



Canadian Water Quality Guidelines for the Protection of Aquatic Life

INTRODUCTION

The aquatic ecosystem is composed of the biological community (producers, consumers, and decomposers), the physical and chemical (abiotic) components, and their interactions. Within the aquatic ecosystem, a complex interaction of physical and biochemical cycles exists, and changes do not occur in isolation. Aquatic systems undergo constant change. However, an ecosystem has usually developed over a long period of time and the organisms have become adapted to their environment. In addition, ecosystems have the inherent capacity to withstand and assimilate stress based on their unique physical, chemical, and biological properties. Nonetheless, systems may become unbalanced by natural factors, which include drastic climatic variations or disease, or by factors due to human activities. Any changes, especially rapid ones, could have detrimental or disastrous effects. Adverse effects due to human activity, such as the presence of toxic chemicals in industrial effluents, may affect many components of the aquatic ecosystem, the magnitude of which will depend on both biotic and abiotic site-specific characteristics.

Canadian water quality guidelines are intended to provide protection of freshwater and marine life from anthropogenic stressors such as chemical inputs or changes to physical components (e.g., pH, temperature, and debris). Guidelines are numerical limits or narrative statements based on the most current, scientifically defensible toxicological data available for the parameter of interest. Guideline values are meant to protect all forms of aquatic life and all aspects of the aquatic life cycles, including the most sensitive life stage of the most sensitive species over the long term. Ambient water quality guidelines developed for the protection of aquatic life provide the science-based benchmark for a nationally consistent level of protection for aquatic life in Canada.

Canadian water quality guidelines for aquatic life are not restricted to a particular (biotic) species, but species-specific information is provided in the respective fact sheets, and, more detailed, in the supporting documents, so that the water quality manager and other users may determine the appropriateness of the guideline for the protection and enhancement of local species. A consistent approach according to the nationally approved, scientifically defensible protocol for the development of

water quality guidelines (freshwater and marine) for the protection of aquatic life was maintained. It is important to note that the national protocol emphasizes best scientific judgment in all cases, so the nature of the parameter and the variation in the quality and quantity of supporting information necessitates modifications to the derivation procedures from time to time.

This chapter contains (a) a summary table of the guidelines, listing the ones that either have been carried over from the original *Canadian Water Quality Guidelines* (CCREM 1987), revised since then, or newly developed; (b) the protocol (originally published in 1991); and (c) fact sheets for the respective substances and parameters of concern. These guidelines, therefore, replace the former recommendations published in CCREM (1987) and its appendixes. The fact sheets, and, more extensively, the supporting documents on which they are based, provide details for the derivation of the guidelines, physical-chemical properties, fate in the aquatic environment, use patterns, environmental concentrations, and toxicological data. Effects diagrams give a graphical summary of the relevant toxicity information, i.e., the most sensitive effects thresholds for the different taxonomic groups. The recommended guideline values are expressed to two significant figures, unless otherwise required or indicated by the original toxicity study. The guideline values apply to the total element or substance in an unfiltered sample, unless otherwise specified. It should be noted, however, that certain information about a parameter changes over time, and that the data presented in the fact sheets may not reflect current use patterns. The guidelines and their supporting documents will be reviewed and updated following national priorities and as further relevant information becomes available.

Information on the implementation of guidelines for the protection of aquatic life can be found in the Appendix IV of CCREM (1987). The CCME Task Group recognizes the importance of providing the most up-to-date scientific and technical guidance on implementing national environmental quality guidelines. For this reason, an update of Appendix IV, entitled "Scientific and Technical Guidance on Canadian Water Quality Guideline Implementation", is currently being written and will be released shortly.

For waters of superior quality or that support valuable biological resources, the CCME nondegradation policy states that the degradation of the existing water quality should always be avoided. The natural background concentrations of parameters and their range should also be taken into account in the design of monitoring programs and the interpretation of the resulting data.

In order to apply this scientific information, for example to recommend site-specific water quality objectives, many factors such as the local water quality, resident biotic species, local water demands, and other elements have to be considered. When developing or using guidelines and site-specific objectives for aquatic life, the aquatic ecosystem should be viewed as a whole unit, not as isolated organisms affected by one or a few pollutants. The aquatic ecosystem is part of a complex system with aquatic and terrestrial components and should not be studied in isolation.

Since the release of *Canadian Water Quality Guidelines* (CCREM 1987), it has been recognized that water quality guidelines for highly persistent, bioaccumulative substances such as polychlorinated biphenyls (PCBs), toxaphene, and DDT have a high level of scientific uncertainty and limited practical management value, and are, therefore, no longer recommended. For these substances, it is more appropriate to use the respective tissue residue guidelines and/or sediment quality guidelines.

Reference listing:

Canadian Council of Ministers of the Environment. 1999. Canadian water quality guidelines for the protection of aquatic life: Introduction. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

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It has been recognized that the definition of the terms criteria, guidelines, objectives, and standards varies widely among jurisdictions and users. For the purpose of this chapter, these terms will be defined as follows:

- **Criteria:** scientific data evaluated to derive the recommended limits for water uses.
- **Water quality guideline:** numerical concentration or narrative statement recommended to support and maintain a designated water use.
- **Water quality objective:** a numerical concentration or narrative statement that has been established to support and protect the designated uses of water at a specified site.
- **Water quality standard:** an objective that is recognized in enforceable environmental control laws of a level of government.

References

CCREM (Canadian Council of Resource and Environment Ministers). 1987. Canadian water quality guidelines. Prepared by the Task Force on Water Quality Guidelines.

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