

# Decision-support for Ecological Flow Alterations in the Great Lakes and beyond...



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Assistance: M. Slattery, C. Luukkonen, and D. Holtschlag, and others helped with model development, data management, and mapping

Data Providers: fishery management and conservation agencies and geology groups.

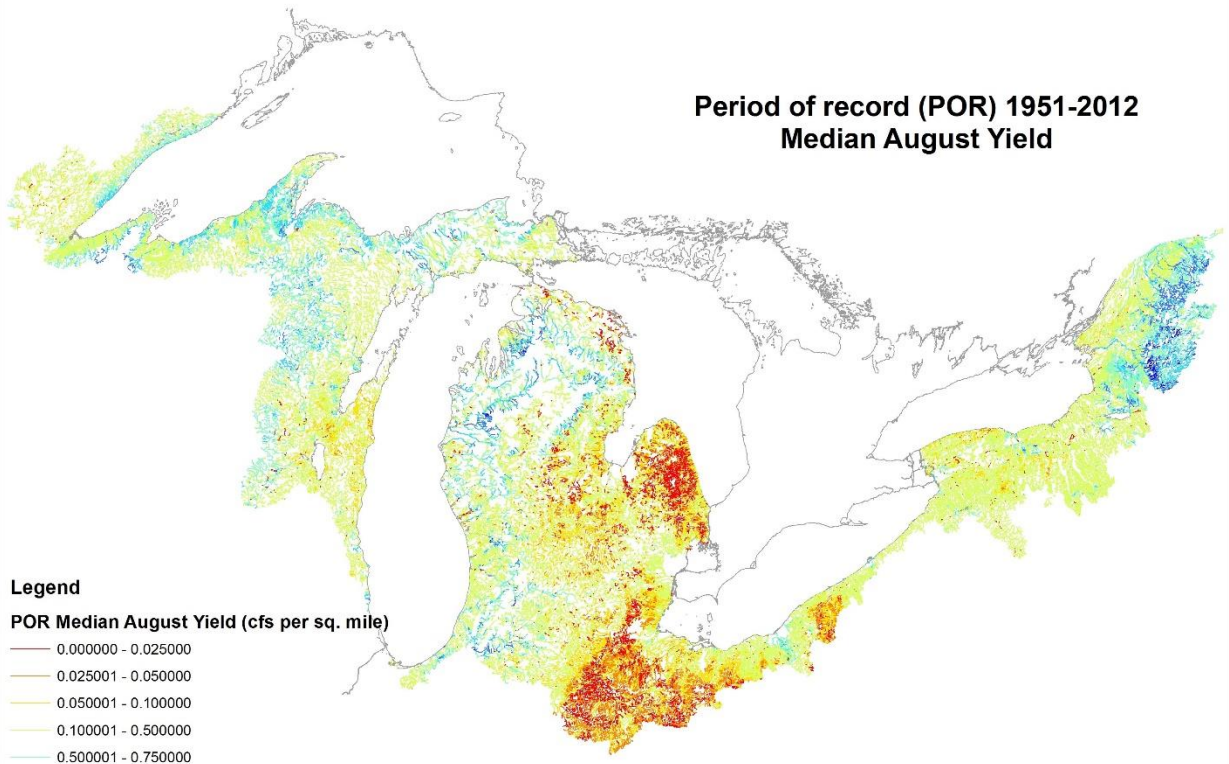
# The Question: How to get the biggest bang for the buck in resource restoration or protection?

- Fish population health depends on Lotic flow: **No water, No fish** – but what is the best flow for fish?



AFINCH Flows  
with updated HUC 401/402 model

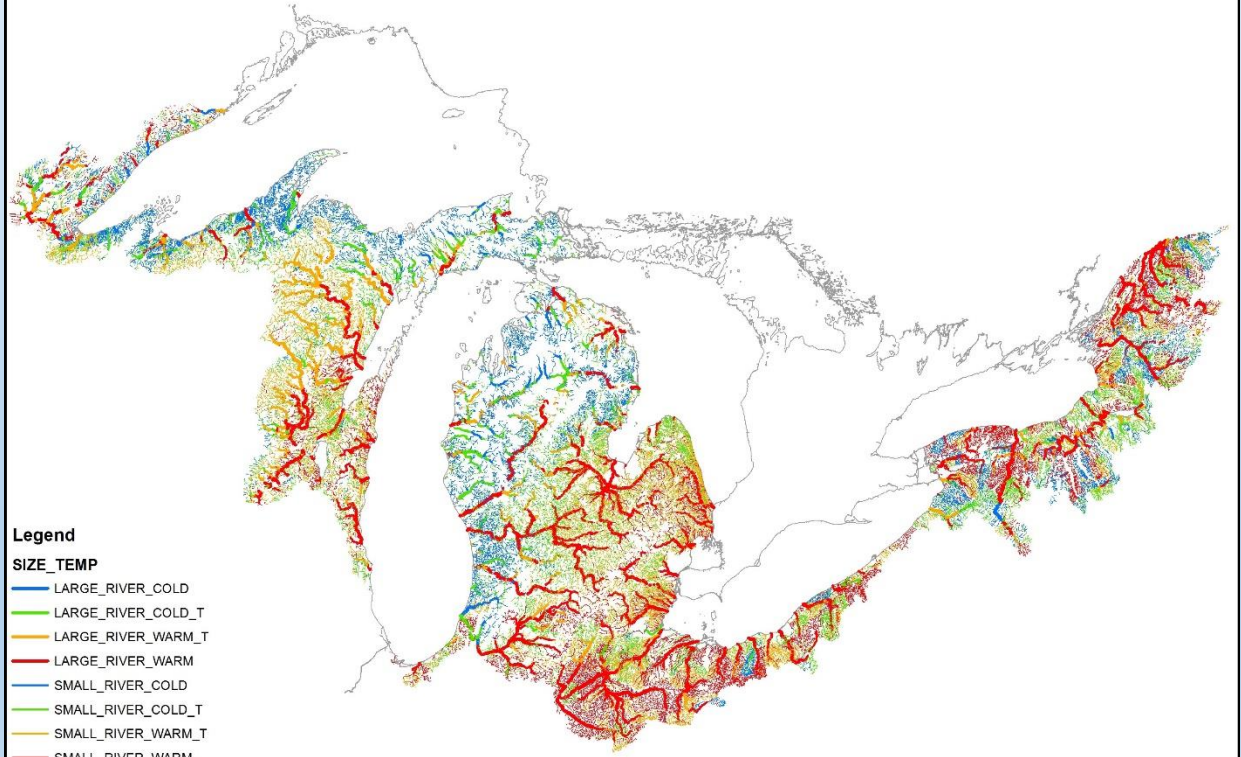
Period of record (POR) 1951-2012  
Median August Yield



- Legend**  
POR Median August Yield (cfs per sq. mile)
- 0.000000 - 0.025000
  - 0.025001 - 0.050000
  - 0.050001 - 0.100000
  - 0.100001 - 0.500000
  - 0.500001 - 0.750000
  - 0.750001 - 1.000000
  - 1.000001 - 1.500000
  - 1.500001 - 2.082961

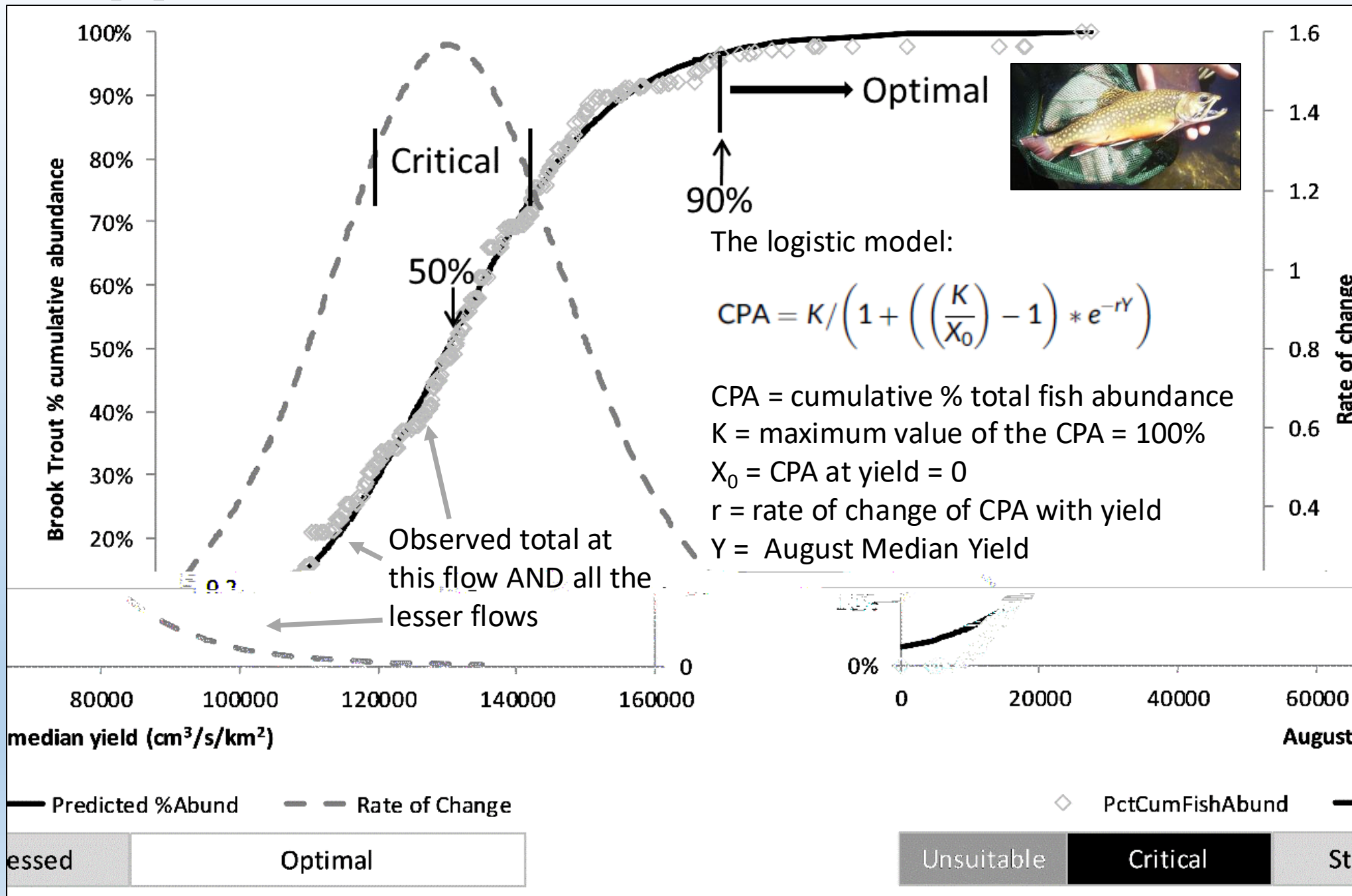
Opportunity to provide  
decision-support

Ecoflows Size-Temperature Classes

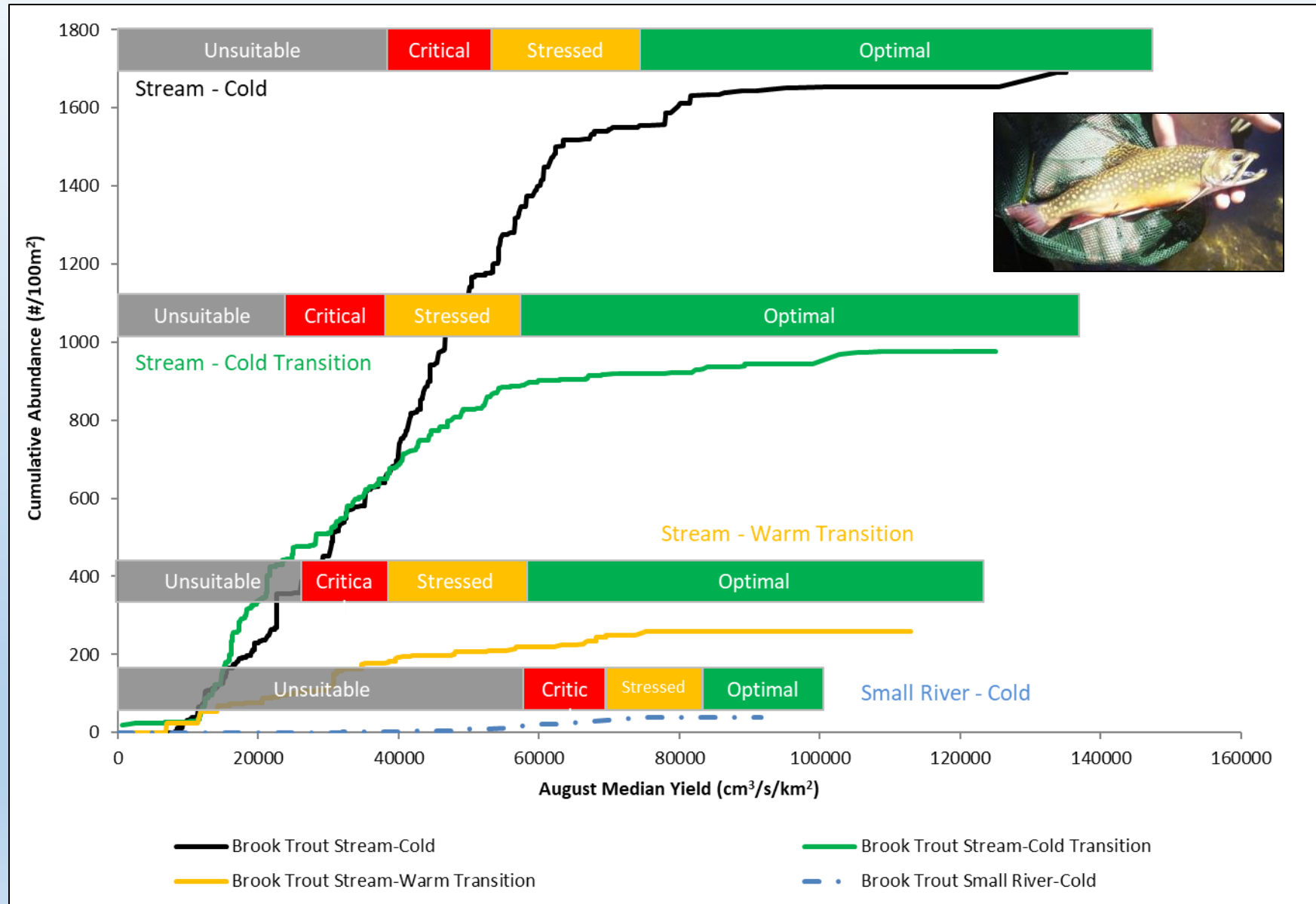


- Legend**  
SIZE\_TEMP
- LARGE\_RIVER\_COLD
  - LARGE\_RIVER\_COLD\_T
  - LARGE\_RIVER\_WARM\_T
  - LARGE\_RIVER\_WARM
  - SMALL\_RIVER\_COLD
  - SMALL\_RIVER\_COLD\_T
  - SMALL\_RIVER\_WARM\_T
  - SMALL\_RIVER\_WARM
  - STREAM\_COLD
  - STREAM\_COLD\_T
  - STREAM\_WARM\_T
  - STREAM\_WARM

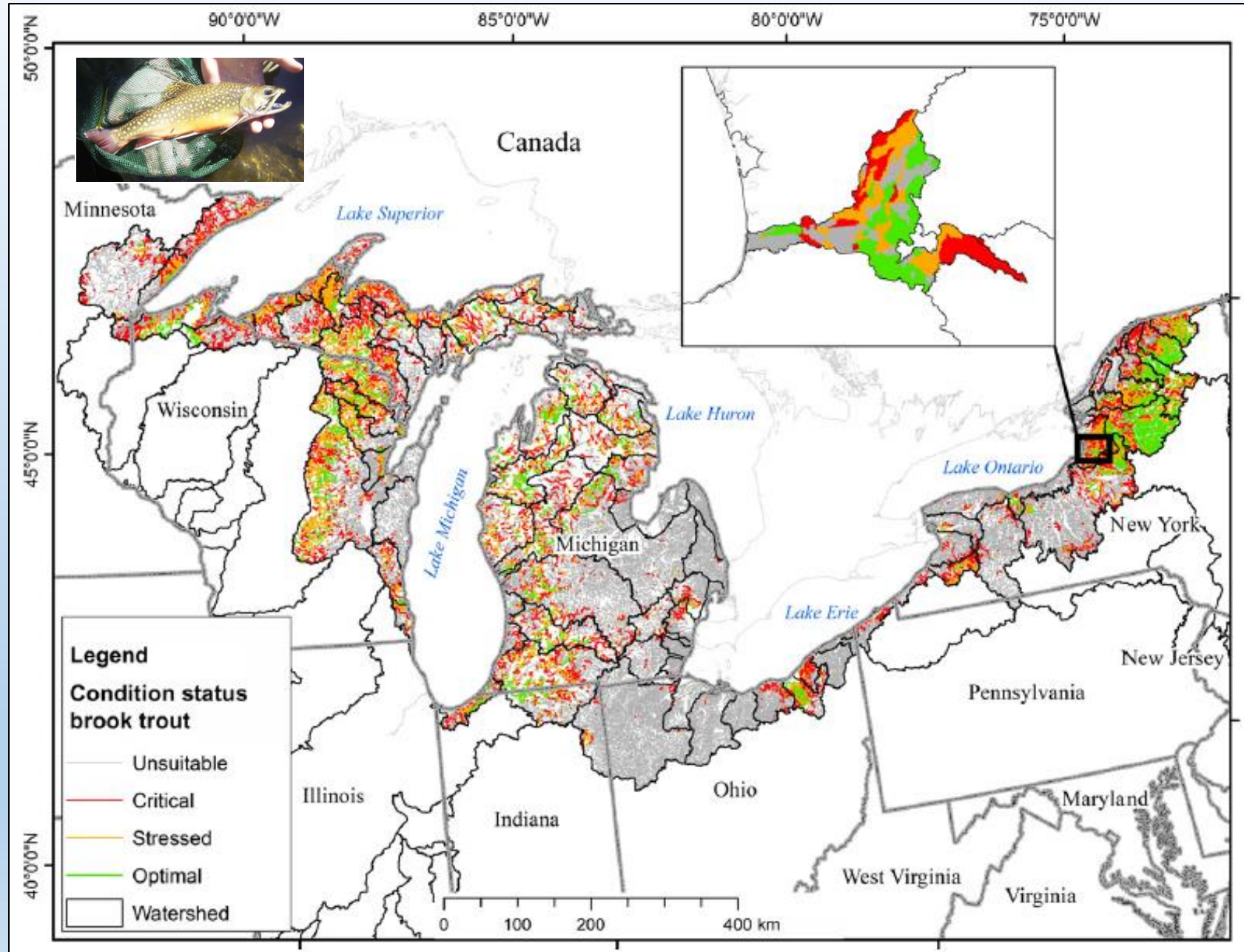
# How do fish populations relate to different flow rates? The Cumulative Abundance Curve



# Brook Trout Abundance and Flow by Lotic System Type



# Regionwide Flow Status: Brook Trout



# Decision Support Program: the App

## Ecological Flows Simulation Tool

by James E. McKenna, Jr. (version 3 Draft)  
USGS GLSC TLAS jemckenna@usgs.gov  
27 December 2019

Flow and Fish Changes

Estimated % Cumulative Abundance:	38.78 %
Yield Change from Starting Yield:	-0.5
% Cum. Abundance Change due to Change in Yield:	-54.67 %

Select Species

- Brook Trout
- Brown Trout
- Lake Sturgeon
- Walleye

NOTE: due to data limitations, not all combination of size, thermal, season, and gear will be available.

NOW, move slider to adjust yield as desired to explore results for this species

Brook Trout in Cold Streams

Select the desired starting yield and then move the slider to the new yield to estimate changes in fish populations

Select Starting Yield:

0  2  
Yield: 0.503

Select Yield Units

- CFS/mi<sup>2</sup>
- cm<sup>3</sup>/s/km<sup>2</sup>

Select Lotic Size

- Stream
- Small River
- Large River
- Great River

Select Thermal Class

- Cold (<17.5 C)
- Cold-Transition (>17.5-19.5 C)
- Warm-Transition (>19.5-21 C)
- Warm (>21 C)

Exit

### Percent of Population that exists at any give flow

Yield (CFS/mi <sup>2</sup> )	% Cumulative Abundance
0.0	0
0.2	10
0.4	25
0.503	38.78
0.6	55
0.8	80
1.0	90
1.2	95
1.4	98
1.6	99
1.8	100
2.0	100

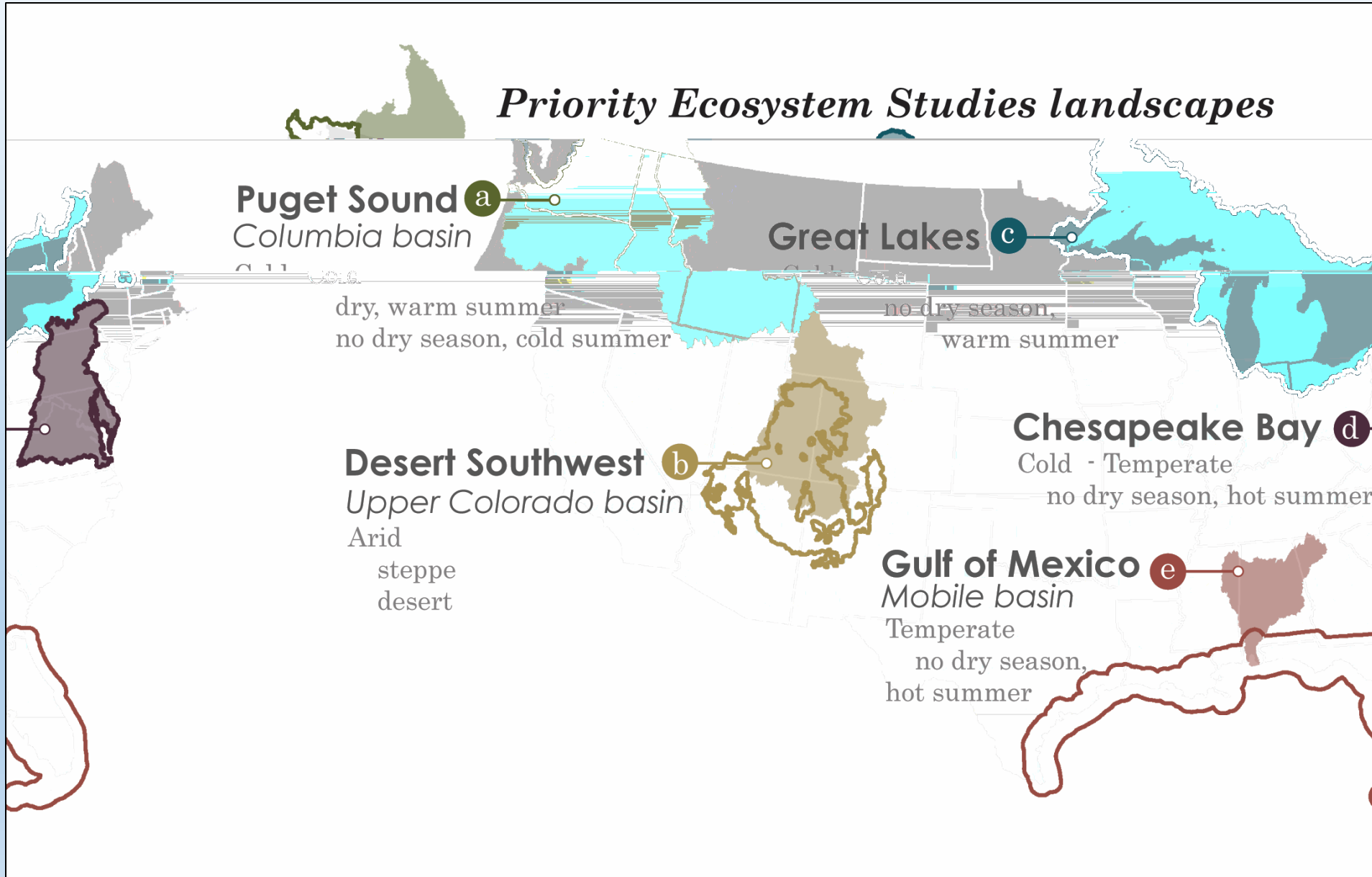
Yield

% cum. Abund.

Logistic Curve %cum.Abund

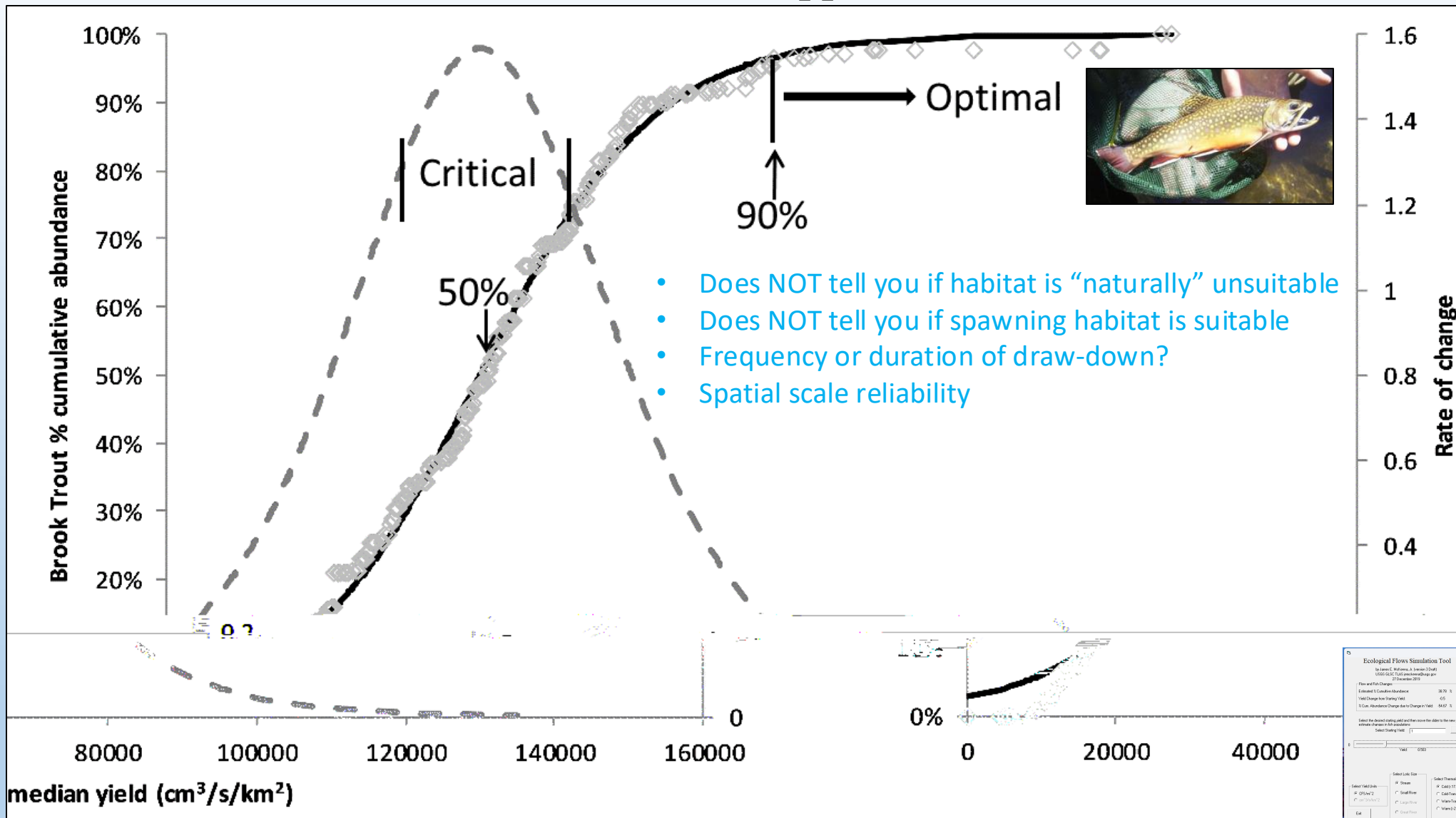
CFS/mi<sup>2</sup>

# Expanding Nationally





# Decision Support



- Does NOT tell you if habitat is “naturally” unsuitable
- Does NOT tell you if spawning habitat is suitable
- Frequency or duration of draw-down?
- Spatial scale reliability

— Predicted %Abund    - - - Rate of Change

essed      Optimal

◇ McKenna, J.E. Jr.,  
PctCumFishAbund  
H.W. Reeves, and P.W.  
18.  
Unsuitable      Critical      Biology Str

