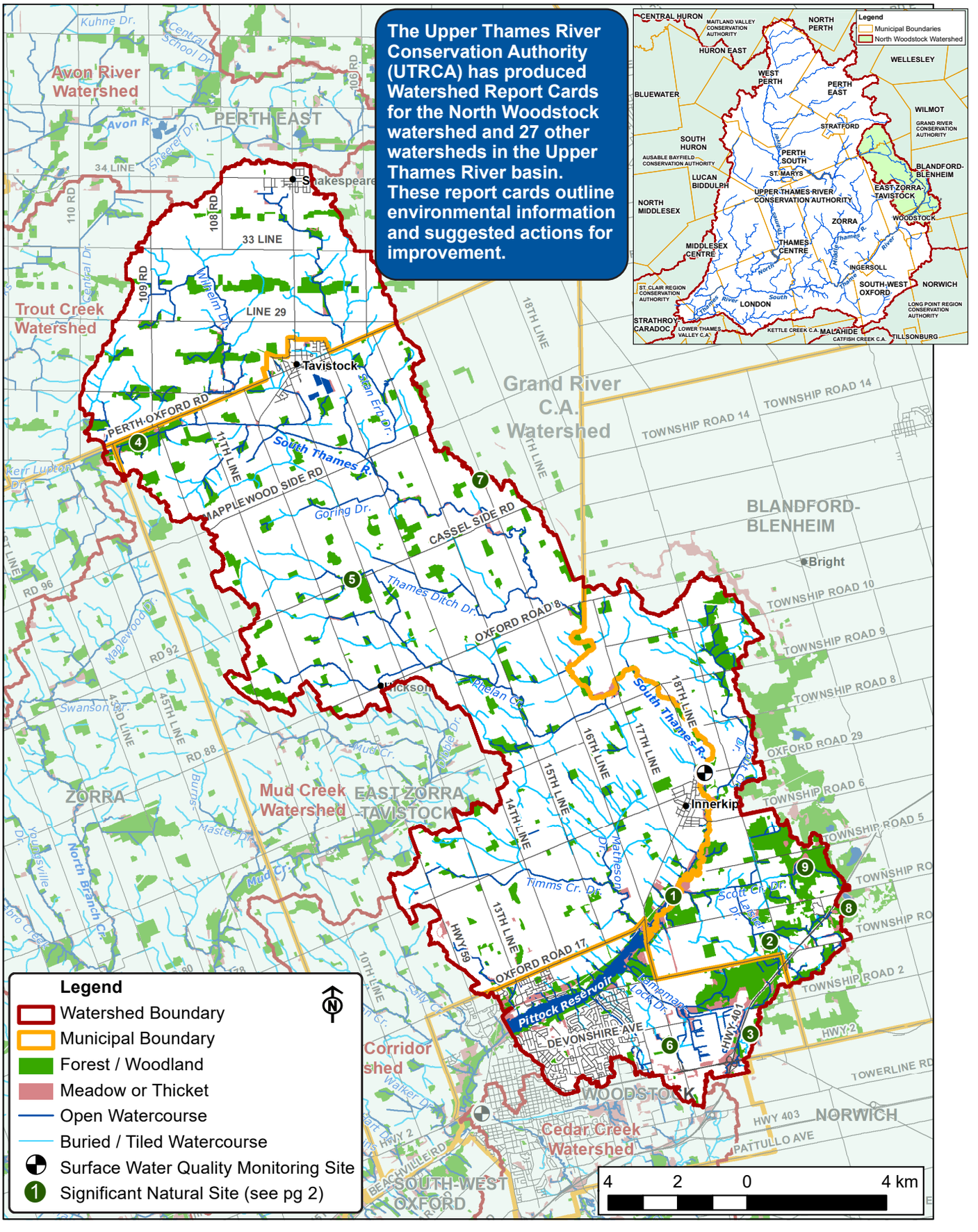
Surface Water Quality
**C - Steady**

Forest Conditions
**D - Slight Improvement**

2022 Watershed Report Card

# North Woodstock

**The Upper Thames River Conservation Authority (UTRCA) has produced Watershed Report Cards for the North Woodstock watershed and 27 other watersheds in the Upper Thames River basin. These report cards outline environmental information and suggested actions for improvement.**



2022 Watershed Report Card

# Watershed Features

| Feature | Description |
|---|---|
| **Municipalities** | East Zorra-Tavistock (58%, 143 km$^2$), Perth East (17%, 41 km$^2$), Blandford-Blenheim (15%, 37 km$^2$), Woodstock (10%, 25 km$^2$). Total Area: 24,702 ha (247 km$^2$), 7% of Upper Thames River watershed. |
| **Significant Natural Sites** | Significant Wetlands: (1) Pittock Reservoir, (2) Central Whiteman/Horner Cr., (3) Kenny Cr. GR15. Other Wetlands: (4) Zorra Swamp, (5) Lovey's Rd. Wetland ZT26B, (6) Duffy Drain Wetland, (7) Stock Drain Wetland. Life Science Areas of Natural and Scientific Interest (ANSI): (8) Fowler's Pond, (9) Trotter's Lake. (See numbered sites on map). Earth Science ANSI: Innerkip Quarry. |
| **Land Cover** | 74% agriculture, 14% natural, 1% open space, 9% urban, < 1% aggregate, 1% water.<br>There is 5% impervious cover (e.g., hard surfaces such as roofs and roads). |
| **Population** | 28,645 in 2021; a 23% increase since 2016, but part of this rise is due to watershed boundary corrections |
| **Soil Type** | 48% silty loam, 22% sandy loam, 12% clay loam, 5% loamy sand, 4% loam, 2% organic, 2% bottomland, 5% not mapped/urban |
| **Physiography** | 44% drumlinized till plain, 16% undrumlinized till plain, 15% spillway, 13% clay plain, 7% till moraine, 3% drumlins, 2% eskers |
| **Soil Erosion/ Delivery** | 15% highly erodible (lands that could potentially contribute > 7 tonnes/ha/yr of soil to a watercourse). The average for the Upper Thames River watershed is 9%. |
| **Tiling and Drainage** | 38% of the watershed has agricultural field tile (5% random + 33% systematic), 9% urban drainage, 53% no tiling. An additional 4% of the watershed is tiled/drained compared to five years ago. |
| **Watercourse Characteristics** | Total length: 429 km of watercourses<br>Watercourse type: 29% natural, 36% channelized, 43% buried/closed<br>Temperature: 19% cool/coldwater, 81% warmwater/unconfirmed<br>Main channel slope: 0.29% slope (low/flat); range is 0.09-1.26% in the Upper Thames River watershed |
| **Dams and Barriers** | 29 barriers to fish passage have been recorded including Pittock Conservation Area Dam. Barriers include dams, weirs, stormwater ponds, perched culverts, debris blockages, and beaver dams. |
| **Spills** | 2001-2005: 14; 2006-2010: 37; 2011-2015: 19; 2016-2020: 14<br>Recent reported spills involved fuels, industrial chemicals, and sewage. |
| **Sewage Treatment** | The Tavistock Wastewater Treatment Plant (WWTP) discharges treated effluent to the South Thames River via Hohner Drain. Woodstock and Innerkip are serviced by the Woodstock WWTP which discharges treated effluent to the South Thames just downstream of this watershed. Shakespeare WWTP discharges treated effluent to the Thames River via Shakespeare Drain. Biosolids are applied to the land in the region. Rural residences are serviced by private septic systems. |
| **% Vegetation Cover and Types** | Vegetation cover: 3,368 ha or 13.6% of the North Mitchell watershed<br>Composition: 61% deciduous forest, 16% mixed forest, 7% plantation/coniferous forest, 14% meadow, 2% thicket |
| **Wetland Cover** | 5.6% (1,385 ha) of the watershed is in wetland cover. Environment Canada (2013) recommends at least 6% wetland cover. 7.8 ha of wetland cover were lost between 2010 and 2015. |
| **Woodlot or Patch Size** | See table below |
| **Fish and Mussels** | Fish Species - 33 species including a historic species. Gamefish - Small and Largemouth Bass.<br>Mussel Species - 11 species recorded. |
| **Species-at-Risk** | Birds - 13 including Bobolink and Wood Thrush. Insects - Monarch. Mammals - American Badger. Mussels - Rainbow. Reptiles - Midland Painted Turtle, Snapping Turtle. Plants - Butternut. |

| Size Category | Number of Woodlots | Average Size (ha) | Total Woodland Area (ha) | % of Woodland Area | Largest Woodlot (ha) |
|---|---|---|---|---|---|
| **Small (< 10 ha)** | 252 | 3 | 816 | 29 | 504 |
| **Medium (10-30 ha)** | 53 | 15 | 807 | 29 | |
| **Large (> 30 ha)** | 15 | 80 | 1204 | 43 | |

**For more information on watershed features and how they compare to the other 27 subwatersheds, see the tables in the full report: 2022 Upper Thames River Watershed Report Cards at www.thamesriver.on.ca.**


2022 Watershed Report Card

# Surface Water Quality

Surface water quality in the North Woodstock watershed has remained steady since the last report card, and scores an overall grade of C  Samples are taken at the provincial water quality monitoring station at Innerkip. The UTRCA has a water quality target of a B grade for this watershed by 2037.

Phosphorous levels have shown some improvement since the 1990s, but since 2015, levels have increased to well above the Upper Thames River average. Phosphorus levels increase from the Innerkip station to the station just downstream of the watershed at the 11th Line and Highway 2 in Woodstock. Elevated phosphorus levels can contribute to algae blooms at Pittock Reservoir.

Since 1990, *E. coli* levels have been improving to current levels which are lower than the Upper Thames River average. *E. coli* levels increase somewhat from the Innerkip station to the station downstream at the 11th Line and Highway 2.

Nitrate levels (from sources like fertilizer like waste) have increased over the long term to current levels that are above the aquatic life guideline. Chloride levels (mainly from road salt) have had an increasing trend since 1990, but remain below the aquatic life guideline.

Stream health, based on benthic monitoring at the Innerkip site, has declined since the last reporting period. However, it shows better benthic water quality than the Upper Thames River average likely due to the fact that much of this section of the South Thames River flows through a natural channel, well buffered by riparian vegetation.

| Indicators | North Woodstock | | | | | Upper Thames 2016-2020 | Provincial Guideline | Indicator Description |
|---|---|---|---|---|---|---|---|---|
| | 1996-2000 | 2001-2005 | 2006-2010 | 2011-2015 | 2016-2020 | | | |
| **Phosphorus (mg/l) *** | 0.117 D | 0.074 D | 0.082 D | 0.106 D | **0.152 D Declined** | 0.110 D | 0.030 B Aquatic Life | Phosphorus is found in products such as fertilizer, detergents, and waste, and contributes to excess algae and low oxygen in streams and lakes. |
| **Bacteria (CFU *E. coli*/ 100 ml) **** | 352 D | 191 C | 195 C | 179 C | **119 C Improved** | 211 C | 200 C Recreation | *E. coli* is a fecal coliform bacteria found in human and animal (livestock/wildlife/ pets) waste. *E. coli* is a strong indicator of the potential to have other disease-causing organisms in the water. |
| **Benthic Score (FBI)** | 5.81 D | 5.94 D | 5.91 D | 5.42 C | **5.73 C Declined** | 5.99 D | < 5.00 B Target Only | Benthic organisms (aquatic invertebrates that live in stream sediments) are good indicators of water quality and stream health. The Family Biotic Index (FBI) scores each taxa according to its pollution tolerance. |

*75th percentile, MECP Provincial Water Quality Monitoring Network data. **Geometric mean, Health Unit data. Province-wide grading system used (see page 8). In 2019, the Provincial Recreational Guideline for *E. coli* changed from 100 Colony Forming Units *E.coli* / 100 ml to 200 CFU *E.coli* / 100 ml.

Found in the North Woodstock watershed, Smallmouth Bass are highly active and visual predators that feed on a range of animals including crayfish, juvenile fish, aquatic insects, and frogs. They require clear water to hunt effectively.

Extreme flooding in February 2018 in St. Marys, Ontario.

## Climate Change

Climate change continues to be a critical issue. Locally, storms and floods are becoming more intense and frequent, which affects water quality by increasing runoff and erosion. Flooding and increased temperatures also stress native plant and animal species. Many local municipalities and industries are enacting Climate Action Plans that focus on reducing greenhouse gases and developing adaptation strategies, including nature-based solutions. Increasing natural cover (trees, wetlands, and forests) and green cover (agricultural cover crops) will absorb carbon and improve resiliency to climate change impacts.


2022 Watershed Report Card

# Forest Conditions

Forest conditions in the North Woodstock watershed have improved slightly since the last report card, and score an overall grade of D. It should be noted that some of the change is due to improved mapping methods.

The percent forest cover (11.4%) has increased slightly from 11.0% in 2017 primarily due to improved mapping and natural succession (see Forest Area Gained table). The Environment Canada (EC) guideline for sustaining species and water quality in southern Ontario is a minimum of 30% forest cover. Meadows and thickets add another 2.2% cover for a total of 13.6% natural vegetation cover.

The percent forest interior (1.6%) has increased slightly from 1.5% but it is still low, indicating most woodlots are too small and narrow to support area sensitive species such as Scarlet Tanager and Ovenbird. The EC guideline for southern Ontario is 10%.

The percent riparian zone forested (35%) has increased from 31.6% in the last report card, partly due to improved mapping methods. Levels are still below the EC guideline of 50%. Additional riparian areas are in permanent meadows and thicket (15.5%) for a total of 50.5% riparian zone vegetated.

| Indicators | North Woodstock 2022* | Upper Thames Average 2022* | EC Guideline ** | Indicator Description |
|---|---|---|---|---|
| **% Forest Cover** | **11.4 D** | 11.3 D | 30.0 B | Percent forest cover is the percentage of the watershed that is forested or wooded. Forest cover includes upland and wetland forest types. |
| **% Forest Interior** | **1.6 F** | 1.5 F | 10.0 B | Percent forest interior is the percentage of the watershed that is forest interior. Forest interior is the protected core area 100 m inside a woodlot that some bird species require to nest successfully. The outer 100 m is considered “edge” habitat and prone to high predation, wind damage and alien species invasion. |
| **% Riparian Zone Forested** | **35.0 C** | 35.7 C | 50.0 B | Percent riparian zone forested is a measure of the amount of forest cover within a 30 m riparian/buffer zone adjacent to all open watercourses. Riparian habitats support high numbers of wildlife species and provide an array of ecological functions including water quality protection. |

* 2022 report card data is based on 2015 colour air photography. ** EC Guideline - Environment Canada guideline based on “How much habitat is enough?” 2013. Grades based on Conservation Ontario (2022).

## Losses and Gains

### Forest Area Removed

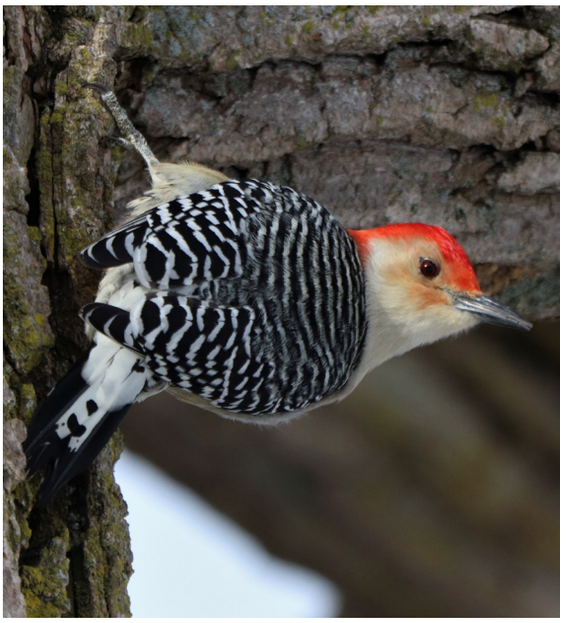
| Years | ha |
|---|---|
| 2000-2006 | 22 |
| 2006-2010 | 28 |
| 2010-2015 | 15 |

Approximately 15 ha of forest were cleared and converted to other uses (e.g., urban, agriculture, aggregates) between the 2010 and 2015 air photography. An additional 50 ha of forest were cleared in the previous 10 years.

### Forest Area Gained

| Years | ha |
|---|---|
| 2010-2015 | 52 |

New data shows that approximately 52 ha of forest were gained between 2010 and 2015 due to forest succession and improved mapping. Several 20- to 30-year-old tree planting sites and some thickets matured to the point where they could be classified as mature woodland in 2015. This data demonstrates the value of continued tree planting and conservation efforts.



Red-bellied Woodpeckers nest locally in tree cavities often at the edge of woodlands. Photo: Sharon Nethercott

2022 Watershed Report Card

# Groundwater

## Municipal Water Supply

Municipal wells include 11 Woodstock wells supplying 44,790 people, three Tavistock wells supplying 3,010 people, two Innerkip wells supplying 1,290 people, two Shakespeare wells (one added since 2017) supplying 260 people, and one Hickson well supplying 100 people. Six of the 11 Woodstock wells are designated as GUDI (groundwater under direct influence of surface water) as they are in a shallow overburden aquifer. Municipal well water is tested and treated.

## Private Wells

Approximately 1,400 private wells are on record in this watershed, drawing from overburden and bedrock aquifers. Properly constructed deep wells have a lower risk of contamination from the surface than shallow wells. The highest risk to a well is from contaminants and activities closest to the well. The safety, testing, and treatment of a private well are the responsibility of the well owner.

## Groundwater Monitoring

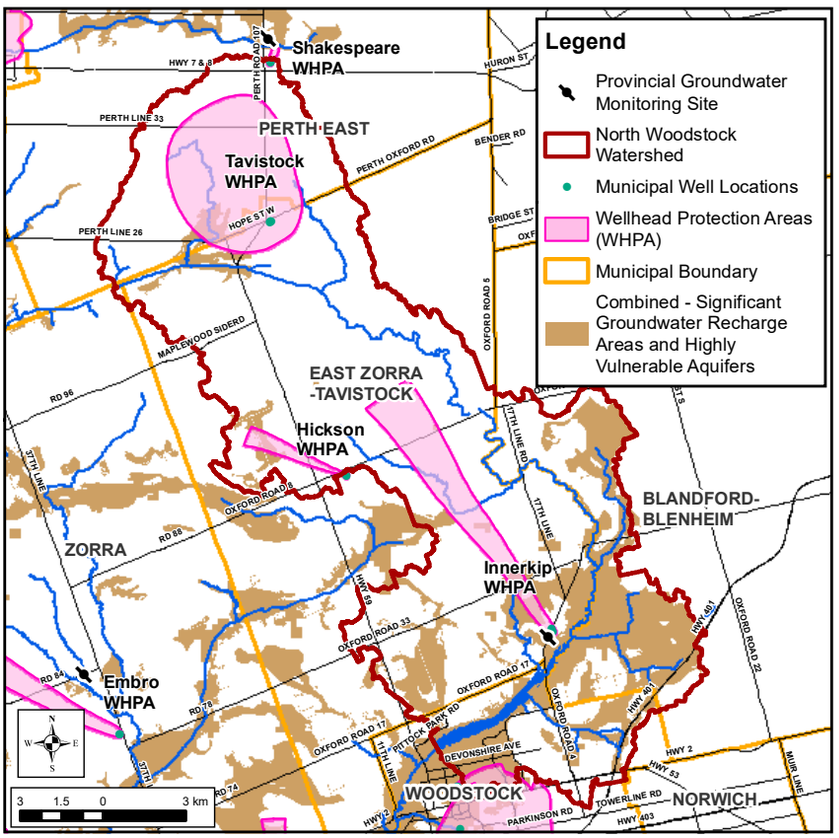
Since 2003, the UTRCA has monitored a Provincial Groundwater Monitoring Network well at Innerkip. It has shown groundwater levels to generally decline from May to October and increase (recharge) from late fall to early spring, with the largest increase in March (up to 1.5 m change). Recent data shows the recharge period is shifting later to November to May, with a trend of warmer and drier weather from October to November and cooler temperatures in May. The rate of decline in groundwater levels is directly related to maximum air temperatures. Summer rainfall does not typically affect groundwater levels as evaporation and plant uptake greatly exceeds rainfall, and most rainfall is utilized by plants during summer.

**Did you know?**

- About 50-70% of total local streamflow is baseflow from groundwater discharging into streams.
- Vegetation relies more on groundwater as it is more stable than rainfall. Most remaining wetlands are groundwater dependent.

## Drinking Water Source Protection

Local source protection plans protect sources of municipal drinking water. The Thames-Sydenham and Region Source Protection Plan (2015) has policies to address risks to municipal water systems. Visit www.sourcewaterprotection.on.ca for information on groundwater resources, Source Protection Plan policies, and a Water Supply System Summary for Woodstock, Innerkip, Tavistock, Shakespeare, and Hickson. Wellhead protection areas were remodelled recently, impacting the shape of the area (see map).




## On The Map

**Significant Groundwater Recharge Areas:** Areas where a relatively large volume of water makes its way from the ground's surface down to the aquifer.

**Highly Vulnerable Aquifers:** Areas where there is a relatively fast pathway from the ground's surface down to an aquifer, generally making the aquifer more vulnerable to contamination.

**Wellhead Protection Areas:** Areas surrounding the wellhead, through which contaminants are reasonably likely to move toward or reach the well.

**Protecting these areas is very important for the protection of local groundwater as a source of drinking water.**

2022 Watershed Report Card

# Local Actions for Improvement

Individuals, groups, businesses, municipalities, and agencies all have a role in improving the health of the watershed through these suggested actions. For more information on agencies that can help, contact the UTRCA (see page 8).

A number of the local actions listed below are also identified in the following reports:

- The Thames River (Deshkan Ziibi) Shared Waters Approach to Water Quality and Quantity (Thames River Clearwater Revival, 2019)
- Oxford Natural Heritage Systems Study (County of Oxford, 2016 draft)
- Upper Thames River Source Protection Area Approved Assessment Report (Thames-Sydenham Source Protection Region, 2015)
- Innovative Nitrogen Management Strategies to Reduce Groundwater Impacts in Drinking Water Source Protection Areas (County of Oxford, 2011)
- Woodstock Natural Heritage Inventory (UTRCA, 2007)
- East Woodstock Secondary Plan and Design Study, Natural Heritage Background Study (Earth Tech Canada Inc., 2007) and Servicing Report (Earth Tech Canada Inc., 2006)

## Local Actions to Improve Surface Water and Groundwater

- Protect and establish buffers (native trees, grasses) along watercourses to cool streams, provide food for aquatic species, stabilize banks, and trap and absorb nutrients and other pollutants.
- Much of the main branch of the South Thames in this watershed is relatively natural and undisturbed. Continue to protect this stream channel and vegetative buffer so stream processes can improve water quality and stream health.
- Implement soil conservation measures on highly erodible land. About 15% of land in this watershed is highly erodible. Continue planting windbreaks to address high wind and water soil erosion rates.
- Consider dam or barrier removal to improve stream health and fish passage, especially when a barrier no longer serves its intended purpose.
- Use drain maintenance methods that protect aquatic habitat (e.g., low flow channels, spot or bottom cleanouts).
- Repair or replace faulty septic systems and ensure proper maintenance of the system.
- Continue to implement agricultural Best Management Practices (BMPs):
  - Use reduced tillage and establish cover crops to protect soil from erosion, prevent nutrient loss, and build soil health.
  - Reduce nutrient loss from cropland (4R Stewardship Approach: right source, right rate, right time, right place).
  - Use best practices in manure storage and spreading, pesticide and fertilizer storage and application, fuel storage, and restricting livestock access to watercourses.
  - Complete and follow Environmental Farm Plans and Nutrient Management Plans (www.omafra.gov.on.ca).
  - Utilize grants for stewardship work from the UTRCA Clean Water Program (www.cleanwaterprogram.ca).
- In urban areas, continue the following actions:
  - For new development, implement urban stormwater planning using Low Impact Development (LID), stormwater BMPs, subwatershed studies, catchment area planning, and erosion control.
  - Incorporate LID into the planning process and promote the implementation of LID techniques, including in Master Plans, Secondary Plans, and any subwatershed studies.
  - Consider using a water balance and landscape approach for inbuilt and new development to manage stormwater runoff.
  - Maintain base flow to natural heritage features through water balance.
  - For existing development, implement pollution prevention and control planning for all aspects of stormwater runoff including combined storm-sewer overflows.
  - Continue to upgrade sewer systems where risk of contamination is greatest (e.g., extend sanitary sewers to urban properties on septic systems).
  - Minimize use of fertilizers, adhere to Ontario's Cosmetic Pesticide Ban, and utilize the municipal hazardous waste disposal program.

## Local Actions to Improve Drinking Water

- Decommission abandoned wells according to Ministry of Environment, Conservation, and Parks standards.
- Homeowners with wells should understand the condition of their well and risks to their water supply (see www.wellaware.ca).
- Sample private wells each spring and fall (available through the Health Unit).
- Keep contaminants (e.g., fuel, pesticides, manure, waste) away from your well area. Consider septic system inspections (see www.omafra.gov.on.ca)
- To protect municipal drinking water sources, implement Source Protection Plan policies.

## Local Actions to Improve Forests and Vegetation Cover

- Connect and extend existing riverside woodlands and meadows with additional plantings to create a continuous wildlife corridor along the South Thames River and its tributaries.
- For tree planting and naturalization projects, create a more natural and diverse habitat by using a variety of native plant species that are better adapted to the local climate, pests, etc. The UTRCA provides tree planting assistance and advice, and grants may be available (see contact information on page 8).
- Target land retirement and naturalization projects on highly erodible soils and retired aggregate pits. In urban areas, increase vegetation cover by targeting naturalization of manicured urban parks and open spaces, river valleys, residential and industrial areas, school yards, and golf courses.
- Municipalities can conserve woodlands, wetlands, and other natural areas by strengthening tree conservation by-laws and enforcement, Official Plan designations, and providing landowner incentives and education.
- Connect woodlots by planting shelterbelts, windbreaks, and buffers along fields and watercourses, which will also protect against soil erosion and improve water quality. Older, denser windbreaks should be thinned.
- Increase forest interior by making woodlots larger and wider by planting native trees and shrubs along the edges or allowing the edges to naturalize on their own.
- Landowners wishing to selectively log their woodlots should use Good Forestry Practices (i.e., Basal Area Guidelines, not Diameter Limit Harvesting) and hire a Certified Tree Marker to mark the woodlot and oversee harvesting.
- Woodlot owners can improve the quality of their woodlots by identifying and removing invasive alien species such as buckthorn (see www.ontarioinvasiveplants.ca and www.thamesriver.on.ca). Keep out livestock and unauthorized motorized vehicles to protect habitat quality.

## Great Lakes Connection

The North Woodstock watershed is in the Thames River watershed, which is part of the Lake Erie watershed. Water from the North Woodstock watershed flows down the South Thames River and takes 4-10 days to flow through London, Chatham, and into Lake St. Clair. About two weeks later, it reaches Lake Erie via the Detroit River.

## Shared Waters Approach

In 2012, partners in the Thames River watershed formed the Thames River Clear Water Revival to work together on the protection of water, with the shared goal of a healthy and vital Thames River which would also benefit Lake St. Clair and Lake Erie. This partnership brings together Indigenous peoples, three levels of government, two local conservation authorities, and the local community. A state of the environment report with a focus on actions needed for water quantity and quality was completed in 2019: The Thames River (Deshkan Ziibi) Shared Waters Approach to Water Quality and Quantity. Implementation by all partners is underway. The Shared Waters Approach contains significant input from four of the eight distinct First Nations whose traditional territory includes the Thames River watershed and highlights the positive participation and sharing of traditional ecological knowledge within this approach.

2022 Watershed Report Card

# Highlights of Progress Since 2017

The North Woodstock watershed is benefiting from many conservation efforts that continue to be implemented by individuals, groups, businesses, agencies, and municipalities on private and public lands. Examples of activities since 2017 include:

- The UTRCA worked with local landowners to create a large wetland on their property. Other works included native species plantings, invasive species removal, installing bird boxes, and more. This undertaking was in partnership with the Clean Water Program (CWP) and Ducks Unlimited Canada.
- The UTRCA partnered with Toyota Motor Manufacturing Canada on a biodiversity project to develop a trail system on its property.
- Many upgrades have been made to the Tavistock Sewage Lagoon to ensure reliable plant performance, optimize treatment, and promote green energy production.
- Recent improvments to the Woodstock Wastewater Treatment Plant include an aeration blower upgrade, a new chlorine chemical tank, upgrades to the power supply (including a 450kw solar farm), and aerobic digestion improvements.
- Two recommendations from the Oxford Natural Heritage Study continue to be implemented. A Woodlands and Wetlands category was added to the CWP to fund tree planting and other woodlot management projects, and a stewardship award is given annually to recognize commitment to the environment. In 2016, the County of Oxford established a wall of fame to recognize winners of the Oxford Stewardship Award.
- UTRCA is working with the Forest Gene Conservation Association to grow endangered native Butternut trees on UTRCA-owned land near Innerkip. This species is threatened by Butternut Canker. Over 350 trees were planted with some genetic tolerance to the canker. The goal is to produce canker-resistant trees and seeds to re-establish the species in its native area.
- The land surrounding Oxford County's Innerkip wellheads has been fully retired to native tallgrass prairie and trees. This project meets the requirement of the County's Drinking Water Source Protection planning objectives to retire land within 100 m of wellheads.
- Many municipalities in the Upper Thames River watershed are taking action on climate change. Perth County municipalities share a Climate Change Coordinator, and are committed to taking action on climate change under the Partners for Climate Protection Program, a network of more than 350 Canadian municipal governments. In addition, Woodstock has climate change adaptation requirements recognized through Oxford County's Future Oxford objectives including target of 100% renewable energy by 2050.
- Over 12,800 trees were planted at 32 sites through the UTRCA's Private Land Reforestation Program from 2016 to 2020.
- In partnership with the City of Woodstock, nearly 1,500 students and community members planted over 3,130 trees, 4,270 wildflowers and grasses, and 300 aquatic plants at seven sites through the UTRCA's Communities for Nature program. Sites included the Woodstock Memorial Forest and Pittock Conservation Area (CA).
- Landowners completed 12 CWP projects involving fragile land retirement/reforestation, erosion control measures, and wellhead protection. The CWP was initiated in 2001 as a partnership between local municipalities to fund environmental projects (www.cleanwaterprogram.ca).
- The City of Woodstock has made habitat improvements to city-owned land (the Sliver) north of Pittock CA. Work included wetland creation and enhancement, tree planting, and accessible trail installation.

The Innerkip tallgrass prairie was thriving following prescribed burns.

## Ontario-Wide Report Cards

Conservation Authorities produce report cards for their watersheds every five years to track changes, using a standardized grading system (www.conservationontario.ca). Grades vary across the province, reflecting the range of physical characteristics and human activities. The complete set of UTRCA report cards and supporting information are available in a report titled 2022 Upper Thames River Watershed Report Cards (thamesriver.on.ca).

## For more information, contact:

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UPPER THAMES RIVER CONSERVATION AUTHORITY

Thames Canadian Heritage River