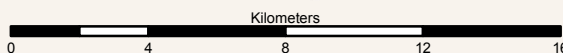
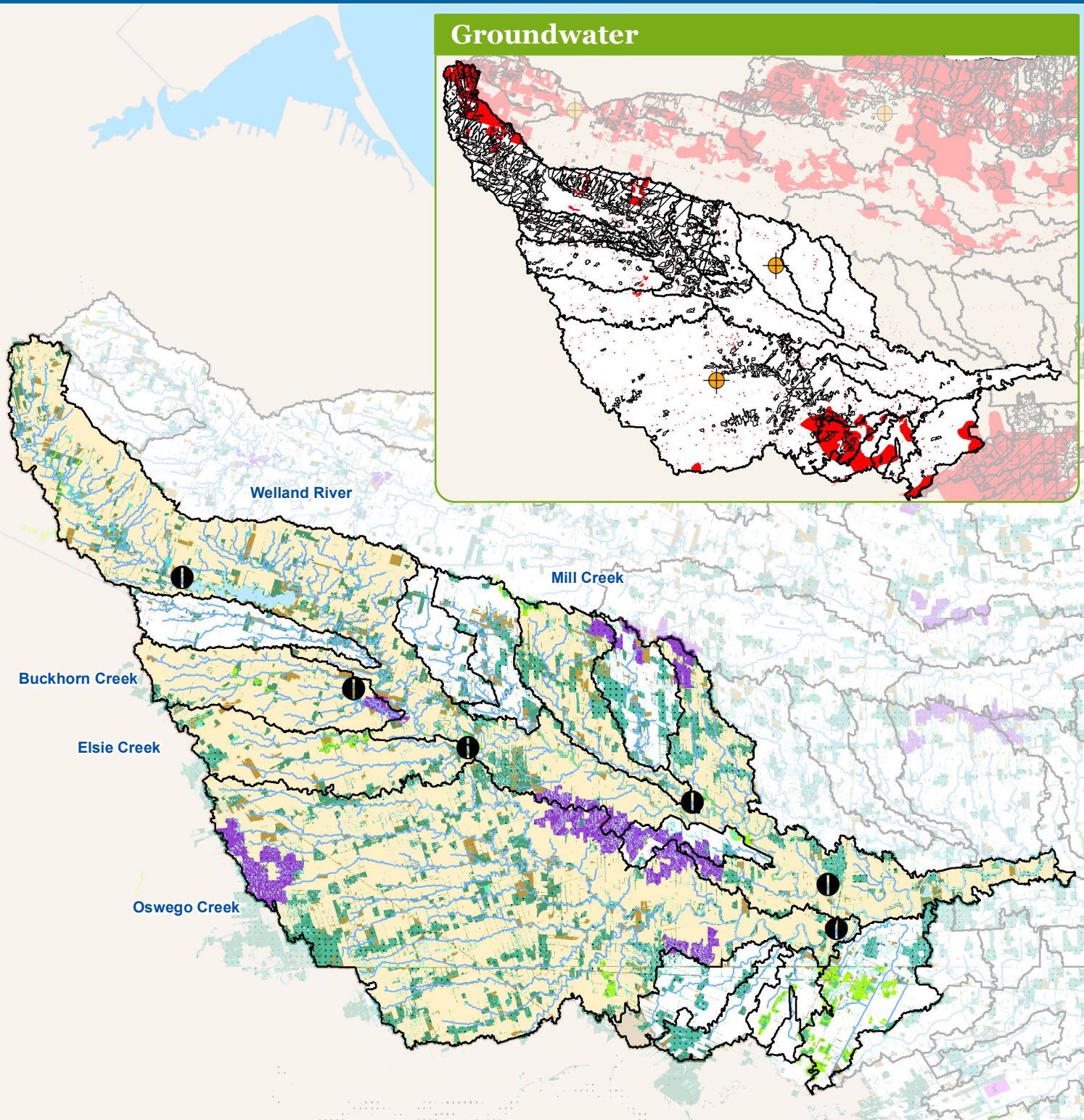
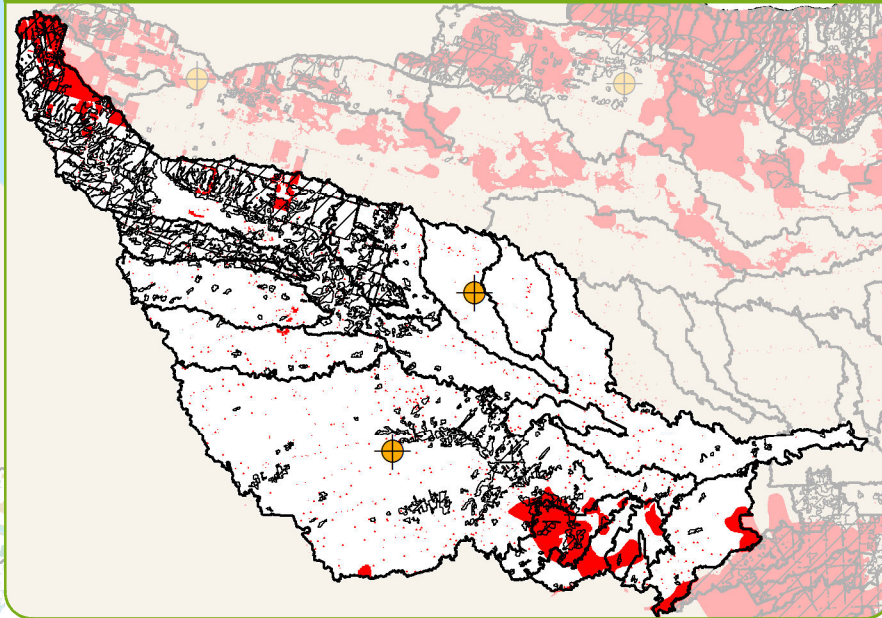






Groundwater





General Natural Areas

-  Rock Barren
-  Bluff
-  Shoreline
-  Open Water


Successional


-  Wetland

-  Swamp


-  Wooded Area

-  Provincially Significant Wetland

-  Locally Significant Wetland

-  Area of Natural and Scientific Interest

-  Surface Water Quality Monitoring Station

-  Provincial Groundwater Monitoring Network

-  Watercourses

-  Significant Groundwater Recharge Area

-  Highly Vulnerable Aquifer

-  Subwatershed Boundary

-  Sampled Subwatershed



Watershed Characteristics



Area	478 km ² ; nearly 3000 km of watercourse.				
Land Use	Mainly agriculture (eggs, poultry, grain, and oilseed). Small concentrated urban land use within the Airport Economic Growth District in the City of Hamilton. There are 7 conservation areas within the watershed with opportunities for recreational boating, fishing, and hiking as well as multiple golf courses.				
Soil Type	1% Developed Areas, 57.0% Mixed Clay and Loam Soils, 6% Mixed Sand and Loam Soils, 35.5% Mixed Silt and Loam Soils, 0.1% Organic Soils, 0.4% Water				
Physiography	The dominant feature in the Upper Welland River Watershed is the Haldimand Clay Plain. The Dunnville Sand Plain extends into the south-eastern portion of the watershed, while the northern portion of the watershed and Twenty Mile Creek watershed are separated by a till ridge known as the Fort Erie Moraine.				
Dams & Barriers	Binbrook Dam serves to conserve wildlife and habitat, control flooding, augment low flow in Welland River downstream of the dam, and for recreational purposes. Stream alteration in this watershed may be causing possible fish barriers in significant fish habitat and could be affecting fish migration.				
Sewage Services	The City of Hamilton owns and operates two large wastewater treatment facilities which service the urban areas such as the Hamilton Airport region. Rural landowners may be serviced by private septic systems. There has been a noted lack of storm water treatment.				
% Natural Area Types	Total Natural Area= 131.8 km ² 32% Wooded , 10% Wetland, 42% Swamp, 16% Successional, <0.1% Unique				
Woodlot or Patch Size	Size Category	Number of Woodlots	Total Woodland Area in WPA (ha)	% Woodland	Largest Woodlot (ha)
	20 to 50 ha	39	1761.57	3.69	48.90
	50 to 75 ha	12	770.87	1.61	73.34
	75 to 100 ha	9	631.26	1.32	98.29
	100 to 200 ha	9	1166.70	2.44	149.23
	>200 ha	4	1929.42	4.04	622.81
Fisheries Resources	43 species of fish are present. These include northern pike, walleye, and various bass, minnows, and shiners.				
Species at Risk	17 species at risk exist in the Upper Welland River watershed. Birds – 4 species including Cerulean Warbler and Short-eared Owl. Fish – Grass Pickerel. Mammals – Woodland Vole. Mussels – Mapleleaf mussel. Plants – 4 including American Chestnut and Butternut. Reptiles – 6 including Eastern Milksnake and Five-lined Skink.				

Groundwater



Groundwater Vulnerability

The Niagara Water Strategy, NPCA Groundwater Study, and the Niagara Peninsula Source Protection Area Assessment Report have identified the Upper Welland River Watershed as having predominantly low natural groundwater vulnerability. This is due to the thick deposits of Haldimand Clay Plain that limit infiltration from any contaminating land uses. There are some limited naturally vulnerable areas associated with sand on the Dunnville Sand Plain and the Niagara Falls Moraine. But there are also older water well transport pathways in municipally serviced areas which can allow for the direct passage of surface water and contaminants to groundwater resources.

Private Wells

The Upper Welland River Watershed is primarily serviced by rural water supplies with about 91% of the population on private water supplies such as groundwater wells. Water wells need to be properly constructed and maintained to prevent contamination. The safety, testing and treatment of a private well is the responsibility of the well owner.

Groundwater Stress

The Niagara Peninsula Source Protection Tier 1 Water Budget identified the Upper Welland River Watershed at a low stress level with respect to groundwater supply relative to its overall demand.

Groundwater Monitoring

The NPCA has been monitoring two Provincial Groundwater Monitoring Network (PGMN) wells in the Upper Welland River watershed since 2003. One PGMN well (W287) is located on Junction Road in Haldimand and it monitors chemistry and water levels of the Salina bedrock formation. The other PGMN well (W080) is located on Abingdon Road in West Lincoln and it monitors chemistry and water levels of the Guelph/Lockport bedrock formation. Water quality results for PGMN well W287 only exceeded Ontario Drinking Water Quality Standards for sodium. Water quality results for PGMN well W080 exceeded Ontario Drinking Water Quality Standards for fluoride, sodium and uranium. All exceedances were thoroughly investigated by Ministry of Environment, NPCA, Municipal and Public Health staff and found to be caused by natural groundwater conditions. Data for both PGMN wells show that groundwater levels generally decline from May to October, and increase from fall to spring with the largest increase in March. Groundwater levels were lowest in 2007 during a significant drought year.

Stewardship Highlights



The Upper Welland River Watershed has benefited from the many activities and the active involvement of individuals, organizations and municipalities on private and public lands. Some examples of the progress which has occurred in the watershed follows:

- Watershed landowners have completed 55 water and habitat improvement projects with the assistance of the NPCA's Water Quality Improvement Program, the *Haldimand County Rural Water Quality Program*, *Land Care Niagara*, *Ontario Power Generation* and *Ducks Unlimited Canada*. These projects included Best Management Farm Practices, Conservation Farm Practices, wetland restoration and enhancement, riparian buffer establishment and upland forest restoration projects. Using over 136000 native trees, shrubs and wildflowers, landowners have enriched over 50 hectares of natural lands.



- The *NPCA* has undertaken several restoration projects at the Binbrook Conservation Area. There has been approximately 33 m² of shoreline restored to provide habitat and erosion control, as well aquatic plantings to enhance a 0.2 hectare constructed pike spawning bed, and additional fish habitat structures constructed and installed to provide habitat for local fish communities. These projects were all implemented with the assistance of the *Glanbrook Conservation Committee*.
- The *NPCA* has also partnered with the *Glanbrook Conservation Committee* on several other activities which help to support the Binbrook Conservation Area and promote a love for the outdoors including the Binbrook Crappie Derby, Binbrook Ice Fishing Derby, and native walleye stocking.
- The *NPCA* also holds an annual Bass Fishing Derby at the Chippawa Creek Conservation Area.
- The *NPCA* has been engaged to monitor Gypsy Moth populations at several conservation areas in the Upper Welland River Watershed Area. The results indicate the Gypsy Moth population is negligible. The moth populations have been on the decline over the last 3 years.
- The *NPCA* upgraded the sewage treatment facilities at the Chippawa Creek Conservation Area and campground to an AQUA Treatment Technologies constructed wetland wastewater treatment system. The AQUA system routinely reduces common waste water parameters by 95% or more, resulting in a clear and odour-free effluent suitable for reuse for not potable purposes (eg. irrigation, flushing). This new wastewater treatment system has been operating at the campground for two camping seasons with great results.
- In 2009, Bell-Stone Public School participated in the *NPCA's* ECO School schoolyard naturalization program. This program has now been replaced by the *NPCA's* Canopies for Kids program which provides shade trees to elementary schools with little or no natural cover.
- In 1987 the Niagara River was designated as one of 43 Areas of Concern (AOCs) around the Great Lakes Basin by the governments of Canada and the United States due to degraded water quality from historical pollution. On the Canadian side, The Niagara River Remedial Action Plan (RAP) was set up in collaboration with the local community to identify water quality concerns (from the official list of 14 Beneficial Use Impairments, or BUIs) and take actions to resolve them. When the concerns have been addressed, the scientific evidence will be presented to “delist” the AOC. According to the RAP’s Stage 2 Report, remedial measures have resulted in the following BUI’s have been re-designated to “Not Impaired”: Restrictions on Wildlife Consumption, Fish Tumours and Other Deformities, and Bird or Animal Deformities or Reproduction Problems. With the implementation of the new Great Lakes Water Quality Protocol of 2012, it is anticipated that actions to delist the AOC will be completed within the next few years. The RAP has produced several reports which can be found in Appendix A



including the Niagara River Remedial Action Plan Stage 2 update report (2009); the Welland River Eutrophication Study report (2011); and the Niagara River (Ontario) AOC Update 2012.

- The *Niagara Restoration Council (NRC)* has been working to improve the local water and habitat quality as well as raise awareness of local environmental issues. In 2010 the NRC completed the Niagara River Area of Concern (AOC) Fish Barrier Project, which saw 148 fish barriers removed, unlocking over 850 km of potential fish habitat.
- The NPCA's Angler Catch & Release Program was developed in 2003 in partnership with the *Ministry of Natural Resources*, the *Ministry of the Environment*, and *Environment Canada*. Since the program began, each fall the NPCA has captured, measured and tagged fish over 150mm at varying locations along the Welland River. Between 2007 and 2011, the NPCA tagged 225 fish of which 11 have been recaptured and reported by the public. Since the inception of the program 14 tagged fish have successfully travelled through the siphons at Merritt Island in Welland.
- The NPCA's Welland River Angler Diary Program which began in 2001 distributed 171 diaries to local anglers between 2007 and 2011. This program was started to monitor the success of the Welland River Walleye Stocking Program in partnership with *Ministry of Natural Resources*, *Fort Erie Conservation Club* and *Port Colborne and District Conservation Club*. In 2009 the NPCA noticed an increase in the capture rate of walleye based on the results of the Angler Diaries.
- The *Port Colborne District Conservation Club* has been actively working in the Watersheds since 1954 to promote the respect and wise management of our natural resources. Since 2007 they have coordinated many public education events from fishing derbies to community clean ups and been involved in various restoration efforts including tree planting and walleye spawning bed creation and enhancement. Of particular note is the release of nearly 28000 walleye, hatched and released back into Welland River Watershed, helping the recovery of our declining native walleye population.
- *Habitat Haldimand* has a variety of programs that they are involved in. Their Seed to Tree program allows local school children the opportunity to learn about tree propagation and forest health as part of the curriculum. These trees are then tended to with assistance by the group in the classroom and as a result 15000-20000 trees are given back to the community as part of the Great Tree Give Away program each year. *Habitat Haldimand* has also kept busy with their Bluebird Nest Box program (approximately 300 boxes each year), their workshop series on various topics for children and adults, and their participation in the establishment of over 1 hectare of wetland habitat since 2007.
- Since 2007 other community groups and organizations such as the *Ontario Soil and Crop Improvement Association*, *Land Care Niagara*, *Fort Erie Conservation Club*, *Haldimand Stewardship Council* and the *Welland*



River Keepers have also been working to improve the local water and habitat quality as well as raise awareness of local environmental issues. These groups have coordinated public education events and taken part in environmental restoration efforts throughout the Upper Welland River Watershed Area.

There has been much work completed on research and improving the health of Upper Welland River Watersheds since 2007. Appendix A provides a list of some of the documents that have been published which have aided in a better understanding of the local issues as well as put forth recommendations and actions for further enhancements and improvements to the watersheds.

Buckhorn Creek

2012 Watershed Report Card

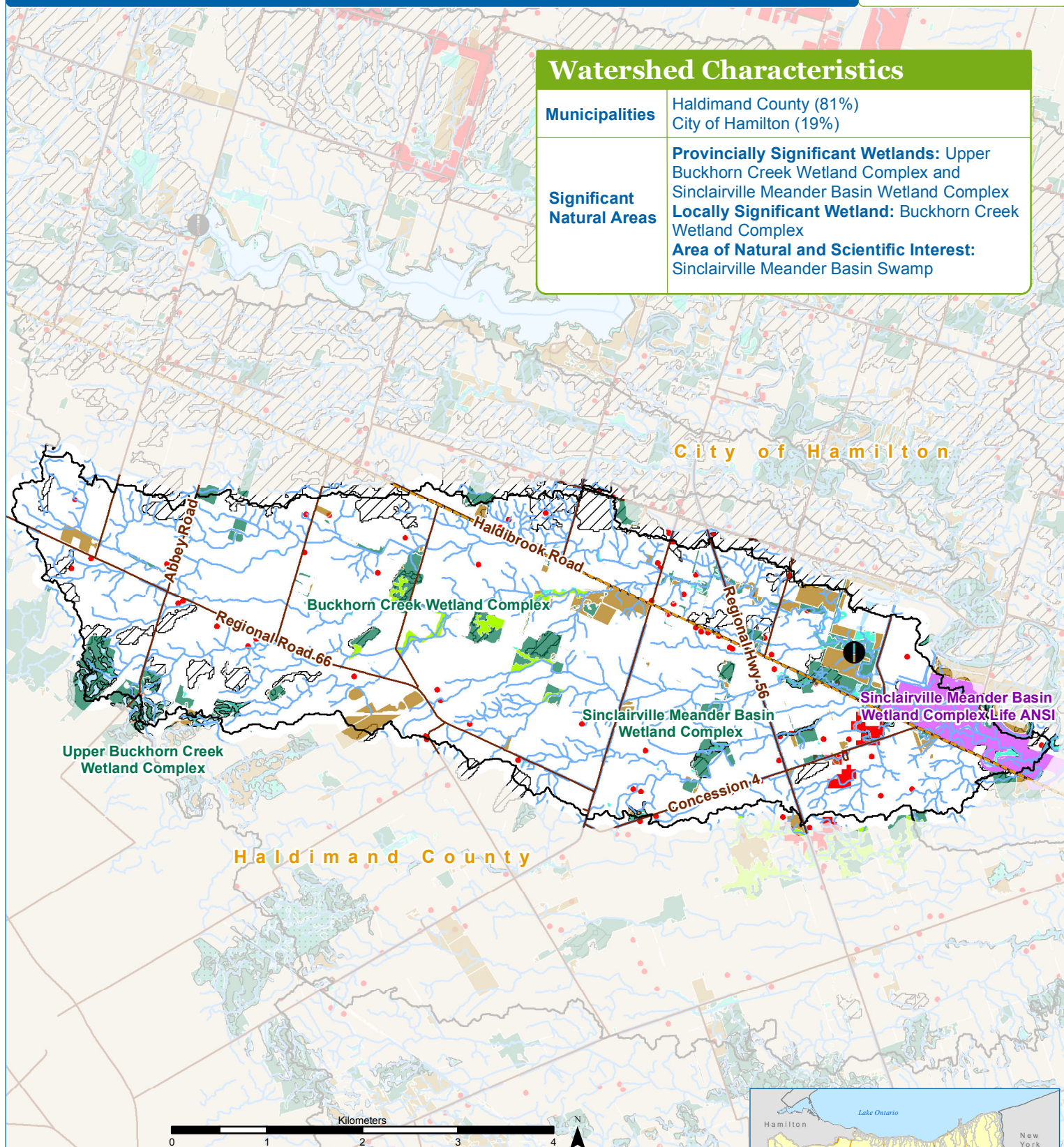
GRADES

Surface Water Quality **D**

Forest Conditions **F**

Watershed Characteristics

Municipalities	Haldimand County (81%) City of Hamilton (19%)
Significant Natural Areas	Provincially Significant Wetlands: Upper Buckhorn Creek Wetland Complex and Sinclairville Meander Basin Wetland Complex Locally Significant Wetland: Buckhorn Creek Wetland Complex Area of Natural and Scientific Interest: Sinclairville Meander Basin Swamp



- | | | |
|------------------------------|---|--|
| General Natural Areas | Successional | Surface Water Quality Monitoring Station |
| Rock Barren | Wetland | Watercourses |
| Bluff | Swamp | Roads |
| Shoreline | Wooded Area | Significant Groundwater Recharge Area |
| Open Water | Provincially Significant Wetland | Highly Vulnerable Aquifer |
| | Locally Significant Wetland | Subwatershed Boundary |
| | Area of Natural and Scientific Interest | Municipal Boundary |



Surface Water Quality

GRADE

D

Surface water quality monitoring of Buckhorn Creek on Haldibrook Road was initiated in 2002 and was given an overall grade of D. The water quality of this watershed regularly exceeded provincial guidelines for phosphorus and *E. coli*. Concentrations of phosphorus have been increasing since 2002 suggesting that water quality conditions are becoming more stressed. The benthic community found in this watershed mainly consisted of pollutant tolerant animals and indicated impaired water quality. Watershed initiatives that reduce nutrient and bacteria contamination will improve the water quality of Buckhorn Creek.

Indicators		2007 - 2011	Provincial Guideline	Indicator Description
Phosphorus	(µg/L)*	400	30	Phosphorus is found in products such as soap, detergent, and fertilizer as well as waste, and contributes to excess algae and low oxygen in streams and rivers
	Grade	F	B	
Bacteria	(<i>E. coli</i> /100ml)**	329	100	<i>E. coli</i> is a fecal coliform bacteria found in human and animal (livestock/wildlife/pets) waste and, in water, indicates fecal contamination. <i>E. coli</i> is a strong indicator for the potential to have other disease-causing organisms in the water.
	Grade	D	B	
Benthic	(FBI)	6.19	<5.00 (Target Only)	Benthic organisms (aquatic invertebrates that live in stream sediments) are good indicators of water quality and stream health. The Family Biotic Index (FBI) scores each taxa according to its pollution tolerance.
	Grade	D	B	

*75th percentile, NPCA data. **Geometric mean, NPCA data. Province-wide Grading System used.

Forest Conditions

GRADE

F

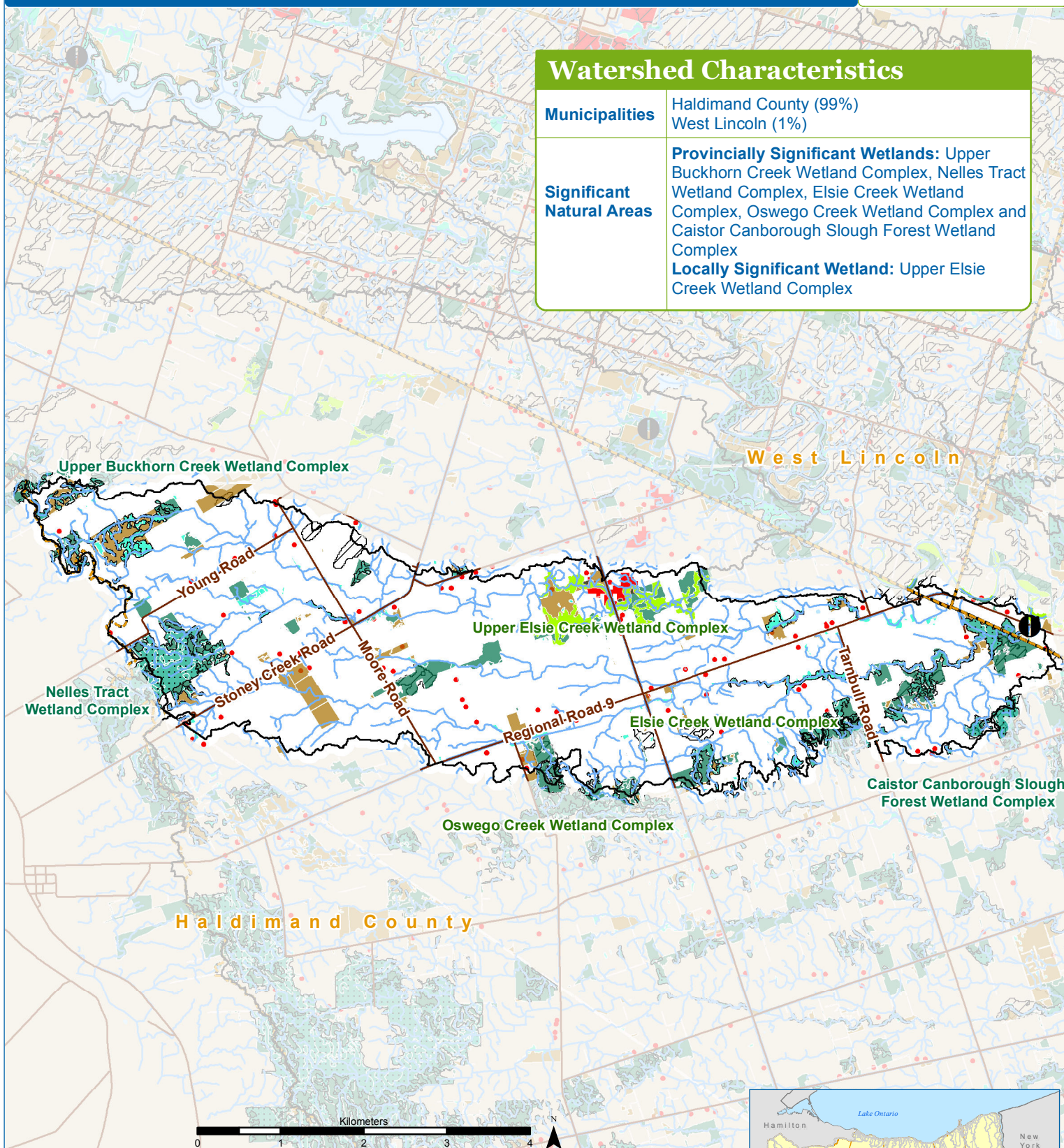
The forest condition indicators for Buckhorn Creek watershed produced an overall grade of F. The Forest Cover % received a grade of D well below the provincial target and a Forest Interior % grade of F at less than 1%. These grades were largely due to the fact that the forests that remain in the watershed are relatively small and lack the connectivity necessary for interior forest habitat. The Riparian Zone Forested % also received a grade of F due to the fact that in areas of the watershed where riparian vegetation still exists, it is successional in nature.

Indicators		2007 - 2011	S. Ont. Target**	Indicator Description
Forest Cover	%	9	30	Percent forest cover is the percentage of the watershed that is forested or wooded. Forest cover includes upland and lowland forest types.
	Grade	D	B	
Forest Interior	%	0.40	10.0	Percent forest interior is the percentage of the watershed that is forested interior. Forest interior is the protected core area 100 m inside a woodlot that some bird species require to nest successfully. The outer 100 m is considered 'edge' habitat and is prone to high predation, wind damage and alien species invasion.
	Grade	F	B	
Riparian Zone Forested	%	10.8	50.0	Percent riparian zone forested is a measure of the amount of forest cover within a 30 m riparian/buffer zone adjacent to all open watercourses. Riparian habitats support high numbers of wildlife species and provide an array of ecological functions.
	Grade	F	B	

** Targets for southern Ontario based on Environment Canada (2004) and Conservation Ontario (2011)

Watershed Characteristics

Municipalities	Haldimand County (99%) West Lincoln (1%)
Significant Natural Areas	Provincially Significant Wetlands: Upper Buckhorn Creek Wetland Complex, Nelles Tract Wetland Complex, Elsie Creek Wetland Complex, Oswego Creek Wetland Complex and Caistor Canborough Slough Forest Wetland Complex Locally Significant Wetland: Upper Elsie Creek Wetland Complex



Surface Water Quality

GRADE

D

Surface water quality monitoring of Elsie Creek on Regional Road 9 was initiated in 2003 and was given an overall grade of D. The water quality of this watershed regularly exceeded the provincial guideline for phosphorus and met the guideline for *E. coli*. Algal blooms occurred regularly at this site due to high phosphorus concentrations. The benthic community found in this watershed mainly consisted of pollutant tolerant animals and indicated impaired water quality. Watershed initiatives that reduce nutrient contamination will improve the water quality of Elsie Creek.

Indicators		2007 - 2011	Provincial Guideline	Indicator Description
Phosphorus	(µg/L)*	230	30	Phosphorus is found in products such as soap, detergent, and fertilizer as well as waste, and contributes to excess algae and low oxygen in streams and rivers
	Grade	F	B	
Bacteria	(<i>E. coli</i> /100ml)**	73	100	<i>E. coli</i> is a fecal coliform bacteria found in human and animal (livestock/wildlife/pets) waste and, in water, indicates fecal contamination. <i>E. coli</i> is a strong indicator for the potential to have other disease-causing organisms in the water.
	Grade	B	B	
Benthic	(FBI)	8.07	<5.00 (Target Only)	Benthic organisms (aquatic invertebrates that live in stream sediments) are good indicators of water quality and stream health. The Family Biotic Index (FBI) scores each taxa according to its pollution tolerance.
	Grade	F	B	

*75th percentile, NPCA data. **Geometric mean, NPCA data. Province-wide Grading System used.

Forest Conditions

GRADE

D

The forest condition indicators for Elsie Creek watershed produced an overall grade of D. The Forest Cover % received a grade of D well below the provincial target and a Forest Interior % grade of F at less than 1%. These grades were largely due to the fact that the forests that remain in the watershed are relatively small and lack the connectivity necessary for interior forest habitat. The Riparian Zone Forested % received a grade of D attributed to a small number of larger forested areas in one central corridor and, the successional nature of the vegetation where it exists along watercourses in other parts of the watershed.

Indicators		2007 - 2011	S. Ont. Target**	Indicator Description
Forest Cover	%	11	30	Percent forest cover is the percentage of the watershed that is forested or wooded. Forest cover includes upland and lowland forest types.
	Grade	D	B	
Forest Interior	%	0.4	10.0	Percent forest interior is the percentage of the watershed that is forested interior. Forest interior is the protected core area 100 m inside a woodlot that some bird species require to nest successfully. The outer 100 m is considered 'edge' habitat and is prone to high predation, wind damage and alien species invasion.
	Grade	F	B	
Riparian Zone Forested	%	13.7	50.0	Percent riparian zone forested is a measure of the amount of forest cover within a 30 m riparian/buffer zone adjacent to all open watercourses. Riparian habitats support high numbers of wildlife species and provide an array of ecological functions.
	Grade	D	B	

** Targets for southern Ontario based on Environment Canada (2004) and Conservation Ontario (2011)

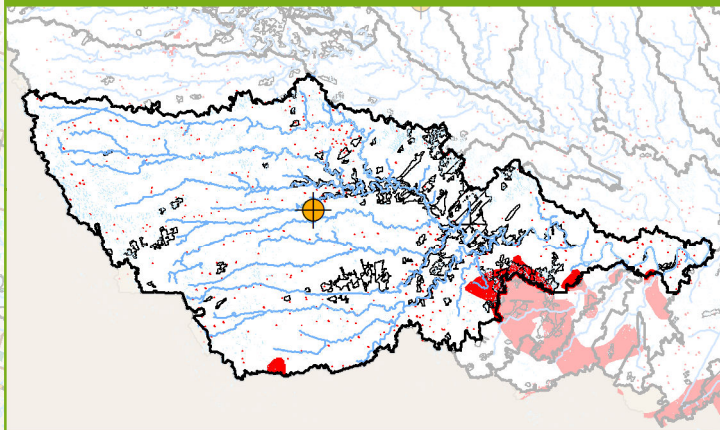
Oswego Creek

2012 Watershed Report Card

GRADES

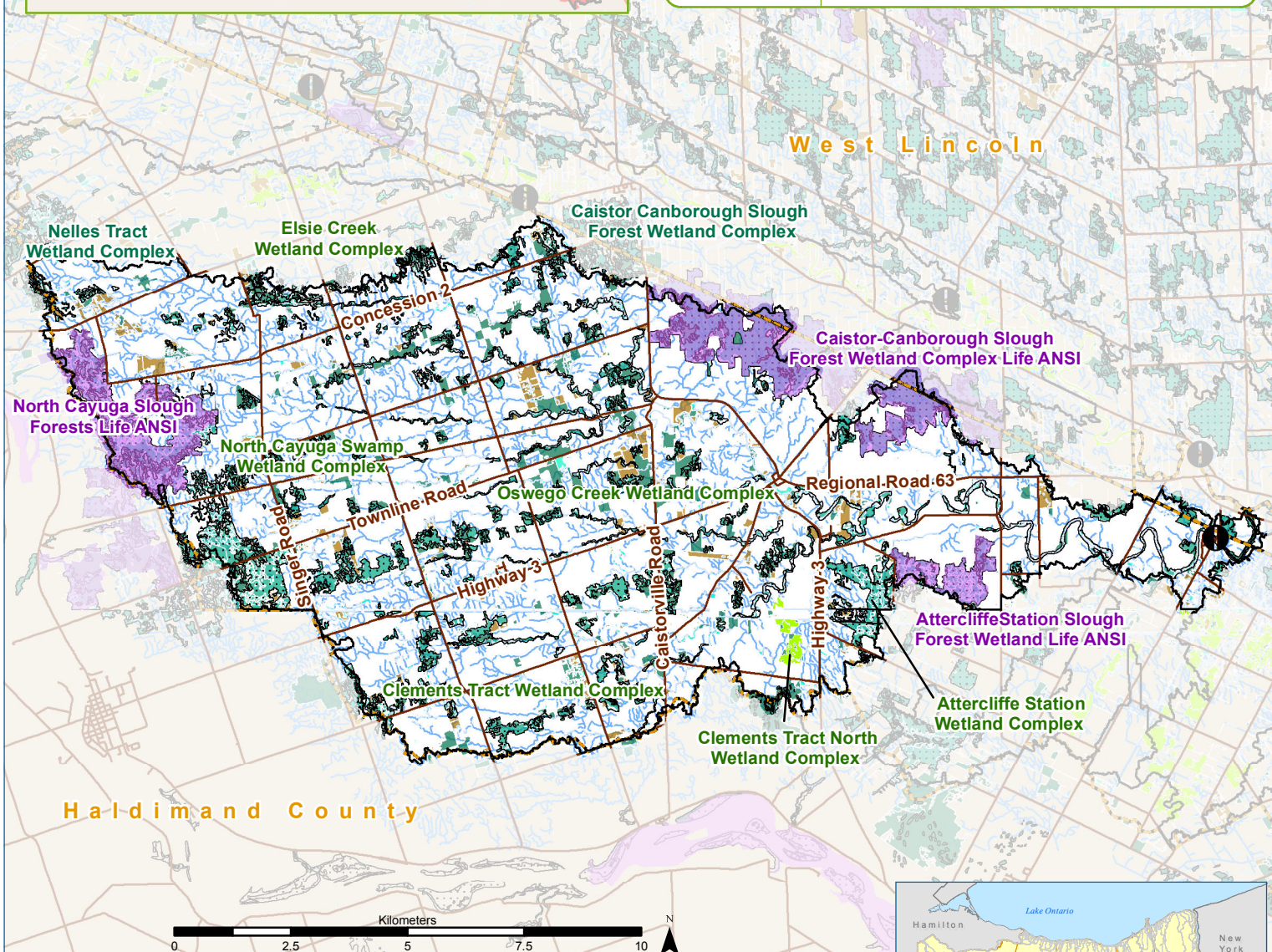
Surface Water Quality	D
Forest Conditions	D

Groundwater



Watershed Characteristics

Municipalities	Haldimand County (99%) West Lincoln (1%)
Significant Natural Areas	<p>Provincially Significant Wetlands: Oswego Creek Wetland Complex, Clements Tract Wetland Complex, Attercliffe Station Wetland Complex, Caistor Canborough Slough Forest Wetland Complex, North Cayuga Swamp Wetland Complex</p> <p>Locally Significant Wetland: Clements Tract North Wetland Complex</p> <p>Areas of Natural and Scientific Interest: North Cayuga Slough Forest, Caistor-Canborough Slough Forest, and Attercliffe Station Slough Forest</p>



- | | | |
|------------------------------|---|---|
| General Natural Areas | Successional | Surface Water Quality Monitoring Station |
| Rock Barren | Wetland | Provincial Groundwater Monitoring Network |
| Bluff | Swamp | Watercourses |
| Shoreline | Wooded Area | Roads |
| Open Water | Provincially Significant Wetland | Significant Groundwater Recharge Area |
| | Locally Significant Wetland | Highly Vulnerable Aquifer |
| | Area of Natural and Scientific Interest | Subwatershed Boundary |



Surface Water Quality

GRADE

D

Surface water quality monitoring of Oswego Creek on Diltz Road was initiated in 2003 and was given an overall grade of D. The water quality of this watershed regularly exceeded the provincial guideline for phosphorus and met the guideline for *E. coli*. Algal blooms occurred regularly at this site due to high phosphorus concentrations. Sediment runoff from rural land use has been increasing steadily since 2003 in Oswego Creek. The benthic community found in this watershed mainly consisted of pollutant tolerant animals and indicated impaired water quality. Watershed initiatives that reduce nutrient contamination will improve the water quality of Oswego Creek.

Indicators		2007 - 2011	Provincial Guideline	Indicator Description
Phosphorus	(µg/L)*	420	30	Phosphorus is found in products such as soap, detergent, and fertilizer as well as waste, and contributes to excess algae and low oxygen in streams and rivers
	Grade	F	B	
Bacteria	(<i>E. coli</i> /100ml)**	92	100	<i>E. coli</i> is a fecal coliform bacteria found in human and animal (livestock/wildlife/pets) waste and, in water, indicates fecal contamination. <i>E. coli</i> is a strong indicator for the potential to have other disease-causing organisms in the water.
	Grade	B	B	
Benthic	(FBI)	7.18	<5.00 (Target Only)	Benthic organisms (aquatic invertebrates that live in stream sediments) are good indicators of water quality and stream health. The Family Biotic Index (FBI) scores each taxa according to its pollution tolerance.
	Grade	F	B	

*75th percentile, NPCA data. **Geometric mean, NPCA data. Province-wide Grading System used.

Forest Conditions

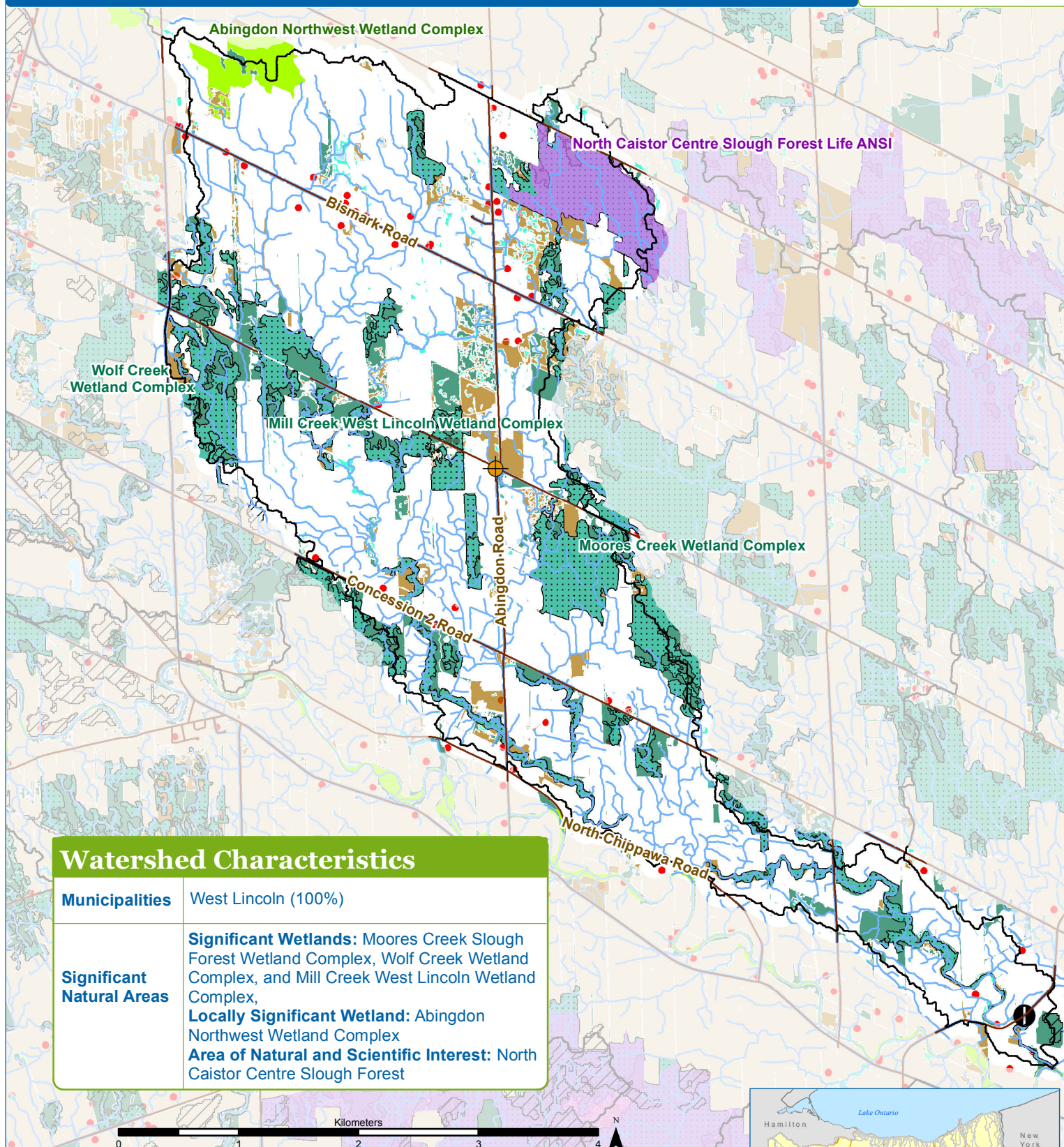
GRADE

D

The forest condition indicators for the Oswego Creek watershed produced an overall grade of D. The Forest Cover % received a grade of C, attributed to very large contiguous slough forest complexes mainly in the headwaters of this system. The Forest Interior % received a grade of D attributed to those large forest complexes in the headwaters as well. The Riparian Zone Forested % received a grade of C as many of the forested areas throughout the remainder of the system are found along the watercourses.

Indicators		2007 - 2011	S. Ont. Target**	Indicator Description
Forest Cover	%	24	30	Percent forest cover is the percentage of the watershed that is forested or wooded. Forest cover includes upland and lowland forest types.
	Grade	C	B	
Forest Interior	%	5.4	10.0	Percent forest interior is the percentage of the watershed that is forested interior. Forest interior is the protected core area 100 m inside a woodlot that some bird species require to nest successfully. The outer 100 m is considered 'edge' habitat and is prone to high predation, wind damage and alien species invasion.
	Grade	D	B	
Riparian Zone Forested	%	29.1	50.0	Percent riparian zone forested is a measure of the amount of forest cover within a 30 m riparian/buffer zone adjacent to all open watercourses. Riparian habitats support high numbers of wildlife species and provide an array of ecological functions.
	Grade	C	B	

** Targets for southern Ontario based on Environment Canada (2004) and Conservation Ontario (2011)



Watershed Characteristics

Municipalities	West Lincoln (100%)
Significant Natural Areas	<p>Significant Wetlands: Moores Creek Slough Forest Wetland Complex, Wolf Creek Wetland Complex, and Mill Creek West Lincoln Wetland Complex,</p> <p>Locally Significant Wetland: Abingdon Northwest Wetland Complex</p> <p>Area of Natural and Scientific Interest: North Caistor Centre Slough Forest</p>

General Natural Areas

- Rock Barren
- Bluff
- Shoreline
- Open Water

Successional

- Wetland
- Swamp
- Wooded Area
- Provincially Significant Wetland
- Locally Significant Wetland
- Area of Natural and Scientific Interest

Surface Water Quality Monitoring Station

- Provincial Groundwater Monitoring Network
- Watercourses
- Roads
- Highly Vulnerable Aquifer
- Subwatershed Boundary



GRADE

D

Surface Water Quality

Surface water quality monitoring of Mill Creek on Smithville Road was initiated in 2003 and was given an overall grade of D. The water quality of this watershed regularly exceeded provincial guidelines for phosphorus and *E. coli*. Algal blooms occurred regularly at this site due to high phosphorus concentrations. Exceedances of chloride and nitrate were also observed at this site. The benthic community found in this watershed mainly consisted of pollutant tolerant animals and indicated impaired water quality. Watershed initiatives that reduce nutrient and bacteria contamination will improve the water quality of Mill Creek.

Indicators		2007 - 2011	Provincial Guideline	Indicator Description
Phosphorus	(µg/L)*	190	30	Phosphorus is found in products such as soap, detergent, and fertilizer as well as waste, and contributes to excess algae and low oxygen in streams and rivers
	Grade	F	B	
Bacteria	(<i>E. coli</i> /100ml)**	106	100	<i>E. coli</i> is a fecal coliform bacteria found in human and animal (livestock/wildlife/pets) waste and, in water, indicates fecal contamination. <i>E. coli</i> is a strong indicator for the potential to have other disease-causing organisms in the water.
	Grade	C	B	
Benthic	(FBI)	8.00	<5.00	Benthic organisms (aquatic invertebrates that live in stream sediments) are good indicators of water quality and stream health. The Family Biotic Index (FBI) scores each taxa according to its pollution tolerance.
	Grade	F	B	

*75th percentile, NPCA data. **Geometric mean, NPCA data. Province-wide Grading System used.

GRADE

C

Forest Conditions

The forest condition indicators for Mill Creek watershed produced an overall grade of C. The Forest Cover % received a grade of B, attributed mainly to a large forested area in the headwaters of the system. The Forest Interior % grade of D is representative of the lack of connectivity between the forested patches that exist. The Riparian Zone Forested % received a grade of D due to the successional nature of the vegetation that exists along the watercourses in the watershed.

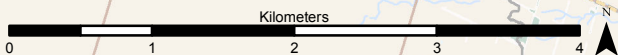
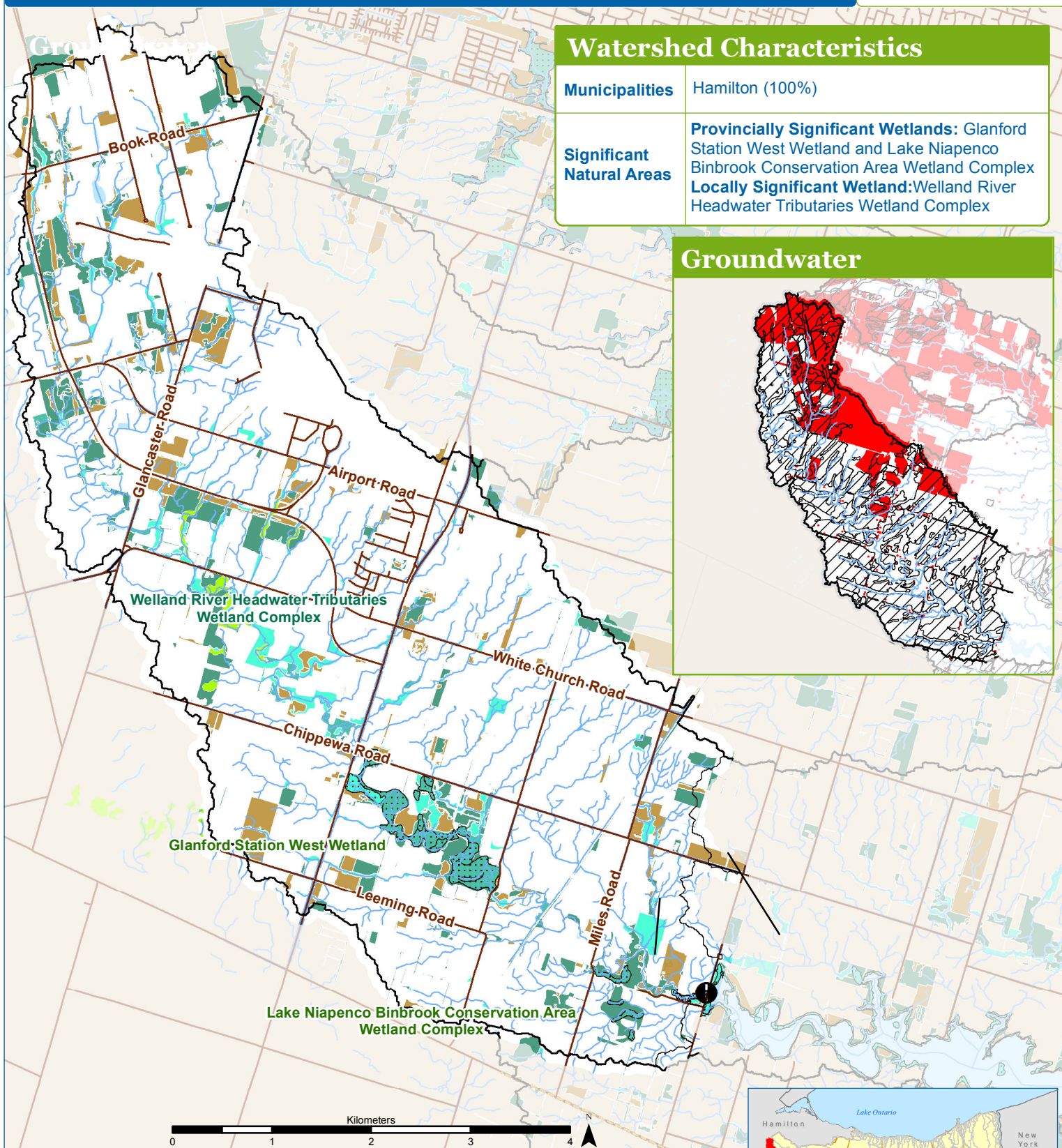
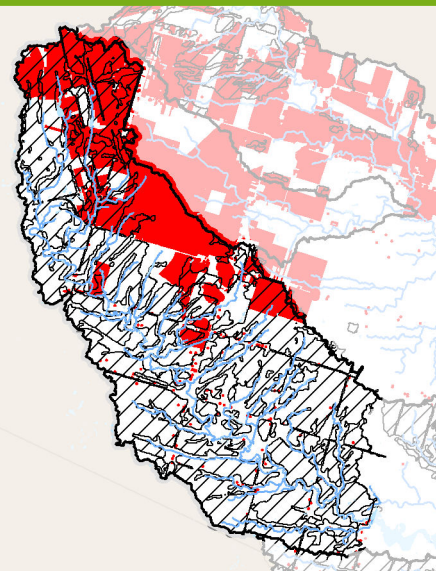
Indicators		2007 - 2011	S. Ont. Target**	Indicator Description
Forest Cover	%	26	30	Percent forest cover is the percentage of the watershed that is forested or wooded. Forest cover includes upland and lowland forest types.
	Grade	B	B	
Forest Interior	%	3.8	10.0	Percent forest interior is the percentage of the watershed that is forested interior. Forest interior is the protected core area 100 m inside a woodlot that some bird species require to nest successfully. The outer 100 m is considered 'edge' habitat and is prone to high predation, wind damage and alien species invasion.
	Grade	D	B	
Riparian Zone Forested	%	26.7	50.0	Percent riparian zone forested is a measure of the amount of forest cover within a 30 m riparian/buffer zone adjacent to all open watercourses. Riparian habitats support high numbers of wildlife species and provide an array of ecological functions.
	Grade	D	B	

** Targets for southern Ontario based on Environment Canada (2004) and Conservation Ontario (2011)

Watershed Characteristics

Municipalities	Hamilton (100%)
Significant Natural Areas	Provincially Significant Wetlands: Glanford Station West Wetland and Lake Niapenco Binbrook Conservation Area Wetland Complex Locally Significant Wetland: Welland River Headwater Tributaries Wetland Complex

Groundwater



General Natural Areas

- Rock Barren
- Bluff
- Shoreline
- Open Water

Successional

- Wetland
- Swamp
- Wooded Area
- Provincially Significant Wetland
- Locally Significant Wetland

Surface Water Quality Monitoring Station

- Watercourses
- Roads
- Significant Groundwater Recharge Area
- Highly Vulnerable Aquifer
- Subwatershed Boundary



GRADE

D

Surface Water Quality

Surface water quality monitoring of the Welland River upstream of Binbrook Reservoir on Tyneside Road was initiated in 2002 and was given an overall grade of D. The water quality of this watershed regularly exceeded provincial guidelines for phosphorus and *E. coli*. Concentrations of phosphorus and *E. coli* have been increasing since 2002 suggesting that water quality conditions are becoming more stressed. The benthic community found in this watershed mainly consisted of pollutant tolerant animals and indicated impaired water quality. Watershed initiatives that reduce nutrient and bacteria contamination will improve the water quality of the Welland River at this site.

Indicators		2007 - 2011	Provincial Guideline	Indicator Description
Phosphorus	(µg/L)*	322	30	Phosphorus is found in products such as soap, detergent, and fertilizer as well as waste, and contributes to excess algae and low oxygen in streams and rivers
	Grade	F	B	
Bacteria	(<i>E. coli</i> /100ml)**	168	100	<i>E. coli</i> is a fecal coliform bacteria found in human and animal (livestock/wildlife/pets) waste and, in water, indicates fecal contamination. <i>E. coli</i> is a strong indicator for the potential to have other disease-causing organisms in the water.
	Grade	C	B	
Benthic	(FBI)	6.96	<5.00	Benthic organisms (aquatic invertebrates that live in stream sediments) are good indicators of water quality and stream health. The Family Biotic Index (FBI) scores each taxa according to its pollution tolerance.
	Grade	F	B	

*75th percentile, NPCA data. **Geometric mean, NPCA data. Province-wide Grading System used.

GRADE

F

Forest Conditions

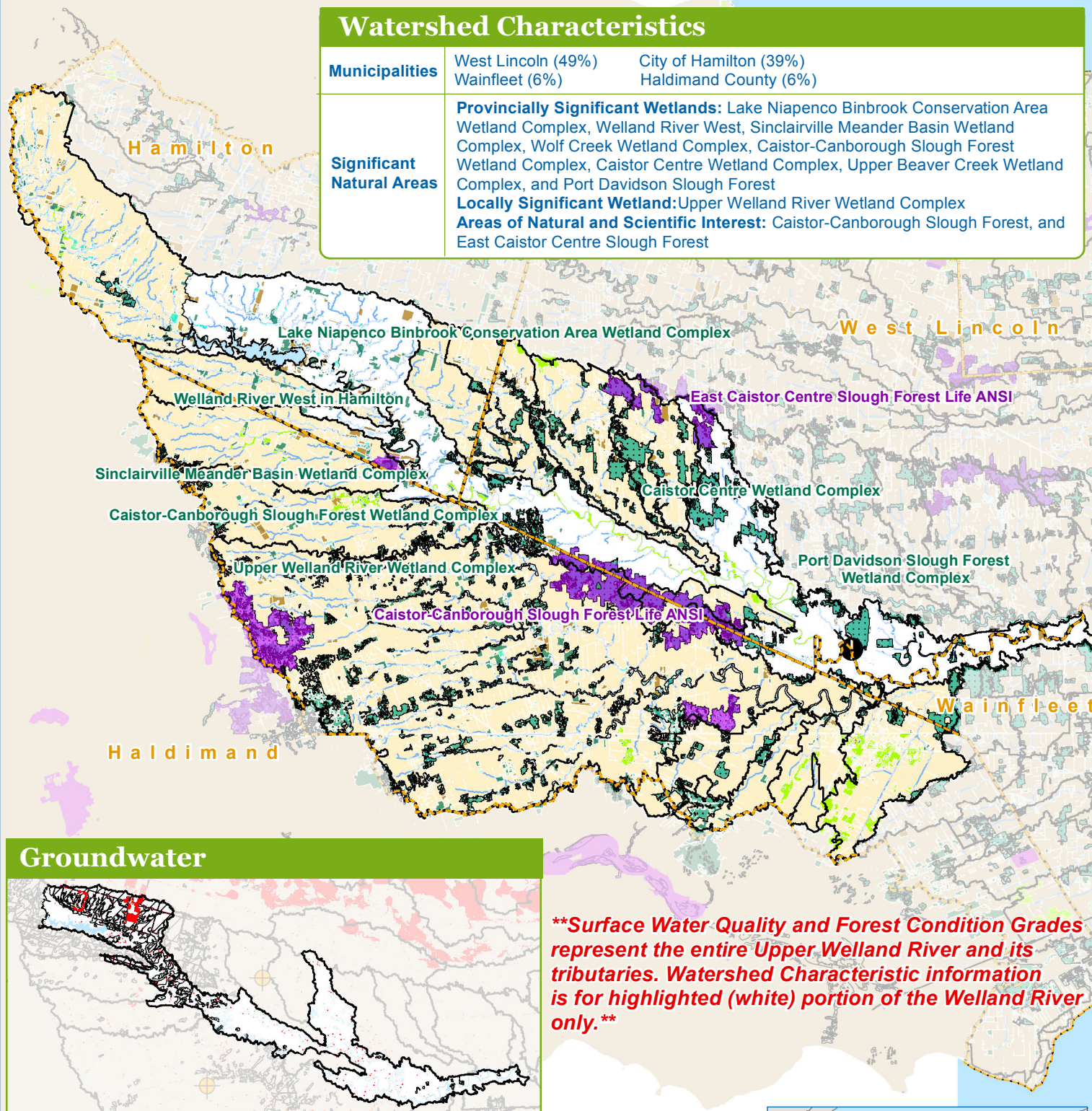
The forest condition indicators for the Welland River Binbrook watershed produced an overall grade of F. The Forest Cover % received a grade of D largely due to a small number of intact woodlots upstream of Regional Road 56. The Forest Interior % received a grade of F, at less than 1% and well below the provincial standard due to the fragmented nature of the woodlands in this watershed. The Riparian Zone Forested % also received a grade of F as the vegetation that does exist along the watercourses in this watershed is successional in nature.

Indicators		2007 - 2011	S. Ont. Target**	Indicator Description
Forest Cover	%	8.3	30	Percent forest cover is the percentage of the watershed that is forested or wooded. Forest cover includes upland and lowland forest types.
	Grade	D	B	
Forest Interior	%	0.2	10.0	Percent forest interior is the percentage of the watershed that is forested interior. Forest interior is the protected core area 100 m inside a woodlot that some bird species require to nest successfully. The outer 100 m is considered 'edge' habitat and is prone to high predation, wind damage and alien species invasion.
	Grade	F	B	
Riparian Zone Forested	%	11.1	50.0	Percent riparian zone forested is a measure of the amount of forest cover within a 30 m riparian/buffer zone adjacent to all open watercourses. Riparian habitats support high numbers of wildlife species and provide an array of ecological functions.
	Grade	F	B	

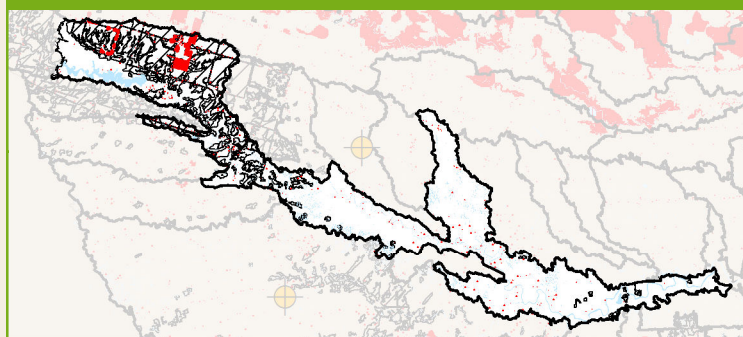
** Targets for southern Ontario based on Environment Canada (2004) and Conservation Ontario (2011)

Watershed Characteristics

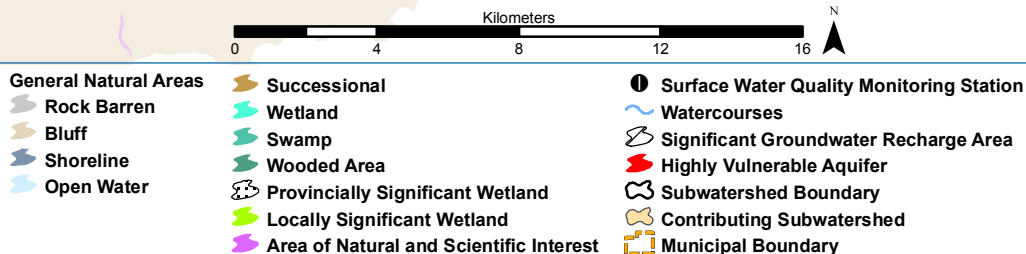
Municipalities	West Lincoln (49%) Wainfleet (6%)	City of Hamilton (39%) Haldimand County (6%)
Significant Natural Areas	<p>Provincially Significant Wetlands: Lake Niapenco Binbrook Conservation Area Wetland Complex, Welland River West, Sinclairville Meander Basin Wetland Complex, Wolf Creek Wetland Complex, Caistor-Canborough Slough Forest Wetland Complex, Caistor Centre Wetland Complex, Upper Beaver Creek Wetland Complex, and Port Davidson Slough Forest</p> <p>Locally Significant Wetland: Upper Welland River Wetland Complex</p> <p>Areas of Natural and Scientific Interest: Caistor-Canborough Slough Forest, and East Caistor Centre Slough Forest</p>	



Groundwater



****Surface Water Quality and Forest Condition Grades represent the entire Upper Welland River and its tributaries. Watershed Characteristic information is for highlighted (white) portion of the Welland River only.****



GRADE

D

Surface Water Quality

Surface water quality monitoring of the Welland River on North Chippawa Road was initiated in 2003 and was given an overall grade of D. This site represents the entire upper Welland River watershed and the water quality regularly exceeded the provincial guideline for phosphorus but met the guideline for *E. coli*. The lower portion of this watershed was prone to duckweed blooms in the summer likely due to high nutrients and low flow conditions. The benthic community found in this watershed mainly consisted of pollutant tolerant animals and indicated impaired water quality. Watershed initiatives that reduce nutrient contamination will improve the water quality of the Welland River.

Indicators		2007 - 2011	Provincial Guideline	Indicator Description
Phosphorus	(µg/L)*	195	30	Phosphorus is found in products such as soap, detergent, and fertilizer as well as waste, and contributes to excess algae and low oxygen in streams and rivers
	Grade	F	B	
Bacteria	(<i>E. coli</i> /100ml)**	53	100	<i>E. coli</i> is a fecal coliform bacteria found in human and animal (livestock/wildlife/pets) waste and, in water, indicates fecal contamination. <i>E. coli</i> is a strong indicator for the potential to have other disease-causing organisms in the water.
	Grade	B	B	
Benthic	(FBI)	6.38	<5.00	Benthic organisms (aquatic invertebrates that live in stream sediments) are good indicators of water quality and stream health. The Family Biotic Index (FBI) scores each taxa according to its pollution tolerance.
	Grade	D	B	

*75th percentile, NPCA data. **Geometric mean, NPCA data. Province-wide Grading System used.

GRADE

D

Forest Conditions

The forest condition indicators for, Welland River Wellandport watershed produced an overall grade of D. The Forest Cover % received a grade of C, attributed mainly to relatively large forested areas in the headwaters of the system. The Forest Interior % grade of D is representative of the lack of connectivity between the forested patches that exist. The Riparian Zone Forested % received a grade of D due to the successional nature of the vegetation that exists along the watercourses in the watershed.

Indicators		2007 - 2011	S. Ont. Target**	Indicator Description
Forest Cover	%	19	30	Percent forest cover is the percentage of the watershed that is forested or wooded. Forest cover includes upland and lowland forest types.
	Grade	C	B	
Forest Interior	%	4.0	10.0	Percent forest interior is the percentage of the watershed that is forested interior. Forest interior is the protected core area 100 m inside a woodlot that some bird species require to nest successfully. The outer 100 m is considered 'edge' habitat and is prone to high predation, wind damage and alien species invasion.
	Grade	D	B	
Riparian Zone Forested	%	27.0	50.0	Percent riparian zone forested is a measure of the amount of forest cover within a 30 m riparian/buffer zone adjacent to all open watercourses. Riparian habitats support high numbers of wildlife species and provide an array of ecological functions.
	Grade	D	B	

** Targets for southern Ontario based on Environment Canada (2004) and Conservation Ontario (2011)