PI Name/Short Description: Largemouth Bass – young-of-year (YOY) recruitment index (Upper St. Lawrence River) **[E16]**

Technical Workgroup: Environmental TWG

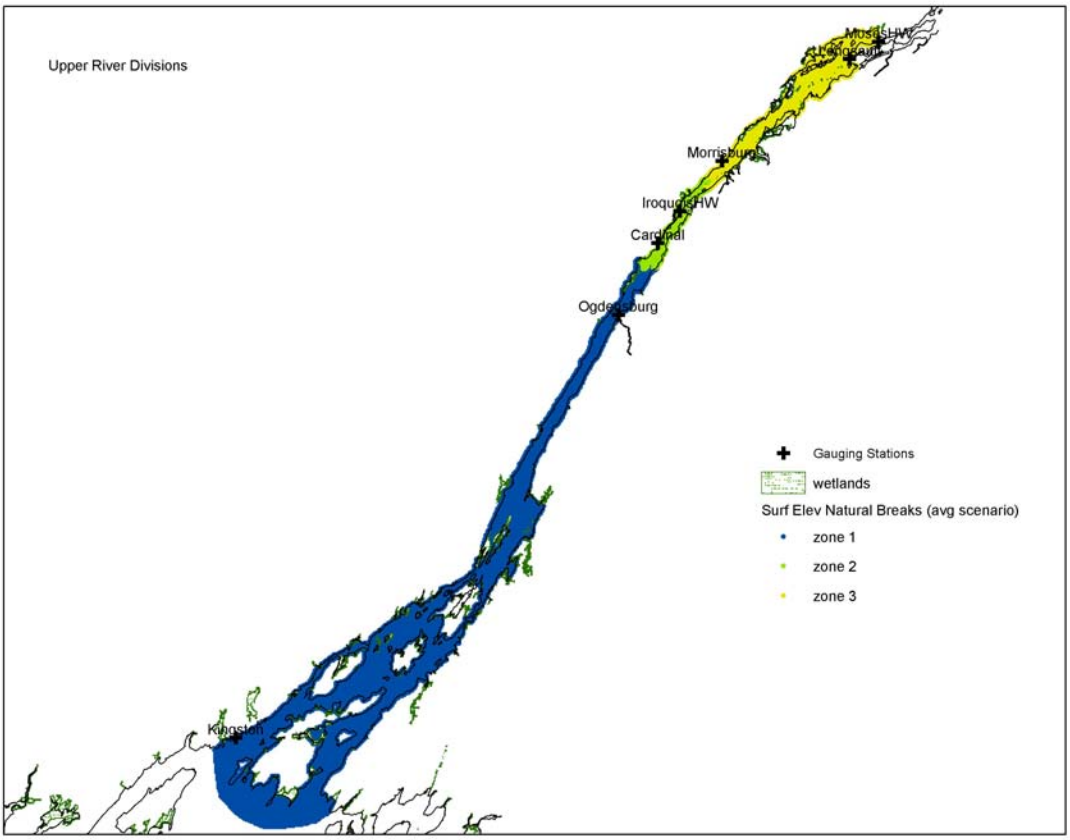
Researched by: Minns, Doka, (Chu, Bakelaar, Leisti)
Modeled by: Moore, DePinto (LTI), Redder (LTI)

Performance Indicator Metric: This performance indicator provides and index of YOY recruitment for largemouth bass in the Upper River Zones 1, 2, and 3 reach groups located in the Upper River. A daily average of the temperatures within the Upper River Zones 1, 2, and 3 areas is used to estimate daily growth of largemouth bass parameterized for specific life stages. In addition, WSA is used to apply density-dependent effects on growth and survival based on space requirements at different life stages. (See WSA PI documentation for additional information.)

Ecological Importance/Niche: Largemouth bass is an important predator that is a recreationally important species, spawning in summer and belonging to the warm water fish guild in nearshore systems.

Temporal Validity: Largemouth bass recruitment is computed on an annual basis and is affected by daily habitat supply results. Each year the total surviving recruits or young-of-the-year are tallied. Currently, a ratio of largemouth bass recruitment between baseline (1958DD) and proposed regulation plans is calculated annually and then the ratios are averaged and a coefficient of variation is calculated over the 101-year simulation period to generate two metrics for comparison.

Spatial Validity: This largemouth bass performance indicator is valid for a contiguous group of 959 reaches and 250 wetlands that comprise the Upper River Zone 1 reach group, and 380 reaches and 85 wetlands that comprise the Upper River Zones 2 and 3 reach groups. Each reach group was selected to represent temperature zones, sampled wetlands, and different geographic regions across Upper River. The size of the reach group area is adequate for supporting distinct largemouth bass populations. Population estimates can be combined across reach groups, where appropriate, based on weightings determined by responsiveness to hydrologic changes. The population modeling reach groups were selected based on habitat variables such as temperature zone, presence of sampled wetlands and represent general geographic zones across the lake. The size of the reach group area is adequate for supporting distinct largemouth bass populations. WSAs can be combined across reach groups with a region, where appropriate, based on weightings determined by responsiveness of the PI to hydrology.



Hydrology Link: Daily weighted suitable area, partly a function of hydrology, is used to calculate the density-dependent effects on growth and mortality of the appropriate life stages of largemouth bass in the Upper River Zones 1, 2, and 3 study area.

Calibration Data: No specific calibration data are available for largemouth bass recruitment, but the bioenergetic and mortality rates used are based on a large body of literature and information available on the species in the Great Lakes.

Validation Data: No specific validation datasets are available for weighted suitable areas. Temperatures used in the habitat supply calculations have been validated using simulated data from different thermal models for Upper River or empirical datasets specific to the Upper River Zones 1, 2, and 3 study area, when available.

Algorithm: Specific equations and algorithms used in the calculation of weighted suitable areas have been documented in IJC Lake Ontario – St. Lawrence Study reports and are too extensive to list here. The equations are part of a habitat supply submodel and database of the IERM for largemouth bass in Upper River.

Documentation & References: The documentation and details of the algorithms used to calculate this PI are summarized in:

Minns, C.K.; S. Doka; C. Bakelaar; C. Chu; K. Leisti, and J.E. Moore. 2005. Year 4 Final Report for Burlington Fish Habitat & Modelling Group.

Risk and Uncertainty Assessment: Population models assume prey is abundant and growth is limited by density-dependent effects and temperature. Uncertainties exist in our density-dependent effects on growth, as currently growth decreases as densities increase. Currently cumulative uncertainties have not been estimated but errors and uncertainties exist at four levels of the analysis: spatial habitat information, habitat models, weighted suitable area calculations, and population models. The relative differences between scenarios should be equally affected by these cumulative uncertainties.