2017 IWMP ANNUAL REPORT

Credit Valley Conservation Integrated Watershed Monitoring Program (IWMP)

A summary of climate, groundwater, stream, forest and wetland conditions in the Credit River Watershed.

Credit Valley Conservation
inspired by nature

The Credit River Watershed

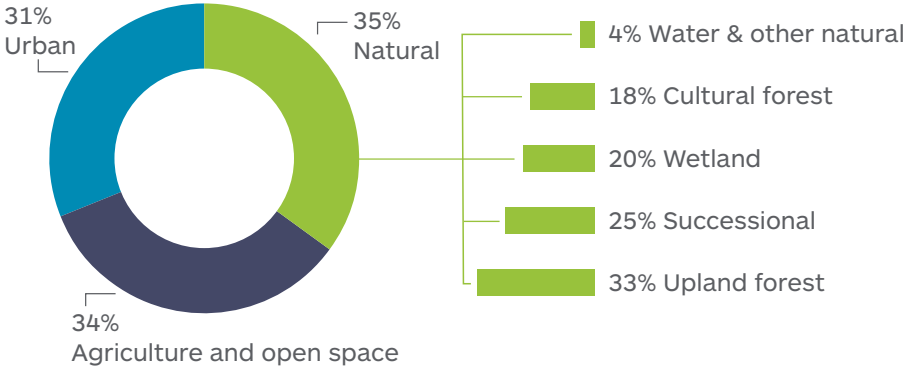
The Credit River Watershed is located in the heart of the Greater Golden Horseshoe. It covers 950 square kilometres and is the most rapidly urbanizing region in Ontario. From its headwaters in Orangeville, the Credit River flows southeast for nearly 100 km to Lake Ontario. It features a rich variety of habitats and species that contribute to regional biodiversity.

Ecosystems in southern Ontario and the Credit River Watershed face a variety of local, regional and global pressures, including:

- Urbanization
- Habitat loss and fragmentation
- Introduced pests, pathogens and non-native species
- Water and air pollution
- Climate change

The combined effects of these pressures on ecosystem health are complex and take time to become apparent in our results.

Land Use and Land Cover in the Credit River Watershed



What's in this report?

This is a high-level overview of our Integrated Watershed Monitoring Program (IWMP) for 2017. The report includes observed conditions and issues of concern throughout the watershed.

Note: In accordance with the monitoring plan, only a select number of IWMP sites were sampled in 2017. Results should be interpreted accordingly.

Please contact CVC at **905-670-1615** to request detailed results.

Monitoring in the Credit River Watershed

We started IWMP in 1999 to better understand ecosystem health and identify changing conditions. Findings support strategies and management decisions by CVC and our partners to protect and improve water quantity and quality, biodiversity and productivity in the Credit River Watershed.

We monitor climate conditions as well as living and non-living attributes in groundwater, streams, forests and wetlands.

We evaluate:

Climate for air temperature and precipitation (rain and snow), which describe daily weather, seasonal extremes and general conditions.

Groundwater for water chemistry and levels.

Streams for water chemistry, water temperature, water quantity, stream stability, fish and aquatic invertebrates (insects and other small organisms that live in a stream).

Forests for soil condition, plants, tree health, dead wood, birds and salamanders.

Wetlands for plants, frogs, tree health and dead wood.

In 2017, we collected data from 143 monitoring sites across the watershed.

14 groundwater | **82 stream** | **30 forest** | **17 wetland**

Ecosystems that we monitor provide many life-supporting benefits.

- **Groundwater** provides clean and abundant drinking water, and maintains surface water supply for multiple uses such as irrigation.
- **Streams** move water and nutrients through the environment, and provide waste treatment and recreational opportunities.
- **Forests** provide air purification, climate regulation and wildlife habitat.
- **Wetlands** provide water purification, flood protection and erosion control.

Climate Conditions

The average pattern of weather for a region, including seasonal extremes.

In 2017, air temperatures were warmer than average, particularly during winter.

Precipitation varied across the watershed and spring was especially wet. The upper watershed saw a record amount of rainfall during the summer – more than double the usual amount compared to previous years.

In Orangeville, heavy summer storms caused flash floods, damaging basements and backyards, and prompting local road closures. An intense and isolated storm in the upper watershed on August 1 saw 78 mm of rain fall in a single hour. The middle and lower watershed experienced between 6 and 13 mm of rain during that same storm.

Did you know?

2017 was the wettest year in the upper watershed since climate records began 57 years ago.

Flooded road in Orangeville during the 2017 summer storms.

Groundwater Conditions

The levels and chemistry of water located below the earth's surface.

Heavy rainfall during spring and summer led to above average groundwater levels at more than half of the wells monitored from May through August. Groundwater levels reached average to below average conditions in fall.

Groundwater chemistry was similar to previous years, with most wells meeting the majority of Ontario drinking water standards. Wells that exceeded Ontario drinking water standards (i.e. had poor rankings) included the following:

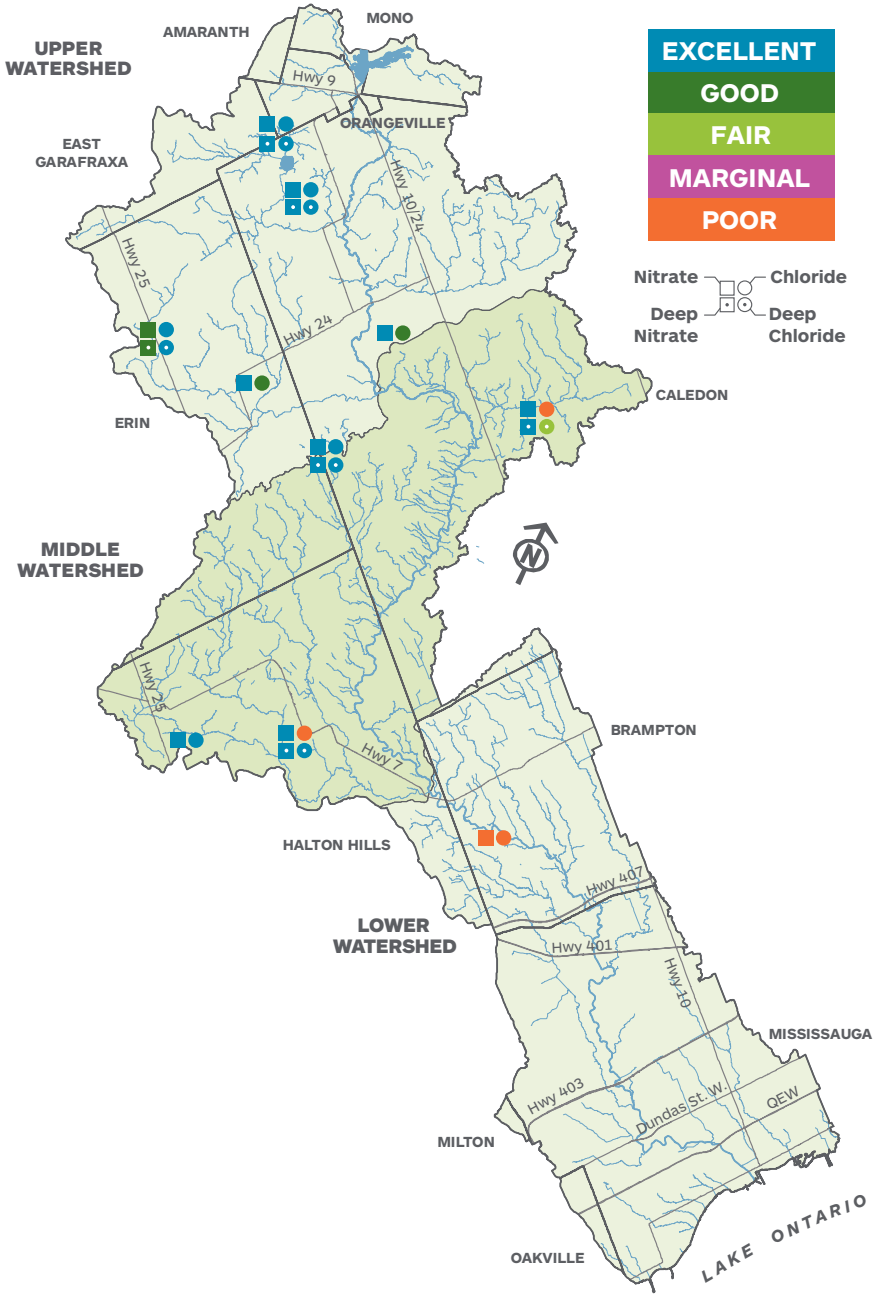
- One shallow well in the lower watershed had elevated levels of nitrate and nitrite. This well is influenced by surrounding agriculture. The same well ranked poor for chloride, likely due to road salt on nearby roads. Chloride concentrations at this well were higher than in previous years.
- Two shallow wells in the middle watershed had elevated levels of chloride. This may have resulted from road salt or septic system effluent.

Did you know?

Of all the freshwater on earth, much more is stored in the ground than in lakes and rivers – about 100 times as much.

Winter road salt contributes to high chloride levels in groundwater and surface water.

Groundwater Conditions



Stream Conditions:
Water Quantity

The amount of water flowing in a stream.

Stream volume is an integral part of the hydrologic cycle and is important to ecosystem health. Flood events are particularly interesting from a monitoring perspective, because they disrupt normal flow patterns.

In 2017, seven of the eight Water Survey of Canada water quantity gauges recorded at least one flood event. While flood events often occur following early spring snowmelt, those in 2017 came in May, June and July following major storms. The summer storms in Orangeville caused the Credit River in the upper watershed to rise by as much as 66 cm in a single hour.

Flooding and high flow conditions are natural. In fact, periodic flooding is necessary for a healthy ecosystem, providing many important functions such as:

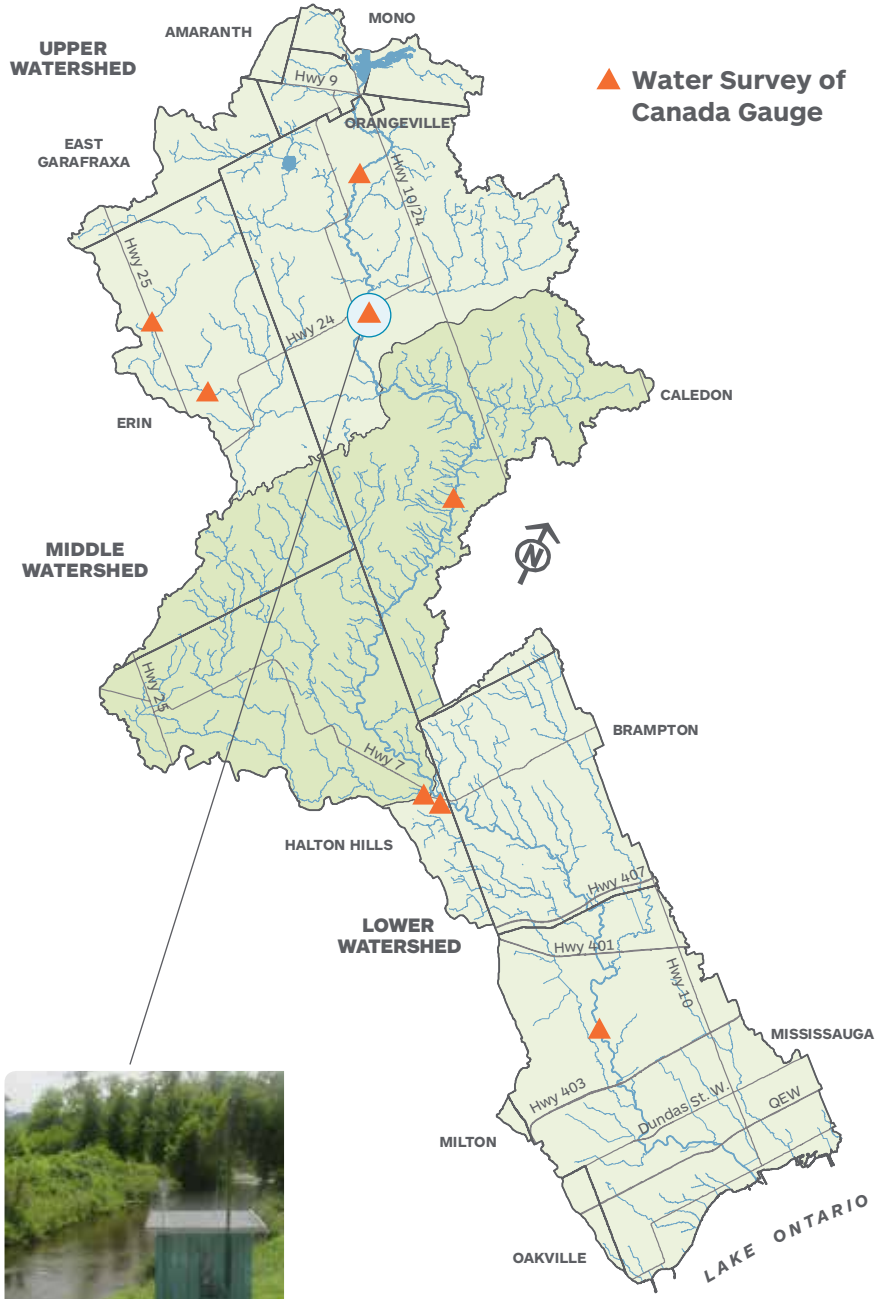
- Replenishing groundwater supplies, ensuring a source of water to streams during times of drought.
- Depositing minerals and nutrients in floodplains and wetlands, making soils more fertile for plants.
- Moving leaf and plant material into the stream, providing food and habitat for aquatic wildlife.

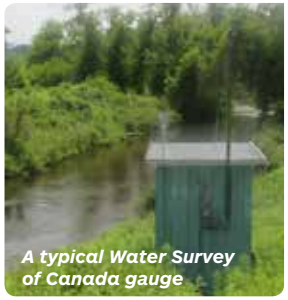
Did you know?

During spring 2017, Lake Ontario water levels reached an all-time high in the nearly 100-year record. This caused flooding of shoreline trails and parks, and raised water levels in the lower Credit River.

Record high water levels in Lake Ontario.

Stream Water Quantity





A typical Water Survey of Canada gauge

Stream Conditions:
Water Temperature

The temperature of water in a stream.

Fish species have different tolerances to water temperature. Some fish, like Smallmouth Bass, are classified as warmwater species and prefer temperatures around 30°C. Others, like Brook Trout, are classified as coldwater species and prefer temperatures around 16°C. When water temperatures exceed their preference fish become stressed, affecting their ability to feed, grow and reproduce.

Water temperatures were compared with two targets: overall summer maximum and average daily summer maximum.

The majority (73 per cent) of monitored stream sites met both target temperatures for healthy fish communities. Sites that failed to meet one of the two stream temperature targets were mainly in coldwater fish community streams in the middle and upper watershed. The single site that did not meet both target temperatures was in the headwaters of the Credit River, downstream of the Island Lake Conservation Area dam. Moving downstream from this site, water temperatures gradually dropped as usual because here, cold groundwater and cold headwater streams feed into the river.

Did you know?

Warm water holds less dissolved oxygen than cold water. Many species of fish such as Brook Trout need both cold water and high dissolved oxygen to survive.

Brook Trout are an indicator of cold water.

Stream Water Temperature

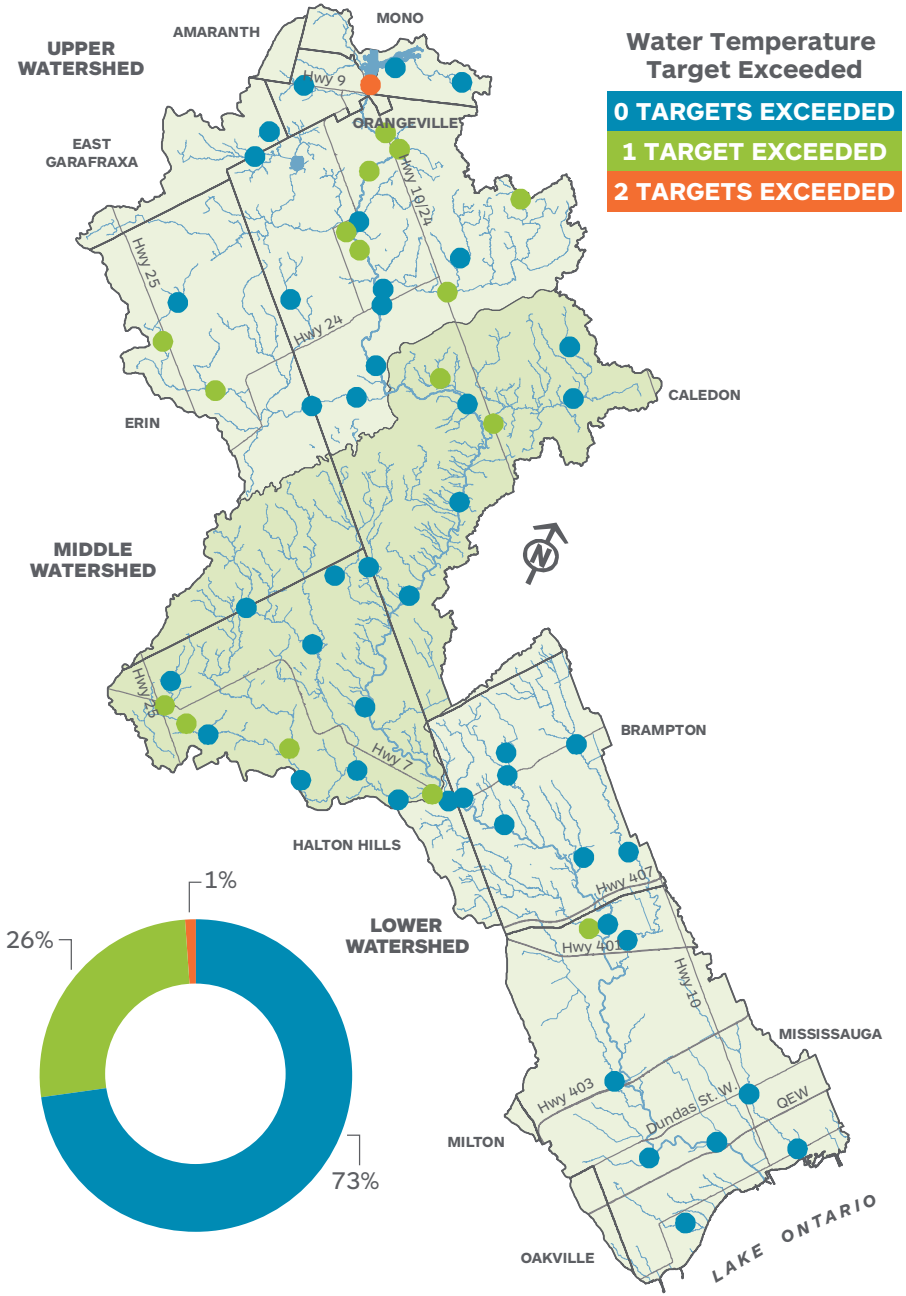


Chart reflects results across the watershed

Stream Conditions:
Water Chemistry

The physical, chemical and biological composition in a stream.

Surface water chemistry conditions ranged from excellent to poor, with 58 per cent of sites ranking excellent to fair. Urbanization, including discharge from wastewater treatment plants and stormwater runoff, impacts water quality. Urban sites generally have higher concentrations of chlorides, nutrients and metals such as aluminum and zinc. Of all the parameters for which we analyze, chloride, phosphorous and aluminum most often had elevated concentrations in these urbanized areas.

Tributaries in the lower watershed are negatively impacted by urbanization. More than three-quarters of these sites ranked marginal or poor for overall water chemistry. These tributaries drain areas with a high density of hardened surfaces (roads, parking lots and rooftops) and older stormwater infrastructure. Most pollutants in these areas drain directly to a stream rather than being absorbed into the ground.

Of the sites that ranked good to excellent, about three-quarters were on rural tributaries in the middle and upper watershed. Main Credit River sites ranged from good to poor.

Did you know?

Chlorides are on the rise in streams throughout Ontario, including within the Credit River Watershed. Road salt is the biggest contributor. Other sources include water softeners, fertilizers and dust suppressants on gravel roads.

Urbanization affects water quality.

Stream Water Chemistry

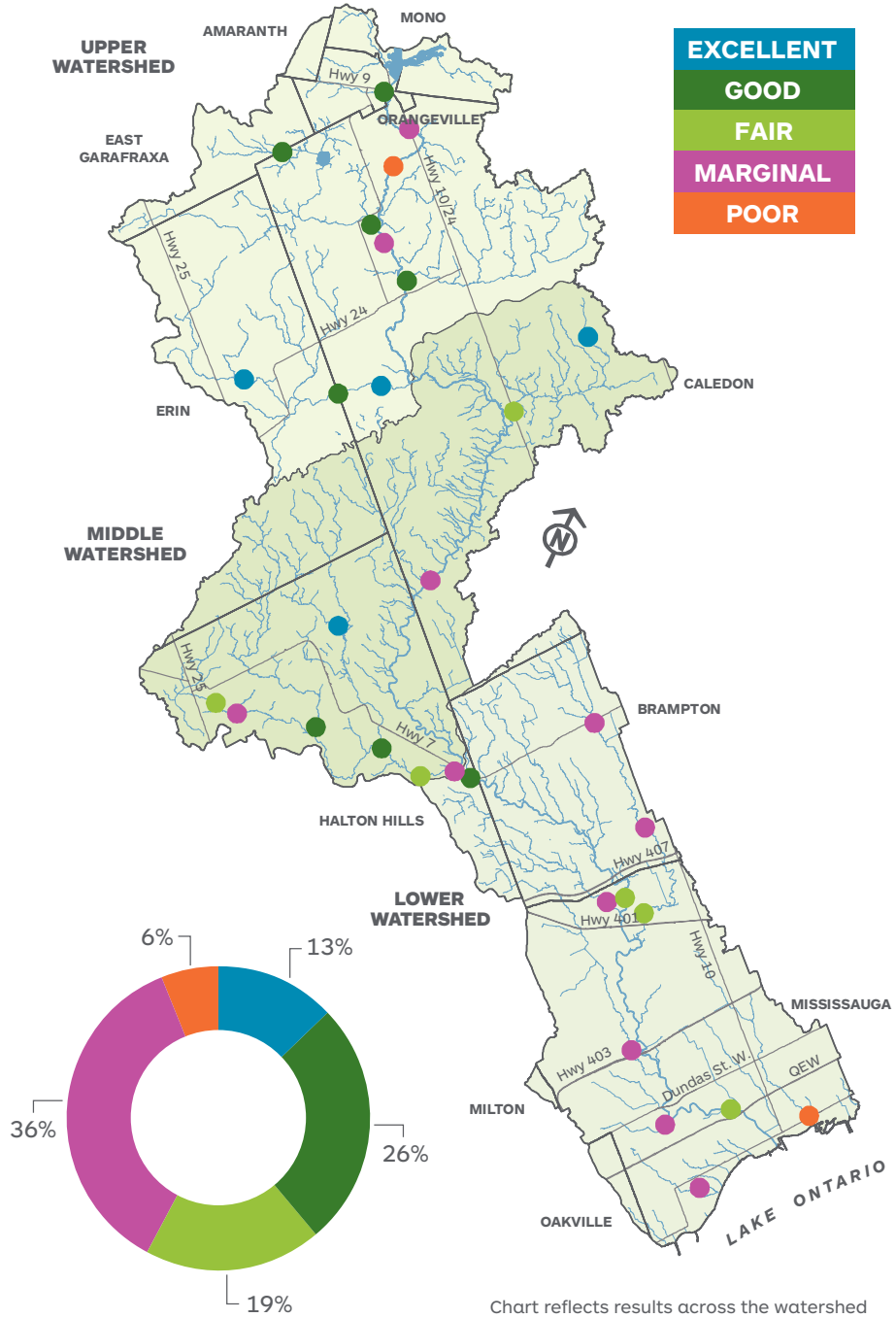


Chart reflects results across the watershed

Stream Conditions:
Stream Stability

Stream form (shape and path through the landscape) and function (movement of water and sediment downstream).

In 2017, most of the 29 sites monitored for stream stability were stable or moderately stable. Sites in the lower watershed were mainly moderately stable to unstable.

All streams, including stable ones, are naturally dynamic and constantly changing. An unstable stream, however, changes rapidly, often leading to significant erosion or sediment deposits which in turn can impact water quality.

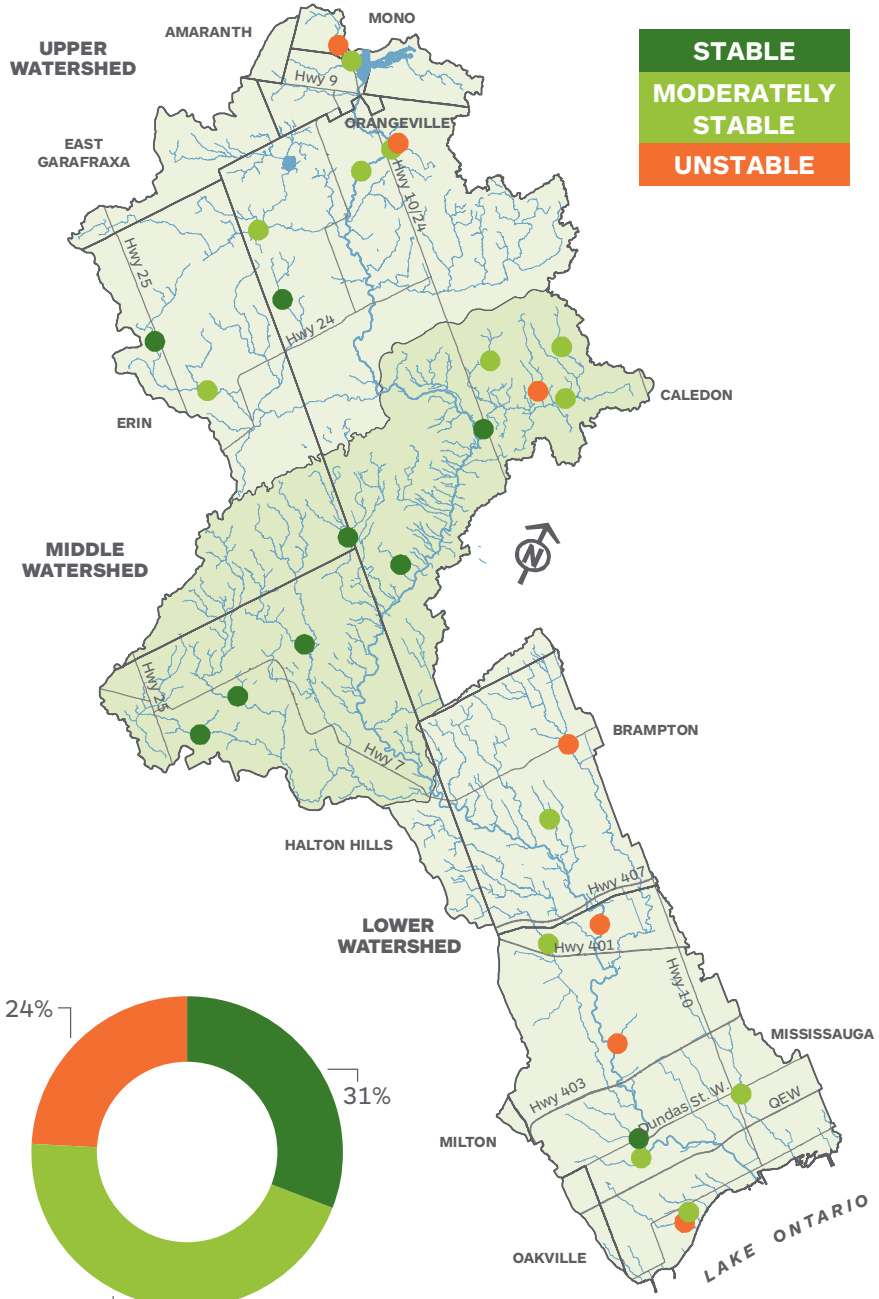
Floodplains serve an important role in minimizing erosion during high flows. When water spills out of a stream channel and into a floodplain, streamflows slow down. This reduces the force on a streambank and streambed, and reduces the potential for erosion.

Did you know?

A floodplain is the relatively flat area of land surrounding a stream that gets inundated with water during a flood. Floodplains are an important part of a stream ecosystem, providing space for natural flood control, allowing interaction between groundwater and surface water, and providing habitat for plants and animals.

Floodplains serve important functions in a healthy stream ecosystem.

Stream Stability



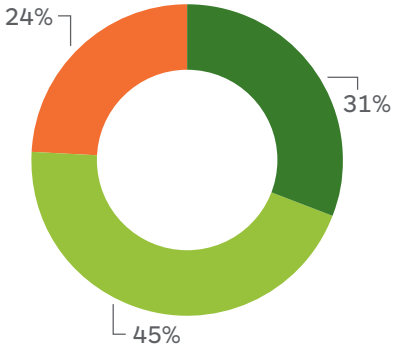


Chart reflects results across the watershed

Stream Conditions:
Fish

The fish community living in a stream.

We observed 37 fish species in 2017. The most downstream site in the main Credit River (at the Mississaugua Golf & Country Club) could not be safely monitored for fish in 2017 because of high water levels in the lower Credit River, caused by record high levels in Lake Ontario. By not sampling this site in 2017, the total number of fish species observed in the watershed was lower than usual. The lower Credit River is home to a number of lake species such as Rosyface Shiner that are unique to this part of the watershed.

More than half of the sites scored poor, while 24 per cent of sites scored fair and the remaining sites were equally split between excellent and good. Excellent scoring sites were found in the middle and upper watershed. These were generally in coldwater streams with healthy trout populations.

Did you know?

Some species of fish take advantage of spring flooding to lay eggs. Following spring snowmelt, when waters rise and spill into the floodplain, Northern Pike lay their eggs in areas of the floodplain that normally dry up in summer.

Juvenile Northern Pike.

Fish Community Health

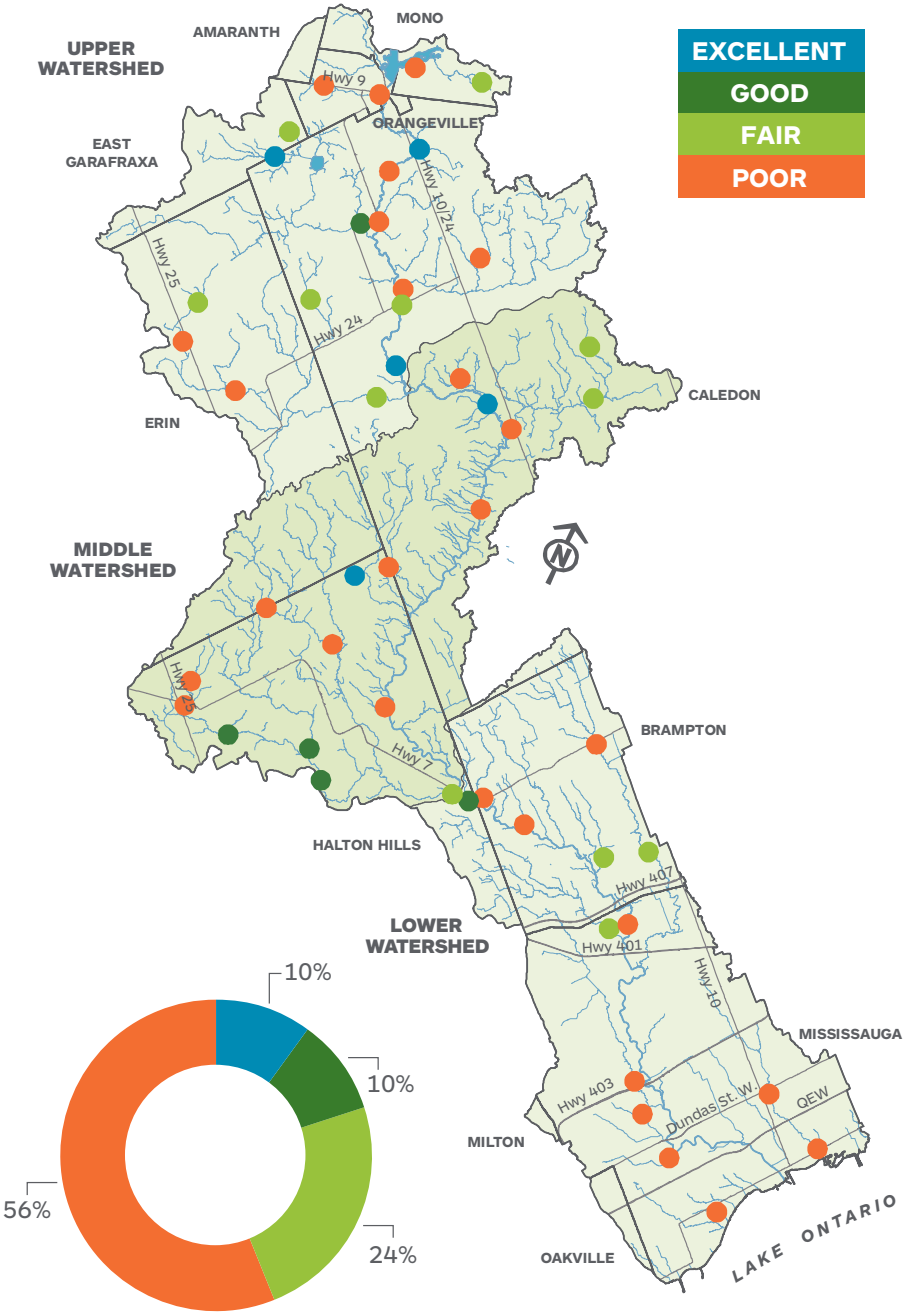


Chart reflects results across the watershed

Stream Conditions:
Aquatic Invertebrates

The insects, worms, snails and other organisms that live in a stream.

In 2017, we observed 76 families of aquatic invertebrates, similar to previous years. The majority of monitoring sites ranked fair or poor. These sites may not have habitat conditions necessary to support sensitive aquatic invertebrates or may be impacted by urban or agricultural runoff.

The five sites that ranked good were on rural tributaries in the middle and upper watershed, where stream temperatures are cool and water quality is generally good.

Although the majority of sites indicate aquatic invertebrate communities in the watershed are negatively impacted, aquatic invertebrates have adapted to changing streamflow conditions. For example, mayflies have flattened bodies that help them swim through fast currents and have strong legs and claws to cling to gravel on the stream bottom. Under high enough flow conditions, aquatic invertebrates may drift with the current and settle in a slower-moving section of stream.

Did you know?

Many aquatic invertebrates spend part of their life cycle above water. Mayflies spend most of their life as nymphs in a stream or lake. After months underwater, they transform and emerge as flying insects, living only for a few hours in the air – long enough to mate, lay eggs and complete their circle of life.

The latin name for mayflies (Ephemeroptera) means 'lasting a day' which describes their short adult life span.

Aquatic Invertebrate Community Health

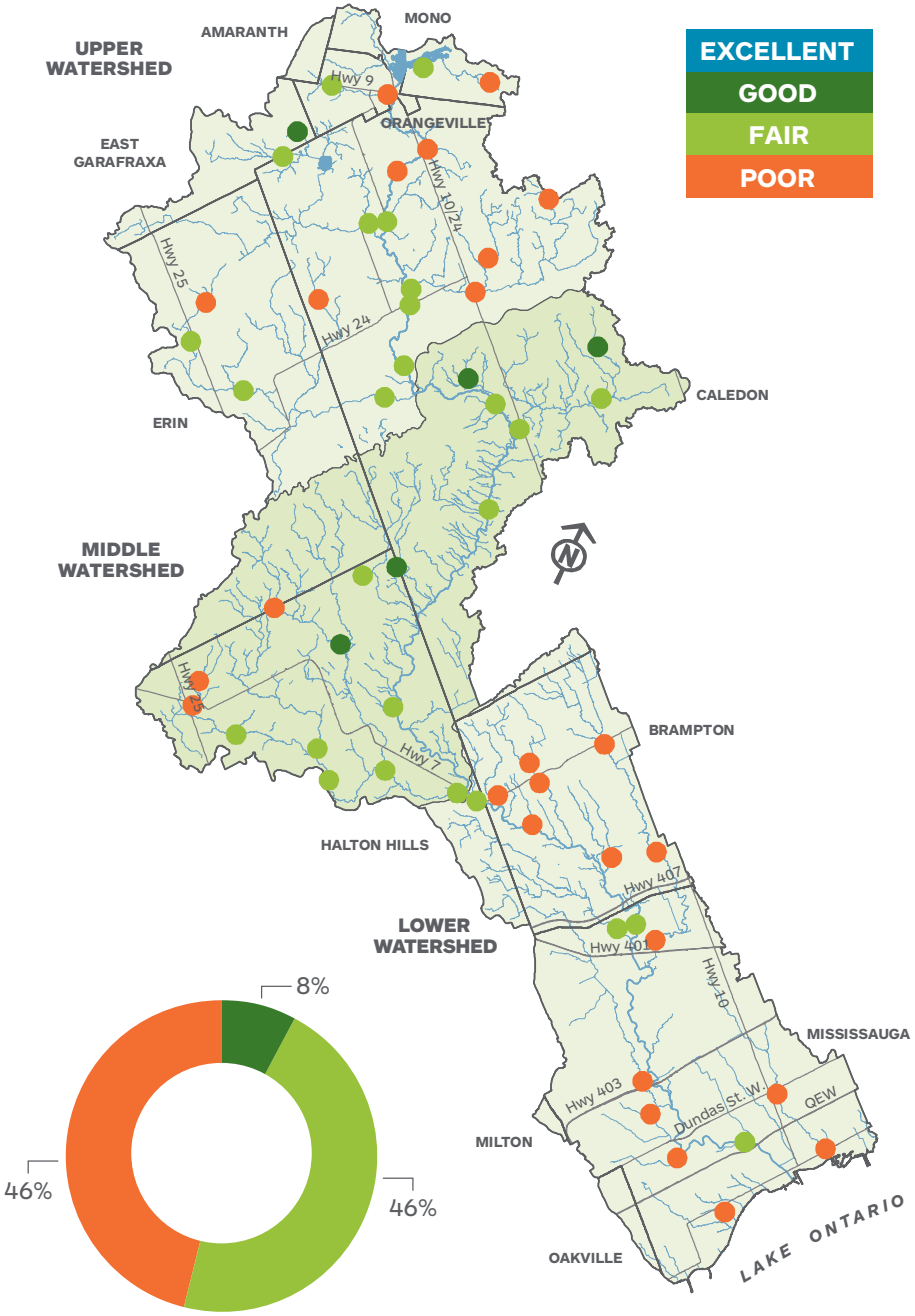


Chart reflects results across the watershed

Forest Conditions:
Tree Health and Dead Wood

The condition of live trees, dead standing trees and dead wood on the forest floor.

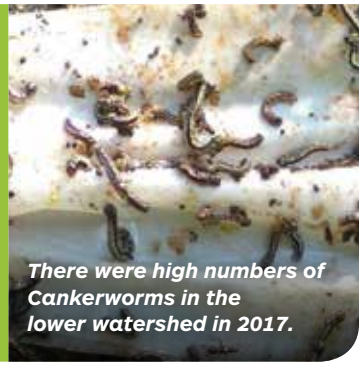
For tree health and dead wood, most sites ranked fair with only three sites ranking poor and one ranking good. Low ranking sites showed signs of tree disease and had low volumes of dead wood.

Tree health may be impacted by various pests, including Fall Cankerworm. In 2017, parts of the lower watershed experienced large infestations of Fall Cankerworm. These native caterpillars feed on hardwood tree leaves and are usually found in higher numbers in urban forests. Cankerworms appear in high numbers periodically, as part of a boom and bust cycle that lasts up to four years.

Healthy trees that experience even three consecutive years of severe leaf loss can quickly grow new leaves, with no long lasting impacts to overall health. However, unhealthy trees that experience longer periods of severe leaf loss can worsen in health and eventually die. Trees in urban areas are more likely to be impacted by severe leaf loss because many are already stressed, and urban environments don't support large populations of birds and beetles that eat cankerworms. We will continue to monitor the potential impacts of the cankerworm, especially in urban forest communities.

Did you know?

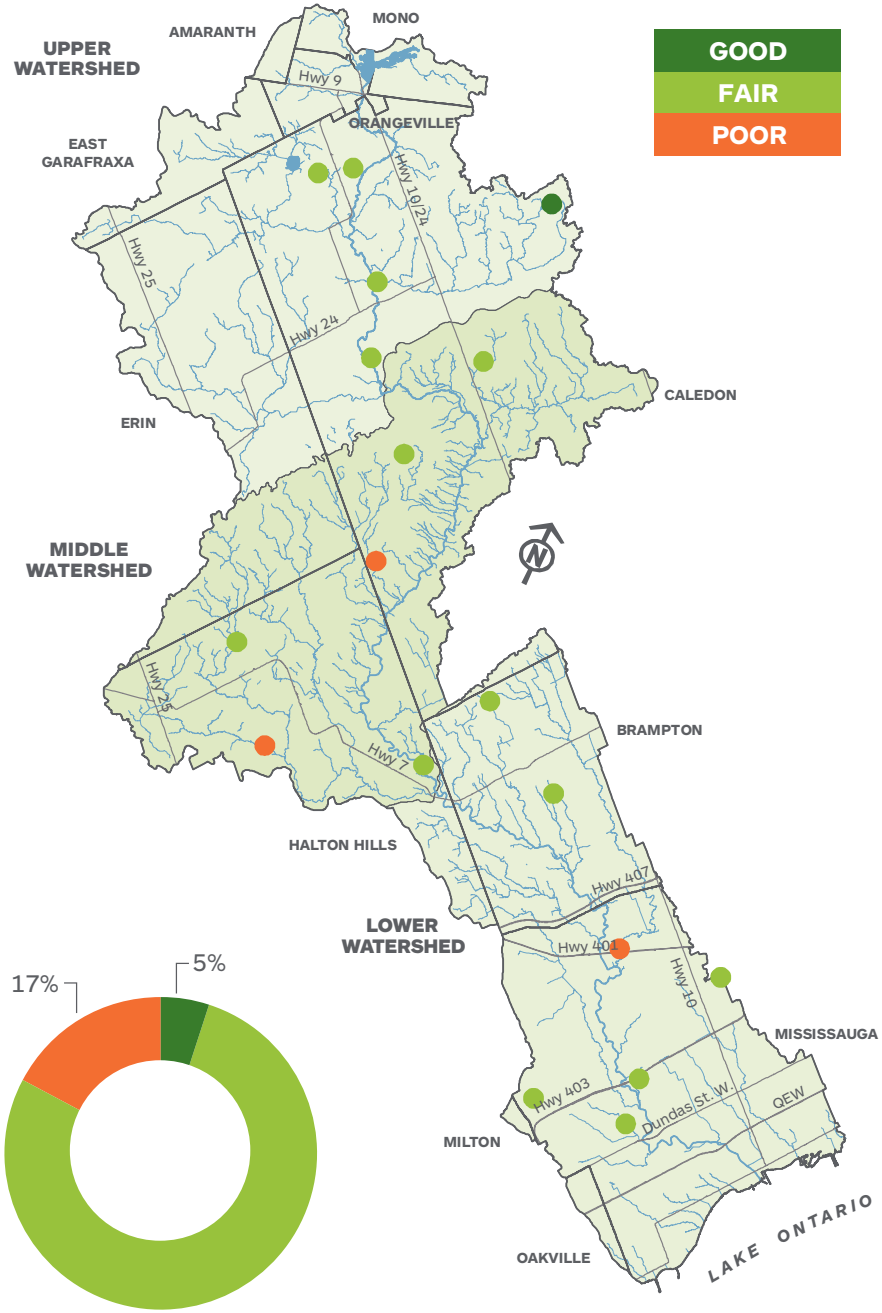
The Fall Cankerworm is an important food source for birds and other insects. You can help combat cankerworm by creating backyard habitats that encourage birds to linger and feed on these potentially troublesome caterpillars.



There were high numbers of Cankerworms in the lower watershed in 2017.

Photo Credit: Karen Ras

Forest Community Tree Health and Dead Wood



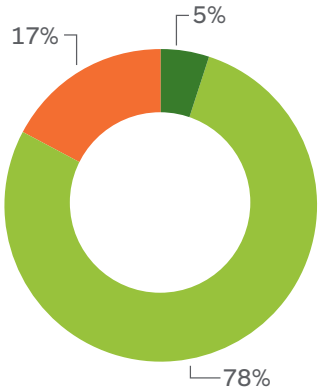


Chart reflects results across the watershed

Forest Conditions:
Plants

The plant community (including ground cover, shrubs and trees) in a forest.

We observed 121 forest plant species in 2017, similar to previous years. Eighty-seven per cent of species were native to Ontario. One species (Canada Waterleaf) is listed as regionally rare. Seven have specific habitat needs, including Maidenhair Fern which is associated with rich deciduous woodlands.

One-third of forest plant communities ranked good, while more than half ranked fair, and the remaining few ranked poor. Forest sites that ranked good were mainly in the upper and middle watershed, while those that ranked poor were found only in the lower watershed.

The forest understory had higher numbers of short tree seedlings on the forest floor than previous years. Tree decay and mortality caused by beech bark disease and Emerald Ash Borer have opened up the canopy in forests throughout the watershed, promoting seedling germination from the forest seed bank. This can potentially encourage spread of invasive species such as Common Buckthorn through our forests. We will continue to monitor the impacts of forest pests and diseases in our watershed.

Did you know?

Seed banks are a reservoir of seeds that have built up in the soil over several years. They help forests regenerate following disturbances. Some seeds are still viable after being buried in the soil for decades.

Hickory tree seedling on the forest floor.

Forest Plant Community Health

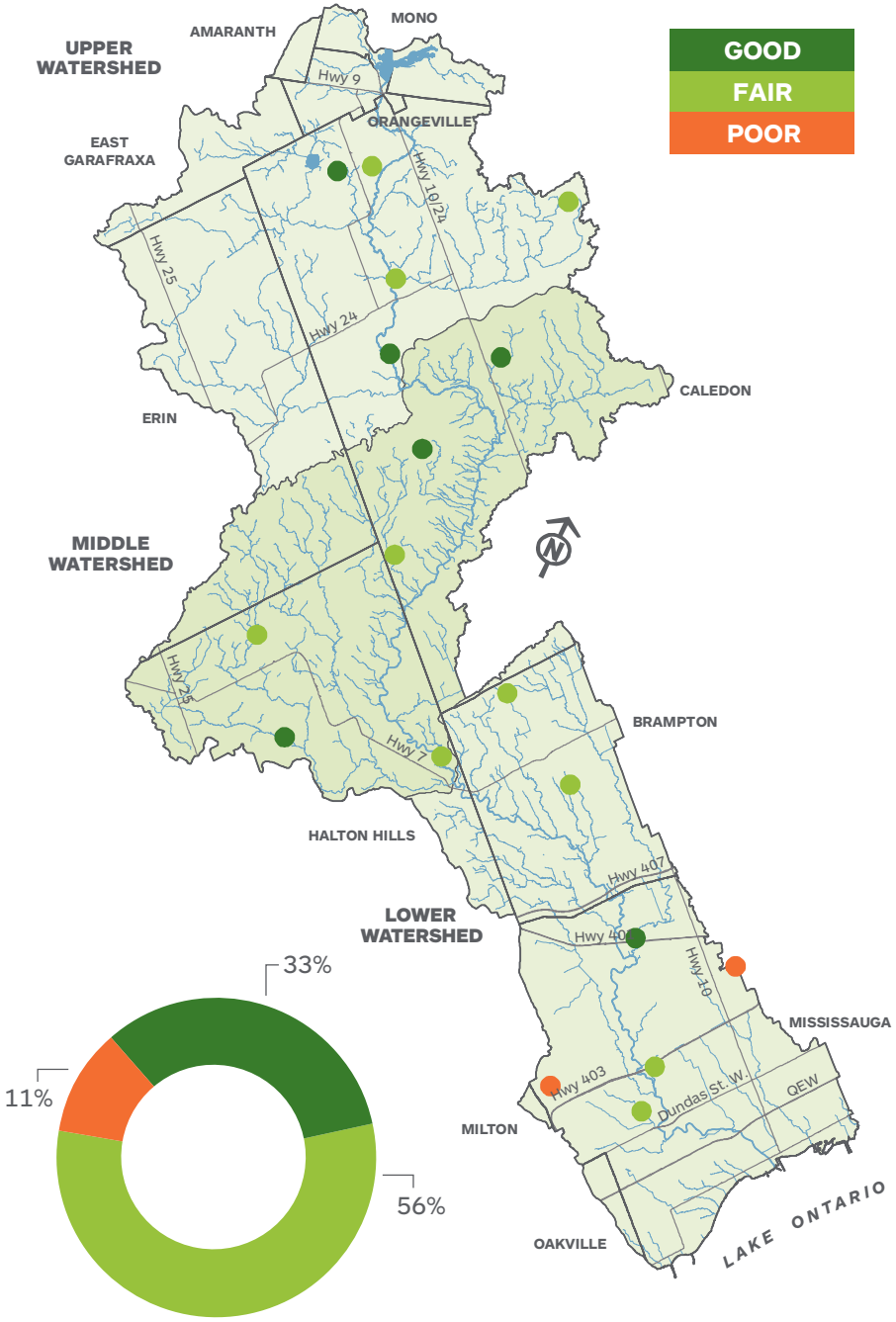


Chart reflects results across the watershed

Forest Conditions:
Birds

The bird community in a forest.

We detected 72 breeding forest bird species in 2017, similar to previous years. Half of forest sites ranked fair for bird community health, while 37 per cent ranked good and the remaining sites ranked poor. All sites that ranked poor for bird community health were in the lower watershed.

In the upper and middle watershed there were high numbers of canopy-nesting species, such as the Red-eyed Vireo, which build their nests high in tree branches. These species typically require mature, undisturbed forested habitats to breed. High numbers of these more sensitive species suggests there are suitable forested areas providing important breeding habitat. Although we haven't yet noticed a decline in canopy-nesting species, continued thinning of the forest canopy from Emerald Ash Borer and beech bark disease could potentially impact their success. A thinner forest canopy could make nestlings more vulnerable to predators.

Many canopy-nesting species are neotropical migrants, a group of birds that travel thousands of kilometres each year from their wintering grounds in Central and South America to breed in Canada. These species face many challenges associated with their long migrations. They depend on healthy forests in our watershed to successfully breed and build up energy for the long journey back to their wintering grounds in the fall.

Did you know?

In 2017, there were 31 species of neotropical migrants breeding in the watershed, including 12 species of warblers and four species of flycatchers. The Red-eyed Vireo migrates to and from its wintering grounds in the Amazon basin each year, an annual distance of over 12,000 kilometres.

The Red-eyed Vireo is a neotropical migrant, flying thousands of kilometres to its wintering grounds each year.

Photo Credit: Adam Gray

Forest Bird Community Health

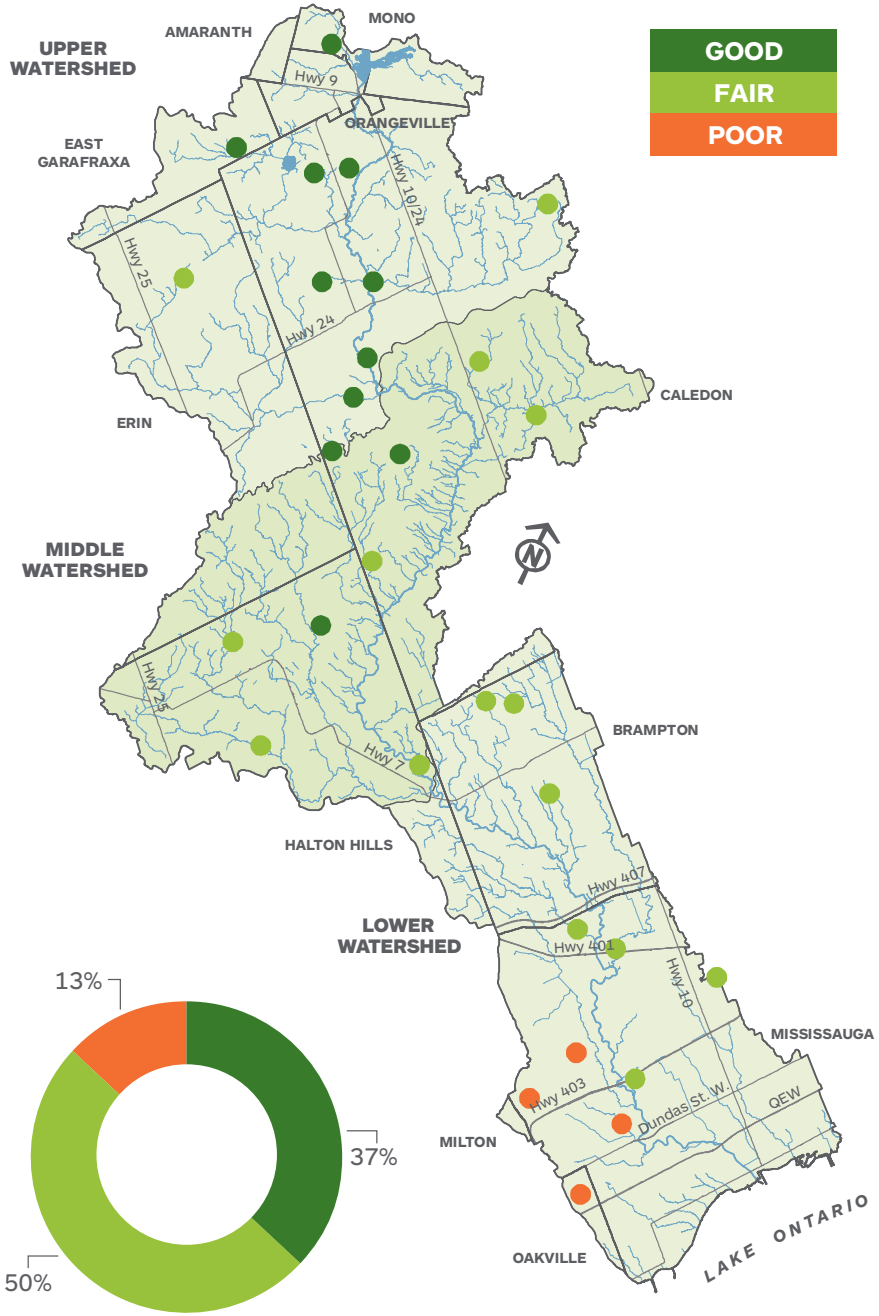


Chart reflects results across the watershed

Wetland Conditions:
Plants

The plant community (including ground cover, shrubs and trees) in a wetland.

We observed 211 plant species at wetland sites in 2017, similar to previous years. Eighty-four per cent of species were native to the watershed. Sites in the lower watershed had considerably fewer native and sensitive plant species than sites in the middle and upper watershed.

Nearly half the monitoring sites ranked excellent for wetland plant community health. These sites, located only in the upper and middle watershed, were rich in fern species and, for those with woody vegetation, had a healthy shrub layer. A variety of 'layers' in a wetland, such as low-lying plants, shrubs and trees, is important for supporting animal diversity including insects, frogs and birds.

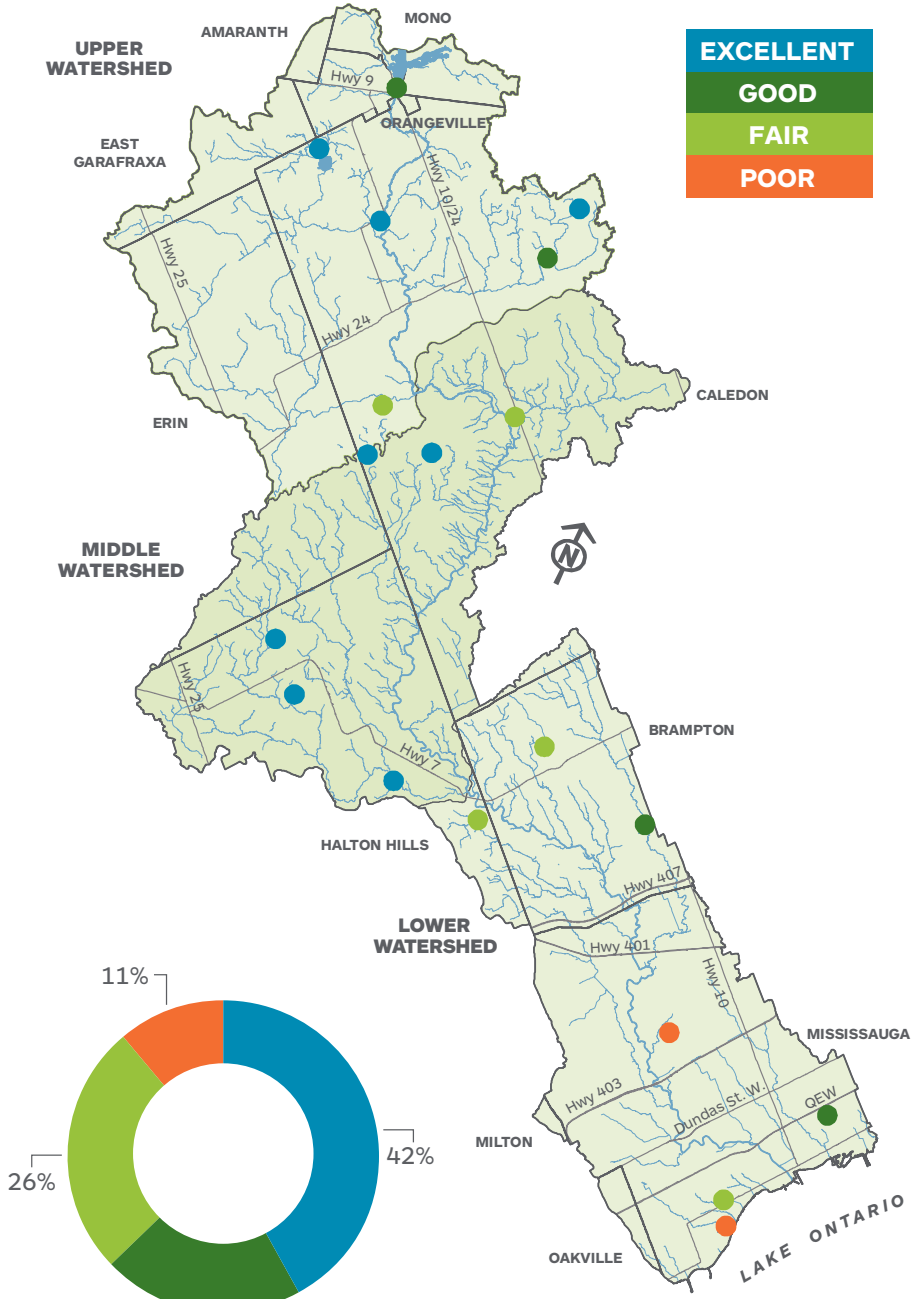
Overall, the wet spring conditions did not have a noticeable impact on wetland community health. However, the record high water levels in Lake Ontario in 2017 caused persistent flooded conditions at Rattray Marsh Conservation Area. This flooding resulted in lower overall plant diversity at the site, but increased in the overall abundance of aquatic grasses and floating plants. We expect diversity and abundance in the plant community at this site to return to normal as water levels recede.

Did you know?

Ferns are found in the fossil record dating back more than 350 million years to the time before dinosaurs. Ferns produce spores instead of seeds, a reproductive strategy that evolved before the system used by flowering plants today.

Sensitive Fern is a species that prefers moist habitats and is found at more than two-thirds of our wetland monitoring sites.

Wetland Plant Community Health



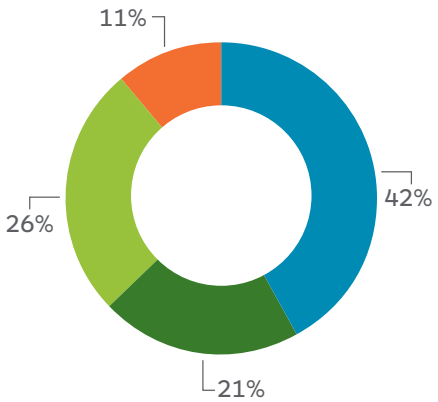


Chart reflects results across the watershed

Wetland Conditions:
Frogs

The frog and toad community in a wetland.

Frogs and toads are highly sensitive to pollution and other changes in their environment, making them good indicators of wetland health. In 2017, we observed seven species of frogs and toads in the watershed, similar to previous years. Four of the 18 sites ranked excellent, two in the middle watershed and two in the upper. The three sites that ranked poor were all in the lower watershed.

We recently began using audio recording units to monitor frog communities. These units allow us to better detect frogs in the watershed. They record frog calls continuously for multiple days during mating season, rather than previously relying on in-person surveys where staff listened for frog calls on-site. Thanks to the new recording units, we had more observations of American Toad in 2017, including at an urban swamp in the lower watershed where we've never detected frogs before. We also recorded Northern Leopard Frogs calling at a middle watershed swamp where we hadn't found them in more than a decade.

Did you know?

Frogs actually have teeth! They don't use them to bite or even chew. A frog uses the small teeth on the roof of its mouth and along its upper jaw with its tongue to stop prey from escaping before swallowing.

Though similar to frogs in appearance, toads actually belong to a separate family. Toads tolerate drier conditions than frogs and are more likely found in disturbed urban environments.

Wetland Frog Community Health

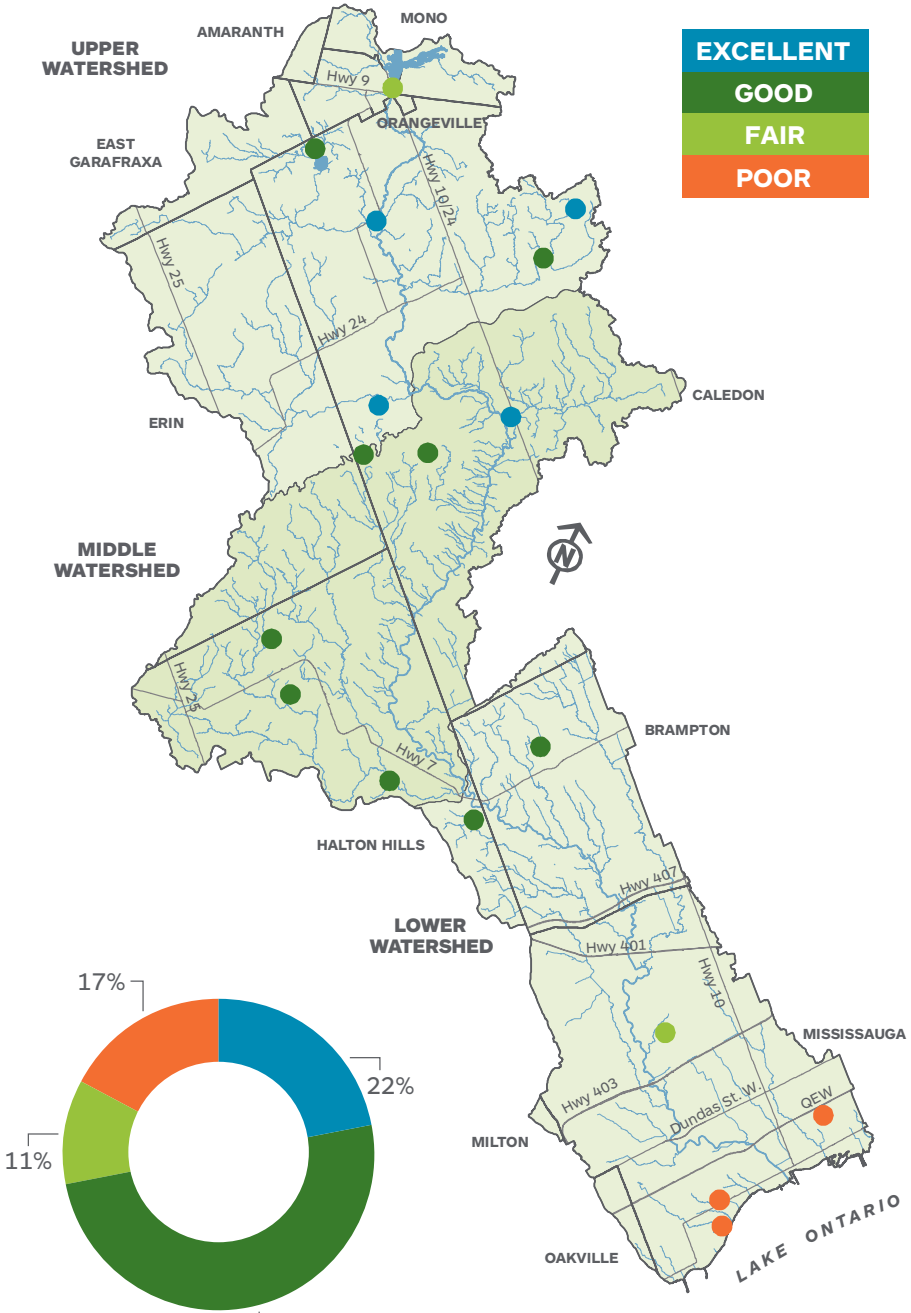


Chart reflects results across the watershed

2017: A Very Wet Year

In 2017, the Credit River Watershed experienced very wet conditions. Record rainfall in spring, combined with record high water levels in Lake Ontario, caused shoreline flooding and high water levels in the lower Credit River. In the upper watershed, intense summer storms in Orangeville triggered flash floods. Heavy rain in the spring also led to higher than normal groundwater levels in spring and summer.

Flooding and high water levels are a natural part of the water cycle. These events are beneficial and even necessary to a healthy ecosystem.

Floods:

- Replenish groundwater, ensuring sufficient water supply for nature and humans.
- Return nutrients to wetlands and forests in floodplains, benefitting native plants.
- Bring leaves and other plant material into streams, providing food for aquatic wildlife.

Flooding and high water levels may cause damage to property and infrastructure in urban centres. Climate change is expected to increase the magnitude and frequency of extreme events, including ice storms, flooding, high winds and drought (such as the drought in 2016). Intense storms such as those we saw in 2017 are expected to become more common, resulting in more frequent flooding and more extensive damage to infrastructure.

Older infrastructure (including roads, bridges, stormwater management and wastewater treatment facilities) in many parts of the watershed was not designed for our changing climate. It doesn't perform well under extreme events. Green infrastructure, such as low impact development (LID) approaches that mimic the natural water cycle, is one way of adapting to our changing climate. We support and promote LID projects throughout the watershed. We're currently developing a Climate Change Strategy that will establish more ways for our agency and partners to adapt to climate change. It will include recommendations for safeguarding communities and managing our waterways and natural spaces within a changing climate.

CVC promotes low impact development as a means of adapting to climate change.

CVC will continue to monitor the effects of the changing climate on our watershed's ecosystems.

What You Can Do:

LEARN about our watershed. Explore one (or all!) of our 10 conservation areas from the headwaters near Orangeville to the shores of Lake Ontario.

GET INVOLVED by taking action to improve your property or volunteering at an event.

JOIN THE CONVERSATION on our website at **cvc.ca/conversations.** Subscribe to our Facebook, Twitter and Instagram accounts. Chat online with fellow environmental enthusiasts. Spread the word about the importance of conservation.

DONATE land or money to the Credit Valley Conservation Foundation and support Credit Valley Conservation's important work in the community.

Acknowledgments

Upper Tier Municipalities

- Dufferin County
- Region of Halton
- Region of Peel
- Wellington County

Lower Tier Municipalities

- City of Brampton
- City of Mississauga
- Town of Caledon
- Town of Erin
- Town of Halton Hills
- Town of Mono
- Town of Oakville
- Town of Orangeville
- Township of Amaranth
- Township of East Garafraxa

Other Partners

- Environment and Climate Change Canada
- Ministry of Natural Resources and Forestry (MNRF)
- Ministry of the Environment, Conservation and Parks (MECP)

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