

## Indicators Chart Health of Great Lakes



Population growth and industrialization had a staggering impact on the aquatic and terrestrial environments of the Great Lakes Basin during the 20th century, compounding the effects of 250 years of human settlement. Home to one-fifth of the world's fresh water, the region has seen its population swell to more than 33 million people, while its natural habitats and the number and diversity of native species have continued to shrink.

To determine the sources and effects of various stresses on the Great Lakes, and the effectiveness of current policies and programs in protecting and restoring this unique and valuable ecosystem, Environment Canada and its partners

under the Great Lakes Water Quality Agreement have identified 80 indicators of environmental health—ranging from contaminant levels in Herring Gull eggs to native mussel populations. These indicators are grouped within seven environmental compartments: air, water, land, sediments, biota, fish and humans; as well as issue by issue. By analyzing a representative selection of these indicators, for which historical and current information was readily available, the third biennial *State of the Great Lakes—1999* report shows how the Great Lakes have changed over the past several decades.

While the report suggests little change over the two years since the previous report, it reveals several longer-term trends. One of these is a steady decline over the past 20 years in the concentrations of many key pollutants in the environment—likely due to banning and restrictions on their use. This has led to declines in levels of these contaminants in human tissues, with composite levels of seven persistent organochlorine pesticides in human breast milk decreasing by 80 per cent since 1975.

Several other environmental indicators reflect this trend, including levels of contaminants in fish tissue, which have been gradually declining for more than a decade. Fish tissue samples show concentrations of the banned pesticide DDT declining at a rate consistent with that of the early 1970s, but mercury concentrations seem to be fluctuating around 1980s levels. Total concentrations of polychlorinated biphenyls (PCBs) have also declined over the last two decades throughout the Lakes. Despite progress, however, concentrations of some contaminants are sufficiently high that consumption advisories remain in place for all five Great Lakes.

Contaminant concentrations in most colonial-nesting, fish-eating birds are also significantly lower than they were 25 years ago, and are currently at levels where gross ecological effects are no longer apparent. Measurements of organochlorine compounds (e.g., DDT, PCBs and some metals) in Herring Gull eggs indicate that most contaminants at most sites are continuing to decline at a rate similar to that over the last couple of decades, and that differences among sites are not as dramatic as they once were.

Air sampling indicates that concentrations of the organochlorine lindane have increased in precipitation in recent years, and may continue to do so due to increased applications of the pesticide throughout North America. Concentrations of dieldrin, on the other hand, have decreased overall. Despite 54-per-cent and 30-per-cent decreases in sulphur dioxide emissions in Canada and the United States, respectively, rain is still acidic throughout most of the Great Lakes region, where it affects inland lakes. Emissions are expected to remain at approximately current levels for the next 10 years, making it unlikely that the situation will improve in the near future.

Terrestrial habitats are also feeling the stresses of human impact. The lands within about a kilometre of the shoreline are not only ideal for diverse plant and animal communities, but also a focal point for human settlement, industry and recreation. By destroying, degrading, fragmenting or otherwise altering this habitat, these activities have a profound impact on the lakeshore's natural communities.

The total coastal wetland area is decreasing within the Basin, and the quality of remaining wetlands is being affected by added sediment loads caused mainly by activities such as agriculture, construction and logging. These loads can bury submergent vegetation and affect fish spawning and other functions, as well as carry high quantities of nutrients, pesticides and other chemicals. Loads in the St. Clair River area are relatively high compared to other Great Lakes wetland watersheds, mainly due to intensive agricultural activity.

At the same time, farmers are adopting more sustainable agricultural practices. Since 1993, almost 8 000 Ontario farmers have had Environmental Farm Plans approved that identify areas of concern on their land and the actions they will take to remediate them. Industries have also demonstrated their willingness to reduce pollutant loads into the Great Lakes, with open-water concentrations of phosphorus relatively stable since the mid-1980s and, in most cases, at or below proposed targets.

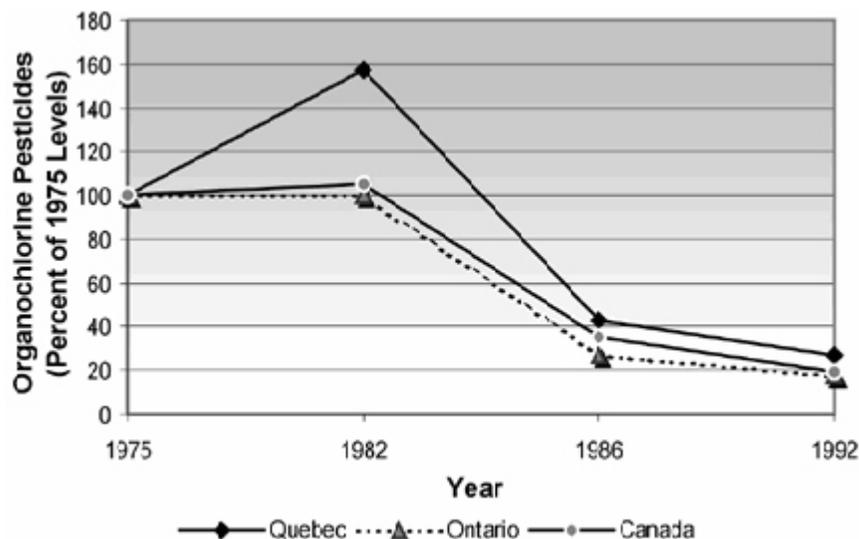
Remedial Action Plans for 42 Great Lakes Areas of Concern continue to be developed and implemented, including a recent effort at Cootes Paradise Marsh near Hamilton, Ontario. By reducing local point-source pollution and creating a barrier to prevent large carp from entering the marsh, more than 200 hectares of vegetation have already been restored, including wild celery, which has been absent from the area for 50 years. Other benefits have included improved water quality and the return of various bird and frog species.

One of the most important regions in North America for many species of birds, the Great Lakes Basin is witnessing the comeback of several once-threatened species. In the past, Peregrine Falcon populations were severely reduced by DDT contamination, which weakened the shells of their eggs and, therefore, lowered their hatching success. Annual Breeding Bird Surveys indicate that efforts to restore their populations through the release of hundreds of pairs of peregrines over the past 20 years are paying off. Now, the species' status in Canada has been upgraded from endangered to threatened nationally. Last August, the peregrine became the first bird to be removed from the endangered species list in the United States.

Giant Canada Goose populations, once thought to be extinct, have exploded since the 1980s, and the species is now considered a nuisance in the region. Regulatory agencies are raising hunting limits to control numbers, while others are involved in capture and relocation projects.

Near extinction in the 1970s due to toxic chemicals, the Double-Crested Cormorant has also staged a dramatic comeback, increasing its population 300-fold over the past three decades to 38 000 pairs. More numerous in the Great Lakes than at any time in its recorded history, the species' impact on fish populations is now being studied.

On the flip side, populations of some wetland-nesting birds, including the American Bittern and the Black Tern, are declining--possibly due to the loss of coastal wetland habitat. The tern, whose population has dropped 75 per cent since 1966, may also be suffering from the continued use of DDT on its wintering grounds in Latin America.



Graph showing aggregate mean concentrations of seven organochlorine pesticides in human breast milk for Ontario, Quebec and Canada, expressed as a percentage of 1975 levels.

Significant decreases in the number of sea lamprey--a non-native, eel-like species that feeds on other fish--have occurred in most areas of the Great Lakes since control measures were implemented in the early to mid-1960s. However, studies in the Great Lakes Basin show that other exotic species remain a significant stress to the

ecosystem. They can cause drastic changes to the food web and the cycling of contaminants, as well as declines in the diversity and density of native populations.

The accidental introduction of the zebra mussel has drastically reduced native clam populations, and could eliminate them completely in some areas within four or five years if the zebra mussel's population continues to grow at its current, rapid rate. The round goby, a non-native fish species whose population is expected to grow and expand, could also pose a threat to the biological community of the Lakes. Several other exotic species that have been discovered in some lakes--including the spiny waterflea and the rusty crayfish--could pose as yet undiscovered problems if they continue to spread.

By including analyses of a greater number of environmental indicators and adding data to the current list, the next State of the Great Lakes report, due out in 2001, will provide an even more complete picture of the way in which the Great Lakes ecosystem is responding to human influences--both good and bad.