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A WATER QUALITY STUDY

OF

COOTES PARADISE

by

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## SUMMARY AND CONCLUSIONS

1. Water quality in the Desjardins Canal and Cootes Paradise is characterized by high concentrations of phosphorus and nitrogen in both water and sediments, by the exceedingly high counts of pollution-indicator bacteria, by high biomass concentrations as revealed by chlorophyll a, by anaerobic conditions throughout the Canal and by the abundance and distribution of pollution-tolerant benthic invertebrates.
2. Based on the total flow of water through Cootes Paradise, the critical period in terms of biological production occurs during the summer months when the relatively low flows from the surrounding streams result in a high residence time for nutrients, trace elements, etc. in the Paradise system.
3. During the summer months in years prior to 1976, the Dundas Sewage Treatment Plant (STP) has been the major contributor of total phosphorus, total Kjeldahl nitrogen and biochemical oxygen demand to the Desjardins Canal and Cootes Paradise. Calculations for the summer of 1975 showed that the plant introduced approximately 87% of the total phosphorus, 88% of the total Kjeldahl nitrogen and 80% of the biochemical oxygen demand to the Canal waters. At other times of the year, the increased flows in Spencer Creek produced loadings of nutrients and BOD to Cootes Paradise comparable to those from the Dundas STP.

For an expanded plant discharging a 4.0 MIGD effluent with 0.5 mg/l P, 2.0 mg/l TKN-N, 5.0 mg/l BOD and 5.0 mg/l suspended solids, the mass input would represent approximately 59% of the total phosphorus, 53% of the total Kjeldahl nitrogen, 49% of the biochemical oxygen

demand and 4% of the suspended solids entering Cootes Paradise. This is with the assumption that the other sources, ie. the streams, are characterized by the water quality parameters as determined during the study period (June-September 1975).

4. Minor watercourses around Cootes Paradise have a less significant input to the Paradise. The exceptions are Chedoke Creek which introduces nutrients, chloride, suspended solids and pollution-indicator bacteria and the streams along the north shore - Long Valley, Vine and Hickory, which input a substantial quantity of heavy metals, primarily as a result of natural geological processes.
5. During the study period, Spencer Creek was observed to be an effective dilutant of the Dundas plant effluent water flowing through the Desjardins Canal. Upon mixing with Spencer Creek, the Desjardins Canal waters recorded concentration reductions up to 70% in total phosphorus, total nitrogen and biochemical oxygen demand.
6. The infilling and subsequent aging of the main area of Cootes Paradise is primarily a result of the input of suspended solids from Spencer Creek.
7. The anoxic conditions which exist in the Desjardins Canal are directly related to the discharge of organic matter from the Dundas Sewage Treatment Plant. The nitrogenous component of this waste adds substantially to the total oxygen demand of the plant effluent.
8. Sediments of the Desjardins Canal, under anaerobic conditions, have the potential to regenerate soluble phosphorus and ammonia to the overlying waters, thus providing a continuing source of nutrients for algal growth in West Pond and the main area of Cootes Paradise.

9. High photosynthetic activity in West Pond during the day time results in high concentrations of dissolved oxygen which afford favourable conditions for nitrifying bacteria to oxidize the incoming organic and ammonia nitrogen compounds.
10. Nitrogen, the major source of which is the Dundas Sewage Treatment Plant, appears to be the controlling nutrient for algal growth in Cootes Paradise, particularly in West Pond.
11. Phosphorus levels in Cootes Paradise are so elevated that phosphorus ceases to be the limiting nutrient in algal growth.

RECOMMENDATIONS:

1. The effluent quality from the Dundas Sewage Treatment Plant must be significantly upgraded to improve the conditions in the Desjardins Canal, West Pond and the main area of Cootes Paradise. Nutrient removal must be a prime concern. The objective of an abatement program should be to reduce phosphorus to make it limiting to phytoplankton growth.
2. To complement the improvement of the effluent quality from the Dundas STP, the following steps must be undertaken to ensure the recovery of the waters in both the Desjardins Canal and Cootes Paradise:
  - a. Removal of the sediments should be undertaken to reduce oxygen demand and the recycling of nutrients in the Desjardins Canal. Dredging should be conducted with care to minimize resuspension of contaminants and a resulting further deterioration of water quality in the Canal and in Cootes Paradise.

- b. Consideration should be given to the installation of an aeration system upstream from Olympic Drive to provide additional improvement of the quality of the Desjardins Canal waters.
  - c. The point of discharge of the Dundas Sewage Treatment Plant effluent should be at the west end of the Desjardins Canal to avoid stagnation in the Canal and West Pond during the summer months.
3. Because of the presence of contaminants in the surrounding watercourses (in particular, the suspended solids in Spencer Creek) monitoring should be continued for several years to define more precisely the effects of these streams upon the desired uses of Cootes Paradise after the new sewage treatment system has been completed.

Additional sources of contamination of Chedoke Creek in the King Street vicinity may have to be monitored at the points of discharge.

## GLOSSARY (WATER)

INVERTEBRATES ----- as opposed to animals with backbone.

B.O.D. ----- Biological oxygen demand. Decaying organisms use available oxygen before live organisms.

PHYTOPLANKTON ----- microscopic plants.

EUTROPHIC ----- nutrients in abundant supply.

KJELDAHL N. ----- all forms of nitrogen - nitrites - nitrates - ammonia, etc.

COLIFORM ----- bacteria found in the intestines of animals

SUSPENDED SOLIDS ----- leaves and pollen, silt, plankton, sawdust.

TURBID ----- light and clearness disturbed.

SPECIES DIVERSITY ----- A measure of different kinds of organisms.