Habitat Conservation Priority – Freshwater Wetlands

The following represents one of a series of summary documents that have been developed to aide in the dissemination of information presented in the *Southwest Nova Scotia Habitat Conservation Strategy*. For more detailed information, please see the final report, Farrow & Nussey 2015.

Freshwater wetlands are a significant habitat type commonly encountered in the SWNS bioregion; this includes bogs, fens, marshes, shrub- and forest-dominated swamps, and seasonal forest vernal pools, with bogs being the most common (Figure 1). The 'Atlantic Plateau Bog', an uncommon type of raised bog, is found only in the southern coastal regions of the province, in Yarmouth and Shelburne County. They rise up sharply from the surrounding terrain to heights of up to four metres with the top nearly flat like a plateau and often with a number of pools (National Wetlands Working Group 1997).

Among the most productive and diverse of all ecosystems, the ecological diversity of the bioregion's freshwater wetlands support a diverse assemblage of wildlife, including a number of Nova Scotia's rare and endangered species. Globally rare species of Atlantic Coastal Plain Flora (ACPF) can be found in lake-edge wetlands; these wetlands are among the most ecologically significant wetlands in the province. Additionally, many bird species depend on freshwater wetlands throughout the year for nesting, brood rearing, migration, and wintering habitat (NS EHJV 2008). Freshwater wetlands also perform vital ecological and social functions, including carbon storage, water quality improvement through natural filtration, a natural sink for pollutants, and the control or abatement of flooding, drought, and soil erosion (Davis & Browne 1996; Nova Scotia Environment 2012c), providing an estimated $7.9 billion worth of benefits in ecosystem services to Nova Scotians annually (Government of Nova Scotia 2011).

Eastern Mountain Avens, a flowering herbaceous perennial plant, is one of the most globally endangered plants in the Canadian Maritimes. The species occurs in Nova Scotia as a highly disjunct population in moist to wet sphagnum peat in sparsely treed coastal peatlands on Digby Neck and Brier Island (COSEWIC 2000). Eastern Mountain Avens is threatened primarily by habitat loss and degradation (caused by the draining of peatlands), and tree and shrub encroachment on their habitat. Thread-leaved Sundew is an endangered species of ACPF that is known to occur in only five peatland sites in Nova Scotia, highly disjunct from the main range of this species (EC & PCA 2010). Atlantic Coastal Plain Flora species are constrained by biologically limiting factors, including small population sizes, northern range limitations, and reduced reproductive capabilities, as well as anthropogenic threats, including infilling, peat mining, and commercial cranberry production for peatland associated species (EC & PCA 2010). Conservation of freshwater wetlands within the bioregion will contribute to the conservation of at least 111 priority species.

Nested Conservation Priority Species

- Blanding's Turtle (EN)
- Eastern Ribbonsnake (TH)
- Snapping Turtle (SC)
- Eastern Mountain Avens (EN)
- Thread-leaved Sundew (EN)
- Long's Bulrush (SC)

Landscape context assessment of freshwater wetlands: Very Good

Information on the amount of freshwater wetlands occurring in Nova Scotia prior to European settlement is limited; however, historic losses appear to have been high for some types of wetlands. Losses of freshwater wetlands are thought to be highest in the most fertile regions, such as the Annapolis Valley (Government of Nova Scotia 2011). In 2011 the Province of Nova Scotia released the Nova Scotia Wetland Conservation Policy, which provides a direction and framework for the conservation and management of wetlands in Nova Scotia, and identifies specific objectives intended to prevent the net loss of Nova Scotia's wetlands (Government of Nova Scotia 2011). This policy, administered by Nova Scotia Environment, should help limit any further loss of freshwater wetlands in the province. In addition, current forest harvesting regulations in Nova Scotia require that all forestry operations leave a minimum 20 m forested buffer along watercourses and wetlands, though some level of harvesting is permitted within these buffers.

The average Landscape Context Index[1] for freshwater wetlands in the SWNS bioregion is 2.52**,** which is very low and considered to be an indication that, on average, the habitat conservation priority is surrounded primarily by natural cover and has good landscape context that will contribute toward the long term viability of the ecosystem type (calculated using

[1] *Landscape Context Index (LCI) is a measure that refers to the 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. An LCI below 20 (30 for coastal ecosystems) indicates that the habitat conservation priority is surrounded primarily by natural cover with higher LCIs indicating increasing amounts of development directly surrounding ecosystem occurrences. An LCI above 50 is considered to be high, with individual occurrences usually rejected as critical (Anderson et al. 2006).*

NAAP data). In total 23,310 ha (18.3%) of freshwater wetlands in the bioregion are currently under protected or conservation status.

Condition assessment of freshwater wetlands: Good

The water quality of wetlands may be impacted by a number of factors including inflowing water and runoff, groundwater inflow, precipitation, and vegetation. Surface waters within the bioregion are generally soft with low buffering capacity, which is typical of water draining from igneous rocks (Kerekes & Schwinghamer 1973). Additionally, freshwater systems in the bioregion have been heavily impacted by acid precipitation originating from industrialized regions of the continent and have some of the most acidic freshwaters in North America (Clair *et al.* 2001). Acidic precipitation may negatively impact some types of freshwater wetlands, such as nutrient-poor swamps and fens, which do not possess adequate buffering capacity to neutralize acid precipitation (Davis & Browne 1996). The collective impacts of these factors may result in poor water quality for some freshwater wetland dependent species. Certain human activities, including residential and cottage development, forest harvesting, agricultural practices, road construction, infilling, and climate change may impact the hydrology or nutrient flows of freshwater wetlands, which can lead to changes in the vegetation community and potentially impact the ecological integrity of these ecosystems for sensitive species (i.e., Atlantic Coastal Plain Flora). Bogs and fens face the additional threats of peat mining and cranberry production, which significantly degrade these freshwater wetlands, though these anthropogenic activities are localized and not currently widespread throughout the bioregion.

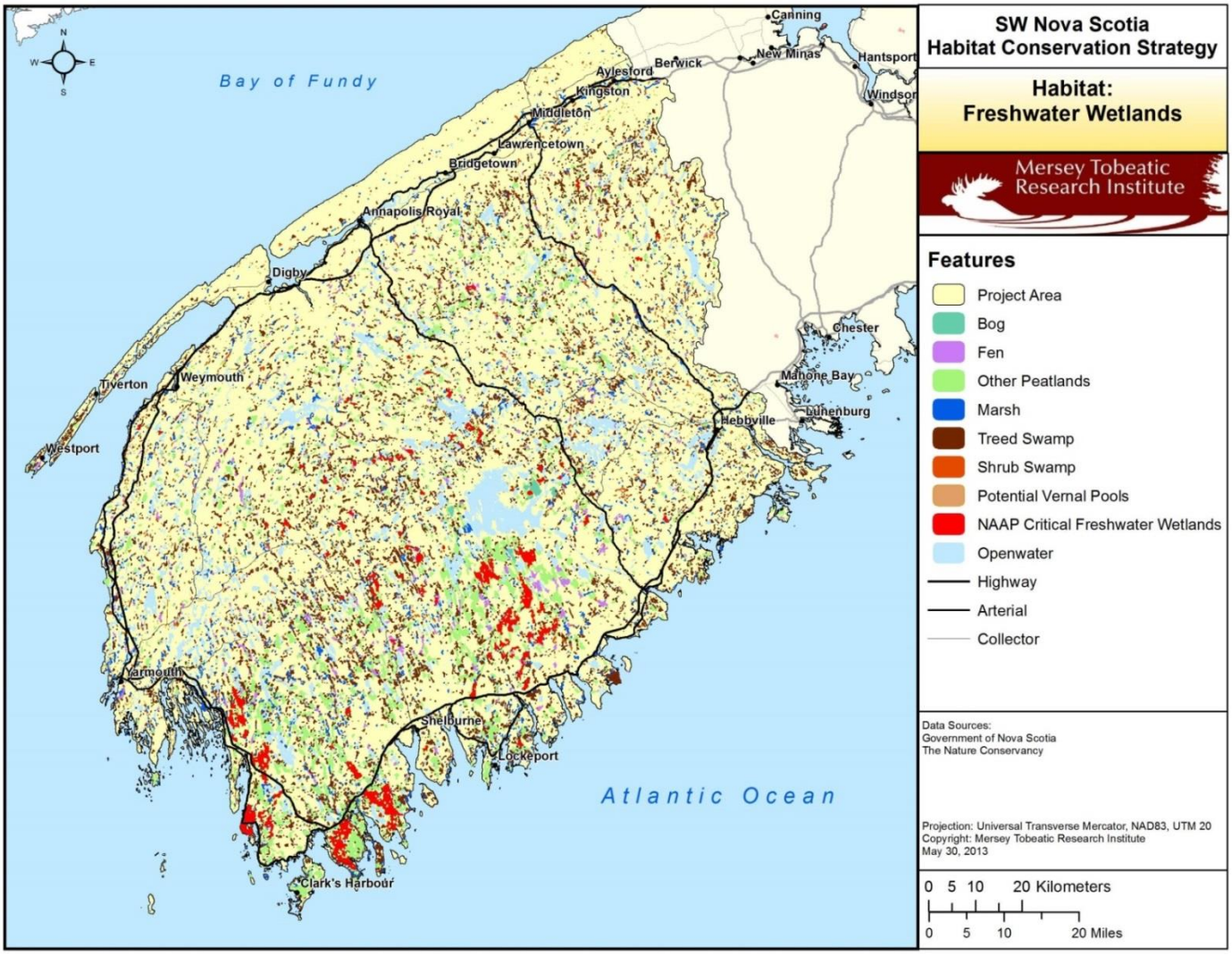

Figure 1. Freshwater wetlands within the Southwest Nova Scotia bioregion.

Size assessment of freshwater wetlands: Good

According to the Nova Scotia provincial wetland inventory, there are 127,071 ha of freshwater wetlands in the bioregion, which make up 7.9% of the total area of the bioregion (note that the area of treed swamp is considered underestimated; S. Basquill, per. comm.). Of these freshwater wetlands, 16,369 ha were identified as critical in the NAAP. The screening criterion for the minimum size of critical occurrences of freshwater wetlands was 20 ha (Anderson *et al.* 2006). A 275 metre buffer was included around freshwater wetlands to protect the ecological functions and integrity of this priority habitat (EC, OMNR & OME 1998). The total area and average size of each of the dominant types of wetlands found in the bioregion is presented in Table 1. The average size of freshwater wetland occurrences is 5.6 ha, which is considerably less than the NAAP minimum size criteria for critical occurrences. Nonetheless, the SWNS bioregion, which makes up 29.3% of the total area of the province, contains 51% of the province's critical occurrences of freshwater wetlands.

Table 1. Total area and average size of occurrences of dominant freshwater wetland types in the SWNS bioregion.

Wetland Type	Total Area (ha)	Average Size (ha)
Peatlands (bog/fen)	69,184	13.4
Marsh	15,886	3.1
Shrub Swamp	3440	2.3
Treed Swamp	38,560	3.5
All Freshwater Wetlands	127,070	5.6

Current threats to freshwater wetlands

- 1.1 Cottage and residential development
- 2.1 Agricultural practices – annual and perennial non-timber crops
- 2.1 Commercial cranberry production
- 3.2 Peat mining
- 5.3 Forest harvesting practices
- 6.1 Off-highway vehicle use
- 7.2 Dams and other aquatic barriers
- 8.1 Invasive plants
- 8.2 Problematic native species
- 9.1 Household sewage & urban waste water
- 9.3 Agricultural and forestry effluents
- 9.5 Air pollution and acid precipitation

Emerging threats to freshwater wetlands

- 11.1 Habitat shifting and alteration (Climate Change)

Overall assessment of freshwater wetlands in the Southwest Nova Scotia bioregion: Good

Table 2. Conservation actions related to freshwater marshes for conservation partners in the Southwest Nova Scotia bioregion.

Conservation Actions[1] Description of related action (specific and measurable if possible)	Collaborators	Importance[2]	Date for Completion	Priority Habitat(s)[3]	Primary Related Threat(s)
1. Land/Water Protection					
1.1 Site/Area Protection Province of Nova Scotia to designate 68 000 ha of new protected areas under the 14% Protected Areas Initiative.	Province of NS	Necessary	2025	All	
1.1 Site/Area Protection Complete a gap analysis for the system of protected areas in the province.	Province of NS	Beneficial		All	
1.1 Site/Area Protection Secure 500 ha of priority 1 and priority 2 habitat for species at risk to protect them from development.	NCC	Necessary	2025		
1.1 Site/Area Protection Develop detailed assessment of land tenure within critical habitat areas for ACPF.	NCC	Beneficial	2017	Freshwater Wetlands, Riparian and Floodplain Systems	1.1 Cottage and residential development
1.1 Site/Area Protection Acquire priority habitat for Blanding's Turtle, Eastern Ribbonsnake, and ACPF as opportunities arise.	NSNT	Necessary	2025	Freshwater Wetlands, Riparian and Floodplain Systems	
2. Land/Water Management					
2.1 Site/Area Management Inform and implement the North American Waterfowl Management Plan (NAWMP) and conduct waterfowl surveys as required by the plan.	EC, EHJV, USFWS, USGS	Necessary	Ongoing	Tidal Marshes, Tidal Flats, Freshwater Wetlands, Grasslands, Riparian and Floodplain Systems	
2.1 Site/Area Management Implement management plans for Sand Pond National Wildlife Area and Sable River, Port Joli, Haley Lake, and Port Hebert Migratory Bird Sanctuaries.	EC	Necessary	Ongoing	All	
2.1 Site/Area Management Complete ecological risk assessments to assess threats to species and ecosystems within existing and proposed protected areas. Create a	Province of NS	Beneficial		All	

[1] Categories based on IUCN – CMP Unified Classification of Conservation Actions Needed (Version 2.0). Actions are meant to be specific and measureable if possible, and are not listed in order of importance.

[2] 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.

[3] Priority Habitats: Beaches and dunes, tidal marshes, tidal flats, coastal islands, freshwater wetlands, Acadian forest, riparian/floodplain systems, grasslands/agro-ecosystems, barrens.

Conservation Actions[1] Description of related action (specific and measurable if possible)	Collaborators	Importance[2]	Date for Completion	Priority Habitat(s)[3]	Primary Related Threat(s)
spatial layer of sensitive habitats and ecosystems to aid in planning and an action plan for protected area managers.					
2.1 Site/Area Management Continue ecological integrity monitoring to assess the state of forest, freshwater, wetland, and coastal ecosystem health in Kejimkujik National Park through the monitoring, analysis, and reporting of approximately 30 measures (e.g., forest birds, salamanders, water quality, Eelgrass) and by summarizing these finding in the *State of the Park Report*.	Parks Canada through collaboration with many partners	Necessary	Ongoing	All	
2.1 Site/Area Management Conduct wildlife connectivity analyses to identify optimal connectivity corridors between core protected areas/natural habitats.	NCC	Necessary	2018	All	
2.1 Site/Area Management Continue to monitor populations of endangered, threatened, and special concern species of ACPF on the 36 high priority lakes identified in the ACPF recovery strategy to complete a full inventory and to document lake-level population changes. Continue to sample water quality on a sub-set of the 36 high priority lakes. Continue to engage volunteers in the monitoring of ACPF and threats along lakeshores in southwest Nova Scotia. In Kejimkujik National Park and National Historic Site, continue annual Water-pennywort surveys on Kejimkujik and George Lakes.	MTRI, PC	Necessary	Ongoing	Riparian and Floodplain Systems, Freshwater Wetlands	1.1 Cottage and residential development
2.1 Site/Area Management Conduct botanical surveys of potential ACPF habitat between Tusket watershed and Queens County.	ACCDC	Necessary	2020	Tidal Marshes, Freshwater Wetlands, Riparian and Floodplain Systems	
2.1 Site/Area Management Conduct insect biodiversity surveys in southwestern Nova Scotia, focusing on the discovery of disjunct species associated with the Atlantic Coastal Plain, including targeted efforts to find species dependent on rare ACPF, such as Sweet Pepperbush and Eastern Baccharis.	ACCDC	Beneficial	2020	Tidal Marshes, Freshwater Wetlands, Riparian and Floodplain Systems	
2.2 Invasive/Problematic Species Control Establish a structure to facilitate collaboration and strategic decision making regarding invasive species control techniques.	NCC, MTRI	Beneficial	2020	All	8.1 Invasive/ alien species/ diseases
2.2 Invasive/Problematic Species Control Raise awareness of invasive species in Nova Scotia and the role they play in ecosystems through the Backyard Biodiversity project.	PC, MTRI	Beneficial	Ongoing	All	8.1 Invasive / alien species/ diseases
3. Species Management					
3.1 Species Management Continue the long-standing volunteer program to protect Blanding's	MTRI, PC, EC, Acadia University,	Necessary	Ongoing	Freshwater Wetlands, Riparian and	

Conservation Actions[1] Description of related action (specific and measurable if possible)	Collaborators	Importance[2]	Date for Completion	Priority Habitat(s)[3]	Primary Related Threat(s)
Turtle nests from predation, flooding, and other risks and work with landowners to protect turtles on their properties. Develop a long term monitoring plan and continue to monitor the three known populations in Southwest Nova Scotia to collect long term data on survivorship, clutch size, headstarting, hatchling success, habitat use, and site fidelity. Search for new populations by soliciting and following up on public sighting reports, and provide information on high priority sites to land trusts.	Friends of Keji, Blanding's Turtle Recovery Team			Floodplain Systems	
3.1 Species Management Continue to conduct systematic surveys and solicit public sightings of Eastern Ribbonsnake to determine their range and abundance in the bioregion. Continue to monitor the one known Eastern Ribbonsnake overwintering site to document site use, snake abundance, and site fidelity, and conduct field surveys around known concentration sites in spring and fall to locate additional overwintering sites.	MTRI, PC, Dalhousie University, Eastern Ribbonsnake Recovery Team	Necessary	Ongoing	Acadian Forest Mosaic, Riparian and Floodplain Systems	
3.1 Species Management Continue to monitor populations of endangered, threatened, and special concern species of ACPF on the 36 high priority lakes identified in the ACPF recovery strategy to document lake-level population changes. Continue to sample water quality on a sub-set of the 36 high priority lakes. Continue to engage volunteers in the monitoring of ACPF species and the identification of threats along lakeshores in southwest Nova Scotia. In Kejimkujik National Park and National Historic Site, continue annual Water-pennywort surveys on Kejimkujik and George Lakes.	MTRI, PC	Necessary	Ongoing	Riparian and Floodplain Systems, Freshwater Wetlands	1.1 Cottage and residential development
3.1 Species Management Continue to monitor the Eastern Mountain Avens on Brier Island and Digby Neck as needed and continue studies of reproduction and growth with partners. Assist with baseline studies of conditions in Big Meadow Bog and other critical habitat sites and monitor gull populations and vegetation threats in Big Meadow Bog.	Fernhill Institute for Plant Conservation in collaboration with many partners	Necessary	Ongoing	Freshwater Wetlands	1.1 Cottage and residential development
3.2 Species Recovery Engage and consult with all partners in the development of SAR recovery documents, and support the activities described within recovery documents for the schedule of studies for SAR and the identification of their critical habitat within the SWNS bioregion.	EC, NSDNR, Academic Institutions, NSNT, NCC, MTRI	Necessary	Ongoing	All	
4. Education and Awareness					
4.2 Training Continue to facilitate opportunities for volunteers to engage in regional SAR and conservation programs in the Southwest Nova Biosphere	PC, Friends of Keji, MTRI, BSC, Acadia University	Beneficial	Ongoing	All	

Conservation Actions[1] Description of related action (specific and measurable if possible)	Collaborators	Importance[2]	Date for Completion	Priority Habitat(s)[3]	Primary Related Threat(s)
Reserve through the Kejimkujik Southwest Nova Volunteer Program. Stewardship tools and guides will be developed and distributed, including *Species at Risk in Nova Scotia, Atlantic Coastal Plain Flora in Nova Scotia, Healthy Lakes and Wetlands for Tomorrow,* and *Invasive Alien Species in Nova Scotia*.					
4.3 Awareness and Communications Address habitat threats through the education and engagement of stakeholders, landowners, and landusers.	NSNT	Beneficial	Ongoing		
4.3 Awareness and Communications Engage in partnerships with agricultural producers and practitioners to improve the conservation and restoration of wetland habitat in the agricultural landscape, primarily through the promotion and delivery of Agricultural Biodiversity Conservation (ABC) Plans, which allow farmers to clearly identify existing and potential Beneficial Management Practices (BMP's) that will promote the maintenance or enhancement of biodiversity on farms.	EHJV	Necessary	Ongoing	Freshwater Wetlands, Grasslands	2.1 Incompatible agricultural practices
4.3 Awareness and Communications Continue to work with partners to engage the communities of Brier Island and Digby Neck about Eastern Mountain Avens conservation through public meetings, the Gulf of Maine Institute youth group, and the community stewardship committee.	Fernhill Institute for Plant Conservation, MTRI, NCC, EC, NSDNR, Acadia University, NS Museum	Necessary	Ongoing	Freshwater Wetlands	1.1.1 Cottage and residential development
5. Law and Policy					
5.1.2 Legislation (National level) *Implement the Migratory Bird Convention Act*, *Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act*, *Species at Risk Act*, *Canadian Environmental Protection Act*, *Canada Wildlife Act*, *Environmental Enforcement Act*, *Canadian Environmental Assessment Act*, *Fisheries Act*.	EC, DFO	Necessary	Ongoing		
5.2 Policies and Regulations Implement the federal policy on wetland conservation.	EC	Necessary	Ongoing	Tidal Marshes, Freshwater Wetlands, Floodplain Systems	
5.2 Policies and Regulations Collaborate with the Province of Nova Scotia and other stakeholders regarding changes to the *Code of Forest Practice for Crown Land*.	MTRI	Beneficial	Ongoing	Acadian Forest Mosaic, Freshwater Wetlands, Riparian and Floodplain Systems	5.3 Forest harvesting practices

Conservation Actions[1] Description of related action (specific and measurable if possible)	Collaborators	Importance[2]	Date for Completion	Priority Habitat(s)[3]	Primary Related Threat(s)
5.4 Compliance and Enforcement Undertake wildlife and environmental enforcement activities (EC Wildlife Enforcement, Environmental Enforcement); address illegal hunting and disturbance, illegal activities and habitat destruction	EC, Province of NS	Necessary	Ongoing	All	
6. Livelihood, Economic, and Other Incentives					
6.1 Linked Enterprises & Livelihood Alternatives Demonstrate strong environmental stewardship and woodland management through the development of the Medway Community Forest Cooperative, a locally governed, long-term, ecologically-based stewardship plan that allows multiple uses of a working community forest, while nurturing new and innovative forest-based businesses that support the local economy.	MTRI, Wind Horse Woods, North Queens Board of Trade, FNSWO, NSWOOA, NS Co-operative Council, EAC, forestry contractors, mills	Beneficial	Ongoing	Acadian Forest Mosaic, Freshwater Wetlands, Riparian and Floodplain Systems	5.3 Forest harvesting practices
6.4 Conservation Payments Implement and encourage the use of EC Ecological Gifts (Ecogifts) program.	EC, NCC, NSNT	Necessary	Ongoing	All	
7. External Capacity Building					
7.2 Alliance and Partnership Development Provide EC-CWS input into: Staying Connected Initiative, Western Hemispheric Shorebird Reserve Network, and Important Bird Areas.	EC through collaboration with many partners	Beneficial	Ongoing	All	
7.3 Conservation Finance Communicate, inform, and increase awareness related to funding opportunities for conservation: *North American Wetland Conservation Act* (NAWCA)/Eastern Habitat Joint Venture (EHJV), North Atlantic Landscape Conservation Cooperative (NALCC); National Conservation Plan (NCP): Atlantic Ecosystems Initiative (AEI), Habitat Stewardship Program (HSP), Aboriginal Fund for Species at Risk (AFSAR), National Wetland Conservation Fund (NWCF).	EC, US Federal and State partners	Necessary	Ongoing	All	
7.3 Conservation Finance Continue to engage longstanding/key funding partners to support conservation work in the SWNS bioregion.	NCC, MTRI, NSNT, ENGOs	Necessary	Ongoing	All	

References

Anderson, M. G., *et al.* 2006. The Northern Appalachian / Acadian Ecoregion: Ecoregional Assessment, Conservation Status and Resource CD. The Nature Conservancy, Eastern Conservation Science, and the Nature Conservancy of Canada, Atlantic and Quebec Regions.

Basquill, Sean, Per. Comm., Provincial Habitat Biologist, Nova Scotia Department of Natural Resources, 136 Exhibition Street, Kentville, Nova Scotia B4N 4E5.

Clair, T. A., T. Pollock, G. Brun, A. Ouellet, & D. Lockerbie. 2001. Environment Canada's Acid Precipitation Monitoring Networks in Atlantic Canada, Occasional Report #16. Environment Canada, Ottawa.

COSEWIC. 2000. COSEWIC assessment and update status report on the Eastern Mountain Avens *Geum peckii* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa.

Davis, D. S. & S. Browne. 1996. The Natural History of Nova Scotia, Volume One: Topics and Habitats. Nova Scotia Museum, Government of Nova Scotia, Nimbus Publishing, Halifax.

Environment Canada, Ontario Ministry of Natural Resources, & Ontario Ministry of Environment (EC, OMNR, & OME). 1998. A Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern. Public Works and Government Services Canada, Toronto, Ontario.

Environment Canada & Parks Canada Agency (EC & PCA). 2010. Recovery Strategy and Management Plan for Multiple Species of Atlantic Coastal Plain Flora in Canada. *Species at Risk Act* Recovery Strategy Series, Ottawa.

Farrow, L. J., & P. Nussey. 2015. Southwest Nova Scotia Habitat Conservation Strategy. Mersey Tobeatic Research Institute, Kempt, NS.

Government of Nova Scotia. 2011. Nova Scotia Wetland Conservation Policy. http://www.gov.ns.ca/nse/wetland/docs/Nova.Scotia.Wetland.Conservation.Policy.pdf.

Kerekes, J. & P. Schwinghamer. 1973. Atlantic Canada National Parks Aquatic Resources Inventories. Environment Canada - Atlantic Canada, Occasional Report No. 20. Environment Canada.

Mersey Tobeatic Research Institute (MTRI). 2012. Invasive Alien Species in Nova Scotia: Identification and Information Guide. Kempt, Nova Scotia.

National Wetlands Working Group. 1997. The Canadian Wetland Classification System, 2nd Edition. Warner, B.G. and C.D.A. Rubec (eds.), Wetlands Research Centre, University of Waterloo, Waterloo, Ontario.

North American Wetlands Conservation Council (NAWCC). 2012. *A Wetland Conservation Vision for Canada.* Wetlands Canada.

Nova Scotia Eastern Habitat Joint Venture (NS EHJV). 2008. Eastern Habitat Joint Venture Five Year (2007-2012) Plan for the Implementation of the North American Waterfowl Management Plan in Nova Scotia. Nova Scotia Department of Natural Resources.

Nova Scotia Environment (NSE). 2012b. Historic Wetland Loss in Nova Scotia. Last updated May 23, 2013. http://www.gov.ns.ca/nse/wetland/historic-wetland-loss-ns.asp.

Nova Scotia Environment (NSE). 2012c. Nova Scotia's Wetlands. Last updated June 11, 2013. http://www.gov.ns.ca/nse/wetland/.