Open Water Sampling Season
Edmonton 2024

CreekWatch
Tributary Stormwater Monitoring

Goldbar Creek Water Quality Data Report

> A south-facing view of Goldbar Creek near the NSR, during a heatwave in August

CreekWatch is a program of the non-profit RiverWatch Institute of Alberta, specializing in community-based environmental monitoring and award-winning citizen science education for thirty years. This 2024 Report shares our findings with the public, governments, and water quality professionals to collaboratively work towards the baseline monitoring and improvement of our stormwater creeks in Alberta.

This annual CreekWatch Report examines the state of The North Saskatchewan's Goldbar Creek based on the water quality data collected with the assistance of water quality technicians. You can view a snapshot of data in the attached graphs generated by the RiverWatch online and responsive **graphing tool**. Thank you to EPCOR, The City of Calgary, and the Land Stewardship Centre's Watershed Stewardship Grant financed by Alberta Environment and Protected Areas for major funding support, and to all of our dedicated volunteers who have made this sampling season possible – we couldn't have done it without you!

Goldbar Creek By-the-Numbers

	2024	2023	2022
Number of Sampling Events	21	7	6
Number of Data Points	150	38	47
Number of Sampling Hours	19.5	6	2

Analysis

This year's data report highlights a significant increase in sampling events and data points generated by CreekWatch technicians. Median values reveal improvements across several key parameters. However, as the creek nears the confluence, dissolved oxygen levels decrease with increased water temperatures, and pH levels slightly rise while many other parameters remain relatively stable.

Goldbar Creek Water Quality Data

Parameter	Median Value		
	2024	2023	2022
Dissolved Oxygen (mg/L)	9.9	8.0	8.5
Water Temperature (°C)	14.98	16.8	17.3
Turbidity (NTU)	5.02	32	19
pH	8.23	8.1	8.3
Ammonia Nitrogen (mg/L)	0.13	0.25	0
Phosphorus (mg/L)	0.10	0.06	0.07
Chloride (mg/L)	45	160	180
Discharge (m^3/s)	0.0337	-	-

NOTE: All data collected during the open water season of the specified calendar year.

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The Calgary Awards 2019

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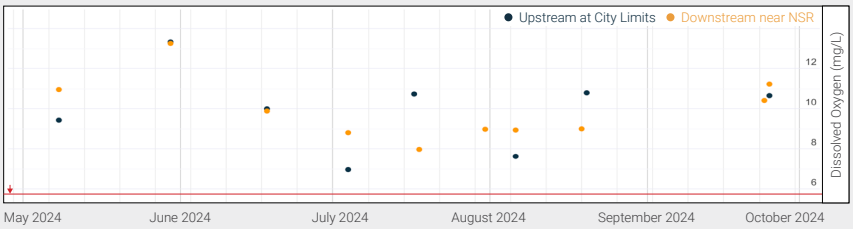
Dissolved Oxygen (mg/L)



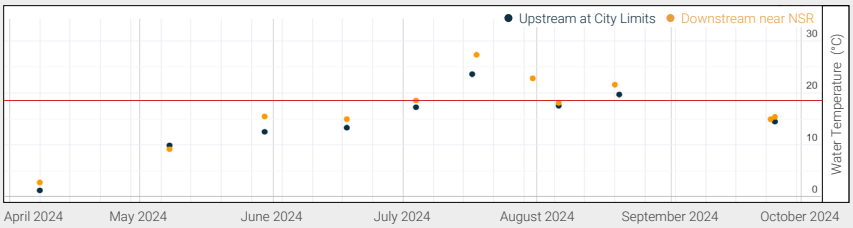
Median	**10.33**	**9.44**

Dissolved oxygen concentrations are measured using either a YSI probe or a Hach kit with a drop-by-drop titration to show a change in water colour until totally clear. Red line indicates the Environmental Quality Guidelines for Alberta Surface Waters (2018) for exceedance is minimum 5 mg/L for instantaneous (short-term) values. Data points may overlap.

What is Dissolved Oxygen?

Dissolved oxygen (DO) is the amount of oxygen mixed into water, crucial for aquatic life but present in only small amounts (1-14 mg/L). DO levels are influenced by water movement, temperature, barometric pressure, photosynthesis, and water clarity, with cold, fast-moving water holding more oxygen. Human activities, like thermal pollution, water withdrawals, and removing riparian vegetation, can decrease DO levels and harm aquatic ecosystems. Low DO concentrations can lead to fish kills and disrupt biodiversity, as organisms like trout and mayfly nymphs require high oxygen levels to survive.

Water Temperature (°C)



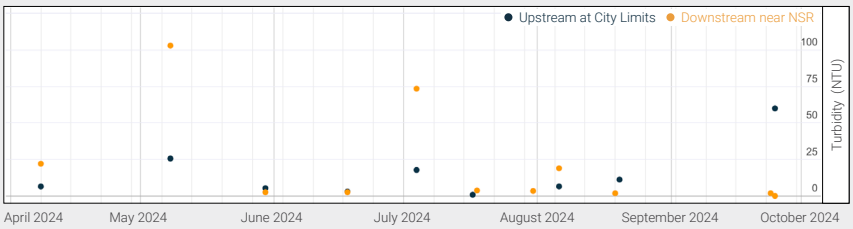
Median	**14.48**	**15.47**

Water temperatures are measured using an Exotech thermometer or YSI probe placed in flowing, shallow water near shore. Red line indicates the Water Quality Objective identified as an ideal value according to the Bow Basin Watershed Management Plan. Values should not exceed a maximum mean of 18°C over a 7-day period. Higher values may cause stress on aquatic life. Data points may overlap.

Why is Water Temperature important?

Temperature plays a crucial role in the chemistry and biology of aquatic ecosystems by influencing chemical reactions, dissolved oxygen levels, and the growth of organisms. Water temperature can fluctuate due to natural characteristics like solar radiation, stream depth, evaporation, groundwater inputs, or human influences such as discharging industrial effluents. Extreme temperature changes can stress aquatic organisms by affecting metabolic rates, growth, and affect the availability of dissolved oxygen, which can be harmful or even lethal. Maintaining stable temperatures within a suitable range is essential for the health of aquatic ecosystems.

Turbidity (NTU)



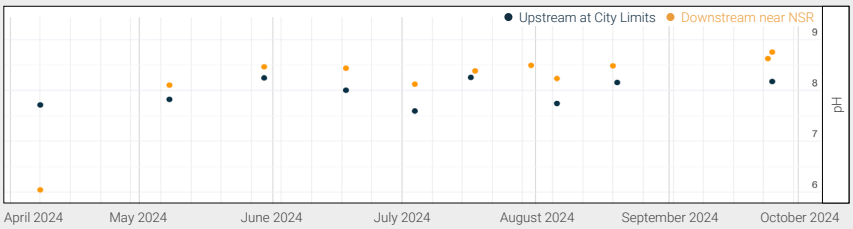
Median	**6.57**	**3.46**

Turbidity is measured by slowly pouring water into a type of graduated cylinder marked with "Nephelometric Turbidity Units" or NTU's or a LaMotte 2020t Turbidity Meter. Data points may overlap.

What does Turbidity mean in water?

Turbidity measures how well water transmits light and is often used to estimate suspended sediment levels in a waterway. It can be influenced by rainfall, snow runoff, urbanization, and removing riparian vegetation, which reduces natural sediment filtering. High turbidity can harm aquatic habitats, reduce plant growth by blocking sunlight, and increase pollutant levels like nutrients and heavy metals. However, low turbidity doesn't always indicate good water quality, as invasive species like zebra mussels may filter out essential nutrients, disrupting the processes behind nutrient cycling.

pH



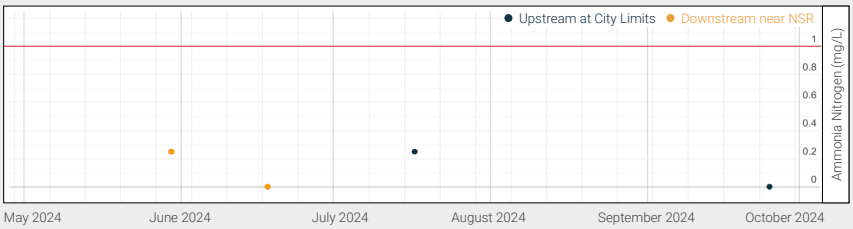
Median	**8.0**	**8.4**

Creek pH is measured using either a YSI probe or a Hach kit that compare a change in water colour. The Environmental Quality Guidelines for Alberta Surface Waters (2018) for exceedance is a pH value outside the range of 6.5 - 9. Data points may overlap.

What does pH measure?

pH measures how acidic or basic a solution is using a scale from 0 to 14, where 7 is neutral. Acids donate protons (H^+), while bases accept them (OH^-). pH levels influence aquatic life, with most ecosystems thriving at a pH between 6.5 and 8.5. Natural processes can raise pH levels, such as photosynthetic plants reducing CO_2 and carbonic acid, along with carbonates released into water through soil and rock erosion. Human activities, such as industrial emissions and the use of ammonia-based fertilizers, can acidify water and harm aquatic life by increasing metal solubility, chemical toxicity, and inhibiting organisms' biological functions and development.

Ammonia Nitrogen (mg/L)



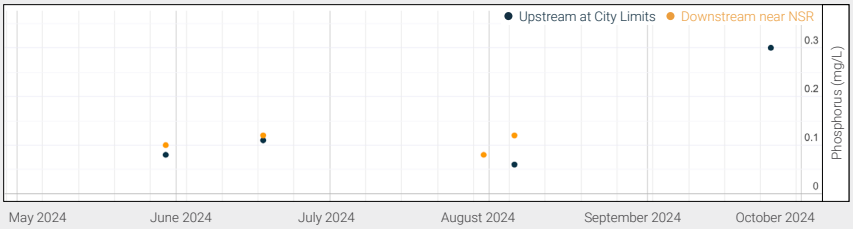
Median	**0.13**	**0.13**

Ammonia nitrogen concentrations are measured by dipping Hach test strips into water and noting the colour change. Red line indicates the Environmental Quality Guidelines for Alberta Surface Waters (2018) for exceedance is maximum 1.0 mg/L at pH 8.0, 10°C. Data points may overlap.

Why monitor Ammonia Nitrogen?

Ammonia nitrogen is a familiar nutrient and pollutant in waterways, consisting of ionized ammonium (NH_4^+) and toxic ammonia (NH_3). It exists in water through natural processes like the nitrogen cycle and can be introduced though human activities, such as agriculture, urban runoff, wastewater discharge, and industrial emissions. Ammonia nitrogen is vital for plant growth but can harm aquatic life at elevated concentrations, causing eutrophication, oxygen depletion, and fish kills. Ammonia toxicity increases with higher water temperatures and pH levels, and prolonged exposure can be harmful to aquatic life, potentially leading to biodiversity loss.

Phosphorus (mg/L)



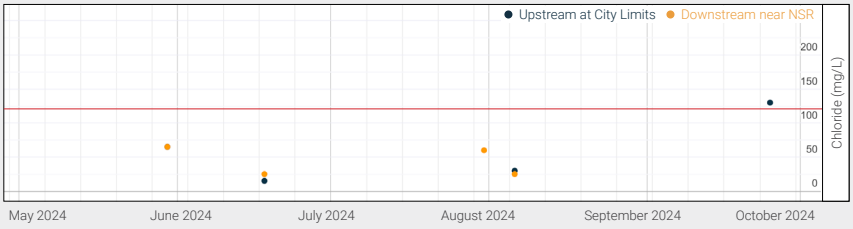
Median	**0.10**	**0.11**

Orthophosphate concentrations are measured with either a LaMotte 1200 Colorimeter or a Hach kit that compare a change in water colour. Data points may overlap.

What is Phosphorus in water?

Phosphorus is a crucial component for living organisms, found in food like eggs, meat, and dairy, and moves through the biogeochemical cycle in ecosystems. It is absorbed by plants as inorganic phosphates and passed through the food web. However, excess phosphorus in waterways, often from human actions like agriculture, sewage, and stormwater runoff, can cause nutrient pollution. Increased phosphorus levels may lead to eutrophication, harmful algae blooms that deplete oxygen, and disrupt the ecosystem. Algae blooms can also release toxins and clog water treatment filters, posing environmental and human health risks.

Chloride (mg/L)



Median	**47.5**	**42.5**

Chloride concentrations are measured using Hach kits with a drop-by-drop titration to show a change in water colour from yellow to orange. Red line indicates the Environmental Quality Guidelines for Alberta Surface Waters (2018) for exceedance is maximum 120 mg/L. Chloride results collected before July 15th, 2024 may have been corrected to account for titrant normality. Data points may overlap.

What does Chloride measure?

Chloride is an element found in compounds like road salts. When dissolved in water, chloride ions can be measured, indicating the "saltiness" of water. It can enter waterways naturally through coastal flooding, groundwater discharge, and weathering of chloride-containing rocks or human activities like deicing, agricultural runoff, and industrial processes like fracking. High chloride concentrations can harm freshwater ecosystems, interfere with an organisms osmoregulation, and make water unsuitable for drinking or irrigation. It may also complicate water treatment plants, requiring additional infrastructure to manage salinity.

To review our data reports, visit
creekwatch.ca/creekwatch-reports