# NB Inner Bay of Fundy Bioregion
# Habitat Conservation Strategy

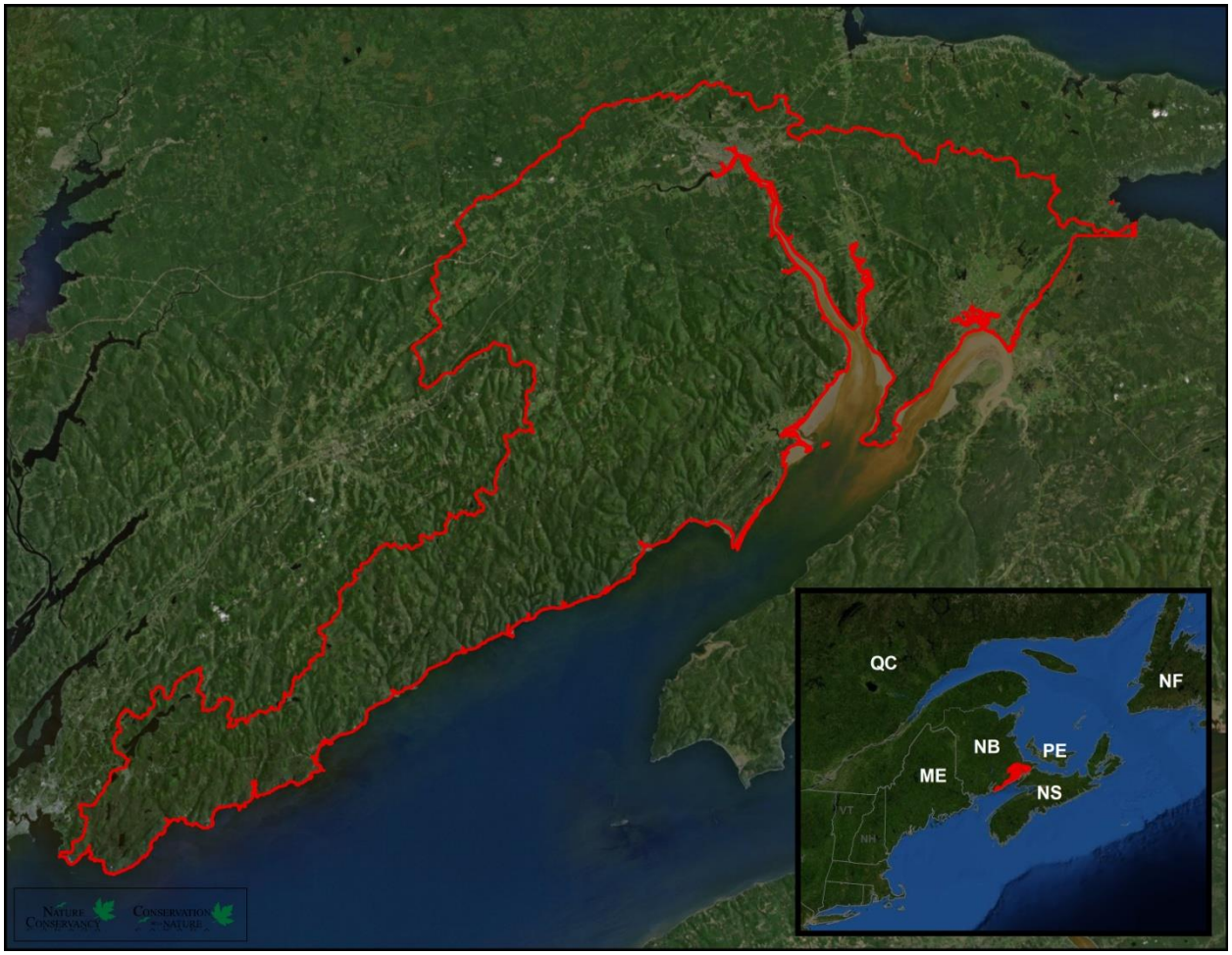



Photo by Mike Dembeck

**New Brunswick Eastern Habitat Joint Venture Steering Committee**
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# NB Inner Bay of Fundy bioregion Habitat Conservation Strategy EXECUTIVE SUMMARY

This Habitat Conservation Strategy (HCS) was developed through collaboration among member organizations of the Eastern Habitat Joint Venture (EHJV) New Brunswick Steering Committee and partner conservation groups. This HCS is part of a series planned to encompass the entire geographic area of New Brunswick.

HCSs are intended to respond to the need to better communicate, coordinate, and inform conservation actions taken by regional and local conservation organizations. In addition to providing decision support for these groups, following an ecosystem approach, it is hoped that HCS development will create opportunities to enhance partnerships, recognizing that each organization is guided by its own particular mission, vision, and/or guiding principles.

**A Shared Approach**

HCSs and their bioregional boundaries are based on meaningful ecological units and important watershed boundaries. HCS bioregions are scaled in a way that captures regional conservation context, priorities, threats and conservation actions. They also are scaled to facilitate the implementation of conservation actions, from land securement to stewardship.

In the first section, each HCS presents descriptions, in general terms, of the spatial extent and ecological significance of the bioregion, the dominant ecological systems found within the bioregion, and the processes that shape them. Each HCS also presents the significance of important habitats for identified species of conservation significance, with a focus on species at risk and other rare taxa, including Bird Conservation Region 14 priority birds (and also bird species making use of adjacent Marine Biogeographic Units, if applicable). The approach taken in the development of the narrative is meant to be thorough but not exhaustive, emphasizing references to more detailed work and in-depth studies.

The second section presents habitat prioritization based on uniqueness, representivity, and patch size. It also presents different perspectives on species-based prioritization by looking at various assemblages of species. Species-based prioritization relies on relative abundance maps derived from best available occurrence data for each species. The reader is cautioned that best available occurrence data for most species remains incomplete, to varying degrees, with availability being a function of survey timing and survey effort, leading to variable, but important bias in some related maps. As such, multi-species composite maps and all other maps derived from the individual species maps also are vulnerable to bias.

Ultimately, the habitat prioritization map (composite of all habitats) and species prioritization map (composite of all species) are combined to yield a Conservation Value Index (CVI) map of the bioregion. For various reasons, including introduced bias, the CVI map, priority habitat maps and various multi-species composite maps can present contrasting perspectives on spatial priorities. This is expected and also reflects the reality that contrasting approaches to conservation may be required for the conservation of different species and the habitats that host them (i.e. land acquisition versus stewardship).

The second section also presents threats to conservation priority habitats and species. These are identified, assessed, and where possible, mapped at the bioregional scale.

In the third section, each HCS presents conservation and stewardship actions that organizations plan to undertake to mitigate identified threats and contribute to the conservation of habitats (and the species they host) over the course of a 5-year planning period. Though they cannot be considered comprehensive, actions are presented for each partner organization within a matrix structured according to IUCN categories.

In addition to presenting avenues for collaboration in the implementation of actions, this matrix presents gaps that can be interpreted as potential opportunities for development of new complementary conservation actions. It should be noted that conservation groups seeking government funding to undertake conservation actions within the bioregion (e.g., Aboriginal Fund for Species at Risk, Habitat Stewardship Fund for Species at Risk, National Conservation Plan – National Wetland Conservation Fund, New Brunswick Environmental Trust Fund, and New Brunswick Wildlife Trust Fund) are strongly encouraged to make specific reference to relevant information contained within the appropriate HCS.

No single map can provide decision support that aligns fully with all priorities of all conservation partners. As such, users of this and all other HCSs thus are encouraged to carefully consider the full suite of maps and information presented to obtain the decision support that is most appropriate to their needs.

**Ecological Context**

The New Brunswick Inner Bay of Fundy (NB IBoF) bioregion covers 734 214 ha, including over 483 863 ha of rich Acadian forest, extensive rivers, streams and wetlands, to the shoreline. The remaining 250 351 ha area includes internationally recognized intertidal wetlands, tidal flats, and their adjacent coastal and offshore marine areas. In addition to exhibiting the world's highest recorded tides, the Bay of Fundy is known for its highly productive and biodiverse marine environments. The tidal flats of the NB IBoF bioregion include critical staging areas of international significance for migratory shorebirds. The bioregion also includes the New Brunswick portion of the Chignecto Isthmus, the only terrestrial corridor connecting Nova Scotia to the rest of North America. These attributes, in addition to the geological uniqueness of the region, enhance the inner Bay of Fundy's ecological diversity. Provincial species at risk within the bioregion include the provincially endangered Bald Eagle (*Haliaeetus leucocephalus*) and the endangered Peregrine Falcon (*Falco peregrinus*). Over 30 species designated 'at risk' by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) depend on the marine, coastal, riparian and upland forest habitats found in the bioregion. These species include lichens, freshwater mussels, fish, birds, reptiles, and terrestrial and marine mammals. Twenty-five globally significant species (G1-G3G4) are present within the bioregion, including Robinson's Hawkweed (*Hieracium robinsonii*), Little Brown Myotis (*Myotis lucifugus*) and Atlantic Sturgeon (*Acipenser oxyrinchus*).

The NB IBoF bioregion has a long history of settlement and land use. Mi'kmaq First Nations, and francophone and anglophone cultures of European descent, are all present within the bioregion. Although historically reliant on natural resource-based industries, the economy within the bioregion today largely is dependent on the service industry, which radiates from the Greater Moncton Area, the second largest Census Metropolitan Area (CMA) in the Maritimes. Tourism is increasingly an economic contributor within rural communities, in addition to resource extraction.

The NB IBoF bioregion has long been recognised as an area of ecological significance (Map 1 – Conservation Context). Fundy National Park, one of Canada's first national parks, exemplifies this fact. Furthermore, two National Wildlife Areas (NWAs), various other provincially- and privately-owned protected areas, one Western Hemispheric Shorebird Reserve Network (WHSRN) site, four Important Bird Areas (IBAs) and two Ramsar wetlands of international importance occur within the bioregion. The bioregion boundary also includes the Fundy Biosphere Reserve (FBR) designated in 2007 under the UNESCO Man and the Biosphere (MAB) program. This suite of initiatives to protect, conserve and highlight these different sites and the important ecosystem services they provide constitutes testament to the rich biodiversity and ecological significance of the NB IBoF bioregion. Further conservation gains have been achieved as the Government of New Brunswick recently created 138 new Protected Natural Areas and extended 21 existing Class II Protected Natural Areas for a new provincial total of 115 240 ha. This total includes 8 445 ha located within the NB IBoF bioregion.

**Conservation Priority Habitat Types**[1]

1) Beaches, rocky shores and cliffs
2) Salt marshes
3) Tidal flats
4) Acadian forest mosaic
5) Freshwater wetlands
6) Riparian systems
7) Caves and calcareous sites
8) Grasslands/agro-ecosystems (fields and meadows)

Priority habitat composite maps do not incorporate information on occurrence records of rare and endangered species, or of conservation priority birds. The subsequent integration of habitat and species information results in a Conservation Value Index (CVI) map for the bioregion (Fig. 35).

When using this document for decision support, the reader is advised to compare and contrast the priority habitat composite map (Fig. 23) with the Conservation Value Index (CVI) map (Fig. 35). Also of value to the planning process are the species composite maps found in Figs. 24 - 34 (p. 80-90) which illustrate the distribution of 10 distinct flora and fauna classes and assemblages that comprise the whole of the species information in this analysis. To supplement these figures, Appendix M presents a summary of the species presented in each map, and the datasets used to represent these species.

**Threats**

The following threats (using IUCN nomenclature) have been characterized as being most important within the NB IBoF bioregion:

Current:

- 7.2 Dams and water management/use (dams and aquatic barriers)
- 8.1 Invasive non-native/alien species/diseases
- 1.1 Housing and urban areas (housing, cottage and rural development)
- 4.1 Roads and railroads (road fragmentation)
- 5.3 Logging and wood harvesting (incompatible forestry activities)

[1] Habitat types, threats and objectives are not given in order of priority.

2.1 Annual and perennial non-timber crops (incompatible agricultural practices)
2.2 Wood and pulp plantations

Emerging:
11.1 Climate change and severe weather – habitat shifting and alteration

**Objectives**

The conservation objectives for these habitats are:

1) To secure key properties at focal conservation areas. To enlarge, complement and consolidate NCC, Environment Canada's Canadian Wildlife Service, Ducks Unlimited Canada, and Nature Trust of New Brunswick, New Brunswick Protetced Natural Areas holdings to enhance their role as focal conservation areas.
2) To maintain suitable staging habitat for shorebirds by protecting roosting and foraging sites.
3) To manage and monitor visitor traffic, to reduce disturbance at locations adjacent to sensitive shorebird roosting sites, during the months of July through September, and to provide public education on this subject.
4) To support research on habitats, biodiversity and threats in the bioregion.
5) To restore salt marsh and river systems in the bioregion through the partial or complete removal of tidal barriers.
6) To enhance community support and understanding of coastal systems, particularly those species found in Chignecto and Shepody Bays, and to promote community participation in their conservation.
7) To document and monitor biodiversity, natural processes and threats, and incorporate the results into future iterations of the HCS for the bioregion.
8) To support and enhance conservation partnerships, especially among Nature Conservancy Canada, the Government of New Brunswick, Parks Canada Agency, Environment Canada's Canadian Wildlife Service, Ducks Unlimited Canada, Fundy Biosphere Reserve, Petitcodiac Watershed Monitoring Group, Fort Folly First Nation and the Nature Trust of New Brunswick through the Eastern Habitat Joint Venture.

**Conservation Actions**

The following summary presents the conservation actions undertaken by organizations working in the NB IBoF bioregion. A more detailed list of conservation actions, including links to the threats associated with each of the different conservation priority habitats, is presented in Table 12 (p. 105).

<u>Government of New Brunswick (GNB)</u>

- Achieve Protected Natural Area designation of up to 10 000 ha of significant habitat, including tidal flats, on Crown land within the bioregion.
- Continue sustainable forest management on Crown lands including the conservation of priority forest wildlife habitats and ecological systems.
- On Crown land DNR will: maintain watercourse and wetland buffer zones, identify and conserve deer winter habitat, identify and conserve site-specific habitats for species at risk and other species (e.g., heron colonies).
- Continue using the New Brunswick Clean Environment Act, Clean Water Act, Wetland Conservation Policy and Coastal Areas Protection Policy and associated regulations to conserve the ecological, economic and social functions of these ecological communities.

- NB Museum to continue research on locations of winter bat hibernacula, effects of climate, and fungal communities on cave systems.
- Continue to support ENGO work on habitat and ecological system conservation/stewardship through direct and in-kind support (Examples: New Brunswick Wildlife Trust Fund, Environmental Trust Fund).
- Participate annually in active recovery planning meetings for species at risk.

Bird Studies Canada (BSC)

- Complete reports on habitat associations and threats to grassland birds by 2015 using data from the recently completed Maritimes Breeding Bird Atlas.
- BSC to complete reports on habitat associations and threats to priority bird species by 2015.
- Will continue to monitor wetland-dependent bird species, assess the effectiveness of EHJV conservation efforts, and encourage local wetland stewardship under the Maritime Marsh Monitoring Program
- Will continue to monitor population levels of Chimney Swift at known roost sites through the citizen-science monitoring and conservation program: "Maritime Swift Watch Program"
- Will continue to hold community outreach workshops for Chimney Swifts ("Swift Night Out")

Nature Conservancy of Canada (NCC)

- Secure 200 ha of priority native/natural lands by 2017 of which at least 175 ha are Priority 1 or Priority 2 and no more than 25 ha are Priority 3 or other.
- Improve forest connectivity through corridor analyses within the bioregion and adjacent areas.
- Improve forest connectivity, condition and landscape context on large industrial land within the bioregion by 2018 through the adoption of FSC principles and/or voluntary designation of high conservation areas on industrial land.
- Update land prioritization within the bioregion to account for new protected areas designated by the province by 2015.
- Prepare Interim Stewardship Statements within one year and Property Management Plans following NCC's approved Stewardship Performance Standards for secured properties.
- Implement critical Property Management Plan actions on NCC lands through 2018.
- Designate all NCC properties in the bioregion under the NB Protected Natural Areas Act by 2018.
- Promote best management practices to prevent impacts on rivers and riparian areas.
- Control the expansion of invasive species in the bioregion and try to prevent the introduction of new invasive species.
- Participate annually in active recovery planning meetings for Species at Risk (currently NCC is only involved in Piping Plover).
- Enhance data management and information on biodiversity through annual submission of records to the ACCDC.
- Carry out aerial surveys to conduct shorebird counts and monitor length of stay during the fall migration of 2013 and 2014.
- NCC will host at least one annual community outreach or Conservation Volunteer event in the bioregion.
- NCC will continue to operate Johnson's Mills Shorebird Interpretive Centre annually and hire interpreters to educate the public and patrol beaches .
- Demonstrate restoration strategies appropriate to the Acadian Forest Ecosite and associated forest groups.
- Demonstrate and build community capacity for restoration and conservation of waterways intersecting farm and forest land.

Government of Canada – Environment Canada (EC)

- Implement and enforce the Migratory Bird Convention Act, Canada Wildlife Act, Species at Risk Act, Canadian Environmental Protection Act, and promote the Federal Policy on Wetland Conservation.
- Offer support to ENGOs, communities, aboriginal organizations, and academia via EC Employment Programs, including the Science Horizons Youth Internship Program and the International Environmental Youth Corps.
- Offer support to ENGOs, communities, aboriginal organizations, and academia via Community Action Programs for the Environment, including work on habitat and ecological system conservation/stewardship through direct and in-kind support (e.g., EcoAction Community Funding Program, Environmental Damages Fund, National Conservation Plan – National Wetland Conservation Fund, National Conservation Plan – Gulf of Maine Initiative, Atlantic Ecosystem Initiatives, Ecological Gifts Program, Habitat Stewardship Program – Prevention Stream, Aboriginal Fund for Species at Risk – Prevention Stream
- Offer support to ENGO and aboriginal organizations for work specifically on species at risk via the Habitat Stewardship Program – Species at Risk Stream, and Aboriginal Fund for Species at Risk.
- Support the activities described within species at risk recovery documents for the completion of schedule of studies for the identification of critical habitat.
- Engage and consult with all partners in development of recovery documents for species at risk.
- Support the Eastern Habitat Joint Venture (EHJV), and provide science guidance to conservation partners on conservation actions and priorities for migratory birds, species at risk, and their habitats, including through development, refinement and implementation of this HCS and of the NB Bird Conservation Region 14 Strategy.
- Coordinate and/or conduct migratory bird surveys (e.g., Semipalmated Sandpiper stopover surveys, Piping Plover breeding surveys, 2 Eastern Waterfowl Survey monitoring plots, Triannual Winter Black Duck Survey, 3 active Breeding Bird Survey routes).
- Identify important areas for marine birds.
- Contribute to development of a Marine Protected Area Network within the Scotian Shelf Marine Bioregion, including consideration of those sites identified as Ecologically and Biologically Significant Areas that are located in the the NB IBoF bioregion.
- Continue management activities associated with coastal and freshwater wetlands, upland habitat at Shepody National Wildlife Area (NWA) and Tintamare NWA.
- Operate and upgrade the Marys Point Shorebird Interpretive Centre, annually hire interpreters to educate the public and patrol beaches at Shepody National Wildife Area through the Connecting Canadians to Nature Initiative of the National Conservation Plan.
- Continue to strengthen partnership with Atlantic Canada Conservation Data Centre (ACCDC) through annual submission of monitoring findings on conservation lands.

Government of Canada – Parks Canada Agency

- Continue comprehensive monitoring to assess the state of park ecosystems and to guide activities aimed at maintaining or improving the park's ecological integrity.
- Continue to support the recovery of the SARA-listed species, including the inner Bay of Fundy Atlantic Salmon, through population monitoring and recovery activities, collaboration/partnerships with stakeholder groups, and participation in Recovery Strategy and Action Planning meetings.
- Implement and/or enforce the *Canada National Park Act* and *Species at Risk Act* on park lands.
- Provide meaningful opportunities (e.g., volunteer and interpretation programs) for park visitors to learn about and contribute to ongoing ecological restoration and monitoring efforts.

Government of Canada – Fisheries and Oceans Canada (DFO)

- Lead other federal partners in the identification of Ecologically and Biologically Significant Areas and refinenment of related information in the Bay of Fundy and Scotian Shelf Bioregion
- Complete coastal and sub-tidal classification schemes in the Scotian Shelf Bioregion
- Lead other federal partners in Marine Protected Area Network planning under the *Oceans Act*. Identify two new *Oceans Act* MPA Areas of Interest in the Scotian Shelf Bioregion by 2020.
- Implement and/or enforce the *Canada Fisheries Act* and *Species at Risk Act* in federal waters.

Ducks Unlimited Canada (DUC)

- DUC to manage and monitor 4 575 ha of habitat (including restored and secured habitat, impoundments, etc.) within the bioregion.
- Pursue opportunities to restore 200 ha of salt marsh and freshwater wetland habitat in the bioregion by 2018, these being essential to support the provincial wetland policy that stipulates no net loss of wetlands or wetland function in New Brunswick.
- DUC to evaluate functionality and improve fish passage in the 66 control structures they manage within the bioregion.
- DUC to continue management on areas identified as Least Bittern (*Ixobrychus exilis*) SAR critical habitat (EC 2011) and create more suitable habitat in known breeding areas.
- DUC to continue education programs for youth such as the Project Webfoot annual school progam.

Nature Trust of NB (NTNB)

- NTNB will work towards the securement of up to 200 ha of significant habitat on private land within the bioregion by 2018.
- NTNB will enhance existing management activities on its established nature preserves at Grindstone Island and Cape Enrage with a network of volunteer stewards.
- Continue to work with local groups including the Friends of Grindstone Island, to undertake land conservation and stewardship projects.
- Continue to work with its conservation partners on conservation issues in the region (data collection, public outreach, invasive species detection/monitoring, species at risk education).
- Continue to host public events and activities, related to its established preserves, as well as land conservation and stewardship.
- Establish new partnerships with local municipalities and promote conservation on municipal lands. The NTNB will also develop a local stewardship group for the Cape Enrage preserve.
- The NTNB will expand its Power of Nature public educational program on its existing preserves in the region in order to reach out to children, youth and newcomers to Canada and help them build lasting connections to the natural landscape.
- The NTNB will seek to obtain official designation under the New Brunswick Protected Natural Area Act for its existing preserves at Grindstone Island and Cape Enrage in order to secure permanent protected status.
- Continue to monitor species at risk (where present) in all NTNB preserves in the bioregion.

Petitcodiac Watershed Alliance / Alliance du basin versant Petitcodiac

- Implement monitoring of fish species on the Petitcodiac River with collaboration from other members of the Petitcodiac Fish Recovery Coalition.
- Implement watercourse restoration projects in the Petitcodiac River watershed in order to improve habitat connectivity, fish habitat and water quality.
- Continue the long term monitoring of water quality at approximately 22 stations within the Petitcodiac River watershed in order to highlight areas of pollution concern and long term trends.

- Implement monitoring, recovery and stewardship programs for aquatic and terrestrial species at risk within the Petitcodiac River watershed.
- Support partners and the community in science or community driven projects within the watershed such as wetland delineation, species inventories, educational programs, with wide communication of results.

Fort Folly First Nation

- Continue to monitor aquatic species, including Species at Risk, such as inner Bay of Fundy Atlantic Salmon, American Eel, Striped Bass, Atlantic sturgeon and Wood Turtle.
- Continue efforts to restore Atlantic Salmon to the Petitcodiac River watershed.
- Actively participate in the Recovery Team and Planning Group for the inner Bay of Fundy Atlantic Salmon.
- Perform stewardship planning and habitat restoration within the Petitcodiac River watershed on behalf of the Petitcodiac Fish Recovery Coalition.

## SOMMAIRE

La présente Stratégie de conservation des habitats (SCH) est le fruit de la collaboration entre les organisations membres du Comité directeur du Plan conjoint des habitats de l'Est (PCHE) du Nouveau-Brunswick et de groupes partenaires actifs dans le domaine de la conservation environnementale. Cette SCH fait partie d'une série de stratégies prévues pour englober tout le territoire géographique du Nouveau-Brunswick.

Les SCH ont pour but de répondre au besoin de mieux communiquer, coordonner et contribuer aux mesures de conservation prises par les organisations locales et régionales de conservation. En plus de fournir à ces groupes un soutien à la prise de décision, il est souhaité que l'élaboration de ces SCH créera des possibilités d'amélioration des partenariats, tout en reconnaissant que chaque organisation est guidée par la mission, la vision et les principes directeurs qui lui sont propres.

**Une approche partagée**

Les SCH et leurs frontières biorégionales sont fondées sur des unités écologiques significatives et les limites d'importants bassins hydrographiques. Les biorégions des SCH sont établies en tenant compte du contexte, des priorités, des menaces et des mesures de conservation propres aux régions. Elles sont aussi établies de manière à faciliter la mise en œuvre des mesures de conservation, allant de la protection à l'intendance de l'habitat.

Dans la première partie, chacune des SCH présente les descriptions, en termes généraux, de l'étendue spatiale et de la signification écologique de la biorégion, des systèmes écologiques dominants que l'on retrouve à l'intérieur de la biorégion, et des processus qui les façonnent. Chaque SCH présente aussi le rôle significatif d'importants habitats pour les espèces identifiées et dont la conservation est jugée importante, en mettant l'accent sur les espèces en péril et autres taxons rares, notamment les espèces aviaires prioritaires de la Région de conservation des oiseaux 14 (ainsi que les espèces d'oiseaux qui se servent des Unités biogéographiques marines adjacentes, le cas échéant). L'approche adoptée dans l'élaboration du texte se veut rigoureuse, mais non exhaustive, et met l'accent sur des références pertinentes vers des travaux plus détaillés et des études approfondies.

La deuxième partie présente les habitats par ordre de priorité en fonction du caractère unique, de la représentativité et de la dimension de la parcelle de territoire. Elle présente également différentes perspectives sur les priorités au niveau des espèces, en examinant des assemblages variés d'espèces. Cet ordre de priorité par espèces repose sur les cartes d'abondance relative issues des meilleures données d'occurrence pour chaque espèce. Le lecteur est avisé que les meilleures données d'occurrence disponibles pour la plupart des espèces demeurent incomplètes, à divers degrés, puisque l'accessibilité dépend du moment où les enquêtes sont faites et des efforts qui y sont consentis, ce qui mène à des biais variables, mais importants, sur certaines cartes connexes. Ainsi, les cartes composites multiespèces et toutes les autres cartes dérivées de cartes sur des espèces individuelles peuvent également être susceptibles à des biais.

Ultimement, la carte des habitats prioritaires (composite de tous les habitats) et la carte des espèces prioritaires (composite de toutes les espèces) sont combinées pour produire une carte de l'Index de la valeur de conservation (IVC) de la biorégion. Pour différentes raisons, incluant le biais évoqué, la carte de l'IVC, les cartes d'habitats prioritaires et les différentes cartes composites multiespèces peuvent présenter des perspectives contrastantes quant aux priorités spatiales. C'est une situation à laquelle on peut s'attendre, et cela témoigne de la réalité que des approches contrastantes en matière de

conservation peuvent être requises pour la protection de différentes espèces et des habitats qui les accueillent (c.-à-d. l'acquisition de terres par opposition à l'intendance).

La deuxième partie présente également les menaces à la conservation des habitats et des espèces prioritaires. Celles-ci sont identifiées, évaluées et, lorsque possible, cartographiées à l'échelle biorégionale.

Dans la troisième partie, chaque SCH présente les mesures de conservation et d'intendance que les organisations prévoient entreprendre pour atténuer les menaces cernées et pour contribuer à la conservation des habitats (et des espèces qu'ils accueillent) au cours d'une période de planification de cinq ans. Bien qu'elles ne puissent être considérées comme un ensemble complet, les mesures sont présentées pour chaque organisation partenaire, à l'intérieur d'une matrice structurée tenant compte des catégories de l'Union internationale pour la conservation de la nature (UICN).

En plus de présenter des pistes de collaboration pour la mise en œuvre des mesures, cette matrice illustre les lacunes qui peuvent être interprétées comme des possibilités pour l'élaboration de nouvelles mesures de conservation complémentaires. Il faut remarquer que les groupes voués à la conservation sollicitant du financement gouvernemental afin de réaliser leurs mesures de conservation à l'intérieur d'une biorégion (p. ex. le Fonds autochtone pour les espèces en péril, le Programme d'intendance de l'habitat pour les espèces en péril, le Plan de conservation national – Le Fonds national de conservation des milieux humides, le Fonds en fiducie pour l'environnement du Nouveau-Brunswick et le Fonds de fiducie de la faune du Nouveau-Brunswick) sont fortement encouragés à se référer spécifiquement à l'information pertinente incluse dans la SCH appropriée.

Il n'existe aucune carte unique pouvant fournir tout le soutien à la prise de décision qui soit entièrement harmonisée avec toutes les priorités de tous les partenaires en conservation. Ainsi, on incite fortement les utilisateurs de cette SCH et de toutes les autres SCH à considérer sérieusement l'usage de la série complète de cartes et de l'information présentées pour obtenir le soutien à la prise de décision qui répond le mieux à leurs besoins.

**Conservation des habitats prioritaires**

En se fondant sur les affinités des habitats des espèces rares, des espèces en péril et des espèces d'oiseaux devant être conservés en priorité, mais indépendamment des modèles spatiaux relatifs à l'occurrence des espèces, les huit types d'habitats suivants ont été cernés comme prioritaires quant à leur conservation dans la biorégion de l'intérieur de la baie de Fundy du Nouveau-Brunswick :

1. Plages de sable et de gravier et falaises
2. Marais salés
3. Battures
4. Mosaïque de la forêt acadienne
5. Milieux humides d'eau douce
6. Systèmes riverains
7. Grottes et paysages calcaires
8. Prairies/agro-écosystèmes (champs et prés)

Les cartes composées des habitats prioritaires n'intègrent pas l'information sur les registres d'occurrence des espèces rares et en voie de disparition, ou des oiseaux qui sont une priorité en matière de conservation. L'intégration subséquente des habitats et des espèces produit les cartes présentant l'Index de la valeur de conservation (IVC) pour la biorégion.

Il est recommandé au lecteur de comparer les cartes d'habitats prioritaires (figure 23) aux cartes de l'Index de la valeur de conservation (IVC) (figure 35) et d'en faire ressortir les différences, lorsqu'il utilise ce document comme soutien à la prise de décision. Les cartes comprenant les espèces de flore et de faune (figures 24 à 34, pages 82 à 92) sont également utiles dans le processus de planification. Elles fournissent toute l'information sur la répartition de 10 catégories distinctes de flore et de faune et assemblages qui constituent l'ensemble de l'information sur les espèces dans la présente analyse. En guise de complément à ces figures, l'annexe M dresse un résumé des espèces présentées sur chaque carte, ainsi que des ensembles de données utilisés pour représenter ces espèces.

**Menaces**

Les menaces suivantes (suivant la nomenclature de l'UICN) ont été caractérisées comme étant les plus importantes dans la biorégion de l'intérieur de la baie de Fundy du Nouveau-Brunswick :

Actuelles :

7.2 Barrages et mécanismes de gestion et d'utilisation de l'eau (autres barrières aquatiques)
8.1 Espèces envahissantes (insectes et maladies)
1.1 Habitations et zones urbaines
4.1 Routes et chemins de fer (fragmentation de routes)
5.3 Exploitation forestière et récolte du bois (pratiques d'exploitation forestière incompatibles)
2.1 Cultures annuelles et pluriannuelles de produits autres que le bois (pratiques d'exploitation agricoles incompatibles)
2.2 Plantations pour la production de bois et de pâte à papier

Émergentes :

11.1 Changements climatiques et conditions météorologiques extrêmes - déplacement et altération de l'habitat

**Objectifs**

Les objectifs de conservation établis pour orienter l'élaboration de cette SCH pour les habitats de l'intérieur de la baie de Fundy du Nouveau-Brunswick sont les suivants :

1) Déterminer les endroits qui revêtent de l'importance pour la conservation des habitats et des espèces prioritaires. Élargir, compéter et consolider les aires de conservation gérées par Conservation de la nature du Canada, le Service canadien de la faune d'Environnement Canada, Canards Illimités, la Fondation pour la protection des sites naturels du Nouveau-Brunswick, et les zones naturelles protégées de la province du Nouveau Brunswick, afin de souligner leur rôle collectif au niveau de la conservation.
2) Maintenir de l'habitat propice pour les haltes migratoires des limicoles migrateurs (aires d'alimentation et de repos).
3) Gérer, assurer le suivi de la présence humaine afin de réduire le dérangement des limicoles sur leurs aires de repos entre juillet et septembre, et contribuer à sensibiliser le grand public à cet égard.
4) Appuyer la recherche sur les habitats, la biodiversité et les menaces dans la biorégion.
5) Contribuer à la restoration des marais salés et des rivières de la biorégion via l'élimination partielle ou complète des barrières intertidales.
6) Encourager la compréhension de systèmes côtiers, en particulier les espèces associées aux basins Chignecto et Shepody, et promouvoir les activités de conservation communautaires.

7) Documenter et assurer le suivi de la biodiversité, des procéssus naturels et menaces, et incorporer ces informations dans les versions futures de la stratégie pour cette biorégion.
8) Maintenir des écosystèmes sains, intacts et entièrement fonctionnels, en tablant sur le travail de conservation existant réalisé par le partenariat, surtout en appuyant le parternariat entre Conservation de la nature Canada, le gouvernement du Nouveau-Brunswick, l'Agence Parcs Canada, le Service canadien de la faune d'Environnement Canada, Canards Illimités Canada, la réserve de la biosphère Fundy, le Groupe de surveillance du bassin de la Petitcodiac, la Première nation de Fort Folly, et la Fondation pour la protection des sites naturels du Nouveau-Brunswick, via le Plan conjoint des habitats de l'Est.

**Mesures de conservation**

Le résumé suivant présente les mesures de conservation entreprises par les organisations qui travaillent dans la biorégion de l'intérieur de la Baie de Fundy du Nouveau-Brunswick. Une liste plus détaillée des mesures de conservation et des liens aux menaces associées à chacun des habitats prioritaires est présentée dans le tableau 12 (p. 105).

<u>Ministère des Ressources naturelles du Gouvernement du Nouveau-Brunswick</u>

- Accorder en 2015, la désignation « Aire naturelle protégée », à 10 000 ha d'habitats significatifs, incluant des battures, sur des terres de la Couronne situées à l'intérieur de la biorégion.
- Continuer l'aménagement durable des forets sur les terres de la Couronne incluant la conservation d'aires prioritaires pour la faune et les écosystèmes.
- Sur les terres de la Couronne, le MRN va maintenir les zones tampons des cours d'eau et des milieux humides, déterminer et conserver les habitats d'hiver de cerf de virginie (ravages), déterminer et conserver les habitats sur des sites spécifiques pour les espèces en péril et d'autres espèces (p. ex. les colonies de hérons).
- Continuer à appliquer la loi sur l'assainissement de l'environnement, la loi sur l'assainissement de l'eau, la politique de conservation des terres humides du Nouveau-Brunswick, la politique de protection des zones côtières pour le Nouveau-Brunswick et toute autre loi servant à conserver les fonctions écologiques, économiques et sociales de ces communautés écologiques.
- Le musée du Nouveau Brunswick continuera ses recherches sur les hibernacula, l'effet des changements climatiques et l'effet des communautés de champignons et moisissures sur les cavernes.
- Continuer à appuyer les efforts des ONG vis-à-vis la conservation et l'intendance via l'assistance directe et en nature (p. ex. le Fonds de fiducie de la faune du Nouveau-Brunswick, le Fonds en fiducie pour l'environnement du Nouveau-Brunswick).
- Participer activement chaque année à des réunions de planification pour le rétablissement des espèces en péril.

<u>Études d'oiseaux Canada</u>

- Compléter en 2015 les rapports sur les liens entre les espèces et les habitats et sur les menaces aux oiseaux des prairies, selon les données de l'Atlas des oiseaux nicheurs des Maritimes.
- Compléter en 2015 les rapports sur les liens entre les espèces et les habitats et sur les menaces aux espèces prioritaires.
- Poursuivre la surveillance des espèces d'oiseaux dépendant des milieux humides, évaluer l'efficacité des efforts de conservation du Plan conjoint des habitats de l'Est (PCHE), et encourager l'intendance des milieux humides locaux en vertu du Programme de surveillance des marais des Maritimes.

- Poursuivre la surveillance des niveaux de population du martinet ramoneur, aux sites de perchoirs connus, dans le cadre du Programme citoyen-science de surveillance et de conservation intitulé Programme de suivi du martinet dans les Maritimes.
- Poursuivre la tenue d'ateliers proactifs dans la communauté au bénéfice des martinets ramoneurs, intitulés « Swift Night Out ».

Conservation de la nature Canada

- Conserver 200 ha d'aires naturelles prioritaires avant 2017, desquelles 175 ha seront de priorité 1 ou 2 (haute priorité) et au maximum 25 ha qui seront de priorité 3 ou moins.
- Améliorer la connectivité des écosystèmes forestiers via l'analyse de corridors potentiels de migration dans la biorégion et les régions adjacentes.
- Améliorer la connectivité, la condition et le contexte de conservation du paysage sur les grandes terres industrielles de la biorégion avant 2018, via l'adoption de principles de certification FSC et/ou la désignation volontaire d'aires de conservation prioritaires sur les terres industrielles.
- Mettre à jour les priorités de conservation de l'habitat dans la biorégion en tenant compte des nouvelles aires naturelles protégées jusqu'en 2015.
- Préparer les énoncés intérimaires d'intendance dans un délai d'un an, et les plans de gestion des propriétés, à la suite de l'approbation des normes de rendement de l'intendance des propriétés sécurisées par Conservation de la nature Canada (CNC).
- Mettre en œuvre les mesures du Plan de gestion des propriétés concernant les terres de CNC jusqu'en 2018.
- Désigner toutes les propriétés de CNC dans la biorégion, en vertu de la *Loi sur les zones naturelles protégées* du Nouveau-Brunswick, d'ici 2018.
- Promouvoir de meilleurs pratiques de gestion afin d'empêcher l'impact sur les cours d'eau et les zones riveraines.
- Contrôler la propagation d'espèces envahissantes dans la biorégion et tenter de prévenir l'introduction de nouvelles espèces envahissantes.
- Participer activement chaque année à des réunions de planification pour le rétablissement des espèces en péril (p. ex. pluvier siffleur).
- Améliorer la gestion des données et de l'information sur la biodiversité via le partage de données avec le Centre de données sur la conservation du Canada atlantique.
- Effectuer des inventaires aériens des limicoles et évaluer la durée de séjour durant la période migratoire automnale de 2013 et 2014.
- CNC acceuillera au minimum une rencontre d'engagement communautaire ou pour les bénévoles de conservation de la biorégion.
- CNC continuera à entreprendre le fonctionnement du Centre d'interprétation de Johnsons Mills et assurera l'embauche annuelle d'interprètes servant à éduquer le public et effecturer la surveillance des plages.
- Démontrer les approches à la restoration qui sont appropriées à la forêt Acadienne
- Démontrer et dévélopper la capacité dans la communauté les moyens de restorer et conserver les cours d'eau se trouvant sur des terres agricoles et boisées.

Gouvernement du Canada – Environnement Canada

- Mettre en œuvre et mettre en application la *Loi sur la convention concernant les oiseaux migrateurs*, la *Loi sur les espèces sauvages du Canada*, la *Loi sur les espèces en péril*, la *Loi canadienne sur la protection de l'environnement*; et promouvoir la Politique fédérale sur la conservation des milieux humides.
- Offrir un soutien aux organisations environnementales non-gouvernementales (OENG), aux organisations autochtones et aux milieux universitaires par l'entremise de programmes d'emploi

d'Environnement Canada, notamment le programme de stages pour les jeunes Horizons-Sciences et le Service écojeunesse international.

- Offrir un soutien aux organisations environnementales non-gouvernementales (OENG), aux organisations autochtones et aux institutions académiques par l'entremise du Programme d'action communautaire pour l'environnement, notamment le travail sur l'habitat et sur la conservation et intendance des systèmes écologiques grâce à un soutien direct et en nature (p. ex. le Programme de financement communautaire ÉcoAction, le Fonds pour dommages à l'environnement, le Plan de conservation national - le Fonds national de conservation des milieux humides, le Plan de conservation national – Initiative du Golfe du Maine, les Initiatives de l'écosystème de l'Atlantique, le Programme des dons écologiques du Canada, le Programme d'intendance de l'habitat – Volet prévention, le Fonds autochtone pour les espèces en péril – Volet prévention).
- Offrir un soutien aux organisations environnementales non-gouvernementales (OENG) et aux organisations autochtones pour le travail spécifique sur les espèces en péril dans le cadre du Programme d'intendance sur les habitats et le Fonds autochtone pour les espèces en péril.
- Soutenir les activités décrites dans les documents de rétablissement des espèces en péril pour en vue de l'achèvement de la série d'études sur la détermination des habitats critiques.
- Engager et consulter tous les partenaires dans l'élaboration de documents sur le rétablissement des espèces en péril.
- Coordonner le Plan conjoint des habitats de l'Est (PCHE) et fournir une orientation scientifique aux partenaires sur les mesures de conservation et sur les priorités concernant les oiseaux migrateurs, les espèces en péril et leurs habitats, notamment par l'élaboration, le peaufinement et la mise en application de cette SCH et de la Stratégie du Nouveau-Brunswick pour la conservation des oiseaux dans la Région 14.
- Poursuivre les activités de gestion associées aux Réserves nationales de la faune de Shepody et de Tintamare.
- Identifier les lieux importants pour les oiseaux marins
- Contribuer à l'élaboration d'un réseau d'aires marines protégées pour la biorégion du plateau néoécossais, incluant des sites identifiés en tant que zones importantes écologiques et biologiques (ZIEB).
- Coordonner et mener des enquêtes sur les oiseaux migratoires (p. ex. inventaire des haltes migratoires du bécasseau semipalmé, inventaire des sites de nidification du pluvier siffleur, 2 parcelles de surveillance de l'Inventaire de la sauvagine de l'est, 1 relevé hivernal triennal du canard noir, 7 parcours actifs du Relevé des oiseaux nicheurs).
- Assurer le fonctionnement et la mise à jour du centre d'interprétation de Marys Point, incluant l'embauche d'interprètes servant à sensibiliser le public et assurer la surveillance de la zone côtière de la Réserve nationale de faune de Shepody, via l'initiative servant à rapprocher les Canadiens à la nature du Plan de conservation national.
- Continuer de renforcer le partenariat avec le Centre de données sur la conservation du Canada atlantique via l'échange de données de monitorage et d'inventaire provenant des aires de conservation.

<u>Gouvernement du Canada – Agence Parcs Canada</u>

- Continuer le monitorage complet afin d'évaluer l'état des écosystèmes des parcs et d'orienter les activités de manière à conserver ou améliorer l'intégrité écologique des parcs
- Continuer d'appuyer le rétablissement d'espèces identifiées par la loi sur les espèces en péril, incluant le saumon de l'intérieur de la baie de Fundy, via le monitorage et les activités de rétablissement, la collaboration et partenariats avec les groupes d'intervenants, et la participation aux rencontres liées aux programmes de rétablissement et aux plans d'action.

- Mettre en œuvre et mettre en application la Loi sur les parcs nationaux du Canada et la Loi sur les espéces en péril à l'intérieur des limites des parcs.
- Fournir des opportunités valables (p. ex. via programmes de bénévolat et d'interprétation) pour la sensibilisation des visiteurs et d'encourager leur appui aux efforts continus de restoration et de monitorage dans les parcs.

Gouvernement du Canada –Pêches et Océans Canada

- Mener les efforts des départements fédéraux liés à l'identification de zones importantes écologiques et biologiques (ZIEB) et le paufinement de l'information relatant à la baie de Fundy et à la biorégion du plateau néo-écossais.
- Compléter les systèmes de classification côtière et infratidale pour la biorégion du plateau néo-écossais.
- Mener les partenaires fédéraux sur le plan de l'élaboration de réseaux d'aires marines protégées via la Loi sur les océans. Identifier deux nouvelles aires d'intérêt dans la biorégion du plateau néo-écossais avant 2020.
- Mettre en œuvre et mettre en application la Loi sur les pêches et la Loi sur les espèces en péril dans les eaux fédérales.

Canards illimités Canada

- Gérer et assurer le monitorage de 4 575 ha d'habitat (incluant des habitats restorés) dans la biorégion.
- Explorer des possibilités de restorer 200 ha additionels de marais salés et de milieux humides d'eau douce dans la biorégion avant 2018, ceux-ci étant primordiaux pour appuyer l'objectif de la politique provinciale sur les milieux humides qui est de n'avoir aucune perte nette fonctionnelle du milieu humide.
- Évaluer et améliorer le fonctionnement de 66 ponceaux gérés par Canards illimités Canada dans la biorégion.
- Sécuriser les milieux humides des plaines inondables significatives et prioritaires dans la province, lorsque les occasions se présenteront.
- Poursuivre la gestion de l'habitat critique du petit blongios (Ixobrychus exilis) et créer un habitat encore plus adéquat dans les zones connues de reproduction.
- Poursuivre la mobilisation du public et des propriétaires terriens, par l'entremise de programmes d'éducation et de sensibilisation, comme le programme des nichoirs de sauvagines, le projet « Webfoot », les centres locaux d'excellence des milieux humides, un programme d'intendance pour les propriétaires terriens, et des programmes de classes en plein air.

Fondation pour la protection des sites naturels du Nouveau-Brunswick

- Sécuriser 200 ha de terres privées comportant des habitats importants dans la biorégion avant 2018.
- Améliorer les activités d'aménagement sur les aires protégées de l'île Grindstone et du Cap Enragé via un réseau de bénévoles.
- Continuer à travailler avec les groupes partenaires du domaine de la conservation sur les besoins communs (collecte de données, efforts de sensibilisation, détection et monitorage d'espèces envahissantes, sensibilisation spécifique aux espèces en péril).
- Continuer à organiser des événements et activités publics, liés aux réserves établies et à l'intendance et à la conservation en général.
- Continuer à favoriser de nouveaux partenariats avec les municipalités et de promouvoir la conservation sur les terres municipales. Ceci incluera aussi le dévéloppement de groupe d'intendance locale pour le Cap Enragé.

- Partager l'information et accroître la prise de conscience quant aux menaces pour les espèces en péril et transmettre des conseils et trucs aux propriétaires privés dans le cadre du Programme « Power of Nature Outreach », le Programme d'intendance des propriétaires terriens, et lors de rencontres ou d'événements publics.
- Tenter d'obtenir une désignation officielle pour les aires protégées de l'île Grindstone et du Cap Enragé, en tant qu'aires naturelles protégées afin de sécuriser une protection à très long-terme.
- Poursuivre la surveillance des espèces en péril connues dans toutes les réserves naturelles de la biorégion.

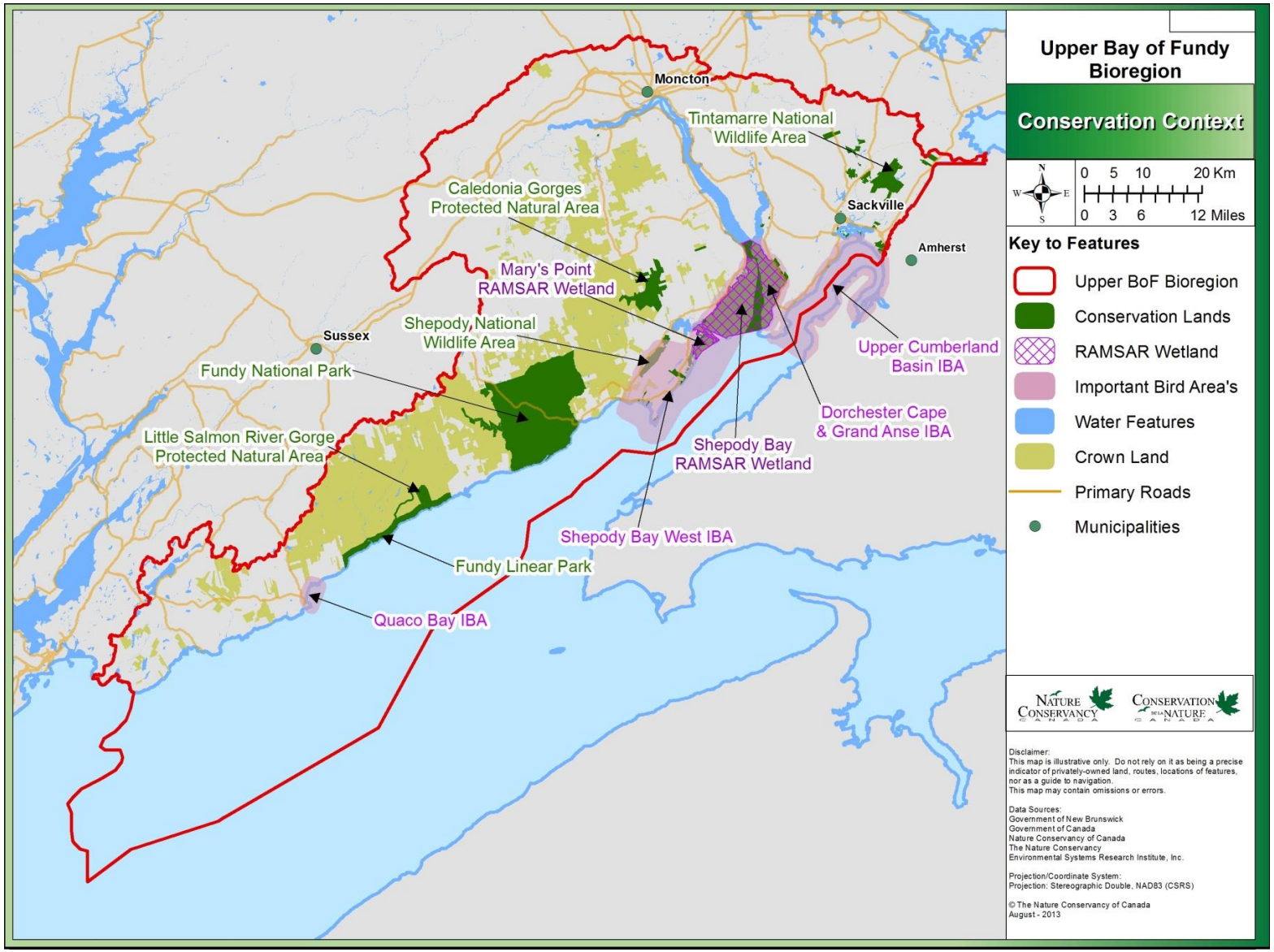
Alliance du basin versant Petitcodiac / Petitcodiac Watershed Alliance

- Mettre en œuvre le monitorage de poisson dans la rivière Petitcodiac avec la collaboration des autres membres de la Coalition pour le rétablissement du poisson dans la rivière Petitcodiac
- Mettre en œuvre des projets de restoration des cours d'eau dans le bassin versant de la rivière Petitcodiac afin d'améliorer la connectivité de l'habitat, la qualité de l'habitat et de l'eau.
- Continuer les efforts de monitorage à long terme de la qualité de l'eau à au moins 22 stations situées à l'intérieur du bassin versant de la rivière Petitcodiac afin d'identifier et de signaler les sources de polluants et les tendances à long terme.
- Mettre en œuvre des programmes de monitorage, de rétablissement et d'intendance pour les espèces en péril se trouvant dans le bassin versant de la rivière Petitcodiac.
- Appuyer les partenaires de la communauté dans des projets de science visant à délimiter les milieux humides, établir des inventaires d'espèces, dévélopper des programmes éducatifs et la communication des résultats à grande échelle.

Première nation Fort Folly / Fort Folly First Nation

- Continuer le monitorage d'espèces aquatiques, en particulier les espèces en péril, incluant le saumon de l'intérieur de la baie de Fundy, l'anguille d'Amérique, le bar rayé, l'esturgeon noir (Population des Maritimes), et la tortue des bois.
- Continuer les efforts de rétablissement liés au saumon de l'intérieur de la baie de Fundy, en particulier dans le bassin versant de la rivière Petitcodiac.
- Effectuer la planification des activités d'intendance et de restoration de l'habitat dans le bassin versant de la rivière Petitcodiac au près de la Coalition pour le rétablissement du poisson dans la rivière Petitcodiac.

**Map 1 - Conservation Context for the NB IBoF bioregion.**



# NB Inner Bay of Fundy Bioregion
# Habitat Conservation Strategy
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## ACKNOWLEDGEMENTS

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# 1. CONSERVATION CONTEXT

## A. BIOREGION SCOPE

### *i. Location and Size*

The NB IBoF bioregion is a complex of marine, coastal and forest ecosystems situated within southeastern New Brunswick (Figure 1). The total area of the bioregion is 734 214 ha, of which 483 863 ha is terrestrial and 250 351 ha is intertidal and marine. The coastline within the bioregion is approximately 517 km long, representing 23% of the province's entire coastline. The bioregion falls within the Northern Appalachian – Acadian Ecoregion and encompasses portions of four subregions (Anderson et al. 2006; Table 1). The terrestrial portion of the bioregion represents approximately 6.6% of the New Brunswick land base and contains portions of four provincial ecoregions, each of which have one or more ecodistricts (Zelazny 2007). All of the Maritimes falls under the Atlantic Northern Forest (Bird Conservation Planning Region 14) in the North American Bird Conservation Initiative (NABCI) and is classified as the Atlantic Maritime Ecozone within the National Ecological Framework for Canada (Ecological Stratification Working Group 1996). The intertidal and marine components of the bioregion fall within the Bay of Fundy portion of Canada's Scotian Shelf Bioregion (Government of Canada 2011). In EC Bird Conservation Strategies, waters of the bioregion fall within Marine Biogeographic Unit 11 (EC 2013). The Scotian Shelf Bioregion constitutes the planning area for design, development and designation of a Network of Marine Protected Areas through collaboration among federal and provincial partners (DFO 2012). As a basis for the latter work, physiographic classification systems have been developed for both coastline (i.e., inland limit of marine waters, sediment and saline influences to 10 m depth) and coastal sub-tidal (i.e., inshore 10 m depth boundary to approximately 100 m depth) areas (Greenlaw et al. 2012; DFO 2012). Further, Environment Canada has undertaken work to identify important marine habitat sites for shorebirds, waterfowl, seabirds and seabird colonies in Eastern Canada, including the Bay of Fundy (Allard et al. 2014). DFO has initially identified 16 Ecologically and Biologically Significant Areas (EBSAs) in the Bay of Fundy that meet DFO and Convention on Biological Diversity (CBD) criteria, including one or several of the following: uniqueness, biological diversity, aggregation, fitness consequences, naturalness, resilience, productivity, species at risk habitat (DFO 2012). It should be noted that additional EBSAs may be identified as information on new locations is assessed against these criteria (Buzeta et al. 2003; DFO 2012). Given these efforts, the NB IBoF HCS focuses on terrestrial ecosystems, also including intertidal habitats.

**Table 1. Ecological land classifications of the NB IBoF bioregion.**

<table>
<tr><td>Classification Source</td><td>Classifier</td><td colspan="4">Primary and Nested Classifications</td></tr>
<tr><td rowspan="2">NAAP[1]</td><td><u>Ecoregion:</u></td><td colspan="4">Northern Appalachian - Acadian</td></tr>
<tr><td><u>Subregion:</u></td><td>Gulf of Maine - Bay of Fundy - Minas Basin</td><td>Acadian 'Uplands'</td><td>Northumberland - Bras D'Or 'lowlands'</td><td>Acadian Highlands</td></tr>
<tr><td rowspan="3">New Brunswick DNR[2]</td><td><u>Ecoregion:</u></td><td>3: Central Uplands</td><td>4: Fundy Coast</td><td>5: Valley Lowlands</td><td>6: Eastern Lowlands</td></tr>
<tr><td rowspan="2"><u>Ecodistrict(s):</u></td><td rowspan="2">3-6: Caledonia</td><td rowspan="2">4-1: Fundy Coastal</td><td>5-11: Kingston</td><td rowspan="2">6-7: Petitcodiac</td></tr>
<tr><td>5-12: Anagance</td></tr>
</table>

| | | |
|---|---|---|
| **North American Bird Conservation Initiative[3]** | BCR<br>MBU | Bird Conservation Region (BCR) 14: Atlantic Northern Forest<br>Marine Biogeographic Unit (MBU) 11: Bay of Fundy |
| **National Ecological Framework for Canada[4]** | Ecozone: | Atlantic Maritime |

[1] Anderson et al. 2006
[2] Zelazny, 2007
[3] North American Bird Conservation Initiative Canada, 2012
[4] Ecological Stratification Working Group, 1996

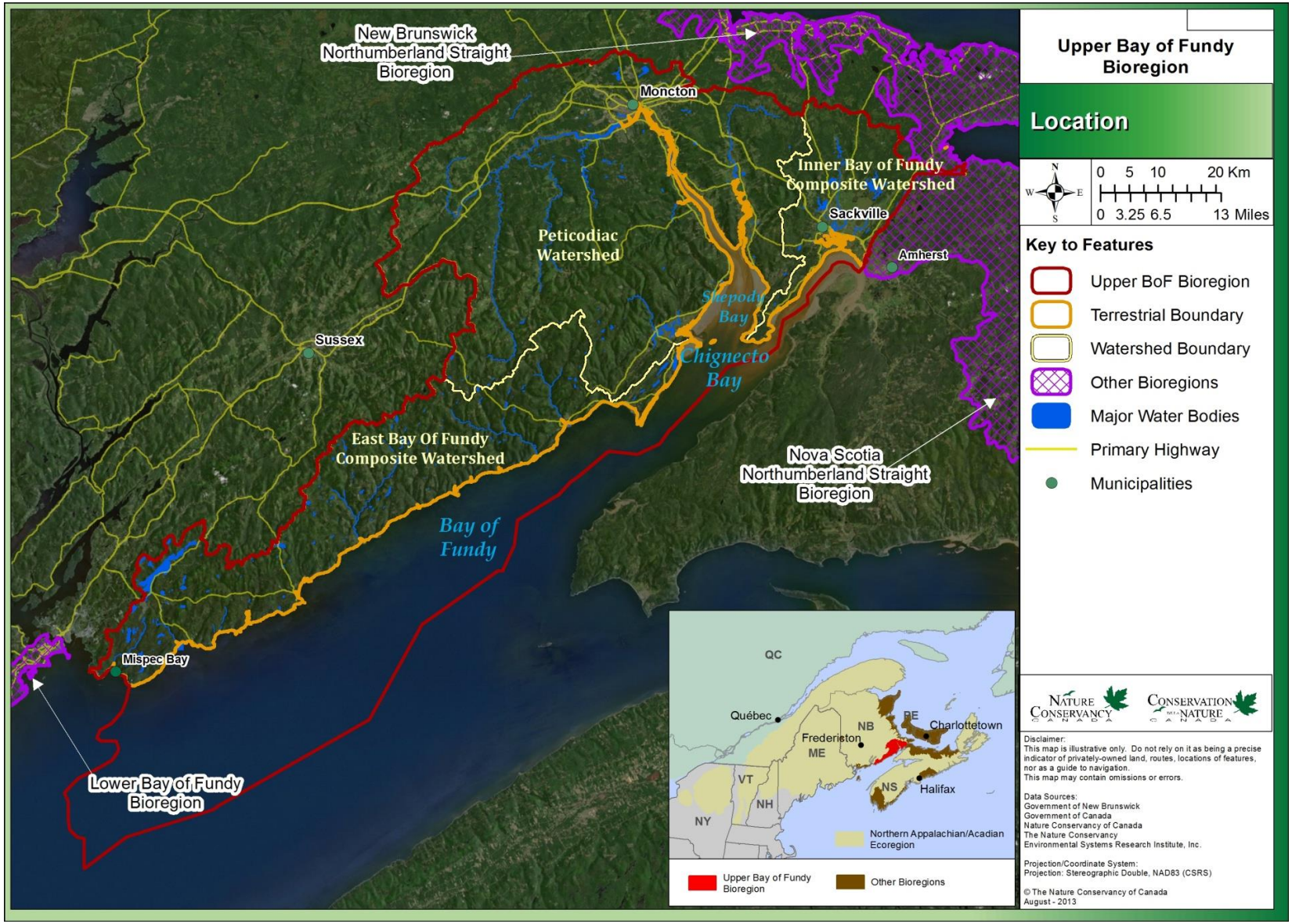



**Figure 1. Boundaries of the NB IBoF bioregion.**

### *ii. Boundary Justification*

The landward terrestrial boundary includes 3 primary watersheds that flow into the NB IBoF bioregion. The size and shape of the terrestrial boundary was delineated according to the Petitcodiac, East Bay of Fundy Composite and Inner Bay of Fundy Composite watersheds of the Atlantic Seaboard Drainage Basin (Natural Resources Canada 2006). This includes all watersheds and estuaries stretching from Mispec Bay to the Tantramar Marshes along the Nova Scotia border, and includes the basins of both Chignecto Bay and Shepody Bay, as well as the Petitcodiac, Memramcook, Big Salmon, Tantramar, Point Wolf, Shepody and Missaguash rivers. This boundary was chosen in order to capture the spatial origins of threats occurring throughout the watersheds, but that may have significant impacts downstream on coastal and marine habitats.

The NB IBoF bioregion's marine boundary follows the provincial "Submerged Land Management Areas" to the south in order to distinguish from the Nova Scotian portion of the inner Bay of Fundy. The seaward limit of the largely terrestrial species and habitat data assessment undertaken within this HCS reaches the coastline, described in Greenlaw (2012) as coastal sub-segments: 6a – Fundy Erodable Cliffs and Coarse Beaches, 6b – Fundy High Cliffs and 7a - Inner Bay of Fundy Tidal Flats and Marshes. The reader is encouraged to refer to DFO (2012) for information on habitat conservation efforts in marine environments within the NB IBoF bioregion.

### *iii. Ecological Significance*

In addition to exhibiting the world's highest recorded tides, with significant mixing of the water column, and extensive nutrient transport via erosive and depositional processes, the Bay of Fundy is known for its highly productive and biodiverse marine environments (Hunter and Associates 1982; Prouse et al. 1984; Buzeta et al. 2003).

The need for a HCS within the NB IBoF bioregion was first cited due to its importance as a critical regional and international staging area for migratory shorebirds during their fall migration (WSHRN 2014). As these shorebirds move south from their arctic and sub-arctic breeding grounds, the inner Bay of Fundy is used as a stopover site for resting and feeding en route to their wintering grounds in Central and South America. From late July to mid-September, millions of shorebirds, representing as many as 42 migratory species, stage in the inner Bay of Fundy (D. Christie pers. comm.; Appendix G). Perhaps most notably, between 1.5 and 2 million Semipalmated Sandpiper (*Calidris pusilla*) individuals, representing up to 75% of the global population of this species, leave their breeding grounds and fly non-stop to the inner Bay of Fundy, converging on the nutrient-rich tidal flats.

In 1982, Marys Point was designated a Ramsar wetland of international importance, the 3$^{rd}$ such designation in Canada, followed by the Shepody Bay Ramsar designation in 1987 (Ramsar 2014). That same year, Shepody Bay and Marys Point together were the first sites in Canada to be declared Hemispheric Shorebird Reserves, under the Western Hemisphere Shorebird Reserve Network (WHSRN 2014). Four Canadian designated Important Bird Areas (IBAs) have also been established within the bioregion; Shepody Bay West, Dorchester Cape and Grande Anse, Quaco Bay and Upper Cumberland Basin, the latter of which straddles the New Brunswick – Nova Scotia border (IBA Canada 2014). All of these sites are shown in Figure 2.

The bioregion also includes a significant portion of the Chignecto Isthmus, an ecological land bridge and the only terrestrial corridor connecting Nova Scotia with the rest of North America. The isthmus is divided into two regions, the Northumberland Strait coast and the Bay of Fundy coast, the NB portion of the latter being encompassed within the NB IBoF bioregion. Habitat fragmentation due todevelopment

within the isthmus limits connectivity and may restrict wildlife population dispersal and gene flow between the two provinces (Nussey 2010).

The Northern Appalachian-Acadian Ecoregional Plan (NAAP; Anderson et al. 2006) identified a number of critical ecological systems for the NB IBoF bioregion including a large matrix forest block, beaches, salt marshes, tidal flats, freshwater wetlands, riparian systems, summits, steep slopes and sheltered forest coves. The NAAP also identified species that are considered primary targets - those that cannot be adequately conserved by the protection of ecosystems alone but require explicit and direct conservation attention – including five coastal/aquatic species: Robinson's Hawkweed (*Hieracium robinsonii*), Semipalmated Sandpiper, Peregrine Falcon (*Falco peregrinus anatum*), Atlantic Salmon (*Salmo salar*) and Brook Floater (*Alasmidonta varicosa*), as well as inland species: Maritime Shrew (*Sorex maritimensis*), Sedge Wren (*Cistothorus platensis*), Long-tailed Shrew (*Sorex dispar*) and Upland Sandpiper (*Bartramia longicauda*). Additionally, there are 31 COSEWIC-designated species found in the bioregion, as well as 4 provincially listed species-at-risk, two of which are not federally listed. Twenty-five globally significant species (G1-G3G4) were also identified within the bioregion, 6 of which are also COSEWIC-designated.

The NB IBoF bioregion is considered highly significant due to the diversity of ecological systems and associated species. The bioregion contains a notable concentration of at-risk and globally significant species, and provides critical breeding and staging ground for a variety of waterfowl, shorebird and marsh bird species (Allard et al. 2014). The area encompassing the salt marshes, tidal flats, rocky shorelines and turbid waters of Chignecto Bay, within the NB IBoF bioregion, has been identified as an Ecologically and Biologically Significant Area by DFO (Buzeta et al. 2003). Further, the Eastern Habitat Joint Venture (EHJV) identified the Shepody and Tantramar region as a priority area for securement of private lands due to the high concentrations of shorebirds and waterfowl that occur there and in adjacent coastal and intertidal habitats (Sabine 2002). Significant resources have been invested in the area through the North American Wetlands Conservation Act (NAWCA), which is an international agreement providing long-term protection of habitats needed by waterfowl and other migratory bird species. The diversity of conservation initiatives occurring within the bioregion is a testament to the ecological significance contained within it. Ongoing conservation planning and implementation will be fundamental to the continued protection of biodiversity and sustainability within this unique bioregion.

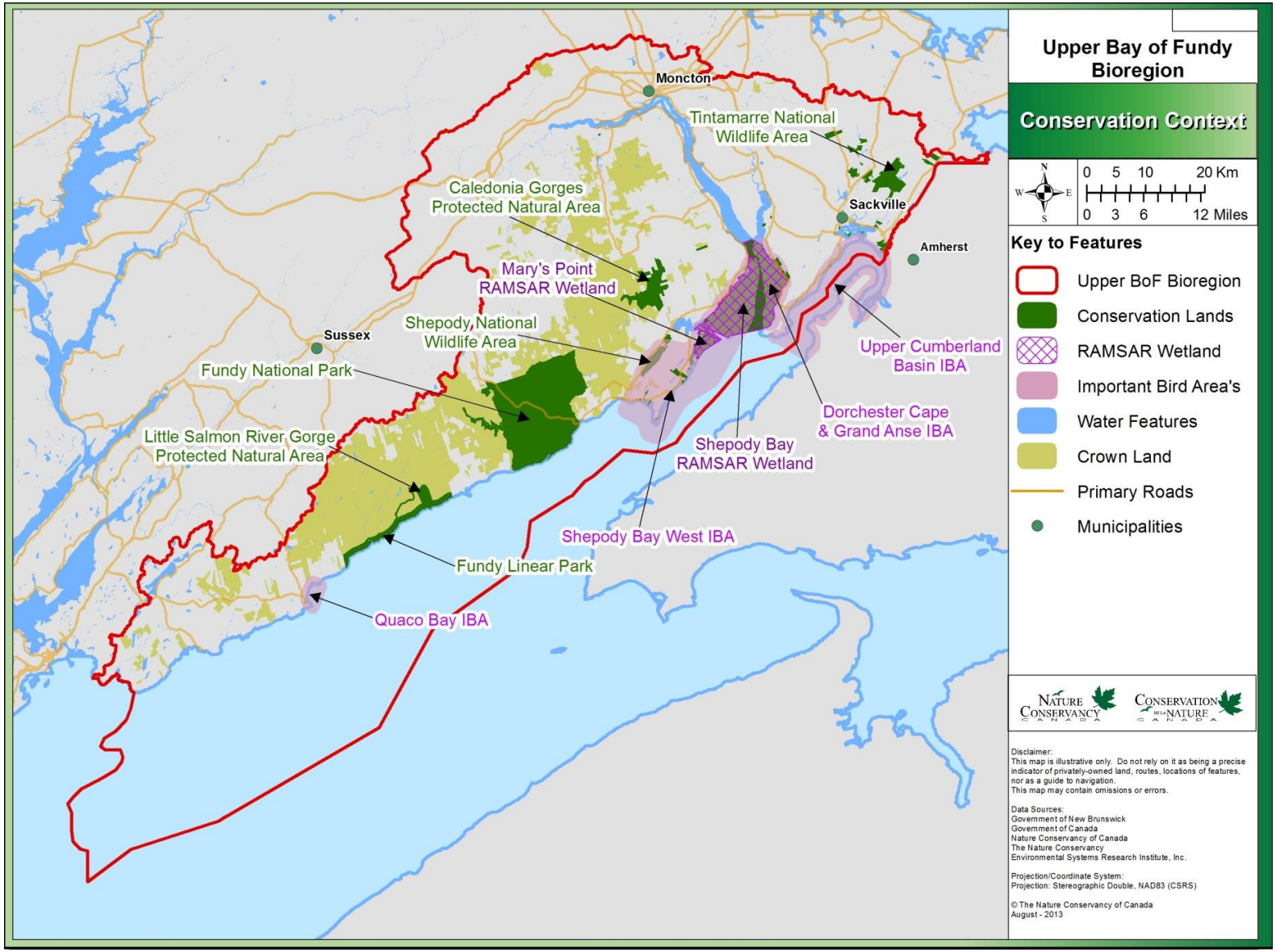



**Figure 2. Designated and conserved lands in the NB IBoF bioregion.**

## B. ECOLOGICAL CONTEXT

### *i. Ecological Systems and Vegetation Communities*

**Acadian Matrix Forest (Acadian forest mosaic)**

The forests in this bioregion are part of the Acadian forest type. This forest type, one of the ten forest types occurring in Canada, is found almost exclusively within the Maritimes, the remainder of which is found in limited parts of northern New England and southern Quebec. Acadian forest in New Brunswick is a mix of boreal conifer-dominated forest blended with those of southern hardwood forest, which creates a remarkably diverse system. Human influence over the past 200 years has simplified the forest structure, composition and age class. Old stand types are far less abundant than were historically found in this area (Erdle and Sullivan 1998; Loo and Ives 2003) and only 5% of Northern Appalachian - Acadian forest remains in pre-settlement condition (Davis et al. 2014).

The cool, moist climate of the Fundy coast together with relatively moderate winter low temperatures has led to a mainly coniferous forest cover dominated by Red Spruce (*Picea rubens)* - an Appalachian endemic - together with Balsam Fir (*Abies balsamea*), Black Spruce (*Picea mariana*), White Spruce (*Picea glauca*), and Eastern Larch (*Larix laricina*). The most common hardwood species in this zone are White Birch (*Betula papyrifera)*, Yellow Birch (*Betula alleghaniensis*), American Mountain-ash (*Sorbus americana*) and Red Maple (*Acer rubrum*) (Zelazny 2007). The inland portions of the bioregion, especially (or particularly) in the Petitcodiac watershed, are also dominated by coniferous forest, but include more temperate species such as Eastern Hemlock (*Tsuga canadensis*) and Eastern White Pine (*Pinus strobus*). Trembling Aspen (*Populus tremuloides*) is also dominant within the Petitcodiac watershed, particularly in disturbed areas. The bioregion encompasses numerous ridge tops and areas of higher elevation such as the Caledonia Hills near Shepody, where extensive shade-tolerant hardwood communities consisting of Sugar Maple (*Acer saccharum*), Yellow Birch and American Beech (*Fagus grandifolia*) can be found. Toward the northwest boundary of the bioregion, White Ash (*Fraxinus americana*), Ironwood (*Ostrya virginiana*) and Red Oak (*Quercus rubra*) are also present as minor forest constituents. These shade-tolerant hardwood communities often transition into mixedwood communities along slopes and flatlands, with increases in its proportion of Red Spruce and Balsam Fir (Zelazny 2007).

A number of unique forest communities occur in the region, some of which are not found elsewhere in the province. For instance, coastal fog forest dominated by Red Spruce is restricted to the upper Fundy coast and contains a high diversity of rare and uncommon lichen species. Similarly, coastal ravine forest, which has unique microclimatic conditions, supports a unique suite of boreal and arctic flora (Zelazny 2007). Eastern Hemlock-dominated forest, found in areas of calcareous bedrock, are rare both within the province, as well as across Canada (NSDNR 2010). The contiguous transition of forest communities, or “forest matrix”, provide habitat for a wide range of plant and animal species. The Northern Appalachian-Acadian Ecoregional Plan (NAAP) determined that there is a tier 1 forest matrix block within the boundaries of the bioregion. Through analysis of the historic size ranges of documented natural disturbance events, along with the area requirements of forest-interior breeding species in the region (Fig. 3), Anderson et al. (2006) determined that a 10 000 ha minimum-sized matrix block in the Acadian forest would be able to withstand any natural disturbance (hurricanes, fire, ice storms) while maintaining all of its natural ecological processes.

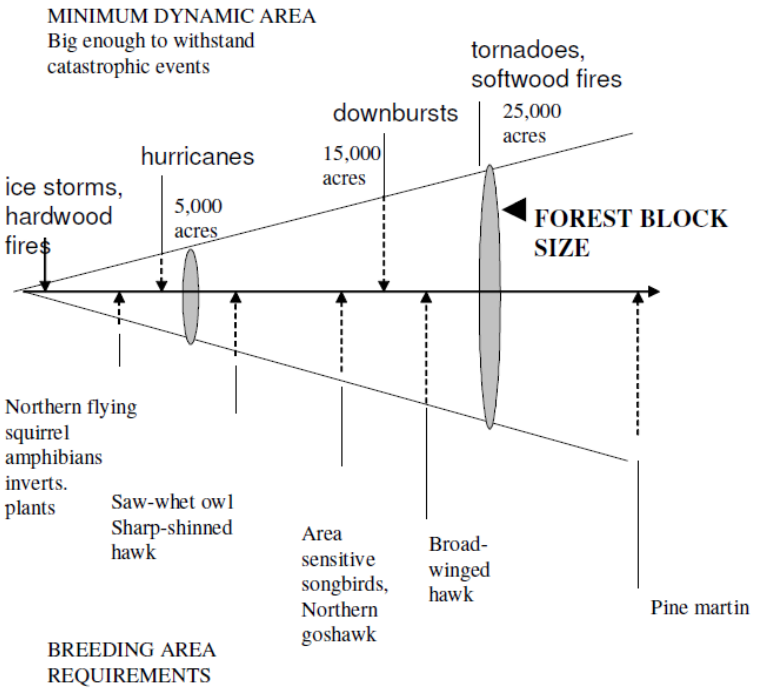



**Figure 3. Scaling factors for matrix forming forest in the Northern Appalachian/Acadian ecoregion showing rationale for minimum core protected area (forest block size), from Anderson et al. (2006).**

Additionally, the NAAP singled out three elevation-dependent ecological systems within the bioregion, which have been included within the Acadian forest mosaic: steep slopes, summits and sheltered forest coves. Most of these higher elevation ecological systems are located in the Caledonia Gorge Provincial Protected Natural Area (PNA) and are generally well represented in protected areas within the bioregion. There are 576 ha of critical steep slopes identified (screening criteria: size=10 ha minimum), 3 405 ha of critical summits identified (screening criteria: size=12 ha minimum) and 3 610 ha of critical sheltered forest coves identified (screening criteria: size=10 ha minimum).

**Riparian Systems**

Riparian systems refer to aquatic ecosystems, their adjacent uplands and the interface between the two. As such, these systems are considered ecotones, where boundaries exhibit a gradient between permanent water and seasonally flooded zones, and further extend into streamside terrestrial communities (Gregory et al. 1991). Generally, riparian habitats are recognized as the most biodiverse, complex and dynamic terrestrial systems on the planet, and this diversity is attributed to factors such as changing flooding regimes, microclimatic shifts in altitude, geomorphological processes related to channel formation and upland influences (Naiman et al. 1993). Improper forestry and agricultural practices are known to have negative impacts on riparian conditions and processes, as well as the species that depend on them, such as those caused by increases in watercourse temperature following forest harvesting (Moore et al. 2007) and changes in watercourse chemistry due to agricultural runoff (Martin et al. 1999).

Within the NB IBoF bioregion, a number of large river systems occur, including the Petitcodiac, Memramcook, Big Salmon, Tantramar, Point Wolfe, Upper Salmon, Shepody and Missaguash. Numerous lakes and ponds are also present within the bioregion, the largest and most numerous of which occur in the western extremity (nearer Saint John). There is a notable absence of lakes and ponds within the western portion of the Petitcodiac watershed, owing to the rugged terrain that occurs within this area (Zelazny 2007). Intact, well-buffered riparian systems are essential for a variety of anadromous

fish species as well as numerous other species at risk within the bioregion These include, among others, both Wood Turtle and Snapping Turtle, which depend on relatively undisturbed riparian environments and areas surrounding freshwater wetlands that provide mesic ecotones (a balanced mixture of wet and dry habitat) for virtually their entire life cycle (Arvisais et al. 2002; Semlitsch and Bodie 2003; COSEWIC 2007a; COSEWIC 2008).

Within the NB IBoF bioregion, a total of 394 ha of ecoregionally critical riparian habitat was identified in the NAAP (Size >=40 ha). The total amount of riparian habitat also included priority Wood Turtle (*Glyptemys insculpta*) habitat, inner Bay of Fundy Atlantic Salmon (*Salmo salar* pop. 1) rivers and all major watercourses identified within the provincial water inventory (all buffered by 275m; Semlitsch and Bodie 2003).

**Freshwater Wetlands**

According to the New Brunswick provincial wetland inventory, over 16 567 ha of freshwater wetlands occur within the bioregion, of which 4 548 ha have been identified as ecoregionally critical in the NAAP (size >= 20 ha). The provincial inventory identifies 6 primary wetland types within the bioregion, the major type being shrub dominated wetland (Fig. 4).

One of the most prominent wetland complexes within the bioregion is the Tantramar marshes. The marshes occupy a large area at the head of the Cumberland Basin where the flat terrain meets the sediment-laden waters of the Bay of Fundy. It is an intricate system containing 49 000 ha of wetlands spanning the New Brunswick and Nova Scotia border, and includes open marshes, shallow peatlands and the largest expanse of dyked marshland in North America (Davis and Browne 1996). Some of the more marginal dyked areas have been reclaimed as wetland habitat. Raised coastal bogs are present in the southwestern corner of the bioregion, although these are mainly restricted to the landscape west of the bioregion boundary. Raised bogs are characterized as having deep depressions where expansion is restricted, whereas the more common flat bogs form in shallow depressions and expand into extensive complexes over time, including open pools and wet hollows. Within the higher elevation portions of the bioregion, riparian alder wetlands, marshes and shallow open water wetlands are more prevalent, although shallow peatlands may also be present. Treed swamps constitute a relatively minor spatial component of the bioregion, and are mostly restricted to the central area between Hillsborough and Elgin.

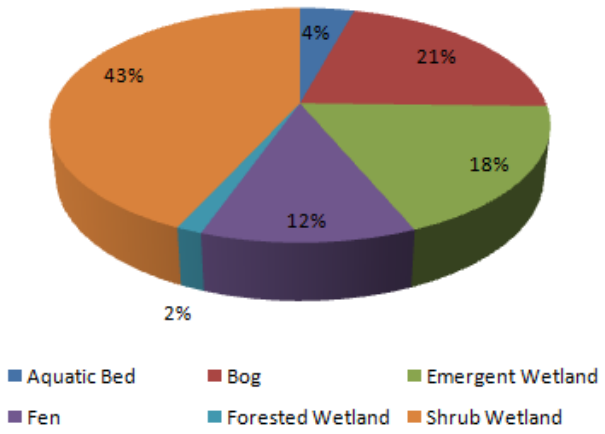



**Figure 4. Composition of freshwater wetlands within the NB IBoF bioregion according to the provincial wetland classification.**

Often overlooked, but of ecological significance, are seasonal vernal pools that occur throughout the Acadian forest mosaic. Vernal pools are small (generally < 1 ha), isolated and shallow wetlands that lack permanent inflow or outflow and often contain open water for only a portion of the year (Lichko and Calhoun 2003; Calhoun and de Maynadier 2008). Vernal pools provide breeding habitat that is critical for a variety of species such as the Wood Frog (*Lithobates sylvaticus*) and various mole salamanders (*Ambystoma* spp.), which have adapted to living in these temporary, predator-free pools. They are important for a wide diversity of insects, especially those that require an aquatic habitat for part of their life cycle, such as Odonata (i.e., Dragonflies and Damselflies;Stoks and McPeek 2003). Vernal pools also provide foraging sites and refugia for a variety of wetland and non-wetland dependent flora, herptiles, waterfowl, forest interior passerines and mammals (Semlitsch and Bodie 1998; Gibbs 2000; Snodgrass et al. 2000). As discussed further in this HCS, vernal pools are not captured by the Provincal Wetlands layers, and this can be expected to have significant ecological implications resulting from the planning of conservation actions in the absence of this information.

**Salt Marshes**

Among the most biologically productive ecosystems in the world, coastal salt marshes are a characteristic wetland type in this bioregion. Notably, they provide breeding, staging and wintering habitat that is critical for a wide variety of bird species (Hanson 2004). Historically, the NB IBoF bioregion harboured the largest concentration of salt marshes in the Bay of Fundy. Coastal marshes in the bioregion are unique in that they include extensive areas of both low and high salt marsh, which is an uncommon feature within New Brunswick and the region as a whole. Low salt marsh is inundated daily by tides and is dominated by Saltwater Cordgrass (*Spartina alterniflora*). In contrast, the high salt marsh occurs above the mean high tide level, is only infrequently inundated and is dominated by Saltmeadow Cordgrass (*Spartina patens*) and Black-grass Rush (*Juncus gerardii*) (Zelazny 2007). Brackish marsh is also present within the bioregion where the tidal estuaries interact with the outflow of major rivers. Salt marshes within the bioregion are a primary source of nutrients that support life within adjacent coastal and marine habitats (Gordon et al. 1985). Salt marshes are also expected to perform an important role in the net accumulation of atmospheric carbon (e.g., natural soil carbon sequestration), at least during the first half of 21$^{st}$ century (Kirwan and Mudd 2012).

The critical size recognized within the NAAP for a salt marsh to maintain its ecological integrity( i.e., to support all of the species that depend on it) was 24 ha or greater, unless it is part of a larger complex (Anderson et al. 2006). Of the approximately 3 601 ha of salt marsh delineated within the provincial wetland inventory, 292 ha were deemed critical in the NB IBoF bioregion.

**Beaches, Rocky Shores and Cliffs**

Beaches within the bioregion are primarily restricted to Shepody Bay and Chignecto Bay, and are mainly composed of cobble and coarse sand interspersed with sandstone and conglomerate. Some of the more characteristic floral species of these beaches include American Dunegrass (*Elymus mollis*), Seabeach Sandwort (*Honckenya peploides*) and American Searocket (*Cakile edentula*). Many of the smaller beaches around Shepody Bay constitute important shorebird roosting areas, especially near Johnson's Mills, Marys Point, Daniels Flats and Hopewell Cape. Because of therestricted extent of this habitat, a particular beach was considered critical within the NAAP if it was > 8 ha in size, found in a relatively intact landscape and its importance corroborated by an expert or an element occurrence to confirm its viability (Anderson et al. 2006). Of the 169 ha of beach habitat found within the provincial wetland inventory, approximately 51 ha of beach habitat deemed critical were noted by the NAAP, with examples situated in the Waterside, New Horton and Shepody areas. Many roosting beaches and their adjacent upland habitat, critical to shorebirds at high tide, are still under private ownership in several locations, with associated threats. More common within the bioregion are rocky shorelines, which are classified as "primary coasts" within Atlantic Canada (DFO 2008a). Over 809 ha of rocky shoreline have

been delineated by (within) the provincial wetland inventory, and 176 ha of these have been recognized as rocky shoreline habitat deemed critical within the NAAP. Rocky shorelines occur along the cliff faces all along the Fundy Escarpment between Mispec Bay and Cape Enrage.

Cliffs within the bioregion are generally restricted to the coastline and forested ravines along the Fundy coast, with a few inland examples present in the Caledonia Hills and Gorge area. Waterfalls, sea stacks and coastal cliffs over 300 m in elevation are all present within the bioregion (Zelazny 2007). The Department of Fisheries and Oceans (2012) has categorized all shorelines within the Scotian Shelf bioregion and have outlined discrete boundaries for cliff habitat within the Bay of Fundy, which is referred to as " coastal sub-segment 6b: Fundy High Cliffs". Although the nature of cliff habitat as a linear feature does not allow for area-based summaries as do other ecological systems, identifying cliffs is nevertheless essential for assessing potential habitat of species such as the Peregrine Falcon, which depends on these elevated vertical areas for nesting.

**Tidal Flats**

The inner Bay of Fundy tidal flats are extensive, horizontal tracts of unconsolidated clays, silts, sands and organic materials that are alternately covered and uncovered by the tide. Intertidal sediments originate largely from the erosion of local coastal sedimentary rock cliffs (see Beaches, rocky shores and cliffs), are mostly mud and are sparsely vegetated (Buzeta et al. 2003). This lack of vegetative cover belies their ecological importance; indeed, during low tide, shorebirds forage here in vast numbers at certain times of year. The tidal flats also provide habitat for numerous invertebrate species, including the introduced mud shrimp *Corophium volutator)* and mud worm (*Hediste diversicolor*) (T. Einfeldt pers. comm.; DFO 2008b), as well as native molluscs and immense concentrations of unicellular organisms such as diatoms and dinoflagellates, which together form the basis of the food web in this habitat.

Within the NAAP tidal flat habitat was deemed critical if it was > 40 ha or part of a larger complex and corroborated by an expert or an element occurrence and was found in a relatively intact landscape (Anderson et al. 2006). Over 6 050 ha of tidal flats occur within the bioregion according to the provincial wetland inventory. Of this, approximately 2 541 ha of tidal flat habitat deemed critical was captured by the NAAP analysis, far surpassing the portions of all other coastal habitat types deemed critical.

**Caves and Calcareous Sites**

Over 10 198 ha of Mississippian limestone and gypsum bedrock occur within the bioregion, representing 2.1% of its total terrestrial area. These calcareous deposits are classified provincially as the "Windsor Group" and give rise to karst formations within the region. Karst topography is a result of the dissolution of soluble calcium carbonate. The natural carbon dioxide found in rain water creates a weak carbonic acid when mixed with calcium carbonate which dissolves the limestone over time, leading to the formation of sinkholes, caverns and caves. Approximately 20 solution caves have been documented in New Brunswick, as well as a single tectonic rift cave, which is present within Fundy National Park (McAlpine 1983). Of the solution caves, at least 7 occur within the bioregion, representing a significant proportion of these unique and fragile habitats. No New Brunswick species have been recorded to date that depend entirely on caves to complete their lifecycle (termed "troglophiles"), but past surveys have shown a diverse array of vertebrate and invertebrate species that regularly use the caves (termed "trogloxenes"), including unpigmented varieties (McAlpine 1979).

An additional 5 192 ha of calcareous soils occur within the bioregion that are not restricted to areas of limestone and gypsum bedrock. The two soil types that make up this area are the Saltsprings type (compact till; 3 818 ha) and the Erb Settlement type (non-compact till; 2 004 ha), both of which are composed of grey calcareous mudstones and/or feldspathic or lithic sandstones. The combined area of calcareous bedrock and soil represents 3.1% of the total terrestrial area of the bioregion.

The Atlantic Conservation Data Centre has also identified a rare forest habitat association within the karst region of the bioregion: "Eastern Hemlock – Karst – Mixedwood Forest" (S1). Although only one record of this forest type occurs within the bioregion, this is likely due to lack of intensive surveying (S. Robinson pers. comm.). Temperate karst forests are rare within Canada, the majority of which occur within Nova Scotia (NSDNR 2010).

### *ii. Dominant Ecological Processes*

**Climate**

The NB IBoF bioregion is characterized by a temperate climate with cold winters from December to March (-4.7°C to -2.5°C), with the warmest weather occurring in July and August (17.1°C and 16.9°C, respectively). Most precipitation falls in May and October (115.9 mm and 122.6 mm, respectively) (WHSRN 2014). Along the coast, the climate is moderated by strong tidal mixing, which creates persistent summer fogs as the cool coastal air mixes with warm inland air (advection fog).

**Geology**

The geology of this region is characterized by some of the the oldest and youngest rocks known in the province, ranging in age from Precambrian metasediments to Jurassic volcanic types. The landscape is diverse due in part to its variable bedrock. Although elevations generally lie below 100 m, coastal cliffs can reach over 300 m in height. The bedrock within the Petitcodiac drainage basin is mostly comprised of Pennsylvanian red and grey sandstones, conglomerates and siltstones. On the northern shores of the Petitcodiac River, the bedrock consists mainly of Mississippian red to grey sandstones, with shale and felsic volcanic rocks, mixed igneous rocks or felsic pebble conglomerates. The southern shores of the watershed are similar with red to grey Mississippian sandstone bedrock. Some limestone is also present with cave formations that are scattered mostly through the Caledonia Mountains. Most of the basin is characterized by compact till topsoil (first 0.5 m) made of veneer (sand and silt with some clay), typically under ablation moraines. Near the main river banks however, the intertidal plains and salt marshes have soils composed mostly of clay and silt with some fine sand (St. Hilaire et al. 2001). Glacially derived sediments form much of the seabed of the inner Bay, but sediment derived from coastal erosion accounts for local differences in the bottom sediments. The seabed of Shepody and Chignecto Bays are muddy clay, derived largely from shales from the nearby coasts. The soils along the Shepody and Chignecto Bays consist mainly of early carboniferous red sediments (Davis and Browne 1994).

**Forest**

In the absence of the major influence of human disturbance (e.g., forestry), the forests in the bioregion are almost entirely dependent on gap-replacing natural disturbance regimes, where small canopy openings are created by tree mortality from old age, wind damage or slope failure. Wind disturbance is generally considered the major stand-replacing agent along the Fundy Coast, although this typically does not extend past 0.5 km inland (Betts and Forbes 2005). These coastal forests are generally found along the fog belt and contain a variety of unique lichens and bryophytes that have adapted to persist in this unique environment. Within the East Bay of Fundy Composite watershed, gap disturbance regimes are the most prominent type when allowed to evolve naturally, particularly in areas dominated by tolerant hardwood and mixedwood communities. Large scale mortality from periodic insect outbreaks also occurs, such as those caused by the Spruce Budworm (*Choristoneura fumiferana*), and these epizootic outbreaks extend throughout the bioregion wherever Balsam Fir is present. More recently, the native Spruce Bark Beetle (*Dendroctonus rufipennis*) has caused fairly substantial mortality of Red Spruce in the Coastal Fog Forest of the park and beyond. Although it is a native species, more recently changing climate, especially less severe winters, may have enabled this insect to increase its population to epidemic proportions, leading to a new type of outbreak and major spuce mortality (Ben Phillips

unpublished report). Large-scale events such as fire and recurrent fire regimes are less common, particularly along the Fundy coast due to the cool, moist climate (Parks Canada 2005), although fire appears to have played a larger role within the Petitcodiac watershed, where naturally occurring stands of Jack Pine (*Pinus banksiana*) are present in low amounts (Zelazny 2007).

**Coastal Systems**

The coastal systems of the inner Bay of Fundy, like all coastal ecosystems, are dynamic by definition. These systems are influenced by tides, wave action, salt concentration, sediment structure, currents, wind, temperature, ice cover and scouring, among others (Buzeta et al. 2003; DFO 2008a; DFO 2008b). The duration and frequency of tidal flooding in the coastal zone determines where species will occur (Olsen et al. 2005; Bertness 2007). Coastal marshes respond to gradual sea level rise by growing vertically and transgressing inland, provided there is a sufficient sediment supply and that human activity on the upland does not inhibit inland migration (Redfield 1972). The strong daily tidal currents that flow into the inner Bay of Fundy continually reshape its shorelines and bottom. The soft rocks of the inner Bay of Fundy are constantly eroding, releasing vast quantities of clay, silt and sand into the water. Much of this sediment settles out to form mud flats and salt marshes, and contributes to sea-floor buildup (Buzeta et al. 2003). These mudflats, salt marshes and submarine deposits are transitory and owe their existence to subtle balances in the competing forces of the tides and currents that deposit sediments and those that erode them away. If either the rate of deposition or the rate of erosion changes over time, the mud layers will change, enlarging, shrinking or disappearing altogether (Daborn *in* Percy et al. 1997; Percy 1999). The seemingly barren flats support an abundance of diatoms, bacteria and other micro-organisms that secrete muccopolysaccharides, which increase the natural adhesiveness of the surrounding sediment particles, making the mud surface firmer and less likely to be swept away. In addition to geological and biological processes, rising sea level and changing tidal amplitude, ice scour and storms also modify and shape the inner Bay of Fundy. Winter ice can be particularly damaging, where thick layers of ice can form on the salt marshes and tidal flats, and sediments may be deeply gouged or completely abraded away over large areas.

Unlike beaches and tidal flats, the structural characteristics of rocky shorelines are mostly determined by terrestrial-based processes such as glaciations and tectonic forces. Rocky shores are exceptionally productive and biologically rich systems, particularly within the Bay of Fundy. This productivity is expressed in terms of zonation, where specific plants and animals occur along the intertidal gradient in relation to tide height. Generally, the Bay of Fundy is recognized as having greater diversity of intertidal zones than other coastal areas within eastern North America due to the extreme tidal ranges that occur here (up to 16 m). Five primary intertidal zones have been delineated, each with its own specific biological characteristics. From highest to lowest exposure to air, these are the spray zone, black zone, barnacle zone, brown algae zone and Irish moss zone (DFO 2008a).

**Hydrology**

Freshwater wetlands and riparian habitats are dynamic ecological systems that are constantly changing over space and time. The extent and type of wetlands and riparian systems that occur within any given watershed are a function of climate, geology and landscape condition (Naiman et al. 1992), all of which ultimately dictate the biota and ecological processes that will occur there. Within the NB IBoF bioregion, variations in these three factors across the landscape have led to a diversity of habitats. Between the three watersheds that comprise the bioregion, major differences in elevation gradients, seasonal climatic conditions, lithology and hydrological regimes have resulted in distinct patterns of wetlands and riparian systems across the landscape. Within the Inner Bay of Fundy Composite watershed, relatively flat terrain and low elevation have led to extensive wetland complexes. Large bogs and fens are common in this watershed, often interspersed amongst open aquatic beds and emergent wetlands, which are fed by ground water close to the soil surface. Within the Petitcodiac watershed, the rugged

terrain has created a labyrinth of stream channels dominated by shrub wetlands within smaller watercourse riparian areas, and larger floodplains where low-lying watercourses meander toward the Petitcodiac River and its tributaries. Tidal influences within these two watersheds have a strong influence on the riparian environment. Coastal wetlands tend to dominate the major watercourses feeding into the Bay of Fundy due to the extreme tidal range that occurs here. Conversely, within the East Bay of Fundy Composite watershed, distinct stream channelization within ravines and gorges create comparatively narrow riparian habitats dominated by shrub wetlands. The lack of low-lying areas along the coast, attributed to the major elevation gradients, generally prevent coastal wetlands from establishing themselves here. Toward the western border of the watershed, bogs and fens become more prevalent as the topography begins to flatten toward the adjacent Saint John River watershed.

### *iii. Significant Species*

**Rare and at-risk species**

While a number of species references have been made previously within this document, the following is a more detailed discussion of particular species deemed significant within the bioregion. Species are considered "significant" if the habitats within the bioregion are particularly relevant to them, or if the species are considered of conservation concern. Appendix C and D each provide a list of significant species within the NB IBoF bioregion with their associated coarse and fine filter habitats, respectively. These lists include all SARA and provincially listed species at risk, species designated as at risk nationally by COSEWIC, provincially most rare- (S1 or S2) or globally- (G1-G3G4) rare or uncommon element occurrence records from the Atlantic Canada Conservation Data Centre (ACCDC) most recent dataset, as well as all BCR 14 and MBU 11 priority bird species that occur within the bioregion. An additional list of all S3 (rare) species element occurrences within the bioregion can be found in Appendix E. For a complete glossary of definitions for Biodiversity and Conservation Ranks, see Appendix B. There are a total of 25 globally significant species (G1-G3G4) that are known to occur within the bioregion (Table 2), 6 of which are COSEWIC-designated species at risk. There are an additional 25 COSEWIC-designated species found to date in the NB IBoF bioregion (Table 3).

**Table 2. Globally significant species (G1-G3G4) within the NB IBoF bioregion.**

| Common Name | Scientific Name | Global Rank |
|---|---|---|
| Atlantic Sturgeon | *Acipenser oxyrinchus* | G3 |
| Brook Floater | *Alasmidonta varicosa* | G3 |
| Fernald's Serviceberry | *Amelanchier fernaldii* | G2G4Q |
| Frankton's Saltbush | *Atriplex franktonii* | G2G4 |
| Fin Whale - Atlantic pop. | *Balaenoptera physalus* | G3G4 |
| A moss | *Bryum salinum* | G2G3 |
| Piping Plover *melodus ssp*. | *Charadrius melodus melodus* | G3 |
| Robinson's Hawkweed | *Hieracium robinsonii* | G2G3 |
| Lax Notchwort | *Hygrobiella laxifolia* | G3G4 |
| Tidewater Mucket | *Leptodea ochracea* | G3G4 |
| Auricled Twayblade | *Listera auriculata* | G3G4 |
| Little Brown Myotis | *Myotis lucifugus* | G3 |
| Northern Long-eared Bat | *Myotis septentrionalis* | G1G3 |
| Tri-colored Bat | *Perimyotis subflavus* | G3 |
| Lurking Leskea | *Plagiothecium latebricola* | G3G4 |
| Ghost Antler Lichen | *Pseudevernia cladonia* | G2G4 |
| Tenacious Scalewort | *Radula tenax* | G3G4 |

| | | |
|---|---|---|
| A lichen | *Ramalina thrausta* | G3G4 |
| Little Curlygrass Fern | *Schizaea pusilla* | G3G4 |
| A Moss | *Seligeria diversifolia* | G2G3 |
| Torrey's Peatmoss | *Sphagnum torreyanum* | G3G4 |
| A lichen | *Stereocaulon subcoralloides* | G3? |
| Roland's Sea-Blite | *Suaeda rolandii* | G1G2 |
| Brown's Four-toothed Moss | *Tetrodontium brownianum* | G3G4 |
| Gaspé Arrowgrass | *Triglochin gaspensis* | G3G4 |

**Table 3. COSEWIC-designated species and NB species-at-risk within the NB IBoF bioregion.**

| Common Name | Scientific Name | COSEWIC status | NB Status (cf 2013 NB SARA) |
|---|---|---|---|
| Atlantic Sturgeon | *Acipenser oxyrinchus* | Threatened | Threatened |
| Brook Floater | *Alasmidonta varicosa* | Special Concern | Special Concern |
| American Eel | *Anguilla rostrata* | Threatened | Threatened |
| Eastern Whip-Poor-Will | *Antrostomus vociferus* | Threatened | Threatened |
| Short-eared Owl | *Asio flammeus* | Special Concern | Special Concern |
| Fin Whale | *Balaenoptera physalus* | Special Concern | Special Concern |
| Red Knot *rufa ssp*. | *Calidris canutus rufa* | Endangered | Endangered |
| Canada Warbler | *Cardellina canadensis* | Threatened | Threatened |
| Bicknell's Thrush | *Catharus bicknelli* | Threatened | Threatened |
| Chimney Swift | *Chaetura pelagica* | Threatened | Threatened |
| Piping Plover *melodus ssp*. | *Charadrius melodus melodus* | Endangered | Endangered |
| Snapping Turtle | *Chelydra serpentina* | Special Concern | Special Concern |
| Common Nighthawk | *Chordeiles minor* | Threatened | Threatened |
| Olive-sided Flycatcher | *Contopus cooperi* | Threatened | Threatened |
| Yellow Rail | *Coturnicops noveboracensis* | Special Concern | Special Concern |
| Monarch | *Danaus plexippus* | Special Concern | Special Concern |
| Bobolink | *Dolichonyx oryzivorus* | Threatened | Threatened |
| Vole Ears Lichen | *Erioderma mollissimum* | Endangered | Endangered |
| Rusty Blackbird | *Euphagus carolinus* | Special Concern | Special Concern |
| Peregrine Falcon | *Falco peregrinus* | Special Concern | Endangered |
| Wood Turtle | *Glyptemys insculpta* | Threatened | Threatened |
| Bald Eagle | *Haliaeetus leucocephalus* | | Reg. Endangered |
| Barn Swallow | *Hirundo rustica* | Threatened | Threatened |
| Least Bittern | *Ixobrychus exilis* | Threatened | Threatened |
| Canada Lynx | *Lynx canadensis* | | Reg. Endangered |
| Striped Bass | *Morone saxatilis* | Threatened | Threatened |
| Little Brown Myotis | *Myotis lucifugus* | Endangered | Endangered |
| Northern Myotis | *Myotis septentrionalis* | Endangered | Endangered |
| Tricolored Bat | *Perimyotis subflavus* | Endangered | Endangered |
| Harbour Porpoise | *Phocoena phocoena* | Special Concern | Special Concern |
| Atlantic Salmon | *Salmo salar* | Endangered | Endangered |
| Eastern Meadowlark | *Sturnella magna* | Threatened | Threatened |

Nine critical species targets identified within the NAAP occur within the NB IBoF bioregion, three of which were previously singled out as both COSEWIC-designated and provincially-listed SARA species: Peregrine Falcon, Brook Floater and Atlantic Salmon. Moreover, these particular three species are additionally legally protected under the federal Species at Risk Act (SARA). The remaining NAAP species targets are as follows: Maritime Shrew (*Sorex maritimensis*) – the only endemic mammal within the Maritimes, Long-tailed Shrew (*Sorex dispar*) – an Appalachian Mountain endemic, Semipalmated Sandpiper, Upland Sandpiper (*Bartramia longicauda*), Sedge Wren (*Cistothorus platensis*) and Robinson's Hawkweed (*Hieracium robinsonii*). Additional information on NAAP critical species criteria and descriptions can be found in Appendix H.

In addition to species-at-risk, globally significant species and NAAP critical species targets, a diverse assemblage of flora and fauna depend on the diverse suite of ecological systems that occur within the bioregion and are discussed in further detail in the following section.

**Birds**

There are 102 species of birds in the NB IBoF bioregion that have been retained as priority species for conservation/management action (Table 4). These species could be grouped into four large guilds based on the habitats with which they are generally associated when present within the bioregion: tidal flats (shorebirds), coastal and freshwater wetlands (marsh birds and waterfowl), forested lands (forest birds) and grasslands/agro-ecosystems (grassland birds).

Perhaps most notably, over two million shorebirds stage within the NB IBoF bioregion from mid-July to mid-September, representing as many as 42 migratory species (David Christie pers. comm; Appendix G). Such concentrations make tidal flat sites in this bioregion among the most important in all of Eastern Canada (Allard et al. 2014). The Semipalmated Sandpiper is by far the most numerous, with up to 75% of its estimated global population using the Bay of Fundy. This is one of Canada's smallest shorebirds, weighing approximately 30 g (1.05 oz) and measuring 14 cm long. There are frequently flocks reaching 100,000 birds, and flocks of up to 400,000 individuals have been recorded in the past (Hicklin 1987; Environment Canada 1993; WHSRN 2014). Smaller numbers of Semipalmated Plover (*Charadrius semipalmatus*), Black-bellied Plover (*Pluvialis squatarola*), Least Sandpiper (*Calidris minutilla*), White-rumped Sandpiper (*Calidris fuscicollis*), Sanderling (*Calidris alba*), Ruddy Turnstone (*Arenaria interpres*) and a variety of other species also use the extensive coastal habitats (Environment Canada 2009; D. Roy pers. comm.). The reason for the spectacular convergence of shorebirds in the inner Bay of Fundy lies in the large expanses of tidal flats, rich in food resources, including lipid-rich *Corophium,* or "mud-shrimp" at certain locations (Quinn and Hamilton 2012).

The large expanses of coastal and freshwater wetlands within the bioregion provide important breeding and staging areas for a variety of waterfowl and marsh bird species (MBBA 2014; Allard et al. 2014). Within Shepody Bay, the salt marshes support several hundred staging Canada Geese (*Branta canadensis*) and Black Duck (*Anas rubripes*), lesser numbers of Green-winged Teal (*Anas crecca*) and Northern Pintail (*Anas acuta*) during spring, while inshore waters of the Bay support large numbers of Common Eider (*Somateria mollissima*) and scoters (*Melanita* spp.) during migration. Within the Shepody National Wildlife Area, Blue-winged Teal (*Anas discors*) and Ring-necked Duck (*Aythya collaris*) regularly breed (Barkhouse 1984). The Tantramar marshes support significant numbers of Ring-necked Duck, as well as American Black Duck, Green-winged Teal, Northern Pintail, Blue-winged Teal and American Wigeon (*Anas americana*). The managed marshes have also attracted rare or uncommon ducks, including the Northern Shoveler (*Anas clypeata*), Gadwall (*Anas strepera*), Redhead (*Aythya americana*) and Ruddy Duck (*Oxyura jamaicensis*). High densities of marsh birds occur here as well, including Pied-billed Grebes (*Podilymbus podiceps*), American Bitterns (*Botaurus lentiginosus*) and Soras (*Porzana carolina*). They have also attracted less common species including the SARA-listed

(Threatened) Least Bittern (*Ixobrychis exilis*), as well as other species that may simply be at the edge of their distribution range, such as the Virginia Rail (*Rallus limicola*), Common Gallinule (*Gallinula galeata*), American Coot (*Fulica americana*), Black Tern (*Chlidonias niger*) and Marsh Wren (*Cistothorus palustris*) (Barkhouse 1984). Two separate Canada Goose (*Branta Canadensis*) populations are identified as individual 'priority species' in Table 4. It should be noted that the 'Temperate' population was identified as a priority species due to management need and that a decrease was identified as its population objective. Emphasis remains on important habitat for Canada Goose (North Atlantic), shared by both populations during fall and winter.

**Table 4. New Brunswick Bird Conservation Region 14 (BCR14) and Marine Biological Unit 11 (MBU11) priority bird species and those relevant to habitat conservation planning in NB IBoF bioregion (adapted from Environment Canada 2013).**

| Priority Species | Group | Population Objective[1] | SARA[2] | COSEWIC[3] | Provincial Listing[4] | National/Continental Concern | National/Continental Stewardship | BCR 14-NB | MBU 11-NB | Inner Bay of Fundy Bioregion Relevance |
|---|---|---|---|---|---|---|---|---|---|---|
| American Bittern | Waterbird | Increase 100% | | | | √ | | √ | | √ |
| American Black Duck | Waterfowl | Maintain current | | | | | | √ | √ | √ |
| American Golden-Plover | Shorebird | Assess / Maintain | | | | √ | | √ | | √ |
| American Redstart | Landbird | Maintain current | | | | | | √ | | √ |
| American Three-toed Woodpecker | Landbird | Assess / Maintain | | | | | | √ | | √ |
| American Woodcock | Shorebird | Increase 50% | | | | √ | | √ | | √ |
| Arctic Tern | Waterbird | Assess / Maintain | | | | | | | √ | |
| Bald Eagle | Landbird | Maintain current | | | RE | | | √ | | √ |
| Bank Swallow | Landbird | Increase 100% | | | | | | √ | | √ |
| Barn Swallow | Landbird | Increase 100% | | TH | | | | √ | | √ |
| Barrow's Goldeneye (Eastern) | Waterfowl | Assess / Maintain | SC | SC | | | | √ | √ | √ |
| Bay-breasted Warbler | Landbird | Maintain current | | | | | √ | √ | | √ |
| Belted Kingfisher | Landbird | Assess / Maintain | | | | | | √ | | √ |
| Bicknell's Thrush | Landbird | Increase 50% | TH | TH | | √ | | √ | | √ |
| Black Scoter | Waterfowl | Assess / Maintain | | | | | | | √ | |
| Black Tern | Waterbird | Assess / Maintain | | | | | | √ | | |
| Black-backed Woodpecker | Landbird | Increase 50% | | | | | | √ | | |
| Black-bellied Plover | Shorebird | Assess / Maintain | | | | √ | | | √ | √ |
| Black-billed Cuckoo | Landbird | Increase 100% | | | | √ | | √ | | |
| Blackburnian Warbler | Landbird | Maintain current | | | | | √ | √ | | √ |

| Priority Species | Group | Population Objective[1] | SARA[2] | COSEWIC[3] | Provincial Listing[4] | National/Continental Concern | National/Continental Stewardship | BCR 14-NB | MBU 11-NB | Inner Bay of Fundy Bioregion Relevance |
|---|---|---|---|---|---|---|---|---|---|---|
| Black-legged Kittiwake | Waterbird | Maintain current | | | | | √ | | √ | |
| Black-throated Blue Warbler | Landbird | Maintain current | | | | | | √ | | √ |
| Black-throated Green Warbler | Landbird | Maintain current | | | | | √ | √ | | √ |
| Blue-headed Vireo | Landbird | Maintain current | | | | | √ | √ | | √ |
| Bobolink | Landbird | Increase 100% | | TH | | √ | | √ | | √ |
| Bonaparte's Gull | Waterbird | Assess / Maintain | | | | √ | | | √ | √ |
| Boreal Chickadee | Landbird | Increase 100% | | | | | | √ | | √ |
| Canada Goose (North Atlantic) | Waterfowl | Maintain current | | | | | | √ | √ | √ |
| Canada Goose (Temperate) | Waterfowl | Decrease | | | | | | √ | √ | √ |
| Canada Warbler | Landbird | Increase 100% | TH | TH | | √ | √ | √ | | √ |
| Cape May Warbler | Landbird | Increase 100% | | | | | | √ | | √ |
| Chimney Swift | Landbird | Increase 100% | TH | TH | | √ | | √ | | √ |
| Common Eider | Waterfowl | Increase 50% | | | | | | | √ | √ |
| Common Goldeneye | Waterfowl | Increase 50% (BCR 14)<br>Assess / Maintain (MBU 11) | | | | | | √ | √ | √ |
| Common Loon | Waterbird | Maintain current (BCR 14)<br>Assess / Maintain (MBU 11) | | | | √ | | √ | √ | √ |
| Common Murre | Waterbird | Assess / Maintain | | | | √ | | | √ | |
| Common Nighthawk | Landbird | Increase 100% | TH | TH | | | | √ | | √ |
| Common Tern | Waterbird | Assess / Maintain | | | | | | √ | √ | √ |
| Dovekie | Waterbird | Assess / Maintain | | | | √ | | | √ | |
| Dunlin | Shorebird | Assess / Maintain | | | | √ | | | √ | √ |
| Eastern Kingbird | Landbird | Increase 50% | | | | | | √ | | √ |
| Eastern Meadowlark | Landbird | Increase 50% | | TH | | | | √ | | √ |

| Priority Species | Group | Population Objective[1] | SARA[2] | COSEWIC[3] | Provincial Listing[4] | National/Continental Concern | National/Continental Stewardship | BCR 14-NB | MBU 11-NB | Inner Bay of Fundy Bioregion Relevance |
|---|---|---|---|---|---|---|---|---|---|---|
| Eastern Whip-poor-will | Landbird | Assess / Maintain | TH | TH | | √ | | √ | | √ |
| Eastern Wood-Pewee | Landbird | Increase 100% | | | | | | √ | | √ |
| Evening Grosbeak | Landbird | Increase 100% | | | | | | √ | | √ |
| Great Cormorant | Waterbird | Assess / Maintain | | | | √ | | | √ | √ |
| Great Shearwater | Waterbird | Assess / Maintain | | | | √ | √ | | √ | |
| Green Heron | Waterbird | Assess / Maintain | | | | | | √ | | √ |
| Green-winged Teal | Waterfowl | Increase 50% | | | | | | √ | √ | √ |
| Harlequin Duck (Eastern) | Waterfowl | Recovery objective | SC | SC | EN | | | √ | √ | √ |
| Horned Grebe | Waterbird | Assess / Maintain | EN[7] | EN[7]<br>SC[8] | | | | | √ | |
| Hudsonian Godwit | Shorebird | Assess / Maintain | | | | √ | | | √ | √ |
| Killdeer | Shorebird | Increase 100% | | | | √ | | √ | | √ |
| Leach's Storm-Petrel | Waterbird | Assess / Maintain | | | | √ | √ | | √ | √ |
| Least Bittern | Waterbird | Recovery objective | TH | TH | | √ | | √ | | √ |
| Least Sandpiper[10] | Shorebird | Assess / Maintain | | | | √ | | | √ | √ |
| Lesser Yellowlegs | Shorebird | Assess / Maintain | | | | √ | | √ | √ | √ |
| Long-tailed Duck | Waterfowl | Assess / Maintain | | | | | | | √ | |
| Magnolia Warbler | Landbird | Maintain current | | | | | √ | √ | | √ |
| Mallard | Waterfowl | Increase 100% | | | | | | √ | | √ |
| Manx Shearwater | Waterbird | Assess / Maintain | | | | √ | | | √ | |
| Nelson's Sparrow | Landbird | Assess / Maintain | | | | √ | | √ | | √ |
| Northern Goshawk | Landbird | Increase 50% | | | | | | √ | | √ |
| Olive-sided Flycatcher | Landbird | Increase 100% | TH | TH | | √ | | √ | | √ |
| Peregrine Falcon (anatum) | Landbird | Assess / Maintain | SC | SC | EN | | | √ | | √ |

| Priority Species | Group | Population Objective[1] | SARA[2] | COSEWIC[3] | Provincial Listing[4] | National/Continental Concern | National/Continental Stewardship | BCR 14-NB | MBU 11-NB | Inner Bay of Fundy Bioregion Relevance |
|---|---|---|---|---|---|---|---|---|---|---|
| Pied-billed Grebe | Waterbird | Assess / Maintain | | | | √ | | √ | | |
| Piping Plover (melodus) | Shorebird | Recovery objective | EN | EN | EN | √ | | √ | √ | √ |
| Purple Finch | Landbird | Maintain current | | | | | | √ | | √ |
| Purple Sandpiper | Shorebird | Assess / Maintain | | | | √ | | | √ | √ |
| Razorbill | Waterbird | Assess / Maintain | | | | √ | | | √ | √ |
| Red Knot (ssp. rufa) | Shorebird | Assess / Maintain | EN | EN | | √ | | | √ | √ |
| Red Phalarope | Shorebird | Assess / Maintain | | | | √ | | | √ | |
| Red-necked Grebe | Waterbird | Assess / Maintain | | | | √ | | | √ | |
| Red-necked Phalarope | Shorebird | Assess / Maintain | | SC | | √ | | | √ | |
| Red-shouldered Hawk | Landbird | Assess / Maintain | | | | | | √ | | √ |
| Red-throated Loon | Waterbird | Assess / Maintain | | | | √ | | | √ | |
| Ring-necked Duck | Waterfowl | Increase 50% | | | | | | √ | | √ |
| Roseate Tern | Waterbird | Recovery objective | EN | EN | | | | | √ | √ |
| Rose-breasted Grosbeak | Landbird | Maintain current | | | | | | √ | | √ |
| Ruffed Grouse | Landbird | Assess / Maintain | | | | | | √ | | √ |
| Rusty Blackbird | Landbird | Increase 100% | SC | SC | | | | √ | | √ |
| Sanderling | Shorebird | Assess / Maintain | | | | √ | | | √ | √ |
| Semipalmated Sandpiper | Shorebird | Increase 100% (MBU 11) | | | | √ | | | √ | √ |
| Short-eared Owl | Landbird | Assess / Maintain | SC | SC | | | | √ | | √ |
| Solitary Sandpiper[10] | Shorebird | Assess / Maintain | | | | √ | | √ | √ | √ |
| Sooty Shearwater | Waterbird | Assess / Maintain | | | | √ | | | √ | |
| Sora | Waterbird | Assess / Maintain | | | | √ | | √ | | √ |
| Spotted Sandpiper | Shorebird | Increase 50% | | | | √ | | √ | | √ |

| Priority Species | Group | Population Objective[1] | SARA[2] | COSEWIC[3] | Provincial Listing[4] | National/Continental Concern | National/Continental Stewardship | BCR 14-NB | MBU 11-NB | Inner Bay of Fundy Bioregion Relevance |
|---|---|---|---|---|---|---|---|---|---|---|
| Surf Scoter | Waterfowl | Assess / Maintain | | | | | | | √ | |
| Thick-billed Murre | Waterbird | Assess / Maintain | | | | √ | | | √ | |
| Tree Swallow | Landbird | Maintain current | | | | | | √ | | √ |
| Veery | Landbird | Increase 100% | | | | | | √ | | √ |
| Virginia Rail | Waterbird | Assess / Maintain | | | | √ | | √ | | √ |
| Whimbrel | Shorebird | Assess / Maintain | | | | √ | | √ | √ | √ |
| White-breasted Nuthatch | Landbird | Maintain current | | | | | | √ | | |
| White-throated Sparrow | Landbird | Maintain current | | | | | √ | √ | | √ |
| Willet | Shorebird | Increase 50% | | | | √ | | | √ | √ |
| Wilson's Snipe | Shorebird | Increase 100% | | | | √ | | √ | | √ |
| Wood Duck | Waterfowl | Increase 50% | | | | | | √ | | √ |
| Wood Thrush | Landbird | Increase 100% | TH | TH | | √ | | √ | | √ |
| Yellow Rail | Waterbird | Assess / Maintain | SC | SC | | √ | | √ | | |
| Yellow-bellied Sapsucker | Landbird | Maintain current | | | | | √ | √ | | √ |

[1] Population objectives apply in all units where the species is priority (BCR 14-NB, MBU 11-NB) unless otherwise indicated.
[2] Species listed on Schedule 1 under the Species At Risk Act as Endangered (EN), Threatened (TH) or Special Concern (SC) (Species at Risk Public Registry 2012).
[3] Species assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2012) as Endangered (EN), Threatened (TH) or Special Concern (SC).
[4] Species listed under New Brunswick's Endangered Species Act (NB ESA) as Endangered (EN) or Regionally Endangered (RE) (New Brunswick SARA 2013).

**Wide-ranging Mammals**

Within the Chignecto isthmus, MacDonald and Clowater (2005) used a focal group of species as a basis for assessing ecological connectivity. These included wide ranging mammals such as Canadian Lynx (*Lynx canadensis*), Moose (*Alces americanus*) and Black Bear (*Ursus americanus*), as well as localized mammal species such as American Marten (*Martes americana*) and Northern Flying Squirrel (*Glaucomys sabrinus*). These species all depend on forested ecosystems for foraging and shelter. Moose, which are classed as endangered in mainland Nova Scotia, require softwood and mixedwood dominated cover during winter, and emergent wetlands during summer (Parker 2003). Much of these habitat types currently exist within the Isthmus, although fragmentation limits connectivity between forest patches (MacDonald and Clowater 2005). A number of focal mammal species assessed depend on old forest conditions, requiring structural diversity. American Marten and Northern Flying Squirrel require old coniferous and mixedwood habitats, and connectivity between these old forest patches are essential for dispersal of these species. Similarly, Canadian Lynx require old coniferous forest for denning, but are known to travel through early-successional forest and open areas to disperse. A recent sight record exists of a Canadian Lynx that used the Isthmus to enter Nova Scotia (MacKinnon and Kennedy 2008). Black Bear, which are considered generalist habitat users, are known to move freely through the Isthmus, provided enough forested cover is available. Maintaining a mature forest cover in a north-south corridor through the Isthmus and linking this with large forest blocks is crucial for maintaining genetic flow of wide-ranging mammals between New Brunswick and Nova Scotia.

**Bats**

Three of seven bat species in New Brunswick are known to use caves as hibernacula during the winter months: the Tricolored Bat (*Perimyotis subflavus*), Little Brown Myotis (*Myotis lucifugus*) and the Northern Myotis (*Myotis septentrionalis*), all of which have recently been designated as endangered by COSEWIC (Forbes 2012a; 2012b; 2012c). As of 2011, catastrophic declines of these three bat species have occurred within eastern Canada, resulting in >80% mortality within New Brunswick. The precipitous decline is attributed to white-nose syndrome (WNS), caused by the fungus, (*Pseudgymnoascus destructans*) believed to have been introduced from Europe (Pikula et al. 2012; Blehert 2012). Infected individuals develop a white powdery fungus on exposed skin of the muzzle and wings, hence the name “white-nose syndrome”.

First detected in North America in 2006 (Lorch et al. 2011), WNS has caused widespread declines across northeastern North America, and Forbes (2012b) suggests that the predicted functional extirpation which is occurring in the northeastern United States will most likely occur with Canadian populations. WNS is hypothesized to cause starvation and dehydration by taxing bat energy reserves at a time when they would normally be inactive and hibernating. The bats are then forced to leave the hibernacula in search of food, and subsequently die of exposure (Carey et al. 2003; Turner et al. 2011). Any chance of bat population recovery will likely depend on the probability of certain individuals having a resistance to WNS and passing this resistance on to their offspring. Both banding and laboratory studies suggest that some individuals can survive exposure to WNS (Meteyer et al. 2011; Dobony et al. 2011), and it is believed that a similar situation occurred in Europe where WNS is present but bat mortality is low (Turner et al. 2011). From a conservation perspective, the protection and stewardship of caves and surrounding areas will help prevent additional stresses on potentially resistant bats, and should address the protection of cave entrances from vandalism and other human disturbance, as well as the protection of all lands above and around caves to maintain forest cover (G. Forbes pers. comm.). Finally, bats (especially the migratory species) are more likely to be impacted by wind farms than birds and where such features exist, this needs to be carefully considered in analysing threats and establishing conservation and recovery actions (Arnett et al. 2008; Baerwald and Barclay 2009). This is discussed in more detail in the threats section.

**Riparian and Marine Species**

Riparian ecosystems within the bioregion support a high diversity of species and habitat types, ranging from brackish and freshwater aquatic habitats, to shrub wetlands and seepage areas, forested floodplains, upland forest communities and grasslands/agro-ecosystems. The major river systems along the Fundy coast and the tributaries which feed them are particularly diverse due to the mixing of fresh- and saltwater at the river mouths and the strong tidal influence. A number of rare and at-risk species depend on aquatic habitats to complete their lifecycle, such as anadromous fish – those that spawn in freshwater but migrate to the ocean to feed and mature (e.g., Striped Bass, Atlantic Salmon and Atlantic Sturgeon), catadromous fish – those that spawn in saltwater but can migrate to freshwater (e.g., American Eel) and freshwater mussels such as the Brook Floater, Triangle Floater (*Alasmidonta undulata*) and Tidewater Mucket (*Leptodea ochracea*). The inner Bay of Fundy population of Atlantic Salmon is recognized as an ecologically and genetically distinct from other Atlantic Salmon populations (DFO 2010; Lacroix 2013). Populations have decreased substantially since the early 20$^{th}$ century and although the reasons for this decline are not well understood, it is believed to be linked to low marine survival (DFO 2010) . Within the Petitcodiac River, fish stocks declined (precipitously after) a causeway blocked fish passage to the upper stretches of the watershed (Locke et al. 2003). The causeway was opened in 2010 and since then, the river has seen an increase in both fish diversity, as well as a general increase in numbers of native fish species, including Striped bass, American Eel and a small increase in Atlantic Salmon (Redfield 2013). Wood Turtles, a semi-aquatic species and North American endemic, also depend on riparian habitats. Stream, lakes and ponds are used for mating and hibernation, while upland sites (within 300 m of a watercourse) are used for foraging and nesting (COSEWIC 2007a). Riparian shrub wetlands and forested riparian areas are considered the preferred terrestrial habitat for this species, although they are known to use a range of upland sites, including agricultural lands and roadside ditches (Arvisais et al. 2002; 2004; COSEWIC 2007a).

### *iv. Protected Areas and Conservation Lands*

According to the International Union for Conservation of Nature (IUCN), a protected area is *"a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values"* (Dudley 2008). An extensive network of protected areas exists within the NB IBoF bioregion stemming from a variety of private, provincial and federal initiatives, totalling over 36 500 ha, and over 7.5 % of the IBoF bioregion (Table 5). This diversity of initiatives to support conservation within the region is a testament to the rich biodiversity and ecological significance found within the bioregion.

Federally protected lands within the bioregion include lands managed by Environment Canada via either the Parks Canada Agency or Canadian Wildlife Service. As one of Canada's first designated national parks, Fundy National Park is at the core of conserved lands within the bioregion. Two National Wildlife Areas (NWAs) are located within the bioregion as well. The Tintamarre National Wildlife Area, comprised of bogs, marshland and the Jolicure lakes, was primarily established to increase waterfowl production (Thurston 1990). The New Horton and Germantown sections of the Shepody National Wildlife Area are both comprised largely of freshwater wetlands and provide some of the best waterfowl production and staging habitat, as well as marsh bird breeding habitat, in the Atlantic Provinces (Barkhouse 1984).

There are five provincially designated Protected Natural Areas (PNA) in the bioregion, as well as the provincially owned Fundy Linear Park. The Shepody Bay/Tantramar region constitutes a key Coastal Securement Strategy area for land securement by partners of the EHJV (Sabine 2002). Within the bioregion, private conservation lands mostly are held by 3 EHJV partner organizations: Ducks Unlimited Canada (DUC), Nature Trust of New Brunswick (NBNT) and the Nature Conservancy of Canada (NCC).

DUC has been very active in the region and has secured important wetlands such as Sunken Island Bog, the Germantown marshes and wetlands along the Aulac River, whereas the Nature Trust of New Brunswick has focused its land securement to date within the Cape Enrage marshes and Grindstone Island.

The Government of New Brunswick, having committed to doubling the amount of current Protected Natural Areas across the province (March 2012), has as of November 2014, increased the amount of Protected Natural Areas within the bioregion from 4 456 ha to a total of 8 445 ha. These advancements are shown in Table 5.

**Table 5. Existing conservation lands within the NB IBoF bioregion (January 2015).**

| Landowner | Site Name | Hectares | % of Bioregion |
|---|---|---|---|
| Department of Canadian Heritage, Parks Canada | Fundy National Park | 20,411 | 4.22 |
| Ducks Unlimited | Various | 1,275 | 0.26 |
| Environment Canada, Canadian Wildlife Service | Shepody NWA | 1,125 | 0.59 |
| | Tintamarre NWA | 1,737 | |
| Nature Conservancy of Canada | Johnson's Mills | 202 | 0.25 |
| | Marys Point | 32 | |
| | Waterside | 49 | |
| | Chignecto Isthmus | 391 | |
| | Cookville | 316 | |
| | New Horton | 211 | |
| Nature Trust of New Brunswick | Grindstone Island | 20 | 0.01 |
| | Cape Enrage Marsh | 28 | |
| NB Department of Natural Resources | Caledonia Gorge | 2,962 | 1.71 |
| | Big Salmon River | 1,122 | |
| | Big Meadows | 929 | |
| | Point Wolfe River Gorge | 840 | |
| | Saddleback Brook | 812 | |
| | Little Salmon River | 723 | |
| | Upper Salmon River | 194 | |
| | Mount Tom | 163 | |
| | McManus Hill | 161 | |
| | Lewis Mountain | 133 | |
| | Dowdall Lake | 98 | |
| | Wilson Brook | 77 | |
| | Cat Road | 57 | |
| | Upham Brook | 27 | |
| NB Department of Tourism and Parks | Fundy Linear Park | 2,422 | 0.50 |
| **Total Conservation Lands:** | | **36,517** | **7.54** |

The bioregion boasts two Ramsar Wetlands of International Importance: No. 236, Marys Point (1 200 ha), which supports the largest numbers of shorebird species during fall migration in all of North

America, and No. 320, Chignecto (1 020 ha), which was designated due to the high waterfowl usage and productivity within its salt marshes and adjacent wetlands. Four nationally designated Important Bird Areas (IBAs) are also located within the bioregion (Table 6). Chignecto Bay, from Fort Folly Point to Marys Point/Grindstone Island, to Cape Maringouin, makes up the Shepody Section of the Bay of Fundy WSHRN Site (1987). While Ramsar, IBA, and WSHRN designations do not provide legal protection, varying degrees of protection apply where these designations overlap with legally protected areas. For example, a degree of protection applies to Marys Point where portions of Ramsar, IBA, and WSHRN sites overlap with lands managed by CWS within the Shepody NWA. Above all, designation of these sites is testament to the ecological value of these parts of the bioregion and serves as an important avenue for highlighting their international status.

**Table 6. Important Bird Areas (IBAs) within the NB IBoF bioregion.**

| IBA Code | IBA Name | IBA Criteria | Lat / Long | Elevation (m) | Size ($km^2$) |
|---|---|---|---|---|---|
| NS002 | Upper Cumberland Basin | Globally Significant: Congregatory Species (Shorebird Concentrations) | 45.783° N / 64.386° W | 0 -5 | 193.01 |
| NB009 | Shepody Bay West | Globally Significant: Congregatory Species (Shorebird Concentrations) | 45.69° N / 64.704° W | 0 -35 | 290.63 |
| NB033 | Quaco Bay | Globally Significant: Congregatory Species (Shorebird Concentrations) | 45.342°N / 65.531°W | 0 - 10 | 18.62 |
| NB038 | Dorchester Cape and Grande Anse | Globally and Continentally Significant: Congregatory Species (Shorebird Concentrations) | 45.804° N / 64.522° W | 0 -5 | 50.69 |

## C. SOCIAL AND ECONOMIC CONTEXT

This bioregion includes portions of 4 counties [Westmorland, Kings, Albert and St. John]. Other salient features include the university town of Sackville; New Brunswick's largest metropolitan area - Moncton; many rural communities; the village of St. Martins and a very small portion of east Saint John, NB's second largest Census Metropolitan Area or "CMA" (Statistics Canada 2011).

The area has a long human history; an 11 000 year old Paleo-Indian point was discovered at Quaco Head (near St. Martins, NB), and 4 000 year old First Nation artifacts have been found in the Chignecto Bay area (Atlantic Geoscience Society 2001). Maliseet and Mi'kmaq First Nations have used the area for centuries to hunt, fish and farm along the shores and riverbanks. Today, the Mi'kmaq First Nation of Fort Folly resides on approximately 40 ha of land near the community of Dorchester; it is the only First Nations community still present in this bioregion. In the early eighteenth century, the French (Acadians) began to settle in the Chignecto Bay area. They quickly recognized the rich agricultural potential of the large tracts of salt marsh. Using techniques imported from Europe, they built dykes to drain the marshes and create fertile farmland to grow crops of wheat, vegetables, fruits and herbs. The Acadians also constructed the first drydock in Canada, more specifically at the confluence of the Aulac and La Coupe Rivers, which is currently a Parks Canada National Historic Site. After the deportation of the Acadians in 1755, the New England settlers maintained and expanded the dyke system to grow hay, the major cash crop of the region (Zelazny 2007).

In the 1950s and early 1960s the federal government, under the federal government's Maritime Marshland Reclamation Act of 1948, began a renewed effort to dyke remaining salt marshes. At this time, the government placed dams across many of the rivers flowing through the marshes to reduce costs associated with maintaining large riverside dykes. The dykes are now maintained by the Provincial Department of Fisheries and Agriculture; they protect large expanses of agricultural land as well as infrastructure, including highways and railways built across the dyke lands (Zelazny 2007).

After the completion of the Intercolonial Railway in 1876, Moncton (the 'Hub' city) became a railway centre, which allowed locals access to a broader market, including: Nova Scotia, Quebec, and Ontario. Of particular economic importance at that time, carboniferous sandstone from quarries near Sackville and Dorchester was shipped across the province, country and all over North America. In particular, sandstone quarried from Marys Point ended up at the Bethesda Terrace in Central Park in New York, and in Boston as well. More recently, many of these quarries have re-opened (or stayed open) in order to replace pieces that have degraded since its original excavation over a century ago, as one must return to the original quarry where stones were carved in order to match the exact colour. These sandstones of various unique hues can be seen on buildings in Moncton, Saint John, Truro, Wolfville, Halifax, Ottawa, Toronto and Waterloo. Precut stone for fireplaces was also marketed and shipped as far west as Vancouver (Webb 2000; Martin 1990).

Today, the economy of this bioregion is dominated by Greater Moncton (pop. 138 644), although the western portion of the bioregion is affected by its proximity to Greater Saint John (pop. 127 761; cf Stats Can 2011). The service sector constitutes the largest employer in the region with the business service industry providing most of the jobs, followed by retail and wholesale trade. Combined, the manufacturing and construction industries are the third largest sources of employment. Resource-based industries employ roughly three percent of the area's workers (Statistics Canada 2011); however, there are active oil and gas fields in this bioregion. There has been active natural gas exploration in the area recently, and uranium prospecting in the past.

The Bay of Fundy has become a tourism icon. Eco-tourism destinations include: The Fundy Trail, which is a coastal access network and Interpretive Centre; Fundy National Park; Cape Enrage; The Tidal Bore; and The Hopewell Rocks. Tourism is increasingly important to the economic well-being of several communities in this area that historically relied on agriculture, logging or fisheries.

Urban areas within the bioregion are undergoing a period of rapid growth and development; Dieppe had the highest population increase in the province, growing by 26% from 2006 to 2011 (Statistics Canada 2011). There will be increasing development pressure and competition for land as more second homes are built along the coast; because of the rapid growth in the area, potential threats (i.e., energy production and mining) are more likely to occur.

# 2. HABITAT, THREAT, AND SPECIES SPATIAL PRIORITIZATION

## A. PRIORITY HABITAT TYPES

Priority habitats were selected because they host the native biological entities (i.e., ecological systems, species communities and/or species[2]) that the HCS is aiming to conserve. The planning team selected priority habitats at a coarse enough scale to encompass the most significant elements of conservation concern that could be addressed at the bioregion scale. HCS priority habitats encompass all species of conservation significance occurring in the bioregion (including CB/ERA primary habitats, BCR 14 and MBU 11 priority bird species, species at risk, S1-S2 and G1-G3G4 ranked species) and are representative of the biodiversity of the bioregion (terrestrial and intertidal, with the exception of anthropogenic non-grassland, coastal sub-tidal and offshore). The process used to identify priority habitats in this bioregion was undertaken through research of literature, speaking with experts and iterative review with partners. As a result, priority habitats include the eight ecological systems listed below. Priority is not implied by order.

1) Beaches, rocky shores and cliffs
2) Salt marshes
3) Riparian systems
4) Freshwater wetlands
5) Acadian forest mosaic
6) Caves and calcareous sites
7) Tidal flats
8) Grasslands/agro-ecosystems

Priority habitats are mapped in Figures 4 – 12. For each priority habitat type, a detailed viability assessment was made for its size, condition and landscape context (Low 2003) using background habitat information collected from the bioregion, a review of literature and expert opinion. Habitat prioritization is based on uniqueness, representivity, and patch size. The viability of the priority habitats can be ranked as 'Poor', 'Fair', 'Good' or 'Very Good' (adapted from The Nature Conservancy). The current overall biodiversity habitat viability for the NB IBoF bioregion is 'Good' (Table 7).

## Priority Habitat: Beaches, Rocky Shores and Cliffs

**Habitat Definition (Beaches, Rocky Shores and Cliffs)**: Beaches as defined in the NAAP are "thick accumulations of unconsolidated waterborne, well-sorted sand and pebbles deposited on a shore, or in active transit along it", rocky shores are defined as "rockbound coast... subject to salt spray and wave pounding" and cliffs are defined as "precipitous rock faces which slough off rock fragments and shed water, while accumulating soil and nutrients at their bases" (Anderson et al. 2006). Two distinctive

[2] **Ecological systems**: Assemblages of ecological communities that occur together on the landscape and share common ecological processes (e.g., flooding), environmental features (e.g., soils and geology) or environmental gradients (e.g., temperature).
**Communities**: Groupings of co-occurring species, including natural vegetation associations and alliances.
- Major groupings of targeted species that share common natural processes or have similar conservation requirements (e.g., forest-interior birds, freshwater mussels)
- Globally significant examples of species aggregations (e.g., migratory shorebird stopover area)

**Species**: Types of species targets may include:
- Globally imperilled and endangered native species (e.g., G1 to G3G4)
- Species of concern due to vulnerability, declining trends, disjunct distributions or endemism
- Focal species, including keystone species, wide-ranging regional species and umbrella species

coastal cliff feature classes are present in the NB IBoF bioregion: "Fundy Erodible Cliffs and Coarse Beaches" and "Fundy High Cliffs" (Greenlaw et al. 2012). The former is characterized by sandstones, conglomerates and shales whereas the latter is comprised of Precambrian volcanic deposits. Beaches, rocky shores and cliffs are ecologically linked within coastal areas, however they are distinct in that they are affected differently by inundation rates and associated vegetation (Anderson et al. 2006). Critical occurrences identified in the NAAP: beach size > 8.1 ha; rocky shore size > 4 ha; cliff size > 10.1 ha (Anderson et al. 2006) (Fig. 5).

**Habitat/Species Type (Beaches, Rocky Shores and Cliffs)**: Littoral – sandy shorelines and/or beaches; littoral – single and/or pebble shorelines and/or beaches; littoral – rocky shorelines; littoral – sea cliffs.

**Ecological Justification (Beaches, Rocky Shores and Cliffs)**: Beaches, rocky shores and cliffs are ecologically significant ecosystems as they support a high number of rare and at risk species (Robinson 2010), including the endangered Red Knot (i.e., beaches) and Peregrine Falcon (i.e., cliffs). The extensive rocky shorelines and cobble beaches in this bioregion support priority waterfowl species and a high diversity of priority shorebird species. Beaches are particularly important for roosting shorebirds, such as the Semipalmated Sandpiper, which congregate in large numbers on beach backshore areas during high tide. Cliffs can support a variety of swallow species, including the Bank Swallow (COSEWIC 2013) and Barn Swallow (COSEWIC 2011b), as well as nesting habitat for the Peregrine Falcon (COSEWIC 2007b). Conservation of these habitats will contribute to the health and conservation of over 65 significant species (23%; Appendix D).

**Landscape Context Assessment (Beaches, Rocky Shores and Cliffs)**: Very Good
The average Landscape Context Index[3] (LCI) for beaches, rocky shores and cliffs in the NB IBoF bioregion are 11.7, 12.8 and 2.2, respectively (calculated from NAAP data), which are values considered very good (see habitat definition). Although coastal development is increasing provincially, the rugged terrain along the majority of coasts within this bioregion has limited the amount of development in areas where beaches, rocky shores and cliffs occur. The New Brunswick Coastal Areas Protection Policy recommends restrictions on development in and around coastal habitats and informs decisions relating to land use of coastal areas; while there is no legislative regulation via this policy per se, it does affect various applications such as Environmental Impact Assessment (EIAs) (NBDOE 2002). The potential for coastal erosion where beaches, rocky shores and cliffs occur is generally low but increases to a high risk within Chignecto Bay (See threats; Shaw et al. 1998).

**Condition Assessment (Beaches, Rocky Shores and Cliffs)**: Good
Unlike the extensive beach/dune complexes along the Northumberland Strait and the Acadian Peninsula, beaches and rocky shores within the NB IBoF bioregion have had comparatively little impact from human disturbance. This is most likely due to their inaccessibility along the rugged Fundy coast and the rockier coast and cold water temperatures which limit recreational uses. Waterside Beach has been identified as SAR critical habitat for the endangered Piping Plover (*Charadrius melodus melodus*) (Environment Canada 2012). Very few invasive species have been documented within these habitats. Within the bioregion, 16% of beaches and rocky shores and 8% of coastal cliffs have protected status.

**Size Assessment (Beaches, Rocky Shores and Cliffs)**: Good
The average size of beach and rocky shore areas in the bioregion is 5 and 11 ha respectively. Although the average beach size is considerably less than the critical occurrence criteria (>8 ha), rocky shores are

[3] Landscape Context Index (LCI) is a measure that refers to relative amount of development, agriculture, quarries, roads and other fragmenting features directly surrounding ecosystem occurrences. It provides an estimate of isolation of occurrence as well as potential future encroachment on the occurrence. See Anderson et al. (2006) for more details.

4.7 times greater in abundance and therefore increase the overall size viability (as beaches, rocky shores and cliffs are assessed together as one target). The beaches within the bioregion represent 10% of the provincial total, and 30% of beaches within the bioregion are identified as critical occurrences (NAAP; Anderson et al. 2006). Rocky shores within the bioregion represent 26% of the total provincial amount and 22% of rocky shores within the bioregion are identified as critical occurrences.

**Overall Assessment (Beaches, Rocky Shores and Cliffs)**: **Good**

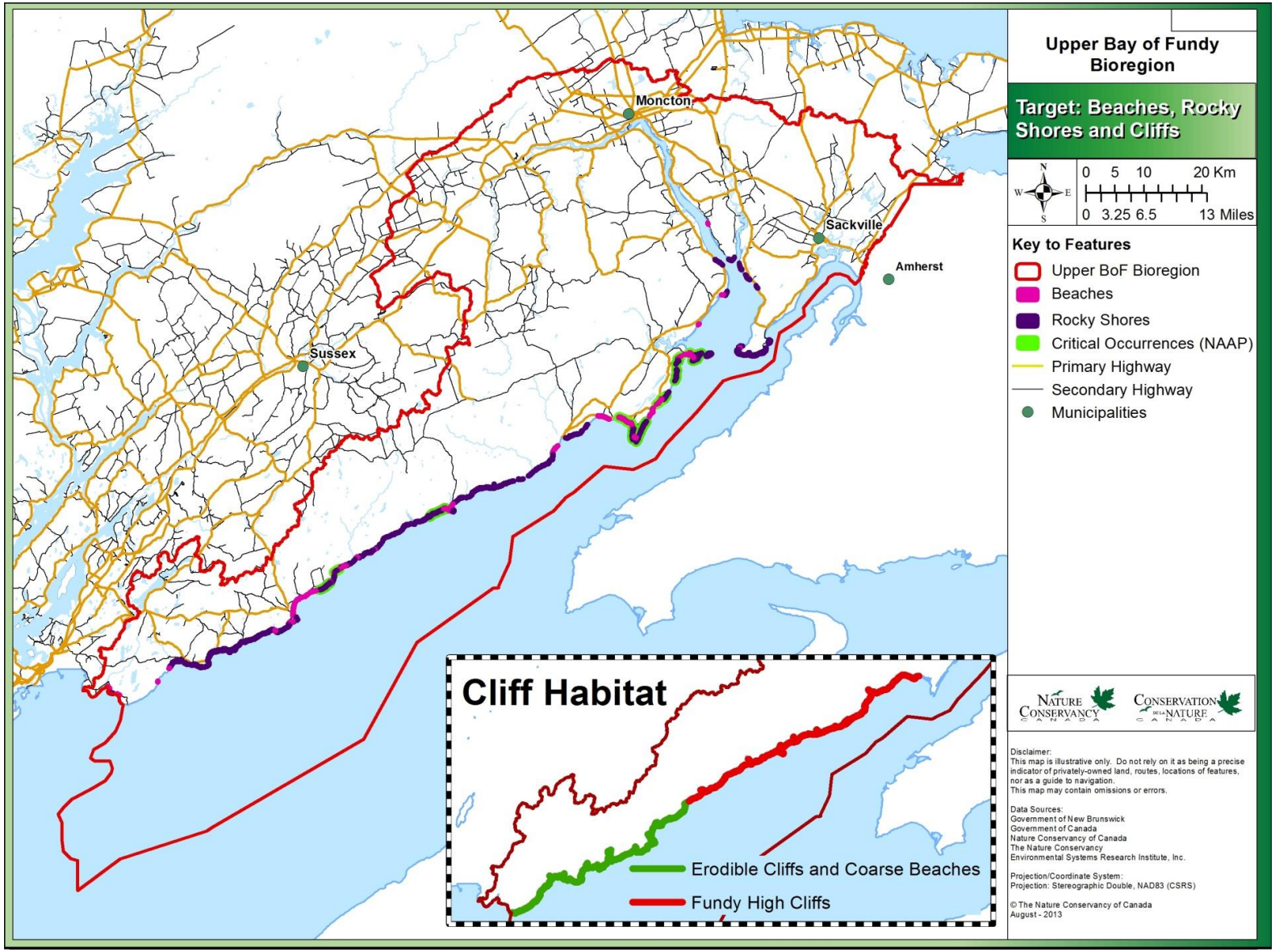



**Figure 5. Beaches, rocky shores and cliffs in the NB IBoF bioregion.**

## Priority Habitat: Salt Marshes

**Habitat Definition (Salt Marshes)**: Salt marshes are flat, poorly drained areas subject to periodic inundation by salt water and are covered with a thick mat of salt tolerant plants dominated by *Spartina* grasses. Critical occurrences of salt marshes identified in NAAP: size >= 24 ha or part of a complex over 40 ha (Anderson et al. 2006). All provincially delineated salt marshes and NAAP critical occurrences are mapped in Figure 6.

**Habitat/Species Type (Salt Marshes)**: Littoral – Salt Marshes; Wetlands – Permanent Saline, Brackish or Alkaline Pools

**Ecological Justification (Salt Marshes)**: Salt marshes are among the most productive ecosystems along the coast and provide habitat that is critical for over 25 significant species within the bioregion (11%; Appendix D). The rich abundance of salt marsh offers refuge to several species of rare or endangered birds and plants such as Roland's Sea-blite, Nelson's Short-tailed Sparrow, and Willet and a variety of other uncommon to rare, habitat-specific taxa (e.g., Salt Marsh Lady Beetle (*Naemia seriata*)). The conservation of this habitat in the inner Bay of Fundy will contribute to the health and conservation of migratory and breeding waterfowl, waterbirds and their colonies, and a number of other bird species considered high priority in BCR 14. Additionally, the protection of uplands adjacent to salt marshes will allow for landward migration of this habitat in the face of sea-level rise due to climate change.

**Landscape Context Assessment (Salt Marshes)**: Fair
The average Landscape Context Index (LCI) for salt marshes in the NB IBoF bioregion is 30, which is considered good (calculated from NAAP data); however, only 49% of upland habitat adjacent to salt marshes (within 275 m) contains natural cover, this being mostly attributed to agricultural and rural development. These two factors have led to contamination of salt marshes from agricultural runoff (Arseneau 2001), as well as coastline hardening from the development of permanent structures. The hardening of coastlines can result in insufficient sediment supply which in turn can limit the ability of salt marshes to migrate inland in response to natural and anthropogenic sea-level rise. Data on salt marsh accretion rates in the lower Bay of Fundy suggest that sediment deficits are currently not a concern (Chmura et al. 2001), and this is assumed to be the case in the Inner Bay as well. This is certainly a knowledge gap that could be addressed by future research.

**Condition Assessment (Salt Marshes)**: Fair
Historically, large expanses of salt marsh were dyked and drained in the Bay of Fundy but have since undergone passive 'restoration' as many dykes were not maintained. Some salt marshes in the bioregion have restricted tidal flow due to historic infrastructure or undersized culverts. New Brunswick's Wetlands Conservation Policy and Coastal Areas Protection Policy both help regulate the amount of development and resource extraction within 30 m of a salt marsh. The Wetlands Conservation Policy refers to coastal marshes as Provincially Signficant Wetlands, and they receive the highest amount of protection afforded under law. Coastal marshes are also subject to the Coastal Areas Protection Policy, which dictates the buffer zones and identifies activities which can and cannot occur within either the marsh or buffer. Despite these regulations, localised infilling still occurs and naturally have some effects on the ecology of salt marshes in the region.

The majority of species that use salt marsh habitat within the bioregion are either NAAP critical species targets, BCR 14 priority birds or designated by COSEWIC as at risk. To date there have been no invasive species of major concern reported within salt marshes in eastern Canada (Mal and Narine 2004). Eight percent of salt marshes (280 ha) are currently under protection within the bioregion.

**Size Assessment (Salt Marshes)**: Very Good
Salt marshes in the bioregion are extensive, with a total area of over 3 561 ha, 8% of which are deemed critical within the NAAP. The average size of a salt marsh in the bioregion is 38 ha and the combined area of salt marshes within the bioregion represents 54% of salt marshes within the province. Approximately 65% of the salt marshes in Atlantic Canada were drained and converted for agriculture beginning in the 17$^{th}$ century – up to 85% of those in the inner Bay of Fundy (Reed and Smith 1972).Storm breaching and tidal gate failure, however, have allowed for salt marsh reclamation in some areas of the Bay of Fundy (Byers and Chmura 2007), and there has been a growing interest to restore former Bay of Fundy salt marshes (GoMCHRS 2004). Today, the area of salt marsh in the bioregion is believed to have increased slightly to greater than 15% of its original extent due to more recent reclamation activities. The size viability analysis is based on the current salt marsh extent.

**Overall Assessment (Salt Marsh)**: **Good**

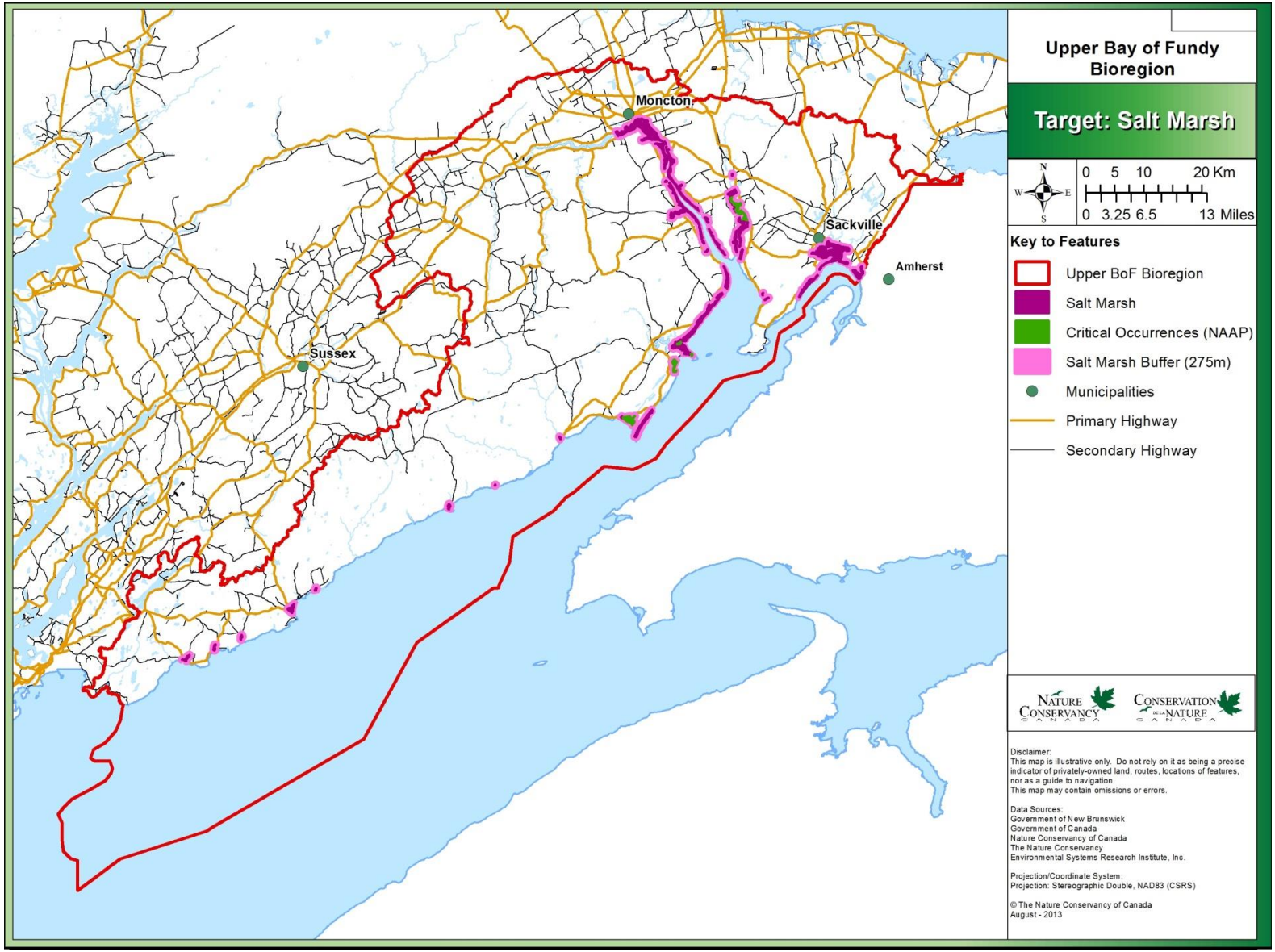



**Figure 6. Salt marshes in the NB IBoF bioregion.**

## Priority Habitat: Riparian Systems

**Habitat Definition (Riparian Systems)**: Riparian systems are characterized as aquatic ecosystems, their adjacent uplands (riversides and floodplains) and the gradient between the two (Gregory et al. 1991). A variety of habitats occur within riparian systems, where upland and floodplain forests, grasslands/agro-ecosystems, herbaceous and woody wetlands, sandbars and oligotrophic – eutrophic freshwater systems interact to form a complex ecosystem rich in biodiversity. The habitat definition for riparian systems within the bioregion includes all NAAP critical occurrences (size >= 40 ha; Anderson et al. 2006), NAAP non-critical floodplains, provincially delineated priority Wood Turtle habitat, all river systems classified by COSEWIC as endangered for the Atlantic Salmon inner Bay of Fundy population (Atlantic Salmon Federation 2012) and all major rivers as delineated by the province and their respective headwaters. All riparian systems, as defined here, are mapped in Figure 7.

**Habitat/ Species Type (Riparian Systems)**: Rivers, Streams, Creeks – Permanent; Rivers, Streams, Creeks – Seasonal/ Intermittent/ Irregular; Riparian Areas; Wetlands – Shrub Dominated

**Ecological Justification (Riparian Systems)**: Riparian zones are recognized as the most biodiverse, complex and dynamic non-marine ecosystems on the planet. This is due to the large variety of habitats that may occur within them, as well as the diversity of biological, geological and hydrological processes that shape them (Naiman et al. 1993). Riparian systems within the bioregion host a diversity of species, such as federally listed freshwater mussels, turtles, anadromous and catadromous fish and a variety of riparian-dependent arthropods and flora. Over 35 208 ha of riparian habitat have been identified within the bioregion according to the criteria described above, 26% of which has been altered by anthropogenic disturbance. Agriculture and residential/cottage development are the primary threats to riparian systems, as well as incompatible forest harvesting, road fragmentation and watercourse barriers. Riparian systems provide habitat that is critical for at least 90 significant species within the bioregion (37%; Appendix D).

**Landscape Context Assessment (Riparian Systems)**: Poor
The average Landscape Context Index (LCI) for riparian systems in the NB IBoF bioregion is 49, which is considered poor (calculated from NAAP data; see Habitat Definition). Only 51% of riparian buffers (within 275 m) contain natural cover, the remainder cover types being mostly agriculture and development. Historically, rich floodplains were cleared for agriculture and hydrological regimes were altered due to infilling of wetlands, road construction and the preference for urban and rural development near watercourses. Erosion and sedimentation is of major concern where natural cover has been removed. Although the Petitcodiac causeway was opened in 2010, resulting in a positive increase in fish numbers and diversity within the Petitcodiac River, over 90 dams and aquatic barriers still persist within the bioregion.

**Condition Assessment (Riparian Systems)**: Good
What remains of intact riparian systems is considered in fair condition. Although exotic species are present along watercourses, these and invasive species are generally not dominant, although a number of invasives are emerging as major threats within the province, such as Glossy False Buckthorn (*Frangula alnus*), Reed Canary-Grass (*Phalaris arundinacea* –S. Blaney and D. Mazerolle pers. comm.), Common Reed (*Phragmites australis*), Garlic Mustard (*Alliaria petiolata*) and Purple Loosestrife (*Lythrum salicaria*), all of which can have very negative impacts on riparian zones (P. Noel pers. comm.). Additionally, aquatic invasive species are of considerable concern, such as Smallmouth Bass (*Micropterus dolomieu*) and Chain Pickerel (*Esox niger*), the latter of which is considered a high threat (CWF 2003). These species are voracious predators; both prey directly on and outcompete native fish

species; both are also listed as threats to regionally rare or at risk arthropod fauna which may yet be found in the bioregion, such as the Pygmy Snaketail and Skillet Clubtail dragonflies, both designated by COSEWIC as at risk (COSEWIC 2008; 2010). Forest management practices require a 30 m buffer to watercourses, although limited harvesting within this buffer is allowed with certain restrictions, such as the requirement to main a minimum basal area. Any activities (not just forestry or agriculture) occurring within 30m of a watercourse or wetland that can result in a change or alteration are governed by the Wetlands Conservation Policy and are subject to permit and approval from the NB Department of Environment and Local Government. Agriculture is known to cause aquatic and riverside degradation through direct erosion causing sedimentation, runoff of pesticides and herbicides, increased water temperatures due to natural cover removal and nutrient loading from fertilizers (Petitcodiac Watershed Alliance 2014; Pavey 2005). In some instances, water quality has been decreased significantly in the bioregion. Due in part to industrial expansion within the Greater Moncton Area, the Petitcodiac was designated as the most endangered river in Canada by Earthwild International in 2003. However, there has been a marked increase in fish diversity and population sizes since the opening of the Peticodiac River causeway in 2010 (Redfield 2011). A number of species designated by COSEWIC as at risk, including the American Eel, Striped Bass and Atlantic Salmon, have been positively impacted by the opening of this causeway (Redfield 2011). Removal of the causeway has also been determined to be the necessary first step in the potential reintroduction of the extirpated Dwarf Wedgemussel (*Alasmidonta heterodon*), identified in its recovery strategy (DFO 2007). Ten percent of riparian areas that meet the criteria described above are currently protected.

**Size Assessment (Riparian Systems)**: Very Good
Riparian systems cover a large portion of the bioregion due to the high concentration of major river systems that occur here. The longest river is the Petitcodiac at 79 km, with a drainage area of 207 104 ha. The average size of riparian patches is 68 ha, which is considered very good.

**Overall Assessment (Riparian Systems): Fair**

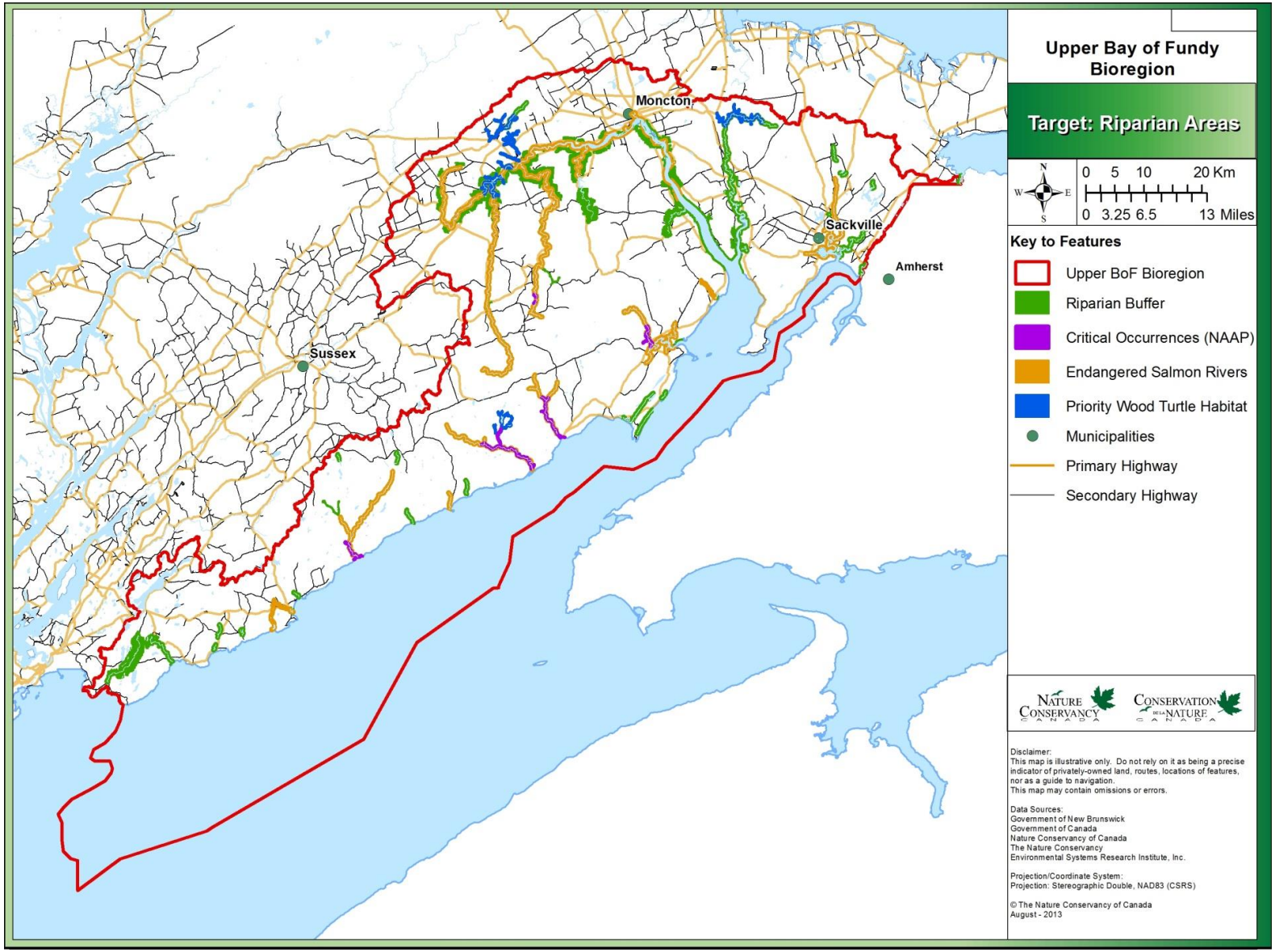



**Figure 7. Riparian areas in the NB IBoF bioregion.**

## Priority Habitat: Freshwater Wetlands

**Habitat Definition (Freshwater Wetlands)**: Freshwater wetlands within the bioregion include bogs, fens, marshes, swamps, shrub- and forest-dominated wetlands, as well as seasonal forest vernal pools. Shrub wetlands are the most common wetland type within the bioregion and occur mostly in riparian areas. All freshwater wetlands, including critical occurrences from the NAAP (size >=20 ha; Anderson et al. 2006) are mapped in Figure 8.

**Habitat/ Species Type (Freshwater Wetlands)**: Wetlands – Shrub Dominated; Wetlands – Bogs, Marshes, Swamps, Fens; Wetlands – Permanent Freshwater Pools; Wetlands – Seasonal / Intermittent Freshwater Pools

**Ecological Justification (Freshwater Wetlands)**: Freshwater wetland systems of the inner Bay of Fundy provide habitat for many federally listed species-at-risk including Wood Turtle, Canada Warbler and Least Bittern. For example, Bell Marsh, bordering on the north shore of the Petitcodiac River, has been identified as SAR critical habitat for the Least Bittern (EC 2011). In total, 109 significant species have been identified that depend on freshwater wetland habitat within the bioregion (45%; Appendix D). Historically, many freshwater wetlands were infilled and converted to agricultural land. In addition to this, road construction and human settlement have altered hydrologic flows across the landscape. Major wetland complexes are still present, however, and provide breeding habitat and stopover sites that are critical for a wide range of wildlife species.

**Landscape Context Assessment (Freshwater Wetlands)**: Fair
The average Landscape Context Index (LCI) for freshwater wetlands in the NB IBoF bioregion is 29, which is considered fair (calculated from NAAP data). Approximately 3.4% of the bioregion land base is comprised of freshwater wetlands according to the provincial wetland database, which does not include the 5,408 forest vernal pools identified. The provincial database is based on visual delineation of wetlands and so greatly underestimates forested and shrub wetlands. Over 135 977 ha of freshwater wetland buffer habitat have been identified and approximately 28% of this has been altered by anthropogenic disturbance.

**Condition Assessment (Freshwater Wetlands):** Fair
New Brunswick currently has a Wetlands Protection Policy which requires a permit for work in or around (within 30 m) of a provincially mapped wetland. Many forested wetlands, however, are not provincially identified and subsequently do not receive any protection. The primary threats to freshwater wetlands are infilling for agriculture and development, as well as commercial forest harvesting within forested wetlands. Approximately 18% of freshwater wetlands are currently within conservation lands. A number of invasive species are emerging as threats but are generally not dominant as yet. Glossy Buckthorn and Phragmites are of particular concern as they are aggressive wetland invasives.

**Size Assessment (Freshwater Wetlands)**: Fair
The total freshwater wetland area in the NB IBoF bioregion is 16 569 ha represented in over 2 700 individual wetlands. The majority of these are small, isolated occurrences and are dominated by shrub vegetation along riparian areas. The average size of freshwater wetlands is 7.7 ha which is considered poor, and only 5% of freshwater wetland occurrences meet the critical size threshold of 20 ha. However, this does not account for wetland complexes connected through above and below-ground water flow.

**Overall Assessment Rank (Freshwater Wetlands)**: **Fair**

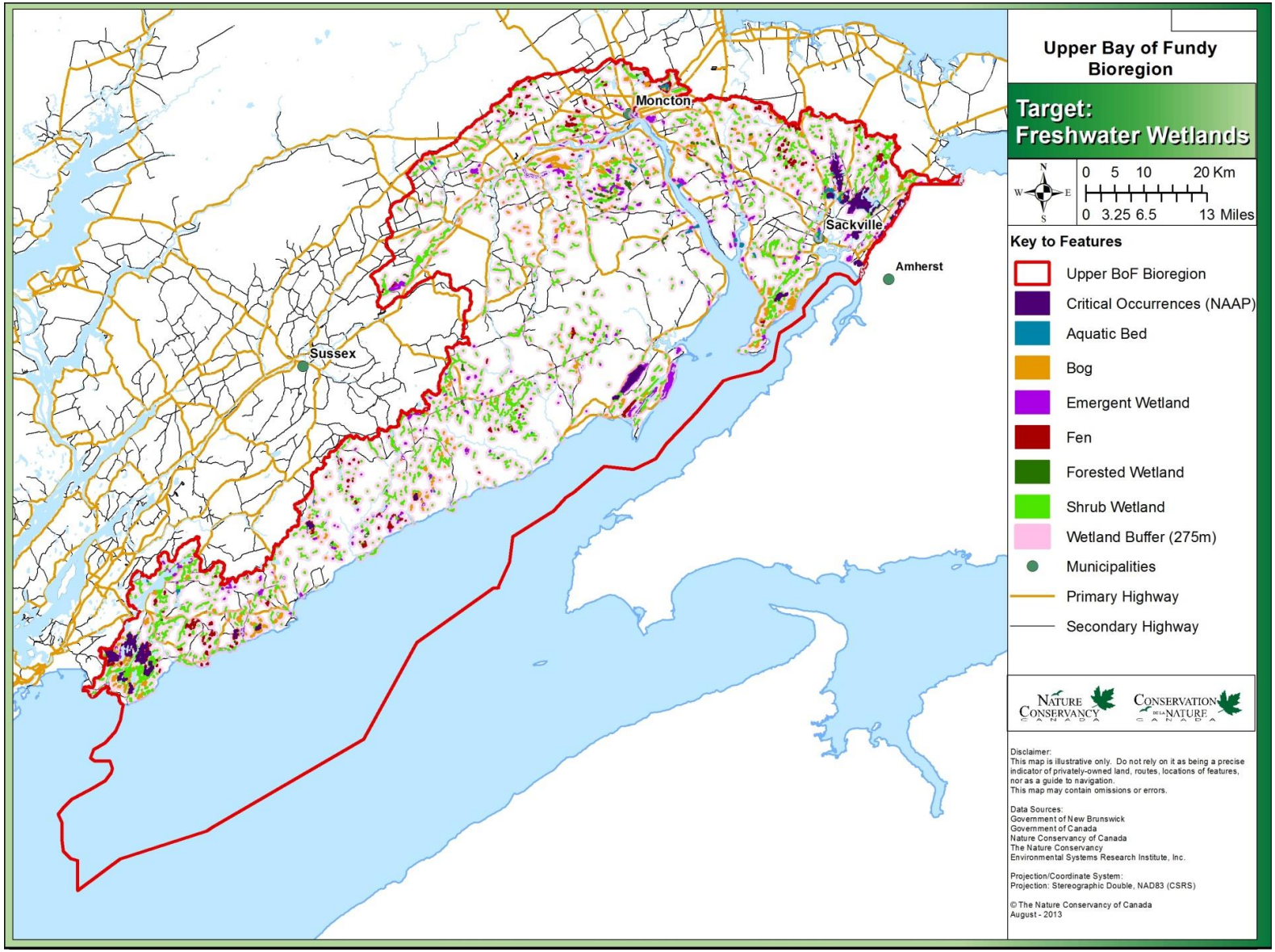



**Figure 8. Freshwater wetlands in the NB IBoF bioregion.**

## Priority Habitat: Acadian Forest Mosaic

**Habitat Definition (Acadian Forest Mosaic)**: The Acadian forest mosaic refers to the diversity of forest types which occur across the bioregion. This includes old forest communities as defined by the New Brunswick Department of Natural Resources (NBDNR), rare and unique forest communities identified by the Atlantic Canada Conservation Data Centre and other partners (Coastal Fog Forest, Hemlock-Karst Forest, etc.), forest of high conservation value as identified by NBDNR (presence of rare species, forest of exceptional quality) and NAAP delineated forest habitats and nested habitats within forests (sheltered forest coves, steep slopes and summits; Fig. 9). The Acadian forest mosaic habitat also includes connectivity between core forest areas for dispersal of wide-ranging mammals, particularly within the Chignecto Isthmus and Anagance Corridors.

**Habitat/ Species Type (Acadian Forest Mosaic)**: Forest – Temperate; Inland Rocky Areas

**Ecological Justification (Acadian Forest Mosaic)**: The Acadian forest is a unique forest region where boreal and temperate forest communities blend to create a highly diverse ecosystem. The World Wildlife Fund has designated the Acadian forest as critically endangered due to the long history of settlement and land clearing that has occurred here, with approximately 5% of the forest remaining in pre-settlement condition (Davis et al. 2014). Within the bioregion, over 145 significant species use the various forest habitats (60%; Appendix D). Old forest communities provide habitat for a variety of significant species, some of which are designated by COSEWIC and provincially listed as species at risk, such as the Canada Warbler, Chimney Swift and Olive-sided Flycatcher. Rare forest communities such as the Coastal Fog Forest are home to a diversity of rare and endangered lichen and bryophyte species, and forests located within calcareous areas support a variety of rare flora. It is critical that both unique and representative forest communities are protected to ensure the continued population viability of the various species that depend on them. This also includes connectivity between forest patches, which is required for the long-term viability of biodiversity and ecosystem processes.

**Landscape Context Assessment (Acadian Forest Mosaic)**: Fair
The average Landscape Context Index (LCI) for the forest habitat is restricted to the three NAAP nested habitats (sheltered forest coves, steep slopes and summits). The overall rank is considered very good as each of the three habitats' LCI values are considerably less than the critical occurrence threshold of 20; Steep Slopes: 2.1, Summits: 10.5, Sheltered Forest Coves: 12.2. Generally the forest within the bioregion is well connected; however, within the larger landscape, connectivity is currently restricted within the Chignecto Isthmus and the Anagance Corridors (de Graaf 2011; Appendix I). Fire suppression has impacted the dynamic processes of conifer dominated areas, particularly within the Petitcodiac watershed, and common forest management practices (i.e., clearcutting, herbiciding, planting) have altered the age class structure and composition in favor of young, even-aged forests dominated by boreal species adapted to regenerating in large open disturbances (termed borealization). Road density is high in the bioregion, which fragments forest patches, limiting dispersal for some species.

**Condition Assessment (Acadian Forest Mosaic)**: Fair
Human influence over the past 200 years has simplified forest structure, composition and age class distribution resulting in a decline in old forest communities (Erdle and Sullivan 1998). Of the current forest within the bioregion, condition may be considered good by using NAAP calculations; although invasive species are present, no significant impacts on forest age-class structure or species composition have been observed within the bioregion. Thirty-six percent of the forest is in a mature or overmature age class, and 39% of these old forest communities meet the minimum patch sizes needed to support the various keystone species as determined by the New Brunswick Department of Natural Resources (see Appendix F for a description of the analysis). Less than 3% of forests within the bioregion are

currently in conservation lands, not including Fundy National Park for which no forest data were available at the time of GIS analysis, and most forest community types are underrepresented in protected areas. Despite this assessment, it should be noted that an unpublished report by Ponomarenko and Ponomarenko (2000), suggests even protected areas that have not been logged in over 60 years, such as Fundy National Park, have lost much of their tree diversity. These data indicate even the most intact forests of the region have not been recovering from this forest simplification inflicted through the 1800s and early 1900s. Fundy National Park represents a mere 4.22% of the region, yet its recovering forest has suffered significant biodiversity loss over the last two centuries. Likely the comparatively vast forest surrounding FNP which is under heavy industrial logging pressure is in far worse condition. It is highly probable the forest condition verges on a poor status in the sense that a very large percentage of forested land will require significant intervention and centuries to recover.

**Size Assessment (Acadian Forest Mosaic)**: Fair
Mosseler et al. (2003) suggested that old forest communities (mature and overmature) within the Acadian forest used to occupy an estimated 50% of the land base prior to European settlement. Of the 314 448 ha of forest within the bioregion, 36% were considered to be in mature or overmature age classes according to provincial forest inventory, which now dates back more than a decade. Of these old forest patches, 42% were in contiguous blocks greater than a minimum patch size of 375 ha. This value is used within NBDNR's Old Forest Habitat Definitions as the minimum patch size required to capture breeding populations of all old-forest dependant species. See Appendix F for a description of the analyses.
Many of the old forest patches are isolated due to road fragmentation and improper forestry practices between patches. The average old forest patch size is 24 ha, which are considered adequate size to support many old forest dependant species, assuming connectivity between patches is available.

It should be noted that over the last 10 year period, much of the mature to overmature tolerant hardwood forest on the Caledonia Plateau has now been removed or strip cut. These data are also missing large areas of private industrial freehold property. While an analysis of this land is ongoing at Mount Allison University, initial assessments speculate very little mature to overmature forests still exist in this land ownership area, therefore reducing the overall percentage of mature to overmature forest. These two data issues could significantly reduce the mature to overmature forest type percentage calculated in the HCS (B. Phillips pers. comm.).

Perhaps more important than an overestimation of old forest area is the potential comparability of the Mosseler et al. (2003) old forest type and the mature to overmature forest as assessed through the NB DNR Forest Inventory Database. Mosseler et al. (2003) refer to old growth forests of pre-settlement times composed of late successional, regional climax tree species, growing in steady state, with multi-aged structure and averaging over 150 years of age. These forests would have exhibited a much greater diversity of tree species (Ponomarenko and Ponomarenko 2000. Conversely, the mature to overmature forests defined by NB DNR Forest Inventory Database are composed of much younger trees with a far more simplified tree species community. In fact, Mosseler et al. (2003) suggest that true old growth forest in New Brunswick covers less than 1% of forested landscape. Over seven years, Ben Phillips personally conducted dendrochronological surveys across southeastern New Brunswick targeting old growth forest and rarely found any with average ages of over 150 years. In his estimation, the Mosseler et al. (2003) assertion that less than 1% of forests are presently in true old growth state is accurate for southeastern New Brunswick (B. Phillips pers. comm.).

**Overall Assessment Rank (Acadian Forest Mosaic)**: **Fair**

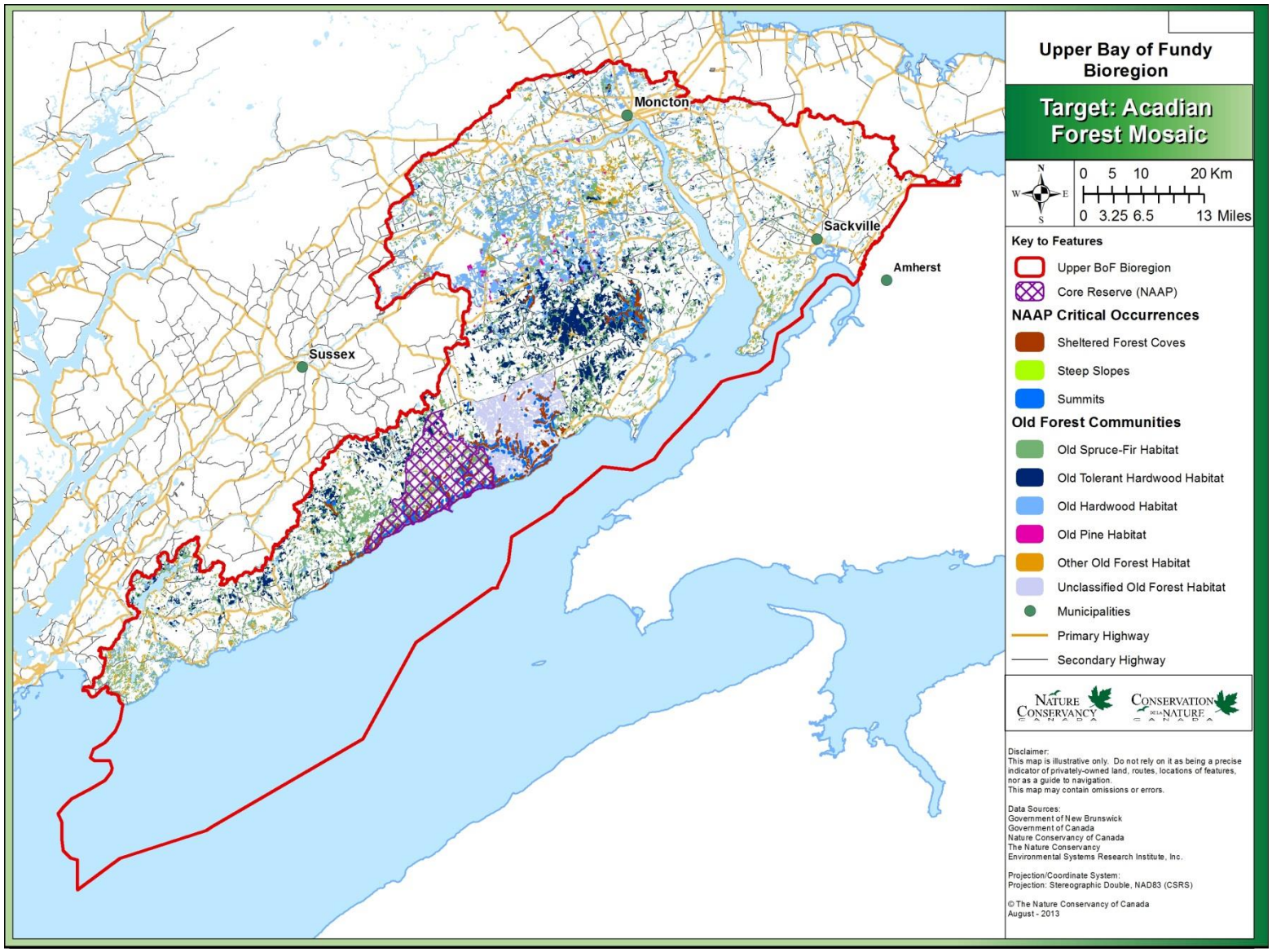



**Figure 9. Acadian forest mosaic in the NB IBoF bioregion.**

## Priority Habitat: Caves and Calcareous Areas

**Habitat Definition** (**Caves and Calcareous Areas):** Caves and calcareous areas refer to lands underlain by calcareous bedrock or soil, particularly those comprised of karst topography in which solution caves have developed. Within the bioregion, this refers specifically to bedrock of the Windsor Group which is composed of terrestrial sediments of the Early Carboniferous Age, as well as Erb Settlement and Saltsprings soil types composed of grey calcareous mudstones and/or feldspathic to lithic sandstones (Fig. 10).

**Habitat/ Species Type (Caves and Calcareous Areas)**: Caves and Subterranean Habitats (Non-Aquatic) – Dry Caves; Caves and Subterranean Habitats (Non-Aquatic) – Other Dry Subterranean Habitats; Karst and Other Subterranean Inland Aquatic Systems

**Ecological Justification (Caves and Calcareous Areas)**: Wetlands and forest habitats that occur within calcareous areas often support a unique suite of flora that is found nowhere else. Within the bioregion, 35 significant vascular plants, lichens and bryophytes have been identified as facultative- or obligate-calcareous species (14%; Appendix D). A number of forest communities have also been identified within calcareous areas which are not represented within current protected areas in the province; karst – hemlock/mixedwood forest (ACCDC) as well as pure tolerant hardwood and mixedwood forest communities (NBDNR). Additionally, solution cave formations within the bioregion provide habitat for a number of species. Of particular concern are bat populations, which are rapidly declining due to white-nose syndrome. Protection of cave habitats will increase the chances of survival and potential recovery to those bats that may be resistant to the disease.

**Landscape Context Assessment (Caves and Calcareous Areas)**: Good
Landscape connectivity for calcareous areas is considered good on the basis that 59% of calcareous land contains natural intact vegetation. Although approximately 1/3 of this area is managed forest, the majority contains natural forest consisting of tolerant hardwood, jack pine, white pine and mixedwood communities. Thirty-five percent of documented solution caves in New Brunswick are present within the bioregion, and all known bat hibernacula within New Brunswick are located within the bioregion (McAlpine 1983).

**Condition Assessment (Caves and Calcareous Areas)**: Fair
Many of the species found in calcareous areas are calciphiles within localized habitats and are therefore restricted in their ability to disperse elsewhere. The condition of caves is currently unknown as the repercussions of white-nose fungus are still in question. However, the massive decline in bat populations will most likely have an impact on cave communities.

**Size Assessment (Caves and Calcareous Areas)**: Good
Over 15 378 ha of calcareous bedrock and soil occur within the bioregion, representing 3.1% of the total terrestrial area. Calcareous bedrock – and subsequent extent of karst topography – within New Brunswick is restricted to only a few locations, with 34% of all calcareous bedrock formations occurring in the bioregion. Although no information is available on the extent of karst topography specifically, it is probably much higher than 34% as it is restricted to limestone formations that only occur east of Saint John (McAlpine 1983).

**Overall Assessment Rank (Caves and Calcareous Areas)**: **Good**

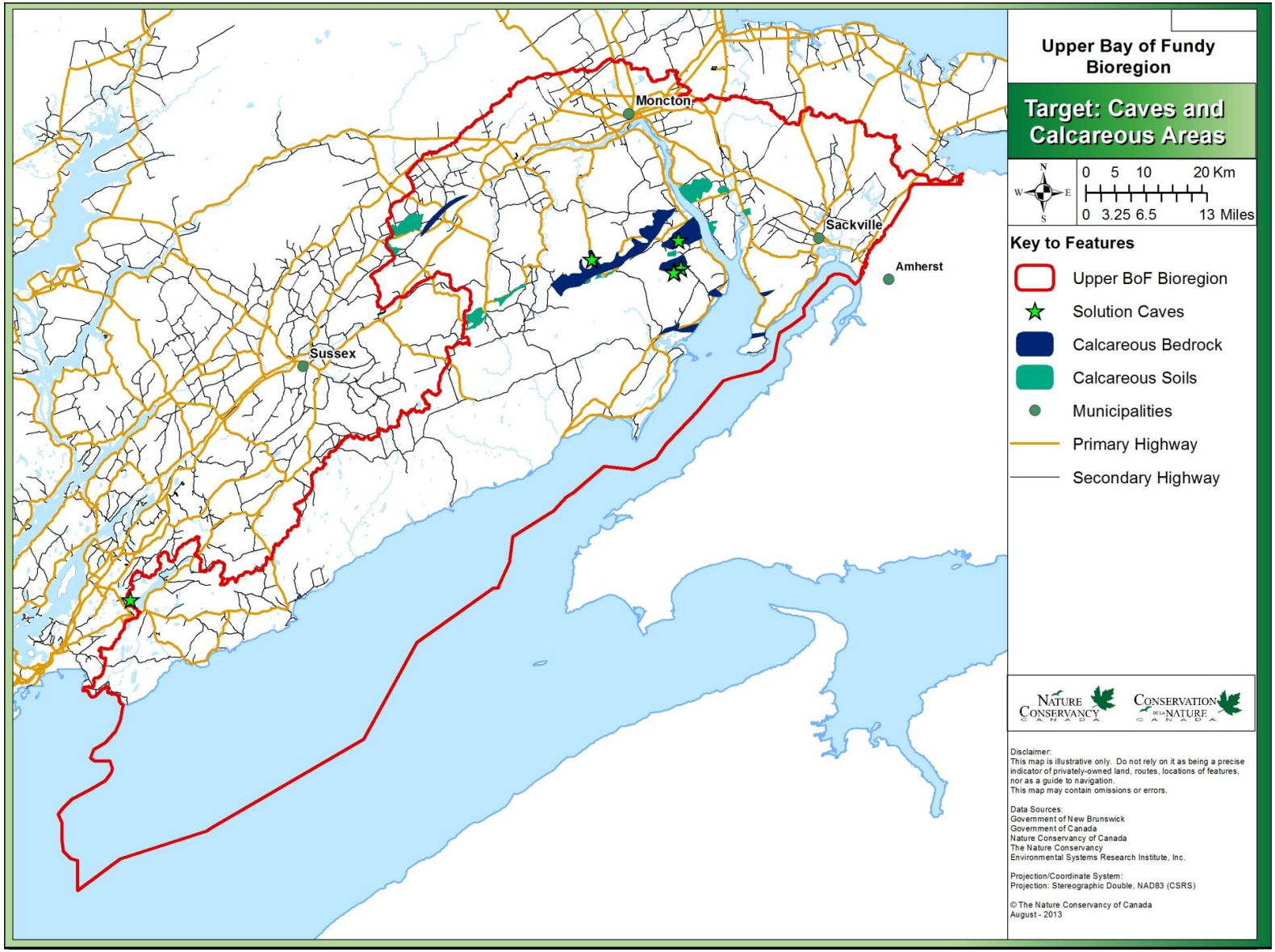



**Figure 10. Caves and calcareous areas in the NB IBoF bioregion.**

## Priority Habitat: Tidal Flats

**Habitat Definition (Tidal Flats)**: Tidal flats are extensive, horizontal tracts of unconsolidated clays, silts, sands and organic material that are alternately covered and uncovered by the tide. Most are sparsely vegetated but during low tide, shorebirds congregate on tidal flats to feast on abundant food resources. Critical occurrences of tidal flats identified in the NAAP: size >= 40 ha (Anderson et al. 2006). All provincially delineated tidal flats and NAAP critical occurrences are mapped in Figure 11.

**Habitat/ Species Type (Tidal Flats)**: Littoral – Mud Shorelines and Intertidal Mudflats

**Ecological Justification (Tidal Flats)**: From late July to mid-September especially, millions of shorebirds, representing as many as 42 migratory species, stage in the inner Bay of Fundy to converge on the nutrient-rich tidal flats to feast on a tiny amphipod, *Corophium volutator* (WHSRN 2014) and a variety of other important prey resources (Quinn and Hamilton 2012). These shorebird species include the endangered Red Knot and up to 75% of the global population of Semipalmated Sandpipers (WHSRN 2014). In total, 24 significant species use the inner Bay of Fundy tidal flats (10%; Appendix D). Tidal flats also provide habitat for a variety of invertebrate species including polychaete worms, molluscs and immense concentrations of unicellular organisms such as diatoms and dinoflagellates, which form the basis of the food web in this habitat (DFO 2008b).

**Landscape Context Assessment (Tidal Flats)**: Very Good
The average Landscape Context Index (LCI) for tidal flats in the NB IBoF bioregion is 18, which is considered very good (calculated from NAAP data); however, 42% of all tidal flats within the bioregion are deemed critical according to the NAAP. Extensive tracts of tidal flats are bordered by agricultural land, roads and residential areas which may impact their ability to migrate inland in response to sea-level rise.

**Condition Assessment (Tidal Flats)**: Good
The nature of tidal flats being inundated daily has limited the amount of direct anthropogenic disturbance, with the exception of recreational activities such as guided tours and mud bathing. Significant species that depend on tidal flats are generally restricted to shorebirds and include species deemed critical according to the NAAP , BCR 14 priority birds and species identified by COSEWIC as at risk. To date there have been no invasive species of major concern reported within Bay of Fundy tidal flats. Tidal flats are almost exclusively crown land and, with few exceptions, cannot be privately owned.

**Size Assessment (Tidal Flats)**: Very Good
Tidal flats are extensive in the bioregion, with over 6 030 ha present according to the provincial wetland database. The average size of tidal flats is 102 ha, which is considered very good. Fifty-one percent of all tidal flats within New Brunswick occur within the bioregion, two of which exceed 1 214 ha in size.

**Overall Assessment Rank (Tidal Flats)**: **Very Good**

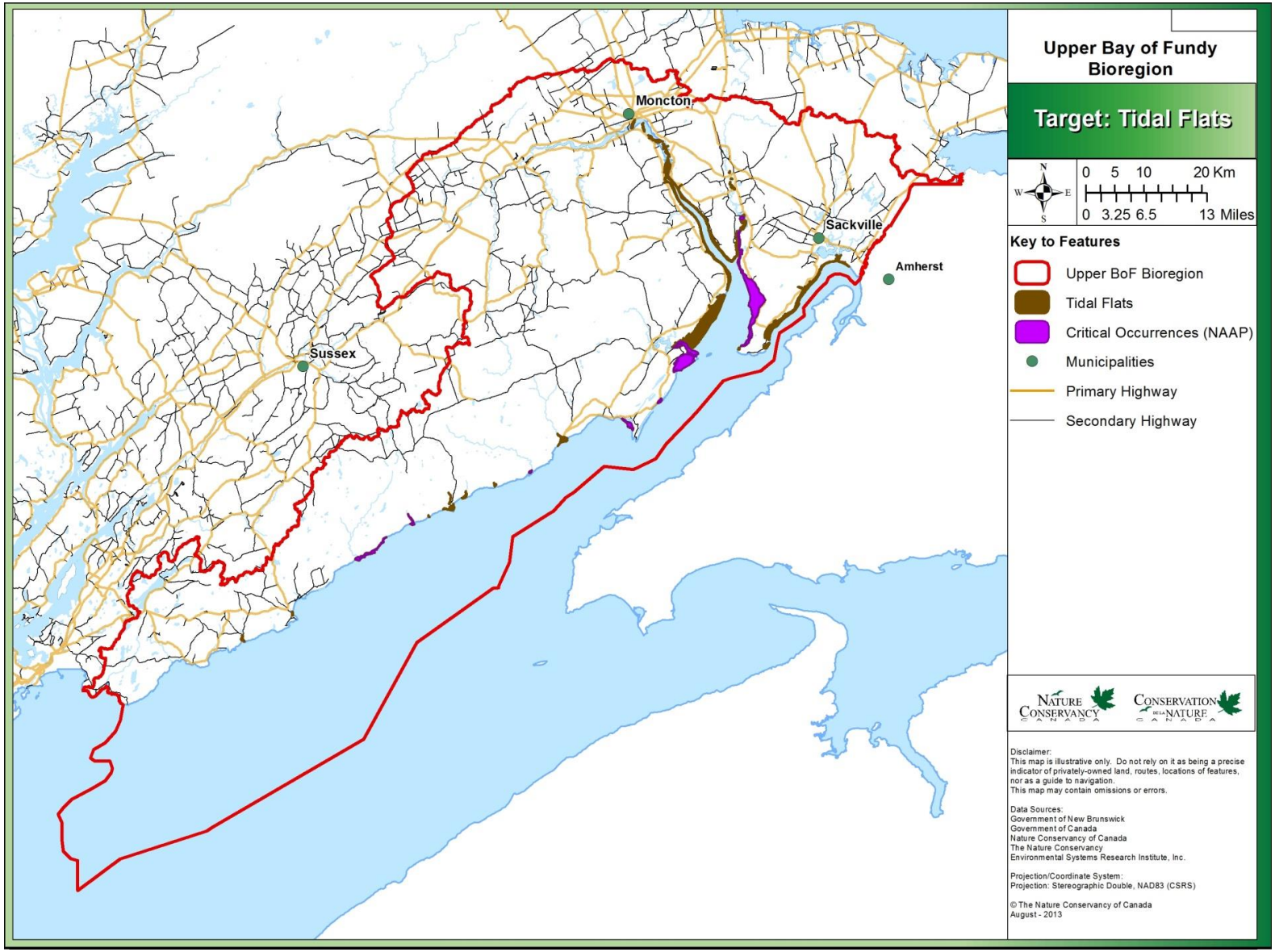



**Figure 11. Tidal flats in the NB IBoF bioregion.**

## Priority Habitat: Grasslands/agro-ecosystems

**Habitat Definition (Grasslands/agro-ecosystems)**: Grasslands within the bioregion refer to large expanses of agricultural land (i.e., anthropogenic), primarily former salt marsh that was dyked and drained during the 17th century, but that now plays a critical role in supporting a variety of federally and provincially listed and BCR 14 priority species. These dykelands are unique within North America and although farming practices still occur, a few tracts of farmland have been abandoned, providing year-round habitat for those species that are dependant on grassland habitat (Austin-Smith 1998). Geographic distribution of grassland habitat can be viewed in Figure 12.

**Habitat/ Species Type (Grasslands/agro-ecosystems)**: Grassland - Temperate

**Ecological Justification (Grasslands/agro-ecosystems)**: A number of species at risk within the bioregion are grassland-dependant such as Eastern Meadowlark, Common Nighthawk, Short-eared Owl, Barn Swallow and Bobolink. A variety of non-grassland-dependant species also use this habitat for foraging and nesting, such as waterfowl, Wood Turtle, Upland Sandpiper and Little Brown Myotis. Declines in grassland birds have been observed across North America and the rate of this decline exceeds that of any other bird guild (Environment Canada 2013). In total, 43 significant species make use of grassland habitat (18%; Appendix d). Incompatible farming practices constitute the greatest identified threat to grassland species. Incompatible farming practices include mowing during the breeding season, and pesticide application (Environment Canada 2013).

**Landscape Context Assessment (Grasslands/agro-ecosystems)**: Good
Very little land use change has occurred within the dykelands of the inner Bay of Fundy. Dykes and aboiteaux are regularly maintained in order to protect the agricultural lands and infrastructure from tidal influences (A. Hanson pers. comm.). The dykelands also serve as a critical flyway for a subspecies of Common Eider (*Somateria mollissima dresseri*), which travel from the Northumberland Strait to the Bay of Fundy to reach wintering areas farther South. Although seaducks such as Eiders typically refrain from flying overland, the narrow strip of land where the dykelands occur provides a quick flyway alternative to the 2 200 km journey around Nova Scotia (MacKinnon and Kennedy 2011).

**Condition Assessment (Grasslands/agro-ecosystems)**: Good
Dykeland protection infrastructure is regularly maintained by the NB Department of Agriculture, Fisheries and Aquaculture. Current infrastructure within the bioregion consists of 80 km of dykes, 73 water control structures and 3 tidal dams (C. Robichaud pers. comm.). The reproductive success of grassland birds is affected by incompatible farm practices such as earlier hay harvests. When hay crops are harvested earlier and at more frequent intervals (e.g., more than once a season), grassland birds do not have sufficient time to complete their nesting cycle (U.S. Department of Agriculture, Natural Resources Conservation Service 2010; Nocera 2005). Haying and mowing for green silage typically occurs during the breeding season for most grassland-dependent birds, causing destruction of nests and young, and removal of protective vegetative cover (Austin-Smith 1998).

**Size Assessment (Grasslands/agro-ecosystems)**: Very Good
The dykelands of the inner Bay of Fundy are unique (A. Hanson pers. comm.; van Proosdij and Page 2012). Although agricultural lands are common throughout the Maritimes, the extent of the grasslands/agro-ecosystems/dykelands is unparalleled elsewhere, providing habitat that is critical to breeding populations of rare and endangered grassland species. Over 5 544 ha of dykeland habitat occurs within the bioregion.

**Overall Assessment Rank (Grasslands/agro-ecosystems)**: **Good**

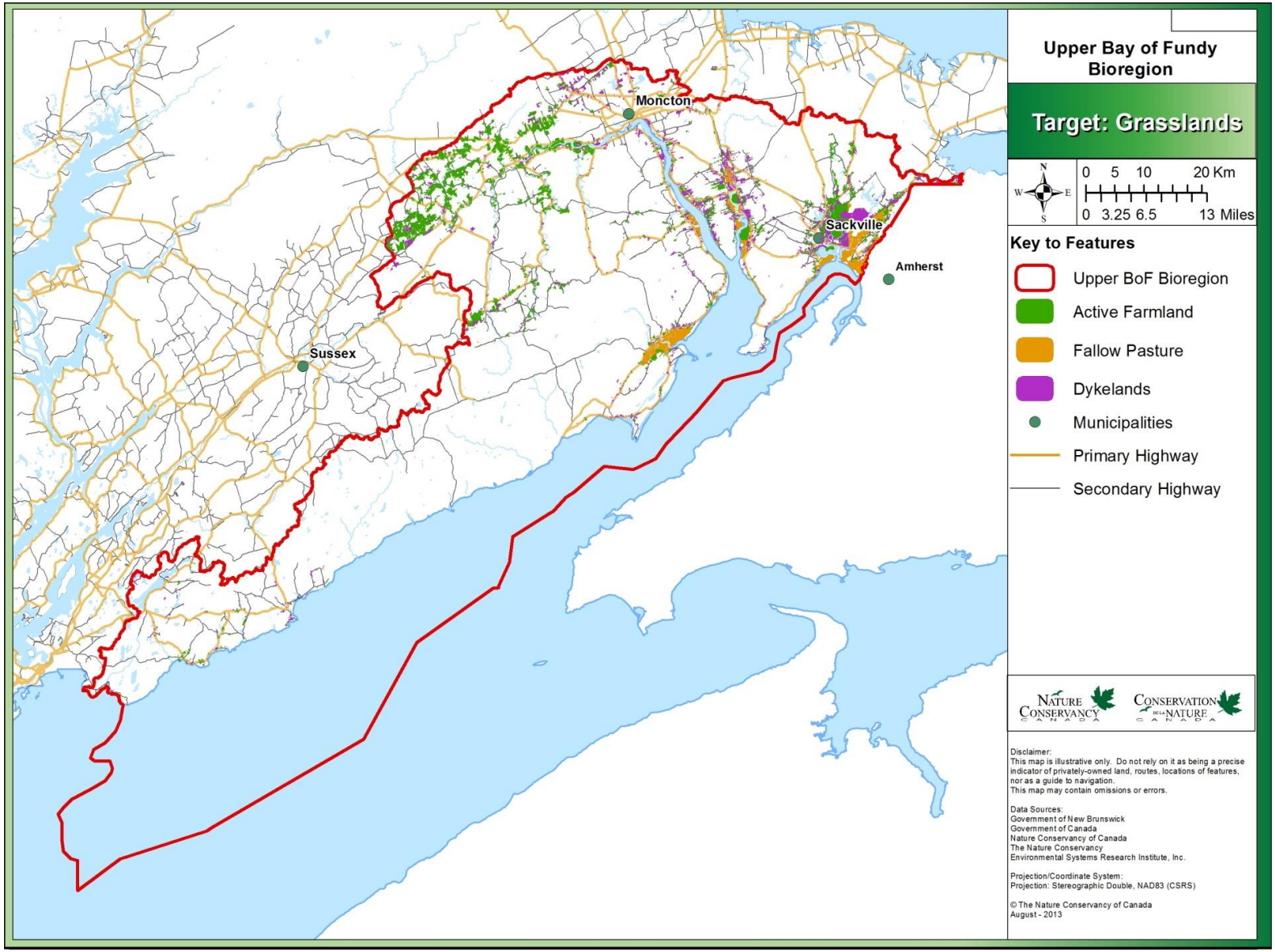



**Figure 12. Grasslands/agro-ecosystems in the NB IBoF bioregion.**

**Table 7a. Assessment of the habitat conservation priorities for the NB IBoF bioregion**.

| Biodiversity Habitat | Assessment | | | Overall Assessment |
|---|---|---|---|---|
| | Landscape Context | Condition | Size | |
| Beaches, rocky shores and cliffs | Very Good | Good | Good | **Good** |
| Salt marshes | Fair | Fair | Very Good | **Good** |
| Tidal flats | Very Good | Good | Very Good | **Very Good** |
| Acadian forest mosaic | Fair | Fair | Fair | **Fair** |
| Freshwater wetlands | Fair | Fair | Fair | **Fair** |
| Riparian systems | Poor | Good | Very Good | **Fair** |
| Caves and calcareous sites | Good | Fair | Good | **Good** |
| Grasslands/agro-ecosystems | Good | Good | Very Good | **Good** |
| **Overall biodiversity habitat assessment for the bioregion** | | | | **Good** |

**Table 7b. Description of the assessment ranks of ecological integrity of the conservation priority habitat types for the NB IBoF bioregion.**

| Rank | Description |
|---|---|
| Very Good | **Ecological Integrity is Optimal**: The structure, species composition, and key ecological processes and functions of the habitat conservation priority are intact and unimpaired by anthropogenic stresses. Ecosystems are functioning at a level comparable with the natural or historic range of variation for that ecosystem, and its capacity for self-renewal is maintained. The habitat conservation priority requires little or no management. |
| Good | **Ecological Integrity is Good**: The structure, species composition, and key ecological processes and functions of the habitat conservation priority are somewhat impaired by anthropogenic stresses. Ecosystems are functioning within a range of acceptable variation compared with the natural or historic range of variation for that ecosystem, and may require some management. |
| Fair | **Ecological Integrity is Degraded**: The structure, species composition, and key ecological processes and functions of the habitat conservation priority are impaired by anthropogenic stresses. Ecosystems are functioning below the range of acceptable variation compared with the natural or historic range of variation for that ecosystem, and require management, without which the habitat conservation priority will be vulnerable to serious degradation. |
| Poor | **Imminent Loss of Ecological Integrity**: The structure, species composition, and key ecological processes and functions of the habitat conservation priority are seriously degraded by anthropogenic stresses. Ecosystems are functioning well below the range of acceptable variation compared with the natural or historic range of variation for that ecosystem, and require significant management and/or restoration. Allowing the habitat conservation priority to remain in this condition for an extended period will make successful restoration highly improbable. |
| Unknown | **Research Need**: The habitat conservation priority is known to occur, but information on this assessment criterion is currently unknown. |
| N/A | **Not Applicable**: This criterion is not significant for assessing the ecological integrity of the habitat conservation priority. |

## B. THREATS

Threats are the proximate activities or processes that have caused, are causing or may cause the destruction, degradation and/or impairment of one or more of the identified biodiversity habitats. Threats impact the habitat's viability and/or key ecological attributes. Threats to the priority habitats were identified by the NB IBoF bioregion project team using past studies, local expert knowledge, and a review of the literature. Though threats originally were assessed at the provincial scale, based on priority bird species, the list of threats identified is seen as comprehensive for the bioregion's biodiversity habitats. These threats were ranked based on their scope, severity and irreversibility of damage to habitats over a 10-year period using the Conservation Action Planning Workbook (Low 2003), and were categorized using established international taxonomy (IUCN-CMP 2006a, with local descriptions; Appendix F). Table 8 provides a summary of the threats identified for the NB IBoF bioregion. The overall threat status for the NB IBoF bioregion is high. The geographic extent of each identified threat is indicated, where known, in Figures 15 – 22.

**Table 8. Summary of threats to the NB IBoF bioregion biodiversity habitats, in order of severity (continued on p 60).**

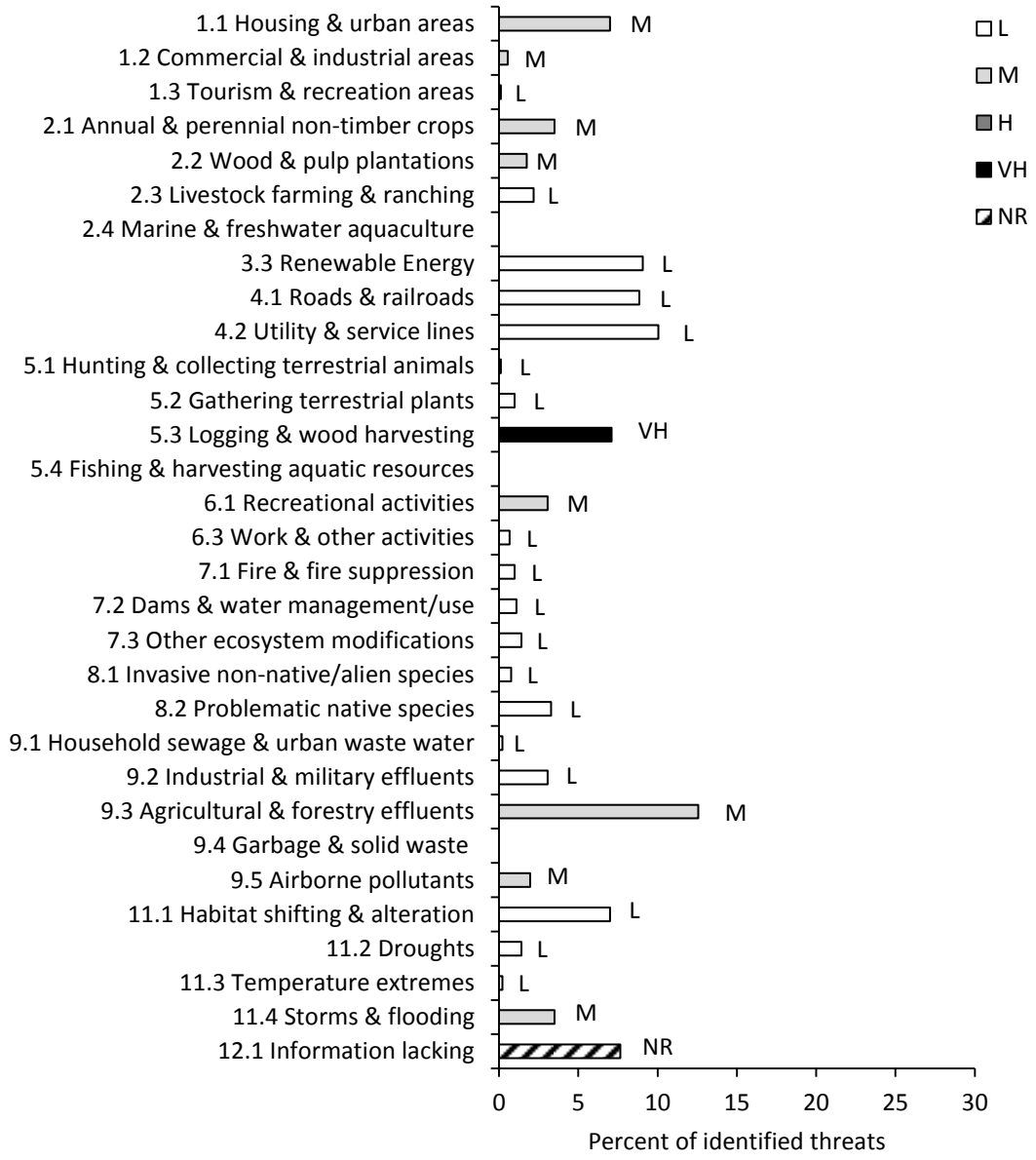
| | |
|---|---|
| **Very high** | The threat is likely to *destroy or eliminate* the priority habitat type |
| **High** | The threat is likely to *seriously degrade* the priority habitat type |
| **Medium** | The threat is likely to *moderately degrade* the priority habitat type |
| **Low** | The threat is likely to *only slightly impair* the priority habitat type |
| **-** | The threat's impact on priority habitat type is *negligible* |
| **Unknown** | The threat's impact on priority habitat type is *unknown* |

**Table 8 (continued). Relative magnitude of identified threats to priority bird species within BCR 14 NB, and MBU 11 NB by threat category and broad habitat class. L = Low magnitude threats; M = Medium; H = High; VH = Very High. Blank cells indicate that no priority bird species had threats identified in the threat category / habitat combination. Adapted with permission from Environment Canada 2013.**

| Threat Category | BCR 14 Habitat Classes | | | | | | | | | | | | | MBU 11 Habitat Classes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Threats across habitats** | Coniferous forest | Deciduous forest | Wetlands | Mixed forest | Riparian | Cultivated and Managed Areas | Shrub/Early Successional | Herbaceous | Urban | Inland Waterbodies | Coastal – Above High Tide | Widespread | **Summary Threat Ranking** | Coastal– intertidal | Marine Waters | Widespread | **Summary Threat Ranking** |
| **5.3 Logging and wood harvesting - incompatible forestry practices** | VH | VH | H | H | H | | | | | L | L | | **VH** | L | L | | **L** |
| **9. Pollution** | H | M | M | M | M | M | L | L | L | M | M | | **H** | H | M | | **M** |
| **1.1 Housing and urban areas (housing, cottage and rural development)** | L | L | M | L | M | M | L | L | H | L | M | L | **M** | L | | | **L** |
| **2.4.1 Marine and freshwater aquaculture - (industrial land-based aquaculture) (Agriculture and aquaculture)** | L | M | M | M | L | H | | | | | L | | **M** | L | M | | **L** |
| **11.1 Climate change and severe weather - habitat shifting and alteration (*emerging*)** | | | | | | | | | | | | H | **M** | | | M | **L** |
| **6.1 Human intrusions and disturbance - recreational activities** | | | L | | L | | | L | L | M | M | | **M** | M | | | **L** |
| **7.2 Dams and water management/use (dams and aquatic barriers)** | L | L | L | L | L | L | L | | | L | M | | **L** | M | | | **L** |
| **8.1 Invasive non-native / alien** | L | L | L | L | L | L | L | L | | L | M | | **L** | L | L | | **L** |

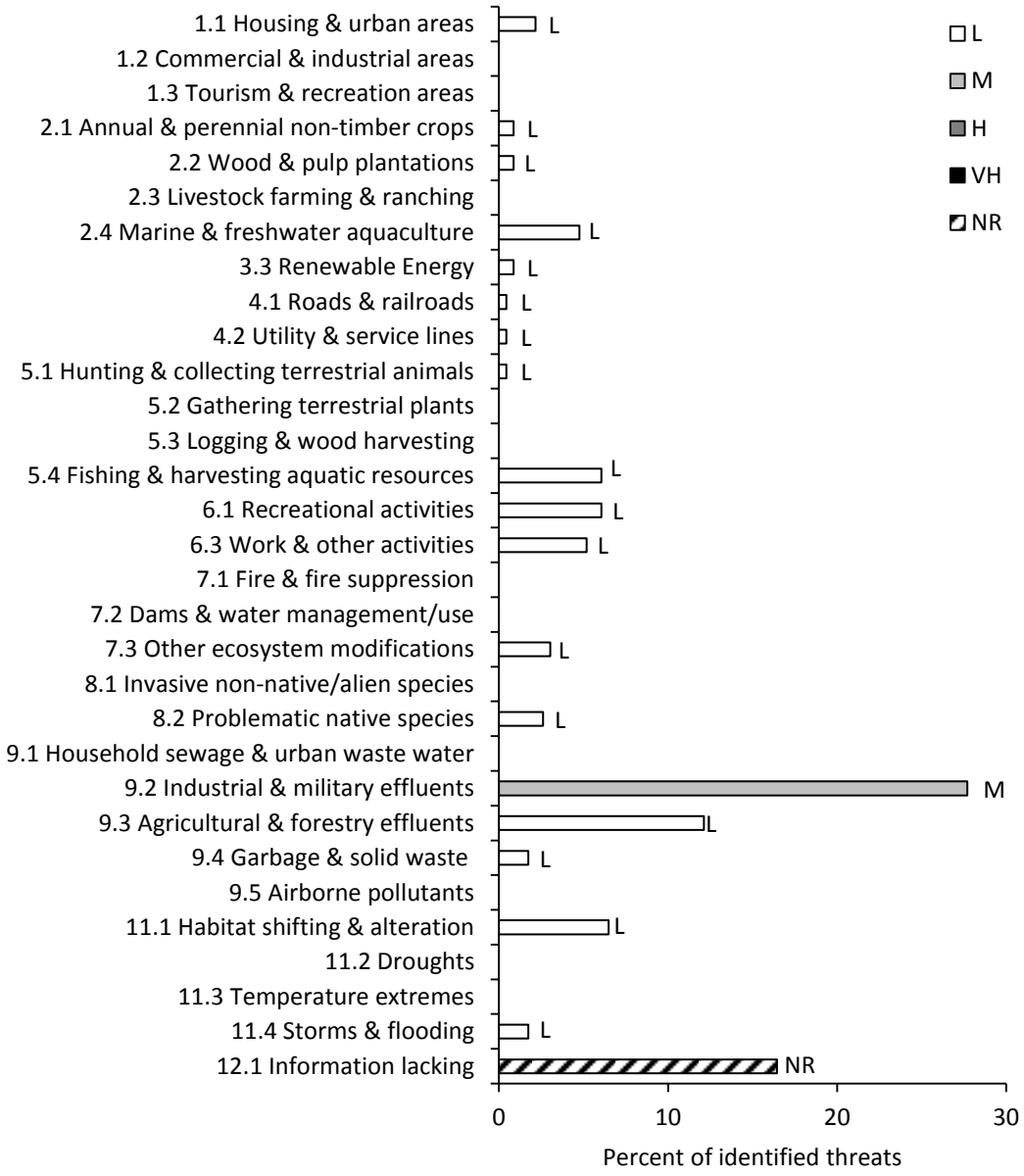
| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **species diseases** | | | | | | | | | | | | | | | | | |
| **4.1 Roads and railroads (road fragmentation)** | M | L | L | L | L | | | L | | | L | L | **L** | L | | | **L** |
| **3.1 Oil and gas drilling** | L | L | | L | | | | L | | | | L | **L** | L | | L | **L** |
| **Summary of threat ratings, by habitat, and for the HCS bioregion** | **H** | **M** | **M** | **M** | **M** | **M** | **L** | **L** | **M** | **M** | **M** | **M** | **H** | **M** | **M** | **L** | **M** |

**Figure 13. Identified IUCN categories of threats to priority bird species within BCR 14 NB expressed as percentage of total number of threats as well as magnitude of threat. Adapted with permission from Environment Canada 2013.**




Note: If 100 threats were identified in total for all priority bird species in BCR 14 NB, and 10 of those threats were in the category 1.1 Housing and urban areas, the bar on the graph would represent this as 10%). Progressive shading in the bars (from L: low, M: medium, H: high, to VH: very high) represents the rolled up magnitude of all threats in each threat subcategory in the BCR. Threats that are unranked due to lack of information are indicated with "NR."

**Figure 14. Identified IUCN categories of threats to priority bird species within MBU 11 NB expressed as percentage of total number of threats as well as magnitude of threat. Adapted with permission from Environment Canada 2013.**




Note: If 100 threats were identified in total for all priority species in MBU 11 NB, and 10 of those threats were in the category 1.1 Housing and urban areas, the bar on the graph would represent this as 10%). Progressive shading in the bars (from L: low, M: medium, H: high, to VH: very high) represents the rolled up magnitude of all threats in each threat subcategory in the BCR. Threats that are unranked due to lack of information are indicated with "NR."

### *i. Current Threats*

**7.2 Dams and water management/use (dams and aquatic barriers):**
(Summary Threat Rank: **High**)

Approximately two-thirds of the world's freshwater flowing into oceans is blocked by large and small dams (Petts 1984; McCully 1996). The effects of dam construction and operation can have both immediate and long term effects on long stretches of both upstream and downstream habitat. One of the most immediate effects is the decrease in aquatic connectivity (the network created by freshwater streams, rivers, and lakes as they flow into one another). Barriers along these aquatic networks can restrict or eliminate the movement of fish and other aquatic species up and down streams, and limit accessibility to suitable spawning, feeding, overwintering, and summer habitats (Fielding 2011). Within the Bioregion, these networks are critically important to the success of a number of aquatic species, such as Atlantic Salmon, Brook Trout, American Shad, and American Eel.

In addition to creating barriers for fish passage and reducing aquatic connectivity, the development of dams has the potential to adversely impact a number of the Bioregion's most sensitive habitats and species. Dams impact freshwater ecosystems by altering the natural hydrology of river systems, including changes to flow regimes, water temperatures, sediment transport, and nutrient loads (Bednarek et al. 2001; Saunders et al. 2002; Nilsson and Berggren 2000). Concerns around damming infrastructure itself are also present. Upstream of dams, the creation of reservoirs from water that once flowed downstream can lead to permanent terrestrial and riparian habitat loss (Nilsson and Berggren 2000), and lasting changes to species density (Nilsson et al. 1997). Reservoirs created from damming activities can also cause changes to water temperatures, resulting in habitat favouring warmwater fishes and encouraging further inundation by introduced species (CRI 2011). The creation of reservoirs also exacerbates predation on Atlantic Salmon by native and invasive species.

Biological communities and species are dependent on the availability of specific habitats, including riffles, pools, and cold water habitat. Flow regimes are fundamental in determining the physical characteristics of river and riparian habitat. Therefore, alteration of the natural flow regime downstream on damming activities affects the distribution and abundance of biodiversity within the river system (Holden 1979; Bednarek et al. 2001).

Seventy large aquatic barriers have been identified within the bioregion, representing a significant threat to riparian/aquatic systems and species (Fig. 21). Additional barriers may exist where major highways or abandoned forestry roads cross rivers and streams. The majority of these smaller barriers have not been assessed for fish passage, but cumulatively may have a significant negative impact on fish populations (Fig. 21). It is estimated that over 90% of the Petitcodiac watershed is affected by barriers that result in partial or total obstruction to fish passage (Wells 1999). Other rivers such as the Shepody, Memramcook, Aulac and Tantramar are 100% obstructed, which is assumed to be a factor in the decline of the inner Bay of Fundy Atlantic Salmon population (Petitcodiac Riverkeeper Inc. 2008), among other fish species. A number of dam removal projects have been initiated within the bioregion such as Back Brook (in 2002) and Humphreys Brook (in 2013). The Petitcodiac River causeway has not been removed but the gates were been opened in 2010. The restoration of tidal flow through the Petitcodiac River causeway structure has resulted in an increase in fish numbers and diversity (Redfield 2011).

**8.1 Invasive non-native/alien species/diseases:**
(Summary Threat Rank: **High**)

Invasive species are commonly cited as one of the most important threats to global native biodiversity (UNEP 2002; Hermoso et al. 2011). Estimates suggest that invasive species dominate 3% of the entire Earth's ice-free surface (Mack 1985). Invasive species have been shown to impact native species via a variety of evolutionary pathways (i.e., competitive exclusion, niche displacement, hybridization, introgression, and extinction; Mooney and Cleland 2001). They are listed at the second greatest threat to species at risk in the US (Wilcove et al. 1998), with approximately ~42% of threatened and endangered species being affected through "competition with or predation by invasive species" (TNC 1996; Wilcove et al. 1998).

Within the NB IBoF bioregion a number of invasive plant species have been identified as significant threats. Two species in particular have been identified as having the potential to severely impact natural systems; Phragmites (*Phragmites australis* ssp*. australis*) and Glossy Buckthorn (*Frangula alnus*) (S. Blaney pers. comm.). The former, known as Common or "European" Reed, is an aggressive wetland invader and colonizer of disturbed areas such as roadside ditches (note the native Common Reed [*Phragmites australis* ssp*. americanus]* also occurs in the bioregion). This species grows in dense stands, is widespread and displaces native wetland vegetation (NBISC 2012). Glossy Buckthorn is another aggressive invader that can grow in any open habitat including wetlands and open forests. Extensive tracts of land can be entirely colonized by this species, displacing all other native species. It is well established within Amherst, Nova Scotia, has spread from there to Sackville. It has also become established in the Greater Moncton Area, possibly because of garden introductions (S. Blaney pers. comm.). It is considered the most significant invasive plant in New Brunswick (NBISC 2012). Woodland Angelica (*Angelica sylvestris*) is another invasive species of concern, although the threat is not as high as the Glossy Buckthorn. This species has been present in New Brunswick for many years but has recently begun spreading more rapidly (NBISC 2012). It is an aggressive displacer of native vegetation and has become established within the Sackville area and Fundy National Park (S. Blaney pers. comm.). Japanese Knotweed (*Fallopia japonica*) is an invasive 'escaped ornamental' plant species occasionally used to stabilize soil embankments. Though seeds can be dispersed by wind and water, spread is facilitated by roadwork and construction activities, and through the displacement of soil and yard waste by gardeners and landscapers. This species typically occurs within and near areas of human habitation, quickly spreading along roadsides and ditches. It can be expected along neighbouring or linked fields, meadows, downstream lakeshores and other wetland margins, displacing native flora and fauna (Anderson 2012). Japanese Knotweed is listed by the World Conservation Union as one of the world's 100 worst invasive species (Global Invasive Species Database 2014). Though locally abundant, it's current distribution and rate of spread do not warrant consideration as an immediate priority in the NB IBoF bioregion (S. Blaney pers. comm.).

White-nose syndrome (WNS) is caused by an invasive alien pathogen that has decimated native bat populations across the eastern seaboard. It is believed to have been introduced from Europe (Pikula et al. 2012) and was first detected in North America in 2006 (Lorch et al. 2011). WNS is hypothesized to cause starvation and dehydration by taxing bat energy reserves at a time when they would normally be inactive and hibernating. The bats are then forced to leave the hibernacula in search of food, and subsequently die of exposure (Carey et al. 2003; Turner et al. 2011).

Smallmouth Bass (*Micropterus dolomieu*) is an aggressive fish species that was introduced in most river systems in the bioregion and has widely spread. Salmonids are poor competitors with this invasive species that reduces aquatic systems diversity through voracious and direct predation of native fish species (Brown et al. 2009). Within just a few years of entering a watershed native Brook Trout populations could be decimated (D. Dauphinee pers. comm.). Chain Pickerel is also a fish species of serious concern, particularly within the Petitcodiac River and its tributaries where it was introduced for

sport fishing (Atlantic Salmon Federation 2013). Chain Pickerel is also a voracious predator and is considered a high threat to Canadian aquatic biodiversity (CWF 2003).

With new invasive species crossing geographic borders and established species' invasive potential increasing with the immigration of more individuals (Mooney and Cleland 2001), research indicates a rise in outbreaks of tree and forests pests and diseases (Boyd et al. 2013). International commerce has assisted the dispersal of species, and continued high volumes and new forms of trade may exacerbate the risk of invasive species spread (Boyd et al. 2013). Interceptions at ports indicate a high number of species landings (Haack 2001; Humble and Allen 2001; Majka and Klimaszewski 2004). The Maritime Provinces are especially vulnerable to adventive species given that our ports are often the first point of contact for ships carrying international goods. While only 1% of these species become established (Williamson 1996), this adds up over time. Invasive species are responsible for major economic losses (Pimentel et al. 2001) as well as dramatic changes to the habitats they occupy and the species with which they interact. Non-native insects and diseases are capable of modifying habitat and ecosystem function (Liebold et al. 1995; Fleming and Candau 1998; Castello et al. 1995).

A number of invasive insect species are already present within the bioregion. The European gypsy moth (*Lymantria dispar*) is a defoliator of over 200 hardwood tree species. The Balsam Woolly Adelgid (*Adelges piceae*) has yet to cause widespread damage across the bioregion, but populations are expanding continuously.

Several diseases are also found within New Brunswick with a subset found within the bioregion . There is both a native and European strain of Scleroderris canker (*Gremmeniella abietina*) in North America. The latter is only found in Michigan (CFIA 2014). The European strain is more virulent and attacks multiple hosts (CFIA 2014). Positive detections have been found in New Brunswick, as well as other provinces and states in eastern North America (CFIA 2014). This species is rated as very high risk by North American Forest Commission Exotic Forest Pest Information System (NAFC-ExFor). Its potential for establishment and spread outside of its native distribution is high. Likewise, because it targets host species of commercial value and has the potential to indirect impacts on a variety of species at risk, its economic and environmental impact potential is listed as high. The European larch canker is particularly harmful fungus that infects the indigenous tamarack. It is distributed throughout southern New Brunswick, central Nova Scotia and has more recently been identified on Prince Edward Island (Simpson and Harrison 1993). Likewise, Dutch elm disease and beech bark disease are distributed throughout Maritime Canada (Hurley et al. 2003).

We lack comprehensive information on how many invasive species impact the environment and the species around them. Regardless, the introduction of invasive species and diseases will remain a threat to native species and the broader ecosystems for years to come.

**1.1 Residential and commercial development - housing and urban areas:**
(Summary Threat Rank: **High**)

The demand and pressure for development along coastal and freshwater systems in New Brunswick has been increasing (New Brunswick Department of Environment and Local Government 2002; MacKinnon et al. 2011). The coastal regions of New Brunswick are experiencing a phenomenon called “coastal squeeze” where natural habitats are becoming increasingly surrounded by infrastructure, including houses, roads, and rock walls (i.e., shoreline hardening), constraining flow, natural habitat migration and other forms of dynamic response to natural forces. Habitat loss due to residential development is one of the main threats to species supported by coastal habitats (Sabine 2002; NB EHJV 2007; Environment Canada 2013). Species found in wetlands and riparian areas are threatened by habitat loss from

conversion to agriculture or commercial and residential developments (Environment Canada 2013). New Brunswick has a Wetland and Watercourse Conservation Policy as well as a Coastal Areas Protection Policy that offer some protective measures (New Brunswick Department of the Environment and Local Government 2002). The Clean Water Act and its associated regulations also provide protection to wetlands and watercourses. However, illegal infilling is still a threat (Sabine 2002) as the demands for development and related disturbances have become more pressing and prevalent in recent years, mostly due to increased land pressures on increasingly valuable real estate (MacKinnon et al. 2011). In addition to direct destruction through infilling, development also indirectly impairs habitat quality with increased use and disturbance (Gautreau 2008). According to the Petitcodiac Riverkeeper (2012), declines in water quality as well as general habitat destruction are increasing rapidly within the Petitcodiac watershed, resulting from urban sprawl and land development (Petitcodiac Watershed Alliance 2008).

The Human Footprint map, developed by the Wildlife Conservation Society (Woolmer 2008), is a good proxy for the threat of development, as it is derived from layers of human development and infrastructure. The human footprint impact for the bioregion is mapped in Figure 15. Within the bioregion, coastal development is not as high a threat as it is in other parts of New Brunswick, mostly owing to the rugged terrain and inaccessibility of much of the Fundy coast. The threat of development mainly occurs within high settlement areas, most notably in the Greater Moncton Area (Fig. 16). It should be noted that human development is also tied to important increased predation pressure on birds by House Cats (*Felis catus*) in developed areas and adjacent habitats (Blancher 2013).

**4.1 Roads and railroads (road fragmentation):**
(Summary Threat Rank: **Medium**)

The ecological impacts of roads can be difficult to quantify, but a growing body of research makes a compelling link between roads and ecological degradation in terrestrial and aquatic ecosystems (Trombulak and Frissell 2000). Road construction has long been linked to habitat fragmentation and degradation. There is also research linking negative impacts to many wildlife species, including some invertebrates, such as butterflies (negative effects on species richness) and certain carabid beetles, herptophauna, and some birds (Fahrig and Rytwinski 2009). It is also a major concern for wide-ranging mammals, such as moose and lynx (Beazley et al. 2004). Roads fragment landscapes and may act as physical barriers between interior patches of habitat. They have negative effects on biodiversity through direct mortality from road construction and vehicle collisions, behavioural modifications (e.g., avoidance), alterations of the physical and chemical environment and increased access to once inaccessible places for invasive species and human use. This includes improved access for off-highway vehicle use, poaching, and legal harvesting of wildlife (Trombulak and Frissell 2000). Road construction can also have a negative impact on freshwater wetlands as a result of changes to hydrology and direct loss of habitat (Saunders et al. 2001).

Vehicle mortality is a recognized threat for Wood Turtles and Snapping Turtles, particularly adult females and hatchlings, given the tendency of females to use roadsides as nest sites (COSEWIC 2007a; 2008b; Fahrig and Rytwinski 2009). Given the longevity and late maturation of turtles, their populations are particularly vulnerable to even small increases in adult mortality (COSEWIC 2007a; 2008b). In areas with high road densities, mortality of females can lead to male-biased population sex ratios (Steen and Gibbs 2002).

Road density is high within the bioregion due to the high population density and resource extraction industries that occur here. There is a total of 4,742 km of roads in the bioregion (Fig. 19), with a road density of 0.98 km/km$^2$. Forest road density is in excess of 0.56 km/km$^2$, the majority of which are

unpaved and located in the interior region of the bioregion. Three areas within the bioregion are of particular concern as the act as “pinch points”, where wide-ranging species are funneled and must cross major highways. These pinch points near the Isthmus of Chignecto and Anagance overlap with adjacent bioregions and contribute to large landscape scale connectivity for wide-ranging species within New Brunswick and Nova Scotia (Appendix I).

**5.3 Logging and wood harvesting - incompatible forestry practices:**
(Summary Threat Rank: **Medium**)

Forest management activities are the main cause of changes in the composition and structure of forests in New Brunswick, with the additional impact of fragmentation due to road and right-of-way construction (Environment Canada 2013). Across the Maritimes, only about 5% of the Acadian forest is currently in pre-European settlement condition. According to the World Wildlife Fund (2002), the major conversion and degradation threats within this region are development and logging, and as such the ecoregion has been classified as endangered. Approximately 35% of the forested land is owned by the Crown and managed by licensees while the other 65% is held in private woodlots. Up to half of private woodland is owned through industrial freehold, which is managed similarily to Crown land. One of the primary harvesting techniques in New Brunswick is clear-cutting, which does not mimic the gap-replacement disturbance dynamics for most climax tolerant softwood and hardwood communities that occur in the region. As a result of this, much of the forest has transitioned to a composition of boreal and/or pioneer species. Additional Protected Natural Area lands have been designated within the bioregion, which will contribute to protection of forest habitat (see Table 5). The geographic extent of forest resource harvesting and silviculture within the bioregion is shown in Figure 20. In addition to related changes in amount and quality of habitat for certain species, direct losses of bird nests to Industrial forestry operations also has been estimated at large spatial scales (Hobson et al. 2013).

**2.1 Annual and perennial non-timber crops (incompatible agricultural practices):**
(Summary Threat Rank: **Medium**)

Incompatible agriculture practices, such as the mowing of hayfields during the breeding season, are one of the main threats to grassland-dependant species at risk that use cultivated and managed areas (Environment Canada 2013; Tews et al. 2013). Many grassland birds, for instance, do not have sufficient time to complete their nesting cycle when hay harvesting is undertaken earlier and at more frequent intervals (U.S. Department of Agriculture, Natural Resources Conservation Service 2010). Timing of harvest can also be detrimental to Wood Turtles, which face threats and mortality associated with farm machinery (COSEWIC 2007). Studies in Nova Scotia have shown that delaying the timing of hay harvesting beyond the breeding season (June to early July) and raising the height of mowers in riparian fields may reduce farm machinery related mortality of Wood Turtles. In addition, Wood Turtle activity is usually restricted to within 300 m of the water’s edge, thus maintaining a seasonal equipment free zone would significantly decrease mortality as well (Arvisais et al. 2004; 2006; Tingley et al. 2009). Generally, the types of habitat required by grassland species are declining in the province as the number of farms are decreasing (Walls 2011; Environment Canada 2013). At least partly as a result of these changes, many grassland bird species are declining (COSEWIC 2010; 2011a; 2011b). Agricultural lands are mapped in Figure 17.

Other incompatible farm practices may include insecticide, pesticide and herbicide application. Insecticides are known to reduce food for insectivorous birds (Newton 2004) and certain pesticides also may affect them directly through toxicity, thus potentially contributing to declines in birds like the Eastern Meadowlark, Short-eared Owl, and Bobolink (Mineau and Whiteside 2013). Use of industrial fertilizers can create nutrient loading in watercourses and wetlands. In addition to affecting water

quality, removal of natural vegetation creates erosion and sedimentation and can increase water temperatures due to a lack of cover (Carpenter et al. 1998; Henley et al. 2000; Allan 2004).

**2.2 Wood and Pulp Plantations:**
(Summary Threat Rank: **Medium**)

According to the provincial forest inventory, over 15 000 ha of forest plantations occur within the bioregion (Fig. 17), representing 5% of the forested land base, which does not include industrial freehold for which data were not available. If industrial freehold land is included, percentage of plantations is likely to exceed 10% of the landscape within the bioregion (B. Phillips pers. comm.). This is higher than the percentage of protected land by area and represents a large loss of natural habitat. Of these, less than 0.5% are in a mature age class. Plantations within New Brunswick have been recognized as having lower biodiversity value as compared to natural forest due to a lack of forest structure including species composition, snags, coarse woody debris and multiple canopy layersand intensive management regimes such as herbicide and pesticide application and hardwood suppression (Betts et al. 2005). Forest plantations may act as fragmentation features across the forested landscape for some species (Christian et al. 1998) and are associated with other fragmentation features such as roads and cut blocks. Roads accessing plantations fragment landscapes and may act as physical barriers between other interior patches of habitat. They have negative effects on biodiversity including species-at-risk such as turtles through direct mortality from road construction and vehicle collisions, behavioural modifications (e.g., avoidance), alterations of the physical and chemical environment and increased access to once inaccessible places for invasive species and human use. This includes improved access for off-highway vehicle use, poaching, and legal harvesting of wildlife (Trombulak and Frissell 2000).

**6.1 Human intrusions and disturbance – recreational activities:**
(Summary Threat Rank: **Low**)

Many beaches are used heavily for recreation throughout the bioregion. Beach use through tourism is increasing, as is ATV use, hiking, camping and mountain biking. The threats associated with traditional recreational beach uses include: increased potential of beachgoers creating trails, increased potential of garbage presence that can be ingested or attract predators, and general disturbance at foraging, nesting and roosting sites (Environment Canada 2012; 2013). Similar threats apply to intertidal mudflats where recreational mudsliding and non-commercial bait work extraction constitute concerns specifically for foraging and roosting shorebirds (Buzeta et al. 2003). There has been local and provincial marketing of the beaches as tourist destinations, especially along the Fundy Coast. Tourism development is rapidly increasing in this region (GNB 2010).

The use of ATVs in wetlands and beaches is illegal under the Vehicle Trespass Act of New Brunswick; however, it occurs nonetheless and enforcement is difficult and rarely occurs. Although not as significant a threat as in northern New Brunswick, disturbances through illegal use of ATVs are a major concern as it can disturb wildlife and severely damage wetland and coastal habitats as well as the species they support (J. Rock pers. comm.). There are challenges with controlling access of ATVs on these sensitive habitats as they can go through all types of landscapes and conditions. There is a risk of increasing use of existing sites (trails) and expansion into new high value areas. ATV traffic in wetlands destroys the vegetation by cutting ruts and causing long-lasting scars on the surface through extensive braided trail networks. ATVs are also an added threat to Wood Turtles, particularly adults, which suffer increased mortality rates by traffic on roads (Seburn and Seburn 2004; COSEWIC 2007).

**3.2 Mining and quarrying:**
(Summary Threat Rank: **Low**)

Although no active mines are present within the bioregion, over 15 358 ha of mineral claims were current between 2010 and 2012. Additionally, over 350 rock quarries and soil and gravel extraction sites are present, 89 of which were active as of 2003 (Fig. 18). Threats from mining and quarrying relate to the permanent destruction of habitat from the construction of roads and processing facilities, erosion and sedimentation as a result of land clearing and disposal of debris, as well as soil and water contamination from chemical by-products that result from the processing of ores (Bell and Donnelly 2006). According to the Fraser Institute's 2012 Survey of Mining Companies, New Brunswick was rated the single best jurisdiction in the world for mining. This is likely because of its low royalty rates, relatively lax regulatory regime and rather important mineral potential. Some of this important potential occurs within the bioregion.

**3.3 Renewable energy (wind farming):**
(Summary Threat Rank: **Low**)

A single wind farm is established within the bioregion: Kent Hills Wind Farm, located between Hopewell and Elgin, operated jointly by TransAlta and Natural Forces Technologies (Fig. 18). The farm consists of fifty Vestas V90 3 MW wind turbines, each of which has a rotor radius of 45 m and stands roughly 80 m in height (TransAlta online 2014). Wind farm projects (land based and offshore) are increasing along the northeastern coast of North America and represent a potential conservation issue for a variety of migratory birds (Langston and Pullan 2003) and, perhaps more acutely, with migratory bats (Arnett et al. 2008; Baerwald and Barclay 2009). Despite the many environmental benefits of wind energy, the rapid growth of the wind energy sector around the globe has raised concerns regarding the impacts of these developments on both resident and migratory populations of wildlife (Arnett et al. 2008). Wildlife may be impacted by wind energy developments through direct mortality, changes to habitat availability, and disruption of movement patterns (e.g., foraging, mating, and migration). Wind turbines are thought to have a negligible effect on bird populations compared to other man made impacts (Environment Canada 2013; Zimmerling et al. 2013), and compared to other groups of wildlife. Documentation of large numbers of bat fatalities at wind energy facilities across North America has raised the profile of this issue as a primary environmental concern associated with their installation (Johnson 2005). In North America, the species most affected are the long-distance migratory bats, including the Hoary Bat (*Lasiurus cinereus*), the Eastern Red Bat (*L. borealis*), and the Silver-haired Bat (*Lasionycteris noctivagans*), which make up about 75-80% of the documented fatalities at wind energy developments, with the Hoary Bat alone comprising about half of all fatalities (Kunz et al. 2007; Arnett et al. 2008). In New Brunswick, the sparse data available suggest that there are some migratory movements of these species in or through the province. While still thought to be rare, they do occur regularly and are especially vulnerable to wind facilities (D. McAlpine pers. comm.). Bat fatalities have also been reported in smaller numbers for resident hibernating bat species, including the Little Brown Myotis, the Northern Myotis, and the Tri-colored Bat (*Perimyotis subflavus*) (Johnson 2005; Arnett et al. 2008).

The majority of efforts to minimize conflicts between wildlife and wind energy developments have focused primarily on risk avoidance through pre-construction surveys of wildlife and careful site selection to avoid areas with high levels of wildlife usage (Weller and Baldwin 2012). The assumption of this approach is that low indices of activity prior to construction should translate to low fatality rates post-construction (Baerwald and Barclay 2009), assuming that there is no source of attraction to turbines for wildlife (e.g., lights to alert navigation). Given the anticipated proliferation of wind turbines, we should continue to ensure that turbines are sited to avoid important wildlife habitats and migration corridors whenever possible.

The Wind Atlas of New Brunswick has identified NB's portion of the inner Bay of Fundy as having some of the best wind resources in the province, especially along the Fundy Plateau. A number of projects were proposed in recent years, such as the Frosty Hollows farm (30 turbines near Sackville) and the Acciona farm (43 turbines in Aulac). The industry has been slow to develop. If wind farming becomes more prominent within the bioregion, the cumulative effects on avian and chiropteran (bat) species could result in a much higher threat ranking being warranted, both because the inner Bay of Fundy is a well-known, important migratory bird corridor and the fact that it is the site of most of NB's remaining known bat hibernacula (D. McAlpine pers. comm.); it also remains to be determined whether it is a significant pathway for the migratory bat species as well. There is some evidence of mortality of migratory species at wind farm sites in NB. It is felt that a better recording and reporting mechanism for bat mortality at wind farm sites needs to be in place as we move forward (D. McAlpine pers. comm.).

**3.1 Oil and gas drilling:**
(Summary Threat Rank: **Unknown**)

Extensive tracts of land have been leased, given full licence, or are currently under review, to oil and natural gas companies for exploration within the bioregion. Over 166 208 ha of land (34% of bioregion) has been distributed between 5 companies, mostly in or around the Greater Moncton Area (Fig. 18). Approximately 24 km of pipeline has been identified within the bioregion.

The primary method contemplated for shale gas extraction is by unconventional, high volume, slick water, horizontal hydraulic fracturing or "hydrofracking", where high volumes of liquid (5-8 million gallons per hydraulic fracturing) are forced into the ground under high pressure to release natural gas from shale deposits (Northrup 2010). Extracting hydrocarbons through the use of unconventional hydrofracking is controversial in New Brunswick and elsewhere for various reasons. In other jurisdictions, it has been linked to small earthquakes. These tremors are apparently caused by injecting fracking waste water into deep underground injection wells (Horton 2012). However, to date, there is no indication that such injection wells are contemplated for this region. Nevertheless, shale gas drilling and extraction can also contaminate both ground- and surface-water from both the chemicals used in the fracking process, as well as those released as a result of the breakup of sub-surface shale (Entrekin et al. 2011). While the chemicals used during the fracturing process are only there in a small percentage of the total volume (under 5% by volume of the fluid), over 600 different chemicals have been identified in various frac fluid mixtures (Colborn et al. 2011). These chemicals are used to facilitate the fracturing process by making the water "slick" (Ingraffea 2013). Many of the chemicals used in particular mixtures are recognized as endocrine disruptors and possess various amounts of toxicity. In some cases, even very low concentrations may be sufficient to cause big health issues in animals and humans. Unfortunately, since many of the frack-fluid mixtures used are deemed proprietary technologies, it is very difficult to find out specifically which chemicals and in which amounts they are used in a particular case (Colborn et al. 2011). Additionally, and perhaps most importantly, there is the high likelihood of failure of the cement well casing over time, which can lead to methane and frac-fluid migration into aquifers (Ingraffea 2013). Also, shale gas operations release air pollutants and very significant quantities of more potent greenhouse gases such as methane through leakage during extraction and transport (Howarth 2010; Petron et al. 2012). These operations also result in extensive clearing of land for well-pads and infrastructure (Hein 2012). Potential additional, indirect impacts of shale gas mining include further fragmentation from road development, rapid road degradation through the increased use by industrial traffic, erosion and sedimentation (Adams et al. 2011).

The threat of shale gas extraction using hydraulic fracturing and otherwise is considered unknown for the bioregion at this time. Although there are currently a few shale gas wells that have been drilled and hydraulically fractured in the bioregion using the newer, unconventional, slick water, horizontally drilled,

high volume technique that is the most controversial, the industry is in its very early stages here and there are no major known or reported incidents that have occurred here associated with this practice to date. Based on problems that have occurred using these same techniques elsewhere, this type of drilling has the potential to be highly damaging to the environment if the industry proceeds on a larger scale.

**4.3 Shipping lanes:**
(Summary Threat Rank: **Unknown**)

There is little transportation of goods and materials within the bioregion. However within the lower Bay of Fundy near Saint John, active shipping lanes are present where large tankers transport oil and other chemicals both to and from the Irving refinery. Although there have been no major spills to date, a major oil spill would impact coastal habitats within the NB IBoF bioregion, through transport of these chemicals by tidal action.

### *ii. Emerging Threats*

Though not discussed in the above table, with the exception of sea-level rise impacts on the coast, climate change may have far reaching impacts on all habitats in the bioregion. A study conducted at Mt. Allison University looked solely at potential growth rate response of eight Acadian forest tree species due to climate change (Phillips and Laroque 2007). Results predict some species will have an increase in radial growth (growth rate of Eastern Hemlock is predicted to increase by 60% by 2100), while other species are expected to decline (Eastern White Cedar growth rates are predicted to decrease by 75% in the same timeframe) (Phillips and Laroque 2007). Effects on tree radial growth rates will be complicated by other factors such as changes in insect populations and new invasive species introductions, also related to, or exacerbated by, a changing climate. Changes in sea ice formation have also been linked to potential changes in coastal communities in the inner Bay of Fundy. Dispersal of tidal mudflat invertebrates has been shown to be highly related to ice rafting during the winter months (MacFarlane et al. 2013) and depressions within salt marshes caused by the ripping action of mobile ice blocks have been linked to increased biodiversity within salt marshes (Hanson 2004). Warming temperatures due to climate change may impact these processes and ultimately decrease biodiversity within coastal systems.

**11.1 Climate change and severe weather – habitat shifting and alteration**
(Summary Threat Rank: **Medium**)

The Earth's climate is warming as a result of anthropogenic emissions of greenhouse gases, such as carbon dioxide, methane, and nitrous oxide, originating from the burning of fossil fuels and land-use change (i.e., climate change; US CCSP 2009). The rate of global climate change observed over the last two decades is already having significant and wide ranging effects on the Earth's ecosystems and wildlife, and presents increasing challenges for species' adaptation (Nicholls et al. 2007).

The Atlantic coast has been shown to be highly sensitive to rises in sea-level (Shaw et al. 1998; Daigle 2006; 2011). With increasing global temperatures, sea-level rise is predicted to accelerate (Daigle 2011). The degree to which the coastline of the NB IBoF bioregion may experience physical changes (flooding, erosion, beach and salt marsh migration) due to climate change and accelerated sea level rise is predicted to be low along the Fundy cliffs, but increases to high within Chignecto Bay (Shaw et al. 1998). Daigle (2011) predicted an increase in approximately 13 cm in sea-level in both Sackville and Moncton by 2025 (relative to 2000 levels). The geographic extent of coastal sensitivity to sea-level rise is shown in Figure 22. The increasing rate of sea-level rise is expected to have a strong effect on coastal habitats

such as beaches and salt marshes (Robinson 2010). One of the major consequences of climate change in New Brunswick is the acceleration of coastal erosion rates, particularly during storm events (Bérubé 2008).

**Table 9. Summary of threats to the NB IBoF bioregion biodiversity habitats.**

| Threats[4] Across Habitats | Riparian Systems | Caves and Calcareous Sites | Acadian Forest Mosaic | Tidal Flats | Freshwater Wetlands | Salt Marshes | Beaches, Rocky Shores and Cliffs | Grasslands/agro-ecosystems | Summary Threat Rank |
|---|---|---|---|---|---|---|---|---|---|
| **7.2 Dams and water management/use (dams and aquatic barriers)** | Very High | | | | Medium | Medium | | | **High** |
| **8.1 Invasive non-native/alien species/diseases** | Medium | Very High | Medium | | Medium | | | | **High** |
| **1.1 Residential and commercial development - housing and urban areas** | High | Medium | Medium | Medium | Medium | Medium | Medium | Low | **High** |
| **4.1 Roads and railroads (road fragmentation)** | Medium | Medium | High | | Medium | | | | **Medium** |
| **11.1 Climate change and severe weather - habitat shifting and alteration (*emerging*)** | | | | High | | Medium | Medium | Medium | **Medium** |
| **5.3 Logging and wood harvesting (incompatible forestry practices)** | Medium | Medium | High | | Low | | | | **Medium** |
| **2.1 Annual and perennial non-timber crops (incompatible agricultural practices)** | Medium | Medium | | | Medium | Medium | | Medium | **Medium** |
| **2.2 Wood and pulp plantations** | Medium | Medium | Medium | | | | | | **Medium** |
| **6.1 Human intrusions and disturbance – recreational activities** | Low | Medium | Low | | Low | Low | Low | | **Low** |
| **3.2 Mining and quarrying** | | Low | Low | | Low | | | | **Low** |
| **3.3 Renewable energy (wind farming)** | | | Low | | | | | | **Low** |
| **3.1 Oil and gas drilling** | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | | **Unknown** |
| **4.3 Shipping lanes** | Unknown | | | Unknown | | Unknown | Unknown | | **Unknown** |
| **Threat Status for Habitats and Project** | **High** | **High** | **High** | **Medium** | **Medium** | **Medium** | **Medium** | **Low** | **High** |

| | |
|---|---|
| **Very High** | The threat is likely to *destroy or eliminate* the priority habitat type |
| **High** | The threat is likely to *seriously degrade* the priority habitat type |
| **Medium** | The threat is likely to *moderately degrade* the priority habitat type |
| **Low** | The threat is likely to *only slightly impair* the priority habitat type |
| **-** | The threat's impact on priority habitat type is *negligible* |
| **Unknown** | The threat's impact on priority habitat type is *unknown* |

[4] Threat nomenclature is based on the IUCN classification of direct threats (IUCN-CMP 2006b).

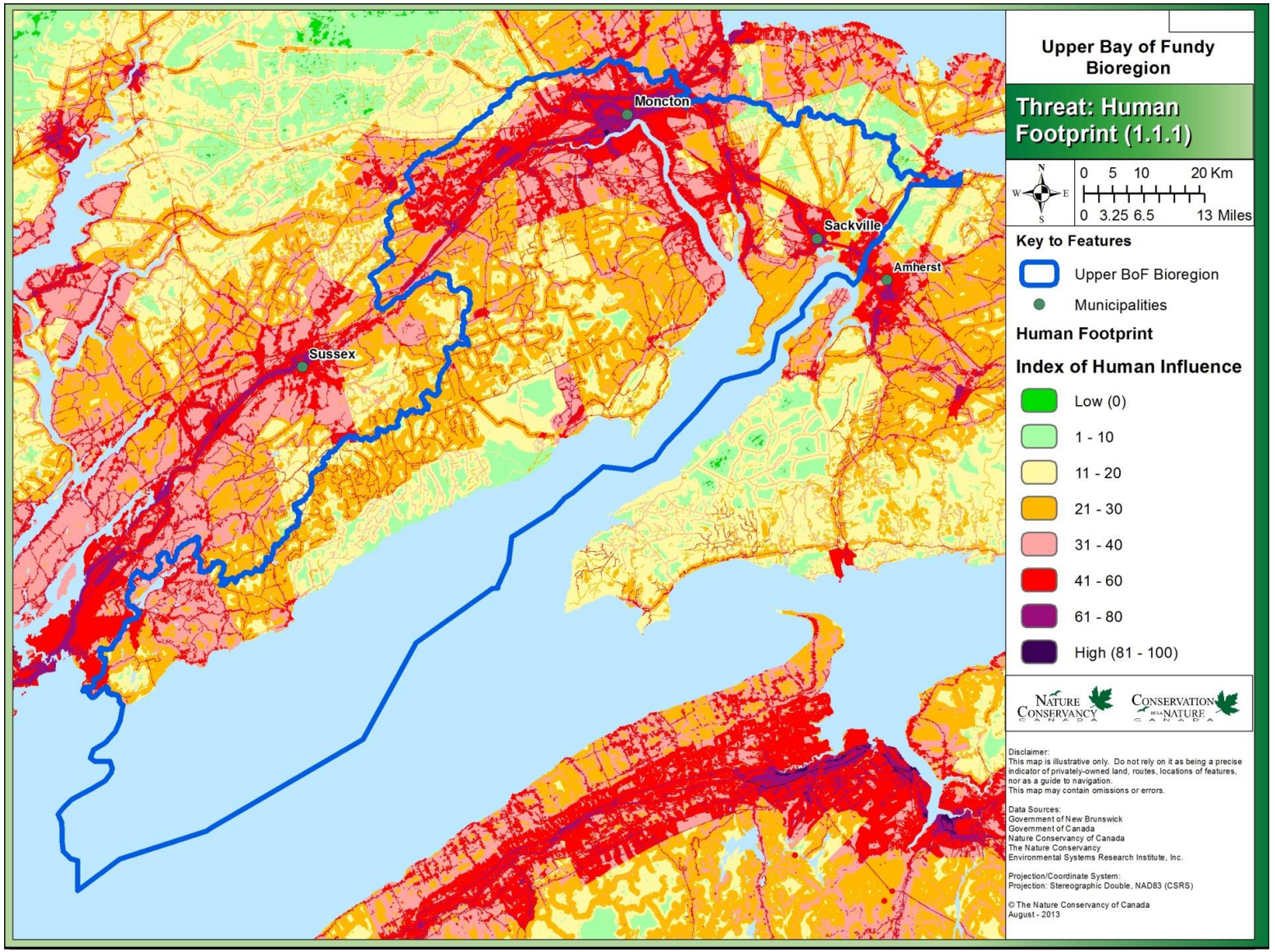



**Figure 15. Human Footprint Index in the NB IBoF bioregion (1.1 Residential and commercial development – housing and urban areas).**

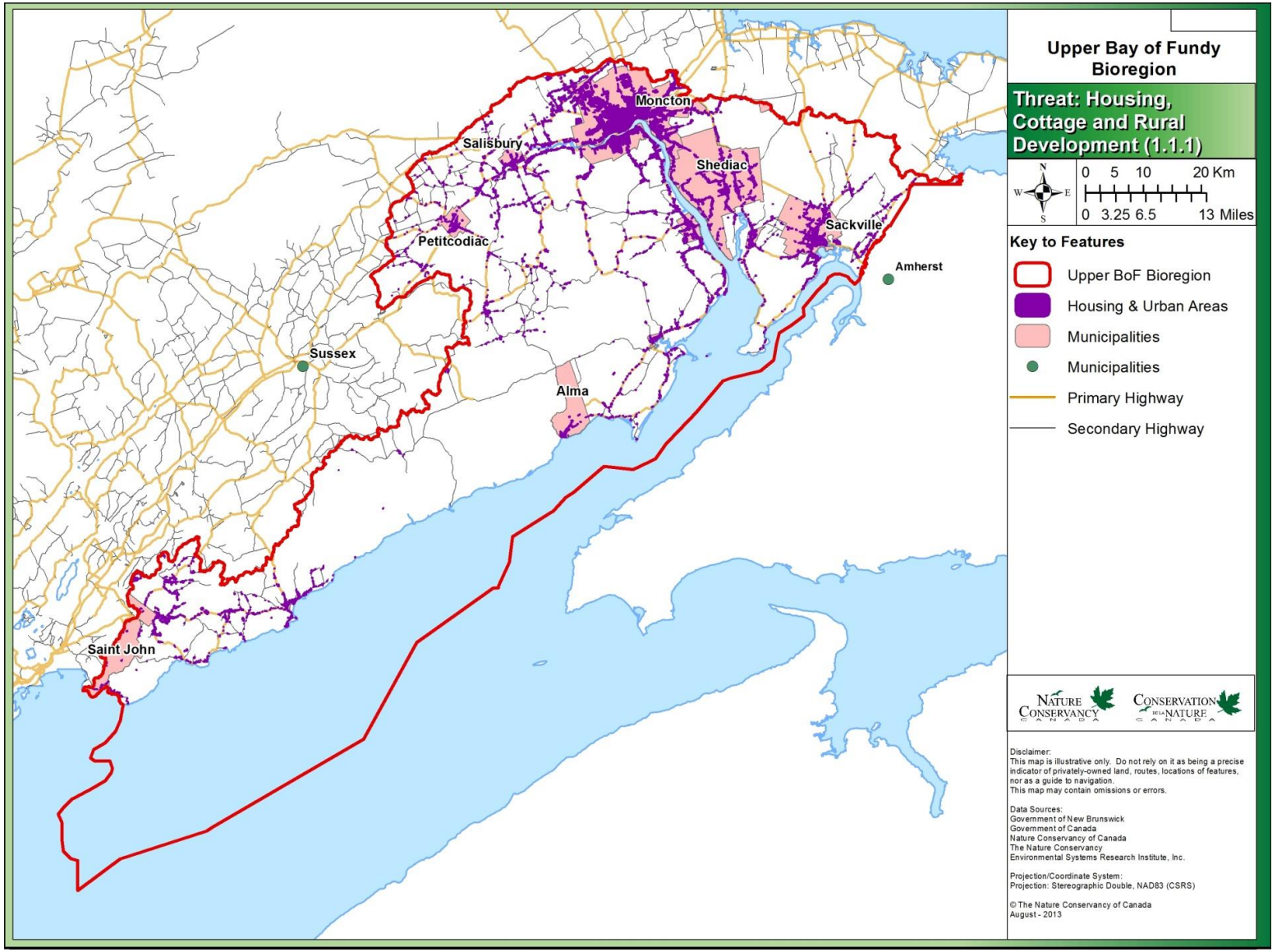



**Figure 16. Housing, cottage and rural development in the NB IBoF bioregion (1.1 Residential and commercial development – housing and urban areas.**

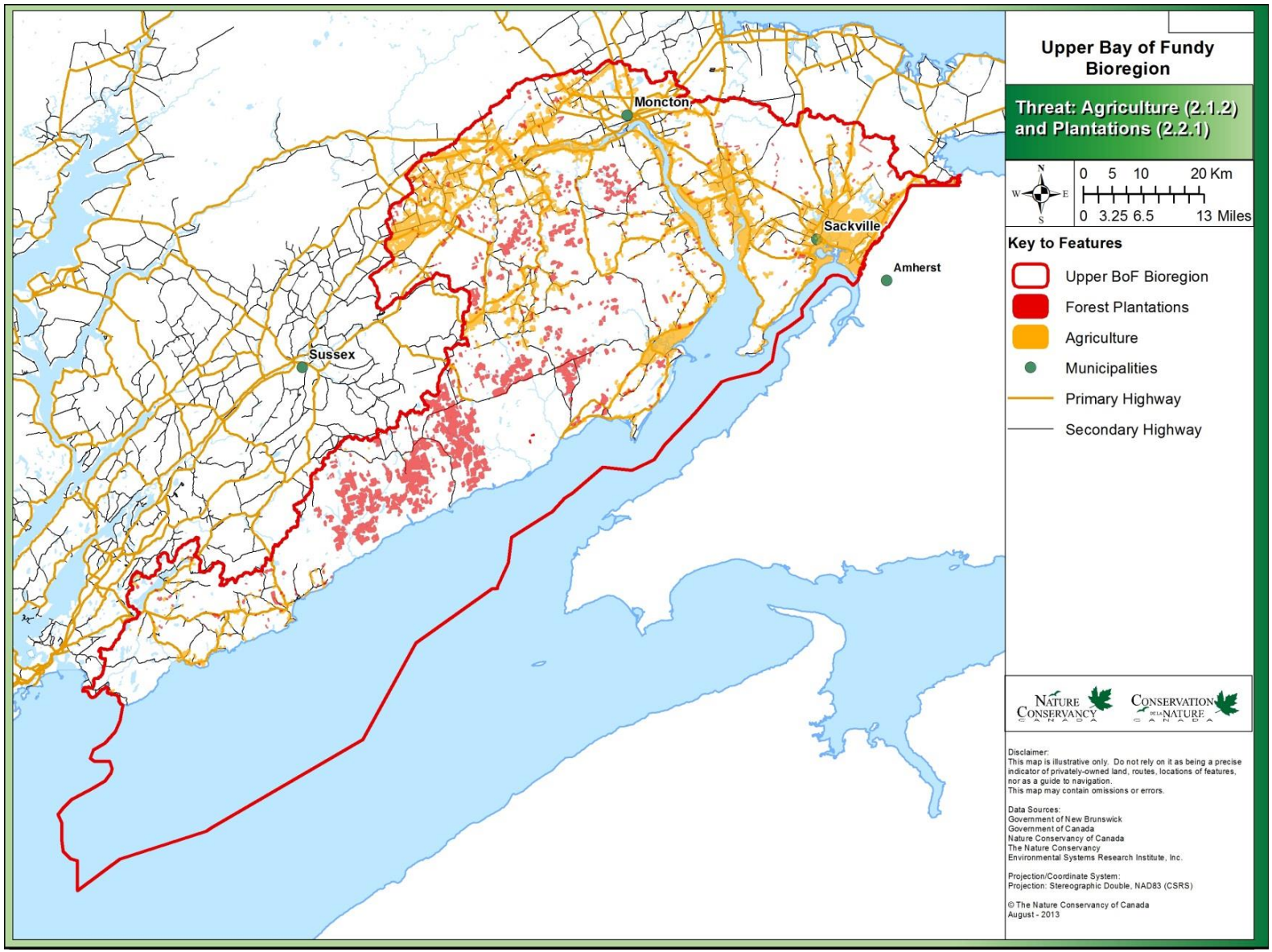



**Figure 17. Agriculture and plantations in the NB IBoF bioregion (2.1 Annual and perennial non-timber crops).**

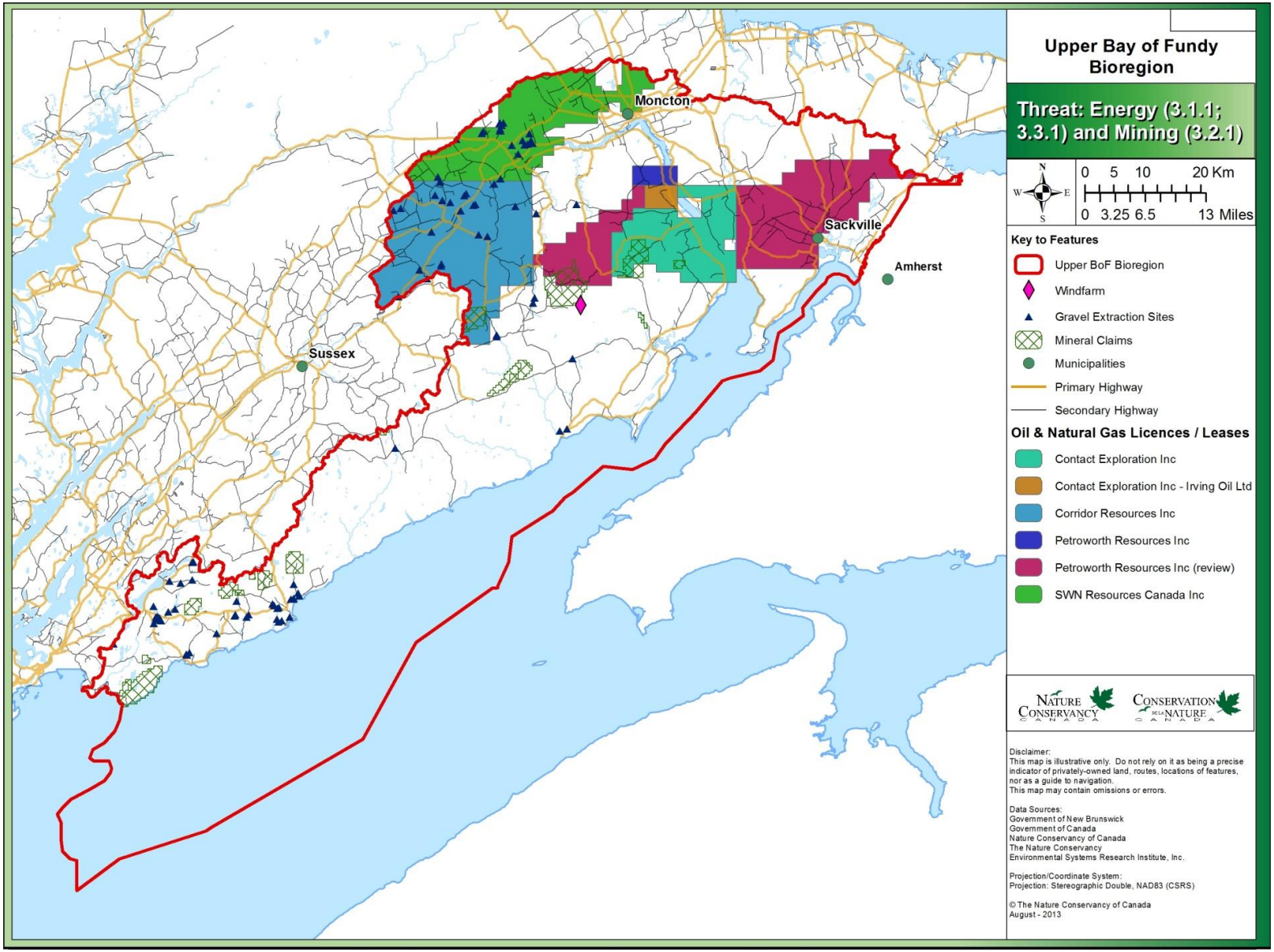



**Figure 18. Energy and mining in the NB IBoF bioregion (3.1 Oil and gas drilling; 3.2 Mining and quarrying; 3.3 Renewable energy).**

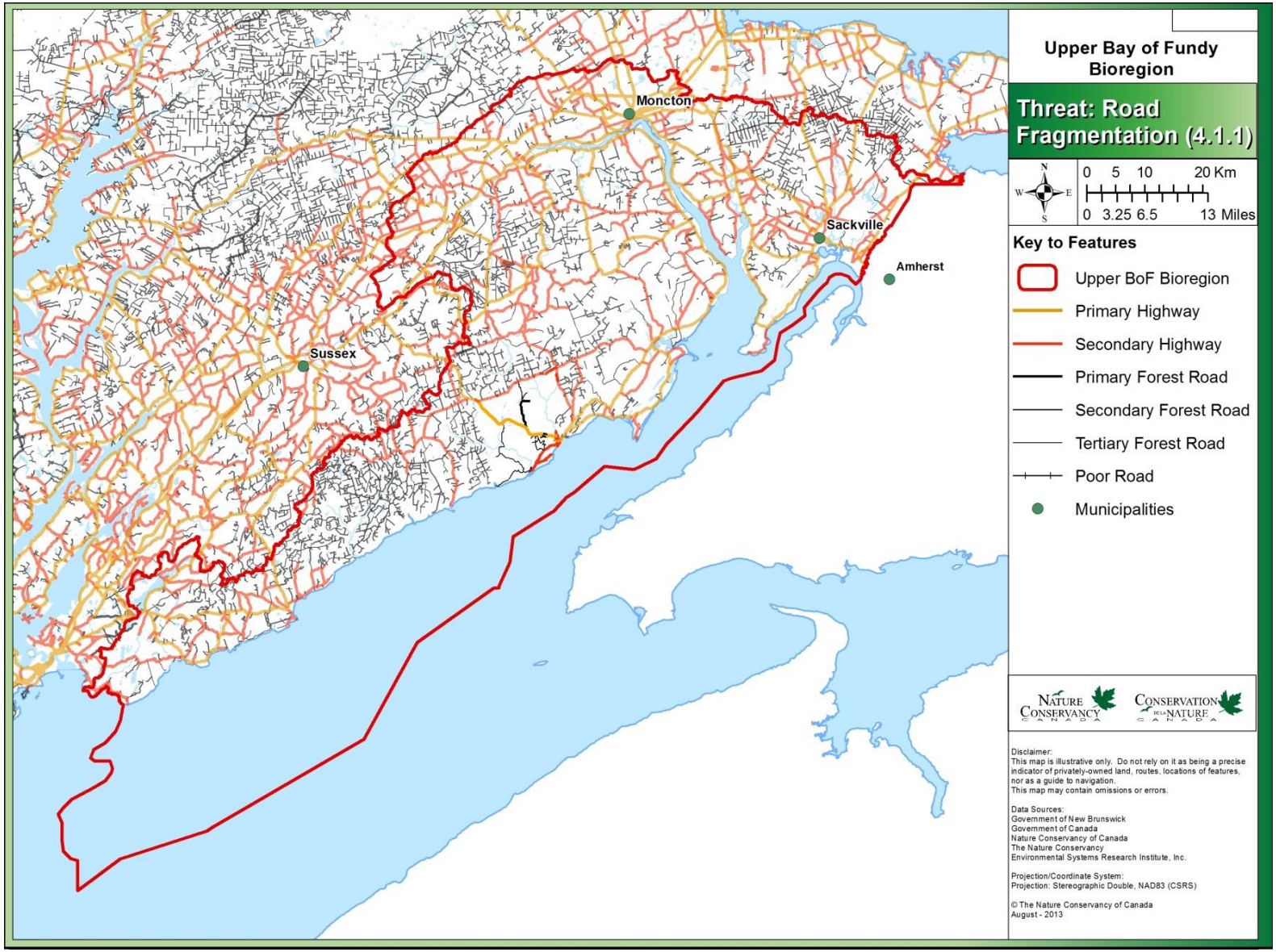



**Figure 19. Road fragmentation in the NB IBoF bioregion (4.1 Roads and railroads).**

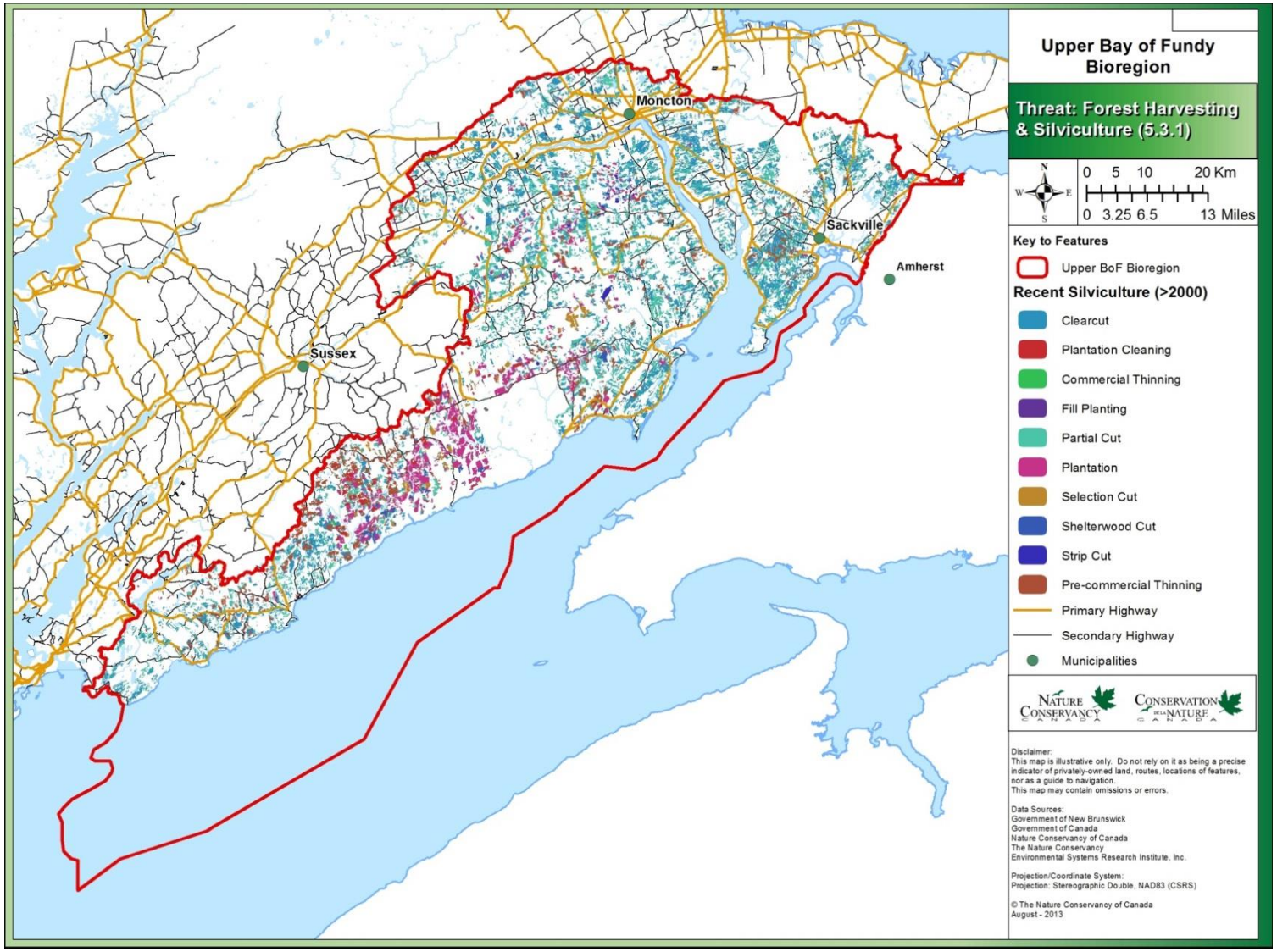



**Figure 20. Forest harvesting and silviculture in the NB IBoF bioregion (5.3 Logging and wood harvesting).**

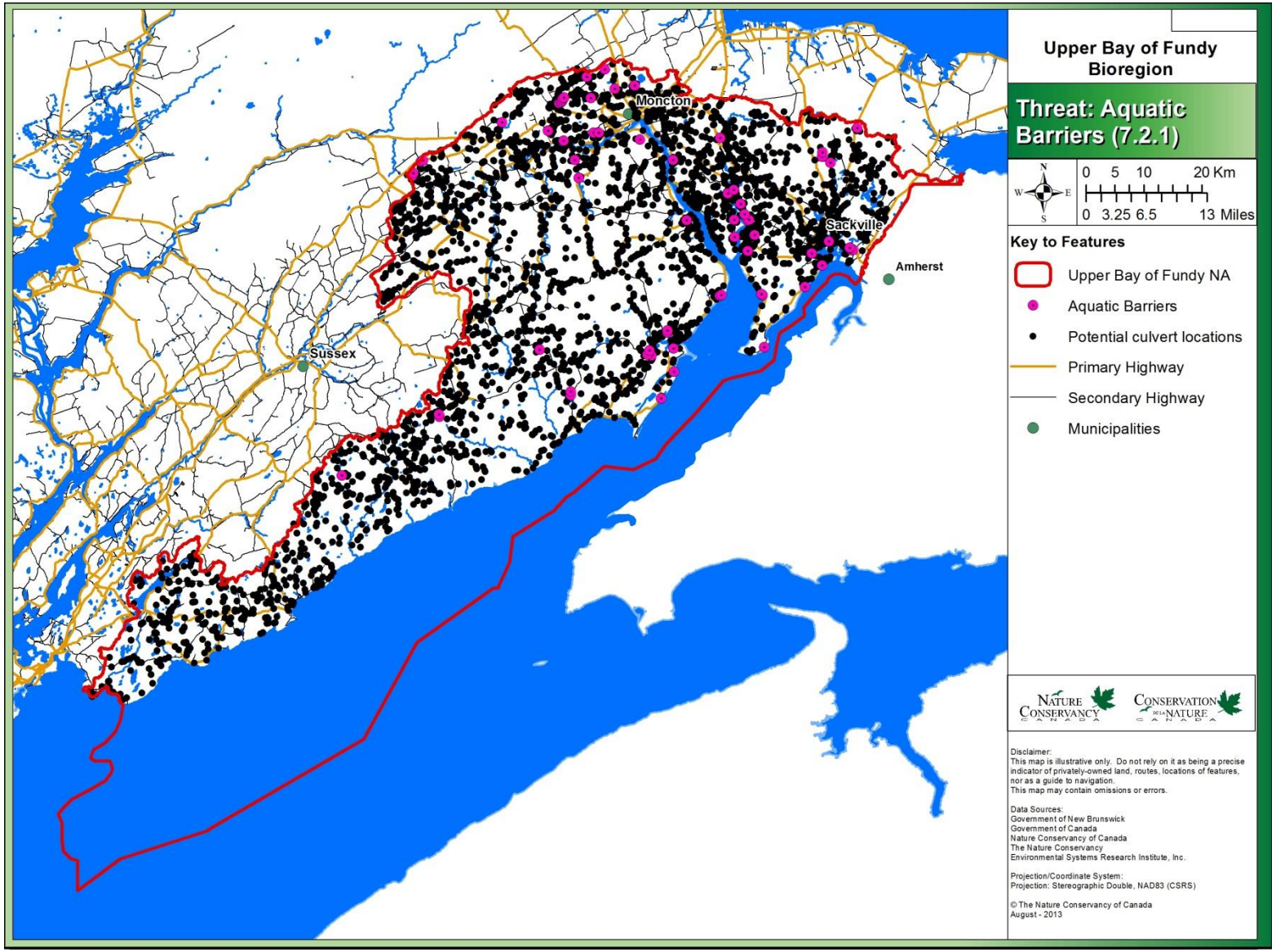



**Figure 21. Aquatic barriers in the NB IBoF bioregion (7.2 Dams and water management/use).**

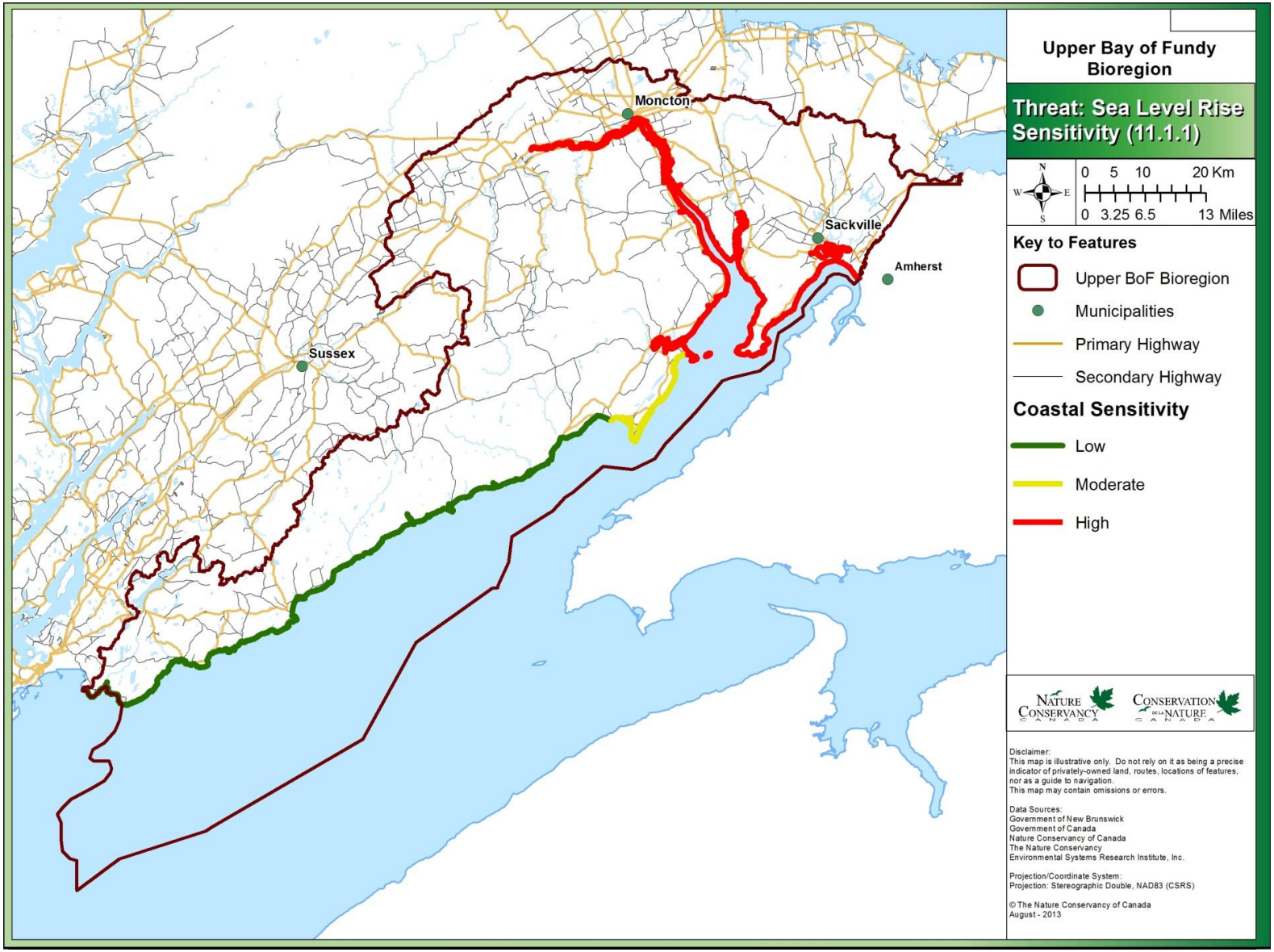



**Figure 22. Sea Level Rise in the NB IBoF bioregion (11.1 Climate change and severe weather – habitat shifting and alteration).**

## C. Habitat spatial prioritization

As part of this Habitat Conservation Strategy, methodologies were developed to define and combine a series of priority habitats with priority species composites to identify areas within the NB IBoF bioregion that have high conservation value. The goal is to achieve the best possible impact of collective conservation actions in those areas that are the most critical for the priority habitats and species. Three sets of maps were produced in the analysis which should be used together as decision-support tools: the Priority Habitat Composite, Conservation Value Index (CVI), and the Species Composite maps. Though the Conservation Value Index map can be consulted, other maps provided in this document likely will provide decision-support that is more appropriate to the mandate of a given conservation group or agency. No single map is intended to answer all questions regarding conservation needs and these maps are not designed as stand-alone products; the narrative of this report as well as the threat maps are important elements to be examined. For various reasons, including introduced bias, the CVI map, priority habitat maps and various species composite maps can present contrasting perspectives on spatial priorities. This is expected and also reflects the reality that different approaches to conservation may be required for the conservation of different species and the habitats that host them (i.e. land acquisition versus stewardship).

Habitat Classification and Data Pre-processing

Prior to assigning conservation priority scores to habitat patches, spatial data for each priority habitat type was "pre-processed" in order to identify and isolate those habitat patches with the highest potential to have conservation value. For rare habitat types (e.g. caves and calcareous sites) all habitats found to be present were considered to have potential, thus no occurrences of these habitats were eliminated from the analysis. More widespread and complex habitats (e.g. Acadian forest mosaic) also include patches of land unsuitable for conservation action such as clear cuts or plantation forest blocks, very young forest, or urban and industrial land. Prior to habitat scoring, these patches of land were eliminated from the analysis by methods developed by EHJV partners. For a detailed description of the datasets used and the habitat classification methods employed in this step please refer to Appendix H.

Habitat Patch Weighting

The process for assigning priority ranks to habitats within the NB IBoF bioregion involved weighting (scoring) certain characteristics of the priority habitats higher than others. Wetland and Acadian forest mosaic habitat occurrences were scored using a three-tiered equation that equally divides the scoring by size (e.g. minimum patch size), representivity (by ecodistrict) and uniqueness (rarity within each ecodistrict and within the Bioregion). All other habitat types were weighted according to size or presence / absence as noted above. For a detailed explanation of the habitat weighting process, please refer to Appendix H. The methodology was deliberately designed to emphasize parcels of land that contained larger patches of priority habitats, those that were not adequately represented within an ecodistrict, and containing rare/priority species and habitat occurrences. The more high quality priority habitats that an area contained, the higher the priority rank it received, and higher scores were given to areas with larger patches of ecosystems selected as biodiversity habitats. Area measurements for the minimum patch size required to supporting biodiversity in each habitat type were used to comparatively rank habitats in order to avoid over-weighting small habitat patches. For each priority habitat type, final scores between 0 and 1 were assigned to each patch represented in the spatial dataset, 1 representing completely suitable habitat for nested habitats and 0 representing unsuitable habitat. Existing protected areas and other conservation lands were not included in the analysis.

**Priority habitat composite**

Methodologies were developed to identify and score individual patches of the defined priority habitats within the IBoF bioregion. The first set of maps produced present composites of the eight priority habitat types but exclude the species-based information; these maps were produced by using an additive function that layered each habitat dataset and compiled the scores for each habitat patch. Scores making up the priority habitat composite include consideration of the uniqueness, representivity, and size of individual patches of defined priority habitat types (see Appendix H for a detailed description of the methodology). The habitat composite represents all of the ranked habitats contained in the bioregion with a value (ranging from 0 to 3) that could be classified and used to illustrate the ranges in conservation value from a habitat-only perspective. Please refer to Fig. 23 (p. 78).

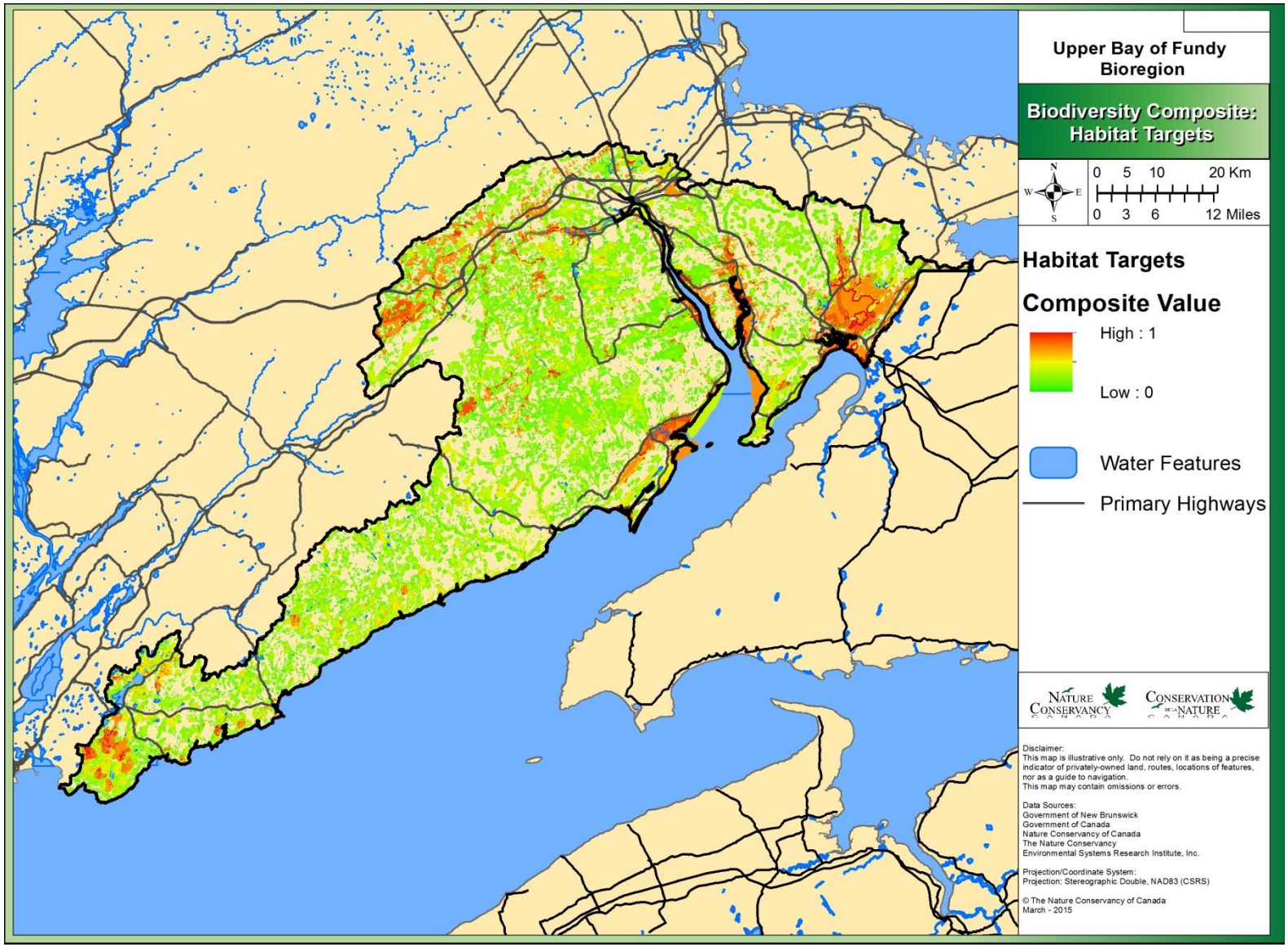



**Figure 23. Priority habitat composite map for the NB IBoF bioregion.**

## D. Species spatial prioritization

### Individual Species Maps

Spatial data were gathered for each priority species from various sources. For some species, multiple sources of spatial data exist, so the most complete or appropriate dataset was chosen (Appendix M). A single layer of information was derived for each species based on the most appropriate data available. A detailed description of the methodology used to create the individual species layers can be found in Appendix L, and the full list of priority species with the conservation status, habitat association and data source for each species can be found in Appendix A.

Species occurrence data are for the most part temporally and/or spatially incomplete. As such, maps that rely on species occurrence data can be expected to reflect bias due to uneven intensity of survey effort. Such effort bias expectedly is pronounced in maps of species for which detections are rare (e.g., difficult to detect species, rare species), surveys are opportunistic and unevenly distributed, or require an intensity that precludes complete coverage, leading to uneven effort.

In order to improve future iterations of individual species maps, we encourage all those with any additional rare and priority species occurrence data to contribute their records to the Atlantic Canada Conservation Data Centre.

### Species Composites

Individual species maps are generated at the scale of the province, not the bioregion, and all species receive equal weighting in species composite maps (see below). An overall biodiversity composite, including data for the full suite of terrestrial and terrestrial aquatic species identified as priorites for the bioregion was generated at the scale of the whole province (Fig. 24). However, given important expected differences among species, conservation status, ecological requirements, survey bias, different partial composites representing different sub-suites of species were also generated (Figs. 25-34). Consideration of the latter 'partial' composite maps will provide the reader with a better sense of the species and data sources driving certain map outputs. This way, the reader can consult the underlying data that are most appropriate to questions of interest and hopefully make more accurate and effective conservation decisions. It is hoped that this approach better reflects the ecological complexity of the bioregion and will constitute improved and more complete decision support for the broad range of users expected to make use of this HCS. Specific data and detailed methodology used to generate each of the various species composites are presented in Appendix M.

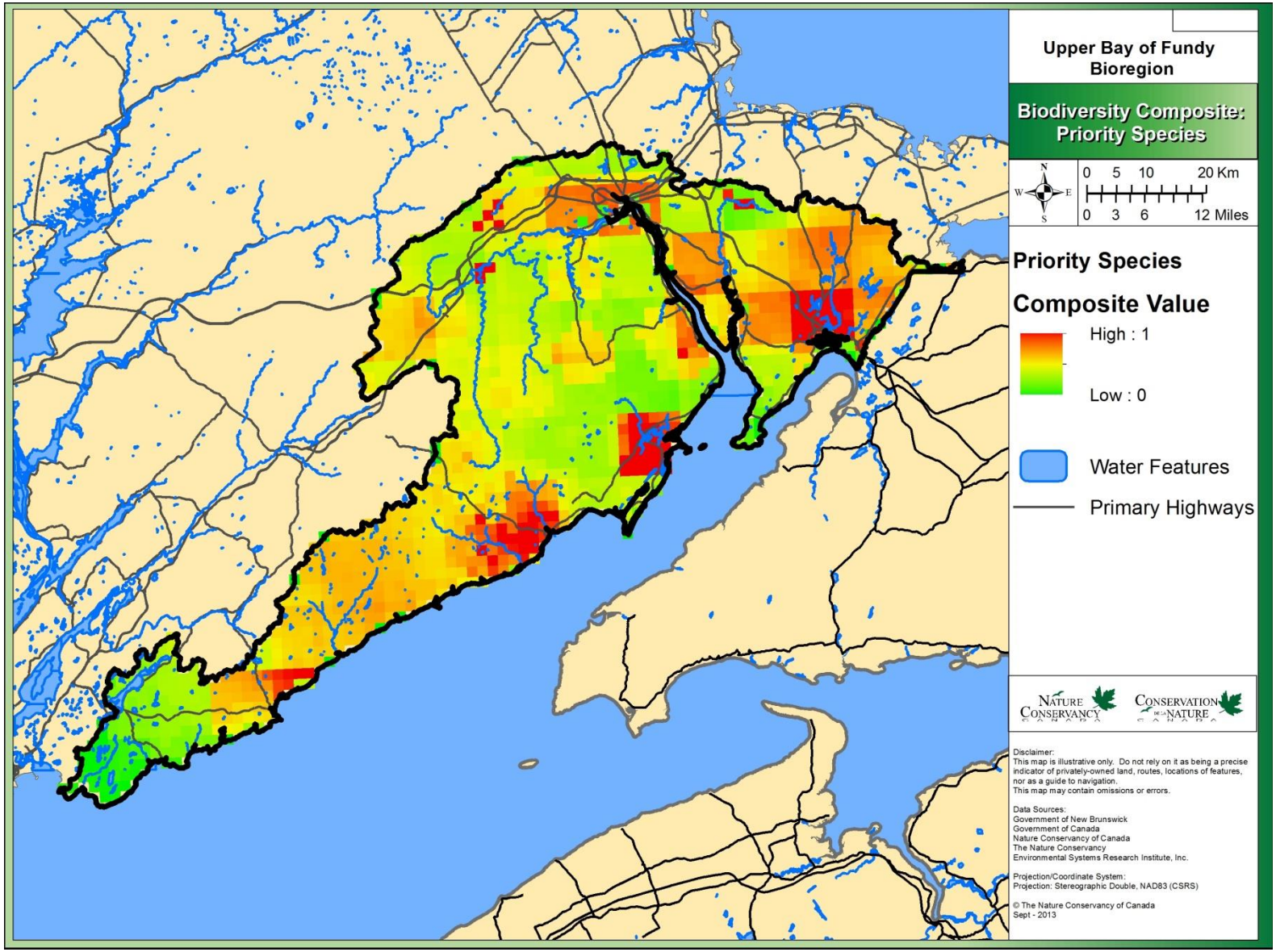



**Figure 24. Species composite for the full list of rare and priority significant species in the NB IBoF bioregion.**

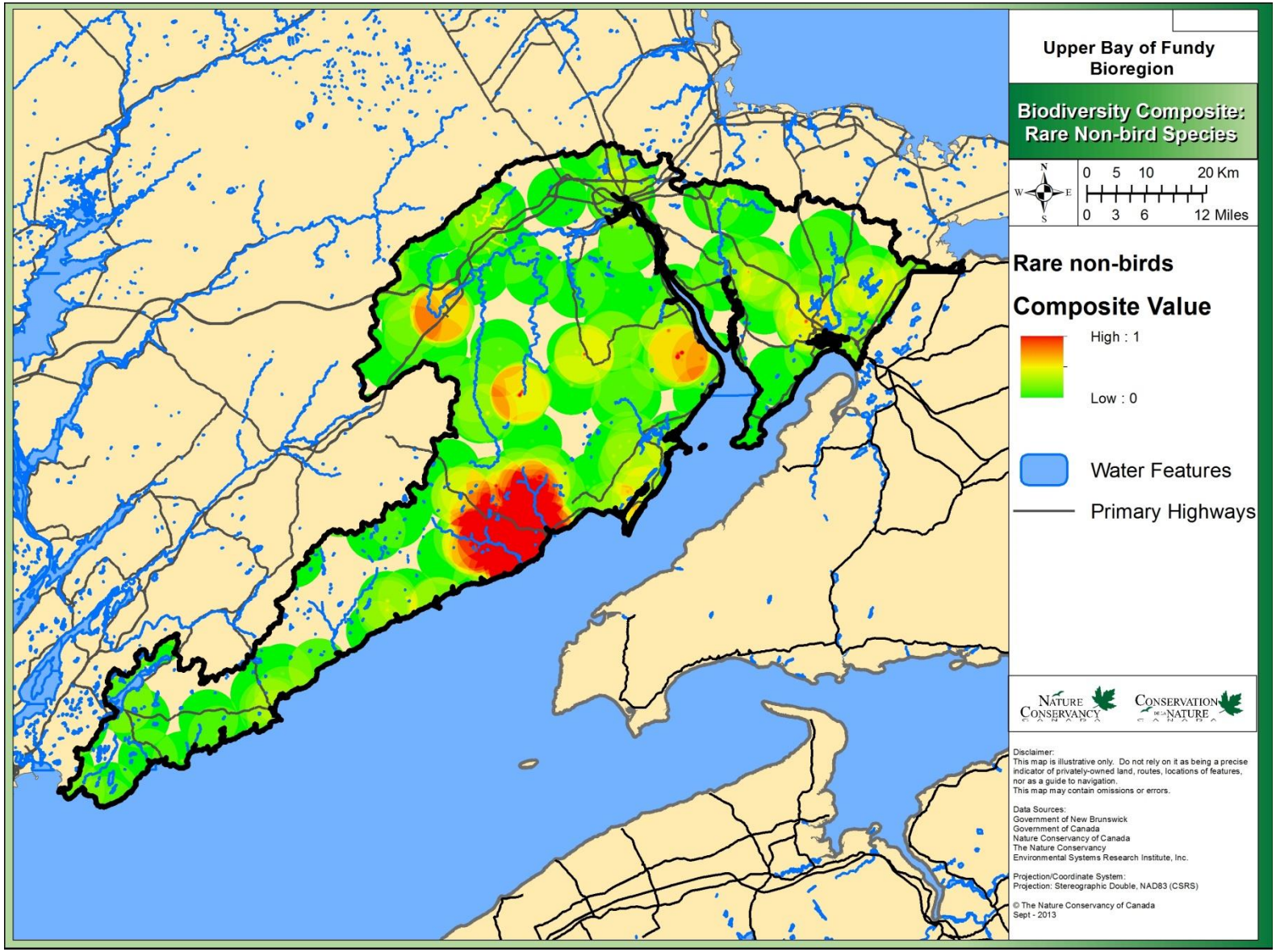



**Figure 25. Species composite for rare non-bird significant species in the NB IBoF bioregion.**

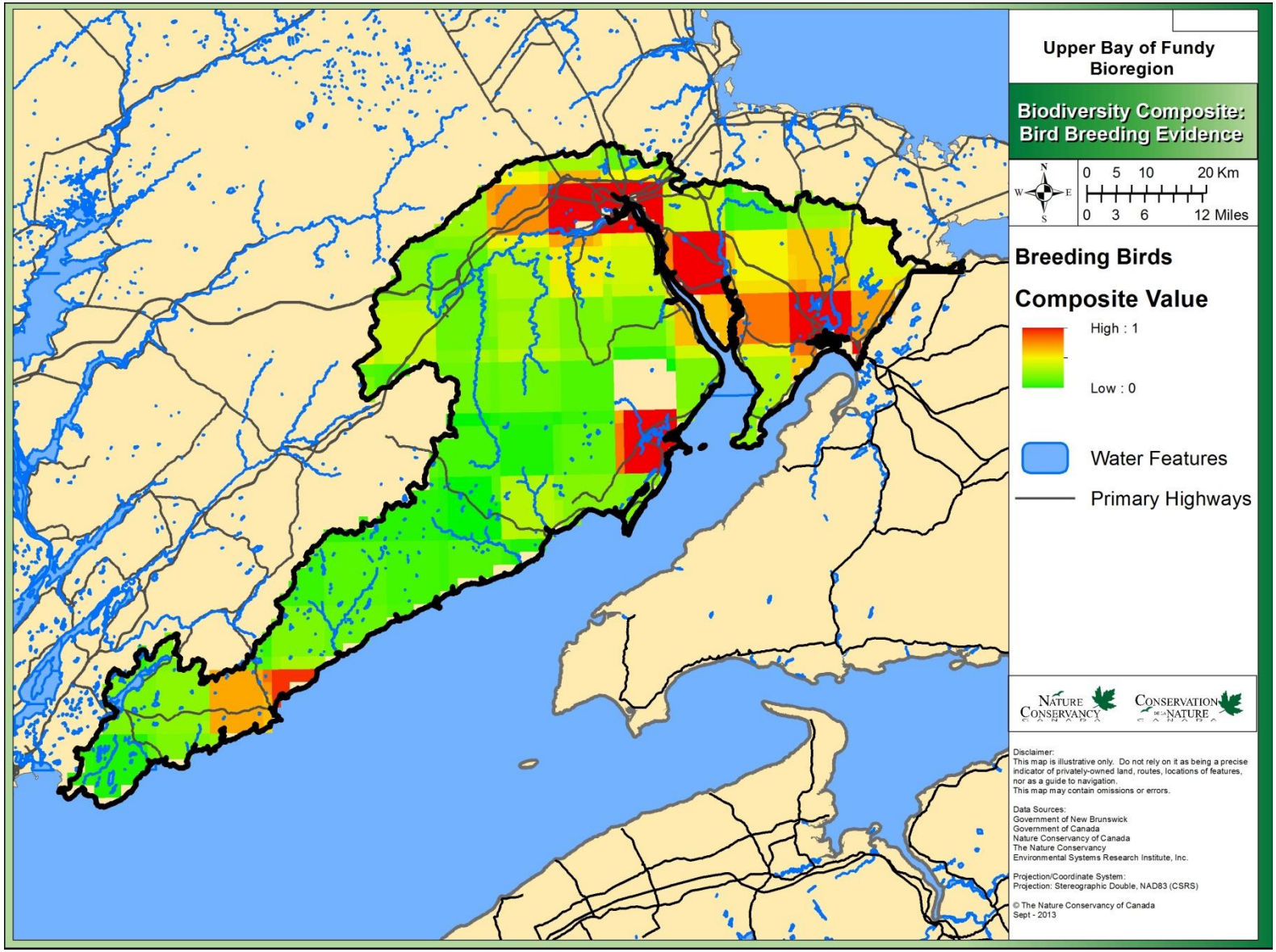



**Figure 26. Species composite for rare and priority breeding bird species in the NB IBoF bioregion.**

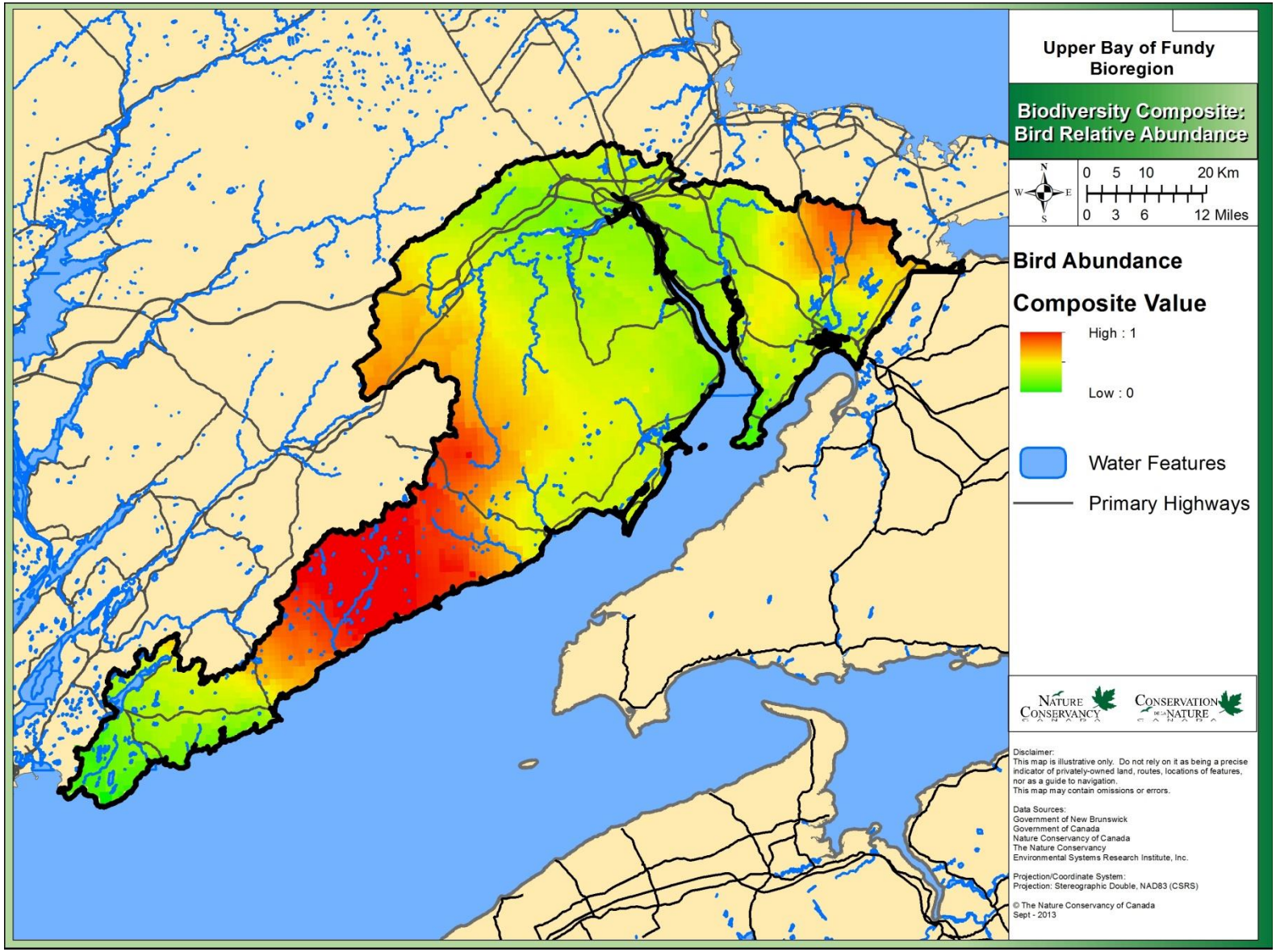



**Figure 27. Species composite for rare and priority breeding bird species in the NB IBoF bioregion (based on relative abundance).**

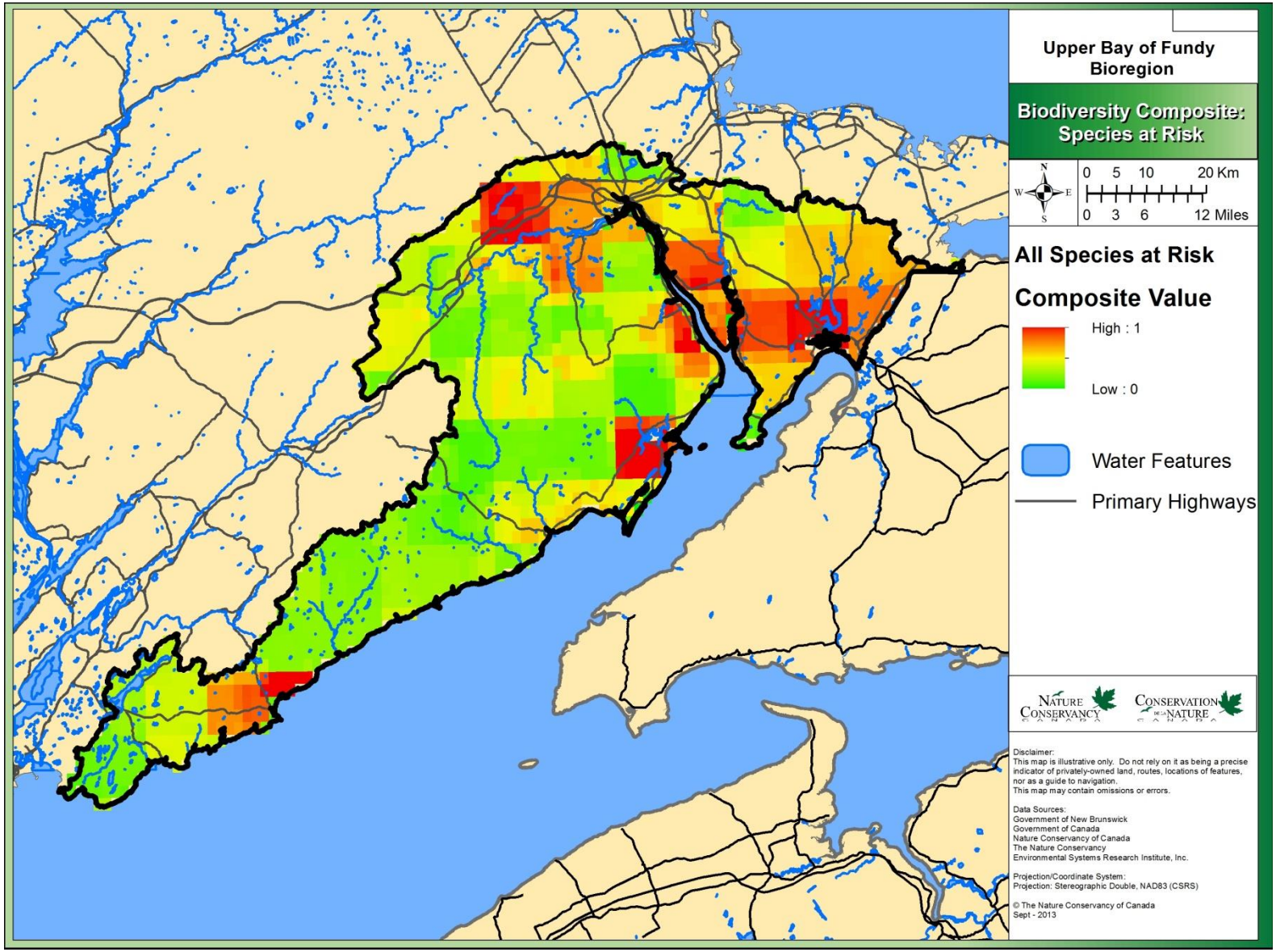



**Figure 28. Species composite for species at risk in the NB IBoF bioregion (COSEWIC; NB ESA).**

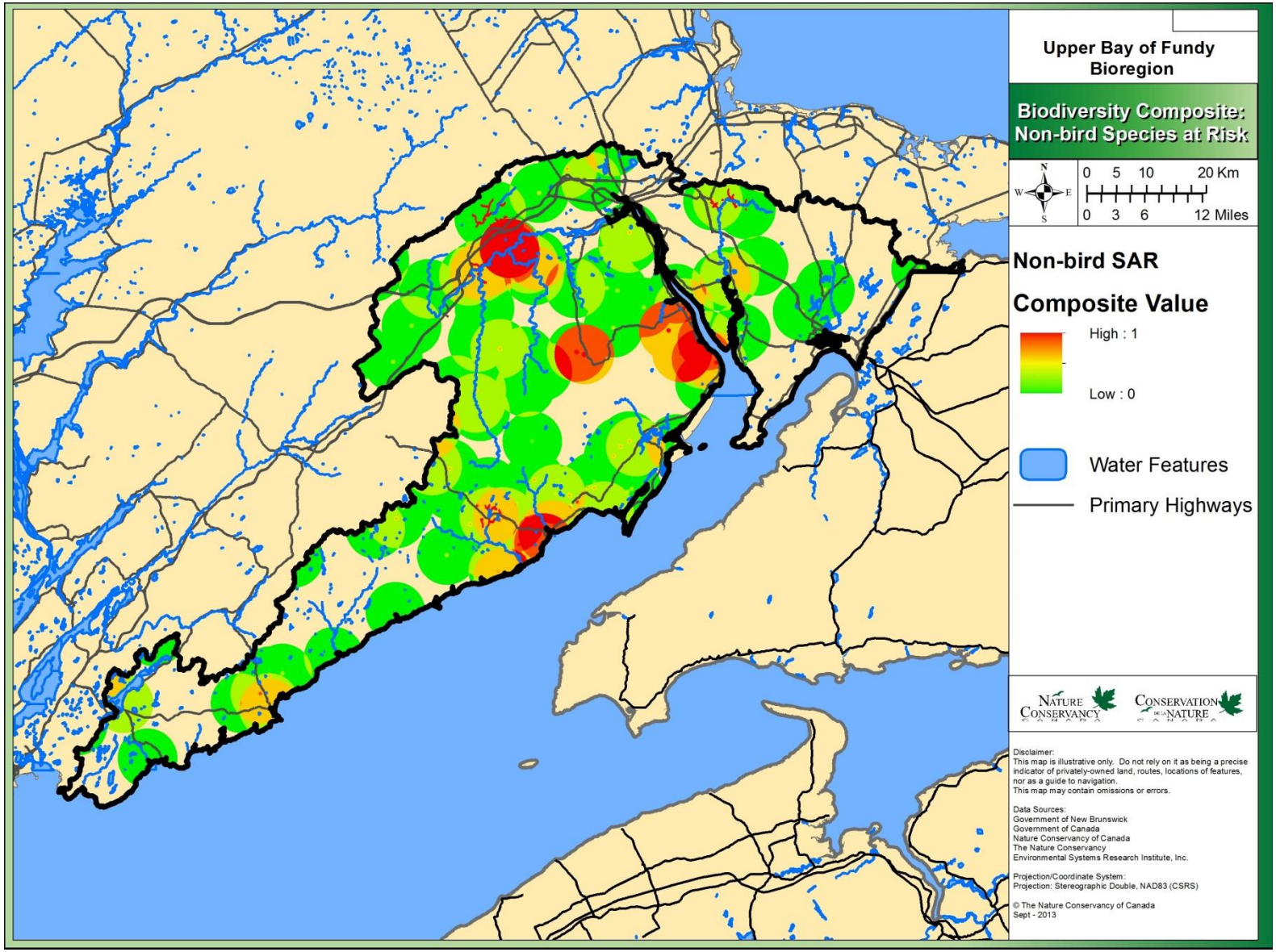



**Figure 29. Species composite for non-bird species at risk (COSEWIC; NB ESA) in the NB IBoF bioregion.**

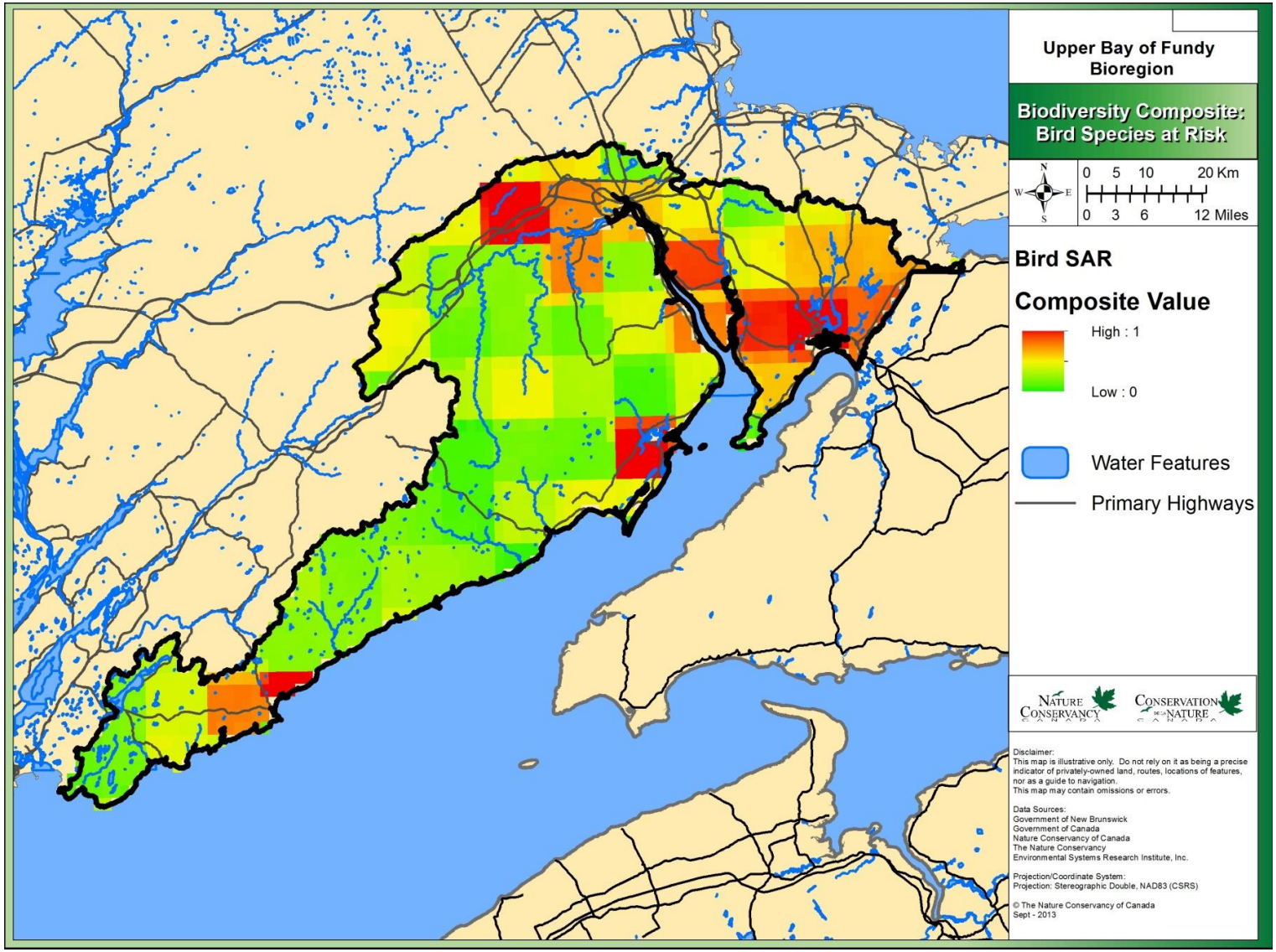



**Figure 30. Species composite for bird species at risk (COSEWIC; NB ESA) in the NB IBoF bioregion (based on breeding evidence and relative abundance) .**

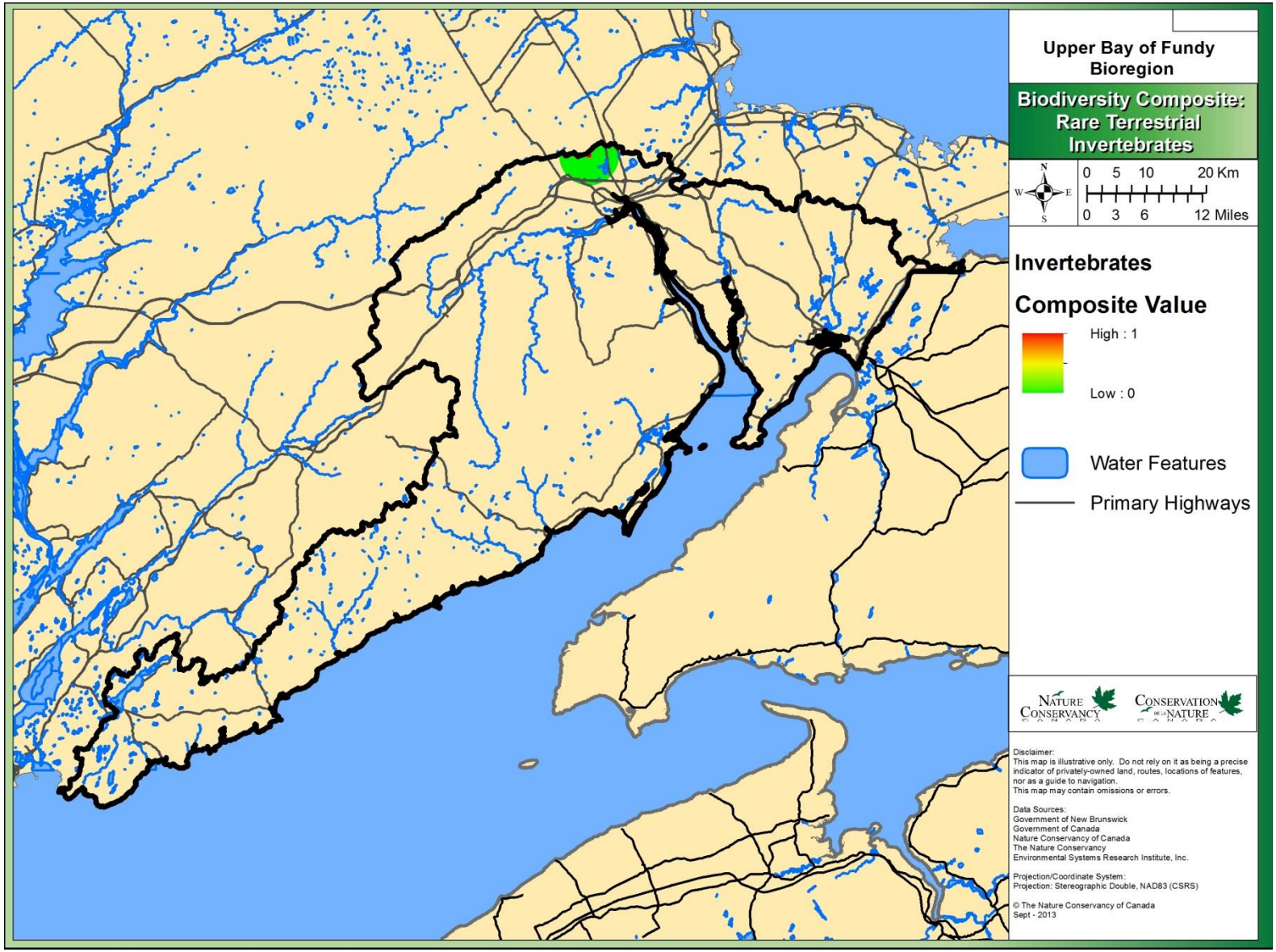



**Figure 31. Species composite for rare terrestrial invertebrate species in the NB IBoF bioregion.**

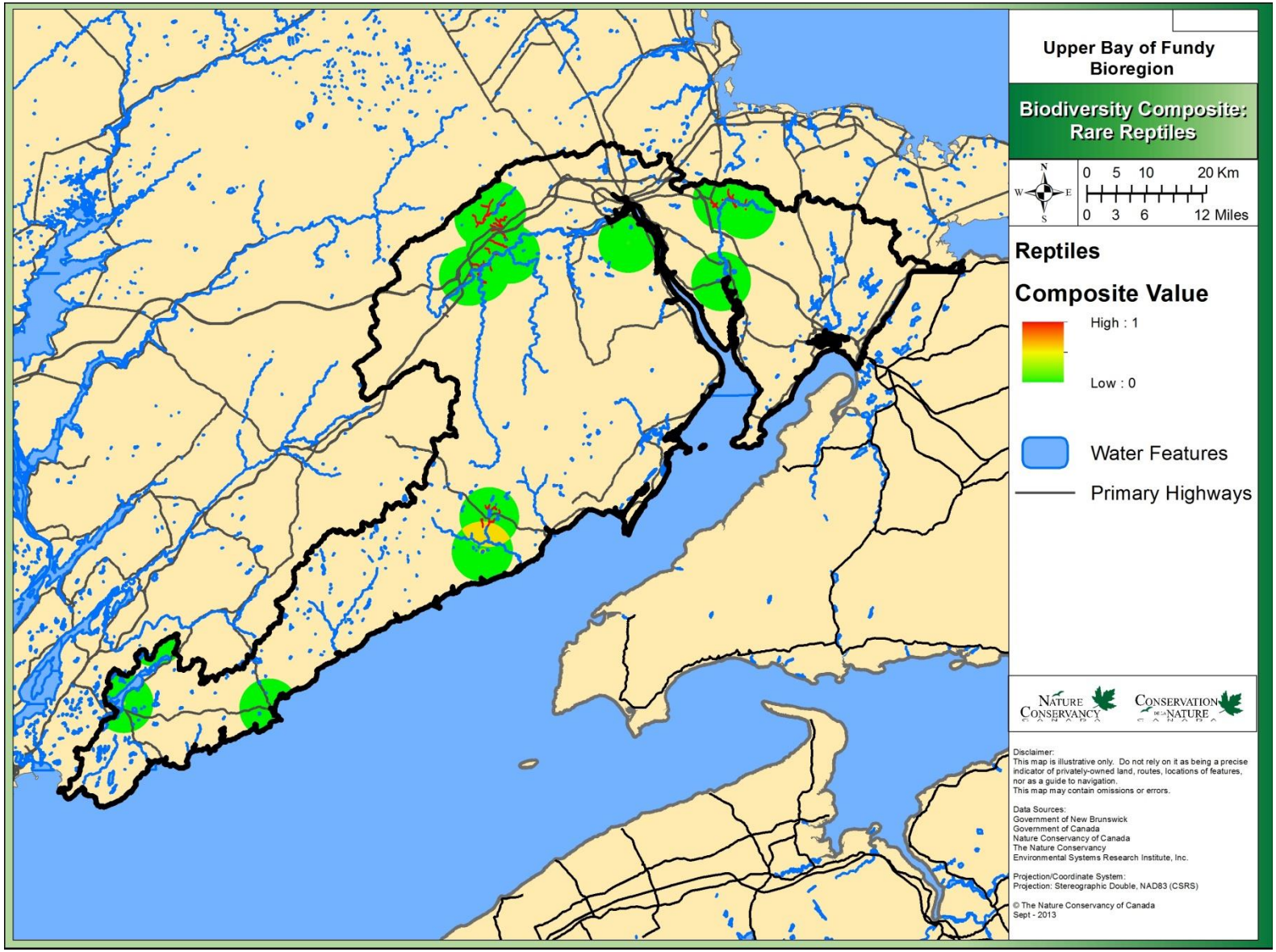



**Figure 32. Species composite for rare reptiles in the NB IBoF bioregion.**

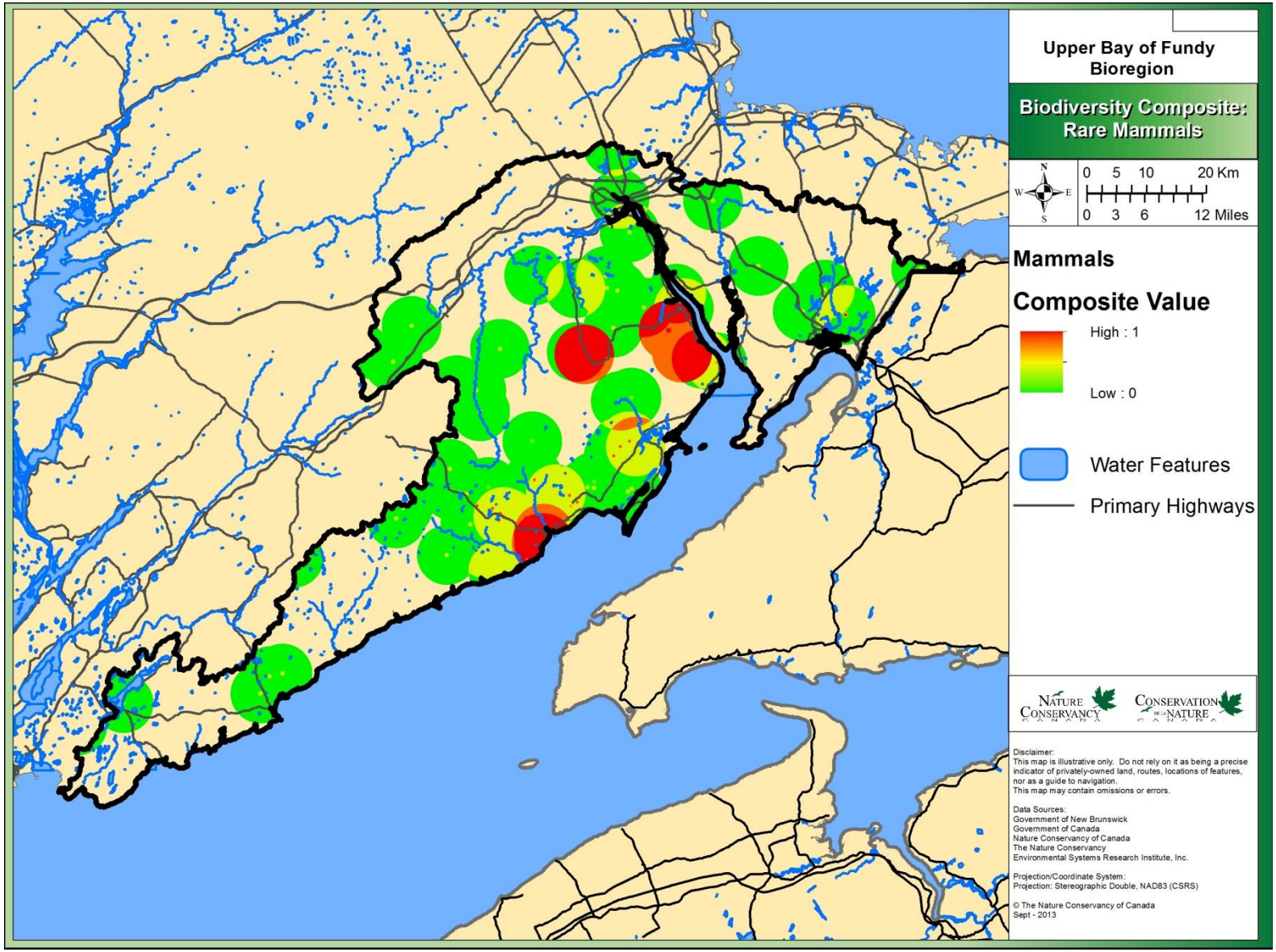



**Figure 33. Species composite for rare mammals in the NB IBoF bioregion.**

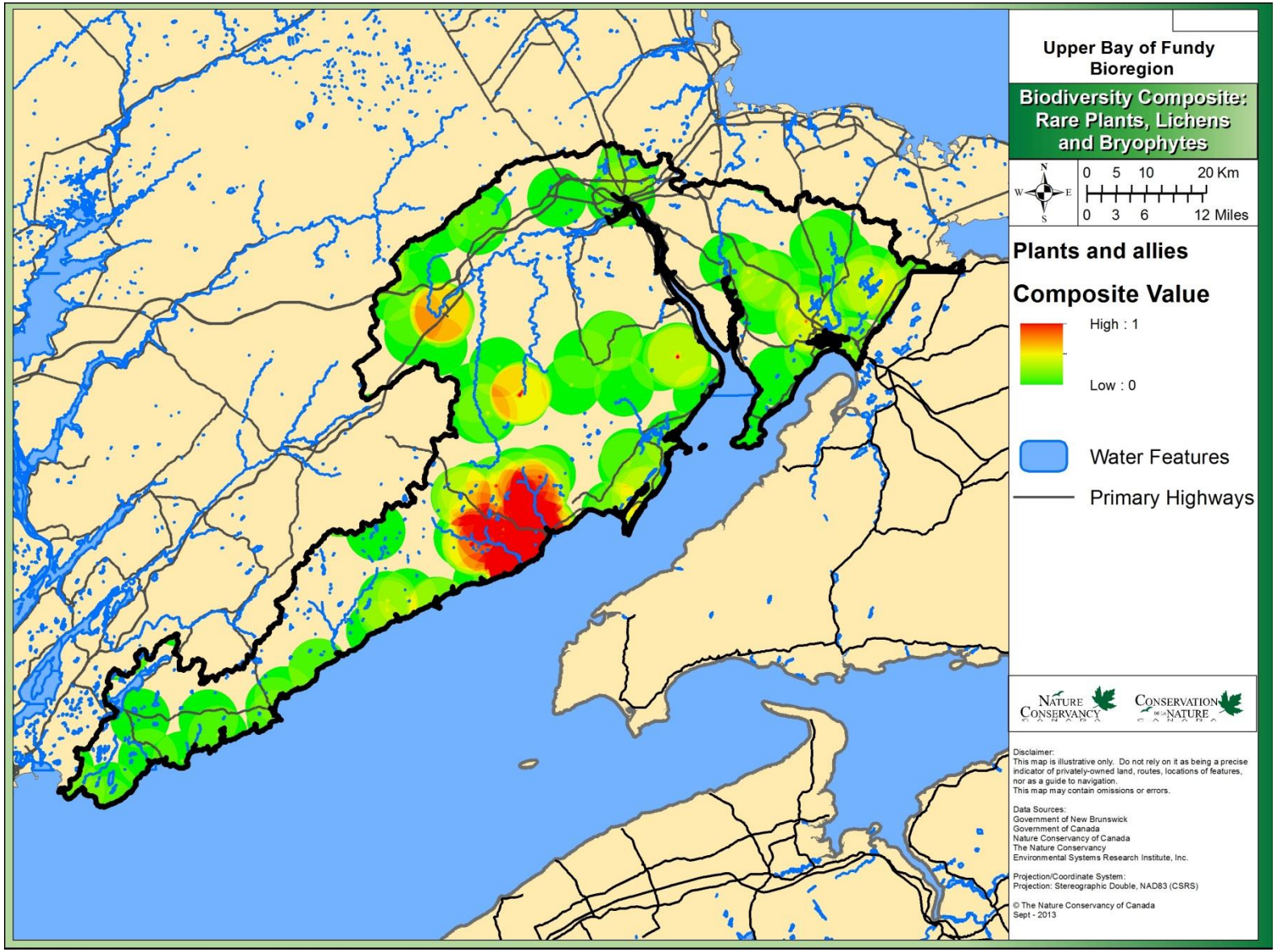



**Figure 34. Species composite for rare plant and lichen species in the NB IBoF bioregion.**

## E. CONSERVATION VALUE INDEX

### GIS Analyses

As part of this HCS, methodologies were developed with partners to make the most of priority habitat information as well as available priority species information. The goal of the spatial analyses is to illustrate how various depictions of the available data can inform conservation decisions that can be habitat-based, species-based or both. Ultimately, the goal is to achieve the best possible impact of collective conservation actions in the bioregion in those areas that are the most critical for the defined conservation priority habitats and species.

### Conservation Value Index

The habitat prioritization map (Fig. 23; composite of all habitats) and species prioritization map (Fig. 24; composite of all species) are combined to yield a Conservation Value Index map of the bioregion. The Conservation Value Index itself has two components: a score based on attributes of the defined habitat conservation priorities, which includes consideration of the uniqueness, representivity, and size of individual patches of defined priority habitats; and a score based on relative available evidence of occurrence of significant species within the bioregion. The two scores are combined to yield the Conservation Value Index for the NB IBoF bioregion, which is presented in Figure 35.

The Conservation Value Index map captures overall conservation priority habitat patches (spatial location, extent and regional context of the different priority habitats) as well as available occurrence records of rare and endangered species (spatial location, and including breeding evidence and relative abundance information of conservation priority birds). As this map is strongly influenced by the degree of co-occurrence of multiple rare and priority significant species, it should be interpreted and applied cautiously. For various reasons, including introduced bias related to limitations of the available data, the CVI map should not be considered a 'final' prioritization. Indeed, the priority habitat map and various species composite maps can present contrasting perspectives on spatial priorities. This is expected and reflects the reality that contrasting approaches to conservation may be required for the conservation of different species and the habitats that host them (i.e. land acquisition versus stewardship).

As such, though the Conservation Value Index map can be considered, other maps provided in this document likely will provide decision-support from a perspective that is more appropriate to the mandate of a given conservation group or agency. The ultimate goal is to achieve the best possible impact of collective, and complementary, conservation actions in the bioregion in those areas that are the most critical for the identified priority habitats and priority species, while taking into consideration associated threats.

**Table 10. Summary results of the property prioritization in the NB IBoF bioregion.**

| Priority Ranking | Break Values/Scores | Hectares (ha) | % of bioregion |
|---|---|---|---|
| P1 | >1 | 63 132 | 13 |
| P2 | 0.8 – 1 | 38 140 | 8 |
| P3 | 0.6 – 0.8 | 71 661 | 15 |
| No Priority | 0 – 0.6 | 277 261 | 57 |
| Protected | N/A | 32 396 | 7 |
| Total | N/A | 482 950 | 100 |

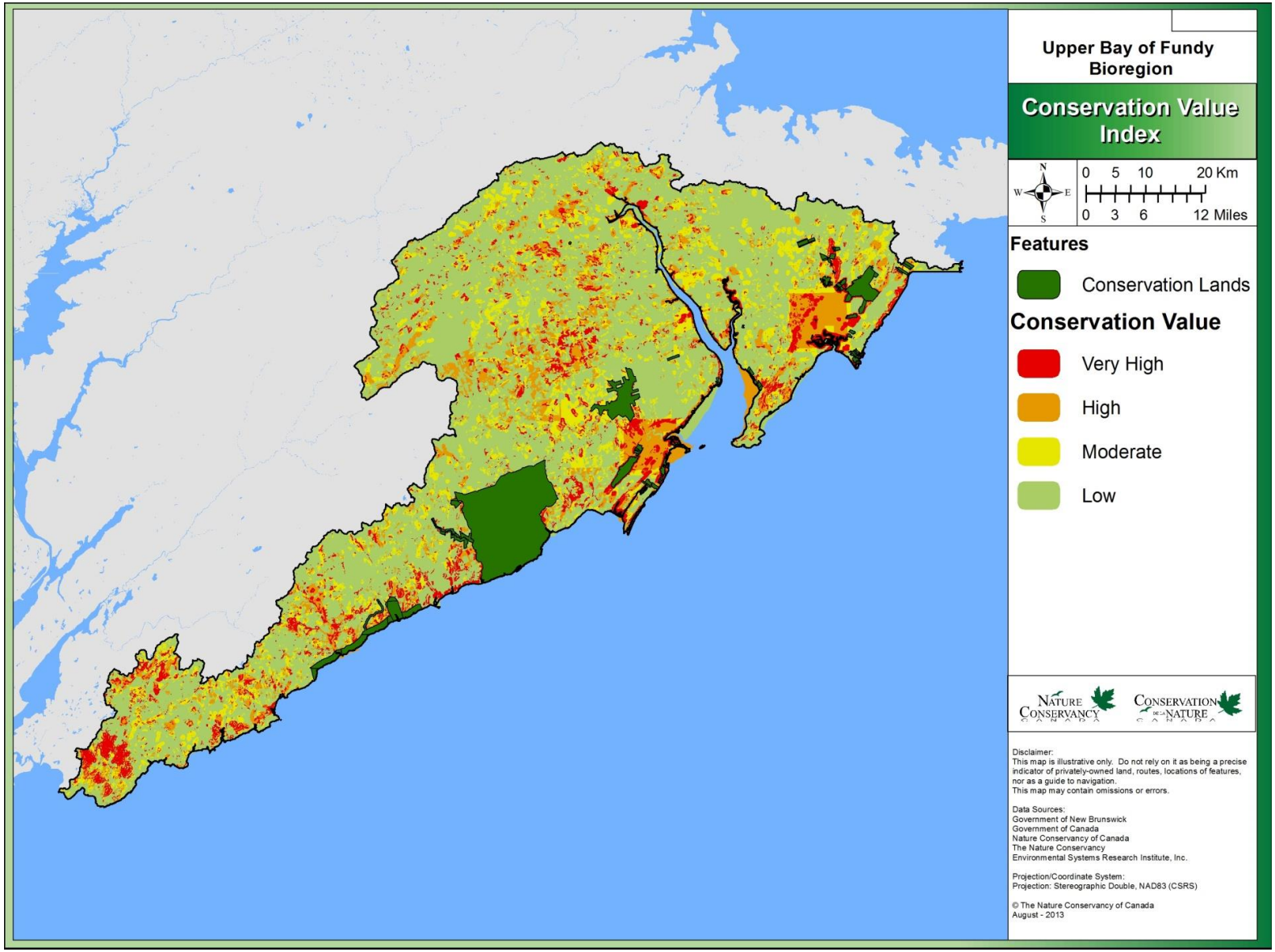



**Figure 35. Conservation Value Index for the NB IBoF bioregion.**

# 3. CONSERVATION ACTIONS

This HCS has been developed by partners and collaborators of the Eastern Habitat Joint Venture (EHJV) New Brunswick Steering Committee. The purpose of this strategy is to identify the species and ecosystems of conservation priority for the NB IBoF bioregion, their spatial location, and the actions that conservation organizations plan to undertake to achieve their conservation and stewardship.

## A. VISION

Focused research, conservation land securement and ongoing management will lead to a better understanding of the environment and species of the NB IBoF bioregion and to improved health of biodiversity habitats. Coastal habitats continue to recover through restoration efforts on tidal rivers and salt marshes. The bioregion area continues to be a critical global link in the migration of millions of shorebirds, especially the Semipalmated Sandpiper, and the understanding of the requirements of species at risk in the area continues to improve. Efforts to restore the inner Bay of Fundy Atlantic Salmon are underway and conservation activities between inland forests, rivers and coastal habitats are well coordinated and effective (DFO 2013). Programs of non-governmental organizations and all levels of government are well coordinated and provide educational opportunities for the local community and visitors to enhance their understanding, appreciation and support for conservation efforts throughout the bioregion.

## B. GOALS

**Table 11. Conservation goals for the NB IBoF bioregion*.**

| |
|---|
| *1. To increase amount of large blocks of old growth Acadian forest mosaic habitat within the bioregion* |
| *2. To maintain suitable staging habitat for shorebirds by protecting roosting and foraging sites.* |
| *3. To reduce the impacts of human visitors to sensitive shorebird feeding and roosting sites during the months of July through September.* |
| *4. To restore salt marsh and river systems in the bioregion through the partial or complete removal of tidal barriers.* |
| *5. To reduce the impacts of human visitors to bat roosting and hibernacula caves to mitigate impacts of white-nose syndrome.* |

* The order of appearance for goals within the table above does not imply order of priority.

## C. CONSERVATION PARTNERS

### Government of New Brunswick (GNB)

The Government of New Brunswick Department of Natural Resources identifies and designates Protected Natural Areas on Crown land throughout the Province and within the IBoF bioregion. The Department also implements sustainable forest management on Crown lands including the conservation of priority forest wildlife habitats and ecological systems (in part through implementation of the New Brunswick Biodiversity Policy). The Government of New Brunswick Department of Environment also implements the New Brunswick Clean Environment Act, Clean Water Act, Wetland Conservation Policy and Coastal Areas Protection Policy to conserve the ecological, economic and social functions of these ecological communities. The Government of New Brunswick works with conservation partners through the Eastern Habitat Joint Venture, and continues to support ENGO work on habitat and ecological system conservation/stewardship through direct and in-kind support (Examples: New Brunswick Wildlife Trust Fund, Environmental Trust Fund).

### Bird Studies Canada (BSC)

Bird Studies Canada (BSC) is Canada's national charitable organization dedicated to bird science, conservation and education. Since 1967, our mission has been to advance the understanding, appreciation, and conservation of wild birds and their habitats in Canada and elsewhere, through studies that engage the skills, enthusiasm, and support of our members, volunteers, and the interested public. In addition to engaging roughly 30,000 volunteer "Citizen Scientists" per year, BSC's work is facilitated and supported by federal, provincial, industry, and other NGO partnerships. In the Atlantic region, BSC's programs focus on bird population monitoring, species at risk and their associated habitats. Of particular interest to the IBoF bioregion, we (1) coordinate with citizens to monitor annual population trends of owl species across NB (Nocturnal Owl Survey, 2001-present); (2) monitor and promote community and individual stewardship for roost and nest sites of Chimney Swifts (Maritimes Swiftwatch, 2010-present); and (3) monitor occurrence, population trends, and habitat associations of waterfowl and wetland-associated species (Maritimes Marsh Monitoring Program (MMMP), 2011-present). As well, the MMMP has been designed to provide a link between the EHJV's habitat conservation and restoration activities and waterfowl and wetland-associated species population goals. Currently in its 3rd year, this program has already made good progress identifying baseline numbers and developing acoustic monitoring protocols for wetland- associated species. We plan to incorporate a stronger citizen-science component to the MMMP, to encourage greater community engagement and stewardship of important wetlands in the Maritimes.

### Nature Conservancy of Canada (NCC)

The Nature Conservancy of Canada is the nation's leading land conservation organization, working to protect our most important natural areas and the species they sustain. Since 1962 NCC and its partners have helped to protect more than 2.6 million acres (over 1 million hectares), coast to coast. NCC has been protecting land in New Brunswick since 1989 and has helped create over 30 nature reserves across the province. NCC owns and manages lands including ecologically significant arrays of wetlands, and forest types.

### Government of Canada – Environment Canada (EC) – Canadian Wildlife Service

The Canadian Wildlife Service has a mandate which focuses on migratory birds, species at risk and their habitats, and is centered on the implementation of the Migratory Bird Convention Act, Canada Wildlife

Act, Species at Risk Act, Canadian Environmental Protection Act and the Federal Policy on Wetland Conservation. CWS identifies, designates and protects important habitats as National Wildlife Areas under the Canada Wildlife Act. Within the IBoF bioregion, in addition to managing the Shepody and Tintamarre National Wildlife Areas and conducting migratory bird surveys, CWS provides support for activities that benefit species at risk through its main funding programs, the Habitat Stewardship Program (HSP) and the Aboriginal Fund for Species at Risk (AFSAR). Additional funding resources include The HSP and AFSAR Prevention Stream (for species other than species at risk), and the National Conservation Plan – National Wetland Conservation Fund, the Gulf of Maine Initiative, and the Ecological Gifts Program. Environment Canada also funds the EcoAction Community Funding Program, the Atlantic Ecosystem Initiatives and Environmental Damages Fund. CWS works closely with its partners in development of recovery documents for species at risk and supports activities described within recovery documents for the completion of schedule of studies for the identification of critical habitat. CWS supports the EHJV, and provides science guidance to conservation partners on conservation actions and priorities for migratory birds, species at risk and their habitats, including involvement in the development, refinement and implementation of HCSs, and the NB Bird Conservation Region 14 Strategy.

CWS shares its migratory bird survey data and expertise to inform biodiversity and habitat conservation initiatives that contribute to meeting not only the CWS mandate but also the broader mandates and objectives of its conservation partners. CWS is supportive of the Habitat Conservation Strategy approach as it represents how species and habitat data can be compiled and assessed in ways that benefit a broader suite of conservation-oriented user-groups.

**Government of Canada – Parks Canada Agency**

Parks Canada's Mandate: On behalf of the people of Canada, we protect and present nationally significant examples of Canada's natural and cultural heritage and foster public understanding, appreciation and enjoyment in ways that ensure their ecological and commemorative integrity for present and future generations.

**Government of Canada – Fisheries and Oceans Canada (DFO)**

Under the Oceans Act, DFO is responsible for leading the development of a national network of MPAs. In 2011, a National Framework for Canada's Network of Marine Protected Areas was released. The Framework is a shared federal, provincial and territorial policy document that provides strategic direction for the planning and implementation of the national network.

A network of MPAs is a collection of specific areas that collectively safeguard the important ecological components of the ocean. There is mounting evidence that effective networks of MPAs can enhance the contributions of individual MPAs to achieve greater ecological benefits that translate into economic, social and cultural benefits. Specific ecological benefits of a network of MPAs include their ability to conserve biodiversity and productivity, conserve important processes and habitats such as spawning and nursery areas and allow for connectivity between them, protect species at risk, and enhance the resilience of ecosystems to the effects of climate change.

For MPA planning, Canadian waters have been divided into thirteen bioregions. The Scotian Shelf Bioregion coincides with the Maritimes Region and includes the Scotian Shelf, the Bay of Fundy and the Canadian portion of the Gulf of Maine.

As the lead agency, DFO will work closely with its federal (Environment Canada and Parks Canada) and provincial (Nova Scotia and New Brunswick) partners to develop an MPA network plan for the Scotian

Shelf Bioregion in the coming years. The major steps in the planning process are: 1) identify and involve government agencies, Aboriginal groups and stakeholders; 2) set the objectives of the network; 3) compile and map ecological and socioeconomic data; 4) design the MPA network; 5) implement the MPA network; 6) monitor, evaluate and adapt the network as needed.

This initiative will build on past regional conservation planning activities, including efforts to engage stakeholders, compile data, and identify ecologically and biologically significant areas.
The multi-year MPA network planning process will include targeted engagement with interested government agencies, Aboriginal groups and stakeholders.

**Ducks Unlimited Canada (DUC)**

Land protection is a critical tool by which Ducks Unlimited conserves waterfowl habitat throughout North America. DU protects land through several means including acquisitions, conservation easements and revolving lands strategy: 1) Land acquisition - In special cases, where intact waterfowl habitat is at imminent risk, DU may seek to acquire the property. Once purchased, the habitat is restored & conservation easements are placed on the land to perpetually protect its resource values; 2) Easements - Conservation easements can meet the needs of interested owners of working farms, ranches, timberlands, sporting properties and recreational lands, who wish to protect valuable natural resources while retaining ownership of the property; and 3) Revolving land - In locations where wildlife habitat has been degraded & the land is for sale, DU will seek to acquire it. Once purchased, the habitat will be restored and easements will be placed on land to perpetually protect resource values.

DUC aims to develop initiatives to conserve existing coastal areas to protect molting, staging and wintering habitat; to maintain diverse habitat quality and quantity needed to sustain current breeding waterfowl numbers; to develop new initiatives that address problems of survival and recruitment of sea ducks; and to acquire wetland inventories and more complete waterfowl surveys to focus conservation programs.

**Nature Trust of NB (NTNB)**

The Nature Trust of New Brunswick (NTNB) is a charitable land trust dedicated to the acquisition of private lands in order to ensure that biological diversity is protected in perpetuity. Conserving habitat is a primary focus of the NTNB, both through land acquisition, and by working with landowners to promote private land stewardship and species at risk awareness. The organization owns several properties within the bioregion, including Grindstone Island, a rare example of coastal island habitat in the Inner Bay of Fundy bioregion suitable for colonial waterbird nesting. The organization continues to work with communities in the vicinity of species at risk habitat locations to educate land owners and the general public about threats to these species, and the importance of protecting them. The Nature Trust of New Brunswick is now actively focusing on the high value conservation areas highlighted in this Habitat Conservation Strategy in order to take a strategic approach to conservation planning. The high conservation value areas identified in this HCS will be used to guide the organization's efforts to build partnerships and work closely with landowners to reduce threats to habitats and species by increasing the amount of private land permanently protected in the IBoF bioregion.

**Petitcodiac Watershed Alliance / Alliance du basin versant Petitcodiac**

The Petitcodiac Watershed Alliance (PWMG-GSBP Inc.) is a non-profit environmental science and education organization that works to enhance and maintain the Petitcodiac and Memramcook Rivers and their tributaries. Our actions are guided by what we want to leave behind for future generations.

The Petitcodiac Watershed Alliance is a charitable organization that promotes watershed awareness, encourages the community to take part in identifying environmental problems, and follows through with actions to restore and protect the watershed.

Education: Information collected through our monitoring program and by being “out-in-the-field” is used to help decision makers at the local and provincial level. We work with community members, developers, government officials and contractors. Our group promotes ‘best management practices’ when developing near a watercourse or sensitive area.
We report issues and problems identified in the watershed to the appropriate authorities.
We also conduct school visits. Students can learn about watershed ecology and science, environmental practices and science. Our program must continue to develop each year to meet the ever changing needs of each community within our watershed. .

Community: This is our watershed and an integral part to everyday life. Turtle Creek provides drinking water for Moncton, Riverview and Dieppe reaching approximately 160,000 residents.
The Petitcodiac and Memramcook Rivers and their tributaries are used for fishing, hunting, trapping, canoeing, bird watching, kayaking, camping, and more. Activities within these watersheds are endless: working, playing and enjoying nature.
Partnerships are a key part of our group’s success. If you would like to work on a partnership with us, please give us a call or send us an e-mail through this website.

Science: Since 1997, the group has been involved in a monitoring program of established sites in Petitcodiac tributaries of concern or interest. These sites are verified through the following stream health indicators: temperature, dissolved oxygen content, total coliforms, E.Coli, Nitrate nitrogen, Phosphorus, bottom substrate and observable changes.

**Fort Folly First Nation**

The Fort Folly First Nation Band is located in Dorchester, NB, about 13kms west of Sackville, NB, and about 40kms east of Moncton, NB. The community resides on approximately 40 hectares of land. Fort Folly First Nation has a registered population of 106.

Fort Folly, as a small independent Community, will show respect to our Environment by promoting a safe and healthy Community through our cultural teachings.

**Canadian Parks and Wilderness Society New Brunswick Chapter (CPAWS NB)**

Since 1963, Canadian Parks and Wilderness Society (CPAWS) has worked to ensure that nature comes first in parks management, and that protected areas maintain and enhance Canada's wild nature. Our vision is that at least one-half of Canada's public lands, freshwater and ocean environments will remain permanently wild in the public trust. CPAWS’ NB chapter was established in 2004 to: encourage the protection of New Brunswick’s wild ecosystems in parks and protected areas; promote awareness and understanding of nature through education, appreciation and experience; and work co-operatively with governments, First Nations, businesses, other organizations and individuals to find solutions to nature conservation challenges. In the IBoF watershed, CPAWS NB is working with the public to ensure that protected natural areas on public land are managed to conserve the nature within them, and that public lands are managed to conserve ecosystem integrity, diversity and resilience.

**The Canadian Rivers Institute**

The Canadian Rivers Institute (CRI) is an internationally recognized research institute based out of the University of New Brunswick. The CRI network, comprised of a number of leading research scientists from across the country, work collaboratively towards advancing river, estuary, and watershed sciences. The CRI's multidisciplinary, cross-sectoral approach emphasizes research based on societal demands while addressing the challenges of sustaining, healthy aquatic ecosystems. This innovative model merges academic ideas-based and applied needs-based science to promote the rapid transfer of new knowledge to regulatory agencies to create effective public policy and provide technical guidance to provincial and federal agencies. The CRI provides these services to both the public and private sectors assisting them to address their unique aquatic health and management challenges.

The CRI has also been integral to Canadian Water Network's (CWN) Canadian Watershed Research Consortium, which aims to support regional efforts to design and use watershed-level cumulative effects monitoring frameworks structured to support decision-making in land use management, natural resource management, impact mitigation and others.

**The Conservation Council of New Brunswick**

The Conservation Council of New Brunswick (CCNB) has been a key advocate for water protection in the province of New Brunswick since its founding in 1969. CCNB was founded in response to the alarm felt by citizens, academics and naturalists to the pollution the St. John River was experiencing in the 50's and 60's. Siltation and wastewater discharge were top of mind issues when the new organization did a day-long teach-in at the Legislature in 1969. The quality of the St. John River has since increased tremendously with regulations enforcing standards for industrial wastewater and municipal effluent discharge.

CCNB currently has staff working in our Forest, Water, and Marine / Fundy Baykeeper programs. We also have a No Child Left Inside project working with elementary schools to facilitate the teaching of existing curriculum outside in nature. Current activities that tie in with the IBoF HCS include participation in stakeholder processes to strengthen the wetland conservation policy; public education activities (including No Child Left Inside); advocacy for protective forestry policy; a campaign to ban shale gas developments.

**The New Brunswick Museum**

The New Brunswick Museum is engaged in extensive field research programs that target gaps in existing knowledge of the province's biodiversity. The museum also has a leading role as an archive for collections documenting the identity, distributions (past and present), and habitats of species in the province. Since 2009, a major focus of NBM research programs has been an annual "Bioblitz". This brings together a group of 40 or more taxonomic experts, graduate and summer students, and volunteers for two weeks of intensive, broad-spectrum, biodiversity studies in the province's Protected Natural Areas. The field studies are followed by months of identification, databasing, and archiving of collections, and preparation of results for publication. To date, the Bioblitz program has targeted the Jacquet River Gorge PNA (2009–2010), Caledonia Gorge PNA (2011–2012), and Grand Lake PNA (2013–2014). Its goal is to survey, over a period of 20 years, all ten of the larger PNAs that were established in 2003.

A sample of other current or recent research projects by NBM staff and research associates includes: impacts of the White-Nose Syndrome on NB bat populations; diversity of fungi in caves that serve as bati hibernacula in NB; diversity and ecology of lichens and allied fungi in cedar swamp-forests in the Maritime Provinces; diversity of lichenicolous fungi in Atlantic Canada; lichens as indicators of air quality

in the greater Saint John region; aquatic mollusks and plants of the Saint John River estuary; abundance and recruitment of the Freshwater Pearl Mussel in the Kennebecasis River; grasshopper diversity in the Maritime Provinces; genetic diversity and distributions of selected mammal species in eastern Canada. Preparation of the book *Biodiversity Assessment of the Atlantic Maritime Ecozone*, a major synthesis published by the National Research Council (NRC Press) in 2010, was coordinated at the NBM (with Dr. Donald McAlpine as lead co-editor); it includes 31 chapters authored by 51 specialists.

The NBM Geology and Palaeontology Section conducts extensive research on the rich fossil record of the province. It (i.e., its curator Dr. Randall Miller) conceived and spearheaded the Steinhammer Geopark in southern New Brunswick. This is the first UNESCO-recognized Global Geopark established in North America. It seeks to protect and interpret the rich geological heritage of the region, while contributing to its economic development. The NBM has a strong public education mandate that is fulfilled through its exhibition centre in the Market Square complex in Saint John, and through a wide range of outreach programs.

**D. CONSERVATION PARTNER ACTIONS**

Government of New Brunswick (GNB)

- Achieve Protected Natural Area designation of up to 10 000 ha of significant habitat, including tidal flats, on Crown land within the bioregion.
- Continue sustainable forest management on Crown lands including the conservation of priority forest wildlife habitats and ecological systems.
- On Crown land DNR will: maintain watercourse and wetland buffer zones, identify and conserve deer winter habitat, identify and conserve site-specific habitats for species at risk and other species (e.g., heron colonies).
- Continue using the New Brunswick Clean Environment Act, Clean Water Act, Wetland Conservation Policy and Coastal Areas Protection Policy and associated regulations to conserve the ecological, economic and social functions of these ecological communities.
- NB Museum to continue research on locations of winter bat hibernacula, effects of climate, and fungal communities on cave systems.
- Continue to support ENGO work on habitat and ecological system conservation/stewardship through direct and in-kind support (Examples: New Brunswick Wildlife Trust Fund, Environmental Trust Fund).
- Participate annually in active recovery planning meetings for species at risk.

Bird Studies Canada (BSC)

- Complete reports on habitat associations and threats to grassland birds by 2015 using data from the recently completed Maritimes Breeding Bird Atlas.
- BSC to complete reports on habitat associations and threats to priority bird species by 2015.
- Will continue to monitor wetland-dependent bird species, assess the effectiveness of EHJV conservation efforts, and encourage local wetland stewardship under the Maritime Marsh Monitoring Program
- Will continue to monitor population levels of Chimney Swift at known roost sites through the citizen-science monitoring and conservation program: “Maritime Swift Watch Program”
- Will continue to hold community outreach workshops for Chimney Swifts (“Swift Night Out”)

Nature Conservancy of Canada (NCC)

- Secure 200 ha of priority native/natural lands by 2017 of which at least 175 ha are Priority 1 or Priority 2 and no more than 25 ha are Priority 3 or other.
- Improve forest connectivity through corridor analyses within the bioregion and adjacent areas.

- Improve forest connectivity, condition and landscape context on large industrial land within the bioregion by 2018 through the adoption of FSC principles and/or voluntary designation of high conservation areas on industrial land.
- Update land prioritization within the bioregion to account for new protected areas designated by the province under action 1.1.2 by 2015.
- Prepare Interim Stewardship Statements within one year and Property Management Plans following NCC's approved Stewardship Performance Standards for secured properties.
- Implement critical Property Management Plan actions on NCC lands through 2018.
- Designate all NCC properties in the bioregion under the NB Protected Natural Areas Act by 2018.
- Promote best management practices to prevent impacts on rivers and riparian areas.
- Control the expansion of invasive species in the bioregion and try to prevent the introduction of new invasive species.
- Participate annually in active recovery planning meetings for Species at Risk (currently NCC is only involved in Piping Plover).
- Enhance data management and information on biodiversity through annual submission of records to the ACCDC.
- Carry out aerial surveys to conduct shorebird counts and monitor length of stay during the fall migration of 2013 and 2014.
- NCC will host at least one annual community outreach or Conservation Volunteer event in the bioregion.
- NCC will continue to operate Johnson's Mills Shorebird Interpretive Centre annually and hire interpreters to educate the public and patrol beaches .
- Demonstrate restoration strategies appropriate to the Acadian Forest Ecosite and associated forest groups.
- Demonstrate and build community capacity for restoration and conservation of waterways intersecting farm and forest land.

<u>Government of Canada – Environment Canada (EC)</u>

- Implement and enforce the Migratory Bird Convention Act, Canada Wildlife Act, Species at Risk Act, Canadian Environmental Protection Act, and promote the Federal Policy on Wetland Conservation.
- Offer support to ENGOs, communities, aboriginal organizations, and academia via EC Employment Programs, including the Science Horizons Youth Internship Program and the International Environmental Youth Corps.
- Offer support to ENGOs, communities, aboriginal organizations, and academia via Community Action Programs for the Environment, including work on habitat and ecological system conservation/stewardship through direct and in-kind support (e.g., EcoAction Community Funding Program, Environmental Damages Fund, National Conservation Plan – National Wetland Conservation Fund, National Conservation Plan – Gulf of Maine Initiative, Atlantic Ecosystem Initiatives, Ecological Gifts Program, Habitat Stewardship Program – Prevention Stream, Aboriginal Fund for Species at Risk – Prevention Stream
- Offer support to ENGO and aboriginal organizations for work specifically on species at risk via the Habitat Stewardship Program – Species at Risk Stream, and Aboriginal Fund for Species at Risk.
- Support the activities described within species at risk recovery documents for the completion of schedule of studies for the identification of critical habitat.
- Engage and consult with all partners in development of recovery documents for species at risk.
- Support the Eastern Habitat Joint Venture (EHJV), and provide science guidance to conservation partners on conservation actions and priorities for migratory birds, species at risk, and their

habitats, including through development, refinement and implementation of this HCS and of the NB Bird Conservation Region 14 Strategy.
- Coordinate and/or conduct migratory bird surveys (e.g., Semipalmated Sandpiper stopover surveys, Piping Plover breeding surveys, 2 Eastern Waterfowl Survey monitoring plots, Triannual Winter Black Duck Survey, 3 active Breeding Bird Survey routes).
- Identify important areas for marine birds.
- Contribute to development of a Marine Protected Area Network within the Scotian Shelf Marine Bioregion, including consideration of those sites identified as Ecologically and Biologically Significant Areas that are located in the the NB IBoF bioregion.
- Continue management activities associated with coastal and freshwater wetlands, upland habitat at Shepody National Wildlife Area (NWA) and Tintamare NWA.
- Operate and upgrade the Marys Point Shorebird Interpretive Centre, annually hire interpreters to educate the public and patrol beaches at Shepody National Wildife Area through the Connecting Canadians to Nature Initiative of the National Conservation Plan.
- Continue to strengthen partnership with Atlantic Canada Conservation Data Centre (ACCDC) through annual submission of monitoring findings on conservation lands.

Government of Canada – Parks Canada Agency

- Continue comprehensive monitoring to assess the state of park ecosystems and to guide activities aimed at maintaining or improving the park's ecological integrity.
- Continue to support the recovery of the SARA-listed species, including the inner Bay of Fundy Atlantic Salmon, through population monitoring and recovery activities, collaboration/partnerships with stakeholder groups, and participation in Recovery Strategy and Action Planning meetings.
- Implement and/or enforce the *Canada National Park Act* and *Species at Risk Act* on park lands.
- Provide meaningful opportunities (e.g., volunteer and interpretation programs) for park visitors to learn about and contribute to ongoing ecological restoration and monitoring efforts.

Government of Canada – Fisheries and Oceans Canada (DFO)

- Lead other federal partners in the identification of Ecologically and Biologically Significant Areas and refinenment of related information in the Bay of Fundy and Scotian Shelf Bioregion
- Complete coastal and sub-tidal classification schemes in the Scotian Shelf Bioregion
- Lead other federal partners in Marine Protected Area Network planning under the *Oceans Act*. Identify two new *Oceans Act* MPA Areas of Interest in the Scotian Shelf Bioregion by 2020.
- Implement and/or enforce the *Canada Fisheries Act* and *Species at Risk Act* in federal waters.

Ducks Unlimited Canada (DUC)

- DUC to manage and monitor 4 575 ha of habitat (including restored and secured habitat, impoundments, etc.) within the bioregion.
- Pursue opportunities to restore 200 ha of salt marsh and freshwater wetland habitat in the bioregion by 2018, these being essential to support the provincial wetland policy that stipulates no net loss of wetlands or wetland function in New Brunswick.
- DUC to evaluate functionality and improve fish passage in the 66 control structures they manage within the bioregion.
- DUC to continue management on areas identified as Least Bittern (*Ixobrychus exilis*) SAR critical habitat (EC 2011) and create more suitable habitat in known breeding areas.
- DUC to continue education programs for youth such as the Project Webfoot annual school progam.

Nature Trust of NB (NTNB)

- NTNB will work towards the securement of up to 200 ha of significant habitat on private land within the bioregion by 2018.
- NTNB will enhance existing management activities on its established nature preserves at Grindstone Island and Cape Enrage with a network of volunteer stewards.
- Continue to work with local groups including the Friends of Grindstone Island, to undertake land conservation and stewardship projects.
- Continue to work with its conservation partners on conservation issues in the region (data collection, public outreach, invasive species detection/monitoring, species at risk education).
- Continue to host public events and activities, related to its established preserves, as well as land conservation and stewardship.
- Establish new partnerships with local municipalities and promote conservation on municipal lands. The NTNB will also develop a local stewardship group for the Cape Enrage preserve.
- The NTNB will expand its Power of Nature public educational program on its existing preserves in the region in order to reach out to children, youth and newcomers to Canada and help them build lasting connections to the natural landscape.
- The NTNB will seek to obtain official designation under the New Brunswick Protected Natural Area Act for its existing preserves at Grindstone Island and Cape Enrage in order to secure permanent protected status.
- Continue to monitor species at risk (where present) in all NTNB preserves in the bioregion.

Petitcodiac Watershed Alliance / Alliance du basin versant Petitcodiac

- Implement monitoring of fish species on the Petitcodiac River with collaboration from other members of the Petitcodiac Fish Recovery Coalition.
- Implement watercourse restoration projects in the Petitcodiac River watershed in order to improve habitat connectivity, fish habitat and water quality.
- Continue the long term monitoring of water quality at approximately 22 stations within the Petitcodiac River watershed in order to highlight areas of pollution concern and long term trends.
- Implement monitoring, recovery and stewardship programs for aquatic and terrestrial species at risk within the Petitcodiac River watershed.
- Support partners and the community in science or community driven projects within the watershed such as wetland delineation, species inventories, educational programs, with wide communication of results.

Fort Folly First Nation

- Continue to monitor aquatic species, including Species at Risk, such as inner Bay of Fundy Atlantic Salmon, American Eel, Striped Bass, Atlantic sturgeon and Wood Turtle.
- Continue efforts to restore Atlantic Salmon to the Petitcodiac River watershed.
- Actively participate in the Recovery Team and Planning Group for the inner Bay of Fundy Atlantic Salmon.
- Perform stewardship planning and habitat restoration within the Petitcodiac River watershed on behalf of the Petitcodiac Fish Recovery Coalition.

**Table 12. Conservation actions and associated information for the NB IBoF bioregion.**

| Conservation Actions | Importance/ Associated Goals[1] | Biodiversity Habitat(s)[2] | Threat(s)[3] | Measures of Success (MOS)[4] / Notes | Partnership involvement identified to date |
|---|---|---|---|---|---|
| 1. Land/Water Protection | | | | | |
| *1.1.1 Secure 450 acres of priority native/natural lands by 2017 of which at least 400 acres are Priority 1 or Priority 2 and no more than 50 acres are Priority 3 or other.* | CRITICAL | ALL | | MOS-I: A minimum of 400 acres of Priority 1 and 2 lands and no more than 50 acres of Priority 3 lands to be secured by 2017. All of these being native/natural lands.<br><br>It is anticipated that the vast majority (> 90% of securement) will be within identified focal areas, to ensure our securement remains strategic and focused on creating large preserves. An exception to this may be if an opportunity comes up to protect Priority 1 or Priority 2 land adjacent to provincial Protected Areas. | NCC |
| *1.1.2 Province of New Brunswick to achieve conservation designation of up to 3 692 acres (1 494 ha) of significant habitat on Crown land within the bioregion by 2014.* | CRITICAL | ALL | | MOS-I: Up to 3 692 acres (1 494 ha) of significant habitat on Crown land to be placed under the provincial Protected bioregions Act by 2014 including old forest communities. | Province of New Brunswick |

[1] ***Critical:*** Conservation actions that, without implementation, would clearly result in the reduction of viability of a biodiversity target or the increase in magnitude of a critical threat within the next 5-10 years. Also includes research information that is needed before key decisions can be made on the management of biodiversity targets.
***Necessary***: Conservation actions that are needed to maintain or enhance the viability of biodiversity targets or reduce critical threats. Also includes research that will assist in decisions on management of biodiversity targets.
***Beneficial***: Conservation actions that will assist in maintaining or enhancing viability of biodiversity targets and reducing threats.
[2] Biodiversity Targets: Beaches, rocky shores and cliffs; salt marshes; tidal flats; Acadian Forest mosaic; freshwater wetlands; riparian systems; caves and calcareous sites; and grasslands/agro-ecosystems.
[3] Biodiversity threats: Housing, Cottage and Rural Development; Dams and Aquatic Barriers; Incompatible Farming Practices; Incompatible Forestry Activities; Sea-level Rise and Erosion; Invasive Species; Habitat Fragmentation due to Roads; and Wood and Pulp Plantations.
[4] Proposed implementation measures for NACP annual progress report. More detailed measures for some actions will be developed as part of action implementation or through Property Management Plans.

| Conservation Actions | Importance/ Associated Goals[1] | Biodiversity Habitat(s)[2] | Threat(s)[3] | Measures of Success (MOS)[4] / Notes | Partnership involvement identified to date |
|---|---|---|---|---|---|
| *1.1.3 If opportunity arises, NTNB will work towards the securement of unknown ha of significant habitat on private land within the Bioregion by 2018.* | CRITICAL | ALL | | MOS-I : Unknown number of hectares of significant habitat will be secured by 2018 within the Bioregion. | NTNB |
| *1.2.1 Improve forest connectivity, condition and landscape context on large industrial land within the bioregion by 2018 through the adoption of FSC principles and/or voluntary designation of high conservation areas on industrial land.* | NECESSARY | Acadian forest mosaic | Habitat Fragmentation | MOS-I: Forest connectivity, condition and landscape context to be improved on large industrial land by 2018 through the adoption of FSC principles.<br><br>The NB Forest Collaborative – a group including NGOs, academic researchers and J.D. Irving Limited is currently looking at FSC in New Brunswick and identifying High Conservation Value Forest Conserved Habitats on Crown and JDI freehold land. | UNB |
| *1.2.2 Update land prioritization within the bioregion to account for new protected areas designated by the province under action 1.1.2 by 2015.* | NECESSARY | ALL | ALL | MOS-I: Prioritization within the bioregion to be updated by 2015 to account for new protected areas designated by the province under action 1.1.2. | NCC |
| *1.2.3 Improve forest connectivity, condition and landscape context through corridor analyses within the bioregion and adjacent areas.* | NECESSARY | Acadian forest mosaic | Habitat Fragmentation | MOS-I: Priority lands within the Chignecto Isthmus and other fragmented corridors prioritized for securement or special management to preserve connectivity. | NCC |
| *1.2.4 Designate all NCC properties in the bioregion under New Brunswick's Protected Natural Areas Act by 2018.* | CRITICAL | ALL | | MOS –I: All NCC owned properties in the bioregion to be placed under the Protected bioregions legislation by 2018.<br>Johnson's Mills properties to be placed under legislation by 2014. | NCC |
| *1.2.5 NTNB will seek to obtain official designation under the New Brunswick Protected Area Act for its existing Cape EnrageNature Preserve to secure permanent protected status.* | CRITICAL | ALL | | MOS-I: Cape Enrage Nature Preserve and all newly acquired Nature Preserves will be placed under the Protected Natural Area Act by 2018. | NTNB |
| *1.2.6 NTNB will develop an internal organization's property prioritization for the area based on the findings in this report.* | NECESSARY | ALL | | MOS-I: Prioritization within the Bioregion to be developed by 2018 to provide the organization with strategic land acquisition directions. | NTNB |

| Conservation Actions | Importance/ Associated Goals[1] | Biodiversity Habitat(s)[2] | Threat(s)[3] | Measures of Success (MOS)[4] / Notes | Partnership involvement identified to date |
|---|---|---|---|---|---|
| 2. Land/Water Management | | | | | |
| *2.1.1 Prepare Interim Stewardship Statements within one year and Property Management Plans following NCC's approved Stewardship Performance Standards for secured properties.* | NECESSARY | ALL | | MOS-I: Interim Stewardship Statements (ISS) to be completed within one year of closing for all secured properties. Baseline Inventories to be completed and Property Management Plans (PMP) developed according to NCC policy and standards. | NCC |
| *2.1.2 Implement critical Property Management Plan actions on NCC lands through 2018.* | CRITICAL | ALL | | MOS-I: Critical Property Management Plan actions to be implemented on all NCC-owned properties, both newly acquired and previously owned between 2013 - 2018. | NCC |
| *2.1.3 Promote best management practices to prevent impacts on rivers and riparian areas.* | BENEFICIAL | Riparian systems | | MOS –I: The Petitcodiac Watershed Alliance to promote best management practices for agriculture, development and other activities in the Petitcodiac River Watershed. | Petitcodiac Watershed Alliance |
| *2.1.4 Bird Studies Canada (BSC) to complete reports on habitat associations and threats to grassland birds by 2013 using data from the recently completed Maritimes Breeding Bird Atlas.* | NECESSARY | Grasslands /agro-ecosystems | Incompatible Farming Practices | MOS-I: Reports on habitat associations and threats completed by BSC by 2013. This information will be used by NCC and others to evaluate threat and appropriate actions for grassland birds in the region. | BSC |
| *2.1.5 Manage and monitor 11 307 acres of habitat (including restored and secured habitat, impoundments, etc.) within the bioregion.* | NECESSARY | Freshwater wetlands | | MOS-I: All DUC projects in the bioregion to be managed accordingly. | DUC |
| *2.1.6 Conduct habitat quality assessments on 4 watercourses in bioregion (Demoiselle Creek, North River, Pollett River, Little River) to identify restoration needs.* | BENEFICIAL | Riparian systems | | MOS-I: Data analysis to be performed and restoration recommendations provided for inclusion in Stewardship Plans. | Fort Folly Habitat Recovery Program |
| *2.1.7 Prepare Stewardship Plans for four watercourses in bioregion (Demoiselle Creek, North River, Pollett River, Little River) to carry out human impact mitigation projects.* | BENEFICIAL | Riparian systems | | MOS-I: Stewardship plans based on DFOs "Ecological Restoration of Degraded Aquatic Habitats: A Watershed Approach" prepared. | Fort Folly Habitat Recovery Program |

| Conservation Actions | Importance/ Associated Goals[1] | Biodiversity Habitat(s)[2] | Threat(s)[3] | Measures of Success (MOS)[4] / Notes | Partnership involvement identified to date |
|---|---|---|---|---|---|
| *2.1.8 NTNB will enhance existing management activities on its established nature preserves at Grindstone Island and Cape Enrage with a network of volunteer stewards.* | NECESSARY | ALL | | MOS-I: Annual monitoring of existing and newly created preserves. Development and support of local stewardship groups (Friends of Grindstone Island). | NTNB |
| *2.1.9 Continue long-term monitoring of water quality within the Petitcodiac River watershed to highlight areas of pollution concern and long-term trends.* | NECESSARY | Riparian systems | | MOS-I: Water quality data collected from approximately 22 stations in the Petitcodiac River watershed. | Petitcodiac Watershed Alliance/Alliance du bassin versant Petitcodiac |
| *2.2.1 Control the expansion of invasive species in the bioregion and try to prevent the introduction of new invasive species through public education and targeted outreach to land owners and land managers.* | CRITICAL | ALL | Invasive Species | MOS –I: New Brunswick Invasive Species Council (NBISC), to hold a minimum of two meetings per year. The public to be made aware of existing and potential threats of invasive species though NBISC website and media interviews. Specific issues to be addressed with the responsible land owner or land manager. | NBISC |
| *2.2.2 Monitor the effect of the Green Crab, an invasive species and a high impact predator in other invaded habitats, on mudflats in the NB IBoF bioregion in 2013.* | NECESSARY | Tidal flats | Invasive Species | MOS-I: Population densities and structure (proportion of juveniles, sex ratio, proportion of ovigerous females) of Green Crabs to be better understood in the NB IBoF bioregion mudflats. The goals of this research are to assess whether there is a breeding population of crabs present, and to look at effects of crabs on the intertidal community through a manipulative study. | Mount Alison University and UNB |
| *2.2.3 Monitor and control spread of invasive species on existing NTNB preserves.* | NECESSARY | ALL | Invasive Species | Monitor, report and potentially remove invasive species found on NTNB's existing nature preserves. | NTNB |
| *2.3.1 Ducks Unlimited Canada, in collaboration with DFO, to evaluate functionality and improve fish passage in many of the 66 control structures they manage (including 7 fish ladders) within the bioregion and work to improve the* | CRITICAL | Freshwater wetlands; riparian systems | Dams and Aquatic Barriers | MOS-I: Fish ladders and other DUC structures to be evaluated and any suggested improvements implemented by 2018. | DUC |

| Conservation Actions | Importance/ Associated Goals[1] | Biodiversity Habitat(s)[2] | Threat(s)[3] | Measures of Success (MOS)[4] / Notes | Partnership involvement identified to date |
|---|---|---|---|---|---|
| *structures they manage by 2018.* | | | | | |
| *2.3.2 Pursue opportunities to restore 500 acres (200 ha) of salt marsh and freshwater wetland habitat in the bioregion by 2018.* | NECESSARY | Salt marsh; freshwater wetlands | | MOS-I: 500 acres (200 ha) of habitat to be restored to a natural state.<br><br>Potential sites include areas surrounding Tantramar, Riverside-Albert, Moncton and Memramcook. | DUC |
| *2.3.3 Implement watercourse restoration projects in the Petitcodiac River watershed to improve habitat connectivity, fish habitat and water quality.* | NECESSARY | Riparian systems | | MOS-1: GIS map created of potential aquatic connectivity barriers.<br>MOS-2: Ground truth potential aquatic barriers using survey tripod methods and DFO/Provincial guidelines for watercourse structures (e.g., culverts)<br>MOS-3: Remediation recommendation plans written for each confirmed barrier send to barrier owner (e.g., municipality, Province, private owner). | Petitcodiac Watershed Alliance/Alliance du bassin versant Petitcodiac |
| *2.3.4 Assess the resilience of indigenous tree species to the effects of climate change in the FBR,and using information developed with NCC on corridor analyses, strategically plant resilient tree species in priority locations by 2015.* | BENEFICIAL | Acadian forest mosaic | Climate Change | MOS-I: A minimum of 2 500 trees are planted in strategic corridors in the Fundy Biosphere Reserve for maximum survival. | Fundy Biosphere Reserve |
| *2.3.5 Protect, maintain and/or restore FNP habitat quality and quantity toward un-impaired natural status.* | CRITICAL | Riparian systems, Acadian forest mosaic | Invasive Species | MOS-I: Measure of Aquatic Connectivity (Dendritic Connectivity Index) for fish assessed at 5 year intervals.<br>MOS-II: Production of maps tracking new or expanding invasive species on park lands.<br>MOS-III: Database (ICE) maintained to reflect changes (expansion and collapse) in distribution of invasive species.<br>MOS-IV: Condition assessment of all FNP trails (including ecological criteria such as extent of erosion damage, invasive plants, footprint etc.) This assessment will allow prioritization of trail restoration actions which will contribute to | Fundy National Park |

| Conservation Actions | Importance/ Associated Goals[1] | Biodiversity Habitat(s)[2] | Threat(s)[3] | Measures of Success (MOS)[4] / Notes | Partnership involvement identified to date |
|---|---|---|---|---|---|
| | | | | improved forest ecosystem condition and public awareness and engagement around FNP restoration efforts. | |
| 3. Species Management | | | | | |
| *3.2.1 Conduct research on tidal flat ecology and invertebrate community dynamics.* | NECESSARY | Tidal flats | | MOS-I: Research conducted and results communicated to partners to guide future conservation, management and threat abatement strategies.<br><br>Ongoing study includes topics related to sediment dynamics, biofilm dynamics and bottom-up effects, fish and bird habitat use and interactions with humans, genetic responses in mudflat invertebrates (genomic signatures) to pollution from human activities, and ecological modelling. | UNB, MtA, EC and various other universities |
| *3.2.2 Carry out aerial surveys to conduct shorebird counts and monitor length of stay through telemetry during the fall migration of 2013 and 2014.* | NECESSARY | Beaches, rocky shores and cliffs; tidal flats | | MOS-I: Ensure shorebird population within the bioregion is accurately counted and their length of stay is reassessed. This study is essential in measuring shorebird population and better understanding trends and habitat use factors in order to monitor any changes and thus making informed management decisions. | CWS and Mount Alison University |
| *3.2.3 NB Museum to continue research on locations of winter bat hibernacula, effects of climate, and fungal communities on cave systems.* | NECESSARY | Caves and calcareous sites | | MOS-I: Research conducted and results (locations of winter hibernacula, climate effects, fungal studies) communicated to partners to guide future conservation, management and threat abatement strategies. | NB Museum |
| *3.2.4 DUC to continue management on areas identified as least bittern SAR critical habitat and create more suitable habitat in known breeding areas when opportunities arise.* | NECESSARY | Freshwater wetlands | | MOS-I: Suitable breeding habitat for least bittern protected or created by 2018. | DUC |

| Conservation Actions | Importance/ Associated Goals[1] | Biodiversity Habitat(s)[2] | Threat(s)[3] | Measures of Success (MOS)[4] / Notes | Partnership involvement identified to date |
|---|---|---|---|---|---|
| *3.2.5 Participate and/or lead in the monitoring of inner Bay of Fundy Atlantic Salmon in four rivers: Petitcodiac, Upper Salmon, Point Wolfe, and Big Salmon.* | NECESSARY | Riparian systems | | MOS-I: Operation of rotary screw traps on Pollett and Big Salmon Rivers to monitor/retain smolt as prioritized by the Recovery Team and Planning Group. Perform electrofishing surveys for salmon parr. Perform adult salmon monitoring through snorkel surveys and seining. | Fort Folly First Nation / Fort Folly Habitat Recovery Program |
| *3.2.6 Fish population monitoring on the Petitcodiac River on behalf of the Petitcodiac Fish Recovery Coalition.* | BENEFICIAL | Riparian systems | | MOS-I: Data collected on fish numbers and diversity annually from spring to early fall. Data analyses performed and written report prepared. | Fort Folly First Nation / Fort Folly Habitat Recovery Program; Petitcodiac Watershed Alliance/Alliance du bassin versant Petitcodiac |
| *3.2.7 Species at Risk data collection – primarily inner Bay of Fundy Atlantic Salmon, but could include data on wood turtle, striped bass, American Eel, and Atlantic sturgeon.* | NECESSARY | Riparian systems | | MOS-I: Data collected on SAR to be included in project reports and provided to appropriate government departments as well as ACCDC. | Fort Folly First Nation / Fort Folly Habitat Recovery Program; Petitcodiac Watershed Alliance/Alliance du bassin versant Petitcodiac |
| *3.3.1 Re-introduction of adult IBoF Atlantic Salmon.* | CRITICAL | Riparian systems | | MOS-I: Planned releases of IBoF Atlantic Salmon to Park rivers over the next 5 years.<br>- Pending successful spawning, large numbers of juveniles will be produced which are free from captive exposure and the associated negative effects.<br>- Adult releases and adult returns will continue to be monitored on both rivers through multiple annual snorkel surveys. | Fundy National Park |

| Conservation Actions | Importance/ Associated Goals[1] | Biodiversity Habitat(s)[2] | Threat(s)[3] | Measures of Success (MOS)[4] / Notes | Partnership involvement identified to date |
|---|---|---|---|---|---|
| *3.4.2 Participate in and monitor effectiveness of Live Gene Bank (LGB) recovery activities to preserve local IBoF Atlantic Salmon stocks in effective qualities on the Point Wolfe and Upper Salmon Rivers.* | CRITICAL | Riparian systems | | MOS-I: Continued collaboration with DFO through Annual Inter-departmental letter of agreement (ILA), detailing the status and plans for release, collection and spawning of FNP stocks.<br>MOS-II: Unique genetics of Point Wolfe River High Ancestry stock will be identified by external markings and collected as smolts by rotary screw trap. Periodic genetic analyses carried out under ILA with DFO will track population genetic composition. | Fundy National Park |
| *4. Education and Awareness* | | | | | |
| *4.3.1 NCC will continue local community outreach and education through hosting at least one annual community outreach or Conservation Volunteer event in the bioregion.* | BENEFICIAL | ALL | ALL | MOS-I: At least one community outreach event or Conservation Volunteer event to be held on an NCC preserve in the bioregion annually. | NCC |
| *4.3.2 DUC to continue education programs, such as the Project Webfoot.* | BENEFICIAL | ALL | ALL | MOS-I: Approximately 1000 elementary school youth from Grades 4-6 to be given the opportunity each year to apply their learning and connect with nature through the interactive and education al outreach program provided by DUC's Project Webfoot. | DUC |
| *4.3.3 Continue to operate Johnson's Mills Shorebird Interpretive Centre annually and hire interpreters to educate and patrol beaches.* | BENEFICIAL | ALL | ALL | MOS–I: Interpretive Centre is operated annually from July to September (peak shorebird migration period) and employs five interpretive staff to educate the public and patrol the beaches to prevent disturbance to the shorebirds. | NCC |
| *4.3.4 Demonstrate restoration strategies appropriate to the Acadian Forest Ecosite and associated forest groups while providing complimentary educational opportunities that foster the return of a late-succession, uneven-aged forest conditions on private and public forestland throughout the region.* | BENEFICIAL | Acadian forest mosaic | Incompatible Forestry Activities | MOS–I: Canadian Forests International (CFI) will offer workshops annually on Acadian forest restoration. | CFI |

| Conservation Actions | Importance/ Associated Goals[1] | Biodiversity Habitat(s)[2] | Threat(s)[3] | Measures of Success (MOS)[4] / Notes | Partnership involvement identified to date |
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| *4.3.5 Demonstrate and build community capacity for restoration and conservation of waterways intersecting farm and forest land; and demonstrate agriculture systems that maintain the ecological integrity of working lands by protecting waterways, conserving soil, and promoting beneficial wildlife.* | BENEFICIAL | Riparian systems | Incompatible Forestry Activities; Incompatible Farming Practices | MOS–I: Canadian Forests International (CFI) will offer workshops annually on restoration and best management techniques in riparian areas. | CFI |
| *4.3.6 . Create a series of short conservation education videos on the habitats of the FBR (part of the Amazing Places project), which are made available to all partners for educational purposes.* | BENEFICIAL | | | MOS-I: A minimum of 15 videos completed and inuse by 2016. | Fundy Biosphere Reserve |
| *4.3.7 Continue to host public events and activities related to NTNB established preserves as well as conservation and stewardship.* | BENEFICIAL | ALL | | MOS-I: Continue to work with local groups, including Friends of Grindstone Island, to undertake land conservation and stewardship projects. Continue to educate wider audience about land conservation through established Bores Music Festival – annual NTNB's fundraiser in Hillsborough. | NTNB |
| *4.3.8 NTNB will expand its Power of Nature public educational program on its existing preserves in the region to reach out to children, youth and newcomers to Canada, and help them build lasting connections to the natural landscape.* | BENEFICIAL | | | MOS-I: Engage more schools and local clubs to promote stewardship and land conservation on Cape Enrage and Grindstone Island. | NTNB |
| *4.3.9 Continue interpretative and/or citizen science programs to present and celebrate the natural and cultural treasures of Fundy National Park and to enable park visitors to contribute to ongoing ecological monitoring and restoration work.* | BENEFICIAL | ALL | ALL | MOS-I: Various interpretive and/or citizen science programs offered during seasonal operation at Fundy National Park. | Fundy National Park |
| *5. Law and Policy* | | | | | |
| *5.2.1 Examine options for conservation of of tidal flats (submerged crown land) in Chignecto and Shepody Bay.* | NECESSARY | | | MOS-I: Required research and consultation to determine best options for conservation of tidal flats in Chignecto and Shepody Bays to be | Province of NB, CWS, DFO |

| Conservation Actions | Importance/ Associated Goals[1] | Biodiversity Habitat(s)[2] | Threat(s)[3] | Measures of Success (MOS)[4] / Notes | Partnership involvement identified to date |
|---|---|---|---|---|---|
| | | | | completed with recommendations made by 2018. | |
| *7. External Capacity Building* | | | | | |
| *7.1.1 . The NTNB will develop a local stewardship group for the Cape Enrage and Grindstone Island preserves.* | BENEFICIAL | | | MOS-I: Work with local individual and groups to continue on build on success of the Friends of Grindstone Island. Have at least one of the groups independently meeting and applying action items under NTNB's supervision. | NTNB |
| *7.2.1 Attend partnership meetings and any relevant ecotourism development meetings on on-going basis to build and strengthen partnerships.* | NECESSARY | ALL | ALL | MOS-I: Attend partnership meetings and any relevant ecotourism development meetings; provide conservation input into tourism initiatives. | |
| *7.2.2 Attend meetings of the National Recovery Team and Planning Group for inner Bay of Fundy Atlantic Salmon.* | NECESSARY | Riparian systems | | MOS-I: Spring and fall meetings of the Recovery Team and Planning Group attended by representatives of Fort Folly First Nation. | Fort Folly First Nation / Fort Folly Habitat Recovery Program |
| *7.2.3 Participate annually in active recovery planning meetings for Species at Risk (currently only Piping Plover).* | NECESSARY | ALL | ALL | MOS-I: Attend working group meetings for the Piping Plover recovery team (annually) and support recovery strategy for Piping Plover. MOS-2: Establish working groups for other species at risk in the bioregion. | |
| *7.2.4 Work with Canadian Wildlife Service (CWS) staff to identify appropriate groups / agencies to address necessary recovery actions to protect Species at Risk in the bioregion, including grassland birds.* | NECESSARY | ALL | ALL | MOS-I: The appropriate groups / agencies identified and contacted to work on best management practices in agricultural lands to protect grassland birds as well as monitoring Species at Risk in the bioregion. | |
| *7.2.5 Enhance data management and information on biodiversity in the bioregion through annual submission of species records to the Atlantic Canada Conservation Data Centre (ACCDC).* | BENEFICIAL | ALL | ALL | MOS-I: Baseline monitoring information on rare species to be submitted to ACCDC on an ongoing basis. | ALL |

| Conservation Actions | Importance/ Associated Goals[1] | Biodiversity Habitat(s)[2] | Threat(s)[3] | Measures of Success (MOS)[4] / Notes | Partnership involvement identified to date |
|---|---|---|---|---|---|
| *7.2.6 Establish new partnerships with local municipalities and promote conservation on municipal lands.* | NECESSARY | ALL | ALL | MOS-I: Continue to work with municipalities to outline the importance of land conservation and available conservation tools in the province. | NTNB |
| *7.2.7 Attend partnership meetings on-going basis to build and strengthen partnerships.* | NECESSARY | ALL | ALL | MOS-I: Attend partnership meetings; provide input to conservation initiatives. | Fundy National Park |
| *7.2.8 Participate annually in active recovery planning meetings for Species at Risk.* | NECESSARY | ALL | ALL | MOS-I: Attend working group meetings and support recovery strategy for IBoF Atlantic Salmon.<br>MOS-II: Contribute to working groups for other species at risk in the region as opportunities arise. | Fundy National Park |

*** Categories based on IUCN – CMP Unified Classification of Conservation Actions Needed (Version 2.0). Actions and MOS are not listed in order of importance.**

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**APPENDIX A: List of Abbreviations**

| Acronyms | Full reference |
|---|---|
| ATV | All-terrain-vehicle |
| ACCDC | Atlantic Canada Conservation Data Centre |
| BD | Beaches/Dunes |
| BSC | Bird Studies Canada |
| CAP | Conservation Action Planning |
| COSEWIC | Committee on the Status of Endangered Wildlife in Canada |
| CWS | Canadian Wildlife Service |
| DUC | Ducks Unlimited Canada |
| EC | Environment Canada |
| EHJV | Eastern Habitat Joint Venture |
| FM | Forest Mosaic |
| FW | Freshwater Wetland |
| IBA | Important Bird Area |
| IUCN-CMP | International Union for the Conservation of Nature and Natural Resources – Conservation Measures Partnership |
| LCI | Landscape Context Index |
| MBBA | Maritimes Breeding Bird Atlas |
| MOS | Measure of Success |
| bioregion | bioregion |
| NAAP | Northern Appalachian - Acadian Ecoregional Plan |
| NABCI | North American Bird Conservation Initiative |
| NACP | Bioregion Conservation Plan |
| NAWCA | North American Waterfowl Conservation Act |
| NB | New Brunswick |
| NB DNR | New Brunswick Department of Natural Resources |
| NB EHJV | New Brunswick Eastern Habitat Joint Venture |
| NWA | National Wildlife Area |
| Pers. comm. | Personal Communication |
| Pers. obs. | Personal observation |
| SAR | Species at Risk |
| SM | Salt Marsh |

## APPENDIX B: Glossary of Biodiversity and Conservation Ranks

**Committee on the Status of Endangered Wildlife in Canada (COSEWIC):** is a national committee of experts that assesses and designates which wild species are in danger of disappearing from Canada. COSEWIC assigns the following status to species:

| | |
|---|---|
| **Extinct (EXT)** | A species that no longer exists |
| **Extirpated (EXP)** | A species no longer existing in the wild in Canada, but occurring elsewhere in the wild |
| **Endangered (END)** | A species facing imminent extirpation or extinction throughout its range |
| **Threatened (THR)** | A species likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction |
| **Special Concern (SC)** | A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events, but does not include an extirpated, endangered or threatened species |
| **Not At Risk (NAR)** | A species that has been evaluated and found to be not at risk |
| **Data Deficient (DD)** | A species for which there is insufficient information to support a status designation |

**Species at Risk (SAR):** species designated as Endangered, Threatened or Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or listed through provincial endangered species legislation.

**Global Rank (G-RANK):** the overall status of a species or ecological community is regarded as its "global" status; this range-wide assessment of condition is referred to as its global conservation status rank. Global conservation status assessments are generally carried out by NatureServe scientists with input from relevant natural heritage member programs (e.g., CDCs and NHICs) and experts on particular taxonomic groups, and are based on a combination of quantitative and qualitative information. The factors considered in assessing conservation status include the total number and condition of occurrences; population size; range extent and area of occupancy; short- and long-term trends in these previous factors; scope, severity, and immediacy of threats, number of protected and managed occurrences, intrinsic vulnerability and environmental specificity.

**Global Ranks**

| Rank | Definition |
|---|---|
| **GX** | **Presumed Extinct** (species): Not located despite intensive searches and virtually no likelihood of rediscovery.<br>**Eliminated** (ecological communities): Eliminated throughout its range, with no restoration potential due to extinction of dominant or characteristic species. |
| **GH** | **Possibly Extinct** (species): Missing; known from only historical occurrences but still some hope of rediscovery.<br>**Presumed Eliminated**: Historic, ecological communities)-Presumed eliminated throughout its range, with no or virtually no likelihood that it will be rediscovered, but with the potential for restoration, for example, American Chestnut Forest. |
| **G1** | **Critically Imperilled**: At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors. |
| **G2** | **Imperilled**: At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors. |
| **G3** | **Vulnerable**: At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors. |
| **G4** | **Apparently Secure**: Uncommon but not rare; some cause for long-term concern due to declines or other factors. |
| **G5** | **Secure**: Common; widespread and abundant. |

**Variant Ranks**

| Rank | Definition |
|---|---|
| **G#G#** | **Range Rank**—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community. A G2G3 rank would indicate that there is a roughly equal chance of G2 or G3 and other ranks are much less likely. Ranges cannot skip more than one rank (e.g., GU should |

| | |
|---|---|
| | be used rather than G1G4). |
| **GU** | **Unrankable**—-Currently unrankable due to lack of information or due to substantially conflicting information about status or trends. Whenever possible, the most likely rank is assigned and a question mark qualifier may be added (e.g., G2?) to express minor uncertainty, or a range rank (e.g., G2G3) may be used to delineate the limits (range) of uncertainty. |
| **GNR** | **Unranked**—Global rank not yet assessed. |
| **GNA** | **Not Applicable**—A conservation status rank is not applicable because the species is not a suitable target for conservation activities. |

**Rank Qualifiers**

| Rank | Definition |
|---|---|
| **?** | **Inexact Numeric Rank**—Denotes some uncertainty about the numeric rank (e.g., G3? - Believed most likely a G3, but some chance of either G2 or G4). |
| **Q** | **Questionable taxonomy**—Taxonomic distinctiveness of this entity at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or the inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority conservation priority. |
| **C** | **Captive or Cultivated Only**—At present extant only in captivity or cultivation, or as a reintroduced population not yet established. |

**Sub-national (Provincial) Rank (S-RANK):** provincial ranks are used by natural heritage member programs to set conservation priorities for rare species and vegetation communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks, but consider only those factors within the political boundaries of a province. Comparison of global and provincial ranks, gives an indication of the status and rarity of an element in that province in relation to its overall conservation status, therefore providing insight into the urgency of conservation action for it in the province.

**Subnational (S) Conservation Status Ranks**

| Status | Definition |
|---|---|
| **SX** | **Presumed Extirpated**—Species or community is believed to be extirpated from the province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered. |
| **SH** | **Possibly Extirpated** (Historical)—Species or community occurred historically in the province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become SH without such a 20-40 year delay if the only known occurrences in a nation or state/province were destroyed or if it had been extensively and unsuccessfully looked for. The SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences. |
| **S1** | **Critically Imperilled**—Critically imperilled in the province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province. |
| **S2** | **Imperilled**—Imperilled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province. |
| **S3** | **Vulnerable**—Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation. |
| **S4** | **Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors. |
| **S5** | **Secure**—Common, widespread, and abundant in the province. |
| **SNR** | **Unranked**—Province conservation status not yet assessed. |
| **SU** | **Unrankable**—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends. |
| **SNA** | **Not Applicable** —A conservation status rank is not applicable because the species is not a suitable target for conservation activities. |

| | |
|---|---|
| **S#S#** | **Range Rank —**A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4). |

**APPENDIX C: List of Significant Species for the NB IBoF bioregion with Coarse Resolution Habitat Associations**

| Scientific Name | Common Name | COSEWIC Status[1] | Provincial status[2] | G Rank[3] | S Rank[4] | Blueprint Target | Other Status[5] | Coarse Resolution Biodiversity Targets | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Beaches, rocky shores and cliffs | Salt marshes | Riparian systems | Freshwater wetlands | Acadian forest mosaic | Grasslands/agro-ecosystems | Caves and calc. sites | Tidal flats |
| ***Fungi or Lichens*** | | | | | | | | | | | | | | | |
| *Bryoria bicolor* | A lichen | | | GNR | S1 | | | X | | | | X | | | |
| *Cladonia macrophylla* | A Reindeer Lichen | | | GNR | S2 | | | | | | | X | | | |
| *Cladonia metacorallifera* | A Reindeer Lichen | | | GNR | S1 | | | X | | | | X | | | |
| *Coccocarpia palmicola* | Coccocarpia Lichen | | | G5 | S1 | | | | | | | X | | | |
| *Erioderma mollissimum* | Vole Ears | Endangered | Endangered | G4G5 | S1 | | | | | | X | X | | | |
| *Hydrothyria venosa* | Hydrothyria Lichen | | | G4 | S1 | | | | | X | | | | | |
| *Nephroma arcticum* | Arctic Kidney Lichen | | | G5? | S2 | | | | | | | X | | | |
| *Peltigera malacea* | A Dog's tooth Lichen | | | G5 | S1 | | | | | | | X | | X | |
| *Peltigera scabrosa* | A Dog's tooth Lichen | | | G4 | S1S2 | | | X | | | | X | | | |
| *Pseudevernia cladonia* | Light-and-dark Lichen | | | G2G4 | S3 | | | | | | | X | | | |
| *Ramalina pollinaria* | Powdery Twig Lichen | | | G4 | S2 | | | | | | | X | | | |
| *Ramalina thrausta* | A lichen | | | G3G4 | S3S4 | | | | | | | X | | | |
| *Stereocaulon subcoralloides* | A lichen | | | G3? | S3S4 | | | X | | | | | | | |
| *Umbilicaria vellea* | A Rocktripe Lichen | | | G4? | S2 | | | X | | | | X | | | |
| ***Non-vascular Plants*** | | | | | | | | | | | | | | | |
| *Aloina rigida* | Rigid Screw Moss | | | G3G5 | S1 | | | | | | | X | | X | |
| *Andreaea rothii* | Dusky Rock Moss | | | G5 | S1S2 | | | X | | | | X | | | |
| *Anomobryum filiforme* | Slender Silver Moss | | | G4G5 | S1? | | | X | | | | X | | | |
| *Bartramia ithyphylla* | A moss | | | G4G5 | S1 | | | X | | | | X | | X | |

| Scientific Name | Common Name | COSEWIC Status[1] | Provincial status[2] | G Rank[3] | S Rank[4] | Blueprint Target | Other Status[5] | Coarse Resolution Biodiversity Targets | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Beaches, rocky shores and cliffs | Salt marshes | Riparian systems | Freshwater wetlands | Acadian forest mosaic | Grasslands/agro-ecosystems | Caves and calc. sites | Tidal flats |
| *Bryum salinum* | A moss | | | G2G4 | S1 | | | X | | | | | | | |
| *Campylium polygamum* | Campylium Moss | | | G5 | S2 | | | | | | X | X | | | |
| *Cirriphyllum piliferum* | Cirriphyllum Moss | | | G5 | S2 | | | | | | | X | | X | |
| *Dicranella palustris* | Marsh Forklet Moss | | | G5? | S2 | | | | | | X | X | | | |
| *Dicranoweisia crispula* | A moss | | | G4G5 | S1 | | | | | | | X | | | |
| *Dicranum condensatum* | Condensed Dicranum Moss | | | G5 | S1 | | | | | | | X | | X | |
| *Didymodon fallax var. reflexus* | A moss | | | G5T5? | S1S2 | | | X | | | | X | | X | |
| *Didymodon rigidulus var. gracilis* | A moss | | | G5T5? | S1 | | | X | | | | X | | X | |
| *Distichium inclinatum* | A moss | | | G4G5 | S1 | | | X | | | | X | | X | |
| *Fontinalis antipyretica* | Aquatic Moss | | | G5 | S1? | | | | | X | X | | | | |
| *Hamatocaulis vernicosus* | A moss | | | G5 | S1 | | | | | | X | | | | |
| *Hygrobiella laxifolia* | Lax Notchwort | | | G3G4 | S1S3 | | | | | X | | | | X | |
| *Hygrohypnum bestii* | A moss | | | G4 | S1S2 | | | | | X | X | X | | | |
| *Hygrohypnum montanum* | Mountain Brook Moss | | | G3G5 | S1S2 | | | | | X | X | X | | | |
| *Plagiomnium rostratum* | A moss | | | G5 | S1S2 | | | | | | X | | | | |
| *Plagiothecium latebricola* | Lurking Leskea | | | G3G4 | S1 | | | | | X | X | X | | | |
| *Pseudotaxiphyllum distichaceum* | Two-ranked Moss | | | G4G5 | S1 | | | X | | | | X | | | |
| *Radula tenax* | Tenacious Scalewort | | | G3G4 | S1S3 | | | | | | | X | | | |
| *Rhytidiadelphus loreus* | Lanky Moss | | | G5 | S1 | | | | | | | X | | | |
| *Rhytidium rugosum* | Golden Glade -moss | | | G5 | S1 | | | | | | | X | | X | |

| Scientific Name | Common Name | COSEWIC Status[1] | Provincial status[2] | G Rank[3] | S Rank[4] | Blueprint Target | Other Status[5] | Coarse Resolution Biodiversity Targets | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Beaches, rocky shores and cliffs | Salt marshes | Riparian systems | Freshwater wetlands | Acadian forest mosaic | Grasslands/agro-ecosystems | Caves and calc. sites | Tidal flats |
| *Seligeria campylopoda* | A moss | | | G3G5 | S1S2 | | | | | | | | | X | |
| *Seligeria diversifolia* | Diverse-leaved Bristle Moss | | | G2G3 | S1S2 | | | X | | | | X | | X | |
| *Sphagnum centrale* | A Sphagnum | | | G5 | S2 | | | | | | X | | | | |
| *Sphagnum flexuosum* | Flexuous Peatmoss | | | G5 | S2 | | | | | | X | | | | |
| *Sphagnum lindbergii* | Lindberg's Sphagnum | | | G5? | S2 | | | | | | X | | | | |
| *Sphagnum strictum* | A Sphagnum | | | G5 | S1 | | | | | | X | X | | | |
| *Sphagnum torreyanum* | Giant Peatmoss | | | G3G4 | S3 | | | | | X | | X | | | |
| *Tayloria serrata* | Slender Splachnum | | | G4 | S2 | | | | | | | X | | | |
| *Tetrodontium brownianum* | Brown's Four-toothed Moss | | | G3G4 | S1S2 | | | X | | X | | X | | | |
| *Thamnobryum alleghaniense* | Alleghany Thamnobryum Moss | | | G5? | S2 | | | X | | | | X | | X | |
| *Timmia norvegica var. excurrens* | Nerved Norwegian Timmia | | | G4? TNR | S1 | | | X | | | | X | | X | |
| *Tortella humilis* | Small Twisted Moss | | | G5 | S1 | | | | | X | X | X | | | |
| *Desmatodon obtusifolius* | A moss | | | G5 | S1 | | | | | | | | | X | |
| ***Vascular Plants*** | | | | | | | | | | | | | | | |
| *Allium tricoccum* | Small White Leek | | | G5 | S2 | | | | | X | | X | | | |
| *Amelanchier fernaldii* | Fernald's Serviceberry | | | G2G4 Q | S1 | | | X | | | | | | X | |
| *Anemone parviflora* | Small-flower Anemone | | | G5 | S2 | | | | | X | | | | X | |
| *Arabis drummondii* | Drummond's Rockcress | | | G5 | S2 | | | X | | | | X | | | |
| *Asplenium trichomanes* | Maidenhair Spleenwort | | | G5 | S2 | | | | | | | | | X | |

| Scientific Name | Common Name | COSEWIC Status[1] | Provincial status[2] | G Rank[3] | S Rank[4] | Blueprint Target | Other Status[5] | Coarse Resolution Biodiversity Targets | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Beaches, rocky shores and cliffs | Salt marshes | Riparian systems | Freshwater wetlands | Acadian forest mosaic | Grasslands/agro-ecosystems | Caves and calc. sites | Tidal flats |
| *Atriplex franktonii* | Frankton's Saltbush | | | G2G4 | S2 | | | X | X | | | | | | |
| *Calamagrostis stricta ssp. inexpansa* | New England Northern Reedgrass | | | G5T5 | S1 | | | | X | X | | | | | |
| *Callitriche hermaphroditica* | Autumnal Water-starwort | | | G5 | S2 | | | | | | X | | | | |
| *Calypso bulbosa var. americana* | Fairy Slipper | | | G5T5? | S2 | | | | | | X | X | | X | |
| *Carex albicans var. emmonsii* | Emmons' Sedge | | | G5T5 | S2 | | | | | | | X | | | |
| *Carex atlantica ssp. atlantica* | Atlantic Sedge | | | G5T4 | S1 | | | | | | X | | | | |
| *Carex backii* | Back's Sedge | | | G4 | S1 | | | | | | | X | | X | |
| *Carex comosa* | Bristly Sedge | | | G5 | S1 | | | | | | X | | | | |
| *Carex hirtifolia* | Pubescent Sedge | | | G5 | S2 | | | | | X | | X | | | |
| *Carex merritt-fernaldii* | Merritt Fernald's Sedge | | | G5 | S1 | | | | | X | | X | | | |
| *Carex rostrata* | Beaked Sedge | | | G5 | S1S2 | | | | | | X | | | | |
| *Carex tenuiflora* | Sparse-Flowered Sedge | | | G5 | S2 | | | | | | X | | | X | |
| *Ceratophyllum echinatum* | Prickly Hornwort | | | G4? | S1S2 | | | | | X | X | | | | |
| *Chenopodium simplex* | Giant-seed Goosefoot | | | G5 | S1 | | | | | | | X | | | |
| *Coeloglossum viride var. virescens* | Long-bracted Green Orchis | | | G5T5 | S2 | | | | | | | X | | X | |
| *Crataegus scabrida* | Rough Hawthorn | | | G5? | S2 | | | | | X | | X | | | |
| *Dirca palustris* | Eastern Leatherwood | | | G4 | S2 | | | | | | | X | | | |
| *Draba arabisans* | Rock Whitlow-Grass | | | G4 | S1 | | | | | | | X | | X | |
| *Draba glabella* | Rock Whitlow-Grass | | | G4G5 | S1 | | | X | | | | | | | |
| *Dryas integrifolia* | Entire-leaved Mountain- | | | G5 | S1 | | | | | | | X | | X | |

| Scientific Name | Common Name | COSEWIC Status[1] | Provincial status[2] | G Rank[3] | S Rank[4] | Blueprint Target | Other Status[5] | Coarse Resolution Biodiversity Targets | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Beaches, rocky shores and cliffs | Salt marshes | Riparian systems | Freshwater wetlands | Acadian forest mosaic | Grasslands/agro-ecosystems | Caves and calc. sites | Tidal flats |
| | avens | | | | | | | | | | | | | | |
| *Dryopteris filix-mas* | Male Fern | | | G5 | S1 | | | | | | | X | | X | |
| *Elymus canadensis* | Canada Wild Rye | | | G5 | S2 | | | | | X | | | | | |
| *Eragrostis pectinacea* | Purple Love Grass | | | G5 | S2? | | | | | X | | | | | |
| *Eriophorum gracile* | Slender Cotton-grass | | | G5 | S1 | | | | | | X | | | | |
| *Euphrasia randii* | Small Eyebright | | | G5 | S2 | | | X | | | | | | | |
| *Goodyera pubescens* | Downy Rattlesnake-Plantain | | | G5 | S1 | | | | | | | X | | | |
| *Hieracium robinsonii* | Robinson's Hawkweed | | | G2G3 | S1 | Y | | | | X | | | | | |
| *Juncus greenei* | Greene's Rush | | | G5 | S1 | | | | | | X | | | | |
| *Juncus stygius ssp. americanus* | Moor Rush | | | G5T5 | S1 | | | | | | X | | | | |
| *Juncus vaseyi* | Vasey's Rush | | | G5? | S2 | | | | | X | | | | | |
| *Lemna trisulca* | Star Duckweed | | | G5 | S2 | | | | | X | X | | | | |
| *Listera auriculata* | Auricled Twayblade | | | G3G4 | S2S3 | Y | | | | X | X | | | | |
| *Lycopodium sitchense* | Alaskan Clubmoss | | | G5 | S2 | | | | | | | X | | | |
| *Myriophyllum humile* | Low Water-milfoil | | | G5 | S2 | | | | | X | X | | | | |
| *Nuphar lutea ssp. rubrodisca* | Yellow Pond-lily | | | G5T3-T5 | S2 | | | | | X | X | | | | |
| *Piptatherum canadense* | Canada Mountain Ricegrass | | | G5 | S2 | | | | | | | X | | | |
| *Piptatherum pungens* | Slender Mountain Ricegrass | | | G5 | S2 | | | | | | | X | | | |
| *Platanthera orbiculata var. macrophylla* | Large Roundleaf Orchid | | | G5T4 | S1 | | | | | | | X | | | |

| Scientific Name | Common Name | COSEWIC Status[1] | Provincial status[2] | G Rank[3] | S Rank[4] | Blueprint Target | Other Status[5] | Coarse Resolution Biodiversity Targets | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Beaches, rocky shores and cliffs | Salt marshes | Riparian systems | Freshwater wetlands | Acadian forest mosaic | Grasslands/agro-ecosystems | Caves and calc. sites | Tidal flats |
| *Primula laurentiana* | Bird's-eye Primrose | | | G5 | S1 | | | X | | | | X | | X | |
| *Pseudognaphalium macounii* | Macoun's Rabbit-tobacco | | | G5 | S2 | | | | | | | X | X | | |
| *Pseudognaphalium obtusifolium* | Fragrant Cudweed | | | G5 | S1 | | | | | | | X | X | | |
| *Puccinellia phryganodes* | Creeping Alkali Grass | | | G5 | S2 | | | | X | | | | | | |
| *Rubus pensilvanicus* | Pennsylvania Blackberry | | | G5 | S2? | | | | | | | X | | | |
| *Rubus recurvicaulis* | Arching Dewberry | | | G4? | S2? | | | | | | | X | | | |
| *Salix myrtillifolia var. myrtillifolia* | Myrtle-leaf Willow | | | G5 | S1 | | | | | | | X | | X | |
| *Sanguisorba canadensis* | Canada Burnet | | | G5 | S2 | | | | | | X | | | | |
| *Saxifraga paniculata ssp. neogaea* | White Mountain Saxifrage | | | G5T5? | S1 | | | | | | | X | | X | |
| *Schizaea pusilla* | Curly-grass Fern | | | G3G4 | S1 | | | | | | X | | | | |
| *Scirpus pendulus* | Pendulous Bulrush | | | G5 | S1 | | | | | X | | | | X | |
| *Scrophularia lanceolata* | Hare Figwort | | | G5 | S2 | | | | | | | X | X | | |
| *Selaginella selaginoides* | Low Spikemoss | | | G5 | S2 | | | | | | X | | | X | |
| *Shepherdia canadensis* | Canada Buffaloberry | | | G5 | S2 | | | | | | | X | | X | |
| *Solidago altissima* | Tall Goldenrod | | | G5 | S2 | | | | | X | | | X | | |
| *Solidago multiradiata* | Alpine Goldenrod | | | G5 | S1 | | | X | | | | | | X | |
| *Spiranthes cernua* | White Nodding Ladies'-tresses | | | G5 | S2 | | | | | | | X | | | |
| *Spiranthes lucida* | Shining Ladies'-tresses | | | G5 | S2 | | | | | X | X | | | X | |
| *Spiranthes ochroleuca* | Yellow Nodding Ladies'-tresses | | | G4 | S1 | | | | | | | | X | | |

| Scientific Name | Common Name | COSEWIC Status[1] | Provincial status[2] | G Rank[3] | S Rank[4] | Blueprint Target | Other Status[5] | Coarse Resolution Biodiversity Targets | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Beaches, rocky shores and cliffs | Salt marshes | Riparian systems | Freshwater wetlands | Acadian forest mosaic | Grasslands/agro-ecosystems | Caves and calc. sites | Tidal flats |
| *Stuckenia pectinata* | Sago Pondweed | | | G5 | S2 | | | | | X | X | | | X | |
| *Suaeda rolandii* | Roland's Sea-blite | | | G1G2 | S1 | Y | | | X | | | | | | |
| *Symphyotrichum novi-belgii var. crenifolium* | Longleaf Aster | | | G5TNR | S2? | | | | | X | X | | | | |
| *Triglochin gaspensis* | Gaspe Peninsula Arrow-grass | | | G3G4 | S3 | | | | X | | | | | | |
| *Vaccinium boreale* | Northern Blueberry | | | G4 | S1 | | | | | | X | X | | | |
| *Waldsteinia fragarioides* | Barren Strawberry | | | G5 | S1 | | | | | X | X | X | | | |
| *Woodsia alpina* | Northern Woodsia | | | G4 | S2 | | | | | | | X | | X | |
| ***Invertebrates*** | | | | | | | | | | | | | | | |
| *Alasmidonta undulata* | Triangle Floater | | | G4 | S2 | | | | | X | | | | | |
| *Alasmidonta varicosa* | Brook Floater | Special Concern | Special Concern | G3 | S1S2 | Y | | | | X | | | | | |
| *Callophrys henrici* | Henry's Elfin | | | G5 | S2 | | | | | X | X | X | | | |
| *Danaus plexippus* | Monarch | Special Concern | Special Concern | G5 | S3B | | | | | | X | | | | |
| *Erora laeta* | Early Hairstreak | | | GU | S1 | | | | | | | X | | | |
| *Leptodea ochracea* | Tidewater Mucket | | | G3G4 | S3 | | | | | X | | | | | |
| ***Fish*** | | | | | | | | | | | | | | | |
| *Acipenser oxyrinchus* | Atlantic Sturgeon | Threatened | Threatened | G3 | S3 | Y | | | | X | | | | | |
| *Anguilla rostrata* | American Eel | Threatened | Threatened | G4 | S5 | | | | | X | | | | | |
| *Morone saxatilis* | Striped Bass | Endangered | Endangered | G5 | S2 | | | | | X | | | | | |
| *Salmo salar pop. 1* | Atlantic Salmon - inner Bay of Fundy pop. | Endangered | Endangered | G5TNR | S2 | Y | | | | X | | | | | |

| Scientific Name | Common Name | COSEWIC Status[1] | Provincial status[2] | G Rank[3] | S Rank[4] | Blueprint Target | Other Status[5] | Coarse Resolution Biodiversity Targets | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Beaches, rocky shores and cliffs | Salt marshes | Riparian systems | Freshwater wetlands | Acadian forest mosaic | Grasslands/agro-ecosystems | Caves and calc. sites | Tidal flats |
| *Salvelinus alpinus* | Arctic Char | | | G5 | S1 | | | | | X | | | | | |
| ***Turtles*** | | | | | | | | | | | | | | | |
| *Chelydra serpentina* | Snapping Turtle | Special Concern | Special Concern | G5 | S4 | | | | | X | X | X | | | |
| *Glyptemys insculpta* | Wood Turtle | Threatened | Threatened | G4 | S3 | | | | | X | X | X | X | | |
| ***Amphibians*** | | | | | | | | | | | | | | | |
| *Hemidactylium scutatum* | Four-toed Salamander | Not at Risk | | G5 | S1? | | | | | X | X | X | | | |
| ***Birds*** | | | | | | | | | | | | | | | |
| *Accipiter cooperii* | Cooper's Hawk | Not at Risk | | G5 | S1S2B | | | | | | | X | | | |
| *Accipiter gentilis* | Northern Goshawk | Not at Risk | | G5 | S4 | | ^ | | | | | X | | | |
| *Actitis macularius* | Spotted Sandpiper | | | G5 | S4B | | ^ | X | | X | | X | X | | |
| *Aegolius funereus* | Boreal Owl | Not at Risk | | G5 | S1S2B | | | | | | X | X | | | |
| *Ammodramus nelsoni* | Nelson's Sparrow | Not at Risk | | G5 | S4B | | ^ | | X | | | | X | | |
| *Anas clypeata* | Northern Shoveler | | | G5 | S2B | | | | | X | X | X | X | | X |
| *Anas crecca* | Green-winged Teal | | | G5 | S4S5B | | ^ + | | | X | X | X | X | | |
| *Anas platyrhynchos* | Mallard | | | G5 | S5B,S4N | | ^ | | | X | X | X | X | | |
| *Anas rubripes* | American Black Duck | | | G5 | S5B,S4N | | ^ + | | | X | X | X | X | | |
| *Anas strepera* | Gadwall | | | G5 | S2B | | | | | | X | X | X | | |
| *Antrostomus vociferus* | Eastern Whip-Poor-Will | Threatened | Threatened | G5 | S2B | | ^ | | | | | X | | | |
| *Asio flammeus* | Short-eared Owl | Special Concern | Special Concern | G5 | S3B | | ^ | X | X | X | X | | X | | |
| *Aythya collaris* | Ring-necked Duck | | | G5 | S5B | | ^ | | | | X | | | | |

| Scientific Name | Common Name | COSEWIC Status[1] | Provincial status[2] | G Rank[3] | S Rank[4] | Blueprint Target | Other Status[5] | Coarse Resolution Biodiversity Targets | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Beaches, rocky shores and cliffs | Salt marshes | Riparian systems | Freshwater wetlands | Acadian forest mosaic | Grasslands/agro-ecosystems | Caves and calc. sites | Tidal flats |
| *Bartramia longicauda* | Upland Sandpiper | | | G5 | S1B | Y | | | | | X | | X | | |
| *Bonasa umbellus* | Ruffed Grouse | | | G5 | S5 | | ^ | | | | | X | | | |
| *Botaurus lentiginosus* | American Bittern | | | G4 | S4B | | ^ | | X | | X | | | | |
| *Branta canadensis* | Canada Goose | | | G5 | SNAB,S4M | | ^ + | | | X | X | X | X | | |
| *Bucephala clangula* | Common Goldeneye | | | G5 | S4B,S5M, S4N | | ^ + | | | X | X | | | | |
| *Buteo lineatus* | Red-shouldered Hawk | Not at Risk | | G5 | S2B | | ^ | | | | X | X | | | |
| *Butorides virescens* | Green Heron | | | G5 | S1S2B | | ^ | | | X | X | X | | | |
| *Calidris alba* | Sanderling | | | G5 | S4M,S1N | | + | X | | X | | | | | X |
| *Calidris alpina* | Dunlin | | | G5 | S4M | | + | X | | X | X | X | | | X |
| *Calidris canutus rufa* | Red Knot rufa ssp | Endangered | Endangered | G4T1 | S3M | | + | X | | | | | | | X |
| *Calidris maritima* | Purple Sandpiper | | | G5 | S3M,S3N | | + | X | | | | | | | X |
| *Calidris minutilla* | Least Sandpiper | | | G5 | S4M | | + | X | | X | X | X | | | X |
| *Calidris pusilla* | Semipalmated Sandpiper | | | G5 | S4M | Y | + | X | | X | X | X | | | X |
| *Catharus bicknelli* | Bicknell's Thrush | Threatened | Threatened | G4 | S2S3B | Y | ^ | | | | | X | | | |
| *Catharus fuscescens* | Veery | | | G5 | S4B | | ^ | | | | X | X | | | |
| *Chaetura pelagica* | Chimney Swift | Threatened | Threatened | G5 | S2S3B | | ^ | | | | X | X | | | |
| *Charadrius melodus melodus* | Piping Plover melodus ssp. | Endangered | Endangered | G3TNR | S2B | Y | ^ + | X | | | | | | | X |
| *Charadrius vociferus* | Killdeer | | | G5 | S3B | | ^ | X | | | X | | X | | |

| Scientific Name | Common Name | COSEWIC Status[1] | Provincial status[2] | G Rank[3] | S Rank[4] | Blueprint Target | Other Status[5] | Coarse Resolution Biodiversity Targets | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Beaches, rocky shores and cliffs | Salt marshes | Riparian systems | Freshwater wetlands | Acadian forest mosaic | Grasslands/agro-ecosystems | Caves and calc. sites | Tidal flats |
| *Chlidonias niger* | Black Tern | Not at Risk | | G4 | S2B | | ^ | | | X | X | | X | | X |
| *Chordeiles minor* | Common Nighthawk | Threatened | Threatened | G5 | S3B | | ^ | | | | X | X | X | | |
| *Cistothorus palustris* | Marsh Wren | | | G5 | S2B | | | | X | | X | X | | | |
| *Cistothorus platensis* | Sedge Wren | Not at Risk | | G5 | S1B | Y | | | X | X | X | X | X | | |
| *Clangula hyemalis* | Long-tailed Duck | | | G5 | S4N | | + | | | | X | | | | |
| *Coccothraustes vespertinus* | Evening Grosbeak | | | G5 | S3S4B, S4S5N | | ^ | | | | | X | | | |
| *Coccyzus erythropthalmus* | Black-billed Cuckoo | | | G5 | S4B | | ^ | | | | | X | | | |
| *Contopus cooperi* | Olive-sided Flycatcher | Threatened | Threatened | G4 | S3S4B | | ^ | | | | X | X | | | |
| *Contopus virens* | Eastern Wood-Pewee | Special Concern | Special Concern | G5 | S4B | | ^ | | | | | X | | | |
| *Coturnicops noveboracensis* | Yellow Rail | Special Concern | Special Concern | G4 | S1?B | | ^ | | X | X | X | | X | | |
| *Dolichonyx oryzivorus* | Bobolink | Threatened | Threatened | G5 | S3S4B | | ^ | | | | X | | X | | |
| *Empidonax traillii* | Willow Flycatcher | | | G5 | S1S2B | | | | | X | X | X | | | |
| *Eremophila alpestris* | Horned Lark | | | G5 | S2B | | | | | | | | X | | |
| *Euphagus carolinus* | Rusty Blackbird | Special Concern | Special Concern | G4 | S3B | | ^ | | | X | X | X | | | |
| *Falco peregrinus pop. 1* | Peregrine Falcon - anatum/tundrius | Special Concern | Endangered | G4T4 | S1B | Y | ^ | X | | | | X | | | |
| *Fulica americana* | American Coot | Not at Risk | | G5 | S2B | | | | | X | X | X | | | X |
| *Gallinago delicata* | Wilson's Snipe | | | G5 | S4B | | ^ | | | X | X | X | X | | |
| *Gallinula galeata* | Common Moorhen | | | G5 | S1S2B | | | | | X | X | | | | |

| Scientific Name | Common Name | COSEWIC Status[1] | Provincial status[2] | G Rank[3] | S Rank[4] | Blueprint Target | Other Status[5] | Coarse Resolution Biodiversity Targets | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Beaches, rocky shores and cliffs | Salt marshes | Riparian systems | Freshwater wetlands | Acadian forest mosaic | Grasslands/agro-ecosystems | Caves and calc. sites | Tidal flats |
| *Gavia immer* | Common Loon | Not at Risk | | G5 | S4B,S5M, S4N | | ^ + | | | X | | | | | |
| *Haemorhous purpureus* | Purple Finch | | | G5 | S4S5B | | ^ | | | | | X | | | |
| *Haliaeetus leucocephalus* | Bald Eagle | Not at Risk | Endangered | G5 | S3B | | ^ | X | | X | X | X | | | |
| *Hirundo rustica* | Barn Swallow | Threatened | Threatened | G5 | S3B | | ^ | X | | X | X | X | X | X | |
| *Hylocichla mustelina* | Wood Thrush | Threatened | Threatened | G5 | S1S2B | | ^ | | | | | X | | | |
| *Ixobrychus exilis* | Least Bittern | Threatened | Threatened | G5 | S1S2B | | ^ | | X | | X | | | | |
| *Larus atricilla* | Laughing Gull | | | G5 | S1B | | | X | X | | | | | | X |
| *Limosa haemastica* | Hudsonian Godwit | | | G5 | S3M | | + | X | X | X | X | | X | | X |
| *Megaceryle alcyon* | Belted Kingfisher | | | G5 | S5B | | ^ | X | | X | X | X | | | |
| *Melanitta americana* | Black Scoter | | | G5 | S3M,S2S3N | | + | | | X | X | | | | X |
| *Melanitta perspicillata* | Surf Scoter | | | G5 | S4M,S4N | | + | | | X | X | | | | X |
| *Numenius borealis* | Eskimo Curlew | Endangered | Endangered | GH | SXM | | | X | | | X | | X | | X |
| *Numenius phaeopus* | Whimbrel | | | G5 | S4M | | + | X | | X | X | | X | | X |
| *Nycticorax nycticorax* | Black-crowned Night-heron | | | G5 | S1S2B | | | X | X | X | X | | | | X |
| *Passerculus sandwichensis* | Savannah Sparrow | | | G5 | S5B | Y | | | X | X | X | | X | | |
| *Phalaropus fulicaria* | Red Phalarope | | | G5 | S3M | | + | X | | | | | | | |
| *Phalaropus lobatus* | Red-necked Phalarope | | | G4G5 | S3M | | + | X | X | | | | | | |
| *Phalaropus tricolor* | Wilson's Phalarope | | | G5 | S1B | | | X | X | | X | | X | | X |
| *Picoides arcticus* | Black-backed Woodpecker | | | G5 | S4 | | ^ | | | | X | X | | | |

| Scientific Name | Common Name | COSEWIC Status[1] | Provincial status[2] | G Rank[3] | S Rank[4] | Blueprint Target | Other Status[5] | Coarse Resolution Biodiversity Targets | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Beaches, rocky shores and cliffs | Salt marshes | Riparian systems | Freshwater wetlands | Acadian forest mosaic | Grasslands/agro-ecosystems | Caves and calc. sites | Tidal flats |
| *Picoides dorsalis* | American Three-toed Woodpecker | | | G5 | S3? | | ^ | | | | X | X | | | |
| *Pluvialis dominica* | American Golden-Plover | | | G5 | S3M | | ^ + | X | | | | | X | | X |
| *Pluvialis squatarola* | Black-bellied Plover | | | G5 | S4M | | + | X | X | | | | X | | X |
| *Podilymbus podiceps* | Pied-billed Grebe | | | G5 | S4B | | ^ | | X | | X | | | | |
| *Poecile hudsonica* | Boreal Chickadee | | | G5 | S4 | | ^ | | | | | X | | | |
| *Pooecetes gramineus* | Vesper Sparrow | | | G5 | S2B | | | | | | | | X | | |
| *Progne subis* | Purple Martin | | | G5 | S1S2B | | | | X | X | X | X | X | | X |
| *Rallus limicola* | Virginia Rail | | | G5 | S3B | | ^ | | | | X | X | | | |
| *Riparia riparia* | Bank Swallow | | | G5 | S3B | | ^ | X | | X | | X | | | |
| *Setophaga caerulescens* | Black-throated Blue Warbler | | | G5 | S5B | | ^ | | | | | X | | | |
| *Setophaga castanea* | Bay-breasted Warbler | | | G5 | S4B | | ^ | | | X | | X | | | |
| *Setophaga fusca* | Blackburnian Warbler | | | G5 | S5B | | ^ | | | | | X | | | |
| *Setophaga magnolia* | Magnolia Warbler | | | G5 | S5B | | ^ | | | | X | X | | | |
| *Setophaga ruticilla* | American Redstart | | | G5 | S5B | | ^ | | | | X | X | | | |
| *Setophaga tigrina* | Cape May Warbler | | | G5 | S4B | | ^ | | | | | X | | | |
| *Setophaga virens* | Black-throated Green Warbler | | | G5 | S5B | | ^ | | | | X | X | | | |
| *Somateria mollissima* | Common Eider | | | G5 | S4 | | + | X | X | | | | | | |
| *Sphyrapicus varius* | Yellow-bellied Sapsucker | | | G5 | S5B | | ^ | | | | | X | | | |
| *Sterna hirundo* | Common Tern | Not at Risk | | G5 | S3B | | ^ + | X | X | | | | | | |

| Scientific Name | Common Name | COSEWIC Status[1] | Provincial status[2] | G Rank[3] | S Rank[4] | Blueprint Target | Other Status[5] | Coarse Resolution Biodiversity Targets | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Beaches, rocky shores and cliffs | Salt marshes | Riparian systems | Freshwater wetlands | Acadian forest mosaic | Grasslands/agro-ecosystems | Caves and calc. sites | Tidal flats |
| *Sturnella magna* | Eastern Meadowlark | Threatened | Threatened | G5 | S1S2B | | ^ | | | | | | X | | |
| *Tachycineta bicolor* | Tree Swallow | | | G5 | S4B | | ^ | | | X | X | X | | | |
| *Toxostoma rufum* | Brown Thrasher | | | G5 | S2B | | | | | | | X | | | |
| *Tringa flavipes* | Lesser Yellowlegs | | | G5 | S5M | | ^ + | X | X | X | X | X | | | X |
| *Tringa semipalmata* | Willet | | | G5 | S2S3B | | + | X | X | X | X | X | X | | X |
| *Tringa solitaria* | Solitary Sandpiper | | | G5 | S2B,S5M | | ^ + | | X | X | X | X | | | X |
| *Troglodytes aedon* | House Wren | | | G5 | S1B | | | | | X | X | X | X | | |
| *Tryngites subruficollis* | Buff-breasted Sandpiper | Special Concern | | G4 | SNA | | | X | | X | X | | X | | X |
| *Tyrannus tyrannus* | Eastern Kingbird | | | G5 | S3S4B | | ^ | | | X | X | X | X | | |
| *Vireo solitarius* | Blue-headed Vireo | | | G5 | S5B | | ^ | | | | | X | | | |
| *Wilsonia canadensis* | Canada Warbler | Threatened | Threatened | G5 | S3S4B | | ^ | | | | X | X | | | |
| *Zonotrichia albicollis* | White-throated Sparrow | | | G5 | S5B | | ^ | | | X | X | X | X | | |
| ***Mammals*** | | | | | | | | | | | | | | | |
| *Eptesicus fuscus* | Big Brown Bat | | | G5 | S2? | | | | | X | | X | | X | |
| *Lynx canadensis* | Canada Lynx | Not at Risk | Reg. Endangered | G5 | S1 | Y | | | | | X | X | | | |
| *Myotis lucifugus* | Little Brown Myotis | Endangered | Endangered | G3 | S4 | | | | | X | X | X | X | X | |
| *Myotis septentrionalis* | Northern Myotis | Endangered | Endangered | G1G3 | S4 | | | | | X | X | X | | X | |
| *Perimyotis subflavus* | Tricolored Bat | Endangered | Endangered | G3 | S2? | | | | | X | X | X | X | X | |
| *Puma concolor pop. 1* | Eastern Cougar | Data Deficient | Endangered | G5THQ | SU,SH | | | | | X | | X | | | |

| Scientific Name | Common Name | COSEWIC Status[1] | Provincial status[2] | G Rank[3] | S Rank[4] | Blueprint Target | Other Status[5] | Coarse Resolution Biodiversity Targets | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Beaches, rocky shores and cliffs | Salt marshes | Riparian systems | Freshwater wetlands | Acadian forest mosaic | Grasslands/agro-ecosystems | Caves and calc. sites | Tidal flats |
| *Sorex dispar* | Long-tailed Shrew | Not at Risk | | G4 | S1 | Y | | | | X | X | X | | | |
| *Sorex maritimensis* | Maritime Shrew | | | GNR | S3 | Y | | | | | X | X | | | |

[1] Committee on the Status of Endangered Wildlife in Canada (COSEWIC)
[2] New Brunswick Species at Risk
[3] Global Rank
[4] Sub-national Rank
[5] Other Status: ^ Bird Conservation Region (BCR) 14 Priority Bird Species. Preliminary list obtained from Canadian Wildlife Service (P. Chamberland pers. comm.).
+ Marine Biogeographic Unit (MBU) 11 Priority Bird Species. Preliminary list obtained from Canadian Wildlife Service (A. Benoit pers. comm.).

**APPENDIX D: List of Significant Species for the NB IBoF bioregion with Fine Resolution Habitat Associations**

| Scientific Name | Common Name | Beaches, Rocky Shores and Cliffs | | | Freshwater Wetlands | | | | | | Riparian | | | Acadian Forest Mosaic | | | | | | | Caves and Calc. Sites | | Grasslands/agro-ecosystems | Salt Marsh | Tidal Flats | Data Source | Habitat Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Beach | Rocky Shore | Cliff | Aquatic Bed | Bog | Fen | Emergent WL | Shrub WL | Forested WL | Aquatic | Banks | Floodplain | Coniferous | Deciduous | Mixedwood | Fog Forest | Vernal Pools | Summits and Slopes | Forested Ravines | Caves | Calcareous Sites | | | | | |
| ***Fungi or Lichens*** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Bryoria bicolor* | A lichen | | | X | | | | | | | | | | X | | | X | | X | | | | | | | 1 26 | Coastal rocky summits |
| *Cladonia macrophylla* | A Reindeer Lichen | | | | | | | | | | | | | | | | X | | X | | | | | | | 2 | Rocky, open forest |
| *Cladonia metacorallifera* | A Reindeer Lichen | | | X | | | | | | | | | | X | | | | | X | | | | | | | 2 | Cliffs in dry, open coniferous |
| *Coccocarpia palmicola* | Coccocarpia Lichen | | | | | | | | | | | | | X | | | X | | | X | | | | | | 3 | Moist coniferous forest |
| *Erioderma mollissimum* | Vole Ears | | | | | X | | | | | | | | X | | | X | | | X | | | | | | 4 | Humid coastal coniferous forest |
| *Hydrothyria venosa* | Hydrothyria Lichen | | | | | | | | | | X | | | | | | | | | | | | | | | 5 | Aquatic lichen (streams) |
| *Nephroma arcticum* | Arctic Kidney Lichen | | | | | | | | | | | | | X | | | X | | X | X | | | | | | 6 | Dry rock and coniferous forest floor |
| *Peltigera malacea* | A Dog's tooth Lichen | | | | | | | | | | | | | X | | | X | | X | | | X | | | | 2 | Damp coniferous forest can calcareous sites |
| *Peltigera scabrosa* | A Dog's tooth Lichen | | | X | | | | | | | | | | X | | | | | X | | | | | | | 2 | Conifer forest and alpine cliffs |
| *Pseudevernia cladonia* | Light-and-dark Lichen | | | | | | | | | | | | | X | | | X | | | X | | | | | | 2 | Foggy, cool coniferous forests |
| *Ramalina pollinaria* | Powdery Twig Lichen | | | | | | | | | | | | | X | X | X | X | | | | | | | | | 2 | Coastal hardwood? |
| *Ramalina thrausta* | A lichen | | | | | | | | | | | | | X | | X | X | | | X | | | | | | 2 | Mainly coniferous forest |
| *Stereocaulon subcoralloides* | A lichen | | X | X | | | | | | | | | | | | | | | | | | | | | | 7 | Exposed rock in splash zone above high tide line |
| *Umbilicaria vellea* | A Rocktripe Lichen | | | X | | | | | | | | | | | | | | | X | X | | | | | | 8 | Alpine rocks |
| ***Non-vascular Plants*** | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Scientific Name | Common Name | Beaches, Rocky Shores and Cliffs | | | Freshwater Wetlands | | | | | | Riparian | | | Acadian Forest Mosaic | | | | | | | Caves and Calc. Sites | | Grasslands/agro-ecosystems | Salt Marsh | Tidal Flats | Data Source | Habitat Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Beach | Rocky Shore | Cliff | Aquatic Bed | Bog | Fen | Emergent WL | Shrub WL | Forested WL | Aquatic | Banks | Floodplain | Coniferous | Deciduous | Mixedwood | Fog Forest | Vernal Pools | Summits and Slopes | Forested Ravines | Caves | Calcareous Sites | | | | | |
| *Aloina rigida* | Rigid Screw Moss | | | X | | | | | | | | | | | | | | | X | | | X | | | | 9 | Arid, calcareous soil and rock |
| *Andreaea rothii* | Dusky Rock Moss | | | X | | | | | | | | | | | | | | | X | X | | | | | | 10 | Siliceous rock, cliffs, boulders |
| *Anomobryum filiforme* | Slender Silver Moss | | | X | | | | | | | | | | | | | | | X | X | | | | | | 11 | Cliffs with seepage |
| *Bartramia ithyphylla* | A moss | | | X | | | | | | | | | | | | | | | X | X | | X | | | | 10 | Base-rich rock crevices |
| *Bryum salinum* | A moss | X | X | | | | | | | | | | | | | | | | | | | | | | | 9 | Dune slacks and coastal soil |
| *Campylium polygamum* | Campylium Moss | | | | | | | | | X | | | | X | | X | X | | | X | | | | | | 12 | Moist coniferous and mixedwood forest |
| *Cirriphyllum piliferum* | Cirriphyllum Moss | | | | | | | | | | | | | X | X | X | | | X | X | | X | | | | 13 | Base-rich, moist forested slopes |
| *Dicranella palustris* | Marsh Forklet Moss | | | | | | | X | | | | | | | | | | X | | | | | | | | 9 | Wet springy areas |
| *Dicranoweisia crispula* | A moss | | | | | | | | | | | | | X | X | X | | | | | | | | | | 10 | Tree trunks and rock crevices |
| *Dicranum condensatum* | Condensed Dicranum Moss | | | | | | | | | | | | | X | | X | | | | | | X | | | | 10 | Sandy soil, sandstone and limestone , often with pine |
| *Didymodon fallax var. reflexus* | A moss | | | X | | | | | | | | | | | | | | | X | X | | X | | | | 10 | Soil, ledges and outcrops, limestone and wet areas |
| *Didymodon rigidulus var. gracilis* | A moss | | | X | | | | | | | | | | | | | | | X | X | | X | | | | 10 | Basalt, calcareous outcrops and ledges |
| *Distichium inclinatum* | A moss | | | X | | | | | | | | | | | | | | | X | X | | X | | | | 10 | Calciphilic, sandy soils, rocks, ledges |
| *Fontinalis antipyretica* | Aquatic Moss | | | | X | | | | | | X | | | | | | | | | | | | | | | 14 | Swift or still water |
| *Hamatocaulis vernicosus* | A moss | | | | | | X | | | | | | | | | | | | | | | | | | | 15 | Fens |
| *Hygrobiella laxifolia* | Lax Notchwort | | | | | | | | | | | | X | | | | | | | | | X | | | | 10 | Base-rich riparian areas |
| *Hygrohypnum bestii* | A moss | | | | X | | | | | | X | | | | | | | X | | | | | | | | 16 | Aquatic |

| Scientific Name | Common Name | Beaches, Rocky Shores and Cliffs | | | Freshwater Wetlands | | | | | | Riparian | | | Acadian Forest Mosaic | | | | | | | Caves and Calc. Sites | | Grasslands/agro-ecosystems | Salt Marsh | Tidal Flats | Data Source | Habitat Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Beach | Rocky Shore | Cliff | Aquatic Bed | Bog | Fen | Emergent WL | Shrub WL | Forested WL | Aquatic | Banks | Floodplain | Coniferous | Deciduous | Mixedwood | Fog Forest | Vernal Pools | Summits and Slopes | Forested Ravines | Caves | Calcareous Sites | | | | | |
| *Hygrohypnum montanum* | Mountain Brook Moss | | | | X | | | | | | X | | | | | | | X | | | | | | | | 16 | Aquatic |
| *Plagiomnium rostratum* | A moss | | | | | | | X | | | | | | | | | | | | | | | | | | 15 | Wet meadow |
| *Plagiothecium latebricola* | Lurking Leskea | | | | | | | | X | X | | | X | | X | | | | | | | | | | | 9 | Hardwood swamps and other marshy habitats |
| *Pseudotaxiphyllum distichaceum* | Two-ranked Moss | | | X | | | | | | | | | | | | | | | X | X | | | | | | 10 | Humus banks, sandstone bluffs, and frequently on cliff ledges |
| *Radula tenax* | Tenacious Scalewort | | | | | | | | | | | | | X | | | X | | X | X | | | | | | 10 | Moist, cool coniferous forest |
| *Rhytidiadelphus loreus* | Lanky moss | | | | | | | | | | | | | X | | | X | | | | | | | | | 10 | Coastal, moist coniferous forest floor |
| *Rhytidium rugosum* | Golden Glade - moss | | | | | | | | | | | | | X | X | X | | | X | | | X | | | | 10 | Calcareous ledges, slopes and semi-open dry forests |
| *Seligeria campylopoda* | A moss | | | | | | | | | | | | | | | | | | | | | X | | | | 10 | Calcareous substrates |
| *Seligeria diversifolia* | Diverse-leaved Bristle Moss | | | X | | | | | | | | | | | | | | | X | | | X | | | | 9 | Calcareous rocks and cliffs. |
| *Sphagnum centrale* | A Sphagnum | | | | | | X | | | X | | | | | | | | | | | | | | | | 10 | Rich coniferous and sedge fens |
| *Sphagnum flexuosum* | Flexuous Peatmoss | | | | | | X | | | | | | | | | | | | | | | | | | | 10 | Nutrient poor- medium- fens |
| *Sphagnum lindbergii* | Lindberg's Sphagnum | | | | | X | | | | | | | | | | | | | | | | | | | | 10 | Ombrotrophic bogs |
| *Sphagnum strictum* | A Sphagnum | | | | | X | | | | | | | | X | | | | | X | | | | | | | 10 | Peaty sand, pine barrens, burn-overs and mtn. seaps |
| *Sphagnum torreyanum* | Giant Peatmoss | | | | | | | | | | X | | X | | | | | X | | | | | | | | 9 | Small, slow moving streams and pools |
| *Tayloria serrata* | Slender Splachnum | | | | | | | | | | | | | X | X | X | | | | | | | | | | 18 | Grows on dung, animal remains, humus and occasionally rotting wood |

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| *Tetrodontium brownianum* | Brown's Four-toothed Moss | | | X | | | | | | | | X | | | | | | | X | X | | | | | | 9 | Damp, shaded places, in crevices, recesses of cliffs or rocky banks |
| *Thamnobryum alleghaniense* | Alleghany Thamnobryum Moss | | | X | | | | | | | | | | | | | | | X | X | | X | | | | 9 | Wet face of cliffs, deep gorges, cool ravines, on limestone or acid rock |
| *Timmia norvegica var. excurrens* | Nerved Norwegian Timmia | | | X | | | | | | | | | | | | | | | X | X | | X | | | | 9 | Calcareous cliffs and Mtn. slopes |
| *Tortella humilis* | Small Twisted Moss | | | | | X | | | | X | | X | X | X | X | X | | | | | | | | | | 10 | Cedar swamps and bogs, near streams, hard and softwood forests |
| *Desmatodon obtusifolius* | A moss | | | | | | | | | | | | | | | | | | | | | X | | | | 10 | Calcareous soil and rock |
| ***Vascular Plants*** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Allium tricoccum* | Small White Leek | | | | | | | | | | | | X | | X | | | | | | | | | | | 19 | Rich hardwood stands and bottomlands |
| *Amelanchier fernaldii* | Fernald's Serviceberry | | X | | | | | | | | | | | | | | | | | | | X | | | | 19 | Calcareous thickets and shorelines |
| *Anemone parviflora* | Small-flower Anemone | | | | | | | | | | | | X | | | | | | | | | X | | | | 19 | Wet calcareous ledges and shorelines |
| *Arabis drummondii* | Drummond's Rockcress | | X | | | | | | | | | | | | | | | | X | | | | | | | 19 | Ledges, gravelly shores and rocky thickets |
| *Asplenium trichomanes* | Maidenhair Spleenwort | | | | | | | | | | | | | | | | | | | | | X | | | | 19 | Shaded, calcareous ledges |
| *Atriplex franktonii* | Frankton's Saltbush | X | | | | | | | | | | | | | | | | | | | | | | X | | 19 | Salt marsh and beach |
| *Calamagrostis stricta ssp. inexpansa* | New England Northern Reedgrass | | | | | | | X | | | | | | | | | | | | | | | | X | | 19 | Wet meadows and salt marsh edges |
| *Callitriche* | Autumnal Water- | | | | X | | | | | | | | | | | | | | | | | | | | | 19 | Also found in brackish waters |

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| *hermaphroditica* | starwort | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Calypso bulbosa var. americana* | Fairy Slipper | | | | | | | | | X | | | | X | | | | | | | | X | | | | 19 | Old growth calcareous cedar swamps |
| *Carex albicans var. emmonsii* | Emmons' Sedge | | | | | | | | | | | | | X | | | | | X | | | | | | | 20 | Cedar slopes and clearings |
| *Carex atlantica ssp. atlantica* | Atlantic Sedge | | | | | X | | | X | X | | | | | | | | | | | | | | | | 21 | Bogs and acidic, open, forested swamps |
| *Carex backii* | Back's Sedge | | | | | | | | | | | | | | | | | | X | | | | | | | 19 | Shaded ledges and rocky soil |
| *Carex comosa* | Bristly Sedge | | | | | | | X | | | | | | | | | | | | | | | | | | 19 | Marshy shores |
| *Carex hirtifolia* | Pubescent Sedge | | | | | | | | | | | | X | | X | | | | | | | | | | | 19 | Dry rich woods and rocky floodplains |
| *Carex merritt-fernaldii* | Merritt Fernald's Sedge | | | | | | | | | | | X | | | | | | X | X | | | | | | | 19 | Ledge crevice on Mtn. summit |
| *Carex rostrata* | Beaked Sedge | | | | | X | | X | | | | | | | | | | | | | | | | | | 19 | Boggy shores and meadows |
| *Carex tenuiflora* | Sparse-Flowered Sedge | | | | | X | X | | | | | | | | | | | | | | | X | | | | 19 | Lime rich fens and boggy meadows |
| *Ceratophyllum echinatum* | Prickly Hornwort | | | | X | | | | | | X | | | | | | | | | | | | | | | 19 | Still waters |
| *Chenopodium simplex* | Giant-seed Goosefoot | | | | | | | | | | | | | X | X | X | | | | | | | | | | 19 | Moist Rocky woods |
| *Coeloglossum viride var. virescens* | Long-bracted Green Orchis | | | | | | | | | | | | | | X | | | | | | | X | | | | 19 | Rich woods and meadows, often calcareous |
| *Crataegus scabrida* | Rough Hawthorn | | | | | | | | | | | X | | X | X | X | | | | | | | | | | 19 | Clearings, rocky shores and forest borders |
| *Dirca palustris* | Eastern Leatherwood | | | | | | | | | | | | | | X | X | | | | | | | | | | 19 | Rich deciduous or mixedwood |
| *Draba arabisans* | Rock Whitlow- | | | | | | | | | | | | | | | | | | X | | | X | | | | 19 | Dry calcareous ledges |

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| | Grass | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Draba glabella* | Rock Whitlow-Grass | X | | | | | | | | | | | | | | | | | | | | | | | | 19 | Sand-gravel spit |
| *Dryas integrifolia* | Entire-leaved Mountain-avens | | | | | | | | | | | | | | | | | | | X | | X | | | | 19 | Gypsum cliffs and talus |
| *Dryopteris filix-mas* | Male Fern | | | | | | | | | | | X | X | | X | | | | | | | X | | | | 19 | Limestone substrates |
| *Elymus canadensis* | Canada Wild Rye | | | | | | | | | | | X | X | | | | | | | | | | | | | 19 | Sandy and gravelly banks |
| *Eragrostis pectinacea* | Purple Love Grass | | | | | | | | | | | X | X | | | | | | | | | | | | | 19 | Sandy shores |
| *Eriophorum gracile* | Slender Cotton-grass | | | | | X | X | | | | | | | | | | | | | | | | | | | 19 | Peat bogs and fens |
| *Euphrasia randii* | Small Eyebright | | X | X | | | | | | | | | | | | | | | | | | | | | | 19 | Exposed coastal headlands |
| *Goodyera pubescens* | Downy Rattlesnake-Plantain | | | | | | | | | | | | | X | | X | | | | | | | | | | 19 | Dry-moist coniferous and mixedwood. Often sandy substrates with oak and pine. |
| *Hieracium robinsonii* | Robinson's Hawkweed | | | | | | | | | | | X | X | | | | | | | | | | | | | 19 | Ledge crevices and rocky streamsides |
| *Juncus greenei* | Greene's Rush | | | | | | | X | | | | | | | | | | | | | | | | | | 19 | Wet meadows |
| *Juncus stygius ssp. americanus* | Moor Rush | | | | | X | | | | | | | | | | | | | | | | | | | | 19 | Boggy open ground |
| *Juncus vaseyi* | Vasey's Rush | | | | | | | | | | | | X | | | | | | | | | | | | | 19 | Wet sandy shores and dune hollows |
| *Lemna trisulca* | Star Duckweed | | | | X | | | | | | X | | | | | | | | | | | | | | | 19 | Quiet waters |
| *Listera auriculata* | Auricled Twayblade | | | | | | | | X | X | | X | X | | | | | | | | | | | | | 19 | Alder thickets on rocky stream edge and cedar swamps |
| *Lycopodium sitchense* | Alaskan Clubmoss | | | | | | | | | | | | | X | X | X | | | | | | | | | | 19 | Open dry heathland |

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| *Myriophyllum humile* | Low Water-milfoil | | | | X | | | | | | X | | X | | | | | | | | | | | | 19 | Shallow acid waters and shorelines |
| *Nuphar lutea ssp. rubrodisca* | Yellow Pond-lily | | | | X | | | | | | X | | | | | | | | | | | | | | 19 | Lakes, ponds, sluggish streams and backwaters |
| *Piptatherum canadense* | Canada Mountain Ricegrass | | | | | | | | | | | | | X | X | X | | | | | | | | | 19 | Sandy barrens and rocky clearings |
| *Piptatherum pungens* | Slender Mountain Ricegrass | | | | | | | | | | | | | X | X | X | | | | | | | | | 19 | Rocky or sandy, open woods and clearings |
| *Platanthera orbiculata var. macrophylla* | Large Roundleaf Orchid | | | | | | | | | | | | | | X | | | | | | | | | | 19 | Rich deciduous (sometimes mixed with hemlock). |
| *Primula laurentiana* | Bird's-eye Primrose | | | X | | | | | | | | | | | | | | | X | | | X | | | 19 | Coastal, usually calcareous ledges |
| *Pseudognaphalium macounii* | Macoun's Rabbit-tobacco | | | | | | | | | | | | | X | X | X | | | | | | | X | | 19 | Clearings and disturbed areas |
| *Pseudognaphalium obtusifolium* | Fragrant Cudweed | | | | | | | | | | | | | X | X | X | | | | | | | X | | 19 | Disturbed soil, fields and clearings |
| *Puccinellia phryganodes* | Creeping Alkali Grass | | | | | | | | | | | | | | | | | | | | | | | X | 19 | Sandy or gravelly openings in salt marshes |
| *Rubus pensilvanicus* | Pennsylvania Blackberry | | | | | | | | | | | | | X | X | X | | | | | | | | | 19 | Clearings and roadsides |
| *Rubus recurvicaulis* | Arching Dewberry | | | | | | | | | | | | | X | X | X | | | | | | | | | 19 | Sandy soils |
| *Salix myrtillifolia var. myrtillifolia* | Myrtle-leaf Willow | | | | | | | | | | | | | X | X | X | | | | | | X | | | 19 | Gypsum cliffs and woods |
| *Sanguisorba canadensis* | Canada Burnet | | | | | X | | X | | | | | | | | | | | | | | | | | 19 | Bogs and wet open ground |
| *Saxifraga paniculata ssp. neogaea* | White Mountain Saxifrage | | | | | | | | | | | | | | | | | | X | | | X | | | 19 | Moist calcareous ledges |
| *Schizaea pusilla* | Curly-grass Fern | | | | | X | | | | | | | | | | | | | | | | | | | 19 | Edges of acid bogs |

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| *Scirpus pendulus* | Pendulous Bulrush | | | | | | | | | | | X | | | | | | | | | | X | | | | 19 | Calcareous banks |
| *Scrophularia lanceolata* | Hare Figwort | | | | | | | | | | | | | X | X | X | | | | | | | X | | | 19 | Open woods and old fields |
| *Selaginella selaginoides* | Low Spikemoss | | | | | X | X | | | | | | | | | | | | | | | X | | | | 19 | Calcareous bogs, fens and ledges |
| *Shepherdia canadensis* | Canada Buffaloberry | | | | | | | | | | | | | X | X | X | | | X | | | X | | | | 19 | Calcareous ledges, slopes and open woods |
| *Solidago altissima* | Tall Goldenrod | | | | | | | | | | | | X | | | | | | | | | | X | | | 19 | Alluvial meadows and sandy fields |
| *Solidago multiradiata* | Alpine Goldenrod | | | X | | | | | | | | | | | | | | | | | | X | | | | 19 | Gypsum cliffs |
| *Spiranthes cernua* | White Nodding Ladies'-tresses | | | | | | | | | | | | | X | X | X | | | X | | | | | | | 19 | Sandy open areas and springy slopes |
| *Spiranthes lucida* | Shining Ladies'-tresses | | | | | | | X | X | | | | X | | | | | | | | | X | | | | 19 | Open calcareous rocky river shores, meadows and thickets |
| *Spiranthes ochroleuca* | Yellow Nodding Ladies'-tresses | | | | | | | | | | | | | | | | | | | | | | X | | | 19 | Open disturbed areas |
| *Stuckenia pectinata* | Sago Pondweed | | | | X | | | | | | X | | | | | | | | | | | X | | | | 19 | Brackish and alkaline still water |
| *Suaeda rolandii* | Roland's Sea-blite | | | | | | | | | | | | | | | | | | | | | | | X | | 19 | Salt marsh |
| *Symphyotrichum novi-belgii var. crenifolium* | Longleaf Aster | | | | | | | | X | | | | X | | | | | | | | | | | | | 19 | Thickets and gravelly shores |
| *Triglochin gaspensis* | Gaspe Peninsula Arrow-grass | | | | | | | | | | | | | | | | | | | | | | | X | | 19 | Salt Marsh |
| *Vaccinium boreale* | Northern Blueberry | | | | | X | | | | | | | | | | | | | X | | | | | | | 19 | Peaty barrens (mtn. summit) |
| *Waldsteinia fragarioides* | Barren Strawberry | | | | | | | | X | | | | X | X | X | X | | | | | | | | | | 19 | Thickets, wood edges and shores |
| *Woodsia alpina* | Northern Woodsia | | | | | | | | | | | | | | | | | | X | | | X | | | | 19 | Calcareous ledges |

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| ***Invertebrates*** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Alasmidonta undulata* | Triangle Floater | | | | | | | | | | X | | | | | | | | | | | | | | | 9 | Small streams with gravel and sand |
| *Alasmidonta varicosa* | Brook Floater | | | | | | | | | | X | | | | | | | | | | | | | | | 23 | Shallow rivers or streams |
| *Callophrys henrici* | Henry's Elfin | | | | | X | | | X | | | | X | X | X | X | | | | | | | | | | 9 | Forests, shrub bogs, streamsides |
| *Danaus plexippus* | Monarch | | | | | | | X | X | | | | | | | | | | | | | | | | | 9 | Milkweed dependant |
| *Erora laeta* | Early Hairstreak | | | | | | | | | | | | | | X | X | | | | | | | | | | 9 | Hardwood or mixed forests |
| *Leptodea ochracea* | Tidewater Mucket | | | | | | | | | | X | | | | | | | | | | | | | | | 9 | Shallow rivers or streams |
| ***Fish*** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Acipenser oxyrinchus* | Atlantic Sturgeon | | | | | | | | | | X | | | | | | | | | | | | | | | 9 | Anadromous |
| *Anguilla rostrata* | American Eel | | | | | | | | | | X | | | | | | | | | | | | | | | 9 | Catadromous |
| *Morone saxatilis* | Striped Bass | | | | | | | | | | X | | | | | | | | | | | | | | | 9 | Anadromous |
| *Salmo salar pop. 1* | Atlantic Salmon - inner Bay of Fundy pop. | | | | | | | | | | X | | | | | | | | | | | | | | | 9 | Anadromous |
| *Salvelinus alpinus* | Arctic Char | | | | | | | | | | X | | | | | | | | | | | | | | | 9 | Anadromous |
| ***Turtles*** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Chelydra serpentina* | Snapping Turtle | | | | X | | | X | X | X | X | | X | | | | | X | | | | | | | | 9 25 | All types of freshwater habitats |
| *Glyptemys insculpta* | Wood Turtle | | | | | X | | X | | | X | X | X | | X | | | X | | | | | X | | | 9 25 | Permanent streams but will roam to a variety of terrestrial habitats |
| ***Amphibians*** | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| *Hemidactylium scutatum* | Four-toed Salamander | | | | | X | | X | | X | | | X | | | | | X | | | | | | | | 9 25 | Swamps, boggy streams, wet forest, near ponds or quiet, mossy or grassy/sedgy pools |
| ***Birds*** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Accipiter cooperii* | Cooper's Hawk | | | | | | | | | | | | | X | X | X | | X | | | | | | | | 9 25 | Mature forest, mostly deciduous |
| *Accipiter gentilis* | Northern Goshawk | | | | | | | | | | | | | | X | | | X | | | | | | | | 23 25 | Old hardwood forest |
| *Actitis macularius* | Spotted Sandpiper | X | | | | | | | | | | | X | | | | | X | | | | | X | | | 23 25 | Beaches and riparian/ grasslands/agro-ecosystems near shoreline |
| *Aegolius funereus* | Boreal Owl | | | | | | | | X | | | | | X | | X | | | | | | | | | | 9 | Dense coniferous or mixedwood forest and alder thickets |
| *Ammodramus nelsoni* | Nelson's Sparrow | | | | | | | | | | | | | | | | | | | | | | X | X | | 23 | Grasslands/agro-ecosystems and salt marsh |
| *Anas clypeata* | Northern Shoveler | | | | X | | | X | | | X | | | | | | | X | | | | | X | | X | 9 25 | Open water and grasslands/agro-ecosystems |
| *Anas crecca* | Green-winged Teal | | | | X | | | X | X | | X | | | | | | | X | | | | | X | | | 23 25 | Open water and grasslands/agro-ecosystems |
| *Anas platyrhynchos* | Mallard | | | | X | | | X | X | | X | | | | | | | X | | | | | X | | | 23 25 | Open water and grasslands/agro-ecosystems |
| *Anas rubripes* | American Black Duck | | | | X | | | X | X | | X | | | | | | | X | | | | | X | | | 23 25 | Open water and grasslands/agro-ecosystems |
| *Anas strepera* | Gadwall | | | | X | | | X | X | | | | | | | | | X | | | | | X | | | 9 25 | Open water and grasslands/agro-ecosystems |
| *Antrostomus vociferus* | Eastern Whip-Poor-Will | | | | | | | | | | | | | | X | X | | X | | | | | | | | 23 25 | Open deciduous and mixed forest |
| *Asio flammeus* | Short-eared Owl | | | | | X | | X | X | | | | X | | | | | | | | | | X | X | | 23 | Herbaceous and shrub cover |

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| *Aythya collaris* | Ring-necked Duck | | | | X | | | X | | | | | | | | | | | | | | | | | | 23 | Open water with vegetation |
| *Bartramia longicauda* | Upland Sandpiper | | | | | X | | X | | | | | | | | | | | | | | | X | | | 9 | Dry patches in wet meadows, peat- and grasslands/agro-ecosystems |
| *Bonasa umbellus* | Ruffed Grouse | | | | | | | | | | | | | | X | X | | X | | | | | | | | 23 25 | Mature forest with coarse woody debris |
| *Botaurus lentiginosus* | American Bittern | | | | | X | X | X | X | | | | | | | | | | | | | | | X | | 23 | Wetlands |
| *Branta canadensis* | Canada Goose | | | | X | | | X | | | X | | | | | | | X | | | | | X | | | 23 25 | Open water and herbaceous |
| *Bucephala clangula* | Common Goldeneye | | | | X | | | | | X | X | | | | | | | | | | | | | | | 23 | Mature forest near water |
| *Buteo lineatus* | Red-shouldered Hawk | | | | | | | | | X | | | | | X | X | | X | | | | | | | | 23 25 | Deciduous forest and swamp |
| *Butorides virescens* | Green Heron | | | | | | | X | | | | X | X | | | | | X | | | | | | | | 23 25 | Marsh and shorelines |
| *Calidris alba* | Sanderling | X | | | | | | | | | | | X | | | | | | | | | | | | X | 9 | Beach, mudflats and shorelines |
| *Calidris alpina* | Dunlin | X | | | | X | X | X | | | | | X | | | | | X | | | | | | | X | 9 | Beach, mudflats and shorelines |
| *Calidris canutus rufa* | Red Knot rufa ssp | X | | | | | | | | | | | | | | | | | | | | | | | X | 9 | Coastal areas |
| *Calidris maritima* | Purple Sandpiper | X | X | | | | | | | | | | | | | | | | | | | | | | X | 9 | Coastal areas |
| *Calidris minutilla* | Least Sandpiper | X | X | | | X | X | X | | | | | X | | | | | X | | | | | | | X | 9 | Wetlands and coastal areas |
| *Calidris pusilla* | Semipalmated Sandpiper | X | X | | | | | X | | | | | X | | | | | X | | | | | | | X | 9 | Wetlands and coastal areas |
| *Catharus bicknelli* | Bicknell's Thrush | | | | | | | | | | | | | X | | | | | X | X | | | | | | 23 | High elevation dense conifers |
| *Catharus fuscescens* | Veery | | | | | | | | X | | | | | | X | X | | X | | | | | | | | 23 25 | Moist, 2nd growth forest with dense understory |

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| *Chaetura pelagica* | Chimney Swift | | | | | | | | | X | | | | X | X | X | | X | | | | | | | 23 25 | Mature Pine and Poplar |
| *Charadrius melodus melodus* | Piping Plover melodus ssp. | X | | | | | | | | | | | | | | | | | | | | | | X | 23 | Beaches (sand or cobble) |
| *Charadrius vociferus* | Killdeer | X | | | | | | X | | | | | | | | | | | | | | | X | | 23 | Beach, marsh and grasslands/agro-ecosystems |
| *Chlidonias niger* | Black Tern | | | | X | | | X | | | X | | | | | | | | | | | | X | X | 239 | Wetlands, coastal areas and grasslands/agro-ecosystems |
| *Chordeiles minor* | Common Nighthawk | X | | | | X | | X | | | | | | X | | X | | X | | | | | X | | 23 25 | Mature open forest, bogs, beaches and herbaceous |
| *Cistothorus palustris* | Marsh Wren | | | | | | | X | | | | | | | | | | X | | | | | | X | 9 25 | Fresh and brackish marsh |
| *Cistothorus platensis* | Sedge Wren | | | | | X | X | X | | | | | X | | | | | X | | | | | X | X | 9 25 | Various wet areas and grasslands/agro-ecosystems |
| *Clangula hyemalis* | Long-tailed Duck | | | | | | | | | | X | | | | | | | | | | | | | | 9 | Large water bodies |
| *Coccothraustes vespertinus* | Evening Grosbeak | | | | | | | | | | | | | X | | X | | | | | | | | | 23 | Requires old spruce-fir |
| *Coccyzus erythropthalmus* | Black-billed Cuckoo | | | | | | | | | | | | | | X | X | | | | | | | | | 23 | 2nd growth forest with shrub layer |
| *Contopus cooperi* | Olive-sided Flycatcher | | | | | X | | | | | | | | X | | X | | X | | | | | | | 23 25 | Open areas in old spruce-fir (2nd growth – mature) |
| *Contopus virens* | Eastern Wood-Pewee | | | | | | | | | | | | | | X | X | | X | | | | | | | 23 25 | Old tolerant hardwood |
| *Coturnicops noveboracensis* | Yellow Rail | | | | | | | X | | | | | X | | | | | | | | | | X | X | 23 | Marshy areas and grasslands/agro-ecosystems |
| *Dolichonyx oryzivorus* | Bobolink | | | | | | | X | | | | | | | | | | | | | | | X | | 23 | Grasslands/agro-ecosystems and herbaceous |
| *Empidonax traillii* | Willow Flycatcher | | | | | | | | X | X | | | X | | X | X | | X | | | | | X | | 9 25 | Deciduous wetlands and forest |

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| *Eremophila alpestris* | Horned Lark | | | | | | | | | | | | | | | | | | | | | | X | | | 9 | Grasslands/agro-ecosystems |
| *Euphagus carolinus* | Rusty Blackbird | | | | | X | | | | X | | | X | X | | X | | | | | | | | | | 23 | Moist and swampy forest, bogs |
| *Falco peregrinus pop. 1* | Peregrine Falcon - anatum/tundrius | X | | X | | | | | | | | | | | | | | | X | | | | | | | 23 | Beaches for foraging |
| *Fulica americana* | American Coot | | | | X | X | X | X | | X | X | | X | | | | | X | | | | | | | | X | 9 25 | Wetlands and coastal areas |
| *Gallinago delicata* | Wilson's Snipe | | | | X | X | X | X | X | X | X | | | | | | | X | | | | | X | | | 23 9 | Wetlands and wet grasslands/agro-ecosystems |
| *Gallinula galeata* | Common Moorhen | | | | X | | | X | X | X | X | | | | | | | | | | | | | | | 9 | Wetlands and riparian |
| *Gavia immer* | Common Loon | | | | | | | | | | X | | | | | | | | | | | | | | | 23 9 | Large water bodies with sheltered coves |
| *Haemorhous purpureus* | Purple Finch | | | | | | | | | | | | | | X | X | | | | | | | | | | 23 | Moist deciduous and mixed forest |
| *Haliaeetus leucocephalus* | Bald Eagle | | | X | | | | | | X | | | X | X | X | X | | | | | | | | | | 23 | Mature forest near water |
| *Hirundo rustica* | Barn Swallow | | | X | | | | X | | | | | X | | | | | X | | | X | | X | | | 23 9 25 | Open areas near water |
| *Hylocichla mustelina* | Wood Thrush | | | | | | | | | | | | | | X | X | | X | | | | | | | | 23 25 | Mature forest with dense understory |
| *Ixobrychus exilis* | Least Bittern | | | | | | | X | | | | | | | | | | | | | | | | X | | 23 | Emergent wetlands |
| *Larus atricilla* | Laughing Gull | X | | | | | | | | | | | | | | | | | | | | | | X | X | 9 | Coastal areas |
| *Limosa haemastica* | Hudsonian Godwit | X | | | | X | X | X | | | | | X | | | | | | | | | | X | X | X | 9 | Coastal areas, wetlands and grasslands/agro-ecosystems |
| *Megaceryle alcyon* | Belted Kingfisher | | | X | | | | | | X | | X | X | | | | | X | | | | | | | | 23 9 25 | Water bodies with banks |
| *Melanitta americana* | Black Scoter | | | | X | | | X | | | X | | X | | | | | | | | | | | | X | 9 | Open water, mostly coastal |
| *Melanitta perspicillata* | Surf Scoter | | | | X | X | X | X | | | X | | X | | | | | | | | | | | | X | 9 | Coastal areas and wetlands |

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| *Numenius borealis* | Eskimo Curlew | X | | | | | | X | | | | | | | | | | | | | | | X | | X | 9 | Coastal areas, herbaceous |
| *Numenius phaeopus* | Whimbrel | X | X | | | X | | X | X | | | | X | | | | | | | | | | X | | X | 23 9 | Primarily coastal but breeds in herbaceous-shrub areas |
| *Nycticorax nycticorax* | Black-crowned Night-heron | | X | | X | | | X | X | X | | | X | | | | | | | | | | | X | X | 9 | Wetlands and coastal areas |
| *Passerculus sandwichensis* | Savannah Sparrow | | | | | X | X | X | | | | | X | | | | | | | | | | X | X | | 9 | Herbaceous areas |
| *Phalaropus fulicaria* | Red Phalarope | X | | | | | | | | | | | | | | | | | | | | | | | | 9 | Primarily pelagic |
| *Phalaropus lobatus* | Red-necked Phalarope | X | | | | | | | | | | | | | | | | | | | | | | X | | 9 | Primarily pelagic |
| *Phalaropus tricolor* | Wilson's Phalarope | X | | | | | | X | | | | | | | | | | | | | | | X | X | X | 9 | Wetlands and coastal areas |
| *Picoides arcticus* | Black-backed Woodpecker | | | | | | | | | X | | | | X | | | | | | | | | | | | 23 | Old spruce-fir forest |
| *Picoides dorsalis* | American Three-toed Woodpecker | | | | | | | | | X | | | | X | | X | | | | | | | | | | 23 | Mature, moist-swampy Black Spruce forest |
| *Pluvialis dominica* | American Golden-Plover | X | | | | | | | | | | | | | | | | | | | | | X | | X | 23 | Coastal areas and grasslands/agro-ecosystems |
| *Pluvialis squatarola* | Black-bellied Plover | X | | | | | | | | | | | | | | | | | | | | | X | X | X | 23 | Coastal areas and grasslands/agro-ecosystems |
| *Podilymbus podiceps* | Pied-billed Grebe | | | | X | | | X | | | | | | | | | | | | | | | | X | | 23 | Emergent vegetation with open water |
| *Poecile hudsonica* | Boreal Chickadee | | | | | | | | | | | | | X | | | | | | | | | | | | 23 | Old spruce-fir forest |
| *Pooecetes gramineus* | Vesper Sparrow | | | | | | | | | | | | | | | | | | | | | | X | | | 9 | Grasslands/agro-ecosystems |
| *Progne subis* | Purple Martin | | | | | | | X | | | | | X | X | X | X | | X | | | | | X | X | X | 9 25 | Open areas near water |
| *Rallus limicola* | Virginia Rail | | | | X | | | X | | | | | | | | | | X | | | | | | | | 23 25 | Shallow water with emergent vegetation |

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| *Riparia riparia* | Bank Swallow | | | X | | | | | | | | X | | | | | | X | | | | | | | | 23 25 | Banks and cliffs with sandy soil |
| *Setophaga caerulescens* | Black-throated Blue Warbler | | | | | | | | | | | | | | X | X | | | | | | | | | | 23 | Old growth tolerant hardwood forest |
| *Setophaga castanea* | Bay-breasted Warbler | | | | | | | | | | | | X | X | | X | | | | | | | | | | 23 | Old spruce-fir forest |
| *Setophaga fusca* | Blackburnian Warbler | | | | | | | | | | | | | X | X | X | | | | | | | | | | 23 | Old mixedwood forest |
| *Setophaga magnolia* | Magnolia Warbler | | | | | X | | | | | | | | X | | | | | | | | | | | | 23 | Dense conifers and peat bogs |
| *Setophaga ruticilla* | American Redstart | | | | | | | | | X | | | | X | X | X | | | | | | | | | | 23 | Forest with dense understory, near water |
| *Setophaga tigrina* | Cape May Warbler | | | | | | | | | | | | | X | | | | | | | | | | | | 23 | Old spruce-fir forest |
| *Setophaga virens* | Black-throated Green Warbler | | | | | | | | X | | | | | X | | X | | | | | | | | | | 23 | Mature forest and shrubland |
| *Somateria mollissima* | Common Eider | X | X | | | | | | | | | | | | | | | | | | | | | X | | 9 | Coastal areas |
| *Sphyrapicus varius* | Yellow-bellied Sapsucker | | | | | | | | | | | | | | X | X | | X | | | | | | | | 23 25 | Old intolerant hardwood |
| *Sterna hirundo* | Common Tern | X | | | | | | | | | | | | | | | | | | | | | | X | | 23 9 | Prefers islands in large water bodies. Nests on beaches |
| *Sturnella magna* | Eastern Meadowlark | | | | | | | | | | | | | | | | | | | | | | X | | | 9 | Grasslands/agro-ecosystems |
| *Tachycineta bicolor* | Tree Swallow | | | | | | | X | | X | | | X | | | | | X | | | | | | | | 23 9 25 | Tree cavities near water |
| *Toxostoma rufum* | Brown Thrasher | | | | | | | | | | | | | | X | | | | | | | | | | | 9 | Thickets in deciduous clearings |
| *Tringa flavipes* | Lesser Yellowlegs | X | | | | X | | X | | X | | | X | | | | | X | | | | | | X | X | 23 9 | Coastal areas and wetlands |
| *Tringa semipalmata* | Willet | X | X | | X | | | X | | | | | X | | | | | X | | | | | X | X | X | 9 | Coastal areas and wetlands |

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| *Tringa solitaria* | Solitary Sandpiper | | | | | X | X | X | | X | | | X | X | X | X | | X | | | | | | X | X | 23 9 | Forested wetlands and coastal areas |
| *Troglodytes aedon* | House Wren | | | | | | | | X | X | | | X | X | X | X | | | | | | | X | | | 9 | Dense thickets in forest |
| *Tryngites subruficollis* | Buff-breasted Sandpiper | X | | | | | | X | | | | X | X | | | | | | | | | | X | | X | 9 | Coastal areas and wetlands |
| *Tyrannus tyrannus* | Eastern Kingbird | | | | | | | X | X | X | | | X | X | X | X | | X | | | | | X | | | 23 9 25 | Forest edges with shrub cover near water |
| *Vireo solitarius* | Blue-headed Vireo | | | | | | | | | | | | | X | | X | | | | | | | | | | 23 | Old spruce-fir forest |
| *Wilsonia canadensis* | Canada Warbler | | | | | | | | | X | | | | X | X | X | | | | | | | | | | 23 | Moist forest / wetland with dense understory |
| *Zonotrichia albicollis* | White-throated Sparrow | | | | | X | X | X | X | X | | | X | X | X | X | | X | | | | | X | | | 23 9 25 | Forest with shrubby areas |
| ***Mammals*** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Eptesicus fuscus* | Big Brown Bat | | | | | | | | | | | | X | X | X | X | | X | | | X | | | | | 9 25 | Wooded areas and caves |
| *Lynx canadensis* | Canada Lynx | | | | | | | | | X | | | | X | | X | | X | | | | | | | | 9 25 | Prefers old coniferous forest |
| *Myotis lucifugus* | Little Brown Myotis | | | | | X | X | X | | X | | | X | | X | X | | X | | | X | | X | | | 9 25 | Wide range of habitats |
| *Myotis septentrionalis* | Northern Myotis | | | | | | | | | X | | | X | X | X | X | | X | | | X | | | | | 9 25 | Old forest |
| *Perimyotis subflavus* | Tricolored Bat | | | | | | | | | X | | | X | | X | | | X | | | X | | X | | | 9 25 | Open forest and edges |
| *Puma concolor pop. 1* | Eastern Cougar | | | | | | | | | | | | X | X | X | X | | | X | | | | | | | 9 | Mountainous forest |
| *Sorex dispar* | Long-tailed Shrew | | | | | | | | | | | | X | | X | X | | | X | X | | | | | | 9 | Forest with loose talus |
| *Sorex maritimensis* | Maritime Shrew | | | | | | | X | | | | | | X | | | | X | | | | | | | | 24 | Wetland specialist |
| **Totals by Fine-filter Habitat:** | | 28 | 12 | 25 | 28 | 36 | 18 | 58 | 26 | 34 | 32 | 15 | 57 | 65 | 60 | 63 | 9 | 52 | 37 | 19 | 5 | 33 | 43 | 25 | 25 | | |

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| **Totals by Coarse-filter Habitat:** | | 65 | 200 | 104 | 305 | 38 | 43 | 25 | 25 | | |

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**APPENDIX E: List of S3 Species for the NB IBoF bioregion**

| Scientific Name | Common Name | G Rank | S Rank |
|---|---|---|---|
| ***Fungi or Lichens*** | | | |
| *Anzia colpodes* | Black Foam Lichen | G3G5 | S3 |
| *Cladonia carneola* | Crowned Pixie-cup | G5 | S3? |
| *Cladonia farinacea* | A Reindeer Lichen | G3G5 | S3? |
| *Cladonia sulphurina* | A Reindeer Lichen | G5? | S2S3? |
| *Dermatocarpon luridum* | Silverskin Lichen | G4G5 | S3?S4? |
| *Leptogium laceroides* | A lichen | G5 | S3 |
| *Leptogium lichenoides* | A lichen | G5 | S3 |
| *Nephroma bellum* | A lichen | G3G5 | S2S3 |
| *Peltigera membranacea* | A Dog's tooth Lichen | G4G5 | S3 |
| *Pannaria pezizoides* | A lichen | G4G5 | S3 |
| *Solorina saccata* | Common Chocolate-chip Lichen | G3G5 | S3 |
| *Sphaerophorus globosus* | Globe Ball Lichen | G4G5 | S2S3 |
| *Usnea strigosa* | An Old Man's Beard Lichen | G5? | S3 |
| ***Non-vascular Plants*** | | | |
| *Cladopodiella francisci* | Holt's Notchwort | G3G5 | S1S3 |
| *Harpanthus flotovianus* | Great Mountain Flapwort | G5 | S1S3 |
| *Huperzia appalachiana* | Appalachian Fir-clubmoss | G4G5 | S3 |
| *Jungermannia obovata* | Egg Flapwort | G4G5 | S1S3 |
| *Lophozia ascendens* | Small Notchwort | G4 | S1S3 |
| *Pleuridium subulatum* | A Moss | G5 | S3 |
| *Scapania gymnostomophila* | Narrow-leaved Earwort | G4 | S1S3 |
| *Sphagnum lescurii* | Yellow Peatmoss | G5 | S3? |
| *Tritomaria scitula* | Mountain Notchwort | G4 | S1S3 |
| ***Vascular Plants*** | | | |

| Scientific Name | Common Name | G Rank | S Rank |
|---|---|---|---|
| *Amelanchier canadensis* | Oblong-leaf Serviceberry | G5 | S3 |
| *Arabis hirsuta var. pycnocarpa* | Western Hairy Rockcress | G5T5 | S3 |
| *Artemisia campestris ssp. caudata* | Beach Wormwood | G5T5 | S3 |
| *Asplenium trichomanes-ramosum* | Green Spleenwort | G4 | S3 |
| *Bartonia paniculata ssp. iodandra* | Twining Screwstem | G5T3T5 | S2S3 |
| *Boloria chariclea* | Arctic Fritillary | G5 | S3 |
| *Botrychium dissectum* | Cutleaf Grapefern | G5 | S3 |
| *Botrychium lanceolatum var. angustisegmentum* | Lanceleaf Grapefern | G5TNR | S3 |
| *Botrychium simplex* | Least Grapefern | G5 | S3 |
| *Bromus latiglumis* | Broad-Glumed Brome | G5 | S3 |
| *Cardamine maxima* | Large Toothwort | G5 | S3 |
| *Carex adusta* | Crowded Sedge | G5 | S2S3 |
| *Carex arcta* | Northern Clustered Sedge | G5 | S3 |
| *Carex capillaris* | Hairlike Sedge | G5 | S3 |
| *Carex chordorrhiza* | Creeping Sedge | G5 | S3 |
| *Carex eburnea* | Bristle-leaved Sedge | G5 | S3 |
| *Carex exilis* | Coast Sedge | G5 | S3 |
| *Carex michauxiana* | Michaux's Sedge | G5 | S3 |
| *Carex ormostachya* | Necklace Spike Sedge | G4 | S3 |
| *Carex recta* | Salt-marsh Sedge | G4 | S3 |
| *Carex tenera* | Slender Sedge | G5 | S3 |
| *Carex tuckermanii* | Tuckerman's Sedge | G4 | S3 |
| *Carex wiegandii* | Wiegand's Sedge | G4 | S3 |
| *Clematis occidentalis* | Purple Clematis | G5 | S3 |
| *Corallorhiza maculata var. occidentalis* | Spotted Coralroot | G5T3T5 | S2S3 |

| Scientific Name | Common Name | G Rank | S Rank |
|---|---|---|---|
| *Cryptogramma stelleri* | Fragile Rockbrake | G5 | S3 |
| *Cyperus esculentus* | Chufa Flatsedge | G5 | S3 |
| *Cypripedium reginae* | Showy Lady's-Slipper | G4 | S3 |
| *Dryopteris fragrans var. remotiuscula* | Fragrant Fern | G5T3T5 | S3 |
| *Elatine americana* | American Waterwort | G4 | S2S3 |
| *Elatine minima* | Small Waterwort | G5 | S3 |
| *Epilobium hornemannii ssp. hornemannii* | Hornemann's Willowherb | G5T5 | S3 |
| *Epilobium strictum* | Downy Willowherb | G5? | S3 |
| *Erigeron hyssopifolius* | Daisy Fleabane | G5 | S3 |
| *Eriophorum chamissonis* | Russet Cotton-Grass | G5 | S3 |
| *Galium labradoricum* | Bog Bedstraw | G5 | S2S3 |
| *Geocaulon lividum* | Northern Comandra | G5 | S3 |
| *Geranium bicknellii* | Bicknell's Northern Crane's-bill | G5 | S3 |
| *Geranium robertianum* | Herb-Robert | G5 | S2S3 |
| *Isoetes tuckermanii* | Tuckerman's Quillwort | G4? | S3 |
| *Lycopodium hickeyi* | Hickey's Clubmoss | G5 | S3 |
| *Lycopodium sabinifolium* | Ground-Fir | G4 | S3 |
| *Muhlenbergia frondosa* | Wirestem Muhly | G5 | S3 |
| *Myriophyllum farwellii* | Farwell's Water-milfoil | G5 | S3 |
| *Myriophyllum verticillatum* | Whorled Water-milfoil | G5 | S3 |
| *Nuphar lutea ssp. pumila* | Yellow Cow-lily | G5T4T5 | S3 |
| *Ophioglossum pusillum* | Northern Adder's-tongue | G5 | S2S3 |
| *Panax trifolius* | Dwarf Ginseng | G5 | S3 |
| *Pilea pumila* | Canada Clearweed | G5 | S3 |
| *Platanthera blephariglottis* | White Fringed-orchis | G4G5 | S3 |

| Scientific Name | Common Name | G Rank | S Rank |
|---|---|---|---|
| *Platanthera grandiflora* | Large Purple-fringe Orchis | G5 | S3 |
| *Poa glauca* | White Bluegrass | G5 | S3 |
| *Polygonum arifolium* | Halberd-leaf Tearthumb | G5 | S3 |
| *Polygonum punctatum var. confertiflorum* | Dotted Smartweed | G5T5 | S3 |
| *Polypodium appalachianum* | Appalachian Rockcap Fern | G4G5 | S3 |
| *Potamogeton obtusifolius* | Blunt-leaf Pondweed | G5 | S3 |
| *Pyrola minor* | Lesser Wintergreen | G5 | S3 |
| *Ranunculus gmelinii* | Small Yellow Water-crowfoot | G5 | S3 |
| *Rhodiola rosea* | Roseroot Stonecrop | G5 | S3 |
| *Rhynchospora capitellata* | Brownish Beakrush | G5 | S3 |
| *Rhynchospora fusca* | Brown Beakrush | G4G5 | S3 |
| *Rosa palustris* | Swamp Rose | G5 | S3 |
| *Rubus chamaemorus* | Cloudberry | G5 | S3 |
| *Rumex maritimus* | Sea-Side Dock | G5 | S3 |
| *Salix myricoides* | Blueleaf Willow | G4 | S3 |
| *Salix pedicellaris* | Bog Willow | G5 | S3 |
| *Schoenoplectus fluviatilis* | River Bulrush | G5 | S2S3 |
| *Stellaria humifusa* | Creeping Sandwort | G5? | S3 |
| *Subularia aquatica var. americana* | Water Awlwort | G5T5 | S3 |
| *Symphyotrichum boreale* | Boreal Aster | G5 | S3 |
| *Trichophorum clintonii* | Clinton's Clubrush | G4 | S3 |
| *Trisetum melicoides* | Purple False Oats | G4 | S3 |
| *Vaccinium caespitosum* | Dwarf Huckleberry | G5 | S3 |
| *Veronica serpyllifolia ssp. humifusa* | Thymeleaf Speedwell | G5T5? | S3 |
| *Viola adunca* | Sand Violet | G5 | S3 |

| Scientific Name | Common Name | G Rank | S Rank |
|---|---|---|---|
| *Viola nephrophylla* | Northern Bog Violet | G5 | S3 |
| *Woodsia glabella* | Smooth Woodsia | G5 | S3 |
| *Xyris montana* | Northern Yellow-eyed-grass | G4 | S3 |
| *Zannichellia palustris* | Horned Pondweed | G5 | S3 |
| ***Invertebrates*** | | | |
| *Cicindela hirticollis* | Hairy-necked Tiger Beetle | G5 | S2S3 |
| *Plebejus idas* | Northern Blue | G5 | S3 |
| *Lycaena hyllus* | Bronze Copper | G5 | S3 |
| *Nymphalis l-album j-album* | Compton Tortoiseshell | G5T5 | S3 |
| *Plebejus saepiolus* | Greenish Blue | G5 | S3 |
| *Satyrium acadica* | Acadian Hairstreak | G5 | S3 |
| *Somatochlora cingulata* | Lake Emerald | G5 | S3 |
| *Somatochlora forcipata* | Forcipate Emerald | G5 | S3 |
| *Stylurus scudderi* | Zebra Clubtail | G4 | S3 |
| *Williamsonia fletcheri* | Ebony Boghaunter | G4 | S3 |
| ***Amphibians*** | | | |
| *Desmognathus fuscus* | Northern Dusky Salamander | G5 | S3 |
| ***Birds*** | | | |
| *Anas acuta* | Northern Pintail | G5 | S3B |
| *Anas americana* | American Wigeon | G5 | S3B |
| *Asio otus* | Long-eared Owl | G5 | S2S3 |
| *Bucephala albeola* | Bufflehead | G5 | S3N |
| *Cathartes aura* | Turkey Vulture | G5 | S3B |
| *Cepphus grylle* | Black Guillemot | G5 | S3 |
| *Larus delawarensis* | Ring-billed Gull | G5 | S3B |

| Scientific Name | Common Name | G Rank | S Rank |
|---|---|---|---|
| *Loxia curvirostra* | Red Crossbill | G5 | S3 |
| *Mimus polyglottos* | Northern Mockingbird | G5 | S3B |
| *Molothrus ater* | Brown-headed Cowbird | G5 | S3B |
| *Myiarchus crinitus* | Great Crested Flycatcher | G5 | S3B |
| *Oxyura jamaicensis* | Ruddy Duck | G5 | S1B,S4N |
| *Passerina cyanea* | Indigo Bunting | G5 | S3B |
| ***Mammals*** | | | |
| *Globicephala melas* | Long-finned Pilot Whale | G5 | S2S3 |
| *Synaptomys cooperi* | Southern Bog Lemming | G5 | S3 |

**Appendix F: IUCN Threats Classification Scheme (Version 3.2; taken directly from the IUCN website)**

The hierarchical structure of the threat types as listed on the species Fact Sheets is shown here.

Direct threats are the proximate human activities or processes that have impacted, are impacting, or may impact the the status of the taxon being assessed (e.g., unsustainable fishing or logging). Direct threats are synonymous with sources of stress and proximate pressures.

In using this hierarchical classification of causes of species decline, Assessors are asked to indicate the threats that triggered the listing of the taxon concerned at the lowest level possible. These threats could be in the past ("historical, unlikely to return" or "historical, likely to return"), "ongoing", and/or likely to occur in the "future", using a time frame of three generations or ten years, whichever is the longer (not exceeding 100 years in the future) as required by the Red List Criteria. The 'Major Threats' referred to in the 'Required and Recommended Supporting Information for IUCN Red List Assessments', are threats coded as having High or Medium impacts (see threat impact scoring below).

The attached working document provides a list of the threat types with definitions, examples of the threats and guidance notes on using the scheme. Comments on the Threats Classification Scheme are welcome - click feedback.

**Note:** Any analysis of the threats should preferably take into account the timing, scope and severity of the threats (threat impact scores) and also how the threats impact the taxa concerned as recorded by the stresses. These additional attributes, with the exception of the impact scores, are displayed on the Red List web site for instances where this information has been coded.

**1 Residential & commercial development**
- 1.1 Housing & urban areas
- 1.2 Commercial & industrial areas
- 1.3 Tourism & recreation areas

**2 Agriculture & aquaculture**
- 2.1 Annual & perennial non-timber crops
  - 2.1.1 Shifting agriculture
  - 2.1.2 Small-holder farming
  - 2.1.3 Agro-industry farming
  - 2.1.4 Scale Unknown/Unrecorded
- 2.2 Wood & pulp plantations
  - 2.2.1 Small-holder plantations
  - 2.2.2 Agro-industry plantations
  - 2.2.3 Scale Unknown/Unrecorded
- 2.3 Livestock farming & ranching
  - 2.3.1 Nomadic grazing
  - 2.3.2 Small-holder grazing, ranching or farming
  - 2.3.3 Agro-industry grazing, ranching or farming
  - 2.3.4 Scale Unknown/Unrecorded
- 2.4 Marine & freshwater aquaculture
  - 2.4.1 Subsistence/artisinal aquaculture
  - 2.4.2 Industrial aquaculture
  - 2.4.3 Scale Unknown/Unrecorded

**3 Energy production & mining**

- 3.1 Oil & gas drilling
- 3.2 Mining & quarrying
- 3.3 Renewable energy

**4 Transportation & service corridors**

- 4.1 Roads & railroads
- 4.2 Utility & service lines
- 4.3 Shipping lanes
- 4.4 Flight paths

**5 Biological resource use**

- 5.1 Hunting & collecting terrestrial animals
  - 5.1.1 Intentional use (species being assessed is the target)
  - 5.1.2 Unintentional effects (species being assessed is not the target)
  - 5.1.3 Persecution/control
  - 5.1.4 Motivation Unknown/Unrecorded
- 5.2 Gathering terrestrial plants
  - 5.2.1 Intentional use (species being assessed is the target)
  - 5.2.2 Unintentional effects (species being assessed is not the target)
  - 5.2.3 Persecution/control
  - 5.2.4 Motivation Unknown/Unrecorded
- 5.3 Logging & wood harvesting
  - 5.3.1 Intentional use: subsistence/small scale (species being assessed is the target) [harvest]
  - 5.3.2 Intentional use: large scale (species being assessed is the target) [harvest]
  - 5.3.3 Unintentional effects: subsistence/small scale (species being assessed is not the target) [harvest]
  - 5.3.4 Unintentional effects: large scale (species being assessed is not the target) [harvest]
  - 5.3.5 Motivation Unknown/Unrecorded
- 5.4 Fishing & harvesting aquatic resources
  - 5.4.1 Intentional use: subsistence/small scale (species being assessed is the target) [harvest]
  - 5.4.2 Intentional use: large scale (species being assessed is the target) [harvest]
  - 5.4.3 Unintentional effects: subsistence/small scale (species being assessed is not the target) [harvest]
  - 5.4.4 Unintentional effects: large scale (species being assessed is not the target) [harvest]
  - 5.4.5 Persecution/control
  - 5.4.6 Motivation Unknown/Unrecorded

**6 Human intrusions & disturbance**

- 6.1 Recreational activities
- 6.2 War, civil unrest & military exercises
- 6.3 Work & other activities

**7 Natural system modifications**

- 7.1 Fire & fire suppression
  - 7.1.1 Increase in fire frequency/intensity

7.1.2 Suppression in fire frequency/intensity
7.1.3 Trend Unknown/Unrecorded
7.2 Dams & water management/use
7.2.1 Abstraction of surface water (domestic use)
7.2.2 Abstraction of surface water (commercial use)
7.2.3 Abstraction of surface water (agricultural use)
7.2.4 Abstraction of surface water (unknown use)
7.2.5 Abstraction of ground water (domestic use)
7.2.6 Abstraction of ground water (commercial use)
7.2.7 Abstraction of ground water (agricultural use)
7.2.8 Abstraction of ground water (unknown use)
7.2.9 Small dams
7.2.10 Large dams
7.2.11 Dams (size unknown)
7.3 Other ecosystem modifications

**8 Invasive & other problematic species, genes & diseases**
8.1 Invasive non-native/alien species/diseases
8.1.1 Unspecified species
8.1.2 Named species
8.2 Problematic native species/diseases
8.2.1 Unspecified species
8.2.2 Named species
8.3 Introduced genetic material
8.4 Problematic species/diseases of unknown origin
8.4.1 Unspecified species
8.4.2 Named species
8.5 Viral/prion-induced diseases
8.5.1 Unspecified "species" (disease)
8.5.2 Named "species" (disease)
8.6 Diseases of unknown cause

**9 Pollution**
9.1 Domestic & urban waste water
9.1.1 Sewage
9.1.2 Run-off
9.1.3 Type Unknown/Unrecorded
9.2 Industrial & military effluents
9.2.1 Oil spills
9.2.2 Seepage from mining
9.2.3 Type Unknown/Unrecorded
9.3 Agricultural & forestry effluents
9.3.1 Nutrient loads
9.3.2 Soil erosion, sedimentation
9.3.3 Herbicides and pesticides
9.3.4 Type Unknown/Unrecorded
9.4 Garbage & solid waste
9.5 Air-borne pollutants
9.5.1 Acid rain
9.5.2 Smog

9.5.3 Ozone
9.5.4 Type Unknown/Unrecorded
9.6 Excess energy
9.6.1 Light pollution
9.6.2 Thermal pollution
9.6.3 Noise pollution
9.6.4 Type Unknown/Unrecorded

**10 Geological events**
10.1 Volcanoes
10.2 Earthquakes/tsunamis
10.3 Avalanches/landslides

**11 Climate change & severe weather**
11.1 Habitat shifting & alteration
11.2 Droughts
11.3 Temperature extremes
11.4 Storms & flooding
11.5 Other impacts

**12 Other options**
12.1 Other threat

**Appendix G: IUCN Conservation Actions Classification Scheme (Version 2.0; taken directly from the IUCN website)**

The hierarchical structure for the Conservation Actions Needed as show on the species Fact Sheets is provided here.
Assessors are asked to use this Classification Scheme to indicate the conservation actions or measures that are needed for the plant or animal concerned. In suggesting what actions are needed, assessors are asked to be realistic and not simply select everything. The selection should be for those actions that are most urgent, significant and important; and that they could realistically be achieved within the next five years.The actions needed should also be informed by the conservation actions already in place.
The attached working document provides a list of the conservation actions needed with definitions, examples of the actions and guidance notes on using the scheme. Comments on the Conservation Actions Needed Classification Scheme are welcome - click feedback.

**1 Land/water protection**
- 1.1 Site/area protection
- 1.2 Resource & habitat protection

**2 Land/water management**
- 2.1 Site/area management
- 2.2 Invasive/problematic species control
- 2.3 Habitat & natural process restoration

**3 Species management**
- 3.1 Species management
  - 3.1.1 Harvest management
  - 3.1.2 Trade management
  - 3.1.3 Limiting population growth
- 3.2 Species recovery
- 3.3 Species re-introduction
  - 3.3.1 Reintroduction
  - 3.3.2 Benign introduction
- 3.4 Ex-situ conservation
  - 3.4.1 Captive breeding/artificial propagation
  - 3.4.2 Genome resource bank

**4 Education & awareness**
- 4.1 Formal education
- 4.2 Training
- 4.3 Awareness & communications

**5 Law & policy**
- 5.1 Legislation
  - 5.1.1 International level
  - 5.1.2 National level
  - 5.1.3 Sub-national level
  - 5.1.4 Scale unspecified
- 5.2 Policies and regulations
- 5.3 Private sector standards & codes
- 5.4 Compliance and enforcement

5.4.1 International level
5.4.2 National level
5.4.3 Sub-national level
5.4.4 Scale unspecified

**6 Livelihood, economic & other incentives**

6.1 Linked enterprises & livelihood alternatives
6.2 Substitution
6.3 Market forces
6.4 Conservation payments
6.5 Non-monetary values

**APPENDIX H: Methodology: Conservation Actions Prioritisation**

## 1. Purpose of Analysis

The prioritization methodology used in this report identified areas within the NB IBoF bioregion where conservation efforts should be concentrated. The goal is to achieve the best possible impact in the areas that are the most critical for the defined priority habitats while minimizing threats to those habitats.

## 2. Focal Area Selection

The main goal of identifying Focal Areas is to concentrate efforts in a few locations to increase the effectiveness of conservation activities such as landowner contact and to promote the creation of large land assemblies. This includes building on existing protected areas secured by partners. Properties outside of Focal Areas may be considered as opportunities arise.

Focal Areas were selected based on output from the prioritization analysis (see Appendix J). The Focal Area maps are simply zoomed in versions of the original prioritization to show greater detail at the property level. The FA boundaries were determined by encompassing the greatest concentrations of Priority 1 and 2 areas. Major fragmentation features were also considered and avoided if possible with the boundary delineation (e.g., major highway, harvested area, major river). All areas with high densities of Priority 1 and Priority 2 were examined and small subsets of these were identified for conservation action in the HCS.

## 3. Conservation Prioritization

The process for assigning priority ranks within the NB IBoF bioregion involved weighting (scoring) certain characteristics of the priority habitats higher than others. Wherever possible, weighting criteria included size (e.g., minimum patch size), representivity (by ecodistrict) and uniqueness (rarity within each ecodistrict and within the bioregion). The methodology was deliberately designed to promote parcels of land that contained larger patches of priority habitats, those that were not adequately represented within current protected areas and rare/priority species and habitat occurrences. The more high quality priority habitatsan area contained, the higher the priority rank it received. Promoting small extents of multiple priority habitatswas avoided by selecting minimum size criteria for habitat-based biodiversity habitats. Higher scores were given to areas with larger patches of ecosystems selected as biodiversity habitats. All parcels of land that were 2 acres or smaller were removed from the prioritization analysis in order to avoid prioritizing developed areas. Existing protected areas and other conservation lands were included in the analysis.

## 4. Data Pre-Processing

All priority habitatswere directly included in the prioritization analysis except cliffs. By nature, cliffs are linear features that do not lend themselves to spatial methodologies that allow for prioritization.

*Target data sources*

- Beaches and Rocky Shores – All beaches and rocky shores were selected from the provincial wetland Inventory database (WT = BC and RK). All provincial beaches and rocky shores were erased using NAAP critical occurrences of these two habitat types in order to create a seamless layer.
- Salt marsh – Salt marsh was selected from the provincial wetland Inventory database and included a number of salt pond occurrences within the bioregion (WT = SA and SL). All provincial salt marshes were erased using NAAP critical occurrences of this habitat type in order to create a seamless layer. A 275 metre buffer was applied to all of the polygons (Environment Canada et al. 1998).

- Freshwater Wetlands – Six types of freshwater wetlands were located within the bioregion according to the provincial wetland inventory: Bog, Fen, Emergent Wetland, Aquatic Bed, Forested Wetland and Shrub Wetland (WT = BO, FE, EW, AB, FW, SW, respectively). All provincial freshwater wetlands were erased using NAAP critical occurrences in order to create a seamless layer. A 275 metre buffer was applied to all of the polygons (Environment Canada et al. 1998).
- Acadian Forest Mosaic – using the provincial forest inventory, stand types were grouped together into communities using provincial community groupings. These groupings were further grouped into old forest communities using the following methods adapted from the provincial Old Forest Community definition guidelines (NBDNR 2011):
    - All forest polygons tiles were merged together.
    - Only mature (M) and overmature (O) were exported out using the L1DS field.
    - All polygons with the following treatment attributes were selected and deleted using the L1TRT field (580 records):
        - Clear Cut (CC)
        - Plantation cleaning (CL)
        - Intermediate or semi-commercial thin (IT)
        - Commercial Thin (CT)
        - Fill Planting (FP)
        - Planting (PL)
        - Regeneration protection clear cut (RC)
        - Pre-commercial thinning (TI)
        - Two pass cut (TP)
        - Family test (FP) and Progeny test (PT) sere selected for removal but had no records in the inventory.
    - Old Forest Communities were queried and exported following the Provincial definitions:
        - **Old Tolerant Hardwood Habitat (OTHH)**
            - Tolerant Hardwood Pure (THP)
            - Tolerant Hardwood-Softwood (THSW)
            - Tolerant Hardwood-Intolerant Hardwood (THIH)
        - **Old Hardwood Habitat (OHWH)**[1]
            - Intolerant Hardwood Mix (IHMX)
        - **Old Pine Habitat (PINE)**
            - Red Pine (RP)
            - White Pine (WP)
        - **Old Spruce-Fir Habitat (OSFH)**[2]
            - Eastern Cedar (CE)
            - Eastern hemlock (EH)
            - Red Spruce (RS)
            - Black Spruce – moderate (BSM)[3]
            - White Spruce (WS)
            - Balsam Fir (BF)
            - Tolerant Softwood (TOSW)
            - Softwood – Tolerant Hardwood (SWTH)

[1] The Old Hardwood Habitat group also includes the three communities within the OTHH group within the provincial definitions. However, these were removed to prevent overlap of polygons within our analyses.
[2] OSFH also included the "SP" veg community, which represents Spruce dominated habitat, although there is no reference to this category in the Provincial definitions.

        - Softwood Mix (SWMX)
    - **Other Old Forest Habitat (OOFH)**
        - Jack Pine (JP)
        - Tamarack (TL)
        - Black Spruce – poor (BSP)[3]
        - Black Spruce – wet (BSW)[1]

  Critical occurrences of steep slopes, summits and forested ravines were used to erase the old forest community patches. Similarly, forest types of particular concern (Eastern Hemlock, Eastern White Cedar, White Pine, Red Pine) were taken from the provincial Conservation Forest layer to give higher weighting. These polygons were used to erase the old forest communities.
- Riparian Areas – Riparian areas were taken from a variety of sources including NAAP critical riparian areas, river systems of the COSEWIC-designated inner Bay of Fundy Atlantic Salmon (275m buffer), priority wood turtle habitat (from CWS), all other major river systems as determined within the provincial watercourse inventory (275m Buffer).
- Caves and Calcareous areas – Cave locations were received as point layers from the New Brunswick Museum. Calcareous areas were taken from the provincial bedrock inventory (Unit = Windsor Group) as well as the provincial soil inventory (Soil Type = SS and EB).
- Tidal Flats – All tidal flats were selected from the provincial wetland Inventory database (WT = TF). All provincial tidal flats were erased using NAAP critical occurrences in order to create a seamless layer.
- Grasslands/agro-ecosystems – Grasslands/agro-ecosystems were selected from the provincial non-forest inventory based on recommendations from Bird Studies Canada and Canadian Wildlife Service. (Land used for airstrips: AI; Blueberry Production: CB; Croplands: CL; Orchards: CO; Dykelands: FD; Fallow Pasture: FP; Landscaped areas: LE).

**Cleaning the Data**

The first step prior to the prioritization analysis was to clean the GIS data before assignment of weights on the habitats was calculated. In order to avoid weighting polygons based on topographic errors, all polygons of the same habitat type were dissolved in ArcGIS to eliminate any insignificant boundaries between contiguous patches. The selected patches were then dissolved to form new contiguous polygons. Area of each patch was recalculated using "Calculate Geometry" and weights were then assigned based on the new area of the dissolved polygons.

**Weighting the Data**

For each habitat/biodiversity habitat, final scores between 0 and 1 were assigned, the latter representing completely suitable habitat for nested habitats. All NAAP habitat occurrences deemed critical were assigned a value of 1. All other habitat occurrences (except for caves, calcareous areas and riparian areas – see below) were scored using a three-tiered equation (with the exception of grasslands/agro-ecosystems, which were solely weighted on size criteria) that equally divides the scoring by habitat uniqueness, representivity and size.

Uniqueness

Conceptually, variations in enduring features across the landscape (geology, climate, topography and soils) can potentially result in different ecological attributes of a habitat type (for example, high elevation bogs host different specie assemblages than coastal blanket bogs). In order to address the potential differences of habitat types across the bioregion, each habitat type was categorized by the

[1] Black Spruce categories are based on landscape features as they relate to soil moisture. These categories are determined using the Wet-areas Mapping tool (BSW < 25cm DTW, BSP 25-100cm DTW, BSM > 100cm DTW).

ecodistrict in which it was located (see Zelazny 2007). To determine the uniqueness of each categorized habitat type across the bioregion, two area based assessments were conducted ($U_1$ and $U_2$) as follows:

$$U_1 = 1 - \left( \frac{Habitat_{NA-Ecodistrict}}{Habitat_{NA-Total}} \right)$$

$$U_2 = 1 - \left( \frac{Habitat_{NA-Total}}{Ecosystem_{NA-Total}} \right)$$

Where *Habitat* refers to the specific form of habitat (such as Bog) that contributes to the overall *Ecosystem* (such as Freshwater Wetlands). Subscript *bioregion-Ecodistrict* denotes the portion of ecodistrict area that is within the bioregion boundary and subscript *bioregion* denotes the total area within the bioregion. The final uniqueness score is calculated as:

$$Uniqueness = \frac{(U_1 + U_2)}{2}$$

This method of calculating uniqueness gives equal weighting to each of the 2 area based assessments. $U_1$ addresses the uniqueness of each categorized habitat as compared to all other occurrences of the same habitat within the bioregion (for example, uniqueness of bogs along the Fundy coast as compared to all other bogs within the bioregion), and $U_2$ addresses the uniqueness of the habitat type in general (for example, the uniqueness of bogs as compared to all other freshwater wetlands within the bioregion).

For habitat types that are within their own habitat category (salt marsh, tidal flats, beaches, rocky shores), the $U_2$ equation was not relevant and the final uniqueness score for these habitats was based on the output of the $U_1$ equation.

Representivity

Using the enduring feature approach discussed above, representivity was calculated using two area based assessments ($R_1$ and $R_2$), as follows:

$$R_1 = \frac{Ecodistrict_{NA}}{Ecodistrict_{Total}}$$

$$R_2 = \frac{Habitat_{NA-Ecodistrict}}{Habitat_{Ecodistrict}}$$

where *Ecodistrict* refers to the land area in total (subscript *Total*) and portion of land area within the bioregion (subscript *bioregion*) for each ecodistrict. The subscript *Ecodistrict* refers to the total amount of each habitat within the ecodistrict, regardless of the proportion that is within the bioregion boundary. The final representivity score is calculated as:

$$Representivity = 1 - \left( \frac{R_1}{R_2} \right)$$

This method of calculating representivity accounts for the total area each ecodistrict represents within the bioregion boundary ($R_1$) and this number is prorated by the percent of habitat that occurs within the portion of the ecodistrict within the bioregion. Conceptually, if both $R_1$ and $R_2$ are equal, than the habitat type is equally represented across the ecodistrict, both inside and outside the bioregion boundary (*Representivity* = 0). If $R_1$ is smaller than $R_2$, than a higher proportion of habitat is located within the bioregion portion of the ecodistrict, which results in a higher score (*Representivity* > 0). If $R_1$ is larger than $R_2$, than a lower proportion of habitat is located within the bioregion portion of the ecodistrict than outside of it. This results in a negative score (*Representivity* < 0), meaning that the habitat type is more represented outside the bioregion portion of the ecodistrict. All negative values are converted to 0.

Size

Size is calculated for each occurrence of each habitat type across the bioregion. For example, if the habitat met the minimum size criteria based on the NAAP, it would receive a score of "1". If it was below the minimum size threshold, then it received a score from 0 to 0.99 depending on the size of the patch. The sliding scale was calculated by dividing the actual patch size by the minimum patch size. Patches of habitat that are close to the minimum patch size will receive a higher score than those which are smaller. Smaller patches are still used by many species and may offer other benefits other than nesting or breeding grounds; however the larger patches offer the greatest benefit to all species. See table H.1 below for a summary of size criteria used within the analyses.

Table H.1. Minimum size criteria for each habitat type within the NB IBoF bioregion analyses.

| **Habitat habitat** | **Minimum Size Acres (ac)** | **Minimum Size Hectares (ha)** |
|---|---|---|
| Beaches | 20 | 8.1 |
| Rocky Shores | 10 | 4.0 |
| Salt Marsh | 60 | 24.3 |
| Tidal Flats | 100 | 40.5 |
| Freshwater Wetlands | 50 | 20.2 |
| Riparian Areas | 100 | 40.5 |
| Grasslands/agro-ecosystems | 25 | 10.1 |
| **Acadian Forest Mosaic**[1] | | |
| Tolerant Hardwood (OTHH) | 98.8 | 40 |
| Intolerant Hardwood (OHWH) | 74.1 | 30 |
| Spruce / Fir (OSFH) | 926.6 | 375 |
| Pine (PINE) | 24.7 | 10 |
| Other (OOFH) | 926.6 | 375 |

*Final Habitat Weighting*

The final score for each habitat type was calculated as:

[1] For old forest communities, patch sizes were adapted from the Provincial Old Forest Community and Wildlife Habitat Definitions. The largest patch size for each community was used in the analysis to capture all species that were identified for each community type.

$$Score = \frac{(Uniqueness + Representivity + Size)}{3}$$

This gives equal value to each of the uniqueness, representivity and size categories.

*Buffer Weighting*
Salt marsh and freshwater wetland habitat habitats were assigned buffers of 275m. Buffers were assigned the score of their respective habitat occurrence. Where 2 buffers overlapped, priority was given to the higher score, both within the same layer as well as between layers.

**Species Analyses**
As part of collaboration with the Canadian Wildlife Service and other conservation organizations within the Maritime region, a biodiversity composite was developed for New Brunswick. The objective of the composite was to determine "biodiversity hotspots" across the province, which was then used within the bioregion boundary to determine areas of high conservation value. See Appendix K for a complete methodology of the New Brunswick Biodiversity Composite.

**Combining the Data**
Once all vector layers (shapefiles) and species composites (GRIDS) were prepared, each was converted into raster format using a cell size of 10m. A small cell size was based on the error of the data layers and was used in order to ensure the resolution of the data would not be generalized. All rasters were then overlaid and added together to give an overall scoring across the bioregion (using the Cell Statistics tool). Each biodiversity habitat was weighted the same when the final score was calculated. Table H.2 shows the list of all rasters that were combined for prioritization with their respective scoring.

Table H.2. List of rasterized layers used in the bioregion analyses with their respective scoring range.

| Prioritization Raster | Scoring Values |
|---|---|
| Beaches and Rocky Shores | 0.05 - 1 |
| Salt marsh | 0.18 - 1 |
| Tidal Flats | 0.19 - 1 |
| Acadian Forest Mosaic | 0.18 - 1 |
| Freshwater wetlands | 0.19 - 1 |
| Buffers (salt marsh and freshwater wetlands) | 0.19 - 1 |
| General biodiversity species composite | 0.2 - 1 |
| Species-at-risk composite | 0.2 - 1 |
| Calcareous Areas | 0.2 |
| Riparian Areas | 0.2 |
| Grasslands/agro-ecosystems | 0.1 - 1 |

**Post-hoc prioritization Analysis**
A number of shapefile datasets were received as point layers. In order to include these in the prioirtization analysis they were assigned buffers and given values following the table below:

| Point Layer | Buffer Width (m) | Score and comments |
|---|---|---|
| Caves | 100 | 0.8; when overlaid on calcareous areas = 1 |
| ACCDC Communities | 100 | 1; When overlaid on forest habitat values did not exceed 1. |
| Vernal Pools | 10 | 0.2; When overlaid on forest habitat values did not exceed 1. |

**RESULTS**

The results of the final prioritization (Fig. 21) seem to be consistent with firsthand knowledge of conditions across the NB IBoF bioregion, although the results of this analysis should be used in combination with field visits and local knowledge. A P3 rank does not indicate that an area is of little conservation value rather it is of lesser conservation value than P1 or P2 areas.

**Summary Table**

**Table H.3: Summary results of the property prioritization in the Eastern Shore Forest and Coast bioregion**

| Priority Ranking | Break Values/Scores | Acres (ac) | Hectares (ha) | % of bioregion |
|---|---|---|---|---|
| P1 | >1 | 156 003 | 63 132 | 13 |
| P2 | 0.8 - 1 | 94 245 | 38 140 | 8 |
| P3 | 0.6 – 0.8 | 177 077 | 71 661 | 15 |
| No Priority | 0 – 0.6 | 686 015 | 277 261 | 57 |
| Protected | N/A | 80 053 | 32 396 | 7 |
| Total | N/A | 1 193 393 | 482 950 | 100 |

**APPENDIX I: Shorebird species seen in the Bay of Fundy - New Brunswick**

Key: A = accidental, M = migratory, B = breeding, R = rare

Northern Lapwing / Vanneau huppé (*Vanellus vanellus*) A
Black-bellied Plover / Pluvier argenté (*Pluvialis squatarola*) M
American Golden-Plover / Pluvier bronzé (*Pluvialis dominica*) M
Semipalmated Plover / Pluvier semipalmé (*Charadrius semipalmatus*) M*
Piping Plover / Pluvier siffleur (*Charadrius melodus*) B
Killdeer / Pluvier kildir (*Charadrius vociferus*) B
American Oystercatcher / Huîtrier d'Amérique (*Haematopus palliatus*) R
Black-necked Stilt / Échasse d'Amérique (*Himantopus mexicanus*) A
American Avocet / Avocette d'Amérique (*Recurvirostra americana*) R
Greater Yellowlegs / Grand Chevalier (*Tringa melanoleuca*) M
Lesser Yellowlegs / Petit Chevalier (*Tringa flavipes*) M
Solitary Sandpiper / Chevalier solitaire (*Tringa solitaria*) MB
Willet / Chevalier semipalmé (*Catoptrophorus semipalmatus*) B
Spotted Sandpiper / Chevalier grivelé (*Actitis macularia*) B
Upland Sandpiper / Maubèche des champs (*Bartramia longicauda*) B
Eskimo Curlew / Courlis esquimau (*Numenius borealis*) A
Whimbrel / Courlis corlieu (*Numenius phaeopus*) M
Long-billed Curlew / Courlis à long bec (*Numenius americanus*) A
Hudsonian Godwit / Barge hudsonienne (*Limosa haemastica*) M
Marbled Godwit / Barge marbrée (*Limosa fedoa*) R
Ruddy Turnstone / Tournepierre à collier (*Arenaria interpres*) M
Red Knot / Bécasseau maubèche (*Calidris canutus*) M
Sanderling / Bécasseau sanderling (*Calidris alba*) M
Semipalmated Sandpiper / Bécasseau semipalmé (*Calidris pusilla*) M
Western Sandpiper / Bécasseau d'Alaska (*Calidris mauri*) M
Little Stint / Bécasseau minute (*Calidris minuta*) A
Least Sandpiper / Bécasseau minuscule (*Calidris minutilla*) M
White-rumped Sandpiper / Bécasseau à croupion blanc (*Calidris fuscicollis*) M
Baird's Sandpiper / Bécasseau de Baird (*Calidris bairdii*) M
Pectoral Sandpiper / Bécasseau à poitrine cendrée (*Calidris melanotos*) M
Purple Sandpiper / Bécasseau violet (*Calidris maritima*) M
Dunlin / Bécasseau variable (*Calidris alpina*) M
Curlew Sandpiper / Bécasseau cocorli (*Calidris ferruginea*) R
Stilt Sandpiper / Bécasseau à échasses (*Calidris himantopus*) M
Buff-breasted Sandpiper / Bécasseau roussâtre (*Tryngites subruficollis*) M
Ruff / Combattant varié (*Philomachus pugnax*) R
Short-billed Dowitcher / Bécassin roux (*Limnodromus griseus*) M
Long-billed Dowitcher / Bécassin à long bec (*Limnodromus scolopaceus*) M
Wilson's Snipe / Bécassine des marais (*Gallinago delicata*) B
American Woodcock / Bécasse d'Amérique (*Scolopax minor*) B
Wilson's Phalarope / Phalarope de Wilson (*Phalaropus tricolor*) B
Red Phalarope / Phalarope à bec large (*Phalaropus fulicarius*) M

**APPENDIX J: NAAP Target Species descriptions and definitions**

Peregrine Falcon

The *anatum* subspecies of Peregrine Falcon (*Falco peregrinus anatum*) is designated as a species of Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The Peregrine Falcon is a long-winged raptor that specializes in direct pursuit of prey in the open, and nests mostly on precipitous cliffs. As a result, it favours non-forested areas, particularly shores, marshes, river valleys, open moors, and tundra. Continental populations of this species have shown continuing increases in population size since the 1970s up to near historical numbers. Population thresholds have been achieved for the *anatum* subspecies which resulted in the species being downlisted from Threatened to Special Concern by COSEWIC in 2007. This recovery has been the result of reintroductions across much of southern Canada, and natural increases in productivity following the ban in Canada of organochlorine pesticides (e.g., DDT). Since their re-introduction to the Bay of Fundy by Environment Canada in the mid-1980s, the Peregrine Falcon has become re-established as a viable population in the Fundy ecosystem. Peregrines are the main predator of Semipalmated Sandpipers in Chignecto Bay, and nest sites are located on Grindstone Island, just to the east of Marys Point, as well as Edgetts Landing, 5 km south of Hillsborough on the upper Shepody Bay (Minich 2007).

Maritime Shrew

The Maritime Shrew (*Sorex maritimensis*) has no COSEWIC designation but is ranked as uncommon or restricted in New Brunswick and is only known to occur in one location within the bioregion. The Maritime Shrew was recently elevated to species status, as it was originally considered a subspecies. It was selected as an NAAP critical species as it is endemic to the Maritimes. It is considered to be a wetland habitat specialist, a habitat type which is highly fragmented in the Maritimes, raising concern for the persistence of this endemic species. Contiguous wetland habitats are important for maintaining connectivity and gene flow between populations of the Maritime Shrew (Dawe 2005).

Long-tailed Shrew

The Long-tailed Shrew (*Sorex dispar*) is designated Not At Risk by COSEWIC but was selected as an NAAP critical species as it is an Appalachian Mountains endemic. The Long-tailed Shrew prefers forested habitats (deciduous or evergreen) with loose talus. Rocky damp areas with deep crevices covered by leaf mold and roots are preferred, and it may also occur along small mountain streams (Natureserve 2008). Nest sites are usually associated with natural subterranean tunnels among boulder crevices. Breeding occurs in spring and summer, possibly late April to August (Kirkland and Van Deuen 1979).

Brook Floater

A rare freshwater mussel, the Brook Floater (*Alasmidonta varicosa*) is designated as a species of Special Concern by COSEWIC. It is present at a number of localities within the Petitcodiac river system, which is one of the few New Brunswick river systems that have had repeated mollusc surveys. The Brook Floater has a status of threatened in the United States and as such was selected as a primary species in the NAAP. It is rare in the Petitcodiac and is not found in Canada outside of New Brunswick and Nova Scotia. Researchers with the Department of Fisheries and Oceans believe the host of this mussel may be the Alewife (*Alosa pseudoharengus*) or Blueback Herring (*Alosa aestivalis*) (LeBlanc 2000).

Semipalmated Sandpiper

The Semipalmated Sandpiper has no COSEWIC designation, but is considered an NAAP primary species due to the high percentage of the global population (75%) that depends on the inner Bay of Fundy tidal flats and beaches as a migratory stopover. The Semipalmated Sandpiper is by far the most numerous shorebird species within the bioregion, and it depends on the large expanses of tidal flats teeming with food resources, including lipid-rich *Corophium volutator*. In North America, *C. volutator* occurs only in

the Gulf of Maine. In late spring, densities of juvenile *C. volutator* are as high as 60,000 per square metre; by the end of August, when Semipalmated Sandpipers are present, densities are reduced to 3,000-5,000 per square metre (P. Hicklin pers. comm.). These are important findings because in recent years shorebird distributions have changed in the inner Bay of Fundy (P. Hicklin pers. comm). Semipalmated Sandpiper numbers have shown declines in almost all major analyses, yet both the cause and the true extent of the decline are poorly understood (Donaldson et al. 2000; NABCI Canada 2012). An important component of the decline is likely related to factors affecting survival of adults and juveniles during migration or at their southern wintering grounds, rather than productivity at subarctic breeding grounds (Hitchcock and Gratto-Trevor 1997).

Upland Sandpiper

The Upland Sandpiper (*Bartramia longicauda*) has no COSEWIC designation, but is considered an NAAP primary species target due to the limited breeding locales within the ecoregion. The Upland Sandpiper, as the name suggests, does not depend on estuarine habitat like other shorebirds. It prefers upland areas that are open and treeless such as grasslands/agro-ecosystems, but is also known to use peatlands as breeding sites (Calme and Haddad 1996).

Sedge Wren

The Sedge Wren (*Cistothorus platensis*) is designated Not At Risk by COSEWIC. It was once common in parts of the ecoregion but is now very rare and was therefore selected as an NAAP critical species target. The Sedge Wren appears to be one of the most nomadic terrestrial birds in North America, with breeding concentrated in widely different portions of its range at different times of the breeding season. Owing to its erratic movements, generally low site fidelity, and secretive habits, there have been relatively few field studies of this species, and thus many aspects of its natural history remain poorly known (Herkert et al. 2001).

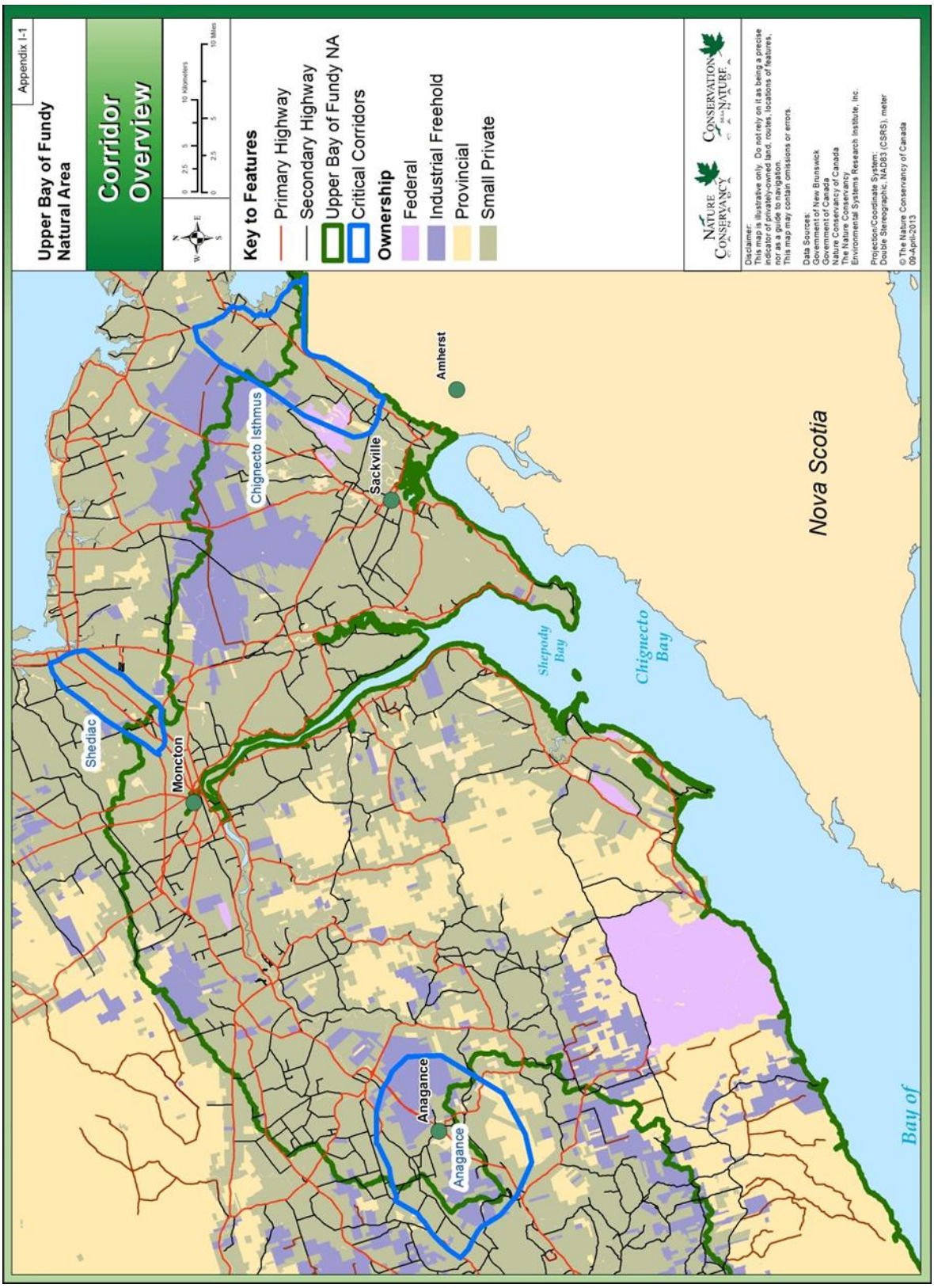
Robinson's Hawkweed

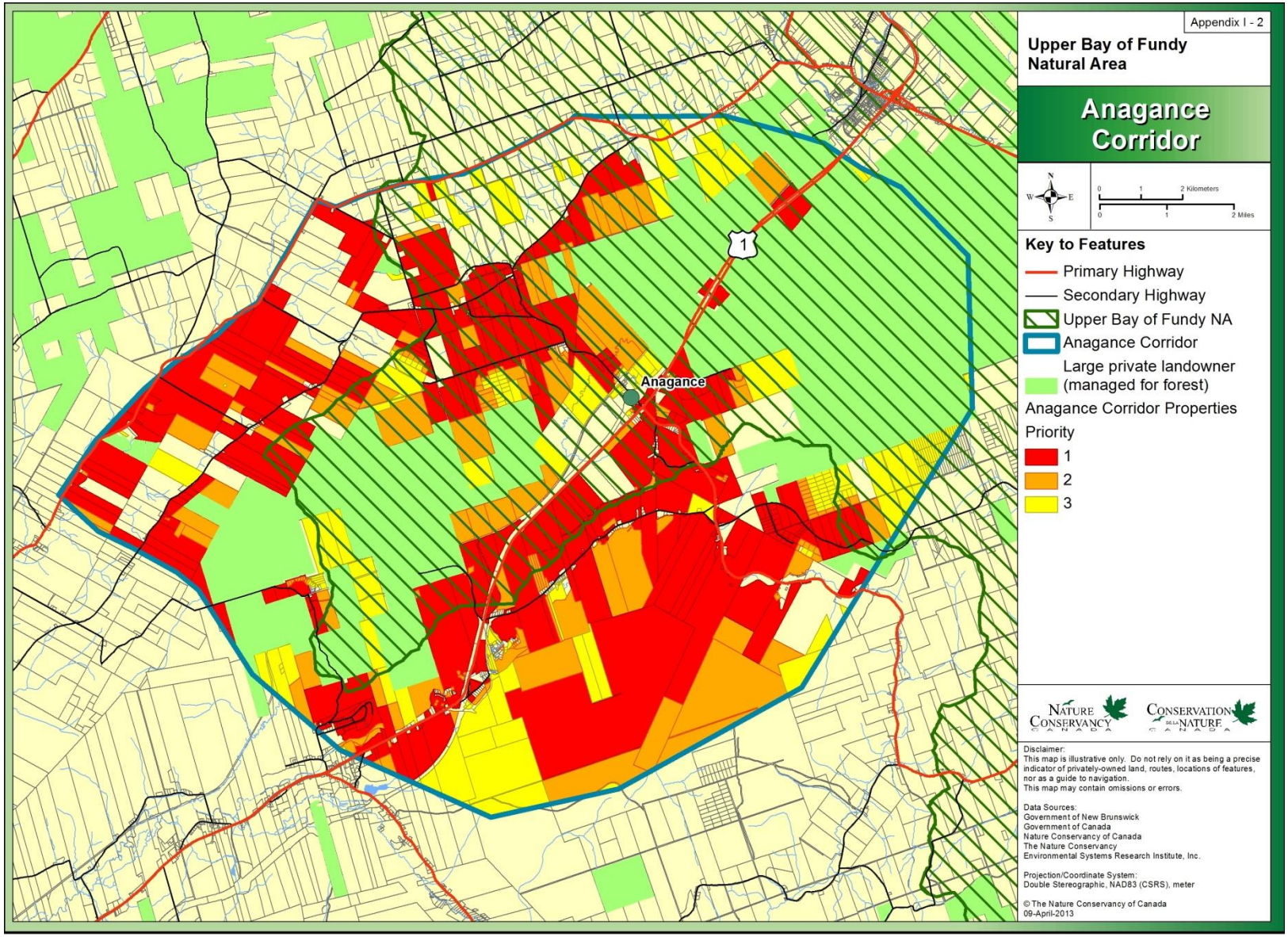
Robinson's Hawkweed (*Hieracium robinsonii*) has no COSEWIC designation, but is considered an NAAP primary species target due to its global significance (G2G3). This perennial species is only known within eastern Canada and New Hampshire. As with all members of the genus *Hieracium*, the species is apomictic, and can form viable seeds without pollination or fertilization. Across its range it appears to prefer calcareous sites on ledges, rocks, cliffs and gravel shores (Schori 2003).

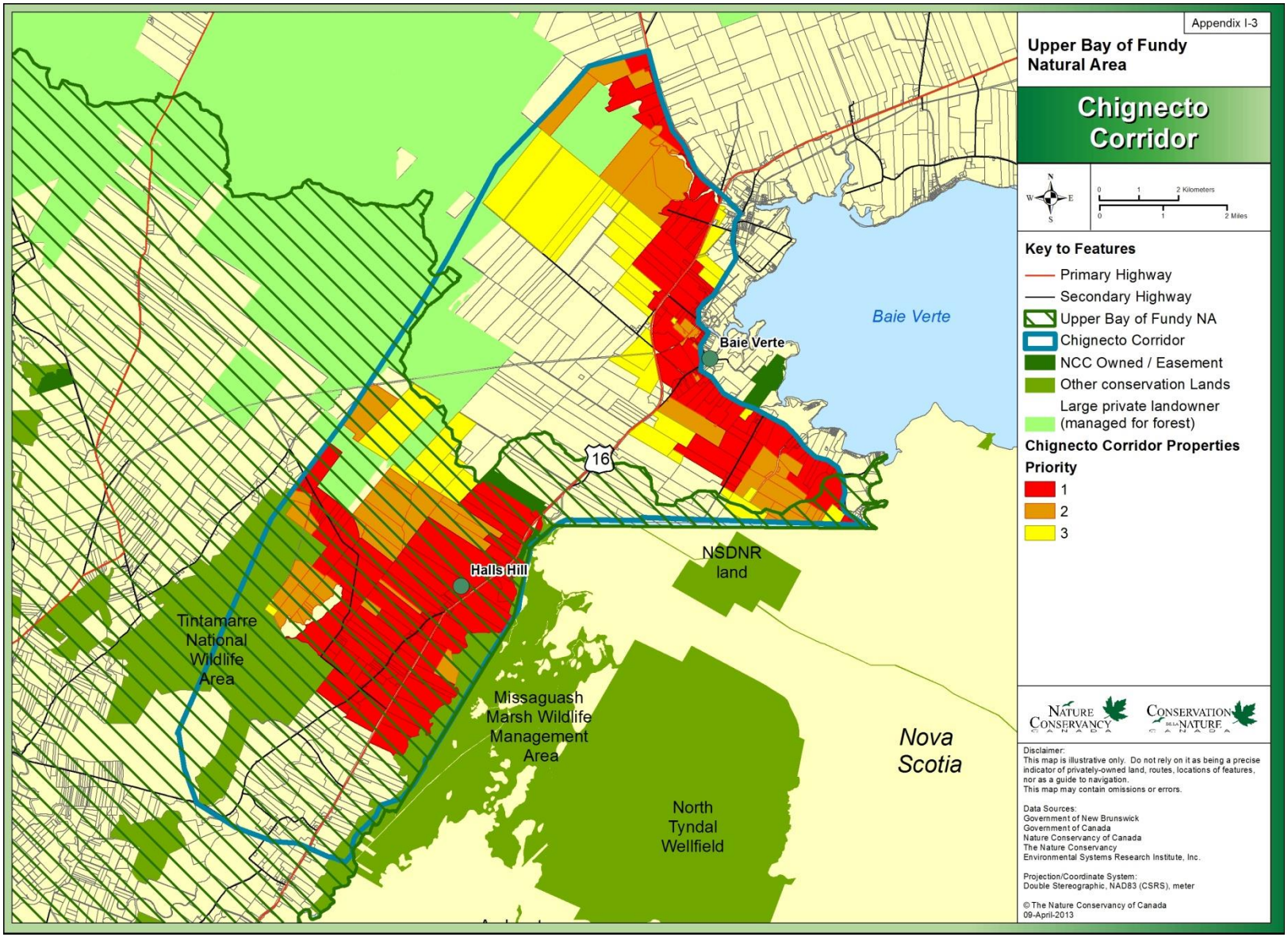
Atlantic Salmon

The inner Bay of Fundy Atlantic Salmon (*Salmo salar* pop. 1) is designated as Endangered by COSEWIC and is therefore a NAAP critical species target within the Chignecto Bay bioregion. The historical presence of Atlantic Salmon in the Petitcodiac River, prior to 1968, supported a run of 2-3 thousand salmon annually, but after the causeway was completed, the Petitcodiac run dwindled to mere hundreds of salmon. This decline preceded the crash of inner Bay of Fundy Atlantic Salmon stocks. These salmon represent a unique Canadian endemic; their entire biological distribution exists within Canada. Adult numbers are estimated to have declined by more than 95 percent in 30 years, and most rivers no longer have either adults or juveniles. In 2003, fewer than 100 adults are estimated to have returned to the 32 rivers known to have historically contained the species. Most of the freshwater habitats of the Inner Bay of Fundy river systems are in fairly pristine condition, so freshwater habitat loss is not considered the cause for the declines (F. Whoriskey pers. comm.). Overall, as much as 30 percent of the habitat of the inner Bay of Fundy Atlantic Salmon complex was found in the Petitcodiac River (F. Whoriskey pers. comm.). Other salmon rivers in the bioregion include Pollett, Demoiselle, Crooked, Tantramar and Shepody Rivers.

**APPENDIX K: Wildlife Corridors within the NB IBoF bioregion**




Appendix I - 2
Upper Bay of Fundy Natural Area
Anagance Corridor
N
W
E
S
0 1 2 Kilometers
0 1 2 Miles
Key to Features
Primary Highway
Secondary Highway
Upper Bay of Fundy NA
Anagance Corridor
Large private landowner (managed for forest)
Anagance Corridor Properties
Priority
1
2
3
1
Anagance
Nature Conservancy Canada
Conservation de la nature Canada
Disclaimer:
This map is illustrative only. Do not rely on it as being a precise indicator of privately-owned land, routes, locations of features, nor as a guide to navigation.
This map may contain omissions or errors.
Data Sources:
Government of New Brunswick
Government of Canada
Nature Conservancy of Canada
The Nature Conservancy
Environmental Systems Research Institute, Inc.
Projection/Coordinate System:
Double Stereographic, NAD83 (CSRS), meter
© The Nature Conservancy of Canada
09-April-2013


Appendix I-3
Upper Bay of Fundy Natural Area
Chignecto Corridor
N
W
E
S
0 1 2 Kilometers
0 1 2 Miles
Key to Features
Primary Highway
Secondary Highway
Upper Bay of Fundy NA
Chignecto Corridor
NCC Owned / Easement
Other conservation Lands
Large private landowner (managed for forest)
Chignecto Corridor Properties
Priority
1
2
3
Baie Verte
Baie Verte
16
Halls Hill
NSDNR land
Tintamarre National Wildlife Area
Missaguash Marsh Wildlife Management Area
North Tyndal Wellfield
Nova Scotia
Nature Conservancy Canada
Conservation de la nature Canada
Disclaimer:
This map is illustrative only. Do not rely on it as being a precise indicator of privately-owned land, routes, locations of features, nor as a guide to navigation.
This map may contain omissions or errors.
Data Sources:
Government of New Brunswick
Government of Canada
Nature Conservancy of Canada
The Nature Conservancy
Environmental Systems Research Institute, Inc.
Projection/Coordinate System:
Double Stereographic, NAD83 (CSRS), meter
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**APPENDIX L: Biodiversity Composite Methodology**

Analyses rely on priority biodiversity species lists established by consensus according to objective selection criteria, recognising that important data gaps exist for several taxa. Specifically, species within these lists include ACCDC ranked S1, S2, or S3 with a G1, G2, or G3 ranking; BCR 14 'priority species' by province; COSEWIC Endangered, Threatened, and Special Concern. Species for which occurrence is considered accidental, specifically birds, were excluded from lists. Priority species habitat associations (where this information is available) can be considered for the purpose of more objective identification of priority habitats. In other words, tallies based on occurrence of priority species within certain habitat types can help inform the selection of habitat priorities if none are identified otherwise (see section on habitat data, below).

**2.2 SPECIES DATA SOURCES**

Data layers, data sources and data types used to describe species spatial distribution:

| Data layers | Data source | Source data type |
|---|---|---|
| Occurrence of mammals, reptiles, amphibians, vascular plants, non-vascular plants, lichens, etc. | AC CDC | Points |
| Relative abundance of birds | MBBA point count | Points, counts |
| Breeding evidence of birds | MBBA breeding evidence | Polygons (10X10 km squares), breeding evidence categories |
| Occurrence and abundance of rare and colonial bird species | MBBA rare/colonial species | Points, counts |
| Occurrence and abundance of shorebirds | CWS Atlantic Canada Shorebird Survey database | Points, counts |
| Occurrence and abundance of colonial birds | CWS Atlantic Region Colonial Waterbird database | Points, counts |
| Occurrence and abundance of coastal waterfowl | CWS Atlantic Canada Coastal Waterfowl Survey database | Polygons (irregular blocks), counts |
| Occurrence of SAR critical habitat | CWS Atlantic Region Critical Habitat Mapping Database | Polygons (irregular) |

**Atlantic Canada Conservation Data Centre (ACCDC) data**

*Species Occurrence Data*

The ACCDC dataset contains point data records for a large number of species occurring in Atlantic Canada (mostly the Maritimes). Points within the ACCDC database with low geographic certainty, and species that were not appropriate for the analyses were excluded from the dataset. All records with higher geographic certainty (according to the ACCDC data) were retained and then classified into broad groups consisting of: Aquatic, Mammal, Bird, Reptile/Amphibian, Insect, or Plant. Next, G and S ranks for these species were assessed. Only species with a ranking of S1 or S2, or S3 with a global ranking of G1, G2 or G3, were retained. All species designated by COSEWIC were retained, regardless of their S or G rankings.

Species listed as BCR priority species were retained, regardless of S or G rankings. Those not already listed in the ACCDC were added to the list. However, information from the ACCDC dataset for BCR

priority species was retained for analyses only if information could not be obtained via the original data sources (i.e., MBBA, CWS).

Habitat associations were determined (where possible) for each species, based on information within datasets, specific studies, or expert advice.

**Maritimes Breeding Bird Atlas (MBBA) data**

*Point Count Data*

During development of the Maritimes Breeding Bird Atlas, species relative abundance maps were derived from point data records originating primarily from priority squares (approximately ¼ of all squares in the Maritimes). These point count data were used by Bird Studies Canada to derive species relative abundance maps for the Maritimes on behalf of the Maritimes Breeding Bird Atlas. Methodologies for creating these relative abundance maps since have changed and this set will not be used within the publication.

*Breeding Evidence Data*

Confirmed = 0.5 (for each Atlas; max value of 1)
Probable = 0.3 (for each Atlas; max value of 0.6)
Possible = 0.1 (for each Atlas; max value of 0.2)

*Rare/Colonial Species Data*

*Colonial buffer = 500 m*

**CWS data**

*Atlantic Canada Shorebird Survey Data*

This dataset began as the Maritimes Shorebird Survey (MSS), following initial efforts by Canadian Wildlife Service employees to monitor migrating shorebirds at a limited number of sites. The program now enlists skilled volunteer contributors from throughout Atlantic Canada and now includes a small (and growing) number of sites in Newfoundland and Labrador. Repeated within-season surveys follow a defined protocol and typically occur during spring, summer and fall periods at established locations.

*Atlantic Colonial Waterbird Data*

This database contains records of individual colony counts, by species, for known colonies located in Atlantic Canada. Although some colonies are surveyed annually, most are visited much less frequently. Methods used to derive colony population estimates vary markedly among colonies and among species.

*Atlantic Coastal Waterfowl Survey Data*

This dataset is derived from aerial surveys of waterfowl (e.g., ducks and geese) occurring within coastal and inshore waters of Atlantic Canada, and organised within polygons rather than by points. The sampling unit for these databases is the coastal (and inshore) waterfowl 'block'. Coastal waterfowl 'block' polygons were established at the beginning of these monitoring programs and have remained fixed over time. Polygon sizes differ geographically (within and among EC CWS Regions) and are irregularly shaped. 'Blocks' were initially designed to reflect prominent coastline features that separate coastal segments, inshore bays and estuaries, and thus define functionally distinct habitat units (for waterfowl). Records include counts of birds of each species observed within each polygon during each survey visit.

Although observers attempt to identify individuals or flocks of birds to species, this is not always possible. Incidental records (i.e., not gathered consistently) of other bird species, mostly marine, can be

found within these databases. In particular, incidental records include coastal and inshore zone species not well captured through other surveys (e.g., loons, grebes, gulls, shorebirds, and cormorants).

*Atlantic Region Species at Risk Critical Habitat Mapping*

Mapping of Species at Risk critical habitat in the Atlantic Region has involved identifying the unique aspects of each species' habitat and illustrating those elements through a GIS model. Through field work data and GIS applications, spatial reference that reflects the sensitivity of species and their respective habitats was created for 23 species. The model for the identification of Species at Risk critical habitat will continue to be used to identify habitat for new species, as well as to refine the data available for existing Species at Risk.

**SPECIES DATA STEPS**

**ACCDC data**

1) Generate point process layers (shapefiles) for each species within the dataset. All records must have a CDC Precision Code value of 3.7 or less (see table L.1).
2) Generate 'Primary Buffers' by conducting kernel density analysis for each species, using a 500 m radius, a 10m output cell size and the appropriate 'POPULATION' parameter value (see Fig. L.1). This approach attributes more value to pixels closest to the centroid with more precise observations.

Table L.1: ACCDC precision code, definitions, spatial context, unit size and range of values within the dataset.

| *prec* | *common speech* | *example* | *unit size* | *literal range (m)* |
|---|---|---|---|---|
| **6.0** | within province | province | 1000.0km | 562.3 - 1778.3 |
| **5.7** | in part of province | 'NW NB' | 500.0km | 281.2 - 889.1 |
| **5.0** | within in county | county | 100.0km | 56.2 - 177.8 |
| **4.7** | within 50s of kilometers | | 50.0km | 28.1 - 88.9 |
| **4.0** | within 10s of kilometers | BBA grid | 10.0km | 5.6 - 17.8 |
| **3.7** | within 5s of kilometers | | 5.0km | 2.8 - 8.9 |
| **3.0** | within kilometers | topo grid | 1.0km | 0.6 - 1.8 |
| **2.7** | within 500s of meters | | 500.0m | 281.2 - 889.1 |
| **2.0** | within 100s of meters | ball field | 100.0m | 56.2 - 177.8 |
| **1.7** | within 50s of meters | | 50.0m | 28.1 - 88.9 |
| **1.0** | within 10s of meters | boxcar | 10.0m | 5.6 - 17.8 |
| **0.7** | within 5s of meters | | 5.0m | 2.8 - 8.9 |
| **0.0** | within meters ***NOT USED*** | pace | 1.0m | 0.6 - 1.8 |
| **-1.0** | within 10s of centimeters | fingernail | 0.1m | 0.1 - 0.2 |

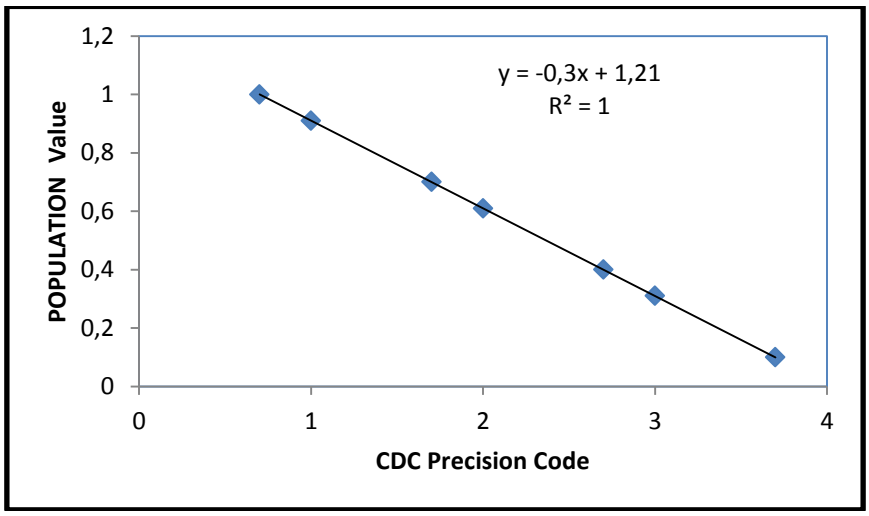


Figure L.1: Population values derived for the purpose of informing the kernel density point process using precision code values found within the ACCDC dataset. Linear equation can be used to populate a new attribute field with POPULATION value information.

3) Conduct buffer analysis to derive 'secondary buffers' for each species, using a 5000 m radius. Use a fixed value of 0.2 for pixels within the secondary buffer.
4) Combine Primary and Secondary buffers for each species (at the provincial geographic scale) to create species rasters with pixel values ranging from 0 to 1 (Maritimes scale).
5) Overlay rasters from the suite of species to derive multi-species 'Biodiversity Composites'.

**MBBA point count**
1) These data can be used to represent the relative abundance of breeding priority bird species detected during the course of point count surveys.
2) Relative abundance rasters were derived from point count information by Bird Studies Canada.
3) Final decisions on quality and appropriateness of individual rasters were made 'a priori' by MBBA and BSC staff.
4) All rasters were reclassified such that values range between 0 and 1.

**MBBA breeding evidence**
1) These data can only be used to represent evidence of breeding of priority bird species as determined during the course of breeding evidence surveys. These data specifically were used for species not captured adequetaly during the course of point count surveys.
2) The highest level of breeding evidence was determined, by species, for each square, for each of two Atlas periods (1986-1991; 2006-2011).
3) Raster values were derived using this breeding evidence data according to following rules: Confirmed = 0.5; Probable = 0.3; Possible = 0.1.
5) Rasters for both Atlas periods were summed such that combined values for a given species range from 0 to 1.

**MBBA rare and colonial**
1) To represent breeding priority bird species
2) Use rare and colonial data records
3) Derive rasters using colonial data only for species not captured adequately in either point count or breeding evidence datasets.
4) Buffer colonies by 500 m

5) Values within buffer area given value of 1. Kernel density estimator, range from 0.2 to 1.
6) 'Rare' species records to be used 'a posteriori' for verification of specific areas and land parcels.

**ACSS data: shorebirds**
1) These data were used to represent predominantly non-breeding priority shorebird species surveyed during the spring or Fall migration periods.
2) Use species abundance data (counts, by shorebird survey site, by species)
3) Derive rasters using count data for species not captured adequately through other surveys.
4) Create rasters for each species such that combined values for a given species range from 0 to 1.

**ACW data: colonial waterbirds**
1) To represent non-breeding priority bird species
2) Use species abundance data (counts, by colony survey site, by species)
3) Derive rasters using count data for species not captured adequately through other surveys.
4) Create rasters for each species such that combined values for a given species range from 0 to 1.

**AR SAR CH mapping data**
1) To represent Atlantic Region Species at Risk for which critical habitat (CH) mapping has been initiated.
2) Map CH polygons, for Endangered and Threatened priority species, instead of using layers for species derived using other datasets.
3) Buffer CH polygons by 5 km
4) CH polygons given value of 0.8, surrounding buffer given value of 0.2, for a total ranking of 1 for CH polygons.

**SPECIES DATA COMPOSITES**

**Results:**
Overlaying the rasters for the suite of priority species creates a biodiversity composite. These biodiversity composites can be adapted to illustrate biodiversity hotspots, hotspots for particular suites of species, hotspots for species associated with target habitats (based on species-habitat matrices), etc.
NOTE: A batch processing tool was developed by NCC to automate steps 1) through 5), with the exception of establishing the target list of species considered.
Tool: The tool currently creates both Primary and Secondary buffers (rasters). The tool also normalizes the individual kernel density rasters (max value of 0.8) and adds to them the fixed primary buffer values (fixed value of 0.2), such that the total for each resulting species raster varies between 0-1.

**APPENDIX M: Summary of species and data sources for species composites (Figs. 24-34).**

| Priority Species | | Species Data Source | | | | | | | Map Name | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Common Name | Species Name | COSEWIC Rank | AC CDC Database 2012 | CWS Critical Habitat Mapping Database 2013 | MBBA Relative Abundance Raster Data Feb 2013 | MBBA Breeding Evidence Data 1990; 2010 | CWS Atlantic Canada Shorebird Survey Database 2012 | CWS Atlantic Coastal Waterfowl Survey Database 2012 | All Rare and Priority Significant Species (Fig. 24) | Rare Non-bird Significant Species (Fig. 25) | Rare and Priority Bird Species - Breeding Evidence (Fig. 26) | Rare and Priority Bird Species - Relative Abundance (Fig. 27) | All Species at Risk (Fig. 28) | Non-bird Species at Risk (Fig. 29) | Bird Species at Risk (Fig. 30) | Rare Terrestrial Invertebrate Species (Fig. 31) | Rare Amphibians/Reptile Species (Fig. 32) | Rare Mammal Species (Fig. 33) | Rare Plant, Lichen, and Bryophyte Species (Fig. 34) |
| **Birds** | | | | | | | | | | | | | | | | | | | |
| American Bittern | *Botaurus lentiginosus* | | | | | x | | | x | | x | | | | | | | | |
| American Black Duck | *Anas rubripes* | | | | x | | | | x | | | x | | | | | | | |
| American Coot | *Fulica americana* | | | | | x | | | x | | x | | | | | | | | |
| American Redstart | *Setophaga ruticilla* | | | | x | | | | x | | | x | | | | | | | |
| American Three-toed | *Picoides dorsalis* | | | | | x | | | x | | x | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Woodpecker | | | | | | | | | | | | | | | | | | | |
| American Woodcock | *Scolopax minor* | | | | | x | | | x | | x | | | | | | | | |
| Bald Eagle | *Haliaeetus leucocephalus* | | | | x | | | | x | | | x | | | | | | | |
| Bank Swallow | *Riparia riparia* | | | | x | | | | x | | | x | | | | | | | |
| Barn Swallow | *Hirundo rustica* | T | | | | x | | | x | | x | | x | | x | | | | |
| Bay-breasted Warbler | *Setophaga castanea* | | | x | | | | | x | | | | | | | | | | |
| Belted Kingfisher | *Megaceryle alcyon* | | | x | | | | | x | | | | | | | | | | |
| Black Tern | *Chlidonias niger* | | | | | | x | | x | | | | | | | | | | |
| Black-backed Woodpecker | *Picoides arcticus* | | | | | x | | | x | | x | | | | | | | | |
| Black-billed Cuckoo | *Coccyzus erythropthalmus* | | | | | x | | | x | | x | | | | | | | | |
| Blackburnian Warbler | *Dendroica fusca* | | | | x | | | | x | | | x | | | | | | | |
| Black-throated Blue Warbler | *Dendroica caerulescens* | | | | x | | | | x | | | x | | | | | | | |
| Black-throated Green Warbler | *Setophaga virens* | | | | x | | | | x | | | x | | | | | | | |
| Blue-headed Vireo | *Vireo solitarius* | | | | x | | | | x | | | x | | | | | | | |
| Bobolink | *Dolichonyx oryzivorus* | T | | | | x | | | x | | x | | x | | x | | | | |
| Boreal Chickadee | *Poecile hudsonicus* | | | x | | | | | x | | | | | | | | | | |
| Brown Thrasher | *Toxostoma rufum* | | | | | x | | | x | | x | | | | | | | | |
| Canada Goose | *Branta canadensis* | | | | | | | x | x | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Canada Warbler | *Wilsonia canadensis* | T | | | x | | | | x | | | x | x | | x | | | | |
| Cape May Warbler | *Setophaga tigrina* | | | | | x | | | x | | x | | | | | | | | |
| Chimney Swift | *Chaetura pelagica* | T | | | | x | | | x | | x | | x | | x | | | | |
| Common Goldeneye | *Bucephala clangula* | | | | | x | | | x | | x | | | | | | | | |
| Common Loon | *Gavia immer* | | | | x | | | | x | | | x | | | | | | | |
| Common Moorhen | *Gallinula chloropus* | | | | | x | | | x | | x | | | | | | | | |
| Common Nighthawk | *Chordeiles minor* | T | | | | x | | | x | | x | | | | | | | | |
| Common Tern | *Sterna hirundo* | | | | x | | | | x | | | x | | | | | | | |
| Cooper's Hawk | *Accipiter cooperii* | | | | | x | | | x | | x | | | | | | | | |
| Eastern Kingbird | *Tyrannus tyrannus* | | | | | x | | | x | | x | | | | | | | | |
| Eastern Meadowlark | *Sturnella magna* | T | | | | x | | | x | | x | | x | | x | | | | |
| Eastern Whip-poor-will | *Caprimulgus vociferus* | T | | | | x | | | x | | x | | x | | x | | | | |
| Eastern Wood-Pewee | *Contopus virens* | SC | | | x | | | | x | | | x | | | | | | | |
| Evening Grosbeak | *Coccothraustes vespertinus* | | | | x | | | | x | | | x | | | | | | | |
| Gadwall | *Anas strepera* | | | | | x | | | x | | x | | | | | | | | |
| Greater Scaup | *Aythya marila* | | | | | x | | | x | | x | | | | | | | | |
| Green Heron | *Butorides virescens* | | | | | x | | | x | | x | | | | | | | | |
| Green-winged Teal | *Anas coralinensis* | | | | x | | | | x | | | x | | | | | | | |
| Horned Lark | *Eremophila alpestris* | | | | | x | | | x | | x | | | | | | | | |

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| House Wren | *Troglodytes aedon* | | | | | x | | | x | | x | | | | | | | | |
| Killdeer | *Charadrius vociferus* | | | | | x | | | x | | x | | | | | | | | |
| Least Bittern | *Ixobrychus exilis* | T | | x | | x | | | x | | | | x | | x | | | | |
| Long-eared Owl | *Asio otus* | | | | | x | | | x | | x | | | | | | | | |
| Magnolia Warbler | *Setophaga magnolia* | | | | x | | | | x | | | x | | | | | | | |
| Mallard | *Anas platyrhynchos* | | | | x | | | | x | | | x | | | | | | | |
| Marsh Wren | *Cistothorus palustris* | | | | | x | | | x | | x | | | | | | | | |
| Nelson's Sparrow | *Ammodramus nelsoni* | | | | | x | | | x | | x | | | | | | | | |
| Northern Goshawk | *Accipiter gentilis* | | | | | x | | | x | | x | | | | | | | | |
| Northern Rough-winged Swallow | *Stelgidopteryx serripennis* | | | | | x | | | x | | x | | | | | | | | |
| Northern Shoveler | *Anas clypeata* | | | | | x | | | x | | x | | | | | | | | |
| Olive-sided Flycatcher | *Contopus cooperi* | T | | | x | | | | x | | | x | x | | x | | | | |
| Peregrine Falcon (anatum) | *Falco peregrinus pop. 1* | SC | | | | x | | | x | | x | | x | | x | | | | |
| Pied-billed Grebe | *Podilymbus podiceps* | | | | | x | | | x | | x | | | | | | | | |
| Pine Grosbeak | *Pinicola enucleator* | | | | x | | | | x | | | x | | | | | | | |
| Purple Finch | *Carpodacus purpureus* | | | | x | | | | x | | | x | | | | | | | |
| Purple Martin | *Progne subis* | | | | | x | | | x | | x | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Red-shouldered Hawk | *Buteo lineatus* | | | | | x | | | x | | x | | | | | | | | |
| Ring-necked Duck | *Aythya collaris* | | | | x | x | | | x | | x | x | | | | | | | |
| Rose-breasted Grosbeak | *Pheucticus ludovicianus* | | | | x | | | | x | | | x | | | | | | | |
| Ruffed Grouse | *Bonasa umbellus* | | | | x | | | | x | | | x | | | | | | | |
| Rusty Blackbird | *Euphagus carolinus* | SC | | | x | | | | x | | | x | x | | x | | | | |
| Sedge Wren | *Cistothorus platensis* | | | | | x | | | x | | x | | | | | | | | |
| Short-eared Owl | *Asio flammeus* | SC | | | | x | | | x | | x | | x | | x | | | | |
| Solitary Sandpiper | *Tringa solitaria* | | | | x | | | | x | | | x | | | | | | | |
| Sora | *Porzana carolina* | | | | | x | | | x | | x | | | | | | | | |
| Spotted Sandpiper | *Actitis macularius* | | | | x | | | | x | | | x | | | | | | | |
| Tree Swallow | *Tachycineta bicolor* | | | | x | | | | x | | | x | | | | | | | |
| Upland Sandpiper | *Bartramia longicauda* | | | | | x | | | x | | x | | | | | | | | |
| Veery | *Catharus fuscescens* | | | | x | | | | x | | | x | | | | | | | |
| Vesper Sparrow | *Pooecetes gramineus* | | | | x | | | | x | | | x | | | | | | | |
| Virginia Rail | *Rallus limicola* | | | | | x | | | x | | x | | | | | | | | |
| White-breasted Nuthatch | *Sitta carolinensis* | | | | | x | | | x | | x | | | | | | | | |
| White-throated Sparrow | *Zonotrichia albicollis* | | | | x | | | | x | | | x | | | | | | | |
| Willow Flycatcher | *Empidonax traillii* | | | | | x | | | x | | x | | | | | | | | |

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| Wilson's Phalarope | *Phalaropus tricolor* | | | | | x | | | x | | x | | | | | | | | |
| Wilson's Snipe | *Gallinago delicata* | | | | x | | | | x | | | x | | | | | | | |
| Wood Duck | *Aix sponsa* | | | | x | | | | x | | | x | | | | | | | |
| Wood Thrush | *Hylocichla mustelina* | T | | | | x | | | x | | x | | x | | x | | | | |
| Yellow Rail | *Coturnicops noveboracensis* | SC | | | | x | | | x | | x | | x | | x | | | | |
| Yellow-bellied Sapsucker | *Sphyrapicus varius* | | | | x | | | | x | | | x | | | | | | | |
| **Invertebrates** | | | | | | | | | | | | | | | | | | | |
| Blue Dasher | *Pachydiplax longipennis* | | x | | | | | | x | x | | | | | | x | | | |
| Boreal Snaketail | *Ophiogomphus colubrinus* | | x | | | | | | x | x | | | | | | x | | | |
| Cobblestone Tiger Beetle | *Cicindela marginipennis* | E | x | | | | | | x | x | | | x | x | | x | | | |
| Juvenal's Duskywing | *Erynnis juvenalis* | | x | | | | | | x | x | | | | | | x | | | |
| Maritime Ringlet | *Coenonympha nipisiquit* | E | x | | | | | | x | x | | | x | x | | x | | | |
| Pygmy Snaketail | *Ophiogomphus howei* | SC | x | | | | | | x | x | | | x | x | | x | | | |
| Skillet Clubtail | *Gomphus ventricosus* | E | x | | | | | | x | x | | | x | x | | x | | | |
| Banded Hairstreak | *Satyrium calanus* | | x | | | | | | x | x | | | | | | x | | | |
| Clamp-Tipped Emerald | *Somatochlora tenebrosa* | | x | | | | | | x | x | | | | | | x | | | |
| Cobra Clubtail | *Gomphus vastus* | | x | | | | | | x | x | | | | | | x | | | |
| Fragile Forktail | *Ischnura posita* | | x | | | | | | x | x | | | | | | x | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gray Hairstreak | *Strymon melinus* | | x | | | | | | x | x | | | | | | x | | | |
| Henry's Elfin | *Callophrys henrici* | | x | | | | | | x | x | | | | | | x | | | |
| Lilypad Clubtail | *Arigomphus furcifer* | | x | | | | | | x | x | | | | | | x | | | |
| Monarch | Danaus plexippus | SC | x | | | | | | x | x | | | x | x | | x | | | |
| Mottled Darner | *Aeshna clepsydra* | | x | | | | | | x | x | | | | | | x | | | |
| Spine-crowned Clubtail | *Gomphus abbreviatus* | | x | | | | | | x | x | | | | | | x | | | |
| Swamp Spreadwing | *Lestes vigilax* | | x | | | | | | x | x | | | | | | x | | | |
| **Mammals** | | | | | | | | | | | | | | | | | | | |
| Canada Lynx | *Lynx canadensis* | | x | | | | | | x | x | | | | | | | | x | |
| Silver-haired Bat | *Lasionycteris noctivagans* | | x | | | | | | x | x | | | | | | | | x | |
| Long-tailed Shrew | *Sorex dispar* | | x | | | | | | x | x | | | | | | | | x | |
| Big Brown Bat | *Eptesicus fuscus* | | x | | | | | | x | x | | | | | | | | x | |
| Tri-coloured Bat | *Perimyotis subflavus* | E* | x | | | | | | x | x | | | x | x | | | | x | |
| Hoary Bat | *Lasiurus cinereus* | | x | | | | | | x | x | | | | | | | | x | |
| Red Bat | *Lasiurus borealis* | | x | | | | | | x | x | | | | | | | | x | |
| Northern Myotis | *Myotis septentrionalis* | E* | x | | | | | | x | x | | | x | x | | | | x | |
| Little Brown Myotis | *Myotis lucifugus* | E* | x | | | | | | x | x | | | x | x | | | | x | |
| **Vegetation** | | | | | | | | | | | | | | | | | | | |
| a macro-lichen | *Sphaerophorus globosus* | | x | | | | | | x | x | | | | | | | | | x |
| a moss | *Anomobryum filiforme* | | x | | | | | | x | x | | | | | | | | | x |
| a Moss | *Anomodon minor* | | x | | | | | | x | x | | | | | | | | | x |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| a Moss | *Anomodon tristis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Anomodon viticulosus* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Brachythecium digastrum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Bryum muehlenbeckii* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Bryum pallescens* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Calliergon trifarium* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Calliergonella cuspidata* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Campylium radicale* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Cirriphyllum piliferum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Dichelyma falcatum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Dicranum bonjeanii* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a moss | *Didymodon ferrugineus* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Ditrichum pallidum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Ephemerum serratum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Eurhynchium hians* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Fontinalis antipyretica* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Homomallium adnatum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |

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| a Moss | *Hygrohypnum bestii* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Hypnum pratense* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Physcomitrium immersum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Plagiomnium rostratum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Pleuridium subulatum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Pseudotaxiphyllum distichaceum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Rhytidium rugosum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Scorpidium scorpioides* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Seligeria diversifolia* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Seligeria recurvata* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Syntrichia ruralis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Thamnobryum alleghaniense* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Timmia norvegica* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Moss | *Tortula mucronifolia* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Peatmoss | Sphagnum angermanicum | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| a Peatmoss | Sphagnum lescurii | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Acadian Quillwort | *Isoetes acadiensis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Alpine Cliff Fern | *Woodsia alpina* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |

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| Alpine Sweet-vetch | *Hedysarum alpinum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| American False Pennyroyal | *Hedeoma pulegioides* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| American Lopseed | *Phryma leptostachya* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| American Yellow Rocket | *Barbarea orthoceras* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Anticosti Aster | *Symphyotrichum anticostense* | T | **x** | | | | | | **x** | **x** | | | **x** | **x** | | | | | x |
| Arching Dewberry | *Rubus recurvicaulis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Arrow-Leaved Violet | *Viola sagittata var. ovata* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Auricled Twayblade | *Listera auriculata* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Awned Flatsedge | *Cyperus squarrosus* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Back's Sedge | *Carex backii* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Blood Milkwort | *Polygala sanguinea* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Blue-stemmed Goldenrod | *Solidago caesia* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Blunt-leaved Bedstraw | *Galium obtusum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Blunt-lobed Moonwort | *Botrychium oneidense* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Bog Fern | *Thelypteris simulata* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Bog Yellow-eyed-grass | *Xyris difformis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Brewer's Whitlow-grass | *Draba breweri var. cana* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |

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| Bur Oak | *Quercus macrocarpa* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Butternut | *Juglans cinerea* | E | **x** | | | | | | **x** | **x** | | | **x** | **x** | | | | | x |
| Buttonbush Dodder | *Cuscuta cephalanthi* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Calypso | *Calypso bulbosa var. americana* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Canada Garlic | *Allium canadense* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Canada Honewort | *Cryptotaenia canadensis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Canada Lousewort | *Pedicularis canadensis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Canada Rice Grass | *Piptatherum canadense* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Canada Wild Rye | *Elymus canadensis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Carey's Smartweed | *Polygonum careyi* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Case's Ladies'-Tresses | *Spiranthes casei* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Common Buttonbush | *Cephalanthus occidentalis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Common Hop | *Humulus lupulus var. lupuloides* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Creeping Rush | *Juncus subtilis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Cut-leaved Anemone | *Anemone multifida* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Disguised St John's-wort | *Hypericum dissimulatum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Ditch Stonecrop | *Penthorum sedoides* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Downy Rattlesnake-Plantain | *Goodyera pubescens* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |

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| Drummond's Rockcress | *Arabis drummondii* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Early Saxifrage | *Saxifraga virginiensis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Eastern Cudweed | *Pseudognaphalium obtusifolium* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Eastern Leatherwood | *Dirca palustris* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Eastern Skunk Cabbage | *Symplocarpus foetidus* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Egg Flapwort | *Jungermannia obovata* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Elegant Milk-vetch | *Astragalus eucosmus* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Field Locoweed | *Oxytropis campestris var. johannensis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Five-angled Dodder | *Cuscuta pentagona* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Fleshy Hawthorn | *Crataegus succulenta* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Floating Crystalwort | *Riccia fluitans* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Forked Panic Grass | *Dichanthelium dichotomum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Fragrant Green Orchid | *Platanthera huronensis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Fringed Milkwort | *Polygala paucifolia* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Garber's Sedge | *Carex garberi* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Herb Robert | *Geranium robertianum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Hop Flatsedge | *Cyperus lupulinus* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |

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| Howell's Pussytoes | *Antennaria howellii ssp. petaloidea* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Indian Wild Rice | *Zizania aquatica var. aquatica* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Inflated Narrow-leaved Sedge | *Carex grisea* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Jones' Hawthorn | *Crataegus jonesiae* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Kalm's Hawkweed | *Hieracium kalmii* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Labrador Bedstraw | *Galium labradoricum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Lance-leaved Arnica | *Arnica lanceolata* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Lance-leaved Figwort | *Scrophularia lanceolata* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Large Round-Leaved Orchid | *Platanthera macrophylla* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Large-Fruited Sanicle | *Sanicula trifoliata* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Laurentian Bladder Fern | *Cystopteris laurentiana* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Lesser Brown Sedge | *Carex adusta* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Limestone Meadow Sedge | *Carex granularis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Little Bluestem | *Schizachyrium scoparium* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Livid Sedge | *Carex livida var. radicaulis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Long-beaked Sedge | *Carex sprengelii* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |

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| Long-bracted Frog Orchid | *Coeloglossum viride var. virescens* | | x | | | | | | x | x | | | | | | | | | x |
| Long-leaved Starwort | *Stellaria longifolia* | | x | | | | | | x | x | | | | | | | | | x |
| Low Flatsedge | *Cyperus diandrus* | | x | | | | | | x | x | | | | | | | | | x |
| Low Spikemoss | *Selaginella selaginoides* | | x | | | | | | x | x | | | | | | | | | x |
| Luminous Moss | *Schistostega pennata* | | x | | | | | | x | x | | | | | | | | | x |
| Lyell's Ribbonwort | *Pallavicinia lyellii* | | x | | | | | | x | x | | | | | | | | | x |
| Macoun's Cudweed | *Pseudognaphalium macounii* | | x | | | | | | x | x | | | | | | | | | x |
| Maidenhair Spleenwort | *Asplenium trichomanes* | | x | | | | | | x | x | | | | | | | | | x |
| Maple-leaved Goosefoot | *Chenopodium simplex* | | x | | | | | | x | x | | | | | | | | | x |
| Marsh Notchwort | *Lophozia laxa* | | x | | | | | | x | x | | | | | | | | | x |
| Menzies' Rattlesnake-plantain | *Goodyera oblongifolia* | | x | | | | | | x | x | | | | | | | | | x |
| Montane Notchwort | *Lophozia alpestris* | | x | | | | | | x | x | | | | | | | | | x |
| Narrow-Leaved Gentian | *Gentiana linearis* | | x | | | | | | x | x | | | | | | | | | x |
| Narrow-leaved Panic Grass | *Dichanthelium linearifolium* | | x | | | | | | x | x | | | | | | | | | x |
| Nees' Pouchwort | *Calypogeia neesiana* | | x | | | | | | x | x | | | | | | | | | x |
| New England Blue Violet | *Viola novae-angliae* | | x | | | | | | x | x | | | | | | | | | x |

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| New York Aster | *Symphyotrichum novi-belgii var. crenifolium* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Nodding Ladies'-Tresses | *Spiranthes cernua* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Northern Adder's-tongue | *Ophioglossum pusillum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| One-Flowered Broomrape | *Orobanche uniflora* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Orange-fruited Tinker's Weed | *Triosteum aurantiacum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Pale Dogwood | *Cornus obliqua* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Panicled Hawkweed | *Hieracium paniculatum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Parlin's Pussytoes | *Antennaria parlinii* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Pennsylvania Blackberry | *Rubus pensilvanicus* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Pinnate Scalewort | *Porella pinnata* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Poison Ivy | *Toxicodendron radicans* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Prototype Quillwort | *Isoetes prototypus* | SC | **x** | | | | | | **x** | **x** | | | **x** | **x** | | | | | x |
| Pubescent Sedge | *Carex hirtifolia* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Purple-veined Willowherb | *Epilobium coloratum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Red Pigweed | *Chenopodium rubrum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| River Bulrush | *Schoenoplectus fluviatilis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Rock Spikemoss | *Selaginella rupestris* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |

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| Rock Whitlow-Grass | *Draba arabisans* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Rough Dropseed | *Sporobolus compositus* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Rough Hawthorn | *Crataegus scabrida* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Round-headed Bush-clover | *Lespedeza capitata* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Round-lobed Hepatica | *Hepatica nobilis var. obtusa* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Russet Sedge | *Carex saxatilis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Seabeach Dock | *Rumex pallidus* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Shining Ladies'-Tresses | *Spiranthes lucida* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Slender Agalinis | *Agalinis tenuifolia* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Slender Beakrush | *Rhynchospora capillacea* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Slender Cottongrass | *Eriophorum gracile* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Slender Splachnum | *Tayloria serrata* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Small White Aster | *Symphyotrichum racemosum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Small-flowered Agalinis | *Agalinis paupercula var. borealis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Small-flowered Bittercress | *Cardamine parviflora var. arenicola* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Small-spike False-nettle | *Boehmeria cylindrica* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Smooth Alder | *Alnus serrulata* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |

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| Smooth Sweet Cicely | *Osmorhiza longistylis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Southern Dung Moss | *Splachnum pennsylvanicum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Southern Twayblade | *Listera australis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Southern Water Plantain | *Alisma subcordatum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Spotted Coralroot | *Corallorhiza maculata* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Spreading Wild Rye | *Elymus hystrix var. bigeloviana* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Spurred Threadwort | *Cephaloziella elachista* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Starved Panic Grass | *Dichanthelium depauperatum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Sterile Sedge | *Carex sterilis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Sticky Goldenrod | *Solidago simplex ssp. randii* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Strawberry-blite | *Chenopodium capitatum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Swamp Beggarticks | *Bidens discoidea* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Sweet Wood Reed Grass | *Cinna arundinacea* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Tall Goldenrod | *Solidago altissima* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Ten-rayed Sunflower | *Helianthus decapetalus* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Tubercled Orchid | *Platanthera flava var. herbiola* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Tufted Love Grass | *Eragrostis pectinacea* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |

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| Urn Moss | *Physcomitrium pyriforme* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Virginia Chain Fern | *Woodwardia virginica* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Virginia Mountain Mint | *Pycnanthemum virginianum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Virginia St John's-wort | *Triadenum virginicum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Wallrue Spleenwort | *Asplenium ruta-muraria var. cryptolepis* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Western Dock | *Rumex aquaticus var. fenestratus* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| White Adder's-Mouth | *Malaxis brachypoda* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| White Cut Grass | *Leersia virginica* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| White Mountain Saxifrage | *Saxifraga paniculata ssp. neogaea* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| White Vervain | *Verbena urticifolia* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| White-tinged Sedge | *Carex albicans var. emmonsii* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Whorled Yellow Loosestrife | *Lysimachia quadrifolia* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Wild Leek | *Allium tricoccum* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Woodland Pinedrops | *Pterospora andromedea* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| Yellow Lady's-slipper | *Cypripedium parviflorum var. makasin* | | **x** | | | | | | **x** | **x** | | | | | | | | | x |
| **Reptiles and amphibians** | | | | | | | | | | | | | | | | | | | |

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| Northern Dusky Salamander | *Desmognathus fuscus* | | **x** | | | | | | **x** | **x** | | | | | | | **x** | | |
| Wood Turtle | *Glyptemys insculpta* | T | **x** | | | | | | **x** | **x** | | | **x** | **x** | | | **x** | | |
| Snapping Turtle | *Chelydra serpentina* | SC | **x** | | | | | | **x** | **x** | | | **x** | **x** | | | **x** | | |
| **Fish** | | | | | | | | | | | | | | | | | | | |
| American Eel | *Anguilla rostrata* | SC | **x** | | | | | | **x** | **x** | | | **x** | **x** | | | | | |
| Shortnose Sturgeon | *Acipenser brevirostrum* | AC | **x** | | | | | | **x** | **x** | | | **x** | **x** | | | | | |
| Atlantic Salmon | *Salmo salar* | | **x** | | | | | | **x** | **x** | | | | | | | | | |
| Atlantic Sturgeon | *Acipenser oxyrinchus* | T | **x** | | | | | | **x** | **x** | | | **x** | **x** | | | | | |
| Striped Bass | *Morone saxatilis* | T | **x** | | | | | | **x** | **x** | | | **x** | **x** | | | | | |
| Round Whitefish | *Prosopium cylindraceum* | | **x** | | | | | | **x** | **x** | | | **x** | | | | | | |