

PI Name/Short Description: High Vegetation, 24C fish guild – spawning habitat supply (Lake Ontario) [E3]

Technical Workgroup: Environmental TWG

Researched by: Minns, Doka, (Chu, Bakelaar, Leisti)

Modeled by: Moore, LTI (DePinto, Redder)

Performance Indicator Metric: This performance indicator represents the annual habitat supply (weighted suitable area) for the HV24 guild spawning in the Lake Ontario reach group located in the Lake Ontario. Emergent vegetation, submergent vegetation, substrate composition, water levels, and reach elevations (used to calculate water depths) are used to compute habitat suitability and supply for the HV24 guild in the Lake Ontario study area. Temperature is used to calculate the appropriate time window for the annual calculations.

Ecological Importance/Niche: The members of the HV24 guild occupy shallow water (<20 m or <65.62 ft) during their life histories and prefer spawning in high vegetation and ≥ 24 degrees C (75.2 degrees F). The species that comprise the guild have been recorded in the Lake Ontario & St. Lawrence systems and their species-specific habitat requirements have been used to calculate weighed suitable areas in the appropriate part of the system. Specific habitat requirements used for calculations are available (see report section).

Temporal Validity: HV24 spawning habitat supply is computed on a daily basis and then summed over an appropriate thermal window to generate annual habitat supply results (in units of hectare-days). Currently, a ratio of annual habitat supplies 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.

Spatial Validity: This HV24 habitat supply performance indicator is valid for a contiguous group of 2455 reaches and 541 wetlands that comprise the Lake Ontario reach group. The weighted suitable area for different fish guilds, based on thermal and vegetation preference during spawning, are calculated for all reaches within Lake Ontario.

Hydrology Link: Habitat suitability for the HV24 guild spawning, which is used to compute weighted suitable area in hectare-days, depends on the interaction between emergent vegetation, submergent vegetation, substrate composition, and water depth in the Lake Ontario study area. Water depth inputs for the habitat suitability model are calculated daily, based on interpolated quarter-monthly water levels. WSAs can be combined across life stages, where appropriate, based on weightings determined by their responsiveness to hydrology.

Calibration Data: No specific calibration data are available, but relationships between habitat suitability and emergent vegetation, submergent vegetation, substrate composition, depth, and temperature are based on a large body of literature and information available on the habitat requirements of the HV24 guild spawning. Individual habitat components, such as shoreline substrate type and temperatures, have been calibrated with different sources of information.

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 Lake Ontario 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 the HV24 guild 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: Currently cumulative uncertainties have not been estimated but errors and uncertainties exist at three levels of the habitat supply analysis: spatial habitat information, habitat models, weighted suitable area calculations based on their suitability and thermal windows. The scenarios should be equally affected by these cumulative uncertainties and also the relative differences used for comparisons. Therefore we are confident in the relative habitat supply effects and predictions.