

**PI Name / Short Description:** Wetland fish - abundance index (Lower St. Lawrence River) [E21]

**Technical Workgroup:** Environmental TWG

**Researched By:** de Lafontaine, Y., and F. Marchand

**Modeled By:** Jean Morin and LTI (DePinto, Redder)

**Performance Indicator Metric:** The metric is the summed abundance of a fish guild consisting of 8 fish species reproducing in the wetland habitats of the lower St. Lawrence River. The metric was derived from the annual catch of adult fish captured between May 15 and October 31 every year at the experimental fishery at St-Nicolas since 1975. The units of the metric are the total number of fish (composing that guild) captured in a given year. The 8 species are: bowfin, brown bullhead, northern pike, yellow perch, longnose gar, pumpinkseed, quillback, rock bass.

**Ecological Importance/Niche:** The metric represents a selected group of 8 fish species that are known to be closely dependent on the wetland habitats for their reproductive behavior and long-term population survival. Some of these fish species are commercially harvestable and others consist of forage fish which are thought to be important for top predators. Given the expected impact of water levels fluctuations on wetlands, this metric is considered an important indicator of the response at igher trophic levels within the ecosystem.

**Temporal Validity:** The metric uses daily captures records collected between May 15 and October 31 every year since 1975. The metric was significantly associated with water levels attributes during spring in the years preceeding the catch. This would suggest that water level fluctuations would affect fish species during spring spawning activity and during their first year of life.

**Spatial Validity:** The metric was developed in using fish captures made at an experimental fishery located at the downstream end of the lower St. Lawrence River. However, tagging study has demonstrated that fish collected at St-Nicoals exhibit seasonal migrations between Lake St-Pierre and Quebec City. It is therefore assumed that fish captures recorded at St-Nicolas are representative of populations inhabiting the river sector downstream of lake St-Pierre Islands.

**Hydrology Link:** The metric was developed using statistical empirical evidence linking the metric values to attributes of water levels recorded at the Jetty#1 in Montreal. It is assumed that water levels fluctuations will affect the reproductive success of wetlands fish. While many factors are probably involved, no experimental study has searched to explain and validate the empirical relationship between the hydrology and the biological response.

**Algorithm:** The metric is positively linked to the spring water level and positively linked to the coefficient of variation of water level in spring. This indicates that higher

water level during spring would favor reproductive success of wetland fish and that high variability (high CV) in spring levels also represent favorable conditions. The total variance explained by the empirical model (using 3 dependent variables) is 65%.

**Calibration Data:** Data used to develop the PI metric were all obtained from daily catch records during 28 consecutive years.

**Validation Data:** The model can be tested in the future years by compiling and using catch data from the experimental trap fishery at St-Nicolas.

**Documentation & References:** Information relative to the PI is found in: de Lafontaine, Y., and F. Marchand, 2004. *Hydrological fluctuations and productivity of freshwater fish in the St. Lawrence River*. Report presented to IJC.

**Risk and Uncertainty Assessment:** Unlike what was done for another PI “Total fish abundance” (de Lafontaine and Despatie, 2004), there has been no sensitivity analysis done with the “Wetland Fish” PI. The metric was developed using data available from 1975 to 2002. Extrapolation outside the range of water level variability observed during that time period should be done with caution and would not be recommended, since the linearity of the PI response is not proven.