

**NATURAL ABUNDANCE –
AN EVALUATION OF SPECIES
RICHNESS IN THE SEAL
RIVER WATERSHED**

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INTRODUCTION



In the northernmost reaches of Manitoba there is a pristine expanse of tundra, wetlands and boreal forest that is teeming with a multitude of large mammals, birds, fish, and plants found few other places on earth. The Seal River Watershed is one of the last remaining large-scale wilderness areas of its size that remains fully ecologically intact. At 50,000 square kilometers, the watershed is nearly the size of Nova Scotia. Protecting the watershed from developments that would adversely impact habitats would provide a solid foundation for these species to thrive.

The Seal River Watershed Alliance of Dene, Cree and Inuit peoples is working to permanently protect the entire watershed for future generations as an Indigenous Protected Area. The Manitoba Chapter of the Canadian Parks and Wilderness Society has supported these efforts since 2016.

This report compiles the records of 260 species that are known to live within the Seal River Watershed — 20 of which are considered “at-risk”—using publicly available data including provincial government records, natural history records, citizen science, and Indigenous Knowledge. This paper serves as a reference tool, describing a preliminary list of species that have been formally recorded in the area and highlighting the species that are at risk. Further research will likely uncover additional species present in the watershed.

BIODIVERSITY & SPECIES RICHNESS

Our world is facing extraordinary change — widespread habitat degradation and climate shifts have forced dramatic decreases in biodiversity unprecedented in human history (Mooney *et al.* 2009; Ceballos *et al.* 2017, Callaghan *et al.* 2020). The world has lost around 60 percent of its mammals, birds, reptiles, amphibians and fish in the past 40 years,¹ according to the World Wildlife Fund. Around a million species are at risk of extinction - many within decades - according to a 2019 UN report which found that a quarter of assessed plant and animal species are threatened.²

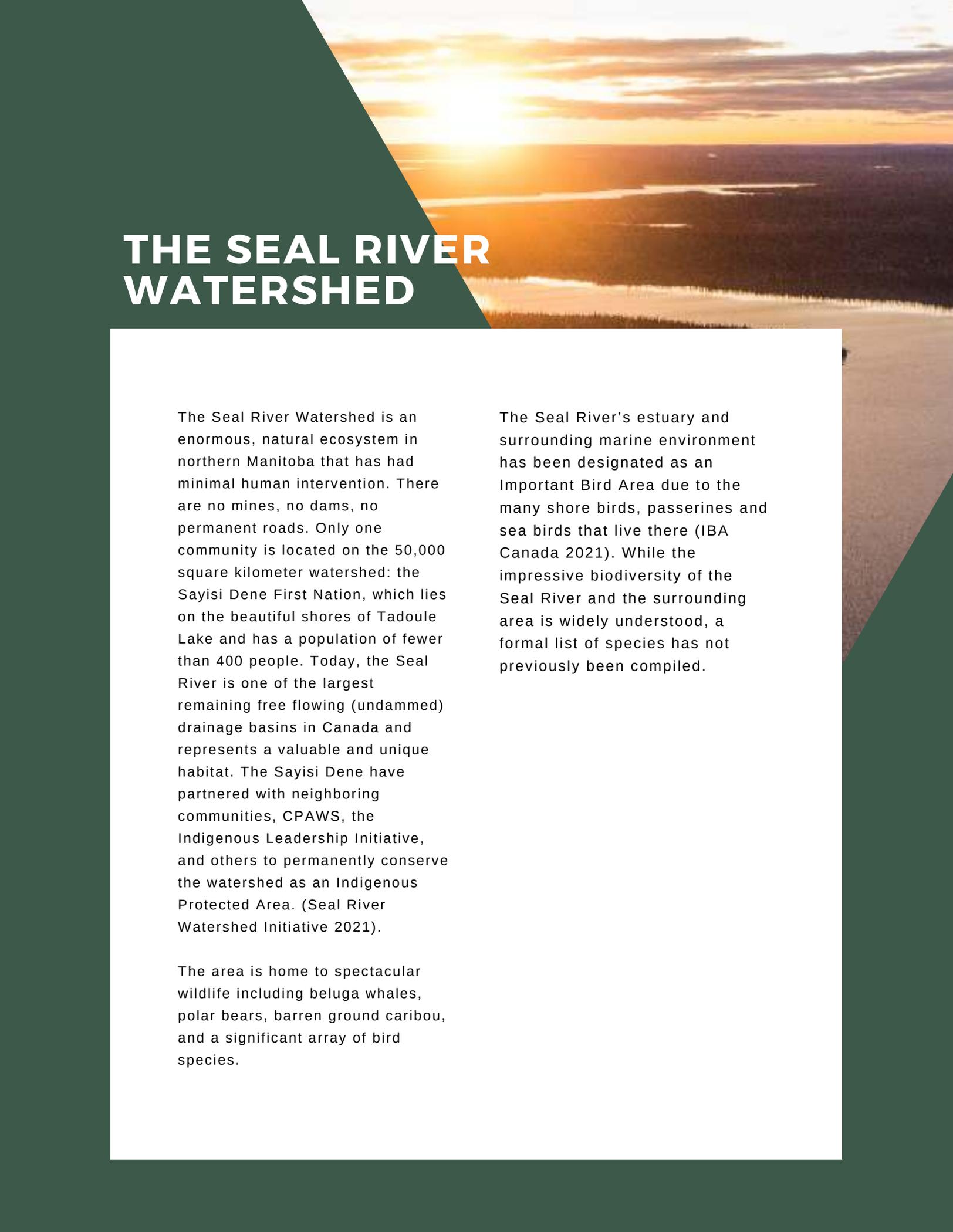
But what is biodiversity and why is it important? Put simply, biodiversity is the variety and abundance of life— all the plants, animals, fungi and microorganisms that make up our natural world.

Biodiversity holds immeasurable intrinsic significance, but also provides great economic, ecological, recreational, cultural and scientific value (Hooper *et al.* 2005; Duffy 2008; Morton & Hill 2014). The water you drink, the food you eat, and the air you breathe all rely on the multitude of species on Earth and the interactions among them.

Understanding regional biodiversity provides a baseline measure to compare ecosystem health and human impacts over time. This understanding can be used for ongoing wildlife monitoring programs and is a critical first step in quantifying the conservation value of a given area. Species richness (the number of species present) is a standard measure used to estimate the more complex concept of biodiversity (Chapin III *et al.* 2002). Estimating species richness for a given area helps identify the presence of species at risk and can help shape conservation decisions based on their critical habitat.

¹ Source: WWF Living Planet Report <https://explore.panda.org/wildlife>

² Source: https://ipbes.net/sites/default/files/2020-02/ipbes_global_assessment_report_summary_for_policymakers_en.pdf IPBES (2019): Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Diaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany. 1148 pages. <https://doi.org/10.5281/zenodo.3831673>



THE SEAL RIVER WATERSHED

The Seal River Watershed is an enormous, natural ecosystem in northern Manitoba that has had minimal human intervention. There are no mines, no dams, no permanent roads. Only one community is located on the 50,000 square kilometer watershed: the Sayisi Dene First Nation, which lies on the beautiful shores of Tadoule Lake and has a population of fewer than 400 people. Today, the Seal River is one of the largest remaining free flowing (undammed) drainage basins in Canada and represents a valuable and unique habitat. The Sayisi Dene have partnered with neighboring communities, CPAWS, the Indigenous Leadership Initiative, and others to permanently conserve the watershed as an Indigenous Protected Area. (Seal River Watershed Initiative 2021).

The area is home to spectacular wildlife including beluga whales, polar bears, barren ground caribou, and a significant array of bird species.

The Seal River's estuary and surrounding marine environment has been designated as an Important Bird Area due to the many shore birds, passerines and sea birds that live there (IBA Canada 2021). While the impressive biodiversity of the Seal River and the surrounding area is widely understood, a formal list of species has not previously been compiled.

METHODOLOGY

Conservationists and ecologists are increasingly relying, at least partially, on digitized natural history collections and citizen science to quantify biodiversity (Hendrick et al. 2020; Suarez & Tsutsui 2004; Meineke et al. 2019). Using a similar approach, in order to estimate the species richness of the Seal River Watershed we reviewed publicly available records of species occurrence that have been created from multiple sources and compiled them in one list (See appendix A). Whenever the occurrence of a species was found within the boundary of the Seal River watershed for any of the following sources, they were included in the list.

- *Canadensys*: an online database that compiles the Canadian natural history collections from 11 universities, five botanical gardens, and two museums which collectively house over 13 million specimens.
- *Important Bird Areas (IBA) Canada*: an online database of avian species jointly managed by Bird Studies Canada and Nature Canada that is part of a global effort to identify, monitor and conserve the most critical sites for birds and biodiversity. The Seal River estuary has been designated an IBA.
- *The Manitoba Herp Atlas*: a citizen science database project aimed at determining where Manitoba's amphibians and reptiles live.
- *Manitoba Conservation Data Centre*: a request for data on species occurrence within the Seal River Watershed was made to and received from the Province of Manitoba in 2019.
- *The Freshwater Fishes of Manitoba*: This is the definitive and highly regarded identification guide for the 93 species of freshwater fishes found in Manitoba. Each species is described in detail with an accompanying map of their distribution.
- *Local Indigenous Knowledge*: Sayisi Dene Elders and landscape users provided expert insight into the species in the area through disclosure of personal observations.

For each species that was found within the Seal River Watershed using the above sources, if applicable, we verified their conservation status (Endangered, Threatened, Special Concern, Extirpated, or Extinct) under the following regulatory and advisory bodies:

- *The Canada Species at Risk Act (SARA)*: This act is part of Canada's strategy to protect wild plants and animal species from becoming extinct and to help in their recovery. SARA legally prohibits the harming of species designated as threatened or endangered and recognizes that protecting the habitat of species at risk is key to their conservation.
- *Committee on the Status of Endangered Wildlife in Canada (COSEWIC)*: COSEWIC acts as the advisory body for SARA. Wildlife species that have been designated at risk by COSEWIC may qualify for legal protection under SARA, however, political, social or economic factors may prevent them from adopting COSEWIC's recommendations.
- *Endangered Species and Ecosystems Act (ESEA) Manitoba*: This act is Manitoba's species and ecosystems at risk legislation. It is meant to ensure the protection of species designated as endangered, threatened or of special concern, and to enhance their survival.
- *International Union for Conservation of Nature (IUCN) Red List of Threatened Species*: The IUCN is the leading information source on the global extinction risk of animal, fungus and plant species. While not a regulatory body, the IUCN Red List is used by government agencies, wildlife departments, conservation-related non-governmental organizations, natural resource planners, educational organizations, students, and businesses to assess the risk of species worldwide.

SUMMARY OF RESULTS

In total, there are 261 documented species in the Seal River Watershed, though this is almost certainly an underrepresentation of the actual number of species. These include: 117 bird, 17 fish, 2 amphibian, 5 insect, 19 mammal, and 101 plant species (Appendix A). Of these, 20 species are designated as at risk (See Table 1).

Table 1: Species designated as “at-risk” according to the Canada Species at Risk Act (SARA), Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Endangered Species and Ecosystems Act Manitoba (MB ESEA) and/or the International Union for Conservation of Nature (IUCN).

Common Name	Scientific Name	Designation
Black Scoter	<i>Melanitta americana</i>	Near Threatened (IUCN)
Blackpoll Warbler	<i>Dendroica striata</i>	Near Threatened (IUCN)
Buff-breasted Sandpiper	<i>Calidris subruficollis</i>	Near Threatened (IUCN); Special Concern (SARA); Special Concern (COSEWIC)
Common Eider	<i>Somateria mollissima</i>	Near Threatened (IUCN)
Common Nighthawk	<i>Chordeiles minor</i>	Threatened (MB ESEA)
Harris' Sparrow	<i>Zonotrichia querula</i>	Near Threatened (IUCN); Special Concern (COSEWIC)
Horned Grebe	<i>Podiceps auratus</i>	Vulnerable (IUCN); Special Concern (SARA); Special Concern (COSEWIC)
Long-Tailed Duck	<i>Clangula hyemalis</i>	Vulnerable (IUCN)
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Near Threatened (IUCN); Threatened (MB ESEA); Threatened (SARA); Threatened (COSEWIC)

Common Name	Scientific Name	Designation
Peregrine Falcon	<i>Falco peregrinus</i>	Endangered (MB ESEA)
Rusty Blackbird	<i>Euphagus carolinus</i>	Vulnerable (IUCN); Special Concern (SARA); Concern (COSEWIC)
Semipalmated Sandpiper	<i>Calidris pusilla</i>	Near Threatened (IUCN)
Short-eared Owl	<i>Asio flammeus</i>	Special Concern (SARA); Special Concern (COSEWIC)
Lake Sturgeon	<i>Acipenser fulvescens</i>	Special Concern (COSEWIC)
Barren-Ground Caribou	<i>Rangifer tarandus</i>	Vulnerable (IUCN); Threatened (COSEWIC)
Barren-Ground Grizzly	<i>Ursus arctos</i>	Special Concern (SARA); Special Concern (COSEWIC)
Beluga Whale	<i>Delphinapterus leucas</i>	Special Concern (COSEWIC)
Bowhead Whale	<i>Balaena mysticetus</i>	Special Concern (SARA); Special Concern (COSEWIC)
Polar Bear	<i>Ursus maritimus</i>	Vulnerable (IUCN); Threatened (MB ESEA); Special Concern (SARA); Special Concern (COSEWIC)
Wolverine	<i>Gulo gulo</i>	Special Concern (SARA); Special Concern (COSEWIC)

Table 2: List of species documented to occur within the Seal River Watershed

Species Type	Common Name	Scientific Name
Bird	Alder Flycatcher	<i>Empidonax alnorum</i>
Bird	American Black Duck	<i>Anas rubripes</i>
Bird	American Golden-Plover	<i>Pluvialis dominica</i>
Bird	American Herring Gull	<i>Larus argentatus smithsonianus</i>
Bird	American Pipit	<i>Anthus rubescens</i>
Bird	American Robin	<i>Turdus migratorius</i>
Bird	American Three-toed Woodpecker	<i>Picoides dorsalis</i>
Bird	American Three-toed Woodpecker	<i>Picoides tridactylus bacatus</i>
Bird	American Tree Sparrow	<i>Spizella arborea</i>
Bird	American Wigeon	<i>Anas americana</i>
Bird	Arctic Tern	<i>Sterna paradisaea</i>
Bird	Baird's Sandpiper	<i>Calidris bairdii</i>
Bird	Bald Eagle	<i>Haliaeetus leucocephalus</i>
Bird	Belted Kingfisher	<i>Megaceryle alcyon</i>
Bird	Black Guillemot	<i>Cephus grylle</i>
Bird	Black Scoter	<i>Melanitta americana</i>
Bird	Black-bellied Plover	<i>Pluvialis squatarola</i>
Bird	Black-legged Kittiwake	<i>Rissa tridactyla</i>
Bird	Blackpoll Warbler	<i>Dendroica (Setophaga) striata</i>
Bird	Bohemian Waxwing	<i>Bombycilla garrulus</i>
Bird	Bonaparte's Gull	<i>Chroicocephalus philadelphia</i>
Bird	Boreal Chickadee	<i>Poecile hudsonicus</i>
Bird	Brant	<i>Branta bernicla</i>
Bird	Buff-bellied Pipit	<i>Anthus spinoletta rubescens</i>
Bird	Buff-breasted Sandpiper	<i>Tryngites subruficollis</i>
Bird	Cackling Goose	<i>Branta hutchinsii</i>
Bird	Canada Goose	<i>Branta canadensis</i>
Bird	Cliff Swallow	<i>Petrochelidon pyrrhonota</i>
Bird	Common Eider	<i>Somateria mollissima</i>
Bird	Common Goldeneye	<i>Bucephala clangula</i>
Bird	Common Loon	<i>Gavia immer</i>
Bird	Common Merganser	<i>Mergus merganser</i>
Bird	Common Nighthawk	<i>Chordeiles minor</i>
Bird	Common Raven	<i>Corvus corax</i>
Bird	Common Redpoll	<i>Acanthis flammea</i>
Bird	Dark-eyed Junco	<i>Junco hyemalis hyemalis</i>
Bird	Dovekie	<i>Alle alle</i>
Bird	Dunlin	<i>Calidris alpina</i>
Bird	Fox Sparrow	<i>Passerella iliaca</i>
Bird	Glaucous Gull	<i>Larus hyperboreus</i>
Bird	Golden Eagle	<i>Aquila chrysaetos</i>
Bird	Gray Jay	<i>Perisoreus canadensis</i>
Bird	Gray-cheeked Thrush	<i>Catharus minimus</i>
Bird	Greater Scaup	<i>Aythya marila</i>
Bird	Greater Yellowlegs	<i>Tringa melanoleuca</i>
Bird	Green-winged Teal	<i>Anas carolinensis</i>
Bird	Grey-cheeked Thrush	<i>Catharus minimus minimus</i>
Bird	Gyrfalcon	<i>Falco rusticolus</i>
Bird	Harris' Sparrow	<i>Zonotrichia querula</i>
Bird	Herring Gull	<i>Larus argentatus</i>

Bird	Hoary Redpoll	<i>Acanthis hornemanni</i>
Bird	Hooded Merganser	<i>Lophodytes cucullatus</i>
Bird	Horned Grebe	<i>Podiceps auritus</i>
Bird	Horned Lark	<i>Eremophila alpestris</i>
Bird	Hudsonian Godwit	<i>Limosa haemastica</i>
Bird	Iceland Gull	<i>Larus glaucooides</i>
Bird	Killdeer	<i>Charadrius vociferus</i>
Bird	Lapland Longspur	<i>Calcarius lapponicus</i>
Bird	Least Sandpiper	<i>Calidris minutilla</i>
Bird	Lesser Yellowlegs	<i>Tringa flavipes</i>
Bird	Lincoln's Sparrow	<i>Melospiza lincolni</i>
Bird	Little Gull	<i>Hydrocoloeus minutus</i>
Bird	Long-tailed Duck	<i>Clangula hyemalis</i>
Bird	Long-tailed Jaeger	<i>Stercorarius longicaudus</i>
Bird	Mallard	<i>Anas platyrhynchos</i>
Bird	Merlin	<i>Falco columbarius</i>
Bird	Nelson's Sparrow	<i>Ammodramus nelsoni</i>
Bird	Northern Flicker	<i>Colaptes auratus</i>
Bird	Northern Harrier	<i>Circus cyaneus</i>
Bird	Northern Pintail	<i>Anas acuta</i>
Bird	Northern Shoveler	<i>Anas clypeata</i>
Bird	Northern Shrike	<i>Lanius excubitor</i>
Bird	Northern Waterthrush	<i>Parkesia noveboracensis</i>
Bird	Olive-sided Flycatcher	<i>Contopus cooperi</i>
Bird	Orange-crowned Warbler	<i>Vermivora celata</i>
Bird	Osprey	<i>Pandion haliaetus</i>
Bird	Pacific Loon	<i>Gavia pacifica</i>
Bird	Parasitic Jaeger	<i>Stercorarius parasiticus</i>
Bird	Pectoral Sandpiper	<i>Calidris melanotos</i>
Bird	Peregrine Falcon	<i>Falco peregrinus</i>
Bird	Pine Grosbeak	<i>Pinicola enucleator</i>
Bird	Pomarine Jaeger	<i>Stercorarius pomarinus</i>
Bird	Purple Finch	<i>Haemorhous purpureus</i>
Bird	Red-breasted Merganser	<i>Mergus serrator</i>
Bird	Red-necked Phalarope	<i>Phalaropus lobatus</i>
Bird	Red-throated Loon	<i>Gavia stellata</i>
Bird	Ring-billed Gull	<i>Larus delawarensis</i>
Bird	Ross's Goose	<i>Chen rossii</i>
Bird	Ruddy Turnstone	<i>Arenaria interpres</i>
Bird	Rusty Blackbird	<i>Euphagus carolinus</i>
Bird	Sanderling	<i>Calidris alba</i>

Bird	Sandhill Crane	<i>Grus canadensis</i>
Bird	Savannah Sparrow	<i>Passerculus sandwichensis</i>
Bird	Semipalmated Plover	<i>Charadrius semipalmatus</i>
Bird	Semipalmated Sandpiper	<i>Calidris pusilla</i>
Bird	Short-billed Dowitcher	<i>Limnodromus griseus</i>
Bird	Short-eared Owl	<i>Asio flammeus</i>
Bird	Smith's Longspur	<i>Calcarius pictus</i>
Bird	Snow Goose	<i>Chen caerulescens</i>
Bird	Spotted Sandpiper	<i>Actitis macularia</i>
		<i>Dendragapus canadensis</i>
Bird	Spruce Grouse	<i>Canadensis</i>
Bird	Stilt Sandpiper	<i>Calidris himantopus</i>
Bird	Surf Scoter	<i>Melanitta perspicillata</i>
Bird	Swainson's Thrush	<i>Catharus ustulatus</i>
Bird	Swamp Sparrow	<i>Melospiza georgiana</i>
Bird	Tennessee Warbler	<i>Loiothlypis peregrina</i>
Bird	Tree Swallow	<i>Tachycineta bicolor</i>
Bird	Tundra Swan	<i>Cygnus columbianus</i>
Bird	Whimbrel	<i>Numenius phaeopus</i>
Bird	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>
Bird	White-rumped Sandpiper	<i>Calidris fuscicollis</i>
Bird	White-winged Crossbill	<i>Loxia leucoptera</i>
Bird	White-winged Scoter	<i>Melanitta deglandi</i>
Bird	Willow Ptarmigan	<i>Lagopus lagopus</i>
Bird	Wilson's Snipe	<i>Gallinago delicata</i>
Bird	Yellow Warbler	<i>Dendroica petechia amnicola</i>
Bird	Yellow-rumped Warbler	<i>Setophaga coronata</i>
Fish	Arctic Char	<i>Salvelinus alpinus</i>
Fish	Arctic Grayling	<i>Thymallus arcticus</i>
Fish	Arctic Sculpin	<i>Myoxocephalus scorpioides</i>
Fish	Brook Trout	<i>Salvelinus fontinalis</i>
Fish	Burbot	<i>Lota lota</i>
Fish	Capelin	<i>Mallotus villosus</i>
Fish	Cisco	<i>Coregonus artedii</i>
Fish	Fourhorn Sculpin	<i>Myoxocephalus quadricornis</i>
Fish	Lake Chub	<i>Couesius plumbeus</i>
Fish	Lake Sturgeon	<i>Acipenser fulvescens</i>
Fish	Lake Trout	<i>Salvelinus namaycush</i>
Fish	Lake Whitefish	<i>Coregonus clupeaformis</i>
Fish	Longnose Sucker	<i>Catostomus catostomus</i>
Fish	Ninespine Stickleback	<i>Pungitius pungitius</i>

Fish	Northern Pike	<i>Esox lucius</i>
Fish	Shorthorn Sculpin	<i>Myoxocephalus scorpius</i>
Fish	Troutperch	<i>Percopsis omiscomaycus</i>
Frog	Boreal Chorus Frog	<i>Pseudacris maculata</i>
Frog	Wood Frog	<i>Lithobates sylvaticus</i>
Insect	A Ground Beetle	<i>Bembidion compressum</i>
Insect	A Ground Beetle	<i>Bembidion hyperboraeorum</i>
Insect	A Ground Beetle	<i>Dicheirotrichus mannerheimii</i>
Insect	A Ground Beetle	<i>Dyschirius hiemalis</i>
Insect	A Ground Beetle	<i>Pterostichus brevicornis</i>
Mammal	Arctic Ground Squirrel	<i>Spermophilus parryi</i>
Mammal	Barren-Ground Caribou	<i>Rangifer tarandus</i>
Mammal	Barren-Ground Grizzly	<i>Ursus arctos</i>
Mammal	Beaver	<i>Castor canadensis</i>
Mammal	Beluga Whale	<i>Delphinapterus leucas</i>
Mammal	Black Bear	<i>Ursus americanus</i>
Mammal	Bowhead Whales	<i>Balaena mysticetus</i>
Mammal	Cinereous shrew	<i>Sorex cinereus cinereus</i>
Mammal	Fox	
Mammal	Gray Wolf	<i>Canis lupus</i>
Mammal	Harbour Seal	<i>Phoca vitulina</i>
Mammal	Moose	<i>Alces alces</i>
Mammal	Northern Short-tailed Shrew	<i>Blarina brevicauda</i>
Mammal	Otter	<i>Lontra canadensis</i>
Mammal	Polar Bear	<i>Ursus maritimus</i>
Mammal	Snowshoe Hare	<i>Lepus americanus</i>
Mammal	Southern red-backed Vole	<i>Myodes gapperi</i>
Mammal	Thirteen-lined Ground Squirrel	<i>Spermophilus tridecemlineatus</i>
Mammal	Wolverine	<i>Gulo gulo</i>
Plant	Alaska Bog Willow	<i>Salix fuscescens</i>
Plant	Alpine Azalea	<i>Loiseleuria procumbens</i>
Plant	Alpine Bearberry	<i>Arctostaphylos alpina</i>
Plant	Alpine Sweet Grass	<i>Anthoxanthum monticola</i>
Plant	Arctic Bellflower	<i>Campanula uniflora Linnaeus</i>
Plant	Arctic Bellflower	<i>Campanula uniflora Vill.</i>
Plant	Arctic Rush	<i>Juncus arcticus Willdenow</i>
Plant	Assiniboia Sedge	<i>Carex assiniboinensis</i>
Plant	Beautiful Cottongrass	<i>Eriophorum callitrix</i>
Plant	Bent Northern Sedge	<i>Carex deflexa</i>
Plant	Big-spore Quillwort	<i>Isoetes macrospora Durieu</i>
Plant	Bigelow's Sedge	<i>Carex bigelowii</i>

Plant	Bigelow's Sedge	<i>Carex bigelowii</i>
Plant	Black Spruce	<i>Picea mariana</i>
Plant	Bluejoint	<i>Calamagrostis canadensis</i>
Plant	Boreal Bog Sedge	<i>Carex magellanica</i>
Plant	Boreal Starwort	<i>Stellaria borealis</i>
Plant	Brownish Sedge	<i>Carex brunnescens</i>
Plant	Capitate Sedge	<i>Carex arctogena</i>
Plant	Chamisso's Cottongrass	<i>Eriophorum chamissonis</i>
Plant	Common Cottongrass	<i>Eriophorum angustifolium</i>
Plant	Common False Asphodel	<i>Tofieldia pusilla</i>
Plant	Common Juniper	<i>Juniperus communis</i>
Plant	Common Moonwort	<i>Botrychium lunaria</i>
Plant	Common Woodrush	<i>Luzula multiflora</i>
Plant	Creeping Sedge	<i>Carex chordorrhiza</i>
Plant	Creeping Thistle	<i>Cirsium arvense</i>
Plant	Crowberry	<i>Empetrum nigrum</i>
Plant	Deergrass	<i>Trichophorum cespitosum</i>
Plant	Dwarf Birch	<i>Betula glandulosa</i>
Plant	Dwarf Scouring Rush	<i>Equisetum scirpoides Michaux</i>
Plant	Fasle Toadflax	<i>Geocaulon lividum</i>
Plant	Fir Clubmoss	<i>Lycopodium selago Linnaeus</i>
Plant	Flixweed	<i>Descurainia sophioides</i>
Plant	Fox-tail Sedge	<i>Carex alopecoidea</i>
Plant	Foxtail Barley	<i>Hordeum jubatum</i>
Plant	Fragrant Woodfern	<i>Dryopteris fragrans</i>
Plant	Glacier Sedge	<i>Carex glacialis</i>
Plant	Glaucous Bluegrass	<i>Poa glauca</i>
Plant	Green Alder	<i>Alnus viridis</i>
Plant	Hair-like Sedge	<i>Carex capillaris</i>
Plant	Hairy Butterwort	<i>Pinguicula villosa Linnaeus</i>
Plant	Intermediate Sedge	<i>Carex media</i>
Plant	Jack Pine	<i>Pinus banksiana</i>
Plant	Lake Quillwort	<i>Isoetes lacustris</i>
Plant	Lapland Sedge	<i>Carex lapponica</i>
Plant	Lesser Saltmarsh Sedge	<i>Carex glareosa</i>
Plant	Long-beaked Willow	<i>Salix bebbiana</i>
Plant	Long-stalked Starwort	<i>Stellaria longipes</i>
Plant	Meadow Sedge	<i>Carex praticola Rydberg</i>
Plant	Mountain Firmoss	<i>Huperzia appressa</i>
Plant	Northern Cluster Sedge	<i>Carex arcta Boott</i>
Plant	Northern Firmoss	<i>Huperzia selago</i>
Plant	Fireweed	<i>Chamaenerion angustifolium</i>

Plant	Northern Ground-cedar	<i>Diphasiastrum complanatum</i>
Plant	Northern interrupted-clubmoss	<i>Spinulum canadense</i>
Plant	Northern Seabeach Sandwort	<i>Honckenya peploides</i>
Plant	Northern White Rush	<i>Juncus albescens</i>
Plant	Northern Willow;	<i>Salix arctophila</i>
Plant	Northern Woodrush	<i>Luzula confusa</i>
Plant	Nuttall's alkaligrass	<i>Puccinellia nuttalliana</i>
Plant	One-cone Clubmoss	<i>Lycopodium lagopus</i>
Plant	Ostrich Fern	<i>Matteuccia struthiopteris</i>
Plant	Peck's Sedge	<i>Carex peckii</i> Howe
Plant	Pendant Grass	<i>Arctophila fulva</i>
Plant	Pincushion Plant	<i>Diapensia lapponica</i> L.
Plant	Polar Daisy	<i>Arctanthemum</i>
Plant	Purple Reed Grass	<i>Calamagrostis purpurascens</i>
Plant	Red Elderberry	<i>Sambucus racemosa</i>
Plant	Richardson's Willow	<i>Salix richardsonii</i>
Plant	Rock Sedge	<i>Carex saxatilis</i>
Plant	Rough Bentgrass	<i>Agrostis scabra</i>
Plant	Round-branch Ground-Pine	<i>Lycopodium dendroideum</i>
Plant	Round-fruited Sedge	<i>Carex rotundata</i> Wahlenberg
Plant	Savin-leaved Clubmoss	<i>Diphasiastrum sabinifolium</i>
Plant	Scant Sedge	<i>Carex rariflora</i>
Plant	Scant Sedge	<i>Carex rariflora</i>
Plant	Seabeach Sandwort	<i>Honckenya peploides</i>
Plant	Seaside Arrowgrass	<i>Triglochin maritima</i>
Plant	Silvery Sedge	<i>Carex canescens</i>
Plant	Sitka Clubmoss	<i>Diphasiastrum sitchense</i>
Plant	Small-flowered Woodrush	<i>Luzula parviflora</i>
Plant	Softleaf Sedge	<i>Carex disperma</i> Dewey
Plant	Sparse-flowered Sedge	<i>Carex tenuiflora</i>
Plant	Spiny-spore Quillwort	<i>Isoetes muricata</i>
Plant	Stiff Clubmoss	<i>Lycopodium annotinum</i>
Plant	Tamarack	<i>Larix laricina</i>
Plant	Thread rush	<i>Juncus filiformis</i>
Plant	Three-hulled Rush	<i>Juncus triglumis</i>
Plant	Three-leaved False Solomon's Seal	<i>Smilacina trifolia</i>
Plant	Three-toothed Saxifrage	<i>Saxifraga tricuspidata</i>
Plant	Tufted Pearlwort	<i>Sagina caespitosa</i>
Plant	Tussock Cottongrass	<i>Eriophorum spissum</i> . <i>Linnaea borealis</i> subsp. <i>longiflora</i>
Plant	Twinflower	
Plant	Wahlenberg's Woodrush	<i>Luzula wahlenbergii</i>
Plant	Water Sedge	<i>Carex aquatilis</i>
Plant	Weak Sedge	<i>Carex supina</i> ssp. <i>spaniocarpa</i>
Plant	White Cottongrass	<i>Eriophorum scheuchzeri</i>
Plant	White Spruce	<i>Picea glauca</i>
Plant	Williams' Sedge	<i>Carex williamsii</i>
Plant	Wood Horsetail	<i>Equisetum sylvaticum</i>

CONCLUSIONS

This report verifies an impressive species richness within the Seal River Watershed with 261 documented species that were identified from multiple sources. Critically, we found that at least 20 of the species in the area are at risk.

It is important to note that the species list outlined here likely represents a gross underestimate of the actual species richness present in the area. Even though we drew upon multiple credible sources, estimates are admittedly incomplete. This is a natural consequence of remote areas being poorly sampled in biodiversity studies generally and the accessibility of this study area in particular (Callaghan et al. 2020). These data could be supplemented in the future with professional surveys, however, this would represent a substantial financial and logistical undertaking. As such, we consider this list a preliminary one that may be expanded as more publicly shared information becomes available.

Readers may note that there also appears to be a bias in the type of species listed in this report. For example, only five species of insect were identified in our sources. This is a natural consequence of the type of data that we were using, given that detection probabilities differ widely among species in natural history collections and citizen science projects tend to focus on vertebrates such as birds and large mammals, and plants of economic importance (White 2005).

Estimating biodiversity remains a fundamental measure in ecological analysis and conservation planning (Nelson & Ellis 2018), especially as we continue to lose species in the sixth global mass extinction event (Ceballos et al. 2017). Information presented in this paper will help inform the value of ecological goods and services in the area and will serve as foundational data as the initiative to protect and steward the Seal River Watershed as an Indigenous Protected Areas unfolds.

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