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.

Thank you to our 2016 River Guardian volunteers:

Wendy Courtice
Blair Hayden
Steve Forbes
Cody Cole
Claire Diggins
Ron Kielback
Vicky Parker
Tami Parks
Kevin O'Keefe

Thank You to Our Funders

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NSLC adopt a stream

TD Friends of the Environment Foundation

Pêches et Océans Canada
Fisheries and Oceans Canada

Other Interesting Work at CARP

Estuary Monitoring

CARP is collaborating with Eastern Charlotte Waterways (ECW) and the Gulf of Maine Council on the Marine Environment to gather baseline water quality information and assess the health of estuaries in the Bay of Fundy.

Ocean Acidification

CARP is partnering with ECW and Dalhousie University to gain a better understanding of how near shore and estuarine environments contribute to ocean acidification in the Bay of Fundy.

Fish Habitat Restoration

Since the early 1990s, CARP has been working to restore degraded fish habitats to improve and maintain healthy fish populations.

Youth Leading Environmental Change

CARP is engaging youth in learning about environmental themes and issues, and developing leadership skills to become environmental stewards in their communities.

Species at Risk (e.g. Wood Turtles)

As part of the Nova Scotia Wood Turtle Recovery Team, CARP is monitoring and protecting endangered wood turtle populations along the Annapolis River.

Land Use Mapping

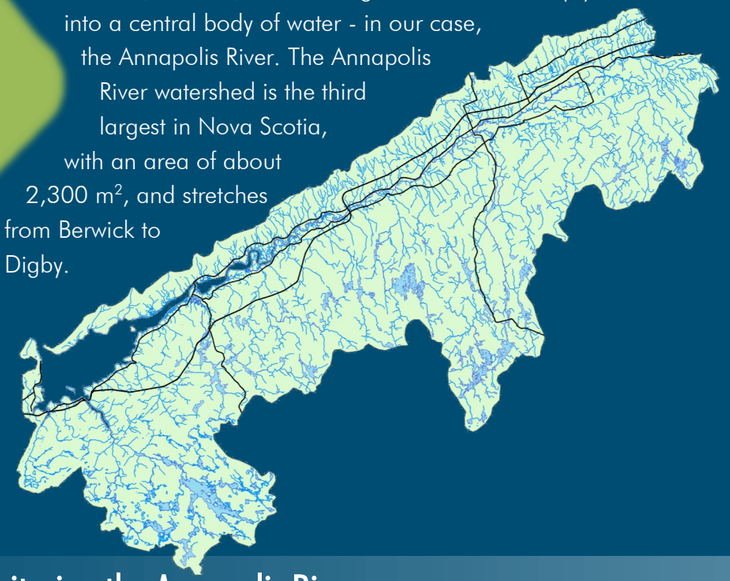
CARP has been mapping and assessing land-based impacts to the Annapolis River estuary to help guide land use management initiatives for the watershed.

Clean Annapolis River Project

Annapolis River Watershed 2016 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.

This report card provides a snapshot of the 2016 monitoring results.

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.

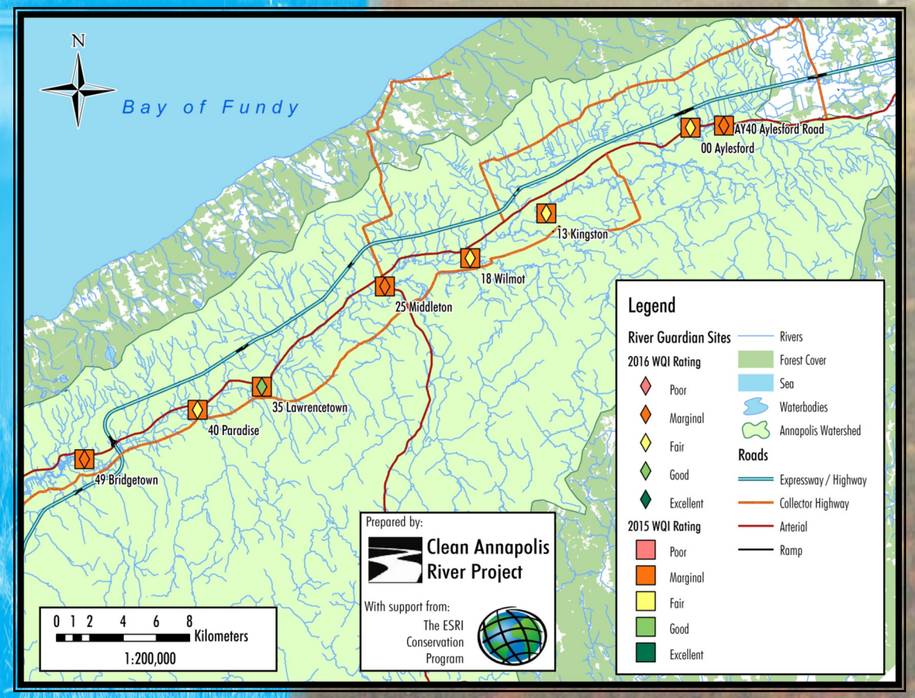
Some of what we measure in the Annapolis River includes:

- ***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 2016 (Diamonds) and 2015 (Squares) for comparison purposes. The 2016 summer season was exceptionally dry, and there was minimal runoff during the monitoring season.

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



See http://annapolisriver.ca/riverguardians.php for more information.

How Healthy is the Watershed?

Variable	Status (2016)	Trend (1992 to 2016)	
E. Coli	Fair	↓ 4 sites	↔ 4 sites
Dissolved Oxygen	Good	↑ 6 sites	↔ 2 sites
Water Temperature	Fair	↓ 7 sites	↔ 1 site
pH	Good	↑ 6 sites	↔ 3 sites
Turbidity	Good	↔ 8 sites*	
Nitrogen	Poor	↔ 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 2006-2016.

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.

One important part of watershed health is the quality and amount of available aquatic habitats for fish and other organisms. With rising summer water temperatures, it is important for fish to be able to access the colder waters and habitats in the headwaters of streams and rivers. Access to habitat is also important for migration, feeding and reproductive success.

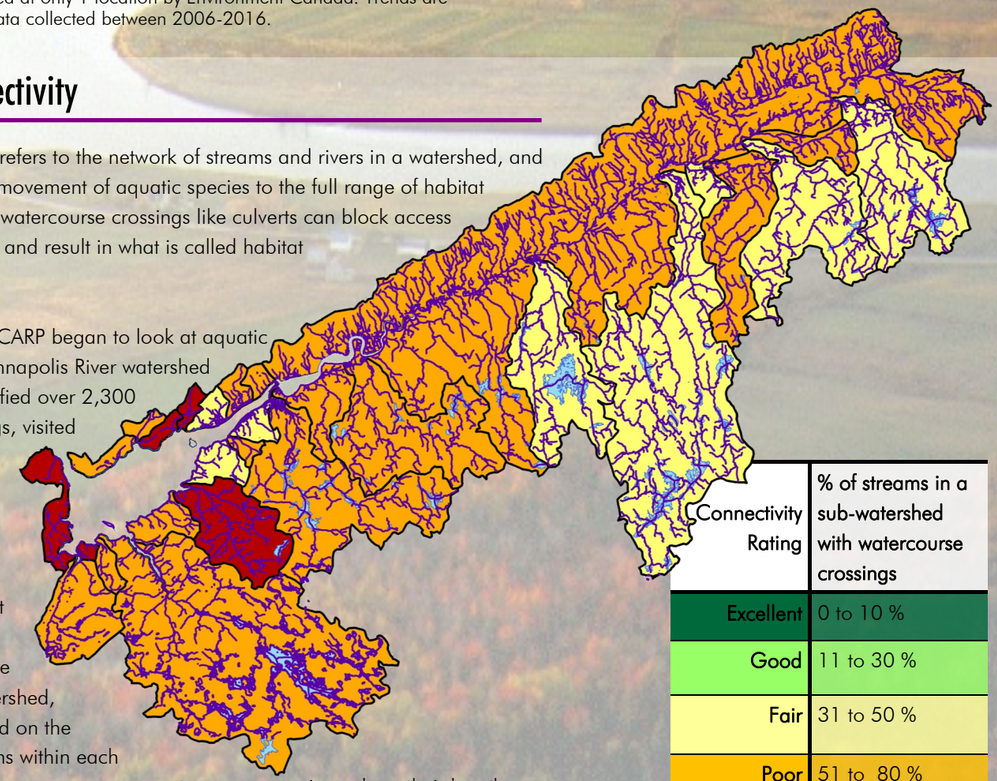
One way in which we measure fish access to stream habitats is by looking at the aquatic connectivity in a watershed.

Aquatic Connectivity

Aquatic connectivity refers to the network of streams and rivers in a watershed, and how well they allow movement of aquatic species to the full range of habitat in their extent. Road watercourse crossings like culverts can block access to upstream habitats and result in what is called habitat fragmentation.

Beginning in 2007, CARP began to look at aquatic connectivity in the Annapolis River watershed and so far has identified over 2,300 watercourse crossings, visited over 1,450 of them, and restored 74 existing barrier crossings.

The map on the right shows the major sub-watersheds of the Annapolis River watershed, and rates them based on the percentage of streams within each sub-watershed that have one or more watercourse crossings along their length.



Connectivity Rating	% of streams in a sub-watershed with watercourse crossings
Excellent	0 to 10 %
Good	11 to 30 %
Fair	31 to 50 %
Poor	51 to 80 %
Very Poor	81 to 100 %