

# Foreword



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The fragmentation of habitats has been acknowledged for 30 years as one of the five main factors of biodiversity loss, in conjunction with pollution, overuse of natural resources, invasive species and climate change.

Since then, public environmental policies have strived to restore the connectivity of natural habitats. That is particularly the case for water policy, which has made the ecological continuity of rivers a central element in policy planning, a quality element for monitoring programmes and one of the basic guidelines for river-basin management plans (RBMP). The time has thus come for decisions, with the resulting controversy given that any attempt to modify existing discontinuities impacts our perception of landscapes and various uses of aquatic environments. Given that there is, on average, at least one obstacle for every five kilometres of river in continental France, this issue concerns the entire country, its population and all water managers. That explains why it was necessary to have a single set of standardised procedures for selecting the work to be done on the basis of objective and comparable data. For the ecological continuity of fish, we now have the ICE method presented in this book, which describes obstacles in rivers and assesses the capacity of fish to overcome those obstacles during their upstream migration.

The design, development and national deployment of this method required five years of intense, collective effort on the part of numerous scientists and the Onema local and regional offices. The method is the result of an outstanding multi-disciplinary approach involving both hydraulics and ecology, two disciplines that some people might see as irreconcilable, but that must work together synergistically in the effort to restore environments.

The publication of this book in the *Knowledge for action* series marks the transition from the team that developed the method to the people who will use it to acquire better understanding of ecological continuity in rivers and as an operational tool in implementing water policy and enhancing biodiversity.

# Preface



**F**ragmentation of natural habitats is one of the main causes of biodiversity loss. Obstacles to flow in rivers result in degradation of aquatic environments and consequently impact the living communities and the ecological processes in those environments.

Given the vast array of regulatory requirements (Water framework directive, Law on water and aquatic environments, Grenelle environmental agreement, European eel regulation, etc.) and the many environmental issues involved in restoring the ecological continuity of aquatic environments, Onema decided to create a "tool" to assess and quantify the impacts of hydraulic structures on the free movement of fish.

The ICE protocol is a national method to produce information on ecological continuity intended for people involved in environmental work and territorial planning, scientists, teachers, engineering firms and all other interested persons.

It is based on a major review of the current scientific knowledge and on the scientific and technical progress made by a work group composed of French (Onema and Ecogea) and Belgian (University of Liège) experts in this field.

The purpose of this document is to present the issues involved in ecological continuity for fish species, the scientific principles underlying the development of this assessment method and the standardised protocol produced by the work. The method consists of a simple and objective means to assess the risks to upstream migration caused by the main types of physical obstacles for numerous common species of fish in the rivers of continental France. The assessment is based on a comparison of the typological, geometric and hydraulic characteristics of obstacles with the physical capabilities of the fish species analysed.



## NOTE

When a hydraulic facility is equipped with a fish pass, a "pre-assessment" of the pass should also be carried out under normal operating conditions (normal discharge and maintenance conditions). The purpose of the pre-assessment is to rapidly identify those fish passes that are clearly not well suited to the species in question and for which a more in-depth assessment may be necessary.

However, the ICE protocol is not intended as an assessment of the hydraulic functioning of the fish pass nor is it a means to check the conformity of the pass with applicable regulations.

Concerning downstream migration, given the complexity of the biological mechanisms involved and the in-depth knowledge required on the local hydrology, on draw-off conditions and on the hydromechanical characteristics of each structure, the ICE protocol does not assess the passage of structures in the downstream direction.