*	*Oxalis stricta*	S5
Common Mare's-Tail	*Plantaginaceae*	*Hippuris vulgaris*	S3S4
Seaside Plantain	*Plantaginaceae*	*Plantago maritima*	S4S5

APPENDIX I: CLIFF FLORA

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
American Speedwell	*Plantaginaceae*	*Veronica americana*	S4
Sea Lavender	*Plumbaginaceae*	*Limonium carolinianum*	S4S5
American Beach Grass	*Poaceae*	*Calamagrostis breviligulata*	S4S5
Sea Lyme Grass	*Poaceae*	*Leymus mollis*	S4
Smooth Cordgrass	*Poaceae*	*Sporobolus alterniflorus*	S4S5
Prairie Cordgrass	*Poaceae*	*Sporobolus michauxianus*	S5
Saltmeadow Cordgrass	*Poaceae*	*Sporobolus pumilus*	S4S5
Fringed Black Bindweed	*Polygonaceae*	*Fallopia cilinodis*	S4
Climbing False Buckwheat	*Polygonaceae*	*Fallopia scandens*	S3
Northern Starflower	*Primulaceae*	*Lysimachia borealis*	S5
Sea Milkwort	*Primulaceae*	*Lysimachia maritima*	S4S5
Swamp Yellow Loosestrife	*Primulaceae*	*Lysimachia terrestris*	S4S5
Tufted Yellow Loosestrife	*Primulaceae*	*Lysimachia thyrsiflora*	S4S5
Red Baneberry	*Ranunculaceae*	*Actaea rubra*	S4
Seaside Buttercup	*Ranunculaceae*	*Halerpestes cymbalaria*	S4
Tall Meadow-Rue	*Ranunculaceae*	*Thalictrum pubescens*	S5
Wild Strawberry	*Rosaceae*	*Fragaria virginiana*	S5
Avens	*Rosaceae*	*Geum sp*	N/A
Common Silverweed	*Rosaceae*	*Potentilla anserina*	S5
Rough Cinquefoil	*Rosaceae*	*Potentilla norvegica*	S4S5
Three-toothed Cinquefoil	*Rosaceae*	*Sibbaldia tridentata*	S3
Common Bedstraw	*Rubiaceae*	*Galium aparine*	S1
Rough Bedstraw	*Rubiaceae*	*Galium asprellum*	S4S5
Bedstraw	*Rubiaceae*	*Galium sp*	N/A
Three-petaled Bedstraw	*Rubiaceae*	*Galium trifidum*	S4S5
Three-flowered Bedstraw	*Rubiaceae*	*Galium triflorum*	S5
Northern Pitcher Plant	*Sarraceniaceae*	*Sarracenia purpurea*	S4
Broad-leaved Cattail	*Typhaceae*	*Typha latifolia*	S5
Common Eelgrass	*Zosteraceae*	*Zostera marina*	S4
FERNS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Common Lady Fern	*Athyriaceae*	*Athyrium filix-femina*	S5
Common Oak Fern	*Cystopteridaceae*	*Gymnocarpium dryopteris*	S5
Eastern Hay-Scented Fern	*Dennstaedtiaceae*	*Dennstaedtia punctilobula*	S5
Bracken Fern	*Dennstaedtiaceae*	*Pteridium aquilinum*	S5
Mountain Wood Fern	*Dryopteridaceae*	*Dryopteris campyloptera*	S4
Spinulose Wood Fern	*Dryopteridaceae*	*Dryopteris carthusiana*	S4S5
Crested Wood Fern	*Dryopteridaceae*	*Dryopteris cristata*	S5
Evergreen Wood Fern	*Dryopteridaceae*	*Dryopteris intermedia*	S5
Christmas Fern	*Dryopteridaceae*	*Polystichum acrostichoides*	S2S3
Sensitive Fern	*Onocleaceae*	*Onoclea sensibilis*	S5
Interrupted Fern	*Osmundaceae*	*Claytosmunda claytoniana*	S5
Cinnamon Fern	*Osmundaceae*	*Osmundastrum cinnamomeum*	S5
Northern Beech Fern	*Thelypteridaceae*	*Phegopteris connectilis*	S5
CLUBMOSSES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
HORSETAILS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Field Horsetail	*Equisetaceae*	*Equisetum arvense*	S5
Woodland Horsetail	*Equisetaceae*	*Equisetum sylvaticum*	S5

APPENDIX I: CLIFF FLORA

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
MOSSES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Glow Moss	Aulacomniaceae	*Aulacomnium palustre*	S5
Mountain Broom Moss	Dicranaceae	*Dicranum montanum*	S5
Wavy-leaved Broom Moss	Dicranaceae	*Dicranum polysetum*	S5
Common Broom Moss	Dicranaceae	*Dicranum scoparium*	S5
Common Cord Moss	Funariaceae	*Funaria hygrometrica*	S5
Stairstep Moss	Hylocomiaceae	*Hylocomium splendens*	S5
Electrified Cat's-tail Moss	Hylocomiaceae	*Rhytidiadelphus triquetrus*	S5
Red-stemmed Feather Moss	Hylocomiaceae	*Pleurozium schreberi*	S5
Beautiful Branch Moss	Hypnaceae	*Callicladium haldanianum*	S5
Crisped Pincushion Moss	Orthotrichaceae	*Ulota crispa*	S5
a Moss	Orthotrichaceae	*Ulota sp.*	SU
Smoothcap Moss	Polytrichaceae	*Atrichum sp*	N/A
Common Haircap Moss	Polytrichaceae	*Polytrichum commune*	S5
Brown Peat Moss	*Sphagnaceae*	*Sphagnum fuscum*	S4S5
Peatmoss	*Sphagnaceae*	*Sphagnum sp*	N/A
LIVERWORTS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Frullania Liverwort	Jubulaceae	*Frullania sp.*	SU
Variable-Leaved Crestwort	Lophocoleaceae	*Lophocolea heterophylla*	SU
	Ptilidiaceae	*Ptilidium pulcherrimum*	SU
LICHENS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Fishnet Lichen	Cladoniaceae	*Cladonia boryi*	S4S5
Powdered Funnel Lichen	Cladoniaceae	*Cladonia cenotea*	S4S5
Mealy Pixie-cup Lichen	Cladoniaceae	*Cladonia chlorophaea*	S4S5
Trumpeting Lichen	Cladoniaceae	*Cladonia fimbriata*	SU
Giant Cladonia Lichen	Cladoniaceae	*Cladonia maxima*	SU
Smooth-footed Powderhorn Lichen	Cladoniaceae	*Cladonia ochrochlora*	S4S5
Gray Reindeer Lichen	Cladoniaceae	*Cladonia rangiferina*	S5
Cladonia spp.	Cladoniaceae	*Cladonia sp*	N/A
Star-tipped Reindeer Lichen	Cladoniaceae	*Cladonia stellaris*	S4S5
Bryoria Lichen	Parmeliaceae	*Bryoria sp*	N/A
Camouflage Lichen	Parmeliaceae	Camouflage Lichen	N/A
Boreal Oakmoss Lichen	Parmeliaceae	*Evernia mesomorpha*	S5
Monk's Hood Lichen	Parmeliaceae	*Hypogymnia physodes*	S5
Powder-headed Tube Lichen	Parmeliaceae	*Hypogymnia tubulosa*	S4S5
Abrading Camouflage Lichen	Parmeliaceae	*Melanelixia subaurifera*	S4S5
Bottlebrush Shield Lichen	Parmeliaceae	*Parmelia squarrosa*	S5
Hammered Shield Lichen	Parmeliaceae	*Parmelia sulcata*	S5
Varied Rag Lichen	Parmeliaceae	*Platismatia glauca*	S5
Usnea	Parmeliaceae	*Usnea sp*	N/A
Buellia spp.	Physciaceae	*Buellia sp*	N/A
Hooded Rosette Lichen	Physciaceae	*Physcia adscendens*	S4S5
Sinewed Ramalina Lichen	Ramalinaceae	*Ramalina americana*	S4S5
Punctured Ramalina Lichen	Ramalinaceae	*Ramalina dilacerata*	S4S5
Hyphenated Ramalina Lichen	Ramalinaceae	*Ramalina farinacea*	S4S5
Rock Foam Lichen	Stereocaulaceae	*Stereocaulon saxatile*	SU
Woolly Foam Lichen	Stereocaulaceae	*Stereocaulon tomentosum*	S4S5

APPENDIX I: CLIFF FLORA

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Maritime Sunburst Lichen		*Xanthoria parietina*	S4S5
FUNGI	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
White Coral Fungi	Clavariaceae	*Clavulina coralloides*	SU?
BIRDS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
MAMMALS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**

Bank Swallow Nests Along Cavendish Cliffs, PEI National Park

SPECIES LIST

COAST TYPE:	DUNES
KRUMMHOLZING SITES	20
SURVEYOR:	DANIEL MCRAE

BIODIVERSITY

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
CONIFEROUS TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
BALSAM FIR	*Pinaceae*	*Abies balsamea*	S5
TAMARACK	*Pinaceae*	*Larix laricina*	S5
WHITE SPRUCE	*Pinaceae*	*Picea glauca*	S5
BLACK SPRUCE	*Pinaceae*	*Picea mariana*	S5
JACK PINE	*Pinaceae*	*Pinus banksiana*	S2S3
RED PINE	*Pinaceae*	*Pinus resinosa*	S2
DECIDUOUS TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
PAPER BIRCH	*Betulaceae*	*Betula papyrifera*	S5
GRAY BIRCH	*Betulaceae*	*Betula populifolia*	S5
NORTHERN RED OAK	*Fagaceae*	*Quercus rubra*	S3S4
PIN CHERRY	*Rosaceae*	*Prunus pensylvanica*	S5
AMERICAN MOUNTAIN ASH	*Rosaceae*	*Sorbus americana*	S5
BALSAM POPLAR	*Salicaceae*	*Populus balsamifera*	S3
TREMBLING ASPEN	*Salicaceae*	*Populus tremuloides*	S5
RED MAPLE	*Sapindaceae*	*Acer rubrum*	S5
SHRUBS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
WESTERN POISON IVY	*Anacardiaceae*	*Toxicodendron radicans var. rydbergii*	S4
MOUNTAIN HOLLY	*Aquifoliaceae*	*Ilex mucronata*	S5
COMMON WINTERBERRY	*Aquifoliaceae*	*Ilex verticillata*	S5
SPECKLED ALDER	*Betulaceae*	*Alnus incana*	S5
BEAKED HAZEL	*Betulaceae*	*Corylus cornuta*	S5
CANADA FLY HONEYSUCKLE	*Caprifoliaceae*	*Lonicera canadensis*	S5
PINEBARREN GOLDEN HEATHER	*Cistaceae*	*Hudsonia ericoides*	S2
WOOLLY BEACH-HEATH	*Cistaceae*	*Hudsonia tomentosa*	S3
ALTERNATE-LEAVED DOGWOOD	*Cornaceae*	*Cornus alternifolia*	S4
RED OSIER DOGWOOD	*Cornaceae*	*Cornus sericea*	S5
COMMON JUNIPER	*Cupressaceae*	*Juniperus communis*	S3
CREEPING JUNIPER	*Cupressaceae*	*Juniperus horizontalis*	S2S3
COMMON BEARBERRY	*Ericaceae*	*Arctostaphylos uva-ursi*	S3
LEATHERLEAF	*Ericaceae*	*Chamaedaphne calyculata*	S4
BROOM CROWBERRY	*Ericaceae*	*Corema conradii*	S2S3
PINK CROWBERRY	*Ericaceae*	*Empetrum eamesii*	S2S3
BLACK CROWBERRY	*Ericaceae*	*Empetrum nigrum*	S3
BLACK HUCKLEBERRY	*Ericaceae*	*Gaylussacia baccata*	S4S5
SHEEP LAUREL	*Ericaceae*	*Kalmia angustifolia*	S5
PALE BOG LAUREL	*Ericaceae*	*Kalmia polifolia*	S4
RHODORA	*Ericaceae*	*Rhododendron canadense*	S5
COMMON LABRADOR TEA	*Ericaceae*	*Rhododendron groenlandicum*	S5
LATE LOWBUSH BLUEBERRY	*Ericaceae*	*Vaccinium angustifolium*	S5
VELVET-LEAVED BLUEBERRY	*Ericaceae*	*Vaccinium myrtilloides*	S4S5

APPENDIX II: DUNE FLORA

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Skunk Currant	*Grossulariaceae*	*Ribes glandulosum*	S5
Smooth Gooseberry	*Grossulariaceae*	*Ribes hirtellum*	S5
Northern Bayberry	*Myricaceae*	*Morella pensylvanica*	S5
Sweet Gale	*Myricaceae*	*Myrica gale*	S5
Serviceberry	*Rosaceae*	*Amelanchier sp*	N/A
Black Chokeberry	*Rosaceae*	*Aronia melanocarpa*	S4S5
Aronia sp	*Rosaceae*	*Aronia sp*	N/A
Chokecherry	*Rosaceae*	*Prunus virginiana*	S5
Virginia Rose	*Rosaceae*	*Rosa virginiana*	S5
Alleghaney Blackberry	*Rosaceae*	*Rubus allegheniensis*	S4S5
Red Raspberry	*Rosaceae*	*Rubus idaeus*	S5
White Meadowsweet	*Rosaceae*	*Spiraea alba*	S5
Willow	*Salicaceae*	*Salix spp.*	N/A
Canada Yew	*Taxaceae*	*Taxus canadensis*	S4
Red Elderberry	*Viburnaceae*	*Sambucus racemosa*	S5
Northern Wild Raisin	*Viburnaceae*	*Viburnum cassinoides*	S5
NON-NATIVE TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
WILDFLOWERS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Thin-leaved Orache	*Amaranthaceae*	*Atriplex prostrata*	S4
Sea Glasswort	*Amaranthaceae*	*Salicornia maritima*	S4S5
White Sea-blite	*Amaranthaceae*	*Suaeda maritima*	S4S5
Scotch Lovage	*Apiaceae*	*Ligusticum scoticum*	S4
Common Water Parsnip	*Apiaceae*	*Sium suave*	S5
Turion Duckweed	*Araceae*	*Lemna turionifera*	S4S5
Bristly Sarsaparilla	*Araliaceae*	*Aralia hispida*	S4
Wild Sarsaparilla	*Araliaceae*	*Aralia nudicaulis*	S5
Wild Lily-of-The-Valley	*Asparagaceae*	*Maianthemum canadense*	S5
Starry False Solomon's Seal	*Asparagaceae*	*Maianthemum stellatum*	S3
Common Ragweed	*Asteraceae*	*Ambrosia artemisiifolia*	S4
Pearly Everlasting	*Asteraceae*	*Anaphalis margaritacea*	S5
Hairy Flat-top White Aster	*Asteraceae*	*Doellingeria umbellata*	S5
Eastern Burnweed	*Asteraceae*	*Erechtites hieraciifolius*	S4
Canada Horseweed	*Asteraceae*	*Erigeron canadensis*	S5
Grass-leaved Goldenrod	*Asteraceae*	*Euthamia graminifolia*	S5
Spotted Joe Pye Weed	*Asteraceae*	*Eutrochium maculatum*	S5
Hawkweed spp.	*Asteraceae*	*Hieracium sp*	N/A
Three-leaved Rattlesnakeroot	*Asteraceae*	*Nabalus trifoliolatus*	S5
Whorled Wood Aster	*Asteraceae*	*Oclemena acuminata*	S5
Rough-stemmed Goldenrod	*Asteraceae*	*Solidago rugosa*	S5
Seaside Goldenrod	*Asteraceae*	*Solidago sempervirens*	S4S5
Calico Aster	*Asteraceae*	*Symphyotrichum lateriflorum*	S5
New York Aster	*Asteraceae*	*Symphyotrichum novi-belgii*	S5
Rough Cocklebur	*Asteraceae*	*Xanthium strumarium*	S4
Spotted Jewelweed	*Balsaminaceae*	*Impatiens capensis*	S5
American Searocket	*Brassicaceae*	*Cakile edentula*	S4S5
Twinflower	*Caprifoliaceae*	*Linnaea borealis*	S5
Seabeach Sandwort	*Caryophyllaceae*	*Honckenya peploides*	S3S4

APPENDIX II: DUNE FLORA

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Blunt-leaved Sandwort	*Caryophyllaceae*	*Moehringia lateriflora*	S5
Saltmarsh Sandspurrey	*Caryophyllaceae*	*Spergularia salina*	S4
Hedge False Bindweed	*Convolvulaceae*	*Calystegia sepium*	S5
Bunchberry	*Cornaceae*	*Cornus canadensis*	S5
Saltmarsh Bulrush	*Cyperaceae*	*Bolboschoenus maritimus*	S4
Round-leaved Sundew	*Droseraceae*	*Drosera rotundifolia*	S4
Trailing Arbutus	*Ericaceae*	*Epigaea repens*	S4
One-flowered Wintergreen	*Ericaceae*	*Moneses uniflora*	S3
Convulsion-Root	*Ericaceae*	*Monotropa uniflora*	S5
One-sided Wintergreen	*Ericaceae*	*Orthilia secunda*	S4S5
Shinleaf	*Ericaceae*	*Pyrola elliptica*	S5
Large Cranberry	*Ericaceae*	*Vaccinium macrocarpon*	S4S5
Small Cranberry	*Ericaceae*	*Vaccinium oxycoccos*	S4
Mountain Cranberry	*Ericaceae*	*Vaccinium vitis-idaea*	S3
Seaside Spurge	*Euphorbiaceae*	*Euphorbia polygonifolia*	S2S3
Clover spp.	*Fabaceae*	*Clover spp.*	N/A
Beach Pea	*Fabaceae*	*Lathyrus japonicus*	S4S5
Harlequin Blue Flag	*Iridaceae*	*Iris versicolor*	S5
Seaside Arrowgrass	*Juncaginaceae*	*Triglochin maritima*	S4S5
Marsh Skullcap	*Lamiaceae*	*Scutellaria galericulata*	S4S5
Canada Germander	*Lamiaceae*	*Teucrium canadense*	S3S4
Yellow Bluebead Lily	*Liliaceae*	*Clintonia borealis*	S5
Fireweed	*Onagraceae*	*Chamaenerion angustifolium*	S5
Small Enchanter's Nightshade	*Onagraceae*	*Circaea alpina*	S5
Common Evening Primrose	*Onagraceae*	*Oenothera biennis*	S5
Small-flowered Evening Primrose	*Onagraceae*	*Oenothera parviflora*	S4S5
Tuberous Grass Pink	*Orchidaceae*	*Calopogon tuberosus*	S3
Pink Lady's-Slipper	*Orchidaceae*	*Cypripedium acaule*	S5
Loesel's Twayblade	*Orchidaceae*	*Liparis loeselii*	S3
Slender Ladies'-tresses	*Orchidaceae*	*Spiranthes lacera*	S4
American Cow Wheat	*Orobanchaceae*	*Melampyrum lineare*	S4S5
Seaside Plantain	*Plantaginaceae*	*Plantago maritima*	S4S5
Sea Lavender	*Plumbaginaceae*	*Limonium carolinianum*	S4S5
American Beach Grass	*Poaceae*	*Calamagrostis breviligulata*	S4S5
Sea Lyme Grass	*Poaceae*	*Leymus mollis*	S4
Smooth Cordgrass	*Poaceae*	*Sporobolus alterniflorus*	S4S5
Prairie Cordgrass	*Poaceae*	*Sporobolus michauxianus*	S5
Saltmeadow Cordgrass	*Poaceae*	*Sporobolus pumilus*	S4S5
Tierra del Fuego Dock	*Polygonaceae*	*Rumex fueginus*	S4
Northern Starflower	*Primulaceae*	*Lysimachia borealis*	S5
Sea Milkwort	*Primulaceae*	*Lysimachia maritima*	S4S5
Swamp Yellow Loosestrife	*Primulaceae*	*Lysimachia terrestris*	S4S5
Marsh Cinquefoil	*Rosaceae*	*Comarum palustre*	S4
Wild Strawberry	*Rosaceae*	*Fragaria virginiana*	S5
Common Silverweed	*Rosaceae*	*Potentilla anserina*	S5
Three-toothed Cinquefoil	*Rosaceae*	*Sibbaldia tridentata*	S3
Bedstraw	*Rubiaceae*	*Galium sp*	N/A

APPENDIX II: DUNE FLORA

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Three-petaled Bedstraw	*Rubiaceae*	*Galium trifidum*	S4S5
Three-flowered Bedstraw	*Rubiaceae*	*Galium triflorum*	S5
Bastard's Toadflax	*Santalaceae*	*Comandra umbellata*	S3
Broad-leaved Cattail	*Typhaceae*	*Typha latifolia*	S5
Common Eelgrass	*Zosteraceae*	*Zostera marina*	S4
FERNS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Common Oak Fern	*Cystopteridaceae*	*Gymnocarpium dryopteris*	S5
Bracken Fern	*Dennstaedtiaceae*	*Pteridium aquilinum*	S5
Mountain Wood Fern	*Dryopteridaceae*	*Dryopteris campyloptera*	S4
Spinulose Wood Fern	*Dryopteridaceae*	*Dryopteris carthusiana*	S4S5
Evergreen Wood Fern	*Dryopteridaceae*	*Dryopteris intermedia*	S5
Sensitive Fern	*Onocleaceae*	*Onoclea sensibilis*	S5
Cinnamon Fern	*Osmundaceae*	*Osmundastrum cinnamomeum*	S5
CLUBMOSSES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Round-branched Tree-clubmoss	*Lycopodiaceae*	*Dendrolycopodium dendroideum*	S5
Hickey's Tree-clubmoss	*Lycopodiaceae*	*Dendrolycopodium hickeyi*	S3
Northern Bog Clubmoss	*Lycopodiaceae*	*Lycopodiella inundata*	S3
HORSETAILS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Field Horsetail	*Equisetaceae*	*Equisetum arvense*	S5
MOSSES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Glow Moss	Aulacomniaceae	*Aulacomnium palustre*	S5
Wavy-leaved Broom Moss	Dicranaceae	*Dicranum polysetum*	S5
Common Broom Moss	Dicranaceae	*Dicranum scoparium*	S5
Electrified Cat's-tail Moss	Hylocomiaceae	*Rhytidiadelphus triquetrus*	S5
Red-stemmed Feather Moss	Hylocomiaceae	*Pleurozium schreberi*	S5
Beautiful Branch Moss	Hypnaceae	*Callicladium haldanianum*	S5
a Moss	Orthotrichaceae	*Ulota sp.*	SU
Smoothcap Moss	Polytrichaceae	*Atrichum sp*	N/A
Common Haircap Moss	Polytrichaceae	*Polytrichum commune*	S5
Bristly Haircap Moss	Polytrichaceae	*Polytrichum piliferum*	S4S5
Bog Haircap Moss	Polytrichaceae	*Polytrichum strictum*	S4S5
Brown Peat Moss	*Sphagnaceae*	*Sphagnum fuscum*	S4S5
Peatmoss	*Sphagnaceae*	*Sphagnum sp*	N/A
LIVERWORTS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Frullania Liverwort	Jubulaceae	*Frullania sp.*	SU
Variable-Leaved Crestwort	Lophocoleaceae	*Lophocolea heterophylla*	SU
	Ptilidiaceae	*Ptilidium pulcherrimum*	SU
Flat-leaved Scalewort	Radulaceae	*Radula complanata*	SU
LICHENS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Fishnet Lichen	Cladoniaceae	*Cladonia boryi*	S4S5
Powdered Funnel Lichen	Cladoniaceae	*Cladonia cenotea*	S4S5
Mealy Pixie-cup Lichen	Cladoniaceae	*Cladonia chlorophaea*	S4S5
Trumpeting Lichen	Cladoniaceae	*Cladonia fimbriata*	SU
Red-fruited Pixie-cup	Cladoniaceae	*Cladonia pleurota*	SU
Gray Reindeer Lichen	Cladoniaceae	*Cladonia rangiferina*	S5
Cladonia spp.	Cladoniaceae	*Cladonia sp*	N/A
Star-tipped Reindeer Lichen	Cladoniaceae	*Cladonia stellaris*	S4S5
Bryoria Lichen	Parmeliaceae	*Bryoria sp*	N/A

APPENDIX II: DUNE FLORA

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Camouflage Lichen	Parmeliaceae	Camouflage Lichen	N/A
Spiny Heath Lichen	Parmeliaceae	*Cetraria aculeata*	SU
Cetraria Lichen	Parmeliaceae	*Cetraria sp.*	N/A
Boreal Oakmoss Lichen	Parmeliaceae	*Evernia mesomorpha*	S5
Monk's Hood Lichen	Parmeliaceae	*Hypogymnia physodes*	S5
Abrading Camouflage Lichen	Parmeliaceae	*Melanelixia subaurifera*	S4S5
Bottlebrush Shield Lichen	Parmeliaceae	*Parmelia squarrosa*	S5
Hammered Shield Lichen	Parmeliaceae	*Parmelia sulcata*	S5
Varied Rag Lichen	Parmeliaceae	*Platismatia glauca*	S5
Rough Speckleback Lichen	Parmeliaceae	*Punctelia rudecta*	S4S5
Variable Wrinkle Lichen	Parmeliaceae	*Tuckermannopsis orbata*	S4S5
Usnea	Parmeliaceae	*Usnea sp*	N/A
Powdered Sunshine Lichen	Parmeliaceae	*Vulpicida pinastri*	S4S5
Buellia spp.	Physciaceae	*Buellia sp*	N/A
Hooded Rosette Lichen	Physciaceae	*Physcia adscendens*	S4S5
Maritime Sunburst Lichen		*Xanthoria parietina*	S4S5
FUNGI	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Barometer Earthstar	Astraeaceae	*Astraeus hygrometricus*	SU
AMPHIBIANS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
BIRDS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
MAMMALS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**

Bristly Haircap Moss, Polytrichum piliferum, S4S5
Common Sandy-tolerant Polytrichum Species, Secondary Krummholzing Dune Coast-top Zone

SPECIES LIST

COAST TYPE:	Low
KRUMMHOLZING SITES	6
SURVEYOR:	Daniel McRae

BIODIVERSITY

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
CONIFEROUS TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Eastern White Cedar	*Cupressaceae*	*Thuja occidentalis*	S3S4
Balsam Fir	*Pinaceae*	*Abies balsamea*	S5
Tamarack	*Pinaceae*	*Larix laricina*	S5
Black Spruce	*Pinaceae*	*Picea mariana*	S5
DECIDUOUS TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Paper Birch	*Betulaceae*	*Betula papyrifera*	S5
Gray Birch	*Betulaceae*	*Betula populifolia*	S5
Northern Red Oak	*Fagaceae*	*Quercus rubra*	S3S4
White Ash	*Oleaceae*	*Fraxinus americana*	S2S3
Black Ash	*Oleaceae*	*Fraxinus nigra*	S2
American Mountain Ash	*Rosaceae*	*Sorbus americana*	S5
Large-toothed Aspen	*Salicaceae*	*Populus grandidentata*	S4S5
Trembling Aspen	*Salicaceae*	*Populus tremuloides*	S5
Red Maple	*Sapindaceae*	*Acer rubrum*	S5
SHRUBS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Western Poison Ivy	*Anacardiaceae*	*Toxicodendron radicans var. rydbergii*	S4
Mountain Holly	*Aquifoliaceae*	*Ilex mucronata*	S5
Common Winterberry	*Aquifoliaceae*	*Ilex verticillata*	S5
Speckled Alder	*Betulaceae*	*Alnus incana*	S5
Canada Fly Honeysuckle	*Caprifoliaceae*	*Lonicera canadensis*	S5
Red Osier Dogwood	*Cornaceae*	*Cornus sericea*	S5
Black Crowberry	*Ericaceae*	*Empetrum nigrum*	S3
Black Huckleberry	*Ericaceae*	*Gaylussacia baccata*	S4S5
Dwarf Huckleberry	*Ericaceae*	*Gaylussacia bigeloviana*	S3
Sheep Laurel	*Ericaceae*	*Kalmia angustifolia*	S5
Common Labrador Tea	*Ericaceae*	*Rhododendron groenlandicum*	S5
Late Lowbush Blueberry	*Ericaceae*	*Vaccinium angustifolium*	S5
Northern Bayberry	*Myricaceae*	*Morella pensylvanica*	S5
Sweet Gale	*Myricaceae*	*Myrica gale*	S5
Serviceberry	*Rosaceae*	*Amelanchier sp*	N/A
Shining Rose	*Rosaceae*	*Rosa nitida*	S4
Virginia Rose	*Rosaceae*	*Rosa virginiana*	S5
Bristly Dewberry	*Rosaceae*	*Rubus hispidus*	S4
White Meadowsweet	*Rosaceae*	*Spiraea alba*	S5
Northern Wild Raisin	*Viburnaceae*	*Viburnum cassinoides*	S5
NON-NATIVE TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
WILDFLOWERS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Thin-leaved Orache	*Amaranthaceae*	*Atriplex prostrata*	S4
Sea Glasswort	*Amaranthaceae*	*Salicornia maritima*	S4S5
White Sea-blite	*Amaranthaceae*	*Suaeda maritima*	S4S5

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Wild Sarsaparilla	*Araliaceae*	*Aralia nudicaulis*	S5
Wild Lily-of-The-Valley	*Asparagaceae*	*Maianthemum canadense*	S5
Three-leaved False Soloman's Seal	*Asparagaceae*	*Maianthemum trifolium*	S4
Common Ragweed	*Asteraceae*	*Ambrosia artemisiifolia*	S4
Devil's Beggarticks	*Asteraceae*	*Bidens frondosa*	S5
Hairy Flat-top White Aster	*Asteraceae*	*Doellingeria umbellata*	S5
Three-leaved Rattlesnakeroot	*Asteraceae*	*Nabalus trifoliolatus*	S5
Whorled Wood Aster	*Asteraceae*	*Oclemena acuminata*	S5
Canada Goldenrod	*Asteraceae*	*Solidago canadensis*	S5
Rough-stemmed Goldenrod	*Asteraceae*	*Solidago rugosa*	S5
Seaside Goldenrod	*Asteraceae*	*Solidago sempervirens*	S4S5
Calico Aster	*Asteraceae*	*Symphyotrichum lateriflorum*	S5
New York Aster	*Asteraceae*	*Symphyotrichum novi-belgii*	S5
Rough Cocklebur	*Asteraceae*	*Xanthium strumarium*	S4
American Searocket	*Brassicaceae*	*Cakile edentula*	S4S5
Twinflower	*Caprifoliaceae*	*Linnaea borealis*	S5
Seabeach Sandwort	*Caryophyllaceae*	*Honckenya peploides*	S3S4
Saltmarsh Sandspurrey	*Caryophyllaceae*	*Spergularia salina*	S4
Hedge False Bindweed	*Convolvulaceae*	*Calystegia sepium*	S5
Bunchberry	*Cornaceae*	*Cornus canadensis*	S5
Saltmarsh Bulrush	*Cyperaceae*	*Bolboschoenus maritimus*	S4
Trailing Arbutus	*Ericaceae*	*Epigaea repens*	S4
Creeping Snowberry	*Ericaceae*	*Gaultheria hispidula*	S5
Eastern Teaberry	*Ericaceae*	*Gaultheria procumbens*	S4S5
Shinleaf	*Ericaceae*	*Pyrola elliptica*	S5
Large Cranberry	*Ericaceae*	*Vaccinium macrocarpon*	S4S5
Small Cranberry	*Ericaceae*	*Vaccinium oxycoccos*	S4
Clover spp.	*Fabaceae*	*Clover spp.*	N/A
Harlequin Blue Flag	*Iridaceae*	*Iris versicolor*	S5
Seaside Arrowgrass	*Juncaginaceae*	*Triglochin maritima*	S4S5
Northern Water Horehound	*Lamiaceae*	*Lycopus uniflorus*	S5
Mad-dog Skullcap	*Lamiaceae*	*Scutellaria lateriflora*	S5
Canada Germander	*Lamiaceae*	*Teucrium canadense*	S3S4
Tuberous Grass Pink	*Orchidaceae*	*Calopogon tuberosus*	S3
Pink Lady's-Slipper	*Orchidaceae*	*Cypripedium acaule*	S5
White Fringed Orchid	*Orchidaceae*	*Platanthera blephariglottis*	S3S4
Sea Lavender	*Plumbaginaceae*	*Limonium carolinianum*	S4S5
Virginia Wild Rye	*Poaceae*	*Elymus virginicus*	S2S3
Smooth Cordgrass	*Poaceae*	*Sporobolus alterniflorus*	S4S5
Prairie Cordgrass	*Poaceae*	*Sporobolus michauxianus*	S5
Saltmeadow Cordgrass	*Poaceae*	*Sporobolus pumilus*	S4S5
Tierra del Fuego Dock	*Polygonaceae*	*Rumex fueginus*	S4
Sea Milkwort	*Primulaceae*	*Lysimachia maritima*	S4S5
Swamp Yellow Loosestrife	*Primulaceae*	*Lysimachia terrestris*	S4S5
Yellow Marsh Marigold	*Ranunculaceae*	*Caltha palustris*	S4S5
Seaside Buttercup	*Ranunculaceae*	*Halerpestes cymbalaria*	S4
Tall Meadow-Rue	*Ranunculaceae*	*Thalictrum pubescens*	S5

APPENDIX III: LOW PLAIN FLORA

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Wild Strawberry	*Rosaceae*	*Fragaria virginiana*	S5
Common Silverweed	*Rosaceae*	*Potentilla anserina*	S5
Bedstraw	*Rubiaceae*	*Galium sp*	N/A
Three-petaled Bedstraw	*Rubiaceae*	*Galium trifidum*	S4S5
Three-flowered Bedstraw	*Rubiaceae*	*Galium triflorum*	S5
Northern Pitcher Plant	*Sarraceniaceae*	*Sarracenia purpurea*	S4
Broad-leaved Cattail	*Typhaceae*	*Typha latifolia*	S5
Common Eelgrass	*Zosteraceae*	*Zostera marina*	S4
FERNS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Bracken Fern	*Dennstaedtiaceae*	*Pteridium aquilinum*	S5
Spinulose Wood Fern	*Dryopteridaceae*	*Dryopteris carthusiana*	S4S5
Evergreen Wood Fern	*Dryopteridaceae*	*Dryopteris intermedia*	S5
Sensitive Fern	*Onocleaceae*	*Onoclea sensibilis*	S5
Royal Fern	*Osmundaceae*	*Osmunda regalis*	S4
Cinnamon Fern	*Osmundaceae*	*Osmundastrum cinnamomeum*	S5
HORSETAILS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Woodland Horsetail	*Equisetaceae*	*Equisetum sylvaticum*	S5
MOSSES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Glow Moss	Aulacomniaceae	*Aulacomnium palustre*	S5
Wavy-leaved Broom Moss	Dicranaceae	*Dicranum polysetum*	S5
Common Broom Moss	Dicranaceae	*Dicranum scoparium*	S5
Stairstep Moss	Hylocomiaceae	*Hylocomium splendens*	S5
Electrified Cat's-tail Moss	Hylocomiaceae	*Rhytidiadelphus triquetrus*	S5
Red-stemmed Feather Moss	Hylocomiaceae	*Pleurozium schreberi*	S5
a Moss	Orthotrichaceae	*Ulota sp.*	SU
Smoothcap Moss	Polytrichaceae	*Atrichum sp*	N/A
Common Haircap Moss	Polytrichaceae	*Polytrichum commune*	S5
Green Peat Moss	*Sphagnaceae*	*Sphagnum girgensohnii*	S5
Red Peat Moss	*Sphagnaceae*	*Sphagnum rubellum*	S4S5
Peatmoss	*Sphagnaceae*	*Sphagnum sp*	N/A
Shaggy Peat Moss	Sphagnaceae	*Sphagnum squarrosum*	S5
LIVERWORTS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Wood Rustwort	Cephaloziaceae	*Nowellia curvifolia*	SU
Frullania Liverwort	Jubulaceae	*Frullania sp.*	SU
Three-lobed Whipwort	Lepidoziaceae	*Bazzania trilobata*	S5
Variable-Leaved Crestwort	Lophocoleaceae	*Lophocolea heterophylla*	SU
Ciliate Fringewort	Ptilidiaceae	*Ptilidium ciliare*	SU
	Ptilidiaceae	*Ptilidium pulcherrimum*	SU
Flat-leaved Scalewort	Radulaceae	*Radula complanata*	SU
LICHENS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Mealy Pixie-cup Lichen	Cladoniaceae	*Cladonia chlorophaea*	S4S5
Lipstick Powderhorn Lichen	Cladoniaceae	*Cladonia macilenta*	SU
Smooth-footed Powderhorn Lichen	Cladoniaceae	*Cladonia ochrochlora*	S4S5
Gray Reindeer Lichen	Cladoniaceae	*Cladonia rangiferina*	S5
Cladonia spp.	Cladoniaceae	*Cladonia sp*	N/A
Dragon Lichen	Cladoniaceae	*Cladonia squamosa*	S4S5
a Lichen	Graphidaceae	*Graphis scripta*	S5
a Lichen	Haematommataceae	*Loxospora ochrophaea*	S5

APPENDIX III: LOW PLAIN FLORA

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Lungwort Lichen	Lobariaceae	*Lobaria pulmonaria*	S4S5
Burred Horsehair Lichen	Parmeliaceae	*Bryoria furcellata*	S5
Blonde Horsehair Lichen	Parmeliaceae	*Bryoria nadvornikiana*	S2?
Bryoria Lichen	Parmeliaceae	*Bryoria sp*	N/A
Boreal Oakmoss Lichen	Parmeliaceae	*Evernia mesomorpha*	S5
Monk's Hood Lichen	Parmeliaceae	*Hypogymnia physodes*	S5
Abrading Camouflage Lichen	Parmeliaceae	*Melanelixia subaurifera*	S4S5
Bottlebrush Shield Lichen	Parmeliaceae	*Parmelia squarrosa*	S5
Hammered Shield Lichen	Parmeliaceae	*Parmelia sulcata*	S5
Varied Rag Lichen	Parmeliaceae	*Platismatia glauca*	S5
Crumpled Rag Lichen	Parmeliaceae	*Platismatia tuckermanii*	S3S4
Usnea	Parmeliaceae	*Usnea sp*	N/A
Buellia spp.	Physciaceae	*Buellia sp*	N/A
Orange-cored Shadow Lichen	Physciaceae	*Phaeophyscia rubropulchra*	S4S5
Frayed Ramalina Lichen	Ramalinaceae	*Ramalina roesleri*	S4S5
BIRDS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
MAMMALS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**

Black Ash, *Fraxinus nigra* - S2
Secondary Krummholzing Low Plain Coastal Forest Zone

SPECIES LIST

KRUMMHOLZ TYPE:	PRIMEKRUMMHOLZ
# of SITES	29
SURVEYOR:	DANIEL MCRAE

BIODIVERSITY

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
CONIFEROUS TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
EASTERN WHITE CEDAR	*Cupressaceae*	*Thuja occidentalis*	S3S4
BALSAM FIR	*Pinaceae*	*Abies balsamea*	S5
TAMARACK	*Pinaceae*	*Larix laricina*	S5
WHITE SPRUCE	*Pinaceae*	*Picea glauca*	S5
BLACK SPRUCE	*Pinaceae*	*Picea mariana*	S5
JACK PINE	*Pinaceae*	*Pinus banksiana*	S2S3
RED PINE	*Pinaceae*	*Pinus resinosa*	S2
DECIDUOUS TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
PAPER BIRCH	*Betulaceae*	*Betula papyrifera*	S5
GRAY BIRCH	*Betulaceae*	*Betula populifolia*	S5
NORTHERN RED OAK	*Fagaceae*	*Quercus rubra*	S3S4
WHITE ASH	*Oleaceae*	*Fraxinus americana*	S2S3
PIN CHERRY	*Rosaceae*	*Prunus pensylvanica*	S5
AMERICAN MOUNTAIN ASH	*Rosaceae*	*Sorbus americana*	S5
TREMBLING ASPEN	*Salicaceae*	*Populus tremuloides*	S5
RED MAPLE	*Sapindaceae*	*Acer rubrum*	S5
SUGAR MAPLE	*Sapindaceae*	*Acer saccharum*	S4
SHRUBS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
WESTERN POISON IVY	*Anacardiaceae*	*Toxicodendron radicans var. rydbergii*	S4
SPREADING DOGBANE	*Apocynaceae*	*Apocynum androsaemifolium*	S4
MOUNTAIN HOLLY	*Aquifoliaceae*	*Ilex mucronata*	S5
COMMON WINTERBERRY	*Aquifoliaceae*	*Ilex verticillata*	S5
GREEN ALDER	*Betulaceae*	*Alnus alnobetula*	S4S5
SPECKLED ALDER	*Betulaceae*	*Alnus incana*	S5
BEAKED HAZEL	*Betulaceae*	*Corylus cornuta*	S5
CANADA FLY HONEYSUCKLE	*Caprifoliaceae*	*Lonicera canadensis*	S5
PINEBARREN GOLDEN HEATHER	*Cistaceae*	*Hudsonia ericoides*	S2
WOOLLY BEACH-HEATH	*Cistaceae*	*Hudsonia tomentosa*	S3
ALTERNATE-LEAVED DOGWOOD	*Cornaceae*	*Cornus alternifolia*	S4
RED OSIER DOGWOOD	*Cornaceae*	*Cornus sericea*	S5
COMMON JUNIPER	*Cupressaceae*	*Juniperus communis*	S3
CREEPING JUNIPER	*Cupressaceae*	*Juniperus horizontalis*	S2S3
COMMON BEARBERRY	*Ericaceae*	*Arctostaphylos uva-ursi*	S3
LEATHERLEAF	*Ericaceae*	*Chamaedaphne calyculata*	S4
BROOM CROWBERRY	*Ericaceae*	*Corema conradii*	S2S3
PINK CROWBERRY	*Ericaceae*	*Empetrum eamesii*	S2S3
BLACK CROWBERRY	*Ericaceae*	*Empetrum nigrum*	S3
BLACK HUCKLEBERRY	*Ericaceae*	*Gaylussacia baccata*	S4S5
DWARF HUCKLEBERRY	*Ericaceae*	*Gaylussacia bigeloviana*	S3

APPENDIX IV: PRIMARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Sheep Laurel	*Ericaceae*	*Kalmia angustifolia*	S5
Pale Bog Laurel	*Ericaceae*	*Kalmia polifolia*	S4
Rhodora	*Ericaceae*	*Rhododendron canadense*	S5
Common Labrador Tea	*Ericaceae*	*Rhododendron groenlandicum*	S5
Late Lowbush Blueberry	*Ericaceae*	*Vaccinium angustifolium*	S5
Velvet-leaved Blueberry	*Ericaceae*	*Vaccinium myrtilloides*	S4S5
Skunk Currant	*Grossulariaceae*	*Ribes glandulosum*	S5
Smooth Gooseberry	*Grossulariaceae*	*Ribes hirtellum*	S5
Bristly Black Currant	*Grossulariaceae*	*Ribes lacustre*	S5
Sweet-fern	*Myricaceae*	*Comptonia peregrina*	S4
Northern Bayberry	*Myricaceae*	*Morella pensylvanica*	S5
Sweet Gale	*Myricaceae*	*Myrica gale*	S5
Serviceberry	*Rosaceae*	*Amelanchier sp*	N/A
Black Chokeberry	*Rosaceae*	*Aronia melanocarpa*	S4S5
Aronia sp	*Rosaceae*	*Aronia sp*	N/A
Hawthorn	*Rosaceae*	*Crataegus spp.*	N/A
Chokecherry	*Rosaceae*	*Prunus virginiana*	S5
Shining Rose	*Rosaceae*	*Rosa nitida*	S4
Virginia Rose	*Rosaceae*	*Rosa virginiana*	S5
Alleghaney Blackberry	*Rosaceae*	*Rubus allegheniensis*	S4S5
Cloudberry	*Rosaceae*	*Rubus chamaemorus*	S3
Bristly Dewberry	*Rosaceae*	*Rubus hispidus*	S4
Red Raspberry	*Rosaceae*	*Rubus idaeus*	S5
Dwarf Red Raspberry	*Rosaceae*	*Rubus pubescens*	S5
White Meadowsweet	*Rosaceae*	*Spiraea alba*	S5
Willow	*Salicaceae*	*Salix spp.*	N/A
Mountain Maple	*Sapindaceae*	*Acer spicatum*	S5
Canada Yew	*Taxaceae*	*Taxus canadensis*	S4
Red Elderberry	*Viburnaceae*	*Sambucus racemosa*	S5
Northern Wild Raisin	*Viburnaceae*	*Viburnum cassinoides*	S5
NON-NATIVE TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Common Apple	*Rosaceae*	*Malus pumila*	SNA
European Mountain Ash	*Rosaceae*	*Sorbus aucuparia*	SNA
Norway Maple	*Sapindaceae*	*Acer platanoides*	SNA
WILDFLOWERS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
American Sweetflag	*Acoraceae*	*Acorus americanus*	S4
Broad-leaved Arrowhead	*Alismataceae*	*Sagittaria latifolia*	S4
Narrow-leaved Orache	*Amaranthaceae*	*Atriplex littoralis*	SNA
Thin-leaved Orache	*Amaranthaceae*	*Atriplex prostrata*	S4
Common Lamb's Quarters	*Amaranthaceae*	*Chenopodium album*	SNA
Common Saltwort	*Amaranthaceae*	*Kali turgidum*	SNA
Sea Glasswort	*Amaranthaceae*	*Salicornia maritima*	S4S5
White Sea-blite	*Amaranthaceae*	*Suaeda maritima*	S4S5
Seaside Angelica	*Apiaceae*	*Angelica lucida*	S2S3
Bulbous Water-hemlock	*Apiaceae*	*Cicuta bulbifera*	S4S5
Queen Anne's Lace	*Apiaceae*	*Daucus carota*	SNA
Common Cow Parsnip	*Apiaceae*	*Heracleum maximum*	S4

APPENDIX IV: PRIMARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Scotch Lovage	*Apiaceae*	*Ligusticum scoticum*	S4
Maryland Sanicle	*Apiaceae*	*Sanicula marilandica*	S3S4
Common Water Parsnip	*Apiaceae*	*Sium suave*	S5
Turion Duckweed	*Araceae*	*Lemna turionifera*	S4S5
Wild Sarsaparilla	*Araliaceae*	*Aralia nudicaulis*	S5
Wild Lily-of-The-Valley	*Asparagaceae*	*Maianthemum canadense*	S5
Large False Solomon's Seal	*Asparagaceae*	*Maianthemum racemosum*	S4
Starry False Solomon's Seal	*Asparagaceae*	*Maianthemum stellatum*	S3
Three-leaved False Soloman's Seal	*Asparagaceae*	*Maianthemum trifolium*	S4
Common Yarrow	*Asteraceae*	*Achillea millefolium*	SNA
Common Ragweed	*Asteraceae*	*Ambrosia artemisiifolia*	S4
Pearly Everlasting	*Asteraceae*	*Anaphalis margaritacea*	S5
Common Burdock	*Asteraceae*	*Arctium minus*	SNA
Beach Wormwood	*Asteraceae*	*Artemisia stelleriana*	SNA
Nodding Beggarticks	*Asteraceae*	*Bidens cernua*	S4
Devil's Beggarticks	*Asteraceae*	*Bidens frondosa*	S5
Canada Thistle	*Asteraceae*	*Cirsium arvense*	SNA
Hairy Flat-top White Aster	*Asteraceae*	*Doellingeria umbellata*	S5
Canada Horseweed	*Asteraceae*	*Erigeron canadensis*	S5
Large-leaved Aster	*Asteraceae*	*Eurybia macrophylla*	S3
Grass-leaved Goldenrod	*Asteraceae*	*Euthamia graminifolia*	S5
Spotted Joe Pye Weed	*Asteraceae*	*Eutrochium maculatum*	S5
Hawkweed spp.	*Asteraceae*	*Hieracium sp*	N/A
Tansy Ragwort	*Asteraceae*	*Jacobaea vulgaris*	SNA
Oxeye Daisy	*Asteraceae*	*Leucanthemum vulgare*	SNA
Pineapple Weed	*Asteraceae*	*Matricaria discoidea*	SNA
Three-leaved Rattlesnakeroot	*Asteraceae*	*Nabalus trifoliolatus*	S5
Whorled Wood Aster	*Asteraceae*	*Oclemena acuminata*	S5
Woodland Cudweed	*Asteraceae*	*Omalotheca sylvatica*	S4
Cut-Leaved Coneflower	*Asteraceae*	*Rudbeckia laciniata*	S2
White Goldenrod	*Asteraceae*	*Solidago bicolor*	S4
Canada Goldenrod	*Asteraceae*	*Solidago canadensis*	S5
Gray-stemmed Goldenrod	*Asteraceae*	*Solidago nemoralis*	S4
Downy Goldenrod	*Asteraceae*	*Solidago puberula*	S4S5
Rough-stemmed Goldenrod	*Asteraceae*	*Solidago rugosa*	S5
Seaside Goldenrod	*Asteraceae*	*Solidago sempervirens*	S4S5
Field Sow Thistle	*Asteraceae*	*Sonchus arvensis*	SNA
Heart-leaved Aster	*Asteraceae*	*Symphyotrichum cordifolium*	S4
Calico Aster	*Asteraceae*	*Symphyotrichum lateriflorum*	S5
New York Aster	*Asteraceae*	*Symphyotrichum novi-belgii*	S5
Aster spp.	*Asteraceae*	*Symphyotrichum sp*	N/A
Common Dandelion	*Asteraceae*	*Taraxacum officinale*	SNA
Meadow Goatsbeard	*Asteraceae*	*Tragopogon pratensis*	SNA
Coltsfoot	*Asteraceae*	*Tussilago farfara*	SNA
Rough Cocklebur	*Asteraceae*	*Xanthium strumarium*	S4
Spotted Jewelweed	*Balsaminaceae*	*Impatiens capensis*	S5
Small Forget-Me-Not	*Boraginaceae*	*Myosotis laxa*	S4

APPENDIX IV: PRIMARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
American Searocket	*Brassicaceae*	*Cakile edentula*	S4S5
Pennsylvania Bittercress	*Brassicaceae*	*Cardamine pensylvanica*	S4S5
Twinflower	*Caprifoliaceae*	*Linnaea borealis*	S5
Mouse-Ear Chickweed	*Caryophyllaceae*	*Cerastium arvense*	SNA
Seabeach Sandwort	*Caryophyllaceae*	*Honckenya peploides*	S3S4
Blunt-leaved Sandwort	*Caryophyllaceae*	*Moehringia lateriflora*	S5
Canada Sandspurrey	*Caryophyllaceae*	*Spergularia canadensis*	S4
Ruby Sandspurrey	*Caryophyllaceae*	*Spergularia rubra*	SNA
Saltmarsh Sandspurrey	*Caryophyllaceae*	*Spergularia salina*	S4
Hedge False Bindweed	*Convolvulaceae*	*Calystegia sepium*	S5
Bunchberry	*Cornaceae*	*Cornus canadensis*	S5
Round-leaved Sundew	*Droseraceae*	*Drosera rotundifolia*	S4
Trailing Arbutus	*Ericaceae*	*Epigaea repens*	S4
Creeping Snowberry	*Ericaceae*	*Gaultheria hispidula*	S5
Eastern Teaberry	*Ericaceae*	*Gaultheria procumbens*	S4S5
One-flowered Wintergreen	*Ericaceae*	*Moneses uniflora*	S3
Convulsion-Root	*Ericaceae*	*Monotropa uniflora*	S5
One-sided Wintergreen	*Ericaceae*	*Orthilia secunda*	S4S5
Round-leaved Pyrola	*Ericaceae*	*Pyrola americana*	S4
Shinleaf	*Ericaceae*	*Pyrola elliptica*	S5
Large Cranberry	*Ericaceae*	*Vaccinium macrocarpon*	S4S5
Small Cranberry	*Ericaceae*	*Vaccinium oxycoccos*	S4
Mountain Cranberry	*Ericaceae*	*Vaccinium vitis-idaea*	S3
Seaside Spurge	*Euphorbiaceae*	*Euphorbia polygonifolia*	S2S3
Clover spp.	*Fabaceae*	*Clover spp.*	N/A
Beach Pea	*Fabaceae*	*Lathyrus japonicus*	S4S5
Marsh Vetchling	*Fabaceae*	*Lathyrus palustris*	S4S5
Nootka Lupine	*Fabaceae*	*Lupinus nootkatensis*	SNA
Rabbit's-foot Clover	*Fabaceae*	*Trifolium arvense*	SNA
Yellow Clover	*Fabaceae*	*Trifolium aureum*	SNA
Red Clover	*Fabaceae*	*Trifolium pratense*	SNA
White Clover	*Fabaceae*	*Trifolium repens*	SNA
Tufted Vetch	*Fabaceae*	*Vicia cracca*	SNA
Herb Robert	*Geraniaceae*	*Geranium robertianum*	S4
Fraser's St. John's-wort	*Hypericaceae*	*Hypericum fraseri*	S5
Harlequin Blue Flag	*Iridaceae*	*Iris versicolor*	S5
Mountain Blue-eyed-grass	*Iridaceae*	*Sisyrinchium montanum*	S5
Seaside Arrowgrass	*Juncaginaceae*	*Triglochin maritima*	S4S5
Common Hemp-nettle	*Lamiaceae*	*Galeopsis tetrahit*	SNA
American Water Horehound	*Lamiaceae*	*Lycopus americanus*	S4S5
Northern Water Horehound	*Lamiaceae*	*Lycopus uniflorus*	S5
Canadian Mint	*Lamiaceae*	*Mentha canadensis*	S4S5
Marsh Skullcap	*Lamiaceae*	*Scutellaria galericulata*	S4S5
Mad-dog Skullcap	*Lamiaceae*	*Scutellaria lateriflora*	S5
Canada Germander	*Lamiaceae*	*Teucrium canadense*	S3S4
Yellow Bluebead Lily	*Liliaceae*	*Clintonia borealis*	S5
Cucumber Root	*Liliaceae*	*Medeola virginiana*	S3S4

APPENDIX IV: PRIMARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Clasping-leaved Twisted-stalk	*Liliaceae*	*Streptopus amplexifolius*	S4
Purple Loosestrife	*Lythraceae*	*Lythrum salicaria*	SNA
Nodding Trillium	*Melanthiaceae*	*Trillium cernuum*	S4
Fireweed	*Onagraceae*	*Chamaenerion angustifolium*	S5
Small Enchanter's Nightshade	*Onagraceae*	*Circaea alpina*	S5
Broad-leaved Enchanter's Nightshade	*Onagraceae*	*Circaea canadensis*	S2S3
Northern Willowherb	*Onagraceae*	*Epilobium ciliatum*	S5
Willherb spp.	*Onagraceae*	*Epilobium sp*	N/A
Common Evening Primrose	*Onagraceae*	*Oenothera biennis*	S5
Small-flowered Evening Primrose	*Onagraceae*	*Oenothera parviflora*	S4S5
Tuberous Grass Pink	*Orchidaceae*	*Calopogon tuberosus*	S3
Pink Lady's-Slipper	*Orchidaceae*	*Cypripedium acaule*	S5
Small Purple Fringed Orchid	*Orchidaceae*	*Platanthera psycodes*	S4
Slender Ladies'-tresses	*Orchidaceae*	*Spiranthes lacera*	S4
American Cow Wheat	*Orobanchaceae*	*Melampyrum lineare*	S4S5
European Wood Sorrel	*Oxalidaceae*	*Oxalis stricta*	S5
White Turtlehead	*Plantaginaceae*	*Chelone glabra*	S5
Common Mare's-Tail	*Plantaginaceae*	*Hippuris vulgaris*	S3S4
Common Plantain	*Plantaginaceae*	*Plantago major*	SNA
Seaside Plantain	*Plantaginaceae*	*Plantago maritima*	S4S5
American Speedwell	*Plantaginaceae*	*Veronica americana*	S4
Common Speedwell	*Plantaginaceae*	*Veronica officinalis*	SNA
Sea Lavender	*Plumbaginaceae*	*Limonium carolinianum*	S4S5
American Beach Grass	*Poaceae*	*Calamagrostis breviligulata*	S4S5
Sea Lyme Grass	*Poaceae*	*Leymus mollis*	S4
Smooth Cordgrass	*Poaceae*	*Sporobolus alterniflorus*	S4S5
Prairie Cordgrass	*Poaceae*	*Sporobolus michauxianus*	S5
Saltmeadow Cordgrass	*Poaceae*	*Sporobolus pumilus*	S4S5
Water Smartweed	*Polygonaceae*	*Persicaria amphibia*	S4
Arrow-leaved Smartweed	*Polygonaceae*	*Persicaria sagittata*	S5
Sheep Sorrel	*Polygonaceae*	*Rumex acetosella*	SNA
Greater Water Dock	*Polygonaceae*	*Rumex britannica*	S5
Curled Dock	*Polygonaceae*	*Rumex crispus*	SNA
Tierra del Fuego Dock	*Polygonaceae*	*Rumex fueginus*	S4
Northern Starflower	*Primulaceae*	*Lysimachia borealis*	S5
Sea Milkwort	*Primulaceae*	*Lysimachia maritima*	S4S5
Swamp Yellow Loosestrife	*Primulaceae*	*Lysimachia terrestris*	S4S5
Tufted Yellow Loosestrife	*Primulaceae*	*Lysimachia thyrsiflora*	S4S5
Yellow Marsh Marigold	*Ranunculaceae*	*Caltha palustris*	S4S5
Goldthread	*Ranunculaceae*	*Coptis trifolia*	S5
Seaside Buttercup	*Ranunculaceae*	*Halerpestes cymbalaria*	S4
Common Buttercup	*Ranunculaceae*	*Ranunculus acris*	SNA
Creeping Buttercup	*Ranunculaceae*	*Ranunculus repens*	SNA
White Water Buttercup	*Ranunculaceae*	*Ranunculus trichophyllus*	S4
Tall Meadow-Rue	*Ranunculaceae*	*Thalictrum pubescens*	S5
Marsh Cinquefoil	*Rosaceae*	*Comarum palustre*	S4
Wild Strawberry	*Rosaceae*	*Fragaria virginiana*	S5

APPENDIX IV: PRIMARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Rough Avens	*Rosaceae*	*Geum laciniatum*	S4
Avens	*Rosaceae*	*Geum sp*	N/A
Common Silverweed	*Rosaceae*	*Potentilla anserina*	S5
Silvery Cinquefoil	*Rosaceae*	*Potentilla argentea*	SNA
Three-toothed Cinquefoil	*Rosaceae*	*Sibbaldia tridentata*	S3
Rough Bedstraw	*Rubiaceae*	*Galium asprellum*	S4S5
Smooth Bedstraw	*Rubiaceae*	*Galium mollugo*	SNA
Common Marsh Bedstraw	*Rubiaceae*	*Galium palustre*	S5
Bedstraw	*Rubiaceae*	*Galium sp*	N/A
Three-petaled Bedstraw	*Rubiaceae*	*Galium trifidum*	S4S5
Three-flowered Bedstraw	*Rubiaceae*	*Galium triflorum*	S5
Bastard's Toadflax	*Santalaceae*	*Comandra umbellata*	S3
Northern Pitcher Plant	*Sarraceniaceae*	*Sarracenia purpurea*	S4
Bittersweet Nightshade	*Solanaceae*	*Solanum dulcamara*	SNA
Green-fruited Burreed	*Typhaceae*	*Sparganium emersum*	S4S5
Broad-fruited Burreed	*Typhaceae*	*Sparganium eurycarpum*	S4
Broad-leaved Cattail	*Typhaceae*	*Typha latifolia*	S5
Stinging Nettle	*Urticaceae*	*Urtica dioica ssp. gracilis*	S4
Sweet White Violet	*Violaceae*	*Viola blanda*	S4S5
Common Eelgrass	*Zosteraceae*	*Zostera marina*	S4
FERNS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Common Lady Fern	*Athyriaceae*	*Athyrium filix-femina*	S5
Common Oak Fern	*Cystopteridaceae*	*Gymnocarpium dryopteris*	S5
Eastern Hay-Scented Fern	*Dennstaedtiaceae*	*Dennstaedtia punctilobula*	S5
Bracken Fern	*Dennstaedtiaceae*	*Pteridium aquilinum*	S5
Mountain Wood Fern	*Dryopteridaceae*	*Dryopteris campyloptera*	S4
Spinulose Wood Fern	*Dryopteridaceae*	*Dryopteris carthusiana*	S4S5
Crested Wood Fern	*Dryopteridaceae*	*Dryopteris cristata*	S5
Evergreen Wood Fern	*Dryopteridaceae*	*Dryopteris intermedia*	S5
Sensitive Fern	*Onocleaceae*	*Onoclea sensibilis*	S5
Interrupted Fern	*Osmundaceae*	*Claytosmunda claytoniana*	S5
Cinnamon Fern	*Osmundaceae*	*Osmundastrum cinnamomeum*	S5
New York Fern	*Thelypteridaceae*	*Parathelypteris noveboracensis*	S5
Northern Beech Fern	*Thelypteridaceae*	*Phegopteris connectilis*	S5
CLUBMOSSES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Round-branched Tree-clubmoss	*Lycopodiaceae*	*Dendrolycopodium dendroideum*	S5
Running Clubmoss	*Lycopodiaceae*	*Lycopodium clavatum*	S4S5
One-cone clubmoss	*Lycopodiaceae*	*Lycopodium lagopus*	S2S3
HORSETAILS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Field Horsetail	*Equisetaceae*	*Equisetum arvense*	S5
Woodland Horsetail	*Equisetaceae*	*Equisetum sylvaticum*	S5
MOSSES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Glow Moss	Aulacomniaceae	*Aulacomnium palustre*	S5
Silvery Bryum Moss	Bryaceae	*Bryum argenteum*	S4S5
Tall Clustered Thread Moss	*Bryaceae*	*Ptychostomum pseudotriquetrum*	S5
Northern Tree Moss	Climaciaceae	*Climacium dendroides*	S5
Whip Broom Moss	Dicranaceae	*Dicranum flagellare*	S5

APPENDIX IV: PRIMARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Mountain Broom Moss	Dicranaceae	*Dicranum montanum*	S5
Wavy-leaved Broom Moss	Dicranaceae	*Dicranum polysetum*	S5
Common Broom Moss	Dicranaceae	*Dicranum scoparium*	S5
Stairstep Moss	Hylocomiaceae	*Hylocomium splendens*	S5
Electrified Cat's-tail Moss	Hylocomiaceae	*Rhytidiadelphus triquetrus*	S5
Red-stemmed Feather Moss	Hylocomiaceae	*Pleurozium schreberi*	S5
Beautiful Branch Moss	Hypnaceae	*Callicladium haldanianum*	S5
Pellucid Plait Moss	*Hypnaceae*	*Hypnum imponens*	S5
Swan's-neck Leafy Moss	Mniaceae	*Mnium hornum*	S5
Crisped Pincushion Moss	Orthotrichaceae	*Ulota crispa*	S5
a Moss	Orthotrichaceae	*Ulota sp.*	SU
Smoothcap Moss	Polytrichaceae	*Atrichum sp*	N/A
Common Smoothcap Moss	Polytrichaceae	*Atrichum undulatum*	S4S5
Common Haircap Moss	Polytrichaceae	*Polytrichum commune*	S5
Bristly Haircap Moss	Polytrichaceae	*Polytrichum piliferum*	S4S5
Recurved Brotherella Moss	*Sematophyllaceae*	*Brotherella recurvans*	SU
Brown Peat Moss	*Sphagnaceae*	*Sphagnum fuscum*	S4S5
Green Peat Moss	*Sphagnaceae*	*Sphagnum girgensohnii*	S5
Peatmoss	*Sphagnaceae*	*Sphagnum sp*	N/A
LIVERWORTS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Frullania Liverwort	Jubulaceae	*Frullania sp.*	SU
Variable-Leaved Crestwort	Lophocoleaceae	*Lophocolea heterophylla*	SU
Green-tongue Liverwort	Marchantiaceae	*Marchantia polymorpha*	SU
	Ptilidiaceae	*Ptilidium pulcherrimum*	SU
LICHENS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Fishnet Lichen	Cladoniaceae	*Cladonia boryi*	S4S5
Powdered Funnel Lichen	Cladoniaceae	*Cladonia cenotea*	S4S5
Mealy Pixie-cup Lichen	Cladoniaceae	*Cladonia chlorophaea*	S4S5
Trumpeting Lichen	Cladoniaceae	*Cladonia fimbriata*	SU
Giant Cladonia Lichen	Cladoniaceae	*Cladonia maxima*	SU
Smooth-footed Powderhorn Lichen	Cladoniaceae	*Cladonia ochrochlora*	S4S5
Red-fruited Pixie-cup	Cladoniaceae	*Cladonia pleurota*	SU
Gray Reindeer Lichen	Cladoniaceae	*Cladonia rangiferina*	S5
Cladonia spp.	Cladoniaceae	*Cladonia sp*	N/A
Dragon Lichen	Cladoniaceae	*Cladonia squamosa*	S4S5
Star-tipped Reindeer Lichen	Cladoniaceae	*Cladonia stellaris*	S4S5
Tree Tarpaper Lichen	Collemataceae	*Collema subflaccidum*	S4S5
Blue Jellyskin Lichen	Collemataceae	*Leptogium cyanescens*	S5
Lungwort Lichen	Lobariaceae	*Lobaria pulmonaria*	S4S5
Textured Lungwort Lichen	Lobariaceae	*Lobaria scrobiculata*	S4
Smooth Lung Lichen	Lobariaceae	*Ricasolia quercizans*	S4S5
Bryoria Lichen	Parmeliaceae	*Bryoria sp*	N/A
Camouflage Lichen	Parmeliaceae	Camouflage Lichen	N/A
Spiny Heath Lichen	Parmeliaceae	*Cetraria aculeata*	SU
Cetraria Lichen	Parmeliaceae	*Cetraria sp.*	N/A
Boreal Oakmoss Lichen	Parmeliaceae	*Evernia mesomorpha*	S5
Monk's Hood Lichen	Parmeliaceae	*Hypogymnia physodes*	S5

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COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Powder-headed Tube Lichen	Parmeliaceae	*Hypogymnia tubulosa*	S4S5
Abrading Camouflage Lichen	Parmeliaceae	*Melanelixia subaurifera*	S4S5
Bottlebrush Shield Lichen	Parmeliaceae	*Parmelia squarrosa*	S5
Hammered Shield Lichen	Parmeliaceae	*Parmelia sulcata*	S5
Varied Rag Lichen	Parmeliaceae	*Platismatia glauca*	S5
Rough Speckleback Lichen	Parmeliaceae	*Punctelia rudecta*	S4S5
Usnea	Parmeliaceae	*Usnea sp*	N/A
Bushy Beard Lichen	Parmeliaceae	*Usnea strigosa*	S4S5
Buellia spp.	Physciaceae	*Buellia sp*	N/A
Hooded Rosette Lichen	Physciaceae	*Physcia adscendens*	S4S5
Star Rosette Lichen	Physciaceae	*Physcia stellaris*	SU
Sinewed Ramalina Lichen	Ramalinaceae	*Ramalina americana*	S4S5
Punctured Ramalina Lichen	Ramalinaceae	*Ramalina dilacerata*	S4S5
Hyphenated Ramalina Lichen	Ramalinaceae	*Ramalina farinacea*	S4S5
Frayed Ramalina Lichen	Ramalinaceae	*Ramalina roesleri*	S4S5
Rock Foam Lichen	Stereocaulaceae	*Stereocaulon saxatile*	SU
Woolly Foam Lichen	Stereocaulaceae	*Stereocaulon tomentosum*	S4S5
Maritime Sunburst Lichen		*Xanthoria parietina*	S4S5
FUNGI	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Fly Amanita	Amanitaceae	*Amanita muscaria*	SU
Barometer Earthstar	Astraeaceae	*Astraeus hygrometricus*	SU
White Coral Fungi	Clavariaceae	*Clavulina coralloides*	SU?
Smith's Earthstar	Diplocystidiaceae	*Astraeus smithii*	SU
AMPHIBIANS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Spring Peeper	Hylidae	*Pseudacris crucifer*	S5
Green Frog	Ranidae	*Lithobates clamitans*	S4S5
Wood Frog	Ranidae	*Lithobates sylvaticus*	S5
BIRDS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Northern Goshawk	Accipitridae	*Accipiter gentilis*	S4
Sharp-shinned Hawk	Accipitridae	*Accipiter striatus*	S4B
Red-tailed Hawk	Accipitridae	*Buteo jamaicensis*	S4B
Northern Harrier	Accipitridae	*Circus hudsonius*	S4B
Bald Eagle	Accipitridae	*Haliaeetus leucocephalus*	S5
Osprey	Accipitridae	*Pandion haliaetus*	S5B
Canada Goose	Anatidae	*Branta canadensis*	SUB,S5M
Long-tailed Duck	Anatidae	*Clangula hyemalis*	S4N
American Wigeon	Anatidae	*Mareca americana*	S5B
White-winged Scoter	Anatidae	*Melanitta deglandi*	S4N
Surf Scoter	Anatidae	*Melanitta perspicillata*	S4N
Common Eider	Anatidae	*Somateria mollissima*	S4N
Great Blue Heron	Ardeidae	*Ardea herodias*	S4B
Semipalmated Plover	Charadriidae	*Charadrius semipalmatus*	SHB,S4M
Mourning Dove	Columbidae	*Zenaida macroura*	S5
American Crow	Corvidae	*Corvus brachyrhynchos*	S5
Common Raven	Corvidae	*Corvus corax*	S5
Blue Jay	Corvidae	*Cyanocitta cristata*	S5
Dark-eyed Junco	Emberizidae	*Junco hyemalis*	S5

APPENDIX IV: PRIMARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Swamp Sparrow	Emberizidae	*Melospiza georgiana*	S5B
Song Sparrow	Emberizidae	*Melospiza melodia*	S5B
Chipping Sparrow	Emberizidae	*Spizella passerina*	S4B
White-throated Sparrow	Emberizidae	*Zonotrichia albicollis*	S4S5B
Merlin	Falconidae	*Falco columbarius*	S4S5B
Common Redpoll	Fringillidae	*Acanthis flammea*	S5N
Purple Finch	Fringillidae	*Haemorhous purpureus*	S4S5B,S5M
White-winged Crossbill	Fringillidae	*Loxia leucoptera*	S3
Pine Siskin	Fringillidae	*Spinus pinus*	S2S3B,S4N
American Goldfinch	Fringillidae	*Spinus tristis*	S5
Red-throated Loon	Gaviidae	*Gavia stellata*	S4M
Barn Swallow	Hirundinidae	*Hirundo rustica*	S2B
Bank Swallow	Hirundinidae	*Riparia riparia*	S2S3B
Tree Swallow	Hirundinidae	*Tachycineta bicolor*	S3S4B
Red-winged Blackbird	Icteridae	*Agelaius phoeniceus*	S4B
Common Grackle	Icteridae	*Quiscalus quiscula*	S5B
Ring-billed Gull	Laridae	*Larus delawarensis*	S1B,S5M
Great Black-backed Gull	Laridae	*Larus marinus*	S2S3B,S5N
Common Tern	Laridae	*Sterna hirundo*	S1B
Mourning Warbler	Parulidae	*Geothlypis philadelphia*	S4B,S4S5M
Common Yellowthroat	Parulidae	*Geothlypis trichas*	S5B
Black-and-White Warbler	Parulidae	*Mniotilta varia*	S5B
Northern Parula	Parulidae	*Setophaga americana*	S5B
Magnolia Warbler	Parulidae	*Setophaga magnolia*	S5B
Palm Warbler	Parulidae	*Setophaga palmarum*	S5B
American Redstart	Parulidae	*Setophaga ruticilla*	S4S5B,S5M
Black-throated Green Warbler	Parulidae	*Setophaga virens*	S5B
Double-crested Cormorant	Phalacrocoracidae	*Nannopterum auritum*	S5B
Great Cormorant	Phalacrocoracidae	*Phalacrocorax carbo*	S1B
Ruffed Grouse	Phasianidae	*Bonasa umbellus*	S5
Northern Flicker	Picidae	*Colaptes auratus*	S5B
Red-necked Grebe	Podicipedidae	*Podiceps grisegena*	S3M
Sora	Rallidae	*Porzana carolina*	S5B
Golden-crowned Kinglet	Regulidae	*Regulus satrapa*	S5
Ruddy Turnstone	Scolopacidae	*Arenaria interpres*	S3M
Sanderling	Scolopacidae	*Calidris alba*	S3M
Pectoral Sandpiper	Scolopacidae	*Calidris melanotos*	S3M
Least Sandpiper	Scolopacidae	*Calidris minutilla*	S4M
Willet	Scolopacidae	*Tringa semipalmata*	S3B
Red-breasted Nuthatch	Sittidae	*Sitta canadensis*	S5
Short-eared Owl	Strigidae	*Asio flammeus*	S1B
Northern Gannet	Sulidae	*Morus bassanus*	S5N
Hermit Thrush	Turdidae	*Catharus guttatus*	S5B
Swainson's Thrush	Turdidae	*Catharus ustulatus*	S4B
American Robin	Turdidae	*Turdus migratorius*	S5B
Alder Flycatcher	Tyrannidae	*Empidonax alnorum*	S5B
Red-eyed Vireo	Vireonidae	*Vireo olivaceus*	S5B

APPENDIX IV: PRIMARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
MAMMALS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Coyote	Canidae	*Canis latrans*	S5
Red Fox	Canidae	*Vulpes vulpes*	S5
North American Beaver	Castoridae	*Castor canadensis*	S5
Snowshoe Hare	Leporidae	*Lepus americanus*	S5
Ermine	Mustelidae	*Mustela erminea*	S5
American Mink	Mustelidae	*Vison vison*	S5
Red Squirrel	Sciuridae	*Tamiasciurus hudsonicus*	S5
Shrew	Soricidae		N/A
REPTILES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Common Gartersnake	Colubridae	*Thamnophis sirtalis*	S5

Rock Foam Lichen, *Stereocaulon saxatile* - *SU* - Primary Krummholzing Cliff Coast-Top Zone

SPECIES LIST

KRUMMHOLZ TYPE:	SecondaryKrumm
# of SITES	9
SURVEYOR:	Daniel McRae

BIODIVERSITY

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
CONIFEROUS TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Eastern White Cedar	*Cupressaceae*	*Thuja occidentalis*	S3S4
Balsam Fir	*Pinaceae*	*Abies balsamea*	S5
Tamarack	*Pinaceae*	*Larix laricina*	S5
White Spruce	*Pinaceae*	*Picea glauca*	S5
Black Spruce	*Pinaceae*	*Picea mariana*	S5
Jack Pine	*Pinaceae*	*Pinus banksiana*	S2S3
Red Pine	*Pinaceae*	*Pinus resinosa*	S2
DECIDUOUS TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Paper Birch	*Betulaceae*	*Betula papyrifera*	S5
Gray Birch	*Betulaceae*	*Betula populifolia*	S5
Pin Cherry	*Rosaceae*	*Prunus pensylvanica*	S5
American Mountain Ash	*Rosaceae*	*Sorbus americana*	S5
Balsam Poplar	*Salicaceae*	*Populus balsamifera*	S3
Large-toothed Aspen	*Salicaceae*	*Populus grandidentata*	S4S5
Trembling Aspen	*Salicaceae*	*Populus tremuloides*	S5
Red Maple	*Sapindaceae*	*Acer rubrum*	S5
SHRUBS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Western Poison Ivy	*Anacardiaceae*	*Toxicodendron radicans var. rydbergii*	S4
Spreading Dogbane	*Apocynaceae*	*Apocynum androsaemifolium*	S4
Mountain Holly	*Aquifoliaceae*	*Ilex mucronata*	S5
Common Winterberry	*Aquifoliaceae*	*Ilex verticillata*	S5
Speckled Alder	*Betulaceae*	*Alnus incana*	S5
Beaked Hazel	*Betulaceae*	*Corylus cornuta*	S5
Pinebarren Golden Heather	*Cistaceae*	*Hudsonia ericoides*	S2
Woolly Beach-heath	*Cistaceae*	*Hudsonia tomentosa*	S3
Red Osier Dogwood	*Cornaceae*	*Cornus sericea*	S5
Common Juniper	*Cupressaceae*	*Juniperus communis*	S3
Creeping Juniper	*Cupressaceae*	*Juniperus horizontalis*	S2S3
Common Bearberry	*Ericaceae*	*Arctostaphylos uva-ursi*	S3
Leatherleaf	*Ericaceae*	*Chamaedaphne calyculata*	S4
Broom Crowberry	*Ericaceae*	*Corema conradii*	S2S3
Pink Crowberry	*Ericaceae*	*Empetrum eamesii*	S2S3
Black Crowberry	*Ericaceae*	*Empetrum nigrum*	S3
Black Huckleberry	*Ericaceae*	*Gaylussacia baccata*	S4S5
Sheep Laurel	*Ericaceae*	*Kalmia angustifolia*	S5
Pale Bog Laurel	*Ericaceae*	*Kalmia polifolia*	S4
Rhodora	*Ericaceae*	*Rhododendron canadense*	S5
Common Labrador Tea	*Ericaceae*	*Rhododendron groenlandicum*	S5
Late Lowbush Blueberry	*Ericaceae*	*Vaccinium angustifolium*	S5
Velvet-leaved Blueberry	*Ericaceae*	*Vaccinium myrtilloides*	S4S5

APPENDIX V: SECONDARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Skunk Currant	*Grossulariaceae*	*Ribes glandulosum*	S5
Smooth Gooseberry	*Grossulariaceae*	*Ribes hirtellum*	S5
Northern Bayberry	*Myricaceae*	*Morella pensylvanica*	S5
Sweet Gale	*Myricaceae*	*Myrica gale*	S5
Serviceberry	*Rosaceae*	*Amelanchier sp*	N/A
Aronia sp	*Rosaceae*	*Aronia sp*	N/A
Hawthorn	*Rosaceae*	*Crataegus spp.*	N/A
Chokecherry	*Rosaceae*	*Prunus virginiana*	S5
Virginia Rose	*Rosaceae*	*Rosa virginiana*	S5
Alleghaney Blackberry	*Rosaceae*	*Rubus allegheniensis*	S4S5
Red Raspberry	*Rosaceae*	*Rubus idaeus*	S5
White Meadowsweet	*Rosaceae*	*Spiraea alba*	S5
Willow	*Salicaceae*	*Salix spp.*	N/A
Red Elderberry	*Viburnaceae*	*Sambucus racemosa*	S5
Northern Wild Raisin	*Viburnaceae*	*Viburnum cassinoides*	S5
Highbush Cranberry	*Viburnaceae*	*Viburnum opulus*	S3
NON-NATIVE TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
English Oak	*Fagaceae*	*Quercus robur*	SNA
Austrian Pine	*Pinaceae*	*Pinus nigra*	SNA
Scotch Pine	*Pinaceae*	*Pinus sylvestris*	SNA
Common Apple	*Rosaceae*	*Malus pumila*	SNA
European Mountain Ash	*Rosaceae*	*Sorbus aucuparia*	SNA
Norway Maple	*Sapindaceae*	*Acer platanoides*	SNA
NON-NATIVE SHRUBS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Tartarian Honeysuckle	*Caprifoliaceae*	*Lonicera tatarica*	SNA
WILDFLOWERS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Narrow-leaved Orache	*Amaranthaceae*	*Atriplex littoralis*	SNA
Thin-leaved Orache	*Amaranthaceae*	*Atriplex prostrata*	S4
Common Lamb's Quarters	*Amaranthaceae*	*Chenopodium album*	SNA
Common Saltwort	*Amaranthaceae*	*Kali turgidum*	SNA
Sea Glasswort	*Amaranthaceae*	*Salicornia maritima*	S4S5
White Sea-blite	*Amaranthaceae*	*Suaeda maritima*	S4S5
Seaside Angelica	*Apiaceae*	*Angelica lucida*	S2S3
Queen Anne's Lace	*Apiaceae*	*Daucus carota*	SNA
Scotch Lovage	*Apiaceae*	*Ligusticum scoticum*	S4
Common Water Parsnip	*Apiaceae*	*Sium suave*	S5
Bristly Sarsaparilla	*Araliaceae*	*Aralia hispida*	S4
Wild Sarsaparilla	*Araliaceae*	*Aralia nudicaulis*	S5
Wild Lily-of-The-Valley	*Asparagaceae*	*Maianthemum canadense*	S5
Starry False Solomon's Seal	*Asparagaceae*	*Maianthemum stellatum*	S3
Three-leaved False Soloman's Seal	*Asparagaceae*	*Maianthemum trifolium*	S4
Common Yarrow	*Asteraceae*	*Achillea millefolium*	SNA
Common Ragweed	*Asteraceae*	*Ambrosia artemisiifolia*	S4
Pearly Everlasting	*Asteraceae*	*Anaphalis margaritacea*	S5
Beach Wormwood	*Asteraceae*	*Artemisia stelleriana*	SNA
Devil's Beggarticks	*Asteraceae*	*Bidens frondosa*	S5
Canada Thistle	*Asteraceae*	*Cirsium arvense*	SNA

APPENDIX V: SECONDARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Hairy Flat-top White Aster	*Asteraceae*	*Doellingeria umbellata*	S5
Eastern Burnweed	*Asteraceae*	*Erechtites hieraciifolius*	S4
Grass-leaved Goldenrod	*Asteraceae*	*Euthamia graminifolia*	S5
Spotted Joe Pye Weed	*Asteraceae*	*Eutrochium maculatum*	S5
Hawkweed spp.	*Asteraceae*	*Hieracium sp*	N/A
Oxeye Daisy	*Asteraceae*	*Leucanthemum vulgare*	SNA
Pineapple Weed	*Asteraceae*	*Matricaria discoidea*	SNA
Three-leaved Rattlesnakeroot	*Asteraceae*	*Nabalus trifoliolatus*	S5
Whorled Wood Aster	*Asteraceae*	*Oclemena acuminata*	S5
Canada Goldenrod	*Asteraceae*	*Solidago canadensis*	S5
Large-leaved Goldenrod	*Asteraceae*	*Solidago macrophylla*	S2
Rough-stemmed Goldenrod	*Asteraceae*	*Solidago rugosa*	S5
Seaside Goldenrod	*Asteraceae*	*Solidago sempervirens*	S4S5
Field Sow Thistle	*Asteraceae*	*Sonchus arvensis*	SNA
Heart-leaved Aster	*Asteraceae*	*Symphyotrichum cordifolium*	S4
Calico Aster	*Asteraceae*	*Symphyotrichum lateriflorum*	S5
New York Aster	*Asteraceae*	*Symphyotrichum novi-belgii*	S5
Aster spp.	*Asteraceae*	*Symphyotrichum sp*	N/A
Common Dandelion	*Asteraceae*	*Taraxacum officinale*	SNA
Meadow Goatsbeard	*Asteraceae*	*Tragopogon pratensis*	SNA
Coltsfoot	*Asteraceae*	*Tussilago farfara*	SNA
Rough Cocklebur	*Asteraceae*	*Xanthium strumarium*	S4
Spotted Jewelweed	*Balsaminaceae*	*Impatiens capensis*	S5
American Searocket	*Brassicaceae*	*Cakile edentula*	S4S5
Twinflower	*Caprifoliaceae*	*Linnaea borealis*	S5
Seabeach Sandwort	*Caryophyllaceae*	*Honckenya peploides*	S3S4
Blunt-leaved Sandwort	*Caryophyllaceae*	*Moehringia lateriflora*	S5
Canada Sandspurrey	*Caryophyllaceae*	*Spergularia canadensis*	S4
Ruby Sandspurrey	*Caryophyllaceae*	*Spergularia rubra*	SNA
Saltmarsh Sandspurrey	*Caryophyllaceae*	*Spergularia salina*	S4
Hedge False Bindweed	*Convolvulaceae*	*Calystegia sepium*	S5
Bunchberry	*Cornaceae*	*Cornus canadensis*	S5
Mossy Stonecrop	*Crassulaceae*	*Sedum acre*	SNA
Round-leaved Sundew	*Droseraceae*	*Drosera rotundifolia*	S4
Trailing Arbutus	*Ericaceae*	*Epigaea repens*	S4
One-flowered Wintergreen	*Ericaceae*	*Moneses uniflora*	S3
One-sided Wintergreen	*Ericaceae*	*Orthilia secunda*	S4S5
Shinleaf	*Ericaceae*	*Pyrola elliptica*	S5
Large Cranberry	*Ericaceae*	*Vaccinium macrocarpon*	S4S5
Small Cranberry	*Ericaceae*	*Vaccinium oxycoccos*	S4
Mountain Cranberry	*Ericaceae*	*Vaccinium vitis-idaea*	S3
Seaside Spurge	*Euphorbiaceae*	*Euphorbia polygonifolia*	S2S3
Clover spp.	*Fabaceae*	*Clover spp.*	N/A
Beach Pea	*Fabaceae*	*Lathyrus japonicus*	S4S5
Rabbit's-foot Clover	*Fabaceae*	*Trifolium arvense*	SNA
Yellow Clover	*Fabaceae*	*Trifolium aureum*	SNA
Red Clover	*Fabaceae*	*Trifolium pratense*	SNA

APPENDIX V: SECONDARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
White Clover	*Fabaceae*	*Trifolium repens*	SNA
Tufted Vetch	*Fabaceae*	*Vicia cracca*	SNA
Harlequin Blue Flag	*Iridaceae*	*Iris versicolor*	S5
Seaside Arrowgrass	*Juncaginaceae*	*Triglochin maritima*	S4S5
Common Hemp-nettle	*Lamiaceae*	*Galeopsis tetrahit*	SNA
Common Self-heal	*Lamiaceae*	*Prunella vulgaris*	S5
Marsh Skullcap	*Lamiaceae*	*Scutellaria galericulata*	S4S5
Canada Germander	*Lamiaceae*	*Teucrium canadense*	S3S4
Yellow Bluebead Lily	*Liliaceae*	*Clintonia borealis*	S5
Purple Loosestrife	*Lythraceae*	*Lythrum salicaria*	SNA
Nodding Trillium	*Melanthiaceae*	*Trillium cernuum*	S4
Fireweed	*Onagraceae*	*Chamaenerion angustifolium*	S5
Northern Willowherb	*Onagraceae*	*Epilobium ciliatum*	S5
Common Evening Primrose	*Onagraceae*	*Oenothera biennis*	S5
Small-flowered Evening Primrose	*Onagraceae*	*Oenothera parviflora*	S4S5
Tuberous Grass Pink	*Orchidaceae*	*Calopogon tuberosus*	S3
Pink Lady's-Slipper	*Orchidaceae*	*Cypripedium acaule*	S5
Loesel's Twayblade	*Orchidaceae*	*Liparis loeselii*	S3
Nodding Ladies'-Tresses	*Orchidaceae*	*Spiranthes cernua*	S1?
Slender Ladies'-tresses	*Orchidaceae*	*Spiranthes lacera*	S4
American Cow Wheat	*Orobanchaceae*	*Melampyrum lineare*	S4S5
Common Plantain	*Plantaginaceae*	*Plantago major*	SNA
Seaside Plantain	*Plantaginaceae*	*Plantago maritima*	S4S5
Common Speedwell	*Plantaginaceae*	*Veronica officinalis*	SNA
Sea Lavender	*Plumbaginaceae*	*Limonium carolinianum*	S4S5
American Beach Grass	*Poaceae*	*Calamagrostis breviligulata*	S4S5
Sea Lyme Grass	*Poaceae*	*Leymus mollis*	S4
Smooth Cordgrass	*Poaceae*	*Sporobolus alterniflorus*	S4S5
Prairie Cordgrass	*Poaceae*	*Sporobolus michauxianus*	S5
Saltmeadow Cordgrass	*Poaceae*	*Sporobolus pumilus*	S4S5
Climbing False Buckwheat	*Polygonaceae*	*Fallopia scandens*	S3
Dotted Smartweed	*Polygonaceae*	*Persicaria punctata*	S4
Arrow-leaved Smartweed	*Polygonaceae*	*Persicaria sagittata*	S5
Sheep Sorrel	*Polygonaceae*	*Rumex acetosella*	SNA
Greater Water Dock	*Polygonaceae*	*Rumex britannica*	S5
Curled Dock	*Polygonaceae*	*Rumex crispus*	SNA
Tierra del Fuego Dock	*Polygonaceae*	*Rumex fueginus*	S4
Northern Starflower	*Primulaceae*	*Lysimachia borealis*	S5
Sea Milkwort	*Primulaceae*	*Lysimachia maritima*	S4S5
Yellow Marsh Marigold	*Ranunculaceae*	*Caltha palustris*	S4S5
Creeping Buttercup	*Ranunculaceae*	*Ranunculus repens*	SNA
Wild Strawberry	*Rosaceae*	*Fragaria virginiana*	S5
Common Silverweed	*Rosaceae*	*Potentilla anserina*	S5
Silvery Cinquefoil	*Rosaceae*	*Potentilla argentea*	SNA
Three-toothed Cinquefoil	*Rosaceae*	*Sibbaldia tridentata*	S3
Common Marsh Bedstraw	*Rubiaceae*	*Galium palustre*	S5
Bedstraw	*Rubiaceae*	*Galium sp*	N/A

APPENDIX V: SECONDARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Three-petaled Bedstraw	*Rubiaceae*	*Galium trifidum*	S4S5
Three-flowered Bedstraw	*Rubiaceae*	*Galium triflorum*	S5
Bastard's Toadflax	*Santalaceae*	*Comandra umbellata*	S3
Bittersweet Nightshade	*Solanaceae*	*Solanum dulcamara*	SNA
Broad-leaved Cattail	*Typhaceae*	*Typha latifolia*	S5
Common Eelgrass	*Zosteraceae*	*Zostera marina*	S4
FERNS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Common Lady Fern	*Athyriaceae*	*Athyrium filix-femina*	S5
Common Oak Fern	*Cystopteridaceae*	*Gymnocarpium dryopteris*	S5
Eastern Hay-Scented Fern	*Dennstaedtiaceae*	*Dennstaedtia punctilobula*	S5
Bracken Fern	*Dennstaedtiaceae*	*Pteridium aquilinum*	S5
Mountain Wood Fern	*Dryopteridaceae*	*Dryopteris campyloptera*	S4
Spinulose Wood Fern	*Dryopteridaceae*	*Dryopteris carthusiana*	S4S5
Crested Wood Fern	*Dryopteridaceae*	*Dryopteris cristata*	S5
Evergreen Wood Fern	*Dryopteridaceae*	*Dryopteris intermedia*	S5
Sensitive Fern	*Onocleaceae*	*Onoclea sensibilis*	S5
Interrupted Fern	*Osmundaceae*	*Claytosmunda claytoniana*	S5
Royal Fern	*Osmundaceae*	*Osmunda regalis*	S4
Cinnamon Fern	*Osmundaceae*	*Osmundastrum cinnamomeum*	S5
CLUBMOSSES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Round-branched Tree-clubmoss	*Lycopodiaceae*	*Dendrolycopodium dendroideum*	S5
Hickey's Tree-clubmoss	*Lycopodiaceae*	*Dendrolycopodium hickeyi*	S3
Northern Bog Clubmoss	*Lycopodiaceae*	*Lycopodiella inundata*	S3
HORSETAILS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Field Horsetail	*Equisetaceae*	*Equisetum arvense*	S5
Woodland Horsetail	*Equisetaceae*	*Equisetum sylvaticum*	S5
MOSSES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Glow Moss	Aulacomniaceae	*Aulacomnium palustre*	S5
Wavy-leaved Broom Moss	Dicranaceae	*Dicranum polysetum*	S5
Common Broom Moss	Dicranaceae	*Dicranum scoparium*	S5
Fire Moss	Ditrichaceae	*Ceratodon purpureus*	S5
Electrified Cat's-tail Moss	Hylocomiaceae	*Rhytidiadelphus triquetrus*	S5
Red-stemmed Feather Moss	Hylocomiaceae	*Pleurozium schreberi*	S5
Dotted Leafy Moss	Mniaceae	*Rhizomnium punctatum*	S4?
Crisped Pincushion Moss	Orthotrichaceae	*Ulota crispa*	S5
a Moss	Orthotrichaceae	*Ulota sp.*	SU
Smoothcap Moss	Polytrichaceae	*Atrichum sp*	N/A
Common Haircap Moss	Polytrichaceae	*Polytrichum commune*	S5
Bristly Haircap Moss	Polytrichaceae	*Polytrichum piliferum*	S4S5
Bog Haircap Moss	Polytrichaceae	*Polytrichum strictum*	S4S5
Brown Peat Moss	*Sphagnaceae*	*Sphagnum fuscum*	S4S5
Peatmoss	*Sphagnaceae*	*Sphagnum sp*	N/A
Shaggy Peat Moss	Sphagnaceae	*Sphagnum squarrosum*	S5
LIVERWORTS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Frullania Liverwort	Jubulaceae	*Frullania sp.*	SU
	Ptilidiaceae	*Ptilidium pulcherrimum*	SU
Flat-leaved Scalewort	Radulaceae	*Radula complanata*	SU

APPENDIX V: SECONDARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
LICHENS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Reindeer Lichen	Cladoniaceae	*Cladonia arbuscula*	S5
Fishnet Lichen	Cladoniaceae	*Cladonia boryi*	S4S5
Powdered Funnel Lichen	Cladoniaceae	*Cladonia cenotea*	S4S5
Trumpeting Lichen	Cladoniaceae	*Cladonia fimbriata*	SU
Red-fruited Pixie-cup	Cladoniaceae	*Cladonia pleurota*	SU
Gray Reindeer Lichen	Cladoniaceae	*Cladonia rangiferina*	S5
Cladonia spp.	Cladoniaceae	*Cladonia sp*	N/A
Star-tipped Reindeer Lichen	Cladoniaceae	*Cladonia stellaris*	S4S5
Blue Jellyskin Lichen	Collemataceae	*Leptogium cyanescens*	S5
Lungwort Lichen	Lobariaceae	*Lobaria pulmonaria*	S4S5
Bryoria Lichen	Parmeliaceae	*Bryoria sp*	N/A
Camouflage Lichen	Parmeliaceae	Camouflage Lichen	N/A
Spiny Heath Lichen	Parmeliaceae	*Cetraria aculeata*	SU
Cetraria Lichen	Parmeliaceae	*Cetraria sp.*	N/A
Boreal Oakmoss Lichen	Parmeliaceae	*Evernia mesomorpha*	S5
Monk's Hood Lichen	Parmeliaceae	*Hypogymnia physodes*	S5
Abrading Camouflage Lichen	Parmeliaceae	*Melanelixia subaurifera*	S4S5
Bottlebrush Shield Lichen	Parmeliaceae	*Parmelia squarrosa*	S5
Hammered Shield Lichen	Parmeliaceae	*Parmelia sulcata*	S5
Varied Rag Lichen	Parmeliaceae	*Platismatia glauca*	S5
Variable Wrinkle Lichen	Parmeliaceae	*Tuckermannopsis orbata*	S4S5
Usnea	Parmeliaceae	*Usnea sp*	N/A
Powdered Sunshine Lichen	Parmeliaceae	*Vulpicida pinastri*	S4S5
Buellia spp.	Physciaceae	*Buellia sp*	N/A
Punctured Ramalina Lichen	Ramalinaceae	*Ramalina dilacerata*	S4S5
Hyphenated Ramalina Lichen	Ramalinaceae	*Ramalina farinacea*	S4S5
Maritime Sunburst Lichen		*Xanthoria parietina*	S4S5
FUNGI	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Barometer Earthstar	Astraeaceae	*Astraeus hygrometricus*	SU
AMPHIBIANS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Spring Peeper	Hylidae	*Pseudacris crucifer*	S5
BIRDS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Bald Eagle	Accipitridae	*Haliaeetus leucocephalus*	S5
Osprey	Accipitridae	*Pandion haliaetus*	S5B
Canada Goose	Anatidae	*Branta canadensis*	SUB,S5M
Great Blue Heron	Ardeidae	*Ardea herodias*	S4B
Mourning Dove	Columbidae	*Zenaida macroura*	S5
American Crow	Corvidae	*Corvus brachyrhynchos*	S5
Common Raven	Corvidae	*Corvus corax*	S5
Blue Jay	Corvidae	*Cyanocitta cristata*	S5
Dark-eyed Junco	Emberizidae	*Junco hyemalis*	S5
Song Sparrow	Emberizidae	*Melospiza melodia*	S5B
White-throated Sparrow	Emberizidae	*Zonotrichia albicollis*	S4S5B
Bank Swallow	Hirundinidae	*Riparia riparia*	S2S3B
Great Black-backed Gull	Laridae	*Larus marinus*	S2S3B,S5N
Mourning Warbler	Parulidae	*Geothlypis philadelphia*	S4B,S4S5M
Common Yellowthroat	Parulidae	*Geothlypis trichas*	S5B

APPENDIX V: SECONDARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Black-and-White Warbler	Parulidae	*Mniotilta varia*	S5B
Magnolia Warbler	Parulidae	*Setophaga magnolia*	S5B
Palm Warbler	Parulidae	*Setophaga palmarum*	S5B
Double-crested Cormorant	Phalacrocoracidae	*Nannopterum auritum*	S5B
Spotted Sandpiper	Scolopacidae	*Actitis macularius*	S2S3B,S4M
Willet	Scolopacidae	*Tringa semipalmata*	S3B
Northern Gannet	Sulidae	*Morus bassanus*	S5N
Swainson's Thrush	Turdidae	*Catharus ustulatus*	S4B
American Robin	Turdidae	*Turdus migratorius*	S5B
Alder Flycatcher	Tyrannidae	*Empidonax alnorum*	S5B
MAMMALS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Coyote	Canidae	*Canis latrans*	S5
Red Fox	Canidae	*Vulpes vulpes*	S5
Snowshoe Hare	Leporidae	*Lepus americanus*	S5
Red Squirrel	Sciuridae	*Tamiasciurus hudsonicus*	S5
Shrew	Soricidae		N/A

Cloudberry & Dwarf Huckleberry, Tertiary Krummholz on Boggy Low Plain, South Enmore, NCC

SPECIES LIST

KRUMMHOLZ TYPE:	TertiaryKrumm
# of SITES	10
SURVEYOR:	Daniel McRae

BIODIVERSITY

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
CONIFEROUS TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Eastern White Cedar	*Cupressaceae*	*Thuja occidentalis*	S3S4
Balsam Fir	*Pinaceae*	*Abies balsamea*	S5
Tamarack	*Pinaceae*	*Larix laricina*	S5
White Spruce	*Pinaceae*	*Picea glauca*	S5
Black Spruce	*Pinaceae*	*Picea mariana*	S5
DECIDUOUS TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Yellow Birch	*Betulaceae*	*Betula alleghaniensis*	S5
Paper Birch	*Betulaceae*	*Betula papyrifera*	S5
Gray Birch	*Betulaceae*	*Betula populifolia*	S5
Northern Red Oak	*Fagaceae*	*Quercus rubra*	S3S4
White Ash	*Oleaceae*	*Fraxinus americana*	S2S3
Black Ash	*Oleaceae*	*Fraxinus nigra*	S2
Pin Cherry	*Rosaceae*	*Prunus pensylvanica*	S5
American Mountain Ash	*Rosaceae*	*Sorbus americana*	S5
Large-toothed Aspen	*Salicaceae*	*Populus grandidentata*	S4S5
Trembling Aspen	*Salicaceae*	*Populus tremuloides*	S5
Red Maple	*Sapindaceae*	*Acer rubrum*	S5
Sugar Maple	*Sapindaceae*	*Acer saccharum*	S4
SHRUBS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Staghorn Sumac	*Anacardiaceae*	*Rhus typhina*	S3
Western Poison Ivy	*Anacardiaceae*	*Toxicodendron radicans var. rydbergii*	S4
Spreading Dogbane	*Apocynaceae*	*Apocynum androsaemifolium*	S4
Mountain Holly	*Aquifoliaceae*	*Ilex mucronata*	S5
Common Winterberry	*Aquifoliaceae*	*Ilex verticillata*	S5
Green Alder	*Betulaceae*	*Alnus alnobetula*	S4S5
Speckled Alder	*Betulaceae*	*Alnus incana*	S5
Beaked Hazel	*Betulaceae*	*Corylus cornuta*	S5
Canada Fly Honeysuckle	*Caprifoliaceae*	*Lonicera canadensis*	S5
Woolly Beach-heath	*Cistaceae*	*Hudsonia tomentosa*	S3
Alternate-leaved Dogwood	*Cornaceae*	*Cornus alternifolia*	S4
Red Osier Dogwood	*Cornaceae*	*Cornus sericea*	S5
Common Juniper	*Cupressaceae*	*Juniperus communis*	S3
Common Bearberry	*Ericaceae*	*Arctostaphylos uva-ursi*	S3
Leatherleaf	*Ericaceae*	*Chamaedaphne calyculata*	S4
Broom Crowberry	*Ericaceae*	*Corema conradii*	S2S3
Black Crowberry	*Ericaceae*	*Empetrum nigrum*	S3
Black Huckleberry	*Ericaceae*	*Gaylussacia baccata*	S4S5
Dwarf Huckleberry	*Ericaceae*	*Gaylussacia bigeloviana*	S3
Sheep Laurel	*Ericaceae*	*Kalmia angustifolia*	S5

APPENDIX VI: TERTIARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Common Labrador Tea	*Ericaceae*	*Rhododendron groenlandicum*	S5
Late Lowbush Blueberry	*Ericaceae*	*Vaccinium angustifolium*	S5
Skunk Currant	*Grossulariaceae*	*Ribes glandulosum*	S5
Smooth Gooseberry	*Grossulariaceae*	*Ribes hirtellum*	S5
Northern Bayberry	*Myricaceae*	*Morella pensylvanica*	S5
Sweet Gale	*Myricaceae*	*Myrica gale*	S5
Serviceberry	*Rosaceae*	*Amelanchier sp*	N/A
Black Chokeberry	*Rosaceae*	*Aronia melanocarpa*	S4S5
Hawthorn	*Rosaceae*	*Crataegus spp.*	N/A
Chokecherry	*Rosaceae*	*Prunus virginiana*	S5
Shining Rose	*Rosaceae*	*Rosa nitida*	S4
Virginia Rose	*Rosaceae*	*Rosa virginiana*	S5
Cloudberry	*Rosaceae*	*Rubus chamaemorus*	S3
Bristly Dewberry	*Rosaceae*	*Rubus hispidus*	S4
Red Raspberry	*Rosaceae*	*Rubus idaeus*	S5
White Meadowsweet	*Rosaceae*	*Spiraea alba*	S5
Willow	*Salicaceae*	*Salix spp.*	N/A
Mountain Maple	*Sapindaceae*	*Acer spicatum*	S5
Canada Yew	*Taxaceae*	*Taxus canadensis*	S4
Red Elderberry	*Viburnaceae*	*Sambucus racemosa*	S5
Northern Wild Raisin	*Viburnaceae*	*Viburnum cassinoides*	S5
Highbush Cranberry	*Viburnaceae*	*Viburnum opulus*	S3
NON-NATIVE TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
European Mountain Ash	*Rosaceae*	*Sorbus aucuparia*	SNA
Manitoba Maple	*Sapindaceae*	*Acer negundo*	SNA
Norway Maple	*Sapindaceae*	*Acer platanoides*	SNA
WILDFLOWERS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Saline Saltbush	*Amaranthaceae*	*Atriplex dioica*	S4
Narrow-leaved Orache	*Amaranthaceae*	*Atriplex littoralis*	SNA
Thin-leaved Orache	*Amaranthaceae*	*Atriplex prostrata*	S4
Common Lamb's Quarters	*Amaranthaceae*	*Chenopodium album*	SNA
Common Saltwort	*Amaranthaceae*	*Kali turgidum*	SNA
Sea Glasswort	*Amaranthaceae*	*Salicornia maritima*	S4S5
White Sea-blite	*Amaranthaceae*	*Suaeda maritima*	S4S5
Seaside Angelica	*Apiaceae*	*Angelica lucida*	S2S3
Woodland Angelica	*Apiaceae*	*Angelica sylvestris*	SNA
Queen Anne's Lace	*Apiaceae*	*Daucus carota*	SNA
Common Cow Parsnip	*Apiaceae*	*Heracleum maximum*	S4
Scotch Lovage	*Apiaceae*	*Ligusticum scoticum*	S4
Maryland Sanicle	*Apiaceae*	*Sanicula marilandica*	S3S4
Jack-in-the-pulpit	*Araceae*	*Arisaema triphyllum*	S4
Turion Duckweed	*Araceae*	*Lemna turionifera*	S4S5
Wild Sarsaparilla	*Araliaceae*	*Aralia nudicaulis*	S5
Wild Lily-of-The-Valley	*Asparagaceae*	*Maianthemum canadense*	S5
Large False Solomon's Seal	*Asparagaceae*	*Maianthemum racemosum*	S4
Starry False Solomon's Seal	*Asparagaceae*	*Maianthemum stellatum*	S3
Three-leaved False Soloman's Seal	*Asparagaceae*	*Maianthemum trifolium*	S4

APPENDIX VI: TERTIARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Common Yarrow	*Asteraceae*	*Achillea millefolium*	SNA
Common Ragweed	*Asteraceae*	*Ambrosia artemisiifolia*	S4
Pearly Everlasting	*Asteraceae*	*Anaphalis margaritacea*	S5
Beach Wormwood	*Asteraceae*	*Artemisia stelleriana*	SNA
Devil's Beggarticks	*Asteraceae*	*Bidens frondosa*	S5
Canada Thistle	*Asteraceae*	*Cirsium arvense*	SNA
Hairy Flat-top White Aster	*Asteraceae*	*Doellingeria umbellata*	S5
Canada Horseweed	*Asteraceae*	*Erigeron canadensis*	S5
Large-leaved Aster	*Asteraceae*	*Eurybia macrophylla*	S3
Grass-leaved Goldenrod	*Asteraceae*	*Euthamia graminifolia*	S5
Hawkweed spp.	*Asteraceae*	*Hieracium sp*	N/A
Tansy Ragwort	*Asteraceae*	*Jacobaea vulgaris*	SNA
Pineapple Weed	*Asteraceae*	*Matricaria discoidea*	SNA
Three-leaved Rattlesnakeroot	*Asteraceae*	*Nabalus trifoliolatus*	S5
Whorled Wood Aster	*Asteraceae*	*Oclemena acuminata*	S5
White Goldenrod	*Asteraceae*	*Solidago bicolor*	S4
Canada Goldenrod	*Asteraceae*	*Solidago canadensis*	S5
Rough-stemmed Goldenrod	*Asteraceae*	*Solidago rugosa*	S5
Seaside Goldenrod	*Asteraceae*	*Solidago sempervirens*	S4S5
Field Sow Thistle	*Asteraceae*	*Sonchus arvensis*	SNA
Calico Aster	*Asteraceae*	*Symphyotrichum lateriflorum*	S5
New York Aster	*Asteraceae*	*Symphyotrichum novi-belgii*	S5
Aster spp.	*Asteraceae*	*Symphyotrichum sp*	N/A
Common Dandelion	*Asteraceae*	*Taraxacum officinale*	SNA
Meadow Goatsbeard	*Asteraceae*	*Tragopogon pratensis*	SNA
Coltsfoot	*Asteraceae*	*Tussilago farfara*	SNA
Rough Cocklebur	*Asteraceae*	*Xanthium strumarium*	S4
Spotted Jewelweed	*Balsaminaceae*	*Impatiens capensis*	S5
Small Forget-Me-Not	*Boraginaceae*	*Myosotis laxa*	S4
American Searocket	*Brassicaceae*	*Cakile edentula*	S4S5
Large Toothwort	*Brassicaceae*	*Cardamine maxima*	S1
Twinflower	*Caprifoliaceae*	*Linnaea borealis*	S5
Seabeach Sandwort	*Caryophyllaceae*	*Honckenya peploides*	S3S4
Procumbent Pearlwort	*Caryophyllaceae*	*Sagina procumbens*	S4
Ruby Sandspurrey	*Caryophyllaceae*	*Spergularia rubra*	SNA
Saltmarsh Sandspurrey	*Caryophyllaceae*	*Spergularia salina*	S4
Beach Pinweed	*Cistaceae*	*Lechea maritima*	S2
Hedge False Bindweed	*Convolvulaceae*	*Calystegia sepium*	S5
Dodder	Convolvulaceae	*Cuscuta sp.*	S?
Bunchberry	*Cornaceae*	*Cornus canadensis*	S5
Saltmarsh Bulrush	*Cyperaceae*	*Bolboschoenus maritimus*	S4
Round-leaved Sundew	*Droseraceae*	*Drosera rotundifolia*	S4
Trailing Arbutus	*Ericaceae*	*Epigaea repens*	S4
Creeping Snowberry	*Ericaceae*	*Gaultheria hispidula*	S5
Eastern Teaberry	*Ericaceae*	*Gaultheria procumbens*	S4S5
Convulsion-Root	*Ericaceae*	*Monotropa uniflora*	S5
Shinleaf	*Ericaceae*	*Pyrola elliptica*	S5

APPENDIX VI: TERTIARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Large Cranberry	*Ericaceae*	*Vaccinium macrocarpon*	S4S5
Small Cranberry	*Ericaceae*	*Vaccinium oxycoccos*	S4
Clover spp.	*Fabaceae*	*Clover spp.*	N/A
Beach Pea	*Fabaceae*	*Lathyrus japonicus*	S4S5
Marsh Vetchling	*Fabaceae*	*Lathyrus palustris*	S4S5
Rabbit's-foot Clover	*Fabaceae*	*Trifolium arvense*	SNA
Red Clover	*Fabaceae*	*Trifolium pratense*	SNA
Tufted Vetch	*Fabaceae*	*Vicia cracca*	SNA
Herb Robert	*Geraniaceae*	*Geranium robertianum*	S4
Fraser's St. John's-wort	*Hypericaceae*	*Hypericum fraseri*	S5
Large St John's-wort	*Hypericaceae*	*Hypericum majus*	S3
Harlequin Blue Flag	*Iridaceae*	*Iris versicolor*	S5
Seaside Arrowgrass	*Juncaginaceae*	*Triglochin maritima*	S4S5
Common Hemp-nettle	*Lamiaceae*	*Galeopsis tetrahit*	SNA
Northern Water Horehound	*Lamiaceae*	*Lycopus uniflorus*	S5
Canadian Mint	*Lamiaceae*	*Mentha canadensis*	S4S5
Marsh Skullcap	*Lamiaceae*	*Scutellaria galericulata*	S4S5
Mad-dog Skullcap	*Lamiaceae*	*Scutellaria lateriflora*	S5
Canada Germander	*Lamiaceae*	*Teucrium canadense*	S3S4
Yellow Bluebead Lily	*Liliaceae*	*Clintonia borealis*	S5
Cucumber Root	*Liliaceae*	*Medeola virginiana*	S3S4
Rose Twisted-stalk	*Liliaceae*	*Streptopus lanceolatus*	S4
Nodding Trillium	*Melanthiaceae*	*Trillium cernuum*	S4
Fireweed	*Onagraceae*	*Chamaenerion angustifolium*	S5
Small Enchanter's Nightshade	*Onagraceae*	*Circaea alpina*	S5
Broad-leaved Enchanter's Nightshade	*Onagraceae*	*Circaea canadensis*	S2S3
Northern Willowherb	*Onagraceae*	*Epilobium ciliatum*	S5
Bog Willowherb	*Onagraceae*	*Epilobium leptophyllum*	S4S5
Willherb spp.	*Onagraceae*	*Epilobium sp*	N/A
Common Evening Primrose	*Onagraceae*	*Oenothera biennis*	S5
Small-flowered Evening Primrose	*Onagraceae*	*Oenothera parviflora*	S4S5
Tuberous Grass Pink	*Orchidaceae*	*Calopogon tuberosus*	S3
Pink Lady's-Slipper	*Orchidaceae*	*Cypripedium acaule*	S5
White Fringed Orchid	*Orchidaceae*	*Platanthera blephariglottis*	S3S4
Small Purple Fringed Orchid	*Orchidaceae*	*Platanthera psycodes*	S4
Common Eyebright	*Orobanchaceae*	*Euphrasia nemorosa*	SNA
American Cow Wheat	*Orobanchaceae*	*Melampyrum lineare*	S4S5
European Wood Sorrel	*Oxalidaceae*	*Oxalis stricta*	S5
English Plantain	*Plantaginaceae*	*Plantago lanceolata*	SNA
Common Plantain	*Plantaginaceae*	*Plantago major*	SNA
Seaside Plantain	*Plantaginaceae*	*Plantago maritima*	S4S5
Common Speedwell	*Plantaginaceae*	*Veronica officinalis*	SNA
Sea Lavender	*Plumbaginaceae*	*Limonium carolinianum*	S4S5
American Beach Grass	*Poaceae*	*Calamagrostis breviligulata*	S4S5
Virginia Wild Rye	*Poaceae*	*Elymus virginicus*	S2S3
Sea Lyme Grass	*Poaceae*	*Leymus mollis*	S4
Smooth Cordgrass	*Poaceae*	*Sporobolus alterniflorus*	S4S5

APPENDIX VI: TERTIARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Prairie Cordgrass	*Poaceae*	*Sporobolus michauxianus*	S5
Saltmeadow Cordgrass	*Poaceae*	*Sporobolus pumilus*	S4S5
Fringed Black Bindweed	*Polygonaceae*	*Fallopia cilinodis*	S4
Japanese Knotweed	*Polygonaceae*	*Reynoutria japonica*	SNA
Curled Dock	*Polygonaceae*	*Rumex crispus*	SNA
Tierra del Fuego Dock	*Polygonaceae*	*Rumex fueginus*	S4
Northern Starflower	*Primulaceae*	*Lysimachia borealis*	S5
Sea Milkwort	*Primulaceae*	*Lysimachia maritima*	S4S5
Swamp Yellow Loosestrife	*Primulaceae*	*Lysimachia terrestris*	S4S5
Tufted Yellow Loosestrife	*Primulaceae*	*Lysimachia thyrsiflora*	S4S5
Red Baneberry	*Ranunculaceae*	*Actaea rubra*	S4
Seaside Buttercup	*Ranunculaceae*	*Halerpestes cymbalaria*	S4
Creeping Buttercup	*Ranunculaceae*	*Ranunculus repens*	SNA
Tall Meadow-Rue	*Ranunculaceae*	*Thalictrum pubescens*	S5
Wild Strawberry	*Rosaceae*	*Fragaria virginiana*	S5
Avens	*Rosaceae*	*Geum sp*	N/A
Common Silverweed	*Rosaceae*	*Potentilla anserina*	S5
Rough Cinquefoil	*Rosaceae*	*Potentilla norvegica*	S4S5
Three-toothed Cinquefoil	*Rosaceae*	*Sibbaldia tridentata*	S3
Common Bedstraw	*Rubiaceae*	*Galium aparine*	S1
Rough Bedstraw	*Rubiaceae*	*Galium asprellum*	S4S5
Bedstraw	*Rubiaceae*	*Galium sp*	N/A
Three-petaled Bedstraw	*Rubiaceae*	*Galium trifidum*	S4S5
Three-flowered Bedstraw	*Rubiaceae*	*Galium triflorum*	S5
Partridgeberry	*Rubiaceae*	*Mitchella repens*	S2S3
Northern Pitcher Plant	*Sarraceniaceae*	*Sarracenia purpurea*	S4
Broad-leaved Cattail	*Typhaceae*	*Typha latifolia*	S5
Virginia Creeper	Vitaceae	*Parthenocissus quinquefolia*	SNA
Common Eelgrass	*Zosteraceae*	*Zostera marina*	S4
FERNS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Common Oak Fern	*Cystopteridaceae*	*Gymnocarpium dryopteris*	S5
Eastern Hay-Scented Fern	*Dennstaedtiaceae*	*Dennstaedtia punctilobula*	S5
Bracken Fern	*Dennstaedtiaceae*	*Pteridium aquilinum*	S5
Mountain Wood Fern	*Dryopteridaceae*	*Dryopteris campyloptera*	S4
Spinulose Wood Fern	*Dryopteridaceae*	*Dryopteris carthusiana*	S4S5
Evergreen Wood Fern	*Dryopteridaceae*	*Dryopteris intermedia*	S5
Christmas Fern	*Dryopteridaceae*	*Polystichum acrostichoides*	S2S3
Ostrich Fern	*Onocleaceae*	*Matteuccia struthiopteris*	S4
Sensitive Fern	*Onocleaceae*	*Onoclea sensibilis*	S5
Interrupted Fern	*Osmundaceae*	*Claytosmunda claytoniana*	S5
Cinnamon Fern	*Osmundaceae*	*Osmundastrum cinnamomeum*	S5
New York Fern	*Thelypteridaceae*	*Parathelypteris noveboracensis*	S5
Northern Beech Fern	*Thelypteridaceae*	*Phegopteris connectilis*	S5
CLUBMOSSES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Running Clubmoss	*Lycopodiaceae*	*Lycopodium clavatum*	S4S5
HORSETAILS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Field Horsetail	*Equisetaceae*	*Equisetum arvense*	S5

APPENDIX VI: TERTIARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Woodland Horsetail	*Equisetaceae*	*Equisetum sylvaticum*	S5
MOSSES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Heart-leaved Spear Moss	Amblystegiaceae	*Calliergon cordifolium*	S4S5
Glow Moss	Aulacomniaceae	*Aulacomnium palustre*	S5
Silvery Bryum Moss	Bryaceae	*Bryum argenteum*	S4S5
Northern Tree Moss	Climaciaceae	*Climacium dendroides*	S5
Wavy-leaved Broom Moss	Dicranaceae	*Dicranum polysetum*	S5
Common Broom Moss	Dicranaceae	*Dicranum scoparium*	S5
Fire Moss	Ditrichaceae	*Ceratodon purpureus*	S5
Common Cord Moss	Funariaceae	*Funaria hygrometrica*	S5
Stairstep Moss	Hylocomiaceae	*Hylocomium splendens*	S5
Electrified Cat's-tail Moss	Hylocomiaceae	*Rhytidiadelphus triquetrus*	S5
Red-stemmed Feather Moss	Hylocomiaceae	*Pleurozium schreberi*	S5
Beautiful Branch Moss	Hypnaceae	*Callicladium haldanianum*	S5
Pellucid Plait Moss	*Hypnaceae*	*Hypnum imponens*	S5
Feathery Neckera Moss	*Neckeraceae*	*Neckera pennata*	S5
Crisped Pincushion Moss	Orthotrichaceae	*Ulota crispa*	S5
a Moss	Orthotrichaceae	*Ulota sp.*	SU
Smoothcap Moss	Polytrichaceae	*Atrichum sp*	N/A
Common Smoothcap Moss	Polytrichaceae	*Atrichum undulatum*	S4S5
Common Haircap Moss	Polytrichaceae	*Polytrichum commune*	S5
Green Peat Moss	*Sphagnaceae*	*Sphagnum girgensohnii*	S5
Blunt-leaved Peat Moss	*Sphagnaceae*	*Sphagnum palustre*	S5
Red Peat Moss	*Sphagnaceae*	*Sphagnum rubellum*	S4S5
Peatmoss	*Sphagnaceae*	*Sphagnum sp*	N/A
Shaggy Peat Moss	Sphagnaceae	*Sphagnum squarrosum*	S5
LIVERWORTS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Wood Rustwort	Cephaloziaceae	*Nowellia curvifolia*	SU
Frullania Liverwort	Jubulaceae	*Frullania sp.*	SU
Three-lobed Whipwort	Lepidoziaceae	*Bazzania trilobata*	S5
Variable-Leaved Crestwort	Lophocoleaceae	*Lophocolea heterophylla*	SU
Ciliate Fringewort	Ptilidiaceae	*Ptilidium ciliare*	SU
	Ptilidiaceae	*Ptilidium pulcherrimum*	SU
Flat-leaved Scalewort	Radulaceae	*Radula complanata*	SU
LICHENS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Fishnet Lichen	Cladoniaceae	*Cladonia boryi*	S4S5
Mealy Pixie-cup Lichen	Cladoniaceae	*Cladonia chlorophaea*	S4S5
Trumpeting Lichen	Cladoniaceae	*Cladonia fimbriata*	SU
Lipstick Powderhorn Lichen	Cladoniaceae	*Cladonia macilenta*	SU
Smooth-footed Powderhorn Lichen	Cladoniaceae	*Cladonia ochrochlora*	S4S5
Red-fruited Pixie-cup	Cladoniaceae	*Cladonia pleurota*	SU
Gray Reindeer Lichen	Cladoniaceae	*Cladonia rangiferina*	S5
Cladonia spp.	Cladoniaceae	*Cladonia sp*	N/A
Dragon Lichen	Cladoniaceae	*Cladonia squamosa*	S4S5
Star-tipped Reindeer Lichen	Cladoniaceae	*Cladonia stellaris*	S4S5
Tree Tarpaper Lichen	Collemataceae	*Collema subflaccidum*	S4S5
Blue Jellyskin Lichen	Collemataceae	*Leptogium cyanescens*	S5

APPENDIX VI: TERTIARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
A Lichen	Graphidaceae	*Graphis scripta*	S5
A Lichen	Haematommataceae	*Loxospora ochrophaea*	S5
Lungwort Lichen	Lobariaceae	*Lobaria pulmonaria*	S4S5
Burred Horsehair Lichen	Parmeliaceae	*Bryoria furcellata*	S5
Blonde Horsehair Lichen	Parmeliaceae	*Bryoria nadvornikiana*	S2?
Bryoria Lichen	Parmeliaceae	*Bryoria sp*	N/A
Camouflage Lichen	Parmeliaceae	Camouflage Lichen	N/A
Boreal Oakmoss Lichen	Parmeliaceae	*Evernia mesomorpha*	S5
Freckled Tube Lichen	Parmeliaceae	*Hypogymnia krogiae*	S1S2
Monk's Hood Lichen	Parmeliaceae	*Hypogymnia physodes*	S5
Powder-headed Tube Lichen	Parmeliaceae	*Hypogymnia tubulosa*	S4S5
Abrading Camouflage Lichen	Parmeliaceae	*Melanelixia subaurifera*	S4S5
Bottlebrush Shield Lichen	Parmeliaceae	*Parmelia squarrosa*	S5
Hammered Shield Lichen	Parmeliaceae	*Parmelia sulcata*	S5
Varied Rag Lichen	Parmeliaceae	*Platismatia glauca*	S5
Crumpled Rag Lichen	Parmeliaceae	*Platismatia tuckermanii*	S3S4
Rough Speckleback Lichen	Parmeliaceae	*Punctelia rudecta*	S4S5
Usnea	Parmeliaceae	*Usnea sp*	N/A
Buellia spp.	Physciaceae	*Buellia sp*	N/A
Orange-cored Shadow Lichen	Physciaceae	*Phaeophyscia rubropulchra*	S4S5
Frayed Ramalina Lichen	Ramalinaceae	*Ramalina roesleri*	S4S5
Maritime Sunburst Lichen		*Xanthoria parietina*	S4S5
FUNGI	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
White Coral Fungi	Clavariaceae	*Clavulina coralloides*	SU?
AMPHIBIANS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Green Frog	Ranidae	*Lithobates clamitans*	S4S5
BIRDS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Northern Harrier	Accipitridae	*Circus hudsonius*	S4B
American Black Duck	Anatidae	*Anas rubripes*	S5B,S4N
Great Blue Heron	Ardeidae	*Ardea herodias*	S4B
Mourning Dove	Columbidae	*Zenaida macroura*	S5
American Crow	Corvidae	*Corvus brachyrhynchos*	S5
Blue Jay	Corvidae	*Cyanocitta cristata*	S5
Swamp Sparrow	Emberizidae	*Melospiza georgiana*	S5B
Song Sparrow	Emberizidae	*Melospiza melodia*	S5B
Chipping Sparrow	Emberizidae	*Spizella passerina*	S4B
White-throated Sparrow	Emberizidae	*Zonotrichia albicollis*	S4S5B
White-winged Crossbill	Fringillidae	*Loxia leucoptera*	S3
Red-winged Blackbird	Icteridae	*Agelaius phoeniceus*	S4B
Common Grackle	Icteridae	*Quiscalus quiscula*	S5B
Boreal Chickadee	Paridae	*Poecile hudsonicus*	S3
Common Yellowthroat	Parulidae	*Geothlypis trichas*	S5B
Black-and-White Warbler	Parulidae	*Mniotilta varia*	S5B
Northern Parula	Parulidae	*Setophaga americana*	S5B
Magnolia Warbler	Parulidae	*Setophaga magnolia*	S5B
Ruffed Grouse	Phasianidae	*Bonasa umbellus*	S5
Golden-crowned Kinglet	Regulidae	*Regulus satrapa*	S5

APPENDIX VI: TERTIARY KRUMMHOLZ SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Great Horned Owl	Strigidae	*Bubo virginianus*	S4
Hermit Thrush	Turdidae	*Catharus guttatus*	S5B
MAMMALS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Coyote	Canidae	*Canis latrans*	S5
Red Fox	Canidae	*Vulpes vulpes*	S5
Snowshoe Hare	Leporidae	*Lepus americanus*	S5
Common Muskrat	Muridae	*Ondatra zibethicus*	S5
Ermine	Mustelidae	*Mustela erminea*	S5
American Mink	Mustelidae	*Vison vison*	S5
Red Squirrel	Sciuridae	*Tamiasciurus hudsonicus*	S5
Shrew	Soricidae		N/A
REPTILES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Common Gartersnake	Colubridae	*Thamnophis sirtalis*	S5

Cloudberry & Dwarf Huckleberry, Tertiary Krummholz on Boggy Low Plain, South Enmore, NCC

SPECIES LIST

KRUMMHOLZ TYPE:	CoastalForest
# of SITES	3
SURVEYOR:	Daniel McRae

BIODIVERSITY

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
CONIFEROUS TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Balsam Fir	*Pinaceae*	*Abies balsamea*	S5
Tamarack	*Pinaceae*	*Larix laricina*	S5
White Spruce	*Pinaceae*	*Picea glauca*	S5
Black Spruce	*Pinaceae*	*Picea mariana*	S5
DECIDUOUS TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Paper Birch	*Betulaceae*	*Betula papyrifera*	S5
Gray Birch	*Betulaceae*	*Betula populifolia*	S5
Northern Red Oak	*Fagaceae*	*Quercus rubra*	S3S4
White Ash	*Oleaceae*	*Fraxinus americana*	S2S3
Pin Cherry	*Rosaceae*	*Prunus pensylvanica*	S5
American Mountain Ash	*Rosaceae*	*Sorbus americana*	S5
Trembling Aspen	*Salicaceae*	*Populus tremuloides*	S5
Red Maple	*Sapindaceae*	*Acer rubrum*	S5
SHRUBS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Mountain Holly	*Aquifoliaceae*	*Ilex mucronata*	S5
Common Winterberry	*Aquifoliaceae*	*Ilex verticillata*	S5
Speckled Alder	*Betulaceae*	*Alnus incana*	S5
Canada Fly Honeysuckle	*Caprifoliaceae*	*Lonicera canadensis*	S5
Alternate-leaved Dogwood	*Cornaceae*	*Cornus alternifolia*	S4
Round-leaved Dogwood	*Cornaceae*	*Cornus rugosa*	S2
Black Huckleberry	*Ericaceae*	*Gaylussacia baccata*	S4S5
Sheep Laurel	*Ericaceae*	*Kalmia angustifolia*	S5
Common Labrador Tea	*Ericaceae*	*Rhododendron groenlandicum*	S5
Late Lowbush Blueberry	*Ericaceae*	*Vaccinium angustifolium*	S5
Velvet-leaved Blueberry	*Ericaceae*	*Vaccinium myrtilloides*	S4S5
Skunk Currant	*Grossulariaceae*	*Ribes glandulosum*	S5
Northern Bayberry	*Myricaceae*	*Morella pensylvanica*	S5
Serviceberry	*Rosaceae*	*Amelanchier sp*	N/A
Black Chokeberry	*Rosaceae*	*Aronia melanocarpa*	S4S5
Chokecherry	*Rosaceae*	*Prunus virginiana*	S5
Virginia Rose	*Rosaceae*	*Rosa virginiana*	S5
Bristly Dewberry	*Rosaceae*	*Rubus hispidus*	S4
Red Raspberry	*Rosaceae*	*Rubus idaeus*	S5
Dwarf Red Raspberry	*Rosaceae*	*Rubus pubescens*	S5
White Meadowsweet	*Rosaceae*	*Spiraea alba*	S5
Canada Yew	*Taxaceae*	*Taxus canadensis*	S4
Northern Wild Raisin	*Viburnaceae*	*Viburnum cassinoides*	S5
NON-NATIVE TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Red Ash	*Oleaceae*	*Fraxinus pennsylvanica*	SNA
European Mountain Ash	*Rosaceae*	*Sorbus aucuparia*	SNA

APPENDIX VII: COASTAL FOREST SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
WILDFLOWERS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Common Water Parsnip	*Apiaceae*	*Sium suave*	S5
Wild Sarsaparilla	*Araliaceae*	*Aralia nudicaulis*	S5
Wild Lily-of-The-Valley	*Asparagaceae*	*Maianthemum canadense*	S5
Three-leaved False Soloman's Seal	*Asparagaceae*	*Maianthemum trifolium*	S4
Pearly Everlasting	*Asteraceae*	*Anaphalis margaritacea*	S5
Nodding Beggarticks	*Asteraceae*	*Bidens cernua*	S4
Devil's Beggarticks	*Asteraceae*	*Bidens frondosa*	S5
Hairy Flat-top White Aster	*Asteraceae*	*Doellingeria umbellata*	S5
Eastern Burnweed	*Asteraceae*	*Erechtites hieraciifolius*	S4
Whorled Wood Aster	*Asteraceae*	*Oclemena acuminata*	S5
Canada Goldenrod	*Asteraceae*	*Solidago canadensis*	S5
Rough-stemmed Goldenrod	*Asteraceae*	*Solidago rugosa*	S5
Heart-leaved Aster	*Asteraceae*	*Symphyotrichum cordifolium*	S4
Calico Aster	*Asteraceae*	*Symphyotrichum lateriflorum*	S5
New York Aster	*Asteraceae*	*Symphyotrichum novi-belgii*	S5
Purple-stemmed Aster	*Asteraceae*	*Symphyotrichum puniceum*	S5
Twinflower	*Caprifoliaceae*	*Linnaea borealis*	S5
Bunchberry	*Cornaceae*	*Cornus canadensis*	S5
Shinleaf	*Ericaceae*	*Pyrola elliptica*	S5
Fraser's St. John's-wort	*Hypericaceae*	*Hypericum fraseri*	S5
Harlequin Blue Flag	*Iridaceae*	*Iris versicolor*	S5
Common Hemp-nettle	*Lamiaceae*	*Galeopsis tetrahit*	SNA
American Water Horehound	*Lamiaceae*	*Lycopus americanus*	S4S5
Northern Water Horehound	*Lamiaceae*	*Lycopus uniflorus*	S5
Small Enchanter's Nightshade	*Onagraceae*	*Circaea alpina*	S5
Northern Willowherb	*Onagraceae*	*Epilobium ciliatum*	S5
Pink Lady's-Slipper	*Orchidaceae*	*Cypripedium acaule*	S5
Prairie Cordgrass	*Poaceae*	*Sporobolus michauxianus*	S5
Saltmeadow Cordgrass	*Poaceae*	*Sporobolus pumilus*	S4S5
Greater Water Dock	*Polygonaceae*	*Rumex britannica*	S5
Curled Dock	*Polygonaceae*	*Rumex crispus*	SNA
Northern Starflower	*Primulaceae*	*Lysimachia borealis*	S5
Tufted Yellow Loosestrife	*Primulaceae*	*Lysimachia thyrsiflora*	S4S5
Red Baneberry	*Ranunculaceae*	*Actaea rubra*	S4
Wild Strawberry	*Rosaceae*	*Fragaria virginiana*	S5
Common Marsh Bedstraw	*Rubiaceae*	*Galium palustre*	S5
Bittersweet Nightshade	*Solanaceae*	*Solanum dulcamara*	SNA
Broad-leaved Cattail	*Typhaceae*	*Typha latifolia*	S5
FERNS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Common Lady Fern	*Athyriaceae*	*Athyrium filix-femina*	S5
Bracken Fern	*Dennstaedtiaceae*	*Pteridium aquilinum*	S5
Spinulose Wood Fern	*Dryopteridaceae*	*Dryopteris carthusiana*	S4S5
Crested Wood Fern	*Dryopteridaceae*	*Dryopteris cristata*	S5
Sensitive Fern	*Onocleaceae*	*Onoclea sensibilis*	S5
Royal Fern	*Osmundaceae*	*Osmunda regalis var. spectabilis*	S4
Cinnamon Fern	*Osmundaceae*	*Osmundastrum cinnamomeum*	S5

APPENDIX VII: COASTAL FOREST SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Northern Beech Fern	*Thelypteridaceae*	*Phegopteris connectilis*	S5
Eastern Marsh Fern	*Thelypteridaceae*	*Thelypteris palustris*	S4S5
MOSSES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Glow Moss	Aulacomniaceae	*Aulacomnium palustre*	S5
Wavy-leaved Broom Moss	Dicranaceae	*Dicranum polysetum*	S5
Common Broom Moss	Dicranaceae	*Dicranum scoparium*	S5
Stairstep Moss	Hylocomiaceae	*Hylocomium splendens*	S5
Electrified Cat's-tail Moss	Hylocomiaceae	*Rhytidiadelphus triquetrus*	S5
Red-stemmed Feather Moss	Hylocomiaceae	*Pleurozium schreberi*	S5
Pellucid Plait Moss	*Hypnaceae*	*Hypnum imponens*	S5
Swan's-neck Leafy Moss	Mniaceae	*Mnium hornum*	S5
Smoothcap Moss	Polytrichaceae	*Atrichum sp*	N/A
Common Haircap Moss	Polytrichaceae	*Polytrichum commune*	S5
Green Peat Moss	*Sphagnaceae*	*Sphagnum girgensohnii*	S5
Shaggy Peat Moss	Sphagnaceae	*Sphagnum squarrosum*	S5
LIVERWORTS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Three-lobed Whipwort	Lepidoziaceae	*Bazzania trilobata*	S5
Variable-Leaved Crestwort	Lophocoleaceae	*Lophocolea heterophylla*	SU
Common Pellia	Pelliaceae	*Pellia epiphylla*	SU
	Ptilidiaceae	*Ptilidium pulcherrimum*	SU
LICHENS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Blue Jellyskin Lichen	Collemataceae	*Leptogium cyanescens*	S5
Boreal Oakmoss Lichen	Parmeliaceae	*Evernia mesomorpha*	S5
Monk's Hood Lichen	Parmeliaceae	*Hypogymnia physodes*	S5
Abrading Camouflage Lichen	Parmeliaceae	*Melanelixia subaurifera*	S4S5
Hammered Shield Lichen	Parmeliaceae	*Parmelia sulcata*	S5
Varied Rag Lichen	Parmeliaceae	*Platismatia glauca*	S5
Usnea	Parmeliaceae	*Usnea sp*	N/A
BIRDS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
American Black Duck	Anatidae	*Anas rubripes*	S5B,S4N
MAMMALS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
North American Beaver	Castoridae	*Castor canadensis*	S5

Blue Heron in Primary Krummholz Coastal Forest Zone Riparian Area

SPECIES LIST

KRUMMHOLZ TYPE:	INLAND
# of SITES	4
SURVEYOR:	DANIEL MCRAE

BIODIVERSITY

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
CONIFEROUS TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
EASTERN WHITE CEDAR	*Cupressaceae*	*Thuja occidentalis*	S3S4
BALSAM FIR	*Pinaceae*	*Abies balsamea*	S5
TAMARACK	*Pinaceae*	*Larix laricina*	S5
WHITE SPRUCE	*Pinaceae*	*Picea glauca*	S5
RED SPRUCE	*Pinaceae*	*Picea rubens*	S5
RED PINE	*Pinaceae*	*Pinus resinosa*	S2
EASTERN WHITE PINE	*Pinaceae*	*Pinus strobus*	S3S4
EASTERN HEMLOCK	*Pinaceae*	*Tsuga canadensis*	S3
DECIDUOUS TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
PAPER BIRCH	*Betulaceae*	*Betula papyrifera*	S5
GRAY BIRCH	*Betulaceae*	*Betula populifolia*	S5
AMERICAN BEECH	*Fagaceae*	*Fagus grandifolia*	S3S4
WHITE ASH	*Oleaceae*	*Fraxinus americana*	S2S3
PIN CHERRY	*Rosaceae*	*Prunus pensylvanica*	S5
AMERICAN MOUNTAIN ASH	*Rosaceae*	*Sorbus americana*	S5
LARGE-TOOTHED ASPEN	*Salicaceae*	*Populus grandidentata*	S4S5
TREMBLING ASPEN	*Salicaceae*	*Populus tremuloides*	S5
RED MAPLE	*Sapindaceae*	*Acer rubrum*	S5
WHITE ELM	*Ulmaceae*	*Ulmus americana*	S3
SHRUBS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
STAGHORN SUMAC	*Anacardiaceae*	*Rhus typhina*	S3
MOUNTAIN HOLLY	*Aquifoliaceae*	*Ilex mucronata*	S5
COMMON WINTERBERRY	*Aquifoliaceae*	*Ilex verticillata*	S5
GREEN ALDER	*Betulaceae*	*Alnus alnobetula*	S4S5
SPECKLED ALDER	*Betulaceae*	*Alnus incana*	S5
BEAKED HAZEL	*Betulaceae*	*Corylus cornuta*	S5
MOUNTAIN FLY HONEYSUCKLE	*Caprifoliaceae*	*Lonicera villosa*	S4
ALTERNATE-LEAVED DOGWOOD	*Cornaceae*	*Cornus alternifolia*	S4
RED OSIER DOGWOOD	*Cornaceae*	*Cornus sericea*	S5
BLACK HUCKLEBERRY	*Ericaceae*	*Gaylussacia baccata*	S4S5
SHEEP LAUREL	*Ericaceae*	*Kalmia angustifolia*	S5
COMMON LABRADOR TEA	*Ericaceae*	*Rhododendron groenlandicum*	S5
LATE LOWBUSH BLUEBERRY	*Ericaceae*	*Vaccinium angustifolium*	S5
VELVET-LEAVED BLUEBERRY	*Ericaceae*	*Vaccinium myrtilloides*	S4S5
BRISTLY BLACK CURRANT	*Grossulariaceae*	*Ribes lacustre*	S5
NORTHERN BAYBERRY	*Myricaceae*	*Morella pensylvanica*	S5
SWEET GALE	*Myricaceae*	*Myrica gale*	S5
SERVICEBERRY	*Rosaceae*	*Amelanchier sp*	N/A
CHOKECHERRY	*Rosaceae*	*Prunus virginiana*	S5
VIRGINIA ROSE	*Rosaceae*	*Rosa virginiana*	S5

APPENDIX VIII: INLAND SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Alleghaney Blackberry	*Rosaceae*	*Rubus allegheniensis*	S4S5
Smooth Blackberry	*Rosaceae*	*Rubus canadensis*	S5
Bristly Dewberry	*Rosaceae*	*Rubus hispidus*	S4
Red Raspberry	*Rosaceae*	*Rubus idaeus*	S5
Dwarf Red Raspberry	*Rosaceae*	*Rubus pubescens*	S5
White Meadowsweet	*Rosaceae*	*Spiraea alba*	S5
Willow	*Salicaceae*	*Salix spp.*	N/A
Canada Yew	*Taxaceae*	*Taxus canadensis*	S4
Common Elderberry	*Viburnaceae*	*Sambucus canadensis*	S4S5
Red Elderberry	*Viburnaceae*	*Sambucus racemosa*	S5
Northern Wild Raisin	*Viburnaceae*	*Viburnum cassinoides*	S5
Hobblebush	*Viburnaceae*	*Viburnum lantanoides*	S1S2
Highbush Cranberry	*Viburnaceae*	*Viburnum opulus*	S3
NON-NATIVE TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
English Oak	*Fagaceae*	*Quercus robur*	SNA
European linden	*Malvaceae*	*Tilia x europaea*	SNA
Austrian Pine	*Pinaceae*	*Pinus nigra*	SNA
Scotch Pine	*Pinaceae*	*Pinus sylvestris*	SNA
Common Apple	*Rosaceae*	*Malus pumila*	SNA
European Mountain Ash	*Rosaceae*	*Sorbus aucuparia*	SNA
Norway Maple	*Sapindaceae*	*Acer platanoides*	SNA
WILDFLOWERS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Narrow-leaved Orache	*Amaranthaceae*	*Atriplex littoralis*	SNA
Sea Glasswort	*Amaranthaceae*	*Salicornia maritima*	S4S5
White Sea-blite	*Amaranthaceae*	*Suaeda maritima*	S4S5
Woodland Angelica	*Apiaceae*	*Angelica sylvestris*	SNA
Queen Anne's Lace	*Apiaceae*	*Daucus carota*	SNA
Wild Sarsaparilla	*Araliaceae*	*Aralia nudicaulis*	S5
Wild Lily-of-The-Valley	*Asparagaceae*	*Maianthemum canadense*	S5
Three-leaved False Soloman's Seal	*Asparagaceae*	*Maianthemum trifolium*	S4
Common Yarrow	*Asteraceae*	*Achillea millefolium*	SNA
Canada Thistle	*Asteraceae*	*Cirsium arvense*	SNA
Hairy Flat-top White Aster	*Asteraceae*	*Doellingeria umbellata*	S5
Eastern Burnweed	*Asteraceae*	*Erechtites hieraciifolius*	S4
Canada Horseweed	*Asteraceae*	*Erigeron canadensis*	S5
Rough Fleabane	*Asteraceae*	*Erigeron strigosus*	S5
Grass-leaved Goldenrod	*Asteraceae*	*Euthamia graminifolia*	S5
Rough Hawkweed	*Asteraceae*	*Hieracium scabrum*	S4
Hawkweed spp.	*Asteraceae*	*Hieracium sp*	N/A
Tansy Ragwort	*Asteraceae*	*Jacobaea vulgaris*	SNA
Pineapple Weed	*Asteraceae*	*Matricaria discoidea*	SNA
Three-leaved Rattlesnakeroot	*Asteraceae*	*Nabalus trifoliolatus*	S5
Whorled Wood Aster	*Asteraceae*	*Oclemena acuminata*	S5
Black-Eyed Susan	*Asteraceae*	*Rudbeckia hirta*	SNA
White Goldenrod	*Asteraceae*	*Solidago bicolor*	S4
Canada Goldenrod	*Asteraceae*	*Solidago canadensis*	S5
Gray-stemmed Goldenrod	*Asteraceae*	*Solidago nemoralis*	S4

APPENDIX VIII: INLAND SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Downy Goldenrod	*Asteraceae*	*Solidago puberula*	S4S5
Rough-stemmed Goldenrod	*Asteraceae*	*Solidago rugosa*	S5
Seaside Goldenrod	*Asteraceae*	*Solidago sempervirens*	S4S5
Calico Aster	*Asteraceae*	*Symphyotrichum lateriflorum*	S5
New York Aster	*Asteraceae*	*Symphyotrichum novi-belgii*	S5
Purple-stemmed Aster	*Asteraceae*	*Symphyotrichum puniceum*	S5
Aster spp.	*Asteraceae*	*Symphyotrichum sp*	N/A
Common Dandelion	*Asteraceae*	*Taraxacum officinale*	SNA
Small Forget-Me-Not	*Boraginaceae*	*Myosotis laxa*	S4
Yellow Rocket	*Brassicaceae*	*Barbarea vulgaris*	SNA
Twinflower	*Caprifoliaceae*	*Linnaea borealis*	S5
Ruby Sandspurrey	*Caryophyllaceae*	*Spergularia rubra*	SNA
Hedge False Bindweed	*Convolvulaceae*	*Calystegia sepium*	S5
Bunchberry	*Cornaceae*	*Cornus canadensis*	S5
Trailing Arbutus	*Ericaceae*	*Epigaea repens*	S4
Creeping Snowberry	*Ericaceae*	*Gaultheria hispidula*	S5
Eastern Teaberry	*Ericaceae*	*Gaultheria procumbens*	S4S5
One-sided Wintergreen	*Ericaceae*	*Orthilia secunda*	S4S5
Shinleaf	*Ericaceae*	*Pyrola elliptica*	S5
Mountain Cranberry	*Ericaceae*	*Vaccinium vitis-idaea*	S3
Yellow Clover	*Fabaceae*	*Trifolium aureum*	SNA
Tufted Vetch	*Fabaceae*	*Vicia cracca*	SNA
Large St John's-wort	*Hypericaceae*	*Hypericum majus*	S3
Seaside Arrowgrass	*Juncaginaceae*	*Triglochin maritima*	S4S5
Common Hemp-nettle	*Lamiaceae*	*Galeopsis tetrahit*	SNA
Common Self-heal	*Lamiaceae*	*Prunella vulgaris*	S5
Mad-dog Skullcap	*Lamiaceae*	*Scutellaria lateriflora*	S5
Yellow Bluebead Lily	*Liliaceae*	*Clintonia borealis*	S5
Fireweed	*Onagraceae*	*Chamaenerion angustifolium*	S5
Northern Willowherb	*Onagraceae*	*Epilobium ciliatum*	S5
Willherb spp.	*Onagraceae*	*Epilobium sp*	N/A
Common Evening Primrose	*Onagraceae*	*Oenothera biennis*	S5
Small-flowered Evening Primrose	*Onagraceae*	*Oenothera parviflora*	S4S5
Helleborine	*Orchidaceae*	*Epipactis helleborine*	SNA
American Cow Wheat	*Orobanchaceae*	*Melampyrum lineare*	S4S5
European Wood Sorrel	*Oxalidaceae*	*Oxalis stricta*	S5
White Turtlehead	*Plantaginaceae*	*Chelone glabra*	S5
Butter-and-Eggs	*Plantaginaceae*	*Linaria vulgaris*	SNA
Common Plantain	*Plantaginaceae*	*Plantago major*	SNA
Common Speedwell	*Plantaginaceae*	*Veronica officinalis*	SNA
Sea Lavender	*Plumbaginaceae*	*Limonium carolinianum*	S4S5
Sea Lyme Grass	*Poaceae*	*Leymus mollis*	S4
Smooth Cordgrass	*Poaceae*	*Sporobolus alterniflorus*	S4S5
Prairie Cordgrass	*Poaceae*	*Sporobolus michauxianus*	S5
Saltmeadow Cordgrass	*Poaceae*	*Sporobolus pumilus*	S4S5
Fringed Black Bindweed	*Polygonaceae*	*Fallopia cilinodis*	S4
Greater Water Dock	*Polygonaceae*	*Rumex britannica*	S5

APPENDIX VIII: INLAND SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Curled Dock	*Polygonaceae*	*Rumex crispus*	SNA
Northern Starflower	*Primulaceae*	*Lysimachia borealis*	S5
Sea Milkwort	*Primulaceae*	*Lysimachia maritima*	S4S5
Seaside Brookweed	*Primulaceae*	*Samolus parviflorus*	S1
Goldthread	*Ranunculaceae*	*Coptis trifolia*	S5
Creeping Buttercup	*Ranunculaceae*	*Ranunculus repens*	SNA
Marsh Cinquefoil	*Rosaceae*	*Comarum palustre*	S4
Wild Strawberry	*Rosaceae*	*Fragaria virginiana*	S5
Common Silverweed	*Rosaceae*	*Potentilla anserina*	S5
Common Marsh Bedstraw	*Rubiaceae*	*Galium palustre*	S5
Small White Violet	*Violaceae*	*Viola macloskeyi*	S5
Common Eelgrass	*Zosteraceae*	*Zostera marina*	S4
FERNS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Common Lady Fern	*Athyriaceae*	*Athyrium filix-femina*	S5
Bracken Fern	*Dennstaedtiaceae*	*Pteridium aquilinum*	S5
Evergreen Wood Fern	*Dryopteridaceae*	*Dryopteris intermedia*	S5
Sensitive Fern	*Onocleaceae*	*Onoclea sensibilis*	S5
Interrupted Fern	*Osmundaceae*	*Claytosmunda claytoniana*	S5
Cinnamon Fern	*Osmundaceae*	*Osmundastrum cinnamomeum*	S5
New York Fern	*Thelypteridaceae*	*Parathelypteris noveboracensis*	S5
CLUBMOSSES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Round-branched Tree-clubmoss	*Lycopodiaceae*	*Dendrolycopodium dendroideum*	S5
HORSETAILS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Woodland Horsetail	*Equisetaceae*	*Equisetum sylvaticum*	S5
MOSSES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Heart-leaved Spear Moss	Amblystegiaceae	*Calliergon cordifolium*	S4S5
Glow Moss	Aulacomniaceae	*Aulacomnium palustre*	S5
Northern Tree Moss	Climaciaceae	*Climacium dendroides*	S5
Mountain Broom Moss	Dicranaceae	*Dicranum montanum*	S5
Wavy-leaved Broom Moss	Dicranaceae	*Dicranum polysetum*	S5
Common Broom Moss	Dicranaceae	*Dicranum scoparium*	S5
Stairstep Moss	Hylocomiaceae	*Hylocomium splendens*	S5
Electrified Cat's-tail Moss	Hylocomiaceae	*Rhytidiadelphus triquetrus*	S5
Red-stemmed Feather Moss	Hylocomiaceae	*Pleurozium schreberi*	S5
Beautiful Branch Moss	Hypnaceae	*Callicladium haldanianum*	S5
Pellucid Plait Moss	*Hypnaceae*	*Hypnum imponens*	S5
Knight's Plume Moss	*Hypnaceae*	*Ptilium crista-castrensis*	S5
Swan's-neck Leafy Moss	Mniaceae	*Mnium hornum*	S5
Feathery Neckera Moss	*Neckeraceae*	*Neckera pennata*	S5
Crisped Pincushion Moss	Orthotrichaceae	*Ulota crispa*	S5
a Moss	Orthotrichaceae	*Ulota sp.*	SU
Common Smoothcap Moss	Polytrichaceae	*Atrichum undulatum*	S4S5
Common Haircap Moss	Polytrichaceae	*Polytrichum commune*	S5
Green Peat Moss	*Sphagnaceae*	*Sphagnum girgensohnii*	S5
Peatmoss	*Sphagnaceae*	*Sphagnum sp*	N/A
Common Four-tooth Moss	Tetraphidaceae	*Tetraphis pellucida*	S5
Delicate Fern Moss	*Thuidiaceae*	*Thuidium delicatulum*	S4S5
LIVERWORTS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**

APPENDIX VIII: INLAND SPECIES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Wood Rustwort	Cephaloziaceae	*Nowellia curvifolia*	SU
Frullania Liverwort	Jubulaceae	*Frullania sp.*	SU
Three-lobed Whipwort	Lepidoziaceae	*Bazzania trilobata*	S5
Variable-Leaved Crestwort	Lophocoleaceae	*Lophocolea heterophylla*	SU
	Ptilidiaceae	*Ptilidium pulcherrimum*	SU
LICHENS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Smooth-footed Powderhorn Lichen	Cladoniaceae	*Cladonia ochrochlora*	S4S5
Cladonia spp.	Cladoniaceae	*Cladonia sp*	N/A
Lungwort Lichen	Lobariaceae	*Lobaria pulmonaria*	S4S5
Smooth Lung Lichen	Lobariaceae	*Ricasolia quercizans*	S4S5
Bryoria Lichen	Parmeliaceae	*Bryoria sp*	N/A
Camouflage Lichen	Parmeliaceae	Camouflage Lichen	N/A
Boreal Oakmoss Lichen	Parmeliaceae	*Evernia mesomorpha*	S5
Monk's Hood Lichen	Parmeliaceae	*Hypogymnia physodes*	S5
Abrading Camouflage Lichen	Parmeliaceae	*Melanelixia subaurifera*	S4S5
Bottlebrush Shield Lichen	Parmeliaceae	*Parmelia squarrosa*	S5
Hammered Shield Lichen	Parmeliaceae	*Parmelia sulcata*	S5
Varied Rag Lichen	Parmeliaceae	*Platismatia glauca*	S5
Usnea	Parmeliaceae	*Usnea sp*	N/A
Bushy Beard Lichen	Parmeliaceae	*Usnea strigosa*	S4S5
Buellia spp.	Physciaceae	*Buellia sp*	N/A
Hooded Rosette Lichen	Physciaceae	*Physcia adscendens*	S4S5
Maritime Sunburst Lichen		*Xanthoria parietina*	S4S5
FUNGI	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Fly Amanita	Amanitaceae	*Amanita muscaria*	SU
BIRDS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
American Crow	Corvidae	*Corvus brachyrhynchos*	S5
Blue Jay	Corvidae	*Cyanocitta cristata*	S5
MAMMALS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
North American Beaver	Castoridae	*Castor canadensis*	S5

Swan's Neck Leafy Moss - *Mnium hornum* - *S5*

SPECIES LIST

LITTORAL CELL:	ALL
SITES:	ALL
SURVEYOR:	DANIEL MCRAE

BIODIVERSITY

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
CONIFEROUS TREES	FAMILY	SCIENTIFIC NAME	SRANK
EASTERN WHITE CEDAR	*Cupressaceae*	*Thuja occidentalis*	S3S4
BALSAM FIR	*Pinaceae*	*Abies balsamea*	S5
TAMARACK	*Pinaceae*	*Larix laricina*	S5
WHITE SPRUCE	*Pinaceae*	*Picea glauca*	S5
BLACK SPRUCE	*Pinaceae*	*Picea mariana*	S5
RED SPRUCE	*Pinaceae*	*Picea rubens*	S5
JACK PINE	*Pinaceae*	*Pinus banksiana*	S2S3
RED PINE	*Pinaceae*	*Pinus resinosa*	S2
EASTERN WHITE PINE	*Pinaceae*	*Pinus strobus*	S3S4
EASTERN HEMLOCK	*Pinaceae*	*Tsuga canadensis*	S3
DECIDUOUS TREES	FAMILY	SCIENTIFIC NAME	SRANK
YELLOW BIRCH	*Betulaceae*	*Betula alleghaniensis*	S5
PAPER BIRCH	*Betulaceae*	*Betula papyrifera*	S5
GRAY BIRCH	*Betulaceae*	*Betula populifolia*	S5
AMERICAN BEECH	*Fagaceae*	*Fagus grandifolia*	S3S4
NORTHERN RED OAK	*Fagaceae*	*Quercus rubra*	S3S4
WHITE ASH	*Oleaceae*	*Fraxinus americana*	S2S3
BLACK ASH	*Oleaceae*	*Fraxinus nigra*	S2
PIN CHERRY	*Rosaceae*	*Prunus pensylvanica*	S5
AMERICAN MOUNTAIN ASH	*Rosaceae*	*Sorbus americana*	S5
BALSAM POPLAR	*Salicaceae*	*Populus balsamifera*	S3
LARGE-TOOTHED ASPEN	*Salicaceae*	*Populus grandidentata*	S4S5
TREMBLING ASPEN	*Salicaceae*	*Populus tremuloides*	S5
RED MAPLE	*Sapindaceae*	*Acer rubrum*	S5
SUGAR MAPLE	*Sapindaceae*	*Acer saccharum*	S4
WHITE ELM	*Ulmaceae*	*Ulmus americana*	S3
SHRUBS	FAMILY	SCIENTIFIC NAME	SRANK
STAGHORN SUMAC	*Anacardiaceae*	*Rhus typhina*	S3
WESTERN POISON IVY	*Anacardiaceae*	*Toxicodendron radicans var. rydbergii*	S4
SPREADING DOGBANE	*Apocynaceae*	*Apocynum androsaemifolium*	S4
MOUNTAIN HOLLY	*Aquifoliaceae*	*Ilex mucronata*	S5
COMMON WINTERBERRY	*Aquifoliaceae*	*Ilex verticillata*	S5
GREEN ALDER	*Betulaceae*	*Alnus alnobetula*	S4S5
SPECKLED ALDER	*Betulaceae*	*Alnus incana*	S5
BEAKED HAZEL	*Betulaceae*	*Corylus cornuta*	S5
CANADA FLY HONEYSUCKLE	*Caprifoliaceae*	*Lonicera canadensis*	S5
MOUNTAIN FLY HONEYSUCKLE	*Caprifoliaceae*	*Lonicera villosa*	S4
PINEBARREN GOLDEN HEATHER	*Cistaceae*	*Hudsonia ericoides*	S2
WOOLLY BEACH-HEATH	*Cistaceae*	*Hudsonia tomentosa*	S3

APPENDIX IX - SPECIES LIST - ALL SITES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Alternate-leaved Dogwood	*Cornaceae*	*Cornus alternifolia*	S4
Round-leaved Dogwood	*Cornaceae*	*Cornus rugosa*	S2
Red Osier Dogwood	*Cornaceae*	*Cornus sericea*	S5
Common Juniper	*Cupressaceae*	*Juniperus communis*	S3
Creeping Juniper	*Cupressaceae*	*Juniperus horizontalis*	S2S3
Common Bearberry	*Ericaceae*	*Arctostaphylos uva-ursi*	S3
Leatherleaf	*Ericaceae*	*Chamaedaphne calyculata*	S4
Broom Crowberry	*Ericaceae*	*Corema conradii*	S2S3
Pink Crowberry	*Ericaceae*	*Empetrum eamesii*	S2S3
Black Crowberry	*Ericaceae*	*Empetrum nigrum*	S3
Black Huckleberry	*Ericaceae*	*Gaylussacia baccata*	S4S5
Dwarf Huckleberry	*Ericaceae*	*Gaylussacia bigeloviana*	S3
Sheep Laurel	*Ericaceae*	*Kalmia angustifolia*	S5
Pale Bog Laurel	*Ericaceae*	*Kalmia polifolia*	S4
Rhodora	*Ericaceae*	*Rhododendron canadense*	S5
Common Labrador Tea	*Ericaceae*	*Rhododendron groenlandicum*	S5
Late Lowbush Blueberry	*Ericaceae*	*Vaccinium angustifolium*	S5
Velvet-leaved Blueberry	*Ericaceae*	*Vaccinium myrtilloides*	S4S5
Skunk Currant	*Grossulariaceae*	*Ribes glandulosum*	S5
Smooth Gooseberry	*Grossulariaceae*	*Ribes hirtellum*	S5
Bristly Black Currant	*Grossulariaceae*	*Ribes lacustre*	S5
Sweet-fern	*Myricaceae*	*Comptonia peregrina*	S4
Northern Bayberry	*Myricaceae*	*Morella pensylvanica*	S5
Sweet Gale	*Myricaceae*	*Myrica gale*	S5
Serviceberry	*Rosaceae*	*Amelanchier sp*	N/A
Black Chokeberry	*Rosaceae*	*Aronia melanocarpa*	S4S5
Aronia sp	*Rosaceae*	*Aronia sp*	N/A
Hawthorn	*Rosaceae*	*Crataegus spp.*	N/A
Chokecherry	*Rosaceae*	*Prunus virginiana*	S5
Shining Rose	*Rosaceae*	*Rosa nitida*	S4
Virginia Rose	*Rosaceae*	*Rosa virginiana*	S5
Alleghaney Blackberry	*Rosaceae*	*Rubus allegheniensis*	S4S5
Smooth Blackberry	*Rosaceae*	*Rubus canadensis*	S5
Cloudberry	*Rosaceae*	*Rubus chamaemorus*	S3
Bristly Dewberry	*Rosaceae*	*Rubus hispidus*	S4
Red Raspberry	*Rosaceae*	*Rubus idaeus*	S5
Dwarf Red Raspberry	*Rosaceae*	*Rubus pubescens*	S5
White Meadowsweet	*Rosaceae*	*Spiraea alba*	S5
Willow	*Salicaceae*	*Salix spp.*	N/A
Mountain Maple	*Sapindaceae*	*Acer spicatum*	S5
Canada Yew	*Taxaceae*	*Taxus canadensis*	S4
Common Elderberry	*Viburnaceae*	*Sambucus canadensis*	S4S5
Red Elderberry	*Viburnaceae*	*Sambucus racemosa*	S5
Northern Wild Raisin	*Viburnaceae*	*Viburnum cassinoides*	S5
Hobblebush	*Viburnaceae*	*Viburnum lantanoides*	S1S2
Highbush Cranberry	*Viburnaceae*	*Viburnum opulus*	S3
NON-NATIVE TREES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**

APPENDIX IX - SPECIES LIST - ALL SITES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
English Oak	*Fagaceae*	*Quercus robur*	SNA
European linden	*Malvaceae*	*Tilia x europaea*	SNA
Red Ash	*Oleaceae*	*Fraxinus pennsylvanica*	SNA
Austrian Pine	*Pinaceae*	*Pinus nigra*	SNA
Scotch Pine	*Pinaceae*	*Pinus sylvestris*	SNA
Common Apple	*Rosaceae*	*Malus pumila*	SNA
European Mountain Ash	*Rosaceae*	*Sorbus aucuparia*	SNA
Manitoba Maple	*Sapindaceae*	*Acer negundo*	SNA
Norway Maple	*Sapindaceae*	*Acer platanoides*	SNA
NON-NATIVE SHRUBS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Tartarian Honeysuckle	*Caprifoliaceae*	*Lonicera tatarica*	SNA
WILDFLOWERS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
American Sweetflag	*Acoraceae*	*Acorus americanus*	S4
Broad-leaved Arrowhead	*Alismataceae*	*Sagittaria latifolia*	S4
Saline Saltbush	*Amaranthaceae*	*Atriplex dioica*	S4
Narrow-leaved Orache	*Amaranthaceae*	*Atriplex littoralis*	SNA
Thin-leaved Orache	*Amaranthaceae*	*Atriplex prostrata*	S4
Common Lamb's Quarters	*Amaranthaceae*	*Chenopodium album*	SNA
Common Saltwort	*Amaranthaceae*	*Kali turgidum*	SNA
Sea Glasswort	*Amaranthaceae*	*Salicornia maritima*	S4S5
White Sea-blite	*Amaranthaceae*	*Suaeda maritima*	S4S5
Seaside Angelica	*Apiaceae*	*Angelica lucida*	S2S3
Woodland Angelica	*Apiaceae*	*Angelica sylvestris*	SNA
Bulbous Water-hemlock	*Apiaceae*	*Cicuta bulbifera*	S4S5
Queen Anne's Lace	*Apiaceae*	*Daucus carota*	SNA
Common Cow Parsnip	*Apiaceae*	*Heracleum maximum*	S4
Scotch Lovage	*Apiaceae*	*Ligusticum scoticum*	S4
Maryland Sanicle	*Apiaceae*	*Sanicula marilandica*	S3S4
Common Water Parsnip	*Apiaceae*	*Sium suave*	S5
Jack-in-the-pulpit	*Araceae*	*Arisaema triphyllum*	S4
Turion Duckweed	*Araceae*	*Lemna turionifera*	S4S5
Bristly Sarsaparilla	*Araliaceae*	*Aralia hispida*	S4
Wild Sarsaparilla	*Araliaceae*	*Aralia nudicaulis*	S5
Wild Lily-of-The-Valley	*Asparagaceae*	*Maianthemum canadense*	S5
Large False Solomon's Seal	*Asparagaceae*	*Maianthemum racemosum*	S4
Starry False Solomon's Seal	*Asparagaceae*	*Maianthemum stellatum*	S3
Three-leaved False Soloman's Seal	*Asparagaceae*	*Maianthemum trifolium*	S4
Common Yarrow	*Asteraceae*	*Achillea millefolium*	SNA
Common Ragweed	*Asteraceae*	*Ambrosia artemisiifolia*	S4
Pearly Everlasting	*Asteraceae*	*Anaphalis margaritacea*	S5
Common Burdock	*Asteraceae*	*Arctium minus*	SNA
Beach Wormwood	*Asteraceae*	*Artemisia stelleriana*	SNA
Nodding Beggarticks	*Asteraceae*	*Bidens cernua*	S4
Devil's Beggarticks	*Asteraceae*	*Bidens frondosa*	S5
Canada Thistle	*Asteraceae*	*Cirsium arvense*	SNA
Hairy Flat-top White Aster	*Asteraceae*	*Doellingeria umbellata*	S5
Eastern Burnweed	*Asteraceae*	*Erechtites hieraciifolius*	S4

APPENDIX IX - SPECIES LIST - ALL SITES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Canada Horseweed	*Asteraceae*	*Erigeron canadensis*	S5
Rough Fleabane	*Asteraceae*	*Erigeron strigosus*	S5
Large-leaved Aster	*Asteraceae*	*Eurybia macrophylla*	S3
Grass-leaved Goldenrod	*Asteraceae*	*Euthamia graminifolia*	S5
Spotted Joe Pye Weed	*Asteraceae*	*Eutrochium maculatum*	S5
Rough Hawkweed	*Asteraceae*	*Hieracium scabrum*	S4
Hawkweed spp.	*Asteraceae*	*Hieracium sp*	N/A
Tansy Ragwort	*Asteraceae*	*Jacobaea vulgaris*	SNA
Oxeye Daisy	*Asteraceae*	*Leucanthemum vulgare*	SNA
Pineapple Weed	*Asteraceae*	*Matricaria discoidea*	SNA
Three-leaved Rattlesnakeroot	*Asteraceae*	*Nabalus trifoliolatus*	S5
Whorled Wood Aster	*Asteraceae*	*Oclemena acuminata*	S5
Woodland Cudweed	*Asteraceae*	*Omalotheca sylvatica*	S4
Black-Eyed Susan	*Asteraceae*	*Rudbeckia hirta*	SNA
Cut-Leaved Coneflower	*Asteraceae*	*Rudbeckia laciniata*	S2
White Goldenrod	*Asteraceae*	*Solidago bicolor*	S4
Canada Goldenrod	*Asteraceae*	*Solidago canadensis*	S5
Large-leaved Goldenrod	*Asteraceae*	*Solidago macrophylla*	S2
Gray-stemmed Goldenrod	*Asteraceae*	*Solidago nemoralis*	S4
Downy Goldenrod	*Asteraceae*	*Solidago puberula*	S4S5
Rough-stemmed Goldenrod	*Asteraceae*	*Solidago rugosa*	S5
Seaside Goldenrod	*Asteraceae*	*Solidago sempervirens*	S4S5
Field Sow Thistle	*Asteraceae*	*Sonchus arvensis*	SNA
Heart-leaved Aster	*Asteraceae*	*Symphyotrichum cordifolium*	S4
Calico Aster	*Asteraceae*	*Symphyotrichum lateriflorum*	S5
New York Aster	*Asteraceae*	*Symphyotrichum novi-belgii*	S5
Purple-stemmed Aster	*Asteraceae*	*Symphyotrichum puniceum*	S5
Aster spp.	*Asteraceae*	*Symphyotrichum sp*	N/A
Common Dandelion	*Asteraceae*	*Taraxacum officinale*	SNA
Meadow Goatsbeard	*Asteraceae*	*Tragopogon pratensis*	SNA
Coltsfoot	*Asteraceae*	*Tussilago farfara*	SNA
Rough Cocklebur	*Asteraceae*	*Xanthium strumarium*	S4
Spotted Jewelweed	*Balsaminaceae*	*Impatiens capensis*	S5
Small Forget-Me-Not	*Boraginaceae*	*Myosotis laxa*	S4
Yellow Rocket	*Brassicaceae*	*Barbarea vulgaris*	SNA
American Searocket	*Brassicaceae*	*Cakile edentula*	S4S5
Large Toothwort	*Brassicaceae*	*Cardamine maxima*	S1
Pennsylvania Bittercress	*Brassicaceae*	*Cardamine pensylvanica*	S4S5
Twinflower	*Caprifoliaceae*	*Linnaea borealis*	S5
Mouse-Ear Chickweed	*Caryophyllaceae*	*Cerastium arvense*	SNA
Seabeach Sandwort	*Caryophyllaceae*	*Honckenya peploides*	S3S4
Blunt-leaved Sandwort	*Caryophyllaceae*	*Moehringia lateriflora*	S5
Procumbent Pearlwort	*Caryophyllaceae*	*Sagina procumbens*	S4
Canada Sandspurrey	*Caryophyllaceae*	*Spergularia canadensis*	S4
Ruby Sandspurrey	*Caryophyllaceae*	*Spergularia rubra*	SNA
Saltmarsh Sandspurrey	*Caryophyllaceae*	*Spergularia salina*	S4
Beach Pinweed	*Cistaceae*	*Lechea maritima*	S2

APPENDIX IX - SPECIES LIST - ALL SITES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Hedge False Bindweed	*Convolvulaceae*	*Calystegia sepium*	S5
Dodder	Convolvulaceae	*Cuscuta sp.*	S?
Bunchberry	*Cornaceae*	*Cornus canadensis*	S5
Mossy Stonecrop	*Crassulaceae*	*Sedum acre*	SNA
Saltmarsh Bulrush	*Cyperaceae*	*Bolboschoenus maritimus*	S4
Round-leaved Sundew	*Droseraceae*	*Drosera rotundifolia*	S4
Trailing Arbutus	*Ericaceae*	*Epigaea repens*	S4
Creeping Snowberry	*Ericaceae*	*Gaultheria hispidula*	S5
Eastern Teaberry	*Ericaceae*	*Gaultheria procumbens*	S4S5
One-flowered Wintergreen	*Ericaceae*	*Moneses uniflora*	S3
Convulsion-Root	*Ericaceae*	*Monotropa uniflora*	S5
One-sided Wintergreen	*Ericaceae*	*Orthilia secunda*	S4S5
Round-leaved Pyrola	*Ericaceae*	*Pyrola americana*	S4
Shinleaf	*Ericaceae*	*Pyrola elliptica*	S5
Large Cranberry	*Ericaceae*	*Vaccinium macrocarpon*	S4S5
Small Cranberry	*Ericaceae*	*Vaccinium oxycoccos*	S4
Mountain Cranberry	*Ericaceae*	*Vaccinium vitis-idaea*	S3
Seaside Spurge	*Euphorbiaceae*	*Euphorbia polygonifolia*	S2S3
Clover spp.	*Fabaceae*	*Clover spp.*	N/A
Beach Pea	*Fabaceae*	*Lathyrus japonicus*	S4S5
Marsh Vetchling	*Fabaceae*	*Lathyrus palustris*	S4S5
Nootka Lupine	*Fabaceae*	*Lupinus nootkatensis*	SNA
Rabbit's-foot Clover	*Fabaceae*	*Trifolium arvense*	SNA
Yellow Clover	*Fabaceae*	*Trifolium aureum*	SNA
Red Clover	*Fabaceae*	*Trifolium pratense*	SNA
White Clover	*Fabaceae*	*Trifolium repens*	SNA
Tufted Vetch	*Fabaceae*	*Vicia cracca*	SNA
Herb Robert	*Geraniaceae*	*Geranium robertianum*	S4
Fraser's St. John's-wort	*Hypericaceae*	*Hypericum fraseri*	S5
Large St John's-wort	*Hypericaceae*	*Hypericum majus*	S3
Harlequin Blue Flag	*Iridaceae*	*Iris versicolor*	S5
Mountain Blue-eyed-grass	*Iridaceae*	*Sisyrinchium montanum*	S5
Seaside Arrowgrass	*Juncaginaceae*	*Triglochin maritima*	S4S5
Common Hemp-nettle	*Lamiaceae*	*Galeopsis tetrahit*	SNA
American Water Horehound	*Lamiaceae*	*Lycopus americanus*	S4S5
Northern Water Horehound	*Lamiaceae*	*Lycopus uniflorus*	S5
Canadian Mint	*Lamiaceae*	*Mentha canadensis*	S4S5
Common Self-heal	*Lamiaceae*	*Prunella vulgaris*	S5
Marsh Skullcap	*Lamiaceae*	*Scutellaria galericulata*	S4S5
Mad-dog Skullcap	*Lamiaceae*	*Scutellaria lateriflora*	S5
Canada Germander	*Lamiaceae*	*Teucrium canadense*	S3S4
Yellow Bluebead Lily	*Liliaceae*	*Clintonia borealis*	S5
Cucumber Root	*Liliaceae*	*Medeola virginiana*	S3S4
Clasping-leaved Twisted-stalk	*Liliaceae*	*Streptopus amplexifolius*	S4
Rose Twisted-stalk	*Liliaceae*	*Streptopus lanceolatus*	S4
Purple Loosestrife	*Lythraceae*	*Lythrum salicaria*	SNA
Nodding Trillium	*Melanthiaceae*	*Trillium cernuum*	S4

APPENDIX IX - SPECIES LIST - ALL SITES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Fireweed	*Onagraceae*	*Chamaenerion angustifolium*	S5
Small Enchanter's Nightshade	*Onagraceae*	*Circaea alpina*	S5
Broad-leaved Enchanter's Nightshade	*Onagraceae*	*Circaea canadensis*	S2S3
Northern Willowherb	*Onagraceae*	*Epilobium ciliatum*	S5
Bog Willowherb	*Onagraceae*	*Epilobium leptophyllum*	S4S5
Willherb spp.	*Onagraceae*	*Epilobium sp*	N/A
Common Evening Primrose	*Onagraceae*	*Oenothera biennis*	S5
Small-flowered Evening Primrose	*Onagraceae*	*Oenothera parviflora*	S4S5
Tuberous Grass Pink	*Orchidaceae*	*Calopogon tuberosus*	S3
Pink Lady's-Slipper	*Orchidaceae*	*Cypripedium acaule*	S5
Helleborine	*Orchidaceae*	*Epipactis helleborine*	SNA
Loesel's Twayblade	*Orchidaceae*	*Liparis loeselii*	S3
White Fringed Orchid	*Orchidaceae*	*Platanthera blephariglottis*	S3S4
Small Purple Fringed Orchid	*Orchidaceae*	*Platanthera psycodes*	S4
Nodding Ladies'-Tresses	*Orchidaceae*	*Spiranthes cernua*	S1?
Slender Ladies'-tresses	*Orchidaceae*	*Spiranthes lacera*	S4
Common Eyebright	*Orobanchaceae*	*Euphrasia nemorosa*	SNA
American Cow Wheat	*Orobanchaceae*	*Melampyrum lineare*	S4S5
European Wood Sorrel	*Oxalidaceae*	*Oxalis stricta*	S5
White Turtlehead	*Plantaginaceae*	*Chelone glabra*	S5
Common Mare's-Tail	*Plantaginaceae*	*Hippuris vulgaris*	S3S4
Butter-and-Eggs	*Plantaginaceae*	*Linaria vulgaris*	SNA
English Plantain	*Plantaginaceae*	*Plantago lanceolata*	SNA
Common Plantain	*Plantaginaceae*	*Plantago major*	SNA
Seaside Plantain	*Plantaginaceae*	*Plantago maritima*	S4S5
American Speedwell	*Plantaginaceae*	*Veronica americana*	S4
Common Speedwell	*Plantaginaceae*	*Veronica officinalis*	SNA
Sea Lavender	*Plumbaginaceae*	*Limonium carolinianum*	S4S5
American Beach Grass	*Poaceae*	*Calamagrostis breviligulata*	S4S5
Virginia Wild Rye	*Poaceae*	*Elymus virginicus*	S2S3
Sea Lyme Grass	*Poaceae*	*Leymus mollis*	S4
Smooth Cordgrass	*Poaceae*	*Sporobolus alterniflorus*	S4S5
Prairie Cordgrass	*Poaceae*	*Sporobolus michauxianus*	S5
Saltmeadow Cordgrass	*Poaceae*	*Sporobolus pumilus*	S4S5
Fringed Black Bindweed	*Polygonaceae*	*Fallopia cilinodis*	S4
Climbing False Buckwheat	*Polygonaceae*	*Fallopia scandens*	S3
Water Smartweed	*Polygonaceae*	*Persicaria amphibia*	S4
Dotted Smartweed	*Polygonaceae*	*Persicaria punctata*	S4
Arrow-leaved Smartweed	*Polygonaceae*	*Persicaria sagittata*	S5
Japanese Knotweed	*Polygonaceae*	*Reynoutria japonica*	SNA
Sheep Sorrel	*Polygonaceae*	*Rumex acetosella*	SNA
Greater Water Dock	*Polygonaceae*	*Rumex britannica*	S5
Curled Dock	*Polygonaceae*	*Rumex crispus*	SNA
Tierra del Fuego Dock	*Polygonaceae*	*Rumex fueginus*	S4
Northern Starflower	*Primulaceae*	*Lysimachia borealis*	S5
Sea Milkwort	*Primulaceae*	*Lysimachia maritima*	S4S5
Swamp Yellow Loosestrife	*Primulaceae*	*Lysimachia terrestris*	S4S5

APPENDIX IX - SPECIES LIST - ALL SITES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Tufted Yellow Loosestrife	*Primulaceae*	*Lysimachia thyrsiflora*	S4S5
Seaside Brookweed	*Primulaceae*	*Samolus parviflorus*	S1
Red Baneberry	*Ranunculaceae*	*Actaea rubra*	S4
Yellow Marsh Marigold	*Ranunculaceae*	*Caltha palustris*	S4S5
Goldthread	*Ranunculaceae*	*Coptis trifolia*	S5
Seaside Buttercup	*Ranunculaceae*	*Halerpestes cymbalaria*	S4
Common Buttercup	*Ranunculaceae*	*Ranunculus acris*	SNA
Creeping Buttercup	*Ranunculaceae*	*Ranunculus repens*	SNA
White Water Buttercup	*Ranunculaceae*	*Ranunculus trichophyllus*	S4
Tall Meadow-Rue	*Ranunculaceae*	*Thalictrum pubescens*	S5
Marsh Cinquefoil	*Rosaceae*	*Comarum palustre*	S4
Wild Strawberry	*Rosaceae*	*Fragaria virginiana*	S5
Rough Avens	*Rosaceae*	*Geum laciniatum*	S4
Avens	*Rosaceae*	*Geum sp*	N/A
Common Silverweed	*Rosaceae*	*Potentilla anserina*	S5
Silvery Cinquefoil	*Rosaceae*	*Potentilla argentea*	SNA
Rough Cinquefoil	*Rosaceae*	*Potentilla norvegica*	S4S5
Three-toothed Cinquefoil	*Rosaceae*	*Sibbaldia tridentata*	S3
Common Bedstraw	*Rubiaceae*	*Galium aparine*	S1
Rough Bedstraw	*Rubiaceae*	*Galium asprellum*	S4S5
Smooth Bedstraw	*Rubiaceae*	*Galium mollugo*	SNA
Common Marsh Bedstraw	*Rubiaceae*	*Galium palustre*	S5
Bedstraw	*Rubiaceae*	*Galium sp*	N/A
Three-petaled Bedstraw	*Rubiaceae*	*Galium trifidum*	S4S5
Three-flowered Bedstraw	*Rubiaceae*	*Galium triflorum*	S5
Partridgeberry	*Rubiaceae*	*Mitchella repens*	S2S3
Bastard's Toadflax	*Santalaceae*	*Comandra umbellata*	S3
Northern Pitcher Plant	*Sarraceniaceae*	*Sarracenia purpurea*	S4
Bittersweet Nightshade	*Solanaceae*	*Solanum dulcamara*	SNA
Green-fruited Burreed	*Typhaceae*	*Sparganium emersum*	S4S5
Broad-fruited Burreed	*Typhaceae*	*Sparganium eurycarpum*	S4
Broad-leaved Cattail	*Typhaceae*	*Typha latifolia*	S5
Stinging Nettle	*Urticaceae*	*Urtica dioica ssp. gracilis*	S4
Sweet White Violet	*Violaceae*	*Viola blanda*	S4S5
Small White Violet	*Violaceae*	*Viola macloskeyi*	S5
Virginia Creeper	Vitaceae	*Parthenocissus quinquefolia*	SNA
Common Eelgrass	*Zosteraceae*	*Zostera marina*	S4
FERNS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Common Lady Fern	*Athyriaceae*	*Athyrium filix-femina*	S5
Common Oak Fern	*Cystopteridaceae*	*Gymnocarpium dryopteris*	S5
Eastern Hay-Scented Fern	*Dennstaedtiaceae*	*Dennstaedtia punctilobula*	S5
Bracken Fern	*Dennstaedtiaceae*	*Pteridium aquilinum*	S5
Mountain Wood Fern	*Dryopteridaceae*	*Dryopteris campyloptera*	S4
Spinulose Wood Fern	*Dryopteridaceae*	*Dryopteris carthusiana*	S4S5
Crested Wood Fern	*Dryopteridaceae*	*Dryopteris cristata*	S5
Evergreen Wood Fern	*Dryopteridaceae*	*Dryopteris intermedia*	S5
Christmas Fern	*Dryopteridaceae*	*Polystichum acrostichoides*	S2S3

APPENDIX IX - SPECIES LIST - ALL SITES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Ostrich Fern	*Onocleaceae*	*Matteuccia struthiopteris*	S4
Sensitive Fern	*Onocleaceae*	*Onoclea sensibilis*	S5
Interrupted Fern	*Osmundaceae*	*Claytosmunda claytoniana*	S5
Royal Fern	*Osmundaceae*	*Osmunda regalis*	S4
Royal Fern	*Osmundaceae*	*Osmunda regalis var. spectabilis*	S4
Cinnamon Fern	*Osmundaceae*	*Osmundastrum cinnamomeum*	S5
New York Fern	*Thelypteridaceae*	*Parathelypteris noveboracensis*	S5
Northern Beech Fern	*Thelypteridaceae*	*Phegopteris connectilis*	S5
Eastern Marsh Fern	*Thelypteridaceae*	*Thelypteris palustris*	S4S5
CLUBMOSSES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Round-branched Tree-clubmoss	*Lycopodiaceae*	*Dendrolycopodium dendroideum*	S5
Hickey's Tree-clubmoss	*Lycopodiaceae*	*Dendrolycopodium hickeyi*	S3
Northern Bog Clubmoss	*Lycopodiaceae*	*Lycopodiella inundata*	S3
Running Clubmoss	*Lycopodiaceae*	*Lycopodium clavatum*	S4S5
One-cone clubmoss	*Lycopodiaceae*	*Lycopodium lagopus*	S2S3
HORSETAILS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Field Horsetail	*Equisetaceae*	*Equisetum arvense*	S5
Woodland Horsetail	*Equisetaceae*	*Equisetum sylvaticum*	S5
MOSSES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Heart-leaved Spear Moss	Amblystegiaceae	*Calliergon cordifolium*	S4S5
Glow Moss	Aulacomniaceae	*Aulacomnium palustre*	S5
Silvery Bryum Moss	Bryaceae	*Bryum argenteum*	S4S5
Tall Clustered Thread Moss	*Bryaceae*	*Ptychostomum pseudotriquetrum*	S5
Northern Tree Moss	Climaciaceae	*Climacium dendroides*	S5
Whip Broom Moss	Dicranaceae	*Dicranum flagellare*	S5
Mountain Broom Moss	Dicranaceae	*Dicranum montanum*	S5
Wavy-leaved Broom Moss	Dicranaceae	*Dicranum polysetum*	S5
Common Broom Moss	Dicranaceae	*Dicranum scoparium*	S5
Fire Moss	Ditrichaceae	*Ceratodon purpureus*	S5
Common Cord Moss	Funariaceae	*Funaria hygrometrica*	S5
Stairstep Moss	Hylocomiaceae	*Hylocomium splendens*	S5
Electrified Cat's-tail Moss	Hylocomiaceae	*Rhytidiadelphus triquetrus*	S5
Red-stemmed Feather Moss	Hylocomiaceae	*Pleurozium schreberi*	S5
Beautiful Branch Moss	Hypnaceae	*Callicladium haldanianum*	S5
Pellucid Plait Moss	*Hypnaceae*	*Hypnum imponens*	S5
Knight's Plume Moss	*Hypnaceae*	*Ptilium crista-castrensis*	S5
Swan's-neck Leafy Moss	Mniaceae	*Mnium hornum*	S5
Dotted Leafy Moss	Mniaceae	*Rhizomnium punctatum*	S4?
Feathery Neckera Moss	*Neckeraceae*	*Neckera pennata*	S5
Crisped Pincushion Moss	Orthotrichaceae	*Ulota crispa*	S5
a Moss	Orthotrichaceae	*Ulota sp.*	SU
Smoothcap Moss	Polytrichaceae	*Atrichum sp*	N/A
Common Smoothcap Moss	Polytrichaceae	*Atrichum undulatum*	S4S5
Common Haircap Moss	Polytrichaceae	*Polytrichum commune*	S5
Bristly Haircap Moss	Polytrichaceae	*Polytrichum piliferum*	S4S5
Bog Haircap Moss	Polytrichaceae	*Polytrichum strictum*	S4S5
Recurved Brotherella Moss	*Sematophyllaceae*	*Brotherella recurvans*	SU

APPENDIX IX - SPECIES LIST - ALL SITES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Brown Peat Moss	*Sphagnaceae*	*Sphagnum fuscum*	S4S5
Green Peat Moss	*Sphagnaceae*	*Sphagnum girgensohnii*	S5
Blunt-leaved Peat Moss	*Sphagnaceae*	*Sphagnum palustre*	S5
Red Peat Moss	*Sphagnaceae*	*Sphagnum rubellum*	S4S5
Peatmoss	*Sphagnaceae*	*Sphagnum sp*	N/A
Shaggy Peat Moss	Sphagnaceae	*Sphagnum squarrosum*	S5
Common Four-tooth Moss	Tetraphidaceae	*Tetraphis pellucida*	S5
Delicate Fern Moss	*Thuidiaceae*	*Thuidium delicatulum*	S4S5
LIVERWORTS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Wood Rustwort	Cephaloziaceae	*Nowellia curvifolia*	SU
Frullania Liverwort	Jubulaceae	*Frullania sp.*	SU
Three-lobed Whipwort	Lepidoziaceae	*Bazzania trilobata*	S5
Variable-Leaved Crestwort	Lophocoleaceae	*Lophocolea heterophylla*	SU
Green-tongue Liverwort	Marchantiaceae	*Marchantia polymorpha*	SU
Common Pellia	Pelliaceae	*Pellia epiphylla*	SU
Ciliate Fringewort	Ptilidiaceae	*Ptilidium ciliare*	SU
	Ptilidiaceae	*Ptilidium pulcherrimum*	SU
Flat-leaved Scalewort	Radulaceae	*Radula complanata*	SU
LICHENS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Reindeer Lichen	Cladoniaceae	*Cladonia arbuscula*	S5
Fishnet Lichen	Cladoniaceae	*Cladonia boryi*	S4S5
Powdered Funnel Lichen	Cladoniaceae	*Cladonia cenotea*	S4S5
Mealy Pixie-cup Lichen	Cladoniaceae	*Cladonia chlorophaea*	S4S5
Trumpeting Lichen	Cladoniaceae	*Cladonia fimbriata*	SU
Lipstick Powderhorn Lichen	Cladoniaceae	*Cladonia macilenta*	SU
Giant Cladonia Lichen	Cladoniaceae	*Cladonia maxima*	SU
Smooth-footed Powderhorn Lichen	Cladoniaceae	*Cladonia ochrochlora*	S4S5
Red-fruited Pixie-cup	Cladoniaceae	*Cladonia pleurota*	SU
Gray Reindeer Lichen	Cladoniaceae	*Cladonia rangiferina*	S5
Cladonia spp.	Cladoniaceae	*Cladonia sp*	N/A
Dragon Lichen	Cladoniaceae	*Cladonia squamosa*	S4S5
Star-tipped Reindeer Lichen	Cladoniaceae	*Cladonia stellaris*	S4S5
Tree Tarpaper Lichen	Collemataceae	*Collema subflaccidum*	S4S5
Blue Jellyskin Lichen	Collemataceae	*Leptogium cyanescens*	S5
a Lichen	Graphidaceae	*Graphis scripta*	S5
a Lichen	Haematommataceae	*Loxospora ochrophaea*	S5
Lungwort Lichen	Lobariaceae	*Lobaria pulmonaria*	S4S5
Textured Lungwort Lichen	Lobariaceae	*Lobaria scrobiculata*	S4
Smooth Lung Lichen	Lobariaceae	*Ricasolia quercizans*	S4S5
Burred Horsehair Lichen	Parmeliaceae	*Bryoria furcellata*	S5
Blonde Horsehair Lichen	Parmeliaceae	*Bryoria nadvornikiana*	S2?
Bryoria Lichen	Parmeliaceae	*Bryoria sp*	N/A
Camouflage Lichen	Parmeliaceae	Camouflage Lichen	N/A
Spiny Heath Lichen	Parmeliaceae	*Cetraria aculeata*	SU
Cetraria Lichen	Parmeliaceae	*Cetraria sp.*	N/A
Boreal Oakmoss Lichen	Parmeliaceae	*Evernia mesomorpha*	S5
Freckled Tube Lichen	Parmeliaceae	*Hypogymnia krogiae*	S1S2

APPENDIX IX - SPECIES LIST - ALL SITES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Monk's Hood Lichen	Parmeliaceae	*Hypogymnia physodes*	S5
Powder-headed Tube Lichen	Parmeliaceae	*Hypogymnia tubulosa*	S4S5
Abrading Camouflage Lichen	Parmeliaceae	*Melanelixia subaurifera*	S4S5
Bottlebrush Shield Lichen	Parmeliaceae	*Parmelia squarrosa*	S5
Hammered Shield Lichen	Parmeliaceae	*Parmelia sulcata*	S5
Varied Rag Lichen	Parmeliaceae	*Platismatia glauca*	S5
Crumpled Rag Lichen	Parmeliaceae	*Platismatia tuckermanii*	S3S4
Rough Speckleback Lichen	Parmeliaceae	*Punctelia rudecta*	S4S5
Variable Wrinkle Lichen	Parmeliaceae	*Tuckermannopsis orbata*	S4S5
Usnea	Parmeliaceae	*Usnea sp*	N/A
Bushy Beard Lichen	Parmeliaceae	*Usnea strigosa*	S4S5
Powdered Sunshine Lichen	Parmeliaceae	*Vulpicida pinastri*	S4S5
Buellia spp.	Physciaceae	*Buellia sp*	N/A
Orange-cored Shadow Lichen	Physciaceae	*Phaeophyscia rubropulchra*	S4S5
Hooded Rosette Lichen	Physciaceae	*Physcia adscendens*	S4S5
Star Rosette Lichen	Physciaceae	*Physcia stellaris*	SU
Sinewed Ramalina Lichen	Ramalinaceae	*Ramalina americana*	S4S5
Punctured Ramalina Lichen	Ramalinaceae	*Ramalina dilacerata*	S4S5
Hyphenated Ramalina Lichen	Ramalinaceae	*Ramalina farinacea*	S4S5
Frayed Ramalina Lichen	Ramalinaceae	*Ramalina roesleri*	S4S5
Rock Foam Lichen	Stereocaulaceae	*Stereocaulon saxatile*	SU
Woolly Foam Lichen	Stereocaulaceae	*Stereocaulon tomentosum*	S4S5
Maritime Sunburst Lichen		*Xanthoria parietina*	S4S5
FUNGI	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Fly Amanita	Amanitaceae	*Amanita muscaria*	SU
Barometer Earthstar	Astraeaceae	*Astraeus hygrometricus*	SU
White Coral Fungi	Clavariaceae	*Clavulina coralloides*	SU?
Smith's Earthstar	Diplocystidiaceae	*Astraeus smithii*	SU
AMPHIBIANS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Spring Peeper	Hylidae	*Pseudacris crucifer*	S5
Green Frog	Ranidae	*Lithobates clamitans*	S4S5
Wood Frog	Ranidae	*Lithobates sylvaticus*	S5
BIRDS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Northern Goshawk	Accipitridae	*Accipiter gentilis*	S4
Sharp-shinned Hawk	Accipitridae	*Accipiter striatus*	S4B
Red-tailed Hawk	Accipitridae	*Buteo jamaicensis*	S4B
Northern Harrier	Accipitridae	*Circus hudsonius*	S4B
Bald Eagle	Accipitridae	*Haliaeetus leucocephalus*	S5
Osprey	Accipitridae	*Pandion haliaetus*	S5B
American Black Duck	Anatidae	*Anas rubripes*	S5B,S4N
Canada Goose	Anatidae	*Branta canadensis*	SUB,S5M
Long-tailed Duck	Anatidae	*Clangula hyemalis*	S4N
American Wigeon	Anatidae	*Mareca americana*	S5B
White-winged Scoter	Anatidae	*Melanitta deglandi*	S4N
Surf Scoter	Anatidae	*Melanitta perspicillata*	S4N
Common Eider	Anatidae	*Somateria mollissima*	S4N
Great Blue Heron	Ardeidae	*Ardea herodias*	S4B

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COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Semipalmated Plover	Charadriidae	*Charadrius semipalmatus*	SHB,S4M
Mourning Dove	Columbidae	*Zenaida macroura*	S5
American Crow	Corvidae	*Corvus brachyrhynchos*	S5
Common Raven	Corvidae	*Corvus corax*	S5
Blue Jay	Corvidae	*Cyanocitta cristata*	S5
Dark-eyed Junco	Emberizidae	*Junco hyemalis*	S5
Swamp Sparrow	Emberizidae	*Melospiza georgiana*	S5B
Song Sparrow	Emberizidae	*Melospiza melodia*	S5B
Chipping Sparrow	Emberizidae	*Spizella passerina*	S4B
White-throated Sparrow	Emberizidae	*Zonotrichia albicollis*	S4S5B
Merlin	Falconidae	*Falco columbarius*	S4S5B
Common Redpoll	Fringillidae	*Acanthis flammea*	S5N
Purple Finch	Fringillidae	*Haemorhous purpureus*	S4S5B,S5M
White-winged Crossbill	Fringillidae	*Loxia leucoptera*	S3
Pine Siskin	Fringillidae	*Spinus pinus*	S2S3B,S4N
American Goldfinch	Fringillidae	*Spinus tristis*	S5
Red-throated Loon	Gaviidae	*Gavia stellata*	S4M
Barn Swallow	Hirundinidae	*Hirundo rustica*	S2B
Bank Swallow	Hirundinidae	*Riparia riparia*	S2S3B
Tree Swallow	Hirundinidae	*Tachycineta bicolor*	S3S4B
Red-winged Blackbird	Icteridae	*Agelaius phoeniceus*	S4B
Common Grackle	Icteridae	*Quiscalus quiscula*	S5B
Ring-billed Gull	Laridae	*Larus delawarensis*	S1B,S5M
Great Black-backed Gull	Laridae	*Larus marinus*	S2S3B,S5N
Common Tern	Laridae	*Sterna hirundo*	S1B
Boreal Chickadee	Paridae	*Poecile hudsonicus*	S3
Mourning Warbler	Parulidae	*Geothlypis philadelphia*	S4B,S4S5M
Common Yellowthroat	Parulidae	*Geothlypis trichas*	S5B
Black-and-White Warbler	Parulidae	*Mniotilta varia*	S5B
Northern Parula	Parulidae	*Setophaga americana*	S5B
Magnolia Warbler	Parulidae	*Setophaga magnolia*	S5B
Palm Warbler	Parulidae	*Setophaga palmarum*	S5B
American Redstart	Parulidae	*Setophaga ruticilla*	S4S5B,S5M
Black-throated Green Warbler	Parulidae	*Setophaga virens*	S5B
Double-crested Cormorant	Phalacrocoracidae	*Nannopterum auritum*	S5B
Great Cormorant	Phalacrocoracidae	*Phalacrocorax carbo*	S1B
Ruffed Grouse	Phasianidae	*Bonasa umbellus*	S5
Northern Flicker	Picidae	*Colaptes auratus*	S5B
Red-necked Grebe	Podicipedidae	*Podiceps grisegena*	S3M
Sora	Rallidae	*Porzana carolina*	S5B
Golden-crowned Kinglet	Regulidae	*Regulus satrapa*	S5
Spotted Sandpiper	Scolopacidae	*Actitis macularius*	S2S3B,S4M
Ruddy Turnstone	Scolopacidae	*Arenaria interpres*	S3M
Sanderling	Scolopacidae	*Calidris alba*	S3M
Pectoral Sandpiper	Scolopacidae	*Calidris melanotos*	S3M
Least Sandpiper	Scolopacidae	*Calidris minutilla*	S4M
Willet	Scolopacidae	*Tringa semipalmata*	S3B

APPENDIX IX - SPECIES LIST - ALL SITES

COMMON NAME	FAMILY	SCIENTIFIC NAME	SRANK
Red-breasted Nuthatch	Sittidae	*Sitta canadensis*	S5
Short-eared Owl	Strigidae	*Asio flammeus*	S1B
Great Horned Owl	Strigidae	*Bubo virginianus*	S4
Northern Gannet	Sulidae	*Morus bassanus*	S5N
Hermit Thrush	Turdidae	*Catharus guttatus*	S5B
Swainson's Thrush	Turdidae	*Catharus ustulatus*	S4B
American Robin	Turdidae	*Turdus migratorius*	S5B
Alder Flycatcher	Tyrannidae	*Empidonax alnorum*	S5B
Red-eyed Vireo	Vireonidae	*Vireo olivaceus*	S5B
MAMMALS	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Coyote	Canidae	*Canis latrans*	S5
Red Fox	Canidae	*Vulpes vulpes*	S5
North American Beaver	Castoridae	*Castor canadensis*	S5
Snowshoe Hare	Leporidae	*Lepus americanus*	S5
Common Muskrat	Muridae	*Ondatra zibethicus*	S5
Ermine	Mustelidae	*Mustela erminea*	S5
American Mink	Mustelidae	*Vison vison*	S5
Red Squirrel	Sciuridae	*Tamiasciurus hudsonicus*	S5
Shrew	Soricidae		N/A
REPTILES	**FAMILY**	**SCIENTIFIC NAME**	**SRANK**
Common Gartersnake	Colubridae	*Thamnophis sirtalis*	S5

APPENDIX X - SITES

SiteNumber	SiteName	Location	County	LITTORAL CELL	Category	Coast_Type	Distribution
1	LongPond	Dalvay	Queens	Tracadie	PrimeKrummholz	Dunes	Coastal Front
2	StanhopeBeach	Dalvay	Queens	Tracadie	PrimeKrummholz	Dunes	Coastal Front
3	StanhopeCapeBeach	Stanhope Bayshore	Queens	Tracadie	PrimeKrummholz	Dunes	Scattered Areas
4	EastPoint	East Point	Kings	Naufrage	PrimeKrummholz	Cliff	Coastal Front
5	Basinhead	Basinhead	Kings	Northeast	SecondaryKrumm	Dunes	Scattered Areas
6	CampbellsCove_Campground	Campbells Cove	Kings	Naufrage	SecondaryKrumm	Bluff	Sparse
7	Cow River	Cow River	Kings	Naufrage	PrimeKrummholz	Bluff	Coastal Front
8	BelmontPP	Malpeque Bay	Prince	Malpeque	SecondaryKrumm	Cliff	Minimal
9	NorthCape	North Cape	Prince	West	PrimeKrummholz	Cliff	Coastal Front
10	Enmore	Percival Bay	Prince	Egmont	TertiaryKrumm	Low	Minimal
11	Cameron Island	Cameron Island	Queens	Hillsborough	SecondaryKrumm	Cliff	Coastal Front
12	Clearspring1	Clearspring	Kings	Naufrage	PrimeKrummholz	Cliff	Undulating Front
13	Pituamkek_SandHills	Pituamkek	Prince	Malpeque	PrimeKrummholz	Dunes	Scattered Areas
14	Pituamkek_Forest	Pituamkek	Prince	Malpeque	TertiaryKrumm	Cliff	Minimal
15	Dalvay_West	Dalvay	Queens	Tracadie	PrimeKrummholz	Dunes	Coastal Front
16	Dalvay_Parking	Dalvay	Queens	Tracadie	PrimeKrummholz	Cliff	Coastal Front
17	FlatRock	Cavendish	Queens	Cavendish	PrimeKrummholz	Cliff	Coastal Front
18	Oceanview	Cavendish	Queens	Cavendish	PrimeKrummholz	Cliff	Sparse
19	OrbyHead	Cavendish	Queens	Cavendish	PrimeKrummholz	Cliff	Coastal Front
20	BloomingPoint	Blooming Point	Queens	Tracadie	PrimeKrummholz	Dunes	Scattered Areas
21	Greenwich	Greenwich	Kings	St. Peter's	PrimeKrummholz	Dunes	Scattered Areas
22	Cablehead East	Cablehead	Kings	Naufrage	PrimeKrummholz	Dunes	Scattered Areas
23	Clearspring_2	Clearspring	Kings	Naufrage	PrimeKrummholz	Cliff	Undulating Front
24	TracadieBay	Tracade Bay	Queens	Tracadie	TertiaryKrumm	Low	Minimal
25	TracadieIsland	Tracadie Island	Queens	Tracadie	PrimeKrummholz	Dunes	Scattered Areas
26	RobinsonsIsland	Robinsons Island	Queens	Brackley	SecondaryKrumm	Cliff	Coastal Front
27	Oceanview_Dunes	Cavendish	Queens	Cavendish	PrimeKrummholz	Dunes	Scattered Areas
28	Clearspring_3	Clearspring	Kings	Naufrage	PrimeKrummholz	Cliff	Undulating Front
29	Crooked River	Clearspring	Kings	Naufrage	PrimeKrummholz	Cliff	Undulating Front
30	FortuneBeach	Rollo Bay	Kings	Northeast	TertiaryKrumm	Dunes	Minimal
31	BrackleyBeach	Brackley Point	Queens	Brackley	PrimeKrummholz	Dunes	Scattered Areas
32	CapeTurner	Cavendish	Queens	Cavendish	PrimeKrummholz	Cliff	Undulating Front

APPENDIX X - SITES

SiteNumber	SiteName	PID	Steward	Watershed Group	ARU	CAM	Drainage
1	LongPond	214569	ParksCanada	Friends of Covehead and Brackley Bays Inc.	Yes	No	Other
2	StanhopeBeach	214569	ParksCanada	Friends of Covehead and Brackley Bays Inc.	No	No	Other
3	StanhopeCapeBeach	214569	ParksCanada	Friends of Covehead and Brackley Bays Inc.	Yes	No	Other
4	EastPoint	846998	Private	Souris and Area Branch of the PEI Wildlife Federation	Yes	Yes	Other
5	Basinhead	891507	PEI Provincial Park	Souris and Area Branch of the PEI Wildlife Federation	Yes	No	Other
6	CampbellsCove_Campground	112441	Private	Souris and Area Branch of the PEI Wildlife Federation	No	No	Rapid
7	Cow River	427690	PEIGOV	Souris and Area Branch of the PEI Wildlife Federation	Yes	Yes	Rapid
8	BelmontPP	60442	PEI Provincial Park	Unassigned	Yes	No	Well
9	NorthCape	3004	PEIGOV	Tignish & Area Watershed Management Group Inc.	Yes	No	Organic
10	Enmore	22723	NCC	Trout Unlimited Prince County Chapter	Yes	Yes	Poor
11	Cameron Island	332692	PEIGOV	Belfast and Area Watershed Group	Yes	Yes	Well
12	Clearspring1	515445	PEIGOV	Souris and Area Branch of the PEI Wildlife Federation	Yes	No	Well
13	Pituamkek_SandHills	553685	LennoxIsland	Unassigned	No	No	Other
14	Pituamkek_Forest	553685	LennoxIsland	Unassigned	No	No	Other
15	Dalvay_West	214569	ParksCanada	Friends of Covehead and Brackley Bays Inc.	No	No	Other
16	Dalvay_Parking	214569	ParksCanada	Friends of Covehead and Brackley Bays Inc.	No	No	Other
17	FlatRock	232405	ParksCanada	Hunter Clyde Watershed Group Inc.	No	No	Well
18	Oceanview	232405	ParksCanada	Trout River Environmental Committee Inc.	No	No	Well
19	OrbyHead	232405	ParksCanada	Hunter Clyde Watershed Group Inc.	No	No	Well
20	BloomingPoint	111111	FEDERALGOV	Winter River/Tracadie Bay Watershed Association Inc.	No	No	Other
21	Greenwich	180018	ParksCanada	Morell River Management Co-operative	No	No	Other
22	Cablehead East	121624	INT	Souris and Area Branch of the PEI Wildlife Federation	No	No	Well
23	Clearspring_2	541656	PEIGOV	Souris and Area Branch of the PEI Wildlife Federation	No	No	Well
24	TracadieBay	142216	PEIGOV	Winter River/Tracadie Bay Watershed Association Inc.	No	No	Poor
25	TracadieIsland	214569	ParksCanada	Winter River/Tracadie Bay Watershed Association Inc.	No	No	Other
26	RobinsonsIsland	132225	ParksCanada	Friends of Covehead and Brackley Bays Inc.	No	No	Rapid
27	Oceanview_Dunes	232405	ParksCanada	Trout River Environmental Committee Inc.	No	No	Well
28	Clearspring_3	114389	PEIGOV	Souris and Area Branch of the PEI Wildlife Federation	No	No	Well
29	Crooked River	114454	PEIGOV	Souris and Area Branch of the PEI Wildlife Federation	No	No	Well
30	FortuneBeach	904615	Private	Souris and Area Branch of the PEI Wildlife Federation	No	No	Well
31	BrackleyBeach	132225	ParksCanada	Friends of Covehead and Brackley Bays Inc.	No	No	Other
32	CapeTurner	232405	FEDERALGOV	Hunter Clyde Watershed Group Inc.	No	No	Well

APPENDIX X - SITES

SiteNumber	SiteName	MaxDeform	LAT	LONG	Disturbance Factor	Raresppp	Species Rich	SNA	Nativespp	RESTORATION
1	LongPond	4	46.418404	-63.089186	3	3	82	12	70	No
2	StanhopeBeach	4	46.419976	-63.098527	7	3	105	20	85	No
3	StanhopeCapeBeach	4	46.429712	-63.13659	6	1	86	18	68	No
4	EastPoint	7	46.453471	-61.973545	4	6	103	11	92	No
5	Basinhead	3	46.380904	-62.10273	4	16	116	2	114	No
6	CampbellsCove_Campground	4	46.479334	-62.138994	8	1	86	19	67	No
7	Cow River	3	46.469791	-62.443812	5	1	161	14	147	No
8	BelmontPP	3	46.517918	-63.829305	6	0	41	5	36	No
9	NorthCape	6	47.046691	-64.007904	4	8	126	13	113	No
10	Enmore	2	46.602216	-64.078036	4	3	149	15	134	No
11	Cameron Island	4	46.066991	-63.017514	3	3	112	19	93	No
12	Clearspring1	7	46.470281	-62.345356	2	7	40	3	37	No
13	Pituamkek_SandHills	5	46.601676	-63.764693	0	10	117	2	115	No
14	Pituamkek_Forest	2	46.59955	-63.769787	1	16	157	6	151	No
15	Dalvay_West	5	46.417822	-63.081915	3	0	11	1	10	No
16	Dalvay_Parking	5	46.417133	-63.074243	6	0	31	4	27	Yes
17	FlatRock	6	46.499058	-63.368063	5	0	20	4	16	Yes
18	Oceanview	5	46.499901	-63.381164	5	1	18	1	17	Yes
19	OrbyHead	5	46.494095	-63.32705	6	0	27	2	25	Yes
20	BloomingPoint	5	46.418829	-62.967045	5	5	93	3	90	No
21	Greenwich	5	46.454087	-62.698023	4	2	35	1	34	No
22	Cablehead East	5	46.465473	-62.60916	3	4	41	1	40	Yes
23	Clearspring_2	7	46.471176	-62.337806	1	5	58	2	56	No
24	TracadieBay	2	46.389317	-63.004968	4	0	22	2	20	No
25	TracadieIsland	4	46.413862	-63.028031	2	6	40	2	38	No
26	RobinsonsIsland	3	46.438433	-63.250797	7	1	42	3	39	No
27	Oceanview_Dunes	5	46.498981	-63.384056	6	0	9	0	9	No
28	Clearspring_3	7	46.471219	-62.311342	1	6	21	0	21	Potential
29	Crooked River	7	46.470657	-62.328626	1	6	48	3	45	No
30	FortuneBeach	1	46.323733	-62.348487	4	0	10	2	8	No
31	BrackleyBeach	5	46.429859	-63.207604	5	0	12	0	12	No
32	CapeTurner	6	46.48997	-63.315451	4	3	14	0	14	No

APPENDIX X - SITES

SiteNumber	SiteName	Location	County	LITTORAL CELL	Category	Coast_Type	Distribution
33	NorthCape_South	North Cape	Prince	West	PrimeKrummholz	Cliff	Scattered Areas
34	CedarDunesPP	Cedar Dunes	Prince	West	SecondaryKrumm	Dunes	Sparse
35	Savage Harbour	Savage Harbour	Queens	St. Peter's	PrimeKrummholz	Dunes	Coastal Front
36	CabotBeachPP	Cabot Beach	Prince	Malpeque	PrimeKrummholz	Dunes	Coastal Front
37	CowRiver_East	Cow River	Kings	Naufrage	PrimeKrummholz	Cliff	Undulating Front
38	RedPoint_North	Red Point	Kings	Northeast	SecondaryKrumm	Dunes	Coastal Front
39	BrudenellPP	Brudenell Park	Kings	Cardigan	Inland	River_Estuary	Minimal
40	MurrayHarbour	Murray Harbour	Kings	Murray Harbour	TertiaryKrumm	River_Estuary	Minimal
41	Pinette Bay	Pinette Bay	Queens	Southeast	TertiaryKrumm	Bluff	Minimal
42	CapeBear_Inland	Cape Bear	Kings	Southeast	Inland	Inland	N/A
43	PantingShore	Panting Shore	Queens	Southeast	TertiaryKrumm	Dunes	Minimal
44	BeachPoint	Beach Point	Kings	Murray Harbour	SecondaryKrumm	Dunes	Coastal Front
45	Selkirk Park Marshes	Belfast	Queens	Hillsborough	TertiaryKrumm	Low	Minimal
46	Oceanview_East	Cavendish	Queens	Cavendish	PrimeKrummholz	Cliff	Undulating Front
47	LennoxIsland_Mawi_omiGrounds	Lennox Island	Prince	Malpeque	TertiaryKrumm	Low	Minimal
48	Enmore_South	Percival Bay	Prince	Egmont	TertiaryKrumm	Low	Minimal
49	JacquesCartierPP	Jacques Cartier Park	Prince	Malpeque	SecondaryKrumm	Low	Sparse
50	Canavoy Oaks	Canavoy	Kings	St. Peter's	CoastalForest	Inland	Minimal
51	MurrayRiver_Inland	Murray River	Kings	Murray Harbour	Inland	River_Estuary	Minimal
52	MorellRiver_Inland	Morell	Kings	St. Peter's	Inland	River_Estuary	Minimal
53	Dalvay_East	Dalvay	Queens	Tracadie	PrimeKrummholz	Dunes	Scattered Areas
54	Brackley_Inland	Brackley Point	Queens	Brackley	CoastalForest	Inland	Minimal
55	LennoxIsland_InlandEast	Lennox Island	Prince	Malpeque	CoastalForest	Inland	N/A

APPENDIX X - SITES

SiteNumber	SiteName	PID	Steward	Watershed Group	ARU	CAM	Drainage
33	NorthCape_South	914564	Private	Tignish & Area Watershed Management Group Inc.	No	No	Organic
34	CedarDunesPP	45666	PEI Provincial Park	West Point & Area Watersheds Inc.	No	No	Other
35	Savage Harbour	914697	Private	Winter River/Tracadie Bay Watershed Association Inc.	No	No	Other
36	CabotBeachPP	85266	PEI Provincial Park	Kensington North Watersheds Association Ltd.	No	No	Other
37	CowRiver_East	812917	Private	Souris and Area Branch of the PEI Wildlife Federation	No	No	Well
38	RedPoint_North	108266	Private	Souris and Area Branch of the PEI Wildlife Federation	No	No	Other
39	BrudenellPP	617670	PEI Provincial Park	Southeast Environmental Association	No	No	Other
40	MurrayHarbour	271619	Private	Southeast Environmental Association	No	No	Rapid
41	Pinette Bay	925271	Private	Belfast and Area Watershed Group	No	No	Well
42	CapeBear_Inland	659771	Private	Belfast and Area Watershed Group	No	No	Well
43	PantingShore	719559	Private	Belfast and Area Watershed Group	No	No	Other
44	BeachPoint	766352	PEIGOV	Belfast and Area Watershed Group	No	No	Other
45	Selkirk Park Marshes	768622	Community_Org	Belfast and Area Watershed Group	No	No	Other
46	Oceanview_East	232405	ParksCanada	Hunter Clyde Watershed Group Inc.	No	No	Well
47	LennoxIsland_Mawi_omiGrounds	553669	LennoxIsland	Unassigned	No	No	Poor
48	Enmore_South	23135	NCC	Trout Unlimited Prince County Chapter	No	No	Organic
49	JacquesCartierPP	535773	PEI Provincial Park	Tignish & Area Watershed Management Group Inc.	No	No	Well
50	Canavoy Oaks	1072719	INT	Hillsborough Area Watershed Co-operative	No	No	Well
51	MurrayRiver_Inland	428086	Private	Southeast Environmental Association	No	No	Rapid
52	MorellRiver_Inland	820183	PEIGOV	Morell River Management Co-operative	No	No	Imperfect
53	Dalvay_East	214569	ParksCanada	Winter River/Tracadie Bay Watershed Association Inc.	No	No	Other
54	Brackley_Inland	132209	ParksCanada	Friends of Covehead and Brackley Bays Inc.	No	No	Poor
55	LennoxIsland_InlandEast	553669	LennoxIsland	Unassigned	No	No	Poor

APPENDIX X - SITES

SiteNumber	SiteName	MaxDeform	LAT	LONG	Disturbance Factor	Raresppp	Species Rich	SNA	Nativespp	RESTORATION
33	NorthCape_South	5	47.037318	-64.014889	6	0	31	6	25	No
34	CedarDunesPP	5	46.620351	-64.383514	9	7	54	9	45	No
35	Savage Harbour	6	46.43142	-62.884704	5	0	12	1	11	No
36	CabotBeachPP	4	46.559714	-63.70303	6	5	86	15	71	No
37	CowRiver_East	7	46.470563	-62.435644	1	5	30	1	29	No
38	RedPoint_North	3	46.373502	-62.119413	3	7	38	1	37	No
39	BrudenellPP	1	46.197965	-62.578166	10	1	139	24	115	No
40	MurrayHarbour	1	46.006322	-62.523184	8	2	46	17	29	No
41	Pinette Bay	1	46.060631	-62.918927	4	0	23	5	18	No
42	CapeBear_Inland	0	46.002225	-62.466448	2	3	81	6	75	No
43	PantingShore	3	45.960325	-62.707257	6	0	26	2	24	No
44	BeachPoint	4	46.020205	-62.476153	6	1	17	1	16	No
45	Selkirk Park Marshes	1	46.091559	-62.916101	4	1	40	2	38	No
46	Oceanview_East	5	46.501216	-63.375477	2	4	22	0	22	No
47	LennoxIsland_Mawi_omiGrounds	2	46.621818	-63.867828	4	3	25	2	23	Potential
48	Enmore_South	2	46.585641	-64.080985	1	7	97	4	93	No
49	JacquesCartierPP	2	46.847424	-64.015185	7	0	64	7	57	No
50	Canavoy Oaks	1	46.424256	-62.816584	3	0	23	0	23	No
51	MurrayRiver_Inland	1	46.017012	-62.587203	5	4	42	6	36	No
52	MorellRiver_Inland	1	46.413325	-62.697416	4	4	66	4	62	No
53	Dalvay_East	5	46.415294	-63.063046	3	1	14	0	14	No
54	Brackley_Inland	0	46.426062	-63.205743	2	0	88	4	84	No
55	LennoxIsland_InlandEast	0	46.607962	-63.845156	4	2	24	1	23	No

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