Habitat Suitability Modelling

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Linking hydraulic function with ecological or biological suitability has historically been completed through qualitative assessment, or expanded to need complex indices, biological indicators and highly detailed field data collection. This presentation will show how habitat suitability modelling can be simplified and quantify the benefits of channel restoration projects. Using geometry and substrate information gathered as part of channel surveys, a two-dimensional hydraulic model is developed to assess the design changes under varying streamflow. The two-dimensional model contains a triangular mesh where each node considers the hydrodynamics (i.e. water velocities and depth) of a reach, as well as channel substrate. These hydraulic properties are then used to develop a functional relationship between discharge and optimum habitat through a weighted useable area approach.

The combination of velocity, depth and substrate are initially used to develop habitat types (e.g. pool, riffle, run etc.). These habitat types are then linked to suitability rankings for various species and life-cycle conditions during seasonal periods. This method shows how the needs of young of the year (YOY) and juveniles, which may prefer slow moving, shallow water habitats can be ranked independently or combined with the needs of adults which may prefer deeper water with higher velocities. While there is still much uncertainty in the relationship between hydraulic conditions and habitat suitability, species with determined suitability curves or rankings can be used to represent a population group and signify as indicators for others.

Using a two-dimensional hydraulic model to assess the differences in aquatic habitat between a pre and post design flow, the existing degree of aquatic habitat degradation (if any), and the maximum level of beneficial aquatic habitat as a result of the design, can be supported. This presentation will show how the results of the habitat suitability modelling can provide designers, clients and stakeholders with visual and numerical support of biological improvements from channel design and restoration projects.