

Credit Valley Conservation

April 2013



Creditview Wetland Health Update 2012



Acknowledgements

This report was prepared by Donna Havinga, Credit Valley Conservation (CVC), who was a member of the Dougan Creditview Wetland team as a consultant prior to joining CVC in 2008. Donna acted as CVC's lead representative on the Creditview Wetland Stewardship Committee from 2008-2011. Robert Morris, also participated in the original Creditview Wetland Management Plan as the CVC Biologist and now as Manager of Natural Heritage including Wetland Restoration services was responsible for additional assessments, final editing and future direction. Input and review were also provided by:

- staff on CVC's Natural Heritage team;
- staff of the City of Mississauga's Parks and Forestry Department;
- and, members of the Creditview Wetland Stewardship Committee (CWSC).

Flora and fauna data was provided by the Natural Heritage team at CVC and the City of Mississauga's Natural Areas Survey (NAS) consultants North-South Environmental. Water level data was provided by the CWSC.

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1. INTRODUCTION

Creditview Wetland is a Provincially Significant Wetland that was purchased by the City of Mississauga in 1998. It is considered an important natural feature in Mississauga. Along with many wetland plants, birds, amphibians and other animals, there are several plants with fen or bog associations that make this wetland particularly unique within the City of Mississauga.

Several formal and informal studies of the wetland have been undertaken since 1988. In 2003 the City commissioned Dougan and Associates to further this research and provide related management guidelines. The *Creditview Wetland Conservation Plan* report was published in 2004 and has provided guidance to the City, Credit Valley Conservation (CVC), the Creditview Wetland Stewardship (CWS) group and other interested parties.

The purpose of this health report is to update the CWS, the City and other interested parties on the status of the wetland and studies since the Dougan report. This report is not intended to provide a comprehensive analysis but rather a brief overview of the status of studies and current known conditions. The report is focussed on the transfer of science and not on the management philosophy. It is realized that humans are part of the wetland ecosystem in both positive and negative ways and strict definitions such as restoration to original historic conditions are neither realistic nor necessarily desirable. Likewise terms such as control and manage can be interpreted differently. Any recommendations on stewardship approaches and partnership relationships cannot be made by CVC alone in this document and are intended to initiate further discussion and decisions by all stakeholders.

In addition, this report provides some recommendations for further studies and stewardship activities. The report was purposefully written in a non-technical user-friendly style.

2. STATUS OF STUDIES

For a historic overview of known wetland studies prior to 2003 refer to the *Creditview Wetland Conservation Plan*.

The most recent studies of wetland flora and fauna were done by the Mississauga Natural Areas Survey team in 2007 and 2011. General results of these surveys are summarized in *City of Mississauga Natural Areas Survey* (NAS) reports and maps available on the City's website. More detailed data from both NAS surveys was reviewed for this update. Consultants who conduct the NAS surveys follow well established protocols; for details on methodology refer to the noted reports.

Also since 2003, a vegetation monitoring transect was established with additional amphibian surveys conducted annually by Credit Valley Conservation. This was established as part of CVC's Terrestrial Monitoring Program that assesses vegetation and other abiotic parameters at permanent sub-plots. The methods used are rigorous, repeatable and follow standardized protocols designed by a federal agency. The watershed-wide program with close to 30 sites has the objective of evaluating wetlands based on long-term trends and the status of flora, fauna and hydrology indicators. There remain some limitations in monitoring all the specific plants and animals of special interest.

In 2009, the CWS requested that a water quality monitoring station be established. However, given that its catchment is small with no obvious runoff inputs and that water quality sampling can be expensive it has not been pursued to date. This can be further discussed with recommendations.

Water levels were initially monitored by City staff and subsequently by the CWS. Levels are monitored quarterly at every solstice and equinox via a simple staff gauge installed by the City in the south-west corner of the wetland. A piezometer (i.e. an instrument that measures groundwater flow) was installed by the City, but it was removed due to technical failure, the understanding that the wetland receives little if any groundwater inputs and the cost of replacement.

3. RESULTS OF STUDIES

3.1 FLORA

Communities and select species noted in the City’s 2007 and 2011 NAS studies and CVC’s annual transect study were compared with lists provided by Dougan and Associates in 2004 (refer to Table 1). The eight communities noted differ somewhat from those noted in the latest NAS reports. For ease of comparison via the NAS, the 2007 NAS study team worked with four communities identified in NAS surveys conducted prior to the Dougan report as follows:

- Fresh Lowland Deciduous Forest and Mineral Cultural Thicket are merged into one community noted as “Cultural Savannah”. It is preferable to continue to distinguish between the two types, as cultural communities are largely created by humans while Deciduous Forests usually occur naturally. Thicket consists of small trees and shrubs while forests consist of canopy trees and understory layers.
- Three types of swamps were blended into one “Organic Thicket Swamp”. It is preferable to distinguish between the three types. Deciduous swamp consists of more canopy trees. The distinction between organic and mineral was due to the presence of organic peaty bog-like hummocks where many bog-fen indicators were found.
- In 2007, Mineral Cultural Meadow was not included in the NAS survey although it is a feature of the wetland edge. In 2011 the NAS team recommended including this community in future site boundaries.

It is recommended that the communities noted in the Dougan report remain the recognized communities for further monitoring and assessment.

TABLE 1: COMMUNITIES IDENTIFIED IN FORMAL STUDIES TO DATE		
	2004 Dougan & Associates*	2007 Mississauga NAS
Mineral cultural meadow	√	not included
Fresh lowland deciduous forest	√	blended and named Cultural Savannah
Mineral cultural thicket	√	blended and named Cultural Savannah
Mineral thicket swamp	√	blended with Organic Thicket Swamp
Mixed shallow aquatic	√	√
Organic deciduous swamp	√	blended with Organic Thicket Swamp
Organic shallow marsh	√	√
Organic thicket swamp	√	√

*CVC recommends that these communities remain the formally recognized communities for future detailed monitoring and assessment. See text for further explanation.

3.2 SPECIES OF SPECIAL INTEREST

When studies were formally initiated, the wetland was not a bog or a fen but it had some bog/fen-like elements (i.e. indicator plants, peat and fen-like flow). It may have been a fen or contained fen pockets in the past, but no records have been provided to substantiate this. Fen-like elements are unique in Mississauga, and the indicator plants are locally and regionally rare and worthy of special attention.

Of the six species of special interest noted in the Dougan report, two were reported in 2007 and 2011 - Black Chokeberry (*Aronia melanocarpa*) and Virginia Chain Fern (*Woodwardia virginica*). Note that the NAS does not look at all plants and CVC's transect may not capture all bog-fen indicators, so that exclusion on recent NAS and CVC lists do not necessarily indicate that the species are no longer there. Table 2 lists unofficially rare species that should be tracked according to CVC and Dougan.

TABLE 2. SPECIES OF SPECIAL INTEREST TO BE TRACKED IN CREDITVIEW WETLAND.

Common Name	Latin Name
American Larch	<i>Larix laricina</i>
Black Chokeberry	<i>Aronia melanocarpa</i>
Bristly Sedge	<i>Carex comosa</i>
Columbia Watermeal	<i>Wolffia columbiana</i>
Common Buttonbush	<i>Cephalanthus occidentalis</i>
Greater Duckweed	<i>Spirodela polyrrhiza</i>
Highbush Blueberry	<i>Vaccinium corymbosum</i>
Large Bur-reed	<i>Sparganium eurycarpum</i>
Late Lowbush Blueberry	<i>Vaccinium angustifolium</i>
Meadow Willow	<i>Salix petiolaris</i>
Narrow-leaved Meadow-sweet	<i>Spirea alba</i>
Silky Dogwood	<i>Cornus amomum ssp. oblique</i>
Star Duckweed	<i>Lemna trisulca</i>
Swamp Rose	<i>Rosa palustris</i>
Velvet Leaf Blueberry	<i>Vaccinium myrtilloides</i>
Virginia Chain Fern	<i>Woodwardia virginica</i>
Water Loosestrife	<i>Lysimachia thyrsiflora</i>

A full list of flora found in known wetland studies up to 2004 was provided in the Dougan report. A comprehensive updated list was beyond the scope of this brief report, but is also recommended as a future action.

3.3 QUALITY OF VEGETATION

Creditview Wetland remains a highly diverse and valued natural area. Table 3 summarizes NAS data over time. A Coefficient of Conservatism (CC) is assigned to each native species by a panel of experts. The higher the value the more of a habitat specialist the species is (i.e. only able to thrive in select conditions) and likely a higher priority for protection. The CC represents the mean value of conservatism. Four (4) and above is

considered a high value natural area . The Floristic Quality Index (FQI) is derived from the CC combined with the number of native species. An FQI value of 40 or higher is considered a high value natural area (NAS 2002). The slight decline in the mCC over the past 15 years may be cause for alarm and further investigations, particularly for species of special interest. It should be confirmed whether any species have disappeared from the area or whether this decline is due to increasing proportions of generalist species colonizing the site in the recent past. It should also be noted that non-native species threaten the quality of vegetation in the Creditview Wetland area.

TABLE 3: QUALITY OF VEGETATION					
	1995 (NAS, 1996)	2002 (NAS, 2003)	2004 (NAS, 2004)	2007 (NAS, 2008)	2011 (NAS, 2011)
Floristic Quality Index (FQI)	53.01	52.78	54.62	54.64	56.53
Coefficient of Conservatism (CC)	4.5	4.43	4.39	4.33	4.34

Results from CVC studies (Table 4) also used an adjusted FQI together with other measures for an Index of Biotic Integrity (Miller et al. 2006) rating wetland health as poor, fair or good across the Credit watershed. Creditview wetland is ranked as fair. More specific measures scored high for rare species and low with respect to the number of non-native species, but most were moderate in ranking as related to the FQI scores. From 2005 to 2011 the status of biological integrity has remained fair with no statistical increasing or decreasing trends detected.

TABLE 4. SUMMARY OF VEGETATION STATUS AND TRENDS TO EVALUATE SITE INTEGRITY

Vegetation Metric	2011 Value	Observed Statistical Trend (2005 to 2011)
Native Plant Species Richness (#)	21	Variable or No Trend
Proportion Non-native Species (%)	16	Variable or No Trend
Mean Coefficient of Conservatism (mCC)	3.62	Variable or No Trend
Floristic Quality Index Value (adjusted)	16.59	Variable or No Trend
% cover Tolerant Species (CC of 2 or less)	92	Variable or No Trend
% Invasive Species	12	Variable or No Trend
Number -3 weedy species per site	2	Variable or No Trend
Wetness Index value per site	-3	Variable or No Trend
Index of Biotic Integrity	Fair	Variable or No Trend

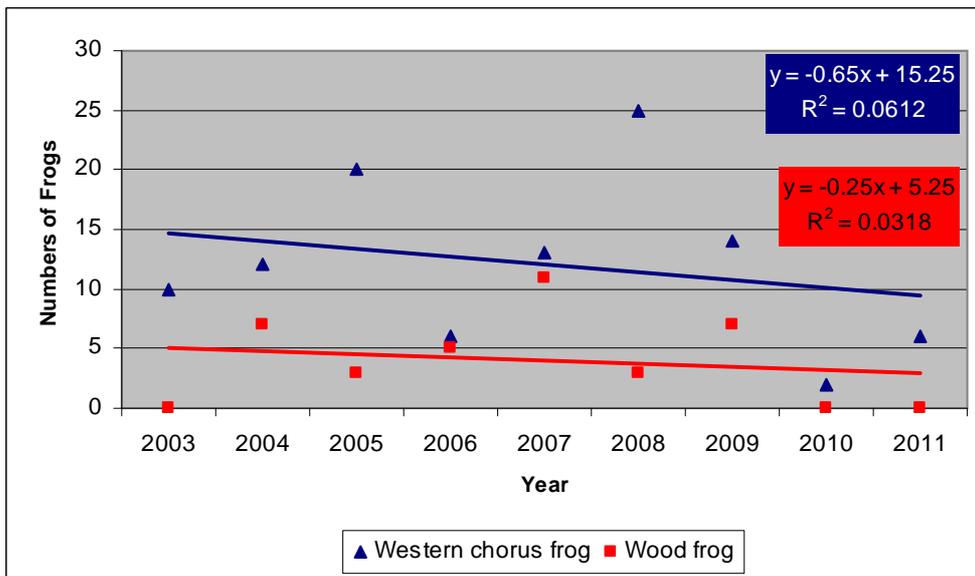
CVC also scored the wetland from a landscape perspective within the Credit River watershed and Mississauga. Both scores are relatively low (2 and 3/9) because of its size and isolation from other natural areas being surrounded by a subdivision. It is however recognized for its diversity and uniqueness, particularly in the context of Mississauga that has only 4% of its jurisdiction with similar natural cover. It is also the only location for a number of rare plants in the City.

4. FAUNA

A full list of fauna found in known wetland studies up to 2004 was provided in the Dougan report. A comprehensive updated list was beyond the scope of this brief report, but is recommended as a future action.

Since 2004, CVC has been monitoring frogs three times a year, the results of which are noted in Figure 1.

FIGURE 1. NUMBER OF FROGS DETECTED IN CREDITVIEW WETLAND BY CVC (2003 TO 2011).



Although the number of frogs may appear to be in decline, there remains no statistically significant trend overall. An Index of Biotic Integrity for amphibians following Crewe and Timmermans (2005) that scores the number of species, their sensitivity, rarity and calling intensity rates the Creditview Wetland as fair with no change over time. The Western Chorus Frog (*Pseudacris triseriata*) scores for being rare and the Wood Frog (*Rana sylvatica*) scores as the most sensitive species.

The absence of Wood Frogs in 2003, 2010 and 2011 may reflect the sampling method and not necessarily a change in habitat or other disturbance. Incidental records confirm it is still present in the wetland as of 2013. Nevertheless frog monitoring must continue given it is considered a high risk population due to its small size, isolation and lack of genetic diversity. Furthermore the two most common urban tolerant species expected, American Toad (*Bufo americanus*) and Green Frog (*Rana clamitans*) have not been recorded during formal monitoring either. These would still indicate, if found, an overall healthier and diverse wetland.

CVC conducted breeding bird surveys from 2009 to 2011 following Bird Studies Canada's Marsh Monitoring Program. The results are provided in Table 5. A total of 19 species have been detected at Creditview Wetland which represents 12% of those known to breed in the Credit River Watershed. Of the six guilds or types of birds monitored, 84% of the birds at Creditview are classified as generalists including non-native European Starlings (*Sturnus vulgaris*) and House Sparrows (*Passer domesticus*). This is indicative of high levels of urbanization and small isolated habitats. Unfortunately no wetland

obligate bird species were recorded during the survey to direct any restoration projects. However, the Red-winged Blackbird (*Agelaius phoeniceus*), a habitat generalist that nests in cattails has been regularly detected, and could represent an indicator species for this wetland community. There appears to be no significant difference in bird abundance or diversity during the three years sampled but no statistical analyses were attempted as data were insufficient to provide adequate power to detect trends. Additional years of data are recommended.

TABLE 5. BIRD SPECIES DETECTED AT CREDITVIEW WETLAND USING MARSH MONITORING PROTOCOLS (BIRD STUDIES CANADA 2009).

2009		2010		2011	
Species	Max Abundance	Species	Max Abundance	Species	Max Abundance
American Robin	1	American Goldfinch	2	American Goldfinch	2
Common Grackle	6	American Robin	2	American Robin	2
Gray Catbird	1	Baltimore Oriole	1	Baltimore Oriole	1
Great-crest Flycatcher	1	Brown-headed Cowbird	1	Black-capped Chickadee	1
Mourning Dove	1	Common Grackle	2	Cedar Waxwing	1
Northern Cardinal	1	European Starling	1	Chipping Sparrow	1
Red-winged Blackbird	5	House Sparrow	1	Common Grackle	3
Song Sparrow	2	Mourning Dove	2	European Starling	1
Yellow Warbler	1	Northern Cardinal	2	House Wren	1
		Red-winged Blackbird	5	Northern Cardinal	2
		Song Sparrow	1	Red-winged Blackbird	4
		Tree Swallow	1	Song Sparrow	2
		Yellow Warbler	2		
9	19	13	23	12	21

Incidental observations of other fauna made by CVC staff include only Canada Goose (*Branta canadensis*), which have been seen every year. Nesting activity by geese on top of bog-like hummocks may be impacting rare plants via compaction and increased nutrients from droppings as many of these plants are adapted to low nutrient soils.

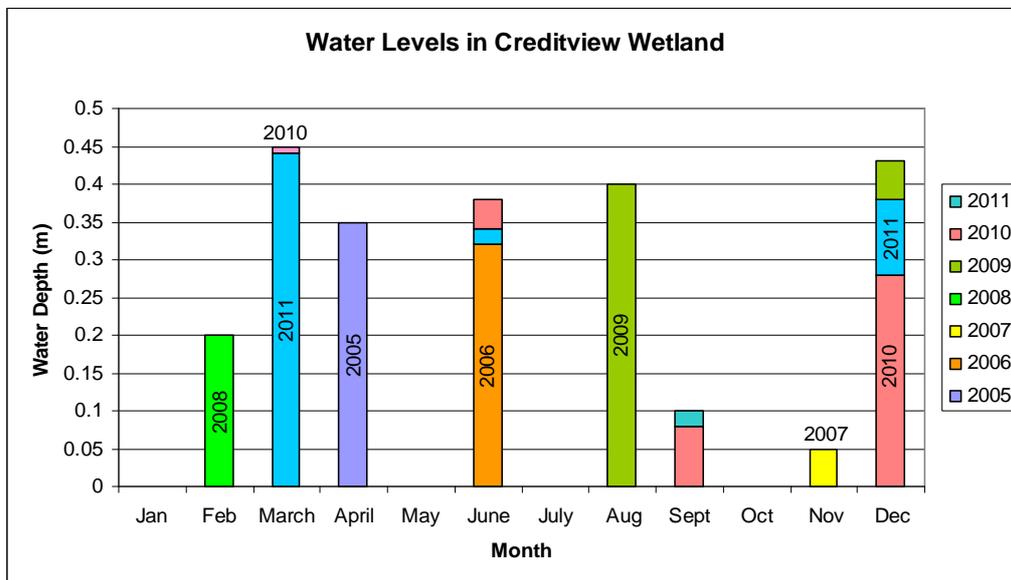
The City's NAS consultants also provided a list of observations of fauna from their 2007 and 2011 surveys and may include observations not indicative of breeding. The additional species noted include Ring-billed Gull (*Larus delawarensis*), Great Crested Flycatcher (*Myiarchus crinitus*), Warbling Vireo (*Vireo gilvus*) and Black-and-white Warbler (*Mniotilta varia*). The Black-and-white Warbler may be a species of local conservation concern and is considered area sensitive.

Incidental observations of mammals made by NAS consultants included Eastern Cottontail Rabbit (*Sylvilagus floridanus*) and Raccoon (*Procyon lotor*), both of which were observed only in 2011. Several species of mammals, birds, reptiles and amphibians that were found in previous studies have not been documented since 2004 but without more rigorous wildlife monitoring protocols it is difficult to assess the populations of many resident and more migratory visitors to the area. Most animals will also reflect the availability and quality of adjacent habitats and corridors and not the health of the Creditview Wetland per se.

5. WATER QUANTITY

Since 2005, the CWSC has monitored water levels using a simple staff gauge in the south-west corner of the wetland that was installed by the City. Only a limited number of readings have been taken each year but a preliminary assessment can be offered from the data in Figure 2. Water levels have fluctuated between a fall low of 5cm to a spring high of 45 cm in depth. Such seasonal patterns typically reflect precipitation patterns but the extremes are not known for historical conditions or in relationship of life cycle requirements of wetland species present. The variation in any given month year to year is only available for four different months with December having the greatest variation. This could be significant in relation to water volumes for dormancy or hibernation during winter months. Given the importance of water level regimes to wetland habitats and the potential to manage water levels more, data and analysis is recommended. CVC has also begun collecting water level data in its monitoring subplots that should be correlated with this gauge data in the future.

FIGURE 2. WATER LEVELS IN CREDITVIEW WETLAND.



6. DISTURBANCES

Disturbances noted by Dougan et al. (2004) included trampling, garbage, limited pesticide drift from adjacent residences, limited encroachment in the form of vegetable gardens or non-native plantings, collection of fauna, problems with the southern outlet, and invasive plants.

Since 2004, disturbances have been noted by the City's NAS consultants and informally by others. The decisions to fence the wetland and to only allow interior visits on a limited basis (Dougan et al, 2004) seem to be aiding with protecting the wetland from trampling and overuse. Disturbances noted in the 2007 NAS included an outdated wire fence, limited trampling, invasive plants and garbage.

The CWS recently removed the old wire fence and initiated regular litter pickups. The City parks by-law officer may be needed in the event of any serious dumping. The Stewardship Committee and other visitors can report any dumping that warrants such intervention.

The outlet was repaired by the City subsequent to 2004. Invasive species monitoring and control are recommended future activities as further discussed below.

7. RECOMMENDED PROTECTION, DATA COLLECTION AND RESTORATION ACTIVITIES

7.1 PAST AND CURRENT ACTIONS

The City of Mississauga, the CWS, CVC and local area schools have undertaken a number of restoration and protection activities since 2004 including:

- construction of a viewing platform
- installation of interpretive signs
- plantings in some adjacent areas and in the Mineral Cultural Meadow
- removal of select invasives, especially Bindweed, in the Mineral Cultural Meadow
- litter pickups
- repairs to the southern outlet
- removal of the old fencing
- school based “Eco-stewardship excursions” (run in 2009 by Tutored by Nature Inc with Fallingbrook Middle School)
- bird and amphibian monitoring by the school and photo website postings of other wildlife
- other school-based wetland studies and arts projects
- community information, celebration and stewardship activities, such as an annual wetland festival and a website
- one workshop on ecological landscaping for area residents
- and, installation of one wood duck box.

These activities are very positive and the various partners are encouraged to continue them.

Efforts to remove Bindweed in the Mineral Cultural Meadow should also continue. Note that all pieces of root must be removed or Bindweed will become more prolific as it sprouts from root pieces. Volunteers may also aid with removal of other invasives outside the fence. Continue to exercise caution with regards to allowing too many people inside the fenced area for any purpose. In order to prevent further invasions, planting or seeding with natives must occur immediately after removing invasives. A more comprehensive invasive species strategy, including the need to protect bog-fen indicators or any other specialized flora, can be developed once an updated inventory has been completed as noted below.

7.2 RECOMMENDED DATA COLLECTION

Continued data collection and analysis is essential for science based actions to protect and restore the Creditview Wetland. Citizen science and the sharing of information to all stakeholders and the public can represent a stewardship activity in itself. Some science, however, still requires agency resources and professional staff, highlighting the need for continued partnerships. The following recommendations on data collection are offered:

- Continue CVC wetland monitoring transect with sub-plots and update trends as appropriate.
- Continue CVC amphibian monitoring. Train volunteers to provide additional data and as a contingency if CVC resources become limited. Investigate volunteer recordings and sonar analysis.
- Continue, with increased frequency (monthly), water level measurements for further seasonal analysis. Obtain at least three years of monthly data including a drier and wetter than average year for analysis of variation. If possible also collect before and after individual storm event data to assess runoff response. Another option is to install a time lapse (Plantwatch) camera to capture gauge readings once or twice a day. In order to interpret water depths across the entire wetland additional measurements or contour mapping is required. In the future CVC is recording water levels along its subplots but will need to read and correlate gauge readings at the same time. Photo interpretation of water levels and extent may also be considered in relation to broader community mapping.
- Sharing of Monitoring Bulletins (Appendix 1) have now been initiated but the frequency of generating these or sharing of raw annual data needs to be further discussed with the City.
- Depending on available resources conduct additional inventories or monitoring of vegetation in order of priority:
 - Request a CVC staff person to review, undertake or direct invasive species mapping for removal and control.
 - Re-survey for the presence/absence of 13 or more species of interest by a qualified botanist with a focus on Organic Deciduous and Thicket Swamp and Mixed Shallow Aquatic and Marsh communities. This might be considered by the City as part of NAS updates. Collect additional information on abundance and distribution where feasible. Limit impacts and frequency of such sampling to every five or ten years.
 - Further consider an additional long term monitoring transect or plots in communities harbouring these 13 species. CVC had investigated this but recommended against it due to potential impacts of such sampling and costs. Consider less frequent surveys or other alternative protocols.
 - Inventory rare and sensitive plants and monitor potential impacts of nesting geese.
- In order to better assess the status of birds, support a review and trend analysis of CVC bird monitoring data as it becomes available. Engage local birdwatchers (e.g. workshop) in adopting the Marsh Monitoring Protocols (Bird Studies Canada 2009) or other incidental surveys.
- Continue to collect incidental observations on all fauna.
- Conduct outreach to neighbours regarding encroachment and report any illegal disturbances to the area immediately to the City.
- Review any past water quality data available and conduct one investigative sampling for phosphorous and chloride levels. Given Creditview was once considered a bog it could be expected to be naturally low in nutrients and support uniquely adapted species. Increases in nutrients may encourage more competition from both native and non-native species. Increases in chlorides from winter salting may also impact water quality and promote invasive species such as phragmites.
- For educational purposes related to the awareness of climate change and broader global actions needed, volunteers could participate in Plantwatch, a program that records the flowering dates of plants year to year.
- It has also been noted that awareness and participation from the local community has improved over the years and given the direct relationships to the health of the wetland, more socially related data and measures of project implementation might be reported on to better engage and recognize these efforts.

7.3 RECOMMENDED RESTORATION ACTIVITIES

- Continue the removal of invasive species such as bindweed from outside the fence around the wetland. Additional invasive removal and replacement can focus on European buckthorn and Garlic mustard. A control plan for within the wetland needs to be developed with the City. If phragmites is relatively new and confined, it should be targeted immediately using a plastic blanket. Control methods for other wetland invaders such as Purple Loosestrife and cattail hybrids are also readily available once a program is agreed upon.
- Additional plantings/mulching could occur in areas P1, O2 and O3 noted in the Dougan report, and in additional areas between Sherwood Mills Public School and the parking lots on the east side of the park. More detailed mapping, site assessments and approvals
- Backyard corridor naturalization promotion featuring an Adopt A Toad program. Target linkages to the west to Carolyn Creek and the main Credit River Valley where breeding populations of toads are most likely.
- If any water quality issues are detected investigate Low Impact Development techniques to improve local ditches and reduce runoff (e.g. rain gardens).
- Other restoration activities recommended upon further data collection and analyses such a water level manipulations or alternatives to winter salting.
- Habitat structures such as bird and bat boxes or basking logs represent simple projects to implement but others such wildlife brush piles, hibernaculum or turtle nesting areas would require further research and possibly approvals.

8. PARTNERSHIP COORDINATION

The CWS has been a great venue to facilitate the partnership and various actions. The committee founder, Gary Mascola, has been instrumental in recruiting members and aiding with coordinating the committee. School participation, art as eco-aesthetics, fundraising, committee meetings, involving local experts, etc. have been and continue to be integrated for community stewardship of the wetland. Partners and other community members have been and continue to be invited, welcomed and encouraged to make suggestions that encourage community based ecological stewardship of the Creditview Wetland that enhances community connections and awareness to the City and Credit River watershed. To ensure continuity and enhance the partnership, it is recommended that all active partners be retained and new participants encouraged with the sharing of reports such as this one and other forms of positive feedback and recognition.

Separate working groups such as for future monitoring reports and other training workshops may also encourage greater participation.

9. CONCLUSION

The 2004 *Creditview Wetland Conservation Plan* summarized results of various studies and outlined a number of management recommendations. Since then, a number of protection and restoration activities and some limited on-going studies have occurred.

Monitoring activities carried out in the Creditview Wetland over about a decade including vegetation and frog surveys conclude that it is in fair and relatively stable health. Given the ecological challenges of this small urban wetland harbouring a number of sensitive and rare species, the City and CWS should be

recognized for their effective efforts in managing the area with some support from CVC. Recommendations are made to maintain or improve conditions from known threats.

It is recommended that additional monitoring data be considered and analysed, such as broader low impact surveys of rarer species and more frequent water level measurements. Such data can better direct protection and restoration activities. Priority actions focus on the control of invasive species while other broader naturalization could involve backyard corridors to allow for the migration of plant and animal species to sustain wetland health into the future. New information such as the simplest of water quality tests may offer new restoration and educational opportunities. The value of volunteers recording any and all incidental faunal observations can be valuable. It is also recommended that this monitoring report, selected information or a simplified report card similar to Monitoring Bulletin provided by CVC in Appendix 1 be distributed to increase community awareness and participation in the management of the area.

Discussions will occur with City staff, CVC and the CWS to develop a plan for taking next steps in implementing and/or funding the monitoring recommendations and invasive species removal.

The on-going work by the City, CVC, the CWS and local area schools to protect, enhance and encourage community stewardship of this unique wetland is commendable and will hopefully continue over the long term.

MONITORING BULLETIN

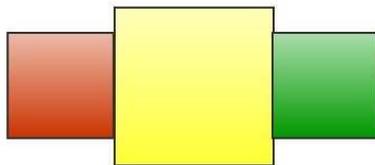
Wetland Site Integrity Report: Creditview Wetland Status and Trends

Kata Bavrlic, Terrestrial Monitoring Specialist

Terrestrial Monitoring Program, Lands and Natural Heritage Department

ISSUE DATE: October 30, 2012

Plant Community Integrity:



Amphibian Community Integrity:

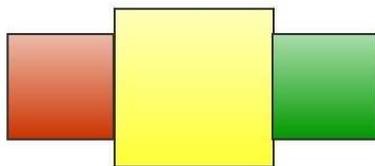


Figure 1. Wetland Integrity scores from separate vegetation and amphibian IBIs used to evaluate overall site integrity.

Abstract

A tool has been developed to evaluate the ecological integrity of temperate wetlands in the Credit River Watershed based on long-term monitoring data collected by the terrestrial monitoring program. The status of wetland patches are evaluated using two Indices of Biotic Integrity (IBI); one for wetland vegetation and one for breeding amphibians. This information is combined with trends over time of select metrics for an overall integrity ranking. Creditview Wetland, a City of Mississauga property, is a fair integrity wetland community in the Lower Watershed. A unique feature in an urban landscape, it has a high diversity of plant species and vegetation communities, and has been designated as a Provincially Significant Wetland. Although the wetland does not support a high diversity of amphibian species, both the Wood Frog and Western Chorus Frog use the wetland as breeding habitat. As a Highly Supporting Ecofunction patch in the City of Mississauga, the site would benefit from invasive species management of Garlic Mustard and Common Buckthorn. The implementation of these management recommendations has the potential to improve and enhance the ecological integrity of the natural heritage system in the City of Mississauga over the long-term.

Introduction

The Terrestrial Monitoring Program (TEMO) is designed to assess and monitor the integrity of wetland ecosystems in the Credit River Watershed over the long-term. Status and trends of measured floral and faunal metrics are used to evaluate wetland integrity and provide insight into how communities are changing over time. In addition, the program evaluates the effects of stressors such as habitat loss, surrounding land-use practices and introduced pests and pathogens on wetland condition.

In this report we will discuss the wetland integrity evaluation for Creditview Wetland. This information can be used to provide triggers for management and restoration activities to maintain or enhance the integrity of a wetland community in the Credit River Watershed. In addition, this evaluation can result in the selection of Reference (high quality) plots against which other plots in the watershed can be compared over the long-term.

Methodology

Two existing Indices of Biotic Integrity (IBI) were adapted to evaluate wetland integrity in the Credit River Watershed. The plant-based Index of Biological Integrity (IBI) was originally developed to evaluate headwater wetland condition to anthropogenic disturbances in Pennsylvania (Miller et al. 2006). It was adapted by the Terrestrial Monitoring Program with confidence because it was developed in an area with similar physiography to that found in Southern Ontario. The IBI incorporated a total of eight metrics representing Community, Functional and Species Specific Indicators (Table 1). Based on Miller et al. (2006), sites with IBI scores below 3.3 represent 'poor' wetland conditions, sites with scores between 3.4 and 5.4 represent 'fair' integrity and sites with scores above 5.4 have 'good' wetland integrity. Generally, sites with fewer tolerant and non-natives species and more tree and fern species would have higher IBI scores. Wetlands within the Credit River Watershed range from 'good' to 'poor' based on the evaluation of the monitored floral and faunal communities at each site.

Table 1. Metrics included in the plant community integrity evaluation with corresponding influence of each on overall wetland integrity.

Indicator	Metric	Influence on Wetland Integrity
Community Composition	Adjusted Floristic Quality Assessment Index	positive (+)
	% cover of tolerant plant species	negative (-)
Functional Groups	% annual species	negative (-)
	% non-native species	negative (-)
	% invasive species	negative (-)
	% trees	positive (+)
	% ferns and allies	positive (+)
Species Specific	% Cover of <i>Phalaris arundinacea</i>	negative (-)

To evaluate wetland amphibian community integrity, an IBI was created for the Credit River Watershed, following methodologies used for coastal wetland communities in Ontario (Crewe and Timmermans 2005). The IBI incorporated a total of five metrics representing amphibian guilds with predictable responses to disturbance (Tables 2 and 3). Sites with no amphibian observations were automatically given a final IBI of 0. Based on thresholds developed by Crewe and Timmermans (2005), sites with IBI scores below 25 represent 'poor' wetland conditions, sites with scores between 26 and 50 represent 'fair' integrity and sites with scores above 50 have 'good' wetland integrity. Generally, a site composed of

more disturbance sensitive and rare species with high overall species richness and larger populations (high maximum calling code) would produce a high score.

Trends over time of composite metrics were also calculated to include in the overall assessment, providing insight into potential emerging threats and areas of concern that could feed into developing management recommendations.

Table 2. Metrics included in the amphibian community integrity evaluation with corresponding influence of each on overall wetland integrity.

Indicator	Metric	Influence on Wetland Integrity
Functional Groups	Number of disturbance tolerant species (TOL)	negative (-)
	Number of disturbance sensitive species (NTOL)	positive (+)
	Number of rare species (RARE)	positive (+)
	Amphibian species richness	positive (+)
	Maximum calling code detected at site	positive (+)

Table 3. Wetland amphibian guilds

Species	Disturbance Tolerant (TOL)	Disturbance Sensitive (NTOL)	Rare Species (RARE)
American Bullfrog (<i>Rana catesbeiana</i>)			X
American Toad (<i>Bufo americanus</i>)	X		
Gray Treefrog (<i>Hyla versicolor</i>)	X		
Green Frog (<i>Lithobates clamitans</i>)	X		
Northern Leopard Frog (<i>Rana pipiens</i>)		X	
Pickerel Frog (<i>Rana palustris</i>)		X	X
Spring Peeper (<i>Pseudacris crucifera</i>)	X		
Western Chorus Frog (<i>Pseudacris triseriata</i>)	X		X
Wood Frog (<i>Lithobates sylvatica</i>)		X	

Results/Discussion

Creditview Wetland is a small wetland pocket, approximately 5ha in size, located in the central part of Mississauga. A City of Mississauga property, it is one of the most urbanized of the wetland plots being monitored by the Terrestrial Monitoring Program (Table 5). Although it was once considered a bog community, it has slowly transitioned into an area with a diversity of wetland community types including willow thicket swamp, willow-buttonbush thicket swamp, cattail marshes and hawthorn thicket community. Historically, surrounding land-use was characterized by agriculture and successional old-field communities; however, it is now nestled in a subdivision of newly built homes. Based on the landscape analysis for Credit River Watershed, the habitat patch within which the monitoring plot is nested scored 2/9, meaning it is part of a Supporting Ecofunction. However, the landscape analysis for the City of Mississauga scored it as 3/9, meaning from an urban perspective it is ranked as a Highly Supporting Ecofunction. These areas are important due to their size, diversity and/or location on the landscape and contribute to the ecological integrity of the Core patches. As natural cover in the City of Mississauga hovers around 4%, Creditview Wetland is an important component of the city's natural heritage system.

Based on the plant and amphibian IBI's, Creditview Wetland ranks as 'fair' (Table 4). The fair rating is reflective of moderate scores for most of the included metrics such as proportion of annual species, and

FQI. It is important to note that the established transect is unable to capture the full diversity of vegetation communities within the wetland, but is intended to reflect the ecology of the remaining, un-sampled portions. Although a number of rare native plant species have been captured within the permanent vegetation plots, the transect's position along the edge also results in a relatively high proportion of non-native plant species identified within the monitoring plots. The evaluation of site integrity therefore results in lower scores for those specific vegetation indicators that are influenced negatively by the presence of non-native species. Metrics that were affected by non-native species presence included proportion of non-native species, proportion of invasive species, proportion of tolerant species and adjusted floristic quality index (FQI adjusted=33.19 out of 100). This is consistent with observations made at other sites that are also nested within an urban matrix.

The 'fair' ranking for amphibian community integrity is typical of wetlands in highly urbanized areas of the Watershed. Amphibian species richness is low with only two species, Chorus and Wood frogs detected at the site since monitoring began in 2003. However, because Wood Frog is believed to be sensitive to habitat fragmentation and alteration, low amphibian richness at the site is compensated for by the presence of a disturbance sensitive species in the IBI. The fact that greater than three individuals of both frog species have been documented at the site regularly over the monitoring period indicates that Creditview Wetland is functioning as important wildlife habitat within a heavily urbanized landscape to these two frog species. Although it is not possible to determine whether these are isolated metapopulations at risk of local extinction, or if the site is a sink habitat in which species are unable to sustain themselves without immigration from other sites, it is clear that Creditview Wetland is a unique remnant of wetland communities in the southern part of the Credit River Watershed.

Table 4. Summary of metric status and trends used to evaluate site integrity.

Metric	2011 Value	Observed Statistically Significant Trend*
<i>Amphibians</i>	<i>Fair</i>	<i>Stable</i>
Amphibian species richness	2	Stable
Number of disturbance tolerant species	1	Stable
Number of disturbance sensitive species	1	Stable
Number of rare species	1	n/a
Maximum calling code recorded at site	1	Stable
<i>Vegetation</i>	<i>Fair</i>	<i>Stable</i>
Native Plant Species Richness (#)	21	Stable
Proportion Non-native Species (%)	16	Stable
Mean Coefficient of Conservatism (mCC)	3.62	Stable
Floristic Quality Index value (adjusted)	16.59	Stable
% cover Tolerant Species (cc of 2 or less)	92	Stable
% invasive Species	12	Stable
Number -3 weedy species per site	2	Stable
Wetness Index value per site	-3	Stable

* trends calculated using data collected between 2005 and 2011 for vegetation and 2003 and 2011 for amphibians: n/a for metrics with insufficient data at time of assessment to calculate trends

Conclusion

This wetland is a unique feature in the city of Mississauga due to its designation as a Provincially Significant Wetland, its high diversity of plant species and vegetation communities, the presence of locally rare plants like buttonbush and its use by waterfowl as nesting grounds (Table 5). This wetland also provides excellent educational and nature appreciation opportunities for local residents and students. Despite being surrounded almost entirely by urban land-use, the fence enclosing the wetland and the

small buffer surrounding it assists in reducing dumping and unsanctioned trails, while the viewing platform still provides a means by which to appreciate the beauty of this community.

It is important to note that the integrity indicators have remained stable since monitoring of the site began in 2003. This means that conditions are not declining, nor are they improving. The high abundance of non-native plant species within the wetland boundaries is consistent with conditions observed at other natural areas that are nested in urban environments. Despite these conditions, Creditview Wetland continues to provide habitat to a diverse assemblage of plant species and select bird and frog species.

Due to the unique nature of the wetland patch, the diversity of vegetation communities present and its importance in providing habitat for some wildlife species, removing highly invasive species such as garlic mustard and common buckthorn should be considered. This may protect the rare vegetation communities in the Creditview Wetland. As storm water from the surrounding residential area drains into the wetland by way of ditches that were constructed in the late 1990's, wetland hydrology monitoring should be considered to determine how this impacts the wetland community over the long-term, especially with the eminent threat of climate change.

Table 5. Summary of key information and plot characteristics

Identification	Details
Plot ID:	W-03/ 501090012
TEEM ID:	351 Supporting Ecofunction (Watershed) and Highly Supporting Ecofunction (Mississauga)
ELC Community Type:	SAM 1-2, SWT 2-2: Duckweed Mixed Shallow Aquatic Type, Willow Mineral Thicket Swamp Type
PSW, ESA and/or ANSI Designation:	ANSI, PSW
Owner:	City of Mississauga
Location	Details
Physiographic Zone:	Lower
Sub-watershed:	2: Carolyn Creek
Region:	Regional Municipality of Peel
City/Town:	Mississauga
Habitat Patch Size (ha):	5.38
Landscape Context	Details
Percent (%) Land-use within 2km radius:	Natural: 16%, Agricultural: 1%, Urban: 83%
Monitoring	Details
Vegetation Indicators:	<ul style="list-style-type: none"> ▪ Regeneration and Ground Vegetation
Wildlife Indicators:	<ul style="list-style-type: none"> ▪ Amphibians
Monitoring Plot Set-up:	2003
Flora	Details
CVC Tracked Species:	<ul style="list-style-type: none"> ▪ Silky Dogwood (<i>Cornus amomum ssp. obliqua</i>), Swamp Rose (<i>Rosa palustris</i>), Meadow Willow (<i>Salix petiolaris</i>), Common Buttonbush (<i>Cephalanthus occidentalis</i>), Narrow-leaved Meadow-sweet (<i>Spiraea alba</i>), Water Loosestrife (<i>Lysimachia thyrsoiflora</i>), Large Bur-reed (<i>Sparganium eurycarpum</i>), Greater Duckweed (<i>Spirodela polyrrhiza</i>), Star Duckweed (<i>Lemna trisulca</i>), Columbia Watermeal (<i>Wolffia columbiana</i>), Bristly Sedge (<i>Carex comosa</i>)
Invasive Species:	<ul style="list-style-type: none"> ▪ CVC Category 1: Common Buckthorn (<i>Rhamnus cathartica</i>), Manitoba Maple (<i>Acer negundo</i>), Purple Loosestrife (<i>Lythrum salicaria</i>), Garlic Mustard (<i>Alliaria petiolata</i>) ▪ CVC Category 2: Creeping Thistle (<i>Cirsium arvense</i>), Narrow-leaved Cattail (<i>Typha angustifolia</i>) ▪ CVC Category 3: Climbing Nightshade (<i>Solanum dulcamara</i>), Tufted Vetch (<i>Vicia cracca</i>)
Fauna	Details
CVC Tracked Species	<ul style="list-style-type: none"> ▪ Western Chorus Frog, Green Frog
Wildlife Use	<ul style="list-style-type: none"> ▪ Waterfowl breeding habitat
Evaluation	Details
Status:	Fair
Management Recommendations:	Invasive species management, focusing on common buckthorn and garlic mustard is recommended to protect the integrity of rare vegetation community types in the wetland.

10. REFERENCES

- Crewe, T.L. and S.T. Timmermans. 2005. Assessing Biological Integrity of Great Lakes Coastal Wetlands Using Marsh Bird and Amphibian Communities. Project # WETLAND3-EPA-01 Technical Report. Marsh Monitoring Program, Bird Studies Canada.
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