

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.

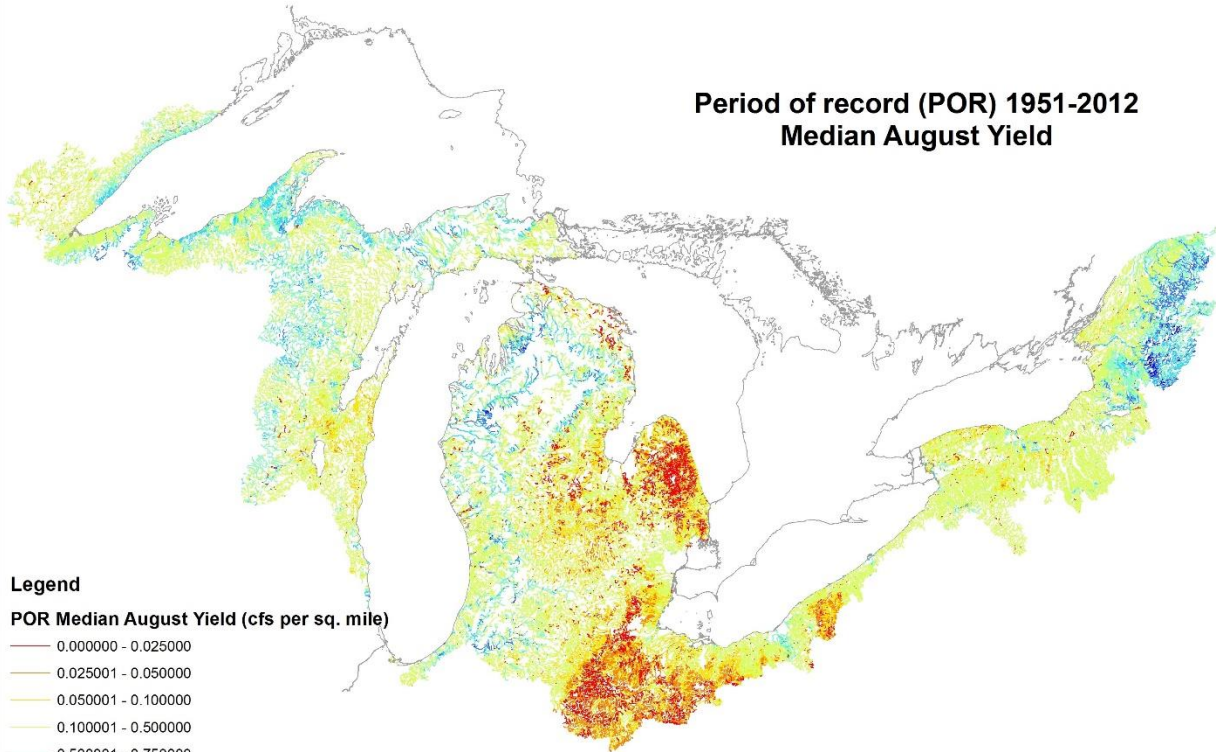
The Question: How to get the biggest bang for the buck in resource restoration or protection?

- 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

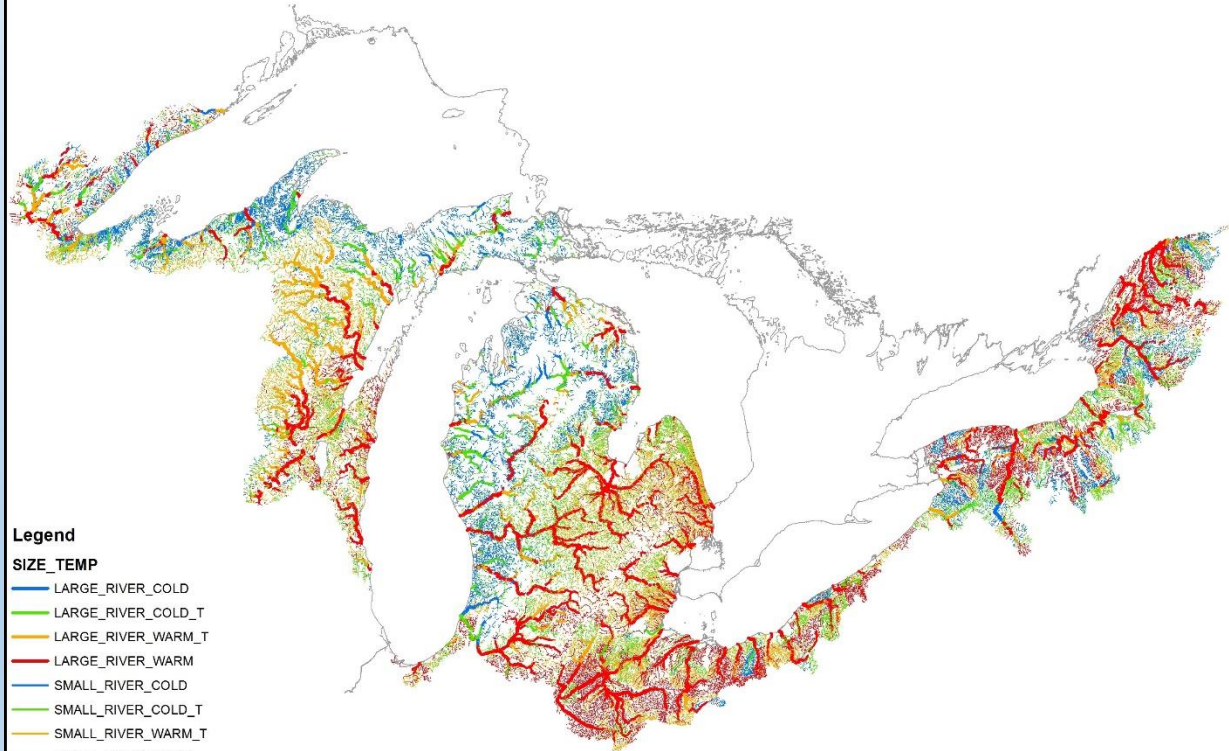


Legend
POR Median August Yield (cfs per sq. mile)

- 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

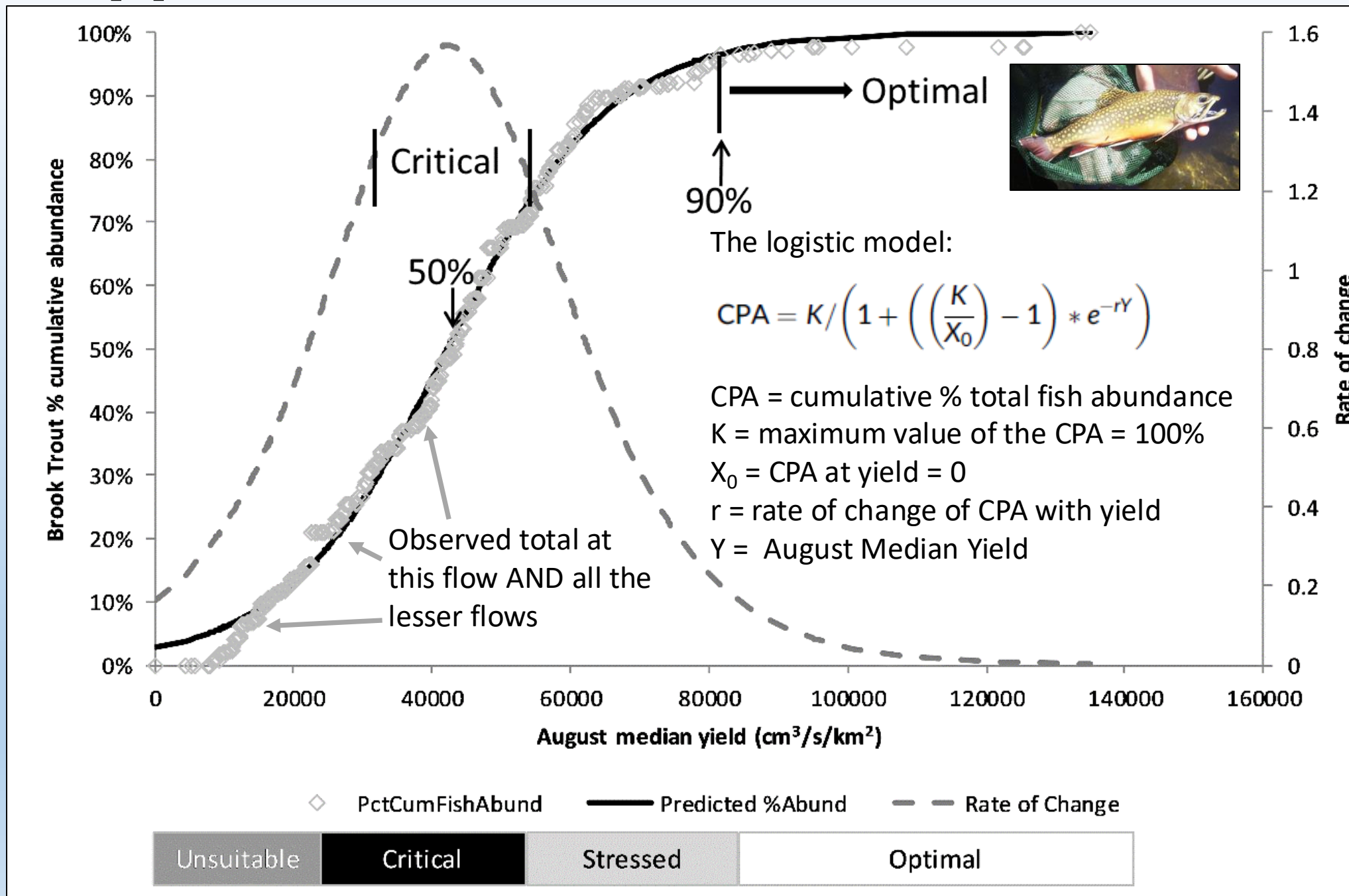
Ecoflows Size-Temperature Classes



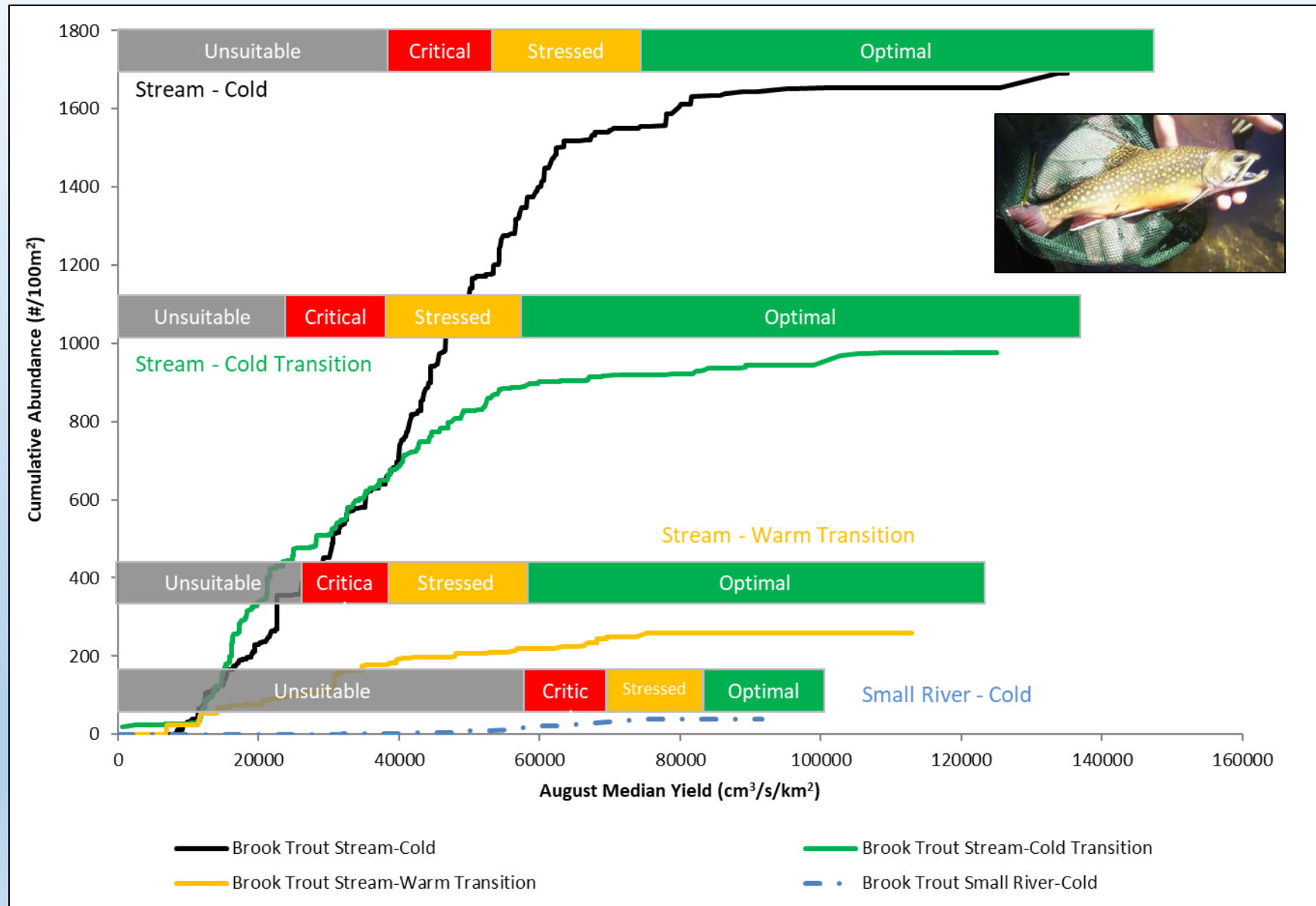
Legend

- 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

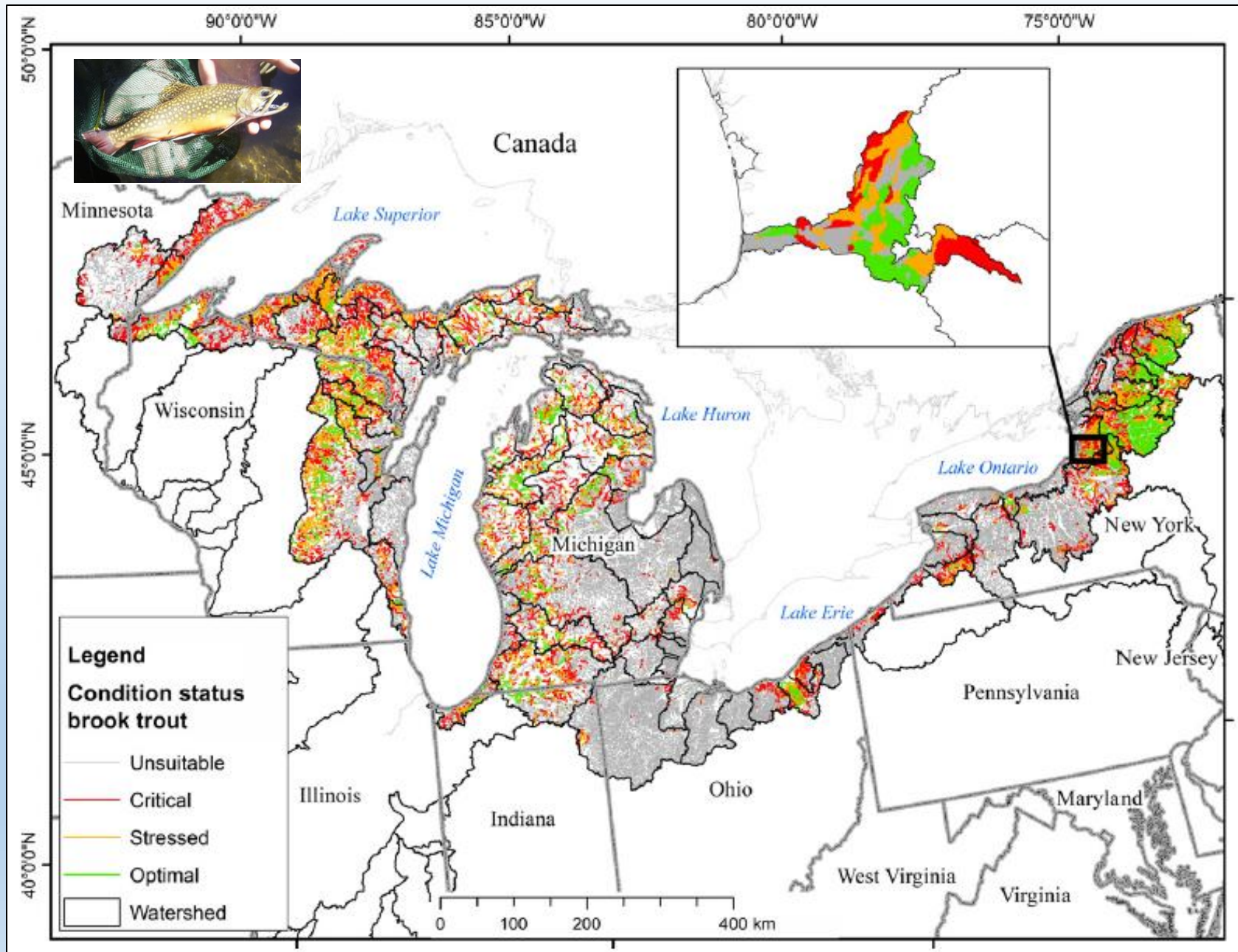
How do fish populations relate to different flow rates? The Cumulative Abundance Curve



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)
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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:

Yield: 2

Select Yield Units

- CFS/mi²
- cm³/s/km²

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

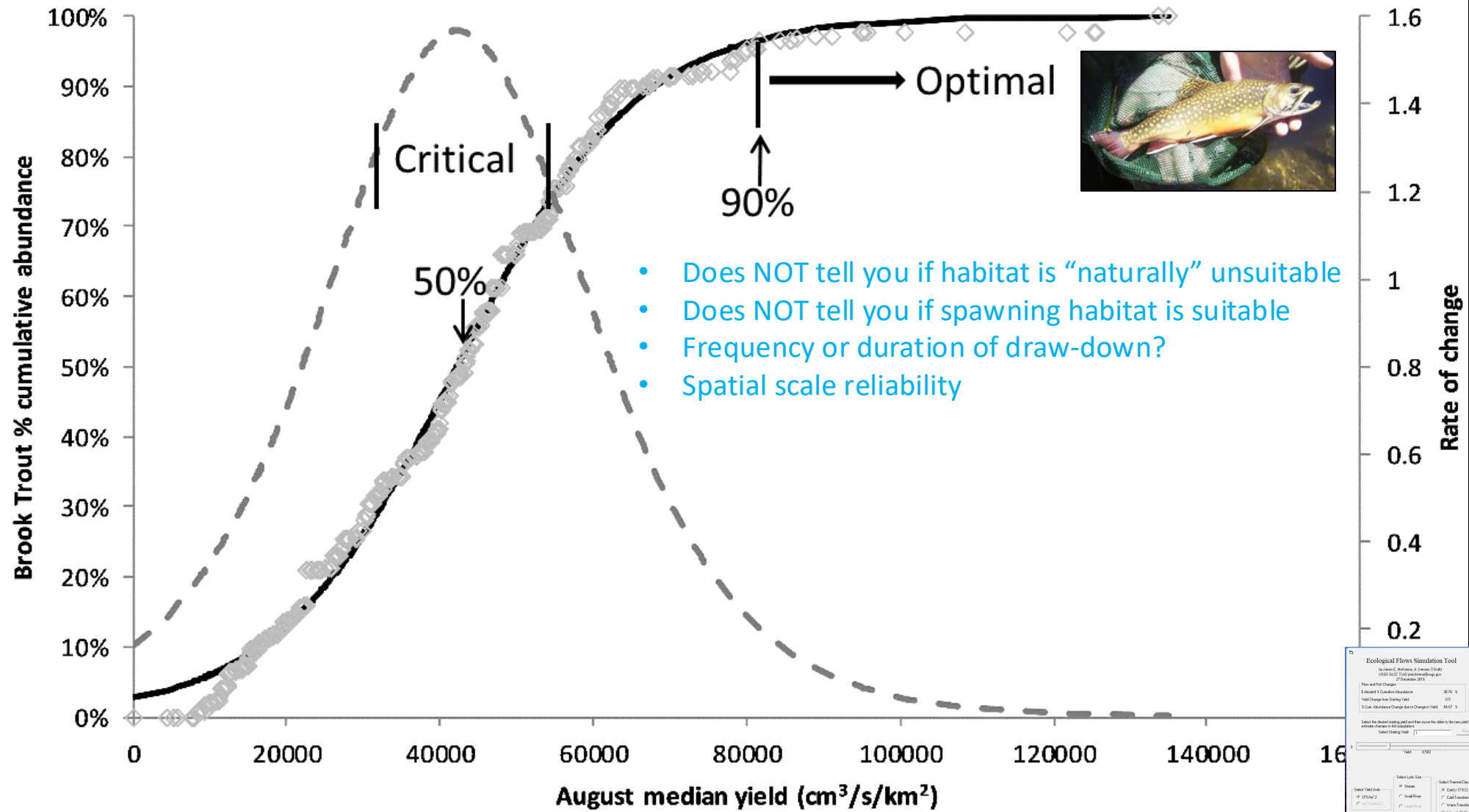
Percent of Population that exists at any give flow

Yield (CFS/mi ²)	% cum. Abund.
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

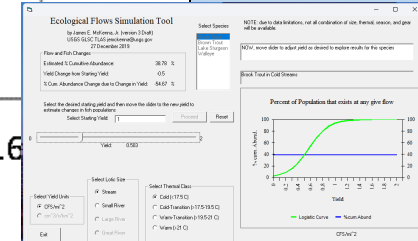
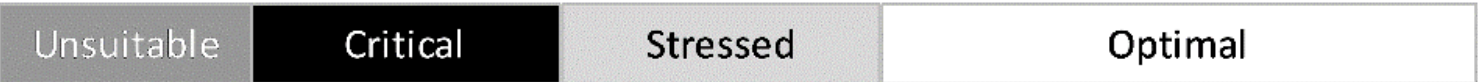
Expanding Nationally



Decision Support



◇ PctCumFishAbund — Predicted %Abund - - Rate of Change



McKenna, J.E. Jr.,
H.W. Reeves, and P.W.
Seelbach. 2018.
Freshwater Biology