Fall 2011

The GRAND

Watershed Report

Environmental news for the residents of the Grand River watershed • Distribution 210,000 copies

Goals for the Grand

What does the future hold for the Grand River?

That's the question at the heart of a three-year project to develop a new Water Management Plan for the Grand River watershed.

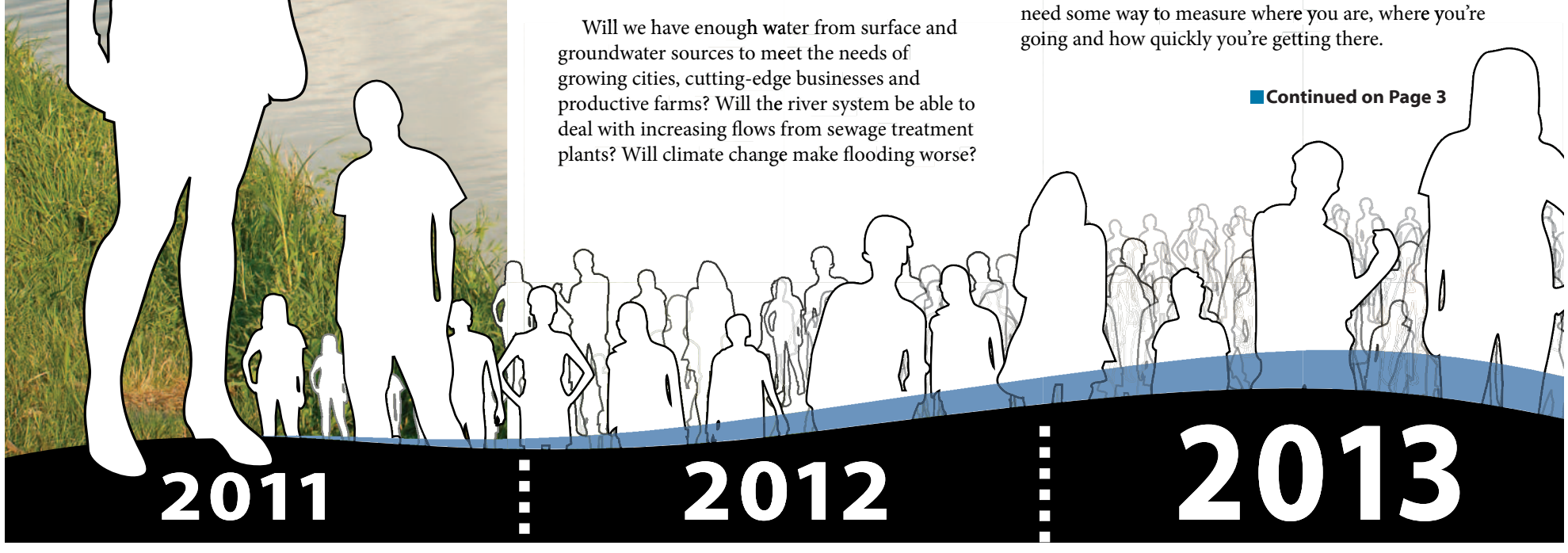
The watershed is a big and busy place. And it's going to get busier as the population rushes toward one million people.

Will we have enough water from surface and groundwater sources to meet the needs of growing cities, cutting-edge businesses and productive farms? Will the river system be able to deal with increasing flows from sewage treatment plants? Will climate change make flooding worse?

The Water Management Plan will outline the actions water management agencies will need to take to address those issues and others. The plan is scheduled to be completed by the spring of 2013 and is being developed by the GRCA, municipalities, provincial agencies, federal departments, First Nations and others.

But like any plan, it needs goals and targets: you need some way to measure where you are, where you're going and how quickly you're getting there.

Continued on Page 3



ALONG The GRAND

The Grand River A Canadian Heritage River

Following the Soft Path

A new approach to water conservation could help communities meet their future needs.

Page 6

Hunting for buried water

A team of scientists has been exploring an underground world in the search for a buried river valley.

Page 8

Building a legacy

Don and Janet Vallery have spent years working to restore natural areas near their property on Lake Belwood

Page 12

The GRCA

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Natural Champions

A Message
From the Chair

Jane Mitchell
Chair

***Shunpiking**: Shunning turnpikes, touring back roads.*

Warren Stauch, a member of the GRCA board, shunpikes tourists along the best of the Grand River. He took board member Pat Salter and me on a hunt for the headwaters of the Grand.

We started just outside West Montrose with a view possibly painted by Homer Watson. Cattle rested under a tree in a summer green field. The river meandered to the covered bridge in the distance.

Travelling along the back roads, we crossed historic iron and bowstring bridges, large and small. An osprey with a large fish in its mouth flew over us. Unfortunately, the rural infrastructure deficit was evident. Old concrete bridge rails missed chunks and were eroded to iron bars.

Many examples of water management popped up. We came across a water gauge. Fences along the sides of creeks stopped cows from entering the water. Farmers had built new manure storage. The Rural Water Quality Program supplied the funds.

Salter, Stauch and Mitchell

The headwaters are sometimes said to be located at Luther Marsh. The Luther Dam helps control flooding. The marsh, like all wetlands, cleans water. Luther Marsh is known for its heronry and large numbers of migrating waterfowl. The marsh also contains grasslands to preserve birds like the bobolink. Common 40 years ago, they are now rare.

The headwaters are actually near Shrigley. The source of a river is often imagined as a bubbling spring. The Grand starts in a wetland.

We returned along byways, though GRCA owned farmland that was originally purchased for a never-built West Montrose dam. A successful shunpiking tour.

A Message
From the CAO

Joe Farwell
Chief Administrative Officer

In this issue of The Grand, we turn our attention to the work being done to develop an updated Water Management Plan for the Grand River watershed. This project has its roots in a 1982 study that examined the watershed and made recommendations related to water quality, water quantity and flooding – issues that are still important today.

The updated study will address these issues within the context of 21st century challenges such as climate change and population growth. The goals of the plan are to ensure sustainable water supply for watershed communities and ecosystems, to reduce potential flood damages, and to improve water quality to maintain river health. The project is led by a steering committee of representatives from watershed municipalities, First Nations, provincial and federal ministries and the Grand River Conservation Authority.

Other stories examine some of the issues being addressed by the study. The cover story outlines water objectives for the Grand River system, which includes streams and rivers feeding into the Grand, as well as the watershed's groundwater resources.

Managing demand for water is highlighted in a story about the Soft Path Approach.

Another story explains the work being done to improve the operation of sewage treatment plants to reduce their impact on the river system. The story on wastewater optimization also outlines how the program can reduce operating costs.

A story on the Dundas Buried Bedrock Valley study highlights the results of a three-year project to examine an ancient buried river valley, which might hold promise for future water supply.

The Grand River watershed supports a complex, living ecosystem. To develop a plan for managing the water within our watershed is a significant challenge, and it requires cooperation and participation from a number of partners. As you read The Grand, I hope you gain a sense of that shared responsibility, and some insight into some of the projects that are under way.

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.

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

Townships of Mapleton and Wellington North: Pat Salter

Township of Centre Wellington: Joanne Ross-Zuj

Town of Erin, Townships of Guelph/Eramosa and Puslinch: John Brennan

Regional Municipality of Waterloo (Cambridge, Kitchener, North Dumfries, Waterloo, Wellesley, Wilmot and Woolwich): Les Armstrong, Todd Cowan, Jan d'Ailly (GRCA 2nd vice-chair), Rob Deutschmann, Jean Haalboom, Ross Kelterborn, Geoff Lorentz, Claudette Millar, Jane Mitchell (GRCA chair), Warren Stauch

City of Guelph: Bob Bell, Maggie Laidlaw

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

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

City of Hamilton: Jeanette Jamieson

County of Oxford (Blandford-Blenheim, East Zorra-Tavistock, Norwich): Bruce Banbury

City of Brantford: Robert Hillier, Vic Prendergast (GRCA 1st vice-chair)

County of Brant: Brian Coleman, Steve Schmitt

Haldimand and Norfolk Counties: Lorne Boyko, Fred Morison

Goals for the Grand

Continued from Page 1

The Water Management Plan will include a set of targets and the steps needed to meet those targets. For example, it will include targets for the oxygen level in river water, which is a key indicator of water quality. Other targets will be set for water quality, water quantity and flooding.

However, it's not a simple task to pull together the information needed to develop a set of targets for a resource as vital as water and a system as complicated as the Grand River watershed.

> We forced ourselves to step back from our disciplines and look at the big picture.
>
> *Sandra Cooke*

Before coming up with hard targets, it's important to understand what people expect from the rivers, streams and groundwater resources – the uses, needs and values they attach to water. In short, what are the objectives for water?

Looked at water needs

Over the years, different groups have looked at pieces of the puzzle, explained Lorrie Minshall, program director for the Water Management Plan. For example, in the 1990s a Grand River Fisheries Management Plan was developed. Also in the 1990s, information was pulled together to support the designation of the Grand River as Canadian Heritage River.

More recently, municipalities have developed waterfront master plans or updated their official plans to recognize the role of the river in community life.

"People have been asked many times in the past several years what they want to see" for the river system and water resources, said Minshall. "So we started with what people have already told us."

Sandra Cooke, senior water quality supervisor with the GRCA, pointed out that "we have all of these different uses in the watershed. We use it for drinking water, we fish in it, we put our treated sewage in it, we use it for canoeing and recreation."

Over the past year, Cooke and her GRCA colleague Claire Holeton, a water quality specialist, have led a working group of people from the GRCA and other water management agencies to develop a set of objectives for water resources.

Over the next year, teams of experts will take the aspirations represented by the objectives and turn them into something firm – numerical targets that can be used to measure progress on the Water Management Plan.

To come up with a comprehensive set of objectives, the working group looked at the ways the river and groundwater system are used now by municipalities, farmers, anglers, businesses and others. The working group members considered the role of the river system in culture, recreation and tourism. And they looked at what

Claire Holeton (left) and Sandra Cooke of the GRCA have worked with representatives of other water management agencies and governments to develop a set of objectives for water in the Grand River watershed.

To see the results of the project to identify water objectives for the Grand River watershed, please turn to Pages 3 and 4.

will be needed to ensure the river system is a healthy, thriving ecosystem for its non-human inhabitants.

At the start, the team members knew that different users look at the river system through the prism of their own interests and responsibilities.

"We forced ourselves to step back from our disciplines and look at the big picture," said Cooke.

Inevitably, not all visions line up in perfect harmony. The key was to come up with a list of objectives that "reflects the whole watershed," said Cooke. "All the partners need to see their interests reflected in it so we can work to common goals."

For example:

- Old mill dams can hamper water quality, which suggests they should be removed. However, communities may want to retain them because of their aesthetic and recreational value.
- All municipalities put their treated sewage effluent into the river system, but only a few take drinking water from the river, which may give rise to different expectations.
- Farmers need to fertilize their crops, but if fertilizer makes its way into the river system it can result in excessive algae growth and poor water quality.
- The GRCA's network of seven reservoirs is operated to moderate flows – reduce flood peaks and ensure flows don't drop below minimum levels – but some species needed greater variety of flows at different times of the year.

Find a balance

The challenge in developing the Water Management Plan will be to find the right balance among the different visions, identify meaningful targets and develop a list of realistic and affordable solutions.

The working group led by Cooke and Holeton has come up with about two dozen objectives grouped into five categories: water supply, hydrologic function, biodiversity and ecosystem integrity, river services and culture, recreation and tourism.

"What we wanted to get to was a list that will support the actions that the partners (to the Water Management Plan) can agree on and implement."

About the plan

Goal: The Grand River Water Management Plan Update will be an action plan that the partners writing it will agree to implement.

It will look at these key issues:

- A sustainable water supply for communities and ecosystems
- A reduction in flood damage potential
- Improvements to water quality to maintain river health, and to reduce the river's impacts on Lake Erie
- Resiliency to deal with a changing climate

Timeline: To be completed by March 2013, although the plan may recommend more research to take place after the final report is done.

Partners: The GRCA, municipalities, First Nations, provincial ministries and federal departments. A project team and working groups are made up of representatives from those agencies along with academics and key stakeholder groups (e.g. agriculture, industry, environmental).

Water objectives

An important part of the Grand River Watershed Water Management Plan will be realistic targets that can be used to report on progress in protecting and improving water resources.

As part of the of the process, a working group of experts has developed a list of objectives based on the way water is used and the values that watershed residents attach to it.

The objectives are in five categories, although they overlap to some degree – a reflection of the fact that in a watershed, everything is connected to everything else.

We want your thoughts

Residents of the Grand River watershed will get a chance to comment on the objectives for the Grand River Watershed Water Management Plan.

An online survey will be available about Oct. 1 on the project website at *www.grandriver.ca/wmp*

The website has more information on the process that will be used to develop the plan, including background documents, study results and more.

Water supply

The people, farms, businesses, institutions and factories of the Grand River watershed go through about 152 million cubic meters of water over the course of the year. To put that number in perspective, the average Canadian household use about one cubic metre of water a day.

About 60 per cent of that water is supplied by municipal water systems. One thing that sets these municipal systems apart from others in Ontario is their dependence on hundreds of municipal wells and a handful of intakes on the Grand River. Most other Ontario cities and towns get their water from the Great Lakes.

Private water sources account for the rest. Many of them are private wells that supply water to rural homes and farms for uses including livestock watering and irrigation. There are also private water takings from wells or intakes on creeks and rivers for a wide variety of uses: aggregate washing, rural businesses and industries, golf course watering, food processing, water bottling and others.

The objectives for water supply in the Grand River Water Management Plan recognize the variety of sources and the many different uses for the water.

Objectives

- The quantity of raw water for municipal supplies is reliable and able to meet current and future needs.
- The quantity of raw water for agricultural and commercial/industrial users is reliable and able to meet their current and future needs.
- The quality of the surface and groundwater used by municipalities is of adequate and predictable quality to produce safe drinking water after going through a normal treatment process.
- Groundwater used by private well owners meets or exceeds provincial drinking water quality standards, unless natural conditions related to the geology of the aquifer cause poor water quality.

Hydrologic function

The hydrologic function of a watershed is the way water moves on the surface, through the ground and back and forth between them.

A river in its natural state – flowing through untouched wilderness and subject to ebbs and flows of the seasons – will have its own cycle.

But the Grand River system is far from natural. The landscape has changed dramatically in the last 200 years. Forests were cleared and wetlands drained to make way for farms, towns and cities.

As a result, the Grand and other rivers and streams in the watershed are more subject to extremes – bigger floods in the spring, lower flows in the summer – that can have an impact on human uses as well as the fish, birds, bugs and animals that depend on the river, wetlands and other features.

To compensate for the lack of natural processes, seven reservoirs have been built to manage flows to reduce flood peaks and ensure the rivers continue to flow during dry summers.

The reservoirs are managed largely to meet human needs and not necessarily the needs of the natural system. For example, when flows are kept within a narrow range during the summer the river may not get enough "flushing flows" which clear out sediment and algae and revitalize the river.

When it comes to groundwater, it's important to ensure that water on the surface, from rain or melting snow, can continue to enter the ground rather than be blocked by asphalt or carried away by farm drains and municipal storm drains.

Objectives

- The flow regime (i.e. the highs and lows of flows) support healthy river processes.
- The amount of water in groundwater aquifers is maintained in the long term.
- The movement of water from the surface to groundwater (recharge) and from groundwater back to the surface (discharge) is maintained so water quality, water supplies and habitat are supported.
- The risk to life and property from flooding and erosion is managed.

Biodiversity and ecosystem integrity

Most people think of the Grand River, tributaries and wetlands in the context of their role in human activity, as a source of drinking water or a place to canoe or fish.

But the system is also vital to many species – plants, animals, birds, fish, insects – that live in the river, along its banks (the riparian zone) or in a wetland.

Like humans, these species need a certain quality and quantity of water. The needs will vary from species to species and may change over the course of a creature's life or from season to season. Their needs must be taken into account to maintain a thriving, healthy ecosystem. When the system is thrown out of balance, some species will thrive – algae, for example – at a cost to other species.

Maintaining a healthy Grand River system is also important to the future health of Lake Erie. The Grand River is a significant source of some materials, such as phosphorous, which lower water quality in the lake.

Objectives

- Water quality supports the health and biodiversity of aquatic, riparian and wetland communities.
- The flow of water in the river system supports the life-cycle requirements of aquatic and riparian species
- Water quality does not promote excessive growth of aquatic vegetation or harmful algal blooms in rivers, streams and reservoirs
- Interactions between Lake Erie and the Grand River support the ecological integrity of both systems.

Culture, recreation and tourism

The Grand River system has gone through a significant transformation over the past decades. A generation ago, it was a place to be avoided. However, improvements in sewage treatment, the protection of natural areas, a significant increase in tree planting and other activities have restored the river as a place for recreation or quiet contemplation.

While in the past some communities turned their back on the river, today they embrace it. Several are developing waterfront plans to improve the amenities along the river including new trails, parks and cultural and recreational facilities. The Grand has attained national recognition as a Canadian Heritage River.

For some communities, the river system has become an important part of their economic development efforts. They cite the river system as an important part of their quality of life as they try to lure new businesses and industries.

River-based tourism has become a growth industry in some places. Businesses offering canoe rentals or guiding services for anglers have popped up along the Grand in recent years.

Objectives

- The rivers are an amenity in the communities through which they pass.
- The rivers are aesthetically pleasing to support recreational, cultural and destination tourism uses.
- Flows are sufficient to reasonably support paddling in the parts of the system where flows are augmented with water from reservoirs.
- Water quality and quantity needs of sport fish populations are met to optimize angling opportunities and community benefits.
- Water quality does not restrict human consumption of fish.
- Restrictions on swimming at public beach areas are minimized.

River services

When people think of community infrastructure, they're likely to picture roads, water treatment plants and sewer lines.

But the Grand River and its tributaries are important parts of community infrastructure as well. In fact, without the river many pieces of municipal and provincial infrastructure simply wouldn't be able to function.

For example, there are more than 30 sewage treatment plants in the Grand River watershed. After they've done their job of treating raw sewage, the effluent is released into a stream or river. Natural processes in the river continue the treatment process.

Storm water from city streets flows through storm sewers into the river system, to reduce urban flooding. Farmers use tile drainage to get rid of water so they can work their land in the spring.

The river system provides other services, as well. There are a handful of hydroelectric plants, some owned by the GRCA and others privately owned.

The Grand River system is also a significant source of fish supporting a thriving commercial fishery on Lake Erie.

Objectives

- The capacity of the river system to accommodate treated wastewater without adverse impacts on the ecosystem or human uses is optimized
- The provision for urban drainage is optimized without adverse impacts on the ecosystem or human uses.
- The provision for drainage of productive agricultural land is optimized without adverse impacts on the ecosystem or human uses.
- Hydroelectric power production is pursued as a secondary benefit of river flow where it is cost effective.
- Water quantity and quality are sufficient for fish species that spend part of their life in the Grand River and are the subject of commercial fishing operations on Lake Erie.

The Soft Path to saving water

Water demand management program could help communities meet their future water needs

By Janet Baine
GRCA Communications Specialist

When it comes to water, the residents of Fergus and Elora may follow a new path which could dramatically cut consumption and infrastructure costs.

It's called the "Soft Path" approach and it was developed after the 1973 energy crisis for energy planning but now it has been refined and applied to water. A recently completed study looked at how to apply the Soft Path approach in Fergus and Elora — two communities in Centre Wellington Township with a municipal water system.

Traditional water management efforts focus on the supply side of the equation — bring more water to consumers through development of new water sources and infrastructure. Future water needs would be forecast by estimating population growth and multiplying that by current water use.

The population of Fergus and Elora is expected to double between 2008 and 2040. Based on the traditional forecast methods, much more water would be needed by 2040 and the community would need new water sources by 2028.

However, finding new supplies and bringing it to users is expensive and may be environmentally unsustainable.

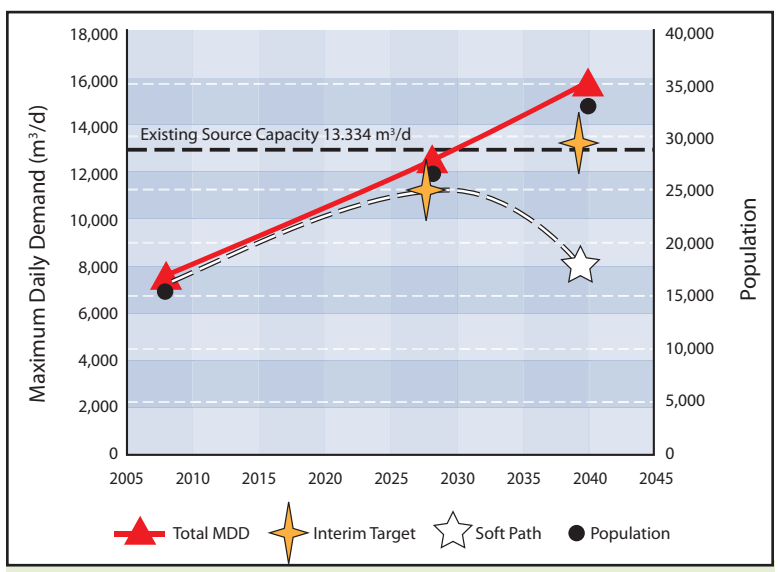
That traditional "supply-side water management doesn't work any more," said James Etienne, the senior water resources engineer with the GRCA who led the project.

More efficient fixtures

One thing that has changed the formula is that average household water use is generally declining as new, more efficient fixtures are introduced, such as low-flow toilets, shower heads, washing machines and so on.

"So even someone with no water awareness will use less water in a newer home," said Etienne. "You can't help but be more efficient now."

However, the Soft Path approach goes even further by looking at water use from a different point of view. The Soft Path offers an alternative to traditional water-saving practices.



The red line shows the increase in total water consumption based on traditional calculations. The dashed line shows the projected water use if the Soft Path approach were to be implemented.

Amanda Wong, water resource analyst with the GRCA uses a homemade rain barrel and drip irrigation system to water plants in a GRCA staff garden.

The four main principles are:

- Treat water as a service, rather than an end in itself.
- Make ecological sustainability a priority.
- Match the quality of water to the end use (for example, using rainwater to water landscapes or grey water to flush toilets).
- Plan from the future goal and work backward.

Fergus and Elora are in the same position as many other communities across Canada and the world: coming face-to-face with the ecological limits of the local water supply. The Soft Path pilot project was initiated by the GRCA in partnership with the POLIS Project on Ecological Governance at the University of Victoria, the Township of Centre Wellington, the Elora Environment Centre, the University of Waterloo and the Ministry of the Environment.

The study says its feasible for Fergus and Elora is to "use the same water tomorrow we use today" by accommodating growth to 2040 and beyond, using the same amount of water used in 2008.

"Adopting a Soft Path approach means Fergus-Elora would follow the lead of communities such as Calgary and York Region in making a commitment to use the same amount of water in the future as they use today – and reap the long-term benefits of significant cost and energy savings," said Carol Maas, innovation and technology director for the POLIS Water Sustainability Project.

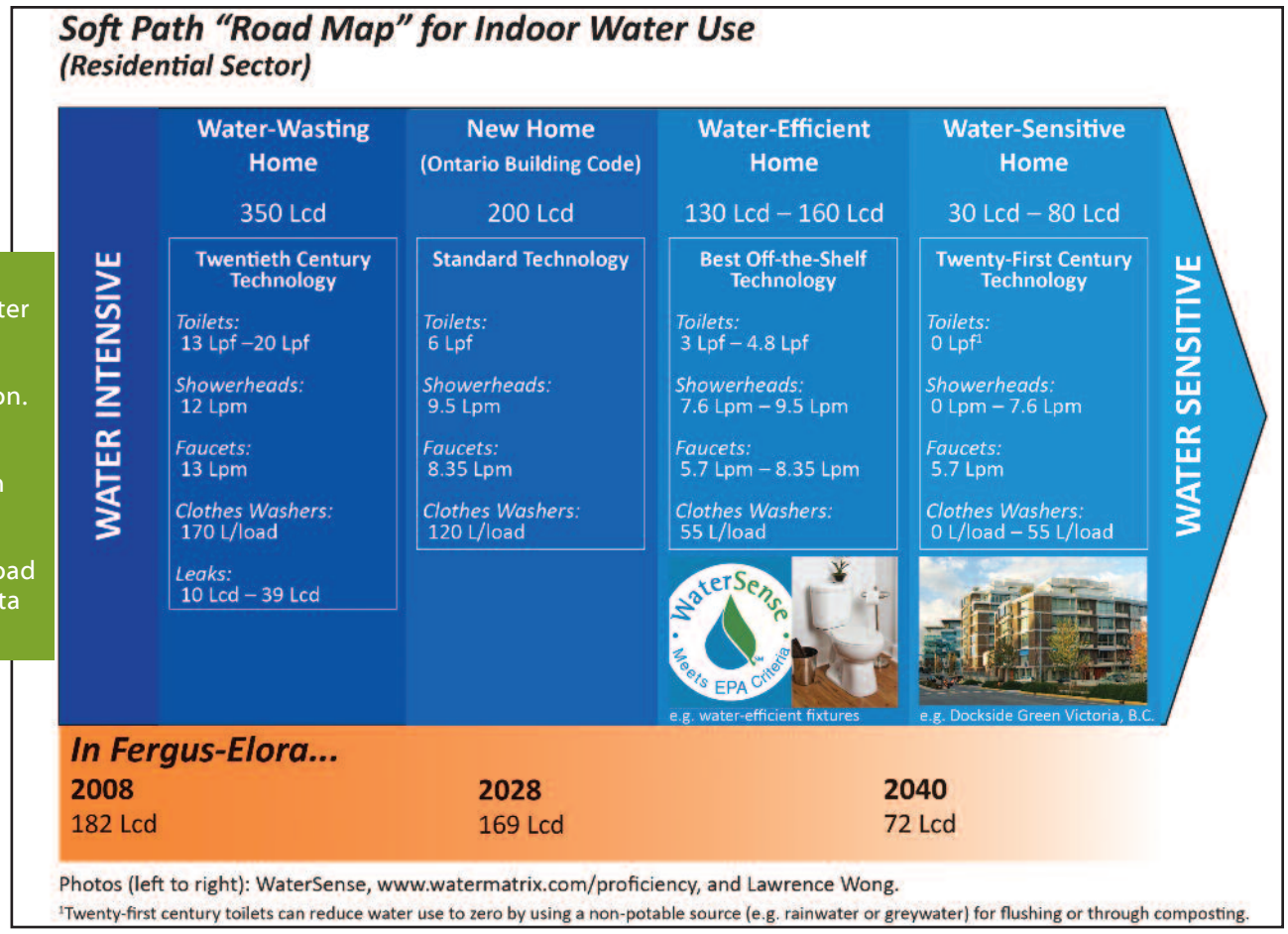
"An overarching target sends a clear signal to the community and decision-makers that water conservation and efficiency is a largely untapped opportunity to reduce costs and support continued economic and ecological health within the watershed."

> "Water conservation and efficiency is a largely untapped opportunity to reduce costs and support continued economic and ecological health."
>
> *Carol Maas*

That target may seem challenging at first glance, but Maas points out that water consumption is already declining. Looking 30 years into the future allows lots of time to implement change. The interim target is "very comfortable" and will help the community find many opportunities to save more water in the coming decades, she said.

Communities such as York Region and Calgary had more staff members and resources to draw upon when they initiated the Soft Path approach. The Fergus-Elora pilot project adapts the concept to a smaller community with fewer resources.

The Fergus-Elora project started in 2009 and is now complete, but it will be up to Centre Wellington Township and its resi-



Photos (left to right): WaterSense, www.watermatrix.com/proficiency, and Lawrence Wong.

[1]Twenty-first century toilets can reduce water use to zero by using a non-potable source (e.g. rainwater or greywater) for flushing or through composting.

This chart shows how changes in indoor water use could result in a significant drop in water use per person.

Legend
- **Lpf** – Litres per flush
- **Lpm** – Litres per minute
- **L/load** – Litres per load
- **Lcd** – Litres per capita per day

dents to decide if and how to implement the Soft Path for water.

"It could be the best plan in the world, but if the community is not going to accept it, then nothing will be accomplished. This plan has to be matched to the community's willingness to undertake the changes," said Etienne.

A significant part of the Soft Path approach is that it focuses on engaging people. The planning process would involve not just staff in the water department, but everyone in the community.

The GRCA undertook a water use survey to find out how residents currently use water. Sarah Wolfe and Catherine Leighton at the University of Waterloo looked at how Fergus and Elora will make this change and the existing social network that can help facilitate it. They conducted interviews, characterized the community's social network and held workshop discussions.

Maas and Susanne Porter-Bopp at the POLIS Project then built on the water use survey to explore each element of a Soft Path plan for Fergus-Elora.

"The detailed analysis and action plan outlines the specific steps for the community to achieve water sustainability over the next 30 years. It focuses on both efficiency and conservation and is a model that can be adapted for any community," Maas said.

Establish targets

The Soft Path plan for Fergus-Elora established an interim target for 2028 and a long-term vision for 2040. The research considered the specific challenges faced by Fergus and Elora as part of the Grand River watershed. It presents three road maps that describe the path forward for each type of water use: one for outdoor water use, one for industries, institutions and commercial use and a third for indoor residential use. These road maps identify opportunities to save water.

More use of grey water

Successes in other communities that have resulted in dramatic improvements in efficiency are also described. Many of these entail matching water quality to the use, such as using grey water or rain water harvesting.

The initial plan was to have the Soft Path report dovetail with Centre Wellington's Water Master Plan which is now underway. The technical work for the master plan is taking longer than anticipated and is not yet complete. The Soft Path report will be presented as an alternative during the public presentations on the water master plan.

"The Soft Path will probably play a very important part in our water strategy master plan," said Ken Elder, director of public works for Centre Wellington. "With the Soft Path, they have another tool in the tool box of water efficiency and reduction."

Dramatic water reduction can become a way of life

Dramatic cuts in water use are not such a crazy idea.

Statistics show that per capita water use is declining across the country and across the watershed.

In Guelph, for example, per capita water use declined by 23 per cent between 2000 and 2010.

In part that's because policies are changing. Since 1996, the Ontario Building Code has required water-efficient fixtures in new buildings.

As well, some individuals are turning reduction in water use into a personal challenge. Erminio Artuso of Guelph, for example, collects nearly 10,000 litres of rainwater a year in cisterns for outdoor use in his gardens. He was presented with a 2011 water efficiency award from the city.

"I feel very proud to be able to save and avoid drawing water from the city's supply," he wrote. "If only a small percentage of Guelph residents would adopt this system, we would be able to save several hundred cubic metres of our precious drinking water every year."

Technology, water pricing and awareness that water resources are limited are combining to drive consumption down.

Even people who are not aware of the water they use will use dramatically less in a new home built in 2011 compared to a similar home built 20 years earlier.

Water conservation in Fergus and Elora

Fergus and Elora residents are already below average in their water use

The GRCA sent a water survey to nearly 6,000 households in Fergus and Elora in March 2009 to ask residents about their current water use.

"We did this research because we didn't have much information about what residents of Fergus and Elora were doing in the way of water conservation," explained Amanda Wong, water resource analyst with the GRCA.

She was impressed that 22 per cent of the surveys were returned, reflecting a strong interest in the issue. The surveys showed that residents are already conserving water. They use 191 litres per person per day, compared to a provincial average of 260 litres a day and a national average of 335 litres.

"People are really conscious of their water use. We found that half of the respondents had undertaken seven or more water saving initiatives," Wong said.

Some of the findings include:

- 70 per cent of respondents already have low flow toilets
- 30 per cent use front-load clothes washers
- 50 per cent have low-flow showerheads and faucets.
- 50 per cent of households have a rain barrel or are planning to get one within a year, even though the municipality doesn't have a rain barrel program.

More on the Soft Path

To learn more about the Soft Path and the Fergus-Elora study, go to website of the POLIS Project on Ecological Governance at *www.poliswaterproject.org*

Hunting for buried water

A study of an ancient buried river valley may lead to water sources for growing communities

By Dave Schultz
GRCA Communications Manager

The landscape of the Grand River watershed – the hills, valleys, sandy soils and clay plains we see today – are the legacy of glaciers that pushed and scraped their way across the surface thousands of years ago.

But there are older landscapes buried deep below the surface. Drill down and you can take a geological time trip, encountering old lakebeds, river deltas, hills, valleys and other long-lost features, some of them dating back hundreds of millions of years.

Exploring ancient valley

For the past three years, scientists from the Grand River Conservation Authority and the Ontario Geological Survey have been exploring that underground world to learn more about an ancient feature known as the Dundas Buried Bedrock Valley.

Geologists call these types of formations "thalwegs." That's a word used to describe the bottom of a river valley.

Many years ago – no one knows when – a river flowed on top of bedrock that is at least 420 million years old. The bedrock valley goes from today's Lake Huron, cuts across southwestern Ontario through the middle of the Grand River watershed, and then east to Hamilton where it plunges deep below Lake Ontario. In some places the valley is 40 metres below the surface, in others it's 160 metres or more.

Between 10,000 and 50,000 years ago, the river valley was filled with sand, soil, and gravel. In some cases, advancing glaciers pushed stuff into the valley. At other times, torrents of melting water from retreating glaciers deposited the material.

GRCA hydrogeologist Gregg Zwiers examines a core sample taken from the Dundas Buried Bedrock Valley.

It's important to understand the shape and structure of the buried valley because it provides insights into the way groundwater moves under today's landscape, says Gregg Zwiers, a hydrogeologist with the GRCA and one of the project's leaders.

And the information from the study can be used by municipalities as they search for water supplies for their growing cities and towns, added Zwiers.

"It's a fascinating thing to track this feature and find out about something hidden," said Zwiers.

The Ontario Geological Survey covered the cost of the $600,000 project. The GRCA contributed the time and expertise of Zwiers and other staff who worked on the project. The Region of Waterloo, City of Hamilton and McMaster University also played a role.

According to Zwiers, the project met its goals.

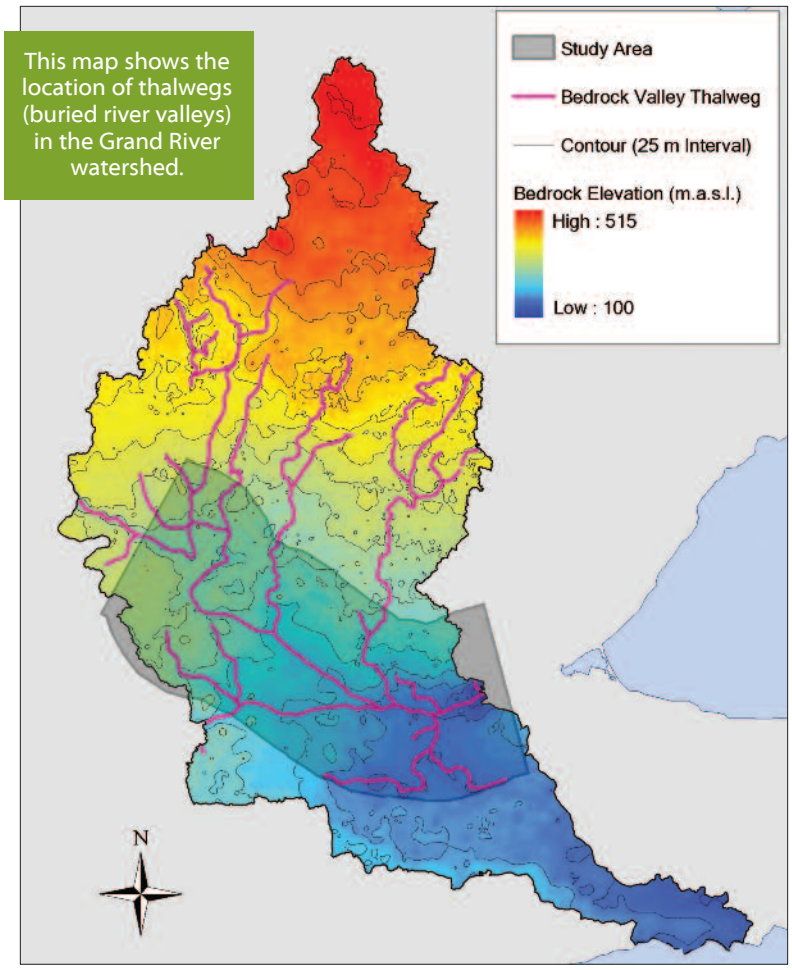
Productive area

"There's very productive material," in the buried valley, said Zwiers. "You could pump quite a bit of water from it."

Whether that will happen will depend on the needs of municipalities along the length of the valley, added Zwiers. (See related story on Page 9.)

A follow-up study could answer questions about whether water is seeping from the buried valley into the Grand near Glen Morris, contributing to an improvement in water quality in the stretch between Cambridge and Paris.

The buried valley takes its name from the Dundas Valley near Hamilton. The town of Dundas is cradled in the valley, which is a notch in the Niagara Escarpment. In the 1880s, Dundas geomorphologist J.W. Spencer studied the Dundas Valley and theorized it was the visible extension of a much bigger valley buried beneath the modern day surface.



This map shows the location of thalwegs (buried river valleys) in the Grand River watershed.

From the time of Spencer's speculation in the 1880s, it took more than a century before the buried parts of the valley were mapped.

That happened in the 1990s when a major study was done of the groundwater system of the Grand River watershed.

As part of the study, water well records collected by the province since the 1940s were examined to learn more about the characteristics of subsurface soils and bedrock.

What they found, said Zwiers, were areas where there was a sudden drop-off in the depth to the bedrock layer.

The researchers plotted the locations on a map and it was a "matter of connecting the dots to trace the buried valley back from Dundas," said Zwiers.

However, there were still some unanswered questions: What shape was the valley? What kind of material was in it? Did it hold useable amounts of water? Was the water quality good enough for human use?

Finding the answers required getting out into the field, said Zwiers.

The research team identified three sections for more study: between Paris and Lynden; southwest of Kitchener to Roseville; and near the village of Wellesley.

In 2007, sophisticated equipment was used to measure tiny changes in gravity caused by changes in the depth to bedrock. That gave the researchers a better

Gilles Bergeron and Luc Houle use a device that measures tiny changes in gravity caused by changes in the distance from the surface to bedrock.

Buried valley study provides useful info for Waterloo Region

Could the Dundas Buried Bedrock Valley be a future source of municipal drinking water?

The information from the Dundas Buried Bedrock Valley study is one piece of information being used by the Region of Waterloo to identify sites for potential new water supply wells, said Richard Wootton, a senior hydrogeologist with the Region.

The Region operates the largest groundwater-based municipal water system in the country. It has more than 120 wells that draw about 80 per cent of the water used to supply about 520,000 people in Kitchener, Waterloo, Cambridge and the surrounding townships. The remaining 20 per cent comes from an intake on the Grand River.

Right now, the Region is updating its long-range water supply master plan, which is expected to take about a year. The previous plan, completed in 2007, says the Region will continue to use the river intake, Aquifer Storage and Recovery, its existing wells and some new or upgraded wells until about 2035, when a Lake Erie pipeline would be brought on line.

However, any water supply master plan is based on future water demand and right now those projections are under scrutiny.

The water consumption trends have shown a continuous decline over the last 10 years, which is attributed to active conservation programs and changes in water use by industry. As a result, the need for new sources isn't as pressing as it was a few years ago, said Wootton.

If it turns out that new wells are needed to meet overall water demand growth, or to meet demand in high-growth areas, the areas spotlighted by the Dundas Valley study could be looked at for potential new well sites.

Long process

But it's not a quick or easy process, cautioned Wootton. The process of bringing a new well online can take three to five years.

Ideally, new wells should be located close to where new growth is taking place and, importantly, close to existing infrastructure – pipes and treatment plants – to keep costs under control.

Data from the Dundas Valley study, along with other hydrogeological work done by the GRCA, the Region, the Ontario Geological Survey and other agencies would be examined to find the best locations where water might be available in the quality and quantity required to meet the Region's needs.

Once a site is identified, a test well is drilled and pumping tests are done to verify the volume and quality of water that would be available.

An Environmental Assessment would be required to ensure the new well would not pose any harm to the natural system or other well owners in the area.

And, finally, the Region would have to get a Permit To Take Water and other approvals from the province in order to operate the well and associated equipment.

picture of the route of the valley and its depth.

Then, in 2008 and 2009, test wells were drilled at eight locations. About 535 metres of core samples were pulled out of the earth, carefully packaged and sent to the OGS lab in Sudbury for analysis.

Elizabeth Priebe, a hydrogeologist with the OGS and another member of the study team, said the results were encouraging. They found sand and gravel soils, which are often rich aquifers because water can easily fill the space between the grains.

Elizabeth Priebe

The core samples yielded some other interesting information, said Priebe. They contained tiny wood chips that carbon dating showed to be about 46,000 years old.

At Lynden they found tiny shards of Queenston shale – one of the materials that makes up the Niagara Escarpment – which suggest that at some point glaciers pushed the material westward up the escarpment, said Zwiers.

The study also produced evidence of what might have been a huge waterfall near Copetown, a village midway between Brantford and Hamilton.

West of Copetown, the drill hit bedrock 40 metres below the surface, explained Zwiers. However, east of the village the drill went down 200 metres and never did hit rock, for a drop of at least 160 metres. Niagara Falls, by comparison, is about 50 metres high.

During 2009 and 2010 the study team looked at the potential of the valley as a source of municipal water. Pumping tests at several locations showed "you could pump quite a bit of water," said Zwiers. Whether it would be enough to meet municipal needs would require more study.

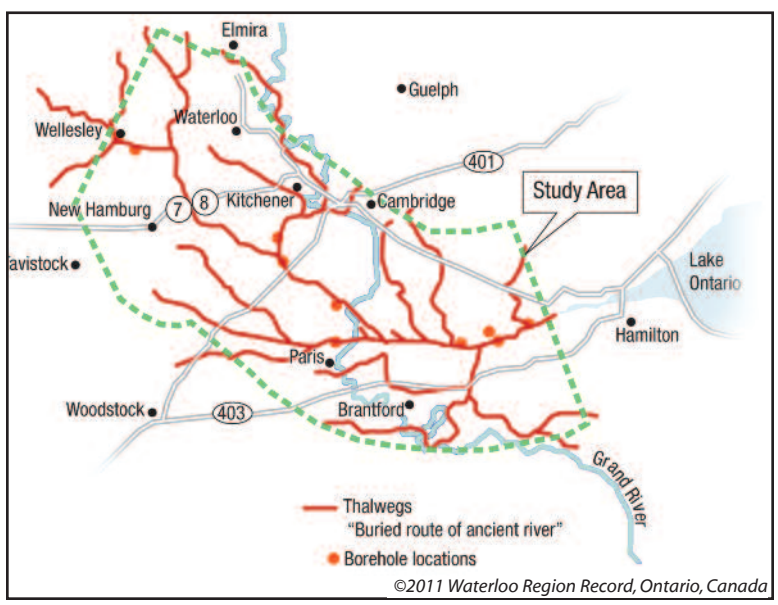
Examined water quality

When the research team studied the quality of the water, they found, to little surprise, that the water was hard and contained sulphates, iron and dissolved solids. That's true for many wells in this part of Ontario, said Zwiers, and is a result of the nature of the bedrock.

However, they also found signs of contamination from human activity. High levels of sodium and chloride were found in the Lynden area, probably a result of decade's worth of road salt making its way from the surface down to the aquifer.

Some wells also showed elevated nitrate levels. Nitrates are found in animal waste with common sources being manure or fertilizer spread on farm fields or leakage from septic systems.

Yet, said Zwiers, most of the Dundas Buried Bedrock Valley has a potential to be a good supply of drinking water. In fact, many private wells already tap into it.



Cleaner future for sewage plants

Gerry Atkinson (right), operations lead hand and Cameron Walsh, former manager of Guelph's wastewater services, during a capacity test of the city's treatment plant. The test showed the plant can reliably treat more wastewater than it is rated for.

Improving the efficiency of treatment plants helps the environment and the pocketbook

By Janet Baine
GRCA Communications Specialist

When you head down to the river to canoe, or go to city hall to pay your property taxes, you can be grateful that sewage plant operators of the Grand River watershed have started talking to each other about something called "optimization."

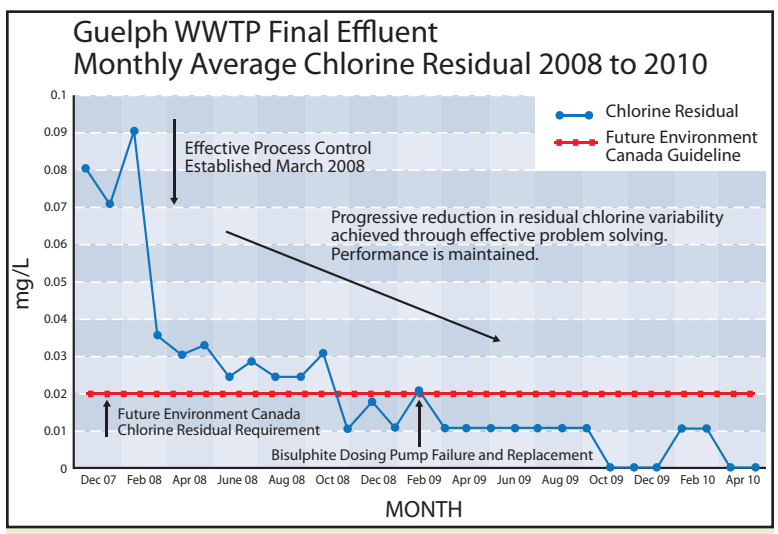
Wastewater optimization is a process sewage plant operators adopt to make their plants as efficient as possible using their existing technology.

It results in cleaner effluent leaving the plants and entering the rivers and streams of the Grand River system. It's also starting to help municipalities save money on plant operations.

So far, plants in Guelph and Haldimand County have gone through the optimization process. The GRCA and wastewater managers would like to see this program extend across the watershed.

There are 30 wastewater treatment plants in the Grand River watershed that take what we put down drains and toilets, clean it up and then put it back into the rivers and tributaries of the Grand.

"What we are hoping to see from optimization is reduced environmental impact such as lower phosphorus and ammonia loading. Also fewer wastewater bypasses. There will be some savings, because this approach uses existing infrastructure, so we expect it will save taxpayer's money," said Mark Anderson, GRCA water quality engineer, who headed up a recent pilot project for watershed-wide wastewater optimization.



Chlorine is used to disinfect wastewater treatment plant effluent before it is put released into the river. By changing the way the plant is run, Guelph managed to meet federal standards for maximum chlorine levels without spending millions on new equipment.

Effluent affects water quality

Effluent changes the physical, chemical and biological characteristics of the water. For example, effluent contains chemicals such as phosphorous and nitrogen which are a component of human and animal waste and are also found in fertilizers. When the phosphorus and nitrogen levels in wastewater effluent are high, it leads to increased algae growth. This decreases the oxygen in the river, creating unhealthy conditions for fish and other aquatic creatures.

Wastewater optimization is a long-term process targeted at the operation, maintenance and design of wastewater treatment plants. It was developed by the Environmental Protection Agency in the United States during the 1980s. The City of Guelph began optimizing in 2005 and Haldimand County began in 2008. Both have had many successes in cleaner effluent and saving money. They are both optimization leaders in the watershed and in Canada.

> The primary focus is not cost savings, but trying to do the best you can with what you have.
>
> *David Chapman*

A $57,000 grant from the Ministry of the Environment's Drinking Water Stewardship Program was used for the pilot program — a test to see if wastewater optimization could be rolled out to all of the plants in the watershed.

Twelve of 13 watershed municipalities with plants participated in three workshops led by Dr. David Chapman, a consultant who specializes in wastewater optimization. Wastewater plant operators toured the Guelph plant and studied optimization in Haldimand County. They did homework assignments to summarize the data from their own facilities and learned how optimization could be applied at their plants.

"The primary focus is not cost savings, but trying to do the best you can with what you have. It is getting the best quality effluent from the existing plants," Chapman said.

Both Chapman and Anderson believe there was enough interest and positive feedback to show that optimization could work

throughout the Grand River watershed. If this takes place it would be very innovative.

"I don't know of any area-wide wastewater optimization programs that are on a watershed basis in Canada or the United States," Chapman said. "I think it is a wonderful opportunity. It is really quite unique and innovative, but there will be lots of challenges."

The Ministry of the Environment issues permits to wastewater treatment plant that set out requirements for the quality of the effluent put out by each plant.

> Wastewater optimization shows that a stewardship approach can be used ... to make a real difference.
>
> *Mark Anderson*

There are, however, big variations in the limits. Each plant is striving to meet effluent requirements that were set individually by different Ministry of the Environment offices at different times over the past 30 years.

However, as new plants come on line or old plants are upgraded the requirements have been tightened. The variation in requirements shows what can be done to improve effluent at plants with older or higher targets.

"The next step looking forward is to complete the data collection for all the plants and then select the ones to participate," Chapman said. Those that would benefit the most could be among the first to participate, but eventually all would be brought into the optimization program.

Anderson is examining what would happen if the 10 big wastewater plants in the central Grand River were optimized.

He is using the Grand River Simulation Model (GRSM) to find out how this change would impact the water quality of the Grand River. A model is necessary because changes in water quality result from a complex interaction of many factors that are changing over time. The model covers the Grand River from the Shand Dam to Ohsweken and the Speed River from Guelph Lake to Cambridge, where it enters the Grand. Preliminary results show that wastewater optimization could improve water quality in the Grand River.

Mark Anderson, a water quality engineer, at one of the GRCA's water quality monitoring stations, which take round-the-clock readings that are uploaded hourly to the GRCA website.

Set voluntary targets

The program is voluntary and based on building partnerships and trust. Anderson expects that plant operators will be able to set new voluntary goals for effluent quality at each plant that would be more stringent than those outlined in their provincial certificate of approval. The plant operators will then report the results and identify and fix any problems that come up.

The GRCA has applied for funding through a provincial program called Showcasing Water Innovation. An announcement was expected this month. If the grant is awarded, the Grand River watershed could have the first optimization program in North America to cover multiple municipalities.

"The GRCA has been working with farmers to make improvements to land management practices through the Rural Water Quality Program for more than a decade," Anderson said. "Wastewater optimization shows that a stewardship approach can be used to work with the operators and managers of wastewater treatment plants to make a real difference in the watershed."

David Chapman (left) and Haldimand County staff members Phil Wilson (centre) and Tim Howarth (right) review plans of a wastewater treatment plant during an on-site evaluation.

Haldimand, Guelph count the savings

The City of Guelph started wastewater optimization in 2005 and Haldimand County began the process in 2008.

Once started, optimization enables wastewater operators to continually improve their practices and the performance of their plants.

Guelph has had many successes since optimization got underway.

The city is on a small river – the Speed – which has a limited capacity to accommodate wastewater. Rather than spend millions on mechanical or structural improvements to the plant, the city chose to invest instead in upgrading the knowledge of their staff.

Starting in 2006, Guelph's wastewater treatment plant made operational changes and encouraged staff efficiency through training. This shrank the gap between knowing how to manage wastewater and doing it consistently.

Here are some benefits:

- Guelph has deferred around $6 million in infrastructure costs and is investigating if there is enough plant capacity to remove an additional $14 million in upgrades.
- Chlorine is used to disinfect the effluent but too much can be harmful to the natural environment. Environment Canada set a new requirement to discharge less than 0.02 mg/litre in the effluent by January 2010. Guelph's existing dechlorination system was not meeting this requirement and a new ultraviolet disinfection system was recommended. Instead, staff optimized the existing process and it now complies with the requirement. This avoided an estimated $8 million in capital expenses, not including maintenance and operations costs.
- Guelph has fewer and smaller wastewater tertiary treatment bypasses — times when treated wastewater bypasses the last filtration step and directly enters the river.
- Since Haldimand County started wastewater treatment optimization in 2008, wastewater treatment plant upgrades valued at $20 million were found to be unnecessary. The overall operation of their plants has been improved thanks to better tools that help manage and report on data so that better decisions can be made.

"Optimization is proving to make a big difference," said Mark Anderson of the GRCA.

The Grand River Conservation Foundation

Building a legacy of conservation and recreation

Inspired by the GRCA, a Lake Belwood couple are restoring former gravel pit

By Logan Walsh
GRCF Development Assistant

Long-time residents of Lake Belwood, successful business owners Don and Janet Vallery know about conservation and recreation.

Aside from being contributors to the GRCF's Living Classroom Campaign and Luther Marsh Wildlife Management Area, Don and Janet own and operate Highland Pines Campground, a family-friendly camping destination on the shores of Lake Belwood, northeast of Fergus. Each year approximately 400 families set up camp at Highland Pines where they fish, swim and enjoy family time in a natural setting.

The Vallerys first got to know the GRCA and, later, the Grand River Conservation Foundation, by being good neighbours: much of their property abuts GRCA land.

In 1913, Don's father bought a plot of land along the Grand River. In 1942, the Shand Dam was built and their riverfront land soon became lakefront property on Lake Belwood, the reservoir created by damming the Grand.

Since then the Vallerys have purchased adjacent lots, developed the Highland Pines Campground and have been working with GRCA to reforest their land.

Growing relationship

What began as a business relationship has grown into something more.

Though his business at Highland Pines property he "developed a respect for the GRCA" and got to know the GRCA's encompassing approach to water and land management, said Don.

Given the Vallerys' working relationship and respect for the GRCA, it was an easy jump to become involved with the Foundation. During GRCF's Living Classroom Campaign in the early 2000s, the Vallerys made their first major contribution to GRCF.

"We feel strongly about environmental education for kids," said Janet. Their donation, along with many others, helped keep nature centres open across the watershed.

Their support of Foundation projects has extended to habitat restoration at Luther Marsh Wildlife Management Area near Grand Valley.

Why restoration? Visiting their property, it is clear to see why habitat restoration is a priority for the Vallerys. The care they have for their land is evident in the thousands of trees they've planted over the decades. Osprey rookeries have been erected and an eco-friendly campground is in development. A retirement community developed by the Vallerys adheres to the highest standards in energy efficiency.

Don and Janet Vallery make habitat restoration their priority.

"We want to support local rehabilitation projects of unused and unhealthy lands. We want to see animals return to naturalized areas," explains Janet.

When the Vallerys visited Luther Marsh they were amazed by its beauty and uniqueness.

Don recognized its importance in the Grand River system and saw how "Luther Marsh is where the Grand begins. Water quality is essential to everyone downstream – especially here at Lake Belwood."

'Amazing transformation'

Janet, too, was inspired by the restoration projects at Luther Marsh: "You take an unusable field and turn it into a healthy wetland habitat – it's an amazing transformation."

The Vallerys support of wetland restoration at Luther Marsh is, in many ways, a test trial for their own wetland restoration.

Several years ago, the Vallerys acquired a heavily degraded parcel of land used for gravel extraction. The land, now depleted of gravel, is a blank canvas for ecological restoration and the Vallerys are taking up the challenge.

Once complete, the restored area will boast a low-density campground, a meandering creek and wetland, a meadow habitat, and many opportunities for bird watching. There will be pathways for observing nature and "no-go" areas to protect wildlife.

"We want to replicate the success at Luther Marsh: take vacant land and create a healthy habitat that stays true to a naturally historic landscape of Southern Ontario," explains Janet. "This is a long-term project and we are creating a lasting legacy for our family and our guests."

You can help, too!

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:

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