Niagara Peninsula Conservation Authority 2012 Watershed Report Cards



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NPCA Watershed Partners

We are pleased to acknowledge the cooperation and support of our watershed partners.

- Niagara Region
- City of Hamilton
- Haldimand County
- Town of Fort Erie
- Town of Grimsby
- Town of Lincoln
- City of Niagara Falls
- Town of Niagara-on-the-Lake
- Town of Pelham
- City of Port Colborne
- City of St. Catharines
- City of Thorold
- Township of Wainfleet
- City of Welland
- Township of West Lincoln
- Ontario Ministry of the Environment
- Environment Canada
- Ontario Ministry of Agriculture, Food and Rural Affairs
- Niagara Escarpment Commission
- Ontario Ministry of Natural Resources



Executive Summary



The Niagara Peninsula Conservation Authority (*NPCA*) is pleased to present the <u>2012 Watershed Report Card</u>. Since 2005 the *NPCA* and its partners have produced report cards to inform its residents on the overall health of the *NPCA* watershed. The 2012 *NPCA* Watershed Report Card is part of an initiative by conservation authorities to evaluate key indicators of watershed health with guidelines and grading system provided by Conservation Ontario. This standardized reporting format also provides an opportunity to compare the health of the *NPCA* watershed with other watersheds in Ontario.

The 2012 NPCA Watershed Report Card consists of 8 Watershed Planning Area (WPA) sections which contain 44 individual report cards. Each section provides information on Watershed Characteristics, Stewardship Highlights, and Groundwater. In addition, within each WPA the NPCA assesses and grades surface water quality and forest conditions. Surface water quality indicators include total phosphorus, bacteria (*E. coli*) and benthic invertebrate community. Forest condition indicators include percent forest cover, percent forest interior, and percent riparian zone forested. The NPCA has used the best available data to produce these Report Cards. This Watershed Report Card does not include grades for the entire NPCA watershed because there was limited data available. These watersheds include the Welland Canal watershed and many small watersheds that drain into Lake Erie, Lake Ontario and the Niagara River. These watersheds are marked as insufficient data on all mapping in the NPCA Watershed Report Card.

Surface water quality grades for the *NPCA* watersheds range from C to F with the majority of watersheds scoring D. Overall, the poorest water quality scores were in the Niagara-on-the-Lake watersheds Two Mile Creek and Four Mile Creek. The highest surface water quality report score was found in the Lower Twelve Mile Creek watershed.

Forest condition grades range from B to F with the majority of the watersheds scoring D. The lowest forest condition report card grade scores were found in the Lake Ontario South Shore watershed (Forty Mile Creek), Niagara-on-the-Lake watershed (Two Mile Creek and Eight Mile Creek), Twelve Mile Creek (Beaver Dams Creek) and Upper Welland River watershed (Buckhorn Creek & Welland River Binbrook). The highest forest condition scores were found in the Lake Erie North Shore (Beaver Dams Drain and Point Abino Drain) and South Niagara Falls watershed (Bayer Creek).

Despite the poor grades in the *NPCA* Watershed Report Cards, there are many examples in the *NPCA* watershed where there are positive actions of individuals, organizations and municipalities on private and public lands. These actions will result in better watershed health and provide benefits to water quality, fish and wildlife habitat, improved forest conditions and the quality of life of residents as well. It is anticipated that these collective efforts will improve future grades in every new report card.

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One Mile Creek

Upper Welland River Watershed Report Card

Buckhorn Creek

Elsie Creek

Oswego Creek

Mill Creek

Welland River: Binbrook

Welland River: Wellandport

Central Welland River Watershed Report Card

Beaver Creek

Coyle Creek

Drapers Creek

Big Forks Creek

Welland River: Welland West

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Bayers Creek

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Lake Erie North Shore Watershed Report Card

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2012 WATERSHED REPORT CARD

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Six Mile Creek

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Section 1: Methods and Results

1.1 Introduction

The Niagara Peninsula Conservation Authority (NPCA) watershed serves approximately 500 000 people and covers an area of 2424 square kilometres encompassing the entire Niagara Region, 21% of the City of Hamilton and 25% of Haldimand County (See Map 1). This watershed is composed of three main drainage basins: Lake Ontario, Niagara River and Lake Erie. The landscape in the NPCA watershed has been defined by its natural features and human activities. The natural features found in this watershed include the Niagara Escarpment, the Niagara Gorge, Point Abino, and the Wainfleet Bog. These features are just some that are home to many ecologically significant plants and animals that are not found in other parts of the country. The landscape in the NPCA watershed is also defined by significant human activities.



Map 1: Drainage Basins and Subwatersheds

Niagara is a major transportation artery between Canada and the United States with extensive shipping (Welland Canal), roadways (400-series highways and QEW) and railways. Niagara is the centre for hydroelectric power generation in Ontario and extensive infrastructure (Sir Adam Beck Hydroelectric Generating Stations) has been built to produce electricity. This infrastructure has had significant effects on the Niagara River Basin. The climatic conditions of Niagara are unique and allow for predominately agricultural

landuse with the growing of tender fruit on prime agricultural lands in the north portion of the watershed. Niagara is also home to several large urban areas such as St.Catharines, Niagara Falls and Welland.

In 2005, 2006 and 2007 the *NPCA* and the Region of Niagara produced Report Cards for its residents on the environmental health of the *NPCA* watershed. These report cards were well received by the public, municipalities and other agencies. Since 2007, there have been significant improvements in resource and monitoring information in the *NPCA* watershed. The *NPCA* has undertaken a <u>Natural Areas</u> <u>Inventory</u>, <u>Watershed Plans</u>, added more <u>Geographic Information Systems</u> (GIS) data layers, completed the <u>Source Water Protection</u> Initiatives, and expanded its <u>surface water quality monitoring</u> networks. All of these sources of information were incorporated into the <u>2012 NPCA</u> Watershed Report Cards.

1.2 Methods

1.2.1. Scale

The NPCA watershed is comprised of over 202 watersheds of varying sizes. These watersheds were combined to form eight Watershed Planning Areas (see **Map 2**). Within each Watershed Planning Area several smaller watersheds were assigned a report card based on available data. Watershed Planning Areas have been used in many NPCA projects such as Natural Areas Inventory, Watershed Planning and Source Water Protection enabling an easy transfer of data into the report cards.

1.2.2. Indicators and Grading System

In 2011, Conservation Ontario (CO) produced the Guide to Developing Conservation Authority Watershed Report Cards under the leadership of staff from CO and 36 Conservation Authorities. This standardized reporting format is being adopted by all conservation authorities and is being used to inform the public about the state of our watersheds for 2012.

These Watershed Report Cards provide information on surface water quality, forest conditions and groundwater, as well as actions being taken to address any concerns. They are intended to provide the public and other agencies with easily understood information about conditions within the watershed.

1.3 Surface Water Quality

The NPCA Water Quality Monitoring Program was implemented in 2001 and is operated in partnership with the Ontario Ministry of the Environment, Regional Municipality of Niagara, and the City of Hamilton. Through these partnerships the NPCA monitors water quality using a network of water quality stations located throughout the NPCA watershed. The surface water quality monitoring results from 2001 to 2006 indicate that most of Niagara's watersheds have poor water quality. Total phosphorus, *E. coli*, suspended solids, and chlorides from non-point sources (agricultural/livestock runoff, faulty septic systems) and point sources (combined sewer overflow, urban stormwater) continue to be the major causes of impairment in the NPCA watershed. The 2012 NPCA Watershed Report Card summarized surface water quality data from 2007 to 2011.



Map 2: Watershed Planning Areas and Subwatersheds

1.3.1. Indicators and Grading System

Three indicators are used to assess surface water quality for each watershed:

- Total phosphorus
- Bacteria (E. coli)
- Benthic invertebrates

As shown in **Table 1**, each indicator is given equal weight in determining the overall surface water quality score for each watershed. Point scores for each indicator were calculated, added together, and divided by three to determine the overall letter grade for water quality in each watershed (Conservation Ontario 2011).

These indicators reflect key issues related to surface water across the province, including nutrients, bacteria/waste, and aquatic health. Descriptions and definitions for these indicators are provided in each watershed report card and below.

Phosphorus (µg/L)	Bacteria (<i>E.coli /</i> 100ml)	Benthic Score	Points	Grades
< 20	0 - 30	0.00 - 4.25	5	А
20 - 30	31 - 100	4.26 - 5.00	4	В
31 - 60	101 – 300	5.01 – 5.75	3	С
61 - 180	301 - 1000	5.76 - 6.51	2	D
> 180	< 1000	6.51 - 10.00	1	F

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Finals	Final
Points	Grade
>4.4	А
3.5 - 4.4	В
2.5 - 3.4	С
1.5 – 2.4	D
< 1.5	F

Table 1: Surface Water Quality Scoring and Grading System

Indicator: Phosphorus

- <u>What it measures:</u> The amount of total phosphorus in the water.
- <u>How it is calculated</u>: The 75th percentile was calculated for all data from 2007-2011 for the site closest to the outlet of each watershed. The 75th percentile (means 75% of the data fall below this value) is used to reflect the tendency for this sampling data to be dry weather biased and, therefore, more accurately reflects pollution levels.
- <u>Why it is important</u>: Phosphorus tends to bind to soil particles and thus is an indicator of soil delivery to streams (as well as other contaminants that are carried to the stream on soil particles). Phosphorus is found in soaps, detergents, fertilizers and waste, and contributes to algae blooms in streams and lakes. Algae blooms have the potential to lower light penetration and decrease dissolved oxygen levels in watercourses. These blooms can also causes aesthetic degradation as the algae clog



waterbodies and create foul odours as it decomposes. In some extreme cases, algal blooms can be harmful to human health.

Indicator: Bacteria

- What it measures: The amount of fecal bacteria (E. coli) in the water,
- <u>How it is calculated</u>: A 5-year geometric mean for data from 2007-2011 are measured in number of Colony Forming Units (CFU) *E. coli* bacteria per 100 ml of water. The geometric mean is a measure of the central tendency of data and minimizes the effect of extreme values.
- <u>Why it is important</u>: *E. coli* bacteria are found in human and animal waste and its presence in water indicates fecal contamination. *E. coli* is also a strong indicator of the potential to have other disease causing organisms in a stream.

Indicator: Benthic

- <u>What it measures</u>: Benthic invertebrates are organisms without a backbone that live in the sediments of a waterbody. Examples of benthic invertebrate organisms that are commonly found in the NPCA watershed include clams, snails, leeches, worms, dragonflies, stoneflies, caddisflies, mayflies, and beetles.
- <u>How it is calculated</u>: The Family Biotic Index (Hilsenhoff 1988) is used to assess water quality based on the number and type of invertebrates found in a sample. Each invertebrate species is given a score from 0 to 10 that indicate its pollution tolerance based on the New York State's Updated Biotic Tolerance Values (Smith *et al.*, 2009). Low numbers indicate sensitivity to pollution while organisms with high numbers are pollution tolerant. The average benthic value was calculated for samples taken from 2007-2011 at a site near the outlet of each watershed.
- <u>Why it is important</u>: Benthic organisms are an excellent indicator of the quality of the water and the habitat where they live. These animals are relatively immobile and spend all or most of their lives in water. As a result they are continuously subjected to the effects of all pollutants and environmental stream conditions over time. The presence or absence of certain animals provides a good indication of water conditions a specific site. These organisms are at the bottom of the food chain so they reflect the health of the aquatic ecosystem.

1.3.2. Data Sources

The *NPCA* operates two programs towards its water quality monitoring initiatives. These include a benthic monitoring program and chemical monitoring program. Data from each of these programs was used to evaluate the watersheds for these report cards.

Chemical Monitoring Network

From 2007 to 2011 the *NPCA* monitored surface water quality at 72 stations covering 41 watersheds. A subset of these stations was used for the 2012 *NPCA* Watershed Report Cards (see **Map 3**). Grab samples were collected monthly during the ice-free season and analyzed at accredited laboratories for a variety of parameters including general chemistry, metals, nutrients and bacteria. The *NPCA* was able to fund the collection of samples for 16 sites but has had cooperative partnerships that expanded the *NPCA* monitoring capacity. These partnerships included: 12 sites as part of the Provincial Water Quality Monitoring Network (PWQMN); 11 sites through the City of Hamilton; 10 sites through the Region of Niagara; and 23 sites through the Niagara River Remedial Action Plan.

Benthic Monitoring Program

The *NPCA* has operated a benthic monitoring program since 1996 using the BioMAP protocol (Griffiths 1999). The *NPCA* collects samples from approximately 75 sites across the watershed on a rotational basis. Each site is sampled once every 3 years in the spring and the fall with 25 sites sampled annually. The most recent sampling event from 2007-2011 for a monitoring station was utilized for calculating the report card scores.



Map 3: Water Quality Monitoring Stations

1.3.3. Surface Water Quality Results

The final grades and point scores for each of the watershed report cards are shown in **Table 2**, summarized in **Table 3**. Of the 44 individual report cards, 1 scored a B, 3 scored a C grade, 38 scored a D grade and 2 scored an F. The watershed distribution of these grades is shown in **Map 4**. The lowest water quality grade scores were found in the Niagara-on-the-Lake watershed and these included Two Mile Creek and Four Mile Creek. The majority of the watershed report cards scored Ds due to high phosphorus concentrations and low benthic indicator scores. The highest surface water quality report card score was found in the Lower Twelve Mile Creek watershed owing to the large volume of Lake Erie water transported by the Welland Canal and Lake Gibson system.

		Total Phospho	orus	Bacteria		Benthic		
	Watershed	75th Percentile		Geometric Mean				Overall Grade
		Concentration		E. coli		Family Biotic		
		(ug/L)	Grade	(CFU/100ml)	Grade	Index Score	Grade	
~	Forty Mile Creek	210	F	478	D	5.04	С	D
o South	Spring Creek	350	F	283	С	5.75	С	D
	North Creek	370	F	441	D	5.81	D	D
aric	Upper Twenty Mile Creek	320	F	162	С	7.88	F	D
Sh	Lower Twenty Mile Creek	205	F	99	В	5.13	С	С
ke (Fifteen Mile Creek	300	F	169	С	6.04	D	D
Lal	Sixteen Mile Creek	272	F	286	С	6.53	F	D
	Eighteen Mile Creek	400	F	230	С	6.3	D	D
e k	Shriners Creek	120	D	157	С	6.48	D	D
elve Cre	Beaver Dams Creek	350	F	142	С	7.12	F	D
ile	Upper Twelve Mile Creek	120	D	180	С	4.71	В	С
Σ	Lower Twelve Mile Creek	30	В	81	В	N/A	N/A	В
the.	Eight Mile Creek	120	D	251	С	6.56	F	D
-t-	Six Mile Creek	105	D	277	С	6.02	D	D
a-c ake	Four Mile Creek	265	F	439	D	7.04	F	F
l Bai	Two Mile Creek	103	D	2425	F	6.81	F	F
Nia	One Mile Creek	115	D	382	D	5.9	D	D
a	Buckhorn Creek	400	F	329	D	6.19	D	D
lan	Elsie Creek	230	F	73	В	8.07	F	D
vel er	Oswego Creek	420	F	92	В	7.18	F	D
Riv	Mill Creek	190	F	106	С	8	F	D
bpe	Welland River - Binbrook	322	F	168	С	6.96	F	D
D	Welland River - Wellandport	195	F	53	В	6.38	D	D
er	Beaver Creek	510	F	98	В	7.95	F	D
al Rive	Covle Creek	170	D	130	С	6.52	F	D
ntr nd	Drapers Creek	150	D	286	С	7.17	F	D
Ce ella	Big Forks Creek	540	F	100	В	8.22	F	D
Ň	Welland River - Welland West	285	F	46	В	8.15	F	D
	Baver Creek	300	F	92	В	6.64	F	D
and outh IIIs	Usshers Creek	460	F	81	В	8.32	F	D
/ell d Sc a Fa	Tee Creek	480	F	116	С	6.96	F	D
er V an gara	Grassy Brook	280	F	75	В	8.36	F	D
owe ver Nia	Lyons Creek	160	D	31	В	7.86	F	D
Ri	Welland River - Lower	101	D	113	С	N/A	N/A	D
-	Lowbanks Drain	205	F	158	C	7.94	F	D
orth	Casey Drain	245	F	258	C	8.04	F	D
Erie No Shore	Eagle Marsh Drain	120	D	292	C	7.71	F	D
	Wignell Drain	230	F	166	C	7.79	F	D
ke	Beaver Dam Drain	220	F	190	<u> </u>	8.37	F	D
La	Point Abino	115	D	59	В	6.83	F	P
	Six Mile Creek	165	D	112	0	N/A	N/A	c c
irie	Kraft Drain	100	D	347	D	6.83	F	P
ht	Erenchman Creek	70	D	130	C	7.31	F	P
Fo	Black Creek	180	D	42	B	69	F	D
	Average	241	F	232	C	6.97	F	P

Table 2: Surface Water Quality Report Card Grades for the NPCA Watershed

Letter Grade	Total Phosphorus	Bacteria <i>E. coli</i>	Benthic Score	Final Score
А	0	0	0	0
В	1	14	1	1
С	0	23	3	3
D	16	6	8	38
F	27	1	29	2

Table 3: Surface Water Quality Indicator ReportCard Grade Summary for NPCA Watersheds



Map 4: Water Quality Summary Grades

The surface water quality monitoring results in the 2012 NPCA Watershed Report Card indicates that most of Niagara's watersheds continue to have poor water quality. Nutrient and bacteria contamination as well as other water quality stressors from non-point sources (agricultural/livestock runoff, faulty septic systems) and point sources (combined sewer overflow, urban stormwater) continue to be the major causes of impairment in the NPCA watershed. Watershed initiatives that reduce nutrient and bacteria contamination will improve the water quality in the NPCA watershed.

1.4 Forest Conditions

The forest communities of Niagara were comprehensively classified and mapped between 2006 and 2009 through the Natural Heritage Areas Inventory (see **Map 5**). The *NPCA* in partnership with the Region of Niagara and a broad cross section of stakeholders then undertook an assessment of those natural features during the Nature for Niagara's Future Project completed in 2011. The project teams were able to not only prove the current state of the forests of the watershed but also identify the contribution of each natural feature to the overall health of the ecosystem, and identify data gaps that remain.



Map 5: Natural Heritage Features

Several trends arise from the current data including the fragmented nature of the natural areas in Niagara and the subsequent lack of forest interior for a suite of species that rely on these undisturbed habitats. Total natural cover in the watershed currently stands at 30.38% and mature forests make up a considerable portion of that at 18.27% of the overall watershed area. Concerted efforts are being made with private landowners throughout *NPCA*'s jurisdiction to improve the connectivity of existing forested areas through voluntary stewardship initiatives.

1.4.1. Indicator and Grading System

Three indicators are used to assess forest conditions for each watershed:

- % Forest Cover
- % Forest Interior
- % Riparian Zone Forest

As shown in **Table 4**, each indicator is given equal weight in determining the overall forest conditions score for each watershed. Point scores for each indicator were calculated, added together, and divided by three to determine the overall letter grade for forest conditions in each watershed (Conservation Ontario 2011).

% Forest Cover	% Forest Interior	% Riparian Zone Forest	Points	Grades
>35	>11.5	>57.5	5	А
25.1 - 35.0	8.6 - 11.5	42.6 - 57.5	4	В
15.1 - 25.0	5.6 - 8.5	27.6 – 42.5	3	С
5.0 - 15.0	2.5 - 5.5	12.5 - 27.5	2	D
< 5.0	< 2.5	<12.5	1	F

Finals	Final
Points	Grade
>4.4	А
3.5 - 4.4	В
2.5 - 3.4	С
1.6 – 2.4	D
< 1.5	F

Table 4: Forest Condition Scoring and Grading System

These indicators reflect key issues related to forest conditions across the province, including overall forest health. Descriptions and definitions for these indicators are provided in each watershed report card and below.

Indicator: Percent Forest Cover

- <u>What it measures</u>: The percentage of the watershed that is forested or wooded. Forest cover includes upland and wetland forest types.
- *How it is calculated*: Divide the area of forested and wooded land by the area of the watershed.
- <u>Why it is important</u>: Based on the best available science, it is believed there should be a minimum of 30% forest or natural cover in southern Ontario's landscape to sustain native plants and animals. Forest birds are a good indicator of habitat quality and the ability of habitats to sustain native animals and plants. In fragmented landscapes such as Niagara, with less than 30% forest cover, forest interior plays a major role in determining breeding success of many species, including several species of birds.

Indicator: Percent Forest Interior

- <u>What it measures</u>: The percentage of the watershed that is forest interior. Forest interior is the
 protected core area 100 m from any edge that some species (primarily birds) require to be successful.
 The outer 100 m is considered 'edge' habitat and is prone to effects such as, high predation, wind
 damage and alien species invasion.
- *How it is calculated*: Divide the area of forest interior by the area of the watershed.
- <u>Why it is important</u>: Many species require large forests that contain a more protected core area to breed successfully. Many forest bird species for example, are declining, a reflection of disappearing habitat. Forest birds are a good indicator of habitat quality and the ability of habitats to sustain native animals and plants.

Forest interior includes the core of the woodlot, minus the outer 100 metres along the edge. According to Environment Canada (2004) the forest interior is required to be greater than 10% in order to maintain breeding bird populations. Birds such as migrant raptors and songbirds require relatively large forest patches to reproduce successfully. The Forest Interior indicator is a measure of the fragmentation and size of our forests.

Indicator: Percent Riparian Zone Forested

- <u>What it measures</u>: A measure of amount of forest cover within a 30 m riparian/buffer zone adjacent to all open watercourses.
- <u>How it is calculated</u>: Divide the area of forest cover within the riparian zone by the area of the riparian zone.
- <u>Why it is important</u>: Riparian habitats are some of the most diverse of all ecological communities. They support high concentrations of wildlife species and provide an array of ecological functions such as acting as corridors for movement and production of food sources. Forest cover along waterways also protects aquatic life and guards against thermal pollution (heating of the water by the sun).

Percent riparian zone forested is a measure of the amount of forest cover within a 30 m riparian zone adjacent to all open watercourses and lakes. Non-forest cover such as meadow, thicket or marsh was not included because the mapping of these cover types does not exist throughout the province. Environment Canada (2004) recommends 75% of stream length be naturally vegetated and that "streams should have a minimum 30 m wide naturally vegetated adjacent-lands area on both sides, greater depending on site-specific conditions." The *NPCA* as well as other conservation authorities are promoting the establishment of riparian buffers through voluntary stewardship to protect water quality, and to serve as a corridor for wildlife movement.

1.4.2. Data Sources

The NPCA was the lead agency on two programs to classify, map and assess the natural heritage features of the NPCA watershed. The Natural Heritage Areas Inventory produced the first comprehensive mapping for every natural heritage feature in the NPCA's jurisdiction using Ecological Land Classification to the Community Series level. The <u>Nature for Niagara's Future Project</u> then generated the assessment of the contribution of each feature to the whole ecosystem. This data served as the basis for the assessment of the forest communities for this watershed report card.

Environment Canada (2004) provides us with the targets for what is required to have a healthy system. The statistics presented in this report card are based on how the communities of Niagara fair in comparison to this well established set of targets.

1.4.3. Forest Indicator Results

The final grades and point scores for each of the watershed report cards are shown in **Table 5**, summarized in **Table 6**. Of the 44 individual report cards, 3 scored a B, 10 scored a C grade, 25 score a D grade and 6 scored an F. The watershed distribution of these grades is shown in **Map 6**. These grades are not surprising because the *NPCA* watershed is located in a highly developed part of south-western Ontario where only 18% forest cover remains.

	Watershed	Forest Cover Forest Interior		terior	Riparian Z	Overall Grade			
	watersneu	%	Grade	%	Grade	%	Grade	Gverall Grade	
	Forty Mile Creek	12	D	2.2	F	9.2	F	F	
irio South ore	Spring Creek	19	С	3.1	D	24.8	D	D	
	North Creek	18	С	2.2	F	19	D	D	
	Upper Twenty Mile Creek	10	D	0.2	F	16	D	D	
Sh. Sh	Lower Twenty Mile Creek	14	С	1	F	20.2	D	D	
(e (Fifteen Mile Creek	19	С	2.3	F	24.9	D	D	
Lal	Sixteen Mile Creek	16	С	1.8	F	20.1	D	D	
	Eighteen Mile Creek	11	D	0.5	F	22.8	D	D	
e k	Shriners Creek	8	D	0	F	20.2	D	D	
elve Cre	Beaver Dams Creek	6	D	0.1	F	9.8	F	F	
Tw ile	Upper Twelve Mile Creek	33	В	4.7	D	45.9	В	С	
Ę	Lower Twelve Mile Creek	17	В	2	F	30.5	С	С	
the	Eight Mile Creek	4	F	0	F	9.5	F	F	
e ou-	Six Mile Creek	14	D	0.8	F	22.9	D	D	
Ira-(Lak	Four Mile Creek	9	D	0.2	F	15.6	D	D	
aga	Two Mile Creek	9	D	0.4	F	11.6	F	F	
Ż	One Mile Creek	12	D	0	F	26.5	D	D	
p	Buckhorn Creek	9	D	0.4	F	10.79	F	F	
llar	Elsie Creek	11	D	0.4	F	13.7	D	D	
We ver	Oswego Creek	24	С	5.4	D	29.1	С	D	
er \ Ri	Mill Creek	26	В	3.8	D	26.7	D	С	
ddſ	Welland River - Binbrook	8	D	0.2	F	11.1	F	F	
ر	Welland River - Wellandport	18	С	4	D	27	D	D	
'er	Beaver Creek	19	С	2.9	D	22.8	D	D	
ral Riv	Coyle Creek	24	С	1.4	F	27	С	D	
ent and	Drapers Creek	21	С	0.1	F	38.6	С	D	
ella	Big Forks Creek	19	С	2.1	F	18	D	D	
3	Welland River - Welland West	21	С	5	D	19.5	D	D	
ъ н	Bayer Creek	37	А	6.3	С	30.4	С	В	
llan Sout alls	Usshers Creek	33	В	4.4	D	32.5	С	С	
We Jd S ra F	Tee Creek	30	В	5.9	D	36.7	С	С	
/er !r al aga	Grassy Brook	23	С	1.9	F	26.3	D	D	
-ow Rive Ni	Lyons Creek	30	В	4.6	D	29.1	С	С	
<u> </u>	Welland River - Lower	28	В	4	D	28.4	C	С	
£	Lowbanks Drain	26	В	7.5	C	17.8	D	С	
lori	Casey Drain	27	В	6.1	D	13.2	D	С	
ie N ore	Beaver Dam Drain	28	В	9	В	31.6	С	В	
e Er Sh	Wignell Drain	10	D	0.1	F	13.4	С	D	
ake	Eagle Marsh Drain	15	С	1.4	F	15	D	D	
-	Point Abino	41	А	11.1	В	30.2	С	В	
e	Six Mile Creek	24	С	1.9	F	24.5	D	D	
Eri	Kraft Drain	33	В	8.4	С	42.1	С	С	
ort	Frenchman Creek	22	В	3.6	D	25	D	D	
Ŀ	Black Creek	21	С	4	D	23.1	D	D	
	Average	20	С	2.9	D	23	D	D	

Table 5: Forest Condition Report Card Grades for the NPCA Watershed

Letter Grade	Forest Cover	Forest Interior	Riparian Zone	Final Score
А	2	0	0	0
В	12	2	1	3
С	16	3	13	10
D	13	14	24	25
F	1	25	6	6

Table 6: Forest Condition Report Card Grades forthe NPCA Watershed



Map 6: Forest Quality Summary Grades

The lowest report card score for forest conditions were found in the Niagara-on-the-Lake watershed (Two Mile Creek and Eight Mile Creek), Upper Welland River watershed (Buckhorn Creek & Welland River Binbrook), Twelve Mile Creek (Beaver Dams Creek) and Lake Ontario South Shore (Forty Mile Creek). The majority of the watershed report cards scored D and this is due to the lack of forest interior found throughout the watershed. Most of the woodlands in Niagara are small, narrow and do not contain interior forest habitat. Woodlands need to be over 200m in length and width (4 ha in area assuming a square shape) to contain forest interior and this is lacking in *NPCA* watersheds. The highest forest condition scores were found in the Lake Erie North Shore (Beaver Dams Drain and Point Abino Drain), and South Niagara Falls (Bayer Creek).

It is evident from the report card grades above that the natural cover in Niagara which includes all of the woodlands is highly fragmented. The lack of large contiguous forested areas leads to very low grades for forest interior in particular. Many watercourses lack any form of vegetated buffer and where vegetation does exist along watercourses, it is successional in nature and therefore, does not contribute to forest targets resulting in the low riparian cover percentages.

The fragmented nature of the forest cover in Niagara can largely be attributed to the significant amount of clearing in the NPCA watershed to make way for new development. This forest loss is being offset by naturalization and voluntary stewardship initiatives carried out by private landowners with the help of the NPCA as well as by other agencies, non-governmental organizations and community groups. These efforts are being implemented throughout the NPCA watershed but can only restore a small percentage of forest each year in the watershed. In time, it is hoped that these efforts will compound and begin to form new woodlands that will improve future forest condition assessments.

1.5 Groundwater

1.5.1 Groundwater Monitoring

The Provincial Groundwater Monitoring Network (PGMN) is a partnership between the MOE and the Conservation Authorities of Ontario. The PGMN is a province-wide groundwater monitoring initiative designed to collect long-term baseline data on groundwater quantity and quality in special areas of interest. There are currently 470 ambient groundwater monitoring wells in the program. Groundwater is monitored through a network of 15 monitoring wells located throughout the NPCA watershed in locally significant hydrogeologic areas. Monitoring wells are instrumented with datalogging equipment which record hourly groundwater levels at all stations. Groundwater quality samples are collected twice yearly from 13 of the 15 wells during the spring and fall, and analyzed for nutrients, metals, bacteria, and general chemistry. The two other wells W356-2 and W356-3 were not sampled due to the request of the well owner. Refer to Map 7 for NPCA groundwater monitoring locations. There is currently insufficient data to include a grade for the 2012 NPCA Watershed Report Card, but exceedances of the Ontario Drinking Water Quality Standards are noted within each set of watershed report cards.



Map 7: Provincial Groundwater Monitoring Stations

1.5.2 Private Wells

Groundwater from dug or drilled wells provides rural residents with their private water supply. The property owner is expected to make sure the well is up to standards and is expected to have the water tested regularly. Regular testing will ensure the water that they are using is clean and safe.

Water well testing kits are free and available throughout the NPCA watershed from the following public health departments.

Niagara Region Residents Niagara Region Public Health Phone: 905-688-8248 or 1-888-505-6074 ext. 7335 www.niagararegion.ca.

City of Hamilton Residents Public Health and Social Services Safe Water Hotline is 905-546-2189 www.hamilton.ca Haldimand Residents Haldimand-Norfolk Health Unit Phone: 519-426-6170 or 905-318-6623 www.hnhu.org

1.5.3 Water Well Decommissioning

NPCA offers a Water Well Decommissioning Grant Program through which 90% (maximum of \$ 2,000) of the cost is covered. Applications must be submitted before work begins and must have two quotes for the proposed work. The project must be completed by a licensed well contractor. More information is available at www.npca.ca/planning-permits/water-well-decommissioning/.

1.6 Source Water Protection

The Niagara Peninsula Source Protection Plan has proceeded well since Royal Assent of the Clean Water Act in 2006. One key accomplishment was approval of the Assessment Report by the Ministry of the Environment in 2011 following extensive public consultation. The Assessment Report summarizes Source Protection technical studies for the Niagara Peninsula. This information was used to prepare the Proposed Source Protection Plan which was submitted to the Ministry of the Environment in July 2012, also following extensive public consultation. Implementation of the plan will begin once it is approved by the province.

1.7 Watershed Characteristics

The NPCA Watershed Report Card contains a "Watershed Characteristics" section for each of the eight Watershed Planning Areas. This information was provided by the NPCA's Watershed Plans that were completed from 2006-2010. This information includes area, land use, soil type, physiography, dams & barriers, sewage services, % natural area types, woodlot or patch size, fisheries resources, and species at risk.

1.8 Watershed Stewardship Highlights

The Watershed Stewardship Division is responsible for improving water quality, water quantity and biodiversity within the NPCA Watershed. The Watershed Stewardship Division advances these areas through the implementation of a comprehensive cost-sharing program that offers local landowners financial incentives to implement water quality and habitat improvement projects on their properties. In addition to providing financial assistance to landowners, NPCA staff will conduct one-on-one site visits providing technical advice about environmental concerns and assisting landowners with hands-on water quality and habitat improvement projects. The goal of the program is to reward the private landowner who protects the public's interest, i.e., clean water. For every NPCA stewardship dollar spent, an additional 5 dollars (approximate) of matching contribution is provided through partnerships, including costs incurred by private landowners, for the implementation of water quality and habitat biodiversity projects.

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Typical projects include habitat naturalization, streambank stabilization/bioengineering, habitat diversification and rehabilitation such as wetland and riparian buffer restoration, Best Management Practices (BMP's) for agriculture including nutrient management and various other improvement projects. To date, the stewardship division has implemented over 1500 water quality, water quantity, and biodiversity improvement projects within the NPCA watershed.

The Stewardship Division is also involved in education and awareness promotion. Programs such as Yellow Fish Road, Envirothon, and Canopies for Kids have reached thousands of children. These programs help instill in children the intrinsic importance of a positive and active role in protecting and enhancing their natural environment. Engaging children and teaching them about the important role the environment has in ensuring a healthy community will help ensure a sustainable environment for future generations. Each year, the program looks for new opportunities to expand and build on the services that it currently offers to watershed residents.

Each section of the NPCA Watershed Report Card provides

a summary from 2007 to 2011 of the many activities and the active involvement of individuals, organizations and municipalities on private and public lands that have benefited the watershed. In some cases, this involvement extends to the whole NPCA watershed. These are highlighted in the next section. More information regarding the NPCA Watershed Stewardship Services is available at <u>www.npca.ca/watershed-management/watershed-stewardship-services/</u>.

1.8.1 Watershed Wide Stewardship Highlights

Natural Areas Inventory

From 2006 to 2009 the NPCA, in collaboration with the Region of Niagara, the Peninsula Field Naturalists and others, worked together on a Natural Areas Inventory. The purpose of the project and resulting document is to provide up-to-date natural areas information that acts as a tremendous benefit in the development of greater environmental awareness within the community and, as a scientifically-defensible baseline. It has built on existing information, confirmed the significance of known sites, and filled information gaps where inventory work was outdated or lacking. The Niagara Peninsula Conservation Authority's watershed supports a rich diversity of natural features including significant habitats and geological formations, rare plants and animals, and important wildlife corridors. The Reports can be found here: http://www.npca.ca/watershed-management/natural-areas-inventory/

Niagara Peninsula Conservation Authority 250 Thorold Rd., Welland, Ontario L3C 3W2 905-788-3135 info@npca.ca





WaterSmart Niagara

WaterSmart Niagara (formerly Niagara Water Strategy) was established in 2003. The intent of WaterSmart Niagara is to work towards a common goal of protection, restoration and management of water resources across the Niagara Watershed. The Niagara Region, NPCA and their partners are implementing the recommendations from the Niagara Water Strategy through an on-going program. One component of the occurring throughout program is to fund projects that are the Niagara watershed. http://www.niagararegion.ca/government/initiatives/nwqps/default.aspx

Land Care Niagara

Since 2007, Land Care Niagara (LCN) has partnered with watershed landowners and other organizations through their Niagara Natural Heritage Corridor rural tree planting program which has seen over 418000 trees planted on 217 hectares. LCN also established their own community tree nursery which has to date provided 900 trees for urban planting projects. Through, the LCN Woodworking for Nature program over 1200 habitat structures have been produced and installed in Niagara for wildlife recovery, Ontario Species At Risk (SAR) research and SAR recovery activities. Additionally LCN has been working in partnership with the Ontario Ministry of Natural Resources and other partners in the development of educational



outreach materials and giving presentations to local schools and community groups to highlight 19 SAR found in Niagara.

http://www.landcareniagara.com/

Niagara Restoration Council

From 2007- 2011 the Niagara Restoration Council planted over 100000 native trees and shrubs along with tens of thousands of native wildflower and grasses. Over 100 hectares of environmental habitat has been protected, maintained and restored with the help of over 2000 volunteers. http://www.niagararestoration.org/

Municipalities

Please check with your local municipalities regarding the numerous stewardship programs that are available. Most of the programs available focus on water conservation.

References

Conservation Ontario. 2011. *Guide to Developing Watershed Report Cards.*

Environment Canada. 2004. *How Much Habitat is Enough? A Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern.* Second edition. www.on.ec.gc.ca/wildlife/publications-e.html.

Griffiths, R.W. 1999. *BioMAP: Bioassessment of Water Quality.* The Centre for Environmental Training, Niagara College: Niagara-on-the-Lake, Ontario.

Hilsenhoff, W.L. 1988. *Rapid field assessment of organic pollution with a family-level biotic index*. Journal of the North America Benthological Society. 7:65-68.

Niagara Peninsula Conservation Authority. 2009. *Natural heritage areas inventory 2006-2009.* Welland, Ontario, NPCA.

Niagara Peninsula Conservation Authority. 2007. Niagara Watershed Report Card. Welland, Ontario, NPCA.

Smith, A., Heitzman, D., Duffy, B. 2009. <u>Standard Operating Procedure: Biological Monitoring of SurfaceWaters</u> <u>in New York State</u>. New York State Department of Environmental Conservation, Division of Water.