FishVis Mapper - Beta Version

UPPER MIDWEST AND GREAT LAKES LANDSCAPE CONSERVATION COOPERATIVE
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➢ Description

Fish Vis Mapper presents possible changes in fish species occurrence in response to global climate change. Global climate change effects on fish species occurrence in streams were evaluated by means of a number of linked general circulation, groundwater recharge, stream temperature, and streamflow exceedance models.

General circulation models (GCMs) : Fish Vis Mapper results are based on an emissions scenario known as "A1B", developed by the Intergovernmental Panel on Climate Change (for more details see: http://www.grida.no/publications/other/ipcc_tar/?src=/climate/ipcc_tar/wg1/343.htm#box91). The A1B emissions scenario assumes a balanced approach to energy production is followed (fossil versus non-fossil) for the remainder of this century. The A1B emissions scenario was used as input to 13 general circulation models that provide potential air temperature and precipitation patterns to the remaining models.

Groundwater recharge model: The USGS Soil-Water-Balance (SWB) model was used to estimate changes in potential groundwater recharge in response to projected air temperature and precipitation patterns for Wisconsin.

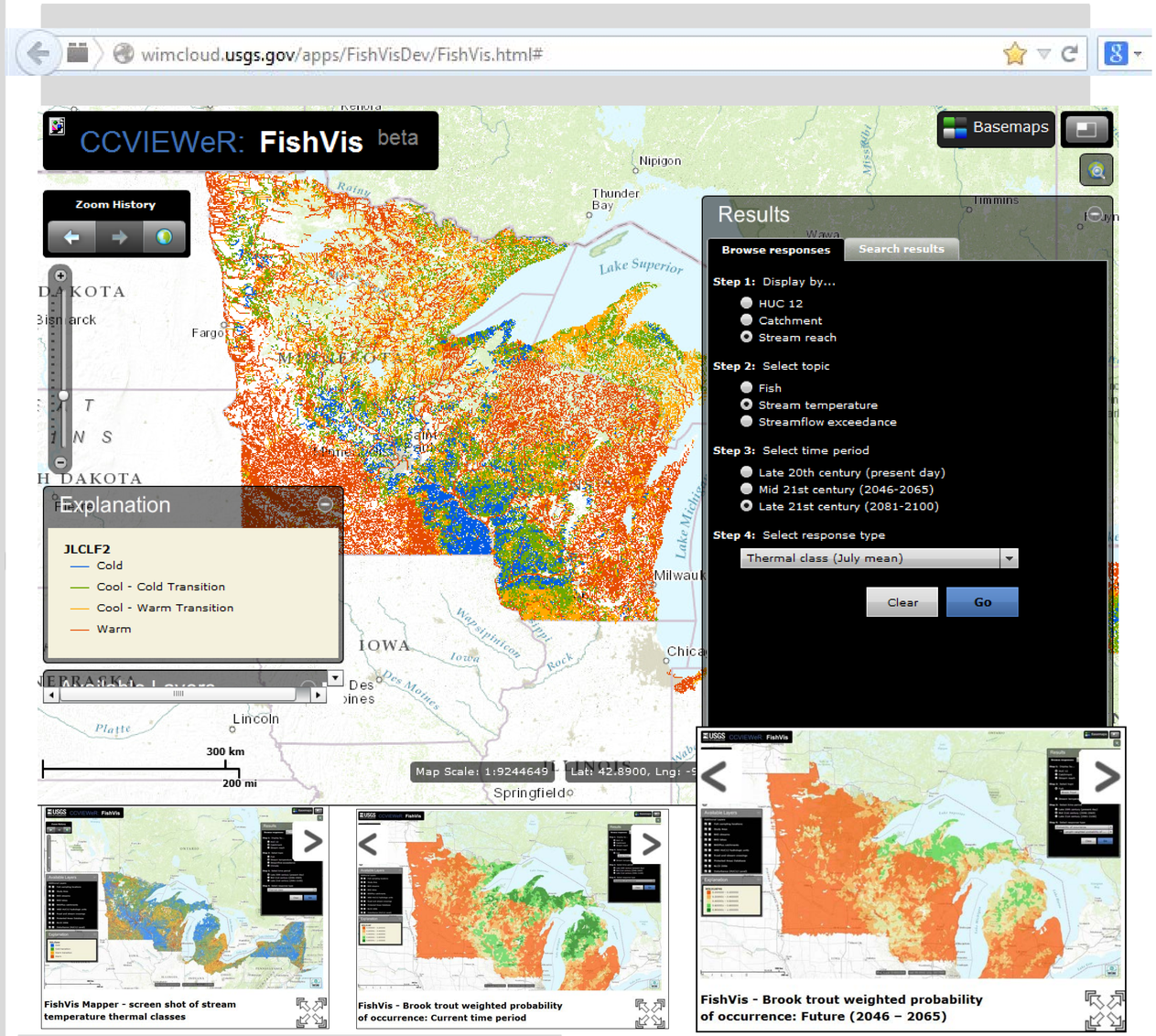
Stream temperature model: An artificial neural network model incorporating landscape factors, air temperatures, and potential groundwater recharge was calibrated to observed stream temperatures. The model was used to estimate potential for changes in stream temperature for individual stream segments.

Stream flow model: Multiple linear regression models were created to relate landscape and stream network characteristics with precipitation amounts in order to provide estimates of streamflow exceedance for specific parts of the year: annual median, 90% exceedence flow for the month of August, and 10% exceedence flow for the month of April.

Fish habitat model: Individual fish presence/absence models for 14 species of interest were calibrated to existing fish sample collection data. Fourteen species were selected that occur across the region and represent three thermal classes (cold, cool, and warm water streams). The fish habitat models generally include landscape, streamflow, stream temperature, and climate variables as drivers.

The selected species include:

Thermal Class – Cold	Thermal Class – Cool	Thermal Class – Warm
Brook Trout	Blackchin Shiner	Common Carp
Brown Trout	Brook Stickleback	Green Sunfish
Mottled Sculpin	Northern Hogsucker	Iowa Darter
Rainbow Trout	Northern Pike	Smallmouth Bass
	White Sucker	Stonecat



FishVis Mapper - screen shot of stream temperature thermal classes

FishVis - Brook trout weighted probability of occurrence: Current time period

FishVis - Brook trout weighted probability of occurrence: Future (2046 – 2065)

Vulnerability Assessment
Vulnerability of fish species to climate change was evaluated by comparing predicted species occurrence under current conditions to predicted fish species occurrence under future climate conditions for 13 climate models and 14 fish species using two measures: 1) vulnerability, opportunity, and sensitivity, and 2) probability of occurrence and change in probability of occurrence.

1) Vulnerability – Opportunity – Sensitivity: The terms vulnerability, opportunity, and sensitivity were adopted to describe loss of species, gain of species, and loss or gain of species for individual stream reaches, respectively and were calculated for individual species and for species thermal classes.

Vulnerability (loss of species): Percent of climate models that predict species occurrence will change from species being Present (P) to species being Absent (A)

Opportunity (gain of species): Percent of climate models that predict species occurrence will change from species being Absent (A) to species being Present (P)

Sensitivity (loss or gain of species): Percent of climate models that predict species occurrence will change from species being Absent (A) to species being Present (P) or from species being Present (P) to species being Absent (A)

2) Probability of Occurrence: Probability of occurrence is estimated for each fish species under the current time period and for 13 general circulation model for two future time periods. An average probability of occurrence is calculated by averaging the resulting probabilities for each of the general circulation models for each stream reach. Change in the probability of occurrence is calculated by subtracting the current probability of occurrence from the future probability of occurrence.

➢ Fish Vulnerability Assessment

In addition, for each stream reach and thermal class we calculated:

- Number of species lost Number of species gained
- Number of species lost or gained
- Percent of species lost
- Percent of species gained

We have also calculated some summary statistics for HUC 12s that include:

- Length-weighted probability of occurrence
- Length-weighted change in probability of occurrence
- Miles of species occurrence
- Miles of species lost
- Miles of species gained
- Miles of species lost or gained
- Percent miles of species occurrence
- Percent miles of species lost
- Percent miles of species gained
- Percent miles of species lost or gained

A new "Search" tool has been added that allows the user to query (e.g. to filter results based on reach, catchment or Huc12; geographic area; etc.) and display only those that meet selected criteria.

Assumptions

The stream temperature and habit at changes presented in this tool are not predictions of what will happen in the future so much as they are representations of what might happen given a set of assumptions about future energy development and use.

FishVis is currently in a beta phase and is being developed by the U.S. Geological Survey Wisconsin Internet Mapping Team.

Acknowledgements & Disclaimers

Poster prepared and submitted informally on behalf of the FishVis collaborative effort by **Kristen Blann, Freshwater Ecologist, The Nature Conservancy in MN, ND, and SD**. All errors and omissions are the fault of the preparer.

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For more information and updates on **FishVis** or the underlying datasets and models, visit the web site above, or contact Jana Stewart, USGS, jsstewar@usgs.gov 608-821-3855