

# Arties Pond Wetlands – Wetland Ecosystem Services Protocol-Atlantic Canada (WESP-AC) Surveys

Bluenose Coastal Action Foundation



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## Description of Arties Pond Wetlands and Method of Assessment

Arties Pond is situated in the community of Broad Cove, Nova Scotia. There are several wetlands that surround Arties Pond that drain fresh water into the pond, which discharges through a culvert into the Atlantic Ocean. Coastal Action completed two wetland assessments at the two larger wetlands which border the pond in the summer months of 2018. The Upper Inlet Wetland was given a site code of ART001 and the Lower Wetland was given the site code of ART002. Both sites were assessed using the Wetland Ecosystem Service Protocol for Atlantic Canada (WESP-AC). Observational wildlife and vegetation surveys were included in the wetland assessments. Staff recorded plant species and wildlife sightings/signs as they moved through the wetland and pond habitats; however, these surveys do not represent a complete list of flora/fauna present in these wetlands.

Site ART001 (44° 10'11.20" N, 064° 28'55.51" W) is approximately 2.9 acres (1.2 ha) in size and is classified as a riparian swamp (see Figure 1). Riparian swamps are situated along lakes, rivers, and streams, with high water level fluctuations and periodic flooding. Swamps are generally dominated by woody plants, often more than 1 m high with periodically standing surface water and gently moving, nutrient-rich groundwater (Fern Hill & Solum Environmental Services, 2017).

Site ART002 (44° 09'55.24" N, 064° 28'54.48" W) is approximately 4 acres (1.6 ha) in size and is classified as a riparian marsh. Riparian marshes are situated in valleys and drainage channels with or without flowing water, water level fluctuations, and flooding. They can have periodic or persistent standing water or slow-moving surface water and their vegetation is dominated by graminoids, shrubs, forbs or emergent plants (Fern Hill & Solum Environmental Services, 2017).

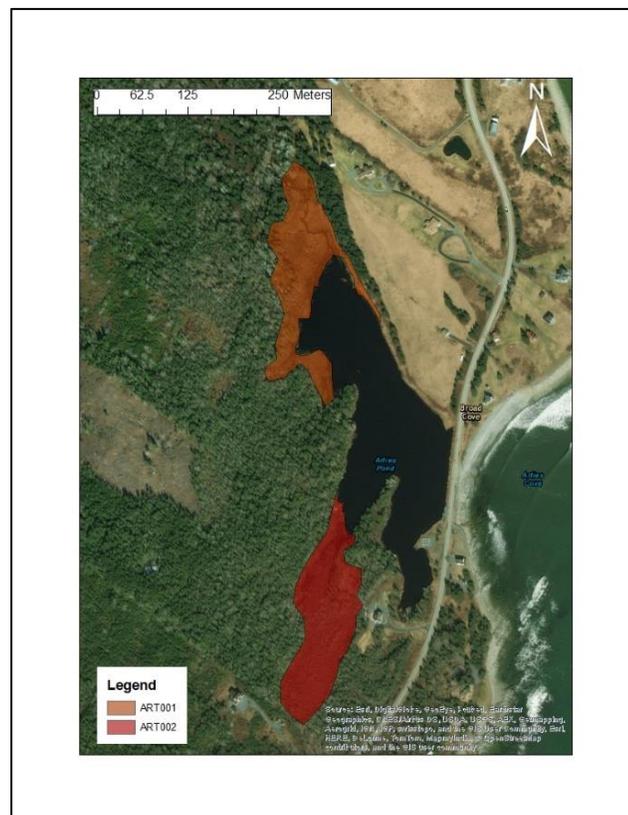


Figure 1. Aerial view of Arties Pond wetlands (note: wetland boundaries have not been officially delineated).

Additional wet areas were observed in the forested habitat between ART001 and ART002. These areas were not mapped; however, any future wetland delineation work in the Arties Pond drainage area should include these small forested wetland habitats, which may be spring-fed. The drainage basin for Arties Pond has been approximated using a contour/topography layer in ArcGIS (see Figure 2) and is roughly 2.3 km<sup>2</sup> in size.

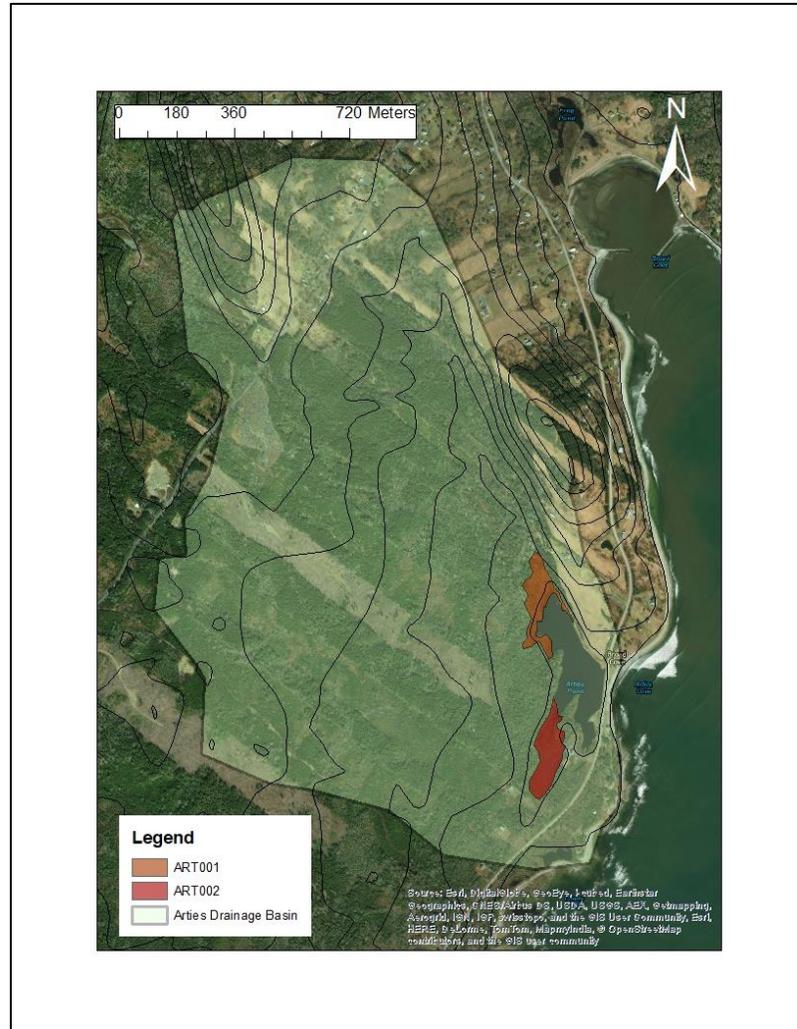


Figure 2. Approximate drainage area for Arties Pond.

## Description of Wetland Ecosystem Service Protocol-Atlantic Canada Assessment

The Wetland Ecosystem Service Protocol for Atlantic Canada (WESP-AC) provides a consistent and comparable survey of wetland benefits. This type of functional assessment provides a standardized method for the rapid assessment of wetland functions. WESP-AC has been regionally calibrated for Atlantic Canada. Assessments are often used as a decision-support tool for regulators and proponents to assist with determining compensation requirements for wetland alterations and evaluating wetland restoration or enhancement success. The assessment can also be used to prioritize wetlands for protection, restoration, or development.

The WESP-AC assessment has both a field evaluation and an office evaluation in which 122 variables are entered into a computer model. The model assesses 21 specific wetland functions and several wetland stresses using a logic-based algorithm. **Table 1** provides a summary of the 21 wetland functions.

*Table 1. (Table adapted from WESP-AC Manual for Nontidal Wetlands – MARCH 2018) List of the calculated wetland functions and stresses, their descriptions and potential benefits.*

Function	Description	Potential Benefit
<b>HYDROLOGIC FUNCTIONS:</b>		
Water storage and delay	The effectiveness for storing runoff or delaying the downslope movement of surface water for long or short periods.	Flood control and maintain ecological systems.
Stream flow support	The effectiveness for contributing water to streams, especially during the driest part of a growing season.	Support fish and other aquatic life.
<b>WATER QUALITY MAINTENANCE FUNCTIONS:</b>		
Thermoregulation (water cooling)	The effectiveness for maintaining or reducing temperature of downslope waters.	Support cold water fish and other aquatic life.
Sediment retention and stabilization	The effectiveness for intercepting and filtering suspended inorganic sediment thus allowing their deposition, as well as reducing energy of waves and current, resisting excessive erosion and stabilising underlying sediments or soil.	Maintain quality of receiving waters and protect shoreline structures from erosion.
Phosphorous retention	The effectiveness for retaining phosphorus for long periods (>1 growing season).	Maintain quality of receiving waters.
Nitrate removal and retention	The effectiveness for retaining particulate nitrate and converting soluble nitrate and ammonium to nitrogen gas while generating little or no nitrous gas oxide (a potent greenhouse gas).	Maintain quality of receiving waters.
Organic matter export	The effectiveness for producing and subsequently exporting organic nutrients (mainly carbon), either particulate or dissolved	Support food chains in receiving waters.
<b>ECOLOGICAL (HABITAT) FUNCTIONS:</b>		
Fish habitat (anadromous and non-anadromous)	The capacity to support an abundance and diversity of native fish (both anadromous and resident species).	Support recreational and ecological values.
Aquatic invertebrate habitat	The capacity to support or contribute to an abundance or diversity of invertebrate animals which spend all or part of their life cycle underwater or in moist soil. Includes dragonflies, midges, clams, snails, water beetles, shrimp, aquatic worms, and others.	Support salmon and other aquatic life and maintain regional biodiversity.

Amphibian and reptile habitat	The capacity to support or contribute to an abundance or diversity of native frogs, toads, salamanders, and turtles.	Maintain regional biodiversity.
Water bird feeding habitat	The capacity to support or contribute to an abundance or diversity of water birds that migrate or winter but do not breed in the region.	Support hunting and ecological values and maintain regional biodiversity.
Water bird nesting habitat	The capacity to support or contribute to an abundance or diversity of water birds that nest in the region.	Maintain regional biodiversity.
Songbird, raptor and mammal habitat	The capacity to support or contribute to an abundance or diversity of native songbird, raptor, and mammal species and functional groups, especially those that are most dependent on wetlands or water.	Maintain regional biodiversity.
Native plant diversity, and pollinator habitat	The capacity to support or contribute to a diversity of native, hydrophytic, vascular plant species, communities, and/or functional groups, as well as the pollinating insects linked to them.	Maintain regional biodiversity and food chains.
Public use and recognition	Prior designation of the wetland, by a natural resource or environmental agency, as some type of special protected area. Also, the potential and actual use of a wetland for low-intensity outdoor recreation, education, or research.	Commercial and social benefits or recreation and protection of prior public investments.
Carbon sequestration	A process by which carbon dioxide is removed from the atmosphere and held in storage within wetland soils.	Climate change mitigation.
<b>WETLAND STRESSORS:</b>		<b>Description</b>
Wetland Condition, Risk and Sensitivity		The aberrant timing of water inputs, accelerated inputs of contaminants and/or salts, accelerated inputs of nutrients, excessive sediment loading from contributing area and soil or sediment alteration within the assessment area.

Scores are reported on a scale of 0-10, while ratings are reported as Lower, Moderate, and Higher. Effectiveness scores and benefit scores are considered independently of one another. Functions can have high effectiveness, but a wetland may have a limited ability to perform that function, giving it a low benefit score, while other functions may have low effectiveness but a high benefit score. Highly functioning wetlands are those that are high in both effectiveness and benefit scores and should always be preserved. **Table 2** displays the suggested action depending on effectiveness and benefit scores for wetland functions.

Table 2. Suggested action depending on effectiveness and benefit scores for wetland functions.

Function Effectiveness Score	Function Benefit Score	Potential Action
High	High	Preserve
Low	High	Restore or enhance
High	Low	Maintain as is
Low	Low	Acceptable for development

### Arties Pond WESP-AC Assessment Results

Results from the WESP-AC assessment can be seen in **Tables 3** and **4** for both Arties Upper Inlet Wetland (ART001) and Arties Lower Wetland (ART002). A list of observed plant species and wildlife signs/sightings can be found in **Tables 5** and **6** for both wetlands.

Table 3. Results from WESP-AC assessment completed at Arties Upper Inlet Wetland (ART001).

Wetland Functions or Other Attributes:	Effectiveness Score (Normalised)	Effectiveness Rating	Benefit Score (Normalised)	Benefit Rating
Water Storage & Delay (WS)	2.04	Lower	7.52	Higher
Stream Flow Support (SFS)	7.31	Higher	10.00	Higher
Water Cooling (WC)	8.42	Higher	9.89	Higher
Sediment Retention & Stabilisation (SR)	3.60	Lower	8.73	Higher
Phosphorus Retention (PR)	2.94	Lower	9.20	Higher
Nitrate Removal & Retention (NR)	4.44	Moderate	10.00	Higher
Carbon Sequestration (CS)	1.99	Lower		
Organic Nutrient Export (OE)	10.00	Higher		
Anadromous Fish Habitat (FA)	8.17	Higher	6.63	Higher
Resident Fish Habitat (FR)	10.00	Higher	6.58	Higher
Aquatic Invertebrate Habitat (INV)	9.00	Higher	10.00	Higher
Amphibian & Turtle Habitat (AM)	8.50	Higher	6.99	Higher
Water bird Feeding Habitat (WBF)	8.58	Higher	10.00	Higher
Water bird Nesting Habitat (WBN)	9.21	Higher	10.00	Higher
Songbird, Raptor, & Mammal Habitat (SBM)	7.46	Moderate	10.00	Higher
Pollinator Habitat (POL)	9.38	Higher	10.00	Higher
Native Plant Habitat (PH)	8.65	Higher	8.06	Higher
Public Use & Recognition (PU)			2.61	Moderate
Wetland Sensitivity (Sens)			4.03	Moderate
Wetland Ecological Condition (EC)			7.10	Higher

Wetland Stressors (STR) (higher score means more stress)			7.26	Higher
<b>Summary Ratings for Grouped Functions:</b>				
HYDROLOGIC Group (WS)	2.04	Lower	7.52	Higher
WATER QUALITY SUPPORT Group (max + avg/2 of SR, PR, NR, CS)	4.05	Lower	9.65	Higher
AQUATIC SUPPORT Group (max + avg/2 of SFS, INV, OE, WC)	9.34	Higher	9.98	Higher
AQUATIC HABITAT Group (max + avg/2 of FA, FR, AM, WBF, WBN)	9.45	Higher	9.02	Higher
TRANSITION HABITAT Group (max + avg/2 of SBM, PH, POL)	8.94	Higher	9.68	Higher
WETLAND CONDITION (EC)			7.10	Higher
WETLAND RISK (average of Sensitivity & Stressors)			5.65	Moderate

Table 4. Results from WESP-AC assessment completed at Arties Lower Wetland (ART002).

Wetland Functions or Other Attributes:	Effectiveness Score (Normalised)	Effectiveness Rating	Benefit Score (Normalised)	Benefit Rating
Water Storage & Delay (WS)	1.89	Lower	10.00	Higher
Stream Flow Support (SFS)	10.00	Higher	10.00	Higher
Water Cooling (WC)	5.79	Higher	10.00	Higher
Sediment Retention & Stabilisation (SR)	3.64	Lower	1.64	Moderate
Phosphorus Retention (PR)	1.32	Lower	2.41	Moderate
Nitrate Removal & Retention (NR)	5.84	Higher	10.00	Higher
Carbon Sequestration (CS)	3.01	Lower		
Organic Nutrient Export (OE)	7.45	Higher		
Anadromous Fish Habitat (FA)	7.53	Higher	4.93	Higher
Resident Fish Habitat (FR)	10.00	Higher	4.85	Higher
Aquatic Invertebrate Habitat (INV)	6.16	Higher	8.79	Higher
Amphibian & Turtle Habitat (AM)	7.61	Higher	6.27	Higher
Water bird Feeding Habitat (WBF)	7.62	Higher	6.67	Moderate
Water bird Nesting Habitat (WBN)	8.28	Higher	6.67	Moderate
Songbird, Raptor, & Mammal Habitat (SBM)	6.39	Moderate	10.00	Higher
Pollinator Habitat (POL)	8.07	Higher	10.00	Higher

Native Plant Habitat (PH)	6.07	Higher	7.40	Moderate
Public Use & Recognition (PU)			1.45	Moderate
Wetland Sensitivity (Sens)			5.83	Moderate
Wetland Ecological Condition (EC)			4.78	Moderate
Wetland Stressors (STR) (higher score means more stress)			6.67	Higher
<b>Summary Ratings for Grouped Functions:</b>				
HYDROLOGIC Group (WS)	1.89	Lower	10.00	Higher
WATER QUALITY SUPPORT Group (max + avg/2 of SR, PR, NR, CS)	4.72	Moderate	7.34	Higher
AQUATIC SUPPORT Group (max + avg/2 of SFS, INV, OE, WC)	8.67	Higher	9.80	Higher
AQUATIC HABITAT Group (max + avg/2 of FA, FR, AM, WBF, WBN)	9.10	Higher	6.27	Higher
TRANSITION HABITAT Group (max + avg/2 of SBM, PH, POL)	7.46	Higher	9.57	Higher
WETLAND CONDITION (EC)			4.78	Moderate
WETLAND RISK (average of Sensitivity & Stressors)			6.25	Higher

Table 5. List of vegetation identified and wildlife signs/observations at Arties Upper Inlet Wetland (ART001).

<b>SITE CODE: ART001</b>		<b>DATE ASSESSED: 30-JUL-18</b>
<b>Vegetation Survey Results</b>		
<b>Species Name</b>	<b>Common Name</b>	
1 <i>Acer rubrum</i>	Red maple	
2 <i>Alnus incana</i>	Speckled alder	
3 <i>Aster prenanthoides</i>	Crooker-stemmed aster	
4 <i>Asteraceae</i>	Goldenrod	
5 <i>Betula papyrifera</i>	White birch	
6 <i>Calamagrostis canadensis</i>	Blue joint grass	
7 <i>Carex folliculata</i>	Northern long sedge	
8 <i>Carex gynandra</i>	Weeping sedge	
9 <i>Carex lurida</i>	Shallow sedge	
10 <i>Carex scoparia</i>	Broom sedge	
11 <i>Carex trisperma</i>	Tree-seeded sedge	
12 <i>Chamaedaphne calyculata</i>	Leather leaf	
13 <i>Cornus canadensis</i>	Bunchberry	
14 <i>Equisetum sylvaticum or fluviatile</i>	Wood or water horsetail	
15 <i>Eriophorum angustifolium</i>	Common cotton grass	
16 <i>Glyceria canadensis</i>	Rattle snake grass	

17	<i>Hypericum virginicum</i>	Marsh St. Johns wort
18	<i>Ilex mucronata</i>	Mountain holly
19	<i>Iris versicolor</i>	Blue flag iris
20	<i>Juncus effusus</i>	Soft rush
21	<i>Kalmia angustifolia</i>	Sheep laurel
22	<i>Larix laricina</i>	Larch
23	<i>Lysimachia terrestris</i>	Swamp candle or yellow-loosestrife
24	<i>Maianthemum dilatatum</i>	False lily of the valley
25	<i>Myrica gale</i>	Sweet gale
26	<i>Nymphaea odorata</i>	Fragrant water-lily
27	<i>Onoclea sensibilis</i>	Sensitive fern
28	<i>Osmunda cinnamomea</i>	Cinnamon fern
29	<i>Osmunda regalis</i>	Royal fern
30	<i>Parathelypteris noveboracensis</i>	New York fern
31	<i>Persicaria sagittata</i>	Arrow-leaved tear thumb or smart weed
32	<i>Picea mariana</i>	Black spruce
33	<i>Pteridium aquilinum</i>	Bracken fern
34	<i>Rhododendron Ledum groenlandicum</i>	Labrador tea
35	<i>Rubus pubescens</i>	Dwarf raspberry
36	<i>Scirpus cyperinus</i>	Common woolly bulrush
37	<i>Scutellaria epilobiifolia</i>	Common or marsh skull cap
38	<i>Sparganium eurycarpum</i>	American burreed
39	<i>Sphagnum</i>	Peat moss
40	<i>Spiraea alba</i>	White meadowsweet
41	<i>Spiraea latifolia</i>	Broadleaf meadowsweet
42	<i>Thalictrum polygamum</i>	Tall meadow-rue
43	<i>Typha latifolia</i>	Common cattail
44	<i>Vaccinium macrocarpon</i>	Large cranberry
45	<i>Viburnum nudum</i>	Wild raisin

**Signs/Observations of Wildlife**

1	Beaver activity: lodge on northern shoreline of Arties Pond, dam observed on inlet stream within ART001 wetland. Adult beaver observed outside of lodge engaging in a territorial dispute with 2 otters.
2	Frogs observed throughout wetland and pond habitat.
3	Pollinators observed throughout wetland habitat (bees, butterflies).
4	Significant amount of dead standing wood with cavities indicating possible habitat for owls, waterfowl, or other cavity-nesting birds.
5	Otter scat observed along pond and wetland shorelines.
6	Garter snake ( <i>Thamnophis sirtalis</i> ) on wetland shoreline.
7	Mallards ( <i>Anas platyrhynchos</i> ) near ART001 wetland, in Arties Pond.
8	Black-capped chickadees ( <i>Poecile atricapillus</i> ) in wetland habitat.
9	Brook trout ( <i>Salvelinus fontinalis</i> ) in inlet stream flowing through ART001.

Table 6. List of vegetation identified and wildlife signs/observations Arties Lower Wetland (ART002).

SITE CODE: ART002		DATE ASSESSED: 10-AUG-18
Vegetation Survey Results		
Species Name		Common Name
1	<i>Acer rubrum</i>	Red maple
2	<i>Alnus incana</i>	Speckled alder
3	<i>Amelanchier intermedia</i>	Intermediate serviceberry
4	<i>Anaphalis margaritacea</i>	Pearly everlasting
5	<i>Calopogon tuberosus</i>	Grass pink
6	<i>Carex radiata</i>	Eastern star sedge
7	<i>Carex stricta</i>	Tussock sedge
8	<i>Chamaedaphne calyculata</i>	Leather leaf
9	<i>Cornus canadensis</i>	Bunchberry
10	<i>Drosera intermedia</i>	Narrow-leaved sundew
11	<i>Gaylussacia dumosa</i>	Bog huckleberry
12	<i>Ilex mucronata</i>	Mountain holly
13	<i>Iris versicolor</i>	Blue flag iris
14	<i>Juncus effusus</i>	Soft rush
15	<i>Kalmia angustifolia</i>	Sheep laurel
16	<i>Larix laricina</i>	Larch
17	<i>Lysimachia terrestris</i>	Swamp candle or yellow-loosestrife
18	<i>Morella caroliniensis</i>	Small bayberry
19	<i>Myrica gale</i>	Sweet gale
20	<i>Nuphar X rubrodisca or microphylla</i>	Yellow pond-lily or small pond lily
21	<i>Nymphaea odorata</i>	Fragrant water-lily
22	<i>Onoclea sensibilis</i>	Sensitive fern
23	<i>Osmunda cinnoamomea</i>	Cinnamon fern
24	<i>Osmunda regalis</i>	Royal fern
25	<i>Picea mariana</i>	Black spruce
26	<i>Polytrichum</i>	Hair cap moss
27	<i>Rhododendrom Ledum groenlandisum</i>	Labrador tea
28	<i>Rhododendron canadense</i>	Rhodora
29	<i>Rhynchospora alba</i>	White beaksedge
30	<i>Rubus pubescens</i>	Dwarf raspberry
31	<i>Salix pedicellaris</i>	Willow
32	<i>Sarracenia purpurea</i>	Purple pitcher plant
33	<i>Scirpus cyperinus</i>	Common woolly bulrush
34	<i>Spartina Pectinata</i>	Freshwater cord grass
35	<i>Sphagnum</i>	Peat moss
36	<i>Spiraea alba</i>	White meadowsweet

37	<i>Spiraea latifolia</i>	Broadleaf meadowsweet
38	<i>Vaccinium angustifolium</i>	Lowbush blueberry
39	<i>Vaccinium macrocarpon</i>	Large cranberry
40	<i>Viburnum nudum</i>	Wild raisin
<b>Signs/Observations of Wildlife</b>		
1	Beaver activity - lodge in Arties Pond, and beaver channels throughout ART002.	
2	Frogs observed throughout wetland and pond habitat.	
3	Pollinators observed throughout wetland habitat (bees, butterflies).	
4	Mallards ( <i>Anas platyrhynchos</i> ) near ART001 wetland, in Arties Pond.	
5	Deer scat observed throughout wetland habitat.	

### Summary and Recommendations

Forty-five plant species were identified, and ten signs/sightings of wildlife were recorded during the assessment of Arties Upper Inlet Wetland (ART001), while forty plant species were identified, and six signs/sightings of wildlife were recorded during the assessment of Arties Lower Wetland (ART002).

Among the list of plants identified in ART002 was an orchid common across the eastern half of North America called grass pink orchid (*Calopogon tuberosus*). The Nova Scotia Department of Lands and Forests currently rank this species as “green” (Nova Scotia Nature Trust, 2005), meaning that it is secure within the province of Nova Scotia. However, grass pink is listed as endangered in Illinois, Kentucky, Maryland, and vulnerable in New York. Grass pink is an indicator species for good remnant hydrology and generally inhabits areas with a very small amount of shade and a constant water supply. The main threat to grass pink is the degradation of suitable habitat due to drying out (Hilty, 2002).

Both wetlands displayed low function scores for water storage and delay (flood control), and high function scores for streamflow support. This suggests that these wetlands do not provide significant water storage support during flood conditions, but they do contribute water to their inlet streams and the nearby pond during periods of drought or a drawdown of the pond’s water level. Both wetlands displayed high function scores for many of the aquatic/terrestrial wildlife habitat categories suggesting that they are providing high quality habitat for wildlife in coastal freshwater wetlands.

ART001 displays high function and benefit scores for aquatic support, aquatic habitat, and transition habitat. Overall, the wetland condition is ranked as higher; however, the wetland risk (due to sensitivity and stressors) is ranked as moderate.

ART002 displays high function and benefit scores for aquatic support, aquatic habitat, and transition habitat. Overall, the wetland condition is ranked as moderate, and the wetland risk (due to sensitivity and stressors) is ranked as higher.

While the WESP survey is just one of many wetland assessment tools, it can provide a useful overview of a wetland’s ecosystem services and provide guidance on future management or protection of an area. For both ART001 and ART002, it is recommended that the high scoring wildlife habitat functions should be maintained. The installation of nest boxes for songbirds, raptors, and cavity-nesting waterfowl would greatly contribute to these functions. Any future efforts to enhance these wetlands should focus on improving functions within the hydrologic group and the water quality support group, especially for ART002.

## References

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