What Can I Do?

There are things that each of us, as residents of the Annapolis River watershed, can do to protect the river's health for years to come.

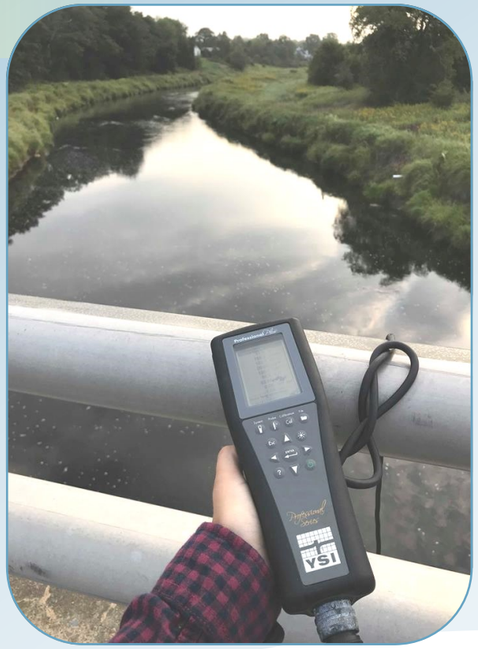
1. Keep shorelines green! Planting natural vegetation along watercourses provides a home for wildlife, keeps waters cool, filters out pollution, and reduces erosion.

2. Encourage fencing of watercourses! Livestock are a source of *E. coli* bacteria and can trample riverbanks, which increases erosion. Fencing livestock out of watercourses is better for the livestock and the river.

3. Conserve water! Rivers rely on inputs from groundwater to maintain flow during the dry summer season. Installing low-flow appliances, modifying existing fixtures and collecting rain water for gardening can conserve water.

4. Keep sewage where it belongs! Ensure that septic tanks are maintained and pumped out every 3-5 years, and that municipal sewage treatment plants are operated to the highest standards.

5. Curb chemical inputs! Look for phosphate-free and biodegradable cleaning products. Reduce or eliminate the cosmetic use of pesticides for lawns and gardens.



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Other Interesting Work at CARP

Stormwater Management

CARP is working with the Town of Middleton and Digby to divert stormwater by constructing rain gardens, bioswales, and dry creek beds. A home water audit program has also been created for homeowners to assess water usage in their own homes.

Wetlands

The Restoration and Enhancement of Wetlands in Working Landscapes project aims to restore and enhance the ecological health of wetland habitats found on agricultural landscapes in and around the Annapolis River watershed.

Lawns to Gardens

In Summer 2018 CARP is piloting a Lawns to Gardens program in order to encourage community members to convert their lawn spaces to garden spaces.

Species at Risk

CARP is collaborating with the Nova Scotia Wood Turtle Recovery Team to monitor and protect endangered wood turtle populations along the Annapolis River.

Microplastics

CARP is collecting surface water and beach sediment samples in the Annapolis Basin as part of an Atlantic Canada partnership to establish baseline information on microplastics.

Fish Habitat Restoration

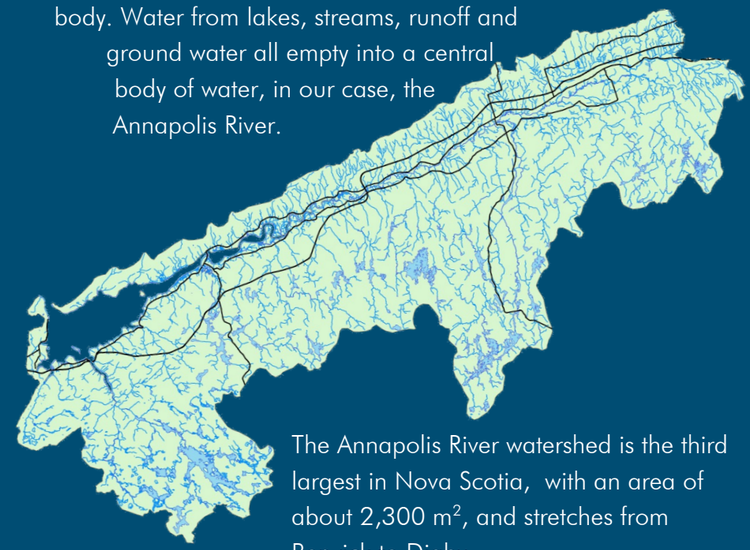
Since the early 1990s, CARP has been working to restore degraded in-stream aquatic habitats to improve their quality for fish species.

Clean Annapolis River Project

Annapolis River Watershed 2017 Report Card

Our Watershed

A watershed represents the drainage area of a water body. Water from lakes, streams, runoff and ground water all empty into a central body of water, in our case, the Annapolis River.



The Annapolis River watershed is the third largest in Nova Scotia, with an area of about 2,300 m^2, and stretches from Berwick to Digby.

Monitoring the Annapolis River

Clean Annapolis River Project (CARP) has been monitoring conditions in the Annapolis River watershed for over 27 years, using a variety of sampling and geospatial analysis techniques.

One of the main indicators that CARP uses to determine the health of the river is the monitoring of surface water quality through the Annapolis River Guardians program. The River Guardians program has historically relied on an extensive volunteer-based monitoring network to collect water samples at eight established monitoring sites along the river.

What Do We Measure?

Surface water quality can be affected by a wide variety of pollution sources. In the Annapolis River watershed, some sources of pollution include urban and agricultural runoff, poorly maintained septic systems, malfunctioning sewage treatment plants and straight pipes. This can result in transport of pollutants such as bacteria, nutrients, heavy metals, and sediment all of which can adversely impact the health of aquatic ecosystems.

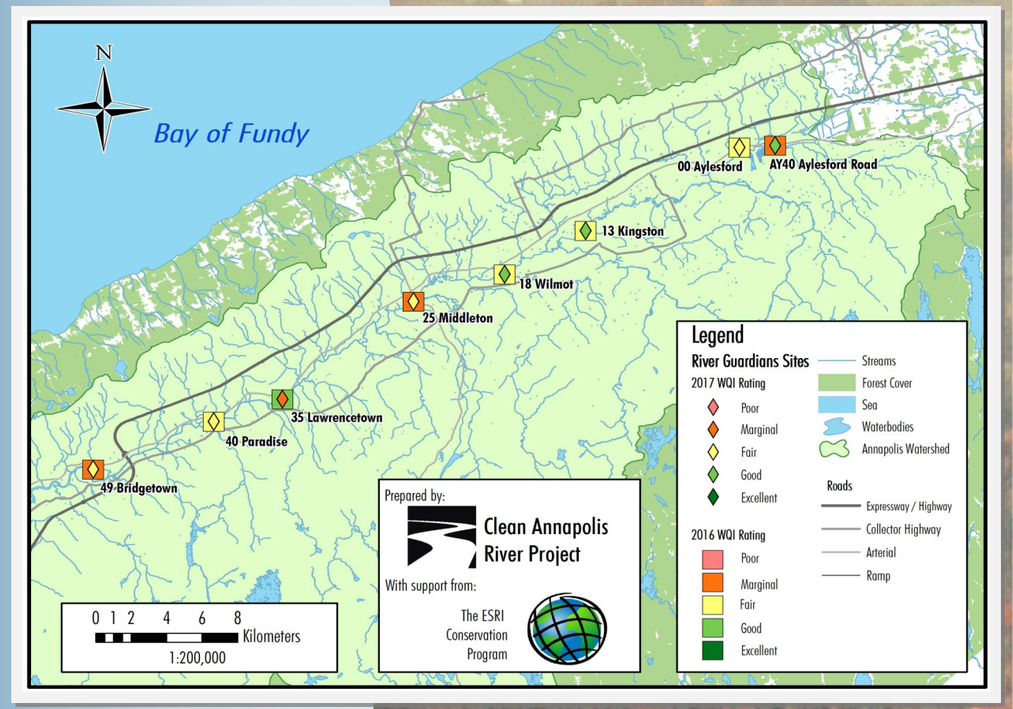
Some of what we measure in the Annapolis River includes:

- ***Water temperature*** — High summer water temperatures can stress or even kill sensitive aquatic species such as trout or salmon.
- ***Dissolved oxygen*** — Aquatic organisms need a lot of dissolved oxygen to survive. High nutrient concentrations in water can lead to low levels of oxygen and can harm aquatic health.
- ***Bacteria (E. coli)*** — A major cause of concern, the presence of *E. coli* can result from livestock waste, poorly maintained septic systems, and malfunctioning sewage treatment plants.
- ***pH*** — This measures the acidity of water. Low pH levels can adversely impact the reproduction and survival of many aquatic species.
- ***Turbidity*** — A measure of haziness caused by suspended particles in water. High levels can block light and interfere with the breathing and feeding of aquatic organisms and fish.
- ***Nutrients (Nitrogen and Phosphorus)*** — Elevated amounts of nutrients can degrade water quality by causing algal blooms that can reduce dissolved oxygen levels, and also by changing the natural state of aquatic ecosystems.

Water Quality Rating

The Water Quality Index (WQI) is a score calculated using several water quality measures. Those used in this calculation were E. coli bacteria count, Dissolved Oxygen, Temperature, pH and Turbidity. The map below shows WQI ratings for 2017 (Diamonds) and 2016 (Squares) for comparison purposes. The 2017 summer season was exceptionally wet, raining 75% of the time within the last 3 days of each sample date. This may have contributed to the elevated E. coli levels detected during sampling by increasing the amount of surface water runoff entering the Annapolis River.

WQI	Water Condition
95-100	EXCELLENT • Absence of threat • Almost pristine
80-94	GOOD • Minor degree of threat • Usually at desirable levels
65-79	FAIR • Occasional threat • Not always at desirable levels
45-64	MARGINAL • Frequent threat • Often not at desirable levels
0-44	POOR • Almost constant threat • Usually not at desirable levels



How Healthy is the Watershed?

Variable	Status (2017)	Trend (1992 to 2017)
E. Coli	Poor	↓ 2 sites ↑ 1 site ↔ 5 sites
Dissolved Oxygen	Good	↓ 6 sites ↔ 2 sites
Water Temperature	Good	↓ 7 sites ↔ 1 site
pH	Good	↑ 5 sites ↔ 3 sites
Turbidity	Good	↔ 8 sites
Nitrogen	Fair	↔ 1 site**
Phosphorus	Poor	↔ 1 site**
Trend Legend	↑ *Improving*	↓ *Declining* ↔ *No trend detected*

*Turbidity sampling was started in 2009, and therefore trends cover the period of 2009-2016.
** Nutrients are sampled at only 1 location by Environment Canada. Trends are calculated based on data collected between 2006-2017.

A map of the results from the Annapolis Basin from 2015-2017 is shown below.

Additional Measures of Health

There are many measures of a watershed's health beyond water quality. Some other important features include land use, presence and quality of forest and wetland cover, and groundwater quality and quantity.

Another important measure of watershed health are nutrient levels, specifically nitrogen and phosphorus.

Nutrients are essential for the growth of both plant and animal life. They can occur naturally, or as a result of anthropogenic activities. Two nutrients commonly monitored in freshwater systems are nitrogen and phosphorus, which are often found to be the limiting factors of plant growth in aquatic systems. When the levels of these nutrients rise, either from natural inputs or from anthropogenic sources such as wastewater or agricultural runoff, excessive periphyton and macrophyton growth can result. Upon the death and decomposition of these plants, oxygen levels can become depleted to such an extent as to threaten aquatic life.

Chlorophyll A & Total Phosphorous Concentrations Map

This data helps link the conditions in the Annapolis Basin to how the surrounding land is used. Phosphorous & chlorophyll are indicators of nutrient pollution like sewage or fertilizers.