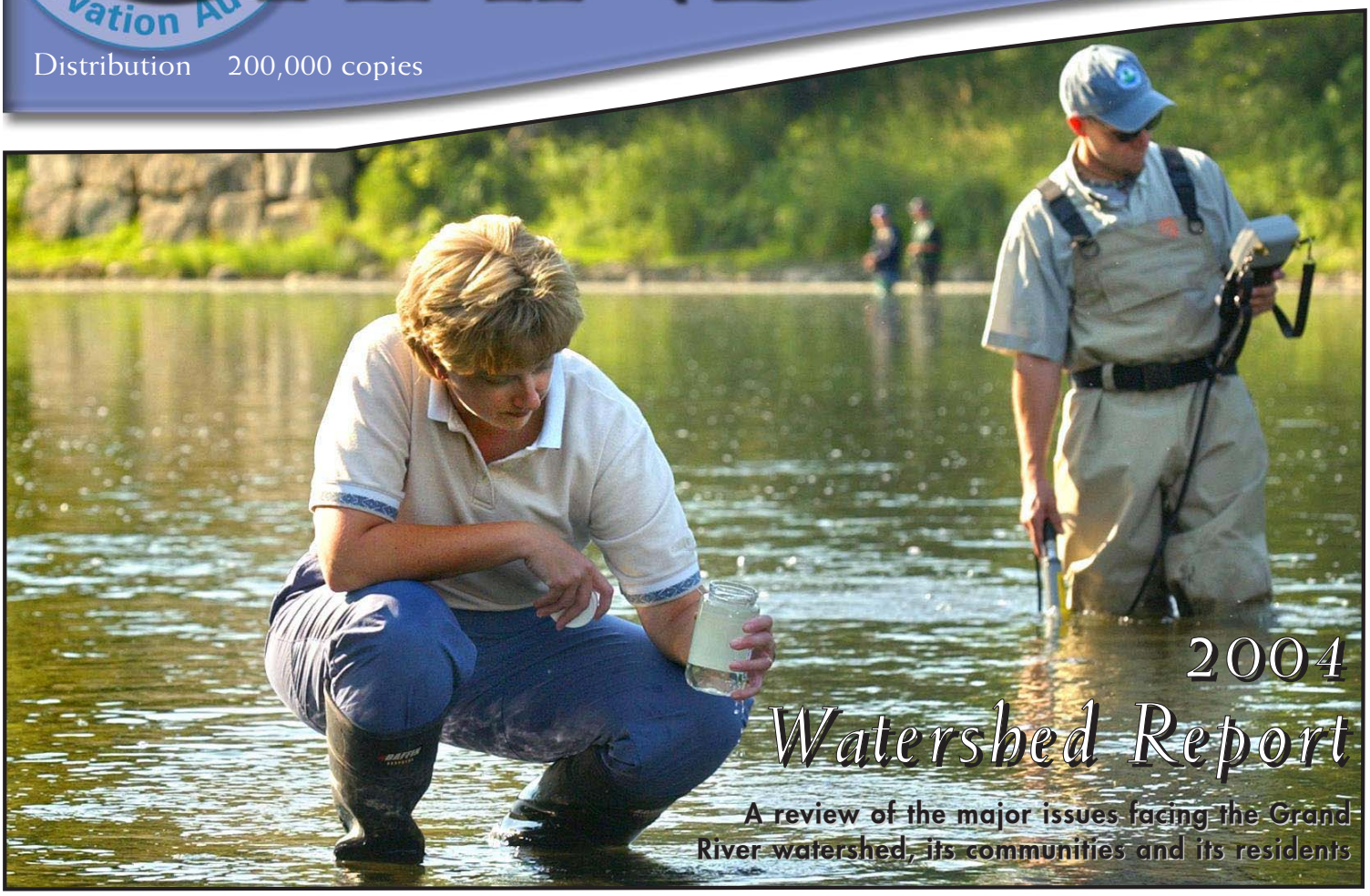
News for Brantford, Cambridge, Guelph, Kitchener, Waterloo and other communities in the Grand River Watershed

Watershed report

The GRAND

GRAND RIVER CONSERVATION AUTHORITY
2004 FALL REPORT

Distribution 200,000 copies



2004 Watershed Report

A review of the major issues facing the Grand River watershed, its communities and its residents

Sandra Cooke, water quality supervisor with the GRCA, examines a water sample from the Grand River in Cambridge as Mark Anderson, a water quality engineer, checks the river's oxygen level and temperature. *Photo courtesy of Robert Wilson and The Record*

Along the Grand

THE GRAND RIVER
A Canadian Heritage River

The GRCA
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A Message FROM THE CHAIRMAN AND THE CAO

Welcome to our second Watershed Report.
We published our first Watershed Report in 2003 with the goal of providing the 875,000 residents of the Grand River watershed with a careful examination of the issues facing our environment and our communities.

In these reports, we are attempting to establish some benchmarks and measure the progress our communities in improving water quality and protecting our land.

It's a big watershed and one year is too short a time in the life of a river to report on any significant changes. However, by analysing existing data and looking ahead at the challenges confronting the watershed, we hope to put many of the key environmental issues into perspective.

From almost any point of view, the most challenging issue facing our watershed is growth.

The Grand River watershed is already one of the fastest growing regions in Canada and there is the prospect for much more to come. The provincial government is taking a hard look at growth in the Greater Golden Horseshoe and at strategies to protect the natural areas that define the horseshoe – the Oak Ridges Moraine and the Niagara Escarpment.

There is the prospect that the growth in the the Golden Horseshoe may "leapfrog" these natural areas and land on our doorsteps in the counties and regions of the Grand River.

What effect will future growth have on our cities, our farms, our natural areas, our rivers and streams, our aquifers, our forests and our wetlands?

Those are the questions that are being addressed by the GRCA in conjunction with the 36 municipalities of the Grand River watershed.

In this report we identify where we stand today in many of these areas. Our research on water quality tells us that we are making progress in dealing with some pollutants (such as phosphorus) but that others are of growing concern (nitrates and road salt.)

We are also presenting reports on where our water comes from and how it is used. This kind of information will be used by the GRCA and municipalities across the watershed to help guide decisions about water use and protecting our water supplies.

We're presenting information on water conservation, an important issue during the drought of the past seven years. Here you will see some positive results from conservation programs introduced by watershed municipalities.

When we think about water issues, we need to keep flooding in mind. Will climate change, which brings the potential for more severe weather, complicate the already complex job of reducing flood damages? So far this year, sudden thaws and torrential downpours have caused flooding in our watershed and in other Ontario communities, such as Peterborough.

As we think about growth issues we must also be mindful of the impact on terrestrial resources. Today, we still feel the impact of the deforestation that took place in the 1800s when this part of Ontario was opened to settlers. How will growth affect our remaining forests and wetlands? Can reforestation programs restore some balance to our environment?

There is no single organization which can address — let alone answer — all of these questions.

That is why it is so important to continue to build partnerships to tackle these issues – partnerships involving municipalities, universities, environmental organizations, the provincial and federal governments, farmers, community groups and individuals.

It will take the resolve of all of us to ensure that the scientific research, careful planning and necessary investment is undertaken to ensure our waters and landscapes are healthy.

Growth brings with it pressures to build more – more water lines, bigger sewage treatment plants, more highways. We expect our governments to ensure that there is adequate investment in these infrastructure projects.

Likewise, we should fight for adequate investment in the natural part of our infrastructure – the wetlands that purify water, the rivers and aquifers that supply our cities and towns, the forests that reduce energy consumption and soak up greenhouse gases.

If we want healthy communities, we need a healthy environment.

If we want a healthy environment, we must commit the resources necessary to do the job.

If we don't invest now, we'll pay a higher price in the future.

Peter Krause
Chairman

Paul Emerson
Chief Administrative Officer

WHO SPEAKS FOR YOU?

The municipality where you live appoints a representative to the Grand River Conservation Authority (GRCA) board to oversee the budget and activities of the Conservation Authority. These appointed members, who have often been elected in your municipality, speak on your behalf at the GRCA.

REGIONAL MUNICIPALITY OF WATERLOO
(including Cities of Cambridge, Kitchener, Waterloo, and Townships of North Dumfries, Wellesley, Wilmot and Woolwich)
Jane Brewer, Jean Haalboom, Ross Kelterborn, Peter Krause (GRCA chair), Joe Martens, Claudette Millar, Jane Mitchell, Ralph Shantz, Bill Strauss, Lynne Woolstencroft

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Archie MacRobbie

COUNTY OF BRANT
Brian Coleman, Gord Moore

Pressures of growth affect water quality

Any canoeist will tell you it's a lot easier to coast downstream than to paddle upstream against the current.

That's true, too, when it comes to the quality of the water in the stream. It takes a lot of time, energy and money to improve water quality in the Grand River watershed while paddling upstream against the "current" of growing cities and agricultural intensification.

Growing cities mean more sewage flowing through treatment plants. Agricultural intensification can mean a greater use of natural or manufactured fertilizers and increased concentration of farm animals.

The Grand River watershed is one of the fastest growing regions in the country. Since 1971, the population has almost doubled to 875,000 and over the next 20 years another 300,000 people will be added.

It's also a prime agricultural area. About 5,300 square kilometres — 80 per cent of the land of the watershed — is farmed, with an astounding array of products: dairy goods, pork, beef, poultry, fruits, vegetables, tobacco and many more.

One way or another, most of this activity is reflected in the quality of the water in the Grand River system.

The early days of development in the Grand River watershed left the river not much more than an open sewer. Manure washed off the land during rainfalls. Cities and towns dumped minimally treated sewage into rivers and creeks.

However, water quality has improved greatly since the 1930s. Wastewater treatment has improved and the adoption of best management practices by agricultural producers has contributed to the improvement.

There are many factors to be taken into account when assessing water quality: nutrients, oxygen content, suspended solids, metals, pesticides and more.

One way to get a handle on this complex issue is a tool called the Water Quality Index, which was developed by the Canadian Council of Ministers of Environment as a way of assessing nutrient levels.

The Grand River system is rich in nutrients, which is a challenge in raising water quality

Nutrient levels in a stream are related to oxygen levels which, in turn, determine how livable the water is for fish and other aquatic animals.

Nutrients, such as phosphorus and nitrates, are found in animal excrement (including manure and human waste) and in manufactured fertilizers. They are also present in decaying vegetation and other natural sources. In the Grand River watershed, most nutrients enter watercourses through runoff from farmland and in the discharge from sewage treatment plants.

Nutrients promote the growth of plants and algae, which produce oxygen during the day, but absorb it during the night. If there are too many plants taking too much oxygen, there may not be enough left for the fish and other aquatic life.

The Water Quality Index is a tool to spot areas with high nutrient levels.

To determine the Water Quality Index for a specific site, information about nutrient levels is added together, creating a total score, which is then slotted into one of five categories, ranging from Excellent to Poor. The index provides an overall rating of general water quality. It does not determine the quality of water for specific purposes.

In the Grand River watershed, there are no areas that fit into the "Excellent" category.

Headwaters 'Good'

The headwater areas of the Grand, Speed and Eramosa earn a "Good" rating. In these areas, there are still considerable parcels of wetlands and forests, which help keep water clean and cool.

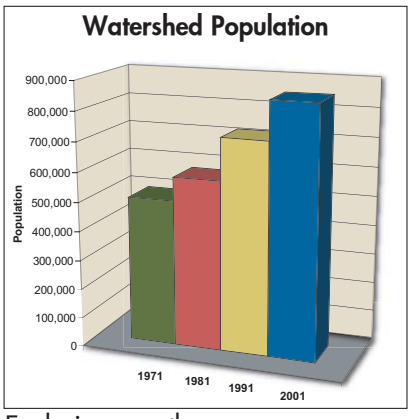
Further downstream, in the Middle Grand River area, water quality drops into the "Fair" category as the river drains regions of intense agriculture and receives sewage plant discharges from towns such as Fergus and Elora.

There is a further decline in water quality downstream of the cities of Waterloo, Kitchener, Guelph and Cambridge as the impact of effluent from sewage treatment plants and runoff from the urban areas is felt. Here, the Grand and Speed rivers drop into the "Poor" category.

Water quality recovers somewhat as groundwater springs and coldwater streams feed the Grand between Cambridge and Brantford, but then it drops off again downstream of Brantford and through the heavy clay soils of Haldimand.

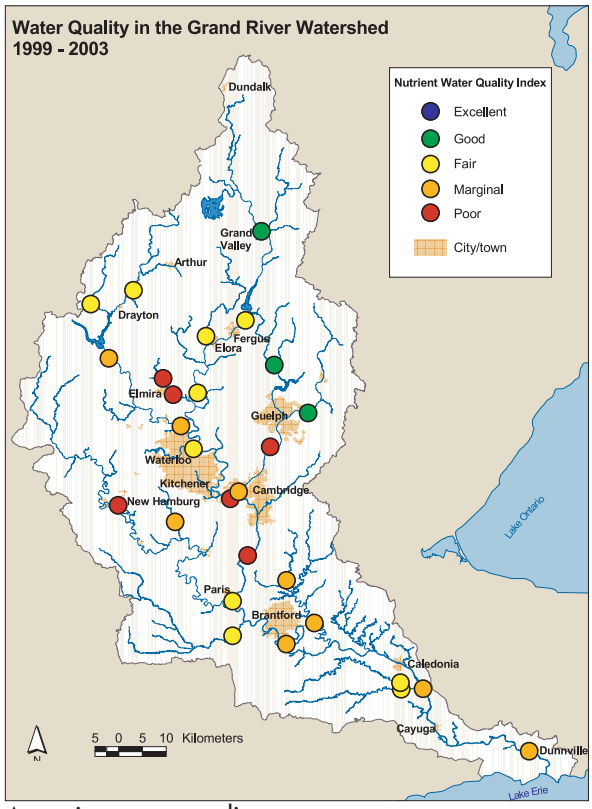
Sewage treatment plants are a major source of nutrients such as phosphorus and nitrates.

There are 26 wastewater treatment plants in the



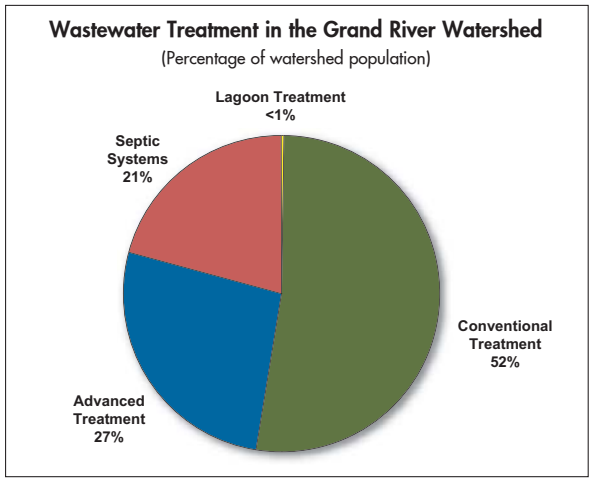
Explosive growth

The Grand River watershed is one of the fastest growing regions in Canada. Most of the growth is in the major urban areas – Kitchener, Waterloo, Cambridge, Guelph and Brantford. Sewage treatment plants have to be upgraded on a regular basis to keep pace.



Assessing water quality

The Water Quality Index is a way of showing areas of high nutrient levels, which can lead to poor water quality, especially in relation to its suitability as a habitat for fish and other aquatic creatures.



Sewage treatment

Municipal sewage treatment plants handle the waste from about 80 per cent of the watershed's residents. The plants provide either conventional treatment or advanced treatment, which removes more pollutants. About 21 per cent of residents have septic systems.

watershed serving 80 per cent of the total population. All 26 plants have the capacity to remove almost all of the phosphorus from sewage. Eight of the plants have advanced nitrogen removal.

The remaining residents of the watershed use septic systems. From septic systems, nutrients can make their way through the groundwater system to a watercourse.

Phosphorus levels are high throughout most of the watershed and in most places exceed the Provincial Water Quality Objective of 0.03 milligrams per litre of water. Phosphorus levels are highest in watercourses downstream of significant agricultural areas and large urban areas.

Despite the increases in population in the last 30 years, phosphorus levels are improving. More than half of the 28 water quality sampling stations in the watershed show a small, though measurable, reduction in phosphorus levels since 1981.

Nitrate levels are high throughout most of the watershed, particularly in major agricultural areas – the Canagagigue Creek near Elmira, Whiteman's Creek west of Brantford, and the Upper Conestogo River.

The oxygen target

Oxygen levels fluctuate over the course of the day, and over the course of the year, depending on plant growth, temperature and flows.

In the Grand River watershed, the goal is to ensure that the amount of oxygen in the water stays above four milligrams per litre for 95 per cent of the time. Oxygen content is monitored automatically at seven stations throughout the watershed, with the results posted hourly to the River Data section of the GRCA website.

The target for dissolved oxygen content is met most of the time. However, during times of hot weather and low flows the amount of oxygen in the river may, for a limited time, slip a small amount below the target downstream of Kitchener and Guelph.

Water Quality Report

The report, Water Quality in the Grand River, is available on the GRCA website at www.grandriver.ca

Study looks at long-term quality trends

It is a big and complicated job to measure the changes in water quality in the Grand River watershed. There are 28 locations where the GRCA collects water samples eight times a year.

The samples are analyzed by the Ontario Ministry of the Environment for a wide range of materials.

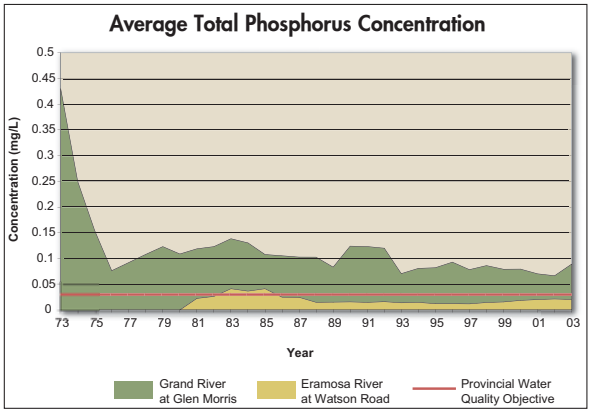
The results were evaluated for a 20-year period to determine changes in quality.

These charts, based on the report, Water Quality in the Grand River, show water quality trends for three key pollutants in various locations throughout the watershed. The charts show three-year running averages.

Locations were chosen to illustrate the range of the presence of phosphorus, nitrates and chloride (salt) at selected sites.

They are also compared to relevant objectives or guidelines set by the provincial and federal governments to get a sense of the current state of water in the Grand and its tributaries.

By studying trends, governments and other agencies can evaluate programs to combat pollution to see if they are working.



Phosphorus

Most of the watercourses of the Grand River watershed are high in phosphorus, which is found in sewage treatment plant effluent, manure, fertilizers and naturally in soil.

Phosphorus promotes the growth of aquatic plants and algae which can reduce the amount of oxygen available for fish and aquatic animals at night.

At one time, phosphorus was a common ingredient in washing detergents. It was removed in the 1970s, resulting in a significant drop in phosphorus levels in the Grand.

Improvements in sewage treatment plants and farm operations have also resulted in small, though measurable, drops in phosphorus levels in some spots. In many other places in the watershed, levels are stable, despite population growth and farm intensification.

The graph shows phosphorus levels at Glen Morris, downstream of Cambridge, where levels remain above the Provincial Water Quality Objective of 0.03 milligrams per litre of water. By comparison, levels are low in the Eramosa River, a forested area with less agriculture.

Nitrates

Organic nitrogen in manure, sewage plant effluent, fertilizers and natural organic materials break down into ammonia, then into nitrites and nitrates.

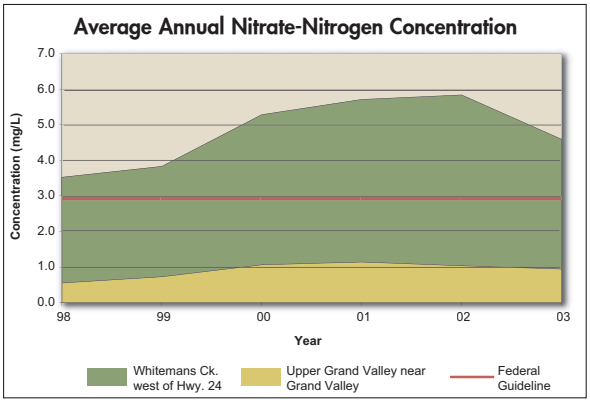
They contribute to the growth of aquatic plants and algae, which can reducing the amount of oxygen available for fish and aquatic animals at night.

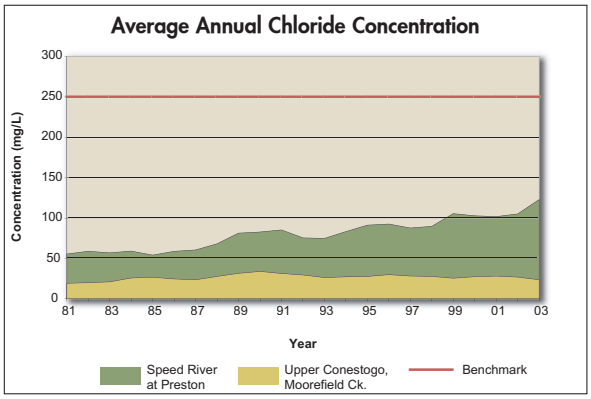
In the Grand River watershed, nitrate-nitrogen levels are highest in the areas downstream of major agricultural regions and urban areas.

The federal government's environmental quality guideline for nitrate as nitrogen is 2.93 milligrams per litre of water.

The graph shows nitrate levels in Whiteman's Creek, in western Brant County, which are among the highest in the watershed. This is an area of intense agriculture and many septic systems.

For comparison, the graph also shows nitrate levels in a less intensely farmed area in the headwaters region near Grand Valley.





Chloride

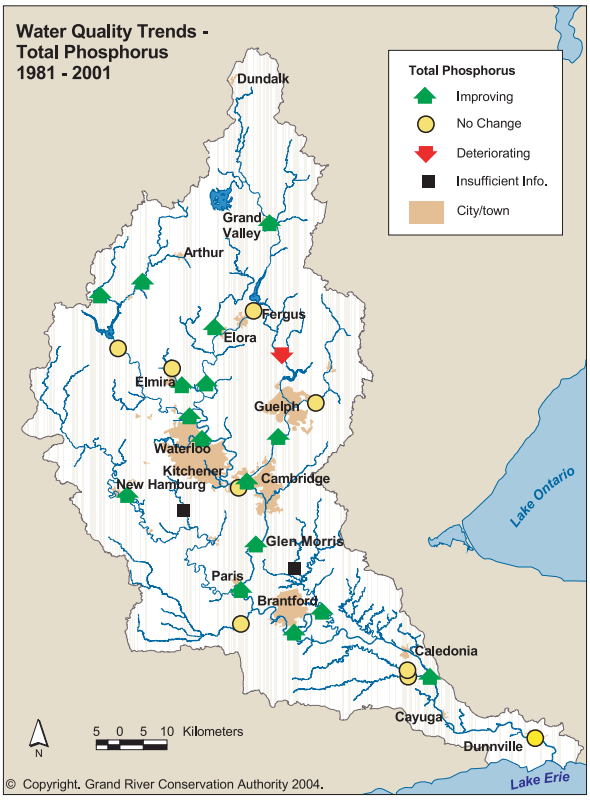
The rising level of chloride (salt) in surface water and groundwater is becoming a concern.

Most of the salt is washed off streets and highways during spring runoff where it enters rivers or seeps into groundwater. Salt from home water softeners may also contribute, though the amount is unknown.

Even though chloride levels are rising, for the most part they are still well below the level that threatens aquatic life or drinking water supplies. Chloride concentrations greater than 250 milligrams per litre have been found to have an impact on the survival of fish. This is used as a benchmark for comparison purposes.

The graph shows the growing presence of chloride in the Speed River at Cambridge (Preston), which is downstream of several urban areas. By comparison, chloride levels are low and stable in the Upper Conestogo River area, an agricultural region.

All levels of government are taking action to reduce salt use, though it may take some time for the results to show up.



Getting better

Improvements in sewage treatment plants and better farm practices have resulted in a small, but measurable, reduction in phosphorus in many places in the Grand River watershed.

Keeping it clean on the farm

Farming practices can have a big impact on water quality. Manure runoff, fuel spills and soil erosion can affect streams and rivers running through farm fields.

About 80 per cent of the Grand River watershed is agricultural, with about 8,000 farms. Farmers need clean water and so do downstream residents.

The Rural Water Quality Program was launched in 1998 to provide farmers with financial support and technical assistance to keep water clean on the farm.

The GRCA administers the program on behalf of Waterloo Region, Wellington County, Brant County, Guelph and Brantford which contribute money.

It is invested in manure storage tanks, fencing along stream banks, tree planting, milkhouse wastewater handling, and fuel storage equipment.

A total of $10 million has been invested so far. Of the total, about $4 million was in grants to landowners, with the landowners contributing about $6 million in cash, labour and materials.

About 1,200 projects have been completed. About 79 kilometres of stream have been fenced to restrict livestock access. About 590 acres of fragile farmland has been reforested and 150 manure storage tanks have been constructed.

The results of the program are starting to show up in improved water quality in streams and rivers.

That's one of the reasons why a test project has been launched to stock brown trout in the Conestogo River in Wellington County and Waterloo Region.

Trout need cool, relatively clean water to survive. Their ability to live in the Conestogo will be a testament to the work done by the upstream farmers through the Rural Water Quality Program.

Studies of lower Grand highlight links between fish, water quality

The lower Grand is rich in fish, but variety of species shows impact of water quality issues

By the time the Grand River empties into Lake Erie, it has been through a lot. It's collected the runoff from thousands of hectares of farm fields and city lawns, accepted the effluent from 26 sewage treatment plants and been warmed by the sun during its 300 kilometre journey.

On the other side of the coin, it has also taken in fresh, clean water entering the river from streams and groundwater springs along the way.

The lower Grand, the section from Brantford to Lake Erie, has its own special characteristics that set it apart from the upper reaches. It flows through an area of heavy clay soil and silt, which can add to the volume of suspended sediments in the water. It's an area of intensive agriculture, which can add more nutrients to the river. There is little groundwater input in this section.

The flow of the river is also broken up by two large dams at Caledonia and Dunnville, which partition the ecosystem into three regions.

Lake and river meet

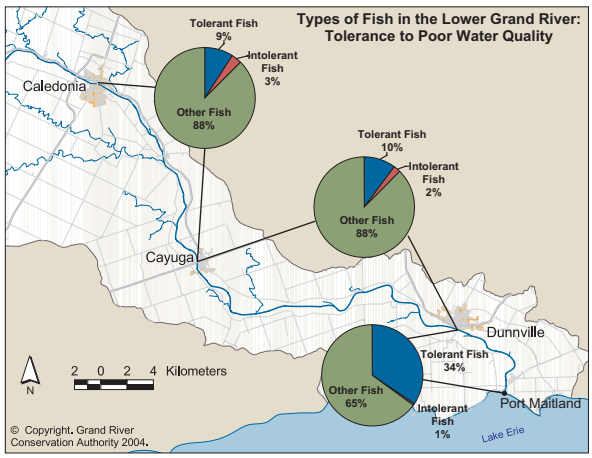
And to top it all off, there is an intermingling of lake and river ecosystems between Dunnville and the mouth of the Grand at Port Maitland on Lake Erie.

All of this makes the lower Grand an excellent laboratory for the study of the relationship between water quality and aquatic life, particularly fish.

Since 2000, the Ontario Ministry of Natural Resources, with the support of the GRCA and several environmental groups and fishing organizations, has been studying the lower Grand.

Some of the work is done at the Dunnville fishway, which was constructed in 1994 to allow fish to move upstream around the Dunnville dam. The fishway allows lake fish, such as walleye and rainbow trout, to get to upstream spawning areas.

The researchers have paid particular attention to walleye, which are a prized commercial and sport fish.



Degrees of tolerance

Different fish have different abilities to tolerate adverse water conditions, such as high temperatures or a narrow range of food supply. These "tolerant" fish do better in areas of lower water quality. The share of tolerant fish increases as you move downstream through the lower Grand River.

Walleye from the lower Grand contribute to a successful fishery within the river, and also make up a significant proportion of the commercial and sport fishery in the eastern part of Lake Erie.

What they've discovered is that this part of the Grand is rich in fish life.

They found 51 species of fish living between the Dunnville dam and the river's mouth. Further upstream, the section between the Dunnville and Cayuga is home to at least 40 species. From Cayuga to Caledonia the researchers found 26 species.

They range from catfish to gizzard shad, walleye, bass, goldfish and even a rare species – the black redhorse sucker.

According to Tom MacDougall of the Ministry of Natural Resources "we can gain insight into the quality of aquatic habitat in a particular area by looking at the makeup of the fish community that lives there."

Species that are tolerant of poor water quality, or aren't picky about what they eat, tend to thrive in areas that challenge species that are intolerant of poor conditions, such as those with specialized diets.

Many of the fish that live in this part of the lower Grand, such as carp and goldfish, are called "generalists" because they don't need specific types of food or habitat. About 25 per cent of the fish found in the lower Grand are considered tolerant of poor water quality.

Other fish that need higher quality or specialized habitat can be found in some locations or at particular times of year. For example, rainbow trout and mooneye move through the area during spawning season

Decline in some species

MacDougall noted that "historically, the fish community of the lower river includes such species as sturgeon and yellow perch."

However, sturgeon are absent now, and yellow perch are rare, he explained.

"Declines in these populations and overall change in the fish community have been attributed to historic declines in water quality, loss of habitat due to dams and the success of several introduced species, notably carp and goldfish."

But, he adds, improved water quality in the middle parts of the Grand River, notably in the Fergus to Cambridge area, has had a dramatic impact on the fish community in that region.

"The status of the fish community in the lower reach will likewise be an indication of the overall habitat quality."

Where our water comes from, where it goes

Look at a map of Ontario, and you can see in an instant the important role the Great Lakes have played in the development of the province.

Most of the major urban areas are nestled up against the lakes and can tap into a nearby supply of water – Toronto, Hamilton, Kingston, Windsor and St. Catharines.

But in the heartland of southwestern Ontario, along the Grand River, the story is much different. Here, in one of the fastest growing regions of Canada, are burgeoning communities that depend on the Grand River and groundwater.

The river and the rich aquifers of the region serve the domestic, agricultural, industrial, commercial and recreational needs of 875,000 people.

It's predicted that the watershed's population will grow by another 300,000 over the next 20 years.

This raises obvious questions about how much water is available, how it is being used and how efficiently it is being used.

New report on water use

A new report, Water Use in the Grand River Watershed, addresses some of those questions.

There is no simple way to get the answers about water use in the Grand River watershed. Information has to be collected from a variety of sources such as municipal records, provincial water taking permits, studies of farm water use and studies on rural domestic water consumption.

The study also examines the various sources of the water – rivers, shallow aquifers, deep aquifers, the Great Lakes – to get a more accurate picture of the relationship between water supply and water consumption.

Water Use Report

This information is drawn from the report Water Use in the Grand River Watershed. The report is available on the GRCA website at *www.grandriver.ca*

One way to look at water use is to compare it to a financial budget. There is a certain level of "income" – represented by annual precipitation – and a certain level of "expenditures" – represented by water use.

The Grand River watershed gets an average of 900 mm of precipitation a year. About two-thirds of it evaporates back into the sky, with the remaining 300 mm running off into the river or soaking into the ground.

Each year, the rivers and aquifers are replenished with about 2,420 million cubic metres of water. To put that into perspective, the average daily water consumption of a household of three people amounts to about one cubic metre.

That's the "income" side of the equation.

On the "expenditure" side, the water use report estimates that the people of the Grand River watershed – along with their farms, industries and commercial operations – consume about 297 million cubic metres of water in a year. That amounts to about 12 per cent of the "income."

However, almost all of that water stays in the watershed and, in fact, one drop of water can be used many times in many different ways on its journey from the headwaters to Lake Erie.

Municipal water systems take about 40 per cent of the water used in the watershed. These water systems supply drinking water to about three-quarters of the residents of the watershed, plus factories, stores, gardens, parks and recreational facilities.

The sources of municipal water vary from place to place. The City of Brantford and the village of Ohsweken in the Six Nations Territory get all of their water from the Grand. The Region of Waterloo gets about a quarter of its water from the river. All together, the Grand River provides about 28 per cent of the total municipal water supply.

Wells supply the rest of the water supply for the Region of Waterloo, as well as Guelph and the remaining towns and villages of the watershed. Groundwater accounts for about 69 per cent of the watershed's total municipal water supply.

The only watershed communities to use Great Lakes water are all in Haldimand County: Caledonia, Cayuga and Dunnville. That accounts for just three per cent of the watershed's total municipal water supply.

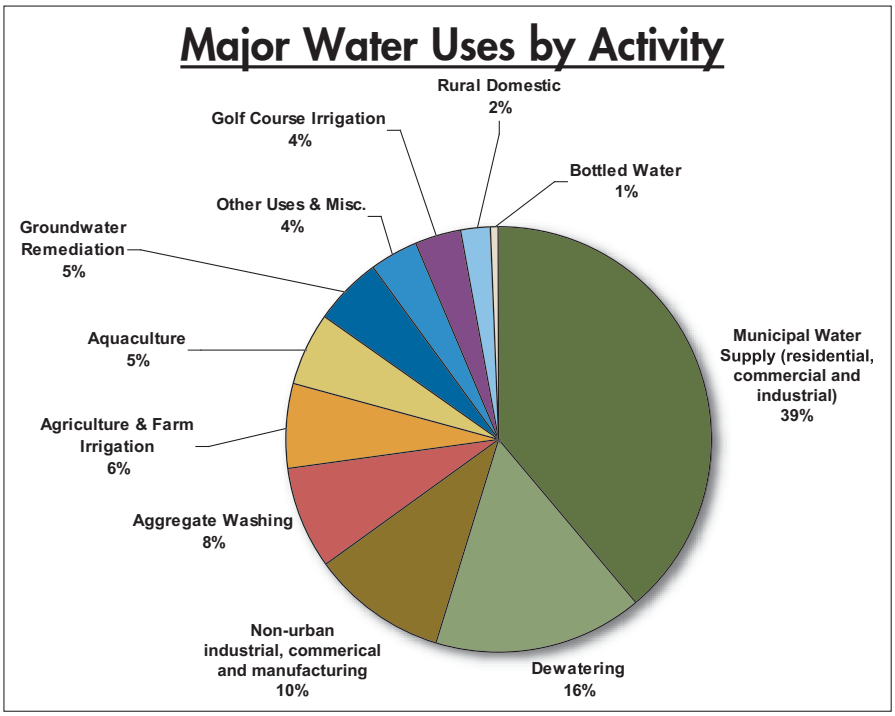
Most of the water taken for municipal water supplies ends up back into the river through sewage plant discharges. Some water re-enters the groundwater system through private septic tanks.

Remove water from mines

Dewatering is the second largest water use in the Grand River watershed, accounting for about 16 per cent of all water use. This involves the removal of groundwater to allow access to materials, such gravel in quarries in the central part of the watershed, or the gypsum mines near Caledonia. This water is usually discharged to a river or creek.

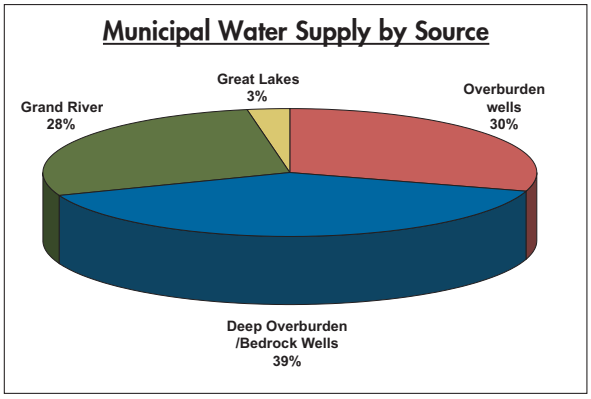
The next largest group of users are industries and businesses that have their own individual water supplies. They account for about 10 per cent of water use. Some examples are rural factories and other businesses with their own wells.

Aggregate washing is a significant water use, accounting for eight per cent of the total. Water is used to clean silt from gravel before it is shipped. Most gravel pits recycle their water and usually draw fresh water only to make up for losses,



How water is used

This graph shows how water is used in the Grand River watershed. Municipal uses include residential, commercial, industrial and other customers served by municipal water systems.



Where water comes from

Most municipal water supplies in the watershed come from groundwater, although the Grand River is providing a growing share of water, particularly in Waterloo Region. The Great Lakes provide only a small percentage of the municipal water supply.

such as through evaporation.

Fifth on the list is water use on the farm. (See the other story on this page for details.)

Aquaculture is the sixth largest water use, amounting to five per cent of the total. This includes water used for large-scale fish farms or public fishing ponds. They require a continuous stream of fresh water. Wastewater is usually discharged to a river.

While most water is used and reused, there are some water uses that result in water leaving the watershed.

Most of the water drawn for farm irrigation, golf course irrigation and lawn watering eventually evaporates back into the atmosphere.

Some water leaves the watershed from water bottling plants, food processing operations and breweries.

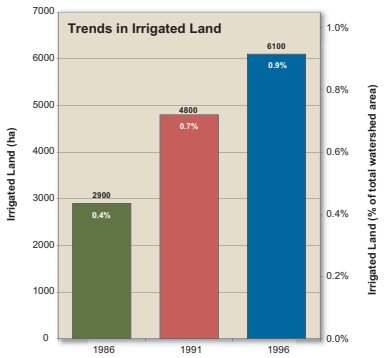
Water bottling accounts for about one per cent of the water used in the Grand River watershed, although these operations tend to be concentrated around Guelph and the eastern part of Wellington County.

Irrigation is growing

About 80 per cent of the Grand River watershed is farmland, so it stands to reason that agriculture would be a significant water use.

Most water use on the farm falls into two categories:

- ❑ general farm use, which includes livestock watering and greenhouse operations
- ❑ crop irrigation.



The amount of water used in each of those two broad categories is roughly equal, about 9.6 million cubic metres per year. Each category represents about three per cent of total water consumption in the watershed

However, there are some significant differences in how and when the water is used.

Water consumption for general farm use is highest in the western parts of Waterloo Region and Wellington County, which are areas known for dairy, beef, hog and mixed farming. General farm water use is also high in the rural portions of the City of Hamilton, around the communities of Jerseyville, Lynden and Sheffield.

Water use tends to be fairly steady over the course of the year.

Crop irrigation is another story. The most intensive area for crop irrigation is in the southwest area of the watershed, in Brant, Norfolk and Oxford counties.

This is a region called the Norfolk Sand Plain and is known for the specialty crops it produces including tobacco, fruits and vegetables.

The sandy soil must be irrigated to stay wet at critical times. That means that the amount of water used for irrigation can be exceptionally high for a short period of time.

In fact, in some years there are weeks when crop irrigation is the second highest water use in the entire watershed, following only municipal water use.

In dry years, when water supplies are at their lowest, irrigation will be at its highest, putting additional strain on groundwater and surface water such as Whitemans, Horner and McKenzie creeks.

Changes in agricultural practices can result in changes in irrigation patterns, too. As more acres of the Norfolk Sand Plain are planted with specialty crops, the number of hectares of irrigated land in the watershed has increased. Between 1986 and 1996 it doubled to more than 6,000 hectares.

Farmers have also implemented programs to limit the impact of irrigation during drought conditions.

Water conservation programs are having an impact in cities

Canadians are fond of quoting the fact that this country has more fresh water than any other country in the world, about 20 per cent of the total.

But they're less likely to be proud of another fact - Canadians use more water than the residents of other industrialized countries. The average Canadian uses about 343 litres of water a day for household chores - cooking, cleaning, showering, lawn watering and so on.

Meanwhile, most Europeans use half that amount. The average resident of Britain or France uses about 150 litres per day.

For most Ontario cities, which draw their water from the Great Lakes, water conservation has not been much of an issue.

But in the Grand River watershed, which depends on the river and groundwater systems, water conservation has been a major goal of local government, particularly during the recent drought.

Most of the urban areas of the watershed have water conservation programs.

These can include toilet replacement programs, water metering, lawn watering restrictions, rain barrel programs and efforts to keep distribution systems in good repair to reduce losses.

In communities with the oldest and most aggressive programs, water consumption has dropped significantly.

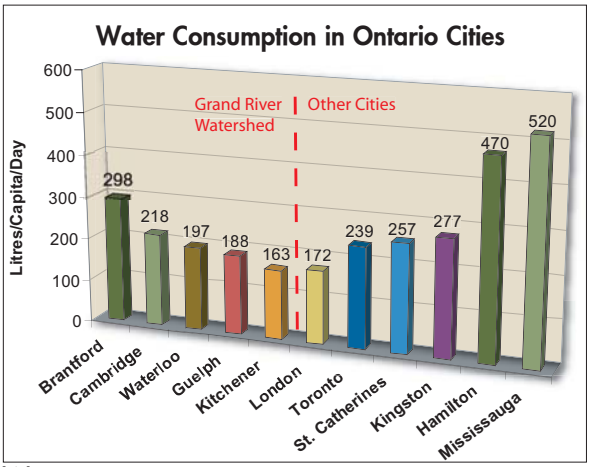
Waterloo, Cambridge and Kitchener in the Region of Waterloo have had a full range of water conservation programs in place for several years. Domestic consumption ranges from 163 litres per day in Kitchener to 218 litres per day in Cambridge.

Guelph also has a full complement of programs and has been particularly strong in implementing controls on outdoor water use, even going so far as to impose a ban during the drought year of 2002. Average consumption there is 188 litres per person per day.

The City of Brantford, which is in the process of implementing new elements of a water conservation program, tops out the watershed cities at 298 litres per person per day.

Outside of the cities, water consumption tends to be significantly lower. This is likely a result of the fact that rural well owners quickly learn to conserve water because of limited supply or to ensure their septic systems operate efficiently.

Rural domestic use has been estimated at about 160 litres per person per day.

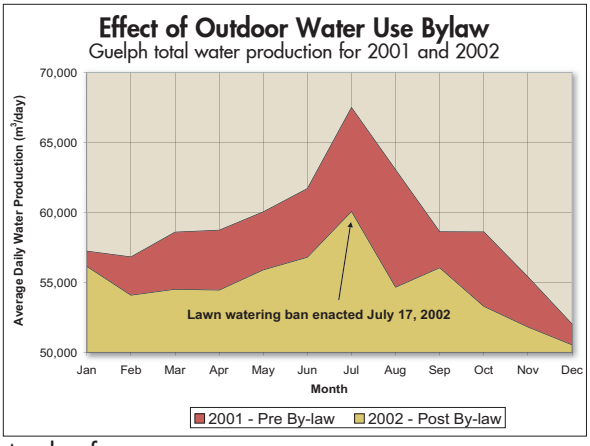


Water use

Water consumption tends to be less in Grand River communities than in cities that draw their water from the Great Lakes.

Water Conservation Programs

Urban Area	Metering	Distribution System Maintenance	Domestic Efficiency Programs	ICI Efficiency Programs	Rain Barrel Program	Outdoor Water Use Bylaw
Brantford	✓	✓			✓	✓
Cambridge	✓	✓	✓	✓	✓	✓
Guelph	✓	✓	✓	✓	✓	✓
Kitchener	✓	✓	✓	✓	✓	✓
Waterloo	✓	✓	✓	✓	✓	✓



A tale of two years

Faced with severe drought, Guelph imposed vigorous regulations on outdoor water use in 2002 which showed up in a significant reduction in water consumption.

Reservoirs play a critical role in water supply, flood control

It's safe to say that without the GRCA reservoir network, the Grand River wouldn't be the river it is today.

In fact, there are hot dry days in the summer when it wouldn't be a fifth of what it is today.

The seven reservoirs, which were built between 1942 and 1976, play an important role in flood protection and maintaining minimum flows in the Grand River system.

The reservoirs are filled during spring runoff, and then the water is released gradually during the summer months. This helps to reduce the size of flood peaks in the spring, and ensure the rivers are still running in the summer.

The reservoirs, along with other flood protection work such as dikes and channel improvements, have resulted in a reduction of annual flood damages by an average of $5 million a year.

Drinking water supply

The water used to augment summer low flows ensures that communities such as Waterloo, Kitchener, Cambridge, Brantford and Ohsweken have enough drinking water.

Low flow augmentation also ensures that there is enough water in the river to receive the effluent from sewage treatment plants, such as those at Doon, on the Grand River, and Guelph on the Speed River.

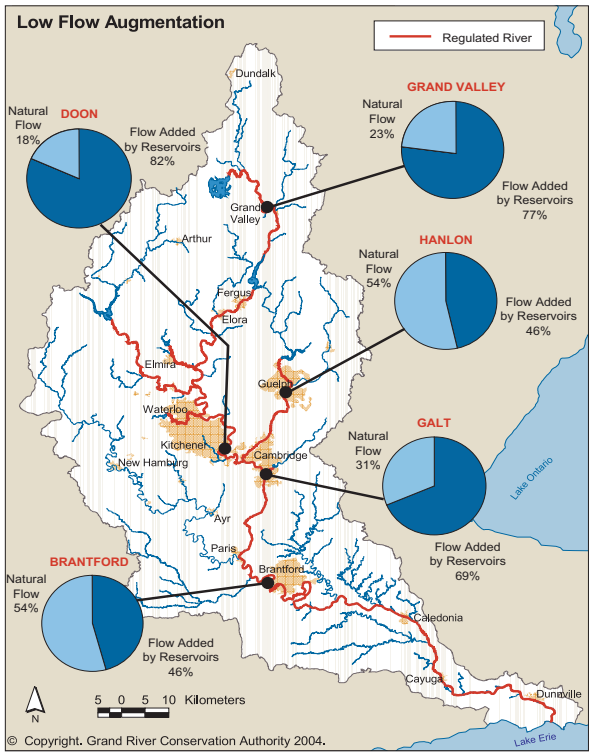
Maintaining minimum flows is also important for aquatic life. It ensures there is enough space and food for fish and other aquatic creatures. In addition, the water coming out of the reservoirs is usually cool, so that makes the river a better habitat for coldwater fish, such as trout.

During the past few years of drought, augmentation of river flows has been vitally important.

During the driest parts of the summer of 2003, more than 82 per cent of the water flowing in the Grand River at Kitchener came from the GRCA reservoirs.

At Cambridge (Galt), reservoir water amounted to about 69 per cent of the flow. Further downstream, in Brantford, reservoir water made up 48 per cent of the flow.

On the Speed River, water from Guelph Lake reservoir amounted to 46 per cent of the flow during the driest week of the summer.



Keeping the rivers flowing

Water stored in GRCA reservoirs in the spring is released during the summer to ensure that minimum flow targets are met on the Grand and Speed rivers. During the driest parts of the summer, water from the reservoirs can represent more than 80 per cent of the flow.

The ups and downs of a year on the Grand

Over the course of a year, the Grand River and its tributaries will rise and fall with surprising speed and frequency.

Flows can double or triple within hours after a major rainstorm.

Most of these fluctuations go unnoticed, because the rivers stay within their banks.

However, several times a year the rivers can threaten to overtop their banks. In these situations, the GRCA monitors conditions, issues warnings and operates dams to reduce floodwaters and damage.

Here are some of the events earlier this year.

January ice jam: A thaw in early January was followed by a sharp, sudden freeze causing the creation of slushy ice in the river. The ice collected in many spots between Fergus and Dunnville, including a jam that extended from Paris to Brantford, causing the water to back up behind them. Fortunately, the jams broke before water spilled over the banks. Ice jams are a constant threat on the Grand and in the past have led to flooding in many communities such as Grand Valley, West Montrose and Paris.

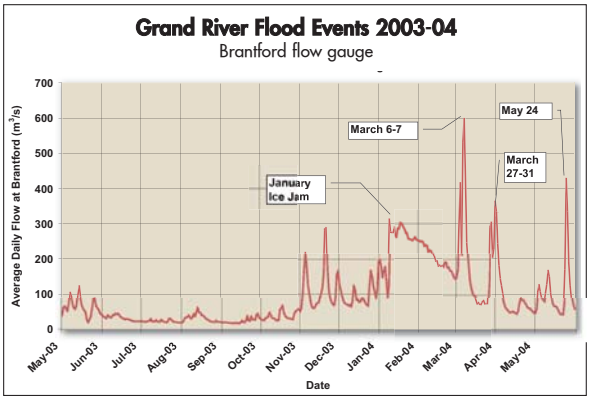
March 6-7: There was plenty of snow on the ground the first week of March when rain and warm air moved in, with a high temperature of 19C. The rain, rapid snowmelt and ice jams led to dramatic rises in flows across the watershed.

On the Nith River, an ice jam near New Hamburg and high water in Ayr led to flooded basements.

On the Grand and Speed rivers, dams were operated to reduce downstream flows, but even then, rivers ran high over the weekend. At Brantford, flows peaked at about 600 cubic metres per second (cms), compared to normal summer flows of about 20 cms.

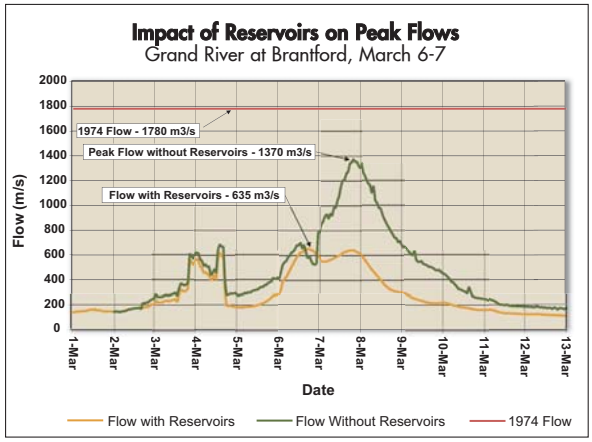
March 27-31: More warm weather melted the remaining snow on the ground throughout most of the watershed. River levels rose quickly, but not enough to spark any formal warnings. At Brantford, flows rose to about 350 cms.

May 24: Early May was wet, so when a major rainstorm passed through the Victoria Day weekend, the result was significant runoff. Some parts of the watershed received a month's worth of rain in a day. With the camping season in progress, warnings were issued to trailer parks along the Grand so owners could safeguard their property. At Brantford, the river rose to more than 400 cms.



Rise and fall

This graph shows flows at Brantford over the course of a year, illustrating the highs and lows associated with changes in the weather. Most of the major tributaries of the Grand have added their water to the Grand by the time it reaches Brantford.



The impact of reservoirs

This graph shows how the GRCA's network of reservoirs can reduce peak flows during flooding events. During the weekend of March 6-7, following a sudden warm spell, flows in the Grand at Brantford peaked at about 600 cubic meters per second. However, the GRCA captured a lot of runoff in its reservoirs, reducing peak flows significantly. Without the reservoirs, the peak would have been twice as high, approaching the level recorded during the 1974 flood.

Healthy forests are part of a healthy watershed

According to Environment Canada, at least 30 per cent percent forest cover is needed to maintain a healthy watershed. Currently, the Grand River watershed contains approximately 19 per cent forest cover.

Forest cover in the Grand River watershed has been changing ever since the retreat of the last glaciers.

First Nations inhabitants of the Grand River valley, particularly in the Brant County area, used periodic burning to improve hunting grounds and later as a way to develop land for agriculture as their settlements became permanent.

Forest cover was 90%

By the time the area was opened to European settlement in the early 1800s, about 90 per cent was covered by forest and wetlands.

From 1800 to the 1870s, European settlers saw the forest as both a resource waiting to be harvested and as an obstacle to their plans to farm.

The Grand River forest is recovering but it remains well below target of 30%

Trees were burned for fuel and turned into raw materials for houses, barns and fences.

But as they cleared the land, the early settlers soon came to realize the consequences of their actions. Forests reduce soil erosion and soak up nutrients, thus keeping water cleaner. The shade cast by trees along rivers and streams keeps water cooler. Forests absorb or hold water during spring runoff and during summer storms, which helps to reduce flood peaks.

As the forests were cleared, summers became noticeably hotter, the winters harsher. The groundwater springs that had been a reliable source of water soon dried up.

On most farms, some bush was retained, usually at the rear of the farm, where it often abutted the neighbour's holdings. These forest remnants left a characteristic pattern on the landscape, reflecting the underlying survey of lots and concessions.

By the end of the 19th century, the transformation from forest to farmland had been pushed to the point where just five or six percent of the watershed remained under forest cover. Even that estimate may be too generous given the impact of grazing, which reduced much of the remaining forest cover to a marginal condition.

Nor was the remaining forest cover spread evenly across the watershed. The forested areas that remained were the acres that were ill-suited to farming because they were too wet, too hilly or too rocky, such as the headwaters area of the Grand in Dufferin County and the Eramosa River in eastern Wellington County. But where the land was good, such as the western parts of Wellington County and Waterloo Region, as well as much of Brant and Haldimand counties, few acres of forest remained.

Negative effects

The negative effects of wholesale forest clearing became obvious to some, but it was not until the late 19th century that the notion that anything could be done about it began to take hold. Sporadic initiatives during these decades were aimed mostly at the planting of roadside maples, which certainly provided an aesthetic improvement and a reduction in wind erosion.

However, it was not until the 1930s and 1940s that serious efforts began to be made to increase forest cover through active reforestation. These plantations, which became the backbone of the system of County Forests, were invariably coniferous, primarily pines, and many of the species used were not native. They were, however, a vast improvement over the eroded farmland they replaced.

Created conservation authorities

The same momentum helped spark the creation of conservation authorities across southern Ontario, including the GRCA.

Conservation authorities are now major players in the establishment and management of forests.

The GRCA owns 4,115 hectares of naturally forested property and has assisted with the reforestation of 8,480 hectares.

About 5,342 ha is GRCA land and 3,138 ha is private land. The GRCA has planted 26 million trees over the past 50 years.

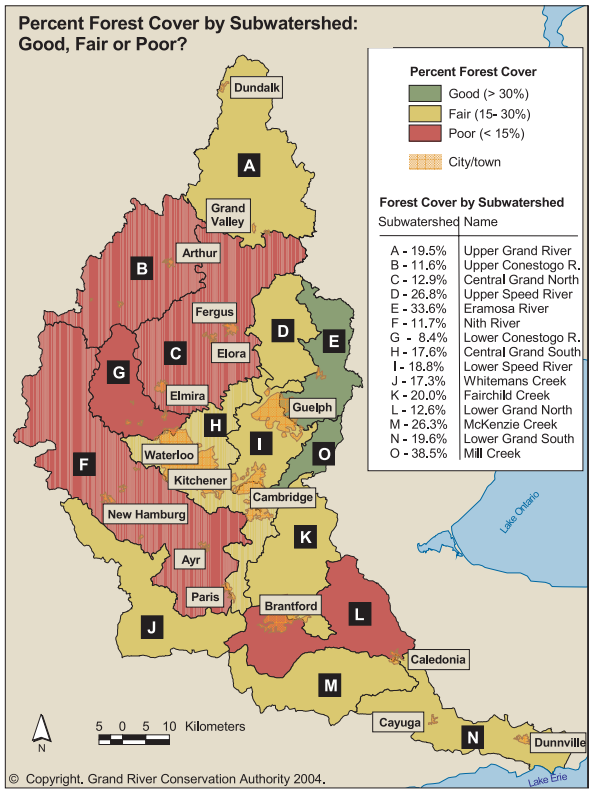
In recent decades, there has also been a marked greening of attitudes toward the environment. The Provincial Policy Statement, issued under the Planning Act, now affords a certain level of protection for significant woodlands. Increasingly, forest remnants are being incorporated into the urban fabric.

Overall, the extent of forest cover in the past 60 or 70 years, has increased rather dramatically due primarily to natural regrowth on abandoned or marginal farmland. Such "replacement woodlands" now make up over half of the Grand River Forest, and their importance will continue to grow.

On the other hand, remnants of the original forest are constantly under pressure from urban expansion, particularly the "suburbanization" of rural areas, with new houses built into the edge of forests.

Watershed Forest Plan

Much of the material about terrestrial resources was drawn from the Watershed Forest Plan. The plan is available on the GRCA website at *www.grandriver.ca*



Forest cover across the watershed.

Environment Canada recommends that a healthy watershed should have forest cover of 30 per cent. This map shows the forest cover in the subwatersheds of the Grand River.

Before and after

These two aerial photos show the same parcel of land between Belwood and Orton along the Wellington-Dufferin border. The photo on the left shows the area in 1963, when it had about 19 per cent forest cover, which is comparable to the watershed as a whole. The photo on the right shows the land in 2000 with about 30 per cent forest cover, which is the target for a healthy watershed.

The forest in our cities

The word "forest" brings to mind rolling, green hills stretching far off into the distance.

But in the Grand River watershed, the forest that is closest to most people is the one we seldom think of — a clear case of missing the forest for the trees.

It is the urban forest, the collection of shade trees, small woodlots and riverbank woodlands that dot our cities and towns.

About 650,000 people live in cities and towns of the watershed, even though they occupy only about five per cent of the total land.

Thus, on a day-to-day basis, the urban forest is the place where city dwellers interact with nature. By keeping the urban forest strong and healthy, we do the same for our communities and their residents.

The urban forest is special in another way: about 80 to 90 per cent of the urban forest is on private property, therefore it is crucial to educate private landowners and involve them in the planning process.

To achieve maximum benefits from the urban forest, it must be considered as a critical component in the community's infrastructure, and not an add-on frill.

One way to assess the size of the urban forest and the benefits it provides is by measuring the canopy cover —- the percentage of a city's area underneath tree leaves.

A study of 1999 satellite images of the cities of Kitchener, Waterloo, Cambridge, Guelph and Brantford shows the total canopy covers about 25 per cent of the total land area of the cities. Among the five cities, canopy cover ranges from a low of 23.5 per cent in Brantford to a high of 29.8 per cent in Waterloo.

Those numbers may surprise a lot of city dwellers, but they are still quite a bit less than the 40 per cent canopy cover recommended as a target by American Forests, a century-old non-profit environmental organization.

To reach that goal would mean planting one new tree for every two that grow today.

Canopy cover varies within the cities, too. In the five watershed cities, the average canopy coverage in residential areas is about 31 per cent, while in industrial-commercial areas it is less than half of that –14 per cent.

The city forest, like its country cousin, must be properly managed if it is going to provide maximum benefits to the environment and to the living creatures who live in it — including human beings.

For example, most of the benefits increase as the leafy area grows. The leaf area depends on the age and type of tree, therefore it is important to plant trees that will live long enough to develop a large canopy.

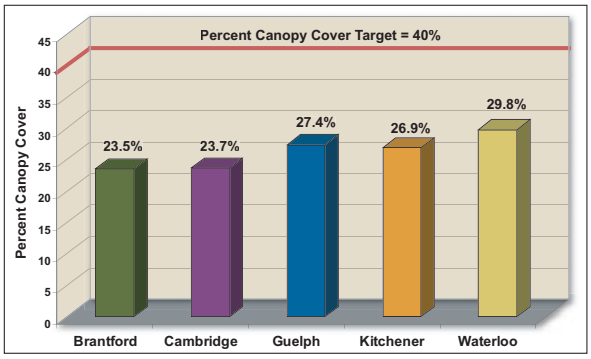
However, many current development practices work against that. Large houses sit on small lots, leaving less space to plant large trees. Bigger driveways in front of houses, and larger parking lots around stores and factories, also reduce the space available for planting trees.

The result is a tendency to plant more species that are smaller and shorter-lived and never develop a large canopy of leaves.

Variety is important in the urban forest. Often, the urban forest consists of a small variety of trees. However, when a forest is dominated by a few species, it is vulnerable to disease and pests, a fact demonstrated by the devastation caused by Dutch elm disease and chestnut blight, which wiped out millions of urban trees in the 20th century.

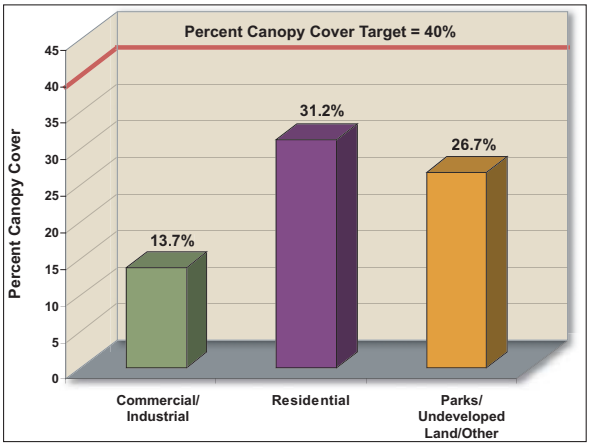
The urban forest:

- ❑ removes air pollutants and dust particles from the air
- ❑ conserves energy by providing shade in summer and acting as windblocks in winter
- ❑ reduces stormwater runoff and improves water quality
- ❑ reduces noise
- ❑ provides wildlife habitat
- ❑ increases property values
- ❑ improves appearance of communities
- ❑ improves psychological well-being



Urban canopy cover

The graph above shows the canopy cover in the five cities of the Grand River watershed, based on information from satellite images. The graph at right shows the average canopy cover for different land uses within the five cities.



Invaders among us

Our forests, gardens and yards are cosmopolitan places. It's not unusual to find them populated with plants, birds or animals from the four corners of the world.

Some have become commonplace and it is hard to imagine the landscape without them: apples, lilacs and English sparrows, for example.

But some exotic species have the potential to wipe out native plants and creatures, reducing the biological diversity of our natural areas.

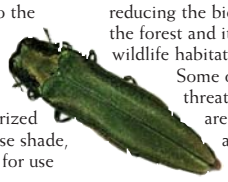
Purple loosestrife, zebra mussels, buckthorns and garlic mustard are some of the many invasive exotics of concern in southern Ontario.

Some of these species arrived accidentally. Others were deliberately introduced but have spread into the wild, where they threaten to overwhelm or replace native species.

Garlic mustard was introduced for culinary use but has become a serious weed in open forests where it can completely cover the forest floor, pushing out many native spring wildflowers.

Oriental bittersweet is sold in garden centres (sometimes, mistakenly, as the native plant) but birds carry its seeds to open forests where it climbs high into the canopy.

A notable example is the Norway maple, which is common in many urban areas. It is prized for its hardiness and dense shade, which make it attractive for use along streets and in parks.



However, those same characteristics make it unwanted in the forest, where the shade prevents other plants, including native sugar maples and ground plants, from growing. Gradually, the Norway maple forces out other species, reducing the biological diversity of the forest and its suitability as a wildlife habitat.

Some of the newest threats to Ontario's forest are two bugs that were accidentally imported in packing crates shipped to North America from the Far East.

The Asian Longhorned beetle has been found near Toronto while the emerald ash borer is in the Windsor area.

Quarantine areas have been established restricting the movement of wood out of these areas. Thousands of trees have been cut down to limit the spread of the bugs which could, if let loose throughout the rest of the province, cause untold damage to the province's urban and rural forests.

Species-at-risk give clues to health of the watershed

The size and location of the Grand River watershed make it the natural home of an amazing variety of plants and animals.

But they have to compete for space with our cities, towns and farms, which puts the survival of some species-at-risk.

In fact, the Grand River watershed is home to a large percentage of species-at-risk in Ontario. Even though the Grand River watershed is less than one per cent of the land of Ontario, it is home to about 80 terrestrial species-at-risk – 37 per cent of the total.

Why is it important to study species-at-risk?

Early warning

In a way, they function like the "canary in a coal mine." The presence of a wide variety of species in an area indicates ecological diversity and health. When numbers dwindle, it often demonstrates that special, and sometimes rare, habitat is being lost.

Number of species-at-risk highlights loss of habitat variety

The effort to identify and protect species-at-risk involves many organizations.

The species-at-risk Program of the Ontario Ministry of Natural Resources assesses the status of species in Ontario. The ministry participates in species recovery teams with other groups, including the GRCA

Many municipalities are undertaking natural heritage inventories, which include searching for regionally and provincially rare species. Bird Studies Canada is involved in bald eagle monitoring in southwestern Ontario. The Royal Ontario Museum is studying fish populations.

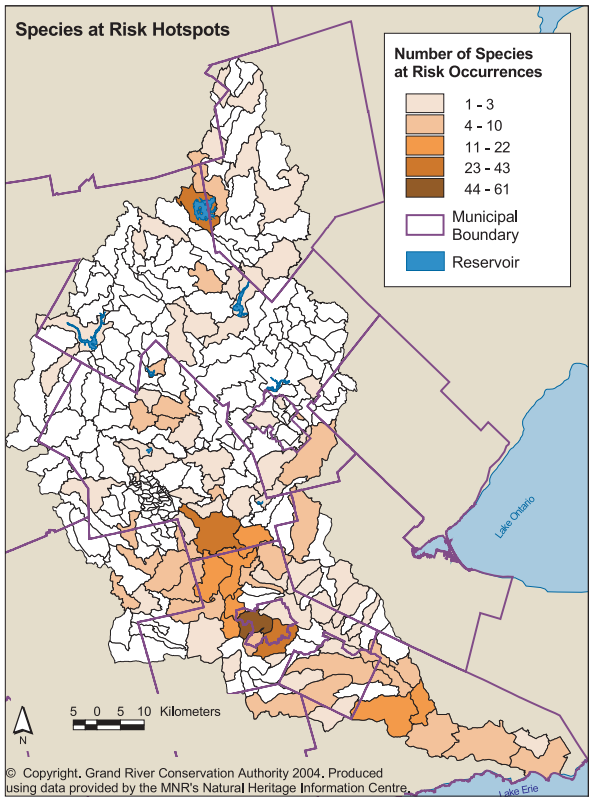
Many other organizations, academic researchers and environmental groups are studying species-at-risk, as well. By narrowing the information gaps, they will help push forward the effort to develop programs to stabilize the populations of species-at-risk.

As the owner of a significant proportion of the natural landscape, the GRCA plays an important role in studying and protecting species-at-risk in the watershed.

One way the GRCA fulfills that role is by buying and owning environmentally sensitive lands.

There are fundamental requirements for all species-at-risk, such as adequate habitat quality and quantity. Protecting and enhancing habitats within the public and private domain is a good first step. As information is gathered on individual species, more effective management recommendations can be made.

The GRCA is developing a database for GRCA-owned land of species-at-risk, as well as an occurrence reporting system. This will provide information for future land management decisions, including incorporating provincial recovery programs into land management practices.



Species hotspots

This watershed map illustrates the number of rare species occurrences (populations) that have been confirmed within the last 20 years. Many spottings have taken place in the southern Grand, which is part of the Carolinian forest zone. The Luther Marsh Wildlife Management Area, at the north end of the watershed, is also a prime habitat for species at risk.

Keep an eye out for these rarities

Here's some information on a pair of species-at-risk living in the Grand River watershed, as well as a rare habitat along the Grand.

<u>Least Bittern</u>
(Ixobrychus exilis)

Description: A small buff coloured heron with a relatively long neck. Nests in freshwater marshes, usually in cattail marshes larger than five hectares. Usually seen crouched amongst the reeds hunting their prey.

Status: About 1,000 to 3,000 pairs in Ontario. About 100 pairs in the rest of Canada. Designated as "threatened" in Canada; may be upgraded to "threatened" from "special concern" in Ontario.

Threats: Loss of habitat due to the draining, filling and degradation of wetlands, natural succession and extremely high water levels. Unnaturally high densities of predators such as raccoons. Susceptible to environmental contamination and disturbances from recreational use of wetlands and human disturbance during nesting periods.

What we can do: Support efforts to enhance, rehabilitate and protect wetlands. During nesting season for birds (May-June) avoid hiking or paddling in bittern habitat.


Photo by B. Dyer

<u>Southern Flying Squirrel</u>
(Glaucomys volans)

Description: A small squirrel with a silky coat, grayish-brown above and white below. It has loose folds of skin between its forelegs and hind legs and a flattened grey-brown tail to facilitate gliding. Nocturnal creatures that make faint, bird-like notes from within the canopy. Usually inhabit deciduous forests with an abundance of beech, maple, oak and hickory tree species.

Status: Designated as "vulnerable" in Ontario

Threats: Loss of habitat. Smaller forest segments cannot accommodate species that require large ranges, or provide the abundance and variety of food necessary. Removal of large canopy trees and cavity trees causes disturbance and food depletion.

What we can do: Ensure large forests exist and that cavity trees remain. Dying or dead trees provide food and shelter to numerous forest dwellers.

<u>Tallgrass Prairies</u>

Description: Characterized by an abundance of grasses that typically grow three or more feet tall, including big and little bluestem grasses, gama grass, Indian grass, switch grass and prairie cord grass. Shorter grasses and sedges are common as are a rich assortment of flowering plants. Prairies are significant habitat for several butterfly species, plants, birds and small mammals, including the American badger, which is endangered in Canada.

Status: Extremely rare. A handful of blocks of two hectares or less exist in Waterloo Region, Brant County and Haldimand County.

Threats: Invasive exotic species threaten these communities by crowding out native species and competing for resources. Fire is important in maintaining this community; in the absence of fire, prairies will likely turn into forest.


Photo by G. Allen

What we can do: Many prairie habitats are under private ownership, therefore landowners can play a significant role in protecting these rare communities. Fire is an integral disturbance component of these habitats. Public understanding of the role of fire is critical to saving prairie habitats. Support community efforts to enhance, rehabilitate and protect prairies in the watershed.

Species spotting

- More information on species-at-risk can be found at http://www.rom.on.ca/ontario/risk.php
- Report sightings to the Ministry of Natural Resources Natural Heritage Information Centre at www.mnr.gov.on.ca/MNR/nhic/nhic.cfm)

The GRAND RIVER CONSERVATION FOUNDATION

Our donors make a difference

Thanks to the generous donation support of corporations, individuals and like-minded foundations, the Grand River Conservation Foundation's programs are making an impact in improving our local environment.

As future decision makers, our children need to understand the importance of their relationship to the environment.

Last year, The Living Classroom - Campaign for Outdoor Education helped 30,000 students attend curriculum-based outdoor education programs, and funded improvements to nature centre lands and facilities.

More than $1.7 million has been raised for this important program, and this major support will continue for all six watershed school boards in the new school year.

Other Foundation initiatives include:

❑ improving the GRCA's popular rail-trails

❑ building the first two phases of a new irrigation system at the Burford Tree Nursery, to help reduce water use and increase tree survival rate

❑ creating new forests by helping to plant thousands of trees

❑ funding numerous fisheries enhancement projects.

❑ sending needy children to the GRCA's Eddie Lackenbauer Fishing Camps

❑ awarding seven high school and university level scholarships

Groups can apply for funding

Again in 2004, the Foundation is accepting applications from community groups needing funds for local environmental projects. With funding from its Grand Champions and Thiess Riverprize endowment funds, the Foundation is offering grants up to $2,000 for worthwhile projects.

Deadline for applications is Oct. 31. To obtain application information, check the Foundation section of the GRCA website at www.grandriver.ca, or e-mail: foundation@grandriver.ca, or phone directly to (519) 621-2763 ext. 271 in Cambridge.

Three ways you can help the environment

1. Plan a local project – We may be able to help with funding

2. Buy a Grand River book – All proceeds from Foundation book sales help to support local conservation work

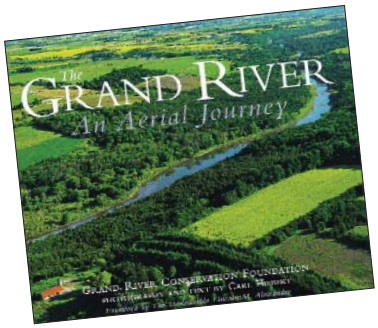
3. Make a donation – Donations are tax deductible and can be directed to one of the Foundation's major project areas.

The Foundation also has a unique bequest and planned giving program, that features accepting donations of environmental lands in partnership with the GRCA.

Growing the future

Students from two Waterloo schools took part in a special tree planting day at Laurel Creek Nature Centre thanks to the generosity of The Friends of Laurel Creek who donated $7,500 to The Grand River Conservation Foundation. The money was used to establish an arboretum of native trees which will be studied by children taking part in outdoor education programs at the nature centre. Trees were planted by Grade 6 students from Northlake Woods School and St. Nicholas School including Kelsey Hergott and Natalie Buttinger from St. Nicholas School.

Two great ways to enjoy the beauty of the Grand River watershed



The Grand River - An Aerial Journey

By Carl Hiebert – $59.95

Foreword by the Honourable Lincoln Alexander

See the Grand River as few have seen it before, through the stunning photographs and informative writing of noted author and photographer Carl Hiebert presented in this large format book.

All profits from book sales support local conservation and outdoor recreation projects.

Buying online: You can buy these books, plus other books, maps and videos about the Grand River, at the GRCA website at *www.grandriver.ca*

Grand River Country Trails 2

By Katherine Jacob

$14.95

(Available early October)

THE RECORD

A new guidebook to another 40 of the best trails in the Grand River watershed. Published by the Grand River Conservation Foundation in cooperation with The Record newspaper, as a complementary volume to their original Grand River Country Trails book.

Special Offer: Purchase both the Grand River Country Trails books for only $25 plus GST – a $5 saving.

zehrs *Grand River Country Trails* 2 is also available at Zehrs Markets.

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Support the Foundation
❑ Outdoor education
❑ Forestry
❑ Fisheries
❑ Trail improvements

Payment Method

Make cheques payable to the Grand River Conservation Authority.

You can use your credit card to pay for books or your donation

MasterCard ❑ Visa ❑

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Please mail the completed form with your cheque (if applicable) to:

The Grand River Conservation Foundation
400 Clyde Road, Box 729
Cambridge, Ontario N1R 5W6

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