

**PI Name/Short Description:** Largemouth Bass – young-of-year (YOY) recruitment index (Lake Ontario) [E6]

**Technical Workgroup:** Environmental TWG

**Researched by:** Minns, Doka, (Chu, Bakelaar, Leisti), Casselman, Farrell

**Modeled by:** Moore, LTI (Redder, DePinto)

**Performance Indicator Metric:** This performance indicator provides an index of YOY recruitment for Largemouth Bass in Lake Ontario. A daily average of the temperatures within the selected 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.)

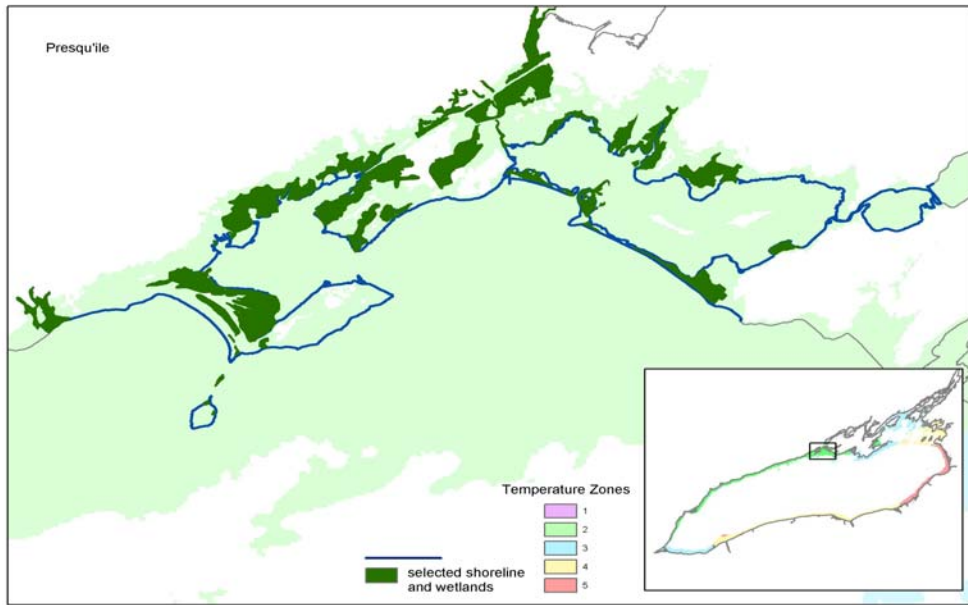
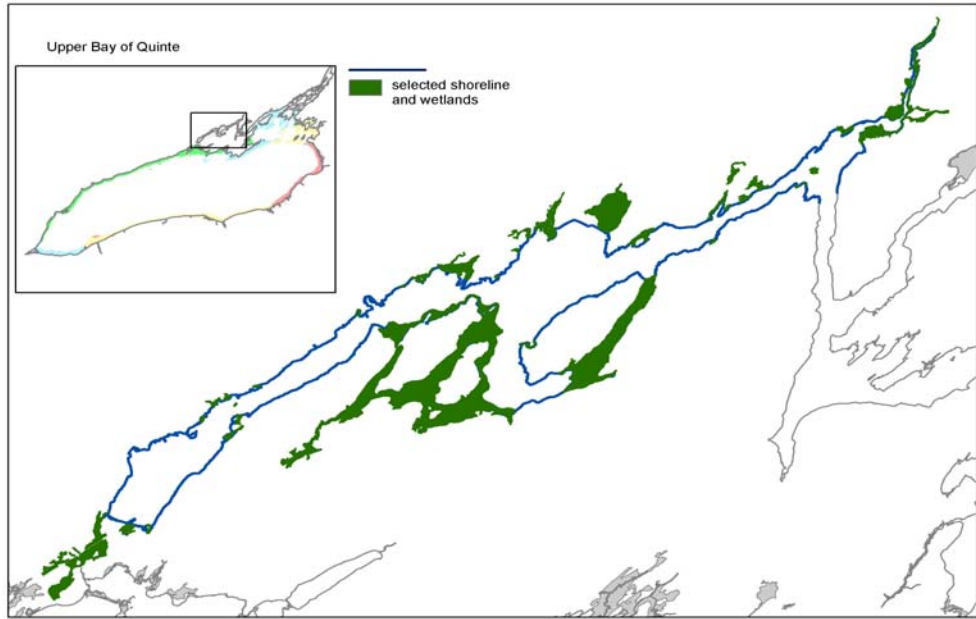
**Ecological Importance/Niche:** Largemouth bass is an important predator that is a recreationally important species, spawning in summer and belonging to the warm water fish guild in nearshore systems.

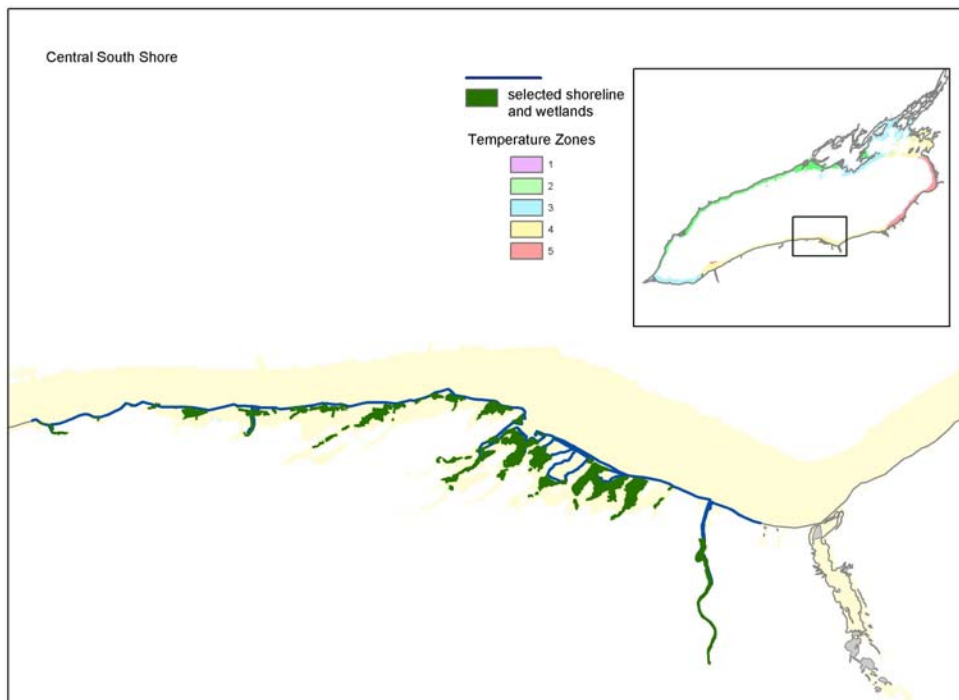
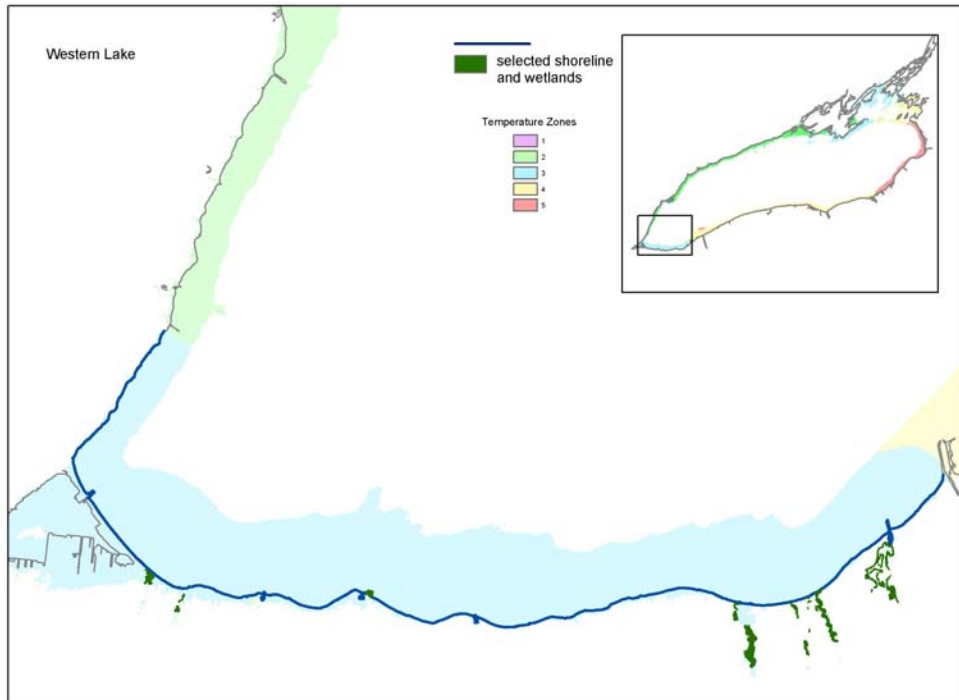
**Temporal Validity:** Largemouth bass recruitment is computed on an annual basis and is affected by daily habitat supply results. Each year the total surviving recruits or young-of-the-year are tallied. Currently, a ratio of largemouth bass recruitment between baseline (1958DD) and proposed regulation 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.

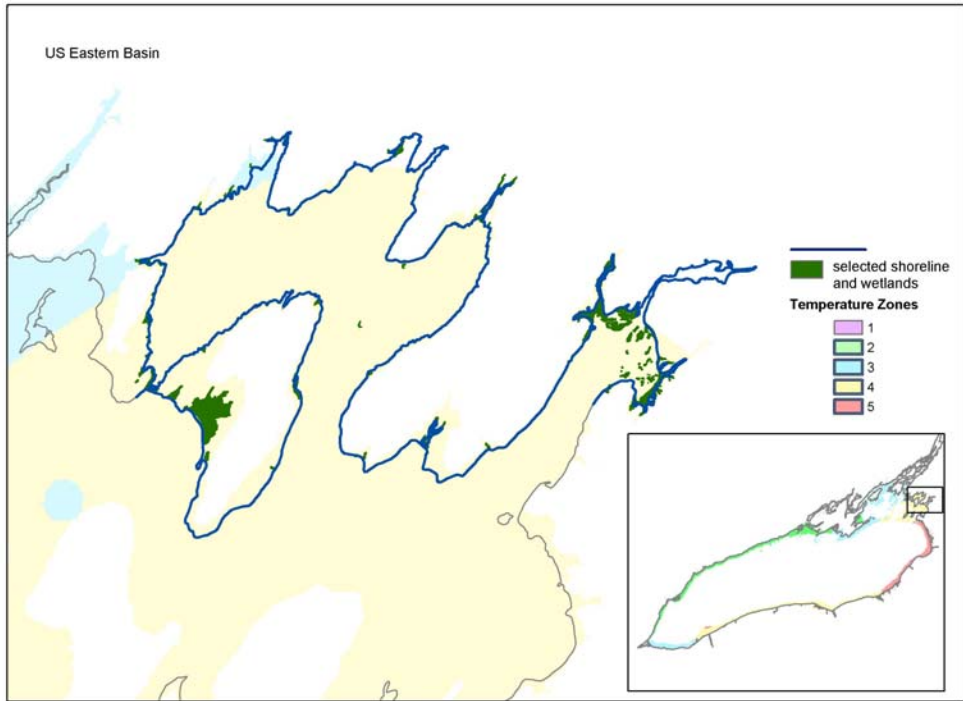
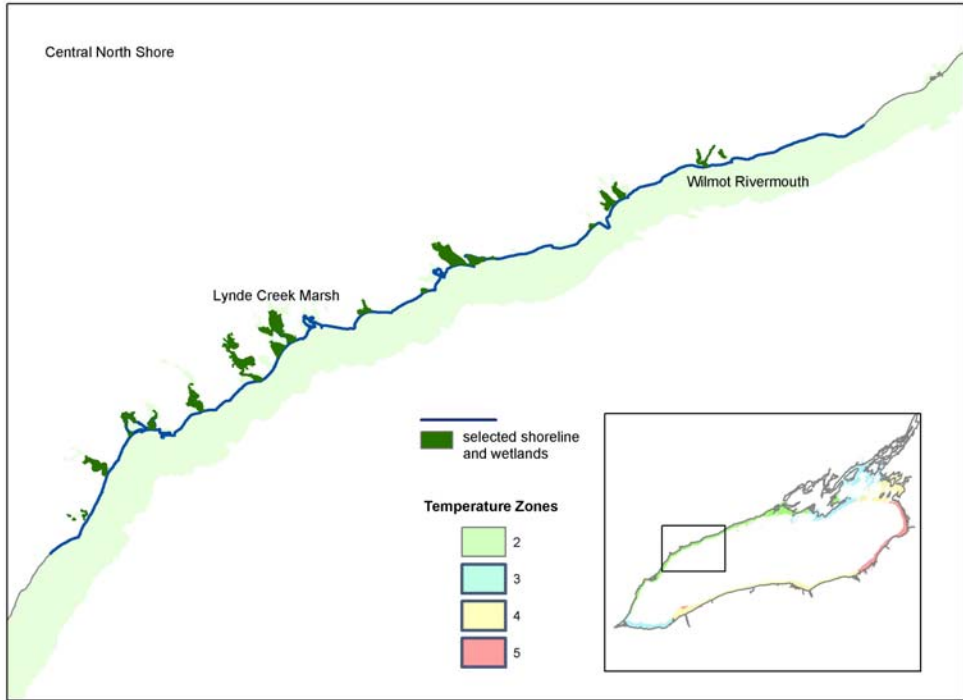
**Spatial Validity:** This largemouth bass performance indicator is valid for the following six contiguous groups, with the number of reaches and wetlands indicated:

- Bay of Quinte: 279 reaches and 56 wetlands
- Presquile: 139 reaches and 31 wetlands
- North Central Shore: 100 reaches and 19 wetlands
- West Shore: 83 reaches and 9 wetlands
- South Central Shore: 102 reaches and 33 wetlands
- Outlet Basin: 141 reaches and 51 wetlands

Each reach group was selected to represent temperature zones, sampled wetlands, and different geographic regions across Lake Ontario. 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 selected study areas.

**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 Lake Ontario or empirical datasets specific to the study areas, 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 Lake Ontario.

**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.