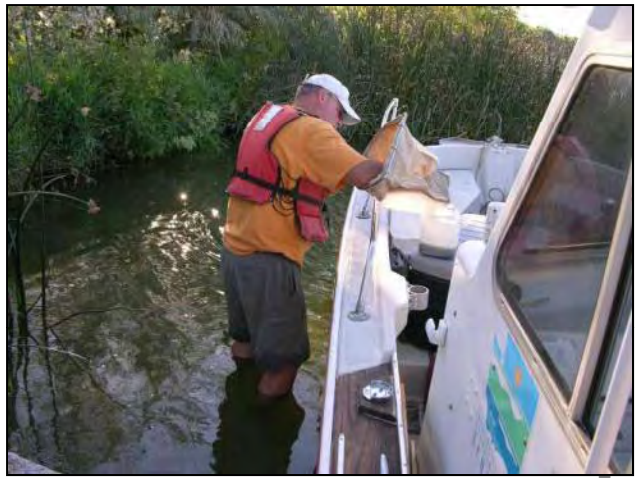
The National Aquatic Resource Surveys (NARS)
Nutrient Results



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Overview of Presentation

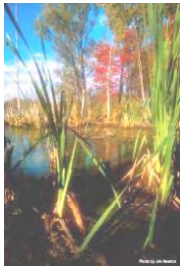
- Take Home Messages
- National Aquatic Resource Survey (NARS)
  - Background
  - Technical Underpinnings
- Key Findings
  - Condition and nutrient related
- Nitrogen: Comparison of Data from Wadeable Streams Assessment and Impaired Waters Listings

Take Home Messages

- NARS data show that excess nutrients are widespread
  - Nutrients are related to decreased biological health in our streams and lakes
- Multiple monitoring designs needed to provide data to protect and restore our waters
  - Statistical surveys provide us with information on the extent of water quality problems and national issues that require broad attention
  - Targeted monitoring allows us to locate specific problems and actions needed to protect/restore those waters.
- Integration of NARS data and 303(d) listing information suggests we don't know where all of our nutrient impacted waters
- We should continue to invest resources in:
  - our monitoring and assessment programs to identify impaired waters; and
  - actions to reduce nutrients throughout our watersheds.

Purpose of the National Aquatic Resource Surveys

- NARS is a statistically-valid characterization of the "health" of the nation's waters with documented confidence
  - streams/rivers,
  - lakes/reservoirs,
  - coastal waters, and
  - wetlands
- NARS is designed to answer national questions and support decision-making
  - What extent of the nation's waters are healthy and support CWA goals?
  - How widespread are key stressors and what are their impacts on condition?
  - How does water quality change over time?



Technical Underpinnings of NARS

- Randomized design to report on condition of each resource (e.g., streams & rivers, lakes, etc.) both nationally and on a regional basis with documented confidence
  - 1,000 sites for national & regional scale reporting in lower 48
  - NHD*Plus* served as the basis for establishing the National Rivers/Streams and National Lakes Assessment sample frames – from which a representative set of sample sites were randomly selected and is used to calculate drainage areas for sampling sites to support data analysis.
- Indicators: Standard field and lab protocols
  - All indicators evaluated for credibility
  - Selected to address national and state-identified needs
- National QA and data management
- Nationally consistent and regionally relevant data interpretation and peer-reviewed reports

Example Survey Indicators and Measures

Surveys assess **biological indicators** such as:

- Benthic macroinvertebrates
- Plants
- Fish community

Surveys assess **public health indicators** such as

- Fish tissue
- Pathogens (enterococci)
- Microcystin

Surveys measure the occurrence and extent of **stressors** such as:

- Nutrient enrichment
- Excess sediment
- Physical habitat characteristics (e.g. riparian cover)

Surveys may include pertinent **research indicators** such as:

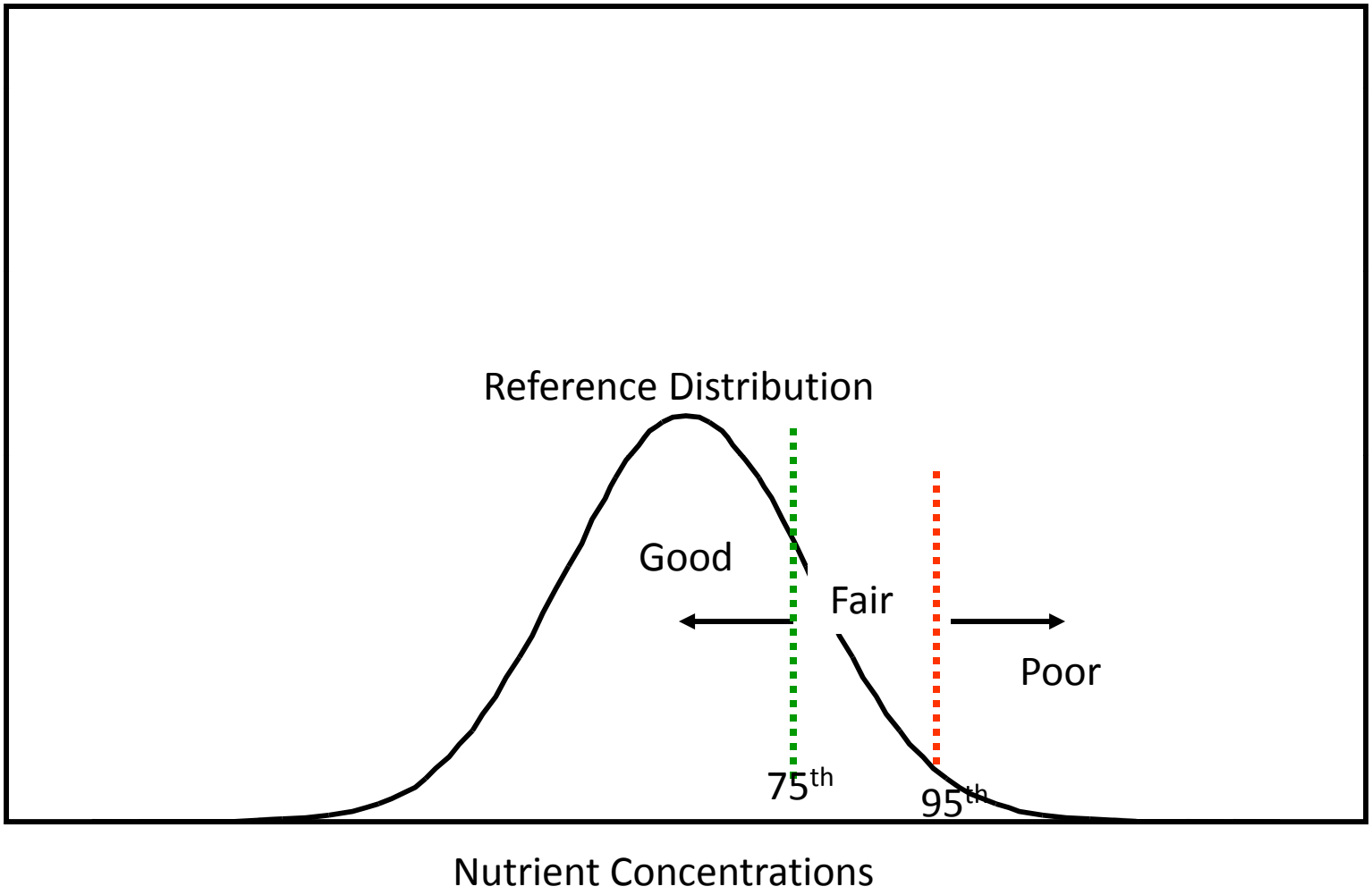
- Sediment enzymes
- Contaminants of emerging concern

Technical Underpinnings - Threshold Development

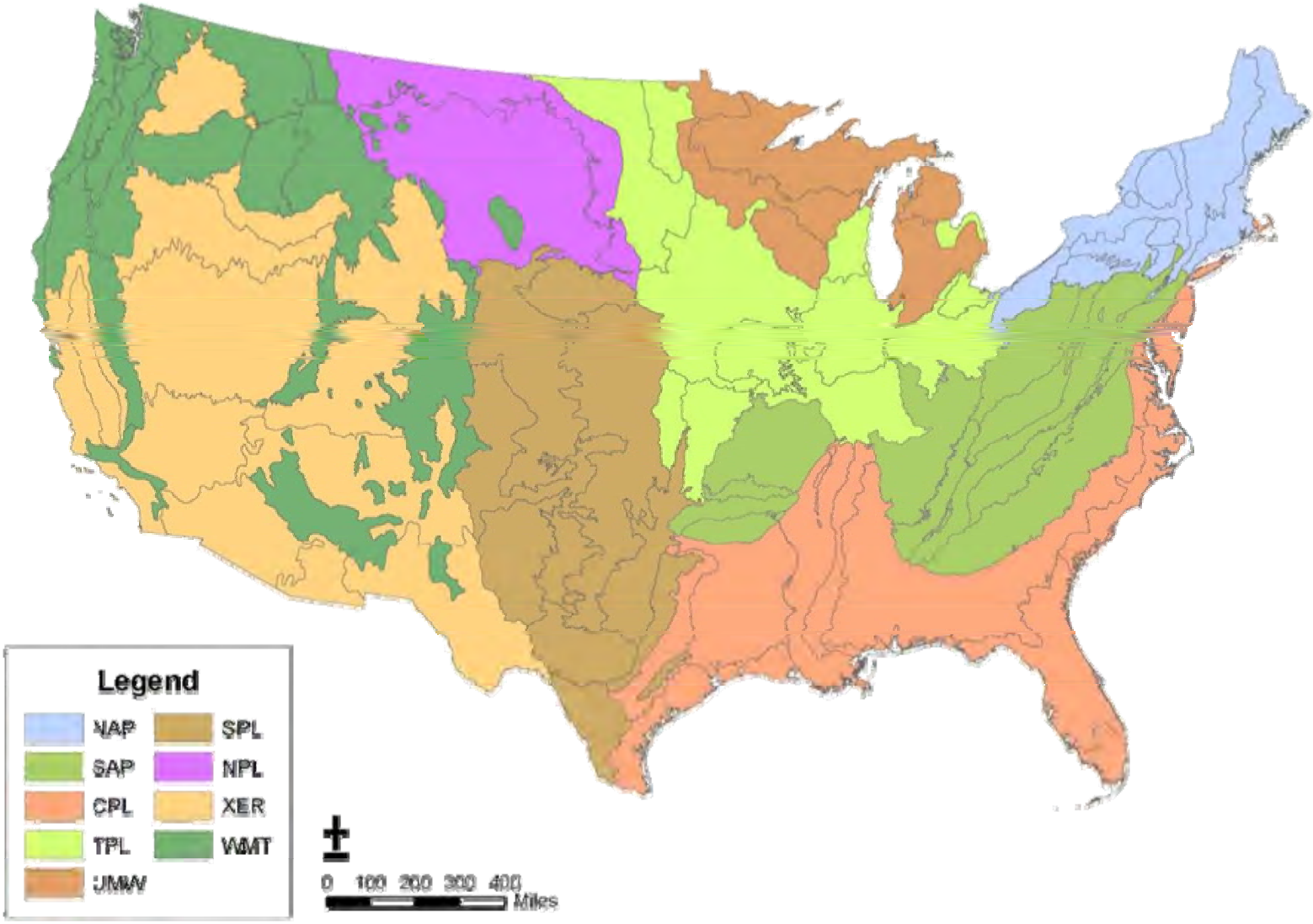
- How do we set thresholds for interpreting condition?
  - Reference-based approach, use “Least Disturbed Sites” in Region
    - Recommended in EPA guidance for development of nutrient and biological criteria
    - Utilized by state bioassessment programs
  - Plot distribution of values at reference sites
  - Use outer tail of distribution to define condition classes (e.g., 5th and 25th percentile to separate poor, fair and good condition; or 75th and 95th) for each ecoregion
- For some indicators, established criteria or benchmarks
  - Trophic state

    World Health Organization values

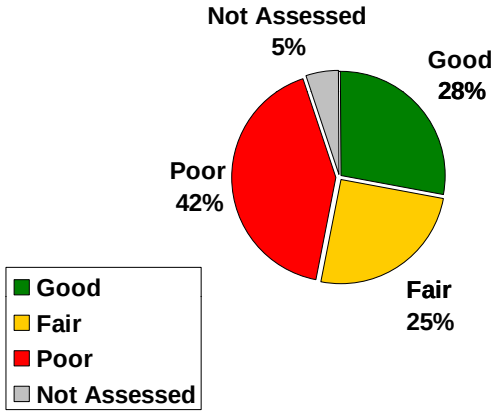
Using Reference Distribution to Define Condition Class Thresholds



Regionally-relevant Thresholds

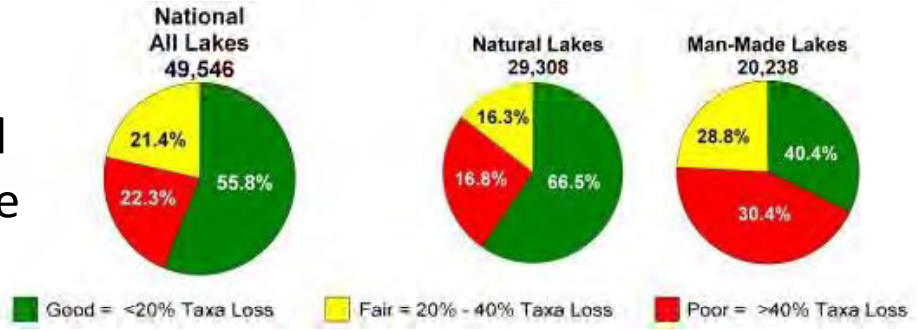


Key Findings To Date: Streams and Lakes

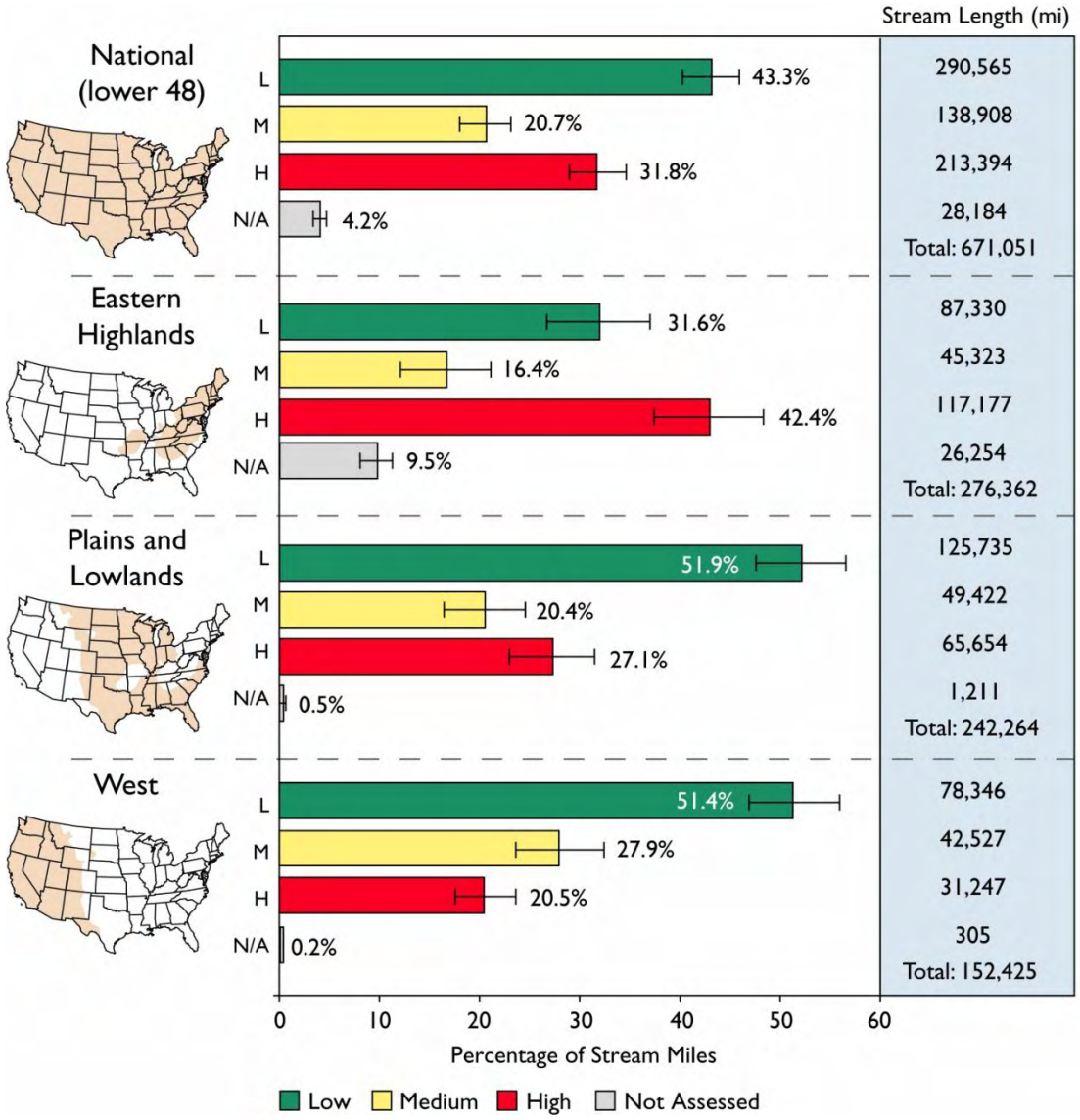


- **Streams:** 28% support healthy biological communities. Most important assessed stressors are **nutrients** and excess sedimentation. Streams with these problems are 2 times more likely to have poor biology.

- **Lakes:** 56% support healthy biological communities. Most important assessed stressors are poor lakeshore habitat **and nutrients**. Lakes with these problems are about 3 times more likely to have poor biology.



Percent of Streams With Excess Total Nitrogen - Streams

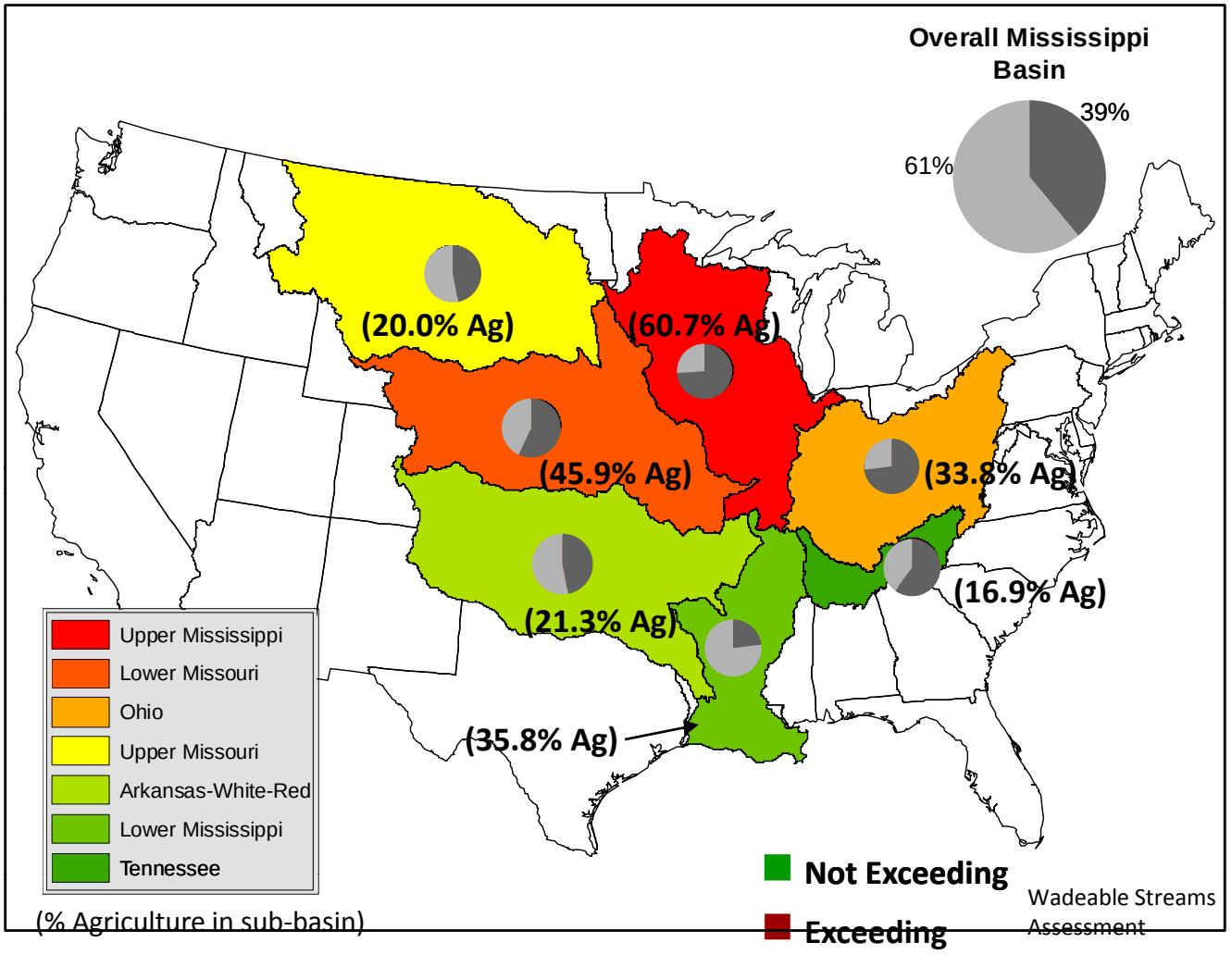


The WSA found that 32% of stream miles have higher levels of nitrogen than reference.

Streams with high levels of nitrogen are 2.1 times as likely to have poor biological condition.

NARS Data Reporting: Mississippi River Basin

Percentage of Streams with Nitrogen Exceeding NARS Regional Thresholds*



*Developed using EPA Office of Science and Technology guidance on developing reference-based nutrient criteria

Comparison between Streams Assessment Results and Impaired Waters Listings

- First things: caveats
  - My example comparison is for streams and nitrogen only
  - NARS
    - Wadeable streams (1-4th order) only
    - Information for a single parameter – in this case nitrogen
    - Exceedences of poor and fair thresholds
    - Small sample sizes in the Tennessee and Lower Miss basins
  - 303(d) listings
    - All streams/rivers listed within the sub-basin
    - Information for a several parameters (nitrogen, nutrients, algal growth, and DO)
    - Double-counting of miles when adding multiple indicators very likely

Mississippi River Basin – Nitrogen

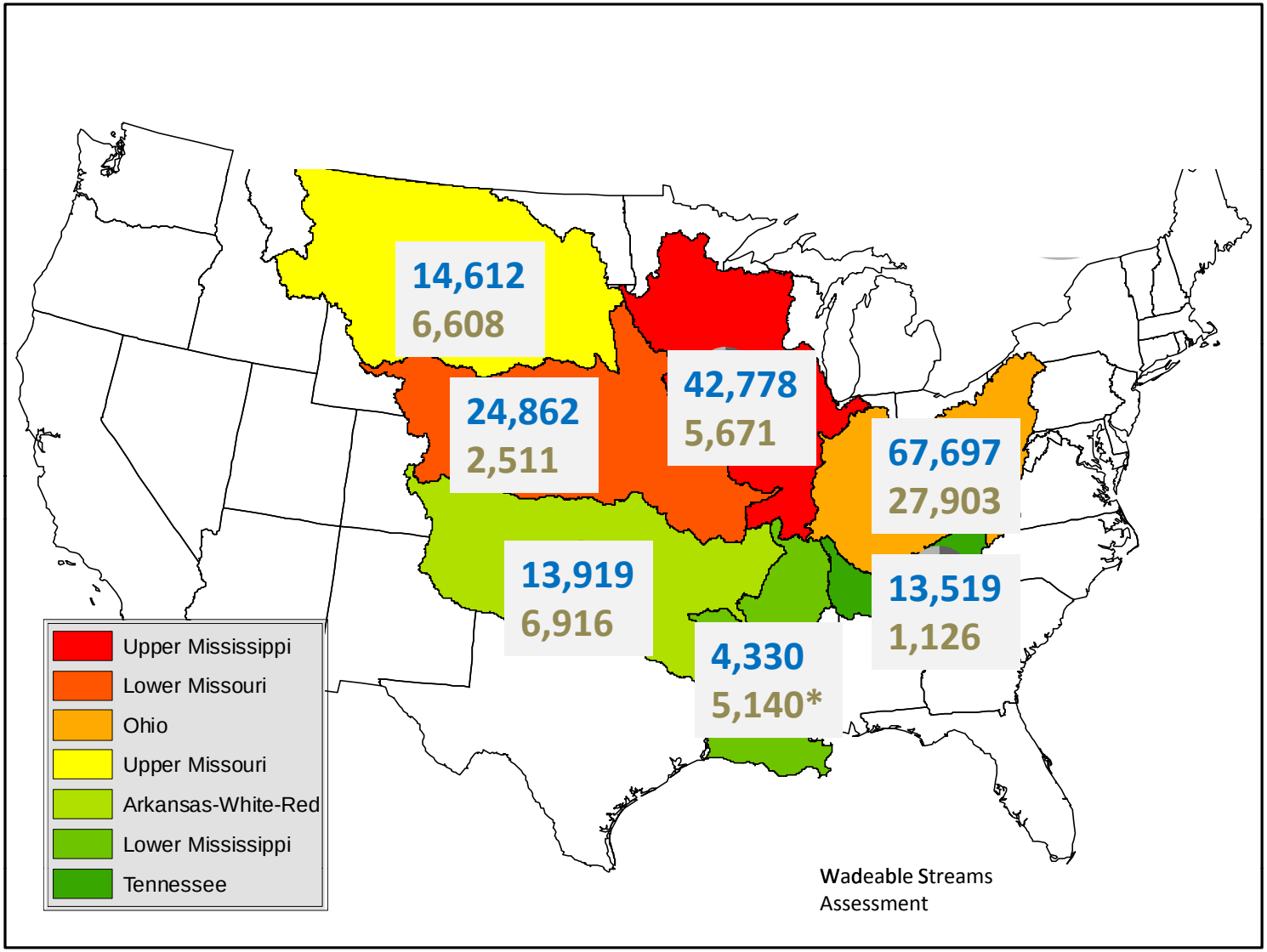
Comparison of NARS Results and Impaired Waters Listings

Statistical surveys provide information on the extent and geographic location of problems; and provide information to help identify nationally significant problems.

Targeted monitoring identifies problems in specific locations and documents information for implementing actions on a local/watershed scale.

Blue = Miles in subbasin exceeding NARS thresholds

Gold= Miles in subbasin 303(d) listed for nitrogen, nutrients, algal growth or DO (2008)



* 303(d) listings for just nitrogen in the Lower Mississippi River = 306 miles

•Please see caveats on previous page

Mississippi River Basin – Nitrogen

Comparison of Streams Assessment Results and Impaired Waters Listings

	NARS		303(d) 2008			
			Nitrogen		Nutrients/Algal growth and DO*	
Subbasins	# of miles in Subbasin	# of miles exceeding NARS thresholds	# of listings	# of miles	# of listings	# of miles
Arkansas-White_Red	29,615	13,919	12	174	395	6,742
Lower Mississippi*	18,824	4,330	49	306	341	4,834
Lower Missouri	43,617	24,862	5	34	175	2,477
Ohio	92,735	67,697	82	715	700	27,188
Tennessee*	22,532	13,519	78	789	52	337
Upper Mississippi	57,809	42,778	142	1,154	544	4,517
Upper Missouri	31,089	14,612	114	4,830	37	1,778
Totals	296220	181,716	482	8,006	2,244	48,897

*Total is made up of: DO = 32,500 miles; nutrients = 15,101 miles; algal growth = 1,296 miles

** Sample sizes in these subbasins smaller; confidence intervals are larger (+/-20-25%)

Multiple designs are need to fully tell our water quality story: statistical designs provide information on extent of problem and targeted designs identify specific locations with problems.

Summary

- Nutrients are widespread and impact water quality across the country.

- Comparison of statistical survey results and 303(d) listings underscores the need to use multiple designs to fully understand and address our water quality problems at a national, regional, state/tribal and local scale.