

US EPA ARCHIVE DOCUMENT

Estimating Perennial and Non-perennial Stream and River Length in 12 Western States

D.V. Peck and A.R. Olsen, U.S. EPA

D.K. Averill and J. Sackinger, Dynamac Inc.

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Research Laboratory

Western Ecology Division

Corvallis, OR



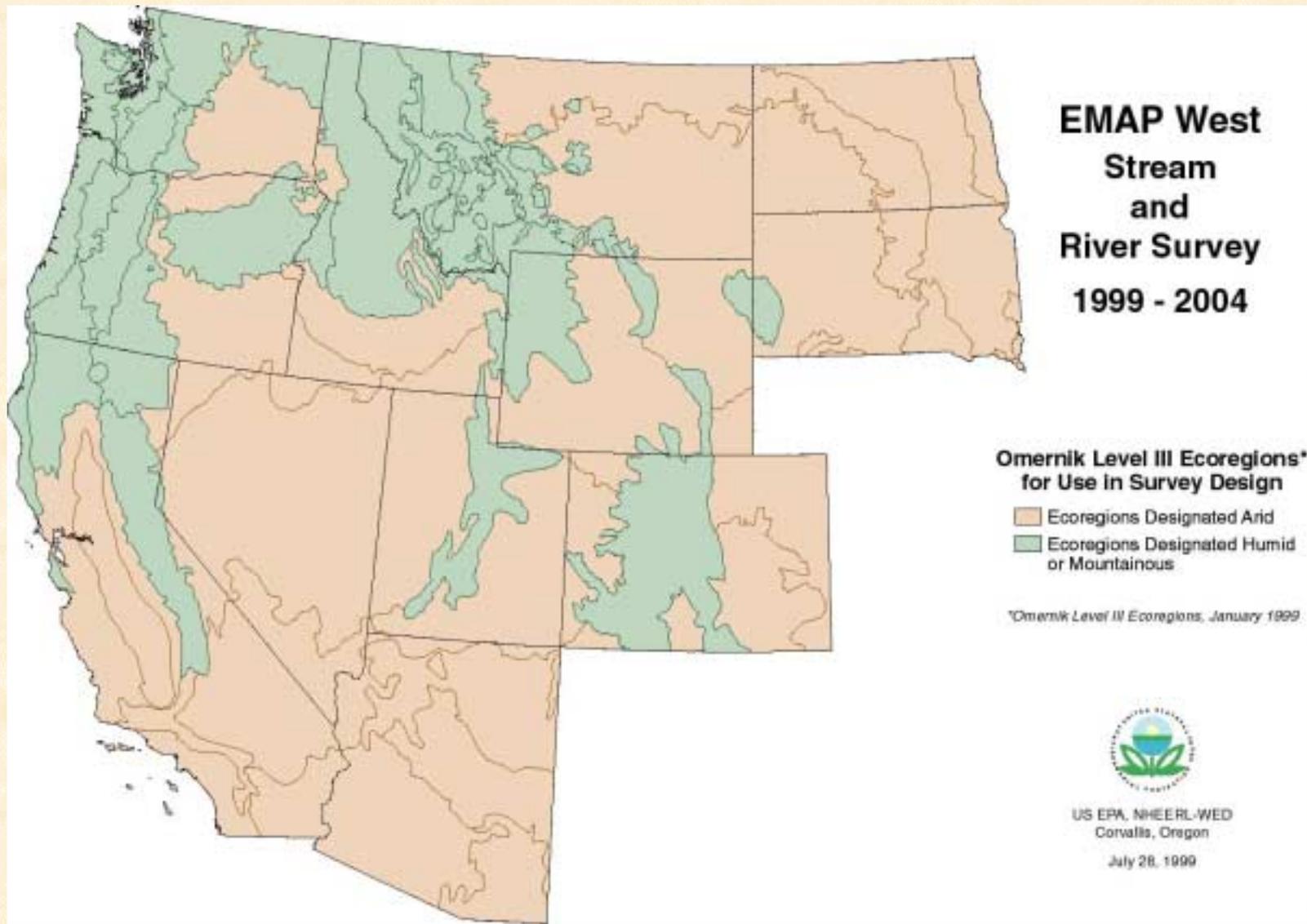
EMAP-West Stream/River Survey Design Objectives

- ❖ Estimate for each State, EPA Region, and Study Region
 - Extent (total length) of perennial and non-perennial streams and rivers
 - Condition of perennial streams and rivers
- ❖ Estimate for each special study area
 - Extent of perennial streams and rivers
 - Condition of perennial streams and rivers

Survey Design Structure

- ❖ Target population: perennial streams excluding "Great Rivers"
 - Mainstem Missouri, Lower Colorado, Columbia, Lower Snake
- ❖ Stratify site selection by State
- ❖ Unequal probability sampling
 - Strahler order classes
 - Ecoregions ("arid" vs. "humid")

Study Area



Sample Frame for Streams

- ❖ GIS coverage of 1:100,000 stream and river traces contained in RF3 from 12 western states
 - NHD was not yet available (1999)
- ❖ RF3 factors used in design
 - Code for perennial and non-perennial
 - State and special study areas
 - Strahler order – added by EMAP
 - Omernik ecoregion – added by EMAP
- ❖ RF3 known to have inaccurate codes
 - Mapping errors
 - Scale (1:100,000)
 - Photo interpretation, date of photo

Site Evaluation Study

- ❖ 1999: set stage for selection of field sampling sites in 2000—2003
- ❖ Survey of RF3 reaches
 - Evaluated using independent approaches
- ❖ Estimate extent of “differences” in RF3 coding
 - Better estimates of total stream length for more accurate extent estimates
 - ☞ What is included that shouldn't be?
 - ☞ What is not included that should be?
 - Minimize wasted visits and other “surprises”

Participants and Acknowledgements

- ❖ Arizona DEQ
 - ❖ California DFG
 - ❖ Idaho DEQ
 - ❖ Montana DEQ
 - ❖ N. Dakota DOH
 - ❖ Oregon DEQ
 - ❖ S. Dakota DNR
 - ❖ Washington DOE
 - ❖ Dynamac, Inc.
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- ❖ 100s of local experts from all 12 States
 - ❖ Barb Rosenbaum (Indus, Inc.) – frame development
 - ❖ Dave Cassell (CSC) – Statistical support for site selection and estimation

Two Surveys

❖ RF3 Non-perennial Survey

- Selected from RF3 reaches coded as “non-perennial”
 - ☞ Excludes large non-perennial rivers
- 100 “sites” per state
 - ☞ site = lat/long coordinates
- All sites were evaluated

❖ RF3 Perennial Survey

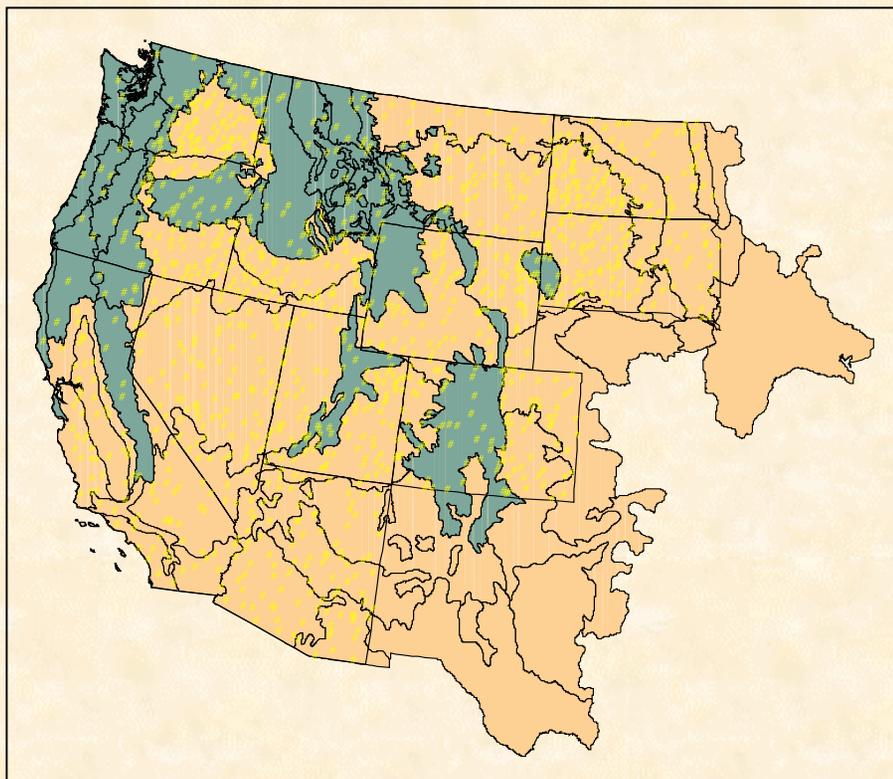
- Selected from RF3 reaches coded as “perennial”
 - ☞ Includes large rivers coded as non-perennial
- Evaluate enough sites to end up with at least 50 per state
 - ☞ n ranged between 78 and 384 sites

Site Evaluation Process

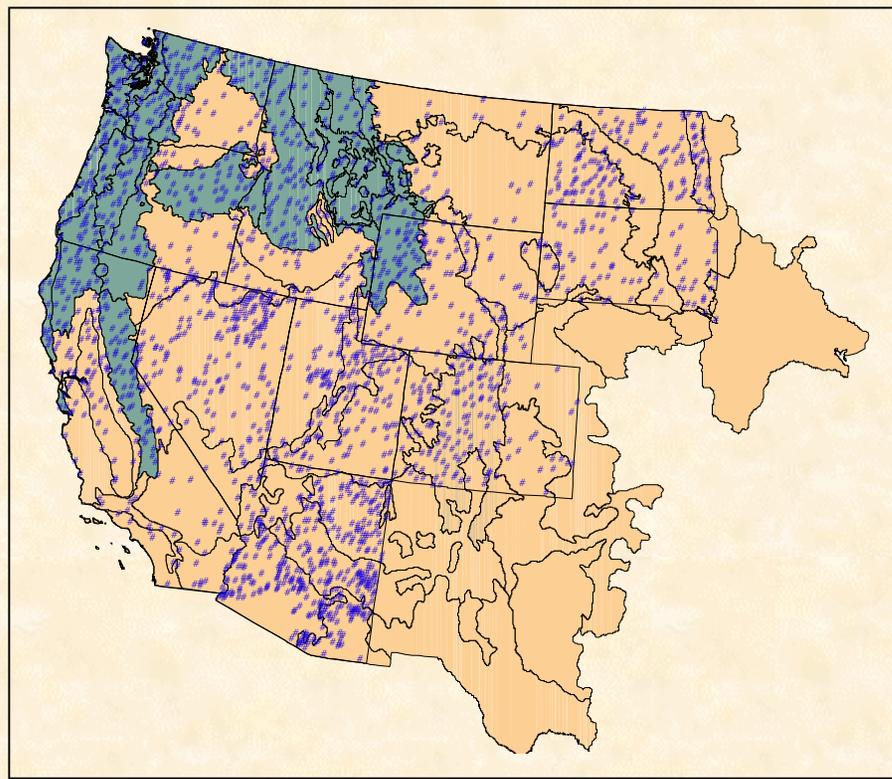
- ❖ Each site evaluated to determine
 - Stream channel existence
 - Perennial or non-perennial
 - ☞ “perennial” = flow all year most years
 - Other characteristics
- ❖ Standardized procedures and data forms
 - Office
 - ☞ Maps
 - ☞ Aerial photographs
 - ☞ Phone calls/local experts
 - ☞ GIS coverages
 - Field visit (if no information from office)
 - ☞ Drive by or actually visit a site for confirmation

Site Locations

Nonperennial Survey



Perennial Survey



Data Analysis

- ❖ Defining and classifying the “target population”
 - “Perennial”: Candidate site; potentially part of target population for EMAP Western Pilot
 - ☞ Includes “unknown” flow regime and inaccessible sites
 - Non-perennial
 - ☞ Includes non-perennial constructed channels
 - Other (Not a stream or river):
 - ☞ Map errors, impoundments, wetlands, tidally influenced, pipelines
- ❖ Compute site “weightings”
- ❖ Compute estimated lengths, percentages, and confidence intervals

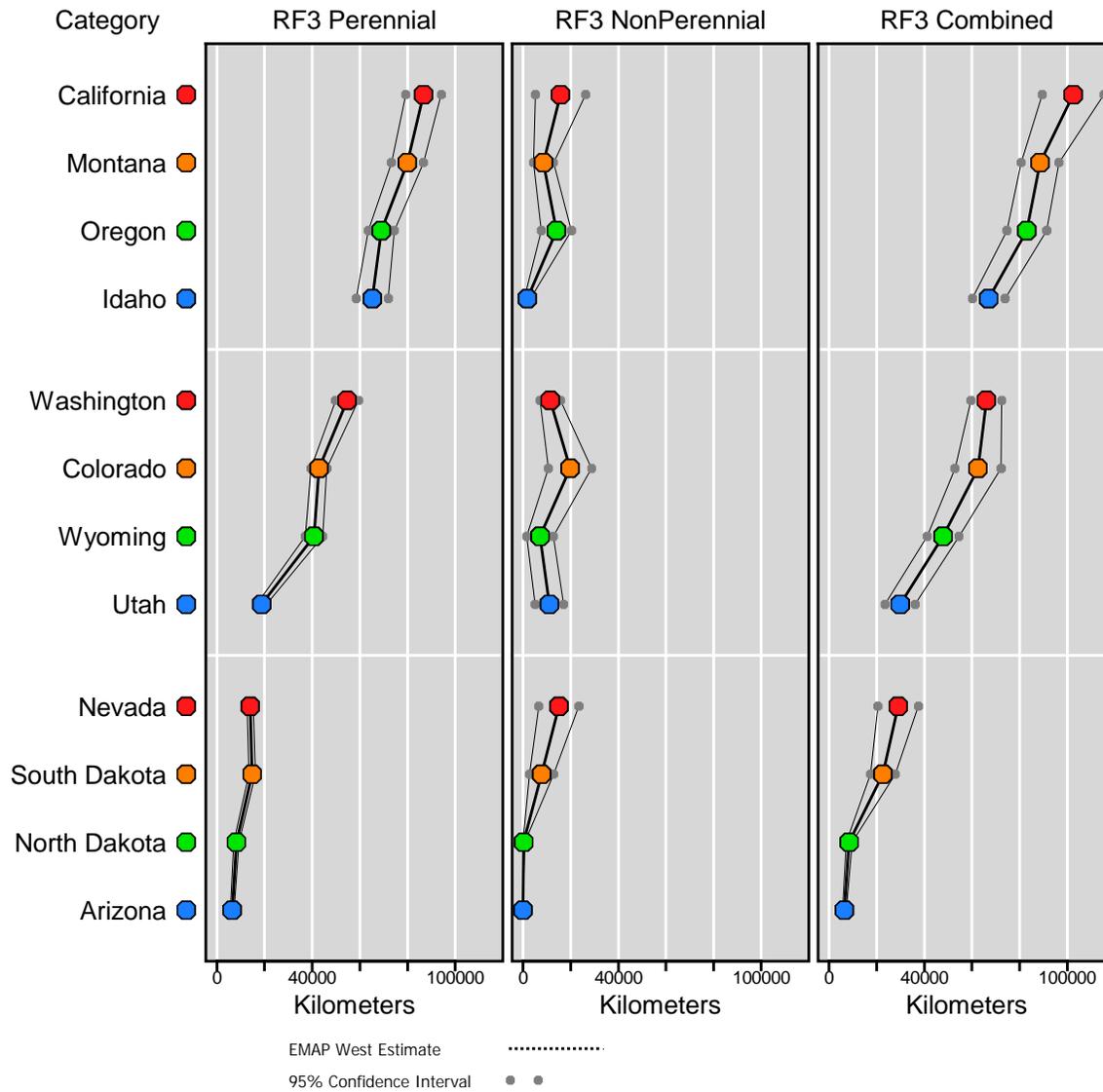
Site Evaluation Questions

- ❖ How many kilometers of streams and rivers are “perennial” and non-perennial overall and by state?
- ❖ How many kilometers of “perennial” streams are estimated as being coded non-perennial in RF3?
- ❖ What percent of RF3 streams coded as perennial are “perennial”?

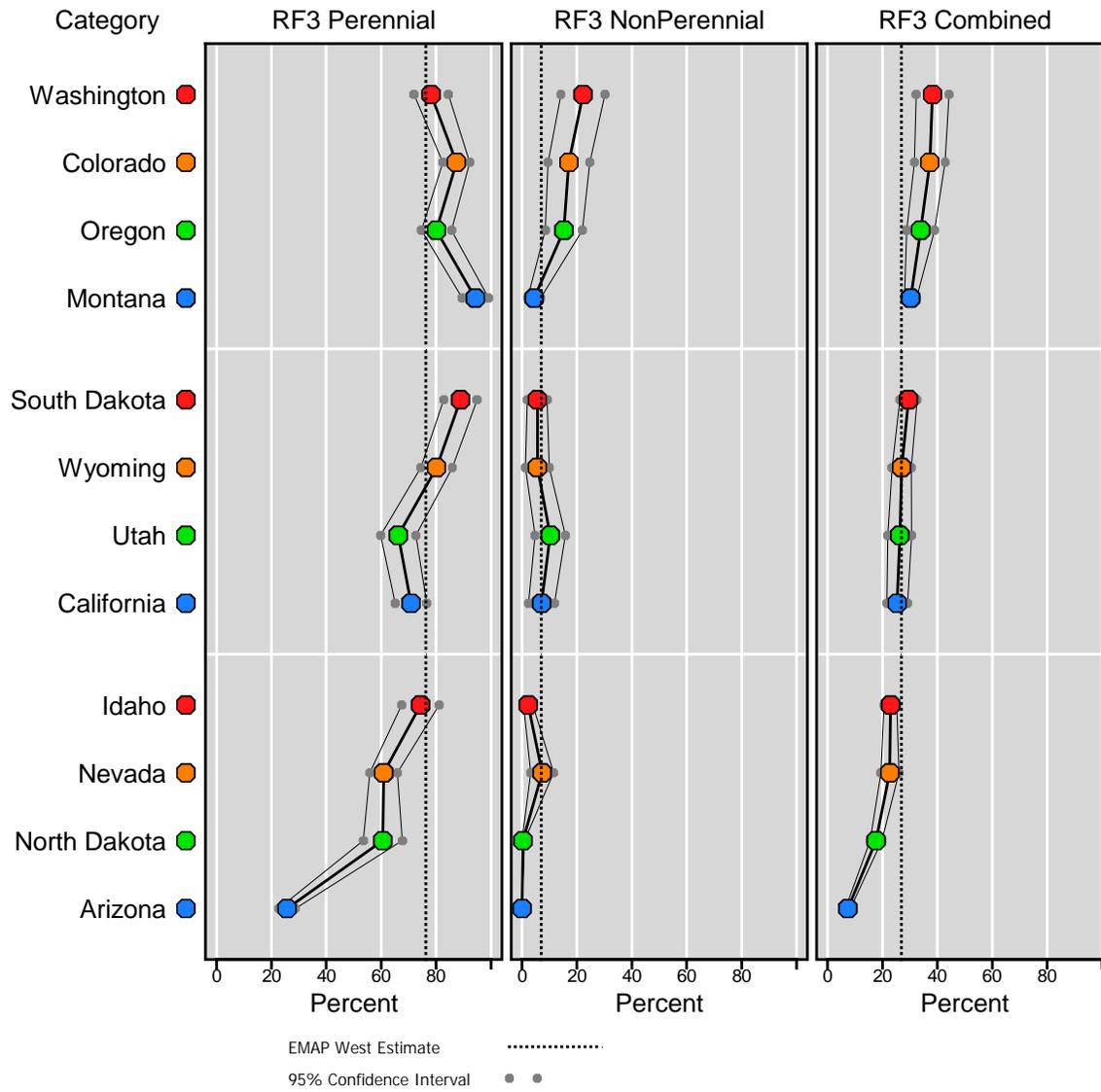
EMAP-West Stream/river Length (km ± 95% CI)

Frame Source	RF3 Frame Size	Evaluated "Perennial"	Evaluated Non-perennial
RF3 Coded Perennial (Perennial Survey)	656,706	501,060 ±15,590	128,328 ±12,709
RF3 Coded Non-perennial (Non-perennial Survey)	1,628,980	112,537 ±21,278	1,469,277 ±63,515
Total	2,285,686	613,597 ±26,378	1,597,605 ±64,774

EMAP West RF3 Site Evaluation Study Evaluated as Perennial

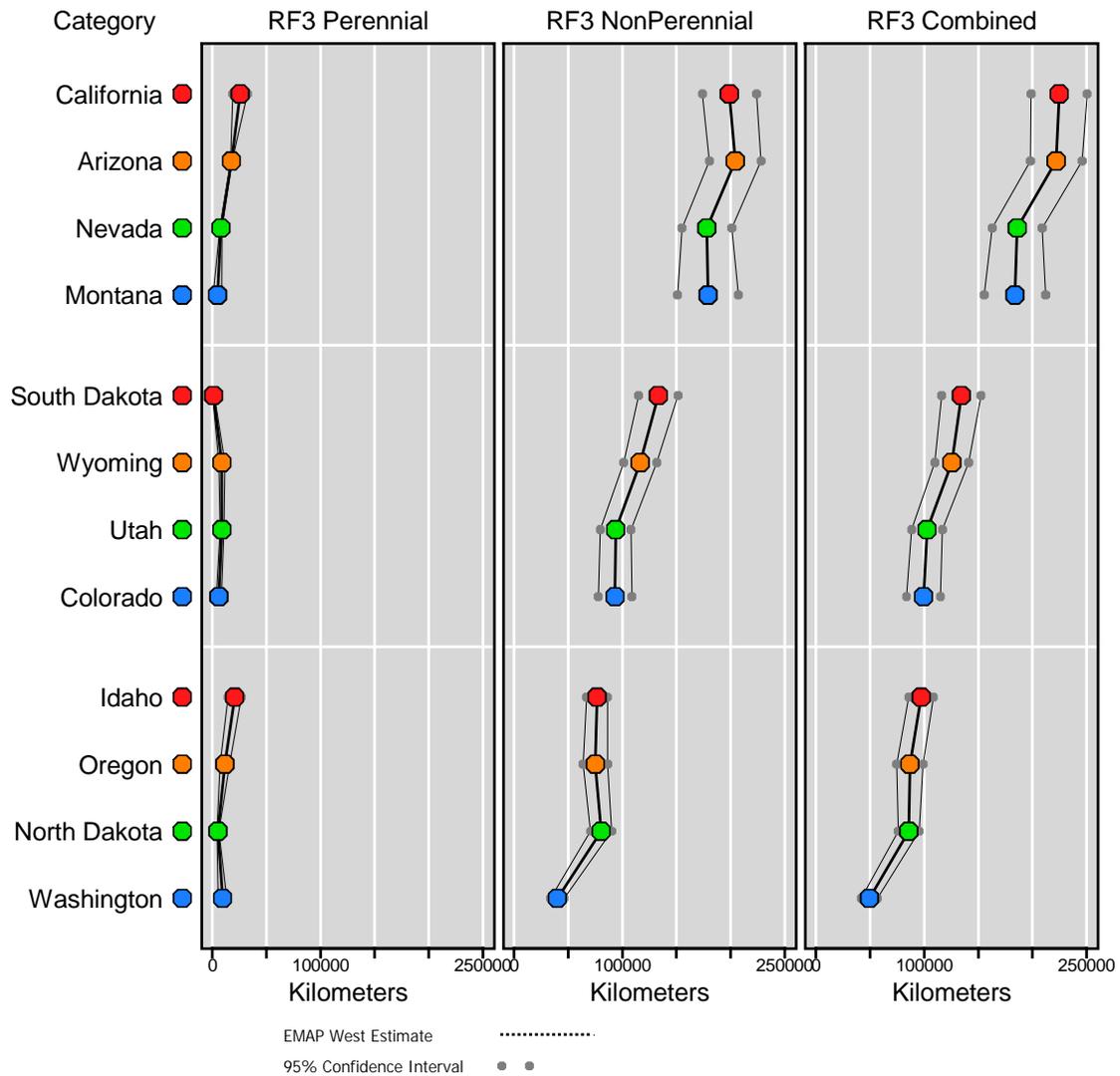


EMAP West RF3 Study Evaluated as Perennial

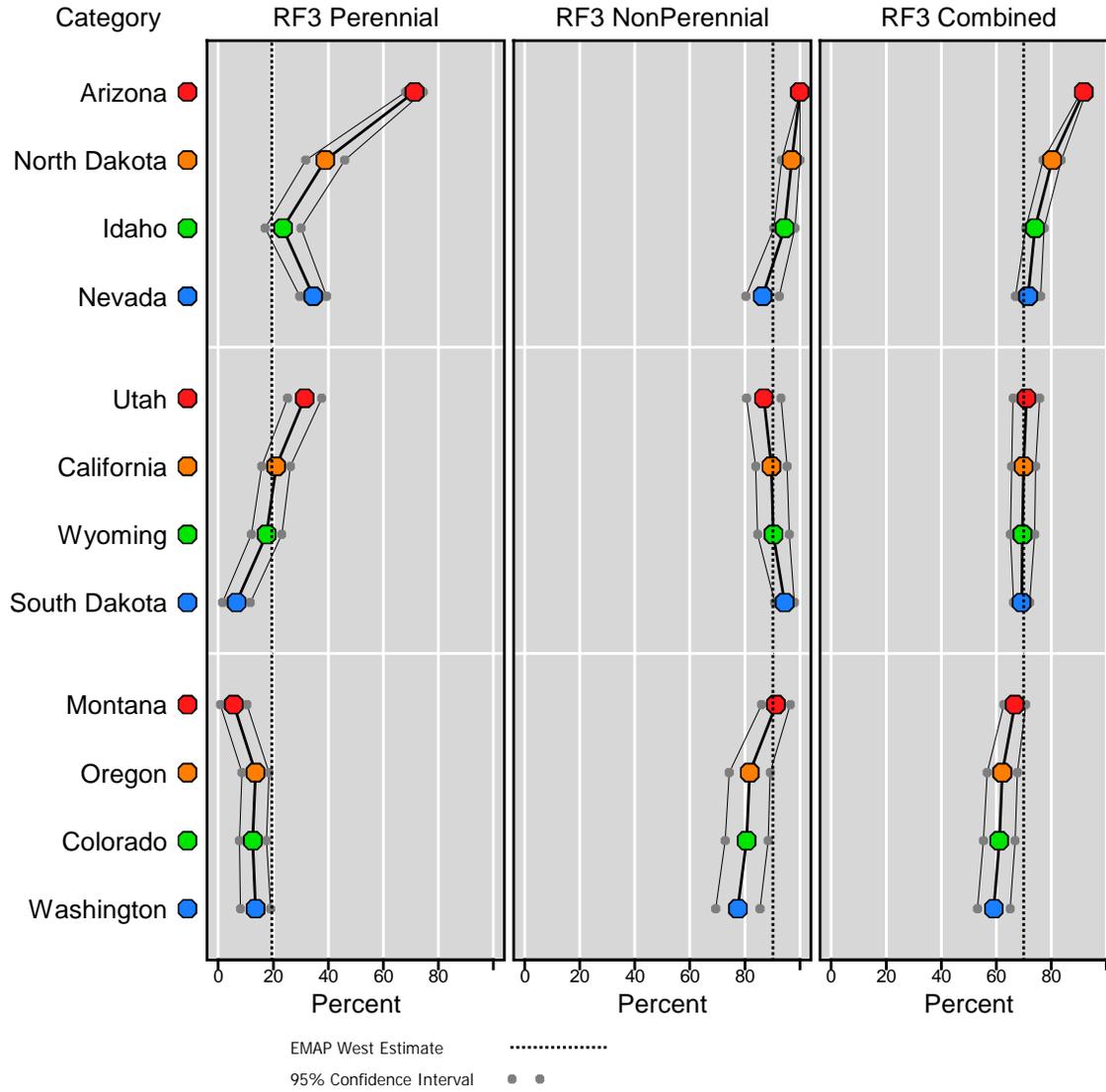


EMAP West RF3 Site Evaluation Study

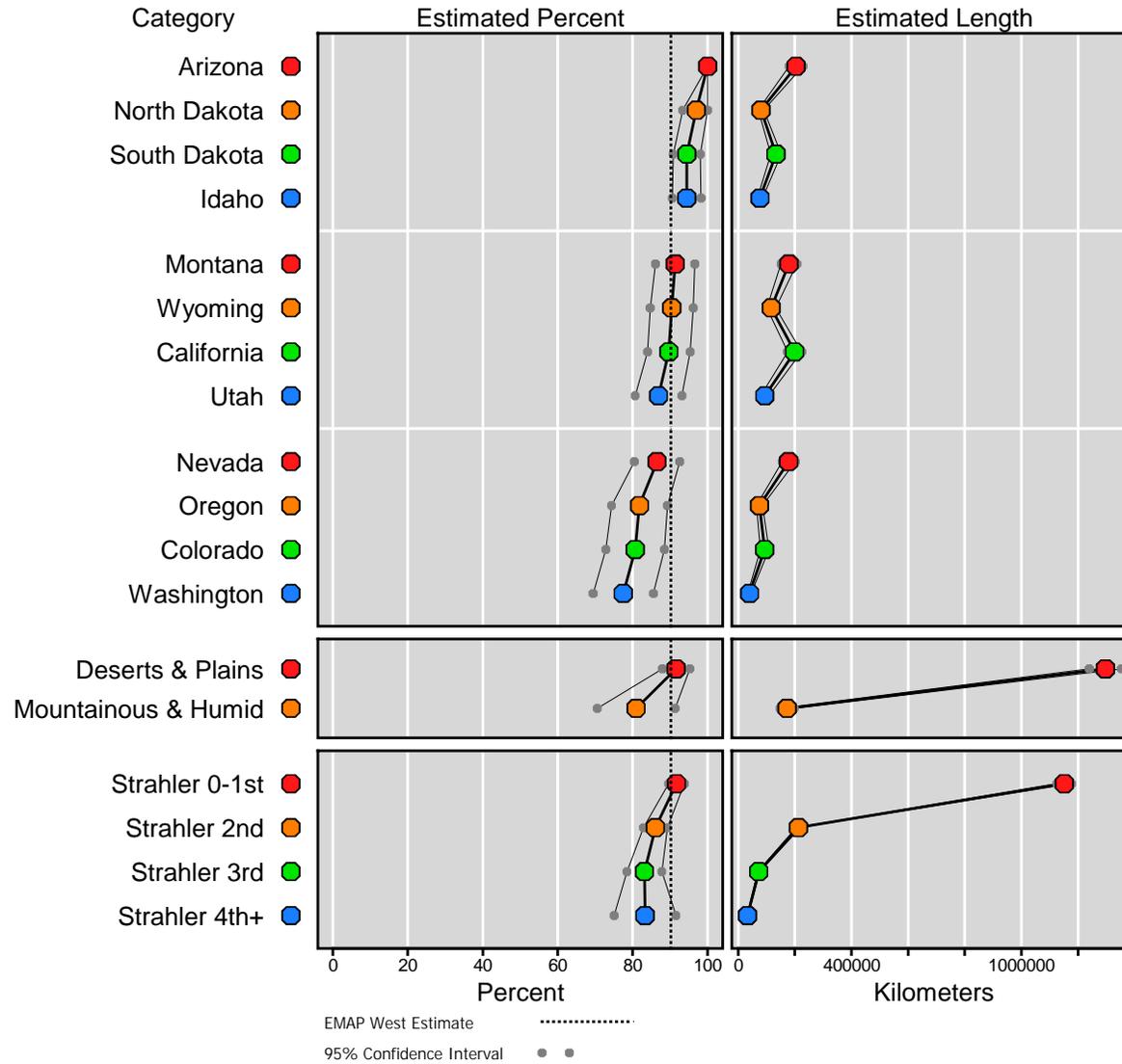
Evaluated as Non-Perennial



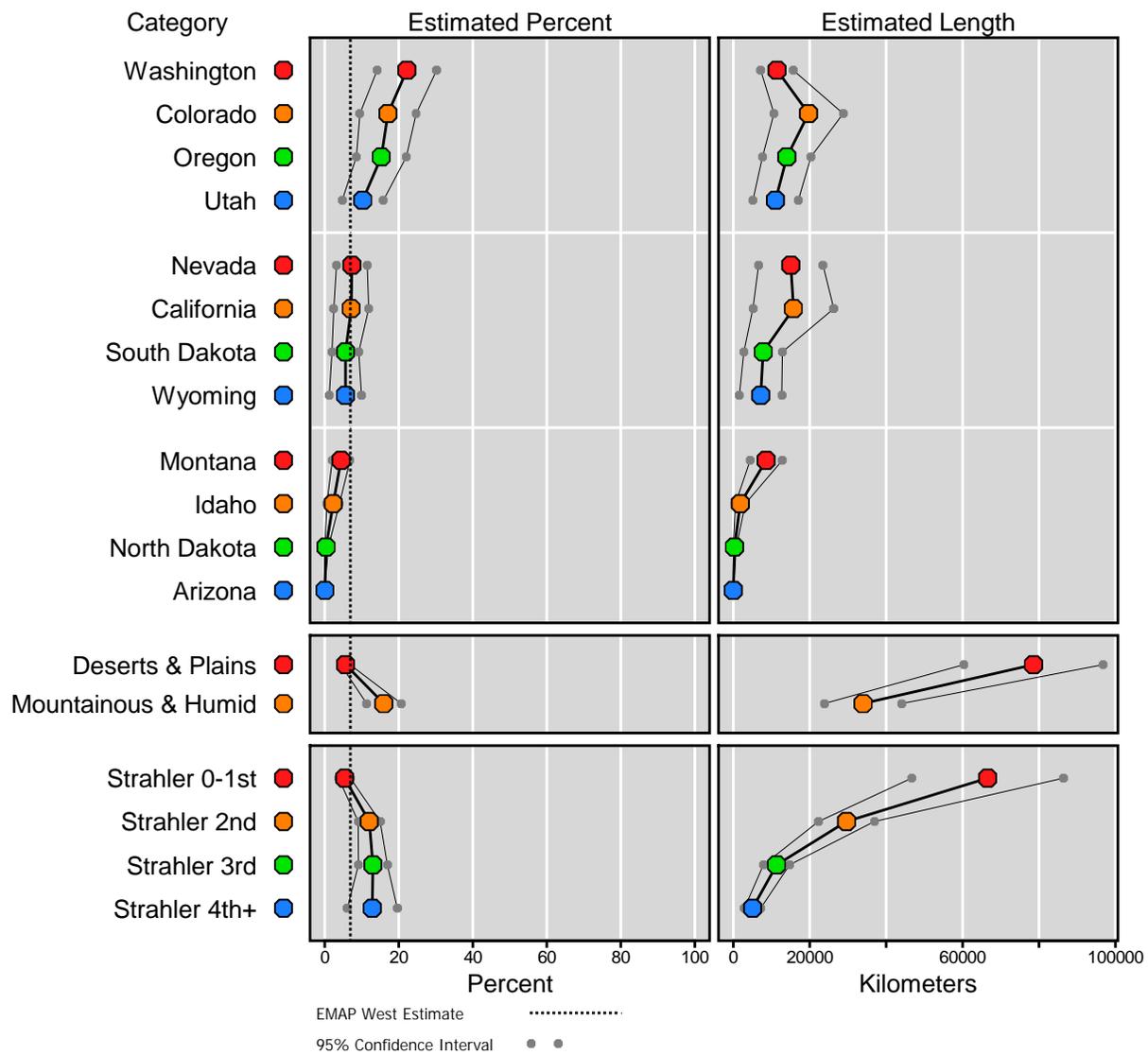
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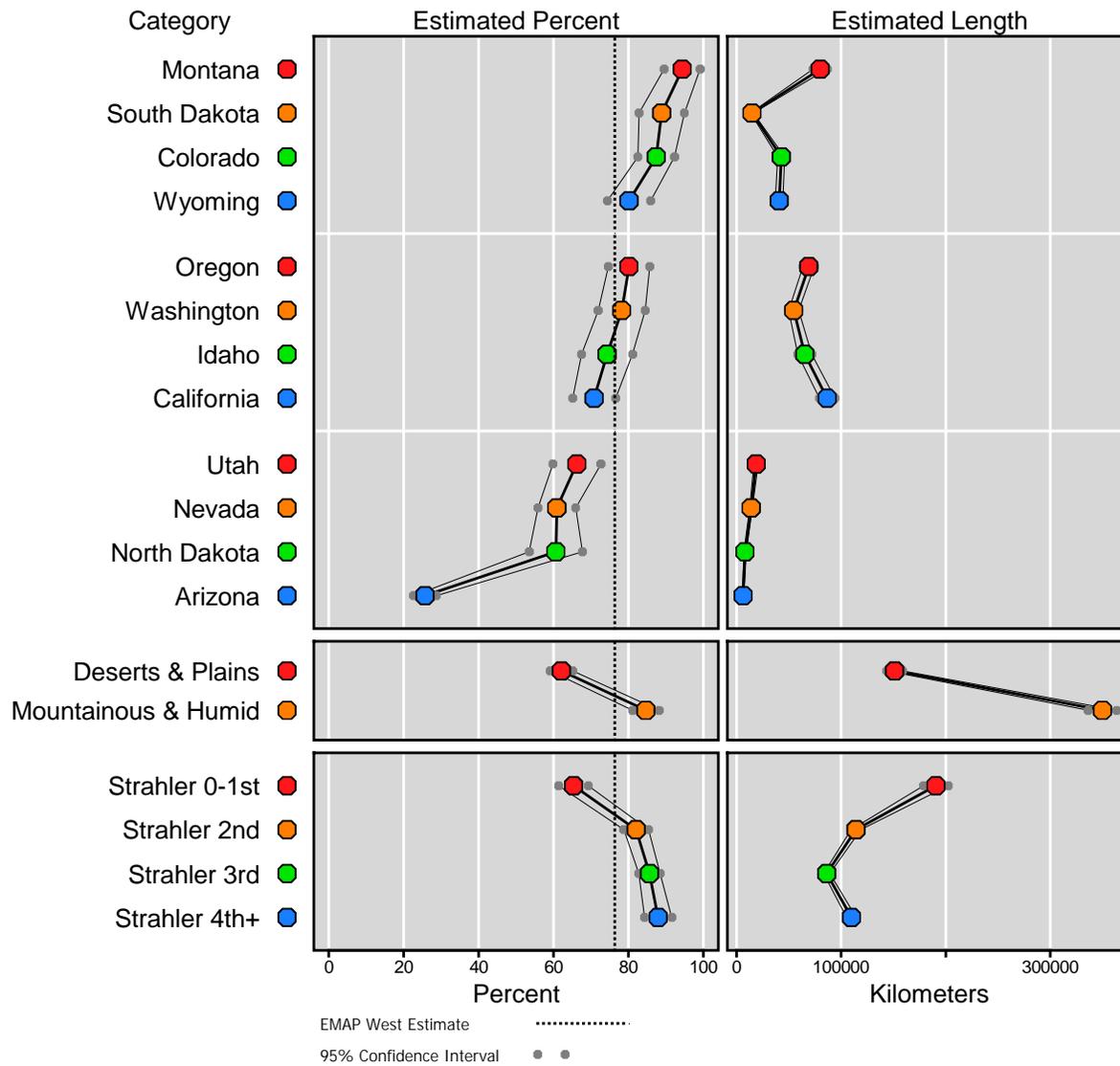
EMAP West RF3 Non Perennial Study RF3 Non-Perennial Evaluated as Non-Perennial



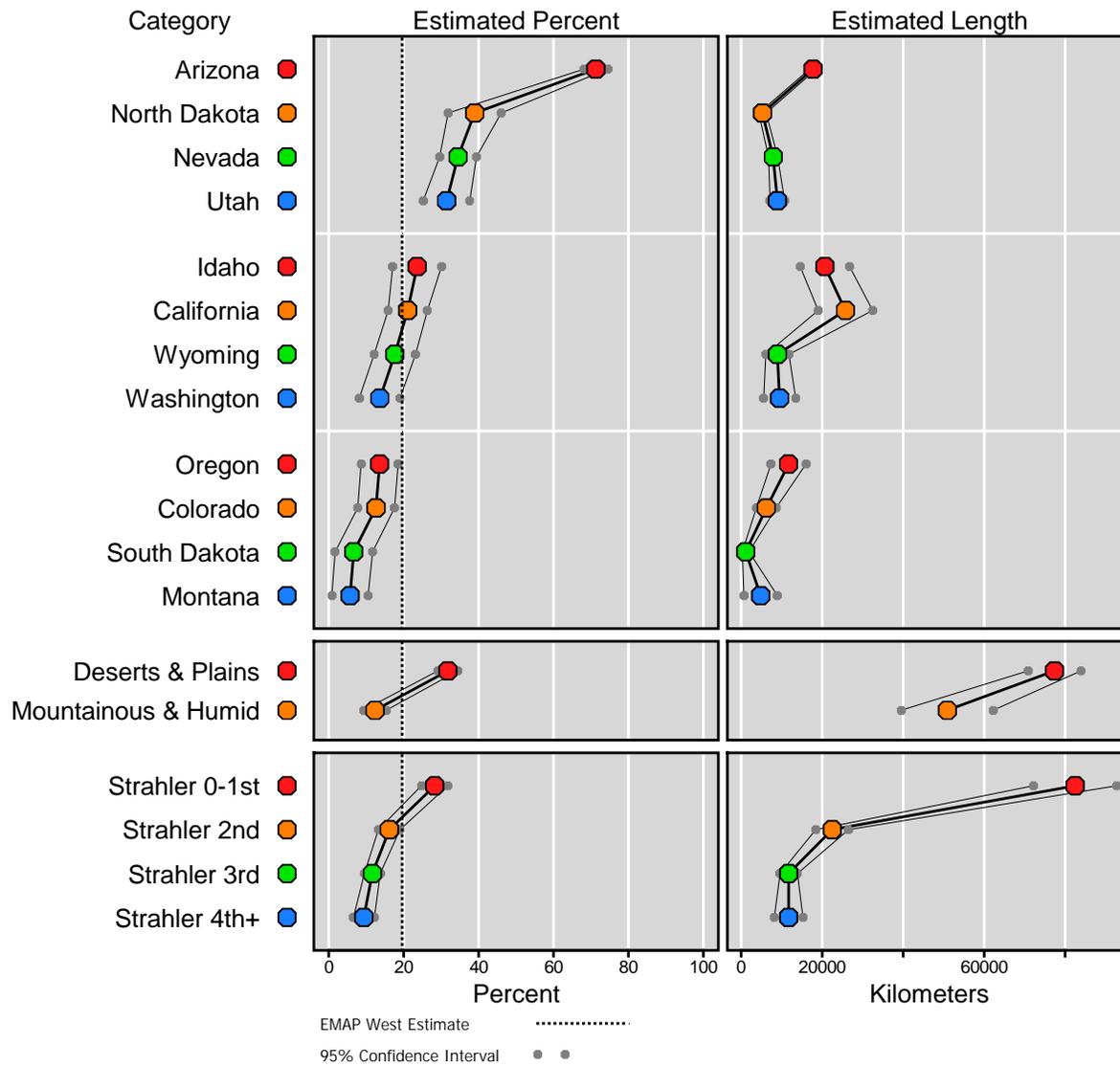
EMAP West RF3 Non Perennial Study RF3 Non-Perennial Evaluated as Perennial



EMAP West RF3 Perennial Study RF3 Perennial Evaluated as Perennial



EMAP West RF3 Perennial Study RF3 Perennial Evaluated as Non-Perennial



Findings

- ❖ RF3 Non-perennial survey
 - “Perennial” sites represent overlooked portion of sample for EMAP-West: 112,000 km (18%)
- ❖ RF3 Perennial survey
 - Extra Recon effort needed to find “perennial” sites: 24% not “perennial”
- ❖ Overall
 - Have refined estimates of target population
 - Will be further refined after field reconnaissance and field sampling
 - ☞ Inaccessible sites (physical barriers, access denials)
 - ☞ More nonperennial sites
 - ☞ Other perennial sites not of interest

Implications

- ❖ Impacts stream and river lengths for 305b Reports (?)
- ❖ RF3/NHD coding for perennial requires care when used.
 - Are there areas or attributes associated with “differences” from RF3/NHD that can assist with review and possible correction?
- ❖ Information from study can be used to improve future survey designs for states

