

Flow Science in South Carolina Water Law and State Water Plan

Saluda Shoals, SC

May 30th, 2018

Purpose

- Understand the flow science context of current water withdrawal regulations
- Understand the benefits and drawbacks of the same
- Envision more advanced approaches, based in modern flow science
- How might we get there?



South Carolina Surface Water Permitting, Withdrawal, and Reporting Act

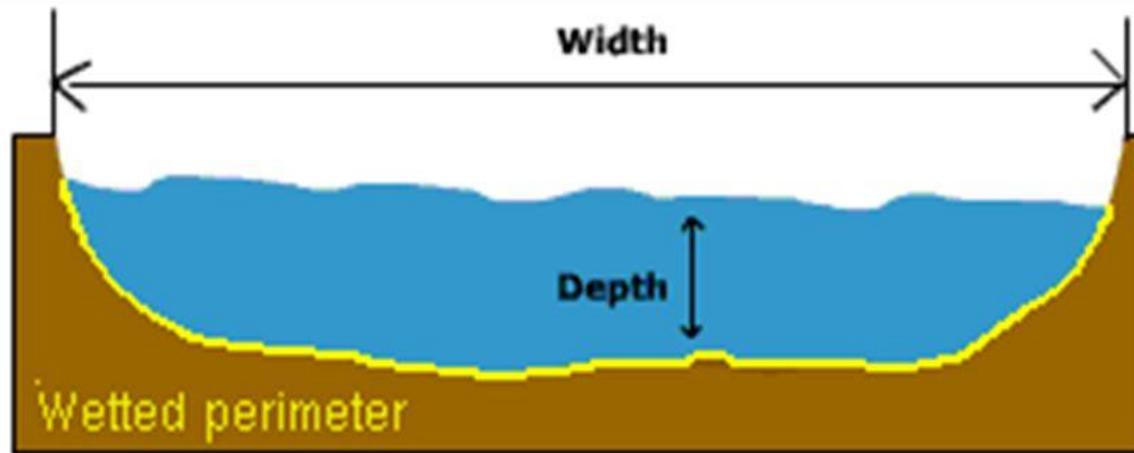
- Effective Jan 1, 2011, requires a surface water withdrawal permit for uses over 3 million gallons per month (SC DHEC administers)
- Established minimum flows of 20, 30 and 40% of mean annual flow at the point of withdrawal
- Previously established permittees continue their current permits by filing an application
- Agricultural users file registrations and are not limited by the 20-30-40 rules, but are required to report their use.

Flow Science in the Act

- Based in methods published by the South Carolina Water Resources Commission in 1988-89
- Based on 1987 flow regime in 9 “priority stream segments”
- Based in physical measurements at segments; applied fish passage requirements of 2 species along with navigation needs
- “Conclusions or recommendations presented are subjected to revision as new information becomes available”



What is the Wetted Perimeter?



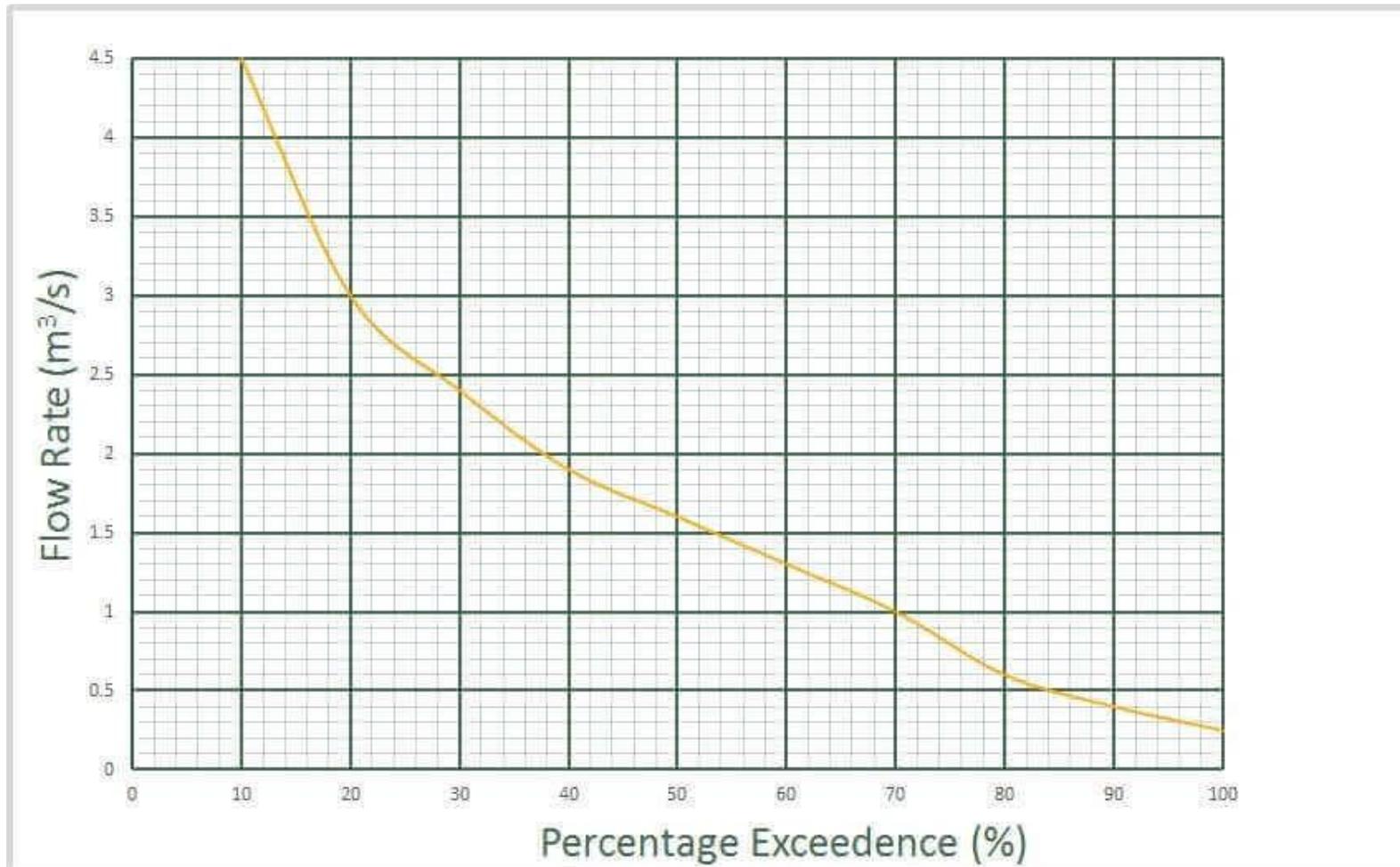
The yellow line shows the wetted perimeter

Flow Science in the Act

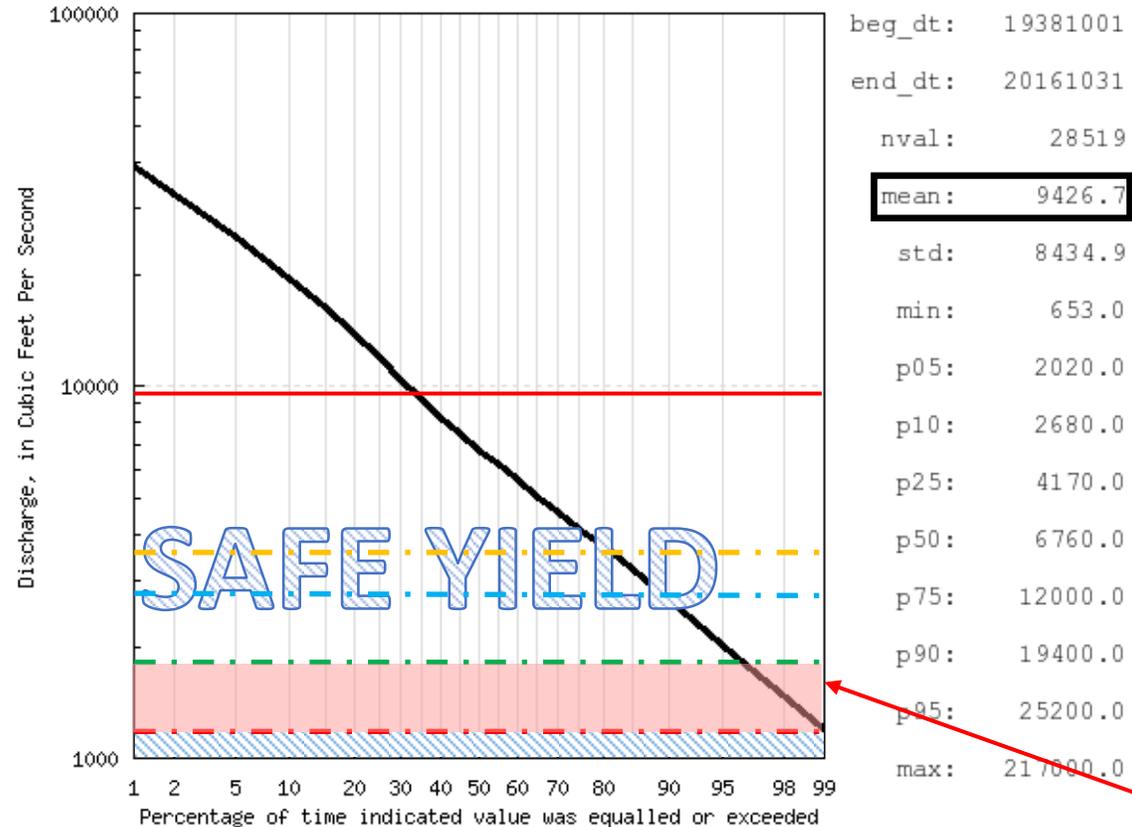
Definitions:

- Mean annual flow: Sum the yearly flow for all years of record, then take the average – this is mean annual flow
- Minimum flow: The amount of water that must remain after all withdrawals are accounted for (agriculture exempted)
- Duration: The percent of time a certain amount of water is present (this may not be continuous, but scattered across points of time)
- Safe Yield: The amount of water available to permit over the applicable minimum flow limit
- 7Q10: The lowest amount of stream flow seen for 7 consecutive days in a 10-year period

Duration Curve



USGS 02131000 PEE DEE RIVER AT PEEDEE, SC
 Drainage Area: 8830.00 Square Miles, Length of Record: 78 Years



Y-Axis
Minimum: one thousand (1,000) CFS

Safe Yield: 7535 CFS or 4.87 Billion Gallons

40%: 3,771 CFS
 30%: 2,828 CFS
 20%: 1,885 CFS

Amount always in stream: 671 CFS or 433 million gallons

Volume unavailable to permit: 1214 CFS or 783 million gallons

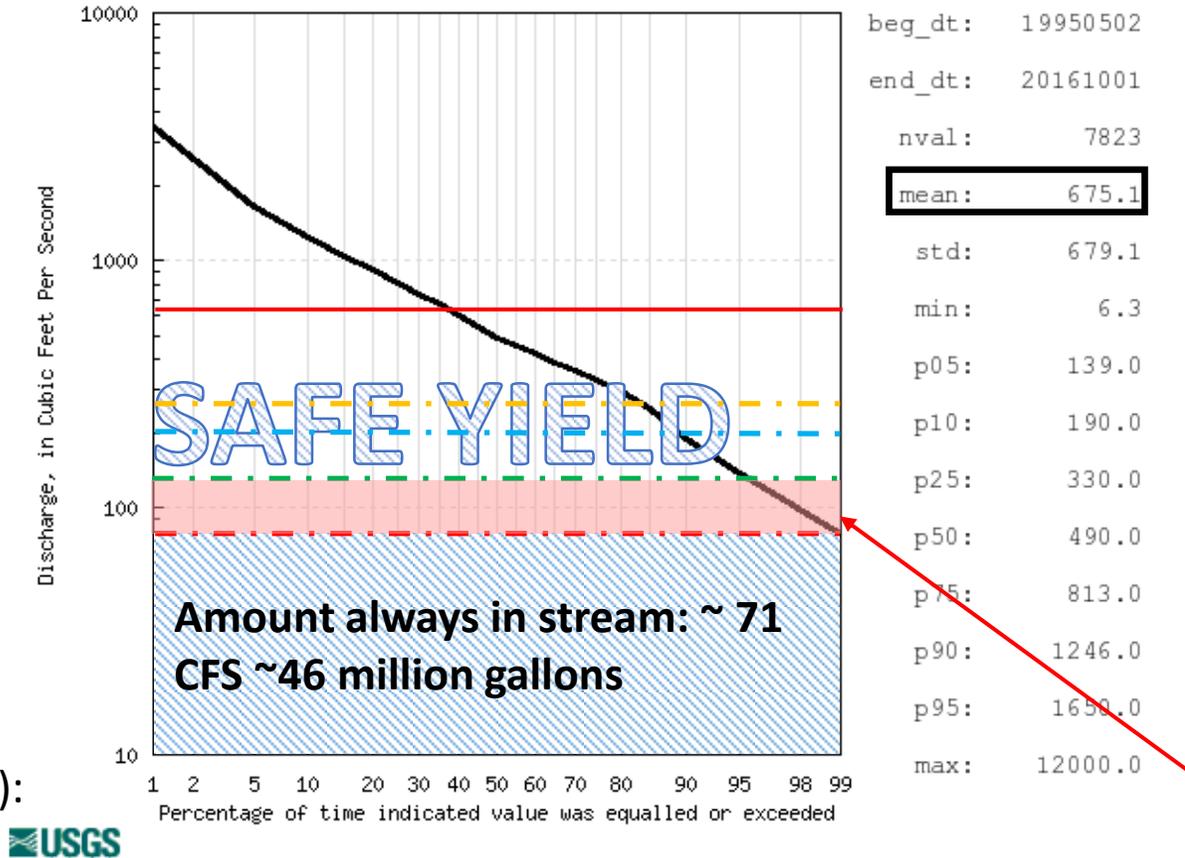
7Q10 (as of 2007): 1,430 CFS



USGS 02163001 SALUDA RIVER NEAR WILLIAMSTON, SC
 Drainage Area: 414 Square Miles, Length of Record: 21 Years

Y-Axis
Minimum: ten
(10) CFS
 Safe Yield: 540
 CFS or 349
 Million Gallons
 40%: 270 CFS
 30%: 203 CFS
 20%: 135 CFS

7Q10 (as of 2008):
 106 CFS



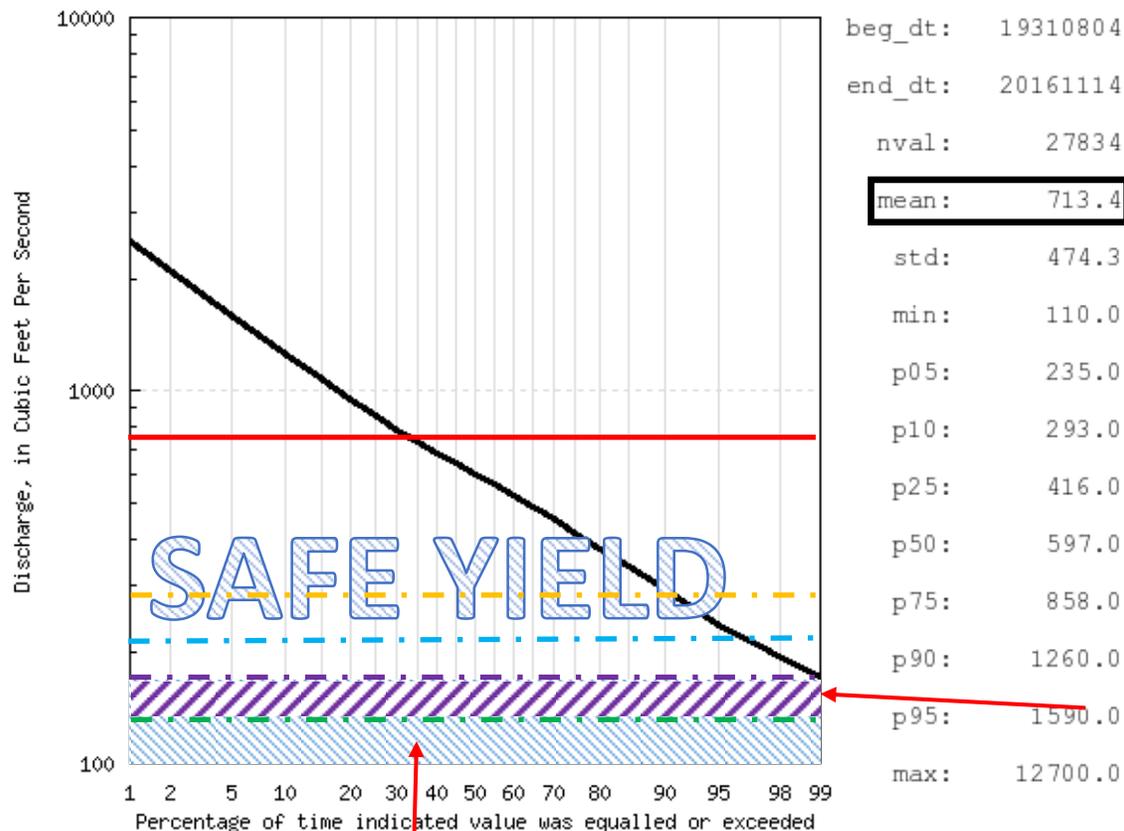
Volume
 unavailable to
 permit: 64 cfs or
 41 million gallons

USGS 02173000 SOUTH FORK EDISTO RIVER NEAR DENMARK, S.C.
 Drainage Area: 720.00 Square Miles, Length of Record: 76 Years

Y-Axis
Minimum: one hundred (100) CFS

Safe Yield: 571 CFS or 369 Million Gallons

40%: 285 CFS
 30%: 214 CFS
 20%: 143 CFS



Amount always in stream: 171 cfs or ~110 Million Gallons

Volume available to permit: 110 mg - 92 mg = 18 million gallons

7Q10 (as of 2008): 175 CFS

Summary: Flow Science in the Act

- Based in real SC streams and measurements thereof
- Applies a concept of seasonable variability
- Generally more protective than 7Q10
- Relatively easy to understand and apply

- Science basis is limited and dated
- Currently being applied outside its intended purpose
- Variably protective from system to system
- Assumes that the timing of the lowest flow is the most important timing

New Approach: Instream Use Standards

- An Instream Use Standard reflects the quality of an environment through the types and arrangements of organisms within it.
- A similar measure is currently used in South Carolina to determine degree of aquatic life support with respect to water quality
- The same principle can be applied to *water quantity*, and has been done so successfully in a number of states
- Can be applied in regulatory or guidance / voluntary manners

Instream Use Standards: What is Needed? Who does it?

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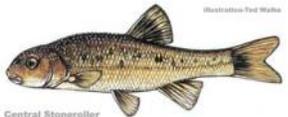


The Nature Conservancy 
Protecting nature. Preserving life.

Instream Use Standards: What is Needed? Who does it?



Cold headwater – brook trout, brown trout, sculpins



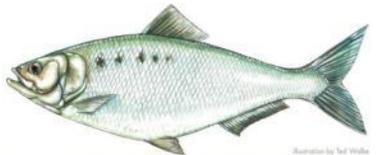
Riffle-obligates – Margined madtom, longnose dace, central stoneroller, fantail darter



Riffle-associates – White sucker, northern hog sucker, shorthead redhorse



Nest-builders – Fallfish, creek chub, river chub, redbreast sunfish, smallmouth bass



Diadromous – American shad, alewife, American eel

Instream Use Standards: What is Needed? Who does it?

Eighty (80) **FLOW-ECOLOGY HYPOTHESES** describe *who* (species or guild) is affected by *what* (flow component), *when* (month or season), *where* (habitat), and *how* (hypothesized ecological response).

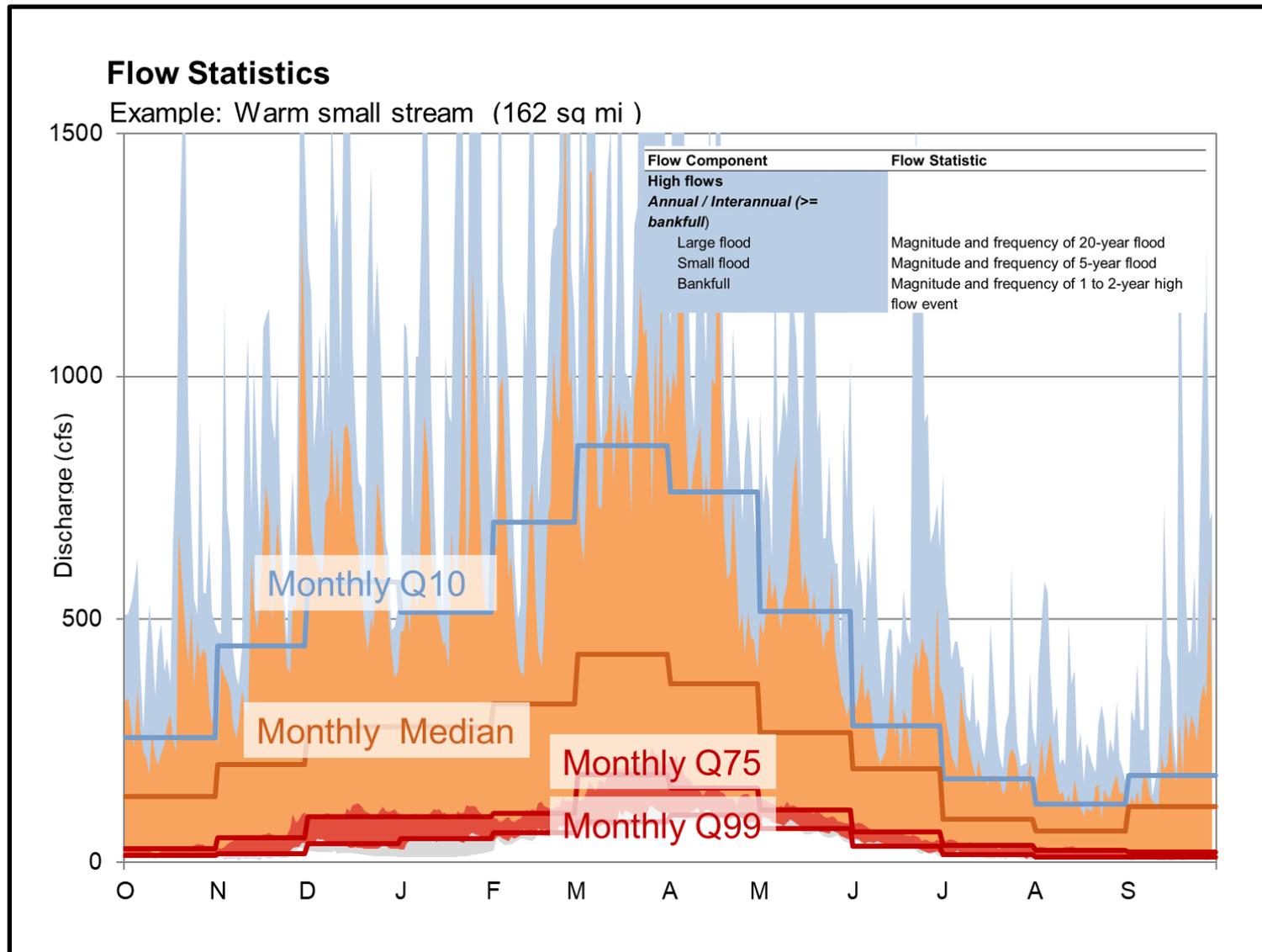
Hypotheses are consolidated into **FLOW NEEDS (20)** ● ●

FLOW RECOMMENDATIONS to support **FLOW NEEDS** defined by:

- Qualitative and quantitative support assessed with Weight-of-Evidence.
- Hydrologic characterization
- Expert review and confirmation

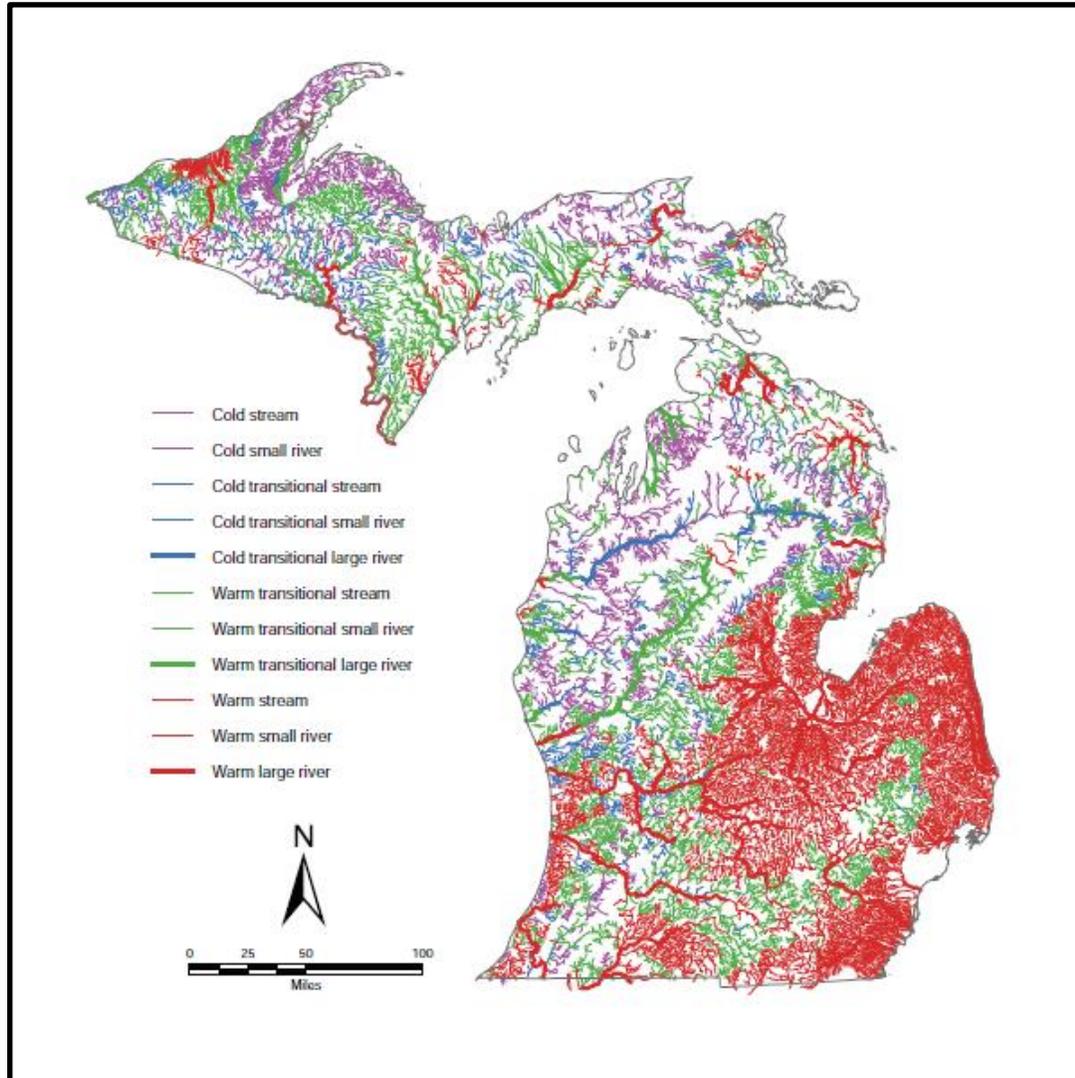
Seasonal flows	<ul style="list-style-type: none">• Less than X% change to seasonal flow range (monthly Q10 to Q50)• Y% change to monthly median;• Z% change to seasonal flow range (monthly Q50-Q75)
Low flows	<ul style="list-style-type: none">• X% change to monthly Q75; and• Y% change to low flow range (monthly Q75 to Q99)

Instream Use Standards: What is Needed? Who does it?

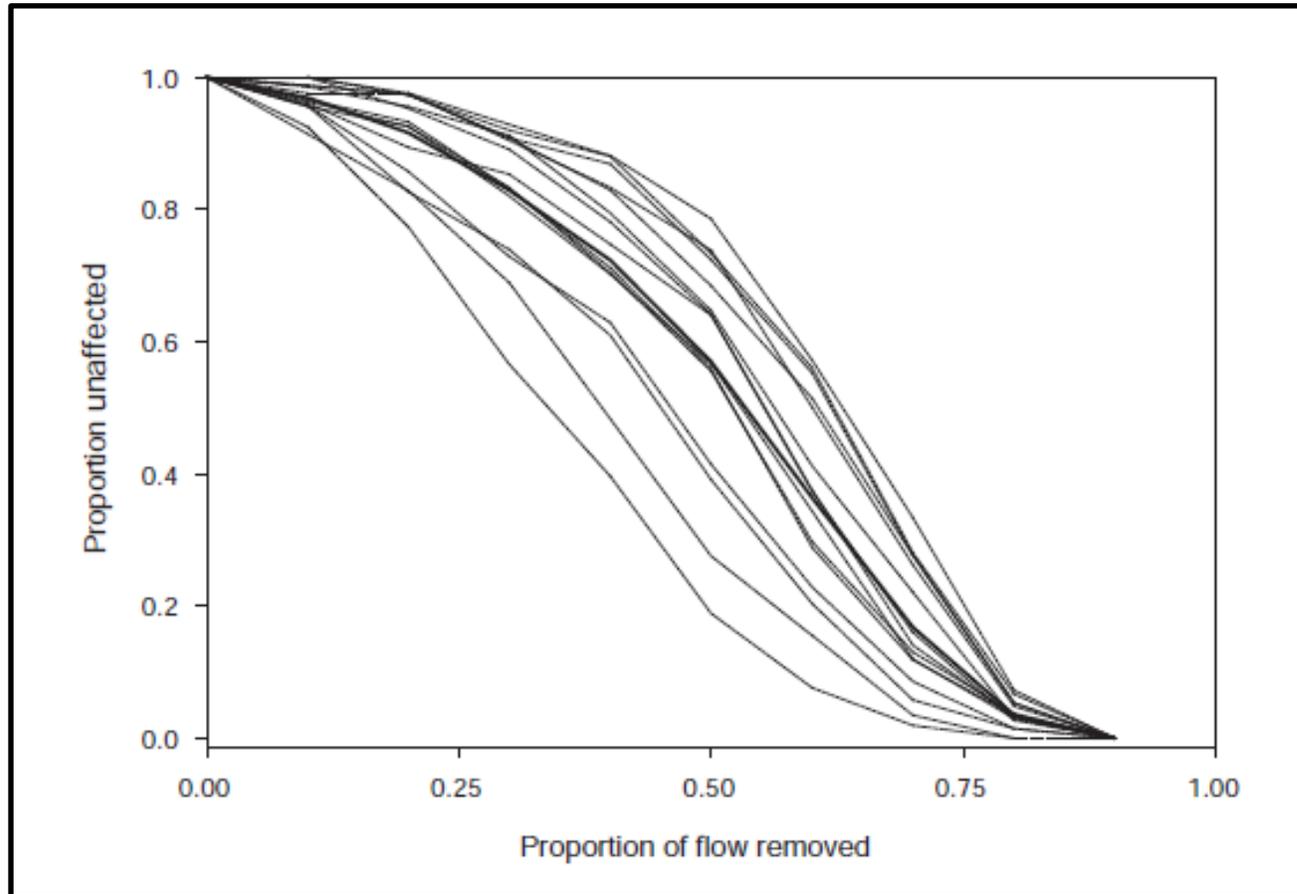


Instream Use Standards: What is Needed? Who does it?

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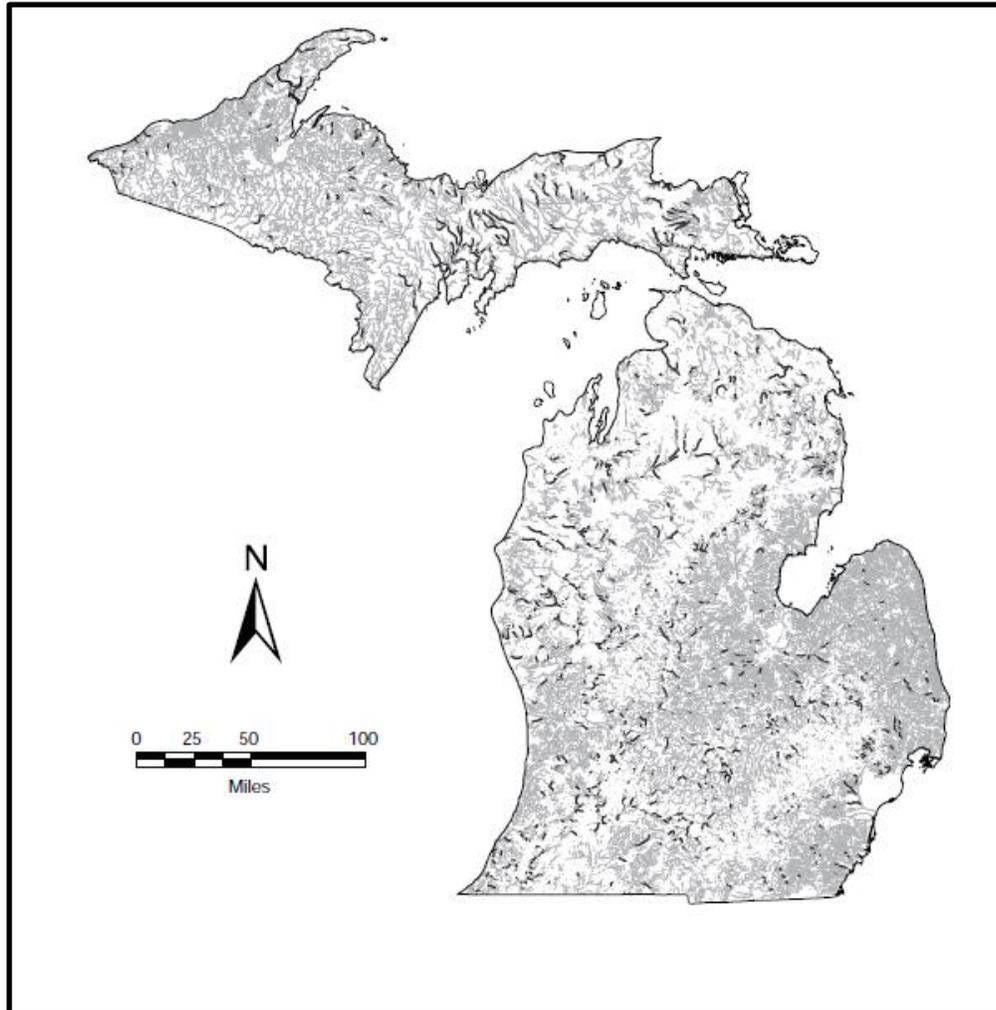


Instream Use Standards: What is Needed? Who does it?



Instream Use Standards: What is Needed? Who does it?

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Carolina Water Law



New Approaches

The screenshot shows the Michigan's Water Withdrawal Assessment Tool (WWAT) interface. At the top left is the logo for the Department of Environmental Quality (DEQ) and the title "Michigan's Water Withdrawal Assessment Tool". At the top right is the "MICHIGAN.GOV Michigan's Official Web Site" logo. Below the header is a navigation bar with links: "Michigan.gov Home | WWAT Home | Map | Access Data | Contact Us". The main content area is titled "Choosing a new or existing registration". It contains two paragraphs of text: "If you are assessing a new withdrawal or proposing to register a new withdrawal for the first time, choose 'New Withdrawal' below." and "If you are modifying an existing registration you have made through the water withdrawal assessment tool, choose 'Modify Existing Registration' below." Below this text is a yellow callout box with a note: "Note: Modifying an existing registration is required when the actual withdrawal construction deviates from what was proposed during the initial registration. This includes modifications such as: changing your location, well casing depth, capacity, etc." At the bottom of the main content area are three blue buttons: "Assess a New Withdrawal", "Modify or Cancel a Registration", and "Replace an Existing Withdrawal". The "Assess a New Withdrawal" button is highlighted with a white border. At the bottom of the page is a footer with links: "Michigan.gov Home | WWAT Home | Contact WWAT | State Web Sites", "Privacy Policy | Link Policy | Accessibility Policy | Security Policy", and "Copyright © 2018 State of Michigan".

DEQ Michigan's Water Withdrawal Assessment Tool
Department of Environmental Quality

MICHIGAN.GOV
Michigan's Official Web Site

[Michigan.gov Home](#) | [WWAT Home](#) | [Map](#) | [Access Data](#) | [Contact Us](#)

Choosing a new or existing registration

If you are assessing a new withdrawal or proposing to register a new withdrawal for the first time, choose "New Withdrawal" below.

If you are modifying an existing registration you have made through the water withdrawal assessment tool, choose "Modify Existing Registration" below.

Note: Modifying an existing registration is required when the actual withdrawal construction deviates from what was proposed during the initial registration. This includes modifications such as: changing your location, well casing depth, capacity, etc.

Assess a New Withdrawal **Modify or Cancel a Registration** **Replace an Existing Withdrawal**

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Questions?

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