



SUMMARY

- Phytoplankton and zooplankton populations make up the base of the aquatic food web and are an important food source.
- Insufficient data on the phytoplankton and zooplankton populations in the Detroit River led to additional studies including a comprehensive study in 2019 by the Department of Fisheries and Oceans.
- Study results indicate that phytoplankton and zooplankton populations are naturally low in the river due to expected river conditions, not human activities.
- Based on the research findings of all studies, there is no evidence of impairment to the plankton populations in the Detroit River and a “not impaired” status is being recommended by the Detroit River Canadian Cleanup.



BACKGROUND

Over the past 100 years, the Detroit River and its watershed have experienced large amounts of industrial, urban, and agricultural development, which has led to the river becoming highly degraded. As a result, the Detroit River was listed as one of the 43 Areas of Concern (AOC) under the Great Lakes Water Quality Agreement (GLWQA) in 1987. AOCs are sites around the Great Lakes where the aquatic ecosystem has been degraded by local human activities sufficient to cause impairments to one or more of the 14 beneficial uses of the Great Lakes under the GLWQA.

A beneficial use is impaired when water quality objectives are not met and the aquatic environment is either not unable to support aquatic life or interferes with local human uses. Each beneficial use was evaluated and assigned a status of either *impaired* or *not impaired*. If there was insufficient data, a beneficial use could be deemed as “requires further assessment” (RFA), as was the case for the *degradation of phyto/zooplankton populations* in the Detroit River AOC.

To restore impairments, each AOC developed a comprehensive Remedial Action Plan (RAP). The Detroit River Canadian Cleanup (DRCC) committee is leading the implementation of the Detroit River Remedial Action Plan.

Once all BUs are considered not impaired, the Detroit River will be removed from the list of AOCs under the Great Lakes Water Quality Agreement.

WHAT ARE PHYTOPLANKTON AND ZOOPLANKTON?

Plankton are small organisms that live in water. They are grouped into three general categories: phytoplankton, zooplankton and microbes.



PHYTOPLANKTON consist of microscopic plants that come in many forms (e.g., diatoms). They make energy from sunlight, similar to land-based plants.



ZOOPLANKTON range in size from microscopic organisms such as water fleas (*Daphnia* sp.) down to smaller organisms like mussel larvae (called veligers). Zooplankton feed on phytoplankton and smaller zooplankton.



MICROBES include the smallest single celled organisms including bacteria and protozoans. Certain bacteria can be a problem in aquatic systems (e.g., *E. coli*), resulting in beach closures, but most are a natural part of the ecosystem.

Together, phytoplankton and zooplankton make up an important part of the aquatic food web. Phytoplankton are an important food source for zooplankton and other aquatic species and zooplankton are a food source for fish and other organisms (e.g., shrimp), some of which are consumed by humans. There must be enough phytoplankton and zooplankton to form the base of the food web.

WHEN WILL PLANKTON POPULATIONS BE CONSIDERED NOT IMPAIRED?

The delisting criteria for phytoplankton and zooplankton populations states that it will be considered not impaired when...

“the composition and relative abundance of phytoplankton and zooplankton of the Detroit River reflect that of Lake Huron, and therefore represent primarily oligotrophic/ mesotrophic conditions.”

An oligotrophic system is characterized by clear water, low nutrient concentrations, and little phytoplankton





growth. Mesotrophic systems have moderate amounts of nutrients and increased phytoplankton growth.

RESULTS OF RESEARCH & MONITORING



Researchers conduct a net haul while sampling for phytoplankton and zooplankton

Environment and Climate Change Canada collected water quality and phytoplankton data to examine spatial and seasonal changes in the phytoplankton community in the nearshore and offshore waters of the Detroit River. The data suggested there was no impairment of the phytoplankton community. The University of Windsor led a zooplankton study which found

no evidence of impairment in the zooplankton community. While these studies indicated no impairment within either of the plankton communities, a comprehensive study to evaluate *both* plankton communities and *microbial* communities collectively, was recommended.

In 2019, this comprehensive study was completed by the Department of Fisheries and Oceans. Samples of phytoplankton, zooplankton, and microbial communities were collected in May, July, September, and November, from 8 sites between Peche Island (upstream) and Amherstburg (downstream) from nearshore and offshore areas.

Key findings of this study were:

- Phytoplankton and zooplankton populations were low, but their levels were consistent with expectations of a fast flowing river environment.
- Despite the low phytoplankton populations, primary production (i.e., when plants make their own food and use that food to live and grow) rates were moderately high, indicating that the river supports viable phytoplankton populations.
- Zooplankton populations decreased significantly from upstream at Peche Island to downstream in

Amherstburg and the community was predominantly comprised of small organisms suggesting the larger zooplankton are being readily consumed by fish in this stretch of the river.

- Lake Huron is not an appropriate comparison area for the Detroit River, as the zooplankton community has already undergone substantial changes as it has passed through both the St. Clair River and Lake St. Clair, each of which is likely to decrease plankton populations and change species composition.

HOW DOES PLANKTON COMPARE TO OTHER AOCs?

The type of fish food in the river provides insight into the health of the food web. Healthy food webs have a high percentage of plankton and zooplankton populations as a food source for fish. Over 80% of the fish food in the Detroit River is made up of plankton, which is higher than other AOCs with impaired or requires further assessment status for this BU.

AOC	BU Status	Phytoplankton
Detroit River	RFA	83.2%
Bay of Quinte	Impaired	63.5%
Hamilton Harbour	RFA	62.4%
Inner Toronto Harbour	RFA	44.8%
Outer Toronto Harbour	RFA	39.1%

CONCLUSIONS

Overall, the planktonic communities in the Detroit River were found to behave as expected in a high flow connecting channel, responding more to seasonality and river conditions than to factors attributable to human activities. Further, given the changes in plankton communities with distance down river, it was also determined that Lake Huron was not an appropriate reference area for the Detroit River.

Based on the research results, there is no evidence of impairment within the phytoplankton and zooplankton communities of the Detroit River AOC. As a result, the DRCC is recommending the status of this BUI be designated as "not impaired". **For more information, please visit www.detroitriver.ca.**

The Detroit River Canadian Cleanup implements the Remedial Action Plan on behalf of a community-based partnership working together to protect, restore, and enhance the Detroit River ecosystem.
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