Environmental news for the residents of the Grand River watershed

Watershed report

The GRAND

GRAND RIVER CONSERVATION AUTHORITY

Fall 2008

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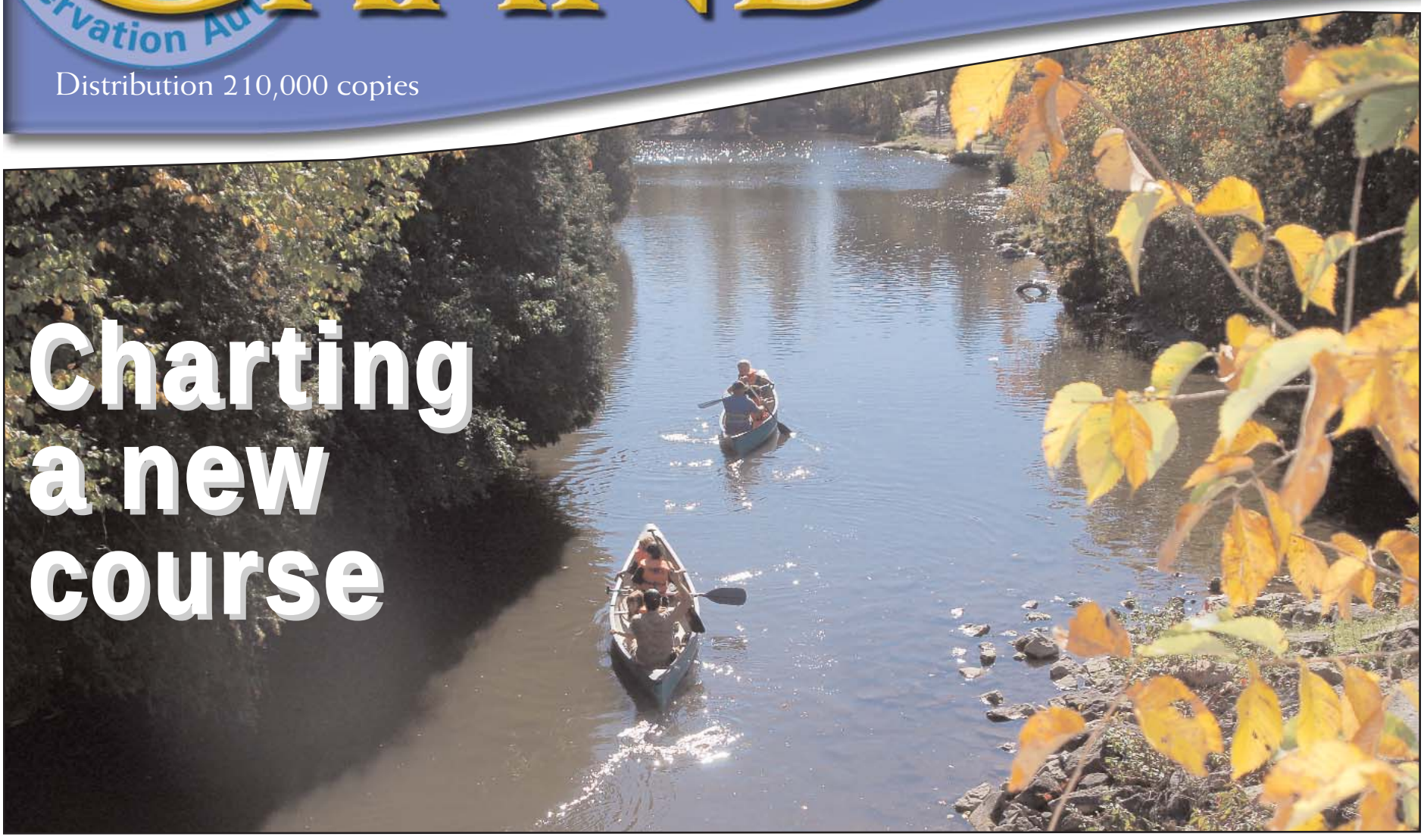

Charting a new course

The GrandRiver watershed has seen tremendous improvements in water quality, flood protection and water supplies in the last few decades.

Some of the success can be attributed to the 1982 Grand River Basin Water Management Study. It set a course followed by decision makers at all levels to reach the common goals of clean water, a healthy environment and prosperous communities.

This edition of The Grand reviews the work done since 1982 and examines the issues to be dealt with in a basin study update as we confront the challenges of climate change and population growth in the next 25 years.

Along the Grand

THE GRAND RIVER
A Canadian Heritage River

The GRCA

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A Message FROM THE CHAIRMAN AND THE CAO

It's time for a new road map

In the middle of the 20th Century, the Grand River was described as an "open sewer."

Since then, a concerted effort by municipalities, the GRCA and the provincial government has restored this historic waterway to its rightful place at the heart of one of the richest regions of Ontario.

A journey of this magnitude requires a road map. One important step on the way to a more robust watershed was the five-year study that led to the Grand River Basin Watershed Management Plan in 1982.

The study was a collaborative project involving the Ministry of the Environment, the GRCA, municipalities and other Ontario ministries. A detailed plan was developed to deal with water supply, flooding and water quality.

The articles in this edition of the Grand describe the goals of the plan, how they were achieved, and some of the issues that confront us now, a quarter of a century after the basin study was released.

The authors of the plan took the long view and weren't afraid to recommend solutions that they knew might take millions of dollars and many years to implement and show results.

They knew that when it comes to restoring something as big and complex as an entire ecosystem, there are no quick, easy – nor cheap – solutions.

Almost all of the study's recommendations were implemented in the 10 years following its release. There have been measurable improvements in all area examined by the study.

But there is no standing still when it comes to the environment. The only way to make progress is to constantly push forward.

Now, more than 25 years after the release of the basin study, the Grand River watershed faces significant challenges, some familiar and some new. Population growth, agricultural intensification and climate change are putting increasing pressures on our water and other natural resources.

It's time to update the basin study and develop a new road map to consolidate the gains we've made and start on the path to new ones. The risk is that if we don't, our watershed health may actually start to move in reverse.

An updated basin study would reflect the knowledge obtained during the past 25 years and help us meet the challenges facing us in the next 25. It would support our collective vision of clean water, a healthy environment and prosperous communities.

Resource management in a period of high growth presents several challenges.

Steps must be taken to ensure that our rivers can adequately handle the effluent from wastewater treatment plants. Pollution from non-point sources on rural and urban land has to be addressed in a more comprehensive fashion.

It is becoming more costly to achieve improvements in water quality through treatment plant upgrades alone. Other alternatives that build a healthy, resilient watershed are required.

Demand for water for municipal supplies is rising and municipalities face difficult and costly decisions about future water sources.

Vital physical features — the Waterloo, Galt-Paris and Orangeville moraines — are facing development pressures which could impair their ability to recharge groundwater aquifers.

Climate change will require new thinking about ways to respond to flooding and other environmental issues.

These issues cannot be considered in isolation from each other. Dealing with one will affect the others. The watershed is an environmental whole, and it needs broad solutions to its problems.

We have to look beyond existing "end-of-pipe" solutions to find new technologies and new approaches to address these issues that will complement and build on existing municipal infrastructure.

We need to build on the existing partnership of watershed municipalities, the GRCA and the province to foster development of new watershed management tools that address current issues and emerging pressures in a sustainable way.

Alan Dale
Chairman

Paul Emerson
Chief Administrative Officer

WHO SPEAKS FOR YOU?

The municipality where you live appoints one or more representatives to the GRCA board to oversee the budget and activities of the conservation authority.

They speak on your behalf at the GRCA.

Townships of Amaranth, East Garafraxa, East Luther Grand Valley, Melancthon, Southgate: Tom Nevills

Townships of Wellington North and Mapleton: Pat Salter

Township of Centre Wellington: Shawn Watters

Town of Erin, Townships of Guelph-Eramosa and Puslinch: Brad Whitcombe

City of Guelph: Vicki Beard, Mike Salisbury

Regional Municipality of Waterloo: (Cambridge, Kitchener, Waterloo, North Dumfries, Wellesley, Wilmot and Woolwich) – Jane Brewer, Kim Denouden, Jean Haalboom, Ross Kelterborn, Claudette Millar, Jane Mitchell (GRCA 1st vice-chair), Wayne Roth, Jake Smola, Bill Strauss, Sean Strickland

Town of North Perth, Township of Perth East: George Wicke

Regional Municipality of Halton: (Halton Hills and Milton) – Barry Lee

City of Hamilton: Anna Kramer

County of Oxford: (Blandford-Blenheim, East Zorra-Tavistock, Norwich) – Alan Dale (GRCA chair)

City of Brantford: Robert Hillier, Vic Prendergast (GRCA 2nd vice-chair)

County of Brant: Robert Chambers, Brian Coleman

Haldimand and Norfolk counties: Lorne Boyko, Craig Grice

A road map for the Grand

A comprehensive study of the watershed has guided decision makers for 25 years as they wrestle with environmental issues

By Dave Schultz
GRCA Staff

Canoeists and anglers on the Grand know the feeling. As they dip their paddles or reel in their lines, they're struck by the sense of being a thousand kilometres away from anywhere.

Hawks swoop overhead, jumping fish pierce the placid waters, and forests line the banks. Surrounded by nature, it's easy to forget that the Grand flows through the heart of some of the fastest-growing cities and richest farmland in the country.

The reality, though, is different. While it may be true, as the poet says, that only God can make a tree, it is people who nurture it and keep it alive.

So much of what appears to be natural about the Grand is really the product of many decades of effort – and the investment of hundreds of millions of dollars – to protect sensitive landscapes and, more significantly, to undo the harm caused by human activities.

For example:

■ One reason trout, bass and other living creatures can survive in the Grand is because of work done to keep pollutants out of the river, including heavy investments in sewage treatment plants and water protection efforts undertaken by farmers

■ There's water in the river to suit most canoeists and anglers because the GRCA stores water from the spring runoff in its seven reservoirs and releases it gradually through the rest of the year.

■ There are trees – not houses and factories – along much of the river's edge because land-use regulations control development in the flood plain.

Back in the 1930s, the Grand River watershed was on a downward spiral towards environmental disaster. The water in some stretches of the Grand was little more than untreated sewage, damaging floods were becoming more common and in dry weather the river all but disappeared.

Many residents of the watershed realized that the health and prosperity of their communities would suffer if something wasn't done to restore and enhance the river system.

More to be done

Significant improvements were made through the middle of the 20th century, although by the 1970s it was increasingly apparent that there was a lot more work to be done, and that a new approach was needed.

Two things heightened the level of concern.

First was the May 1974 flood which caused millions of dollars in damages in Cambridge, Brantford and other communities. That raised questions about flood management efforts.

Second was the rapid growth of the watershed's cities as they boomed along with the rest of Southern Ontario. Some of them, such as Kitchener, Waterloo, Cambridge and Guelph, were concerned about whether their water supplies would keep up. The influx of new residents also pointed to the need for further improvements in sewage treatment to protect the rivers system from harm.

It was also increasingly apparent that none of these issues could be tackled in isolation. Trying to fix one inevitably involved taking a look at the others.

However, responsibility for finding solutions was divided among several agencies and levels of government.

A 1971 provincial government study had pointed out this problem and suggested there should be a "comprehensive water management plan" for the Grand River basin. A few years later, the provincial inquiry into the 1974 flood made precisely the same recommendation.

In 1977, the Ontario government initiated the Grand River Basin Water Management Study, which was financed by the province, housed at the GRCA and overseen by a committee and subcommittees that brought all of the players – provincial ministries, municipal governments and the public – to the table at the same time. A technical team was created, working under the direction of Dr. Tony Smith.

Over the next five years, the technical staff along with the public and government officials examined the issues, preparing more than 40 technical and discussion papers. They worked

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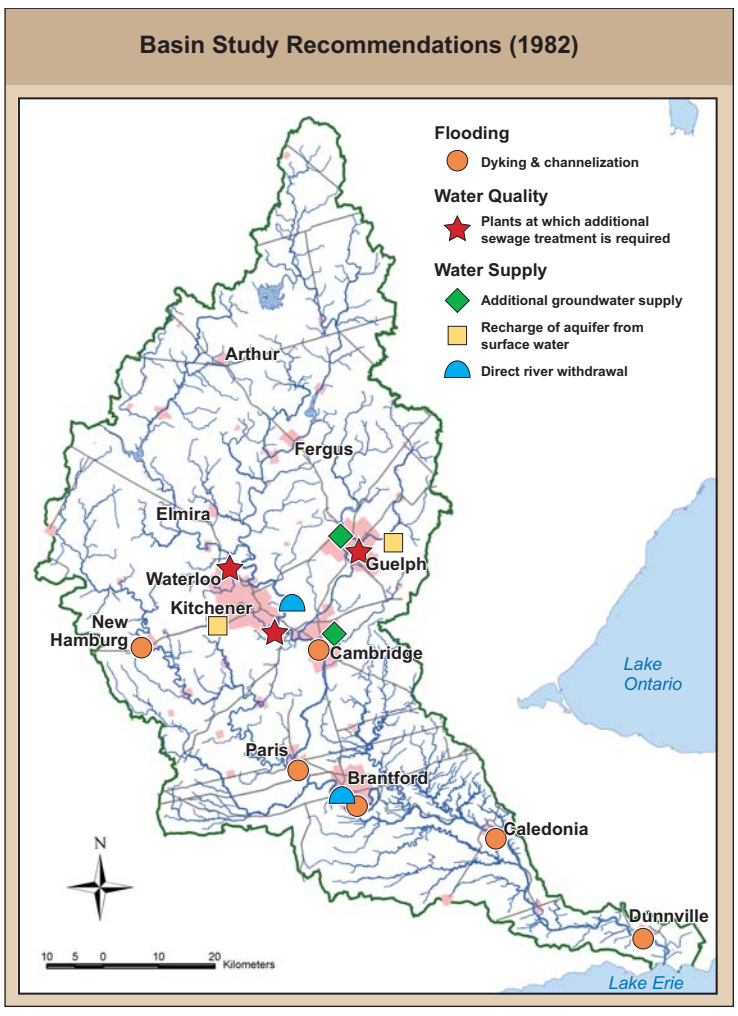


This map shows some of the key recommendations of 1982 Grand River Basin Water Management Study. *Illustration by Lara Vujanic*

Implementing the basin study

Many of the recommendations of the 1982 Grand River Basin Water Management Study were implemented within a decade, although some of the projects are still underway.

■ More than $45 million was spent on flood control projects in Brantford, Cambridge and other communities in the 1980s and early 1990s with a significant reduction in flood damages.

■ The Region of Waterloo started taking water from the Grand River in 1992 and treating it at a plant near Mannheim.

■ The City of Guelph developed new groundwater supplies that have been sufficient to meet its needs.

■ Water conservation programs were stepped up in many communities across the watershed.

■ Controls on development in the floodplain were tightened and included in municipal zoning bylaws and official plans.

■ The Guelph sewage treatment plant was upgraded, which helped raise water quality in the Speed River.

■ The Region of Waterloo has adopted a $500 million plan to upgrade its sewage treatment plants.

■ Water quality programs were introduced to help farmers protect water on their land.

■ Stormwater management systems have become a required element in new developments.

■ The GRCA has updated its operating procedures for its reservoirs to better deal with its dual responsibilities of reducing flood damages and improving water quality.

'Local participation conquers all.'
– Tony Smith

Oxygen level key to a living river

High nutrient levels are a problem in the Grand River watershed

Oxygen. It's the stuff of life, and without it, things die.

Rivers and lakes can die, too, if they're deprived of oxygen.

The scientific word is "anoxic" and it means the body of water doesn't contain enough dissolved oxygen to support fish, bugs and other aquatic life. An oxygen-starved river or lake is often murky and choked with weeds, making it harder to treat for human consumption and less inviting for recreational activities.

Oxygen levels monitored

In the Grand River watershed, the GRCA operates a network of seven water quality monitoring stations that constantly measure oxygen levels, tracking long-term changes.

Most places, and most days, oxygen levels are just fine and the waters of the Grand and its tributaries are relatively healthy, vibrant ecosystems.

But over the years, river scientists have kept a close eye on two stretches of river that have sometimes teetered on the brink. One is the Grand River downstream of Kitchener and the second is the Speed River downstream of Guelph.

They were spotlighted as suffering the "most serious environmental impacts" of oxygen-deprivation in the final report of the Grand River Basin Water Management Study in 1982.

A analysis done this year of long-term dissolved oxygen levels in these two rivers shows that the section of the Speed River was sometimes anoxic in the 1970s. The section of the Grand River was in somewhat better shape back then, although it has declined in recent years.

The 1982 basin study contained a list of recommendations to tackle the water quality issues in these two rivers, many of which were implemented within 10 years. Since then, there has been a dramatic improvement in the Speed as a result of actions taken by the GRCA and the City of Guelph. As for the Grand, the expectations are that the situation will improve as the Region of Waterloo continues its $500 million program to upgrade many of its sewage treatment plants.

Human activity

What causes a body of water to run out of oxygen?

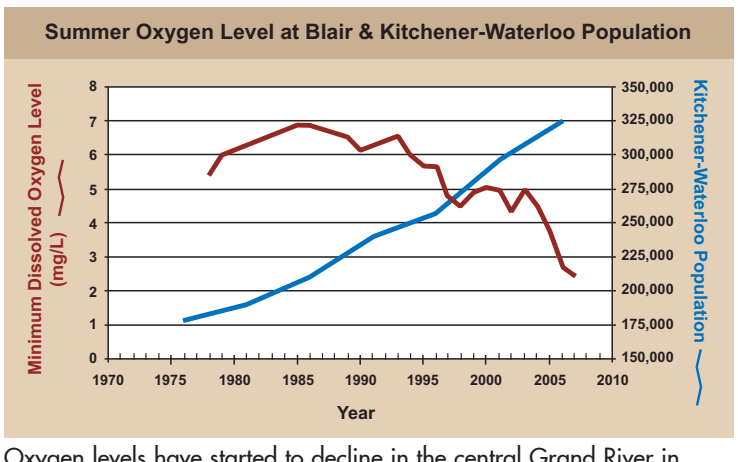
Almost always, it's a result of human activity. In particular, it's linked to the presence of high amounts of chemicals referred to as "nutrients."

These are things like phosphorus and ammonia. They're found in human and animal waste as well as commercial fertilizers.

Municipal wastewater treatment plants will remove some – but not all – of the nutrients from sewage before the treated effluent is released into a river. Similarly, nutrients can run off the land from manure or fertilizers spread on farm fields, lawns and gardens.

When the nutrients get into a river or lake, they become food for algae and aquatic plants. The plants, through the process of respiration, take oxygen out of the water at night. If there are too many plants, they take out so much oxygen that there's none left for the other living creatures that need it. The fish and bugs try to move away to other, more oxygen-rich parts of the river,

The growth of aquatic plants in the Grand, near Paris, is encouraged by high nutrient levels. *Photo by Dave Schultz*



Oxygen levels have started to decline in the central Grand River in recent years, a result of population growth. Upgrades to sewage plants in Waterloo Region should reverse the trend.

Watershed road map

Continued from Page 3

through 26 different scenarios for dealing with the three critical issues of water quality, water supply and flood damages.

In 1982 the study was released, providing a strategy to guide more than $180 million in investments over the coming decades. It included 22 recommendations calling for action by the GRCA, municipal and provincial governments.

In a retrospective look at the program prepared in 2002, Smith commented that the successful implementation of most of the recommendations by the mid-1990s was largely due to the fact that the plan was developed by many of the same people who had day-to-day responsibility to address water issues, such as officials from provincial ministries and senior staff from the municipalities.

Local participation

"Local participation conquers all, even provincial cabinet committees," said Smith. "A determined effort by local agencies (including local provincial offices, municipalities and the GRCA) enabled the recommendations to be implemented."

Success came, though, in spite of the fact that several recommendations were never put into place. No permanent co-ordinating committee was created, no formal reviews were conducted and no permanent technical staff were put in place.

Still, the knowledge gained through the five-year study and 10 years of implementation created a new awareness among many people in the watershed of the benefits of tackling environmental issues in a co-ordinated way and from a watershed-based perspective.

"One of the main differences between the present watershed strategy and the 1982 basin study is the adoption of a 'bottom up' policy, using local agencies to co-ordinate and develop the plan rather than having a strong provincial direction," said Smith's analysis.

but if there's no place for them to go, they'll die.

Oxygen levels change over the course of the day and can change from week to week depending on the season, temperature, flows and other variables. They tend to be lowest during hot, dry periods. The fish and bugs can tolerate some changes in oxygen levels, but if the oxygen levels drop too low, for too long, they'll disappear.

In the case of the Grand River, the 1982 basin study recommended that what was needed to maintain aquatic life was four milligrams of oxygen in a litre of water (mg/l), 95 per cent of the time.

Low oxygen levels

The study found that in the central Grand River region, oxygen levels were frequently only one mg/l – just a quarter of the target. It was even worse on the Speed, where oxygen levels frequently hit zero during summer and fall nights.

Not only do these conditions hurt aquatic life, the presence of excessive amounts of algae complicates the treatment of drinking water by the City of Brantford, which takes all of its water from the Grand.

The 1982 basin study identified the sewage treatment plants serving Kitchener, Waterloo and Cambridge as a significant source of nutrients entering the central Grand. On the Speed, the primary concern was effluent from the Guelph sewage plant.

"Typically, the impact on dissolved oxygen is most severe within a few kilometres downstream from the point of discharge," said the study. Beyond that, oxygen levels usually start to recover.

The study also noted the role played by nutrients from farm runoff.

The study called for upgrades to the Waterloo and Kitchener sewage treatment plants to reduce the nutrient content in their effluent. Guelph had just gone through such an upgrade when the 1982 study was written so it recommended close monitoring of the oxygen levels in the Speed and suggested more improvements might be needed in the future.

The study also proposed investigation of ways to control nutrients running off farmland.

Now, more than a quarter of a century later, the Speed River has seen a remarkable turnaround as oxygen levels have increased, even as the population of Guelph has grown.

In the central Grand, oxygen levels were fairly stable through the early 1990s but have started to drop in the late 1990s as the population of Waterloo Region cities has boomed.

See: 'Bringing the Speed back to life' on Page 7

The next 25 years

Better water beyond the end of the pipe

A look at future approaches to water quality issues

The greatest single thing that can be done to keep a river healthy is to improve and upgrade the sewage treatment plants that put their effluent into the river.

But it's not the only thing. There are some steps that can be taken to make the river itself healthier and better able to absorb and deal with the effluent.

In fact, there may come a time when the technological methods used to treat sewage could reach their effective limit. Theoretically, it's possible to treat sewage so the effluent is pure water, but the cost would break any budget.

Existing sewage treatment plants already remove about 90 per cent of pollutants, but it gets harder and more expensive to gain each additional percentage point of improvement.

So what can be done to lessen the impact of treated sewage effluent on the river system?

One way is to look beyond the end of the pipe and make the river stronger, so it can better handle the effluent. Some of these ideas could be studied as part of an update to the Grand River Basin Watershed Management Study.

■ **Remove small dams**: There are more than 120 small dams on the rivers and streams of the Grand River watershed. Water backs up behind them, where it warms in the summer sun, which results in lower dissolved oxygen content. Nutrients can collect in the sediment on the bottom, rather than being flushed downstream.

■ **Naturalize the watercourse**: A river that twists and turns, with the water burbling over rocks, picks up more oxygen, so it would make sense to take a look at naturalizing some tributaries that might have been straightened and "cleaned up" in earlier years.

■ **Flush the river**: Rivers naturally experience "flushing flows" during the spring melt or after summer storms. This adds oxygen to the water and disrupts excessive plant and algae growth. One idea is to use water from the GRCA's reservoirs to mimic natural flushing flows.

■ **Keep the water cool**: Planting shade trees and shrubs along a river or stream will keep the water cooler, increasing the level of dissolved oxygen. Plantings have the added benefit of soaking up nutrients contained in runoff from the land.

■ **Protect groundwater discharge**: Groundwater, which is usually cold and clean, enters rivers and streams through springs and seeps, which helps raise the overall quality of the river water. That's called groundwater discharge. Those springs, in turn, are fed by rain water and melting snow that recharge the groundwater system. If too much of the landscape is paved over, not enough water will enter the ground, and the recharge-discharge function will break down.

■ **Reduce pollutants coming from the land**: Some of the nutrients in the river come from farm and urban landscapes. Reducing fertilizer use is one way to curb this problem. Where fertilizers are needed, proper application methods can keep them on the land and out of the water. Farmers can adopt management practices to control runoff from fertilized fields. In urban areas, pollutants from fertilizers and animal waste can settle out in stormwater management ponds instead of ending up in the river.

The Mill Creek Rangers are a group of students hired each summer to improve the creek which runs through Puslinch Township and Cambridge. Naturalizing the stream helps restore water quality.

Photo by Janet Baine

However, Waterloo Region is now in the process of upgrading its sewage treatment plants and has developed a $500 million wastewater master plan. Of that, about $260 million is being spent on the Waterloo and Kitchener plants. Waterloo should be done by 2011 and Kitchener by about 2018.

It's possible to use a computer model of the river to project the probable outcome of all of this investment. An analysis done for the Region of Waterloo by the GRCA shows that after the Kitchener upgrade is completed, oxygen levels in the Grand should hit the target of four milligrams per litre most of the time.

Work on the farm

On the other front – runoff from rural areas – Waterloo Region took the lead in the mid-1990s by launching its Rural Water Quality Program, which is administered by the GRCA. Farmers are given grants to cover about half the cost of water protection projects on their land, including constructing manure storage tanks and planting trees and bushes along watercourses.

The program has also been adopted by Wellington County, Guelph, Brantford and Brant.

Across the watershed more than 2,190 projects have been implemented by rural landowners. Watershed municipalities and other agencies have invested approximately $7 million in these projects, while landowners have contributed more than $14 million. Using rough estimates, these projects have kept over 56,500 kilograms of phosphorus on the land and out of the water.

Over 116 kilometres of stream have been fenced to restrict over 10,000 head of livestock from watercourses.

Approximately 400 hectares of fragile land has been retired from agricultural production and planted to trees. This includes riparian areas, wetland buffers, steep slopes and areas of groundwater recharge and discharge.

Improvements in water quality have shown up in a better fishery

By Janet Baine
GRCA staff

Fish have a grander life in the Grand River watershed than they did 25 years ago.

The Grand River and its tributaries — nearly 11,000 km of streams and watercourses — support far more fish than they did a generation ago. The Grand River fishery has become an international symbol of what can be accomplished even when the number of watershed residents is increasing.

In 1982 there were 50 species of fish known in the Grand River system. The main rivers contained mostly warm water species that tolerated poor water quality conditions, recalls Warren Yerex, supervisor of aquatic resources.

Now 82 species of fish have been reported in these waterways. More than half of all the fish species in Canada can be found in the Grand, including cold water fish, such as trout, that need higher quality water. The Upper Grand now has a world class trout fishery and slow-growing bass are now plentiful.

"It takes 20 years for a small mouth bass to grow to 20 inches, so the fact that it's not uncommon to catch bass this size shows they can tolerate all that the river brings their way," Yerex said.

The range of these species is expanding. Bass and pike, for instance, are now found near Dundalk, at the headwaters of the Grand River.

Fish are to the rivers what canaries are to coal mines — their number and variety tell scientists if waterways are life-giving. When fish live in the river, many other aquatic species that play a role in the biological processes that keep rivers clean also live there.

"I don't think people realize how far we've come and all that has gone into improving aquatic ecosystems," Yerex said. "It is as if all the stars were aligned for this to happen at this time."

While river ecologists have been working hard to make the Grand a better place for fish, many other factors have also come into play, including

- Sewage treatment plant upgrades
- Better stormwater management policies to protect water quality
- Subwatershed plans to protect tributaries
- Protection of wetlands
- Programs to protect water on farm land

The many partners who have worked to improve the fisheries have often focused on smaller tributaries, knowing that changes there would lead to improvements in the larger rivers.

The real secret to better fish habitat is co-operation. Government agencies, non-governmental organizations and local residents all work together, looking beyond their own perspective, to find creative solutions, Yerex says.

They helped develop and then have worked from a blueprint called the Grand River Fish Management Plan which is now ten years old. Today river clean-up events, tree planting, educational seminars and river improvement projects are all undertaken annually by volunteer groups from up and down the rivers.

As a result of recommendations in the 1982 Grand River Basin Management Study, the GRCA operates its large dams (the Shand, Conestogo and Guelph) differently. Now minimum river flow targets have been set which provides fish with year-round habitat. In addition, the GRCA's reservoirs hold on to more water during the winter, which helps to keep fish populations alive.

Removing old run-of-the-river dams allows aquatic species to move upstream, cools waterways and improves water quality. Dams that have been removed or have not been replaced when they have failed include the Lorne Dam in Brantford, Chilligo in Cambridge, Taquanyah near Cayuga, Beatty in Fergus and Columbia in Waterloo.

After the Taquanyah Dam was removed, for example, the temperature in Mill Creek dropped 8C. This cooler water now flows into the southern Grand River and offers the fish respite during the hot weather when water temperature in the Grand can reach 30C.

"We need to do a new watershed basin plan because the world and circumstances have changed and we now have something worth protecting," Yerex said.

Angler Steve May and a bass reeled in near Brantford.

Healthier river offers more recreational opportunities

More than 300 kilometres of trails have been developed near the Grand and its tributaries in the last 20 years.

It's not that long ago when many people would have turned up their noses at an outing along the Grand or its tributaries.

Twenty-five years ago the river was thought of as dirty and a place to avoid. A turnaround in water quality had started in the 1950s following the construction of modern sewage treatment plants, but it took a long time for public perceptions to change.

"Treatment plants meant the river became cleaner in the 1970s, and by that time people hadn't used the Grand River for recreation for a long time," said Barbara Veale, co-ordinator of policy, planning and partnerships at the GRCA.

But new and greater recreational opportunities have opened up in the last 25 years. The construction of 300 km of trails, new river access points, regular riverside cleanups and naturalization of stream banks have made the waterways more attractive and more accessible. Designation of the Grand River as a Canadian Heritage River in 1994 has also brought more awareness and sparked new opportunities for water-based recreation.

Ten years ago when Jamie Kent started a Paris-based canoe and kayak outfitting company, his biggest hurdle was that people hadn't heard of the Grand River. That has changed. He estimates more than 50,000 people will paddle the river this year and many who turn to the local outfitters come from other countries.

The Grand River's sports fishery has garnered international attention, especially the brown trout that have been stocked downstream of the Shand Dam near Fergus since 1989 and are now also stocked in the Conestogo River. The Upper Grand tailwater fishery didn't exist in 1982 and now this 28 km stretch brings in over a million dollars annually and is one of the

Continued on Page 7

Bringing the Speed River back to life

Putting more water in the Speed and removing nutrients helped it recover

Guelph can be described as a big city on a small river. It's not just a colourful turn of phrase – it also illustrates an important fact that governs the city's relationship to its environment and even plays a critical role in decisions about future growth.

Lots of people means lots of human waste to be handled by the city's sewage treatment plant and lots of treated effluent to be put into the Speed River.

Sewage treatment plants eliminate most, but not all, of the pollutants in raw sewage such as nutrients (phosphorus and ammonia), suspended solids and organic material.

But there's always a residual volume of nutrients in the effluent. The treatment process then continues in the river itself. Plants and algae absorb phosphorus and other nutrients. As the river tumbles over rocks and through rapids it is aerated – takes in oxygen – which aids the breakdown of pollutants. Naturally-occurring bacteria will consume organic material.

However, there's a limit to how much effluent a river can handle. That's called the "assimilative capacity."

If the volume of pollutants overwhelms the assimilative capacity of the river, the result is an explosion in plant growth and a drop in the amount of dissolved oxygen in the water. The river will become a weed-choked murky body of water bereft of fish and other aquatic life.

In the 1970s, the section of the Speed downstream of the city's sewage treatment plant was in that condition. Oxygen levels frequently dropped to zero during the summer and fall, making it an inhospitable place for fish and other creatures, said the Grand River Basin Water Management Study, which was released in 1982.

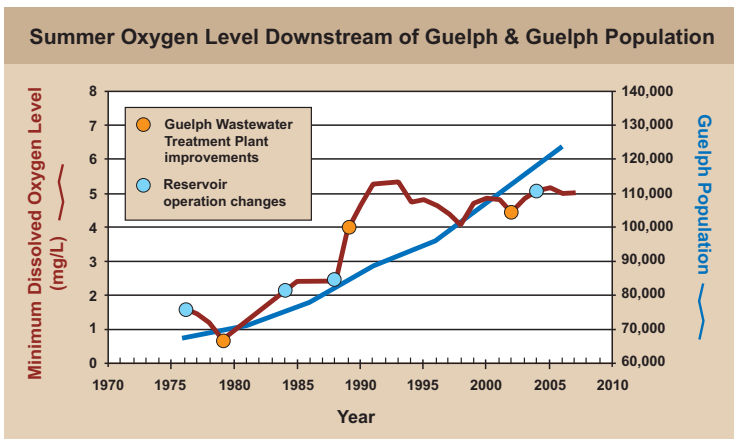
Changes by GRCA, city

But beginning in the 1970s a series of steps taken by the GRCA and the City of Guelph resuscitated the Speed.

The Guelph Dam and reservoir opened in 1976. Water is stored in the reservoir during the spring and then released gradually through the summer. That meant that for the first time it was possible to ensure there would always be a minimum amount of water in the Speed where the sewage plant effluent was entering the river.

Over the next 20 years the GRCA fine-tuned its operation strategy for the reservoir to help maintain flows in the Speed and raise its assimilative capacity.

The Speed River, downstream of Guelph, has seen a significant improvement in oxygen levels in the last 25 years. *Photo by Janet Baine*



Oxygen levels have rebounded in the Speed River following changes in the way the GRCA operates Guelph Lake reservoir, and work done by the City of Guelph in its sewage plant. See story for details.

Meanwhile the City of Guelph was at work expanding, improving and adjusting the operation of its sewage treatment plant:

- **1979**: upgrade to remove more nutrients from effluent
- **1989**: aeration system improved to add more oxygen to effluent
- **2002**: plant expansion

In addition, the operating procedures at the plant have been improved to get higher quality effluent out of the same equipment.

The result is a revitalized Speed River with sufficient oxygen to support fish and aquatic life. Just as significant is that the improvement has taken place even as the population (and the amount of sewage) has increased. While the river still has some bad periods, particularly during a hot dry summer, those days are fewer and the problem much less severe than 30 years ago.

However, there are limits to how much more assimilative capacity can be squeezed out of the Speed. There are limits, too, on what can be done to make sewage effluent cleaner; stripping those last bits of nutrients out of the effluent can be very expensive.

Growth target adjusted

These factors have been considered when setting population growth targets for the City of Guelph.

The Ontario government identified Guelph as a major growth centre in its Places to Grow initiative. However, the City of Guelph argued that the assimilative capacity of the Speed had to be taken into account when discussing future population numbers. After much discussion, Guelph and the province agreed that the population growth target should be 169,000 people by 2031, rather than the province's original target of up to 195,000.

Recreation

Continued from Page 6

best-recognized brown trout fisheries in North America.

The Grand River Bass Derby in Kitchener has been held for 20 years and trophy bass are 18 to 20 inches long. Phone books list numerous fishing stores that have sprung up in the watershed.

"The fishing is excellent from Belwood Lake to the mouth at Dunnville," Nelson Murakami told the Waterloo Region Record.

"It offers diverse species with lots of access and seasonal opportunities, from migratory steelhead in the spring and fall, to walleye in the winter and spring," he said.

The amount of trail development in the last 15 years "has been phenomenal and it is still happening, particularly in rural areas such as Woolwich Township," Veale said. "The trails are now seen as an economic development tool."

Several trails have been built on old rail lines and many of these went along the waterways.

Other new and expanded recreational opportunities include rafting, tubing, dragon boat racing, cycling and horseback riding. Rowing clubs exist in Cambridge, Guelph, Kitchener-Waterloo and Haldimand and are actively improving their facilities to meet increasing demand.

All this riverside recreation increases the potential for conflict between different landowners and different recreational uses that may not be compatible.

Heavier use of these areas may also lead to degrading the natural areas that are the main attraction, unless care is taken to minimize the impact.

"We don't want to go back to the problems we had in the past," Veale said..

Urban growth fuels search for new water sources and increased conservation

Municipalities developing long-range plans to meet growing need for water

Whether you're talking about celery or cities, water is essential to growth.

The five cities of the Grand River watershed are among the fastest growing in Ontario. In 2006 about 675,000 people lived in Kitchener, Waterloo, Cambridge, Guelph and Brantford but by 2031 they're expected to be the home of 970,000 people, an increase of more than 40 per cent.

Where will the water come from to support that growth?

The hunt for an answer requires examination of a lot of complex issues, ranging from the capacity of current supplies to the impact of water conservation programs.

Municipalities are going through that process now as they develop their long-term water supply and growth strategies.

Those five cities are served by three municipal water systems:

■ Kitchener, Waterloo and Cambridge and some surrounding towns are part of the Integrated Urban System (IUS) operated by the Region of Waterloo. It serves about 460,000 people with water taken from 120 wells (80 per cent of supply) and the Grand River (20 per cent)

■ Guelph, with a population of about 120,000 people, relies largely on 19 wells. During the summer, water is occasionally drawn from the Eramosa River to supplement groundwater supplies.

■ Brantford, with 93,000 people, takes all of its water from the Grand River.

All three communities have enough water to see them through the short to medium term. However growth pressures and the complexity of developing new water sources require them to work on solutions now that will take them into the second half of the 21st century.

One idea that has attracted a lot of attention is to use water from Lake Erie to serve most of the communities of the central and southern Grand.

A $300,000 feasibility study for a proposed pipeline is nearing completion. There are seven partners in the study: the Region of Waterloo, Brantford, Brant County, Haldimand County, Norfolk County, Six Nations of the Grand River and Mississaugas of the New Credit. However, final decisions on participation in the project will only come after the feasibility study is complete.

The study is examining the cost, design and other issues for what has been called the Grand River Valley Area Water Supply System.

It would use an existing water intake in Lake Erie near the industrial complex at Nanticoke in Haldimand County.

The intake, constructed in the 1970s, is only being used to 15 per cent of its capacity and could easily handle the needs of the communities involved in the study.

Region of Waterloo

The idea of building a pipeline was one of the options considered in the Grand River Basin Water Management Study in 1982. However, it was ultimately rejected because of the high cost relative to other ideas eventually implemented – a greater reliance on new wells and river water.

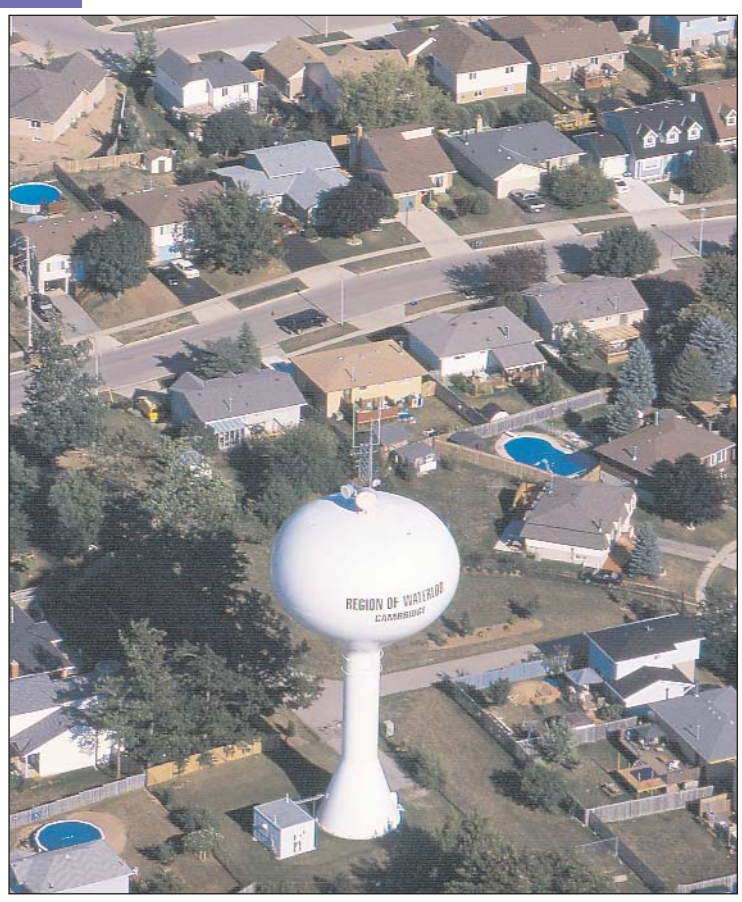
However, the pipeline idea was back on the table by the late 1990s as Waterloo Region started looking at its water needs into the 21st century. Waterloo Regional council has twice supported proposals to have a pipeline in place by about 2034.

According to Waterloo Region's 2007 Water Supply Strategy Update "the pipeline is intended to fulfill two functions – to reduce the region's dependency on groundwater and to augment the water supply available to meet future needs."

The report notes that the urban water system "is extremely complex" because of the number of wells and treatment plants. The result is "high operating costs and complex regulatory reporting."

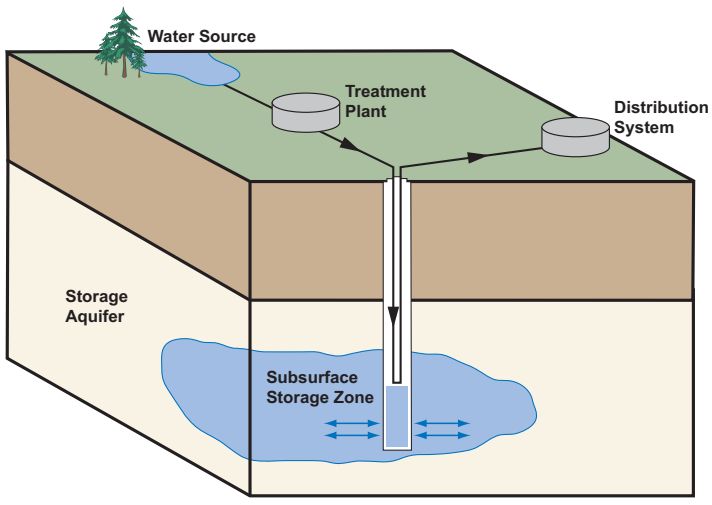
Meanwhile, the Region needs to address its water needs over the next 25 years to cope with population growth prior to the pipeline. It plans to increase its system capacity and cut demand in several ways.

■ Expand its Aquifer Storage

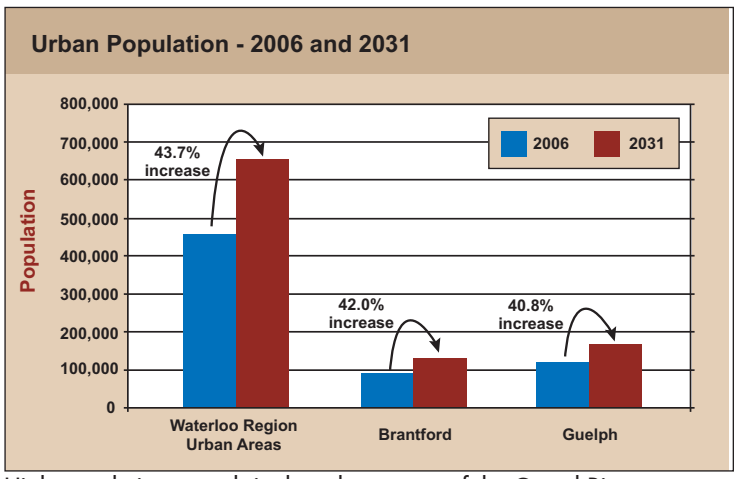


Municipalities are developing plans to deal with the water needs of their expanding populations *Photo by Carl Hiebert*

ASR: water in the bank



The Region of Waterloo uses an Aquifer Storage and Recovery system to store treated surface water in the ground during low consumption periods. The water is then be withdrawn during high consumption days. The City of Guelph is considering a similar system.



High population growth in the urban areas of the Grand River watershed is leading municipal governments to develop long-range water supply strategies.

and Recover System. (See graphic) The first phase of the ASR system went online in 2005 and a second is expected to begin operation in 2015.

■ Develop new wells to come on line in about 10 years.

■ Maximize the amount of water taken from existing wells.

■ Pursue additional water conservation measures to reduce demand by at least 1.3 per cent and as much as three per cent.

With all of these improvements in place, the Region anticipates it will be able to supply about 327 ML/d of water by the early 2020s which should be enough to meet demand into the 2030s.

The pipeline would meet its needs beyond that point by providing about 432 ML/d, an increase in supply of about 32 per cent.

City of Guelph

At one point, it appeared the City of Guelph would also be a participant in the proposed Lake Erie pipeline plan.

In October 2006 city council adopted the the Water Supply Master Plan which recommended the city investigate a Great Lakes supply as a long-term solution. The report said a decision would be needed around 2010.

Municipal elections took place the next month. The new council revisited the issue in May 2007 and changed course. It unanimously approved a resolution directing city staff "to implement all components of the Water Supply Master Plan with the exception of the Great Lakes water supply."

The city plans some improvements in its existing groundwater system but "by 2025 the city's groundwater-based supply system may be at, or close to reaching its maximum servicing capacity."

After that, Guelph will need to supplement its groundwater supplies with surface water sources.

Guelph's current water sources have a maximum capacity of about 75 ML/d. If all of the upgrades, new wells and the new surface water systems work out as planned, the system's capacity would almost double to about 140 ML/d. If the new water conservation measures are as successful as planned, Guelph should be able to meet its water needs from those sources into the 2040s.

To meet the city's needs, the master plan proposes:

■ More water conservation. Guelph's per capita water use is among the lowest in Canada, but is still high by international standards so city officials think further efficiencies can be found. The water plan envisions a 10 per cent drop in consumption by 2010 and an additional 10 per cent cut by 2025.

■ Increased use of groundwater. The city hopes to be able to get more out of its existing well system by upgrading or reinstating some idle wells. New wells are also under consideration.

Some could be developed within city boundaries but others would have to be drilled in neighboring communities such as Puslinch Township (where 60 per cent of Guelph's water now comes from) or Guelph/Eramosa Township. This would require discussions involving Guelph, the townships, Wellington County, the provincial environment ministry and the GRCA.

■ Increased use of surface water. Guelph will examine the potential for an Aquifer Storage and Recovery System (see graphic) that would use water from either the Eramosa River or the GRCA's Guelph Lake Reservoir.

This idea would involve considerable study to determine its feasibility, and would also require discussions with neighboring municipalities and other government agencies.

City of Brantford

Of the Grand River cities, Brantford is the only one that draws all of its water from the river itself.

The quantity of river water available to the city is not a particular concern. The city holds a Permit to Take Water which allows it to draw about 260ML/d from the river, which works out to about three per cent of the river's flow during low flow days in the summer.

However, even on peak demand days the city usually takes only about a third of what it is entitled to. Even with the growth anticipated over the next three decades, the city should be able to meet its water needs without taxing the river.

However, Brantford city council is keeping its options open about its future water sources.

In May 2007 the city council agreed to participate in the study of the Lake Erie pipeline proposal. One reason was concern about the future quality of Grand River water.

"In the future," said a report written by city staff, "water demand is expected to substantially increase and the river water quality may further deteriorate.

"A reliable and good raw water source such as a lake water supply is essential to meet the city's water needs beyond 2050," said the report.

The next 25 years

Putting grey water back to work

By Janet Baine
GRCA Staff

A look at future approaches to water supply issues

Water-saving technology and new ways of thinking about water will change homes and businesses in the Grand River watershed.

In some communities, per capita water consumption rates have leveled off due to water conservation efforts, including outdoor water use controls and low-flow toilet and washing machine rebates. But to find more water savings in the future, governments, businesses, homeowners and researchers are exploring the leading edge of water-saving opportunities.

Match quality to use

One way would be to match the quality of water to its use. For example, treated drinking water is now used to flush toilets, when rainwater or grey water would be just as effective.

Rainwater harvesting systems developed at the University of Guelph are being tested in a new house (the first LEED-certified platinum home in Canada), a retrofitted home and a co-op for 12 students, where rainwater is collected and stored for use.

Researchers believe harvested rainwater can be used for showers, laundry and dishes, but the provincial building code would have to be changed first.

Another new water-saving idea is reusing grey water — water that has already been used for showers, baths, laundry and sinks. It wasn't until 2006 that the Ontario Building Code was amended to allow rainwater and grey water to be used to flush toilets in urban areas. If everyone used grey water or rainwater to flush toilets, it could save about 29 per cent of the total water use in a household.

Both these systems require two sets of pipes that would need to be carefully marked so that the different types of water don't get mixed up. Retrofitting an existing building can be costly; it is easier and cheaper to incorporate dual pipe systems into new buildings.

Commercial, industrial and institutional water customers also have tremendous opportunities to use less municipal water. The Region of Waterloo has a program to help companies evaluate water use and install water saving technologies. For example, a water conservation assessment at The Brick Brewing Co. Ltd. resulted in a 39 per cent reduction in water use with a net savings of $150,000 per year and a four-month payback period. It also recommended more changes for future water savings in the future.

When industrial land near the Waterloo International Airport is developed, dual piping could be part of the infrastructure to allow for water reuse on a large scale, according to the Wastewater Treatment Master Plan for Waterloo Region. This could potentially allow the wastewater from one industry to be used by another within the industrial park.

Installing a 6,500 litre water tank to harvest rainwater at a water-efficient home in south Guelph built by Reid's Heritage Homes.
Photo from Department of Engineering, University of Guelph

Holding back the flood waters

Flood damages have been reduced in many communities

When water from the spring melt poured through the Grand River watershed in early April, most watershed residents hardly noticed.

It's true that a handful of communities, notably New Hamburg and Ayr, did have to deal with flooded basements and closed roads as the Nith River rose to levels that hadn't been seen in 20 years.

But in other parts of the watershed, where the water levels were also among the highest seen in decades, other flood-prone communities, especially those on the Grand, remained unscathed.

That's quite a change from a few decades ago when water that high could have resulted in hundreds of thousands, or even millions of dollars, in damages. For example, the last big flood, in May 1974, inundated sections of several cities including Cambridge, Brantford, and Kitchener, as well as towns such as Caledonia and Dunnville. Total damage was estimated at $6.7 million which, in today's dollars, would be about $29 million.

Ice squeezes under an old railway bridge across the Grand in Brantford in February 1996. The bridge is normally several metres above water level. Dikes prevented a catastrophe when the water rose to within a third-of-a-metre of spilling over the dikes into much of the city. *Brantford Expositor photo*

Flooding has been a chronic problem in the Grand. An analysis done in the early 1980s showed that up to that point, annual average flood damages in the watershed amounted to about $2 million a year (in today's dollars.)

However, since 1978 average annual flood damages have been in the thousands – not millions — of dollars.

Luck has been one factor – the conditions seen in May 1974 haven't been repeated since.

But luck favors those who are prepared and there's been a lot done in the last 25 years to better prepare for serious floods.

The 1982 Grand River Basin Water Management Study, which took a look at flooding issues, recommended a combination of tools to deal with flood damages:

■ Constructing new dikes and improving the river channels in communities such as Cambridge, Brantford, Paris, Caledonia, Dunnville and New Hamburg could reduce annual average flood damages by 90 per cent.

■ Stronger controls on development in flood prone areas would keep people and their property out of harm's way.

■ Existing wetlands, notably those along the Eramosa River, should be preserved since they play an important role in moderating flood flows.

All of those recommendations were carried out over the next 15 years. Meanwhile, the GRCA also implemented the recommendations from the provincial inquiry into the 1974 flood. It urged better flood forecasting tools, revisions in the way the GRCA operates its reservoir system and a better flood warning system.

New dikes built

The most extensive projects were the construction of new dikes in Brantford and Cambridge.

In the Galt section of Cambridge about $24 million was spent to deepen the river channel and built concrete walls along the banks. At the top of the bank, dozens of buildings were removed to make way for new dikes with the capacity to protect the city from floods bigger than those ever recorded in the Grand.

In Brantford, similar work was done at a cost of $18 million. About 17 kilometres of new or improved dikes were built on both banks of the river as it snakes through the centre of the city. A large section of the river channel was excavated to provide

Keeping people out of harm's way

Planning rules have prevented millions in damages

Each year, GRCA planners pour over hundreds of applications from landowners who want to launch projects ranging in size from a backyard deck up to a subdivision with hundreds of homes.

Inevitably, some landowners see the need to get approval from the conservation authority as just another piece of red tape.

But there's good reason for these rules about developing near flood-prone areas. They have probably prevented hundreds of millions of dollars in damage and quite possibly saved lives.

That's the conclusion of a 1996 study which compared some severe rainstorms in southeast Michigan and southwest Ontario during 1986. The study called "A comparison of flooding in Michigan and Ontario" was published in 1997 in the Canadian Water Resources Journal.

The two regions have a lot in common: a populous urban area (Detroit in Michigan, Toronto-Hamilton in Ontario) surrounded by several mid-sized cities and prosperous farmland. The physical features, such as soil and drainage patterns, are similar as well.

During August and September of 1986, both areas were hit by massive rainstorms.

But there were huge differences in the outcome: total damages in Ontario amounted to just $500,000 with no loss of life, while in Michigan the damage toll was $500 million with six people killed.

The researchers explained the stark contrast by pointing to significant differences in land use policies for floodplains.

In Ontario, provincial government policies, municipal land-use plans and conservation authority regulations all forbid most new construction in floodplains.

However, in Michigan, development could take place (although with some restrictions) in the floodplain. To guard against financial loss, landowners could take out federal flood insurance.

The researchers said the large difference in damages could be attributed to "a result of two different long-term approaches to flood plain management."

"Since the mid-1950s Ontario has had an ambitious and comprehensive flood-reduction program. This has not been the case in much of the affected area in Michigan where floodplain restrictions have been limited," said the study.

more capacity.

Since the dikes were completed, both communities have stayed high and dry. This year, in Brantford, water lapped at the foot of the dikes, not the foundation of houses and businesses.

But the most dramatic example of the benefit of the dikes was in 1996 when an ice jam clogged the river in Brantford. Water backed up behind the jam and rose to within one-third of a metre of the top of the dikes.

Fortunately, they had been designed with just such an eventuality in mind. They contained the ice jam which broke on its own, releasing the water downstream. But if the dikes hadn't been there, thousands of homes and businesses would have been under water and potential damages could have exceeded $40 million.

Dikes and channel improvements also help to protect other communities including Paris, Caledonia, Dunnville, Kitchener (Bridgeport), and New Hamburg.

Limits to construction

However, geography sometimes limits the ability to protect a community with dikes. For example, almost all of the central part of New Hamburg is floodplain, surrounded on three sites by the Nith River. It would take a huge and expensive dike encircling the core to protect that part of the town from the largest floods and would effectively cut the community off from the river.

One other factor complicating the construction of new or improved dikes is that the provincial government no longer helps pay the bills.

When the Cambridge and Brantford projects were done, the province paid 50 per cent of the cost, the municipality 40 per cent and the GRCA 10 per cent. Now, a municipality might have to come up with virtually the entire amount.

In one respect, dikes are the last line of defense in flood protection. The first line is the GRCA's network of seven reservoirs which are used to hold back water and lower flood peaks downstream. That reduces the potential for flooding in all communities whether they have dikes or not. In fact, the reservoir network, which is put through its paces on an annual basis, can be credited with a large part of the reduction in flood damages.

Other key components are the flood forecasting and flood warning systems.

Forecasting methods have improved tremendously in the past 25 years leaving the GRCA's reservoir operators in a better position to make decisions that will reduce flood flows.

Better warning systems allow municipalities to take action in their communities to protect life and property.

The next 25 years

Climate change presents new challenges

One thing is certain – at some point there will be a flood bigger than the one that hit the Grand River watershed in 1974.

Flood experts describe floods of that magnitude as having a return rate of "one in 100 years." But that doesn't mean they only occur once every century.

Rather it's a convenient shorthand way of conveying the probability that a storm of a certain size will occur.

But 100-year-floods could easily occur in two consecutive years. And it's possible that the next flood could be a "one in 200" event that would severely challenge existing dikes and flood control systems.

In fact, the prospect of climate change could require a new look at the calculations. What was once a 50-year storm could become a 20-year storm, and so on.

A paper prepared by GRCA staff for an international symposium in Australia this month points out the need to factor climate change into flood protection efforts.

"With a change in precipitation patterns and air temperature, a response from the watershed can be expected. The range of potential responses includes increased flooding and erosion," said the paper.

"Even if the annual precipitation totals remain the same, but occur in more intense high volume rainstorms, the watershed will respond with higher runoff rates" and the result could be more flash flooding, particularly in urban areas.

The response, said the paper, must be to adopt new techniques to make the Grand River watershed better prepared to withstand the impact of climate change.

A look at future approaches to flooding issues

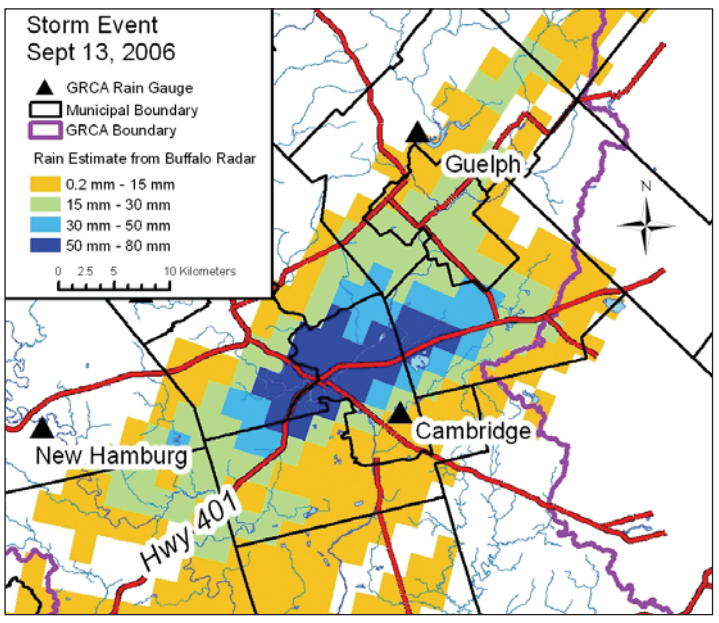
■ New techniques, such as weather radar, can help flood managers respond to severe, isolated storms.

■ Updated mapping, using geographical information systems (GIS) can be used to help decide who needs to be warned and when the warnings need to go out in order to help municipal officials prepare.

■ Municipalities may have to take a look at the design standards for their storm sewer systems in order to deal with more intensive storms. A series of summer storms in the Grand River watershed this year inundated city streets in Kitchener, Guelph and Cambridge this summer, simply because the amount of water was greater than the design capacity of the storm sewers.

■ Wetlands and floodplains naturally serve as temporary holding areas for water during a major storm, but over the years many of those areas have been lost to farmland and urban development. It will be necessary to restore wetland areas and build more storage space on the landscape to help hold back waters. For example, the GRCA is leading a project to turn a one-time farm field near Dunnville into an area of small hills and small depressions that will hold water after a rainfall.

■ In urban areas, especially those that are just being developed, stormwater management ponds and similar ways of temporarily storing water will become even more important.



The GRCA is developing a new mapping system, based on weather radar, to identify big, isolated storms quickly to help flood control staff respond faster.

More than $24 million was spent during the 1980s and '90s on flood control works in Cambridge.

The GRAND RIVER CONSERVATION FOUNDATION

Rotary Clubs are greening the Grand

Rotary Club Forests near Guelph, Waterloo will add thousands of trees to the landscape

Service to others is a cornerstone of the Rotary Club's philosophy. For many years, clubs throughout the Grand River watershed have supported conservation projects that connect people with nature.

Over the past year, two clubs have played a special leading role in promoting the greening of our landscape. The Rotary Club of Kitchener-Conestoga and the Rotary Club of Guelph, both part of District 7080, have stepped up to create a lasting environmental legacy through the establishment of two new Rotary Forests in their respective communities.

Their aim is to provide an outstanding natural resource that will benefit our watershed community, now and for future generations. In doing so, the clubs are also creating special natural places which both beautify our landscape and make it healthier.

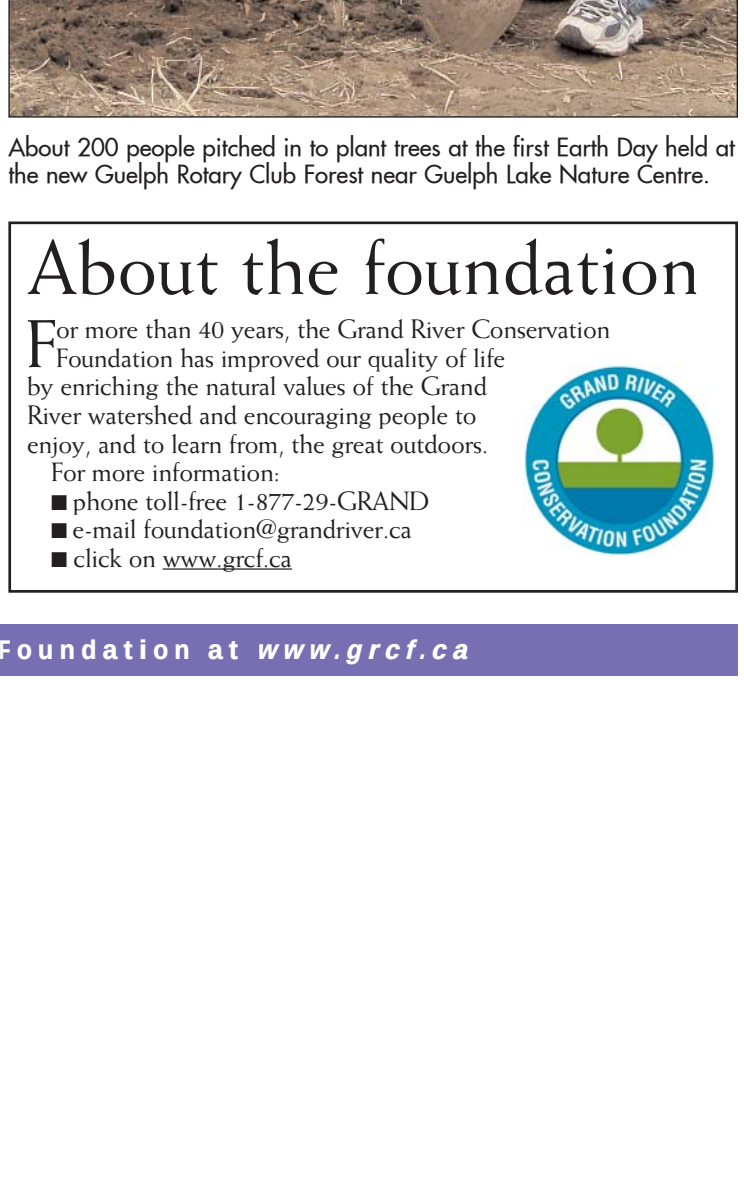
The **Kitchener-Conestoga Rotary Forest**, which will be created with proceeds of its 2008 Dream Home Lottery, will be a vibrant space along the east side of the Grand River at Snyder Flats, with more than 56,000 trees, a 2.5 km Rotary Trail and restored native grassland habitat that is so rare in Ontario. The creation of the forest, which will be fully accessible to the public with no admission cost, will begin in 2009.

The **Rotary Club of Guelph** has worked hard to lead their city to a common goal: 40 percent tree canopy cover in Guelph by 2020. The club has a 13-year vision, which has been accompanied by much action. In the first year alone, more than 5,300 trees have been planted at the Rotary Forest site in northeast Guelph, adjacent to the Guelph Lake Nature Centre. The club will celebrate their completed Forest in their centenary year. Mark your calendar for April 25, 2009 for the next community Earth Day at the Guelph Rotary Forest!

Other clubs help

The foundation is also grateful to many Rotary Clubs throughout the watershed.

- Brantford Rotary Club provided multi-year support of the Living Classroom – Campaign for Outdoor Education, which enabled more than 150,000 elementary school students to attend environmental education programs.
- The Galt, Preston-Hespeler, Cambridge North and Sunrise Clubs of Cambridge have supported improvements to the GRCA's Dumfries Conservation Area as their Centenary Project; and
- The Rotary Club of Cambridge North is a key partner in the restoration of a fourteen-acre wetland in Hespeler.



About 200 people pitched in to plant trees at the first Earth Day held at the new Guelph Rotary Club Forest near Guelph Lake Nature Centre.

More info

To learn more and support these new forests:

ROTARYforest

- In Guelph: visit *www.rotaryclubofguelph.com*

ROTARY DREAM HOME Lottery

- In Kitchener-Waterloo: visit *www.rotarydreamhome.com* to purchase a 2008 DreamHome Lottery ticket.

Part of the proceeds of the lottery for this dream home will go to the Grand River Conservation Foundation.

About the foundation

For more than 40 years, the Grand River Conservation Foundation has improved our quality of life by enriching the natural values of the Grand River watershed and encouraging people to enjoy, and to learn from, the great outdoors.

For more information:

- phone toll-free 1-877-29-GRAND
- e-mail foundation@grandriver.ca
- click on www.grcf.ca

Learn more about the Grand River Conservation Foundation at *www.grcf.ca*