Over 150k dams and road culverts in the Great Lakes region prevent migratory fishes from reaching spawning grounds every year. Opportunistic and poorly funded decisions about barrier removals can be unnecessarily costly and even detrimental. Large, freely available GIS data, increased computing power, and understanding of fish biology make large scale optimal decision making possible.

**INTRODUCTION**

Small scale operations (i.e. Counties) prioritize removal efforts to maximize return on investment. Coordinating small scale operations at a larger level (i.e. watershed or state) to maximize returns taking into account neighboring actions. Binational organizations assessing decadal barrier removal priorities. Maintaining an up-to-date database of barrier locations and conditions.

**APPLICATIONS**

A linear mixed-integer optimization model traverses each river network and calculates the accessible habitat upstream of every barrier. The model tracks the cumulative passability at every barrier and calculates the increase in passability obtainable by removing that barrier. 1.8 million decision variables, 2.5 million equations.

Preprocessing of dendritic solution tree reduces solution time to seconds. CPLEX solver used to determine the optimal solution.

**WEB INTERFACE**

In order to make the model accessible, we developed an online application that allows users to:

- visualize barriers and hydrography with decision-relevant data fields
- manipulate, run, store, recall, and compare different optimization models for different potential scenarios of barrier removal
- edit underlying data, allowing them to integrate local knowledge in order to improve data fidelity

**GAMS OPTIMIZATION**

Preprocessing of dendritic solution tree reduces solution time to seconds. CPLEX solver used to determine the optimal solution.

**COLLABORATIONS**

Application is online at www.greatlakesconnectivity.org