

National Stream and River Assessment Monitoring Design

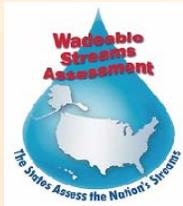
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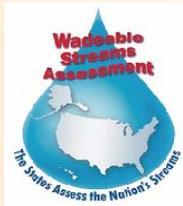
Overview of Presentation

- **National Wadeable Stream Assessment**
- **12- State EMAP West Stream and River Survey design**
- **WSA Survey Design**
 - **36-State WSA-east Survey Design**
 - **12-State WSA-west Survey Design**
- **Estimating extent of stream and river resource**



Wadeable Stream Assessment Design Approach

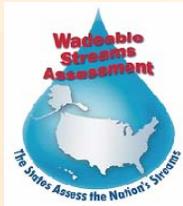
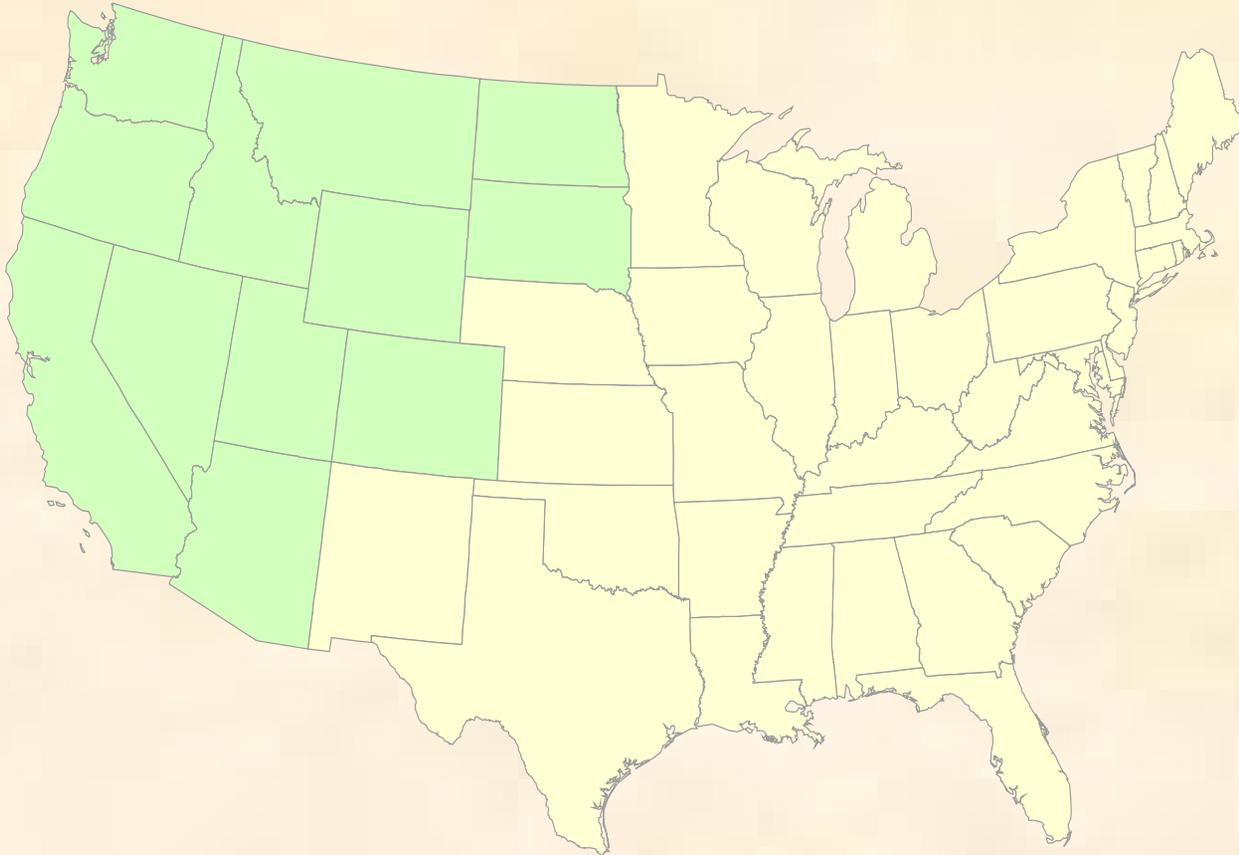
- **Two independent designs are basis for WSA design**
 - Existing survey design from EMAP West Stream and River Assessment for 12 western states
 - New survey design for 36 eastern states for wadeable streams
- **Factors in two study designs that must be considered when combining information from two studies**
 - Different but overlapping stream and river populations
 - Different subsets of RF3 (NHD) as basis for design
 - Different but compatible design requirements



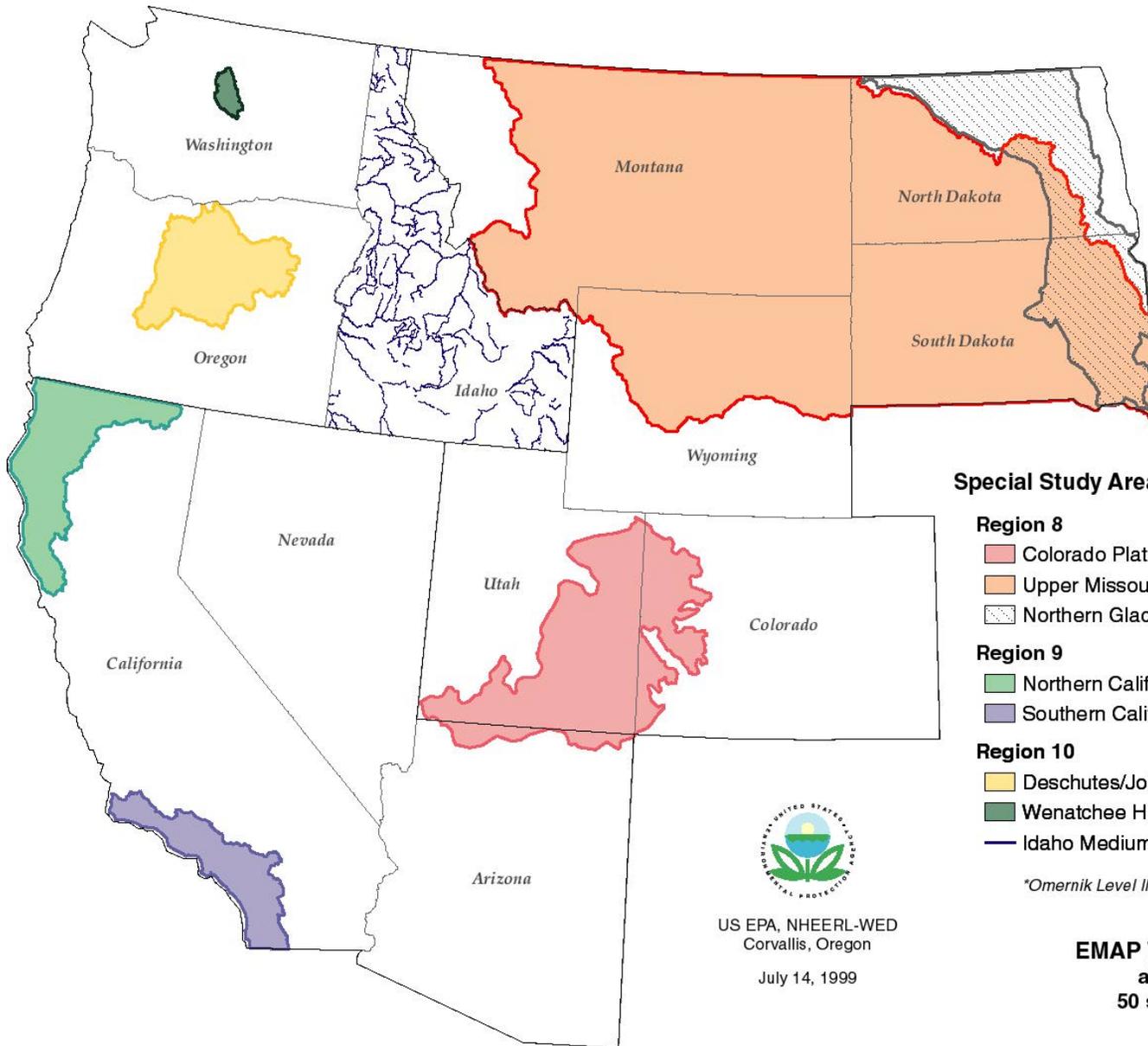
WSA Regions

WSA West

WSA East



EMAP West Stream and River Survey 1999 - 2004



Special Study Areas and Number of Field Sites

Region 8

- Colorado Plateaus Ecoregion* (60)
- Upper Missouri River Basin (160)
- Northern Glaciated Plains Ecoregion* (60)

Region 9

- Northern California Coastal Drainage (160)
- Southern California Coastal Drainage (160)

Region 10

- Deschutes/John Day River Basins (160)
- Wenatchee HUC (60)
- Idaho Medium/Large Rivers (60)

**Omernik Level III Ecoregions, January 1999*



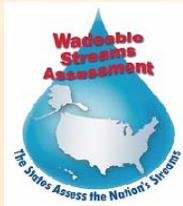
US EPA, NHEERL-WED
Corvallis, Oregon

July 14, 1999

**EMAP West Base Study
also includes
50 sites per state.**

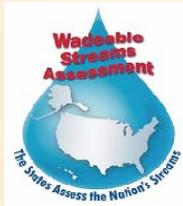
EMAP West: Target Populations for Streams and Rivers

- **Definition: Perennial means flowing water during index period**
- **Perennial condition study**
 - All stream and river channels in 12 western states: wadeable and boatable
 - Exclude Columbia, Snake, Missouri, and Colorado rivers
- **Perennial/Non-perennial extent (length) study**
 - All RF3 stream and river channels in 12 western states
 - Defined channel present
 - Natural and constructed channels



EMAP West: Survey Design Objectives

- **Estimates by State, EPA Region, and Study Region**
 - Extent (total length) of perennial and non-perennial streams and rivers
 - Condition of perennial streams and rivers
- **Estimates for each special study area**
 - Extent (total length) of perennial streams and rivers
 - Condition of perennial streams and rivers
- **Condition estimates**
 - X% of perennial stream km in study region have condition Y

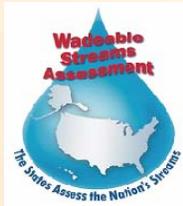
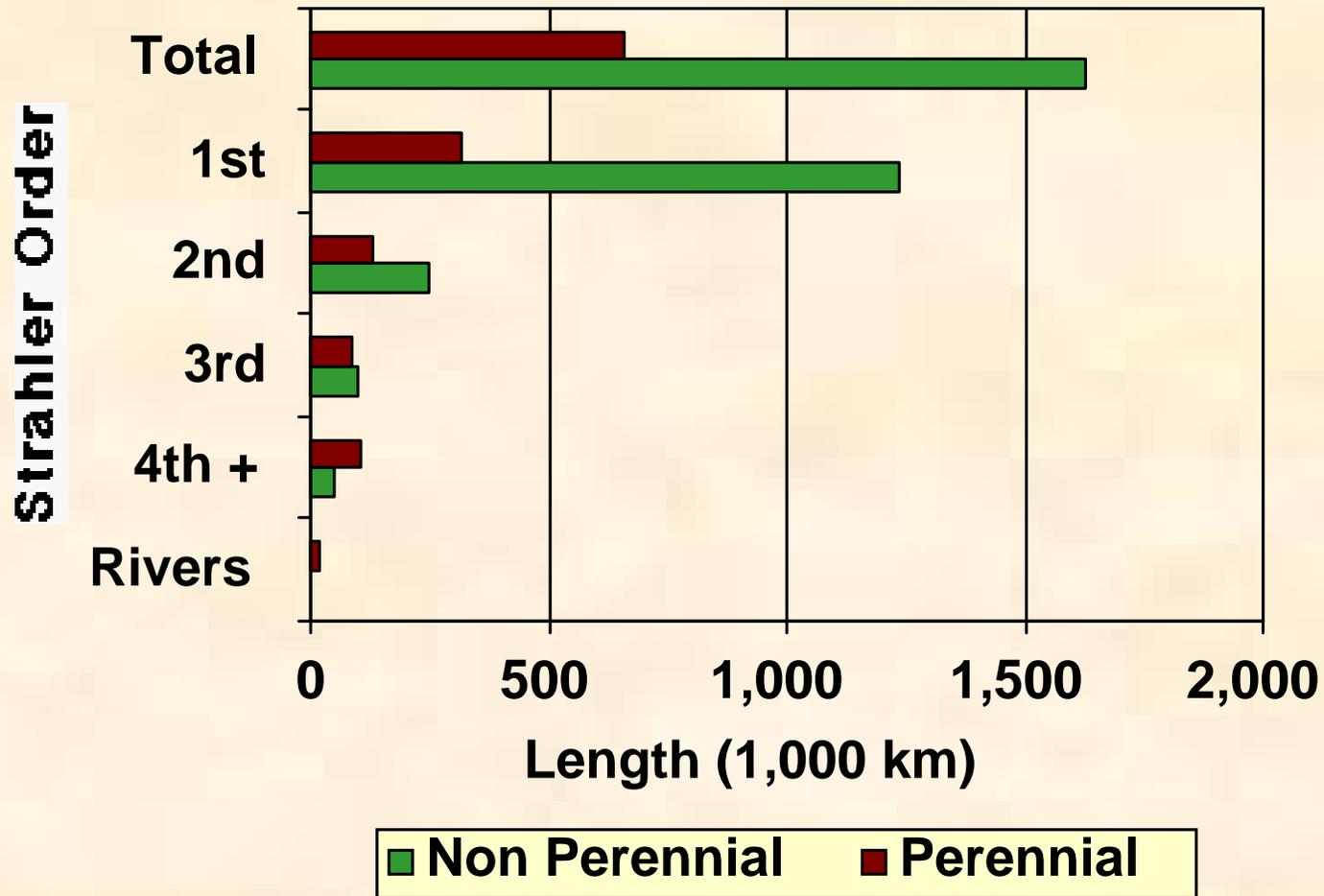


EMAP West: Sample Frame

- **RF3 GIS coverage of 1:100,000 stream and river traces**
 - NHD with Strahler order not available in 1999
 - Added class of large rivers (watersheds < 5,000 sq mi)
- **Factors used in survey design**
 - RF3 codes identifying perennial and non-perennial
 - Strahler order
 - Omernik ecoregion
 - Mountainous/humid and arid ecoregions
 - State and special study area boundaries



RF3 Stream Length



EMAP West Survey Design: Perennial Condition Study

- **Stratify by 12 states and restrict to RF3 Perennial Coded**
- **Spatially balanced survey design for linear network within each stratum**
- **Unequal probability categories based on**
 - Mountainous/humid vs Arid ecoregions
 - Strahler Categories: 1st, 2nd, 3rd, 4th+, and Large Rivers
- **Intensification in special study regions**
- **Panels: 4 years**
- **Sample size:**
 - 50 per state
 - Intensive studies varies from 50 to 160
- **Oversample: 100%**



EMAP West Survey Design: Perennial/Non-Perennial Extent Study

- **Stratify by RF3 perennial and non-perennial codes**
- **RF3 perennial code stratum: Use Perennial Condition Study survey design**
- **RF3 Non-Perennial coded stratum**
 - **Stratify by 12 states**
 - **Spatially balanced survey design for linear network**
 - **Unequal probability categories based on**
 - **Mountainous/humid vs Arid ecoregions**
 - **Strahler Categories: 1st, 2nd, and 3rd+**
 - **Sample size: 100 per state: total 1200**



EMAP West Stream and River Survey 1999 - 2004

Omernik Level III Ecoregions* for Use in Survey Design

-  Ecoregions Designated Arid
-  Ecoregions Designated Humid or Mountainous

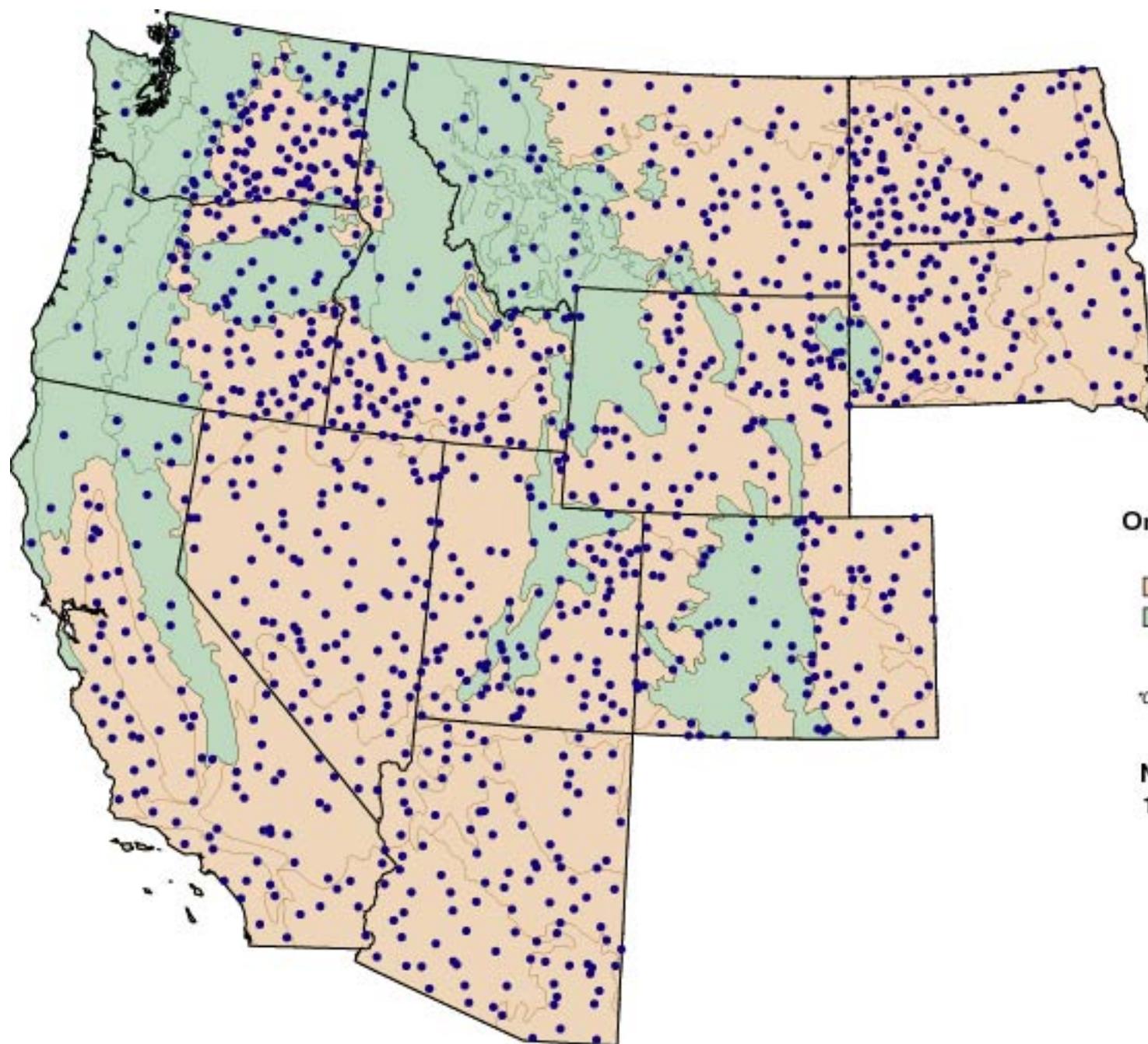
**Omernik Level III Ecoregions, January 1999*

Non-perennial Sample sites
100 sites selected per state
(not intended for field sampling)



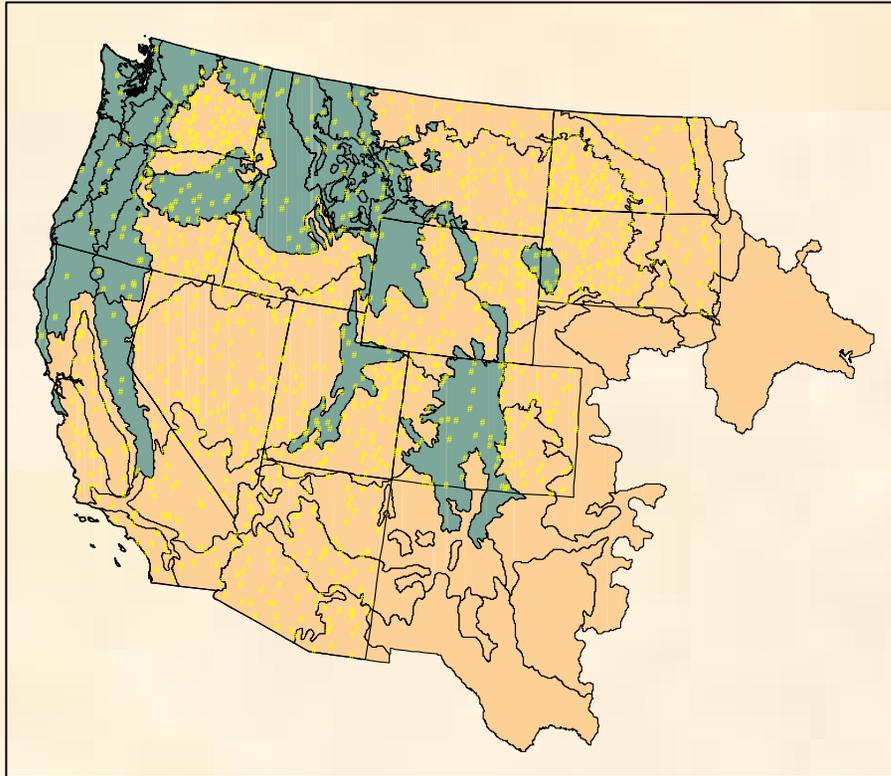
US EPA, NHEERL-WED
Corvallis, Oregon

August 4, 1999

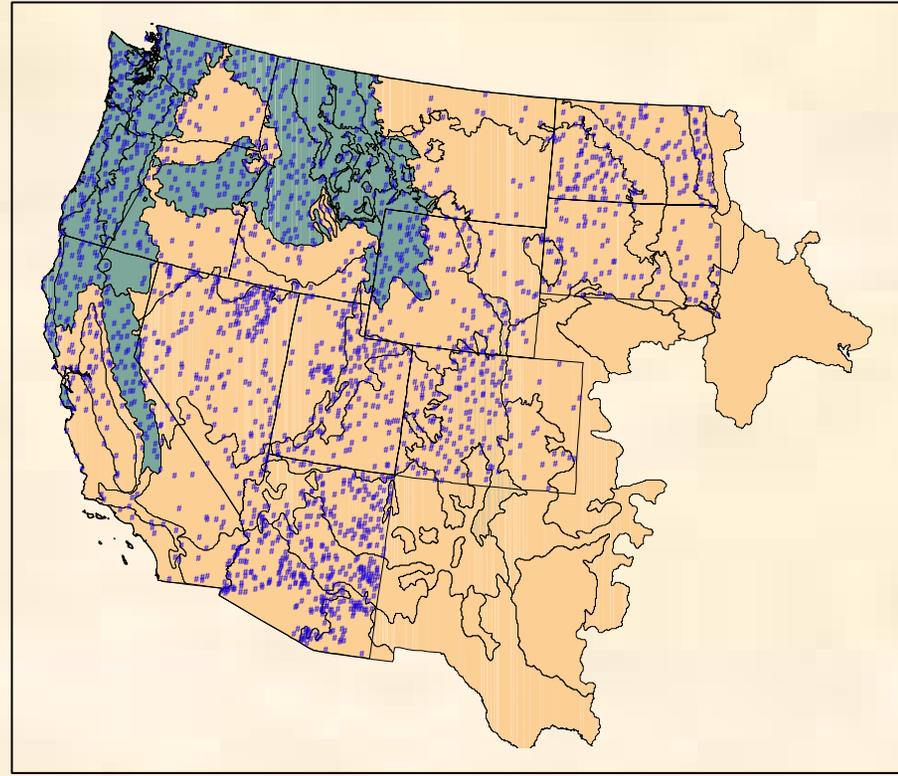


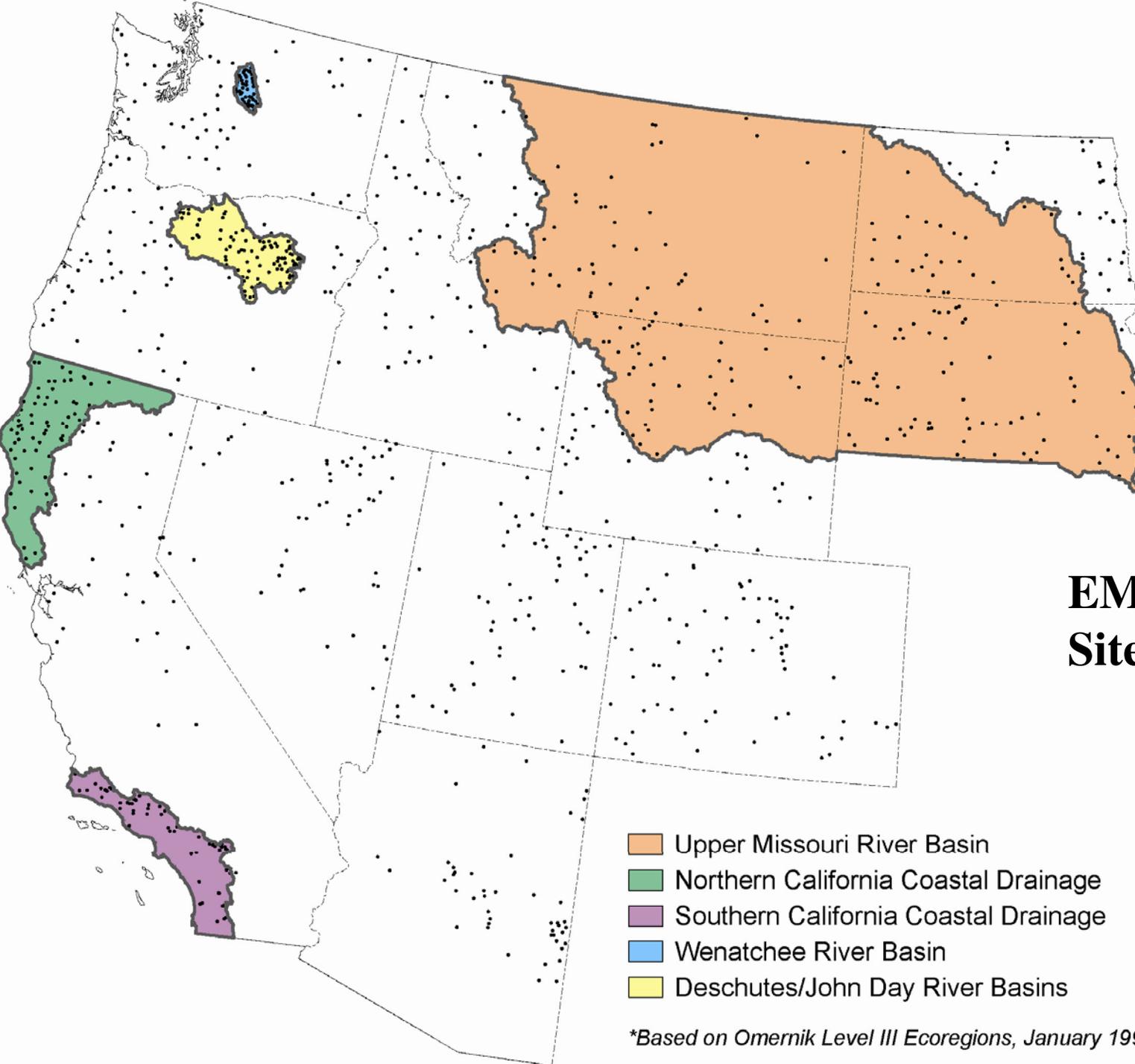
Locations: Sites Evaluated

RF3 Nonperennial Stratum



RF3 Perennial Stratum





EMAP West Sites sampled

- Upper Missouri River Basin
- Northern California Coastal Drainage
- Southern California Coastal Drainage
- Wenatchee River Basin
- Deschutes/John Day River Basins

**Based on Omernik Level III Ecoregions, January 1999*

EMAP West Stream/River Length (miles)

Frame Source	RF3 Frame Size	Evaluated Perennial	Evaluated Non-Perennial	Evaluated Non-Target Perennial
RF3 Coded Perennial	390,609	275,707 ±8,807	Included in non-target perennial	114,901 ±7,982
RF3 Coded NonPerennial	1,017,928	70,569 ±13,054	918,087 ±38,962	29,272 ±11,249
Total	1,408,537	346,276 ±16,390		144,173 ±13,571

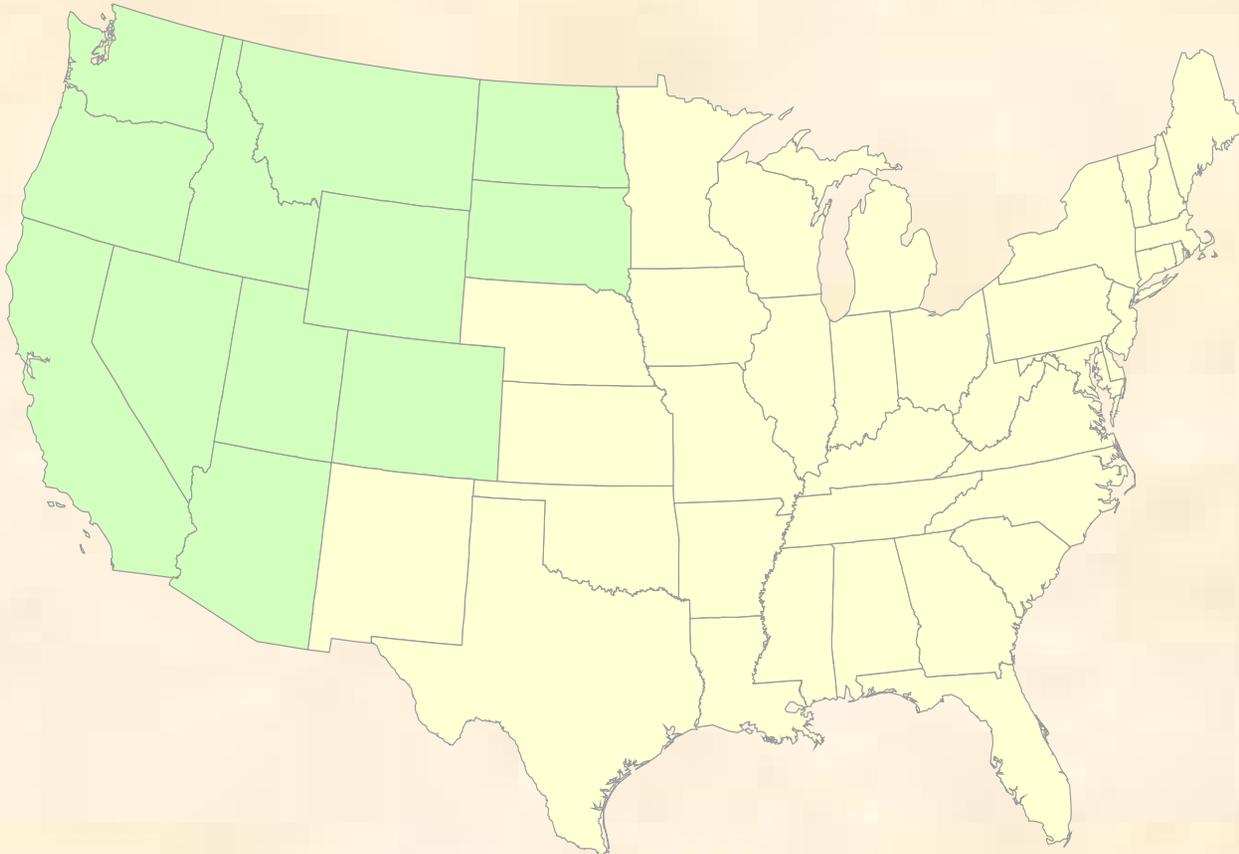


WSA Regions

WSA West Design

WSA East Design

wadeable streams from EMAP West
perennial survey

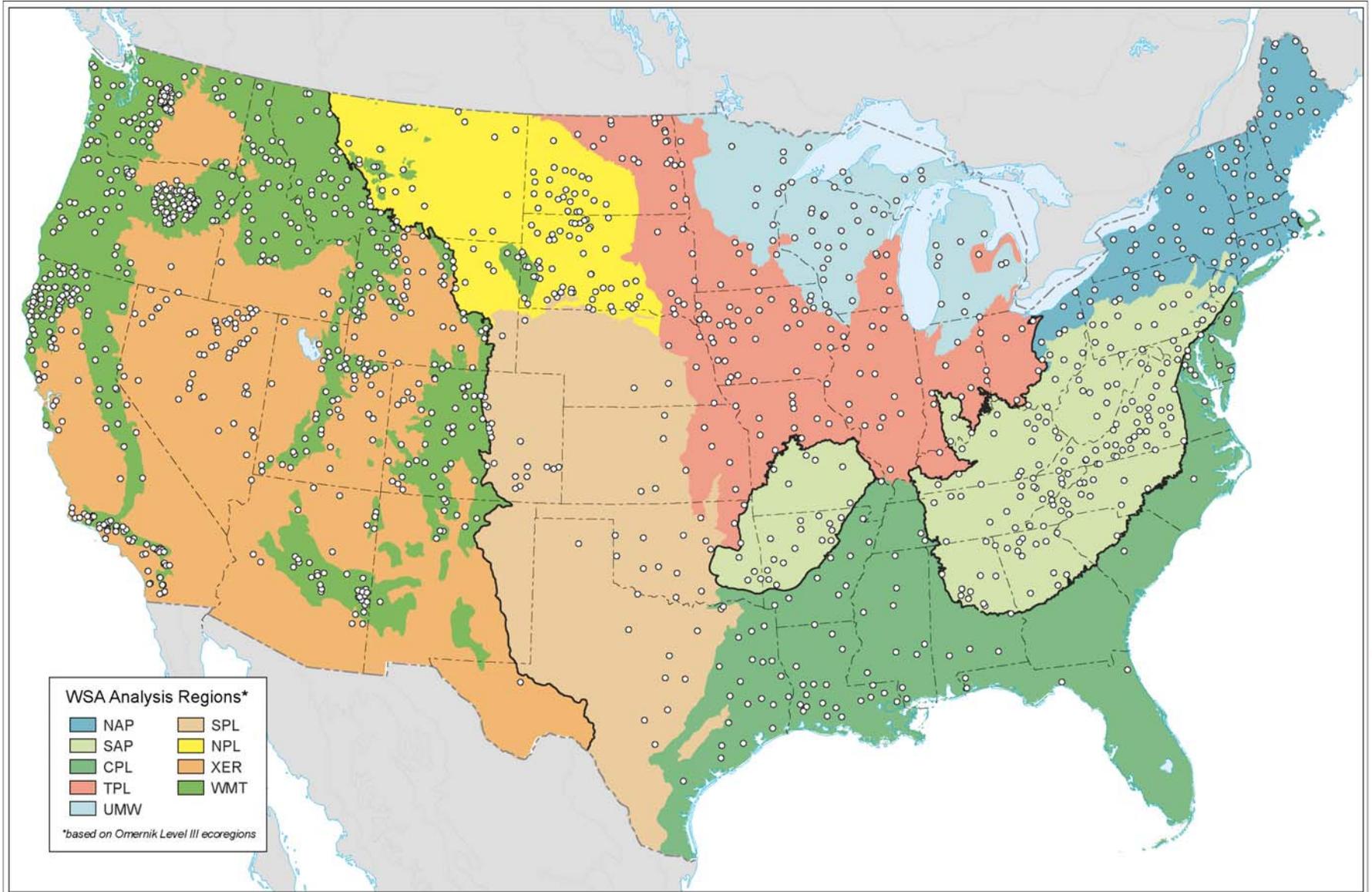


WSA East Survey Design

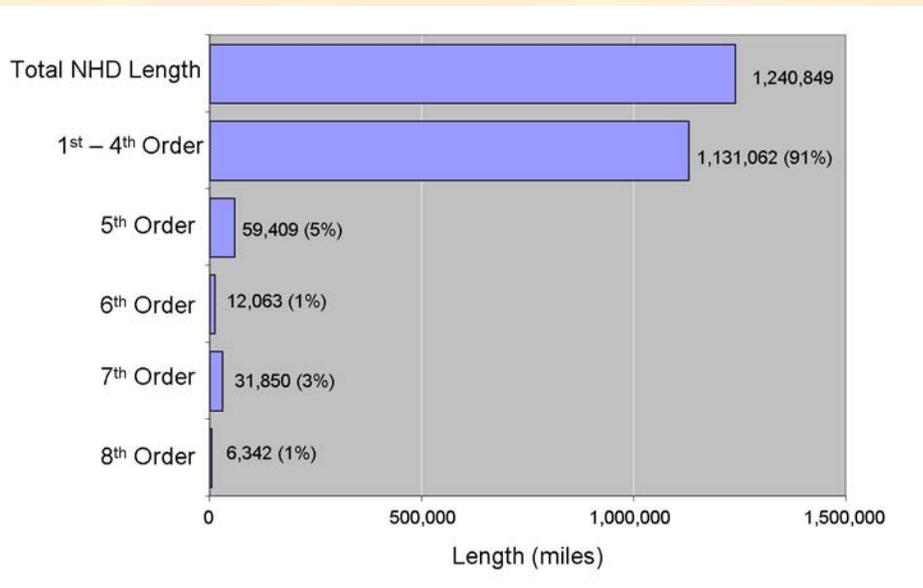
- **Spatially-balanced unequal probability site selection**
- **Unequal probability categories based on**
 - **Omernik ecorgions: combinations of level 2**
 - **USEPA regions**
 - **Strahler order categories: 1st, 2nd, and 3rd&higher**
- **Expected sample size 500 sites**
- **Additional sites selected to be used when initial sites can not be sampled**
 - **Not wadeable stream**
 - **landowner denies access or physically inaccessible**



WSA Wadeable Sites Sampled



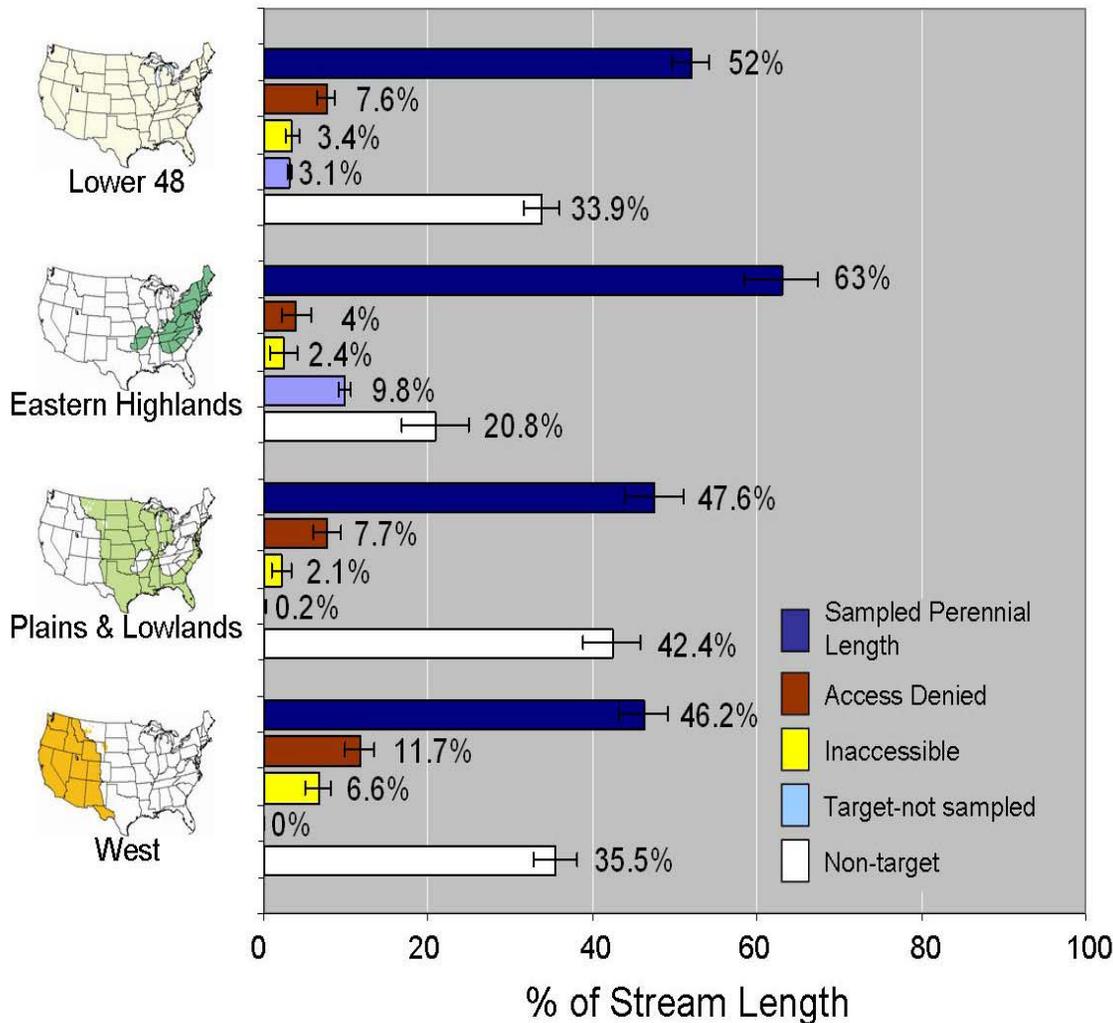
NHD (RF3) Perennial-Coded Stream and River Length



- 1st through 5th order streams comprise 96% of total estimated length in the NHD.
- 1st through 5th order systems form the basis for the sample frame for WSA East.
- All orders form the basis for the sample frame for WSA West



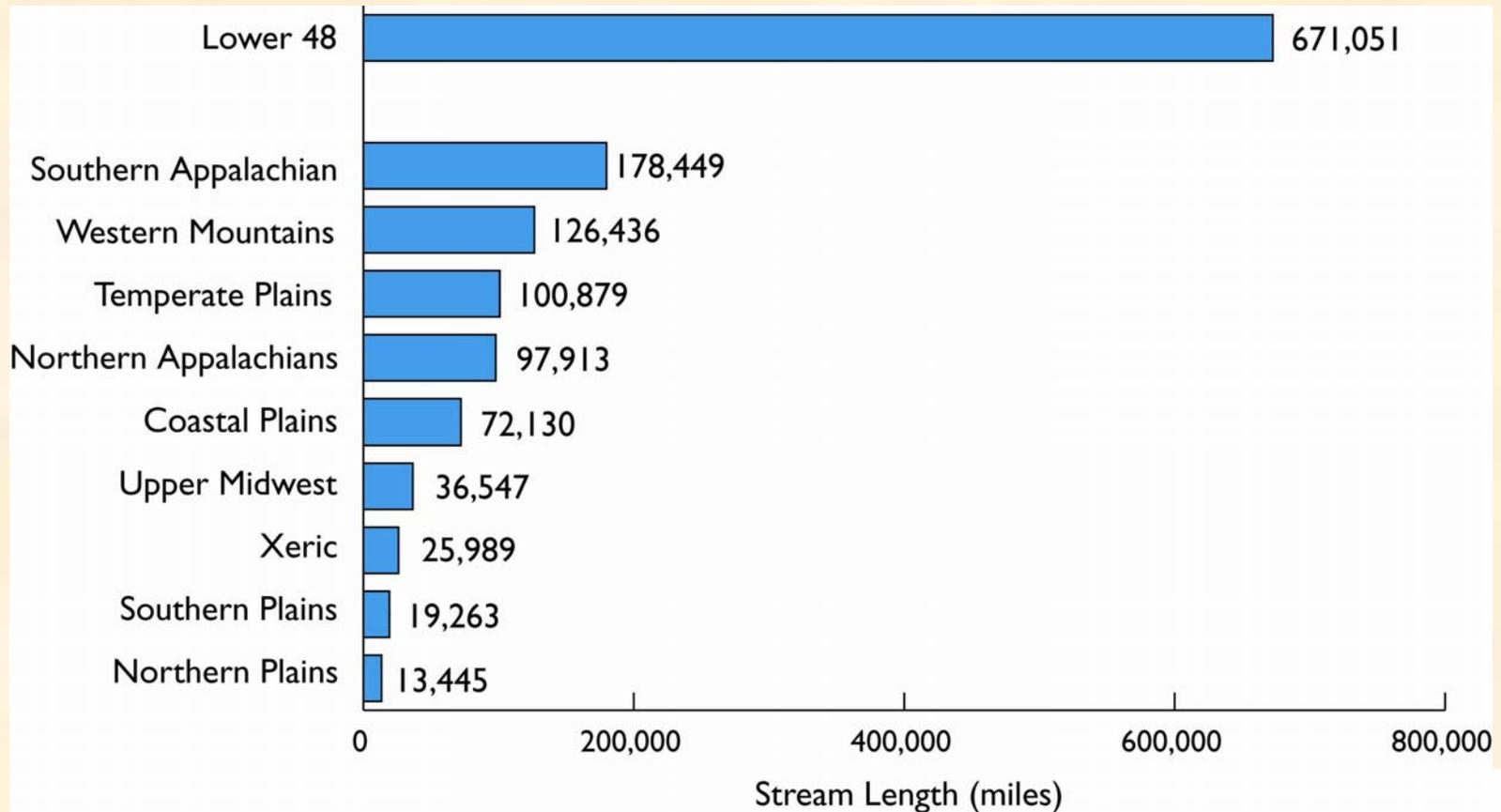
Estimates of Wadeable Stream Extent



- Based on office and field evaluation of sites in sample.
- In each region, percentages are percent of NHD length in the region



WSA Estimated Wadeable Perennial Stream Length that can be Sampled





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