

Muskoka River Watershed IWM Natural Capital Inventory

Addendum 3: OWES Screening

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DISCLAIMER

This document entitled "Muskoka River Watershed IWM Natural Capital Inventory Addendum 3 OWES Screening" was prepared by Dougan & Associates for The District Municipality of Muskoka on October 21st, 2023. The purpose of this document is to provide a summary of data compiled to date and a gap analysis. It should be recognized that this undertaking is to provide proof of concept to assist the District of Muskoka in exploring the potential to pre-screen wetland features and their potential status. The results should not be used or interpreted as an official update to the wetland record for the wetland evaluations used for comparison purposes. This document may be used by the client and approval agencies to whom it was submitted for the stated purpose. Dougan & Associates should be contacted for prior permission if the document is to be used outside of its stated purpose or if any third parties wish to use the document. Our professional judgements and opinions presented in the document are inextricably tied to the project scope, known site conditions, and proposed site plans available to us at the time of the study. Anyone who wishes to apply information from this document to any future decision-making process must obtain prior permission from Dougan & Associates. Dougan & Associates will not be held responsible for any loss or damages incurred as a result of this document being used or interpreted outside of its intended purpose.

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INTRODUCTION AND OBJECTIVES

The Ontario Wetland Evaluation System (OWES) is a framework developed by the Ontario Ministry of Natural Resources and Forestry (MNRF) to assess and identify wetlands of provincial significance. Wetlands, including swamps, fens, marshes, and others, are recognized for their role in supporting diverse species and maintaining ecological processes. The OWES, while rooted in scientific criteria, is primarily tailored to meet the needs of Ontario's planning process, particularly at the municipal level.

The system aims to rank wetlands based on a formalized scoring system, providing valuable information for decision-making in land use planning. The system emphasizes the importance of wetlands in preserving critical ecosystem functions, offering social benefits, moderating storm flows, improving water quality, and protecting rare species. The term "significant wetland" in the OWES specifically refers to Provincially Significant Wetlands (PSWs). The evaluation system is the exclusive means of determining whether a wetland is provincially significant in Ontario, and it includes a northern and southern scoring system adapted to regional conditions. The northern system applies to Ecoregions 2, 3, 4, and 5 (Ontario , 2022a) and the southern system applies to Ecoregions 6 and 7 (Ontario, 2022b).

The system employs four main scoring components: Biological, Social, Hydrological, and Special Features. Each component is assessed independently, further divided into subcomponents, attributes, and sub-attributes. The scoring method is numerical, assigning point totals to predefined values. Within each level of assessment, values are weighted to reflect their relative importance. The total number of points that can be scored for each component is 250, thus the maximum a wetland can score is 1000 points. For both the northern and southern systems, a wetland is considered significant if it scores 600 or more points, or achieves a score of 200 or more points in either the Biological or Special Features components.

A formal evaluation must be undertaken by individuals with the appropriate training and be based on credible data. The OWES manual provides guidance provides specific details, emphasizing that evaluators should rely on their observations, data collection, research, and professional judgment when applying the OWES. From a practical point of view however, these requirements limit the application of OWES, particularly across large geographies and where access to wetlands is limited.

Important changes to OWES were introduced in 2023 as an outcome of the Province’s Bill 23, the More Homes Built Faster Act, 2022. A significant amendment included the removal of points for the presence of endangered and threatened species in the evaluation process, a component previously fundamental in designating a wetland as provincially significant under the Special Features component. As well, changes were introduced to how individual wetlands are grouped (complexed) and scored. Previously, the system allowed for the identification of a wetland complex, where provincially significant wetlands in proximity could be grouped together, recognizing their ecological connection. However, under the introduced changes, this identification of wetland complexes has been removed. The changes also shift wetland assessment responsibility from government agencies to private wetland assessors and reduce the roles of the Ministry of Natural Resources and Forestry in reviewing wetland evaluations. Instead, the roles have been re-directed to municipalities and the private sector.

Advances in the accuracy and resolution of remotely sensed data (e.g., high resolution aerial imagery, high resolution Lidar, and associated derivatives) may provide a feasible approach to estimate, and thus pre-screen, scores for some of the OWES subcomponents and thus provide insight into potential significance. The main objective of this assignment is to develop a framework that can be used to pre-

screen the status of wetland features using OWES criteria based on remotely sensed data and data available from various other sources. The framework involves estimating OWES scores for select criteria using available data layers that were developed as part of the Muskoka River Integrated Watershed Management Natural Capital Inventory or other data sets that are readily available to the District.

The framework will aid the District in determining the baseline OWES scores for wetland features within the watershed and assist in identifying wetlands that are likely to be provincially significant. The general approach involved summarizing OWES criteria and identifying data sets that can be used to derive proxy scores. For those criteria where scores can be estimated, a proposed scoring framework is provided. The preliminary screening is validated against wetland features where existing OWES evaluations have been undertaken.

METHODS

Criteria from the OWES Northern Ontario Manual was extracted and compiled in an excel spreadsheet to summarize the component, section, subsection, scoring range, and general notes describing the criteria, data type that could be used as a proxy, and geoprocessing considerations (Appendix A). A complementary set of methodology tear sheets were also prepared to help document the watershed-scale data layers used for the analysis, assumptions, modifications to the OWES approach, and general steps involved in processing the available data (Appendix B).

A combination of data availability, geoprocessing complexity, and weight of OWES criteria was used to prioritize which criteria had the highest potential for evaluating using existing data. For example, criteria were not prioritized if data was not available, where site-level detail/interpretation was required, and/or if the geoprocessing required manual inputs. As well, where criteria have relatively low scores (e.g., less than 10) and were determined to have a high geoprocessing complexity (e.g., requiring manual or subjective input) the criteria were not included for scoring. In total, score predictions were applied to 37 of the 51 OWES criteria (Appendix A and B).

To determine the efficacy of the OWES score predictions, results were compared to the scores and outcomes of four existing wetland evaluations. This included:

- Childs Pit Quarry (RiverStone Environmental Solutions Inc., 2022)
- Bala Wetland Complex (Beacon Environmental, 2009)
- Mactier Wetland Complex (McDonnell, J. 2009)
- Tandenac North Wetland Complex (Garner Lee Limited, 2004)

The four wetland evaluation comparisons provided variation in status outcomes (e.g., Childs Pit Quarry was determined to be not provincially significant, while the others represent provincially significant wetlands). As well, the wetland evaluations represent a range of dates as to when the wetland records were updated, from 2004 to 2022.

It is also recognized that various iterations of the OWES system have been published across the years in which the various evaluations were undertaken; the most recent version being 2022 (Ontario, 2022). Scoring using the predictions are based on the most recent iteration which required no longer scoring occurrence and/or habitat of Endangered or Threatened species, and changes to how wetland complexes are evaluated. For this analysis, individual wetland units were identified based on the original wetland evaluation mapping to represent what would have historically been represented as a wetland complex.

Predicted scores for each wetland unit were then compiled, and the maximum score from the respective wetland units was used as the score for the respective criterion. The resulting Predicted scores are documented in Appendix C.

Various analyses were undertaken to evaluate the efficacy of the OWES scores that resulted from the predictions:

- Comparison of scores for OWES components and criteria
- Status determination and comparison based on only using the prediction framework and a combined approach using existing OWES scores for criteria that were not evaluated using the framework

The comparison of scores for OWES components and criteria focused on only those criteria that were used for the predictions. General comparisons were made among the four OWES components, as well as identifying criteria that represented the largest mismatches in scoring.

Status comparisons included using the formal OWES evaluation scores as the benchmark, followed with i) the hypothetical status outcomes based on using the predicted scores, and ii) the hypothetical status outcome based on a combined score using the formal OWES evaluation scores for criteria that were not evaluated using the prediction framework. As per the OWES framework, a wetland is considered provincially significant if the score is greater than or equal to 200 for the Biological or Special Feature Components, or if the overall score is equal to or greater than 600.

It should be recognized that this undertaking is to provide a proof of concept to assist the District of Muskoka in exploring the potential to pre-screen wetland features and their potential status. The results should not be used or interpreted as an official update to the wetland record for the wetland evaluations used for comparison purposes.

RESULTS

1.1 CRITERIA COMPARISON

Trends associated with whether scores from the predictions tended to be lower or higher when compared to formal OWES scores depended on the OWES component categories. For example, predicted scores for the Biological Component tended to score lower than the formal OWES scores (average range: -26.5 to 7.5), scores for the Social Component were mixed (average range: -9 to 9) and Hydrological Components tended to be higher (average range: 0.5 to 30), and scores for the Special Features Component was mixed (average range: -36.3 to 22.5).

The highest mismatches in scores related to nine specific criteria; individual criteria where the average difference between the predicted scores compared to the formal OWES scores that represented the most extreme mismatches included the following:

Scores where the average was underpredicted by more than 10 points:

- Vegetation Communities (Biological Component, Biodiversity)
- Wetlands (Special Features, Rarity)
- Provincially Significant Animals (Special Features, Species)
- Provincially Significant Plants (Special Features, Species)
- Colonial Waterbirds (Special Features, Significant Features or Habitat)

Scores where the average was overpredicted by more than 10 points:

- Flood Attenuation (Hydrological Component)
- Shoreline Erosion Control (Hydrological Component)
- Winter Cover for Wildlife (Special Features Component, Significant Features or Habitat)
- Fish Habitat: Staging and Migration Habitat (Special Features Component, Significant Features or Habitat)

1.2 STATUS DETERMINATION

Notwithstanding the deviation in the scores between the predicted scores and the actual formal OWES scores, the predicted OWES scores correctly anticipated the status of all four wetland system examples used for this analysis (see Tables 1 to 4). The qualitative determination of wetland status was predicted accurately by the Special Features component score being greater than 200 for the Bala, Mactier, and Tadenac wetlands; as well, the total scores for the Bala and Mactier wetlands were greater than 600, resulting in a 'significant' determination (Tables 1 to 4). Generally, the OWES scores for the Biological, Social, and Hydrological components were generally under-estimated using the predicted scores. This, however, was expected as predicted scores were only applied to a subset of the criteria. As well, a conservative approach was undertaken, where lower scores were applied where uncertainty exists.

When scores from the formal OWES were used for criteria that were not scored using the prediction framework, the status of all four wetland systems were predicted accurately based on scores for Special Features and the total OWES score. Generally, this resulted from increases in the scores for the Biological and Hydrological components where scores from the existing OWES evaluations (Tables 1 to 4).

Table 1: Childs Pit Quarry Wetland Evaluation Comparison

OWES Component	Formal Evaluation Score	Predicted Score	Combined Estimate
Biological Score	102.5	104.5	112.5
Social Score	44	56	65
Hydrological Score	189.5	193	216
Special Feature Score	185	102	102
Total Score	*521*	*455.5*	*495.5*
Biological Test (>= 200)	No	No	No
Special Feature Test (>=200)	No	No	No
Total Test (>=600)	No	No	No
Provincially Significant	No	No	No

Table 2: Bala Wetland Evaluation Comparison

OWES Component	Formal Evaluation Score	Watershed Estimate	Combined Estimate
Biological Score	207.3	103.5	172.5
Social Score	83	24	86
Hydrological Score	210.2	85	229.1
Special Feature Score	250	198	257.4
Total Score	*750.5*	*410.5*	*745*
Biological Test (>= 200)	Yes	No	No
Special Feature Test (>=200)	Yes	No	Yes
Total Test (>=600)	Yes	No	Yes
Provincially Significant	Yes	No	Yes

Table 3: Mactier Wetland Evaluation Comparison

OWES Component	Formal Evaluation Score	Predicted Score	Combined Estimate
Biological Score	179	131	155
Social Score	84	45	73
Hydrological Score	181	218	238
Special Feature Score	250	250	250
Total Score	*694*	*644*	*716*
Biological Test (>= 200)	No	No	No
Special Feature Test (>=200)	Yes	Yes	Yes
Total Test (>=600)	Yes	Yes	Yes
Provincially Significant	Yes	Yes	Yes

Table 4: Tadenac North Wetland Evaluation Comparison

OWES Component	Formal Evaluation Score	Predicted Score	Combined Estimate
Biological Score	213	106	165
Social Score	153	45	144
Hydrological Score	104	139	216
Special Feature Score	250	250	250
Total Score	*720*	*540*	*775*
Biological Test (>= 200)	Yes	No	No
Special Feature Test (>=200)	Yes	Yes	Yes
Total Test (>=600)	Yes	No	Yes
Provincially Significant	Yes	Yes	Yes

DISCUSSION/CONSIDERATIONS

The results from this analysis indicate that using predicted scores for the Special Features component criteria provides the best reasonable first step to determine whether a wetland is likely to be considered Provincially Significant. As outlined in Appendix B, the data layers and geoprocessing steps required to estimate scores for the Special Features criteria include the respective wetland units, data from NHIC, data from the Global Biodiversity Information Facility (GBIF), and Significant Wildlife Habitat screening mapping (available from the province or based on mapping completed for the Muskoka IWM Natural Capital Inventory Study).

Estimating accurate scores for the remaining components (Biological, Social, and Hydrological) may be feasible, but is limited by a number of factors. For the Biological Component, the predictions tended to underestimate scores as the land cover base mapping used is lower resolution that what is typically used for a formal OWES evaluation. This was best reflected in the lower scores for the diversity of vegetation communities, where the differences in score was almost 40 points lower for the Bala and Tadenac Wetland complexes. As well, the predicted scores were lower as the vegetation community count was based on the highest score from the various wetland units that make up the larger wetland complex. As such, the approach used in the prediction framework may be more reflective of the scoring results that would be expected based on the revised OWES approach that removes wetland complexing. For the Social Component, data required for the criteria are generally difficult to estimate at the watershed-scale and therefore require site-level information and evidence regarding how the wetland is used from an economic and social perspective. For the Hydrological Component, criteria that were evaluated using the prediction framework provided reasonably accurate estimates. The analysis however excluded the two highest scoring criteria (Flood Attenuation and Adjacent Watershed land-use), both of which require either configuration of localized information that estimate wetland catchments and/or data that was not available as an input.

Notwithstanding the limitations identified, the predicted scores do provide a minimum estimate for each of the OWES components which may be used as a point of departure to prioritize complementary desktop and/or site-level data. The following recommendations for each component provide some direction regarding additional information and manual desktop analysis that would complement the prediction framework.

Biological Component:

- Open Water Type (max 30 points): This criteria may also be evaluated using a desktop approach following the methods outlined in the OWES manual (see Appendix B). Similar to interspersion, the scoring depends on unique parameters of the size and shape of open water within wetland units. Methods to accomplish this using the watershed-framework are difficult to automate at this stage.

Social Component:

- Aboriginal Value (max 30): Consultation with First Nations to determine an appropriate watershed-scale approach to documenting the importance of wetlands to First Nations people could be undertaken. This could be incorporated into future version of the watershed-scale screening framework.

Hydrological Component:

- Groundwater Discharge (Max 30 points): A manual assessment of wetland catchment area, the vegetation type, and the associated soil/surficial geology types that exist in upslope areas may be scored using a desktop approach.

Special Features:

- Locally Significant Species (max 250): If an appropriate status list is developed for species that are present within the District, the score for this criteria could be estimated using the same methods used for the occurrence of provincially and regionally significant species. There may be some redundancy however, as rare species at the Regional scale maybe the same as those at the local scale.

- Fish Habitat: Spawning and Nursery Habitat (max 100 points): This criteria requires site-level details regarding a variety of vegetation types associated with marsh habitats. Estimating the score using the watershed-scale data was difficult given the nature of the land-cover vegetation types. Detailed desktop analysis of aerial photos may be used following the methods outlined in the OWES manual (Appendix B).

- Great Lakes Coastal Wetlands (max 75 points): Where wetlands are located in proximity to coastal areas of Georgian Bay, this criteria can be estimated at the watershed scale. For this analysis, assessment was limited by watercourse mapping being restricted to the Muskoka River watershed and adjacent areas.

As outlined in the disclaimer for this assignment, the OWES prediction framework has been developed to provide a proof of concept to assist the District of Muskoka in exploring the potential to pre-screen wetland features and their potential status. The approach developed provides a methodology to anticipate baseline OWES scores for wetlands within the Muskoka Watershed, which in turn may provide useful information to guide the broader management of wetlands in the context of land-use planning. For example, applying the framework to wetlands that have not been formally evaluated on properties where a development application is being considered would help to anticipate whether the wetlands are provincially significant and/or help scope the field program that may be required as part of a development application. For example, the Terms of Reference could stipulate validation/refinement of predicted scores and completion of scoring for the criteria that were not included in the prediction framework. Recommended next steps include, but are not limited to: applying the framework to the broader Muskoka Watershed system, and where feasible, validating the predicted scores with the results from other OWES evaluations that have been completed.

Respectfully Submitted,



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APPENDIX A: OWES CRITERIA EVALUATION FOR APPLYING TO THE PREDICTION FRAMEWORK

Order	Section ID	Component	Section	Subsection	Min Score	Max Score	Scoring notes	Anticipated Ease to Estimate (1 = Extremely Difficult, 2 = Difficult, 3=Moderate, 5 = Easy, 8 = Extremely Easy	Criteria Included in OWES Score Prediction Framework (Y/N)
1	1.1.1	Biological	Productivity	Growing Degree-Days/Soil	4	30	Growing Degree Days crossed with soil type	5	Y
2	1.1.2	Biological	Productivity	Wetland Type	3	15	Fractional area of wetland types based on total wetland area	2	Y
3	1.1.3	Biological	Productivity	Site Type	1	5	Fractional area of site type (isolated, palustrine, riverine, etc)	3	Y
4	1.2.1	Biological	Biodiversity	Number of Wetland Types	9	30		8	Y
5	1.2.2	Biological	Biodiversity	Vegetation Communities	1.5	45		3	Y
6	1.2.3	Biological	Biodiversity	Diversity of Surrounding Habitat	0	7	within 1.5 km and at least 0.5 ha in size to be scored	3	Y
7	1.2.4	Biological	Biodiversity	Proximity to Other Wetlands	0	8	Score based on connectivity of wetland to other wetlands.	5	Y
8	1.2.5	Biological	Biodiversity	Interspersion	3	30	Score based on the ecotones/edges between different vegetation communities	2	Y
9	1.2.6	Biological	Biodiversity	Open Water Type	0	30	Percent of open water within community types	3	N
10	1.3	Biological	Size	Size	1	50	calculated based on scoring from Biological Component and size	3	Y
11	2.1.1	Social Component	Economically Valuable Products	Wood Products	0	14	Determine the area of forested wetland that could be harvested	5	Y
12	2.1.2	Social Component	Economically Valuable Products	Low Bush Cranberry	0	2	Low bush cranberry likely present in most bog and fen types.	5	Y
13	2.1.3	Social Component	Economically Valuable Products	Wild Rice	0	10	Difficult to estimate using available data	2	N
14	2.1.4	Social Component	Economically Valuable Products	Commercial Baitfish	0	12	May require mapping to show where bait fish licenses are available. Check LIO or other provincial sources.	2	Y
15	2.1.5	Social Component	Economically Valuable Products	Furbearers	0	12	Three points for each furbearing species. No points if trapping is not permitted.	2	Y
16	2.2	Social Component	Recreational Activities	Recreational Activities	0	80	Site based information required to determine use of area for hunting, nature appreciation, and/or fishing.	1	N
17	2.3.1	Social Component	Landscape Aesthetics	Distinctiveness	0	3	Uniqueness of the wetland based on adjacent areas.	3	N
18	2.3.2	Social Component	Landscape Aesthetics	Absensence of Human Disturbance	0	7	Score is based on the relative level of human disturbances that affect wetland integrity.	2	N
19	2.4.1	Social Component	Education and Public Awareness	Educational Uses	0	20	Based on actual (not potential use) - requires input for schools, universities, colleges, etc.	2	N
20	2.4.2	Social Component	Education and Public Awareness	Facilities and Programs	0	8	Could be scored based on occurrence of facilities that support nature interpreations. Would be restricted to nature centres, provincial parks, conservation reserves, etc.	2	N
21	2.4.3	Social Component	Education and Public Awareness	Research and Studies	0	12	Could be scored for areas where long-term research and/or other studies have taken place.	2	N

Order	Section ID	Component	Section	Subsection	Min Score	Max Score	Scoring notes	Anticipated Ease to Estimate (1 = Extremely Difficult, 2 = Difficult, 3=Moderate, 5 = Easy, 8 = Extremely Easy	Criteria Included in OWES Score Prediction Framework (Y/N)
22	2.5	Social Component	Proximity to Areas of Human Settlement	Proximity to Areas of Human Settlement	0	40	Measurement is to actual settlement areas (i.e. anthropogenic lands) from the wetland is required. May need input on road distances, but as the 'crow flies' can probably be used for predictive approach.	5	Y
23	2.6	Social Component	Ownership	Ownership	4	10	If ownership data can be provided, could use such data to determine score.	5	Y
24	2.7	Social Component	Size	Size	1	20	Varies based on societal importance score. A minimum score could be determined based on sum of scores from this section.	5	Y
25	2.8.1	Social Component	Aboriginal and Cultural Values	Aboriginal Value	0	30	Requires input from provinces' Aboriginal Liaison to supply information.	5	N
26	2.8.2	Social Component	Aboriginal and Cultural Values	Cultural Heritage	0	30	Requires analysis using provincial guidelines and accepted by MNRF staff.	1	N
27	3.1	Hydrological Component	Flood Attenuation	Flood Attenuation	0	100	See methods on page 93 of the OWES manual. Relatively complicated approach, but all can be estimated using geoprocessing workflows.	2	Y
28	3.2.1	Hydrological Component	Groundwater Recharge	Site Type	0	20	Calculated based on scoring the fractional area of the wetland site type, and weighting based on isolated/palustrine, riverine, or lacustrine.	3	Y
29	3.2.2	Hydrological Component	Groundwater Recharge	Soil Recharge Potential	0	10	Scoring is based on substrates surrounding wetlands, and weighted based on wetland Site Type (Isolated, Palustrine, or Riverine)	3	Y
30	3.3.1	Hydrological Component	Water Quality Improvement	Watershed Improvement Factor	6	30	Calculated based on fractional area of site type based on location relative to water flow direction	3	Y
31	3.3.2	Hydrological Component	Water Quality Improvement	Adjacent Watershed Landuse	0	50	Methods indicate that a general approach is acceptable, but requires a set of steps that will require multiple rounds of geoprocessing based on upstream occurrence of unvegetated land, linear infrastructure and source of pollution.	2	Y
32	3.3.3	Hydrological Component	Water Quality Improvement	Vegetation Form	0	10	Score based on presence of vegetation types being Tree/shrub/herb, emergent/submergent, or little/no veg.	2	N
33	3.4	Hydrological Component	Carbon Sink	Carbon Sink	0	15	Calculated based on wetland type and coverage of organic soils	5	Y
34	3.5	Hydrological Component	Shoreline Erosion Control	Shoreline Erosion Control	0	15	For riverine or lacustrine wetlands, score is based on the vegetation type.	5	Y
35	3.6	Hydrological Component	Groundweater Discharge	Groundwater Discharge	0	30	Catchment interaction and potential for discharge is well defined, with scores provided for specific conditions.	3	N

Order	Section ID	Component	Section	Subsection	Min Score	Max Score	Scoring notes	Anticipated Ease to Estimate (1 = Extremely Difficult, 2 = Difficult, 3=Moderate, 5 = Easy, 8 = Extremely Easy	Criteria Included in OWES Score Prediction Framework (Y/N)
36	4.1.1	Special Features	Rarity	Wetlands	0	70	Scores a base on broad categories of wetland type and rarity in the appropriate Ecodistrict	8	Y
37	4.1.2.1	Special Features	Species	Provincially Significant Animals	0	250	Score based on presence of occurrence of provincially significant animals (use NHIC, GBIF)	5	Y
38	4.1.2.2	Special Features	Species	Provincially Significant Plants	0	250	Score based on presence of occurrence of provincially significant plants (use NHIC, GBIF)	5	Y
39	4.1.2.3	Special Features	Species	Regionally Significant Species	0	250	Score based on presence of occurrence of Regionally significant plants (use NHIC, GBIF)	3	Y
40	4.1.2.4	Special Features	Species	Locally Significant Species	0	250	Score based on presence of occurrence of Locally significant plants (use NHIC, GBIF)	3	N
41	4.1.2.5	Special Features	Species	Species of Special Status	0	20	Based on occurrence of American Black duck	5	Y
42	4.2.1	Special Features	Significant Features or Habitat	Colonial Waterbirds	0	50	Use SWH mapping	5	Y
43	4.2.2	Special Features	Significant Features or Habitat	Winter Cover for Wildlife	0	100	Use SWH mapping	8	Y
44	4.2.3	Special Features	Significant Features or Habitat	Waterfowl Staging and Multing	0	150	Use SWH mapping	5	Y
45	4.2.4	Special Features	Significant Features or Habitat	Waterfowl Breeding	0	150	Use SWH mapping	5	Y
46	4.2.5	Special Features	Significant Features or Habitat	Migratory Passerine, Shorebird, or Raptor Stopover	0	150	Use SWH mapping	5	Y
47	4.2.6	Special Features	Significant Features or Habitat	Ungulate Habitat	0	100	Use SWH mapping	8	Y
48	4.2.7.1	Special Features	Significant Features or Habitat	Fish Habitat: Spawning and Nursery Habitat	0	100	Use SWH mapping	1	N
49	4.2.7.2	Special Features	Significant Features or Habitat	Fish Habitat: Staging and Migration Habitat	0	25	Use SWH mapping	3	Y
50	4.3	Special Features	Ecosystem Age	Ecosystem Age	0	25	Use fractional area of vegetation types and	8	Y
51	4.4	Special Features	Great Lakes Coastal Wetlands	Great Lakes Coastal Wetlands	0	75	Use proximity/connectivity to Georgian Bay	5	N

APPENDIX B: METHODOLOGY FOR ESTIMATING OWES SCORES USING PREDICTION FRAMEWORK

1.0 Biological Component
1.1 Productivity
1.1.1 Growing Degree-Days/Soils

Layers
- Growing Degree Days (GDD)
- Surficial Geology

OWES Modification
- Soil types were translated to associated surficial geology types based on Table 2.

Analysis

1. Determine the correct GDD value for the wetland using GDD layer.

2. Determine the associated/dominant surficial geology type for the wetland.

3. Determine the Fractional Area (FA) of the wetland for each Surficial Geology Type (i.e., the proportion of each Surficial Geology Type).

4. Multiply the fractional area of each Surficial Geology type by the applicable score-factor in the evaluation table (Table 3).

5. Sum the scores for each Surficial Geology Type to obtain the final score (maximum score is 30 points).

Table 1: Growing Degree Days by Soil Type from OWES Manual

Growing Degree-Days	Clay-Loam	Silt-Marl	Lime-stone	Sand	Humic-Mesic	Fibric	Granite
<1600	12	11	9	7	7	6	4
1600-2000	15	13	11	9	8	7	5
2000-2400	18	15	13	11	9	8	7
2400-2800	22	18	15	13	11	9	7
2800-3000	26	21	18	15	13	10	8
>3000	30	25	20	18	15	12	9

Table 2: Surficial Geology types to Soil types

Soil Type	Clay-Loam	Silt-Marl	Limestone	Sand	Humic-Mesic	Fibric	Granite
Fine-textured Glaciolacustrine Deposits	x	x					
Older alluvial Deposits	x	x					
Modern Alluvial Deposits	x	x					
Till				x			
Ice-contact stratified depositsIce-contact stratified deposits				x			
Coarse-textured glaciolacustrine deposits				x			
Bedrock Drift				x			
Organic Deposits					x	x	
Precambrian Bedrock							x

Table 3: Growing Degree Days by Surficial Geology types

Growing Degree Days	Fine-textured Glaciolacustrine Deposits	Older alluvial Deposits	Modern Alluvial Deposits	Till	Ice-contact stratified depositsIce-contact stratified deposits	Coarse-textured glaciolacustrine deposits	Bedrock Drift	Organic Deposits	Precambrian Bedrock
<1600	11	11	11	7	7	7	7	6	4
1600-2000	13	13	13	8	8	8	8	7	5
2000-2400	15	15	15	9	9	9	9	8	7
2400-2800	18	18	18	11	11	11	11	9	7
2800-3000	21	21	21	13	13	13	13	10	8
>3000	25	25	25	15	15	15	15	12	9

1.0 Biological Component
1.1 Productivity
1.1.2 Wetland Type

Layers
- Vegetation type

OWES Modification
- As bog/fen cannot be separated, use the lower score (i.e. for bogs)

Analysis

1. Determine the fractional area (proportion) of each wetland type within the wetland unit (bog/fen, swamp, marsh)

2. Multiply the fractional area (FA) of each wetland type by the appropriate weighting in Table 1.

3. Sum the results for each wetland type to obtain the final score (maximum score is 15 points).

Table 1: Wetland Type Weightings

Bog = FA x 3
Fen = FA x 3
Swamp = FA x 8
Marsh = FA x 15
(maximum score 15 points)

1.0 Biological Component
1.1 Productivity
1.1.3 Site Type

Layers
- Site Type

OWES Modification
- If some site types contexts cannot be discriminated, use the lower of the site type scores.

Analysis

1. Determine the fractional area (proportion) of each wetland site type within the wetland unit (see Table 1).

2. Multiply the fractional area of each wetland site type by the appropriate weighting in Table 1.

3. Sum the results for each wetland site type to obtain the final score (maximum score is 5 points).

Table 1: Fractional Area weightings for Site Types

Isolated FA x 1
Palustrine (permanent or intermittent outflow) FA x 2
Riverine FA x 4
Riverine (at rivermouth) FA x 5
Lacustrine (at rivermouth) FA x 5
Lacustrine (with barrier beach) FA x 3
Lacustrine (exposed to lake) FA x 2 (maximum score 5 points)

1.0 Biological Component
1.2 Biodiversity
1.2.1 Number of Wetland Types

Layers
- Wetland Type

OWES Modification
- Since bog and fen are grouped, max potential number of wetlands is 3, therefore score 20.

Analysis

1. Determine the number of wetlands types (bog/fen, marsh, swamp) present within the wetland unit.

2. Score is based on the number present in Table 1.

Table 1: Score for number of wetland types

Number of Wetland Types

1) One = 9 points
2) Two = 13
3) Three = 20
~~4) Four = 30~~

(Score one only, *maximum score 20 points*)

1.0 Biological Component
1.2 Biodiversity
1.2.2 Number of Vegetation Communities

Layers
- Wetland Type

OWES Modification: Use ELC vegetation community types as a surrogate for wetland vegetation types. This will restrict the score to only include those with one form type. Wetland Type corresponds to ELC type. As vegetation forms cannot be discerned, each Wetland Type was considered an individual community of one form type.

Analysis

1. Determine the number of individual wetland communities (Wetland Types) within the wetland unit.

2. Within each wetland unit, count the number of Wetland Types that are present.

3. Using the Evaluation table, sum the corresponding points based on the number of Wetland Types for each wetland unit (maximum score is 45).

Wetland Type (ELC)	OWES Vegetation Form
Swamp	Deciduous trees, Coniferous, and Dead Trees.
Thicket Swamp	Tall Shrub Dead Shrub
Meadow Marsh	Ground Cover (Herbs) Broad-leaved Emergents Robust Emergents
Bog/Fen	Moss Low Shrub Narrow-leaved Emergents
Shallow Aquatic	Floating Plants Free-floating Plants Submergent Plants
Open Water (surrounded by wetland vegetation)	Unvegetated open water <2 m deep, completely surrounded by wetland vegetation

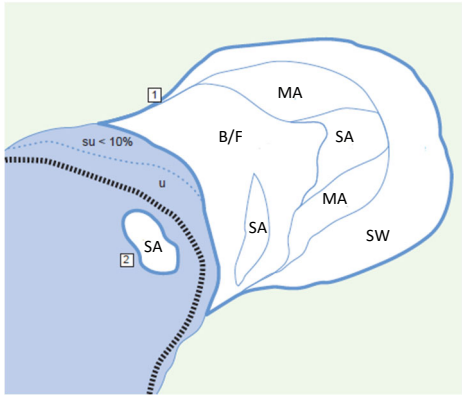
EVALUATION:

# of communities with 1-3 forms	# of communities with 4-5 forms	# of communities with 6 or more forms
1 = 1.5 points	1 = 2 points	1 = 3 points
2 = 2.5	2 = 3.5	2 = 5
3 = 3.5	3 = 5	3 = 7
4 = 4.5	4 = 6.5	4 = 9
5 = 5	5 = 7.5	5 = 10.5
6 = 5.5	6 = 8.5	6 = 12
7 = 6	7 = 9.5	7 = 13.5
8 = 6.5	8 = 10.5	8 = 15
9 = 7	9 = 11.5	9 = 16.5
10 = 7.5	10 = 12.5	10 = 18
11 = 8	11 = 13	11 = 19
+.5 each additional community = _____	+.5 each additional community = _____	+1 each additional community = _____

For example, a wetland with
- 3 one form communities and 4 two form communities (7 communities total = 6 points)
- 12 four form communities (= 13.5 points)
- 8 six form communities (= 15 points)

would score 35 points (i.e., 6 + 13.5 + 15 = 34.5 rounded up to 35).

(maximum score 45 points)



Community 1: 6 forms
Community 2: 1 form
Score = 5.5 + 1.5 = 7

1.0 Biological Component
1.2 Biodiversity
1.2.3 Diversity of Surrounding Habitat

Layers
- Wetland Type
- Land cover layer

OWES Modification: Use a subset of the feature types that are included in the landcover layer. The 0.5 ha size threshold was not imposed.

Analysis

1. Determine if any of the feature types listed in the evaluation table are present within 1.5 km of the wetland unit.
2. Each feature type gets 1 point. Maximum of 6 points using modified approach.

EVALUATION:

(check all appropriate items)

_____ agricultural land
_____ deciduous forest
_____ coniferous forest
_____ mixed forest
_____ open lake or deep river
_____ rock outcrop

1.0 Biological Component
1.2 Biodiversity
1.2.4 Proximity to other wetlands

Layers
- Wetland Type
- Watercourses

OWES Modification: None

Analysis

1. Using the OWES criteria, determine which apply (note that the first two criteria are worth 8 points, and the max is 8 points, so if either apply, the remainder of the criteria are redundant).

EVALUATION:

Check the first appropriate category.

Hydrologically connected by surface water to other wetlands (different dominant wetland type), or open lake or deep river within 1.5 km .....8 points

Hydrologically connected by surface water to other wetlands (same dominant wetland type) within 0.5 km.....8

Hydrologically connected by surface water to other wetlands (different dominant wetland type), or open lake or deep river from 1.5 to 4 km away 5

Hydrologically connected by surface water to other wetlands (same dominant wetland type) from 0.5 to 1.5 km away 5

Within 0.75 km of other wetlands (different dominant wetland type) or open lake or deep river, but not hydrologically connected by surface water.....5

Within 1 km of other wetlands, but not hydrologically connected by surface water.....2

No wetland within 1 km.....0

(Score highest appropriate category, *maximum score 8 points)*

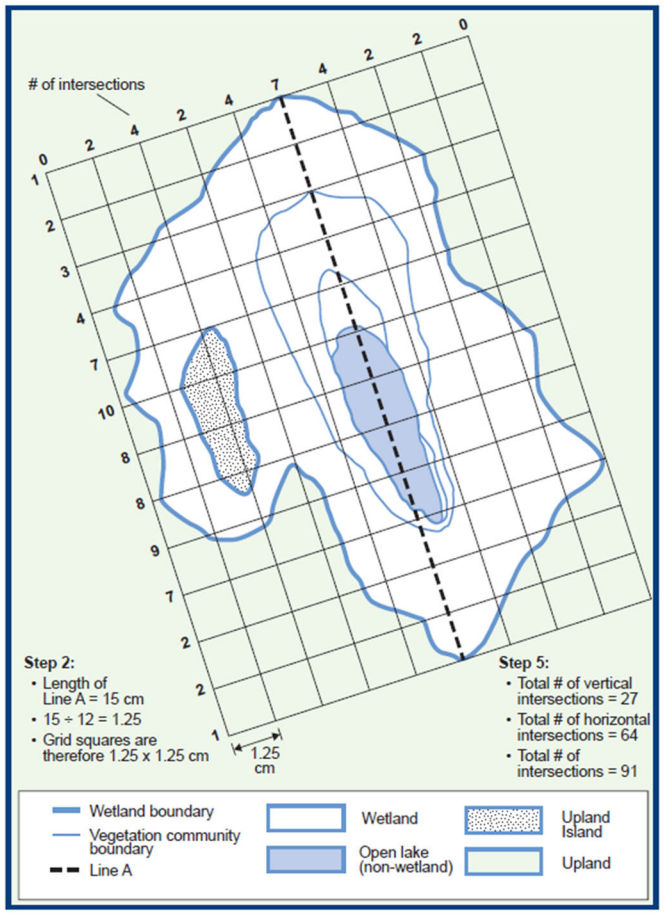
1.0 Biological Component
1.2 Biodiversity
1.2.5 Interspersion

Layers
- Wetland Type
- Watercourses

OWES Modification: None

Analysis

1. Group adjacent wetland polygons if they are the same community type, i.e., community series type.
2. Create a grid over the wetland such that the grid squares are equal to the length of the longest axis of the wetland, divided by 12.
3. Sum the number of times the 'vertical' and 'horizontal' lines of the grid intersect with a vegetation boundary (including the outer boundaries of the wetland. See image for an example.
4. Using the sum of the intersections, use the corresponding score from the Interspersion Evaluation table (max 30 points).



Scoring requires manual interpretation and input.

EVALUATION:

Number of Intersections	Score
26 or less	3 points
27 to 40	6
41 to 60	9
61 to 80	12
81 to 100	15
101 to 125	18
126 to 150	21
151 to 175	24
176 to 200	27
>200	30

(Score one only, *maximum 30 points)*

1.0 Biological Component
1.2 Biodiversity
1.2.6 Open Water Type

Layers
- Wetland Type

OWES Modification: Directly estimate the amount of open water.

Analysis

1. Using wetland communities from 1.2.2, determine the area of open water for each
2. Divide the sum of the open water area by the total wetland size
3. If <5%, score is 0
4. If >5%, determine the wetland pattern type based on the images from the OWES manual (Figure 15):
    - if there is more than one open water polygon or a wetland unit that is surrounded by open water using Type 1, 3, 5, or 7 depending on percent
    - If there is only one open water polygon and no wetland units surround by open water, use Type 2, 4, 6, or 8 depending on percent
5. Use the corresponding permanent open water score based on type

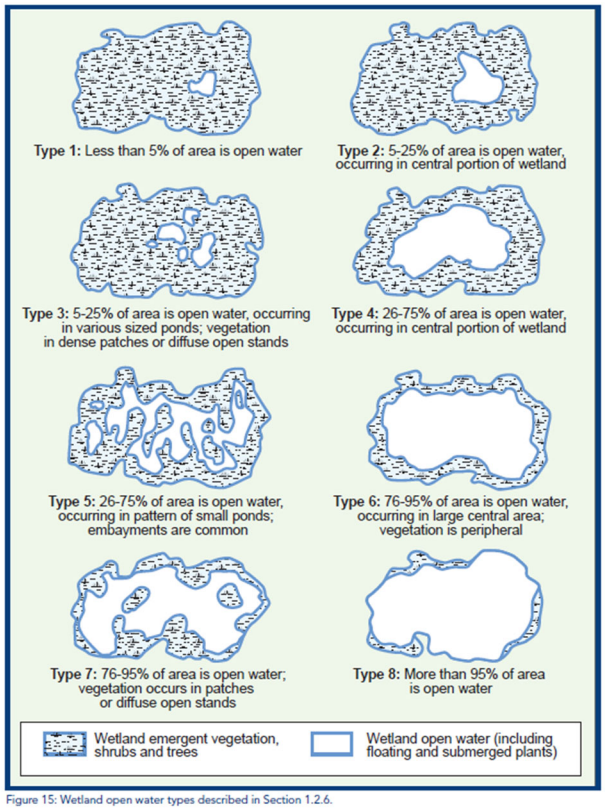


Figure 15: Wetland open water types described in Section 1.2.6.

Scoring requires manual interpretation and input. Not included in predicted scoring.

EVALUATION:

Permanent open water:

1. Type 1 = 8
2. Type 2 = 8
3. Type 3 = 14
4. Type 4 = 20
5. Type 5 = 30
6. Type 6 = 8
7. Type 7 = 14
8. Type 8 = 3
9. No open water = 0 points

(Score one only, *maximum score 30 points)*

1.0 Biological Component
1.3 Size (Biological Component)

Layers
- None

OWES Modification: None

Analysis

1. Using the sum of scores from the Biological Component criteria and the Size of the wetland, determine the appropriate score
2. Add the Size score to the sum of the other Biological Component criteria to determine the overall Biological Component Score.

Table 4: Evaluation Table for Size Score (Biological Component)

Wetland size (ha)	Total Score for Biodiversity Subcomponent									
	<37	37-47	48-60	61-72	73-84	85-96	97-108	109-120	121-132	>132
<20 ha	1	5	7	8	9	17	25	34	43	50
20-40	5	7	8	9	10	19	28	37	46	50
41-60	6	8	9	10	11	21	31	40	49	50
61-80	7	9	10	11	13	23	34	43	50	50
81-100	8	10	11	13	15	25	37	46	50	50
101-120	9	11	13	15	18	28	40	49	50	50
121-140	10	13	15	17	21	31	43	50	50	50
141-160	11	15	17	19	23	34	46	50	50	50
161-180	13	17	19	21	25	37	49	50	50	50
181-200	15	19	21	23	28	40	50	50	50	50
201-400	17	21	23	25	31	43	50	50	50	50
401-600	19	23	25	28	34	46	50	50	50	50
601-800	21	25	28	31	37	49	50	50	50	50
801-1000	23	28	31	34	40	50	50	50	50	50
1001-1200	25	31	34	37	43	50	50	50	50	50
1201-1400	28	34	37	40	46	50	50	50	50	50
1401-1600	31	37	40	43	49	50	50	50	50	50
1601-1800	34	40	43	46	50	50	50	50	50	50
1801-2000	37	43	47	49	50	50	50	50	50	50
>2000	40	46	50	50	50	50	50	50	50	50

2.0 Social Component
2.1 Economically Valuable Products
2.1.1 Wood Products

Layers
- Wetland Type

OWES Modification
- Use ELC instead of wetland vegetation codes

EVALUATION:

Area Forested (ha); **not** wetland size

<5 ha	= 0 points
5 - 25	= 4
26 - 50	= 6
51 - 100	= 8
101 - 200	= 11
>200 ha	= 14

(maximum score 14 points)

Analysis
1. Identify all treed swamp communities (not including thicket swamps)

2. Calculate area within the wetland unit.

3. Determine the appropriate score based on the evaluation table.

2.0 Social Component
2.1 Economically Valuable Products
2.1.2. Lowbush Cranberry

Layers
- Wetland Type

OWES Modification
- Assume all bogs/fens have lowbush cranberry present

Analysis
1. For all bogs/fens assume cranberry is present and is harvestable. Score 2 points.

EVALUATION:

a) ___ a law/regulation prohibits harvesting of cranberry (0 points)"

b) Not as above:

Present = 2 points
Absent = 0

2.0 Social Component
2.1 Economically Valuable Products
2.1.3 Wild Rice

Layers
- Wetland Type
- Global Biodiversity Information Facility data

OWES Modification
- Include wetlands where wild rice has been identified
- Does not use minimum size criteria of 0.5 ha.

Analysis
1. Data not available and not included in OWES prediction framework

EVALUATION:

a) ___ A law/regulation prohibits harvesting of wild rice (0 points)

b) Not as above:

Present = 10 points
Absent = 0

2.0 Social Component
2.1 Economically Valuable Products
2.1.4 Commercial Baitfish

Layers
- Site type

OWES Modification
- Assume that any lacustrine or riverine wetland has potential for commercial baitfish to be present.

Analysis

1. For all lacustrine or riverine wetlands score 12 points

EVALUATION:

a) ___ a law/regulation prohibits harvesting of baitfish (0 points)

b) Not as above:

Present = 12 points
Absent = 0

2.0 Social Component
2.1 Economically Valuable Products
2.1.5 Furbearers

Layers
- Wetland Type
- Global Biodiversity Information Facility data

OWES Modification
- Use occurrence records of fur bearers from GBIF to determine presence

Analysis

1. Records of furbearer species not included in associated data sets.

Schedule 1 from Fish and Wildlife Conservation Act

SCHEDULE 1
FURBEARING MAMMALS

Common Name	Scientific Name
American Badger	*Taxidea taxus*
Arctic Fox	*Vulpes lagopus*
Beaver	*Castor canadensis*
Bobcat	*Lynx rufus*
Coyote	*Canis latrans*
Fisher	*Pekania pennanti*
Gray Fox	*Urocyon cinereoargenteus*
Least Weasel	*Mustela nivalis*
Long-tailed Weasel	*Mustela frenata*
Lynx	*Lynx canadensis*
Marten	*Martes americana*
Mink	*Neovison vison*
Muskrat	*Ondatra zibethicus*
Opossum	*Didelphis virginiana*
Otter	*Lontra canadensis*
Polar Bear	*Ursus maritimus*
Raccoon	*Procyon lotor*
Red Fox (all colour phases)	*Vulpes vulpes*
Red Squirrel	*Tamiasciurus hudsonicus*
Short-tailed Weasel (Ermine)	*Mustela erminea*
Striped Skunk	*Mephitis mephitis*
Wolf	*Canis lupus*
Wolverine	*Gulo gulo*

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EVALUATION:

a) ___ Trapping is prohibited (0 points)

b) ___ Not as above:
For each furbearer species present, either permanently or from time to time = 3 points

(3 points for each species;
maximum score 12 points)

2.0 Social Component
2.2 Recreational Activities

Layers
- No data available

OWES Modification
- Analysis cannot be undertaken with currently available data

Analysis
1. Not Applicable for OWES prediction framework.

EVALUATION:

Sources of information and reasons for scoring a wetland under high or moderate use below must be included in the data record.

	Type of Wetland-Associated Use		
Intensity of Use	Hunting	Nature Appreciation/ Ecosystem Study	Fishing
High	40 points	40 points	40 points
Moderate	20	20	20
Low	8	8	8
Not Possible/ No evidence	0	0	0

(Score one level for each of the three wetland uses; scores are cumulative; *maximum score 80 points*)

2.0 Social Component
2.3 Landscape Aesthetics
2.3.1 Distinctness

Layers
- Wetland Type

OWES Modification
- Criteria not scored as it is relatively subjective and provides low overall points relative to other criteria.

Analysis
1. Not Applicable for OWES prediction framework.

EVALUATION:

Clearly distinct = 3 points
Indistinct = 0

(maximum score 3 points)

2.0 Social Component
2.3 Landscape Aesthetics
2.3.2 Absence of Human Disturbance

Layers
- N/A

OWES Modification
- Criteria cannot be scored based on currently available data.

Analysis
1. Not Applicable for OWES prediction framework.

EVALUATION:

Human disturbances absent or nearly so	= 7 points
One or several localized disturbances	= 4
Moderate disturbance; localized water pollution	= 2
Wetland intact but impairment of ecosystem quality intense in some areas	= 1
Extreme ecological degradation, or water pollution severe and widespread	= 0

(Score one only, *maximum score 7 points)*

2.0 Social Component
2.4 Education and Public Uses
2.4.1 Educational Uses

Layers
- N/A

OWES Modification
- Data are not currently available to evaluate this criteria.

Analysis
1. Not Applicable for OWES prediction framework.

EVALUATION:

Frequent	= 20 points
Infrequent	= 12
No visits	= 0

(Score highest appropriate category; *maximum score 20 points*)

2.0 Social Component
2.4 Education and Public Uses
2.4.2 Facilities and Programs

Layers
- N/A

OWES Modification
- Data are not currently available to evaluate this criteria.

Analysis
1. Not Applicable for OWES prediction framework.

EVALUATION:

Staffed interpretation centre with shelters, trails, literature	= 8 points
No interpretation centre or staff, but a system of self-guiding trails and observation points or brochures available	= 4
Facilities such as maintained paths (e.g., wood chips) boardwalks, boat launches, or observation towers but no brochures or other interpretation	= 2
No facilities or programs	= 0

(Score first appropriate category, *maximum score 8 points*)

2.0 Social Component
2.4 Education and Public Uses
2.4.3 Research and Studies

Layers
- N/A

OWES Modification
- Data are not currently available to evaluate this criteria.

Analysis

1. Not Applicable for OWES prediction framework.

EVALUATION:

Long term research has been done	= 12 points
Research papers published in a refereed scientific journal or as a thesis.	= 10
One or more (non-research) reports have been written on some aspect of the wetland's flora, fauna, hydrology, etc.	= 5
No reports known	= 0

(Score all that apply, *maximum score 12 points*)

2.0 Social Component
2.5 Proximity to Areas of Human Settlement

Layers
- Land cover (anthropogenic)
- Settlement areas (Official Plan mapping)

OWES Modification
- Use distance from anthropogenic lands within settlement areas.

Analysis
1. Determine settlement areas associated population criteria outlined in the Evaluation matrix.

2. Determine the distance to wetland units for each of the settlement area sizes.

3. Score the appropriate highest category based on settlement size and proximity.

EVALUATION:

Circle only the highest score applicable

		population >10,000	population 2,500-10,000	population <2,500 or cottage community
Distance of wetland to settlement	within or adjoining settlement	40 points	26 points	16 points
	0.5 to 10 km from settlement	26	16	10
	10 to 60 km from settlement	12	8	4
	60-100 km from nearest settlement	5	2	0
	>100 km from settlement	0	0	0

(Score highest applicable category, *maximum score 40 points*)

2.0 Social Component
2.6 Ownership

Landownership mapping not incorporated with watershed scale mapping.

Layers
- Ownership

OWES Modification
- Data for a legal bodies holding a conservation contract were not available at the time of analysis therefore would be scored as Crown/Public land or Private Land depending on context.

Analysis

1. Determine the fractional area of ownership within each wetland unit.
2. Score each fraction by multiplying by the weights provided in the Evaluation matrix.

EVALUATION: (FA = Fractional Area)

Land held by or held under a legal contract by a conservation body (as defined by the *Conservation Land Act*) for wetland protection	FA x 10
Wetlands occurring in provincially or nationally protected areas (e.g., parks and conservation reserves)	FA x 10
Not as above: Crown/Public land	FA x 8
Private land	FA x 4

(*maximum score 10 points*)

2.0 Social Component
2.7 Size (Social Component)

Layer
- Scores from **Social Component 2.1, 2.2, and 2.5**
- Wetland unit size

OWES Modification
- None

Analysis

1. Using the evaluation matrix, determine the appropriate wetland unit size and social component score from **subsections 2.1, 2.2, and 2.5**

Table 5. Evaluation Table for Size Score (Social Component)

Total for Size Dependent Social Features

Wetland Size (ha)	<31	31-45	46-60	61-75	76-90	91-105	106-120	121-135	136-150	>150
<5 ha	1	2	4	8	12	13	14	14	15	16
5-8	2	2	5	9	13	14	15	15	16	16
9-12	3	3	6	10	14	15	15	16	17	17
13-17	3	4	7	10	14	15	16	16	17	17
18-28	4	5	8	11	15	16	16	17	17	18
29-37	5	7	10	13	16	17	18	18	19	19
38-49	5	7	10	13	16	17	18	18	19	20
50-62	5	8	11	14	17	17	18	19	20	20
63-81	5	8	11	15	17	18	19	20	20	20
82-105	6	9	11	15	18	18	19	20	20	20
106-137	6	9	12	16	18	19	20	20	20	20
138-178	6	9	13	16	18	19	20	20	20	20
179-233	6	9	13	16	18	20	20	20	20	20
234-302	7	9	13	16	18	20	20	20	20	20
303-393	7	9	14	17	18	20	20	20	20	20
394-511	7	10	14	17	18	20	20	20	20	20
512-665	7	10	14	17	18	20	20	20	20	20
666-863	7	10	14	17	19	20	20	20	20	20
864-1123	8	12	15	17	19	20	20	20	20	20
1124-1460	8	12	15	17	19	20	20	20	20	20
1461-1898	8	13	15	18	19	20	20	20	20	20
1899-2467	8	14	16	18	20	20	20	20	20	20
>2467	8	14	16	18	20	20	20	20	20	20

2.0 Social Component
2.8 Aboriginal and Cultural Values
2.8.1 Aboriginal Values

First Nation consultation may be required to implement.

Layers
- Indian Reserve – Ontario GeoHub

OWES Modification
- Assumes all wetland on First Nations lands are considered valuable

EVALUATION:

Significant	= 30 points
Not Significant	= 0
Not known	= 0

(maximum score 30 points)

Analysis
1. All wetland units on or contiguous with First Nations lands are to be included and score 30 points.

2.0 Social Component
2.8 Aboriginal and Cultural Values
2.8.2 Cultural Heritage

Layers
- N/A

OWES Modification
- Data are not currently available to undertake this evaluation

Analysis

1. Data not available and not included in OWES prediction framework

EVALUATION:

Significant	= 30 points
Not Significant	= 0
Not known	= 0

(maximum score 30 points)

3.0 Hydrological Component
3.1 Flood Attenuation

Layers
- Wetland Types
- Wetland catchments – calculated manually
- Detention areas (see modifications and next slide for guidance on lakes as detention areas)

OWES Modification
- Wetland Types to determine the wetland surface form.
- Detention area (Step C) did not include open water as detention areas is too difficult to calculate using automated process. This could be done site by site, manually.
- Step D, the fractional area of different wetland vegetation types, multiplied by the appropriate surface form score, and then summed to be a fair representation of the surface form factor.

Analysis

1. Follow the Evaluation steps from the OWES manual for Section 3.1, incorporating modifications identified above.
2. Undertaken manually for each wetland.

EVALUATION (worked example; explanatory notes follow)**:**
Check one of the following options:

_ If wetland is a *single coastal wetland* **score 0 points** for this section.

_ If the wetland is entirely lacustrine and the ratio of wetland area to lake area is less than 0.1 ª **score 0 points** for this section.

_ If wetland or is entirely isolated in site type, **score 100 points automatically**.

_ Wetland not as above – proceed through steps **A through G** below.

(A) Total wetland area = _ ha

(B) Size of wetland's catchment = _ ha

(C) Size of other detention areas in catchment = _ ha

Wetland Surface Form (select the form which best describes the non-coastal units of the wetland):
___ flooded with little or no aquatic vegetation = 0
___ flooded but with submergent, emergent, or floating vegetation = 0.2 (Shallow Aquatic)
___ flat (lawn) vegetation (typical of fens) = 0.5 (Meadow Marsh)
___ hummock-depression microtopography = 0.7 (Swamp, Thicket Swamp)
___ patterned (e.g. string bog, ribbed fen) = 1.0 (Bog/Fen)

(D) Wetland Surface Form Factor (from above) = _ (maximum 1.0)

(E) Total area of upstream detention areas = {A + C} = _ ha

(F) Upstream Detention Factor = {(A/E) x 2} = _ (maximum 1.0)

(G) Attenuation Factor = {(A/B) x 10} = _ (maximum 1.0)

Flood Attenuation Final Score = ([F + G + D] /3) x 100] = _

Flood Attenuation Score *(maximum 100 pts)*

3.0 Hydrological Component
3.1 Flood Attenuation (detention areas)

Layers
- Vegetation type (incl Open Water)
- Lakes
- Watercourses

OWES Modification
- None

Analysis

1. Using guidance from Figure 18 from OWES Manual, identify if the open water area of lakes are to be considered detention areas.

2. Focus should be on determining if the open water area of the lake is NOT a detention areas, as there is only one type to consider. All others would be considered detention areas.

3. If the lake and downstream watercourse segment/reach are contiguous, then the lake area should be removed as a detention area. The open water area of all other scenarios would count as a detention area.

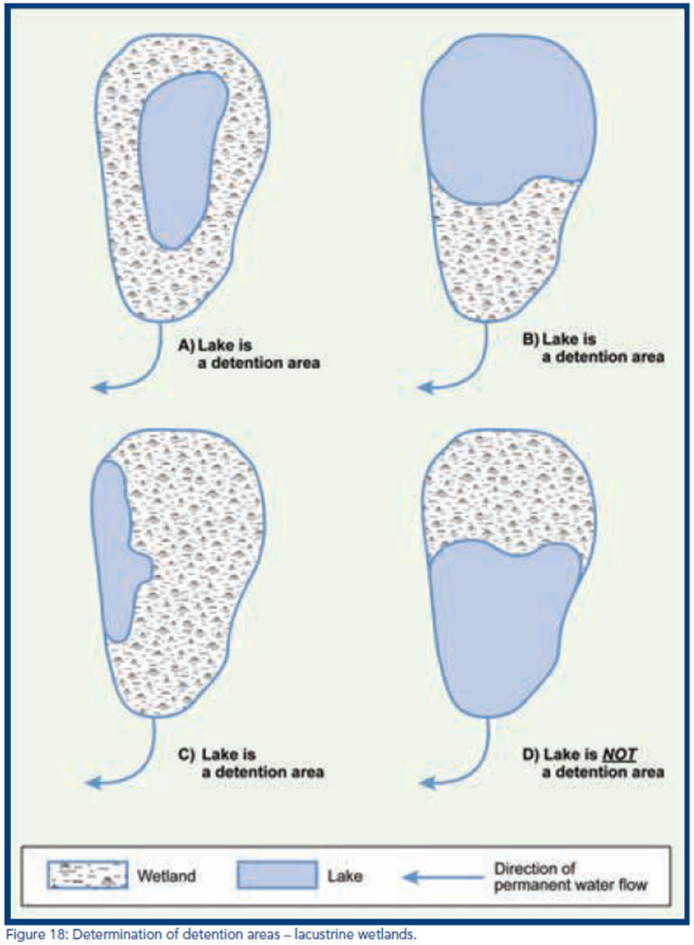

Figure 18: Determination of detention areas – lacustrine wetlands.

3.0 Hydrological Component
3.2 Groundwater Recharge
3.2.1 Site Type

Layers
- Site Type

OWES Modification
- None

Analysis

1. If wetland is greater than 50% lacustrine, score 0; or since none of the wetlands are located on the St. Mary's River, go to (b)

2. Calculate the fractional area of site type for the wetland unit. Note isolated and palustrine wetlands can be combined.

3. Multiply the fractional area by the appropriate weighting factor show in the table.

4. Sum the fractional area x weightings (max is 20 points).

EVALUATION:

(a) Wetland > 50% lacustrine (by area) or located on the St. Mary's River Score = 0

(b) Wetland not as above. Calculate final score as follows:
(FA = area of site type/total area of wetland)

_____ FA of isolated or palustrine wetland x 20 = _____
_____ FA of riverine wetland x 5 = _____
_____ FA of lacustrine wetland (when wetland is <50% lacustrine) x 0 = _____

3.0 Hydrological Component
3.2 Ground Water Recharge
3.2.2 Soil Recharge Potential

Layers
- Site type
- Surficial Geology – Ontario Geological Survey

OWES Modification
- Use modifications used for Biological Component 1.1.1
- For wetlands smaller than 80 ha, use 100m as the adjacent area.

Analysis
1. Adjacent area for wetlands are based on size. For wetlands larger than 80ha, the adjacent 500 m is considered. For wetlands less than 80ha, the adjacent area is determined by the 'radius' of the wetland. For this analysis, use 100 m to speed up the processing.

2. Update the 'surficial geology' layer to represent Group A, B, C or Group D soil types.

3. Determine which soil type is dominant.

4. Determine the dominant wetland site type.

5. Use the Evaluation table to determine the appropriate score based on dominant site type and dominant soil type adjacent to the wetland.

Group A, B, C Group D

Soil Type	Clay-Loam	Silt-Marl	Limestone	Sand	Humic-Mesic	Fibric	Granite
Fine-textured Glaciolacustrine Deposits	x	x					
Older alluvial Deposits	x	x					
Modern Alluvial Deposits	x	x					
Till				x			
Ice-contact stratified depositsIce-contact stratified deposits				x			
Coarse-textured glaciolacustrine deposits				x			
Bedrock Drift				x			
Organic Deposits					x	x	
Precambrian Bedrock							x

EVALUATION:

Circle only one choice that best describes the soils **in the area surrounding the wetland** (i.e., soils within the wetland are not scored under this attribute) being evaluated.

NOTE: if soils surrounding the wetland cannot be classified into any of the categories presented in the table below, score 0 points.

Dominant Site Type	Substrate Adjacent to Wetland: Group A, B, C (sands, gravels, loams)	Substrate Adjacent to Wetland: Group D (clays, substrates in high water tables, shallow substrates over impervious materials such as bedrock)
Lacustrine or on St. Mary's River	0	0
Isolated	10	5
Palustrine	7	4
Riverine (not on St. Mary's River)	5	2

3.0 Hydrological Component
3.3 Water Quality Improvement
3.3.1 Watershed Improvement Factor

Layers
- Site Type
- Water courses

OWES Modification
- None

Analysis

1. Determine the fraction area of wetland site types based on inflow, no inflow, shoreline proximity, or lacustrine at inflow or outflow.

2. Multiply the fractional area by the site type improvement factor weighting

3. Multiply the sum of the improvement factors by site types by 30. Maximum 30 points.

EVALUATION:

Site Type (IF)	Improvement Factor
Isolated	FA____ x 0.5 = _____
Riverine	FA____ x 1.0 = _____
Palustrine with no inflow	FA____ x 0.7 = _____
Palustrine with inflows	FA____ x 1.0 = _____
Lacustrine on lake shoreline	FA____ x 0.2 = _____
Lacustrine at lake inflow or outflow	FA____ x 1.0 = _____

Watershed Improvement Score (IF x 30) (maximum = 30)_____

3.0 Hydrological Component
3.3 Water Quality Improvement
3.3.2 Adjacent and Watershed Land use

Layers
- Land cover
- Wetland Catchment

OWES Modification
- Only consider Broad Upslope land-use (max 20 points) and Linear Upslope land-use (e.g. roads or rail corridors)

Analysis

1. BLU: Using the wetland catchment prepared for 3.1, calculate the percent of anthropogenic or agricultural land cover.

2. LUU: determine if roads or rail corridors are present. If so, use secondary corridor score.

3. Using Step 2 from the OWES methods, determine the appropriate score, and sum them.

EVALUATION:

STEP 1: Determination of Maximum Initial Score

_____ Wetland on the Great Lakes or St. Mary's River (Go to Step 5a)

_____ All other wetlands (Go through steps 2, 3, 4, and 5b)

STEP 2: Determination of Broad Upslope Land Use (BLU)
Assess broad upslope land uses as logging within the previous 5 years, agriculture, or other activities which alter the natural vegetation cover in an extensive manner.

Choose one	*Score*
> 50% of upslope area	20
20-50% of upslope area	14
1-20% of upslope area	4

STEP 3: Determination of Linear Upslope Land Uses (LUU)
Assess linear upslope uses (LUU) e.g., roads, railways, hydro corridors, pipelines, etc., crossing the upslope catchment within 200 m of the wetland boundary.

Choose the highest only	*Score*
Major corridor[1]	15
Secondary corridor	11
Tertiary corridor	6
Temporary or abandoned	3
None	0

STEP 4: Determination of Point-source Land Uses (PS)
Assess point source (PS) land uses producing industrial effluents, such as heavy industry, pulp and paper plants, mines, major aggregate operations (but not small pits used for local road construction) etc. Score as 'present' only if a point source land use is located less than 1 km upstream from the wetland.

Present	15
Not present	0

STEP 5: Calculation of total score for Adjacent and Watershed Land Use

a) Wetland on the Great Lakes or St. Mary's River 0

b) All other wetlands, calculate as follows:

Final Score BLU + LUU + PS_____

1. Major, secondary and tertiary roads are those that are indicated as such on the provincial highways map. Major hydro corridors are trunk lines coming directly from a generating station. Major pipelines are trans-continental lines. Secondary corridors are regional distribution lines (i.e. multi-cable hydro corridors not emanating directly from a generating station or regional gas distribution lines). Tertiary corridors are single hydro lines or local gas distribution lines (i.e. to domestic users).

Analysis requires multiple manual steps to calculate score. May be more appropriate for a detailed desktop analysis.

3.0 Hydrological Component
3.3 Water Quality Improvement
3.3.3 Vegetation Form

Layers
- Wetland Type

OWES Modification
- Use wetland type as general predictor of vegetation form

Analysis

1. Using Wetland Types, choose the appropriate dominant vegetation type from the wetland

EVALUATION:

Choose the category that best describes the vegetation of the wetland.

Choose one	*Score*
1) Trees, shrubs or herbs	8 points
2) Emergents, submergents	10
3) Little or no vegetation	0

OWES Type	**Wetland Type**	**Score**
Trees, shrubs or herbs	Swamp, Swamp Thicket, Open Marsh, Bog/Fen	8
Emergents, submergents	Shallow Aquatic	10
Little or no vegetation	Open Aquatic	0

3.0 Hydrological Component
3.4 Carbon Sink

Layers
- Wetland Types
- Surficial geology

OWES Modification
- None

Analysis

1. Calculate the percent of wetland types within wetland units.

2. Calculate the percent of organic soil within the wetland units.

3. For wetlands with more than 50% organic:
- Bog/fen dominant scores 15 points
- Marsh or swamp scores 9 points

4. For wetlands with 10-50% organics:
- Any type scores 6

EVALUATION:
Choose only one of the following:

	Score
1) Wetland a bog or fen with more than 50% organic soils	15 points
2) Wetland with organic soils occupying 10 to 50% of the area (i.e. mainly mineral or undesignated soils, any wetland type)	6
3) Marshes and swamps with more than 50% organic soil	9
4) Wetland with less than 10% of soils organic	0

3.0 Hydrological Component
3.5 Shoreline Erosion Control

Layers
- Site type
- Vegetation type

OWES Modification
- Wetland Type used to characterize vegetation
- Shoreline area assumed to be 20m from wetland edge.

Analysis

1. Isolated and Palustrine wetlands score 0.

2. For riverine or lacustrine wetlands, determine the type of vegetation within 20m of shoreline edge.

3. Determine the dominant vegetation type based on Wetland Types.

4. Use the appropriate score based on the dominant vegetation type.

EVALUATION:

	Score
STEP 1: Wetland entirely isolated or palustrine	0
Any part of the wetland riverine, or lacustrine (proceed to Step 2)	

STEP 2: Choose the one characteristic that best describes the shoreline vegetation.

	Score
_____ Trees and shrubs	15
_____ Emergent vegetation	8
_____ Submergent vegetation	6
_____ Other shoreline vegetation	3
_____ No vegetation	0

OWES Type	Wetland Type	Score
Trees/Shrubs	Forest, Swamp, Swamp Thicket	15
Emergents	Marsh, Bog/Fen	8
Submergents	Shallow Aquatic	6
Other veg	TBD	3
No Veg		0

3.0 Hydrological Component
3.6 Groundwater Discharge

Layers
- Vegetation type
- Wetland catchment
- Surficial Geology

OWES Modification
- Only can score a subset of criteria (wetland type, wetland area:catchment area, catchment soil permeability).

Analysis

1. Determine the presence of swamp/marsh. Bog/Fen cannot be separated , so assume score is 0.

2. Determine the wetland area as a proportion of its upslope catchment. If >50% score is 0. If 5-50% score is 2. If <5% score 5.

3. Using surficial geology types that correspond with sand: if upslope catchment is 0-10% sand score 0, if 10-50% score 2, if >50% score 5.

4. Other criteria cannot be scored using prediction framework.

4. Sum the scores from steps 1-3.

Soil Type	Clay-Loam	Silt-Marl	Limestone	Sand	Humic-Mesic	Fibric	Granite
Fine-textured Glaciolacustrine Deposits	x	x					
Older alluvial Deposits	x	x					
Modern Alluvial Deposits	x	x					
Till				x			
Ice-contact stratified depositsIce-contact stratified deposits				x			
Coarse-textured glaciolacustrine deposits				x			
Bedrock Drift				x			
Organic Deposits					x	x	
Precambrian Bedrock							x

EVALUATION:
For each category above, select the value in the appropriate column. Sum the values to determine the total score.

		Catchment Interaction/Potential for Discharge		
		None to Little	Some	High
Wetland Characteristics	Wetland type Presence/absence	Bog = 0	Swamp/Marsh = 2	Fen = 5
	Basin Topography	Flat/rolling = 0	Hilly = 2	Major Relief Break = 5
	Wetland area: Upslope catchment area	Large (>50%) = 0	Moderate (5-50%) = 2	Small (<5%) = 5
	Lagg development	None found = 0	Minor = 2	Extensive = 5
	Seeps	None = 0	≤ 3 seeps = 2	> 3 seeps = 5
	Iron precipitates	None = 0	≤ 3 sites = 2	> 3 sites = 5
	Surface marl deposits	None = 0	≤ 3 sites = 2	> 3 sites = 5
	Wetland pH	Low < 4.2 = 0	Moderate 4.2-5.7 = 5	High >5.7 = 10
	Catchment soil coverage	Patchy = 0	Thin (<20 cm) = 2	Thick = 5
	Catchment soil permeability	Low = 0	Moderate = 2	High = 5

Maximum score for Groundwater Discharge is 30 points

Analysis requires multiple manual steps and analysis of catchment and other factors. Maybe more appropriate for a detailed desktop analysis.

4.0 Special Features
4.1 Rarity
4.1.1 Wetlands

Layers

Wetland Type
OWES Modification
- Bog/Fen cannot be separated, so if present score 20 points

Analysis

1. Determine presence of Marsh or Bog/Fen types. If present, score 20 points for each type.

Table 6. Evaluation Table for Scoring for Wetland Rarity in the Landscape and Rarity of Wetland Type

Unit Number	Site Region & District	Marsh	Swamp	Fen	Bog
2E	James Bay	20	20	0	20
2W	Big Trout Lake	20	20	0	10
3E	Lake Abitibi	20	20	10	0
3W	Lake Nipigon	20	20	10	0
3S	Lake St. Joseph	20	20	10	0
4E	Lake Temagami	20	20	10	0
4W	Pigeon River	20	10	20	0
4S	Wabigoon Lake	20	10	20	0
5E-1	Thessalon	10	0	30	20
5E-3	La Cloche	20	0	30	20
5E-4	Sudbury	10	0	30	10
5E-5	North Bay	10	0	20	0
5E-6	Tomiko	10	0	20	0
5E-7	Parry Sound	20	0	30	20
5E-8	Huntsville	20	0	30	20
5E-9	Algonquin Park	10	0	30	0
5E-10	Brent	20	0	30	0
5E-11	Bancroft	0	10	30	10
5E-13	Western Sault Ste. Marie – Lake Superior Coast	20	0	10	30
5-S	Lake of the Woods	10	10	20	10

4.1.1 Rarity of Wetland Type

Score is cumulative, based on presence/absence. Circle all appropriate scores from above table and sum.

Score (maximum 80 points) _____

4.0 Special Features
4.1 Rarity
4.1.2 Species
4.1.2.1 Provincially Significant Animals

Layers
- Wetland Type
- Global Biodiversity Information Facility (GBIF) Species records
- Natural Heritage Information Centre (NHIC) Element Occurrence records

OWES Modification
- Using GBIF and NHIC data to determine occurrence within wetlands.

Analysis

1. Filter GBIF and NHIC animal occurrences to only include those that are tracked by NHIC

2. Sum the number of provincially tracked species within each wetland. Note this is not a sum of the number of occurrences.

3. Based on the number of species, choose the appropriate score.

EVALUATION:

Number of provincially significant plant or animal species in the wetland:

One species =	50 points	14 species =	154
2 species =	80	15 species =	156
3 species =	95	16 species =	158
4 species =	105	17 species =	160
5 species =	115	18 species =	162
6 species =	125	19 species =	164
7 species =	130	20 species =	166
8 species =	135	21 species =	168
9 species =	140	22 species =	170
10 species =	143	23 species =	172
11 species =	146	24 species =	174
12 species =	149	25 species =	176
13 species =	152		

4.0 Special Features
4.1 Rarity
4.1.2 Species
4.1.2.1 Provincially Significant Plant Species

Layers
- Wetland Type
- Global Biodiversity Information Facility (GBIF) Species records
- Natural Heritage Information Centre (NHIC) Element Occurrence records

OWES Modification
- Using GBIF and NHIC data to determine occurrence within wetlands.

Analysis

1. Filter GBIF and NHIC plant occurrences to only include those that are tracked by NHIC

2. Sum the number of provincially tracked species within each wetland. Note this is not a sum of the number of occurrences.

3. Based on the number of species, choose the appropriate score.

EVALUATION:

Number of provincially significant plant or animal species in the wetland:

One species =	50 points	14 species =	154
2 species =	80	15 species =	156
3 species =	95	16 species =	158
4 species =	105	17 species =	160
5 species =	115	18 species =	162
6 species =	125	19 species =	164
7 species =	130	20 species =	166
8 species =	135	21 species =	168
9 species =	140	22 species =	170
10 species =	143	23 species =	172
11 species =	146	24 species =	174
12 species =	149	25 species =	176
13 species =	152		

4.0 Special Features
4.1 Rarity
4.1.2 Species
4.1.2.3 Regionally Significant Species

Layers
- Wetland Type
- Global Biodiversity Information Facility (GBIF) Species records

OWES Modification
- May only be able to process bird data based on Appendix 5 list

Analysis

1. Filter GBIF records based on Regionally Significant lists (e.g. birds from Appendix 5).

2. Sum the number of Regionally Significant species within the wetland boundary.

3. Determine the corresponding score.

Regionally Significant Breeding Birds in Region 2

Arctic Loon	Northern Phalarope	Veery
Pied billed Grebe	Arctic Tern	Gray Catbird
Snow Goose	Mourning Dove	Brown Thrasher
Wood Duck	Black billed Cuckoo	Northern Parula
Northern Shoveler	Great Horned Owl	Black throated Blue Warbler
Lesser Scaup	Barred Owl	Blackburnian Warbler
Bufflehead	Downy Woodpecker	Connecticut Warbler
Hooded Merganser	Pileated Woodpecker	Rose breasted Grosbeak
Goshawk	Eastern Phoebe	Clay coloured Sparrow
Merlin	Eastern Kingbird	LeConte's Sparrow
Sharp tailed Grouse	Horned Lark	Sharp tailed Sparrow
Sora	Cliff Swallow	Bobolink
Semipalmated Plover	Blue Jay	Brown headed Cowbird
Least Sandpiper	House Wren	Pine Grosbeak
American Woodcock	Sedge Wren	Red Crossbill
	Marsh Wren	

4.1.2.3 Number of species significant in Ecoregion

One species	= 20 points	6 species	= 55
2 species	= 30	7 species	= 58
3 species	= 40	8 species	= 61
4 species	= 45	9 species	= 64
5 species	= 50	10 species	= 67

For each significant species over 10 in wetland, add 1 point.
(no maximum score)

4.0 Special Features
4.1 Rarity
4.1.2 Species
4.1.2.4 Locally Significant Species

Layers
- Wetland Type
- Global Biodiversity Information Facility (GBIF) Species records
- Natural Heritage Information Centre (NHIC) Element Occurrence records

OWES Modification:
- None

Analysis

1. No current references for locally significant species.

4.1.2.4 Number of species significant in Ecodistrict

One species	= 10 points	6 species	= 41
2 species	= 17	7 species	= 43
3 species	= 24	8 species	= 45
4 species	= 31	9 species	= 47
5 species	= 38	10 species	= 49

For each significant species over 10 in wetland, add 1 point.
(no maximum score)

4.0 Special Features
4.1 Rarity
4.1.2 Species
4.1.2.5 Species of Special Status

Layers
- Wetland Type
- Black Duck breeding pair density map (from OWES manual)

OWES Modification
- None

Analysis

1. Identify presence of suitable habitat. To be conservative, only consider shallow aquatic.

2. If shallow aquatic is present greater than 0.5 ha use the corresponding table to determine the appropriate score.

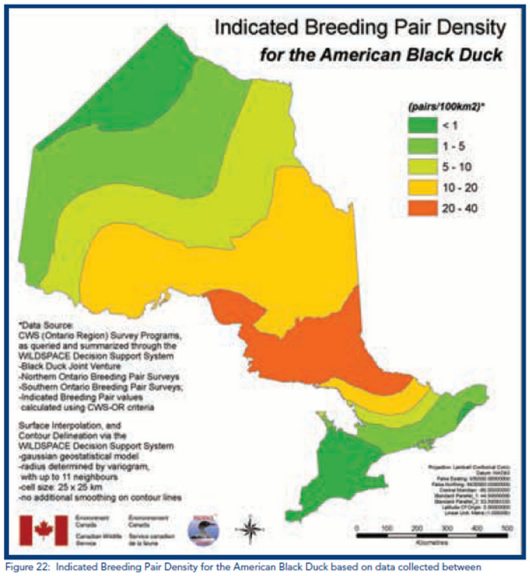

Figure 22: Indicated Breeding Pair Density for the American Black Duck based on data collected between 1989-2005.

EVALUATION (American Black Duck)::

20 - 40	"	= 20
10 - 20	"	= 15
5 - 10	"	= 10
1 - 5	"	= 5
habitat not suitable		= 0
out of assessment range		= 0

(Determine category from Figure 25; , *maximum score 20 points*)

4.0 Special Features
4.2 Significant Features or Habitats
4.2.1 Colonial Waterbirds

Layers
- Wetland Type
- GBIF data

OWES Modification
- Score the minimum points if species records are present

Analysis

1. Determine if any of the listed species are present (except for Great Blue Heron)
2. If present, assume feeding area, and score 15 points.
3.
4.

Species to Consider

- Red-necked Grebe (*Podiceps grisegena*),
- Black-crowned Night Heron (*Nycticorax nycticorax*),
- Great Egret (*Casmerodius albus*),
- Black Tern (*Chlidonias niger*),
- Caspian Tern (*Sterna caspia*),
- Common Tern (*S. hirundo*), and
- Great Blue Heron (*Ardea herodias*) – **scored for nesting occurrences, only**

EVALUATION: Check one only

Currently nesting colony	=	50 points
Known to have nested within the past 5 years	=	25
Active feeding area (great blue heron excluded)	=	15
None known	=	0

(Score highest appropriate category, *maximum score 50*)

4.0 Special Features
4.2 Significant Features or Habitats
4.2.2 Winter Cover for Wildlife

Layers
- Wetland Type
- Winter Deer Yards

OWES Modification
- Only considers one type

Analysis

1. If Winter Deer Yards are present in the wetland unit, score 100.

EVALUATION:

Provincially significant	=	100
Significant in Ecoregion	=	50
Significant in Ecodistrict	=	25
Locally significant	=	10
Little or poor winter cover	=	0

(Score highest appropriate category, *maximum score 100 points*)

4.0 Special Features
4.2 Significant Features or Habitats
4.2.3 Waterfowl Staging and Moulting

Layers
- Wetland Type
- Candidate SWH Waterfowl Stopover and Staging Areas (Aquatic)

OWES Modification
- Only score lowest category if candidate SWH present

Analysis

1. If Candidate SWH Waterfowl Stopover and Staging Areas (Aquatic) are present, score 10.

EVALUATION:

	Staging	Moulting
Nationally/internationally significant	= 150	150
Provincially significant	= 100	100
Significant in the Ecoregion	= 50	50
Significant in the Ecodistrict	= 25	25
Locally significant/Known to occur	= 10	10
Not possible/Unknown	= 0	0

(Score highest applicable category for each of staging and moulting, add and total score, however *maximum score that can be recorded for evaluation is 150 points*)

4.0 Special Features
4.2 Significant Features or Habitats
4.2.4 Waterfowl Breeding

Layers
- Wetland Type
- Candidate SWH Waterfowl Nesting Areas

OWES Modification
- Only score lowest category if candidate SWH present

Analysis

1. If Candidate SWH Waterfowl Nesting Areas are present, score 10.

EVALUATION:

Nationally/internationally significant	=	150 points
Provincially significant	=	100
Significant in the Ecoregion	=	50
Significant in the Ecodistrict	=	25
Locally significant/Habitat suitable	=	10
Habitat not suitable	=	0

(Score highest appropriate category; *maximum score: 150 points*)

4.0 Special Features
4.2 Significant Features or Habitats
4.2.5 Migratory passerine, shorebird, or raptor stopover

Layers
- Wetland Type
- Candidate SWH Shorebird Migratory Stopover Areas

OWES Modification
- Only score lowest category if candidate SWH present

Analysis

1. If Candidate SWH Shorebird Migratory Stopover Areas score 10 points

2. Candidate SWH Landbird Migratory Stopover Areas score 10 points

EVALUATION:

Nationally/internationally significant	=150 points
Provincially significant	=100
Significant in the Ecoregion	= 50
Significant in the Ecodistrict	= 25
Locally Significant/Known to occur	= 10
Not possible/Unknown	= 0

(Score highest appropriate category; *maximum score 150 points)*

4.0 Special Features
4.2 Significant Features or Habitats
4.2.6 Ungulate Habitat

Layers
- Wetland Type
- Candidate SWH Aquatic Feeding Habitat
- Forest Resource Inventory data for associated habitat
- Provincial data for associated habitat

OWES Modification

Analysis

1. Use provincial data to determine if wetland includes identified habitat. If yes, score based on the appropriate class type.

2. For wetlands where aquatic feeding habitat is present, determine if black spruce forests are within 500m using FRI. If they are, score an additional 15 points.

EVALUATION:

Score (1) + (2) + one of (3) to (6)

	Score
1. Ungulate summer cover	= 15 points
2. Mineral licks	= 50
3. Moose aquatic feeding area Class 1	= 0
4. Moose aquatic feeding area Class 2	= 10
5. Moose aquatic feeding area Class 3	= 20
6. Moose aquatic feeding area Class 4	= 35

(Score is cumulative for a maximum possible score of 100)

4.0 Special Features
4.2 Significant Features or Habitats
4.2.7 Fish Habitat
4.2.7.1 Spawning and Nursery Habitat

Layers
- Wetland Type

OWES Modification
- Cannot be completed as requires site level details not available in the land cover layer.

Analysis

1. . Data not available and not included in OWES prediction framework

Fish habitat requires various site-level inputs on detailed plant community types present within permanently flooded areas (low marsh) and seasonally flooded areas (high marsh).

4.0 Special Features
4.2 Significant Features or Habitats
4.2.7 Fish Habitat
4.2.7.2 Migration and Staging Habitat

Layers
- Wetland Type
- Site Type
- Lakes and Watercourses

OWES Modification
- Use Step 3 of the Evaluation Process.

Analysis

1. Determine the context of wetland types at the river mouth using Step 3 of the Evaluation table.

EVALUATION:

STEP 1:

_____ Staging or Migration Habitat is not present in the wetland	Go to Step 4, Score 0 points
_____ Staging or Migration Habitat is present in the wetland, significance of the habitat is known	Go to Step 2
_____ Staging or Migration Habitat is present in the wetland, significance of the habitat is not known	Go to Step 3

STEP 2: *Select the highest appropriate category below. Ensure that documentation is attached to the data record.*

_____ Significant in Ecoregion	Score 25 points in Step 4
_____ Significant in Ecodistrict	Score 15 points in Step 4
_____ Locally Significant	Score 10 points in Step 4
_____ Fish staging and/or migration habitat present, but not as above	Score 5 points in Step 4

STEP 3: *Select the highest appropriate category below based on presence of the designated site type (i.e. does not have to be the dominant site type). Refer to Site Types recorded earlier (section 1.1.3). Distance is measured as the shortest straight line ("as the crow flies"). Attach documentation.*

_____ Wetland is riverine at rivermouth or lacustrine at rivermouth	Score 25 points in Step 4
_____ Wetland is riverine, within 0.75 km of rivermouth	Score 15 points in Step 4
_____ Wetland is lacustrine, within 0.75 km of rivermouth	Score 10 points in Step 4
_____ Fish staging and/or migration habitat present, but not as above	Score 5 points in Step 4

STEP 4: *Enter a score from only one of the three above Steps.*

Score for Staging and Migration Habitat *(maximum score 25 points)*_____

4.0 Special Features
4.3 Ecosystem Age

Layers
- Wetland Type

OWES Modification
- Bog and Fen are grouped in the Land Cover Feature class. The lower value (x20) was used to calculate the age.

Analysis

1. Using the fractional area calculated in the Biological Component Step 1.1.2 (Wetland Type), multiply by the age weightings in the Ecosystem Age Evaluation table.

EVALUATION: (FA = fractional area)

Bog	=	FA x 25
Fen, on deeper soils;		
floating mats or marl	=	FA x 20
Fen, on limestone rock	=	FA x 5
Swamp	=	FA x 3
Marsh	=	FA x 0

(maximum score 25 points)

4.0 Special Features
4.4 Great Lakes Coastal Wetlands

Layers
- Wetland Type

OWES Modification

Analysis

1. Determine if the wetland is a coastal wetland.
2. If yes, use the size criteria to determine the appropriate score.
3.
4.

Coastal Wetland Definition

A 'coastal' wetland is defined as follows (modified from the Strategic Plan for Wetlands in the Great Lakes Basin):

1. any wetland that is on the Great Lakes (Lakes Ontario, Erie, Huron, and Superior) or their connecting channels (Lake St. Clair, St. Mary's, St. Clair, Detroit, Niagara, and St. Lawrence Rivers), OR

2. any wetland that is on a tributary to the Great lakes or their connecting channels (see #1 above) and lies, either wholly or in part, downstream of a line located 2 km upstream (as 'the crow flies') of the 1:100 year floodline (plus wave run-up) of the large water body to which it is connected.

If the 1:100 year floodline is not known, use a line 2 km from the shore of the Great Lake, connecting channel or defined major river as the defining boundary. In other words wetlands on tributaries located within 2 km of one of the defined water bodies are to be considered "coastal".

EVALUATION

Choose one only

Wetland < 10 ha	=	10 points
Wetland 10-50 ha	=	25
Wetland 51-100 ha	=	50
Wetland > 100 ha	=	75

(maximum score 75 points)

APPENDIX C: OWES SCORES USED FOR ANALYSES

							Formal OWES Scores				Predicted OWES Scores				Combined Estimates			
Order	Section ID	Component	Section	Subsection	Min Score	Max Score	Childs Pit Quarry Wetland	Bala Wetland Complex	Mactier Wetland Complex	Tadenac North	Childs Pit Quarry Wetland	Bala Wetland Complex	Mactier Wetland Complex	Tadenac North	Childs Pit Quarry Wetland	Bala Wetland Complex	Mactier Wetland Complex	Tadenac North
1	1.1.1	Biological	Productivity	Growing Degree-Days/Soil	4	30	16.5	17.9	17	15	11	21	11	9	11	21	11	9
2	1.1.2	Biological	Productivity	Wetland Type	3	15	9	10.4	8	12	11	14	10	7	11	14	10	7
3	1.1.3	Biological	Productivity	Site Type	1	5	2	2	2	2	4	4	3		4	4	3	2
4	1.2.1	Biological	Biodiversity	Number of Wetland Types	9	30	20	20	20	20	13	20	20	20	13	20	20	20
5	1.2.2	Biological	Biodiversity	Vegetation Communities	1.5	45	9	45	30	45	5.5	5.5	6	6	5.5	5.5	6	6
6	1.2.3	Biological	Biodiversity	Diversity of Surrounding Habitat	0	7	6	7	6	7	3	3	3	3	3	3	3	3
7	1.2.4	Biological	Biodiversity	Proximity to Other Wetlands	0	8	8	8	8	8	8	8	8		8	8	8	8
8	1.2.5	Biological	Biodiversity	Interspersion	3	30	15	27	24	24	30	30	30	30	30	30	30	30
9	1.2.6	Biological	Biodiversity	Open Water Type	0	30	8	20	14	30					8	20	14	30
10	1.3	Biological	Size	Size	1	50	9	50	50	50	19	50	40	31	19	**50**	**50**	**50**
11	2.1.1	Social Component	Economically Valuable Products	Wood Products	0	14	0	4	8	4	4	4	6	4	4	4	6	4
12	2.1.2	Social Component	Economically Valuable Products	Low Bush Cranberry	0	2	0	2	2	2	2	2	2	2	2	2	2	2
13	2.1.3	Social Component	Economically Valuable Products	Wild Rice	0	10	0	0	0	10					0	0	0	10
14	2.1.4	Social Component	Economically Valuable Products	Commercial Baitfish	0	12	0	0	0	12	12	12	12	12	12	12	12	12
15	2.1.5	Social Component	Economically Valuable Products	Furbearers	0	12	0	12	12	12	0	0	0	0	0	0	0	0
16	2.2	Social Component	Recreational Activities	Recreational Activities	0	80	0	24	16	36					0	24	16	36
17	2.3.1	Social Component	Landscape Aesthetics	Distinctiveness	0	3	0	0	3	0					0	0	3	0
18	2.3.2	Social Component	Landscape Aesthetics	Absensence of Human Disturbance	0	7	4	4	4	7					4	4	4	7
19	2.4.1	Social Component	Education and Public Awareness	Educational Uses	0	20	0	0	0	0					0	0	0	0
20	2.4.2	Social Component	Education and Public Awareness	Facilities and Programs	0	8	0	0	0	0					0	0	0	0
21	2.4.3	Social Component	Education and Public Awareness	Research and Studies	0	12	5	5	5	5					5	5	5	5
22	2.5	Social Component	Proximity to Areas of Human Settlement	Proximity to Areas of Human Settlement	0	40	26	10	16	10	26	12	8	12	26	12	8	12
23	2.6	Social Component	Ownership	Ownership	4	10	4	4	5	7	5	7	8	8	5	7	8	8
24	2.7	Social Component	Size	Size	1	20	5	18	13	18	7	6	9	7	7	**13**	**9**	**18**
25	2.8.1	Social Component	Aboriginal and Cultural Values	Aboriginal Value	0	30	0	0	0	30					0	0	0	30
26	2.8.2	Social Component	Aboriginal and Cultural Values	Cultural Heritage	0	30	0	0	0	0					0	0	0	0
27	3.1	Hydrological Component	Flood Attenuation	Flood Attenuation	0	100	90	90.1	90	0	100	100	100	90	100	100	100	90
28	3.2.1	Hydrological Component	Groundwater Recharge	Site Type	0	20	20	19.6	18	19	20	20	20		20	20	20	19
29	3.2.2	Hydrological Component	Groundwater Recharge	Soil Recharge Potential	0	10	7	7	4	4	10	5	7		10	5	7	4
30	3.3.1	Hydrological Component	Water Quality Improvement	Watershed Improvement Factor	6	30	25.5	27.5	19	28	30	30	30		30	30	30	28
31	3.3.2	Hydrological Component	Water Quality Improvement	Adjacent Watershed Landuse	0	50	10	19	10	0	4	19	29	15	4	19	29	15
32	3.3.3	Hydrological Component	Water Quality Improvement	Vegetation Form	0	10	8	8	8	10	8	8	8	10	8	8	8	10
33	3.4	Hydrological Component	Carbon Sink	Carbon Sink	0	15	6	9	9	9	6	15	9	9	6	15	9	9
34	3.5	Hydrological Component	Shoreline Erosion Control	Shoreline Erosion Control	0	15	0	3	3	8	15	15	15	15	15	15	15	15
35	3.6	Hydrological Component	Groundweater Discharge	Groundwater Discharge	0	30	23	27	20	26					23	27	20	26
36	4.1.1	Special Features	Rarity	Wetlands	0	70	50	50	50	50	20	20	20	20	20	20	20	20
		Special Features	Species	Reproductive habitat for End or Threatened Species (note this is no longer in the OWES scoring criteria as of 2022)	0	250	0	250	250	500	0	0	0	0	0	0	0	0
		Special Features	Species	Traditional Migration or Feeding Habitat for an End or Threatened Species (note this is no longer in the OWES scoring criteria as of 2022)	0	75	0	150	225	150	0	0	0	0	0	0	0	0
37	4.1.2.1	Special Features	Species	Provincially Significant Animals	0	250	80	115	50	115	50	50	95	80	50	50	95	80
38	4.1.2.2	Special Features	Species	Provincially Significant Plants	0	250	50	95	50	80	0	105	80	0	0	105	80	0
39	4.1.2.3	Special Features	Species	Regionally Significant Species	0	250	0	50	20	30	0	0	40	30	0	0	40	30
40	4.1.2.4	Special Features	Species	Locally Significant Species	0	250	0	24	10	0					0	24	10	0
41	4.1.2.5	Special Features	Species	Species of Special Status	0	20	0	10	0	0	0	10	10	10	0	10	10	10
42	4.2.1	Special Features	Significant Features or Habitat	Colonial Waterbirds	0	50	0	50	0	50	0	0	0	0	0	0	0	0
43	4.2.2	Special Features	Significant Features or Habitat	Winter Cover for Wildlife	0	100	0	0	0	10	0	0	0	100	0	0	0	100
44	4.2.3	Special Features	Significant Features or Habitat	Waterfowl Staging and Multing	0	150	0	0	0	20	10	0	10	10	10	0	10	10
45	4.2.4	Special Features	Significant Features or Habitat	Waterfowl Breeding	0	150	0	10	0	10	10	10	10	10	10	10	10	10
46	4.2.5	Special Features	Significant Features or Habitat	Migratory Passerine, Shorebird, or Raptor Stopover	0	150	0	0	0	0	0	0	0	0	0	0	0	0

Order	Section ID	Component	Section	Subsection	Min Score	Max Score	Formal OWES Scores				Predicted OWES Scores				Combined Estimates			
							Childs Pit Quarry Wetland	Bala Wetland Complex	Mactier Wetland Complex	Tadenac North	Childs Pit Quarry Wetland	Bala Wetland Complex	Mactier Wetland Complex	Tadenac North	Childs Pit Quarry Wetland	Bala Wetland Complex	Mactier Wetland Complex	Tadenac North
47	4.2.6	Special Features	Significant Features or Habitat	Ungulate Habitat	0	100	0	25	0	20	0	0	0	20	0	0	0	20
48	4.2.7.1	Special Features	Significant Features or Habitat	Fish Habitat: Spawning and Nursery Habitat	0	100	0	35.4	5.5	25					0	35.4	5.5	25
49	4.2.7.2	Special Features	Significant Features or Habitat	Fish Habitat: Staging and Migration Habitat	0	25	0	5	0	5	0	25	25		0	25	25	5
50	4.3	Special Features	Ecosystem Age	Ecosystem Age	0	25	5	6.2	8	3	12	8	9	5	12	8	9	5
51	4.4	Special Features	Great Lakes Coastal Wetlands	Great Lakes Coastal Wetlands	0	75	0	0	0	75					0	0	0	75

APPENDIX D: DIFFERENCE BETWEEN FORMAL AND PREDICTED OWES SCORES

							Formal OWES Scores				Predicted OWES Scores				Difference in Scores				
Order	Section ID	Component	Section	Subsection	Min Score	Max Score	Childs Pit Quarry Wetland	Bala Wetland Complex	Mactier Wetland Complex	Tadenac North	Childs Pit Quarry Wetland	Bala Wetland Complex	Mactier Wetland Complex	Tadenac North	Childs Pit Quarry Wetland	Bala Wetland Complex	Mactier Wetland Complex	Tadenac North	Average
1	1.1.1	Biological	Productivity	Growing Degree-Days/Soil	4	30	16.5	17.9	17	15	11	21	11	9	-5.5	3.1	-6	-6	-3.6
2	1.1.2	Biological	Productivity	Wetland Type	3	15	9	10.4	8	12	11	14	10	7	2	3.6	2	-5	0.7
3	1.1.3	Biological	Productivity	Site Type	1	5	2	2	2	2	4	4	3		2	2	1		1.7
4	1.2.1	Biological	Biodiversity	Number of Wetland Types	9	30	20	20	20	20	13	20	20	20	-7	0	0	0	-1.8
5	1.2.2	Biological	Biodiversity	Vegetation Communities	1.5	45	9	45	30	45	5.5	5.5	6	6	-3.5	-39.5	-24	-39	-26.5
6	1.2.3	Biological	Biodiversity	Diversity of Surrounding Habitat	0	7	6	7	6	7	3	3	3	3	-3	-4	-3	-4	-3.5
7	1.2.4	Biological	Biodiversity	Proximity to Other Wetlands	0	8	8	8	8	8	8	8	8		0	0	0		0
8	1.2.5	Biological	Biodiversity	Interspersion	3	30	15	27	24	24	30	30	30	30	15	3	6	6	7.5
9	1.2.6	Biological	Biodiversity	Open Water Type	0	30													
10	1.3	Biological	Size	Size	1	50	9	50	50	50	19	50	40	31	10	0	-10	-19	-4.8
11	2.1.1	Social Component	Economically Valuable Products	Wood Products	0	14	0	4	8	4	4	4	6	4	4	0	-2	0	0.5
12	2.1.2	Social Component	Economically Valuable Products	Low Bush Cranberry	0	2	0	2	2	2	2	2	2	2	2	0	0	0	0.5
13	2.1.3	Social Component	Economically Valuable Products	Wild Rice	0	10													
14	2.1.4	Social Component	Economically Valuable Products	Commercial Baitfish	0	12	0	0	0	12	12	12	12	12	12	12	12	0	9
15	2.1.5	Social Component	Economically Valuable Products	Furbearers	0	12	0	12	12	12	0	0	0	0	0	-12	-12	-12	-9
16	2.2	Social Component	Recreational Activities	Recreational Activities	0	80													
17	2.3.1	Social Component	Landscape Aesthetics	Distinctiveness	0	3													
18	2.3.2	Social Component	Landscape Aesthetics	Absensence of Human Disturbance	0	7													
19	2.4.1	Social Component	Education and Public Awareness	Educational Uses	0	20													
20	2.4.2	Social Component	Education and Public Awareness	Facilities and Programs	0	8													
21	2.4.3	Social Component	Education and Public Awareness	Research and Studies	0	12													
22	2.5	Social Component	Proximity to Areas of Human Settlement	Proximity to Areas of Human Settlement	0	40	26	10	16	10	26	12	8	12	0	2	-8	2	-1
23	2.6	Social Component	Ownership	Ownership	4	10	4	4	5	7	5	7	8	8	1	3	3	1	2
24	2.7	Social Component	Size	Size	1	20	5	18	13	18	7	6	9	7	2	-12	-4	-11	-6.3
25	2.8.1	Social Component	Aboriginal and Cultural Values	Aboriginal Value	0	30													
26	2.8.2	Social Component	Aboriginal and Cultural Values	Cultural Heritage	0	30													
27	3.1	Hydrological Component	Flood Attenuation	Flood Attenuation	0	100	90	90.1	90	0	100	100	100	90	10	9.9	10	90	30
28	3.2.1	Hydrological Component	Groundwater Recharge	Site Type	0	20	20	19.6	18	19	20	20	20		0	0.4	2		0.8
29	3.2.2	Hydrological Component	Groundwater Recharge	Soil Recharge Potential	0	10	7	7	4	4	10	5	7		3	-2	3		1.3
30	3.3.1	Hydrological Component	Water Quality Improvement	Watershed Improvement Factor	6	30	25.5	27.5	19	28	30	30	30		4.5	2.5	11		6
31	3.3.2	Hydrological Component	Water Quality Improvement	Adjacent Watershed Landuse	0	50	10	19	10	0	4	19	29	15	-6	0	19	15	7
32	3.3.3	Hydrological Component	Water Quality Improvement	Vegetation Form	0	10	8	8	8	10	8	8	8	10	0	0	0	0	0
33	3.4	Hydrological Component	Carbon Sink	Carbon Sink	0	15	6	9	9	9	6	15	9	9	0	6	0	0	1.5
34	3.5	Hydrological Component	Shoreline Erosion Control	Shoreline Erosion Control	0	15	0	3	3	8	15	15	15	15	15	12	12	7	11.5
35	3.6	Hydrological Component	Groundweater Discharge	Groundwater Discharge	0	30													
36	4.1.1	Special Features	Rarity	Wetlands	0	70	50	50	50	50	20	20	20	20	-30	-30	-30	-30	-30
		Special Features	Species	Reproductive habitat for End or Threatened Species (note this is no longer in the OWES scoring criteria as of 2022)	0	250													
		Special Features	Species	Traditional Migration or Feeding Habitat for an End or Threatened Species (note this is no longer in the OWES scoring criteria as of 2022)	0	75													
37	4.1.2.1	Special Features	Species	Provincially Significant Animals	0	250	80	115	50	115	20	20	95	80	-60	-95	45	-35	-36.3
38	4.1.2.2	Special Features	Species	Provincially Significant Plants	0	250	50	95	50	80	0	105	80	0	-50	10	30	-80	-22.5
39	4.1.2.3	Special Features	Species	Regionally Significant Species	0	250	0	50	20	30	0	0	40	30	0	-50	20	0	-7.5
40	4.1.2.4	Special Features	Species	Locally Significant Species	0	250	0	24	10	0									
41	4.1.2.5	Special Features	Species	Species of Special Status	0	20	0	10	0	0	0	10	10	10	0	0	10	10	5
42	4.2.1	Special Features	Significant Features or Habitat	Colonial Waterbirds	0	50	0	50	0	50	0	0	0	0	0	-50	0	-50	-25
43	4.2.2	Special Features	Significant Features or Habitat	Winter Cover for Wildlife	0	100	0	0	0	10	0	0	0	100	0	0	0	90	22.5
44	4.2.3	Special Features	Significant Features or Habitat	Waterfowl Staging and Multing	0	150	0	0	0	20	10	0	10	10	10	0	10	-10	2.5
45	4.2.4	Special Features	Significant Features or Habitat	Waterfowl Breeding	0	150	0	10	0	10	10	10	10	10	10	0	10	0	5
46	4.2.5	Special Features	Significant Features or Habitat	Migratory Passerine, Shorebird, or Raptor Stopover	0	150	0	0	0	0	0	0	0	0	0	0	0	0	0
47	4.2.6	Special Features	Significant Features or Habitat	Ungulate Habitat	0	100	0	25	0	20	0	0	0	20	0	-25	0	0	-6.3
48	4.2.7.1	Special Features	Significant Features or Habitat	Fish Habitat: Spawning and Nursery Habitat	0	100													
49	4.2.7.2	Special Features	Significant Features or Habitat	Fish Habitat: Staging and Migration Habitat	0	25	0	5	0	5	0	25	25		0	20	25		15
50	4.3	Special Features	Ecosystem Age	Ecosystem Age	0	25	5	6.2	8	3	12	8	9	5	7	1.8	1	2	3
51	4.4	Special Features	Great Lakes Coastal Wetlands	Great Lakes Coastal Wetlands	0	75													