ANNAPOLIS RIVER GUARDIANS

2021 WATER QUALITY MONITORING RESULTS

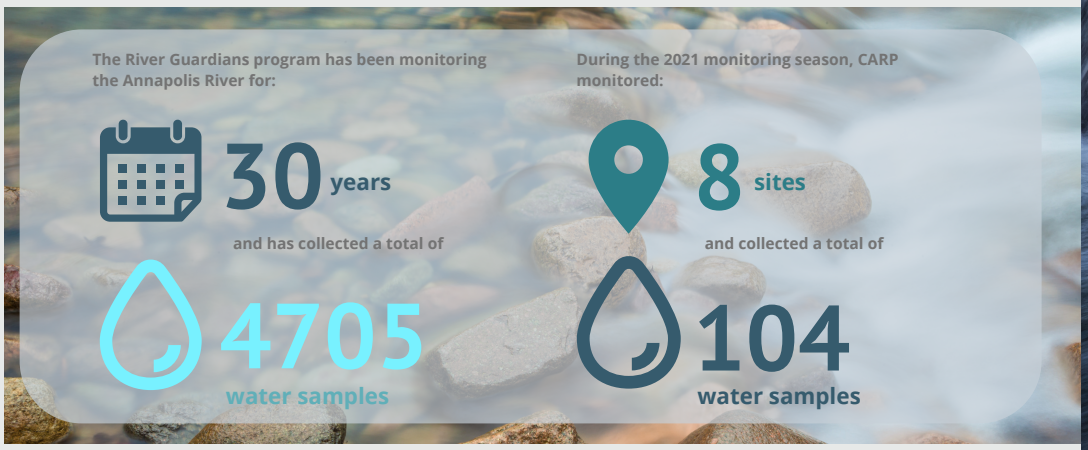
Clean Annapolis River Project, March 2022

Thank you to our funders:

County of Annapolis

Municipality of the County of Kings

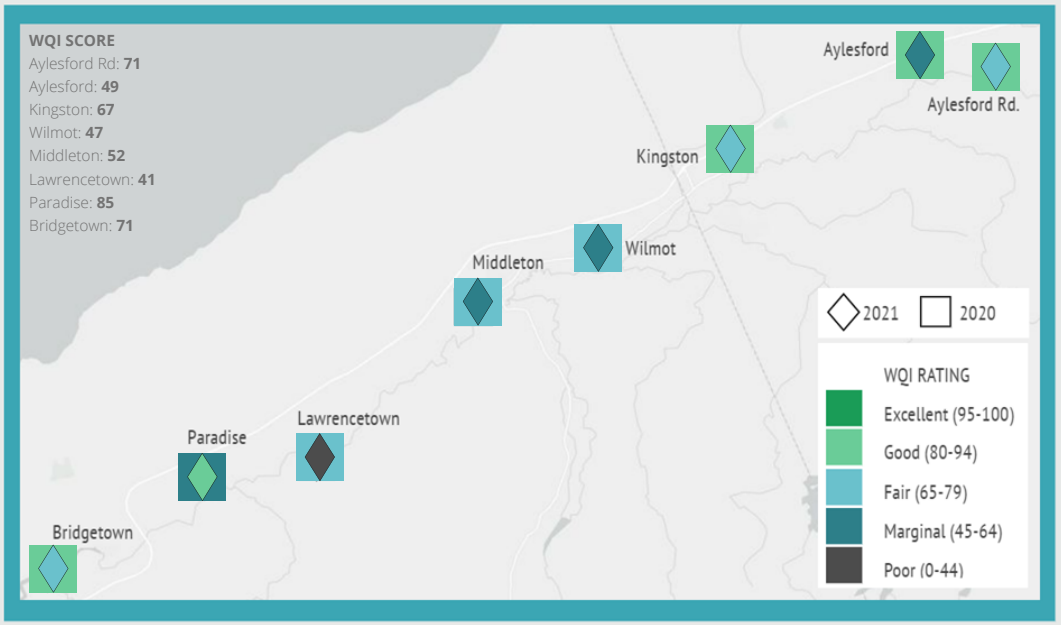
The River Guardians program is a long-standing water quality monitoring effort in the Annapolis River watershed, established by the Clean Annapolis River Project (CARP) in 1992. Historically, the program engaged a wide network of community volunteers, but since 2015, all water quality samples have been collected by CARP staff.



WATER QUALITY INDEX

The water quality index (WQI) is a score rated on a 0-100 scale that was developed by the Canadian Council of Ministers of the Environment (CCME). It provides a framework for assessing water quality relative to accepted water quality guidelines. The parameters included in our calculations were *E.coli*, water temperature, dissolved oxygen saturation, and pH.

In 2021, ***three sites were rated as fair****, decreasing from good in 2020.* ***Three sites were rated as marginal****, all of which dropped from 2020.* ***One site was rated as poor****, declining from fair, and* ***one site was rated as good****, increasing from marginal.*



SUMMARY

Averaged across all eight sample sites, the Water Quality Index score for the Annapolis River in 2021 is '*marginal*', with a value of 60.

Seven of the eight sample sites had a lower water quality index (WQI) score in 2021 when compared to 2020 (Paradise being the only exception). It is worth noting though that the sampling period in 2021 extended earlier in the spring and later into the fall than the sampling season in 2020. The main trends are as follows:

- ***E. coli*, which has historically been of concern in the Annapolis River, continues to reach levels that are harmful to humans, and these observations are most pronounced at the upstream sites. E.coli levels are currently rated as FAIR, but are very close to POOR.**
- **Water temperature trends show a gradual increase at most sites since 1992, but the temperatures reported in 2021 are lower than both the previous year and the historic average.**
- **Dissolved oxygen levels are FAIR, and show a steady increase over time, but the 2021 dissolved oxygen levels were lower than the reported averages in 2020 for most sites.**
- **pH continues to remain within healthy limits along the Annapolis River, and 2021 showed a decrease in pH after the unusually high averages reported in 2020.**
- **Nutrient sampling conducted by ECCC suggests that nitrogen levels seldom exceed the acceptable threshold for the Annapolis River, however phosphorus levels are of greater concern.**

HOW CAN YOU HELP?

1. **Keep shorelines green**. Planting native vegetation, including trees, shrubs and herbaceous plants, along watercourses provides a home for wildlife, keeps waters cool, filters out pollution, and reduces erosion.
2. **Curb chemical inputs**. Look for phosphate-free and biodegradable cleaning products. Reduce or eliminate the cosmetic use of pesticides for lawns and gardens. Maintain healthy riparian buffers to reduce the transport of chemicals into natural watercourses.
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. **Become a member of CARP**. Membership supports implementation of CARP's various conservation and stewardship initiatives. Please see www.annapolisriver.ca/membership for further details.
6. **Volunteer**. Opportunities are available throughout the year for activities such as nature monitoring, field activities, special events and participation on the board of directors. Please see www.annapolisriver.ca/volunteerfor further details.

Clean Annapolis River Project

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The number of sites that rank good, fair, and poor for each parameter are illustrated using the key seen to the right.

GOOD FAIR POOR

TREND ANALYSIS

Each parameter that was monitored in 2021 is ranked as GOOD, FAIR, or POOR according to the percentage of observations that exceed acceptable thresholds.

Parameter	Rank (2021)	Threshold	2021 Observations	Site Trends (2003-2021)
E. coli	FAIR	200cfu / 100mL	29.8% of samples exceed this threshold	1 ↑ 6 ↔ 1 ↓
Water Temp	GOOD	20 degrees C	15.4% of samples exceed this threshold	7 ↑ 0 ↔ 1 ↓
DOSAT (%)	FAIR	60% saturation	97.1% of samples are in healthy range	5 ↑ 3 ↔ 0 ↓
pH	GOOD	6.5-9 pH	9.6% of samples fall outside this optimal range	4 ↑ 4 ↔ 0 ↓

↑ *trend toward increased parameter levels* ↔ *no trend* ↓ *trend toward decreased parameter levels*

E.coli poses the greatest concern, with almost 30% of all samples collected in 2021 exceeding the acceptable guideline. Above 30%, it would move into the POOR category.

Dissolved oxygen levels were FAIR in 2021, and 5 of the 8 sample sites show a trend towards increased dissolved oxygen over time, which reflects an increase in water quality.

pH and water temperature ranked as GOOD in 2021, however long term trends suggest a general increase in water temperature over time, which is reflective of a decrease in water quality.

**2021 nutrient results were not yet available at the time of reporting. No nutrient trends exist between 2006-2020.*

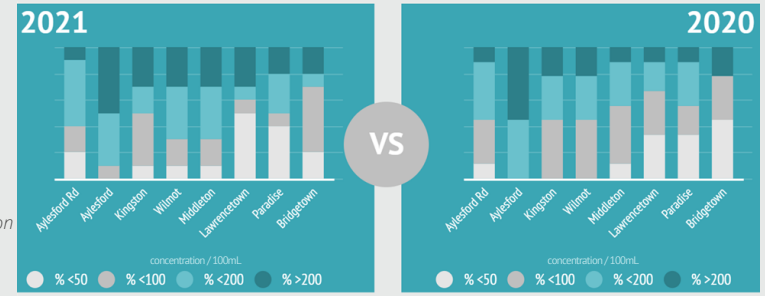
E. COLI

1 6 1

E. coli is a bacteria that poses health risks to humans and livestock, and may indicate the presence of other harmful pathogens. Historically in the Annapolis River, high *E. coli* concentrations have been of great concern, and are likely due to runoff from agricultural lands entering the watershed, and malfunctioning septic systems.

The proportion of samples that are above the threshold for acceptable human contact (E.coli concentration of 200 units/100mL) has increased since 2020.

Aylesford has consistently been the most severely contaminated site, and in general, E. coli contamination appears to be greater at upstream sites than downstream sites.



TEMPERATURE

4 4 0

High summer water temperatures can create stressful or lethal conditions for aquatic organisms. This threshold is often reported to be around 20ºC. The mean summer water temperature in the Annapolis River has exceeded this threshold once since 2003.

The mean summer water temperature in 2021 was 17.43ºC, which was colder than the observed average in 2020 and 2019, and showed a less extreme range of temperatures overall.

All eight sampling sites reported lower temperatures in 2021 compared to 2020. Some individual observations did exceed the 20ºC threshold, but in 2021 these accounted for only 15% of samples compared with 44% in 2020.

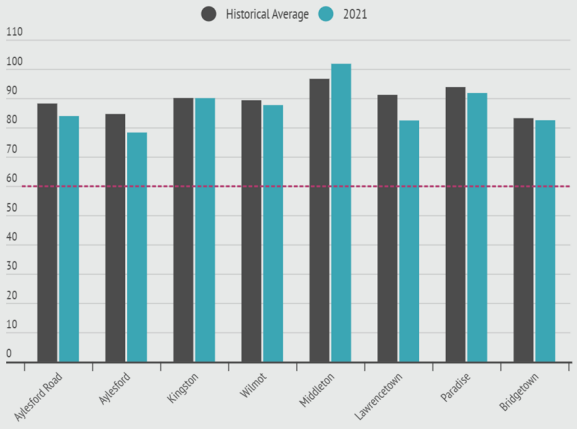
DISSOLVED OXYGEN

5 3 0

The availability of oxygen in the water column is crucial for the survival of aquatic species, and levels below 60% saturation are known to cause stress to aquatic life. Dissolved oxygen saturation is impacted by factors such as water temperature, nutrient concentration, and salinity and measures the amount of dissolved oxygen relative to the *maximum* amount of oxygen that can dissolve under those conditions.

The average summer dissolved oxygen levels observed in 2021 are all above the threshold of 60% saturation. Only three individual observations collected in 2021 were below 60% saturation.

With the exception of Middleton, all sites had lower dissolved oxygen concentrations in 2021 compared to the historical average (encompassing 1992-2021).



pH

6 2 0

pH is a measure of acidity and alkalinity, measured on a scale from 0-14. For aquatic organisms, pH levels that are either too acidic or too alkaline both have adverse effects. The guideline for freshwater organisms is between 6.5 and 9.0 on the pH scale. Bedrock and soil composition can influence the pH of a watershed, and the Annapolis River has historically been within a healthy pH range.

The average pH in 2021 was 7.12, which was only slightly above the historical average of 6.99. All sites showed similar or lower pH values compared to 2020, which reported an uncharacteristically high average.

pH was lowest at the upstream sites and became slightly more alkaline beyond Lawrencetown. In 2021, no observations were reported above the upper threshold of 9.0, however 8.6% of all observations fell below the lower threshold of 6.5.

NUTRIENTS

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Nutrients are essential for the growth of plant and animal life. When nutrient concentration becomes too high, the risk of algal blooms and oxygen depletion rises. Nutrient data come from stations monitored by Environment and Climate Change Canada (ECCC) and currently include one site in Wilmot, and a reference site in Millville. Until 2009, an additional sample site in Lawrencetown was monitored.

Since nutrient sampling began at Wilmot in 2006, 74.2% of all phosphorus readings have been above the acceptable threshold of 0.03mg/L.

Nitrogen levels appear to be of less concern, with only 17% of all records at Wilmot being above the acceptable threshold of 0.9mg/L.

**2021 results were not yet available at the time of reporting, and thus no . Data come from 2006-2020.*