



GRAND Actions

The Grand River watershed newsletter



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Feature

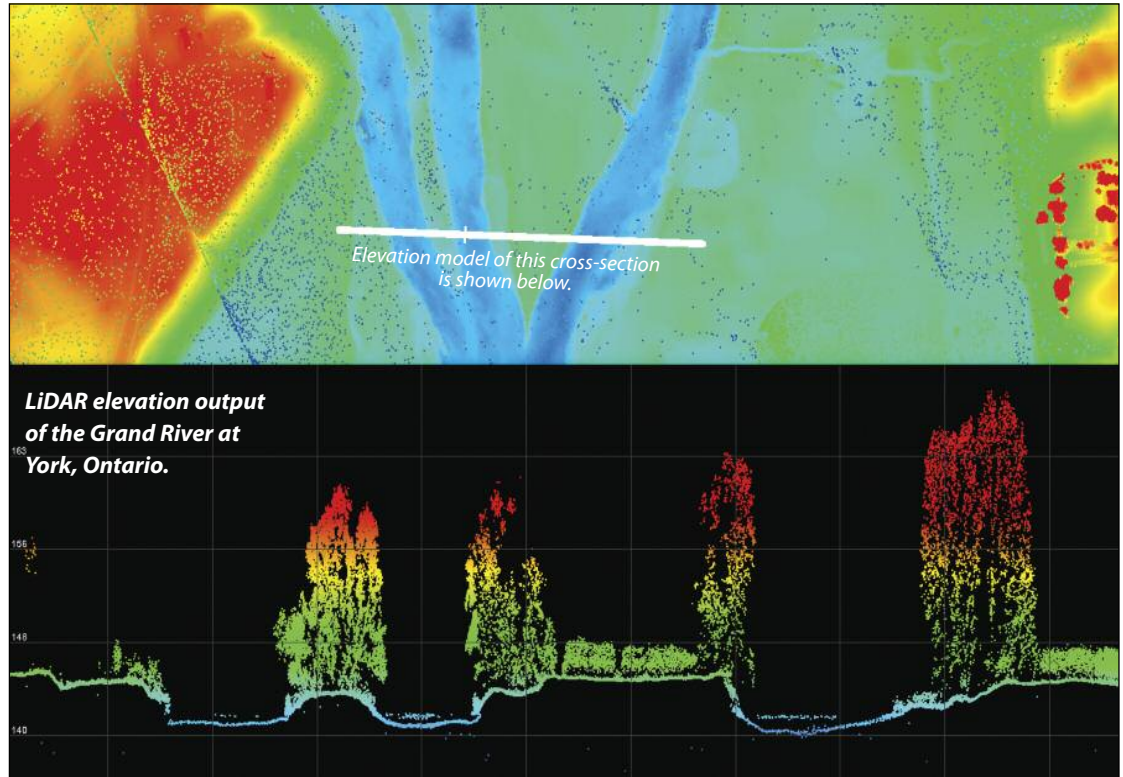
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Cover photo

LiDAR data can be used to answer questions related to surface hydrology mapping, flood risk management, water supply and more.



Painting a digital picture of the Grand River watershed

Scott Robertson, GRCA Senior Water Resources Engineer

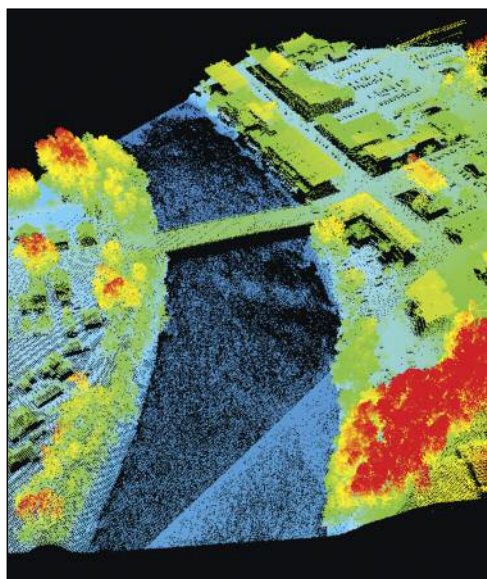
The use of echo-location in determining shapes, distances or movement of objects is a technique used in nature by animals, such as bats and dolphins, to navigate and hunt. The technological form of echo-location, known as sonar (SOund NAVigation Ranging), has been around for more than 100 years. The same principle of sending a signal from a remote location and measuring how long the echo or reflection takes to return is applied using other types of signals as well, often with even greater speed and accuracy. Radar (RAdio DEtection AND Ranging) uses radio waves for this purpose while LiDAR (LIght DEtection AND Ranging) uses light from lasers.

An accurate picture or “model” of the earth’s surface is important to better understand the

world or, in this case, the watershed in which we live. Within the last few years, two separate, but related LiDAR projects have been undertaken in the Grand River watershed using lasers and measuring systems mounted in aircraft.

The first was completed as a joint project between the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) and the Ministry of Natural Resources and Forestry (MNRF). This project involved the collection of ground surface information outside of water bodies, referred to as topographic LiDAR. Within the Grand River watershed, this project collected very precise elevation data at a density of approximately 10 points per square metre. With a watershed area of 6,800 km², this translates into roughly 68 billion elevation data points.





Perspective view of LiDAR data at the Williams Street bridge over the Grand River at Paris, Ontario.

The second project was completed by the GRCA with funding support from the federal government's National Disaster Mitigation Program. Its primary focus was the collection of below-water ground surface data, or bathymetry.

The use of LiDAR technology to study bathymetric surfaces in shoreline environments is not new, with the first application taking place at Lake Ontario in 1968. Until recently, however, there were limitations to its use due to the weight and power requirements of the equipment itself. These limitations restricted it to military applications and larger aircraft capable of handling the loads. Bathymetric LiDAR technology has advanced, resulting in smaller equipment that requires less power making it much easier to mount advanced systems in smaller aircraft, providing access to previously unreachable areas. The GRCA's project is groundbreaking in that it is, to our knowledge, the first time it has been used in a riverine environment in Canada.

Beyond equipment size and site accessibility, there are many other constraints to the application of bathymetric LiDAR that had to be considered in planning the project. The technology relies on light to not only reach its target (i.e., the riverbed), but to do so with enough intensity that the reflected portion has enough energy to bounce back

to sensors in the plane. This is less of an issue with topographic LiDAR, assuming the work is completed in cloud-free conditions. Water makes the collection of LiDAR data much more challenging. Unlike some shoreline environments, rivers and creeks pose their own challenge where elements such as cloudy water due to silt and sand, ice coverage or underwater vegetation growth can all combine with water depth to create conditions that greatly reduce visibility. In short, if light cannot penetrate it, the technology will not be effective.

After assessing the various constraints, the GRCA felt that the likelihood for successful application of bathymetric LiDAR technology across large portions of the watershed was reasonable and undertook the project, with all fieldwork collected in late fall 2018. While still being processed, preliminary review indicates the data obtained is of high quality and accuracy at many locations across the watershed. As expected, in areas where deep waters and/or turbid conditions exist, the collection of data was less successful.

Data from the two projects is being combined to create a topo-bathymetric elevation model, which is a three-dimensional digital picture of ground surface elevations above and below the water line. This type of elevation model can be used to answer many questions related to surface hydrology mapping, flood risk management, water supply and quality, infrastructure and construction management, agriculture and land management, forest resources management, as well as land-use and urban development among other applications. The initial focus for GRCA staff is on watershed hydrology and river hydraulics, and their relation to riverine flooding. The elevation model forms the basis for subsequent analysis that help predict, for example, how runoff from rainfall and/or snowmelt events flows across the surface of the watershed and in developing a better understanding of how deep and fast the water becomes once it enters the creek and river system. The product created from this analysis is called flood hazard mapping. This information is critical to guiding key GRCA activities such as land use planning and regulation, the design and operation of flood control infrastructure and, during flood events,

forecasting and warning activities.

All of these activities are directly tied to the GRCA's strategic objective of protecting life and minimization of property damage from flooding and erosion.

The ability to obtain comprehensive and accurate elevation data is by no means new. Good old-fashioned, boots-on-the-ground hand surveying is an activity that continues to be an invaluable resource of elevation information. However, this approach, particularly when undertaken at a large-scale is time-consuming, expensive, and occasionally dangerous (especially in water) and can be prone to human error. Boat-mounted sonar represents another option, but is also relatively slow and has physical limitations.

Advancements in airborne LiDAR data acquisition capabilities offer the potential for data to be cost-effectively collected at a quantity, accuracy and speed not attainable using other technologies. Advances in data management / processing capabilities, and mathematical modeling and mapping mean that we are better able to use this data in many types of studies. While the GRCA's initial efforts are directed toward improving our understanding of flood hazards and the reduction of associated risks, the data itself will be made publicly available on the GRCA website once a thorough review has been completed, and will be of potential benefit to a wide variety of applications. The LiDAR data will significantly enhance the types of analysis that can be completed and how that work is undertaken.

Celebrating watershed farmers

Jenn Deter,
GRCA Conservation Specialist

It's no coincidence that Ontario Agriculture Week (October 7-11) coincides with Thanksgiving: a time to enjoy the abundance of local food available to us. Agriculture should be appreciated every day, and during Ontario Agriculture Week we celebrate food and other agriculture products that we enjoy daily, thanks to the hard work and

WHAT'S HAPPENING



In 2000, a Guelph-Eramosa Township farmer contacted RWQP staff at the GRCA. He received funding through the Wellington RWQP to fence the cattle out of this watercourse and plant trees in the buffer. The photo on the right shows the same location 19 years later.

dedication of Ontario's farm families.

Approximately one million people in the Grand River watershed depend directly on groundwater or the river and its tributaries for clean drinking water. Since approximately 70 per cent of the watershed is actively farmed, farmers have an important role to play in protecting water. The Region of Waterloo recognized this connection and introduced the Rural Water Quality Program (RWQP) in 1998 to help farmers implement best management practices (BMPs) on their land to improve water quality both on their farms and downstream. For the past 21 years, Waterloo farmers have been able to access both technical assistance on the farm and cost share funding to implement water quality improvement projects on their properties.

Seeing the benefit of this cost-share program, other municipalities across the province have implemented their own RWQP, including Wellington County (1999), Brant County (2002), Haldimand County (2012) and Dufferin County (2017). Each program is funded by the municipality and guided by local farm organizations. The RWQP offers grants ranging from 50 per cent to 100 per cent of the cost of selected BMPs, for projects such as: stream fencing,

tree planting, manure storage, well decommissioning and more. The GRCA contributes administration and delivery costs as part of levy supported service to the municipalities. The GRCA also delivers the Oxford County Clean Water Program, which is administered by the Upper Thames Region Conservation Authority, and a Well Decommission program on behalf of the City of Hamilton.

Since the RWQP was launched in 1998, there have been over \$18 million in grants provided to more than 6,400 projects across the watershed. Together, landowners and funding partners have invested over \$51 million in water quality projects.

This June, the Wellington RWQP celebrated its 20th anniversary with a bus tour. Since 1999, the Wellington RWQP has provided \$9.1 million in grants to support the completion of 2,974 projects including:

- 897,000 trees planted on 1,400 acres, including 202 km of windbreaks and 67 km of stream buffer
- 468 water wells decommissioned to protect groundwater
- 111 fencing projects restricting nearly 5,000 livestock from watercourses, creating

buffers and stabilizing banks along 48 km of watercourse

- 131 cover crop projects protected 6,459 acres of farmland from erosion over winter
- 202 nutrient management plans help guide efficient nutrient applications on about 41,507 acres
- 186 manure storage facilities were built to avoid winter spreading and efficiently manage nutrients

Having a long standing grant program with on the ground staff has allowed the GRCA to build trust in the farm community, and has provided the opportunity to see farms evolve over time. Recently, Jenn Deter, a GRCA Conservation Specialist, was contacted by the son of a Wellington County farmer with whom she worked on a stream fencing and buffer project in 2000. While back on the farm this summer to discuss other potential projects, she was able to see the fencing project 19 years later. "The son was amazed to see the 'before' photos," said Jenn. "The environmental benefit was obvious – getting the cattle out and planting trees to shade the water and create habitat – all because his father chose a better management practice 19 years ago."

The vision of the GRCA is a healthy watershed where we live, work, play and prosper in balance with the natural environment. Municipalities and farmers working together with the Rural Water Quality Program are helping us to achieve this vision. The RWQP plays a key role in supporting farmers' adoption of practices to reduce non-point sources of sediment and phosphorus entering the Grand River and Lake Erie.

To learn more about the Rural Water Quality Program and read the stories of real farmers who have implemented various RWQP projects on their land, please visit www.grandriver.ca/ruralwater.

If you are interested in discussing a project on your property, please contact GRCA staff at 519-621-2761 or email ruralwater@grandriver.ca.

Joe Farwell paddles away from the Grand River Conservation Authority

This article appears courtesy of the Cambridge Times (www.cambridgetimes.ca), written by Ray Martin.

Thirty-two years after he started helping local farmers improve erosion control and enhance the quality of water running off their farms and into the waterways of the Grand River watershed, Joe Farwell is about to retire as the chief administrative officer of the Grand River Conservation Authority.

Growing up in a rural community in southwestern Ontario, Farwell gained an appreciation for the environment. He has developed deep-seated love for the Grand River watershed and enjoys canoeing its waterways and cycling its trails whenever he can.

“The river has changed a lot over the years and people’s appreciation of the river has changed a lot, too. I remember when I started here you could paddle down the river from the Foot Bridge, south of Cambridge, to Paris and you’d have the whole river almost to yourself. I was out on the river on Canada Day and the number of people out in those little rafts was amazing,” he said.

Farwell sees the influx of people looking to hike, bike, canoe and enjoy nature on the Grand as one of the many challenges facing the conservation authority.

“We have to strike a balance between people and protecting the environment,” he said.

Farwell believes he is leaving the organization in good shape.

“One of the things I’m really proud of is we have a really cohesive staff team here that is really committed and I’d like to think I contributed to that,” he said. “I’m also really proud of our new strategic plan.”

The new strategic plan sets in place four



Joe Farwell, Grand River Conservation Authority Chief Administrative Officer from November 2010 to July 2019. Photo courtesy of the Cambridge Times.

pillars to guide authority plans and policies into the future. Those pillars include: The protection of life and minimizing damage from flooding and erosion; improving the health of the watershed; connecting people with the environment; and managing its properties in a sustainable way.

“One of things I’ve noticed is that as the urban areas grow, people want to spend more and more of their time outdoors, which means we now have to come up with management plans for how to have people interact with nature on those little chunks of property we have in and around cities.”

That includes building plans for non-revenue generating properties like Sudden Track, Bannister, Wrigley and FWR Dickson wilderness areas in North Dumfries, and the Dumfries Conservation Area in the middle of Cambridge.

The retiring chief administrative officer (CAO) is quite proud of the improvements the authority has been able to make to improve water quality across the watershed. It has established the highly successful rural water quality program, which provides funding and expertise to farmers to curb erosion and chemical run-off into streams. It also works with partner municipalities to find ways to optimize wastewater treatment

and enhance water quality.

With recent upgrades to the Doon wastewater treatment plant, Farwell said, “The river actually seems better. It looks clearer. It smells better. That was a big improvement. And the Speed River is spectacular compared with how it used to be.”

Farwell is also pleased with the focus that has been brought to the conservation authority’s core programs, while getting away from activities like renting properties, which have been a distraction and a drain on resources. The authority is in a good place financially and is better prepared to meet future challenges as a result.

The authority recently named its next CAO, Samantha Lawson. She joined the conservation authority in 2005 as a resource planner and has gone on to become the authority’s property manager. Lawson will take on her new role July 15, but Farwell plans to work with her on the transition over the rest of the summer.

“I know it’s a big change,” he said. “It’s one thing to manage a program or one area, it’s another thing to be responsible for the entire operation. It’s quite a weight to carry.”

This fall, Farwell will leave the conservation

authority, but at this point he has no real plans other than to paddle the Grand and cycle its trails.

“You think about it from the time you start Grade 1 until the time you retire. You have someone plan what you are doing every single day. Now we have some things to figure out,” he said.

Helen Jowett, chair of the conservation authority, lauded Farwell’s work.

“Joe Farwell has been a consummate professional and I believe with his strong and steady leadership he embedded a corporate culture inclusive of autonomy, respect and humility,” she said. “My time chairing the conservation authority has been truly enhanced because of his leadership and he will truly be missed.”

Restoring the Grand River Watershed

This article appears courtesy of the Jane Goodall Institute of Canada (www.janegoodall.ca), written by Hanna Smit.

In early April, some 40 eager students in grades 5 and 8 were taken on a tour of the Laurel Creek Nature Centre in Waterloo. The nature centre falls within southern Ontario’s ecologically fragile Carolinian zone and is part of the Grand River watershed. (It’s one of six nature centres operated by the Grand River Conservation Authority).

Working together, staff with the Grand River Conservation Authority and the Jane Goodall Institute (JGI) of Canada showed the budding young naturalists the diverse plants and animals that depend on the watershed as well as the non-native species that are encroaching on the area.

The youth were part of the Friends of the Watershed initiative, a Roots & Shoots project generously funded by Toyota Motor Manufacturing Canada (TMMC), which supports habitat restoration in an area

heavily affected by urban development, agriculture and climate change.

Later in June, the students of St. John Catholic Elementary got down to work. Joined by a team from TMMC, everyone pitched in to plant trees, replenish the soil and wildflowers in the pollinator garden, and remove invasive buckthorn plants. The results of their efforts contribute to a healthy habitat that also serves as a protective buffer from nearby residential developments.

By putting classroom learning into practice, students were able to see for themselves that they could each contribute to the conservation and ecological health of an important habitat. As one teacher said, “The ability to connect with nature and to see first-hand the impact of human activity and the impact of invasive species on other plants and animals was very powerful.”



Derek Kidnie, general manager at the nearby Toyota Motor Manufacturing Canada (TMMC) facility, digs in. TMMC generously supported the Friends of the Watershed project and employees joined forces to help rehabilitate an important eco-region. Photo courtesy of JGI Canada.

Making a difference

The support of volunteers helps the GRCA complete important projects.

Interested in volunteering?

Volunteers in the Grand River watershed have taken part in a wide variety of projects, including:

- Habitat restoration (tree planting, meadow restoration, etc.)
- Invasive species removal
- Trail maintenance
- Tree TLC

For current volunteer opportunities, check www.grandriver.ca/volunteer.



Alex and Mark, two grade 5 students from St. John Catholic Elementary School, plant cedar trees to help reforest key areas in the Laurel Creek Nature Centre. Photo courtesy of JGI Canada.

Order trees from the GRCA for spring 2020

As summer begins to fade to fall, it's time for rural landowners to start thinking about ordering trees from the Grand River Conservation Authority for planting next spring.

Private landowners in the watershed own nearly 80 percent of the land and can make an immense contribution toward tree cover.

Landowners in the Grand River watershed who have at least one hectare (2.5 acres) of land are eligible to order trees to plant

themselves. Online tree orders can be placed between October 1, 2019 and March 31, 2020. Orders can also be placed by mail. Early ordering is advised to ensure the best selection of trees.

All tree orders can be picked up during the spring of 2020. A minimum order of 200 seedlings or 20 tall stock trees (this includes saplings, whips and potted trees) is required.

Landowners with at least two hectares (5 acres) of property may also be interested in

having a GRCA forestry specialist come to their property to put together a planting plan, arrange for the planting of their trees, and help access funding programs to offset the cost of tree planting projects (if applicable).

A minimum quantity of 1,000 seedlings or 50 tall stock is required for GRCA staff support with planting. There is no cost for this service, but demand is high. Interested landowners will be put on a waiting list to be contacted at a later date by one of the GRCA's forestry specialists. Please email trees@grandriver.ca or call 519-621-2761 and ask to speak to a forestry specialist.

For more information, to order trees and to view the tree availability list, go to the forestry section of the GRCA website at www.grandriver.ca/Trees.

Fall in love with GRCA conservation areas

Dean McFadden, Superintendent, Conestogo Lake Conservation Area

With students back in school and families settling back into their routines, the fall season at GRCA conservation areas brings with it a renewed sense of calm. Wildlife can often be seen exploring areas of our parks as they begin to prepare for winter. Summer campers are long gone, and the conservation areas take on a much different look after an exciting summer of exploration for many sun-seeking guests.

With the weather often remaining warm and dry well into October, early fall is the perfect time to enjoy camping at one of the GRCA's conservation areas. With 2,200 campsites in eight Grand River Parks, it's easy to find the perfect spot for a camping adventure. The stunning fall colours and crisp, fresh air at night only enhance the warmth and glow of the campfire.

With a greater availability of campsites, many gather for large Thanksgiving celebrations - enjoying a meal and time outdoors with family and friends, creating



These trees were planted by a private landowner in 2001. Trees and forests protect water quality in our rivers and streams, provide habitat for birds and animals and they add to the health of our communities.



After the busy summer season, GRCA conservation areas take on a different look and feel. The fall season brings with it a renewed sense of calm as well as beautiful fall colours. It is an ideal time to explore Grand River Parks.

cherished memories and new traditions.

Fall is also an ideal time for day trips and activities like hiking the trails, picnicking and bird watching in our conservation areas.

For large groups and special events, a number of our parks offer a range of facilities including: large pavilions, shelters as well as enclosed facilities, vast picnic areas and group camping sites. To book an event or group site, visitors should contact the parks directly. More information is available on our Group Facilities page at www.grandriver.ca.

All of our parks are open until October 15, and offer breathtaking beauty and many opportunities to connect outdoors. Some remain open all year long. So go ahead, unplug, and connect with nature ... next door. Please visit www.grandriver.ca/parks to learn more.

An outdoor exploration program for wee ones

Wild Wee Ones is a successful GRCA program that brings nature-based education to preschool kids.

The classroom is the earth, the trees, the creek and fields. The group meets outside and stays outside.

Each class is greeted with a welcome of each other and gratitude for the day. Through playing games and discovering together, the young explorers are challenged to go beyond the familiar. They learn to focus their attention, to ask why, to work together and to develop inquisitive

confidence.

"We provide a nurturing learning environment for you and your young explorers. Our program leaders will guide the children in both nature-based play and discovery. During the powerful stages of early childhood, the sense of exploration is uninhibited, and playing is the core method for learning," said Tracey Ryan, Manager of Environmental Education and Restoration at the GRCA.

Multiple research studies have proven that connecting with nature is beneficial to people of all ages in many ways, but especially in very young children. Not only does it improve their mental and physical health, but it can be the start to a life-long understanding that will help them grow into stewards of the land that we so desperately need. As the saying goes, we protect what we care about.

This program is ideal for parents or guardians who are looking for ways to connect their children with nature and the outdoors at an early age. The program is offered several times throughout the year.

Register and learn more online at www.grandriver.eventbrite.ca.



Our program leaders guide preschoolers in both nature-based play and nature discovery.

THE GRAND CALENDAR

Discovery Day at Pinehurst Lake

September 8

Discover one of our most beautiful parks at this annual open house event. There are lots of fun activities for everyone: get up close and personal with our critters, take in a birds of prey show, plant wildflowers, learn to Geocache, bring home some nature crafts and more. Adventurous visitors won't want to miss the free canoe rentals, fire truck and police cruiser, or catching a fish. Park admission and events are free! (with the exception of face painting). For more information visit www.grandriver/events.

Growing green: Seed collecting at Shade's Mills

October 12

When flowers fade, plants may appear as skeletons of their former selves, but their seeds are very much alive. Help us enhance the biodiversity of our pollinator garden by collecting, sowing and saving seeds from native wildflowers. Everyone will get the opportunity to take some seeds home for their gardens. Learn more at www.grandriver/events.



Two young helpers collect wildflower seed.

Evening campfire and hike at Laurel Creek

September 14

Come settle in by the fire and roast marshmallows, tell stories and stay warm. Then venture out for a night hike to explore the evening wildlife such as bats, owls and moths. Dress warmly! For more details, visit www.grandriver/events.

Other guided nature events at Grand River Parks

The GRCA offers a wide range of quality programs suitable for people of all ages throughout the year. They have an environmental, outdoor focus and are led by GRCA nature guides. Some programs are free, and some are offered at a fee. There's bound to be something for your family to do at one of our Grand River Parks. Please check out our event calendar at www.grandriver/events where you can search for all upcoming events. You can also subscribe to receive GRCA events by email at www.grandriver.ca/subscribe.

Nature Centre PD Day camps

Camps at our nature centres are all about being outdoors, discovering nature, making new friends and creating memories that will last a lifetime. During our PD Day Nature Adventure Camps, your child will experience fun hands on seasonal activities and games that aim to inspire and educate. To learn more visit www.grandriver.ca/daycamps.

About Grand Actions:

This newsletter is produced several times a year by the Grand River Conservation Authority.

Submissions:

Submissions may be edited. We do our best to publish items; however, we are not able to guarantee publication.

More information:

Current and back issues as well as subscription information is available online at www.grandriver.ca/GrandActions.

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