



Conservation Authorities
Moraine Coalition



Credit Valley Conservation
Nottawasaga Valley Conservation
Toronto and Region Conservation
Lake Simcoe Region Conservation
Central Lake Ontario Conservation
Kawartha Conservation
Ganaraska Region Conservation
Otonabee Conservation
Lower Trent Conservation

TO: Municipal Clerks of Oak Ridges Moraine Municipalities

RE: Conservation Authorities Moraine Coalition 2015 Report Card

Please find enclosed copies of the *Report Card on the Environmental Health of the Oak Ridges Moraine and Adjacent Greenbelt Lands*, prepared by the Conservation Authorities Moraine Coalition (CAMC), together with a Backgrounder that summarizes its major findings and recommendations.

The Report Card, and the science-based monitoring data used to compile it, will be used:

- to help inform the 10-year review of the Provincial land use plans for the Oak Ridges Moraine (ORM) and Greenbelt;
- to report on the environmental health of the ORM and adjacent Greenbelt lands to decision-makers and the wider public; and
- to recommend on-the-ground actions and additional tools needed to maintain, improve and restore the environmental health of these important lands.

We would like to take this opportunity to extend thanks to all our partners for their contributions to CAMC's work in protecting and enhancing the Oak Ridges Moraine.

Please find enclosed copies of the CAMC's 2015 Report Card for distribution to the Mayor or Chair and Councilors, along with five extra copies for senior staff.

For additional information, please visit the CAMC website at www.morainecoalition.ca

Sincerely,

Mike Walters
2015 Chair, CAMC
Chief Administrative Officer
Lake Simcoe Region Conservation

Rob Messervey
2014 Past Chair, CAMC
Chief Administrative Officer
Kawartha Conservation



Conservation Authorities Moraine Coalition

Credit Valley Conservation
Nottawasaga Valley Conservation
Toronto and Region Conservation
Lake Simcoe Region Conservation
Central Lake Ontario Conservation
Kawartha Conservation
Ganaraska Region Conservation
Otonabee Conservation
Lower Trent Conservation

Backgrounder:

Report Card on the Environmental Health of the Oak Ridges Moraine and Adjacent Greenbelt Lands

This Report Card, prepared by the Conservation Authorities Moraine Coalition (CAMC), evaluates the environmental health of the Oak Ridges Moraine (ORM) and adjacent Greenbelt lands. It shows that the province's Greenbelt and ORM Conservation Plans have been successful in safeguarding existing forest areas, aquatic habitat and groundwater resources. The Report Card recommends those on-the-ground actions, by-laws, other tools and additional resources needed to improve and restore these important lands. The up-to-date, science-based information can also be used to inform the scheduled 10-year review of the Greenbelt Plan and the ORM Conservation Plan, which is being undertaken by the Province of Ontario in 2015.

Environmental review reveals successes and challenges

Over the last six years, experts from the nine member Conservation Authorities comprising CAMC compiled detailed data on four measures of environmental health: forest conditions, surface water quality, groundwater quality and aquatic habitat. This information is summarized in the Report Card and supported by detailed maps of the ORM showing the full range of results on a subwatershed basis, such as:

- Large amounts of forest cover in critical areas of the ORM are being maintained. However, few large patches of undisturbed forest exist outside the Core Areas, and long stretches of stream bank lack sufficient forest cover. In addition, good data on "forest quality," such as the extent of invasive species, is lacking.
- Groundwater quality is considered generally good across the study area, although chloride levels in some shallow wells along roadsides and in urban areas is trending upward. Ongoing groundwater quality monitoring is needed.
- Coldwater fish communities and coldwater temperatures are evenly distributed across the ORM and adjacent Greenbelt lands, representing good quality aquatic habitat. While some sites represent marginal habitats, land use mitigation and restoration efforts may prevent future deterioration.
- Surface water quality in almost half of the subwatersheds assessed was assigned grades of "fair," "poor" or "very poor." Those subwatersheds with higher scores had greater forest and streambank cover and were located in more protected areas. Again, there was a lack of data for some areas.

Report Card recommends further restoration action

Additional restoration and enhancement work, supported by robust enforcement, new administrative tools and secure long-term funding, is essential to preserving and building on the progress made to date. The Report Card recommends a number of stewardship activities that the province, Conservation Authorities, municipalities, environmental groups and local farmers, business and residents should undertake. Based on

the detailed scientific data in the Report Card, together with the watershed plans developed by individual Conservation Authorities, CAMC and its partners can target where this restoration work should be done to be most effective and get the 'biggest bang for the buck.'

- Strategic planting of trees, shrubs and other native vegetation is needed to expand and connect forest patches and other habitats, control invasive species, and protect coldwater streams.
- Marginal farmlands and areas along the banks of rivers and streams should be re-naturalized to improve water quality and moderate stream flows.
- All new development, site alteration and infrastructure projects on the ORM should meet strict standards to control erosion, ensure the use of uncontaminated fill and minimize the release of sediment into streams. In addition, tree cutting and fill by-laws should be vigorously enforced.
- Municipalities and/or provincial agencies should implement Source Protection Plan policies as soon as possible to better manage road salt, commercial fertilizers and livestock manure.
- Stable funding to encourage greater uptake of Environmental Farm Plans and private land stewardship initiatives would reduce environmental pressures and help achieve restoration objectives.
- Ongoing monitoring of environmental conditions should be expanded in order to fill gaps in the data, reveal developing problems, and gauge whether restoration activities have been successful.

ORM provides invaluable environmental services

The ORM and Greenbelt lands provide essential ecosystem services that the residents of south central Ontario rely on every day. Forested areas reduce soil erosion, clean the air, moderate temperature, and provide wildlife habitat. Wetlands and other greenspaces absorb rain and snow, replenish drinking water aquifers, regulate stream flow, protect aquatic habitat, and prevent downstream flooding. Farmlands provide healthy foods and economic value to local communities, while the scenic natural landscape offers numerous recreational opportunities. The continued protection and enhancement of these lands, and their links to local natural heritage systems in the urban landscape, is also a key strategy for climate change mitigation and resilience for all lands included within the provincial Growth Plan for the Greater Golden Horseshoe.

The provincial protection plans for the Oak Ridges Moraine and Greenbelt have provided a solid foundation to limit urban sprawl and maintain the health of these environmentally important lands. The results and recommendations of this Report Card can help achieve the Plans' additional goals to improve and restore environmental conditions within the ORM and Greenbelt lands.

For more information, contact:

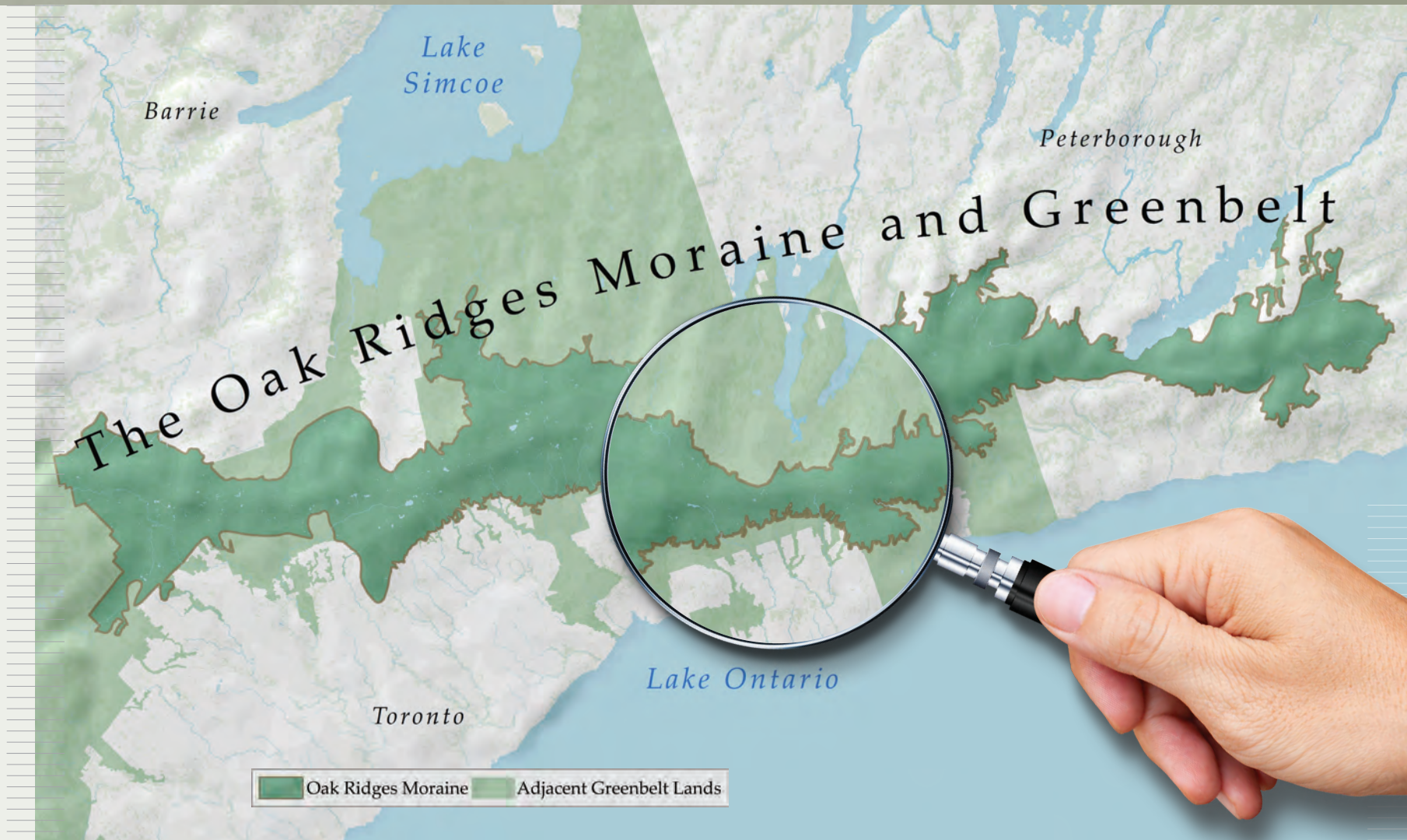
David Burnett, CAMC Coordinator
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The CAMC is a coalition of nine Conservation Authorities that manage the watersheds covering the ORM. Formed in 2000, the CAMC collaborates with numerous groups and individuals to: take action for the protection and restoration of the ORM; provide expert advice on environmental planning and policies; undertake science-based research; and provide opportunities for recreation. A full copy of the Report Card and links to the CAMC members is available on-line at www.morainecoalition.ca

Report Card on the ENVIRONMENTAL HEALTH OF THE OAK RIDGES MORaine AND ADJACENT GREENBELT LANDS

This report card was prepared by the Conservation Authorities Moraine Coalition (CAMC) to provide science-based information to inform the 2015 review of the Greenbelt Plan and the Oak Ridges Moraine Conservation Plan.

Key funding support generously provided by the Friends of the Greenbelt Foundation.



Possibility grows here.



IMPORTANCE OF THE OAK RIDGES MORAINE AND GREENBELT LANDS

Ontario's Greenbelt is comprised of almost two million acres of land that protects environmentally sensitive areas and productive farmlands from urban development and sprawl. The Greenbelt includes the Niagara Escarpment, the Oak Ridges Moraine, and adjacent rural lands designated as Protected Countryside. The benefits of the Greenbelt to the residents of Ontario are numerous:

- Extensive forests provide wildlife habitat, reduce soil erosion, clean the air we breathe, moderate temperatures and provide resilience from the impacts of climate change;
- Wetlands and forests absorb rain and snow replenishing drinking water aquifers, providing baseflow to streams that support fish and aquatic habitat, and helping to control downstream flooding and erosion;
- The value of the above ecosystem services provided by the Greenbelt's natural capital is estimated at \$2.6 billion annually;
- Fresh, nutritious foods are grown across the Greenbelt, providing jobs and \$9.1 billion annual economic value to the local economy;
- Thousands of hectares of scenic natural landscapes are held in public ownership making them available for outdoor recreational activities, contributing to the positive mental and physical aspects of human health; and
- Acting as a boundary to urban sprawl, the Greenbelt helps to implement the Provincial Growth Plan objectives to create compact, walkable, transit-supportive communities.

In short, healthy lands and waters in the Greenbelt are essential to building healthy, sustainable communities in south-central Ontario.



Purpose of this Report Card

- To provide science-based monitoring data and analysis to help inform the 10-year review of the Provincial land use plans for the Oak Ridges Moraine (ORM) and Greenbelt.
- To report on the environmental health of the Oak Ridges Moraine and adjacent Greenbelt lands (i.e. the study area).
- To recommend on-the-ground actions and additional tools needed to maintain, improve or restore the environmental health of these important lands.

Context for the Plans' Review in 2015

The Province of Ontario has been a leader in North America for environmental planning to protect significant landscapes, starting with the Niagara Escarpment Plan (NEP) in 1985. Public support to protect these significant landscapes and limit urban sprawl through "smart growth" initiatives led to the creation of the Oak Ridges Moraine Conservation Plan (ORMCP) in 2002. Its vision is for a "continuous band of green, rolling hills that provides form and structure to south-central Ontario, while protecting the ecological and hydrological features and functions that support the health and well-being of the region's residents and ecosystems". This vision was further complemented in 2005 with the creation of the Greenbelt Plan, which identifies where urbanization should not occur. It provides permanent protection to the agricultural land base and the ecological features and functions occurring on this landscape.

Both the ORMCP and Greenbelt Plan have as their environmental goals and objectives to:

- Protect, maintain and enhance natural heritage and hydrologic features and functions;
- Restore linkages between and among these features; and
- Protect, improve or restore the quality and quantity of ground and surface water and the hydrological integrity of watersheds.

Both Plans are implemented through decisions on matters and applications made under the *Planning Act*, such as official plan and zoning by-law amendments, plans of subdivision and severances.

Report Card Summary

INDICATOR	GRADE	RESULTS
Forest Conditions	B Good	<ul style="list-style-type: none"> The extent of forest cover is being maintained in critical areas. There is little evidence to suggest that the Plans' goals to restore and enhance forest conditions are being achieved in any significant way. Information gaps exist regarding forest quality.
Surface Water Quality	C Fair	<ul style="list-style-type: none"> Almost one half of subwatersheds show surface water quality as fair, poor or very poor. Land use activities are having a negative impact on surface water quality in many parts of the study area. Gaps in monitoring coverage are evident.
Groundwater Quality	Locally Good	<ul style="list-style-type: none"> Groundwater quality is generally good across the study area, with local variability. Chloride levels in groundwater are showing an increasing trend in some areas.
Stream Temperature & Coldwater Fish	Grading Criteria Not Available	<ul style="list-style-type: none"> Coldwater Stream Temperatures and Coldwater Fish species are evenly distributed across the study area, indicating suitable habitat conditions across the Oak Ridges Moraine and adjacent Greenbelt lands. Gaps exist in the monitoring network, especially in the eastern ORM.

Conclusions

- Findings from this report card for Forest Conditions and Surface Water Quality, based on 2008 to 2013 data, are generally consistent with a similar report based on 2002 to 2004 data.
- Implementation of the Greenbelt Plan and Oak Ridges Moraine Conservation Plan through *Planning Act* applications has been generally satisfactory to maintain existing conditions.
- Implementation through the *Planning Act* alone is not sufficient to achieve the Plans' goals and objectives to restore and enhance the environmental health of these lands.
- Without the use of additional tools to restore and enhance natural systems across the study area, environmental conditions may be expected to decline over time due to the cumulative impacts from continued growth, related infrastructure and climate change.
- The sustained and targeted use of additional watershed stewardship and municipal tools are needed to enhance and restore environmental conditions across the Greenbelt.

Recommendations

- Renew partnerships among the Province, Conservation Authorities, municipalities and the agricultural sector to increase funding for watershed stewardship tools and programs such as:
 - Private land stewardship and land acquisition;
 - Environmental Farm Plans;
 - Filling gaps in environmental monitoring;
 - Planting native vegetation in priority areas to create linkages, restore riparian lands, and increase forest interior, for their contributions to improving natural heritage systems surface water quality and aquatic habitat.
- Increase implementation and enforcement of municipal tools such as:
 - Tree cutting and fill bylaws;
 - Erosion and sediment controls;
 - Source Water Protection policies for the management of road salt, commercial fertilizers and livestock manure.
- Repeat this report card assessment prior to the next review of the Provincial Plans to assess and report on trends in the environmental health of the Oak Ridges Moraine and Greenbelt lands.

Indicators of Environmental Health

A total of nine indicators were selected to assess the environmental health of the ORM and adjacent Greenbelt lands and waters, grouped into four categories: Forest Conditions, Surface Water Quality, Groundwater Quality, and a new fourth category, Stream Temperature and Coldwater Fish. The indicators selected met various criteria, such as:

- the data are collected regularly by most Conservation Authorities within the study area or was readily available from a Provincial source;
- the indicators are representative of ecological and hydrological health;
- the indicators are relatively common; and
- the methodology allows for repeatability over time to track trends, as well as being scalable to other parts of the Greenbelt not included in this report (i.e. most of the Niagara Escarpment).

About this Report Card

This report card was prepared by a team of technical experts from the nine individual Conservation Authorities that comprise the CAMC. The indicators selected and methodologies used were based on two prior projects:

- 1) Conservation Ontario's province-wide watershed report card project (2013); and
- 2) the 2011 reports "Measuring Success on the ORM" by the ORM Foundation and the CAMC, based on 2002 to 2004 data.

The CAMC recognizes that trend information is very important for assessing the effectiveness of the Plans over time. This report card, using 2008 to 2013 data, is best considered as baseline information against which future report cards using the same indicators and methodology can be assessed for trends. More detailed information is found in the web-based local report cards prepared by each of the nine Conservation Authorities. The detailed methodology for conducting this report card assessment, assignment of grades, and any deviations and data limitations, is available from the website shown on the back page.

FOREST CONDITIONS

INDICATORS	INDICATOR DESCRIPTION
FOREST COVER	Forest Cover is the percentage of the watershed that is forested. Environment Canada suggests that 30% forest cover is the minimum needed to support healthy wildlife habitat; more coverage is beneficial.
FOREST INTERIOR	Forest Interior is the area of forest that lies more than 100 m from a stream edge to avoid the windy, dry conditions and predators that are associated with the edge. Sensitive forest birds, mammals, reptiles and amphibians require deep forest habitat for survival. Environment Canada suggests that 10% forest interior cover is the minimum needed to support a range of species.
FORESTED RIPARIAN COVER	Streamside forest cover (riparian vegetation) filters pollutants and provides important fish and wildlife habitat. Environment Canada suggests that at least 30 m on each side of the stream (over 75% of its length) should be in natural cover to support healthy streams.



Good Conditions

The three indicators for Forest Conditions assess only the quantity of forested lands across the study area. They do not assess the quality of forested lands, such as what portion of the forest is comprised of non-native, invasive species. The Forest Interior indicator can serve as an indirect proxy for forest quality. Large forest patches are likely to contain the most undisturbed and highest quality forest. A higher percentage of interior forest indicates overall larger forest patches supporting greater biodiversity and resilience. Only the ORM – Natural Core Area (at 23% Forest Interior) exceeds the Environment Canada minimum threshold of 10% Forest Interior.

Table 1 shows that Forest Conditions, as assessed on an overall study area basis, score a “B” or “Good” grade. However, the grades among Plan designations vary widely. As expected, the designations associated with the most significant concentrations of natural features score well: ORM - Natural Core Area receives

an “A” grade; Greenbelt - Natural Heritage System receives a “B” grade. The ORM - Natural Linkage Area designation, a key designation for restoration efforts, scores a “C” or “Fair” grade. Plan designations comprising predominantly settlement or countryside/ agricultural land uses score “Poor” or “D” grades. The designation details reveal that the ORM - Countryside Area designation scores among the poorest for Riparian Cover.

The map opposite shows grades for Forest Conditions by subwatershed. Individual subwatershed scores vary widely, depending on the land uses and Plan designations found in the subwatershed. Details on Forest Conditions for each subwatershed can be found on each Conservation Authority website.

No trends for Forest Conditions are currently identified at the Greenbelt/landscape scale. Local trend information may be included by individual Conservation Authorities for their subwatersheds.

Table 1 - Forest Conditions Scores & Grades

	% FOREST COVER	FOREST COVER GRADE	% INTERIOR FOREST	INTERIOR FOREST GRADE	% FORESTED RIPARIAN	FORESTED RIPARIAN GRADE	OVERALL FOREST CONDITIONS INDICATOR GRADE
Study Area Overall By Plan Designation	33%	B	7%	C	44%	B	B
ORM - Natural Core Area	65%	A	23%	A	64%	A	A
ORM - Natural Linkage Area	32%	B	4%	D	45%	B	C
ORM - Palgrave Estates	22%	C	1%	F	23%	D	D
ORM - Rural Settlement	17%	C	1%	F	25%	D	D
ORM - Settlement Area	16%	C	1%	F	37%	C	D
ORM - Countryside Area	11%	D	1%	F	15%	D	D
Greenbelt - Protected Countryside	15%	D	2%	F	32%	C	D
Greenbelt - Natural Heritage System	45%	A	9%	B	48%	B	B

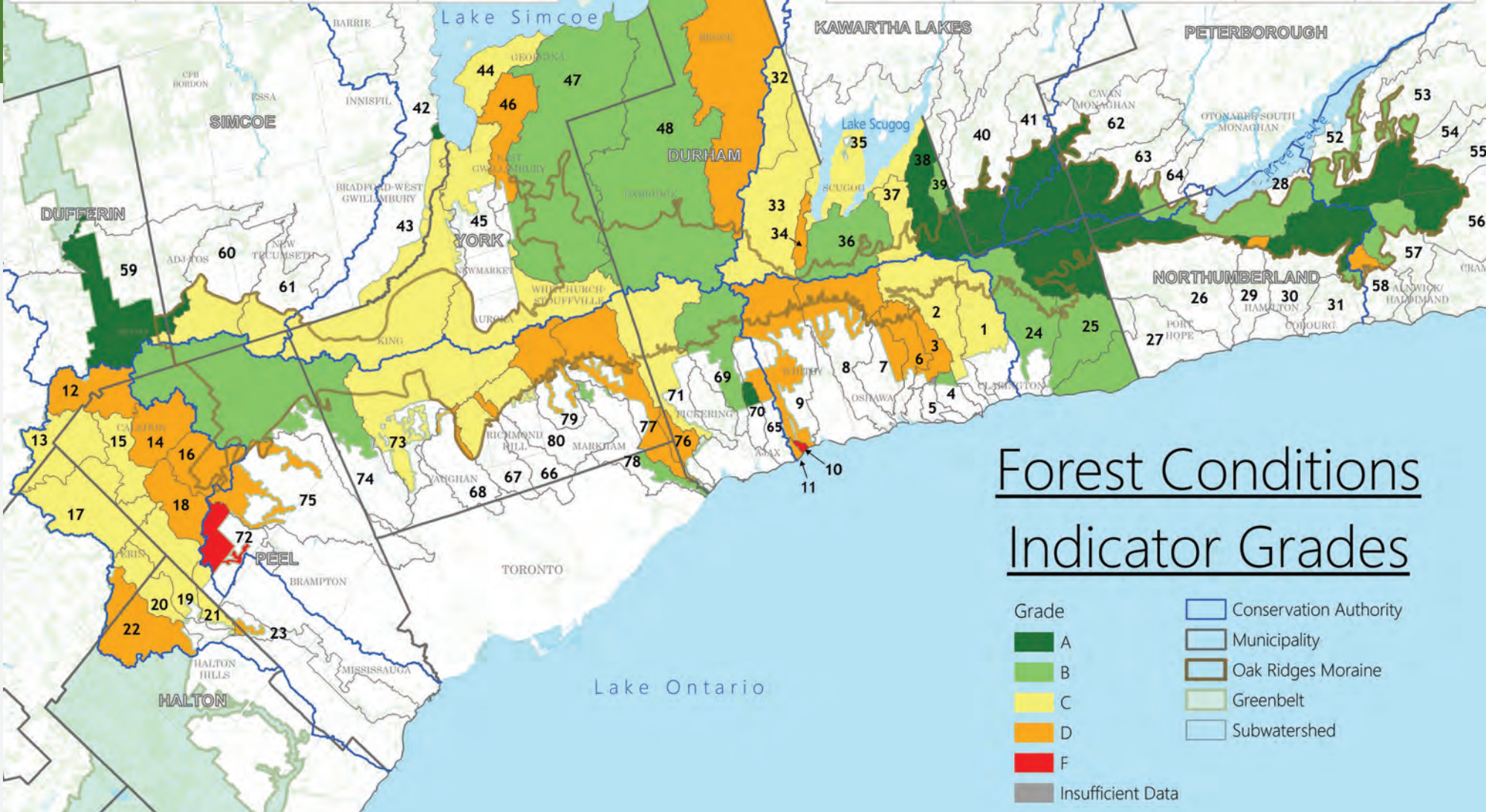
Conclusions

- Large amounts of forest cover in critical areas such as ORM-Natural Core Area and Greenbelt-Natural Heritage System are being maintained.
- Improvement or restoration of forest cover in other Plan designations is not evident.
- Implementation of the Plans through *Planning Act* applications can be an effective tool to maintain existing forest cover. It is not sufficient by itself to improve or restore forest cover. Additional tools are needed.

Recommendations for Action

- Connect and enhance natural heritage systems by planting native trees and shrubs in priority locations identified in watershed plans to:
 - Restore forests on riparian lands;
 - Make forest patches bigger to increase forest interior; and
 - Create linkages between forest patches and along watercourses.
- Renew partnerships among the Province, Conservation Authorities, municipalities and the agricultural sector to increase funding for other tools and programs such as:
 - Private land stewardship and Environmental Farm Plans;
 - Conducting research and monitoring on forest quality;
 - Controlling invasive species;
 - Reporting on trends in Forest Conditions; and
 - Effective implementation of tree cutting bylaws.

Central Lake Ontario Conservation	Credit Valley Conservation	Ganaraska Region Conservation	Kawartha Conservation	Lake Simcoe Region Conservation	Lower Trent Conservation	Nottawasaga Valley Conservation	Otonabee Conservation	Toronto and Region Conservation
1 Soper Creek 2 Bowmanville Creek 3 Black Creek 4 Darlington Creek 5 Tooley Creek 6 Farewell Creek 7 Harmony Creek 8 Oshawa Creek 9 Lynde Creek 10 Cranberry 11 Warbler	12 Orangeville 13 Shaw's Creek 14 Caledon Creek 15 Credit River (Melville) 16 East Credit River 17 West Credit River 18 Credit River (Forks) 19 Credit River (Cheltenham) 20 Silver Creek 21 Credit River (Glen Williams) 22 Black Creek 23 Credit River (Norval)	24 Wilmot Creek 25 Graham Creek 26 Ganaraska River 27 West Lake Ontario Tributaries 28 Rice Lake Tributaries 29 Gages Creek 30 Cobourg Creek 31 East Lake Ontario Tributaries	32 Layton River 33 Nonquon River 34 Cawkers Creek 35 Lake Scugog 36 Lake Scugog Tributaries 37 Blackstock Creek 38 East Cross Creek 39 Janetville Creek 40 Pigeon River 41 Fleetwood Creek	42 Innisfil Creek 43 West Holland River 44 Georgina Creeks 45 East Holland River 46 Maskinonge River 47 Black River 48 Pefferlaw River 49 Talbot River 50 Whites Creek 51 Beaver River	52 Rice Lake Tributaries 53 Percy Creek 54 Burnley Creek 55 Salt Creek 56 Cold Creek 57 Shelter Valley Creek 58 Barnum House Creek	59 Upper Nottawasaga River 60 Bailey Creek 61 Beeton Creek	62 Cavan Creek 63 Baxter Creek 64 Squirrel Creek	65 Carruthers Creek 66 German Mills Creek 67 Upper East Don 68 Upper West Don 69 East Duffins Creek 70 Millers Creek 71 West Duffins Creek 72 Etobicoke Headwtrts 73 East Humber 74 Main Humber 75 West Humber 76 Petticoat Creek 77 Little Rouge 78 Lower Rouge 79 Main Rouge 80 Upper Beaver



Forest Conditions Indicator Grades

- Grade
 - A
 - B
 - C
 - D
 - F
 - Insufficient Data
- Conservation Authority
- Municipality
- Oak Ridges Moraine
- Greenbelt
- Subwatershed

SURFACE WATER QUALITY

INDICATOR	INDICATOR DESCRIPTION
BENTHIC MACRO-INVERTEBRATES	Insects, mollusks, crustaceans and worms that inhabit the streambed are excellent indicators of aquatic health. They are generally abundant, easy to sample, relatively stationary and sensitive to environmental stressors.
TOTAL PHOSPHORUS	Total Phosphorus is an indicator of nutrient levels within a stream. The healthiest streams have levels less than 0.01 mg/L during low flow conditions. Provincial Water Quality Objectives suggest that levels greater than 0.03 mg/L result in unhealthy stream conditions.



Fair
Conditions

Benthic Macro-invertebrates are a reliable indicator of environmental health reflecting stream characteristics (flow, temperature, water quality) at the sampling site over time. Total Phosphorus levels can be more transient in nature and are reflective of management practices on adjacent and upstream lands. Some Conservation Authorities had subwatersheds with limited information. They were able to supplement their data with additional field work in 2013 with funding from the Friends of the Greenbelt Foundation. Other subwatersheds had insufficient or inconclusive data and could not be graded in accordance with protocols.

Table 2 shows that one third of subwatersheds in the Greenbelt have surface water grades that score as good (B) or very good (A) quality. One quarter have a grade of fair (C), while one fifth of subwatersheds grade as poor (D) or

Table 2 – Surface Water Quality Grades

GRADE	# OF SUBWATERSHEDS	% OF SUBWATERSHEDS
A	6	8
B	21	26
C	21	26
D	12	15
F	3	4
Grade N/A	17	21
Totals	80	100

very poor (F) quality. A further one fifth of subwatersheds had insufficient or inconclusive monitoring data available to grade them.

The map opposite shows Surface Water Quality grades by subwatershed. Subwatersheds that score “A” or “B” grades, appear to correlate well to lands with better forest conditions, more protective Plan designations and/or greater distance from urban influences. Subwatersheds that score “D” or “F” grades are likely impacted by settlement areas or countryside/agricultural uses where forest and/or riparian cover is lowest.

No trends for Surface Water Quality are currently identified at the Greenbelt/landscape scale. Local trend information may be included by individual Conservation Authorities for their subwatersheds.



Stonefly nymph - indicative of good water quality

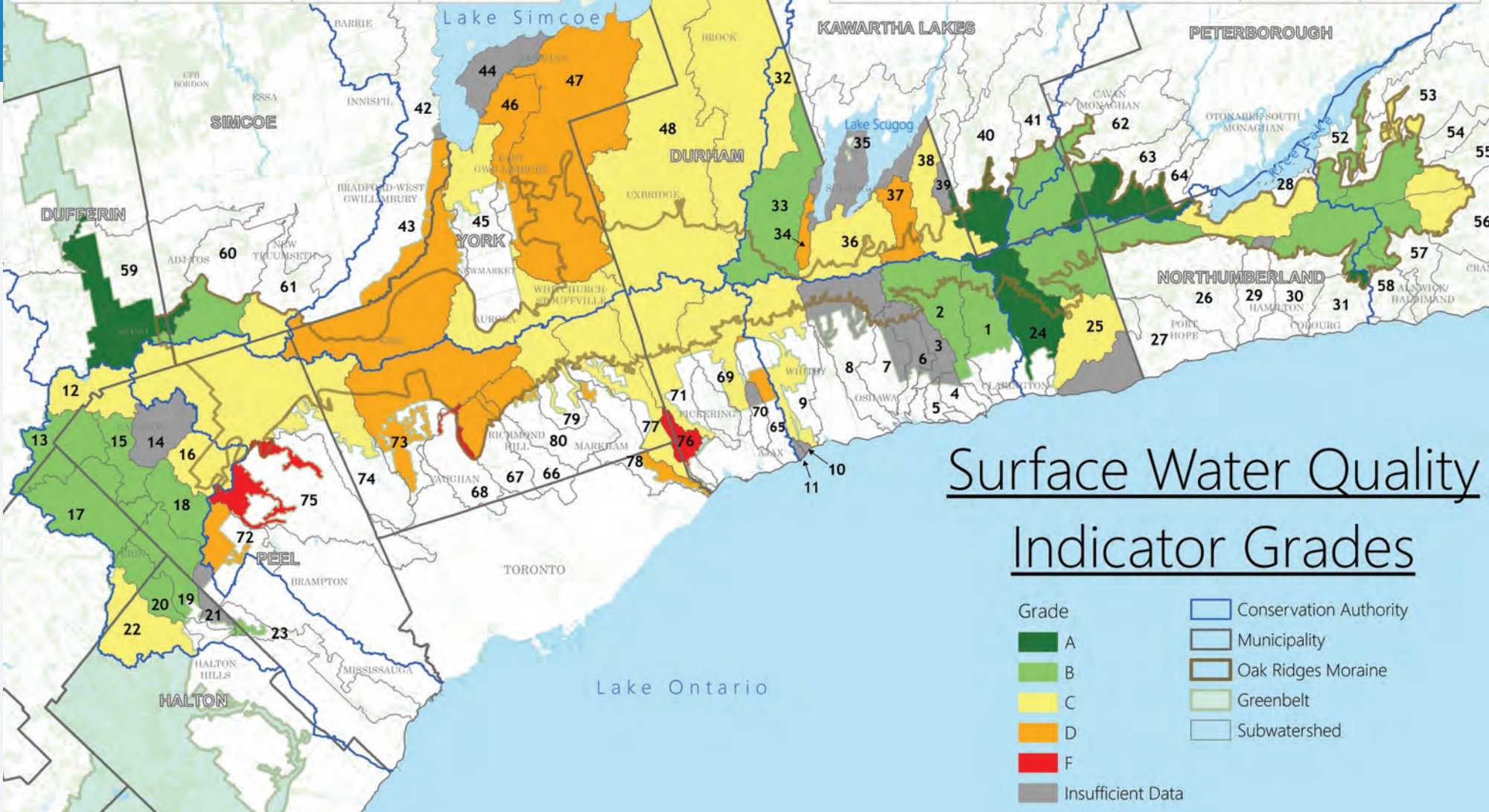
Conclusions

- Almost one half of subwatersheds show surface water quality grades as fair, poor or very poor.
- Data limitations are evident with a lack of sufficient ongoing monitoring coverage in one fifth of subwatersheds and only one year of data in other subwatersheds.
- Subwatersheds with better surface water quality appear to be associated with a greater extent of forest/riparian cover and more protective Plan designations. Subwatersheds with poorer surface water quality are associated with areas of less forest/riparian cover and Plan designations such as settlement and countryside areas.
- Implementation of the Plans through *Planning Act* applications is an insufficient tool by itself to maintain, protect or enhance surface water quality. Additional tools to improve surface water quality are needed.

Recommendations for Action

- Require the use of additional tools and best management practices to improve surface water quality such as:
 - Increased use and better maintenance of erosion & sediment controls on development lands; and
 - Implementation and vigorous enforcement of fill bylaws.
- Renew partnerships among the Province, Conservation Authorities, municipalities and the agricultural sector to increase funding for other watershed stewardship tools and programs such as:
 - Environmental Farm Plans;
 - Enhancement and restoration of natural heritage systems on marginal agricultural and riparian lands; and
 - Implementing a more extensive and robust long term program for monitoring surface water quality;

Central Lake Ontario Conservation	Credit Valley Conservation	Ganaraska Region Conservation	Kawartha Conservation	Lake Simcoe Region Conservation	Lower Trent Conservation*	Nottawasaga Valley Conservation	Otonabee Conservation	Toronto and Region Conservation
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GROUNDWATER QUALITY

Locally
Good*

*Locally Variable

INDICATOR	INDICATOR DESCRIPTION
CHLORIDE (Cl) (MG/L)	Chloride occurs at naturally low levels in the environment. Elevated concentrations can indicate human impacts (e.g. road salt, landfills). The Ontario Drinking Water Quality Standard (ODWQS) for chloride is 250 mg/L based on aesthetic drinking water objectives. From a broader environmental perspective, Environment Canada has placed road salts on its "Priority Substances List" owing to its widespread use that can lead to chloride concentrations that exceed acute and chronic toxicity values for aquatic organisms.
NITRATE (NO₃) (MG/L)	Naturally occurring forms of nitrogen (nitrate) can be found in groundwater at very low concentrations. Elevated concentrations of nitrate can be related to human activities (e.g. excessive fertilizer use, septic system failure). The ODWQS for nitrate is 10 mg/L (reported as nitrate nitrogen) based on health related drinking water objectives. At elevated levels, nitrogen can also be toxic to aquatic organisms. Where there is significant groundwater discharge into surface water streams, such as on the flanks of the ORM or along the Niagara Escarpment, this can pose environmental concerns.

The groundwater resource across the study area is important both for its widespread role as a source of clean drinking water, and as the water source for the many fresh cold water streams that emerge from the Niagara Escarpment and the Oak Ridges Moraine. Chloride and Nitrate have been selected as indicators of groundwater quality owing to their widespread use in both the urban environment (Chloride – predominantly as a de-icing agent on roadways and parking lots) and in the rural environment (Nitrate – predominantly as a crop fertilizer). Both quantity and quality of groundwater are critical to environmental health. However, grading criteria have not been developed due to factors such as: the variability in number and depth of groundwater aquifers; naturally occurring background levels of Chloride; and, the localized results for groundwater quality that often cannot be extrapolated far beyond the individual well sampled.

The map opposite shows the well locations where shallow (< 40m) groundwater has been recently sampled for Chloride and/or Nitrate analyses. The many green symbols on the map indicate that most of the recently obtained shallow groundwater samples show minimal to no impact from surficial land use activities. The red symbols on the map show relatively few locations where either Chloride or Nitrate has been found above the ODWQS. The yellow symbols indicate areas where the groundwater is showing some signs of degradation from surface land uses. The variability of the results, both across the geographical extent of the study area and in wells that are close to one another, demonstrates that groundwater quality varies across short distances. Individual samples do not necessarily reflect the broader groundwater quality in areas removed from a sampled well. Table 3 shows the distribution of the Chloride and Nitrate measured in groundwater samples.

Table 3 – Overview of Groundwater Quality Samples

# of Samples		CHLORIDE (Cl)	NITRATE (NO ₃)
Red	Cl > 250 mg/L NO ₃ > 10 mg/L	37 (11%)	8 (2%)
Yellow	Cl > 50 mg/L, < 250 mg/L NO ₃ > 2 mg/L, < 10 mg/L	105 (30%)	86 (26%)
Green	Cl < 50 mg/L NO ₃ < 2 mg/L	204 (59%)	245 (72%)

Trends

Groundwater quality trends were assessed on wells where samples were taken more than ten times since 2000. Of the 81 samples with sufficient data to evaluate Chloride trends, nearly 30% indicated that Chloride was increasing in the groundwater system. Only 2% indicated a downward trend whereas the remaining 68% of

locations showed no obvious upward or downward trend. Similarly for Nitrate, of the 43 locations that had sufficient repeat samples to look at trends, 12% of samples showed an increasing trend, 7% showed a decreasing trend and the majority, 81%, showed no obvious upward or downward trend.

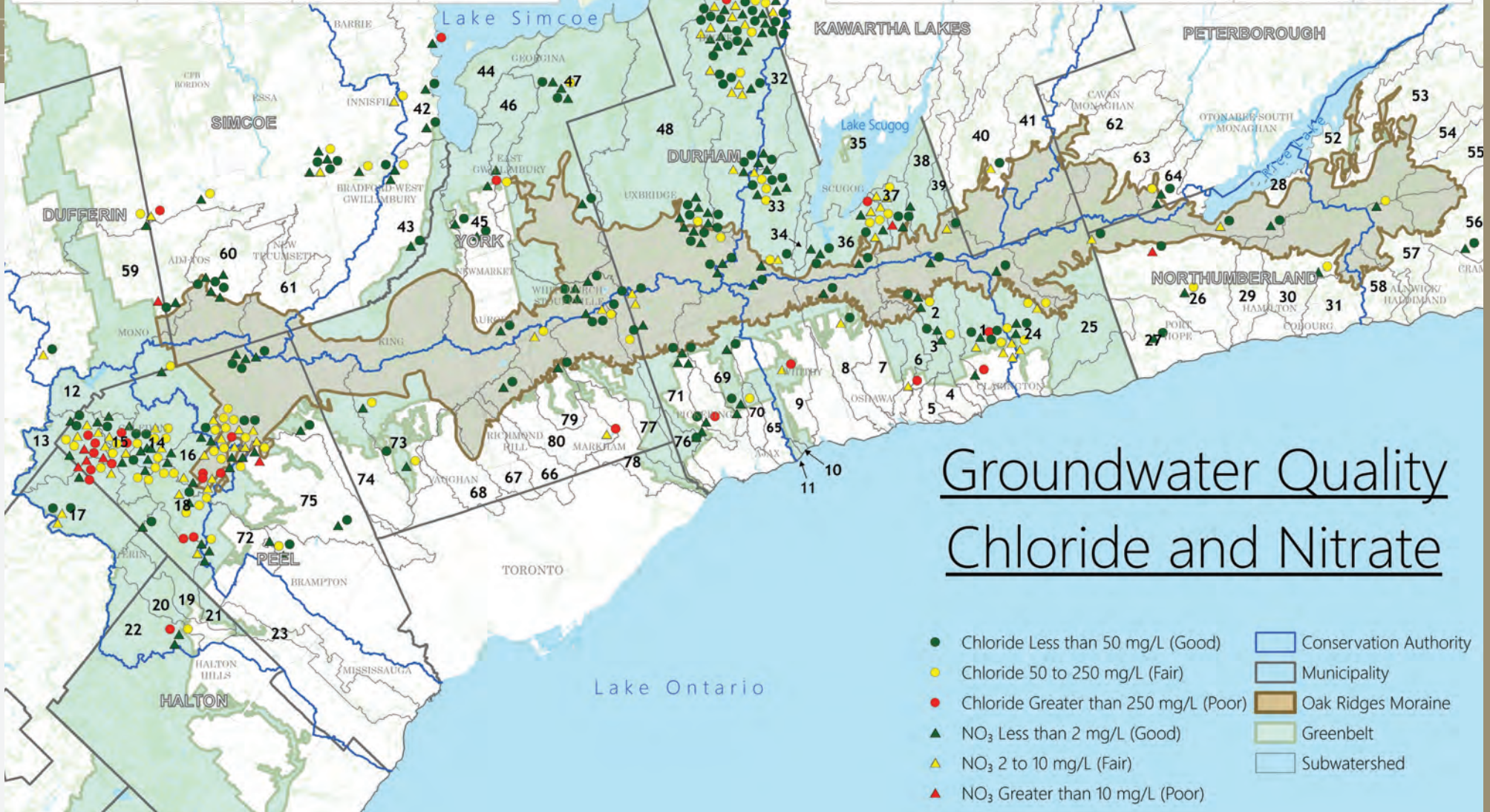
Conclusions

- Groundwater quality, as reflected by the samples available across the study area, is locally good, with the majority of samples collected showing background levels of Chloride and/or Nitrate.
- Elevated levels of Chloride in shallow wells near roadways and in urban areas are trending upward.
- Instances of elevated Nitrate levels in groundwater are less frequent and less widespread than for Chloride.

Recommendations for Action

- Ongoing groundwater monitoring by the CAMC and partners is needed to be able to better characterize environmental groundwater quality changes over time across the broader ORM and Greenbelt landscape;
- Conservation Ontario, CAMC and other partners should lead an effort to identify additional locations for groundwater monitoring of environmental conditions and find mechanisms to financially support the sampling and analysis from these locations; and
- Municipalities and/or Provincial agencies should implement Source Protection Plan policies as soon as possible for the management of road salt, commercial fertilizers and livestock manure.

Central Lake Ontario Conservation	Credit Valley Conservation	Ganaraska Region Conservation	Kawartha Conservation	Lake Simcoe Region Conservation	Lower Trent Conservation	Nottawasaga Valley Conservation	Otonabee Conservation	Toronto and Region Conservation
1 Soper Creek 2 Bowmanville Creek 3 Black Creek 4 Darlington Creek 5 Tooley Creek 6 Farewell Creek 7 Harmony Creek 8 Oshawa Creek 9 Lynde Creek 10 Cranberry 11 Warbler	12 Orangeville 13 Shaw's Creek 14 Caledon Creek 15 Credit River (Melville) 16 East Credit River 17 West Credit River 18 Credit River (Forks) 19 Credit River (Cheltenham) 20 Silver Creek 21 Credit River (Glen Williams) 22 Black Creek 23 Credit River (Norval)	24 Wilmot Creek 25 Graham Creek 26 Ganaraska River 27 West Lake Ontario Tributaries 28 Rice Lake Tributaries 29 Gages Creek 30 Cobourg Creek 31 East Lake Ontario Tributaries	32 Layton River 33 Nonquon River 34 Cawkers Creek 35 Lake Scugog 36 Lake Scugog Tributaries 37 Blackstock Creek 38 East Cross Creek 39 Janetville Creek 40 Pigeon River 41 Fleetwood Creek	42 Innisfil Creek 43 West Holland River 44 Georgina Creeks 45 East Holland River 46 Maskinonge River 47 Black River 48 Pefferlaw River 49 Talbot River 50 Whites Creek 51 Beaver River	52 Rice Lake Tributaries 53 Percy Creek 54 Burnley creek 55 Salt Creek 56 Cold Creek 57 Shelter Valley Creek 58 Barnum House Creek	59 Upper Nottawasaga River 60 Bailey Creek 61 Beeton Creek	62 Cavan Creek 63 Baxter Creek 64 Squirrel Creek	65 Carnuthers Creek 66 German Mills Creek 67 Upper East Don 68 Upper West Don 69 East Duffins Creek 70 Millers Creek 71 West Duffins Creek 72 Etobicoke Headwtrs 73 East Humber 74 Main Humber 75 West Humber 76 Petticoat Creek 77 Little Rouge 78 Lower Rouge 79 Main Rouge 80 Upper Beaver



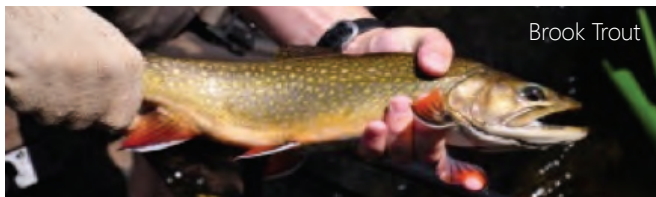
STREAM TEMPERATURE AND COLDWATER FISH

INDICATOR	INDICATOR DESCRIPTION
COLDWATER FISH	Brook Trout and Sculpin were selected as indicators of a healthy aquatic ecosystem. It is assumed that these fish are typical of the study area, characterized by abundant groundwater supplies which they rely on. However, some parts of the study area may be limited in their ability to support coldwater species by natural physiographic conditions or land uses. Changes in fish species found or not found over time may indicate degradation or improvement in local environmental conditions related to groundwater contributions, water quality (e.g. phosphorus, temperature, dissolved oxygen), riparian cover or other parameters such as streamflow and physical stream conditions.
STREAM TEMPERATURE	Distribution of fish communities by Stream Temperature regimes are determined, in large part, by summer average and maximum water temperature thresholds. Stream Temperature is well correlated with Coldwater Fish and can help identify restoration potential.

**Grading
Criteria Not
Established**

Stream Temperatures and Coldwater Fish can be seen as an integrator of other environmental indicators because they have a direct relationship with forest cover, surface water quality and groundwater quality and quantity.

- Forest cover maintains recharge and natural hydrology along streams, reduces water temperatures through shading and provides fish habitat (e.g. woody material for cover).
- Well forested uplands and riparian areas help regulate nutrient loading to streams and maintain good water quality.
- Benthic Macro-invertebrates are indicators of aquatic health and also represent the food supply of many fish species.
- Groundwater contributions may directly influence thermal conditions for Coldwater Fish and other aquatic life. At high concentrations, nitrates can be toxic to aquatic life.



The map opposite shows the distribution of Stream Temperature and Coldwater Fish results. One Conservation Authority (Lower Trent) did not have data available for fish.

Coldwater temperature sites are widely distributed across the study area. Similarly, Brook Trout and Sculpin are also widespread across the study area, with a concentration in streams

flowing off the edge of the Oak Ridges Moraine and the adjacent Greenbelt lands. There is a lack of sampling along the watershed divide of the Oak Ridges Moraine, due to the dominance of recharge zones and intermittent streams with seasonal flows. It is suspected that Coldwater Fish become less common downstream of the Greenbelt due to natural limitations, and human impacts such as impervious cover resulting in increased runoff and warming surface waters.

Coldwater Fish are found at the majority (62%) of sampled fish sites. Given that only 29% of the Stream Temperature sites are coldwater, it is assumed that some of the coldwater fish are found in marginal habitats (e.g. coolwater). 71% of all temperature monitoring sites in the study area have cold or cool water temperatures available to these coldwater fish. Coolwater sites likely represent marginal habitats at greater risk of being impacted by climate change or land use changes. Land use mitigation and restoration efforts may offset such impacts.

As a new indicator, the Stream Temperature and Coldwater Fish results provide a baseline across the study area. Future report cards will show a comparison and highlight any changes in Coldwater Fish found and Stream Temperature regimes over time to detect potential changes across the study area.



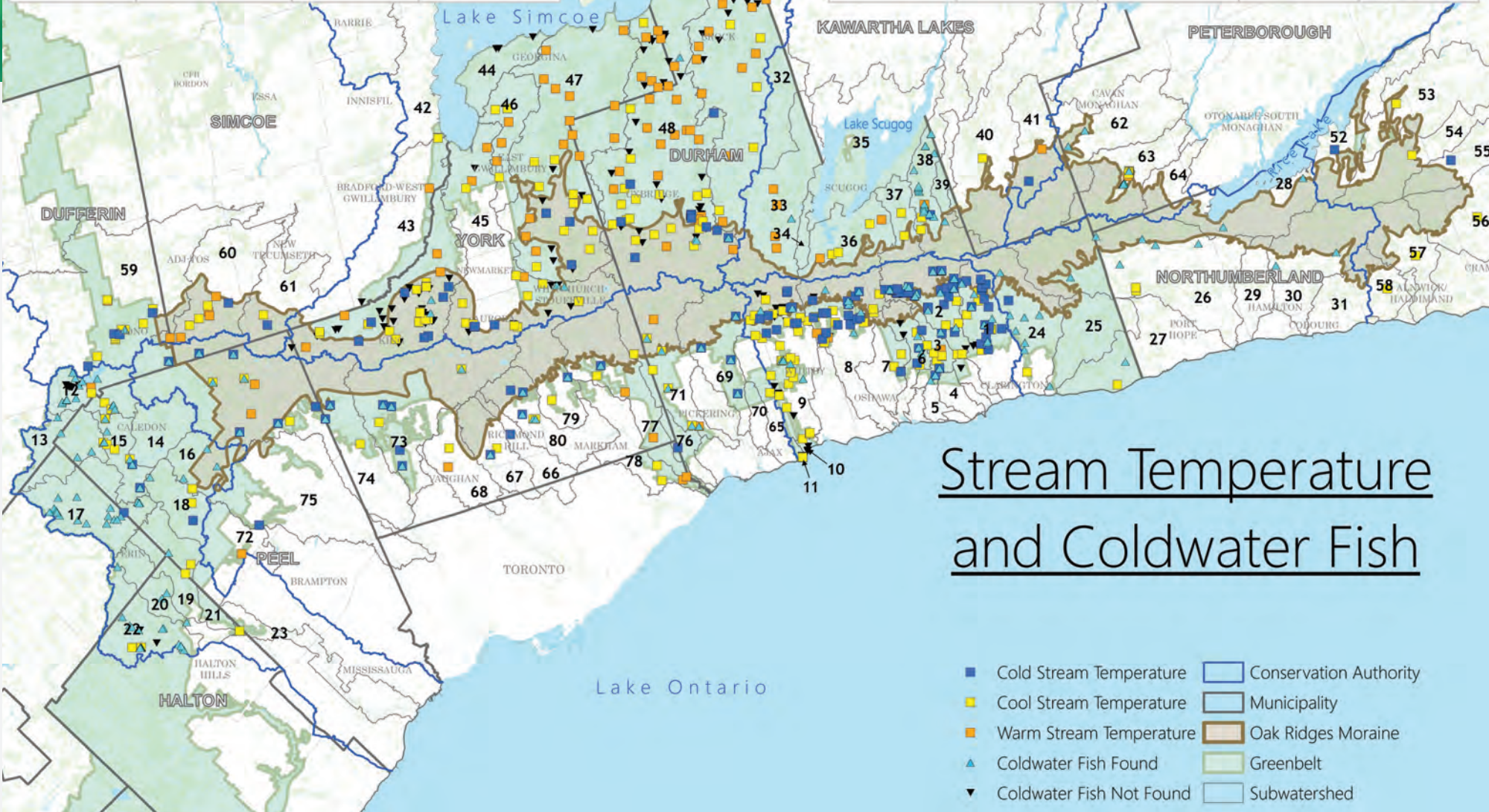
Conclusions

- Coldwater Fish and coldwater Stream Temperatures are evenly distributed across both the Oak Ridges Moraine (except along the watershed divide) and adjacent Greenbelt lands indicating suitable habitat conditions across the study area. However, this does not reflect whether populations are stable or sustainable, particularly in marginal coolwater streams where protection and restoration efforts should continue.
- The Oak Ridges Moraine and adjacent Greenbelt lands provide a strong foundation for fish habitat management related to the rich groundwater resources and good natural cover.

Recommendations for Action

- Continue to implement traditional restoration actions including tree planting and best management practices such as nutrient and salt management plans, erosion and sediment controls and climate change adaptation measures such as low impact development.
- Renew and expand partnerships and funding arrangements among government agencies, non-government environmental organizations and landowners to:
 - Improve the monitoring network for the collection of fish and stream temperature data, including frequency and distribution of sampling sites, especially in the east end of the study area; and
 - Investigate other stressors such as dams and barriers to mitigate or remove them, except where used to manage non-native or invasive species.

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Conservation Authorities Moraine Coalition (CAMC)

The CAMC is a coalition of nine Conservation Authorities with watersheds on the Oak Ridges Moraine (ORM). The Coalition formed in 2000, two years prior to the ORM Conservation Plan, in response to the need for a comprehensive policy, planning and management approach geared to sustaining the health of the entire ORM. The CAMC is a partnership organization. It collaborates with numerous groups and individuals to achieve common objectives to support a robust and resilient environment across the ORM landscape. These objectives include:

- undertaking science-based research;
- providing opportunities for recreation;
- taking action for the protection and restoration of the ORM; and
- providing expert advice for environmental planning and policy matters.

The CAMC has prepared this report card on various indicators of environmental health. The results are intended to inform the review in 2015 of the Provincial Plans for the Oak Ridges Moraine and Greenbelt - particularly, the Plans' effectiveness in maintaining, enhancing and restoring the ecological and hydrological health of these environmentally significant landscapes.

What You Can Do

As Decision Makers:

- Support official plan policies and decisions on *Planning Act* applications that conform to the Greenbelt Plan and the Oak Ridges Moraine Conservation Plan.
- Enact and enforce additional municipal tools such as tree conservation and fill bylaws, and incorporate watershed plan recommendations into official plans.
- Support long term funding for programs such as environmental monitoring, land stewardship and securement, environmental farm plans and environmental restoration activities.

As Citizens

- Get involved in the 2015 Review of the Provincial Plans – attend a public meeting; voice your support and concerns; join a local conservation group.
- Get outdoors to hike, bike, snowshoe, or bird watch in your favourite Conservation Area in the Greenbelt.
- Visit your local Conservation Authority website to learn about land stewardship and healthy land care practices, and apply them on your lands.

Find More Information about the Health of the Oak Ridges Moraine & Greenbelt in Your Watershed

Central Lake Ontario Conservation (CLOCA)
www.cloca.com 905-579-0411

Credit Valley Conservation (CVC)
www.creditvalleyca.ca 905-670-1615

Ganaraska Region Conservation (GRCA)
www.grca.on.ca 905-885-8173

Kawartha Conservation (KRCA)
www.kawarthaconservation.com
705-328-2271

Lake Simcoe Region Conservation (LSRCA)
www.lsrca.on.ca 905-895-1281

Lower Trent Conservation (LTC)
www.ltc.on.ca 613-394-4829

Nottawasaga Valley Conservation (NVCA)
www.nvca.on.ca 705-424-1479

Otonabee Region Conservation (ORCA)
www.otonabee.com 705-745-5791

Toronto and Region Conservation (TRCA)
www.trca.on.ca 416-661-6600

YPDT-CAMC Groundwater Study
www.Oakridgeswater.ca

www.morainecoalition.ca

Visit the address above to link to all nine Conservation Authority local web report cards, and view the CAMC's detailed comments about the 2015 Review.



Possibility grows here.



Conservation Authorities
Moraine



Conservation
ONTARIO
Natural Champions

