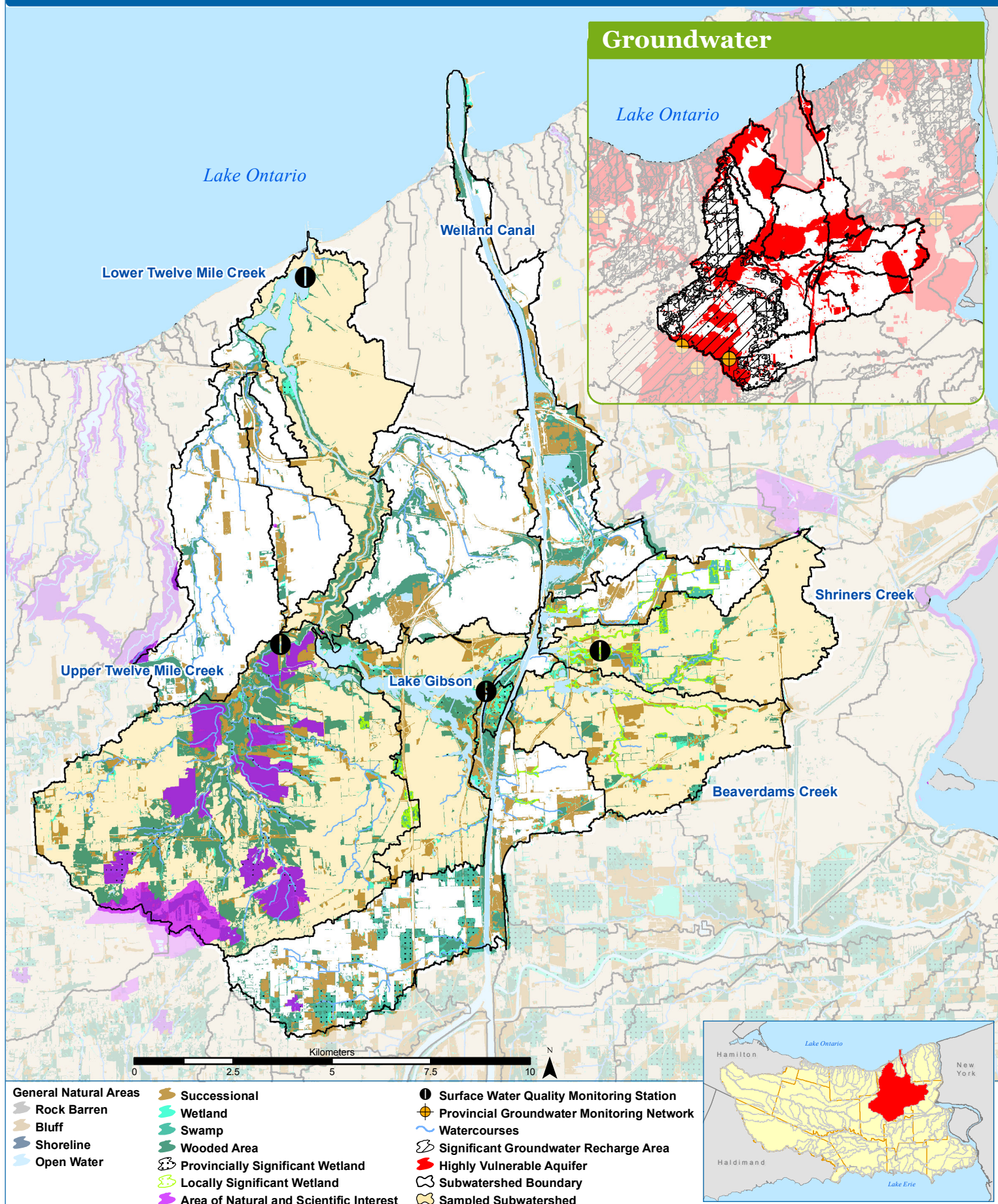


Twelve Mile Creek

2012 Watershed Report Card

Groundwater



Watershed Characteristics



Area	207.4 km ² encompassing the Twelve Mile Creek, Beaverdams Creek, and Shriners Creek watersheds.																														
Land Use	Agricultural and residential land uses dominate this watershed. Urban and residential land uses occur within pockets of Niagara Falls, Pelham, Thorold, St. Catharines, and Welland. Agriculture focuses on fruit, grain, and oilseed. There are numerous recreational opportunities including biking and hiking trails, fishing, golfing, and rowing. Short Hills Provincial Park offers access to a large natural area for activities such as hiking and horseback riding. The Lake Gibson wetland complex is located above the Niagara Escarpment and draws water from the Welland Canal for use at the DeCew Generating Station.																														
Soil Type	0.5% Upland escarpment, 34% Developed areas, 26% Mixed clay and loam, 4.5% Mixed sand and loam, 30% Mixed silt and loam, <0.1% Organic soils, 4.5% Water																														
Physiography	Dominated by the Haldimand Clay Plain extending south of the Escarpment which runs through the study area. Southern portions of the watershed touch the Fonthill Kame Moraine. Sand plains exist along some southern parts of the watershed as well as northern areas along Lake Ontario.																														
Dams & Barriers	Possible fish barriers could exist along waterways preventing movement along the watercourses.																														
Sewage Services	Urbanized areas are serviced by local wastewater treatment plants, while rural areas may be serviced by private septic systems. The City of St. Catharines has two sewage treatment plants.																														
% Natural Area Types	Total Natural Area= 58.55 km ² 52.7% Wooded, 6.6% Wetland, 5.6% Swamp, 35% Successional, <0.2% Unique																														
Woodlot or Patch Size	<table><tr><th>Size Category</th><th>Number of Woodlots</th><th>Total Woodland Area in WPA (ha)</th><th>% Woodland</th><th>Largest Woodlot (ha)</th></tr><tr><td>20 to 50 ha</td><td>19</td><td>674.88</td><td>3.25</td><td>41.53</td></tr><tr><td>50 to 75 ha</td><td>2</td><td>119.31</td><td>0.58</td><td>63.80</td></tr><tr><td>75 to 100 ha</td><td>2</td><td>156.73</td><td>0.76</td><td>80.90</td></tr><tr><td>100 to 200 ha</td><td>3</td><td>265.91</td><td>1.28</td><td>146.28</td></tr><tr><td>>200 ha</td><td>1</td><td>364.86</td><td>1.76</td><td>364.86</td></tr></table>	Size Category	Number of Woodlots	Total Woodland Area in WPA (ha)	% Woodland	Largest Woodlot (ha)	20 to 50 ha	19	674.88	3.25	41.53	50 to 75 ha	2	119.31	0.58	63.80	75 to 100 ha	2	156.73	0.76	80.90	100 to 200 ha	3	265.91	1.28	146.28	>200 ha	1	364.86	1.76	364.86
Size Category	Number of Woodlots	Total Woodland Area in WPA (ha)	% Woodland	Largest Woodlot (ha)																											
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100 to 200 ha	3	265.91	1.28	146.28																											
>200 ha	1	364.86	1.76	364.86																											
Fisheries Resources	Up to 59 species of fish have been identified in this study area. They include Brook Trout, Northern Pike, various Perch, and minnows. Twelve Mile Creek is the only identified cold water stream in the Niagara Region and has the only self-sustaining Brook Trout population.																														
Species at Risk	Birds such as the Barn Owl and Yellow-breasted Chat. Fish such as American Eel and Redside Dace. Mammals such as the Grey Fox. Plants including Butternut and Eastern Flowering Dogwood. Reptiles including the Eastern Milksnake.																														

Groundwater



Groundwater Vulnerability

The Niagara Water Strategy, NPCA Groundwater Study, and the Niagara Peninsula Source Protection Area Assessment Report have identified portions of Twelve Mile Creek watershed as highly vulnerable to groundwater contamination. This vulnerability is due to thin overburden and bedrock outcrops along the Niagara Escarpment, and at surface sand and gravel aquifers along Lake Ontario and the Fonthill Kame-Delta Complex. Thin overburden is unable to effectively provide the groundwater with sufficient protection from bacteria, sediment and other insoluble forms of contaminants that in thicker overburden would become trapped and filtered within the soil pores. In addition, the openings in the fractured bedrock allow for the direct passage of surface water and contaminants to groundwater resources and the at-surface aquifers allow direct access of contaminants to the water table.

Private Wells

Twelve Mile Creek watersheds are primarily serviced by municipal water supplies with only about 3% 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 Twelve Mile Creek watershed as at low stress levels with respect to groundwater supply relative to their overall demands.

Groundwater Monitoring

The NPCA has been monitoring five Provincial Groundwater Monitoring Network (PGMN) wells in the Twelve Mile Creek watershed since 2003. All five PGMN wells (W357, W361-2, W361-3, W362-2 & W362-3) are located in Pelham and monitor the chemistry and water levels of the Fonthill Kame-Delta Complex. Water quality results for PGMN well W361-2 exceeded Ontario Drinking Water Quality Standards (ODWQS) for nitrate. The nitrate exceedance was thoroughly investigated by Ministry of Environment, NPCA, Municipal and Public Health staff and found to be caused by contamination from the adjacent landuse. NPCA and Public Health staff sampled nearby private wells and determined that contamination was isolated to the PGMN well. PGMN wells W361-3 & W362-2 exceeded ODWQS for sodium. These exceedances were also investigated and found to be caused by natural groundwater conditions. Data for these PGMN wells show that groundwater levels generally decline from May to October, and increase from fall to spring with the largest increase in March. Some of these PGMN groundwater levels were lowest in 2007 during a significant drought year.

Stewardship Highlights



The 12 Mile Creek Watersheds have 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 19 water and habitat improvement projects with the assistance of the NPCA's Water Quality Improvement Program and other organizations such as *Ducks Unlimited Canada* (DUC), *Ontario Power Generation* (OPG), *Niagara Restoration Council* (NRC), *St. Catharines Green Committee*, and *Land Care Niagara* (LCN). These projects included Farm Best Management Practices as well as forest, stream and wetland habitat enhancements, using over 26000 native trees, shrubs and wildflowers.
- The NPCA has undertaken several projects at St. Johns Conservation Area including a 0.2 hectare erosion control project in conjunction with an adjacent landowner, an invasive non-native fish species removal and the installation of new information kiosk signs.



- Between 2007-2010, 26 elementary schools within the 12 Mile Creek Watershed Area participated in the *NPCA's* ECO School schoolyard naturalization program. This program has now been replaced by the *NPCA's* current Canopies for Kids program which has seen 6 elementary schools with little or no natural cover receive 25 shade trees for their school yards.
- Since 2008, the *NPCA* and dedicated volunteers from several local naturalist clubs and community organizations have been coordinating the Niagara Envirothon, a Regional competition associated with the Ontario Forestry Associations Provincial Envirothon and the Canon Envirothon which is North America's largest high school environmental education competition. Several schools from the 12 Mile Creek Watershed have participated since 2008 and in 2011 Sir Winston Churchill High School placed 2nd.
- Since 2007 other community groups and organizations such as the *St. Catharines Green Committee*, *Friends of Short Hills Park*, *Trout Unlimited Canada*, and *Carolinian Canada Coalition* and others 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 12 Mile Creek Watershed Area.
- Through Trout Unlimited Canada's Yellow Fish Road program, The *NPCA* coordinated 14 events in the 12 Mile Creek Watershed Area. 248 people from local community groups helped paint yellow fish on 364 stormwater drains and distributed 1113 door hangers to inform the public that the water (clean and dirty) that goes down these drains ends up in our local water bodies.
- OPG has increased native forest cover in the watershed in partnership with the Region of Niagara, *Niagara Restoration Council*, *Bruce Trail Conservancy* and *Niagara College* through the *DeCew Headworks Project*. This project involved the planting of 5.6 hectares of land on the brow of the Niagara Escarpment. In addition, OPG monitors amphibian and reptile populations within the Twelve Mile Creek watershed.
- The *Niagara Restoration Council*, in partnership with the *Mel Swart Park Committee* and *OPG*, restored 32.4 hectares within the Thorold-Lake Gibson corridor to increase the interior forest for a suite of species requiring this undisturbed habitat.
- The *Bruce Trail Conservancy* has been active in the Twelve Mile Creek watershed as the trail runs through the watershed. Several garbage clean ups have taken place on properties managed by BTC.



There has been much research completed on improving the health of the 12 Mile Creek Watershed 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.

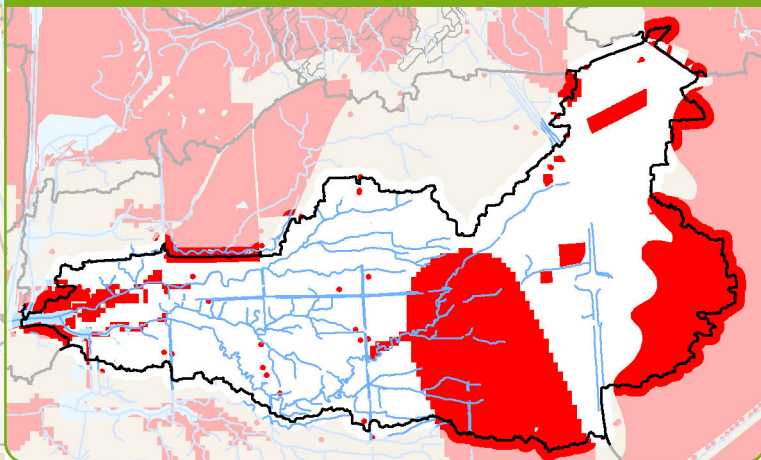
Shriners Creek

2012 Watershed Report Card

GRADES

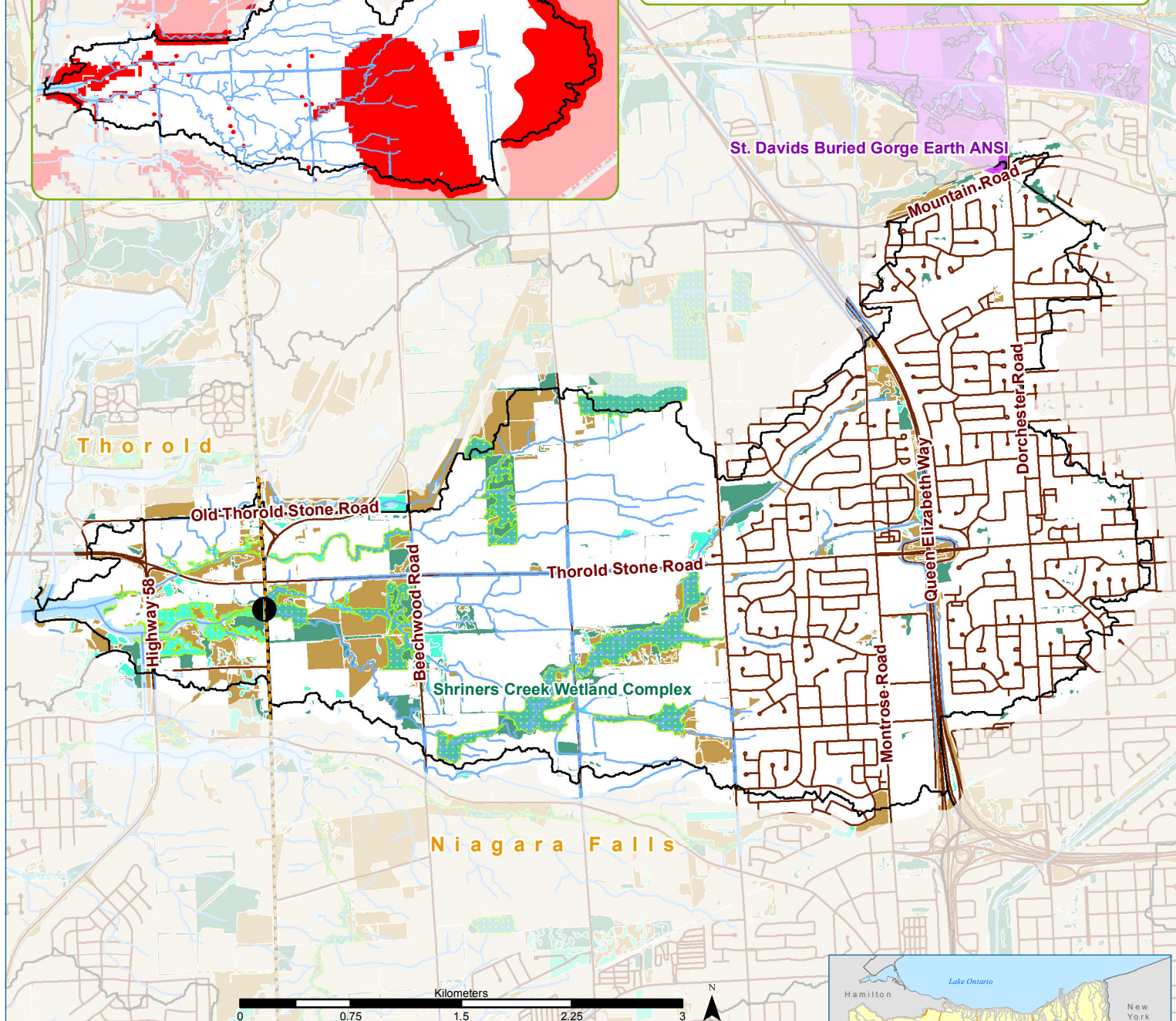
Surface Water Quality	D
Forest Conditions	D

Groundwater



Watershed Characteristics

Municipalities	Niagara Falls (92%) Thorold (8%)
Significant Natural Areas	Locally Significant Wetland: Shriners Creek Wetland Complex Area of Natural and Scientific Interest: St. Davids Buried Gorge



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



GRADE

D

Surface Water Quality

Surface water quality monitoring of Shriners Creek near Thorold Stone Road was initiated in 2008 and was given an overall grade of D. The water quality of this watershed regularly exceeded the provincial guidelines for phosphorus and *E. coli*. High concentrations of chloride have also been observed in this creek and this is likely from road salt contamination. 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 Shriners Creek.

Indicators		2007 - 2011	Provincial Guideline	Indicator Description
Phosphorus	(µg/L)*	120	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	D	B	
Bacteria	(<i>E. coli</i> /100ml)**	157	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)	6.48	<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.

GRADE

D

Forest Conditions

The forest condition indicators for Shriners Creek watershed produced an overall grade of D. The Forest Cover % received a grade of D due in part to two large forested patches in the upper reaches of the system east of Taylor Road. The Forest Interior % grade of F however was well below the provincial standard. This grade can be attributed to the lack of connectivity between the forest patches that do remain. The Riparian Zone Forested % received a grade of D as many of the large intact forest patches are within the valley lands along the watercourses particularly in the area south of Thorold Road along Garner Road.

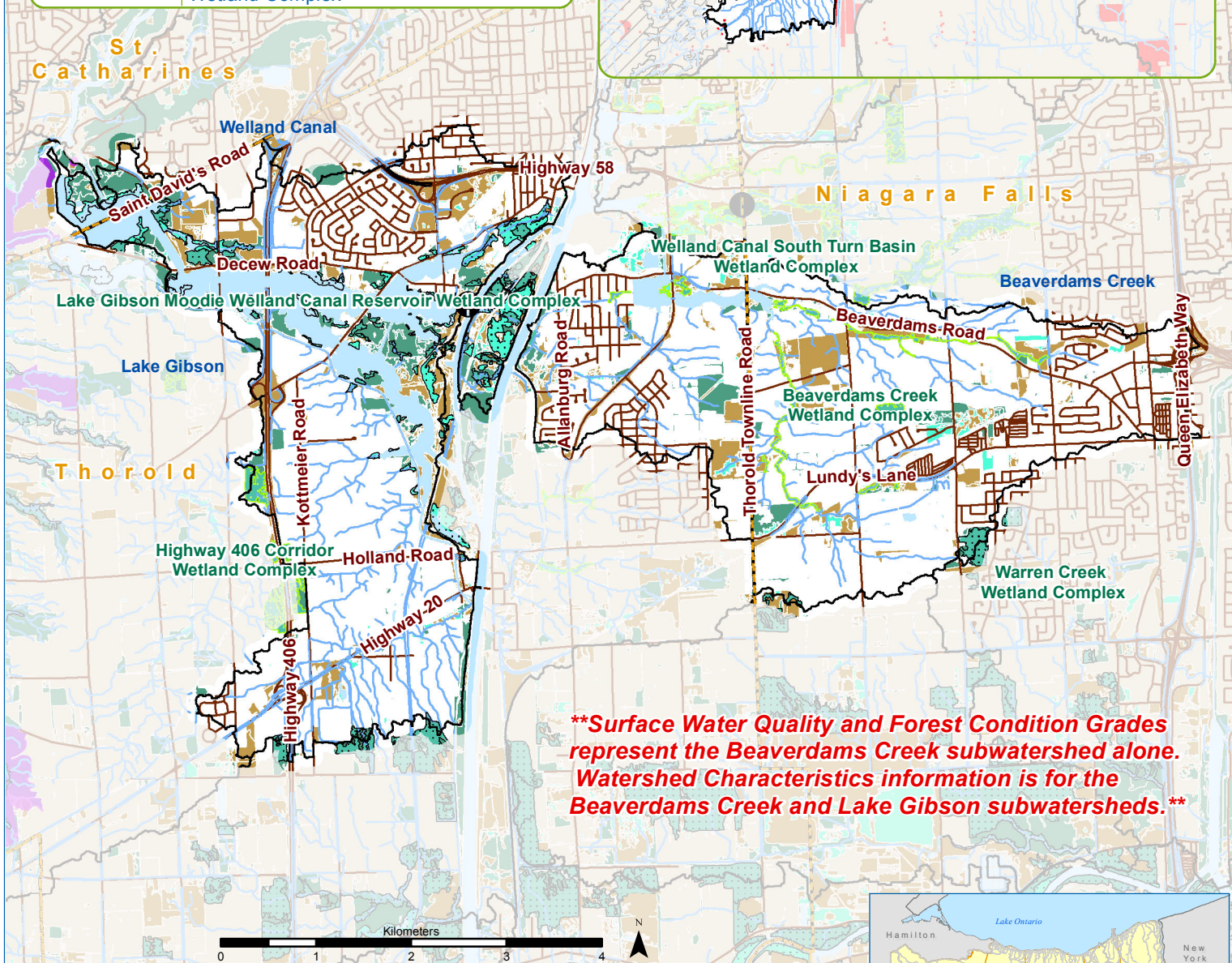
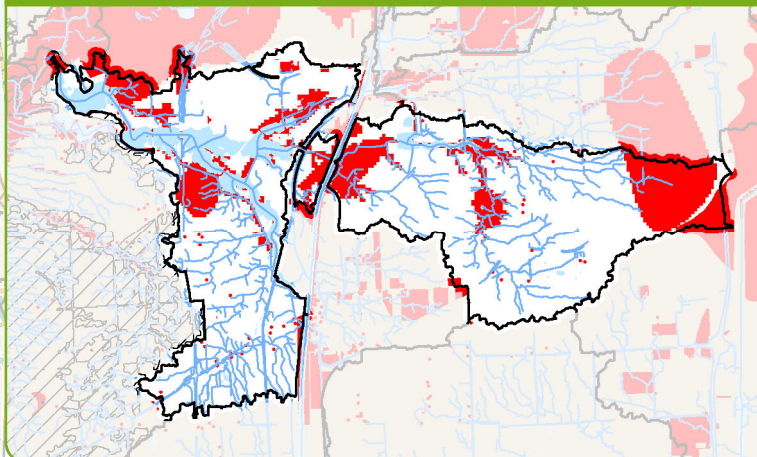
Indicators		2007 - 2011	S. Ont. Target**	Indicator Description
Forest Cover	%	8	30	Percent forest cover is the percentage of the watershed that is forested or wooded. Forest cover includes upland and lowland forest types.
	Grade	D	B	
Forest Interior	%	0	10.0	Percent forest interior is the percentage 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	%	20.2	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	Thorold (64%) Niagara Falls (34%) St. Catharines (2%)
Significant Natural Areas	Provincially Significant Wetlands: Warren Creek Wetland Complex, Lake Gibson Moodie Welland Canal Reservoir Wetland Complex, and Port Robinson Woodlot Wetland Complex Locally Significant Wetlands: Beaverdams Creek Wetland Complex, Welland Canal Turn Basin Wetland Complex, and Highway 406 Corridor 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
- Highly Vulnerable Aquifer
- Subwatershed Boundary
- Municipal Boundary



GRADE

D

Surface Water Quality

Surface water quality monitoring of Beaverdams Creek near Marlatts Road was initiated in 2008 and was given an overall grade of D. The water quality of this watershed regularly exceeded the provincial guidelines for phosphorus and *E. coli*. High concentrations of total suspended solids have also been observed in this creek. 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 Beaverdams Creek.

Indicators		2007 - 2011	Provincial Guideline	Indicator Description
Phosphorus	(µg/L)*	350	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)**	142	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)	7.12	<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.

GRADE

F

Forest Conditions

The forest condition indicators for Beaverdams Creek watershed produced an overall grade of F. The Forest Cover % received a grade of D due in part to several small forest patches in the headwaters of the watershed and the patches that remain along Thorold Townline Road. The Forest Interior % grade of F was well below the provincial standard. This grade can be attributed to the lack of connectivity between the forest patches that do remain. The Riparian Zone Forested % also received a grade of F as the vegetation that does exist along watercourses is largely successional in nature.

Indicators		2007 - 2011	S. Ont. Target**	Indicator Description
Forest Cover	%	6	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	%	0.1	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	%	9.8	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)

Upper Twelve Mile Creek

2012 Watershed Report Card

GRADES

Surface Water Quality **C**

Forest Conditions **C**

Watershed Characteristics

Municipalities

Pelham (51%)
Thorold (45%)
St. Catharines (4%)

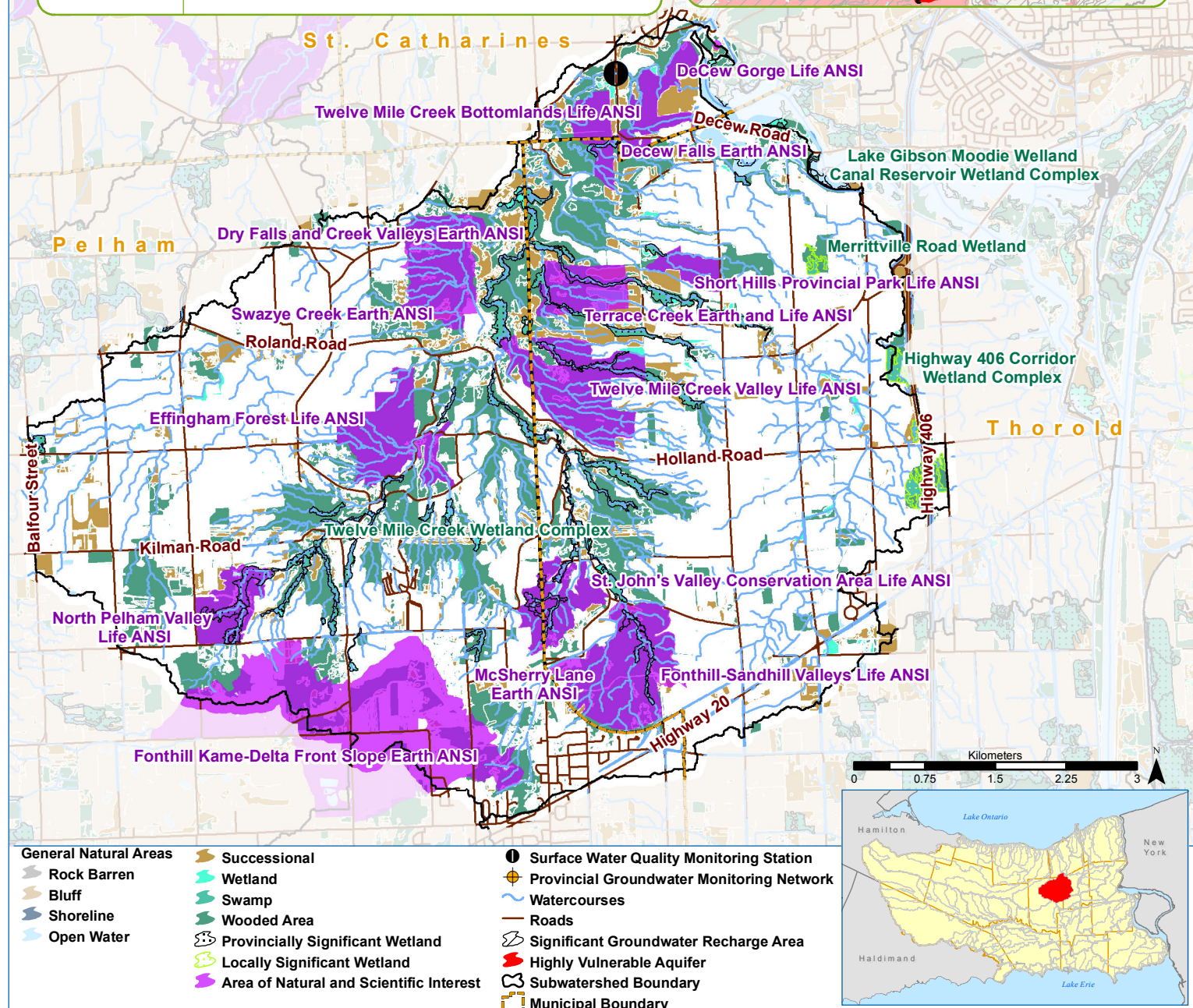
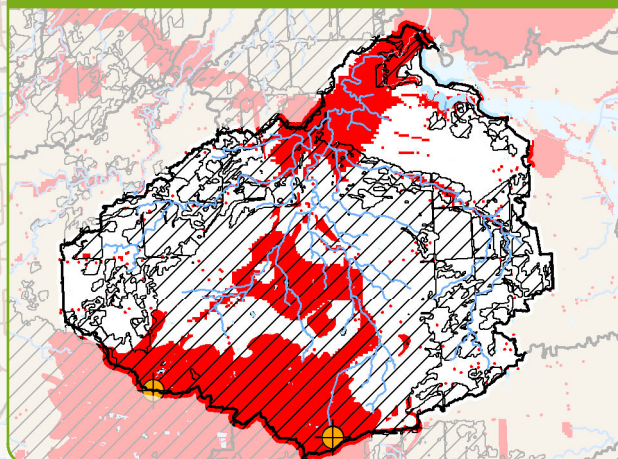
Significant Natural Areas

Provincially Significant Wetlands: Lake Gibson Moodie Welland Canal Reservoir Wetland Complex and Twelve Mile Creek Wetland Complex

Locally Significant Wetlands: Merrittville Road Wetland and Highway 406 Corridor Wetland Complex

Areas of Natural and Scientific Interest: Decew Gorge, Decew Falls, Twelve Mile Creek Bottomlands, Short Hills Provincial Park, Terrace Creek, Twelve Mile Creek Valley, Dry Falls and Creek Valleys, Swayze Creek, Effingham Forest, St. Johns Valley Conservation Area, McSherry Lane, Fonthill-Sandhill Valleys, Fonthill Kame-Delta Front Slope, and North Pelham Valley

Groundwater



GRADE

C

Surface Water Quality

Surface water quality monitoring of the Upper Twelve Mile Creek on 1st Louth Street was initiated in 1977 and was given an overall grade of C. Although the water quality regularly exceeded the provincial guidelines for phosphorus and *E. coli*, there are sections of Upper Twelve Mile Creek watershed (Effingham and St. Johns) that have the best water quality in the entire NPCA watershed. The benthic community found in this watershed consisted of pollutant sensitive animals and achieved the Benthic Indicator target. Watershed initiatives that reduce nutrient and bacteria contamination will improve the water quality of the Upper Twelve Mile Creek.

Indicators		2007 - 2011	Provincial Guideline	Indicator Description
Phosphorus	(µg/L)*	120	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	D	B	
Bacteria	(<i>E. coli</i> /100ml)**	180	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)	4.71	<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	B	B	

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

GRADE

C

Forest Conditions

The forest condition indicators for Upper Twelve Mile Creek watershed produced an overall grade of C. The Forest Cover % received a grade of B which can be attributed to large contiguous forested areas throughout the upper reaches of this system including Short Hills Provincial Park. The Forest Interior % grade of D was still below the provincial target. This grade is linked to issues with connectivity between the forests that are being addressed in part through a concentrated restoration effort in this watershed. The Riparian Zone Forested % received a grade of B as many of the large intact forests are within the valley lands along the watercourses.

Indicators		2007 - 2011	S. Ont. Target**	Indicator Description
Forest Cover	%	33	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	%	4.7	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	%	45.9	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	B	B	

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

Lower Twelve Mile Creek

2012 Watershed Report Card

GRADES

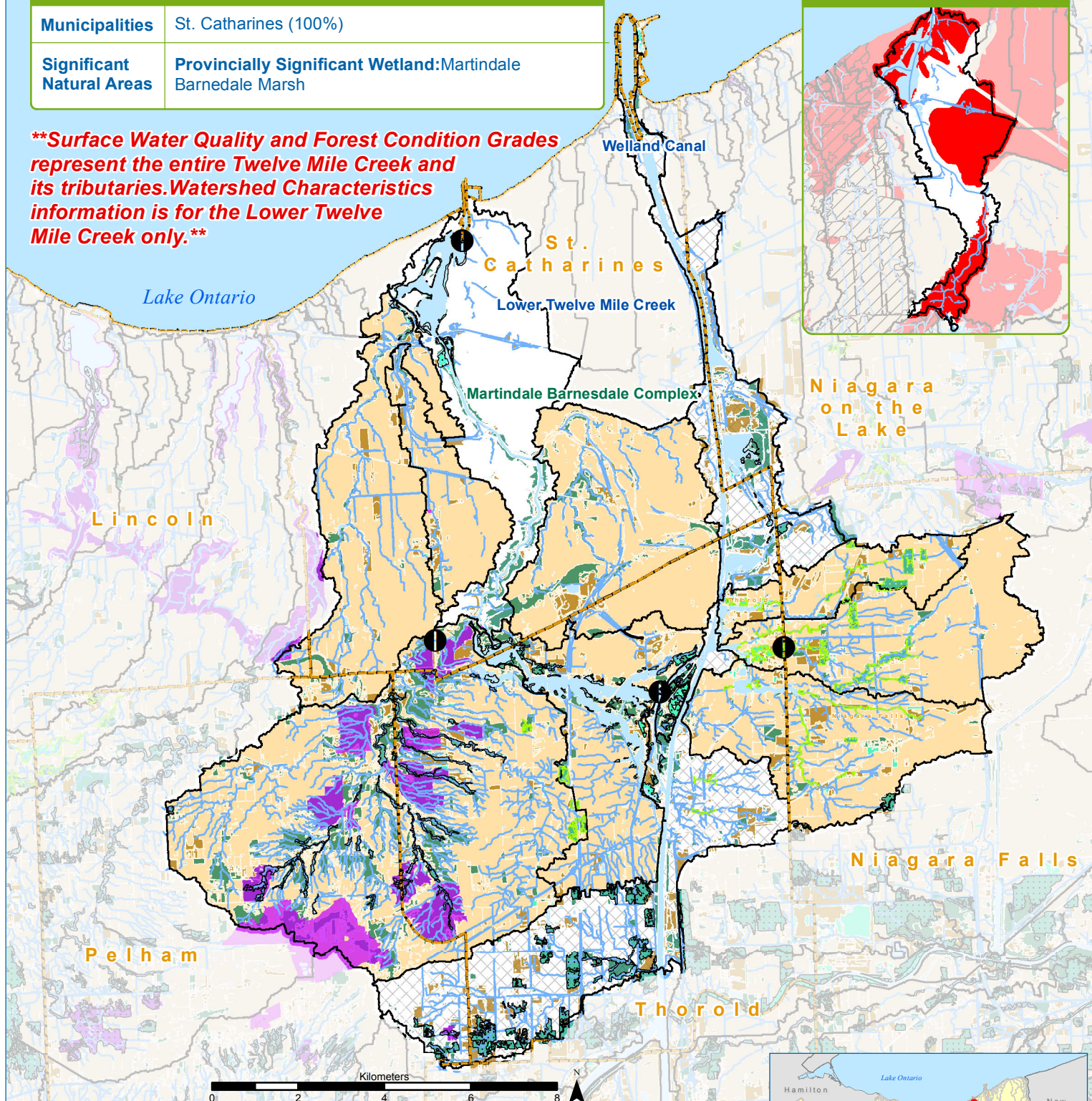
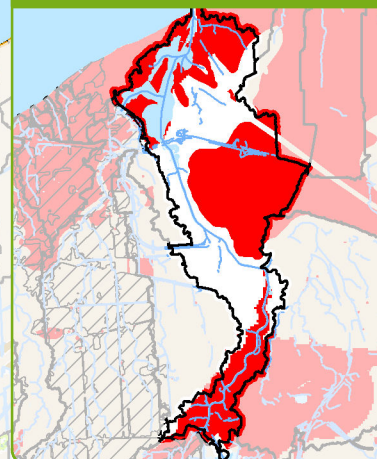
Surface Water Quality	B *
Forest Conditions	C *

Watershed Characteristics

Municipalities	St. Catharines (100%)
Significant Natural Areas	Provincially Significant Wetland: Martindale Barnesdale Marsh

****Surface Water Quality and Forest Condition Grades represent the entire Twelve Mile Creek and its tributaries. Watershed Characteristics information is for the Lower Twelve Mile Creek only.****

Groundwater



- | | | |
|---|---|--|
| General Natural Areas
Rock Barren
Bluff
Shoreline
Open Water | Successional
Wetland
Swamp
Wooded Area
Provincially Significant Wetland | Surface Water Quality Monitoring Station
Watercourses
Roads
Highly Vulnerable Aquifer
Subwatershed Boundary
Contributing Subwatershed
Municipal Boundary |
|---|---|--|



GRADE

B

Surface Water Quality

Surface water quality monitoring of the Lower Twelve Mile Creek on Lakeport Road was initiated in 1977 and this station represents the entire Twelve Mile Creek watershed. It was given an overall grade of B because water quality met the provincial guidelines for phosphorus and *E. coli* and achieved the highest quality grade in the NPCA watershed. Water quality is better in this section of the watershed because clean water is diverted from Lake Gibson into Twelve Mile Creek for Ontario Power Generation which dilutes the concentrations of contaminants in the water. The benthic community has not been sampled at this location but will be in the future.

Indicators		2007 - 2011	Provincial Guideline	Indicator Description
Phosphorus	(µg/L)*	30	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	B	B	
Bacteria	(<i>E. coli</i> /100ml)**	81	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)	n/a	<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		B	

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

GRADE

C

Forest Conditions

The forest condition indicators for Lower Twelve Mile Creek watershed produced an overall grade of C. The Forest Cover % received a grade of B due in part to the fact that this grade accounts for the entire watershed and there is good cover in the upper watershed as well as large patches of forest in the Lake Gibson area on Ontario Power Generation and canal lands. The Forest Interior % grade of F however was well below the provincial standard. This grade can be attributed to the lack of connectivity between the forest patches that do remain. The Riparian Zone Forested % received a grade of C as many of the large intact forest patches are within the valley lands along the watercourses.

Indicators		2007 - 2011	S. Ont. Target**	Indicator Description
Forest Cover	%	17	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	%	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	%	30.5	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)