EMAP-Western Pilot Assessment

A research program aimed at improving the science and tools of environmental monitoring

EMAP Objectives

- Estimate current status of and trends in selected indicators of condition …on a regional basis with known confidence
- Estimate geographic coverage and extent
- Seek associations between biological condition and stresses
- Provide tools

EMAP-West Surface Waters Tools

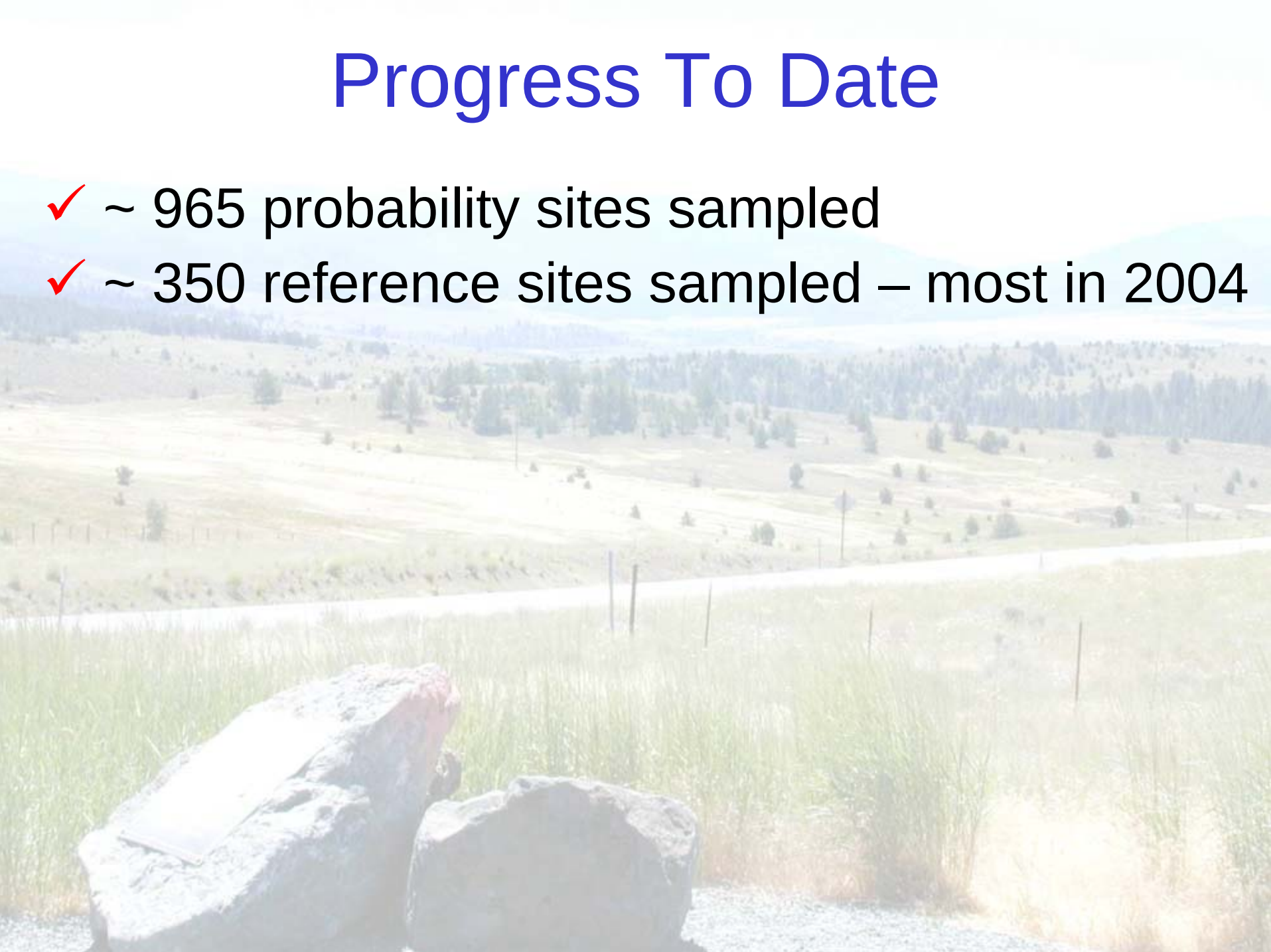
- Sample Survey Design
  - Probability sampling →inferences about target population
- Ecological Indicators
  - Biological and Stressor
- Assessment methods
  - Simpler to more synthetic
- Reference Conditions

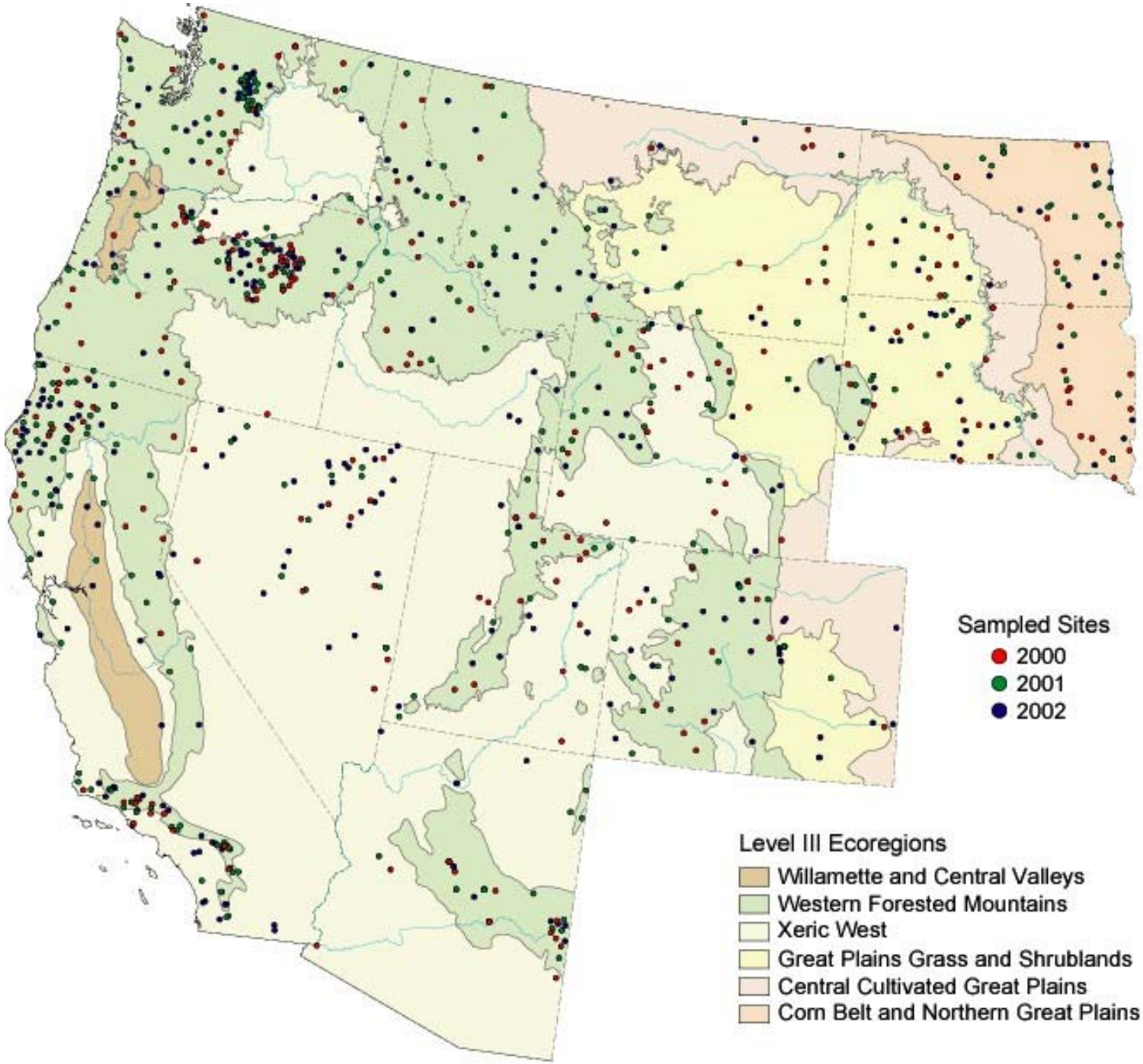
EMAP-West Design

- Sample sizes:
  - ~ 50 per State
  - Special study areas
    - ~160: Missouri Basin
    - ~ 80: S. Calif, N. Calif, OR John Day
    - ~ 60: WA Wenatchee, ID Rivers,
- Unequal probability sample
  - 5 Strahler order categories: 1^{st}, 2^{nd}, 3^{rd}, 4^{th}+, large rivers
  - Arid and mountainous aggregated Omernik ecoregions

Progress To Date

- ✓ ~ 965 probability sites sampled
- ✓ ~ 350 reference sites sampled – most in 2004




Sampled Sites
2000
2001
2002
Level III Ecoregions
Willamette and Central Valleys
Western Forested Mountains
Xeric West
Great Plains Grass and Shrublands
Central Cultivated Great Plains
Corn Belt and Northern Great Plains

EMAP Assessment

(in general)

Based on two key objectives of 305b Report, and National Water Quality Inventory:

- Report on stream length classified according to ecological condition

- Report on relative importance of major stressors to ecological condition

EMAP-Westwide Assessment

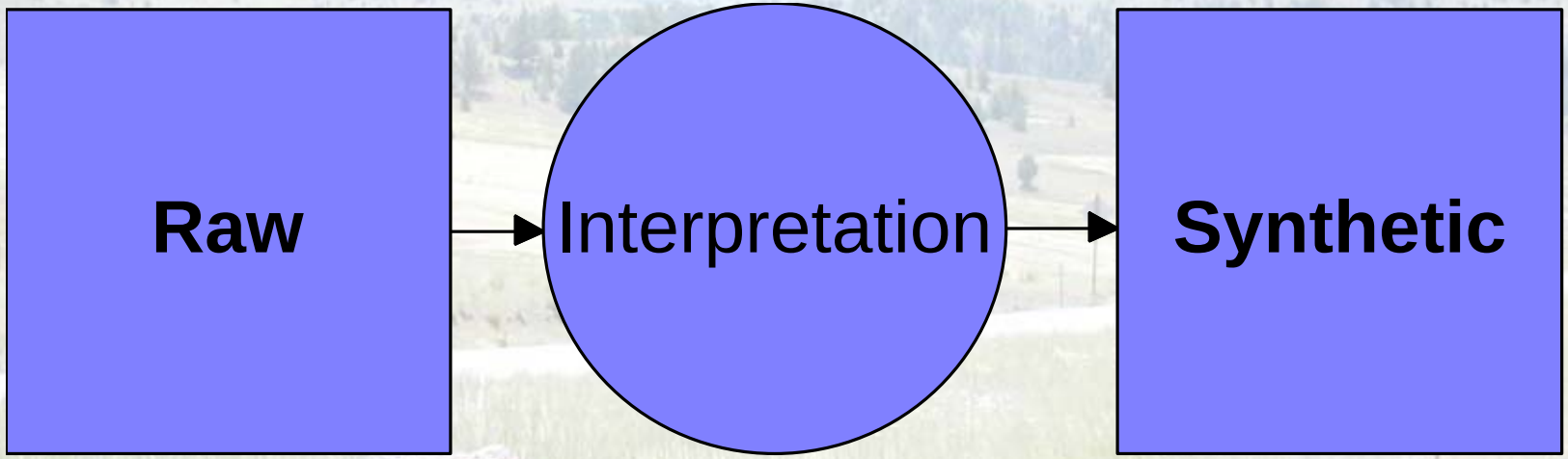
ORD has “Key” Deliverables

Initial Assessment is due September of 2005 with others to follow

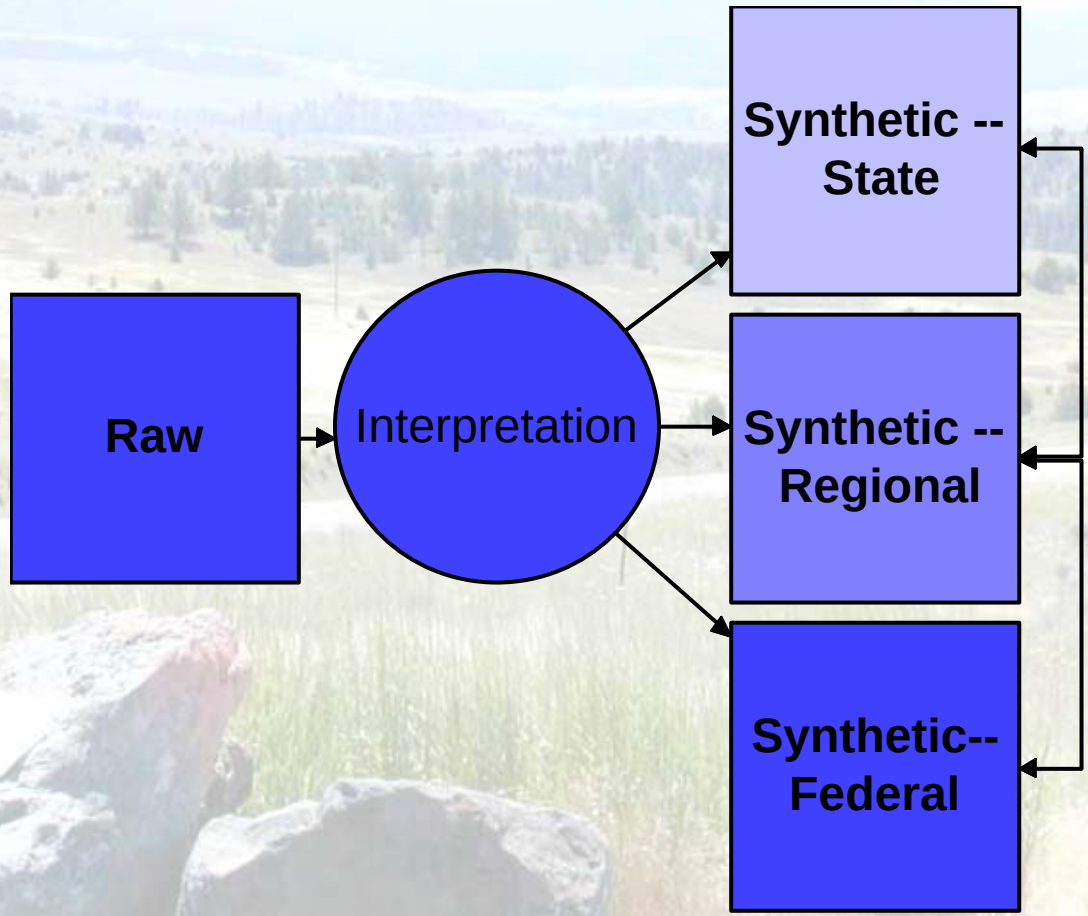
You may think this is ORD’s problem, but:

- Tech. transfer from ORD to States will occur largely through cooperative effort on the West-wide Assessment
- Working groups for each ecological and major stressor indicator
- Will be developing/testing indices and metrics for eventual inclusion in assessments at all levels
- Major opportunity for States and Regions to influence how ORD looks at comprehensive assessments

Indicator Level



Indicator Development – Multiple Organizations



United States
Environmental Protection
Agency

Region 3
Philadelphia, PA 19103

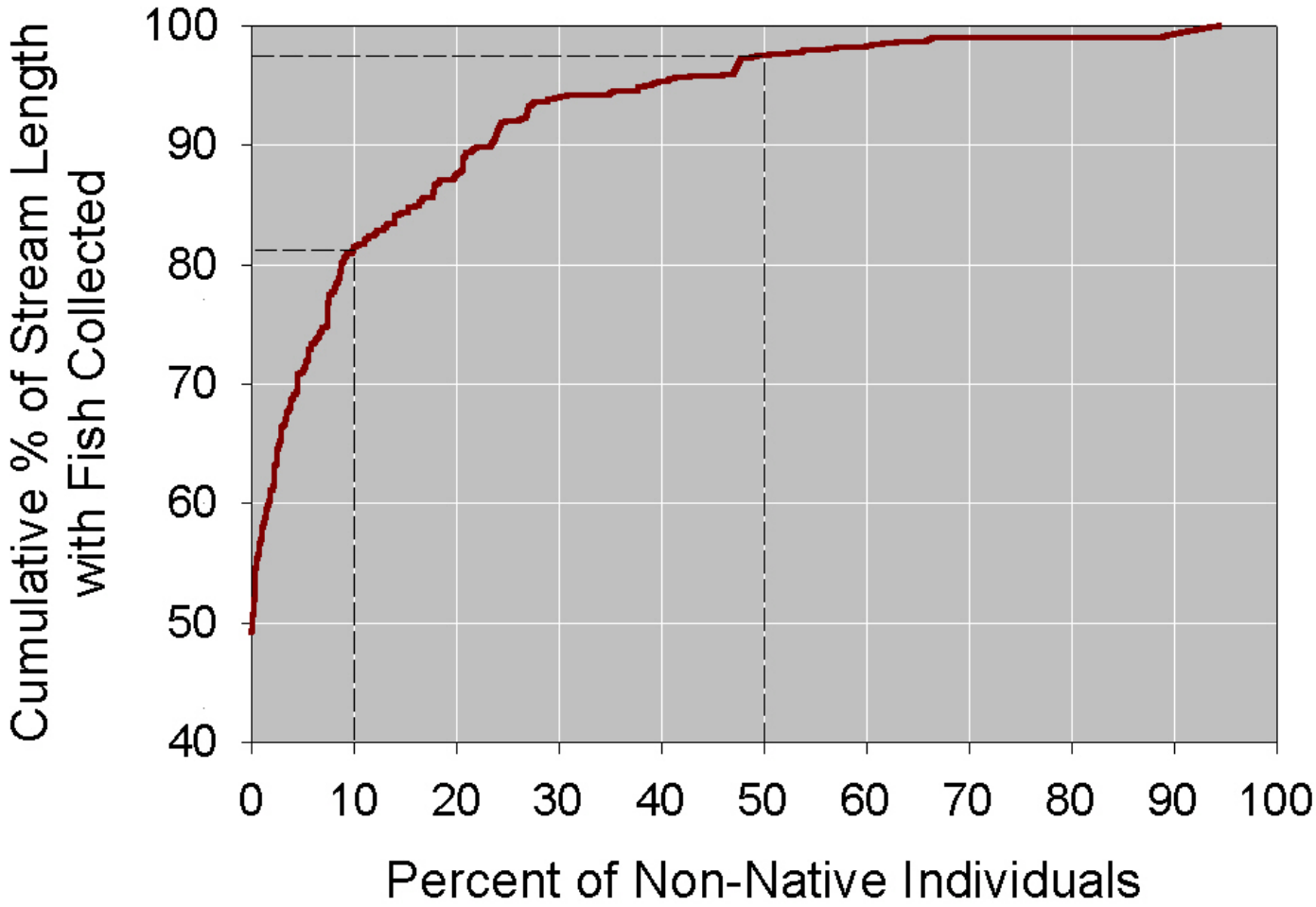
EPA/903
August 2
www.epa

EPA

Mid-Atlantic Highlands Streams Assessment

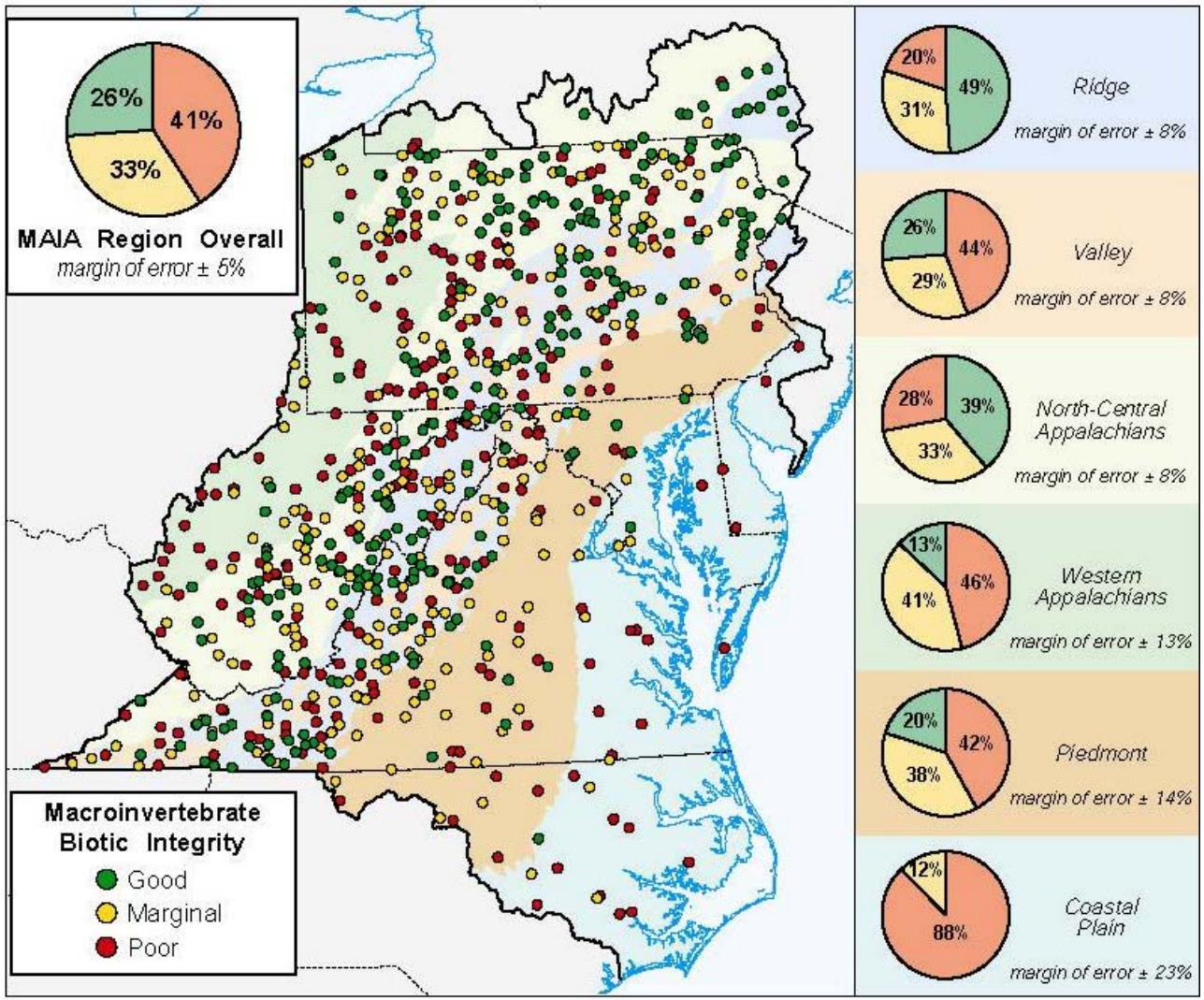
EMAP Assessment - Example

(focus on distributions rather than classes)



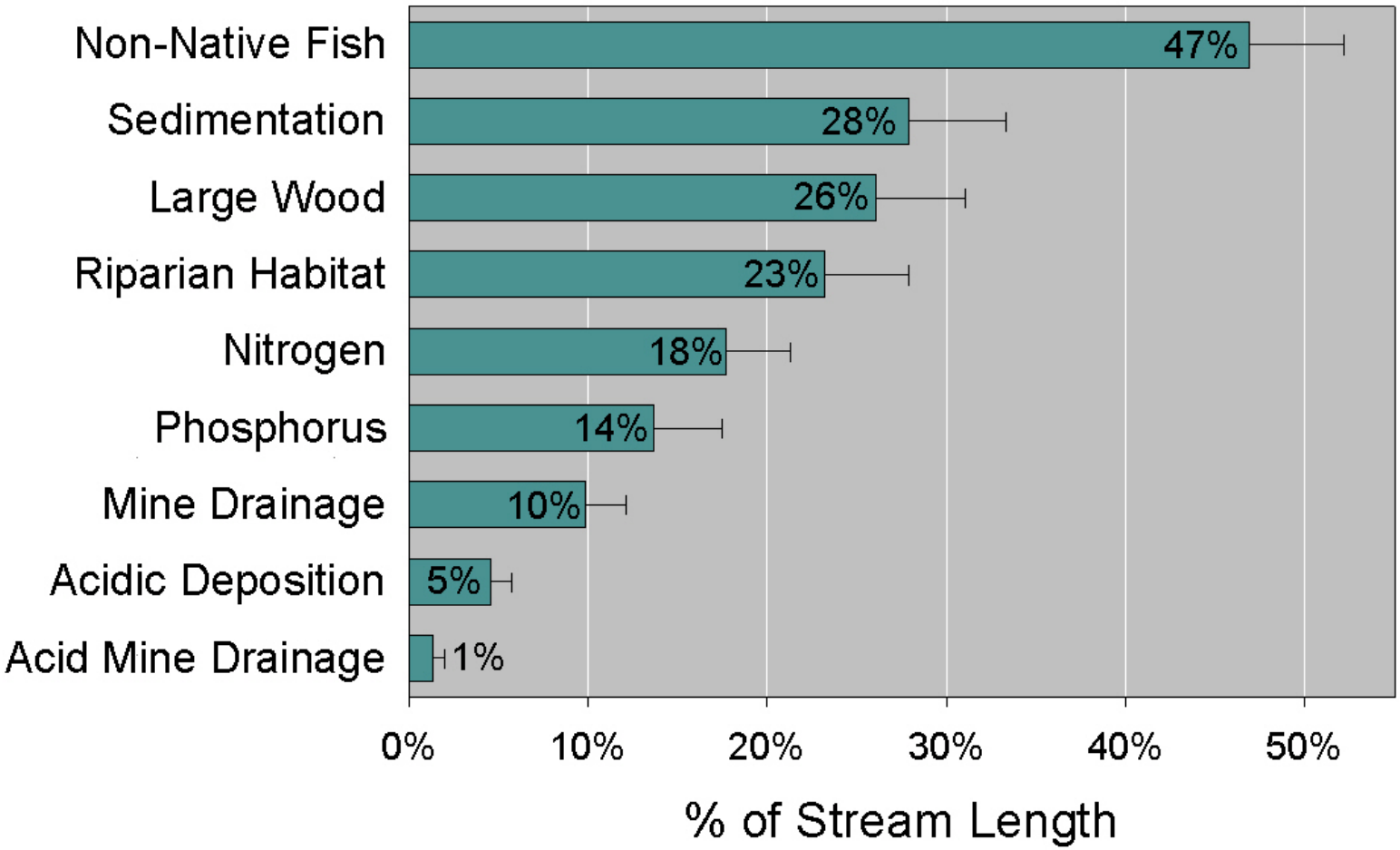
EMAP Assessment – Example

Ecological Condition

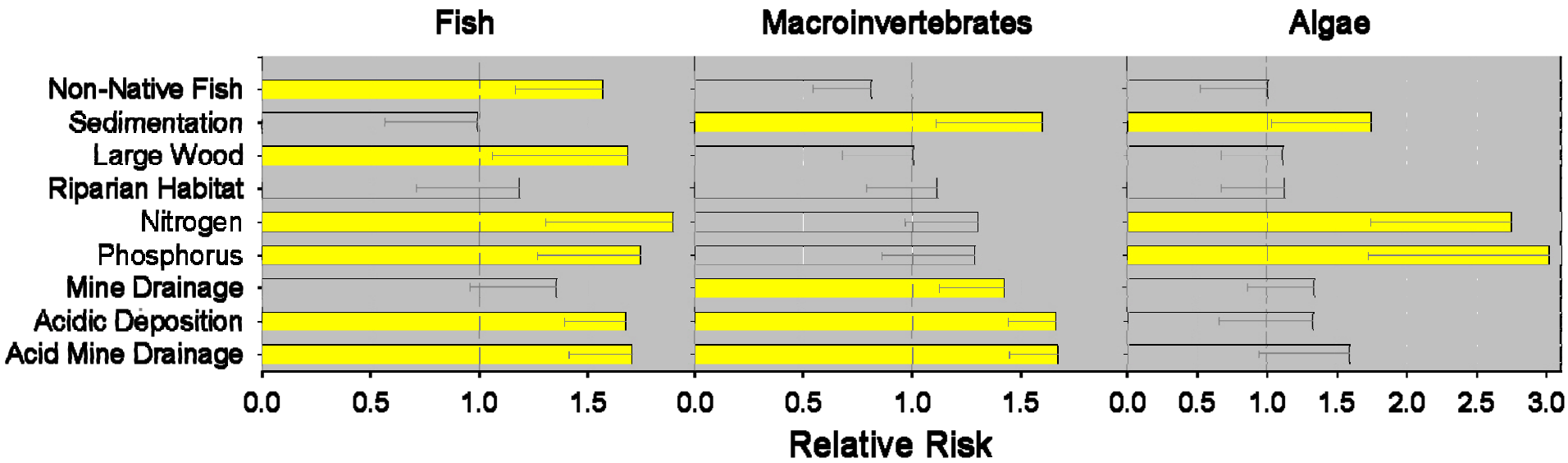


EMAP Assessment - Example

Relative Extent of Stressors



Relative Risk



$$\textbf{Relative Risk} = \frac{\text{Probability of Poor IBI Score, given Poor Stressor Score}}{\text{Probability of Poor IBI Score, given Good Stressor Score}}$$

United States
Environmental Protection
Agency

Western Ecology Division
Corvallis, OR 97330

EPA/xxx/R-05/xxx
September 2005
www.epa.gov

EPA

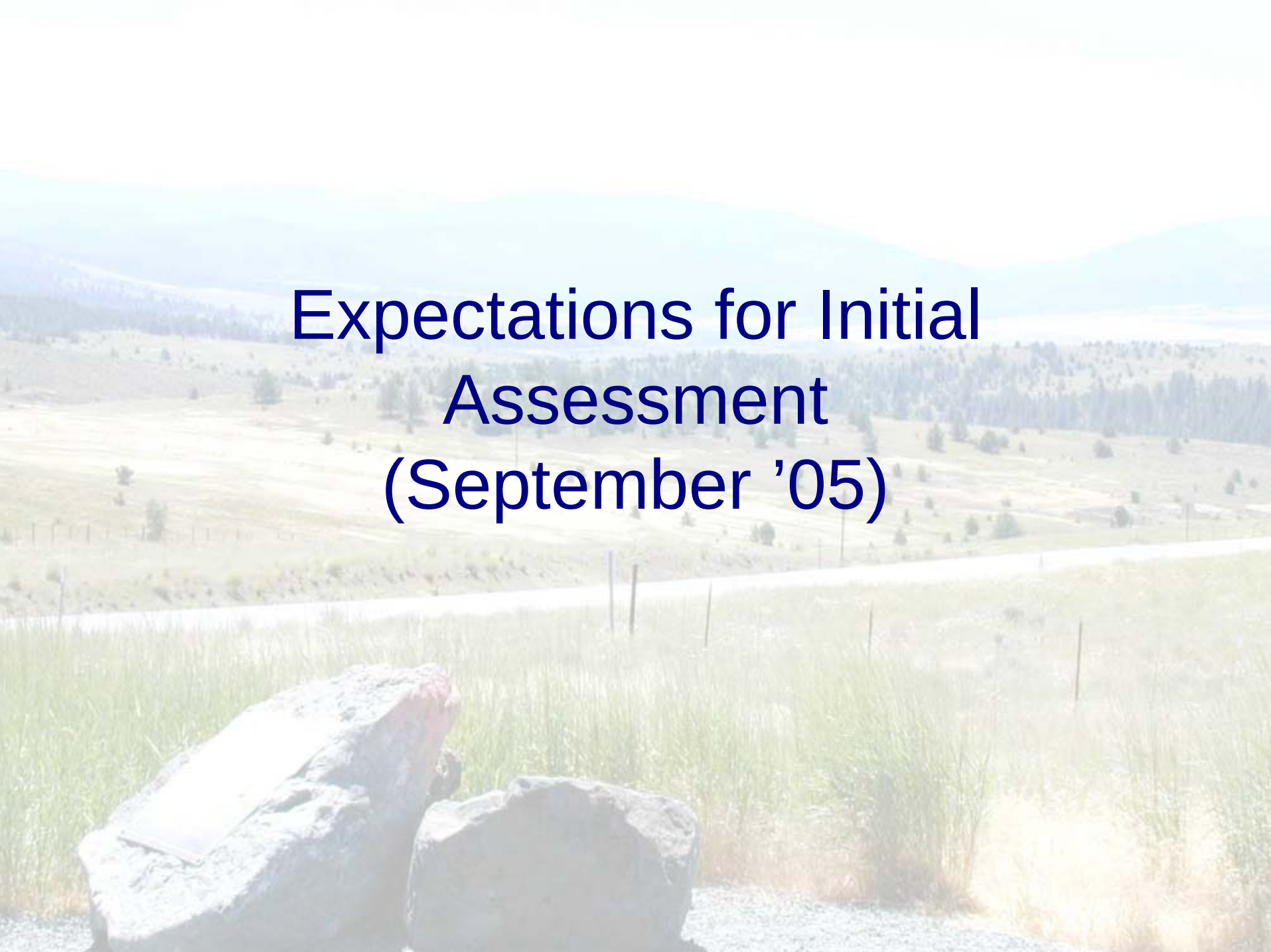
Initial Western Streams Assessment

EMAP-Westwide Assessment

Anticipated Elements:

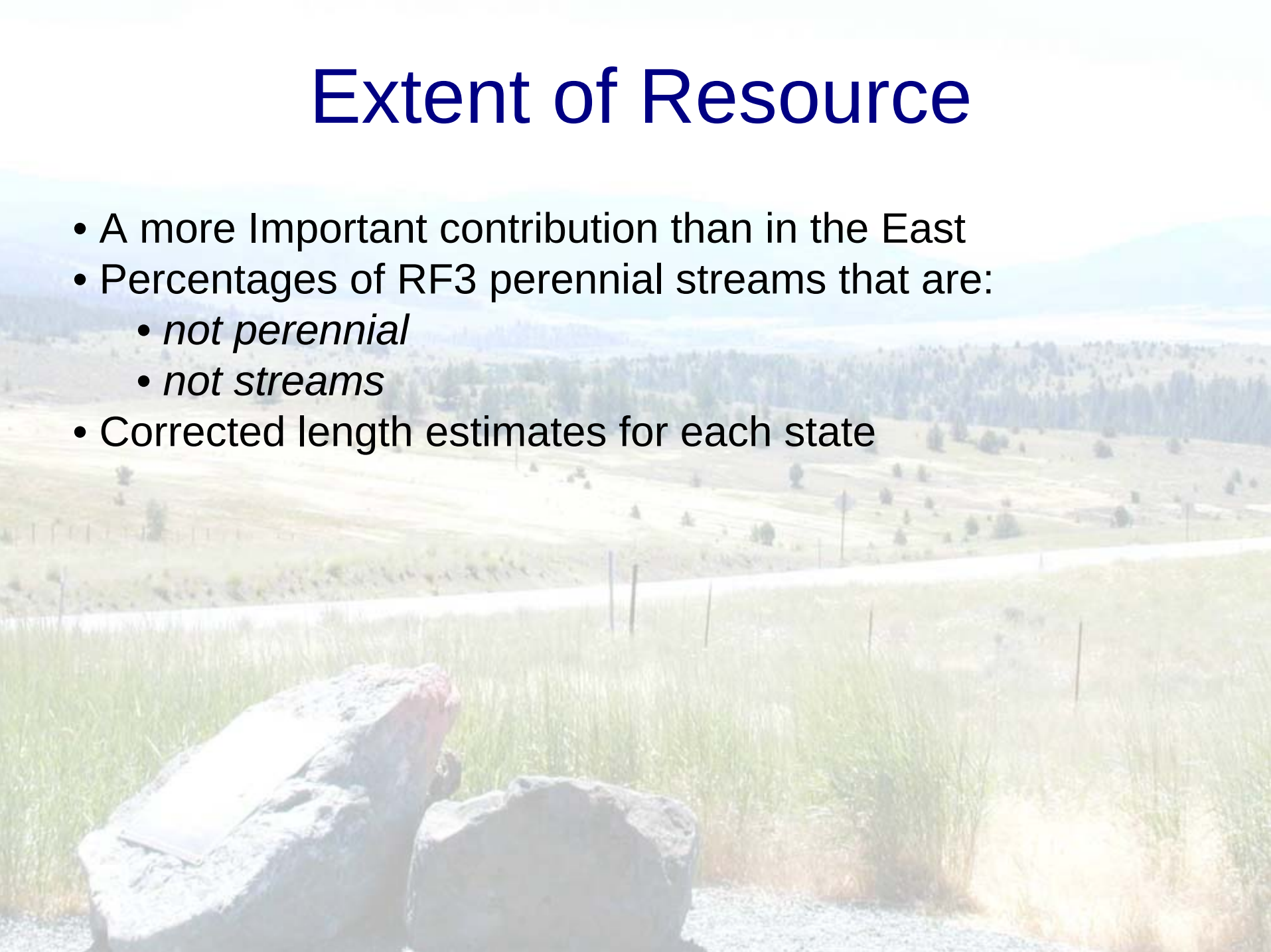
- Extent of Stream Resource
- Ecological Condition
  - Aquatic Vertebrate Assemblages
  - Macroinvertebrate Assemblages
  - Periphyton Assemblages
  - Invasive Plant Species
- Stressor Ranking
  - Invasive Plants
  - Fish Tissue Contaminants
  - Water Chemistry
  - Physical Habitat
  - Watershed Indicators

Expectations for Initial Assessment (September ’05)



Extent of Resource

- A more Important contribution than in the East
- Percentages of RF3 perennial streams that are:
  - *not perennial*
  - *not streams*
- Corrected length estimates for each state



Aquatic Vertebrate Assemblages

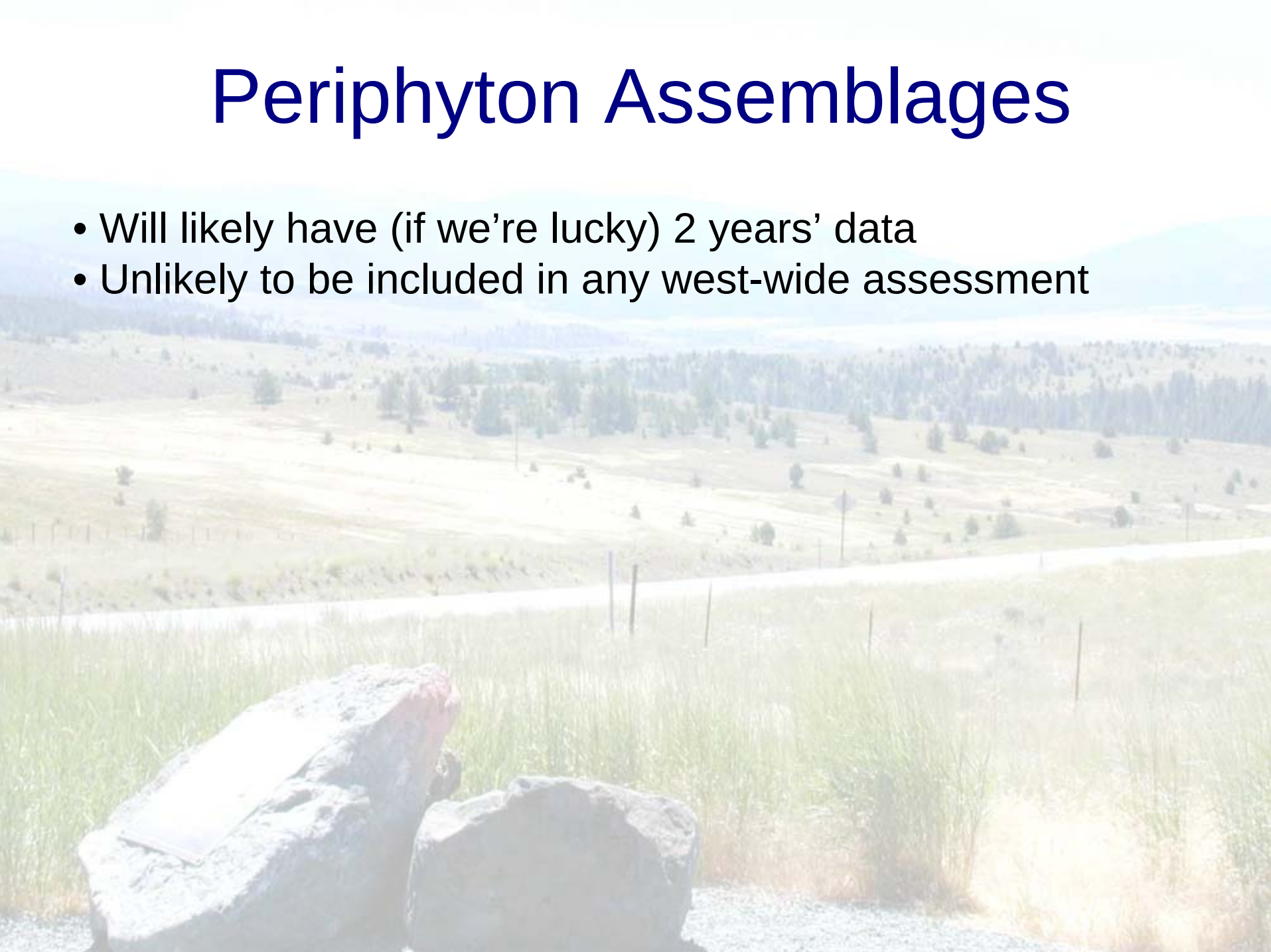
- Will likely have 4 years' data, but not all of reference sites
- IBIs are available only for portions of EMAP-W (Coast Range; Coldwater Rivers; Northwestern Great Plains; Southern Rockies)
- Assessment will likely focus on distribution of key metrics, for example, the number of stream miles with:
    - Non-native fish species (% individuals; # species)
    - Salmonid species (# species)
    - Threatened/Endangered species (e.g., unsampled stream length due to T&E species; % of sampled length with T&E species found)
- Little or no emphasis on *Biotic Integrity*

Macroinvertebrate Assemblages

- Will likely have 4 years' data, but not all of reference sites
- Assessment of key metrics (e.g., EPT taxa richness) may be possible with threshold levels based on BPJ and other data (also provides cross-walk to OW National Assessment)
- Assessment of some non-native species may be possible (e.g., exotic crayfish)
- IBI probable
- West-wide O/E model probable

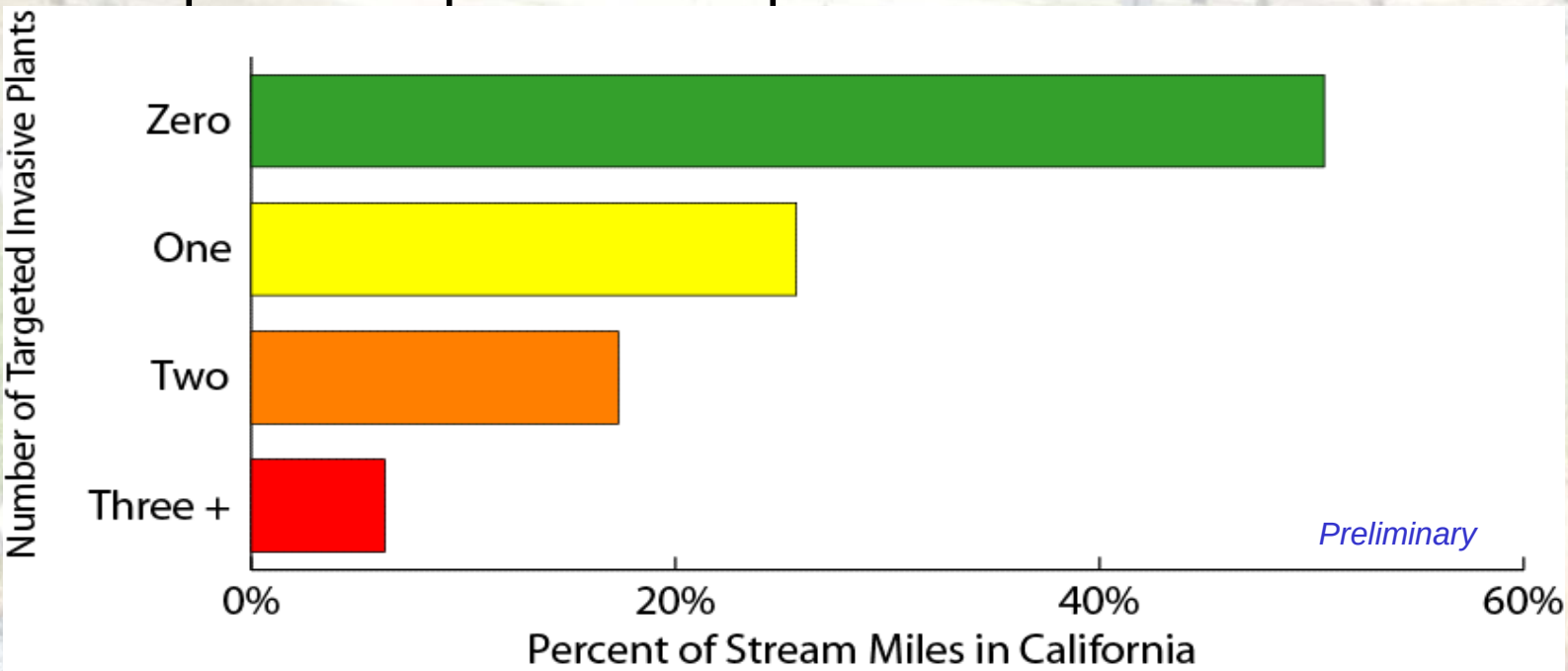
Periphyton Assemblages

- Will likely have (if we're lucky) 2 years' data
- Unlikely to be included in any west-wide assessment



Invasive Plants

- Will probably have 4 years' data available (including all reference sites)
- Discard data from 2000
- Stressor and Biological Indicator
- Known "Reference Condition"
- Anticipate complete description

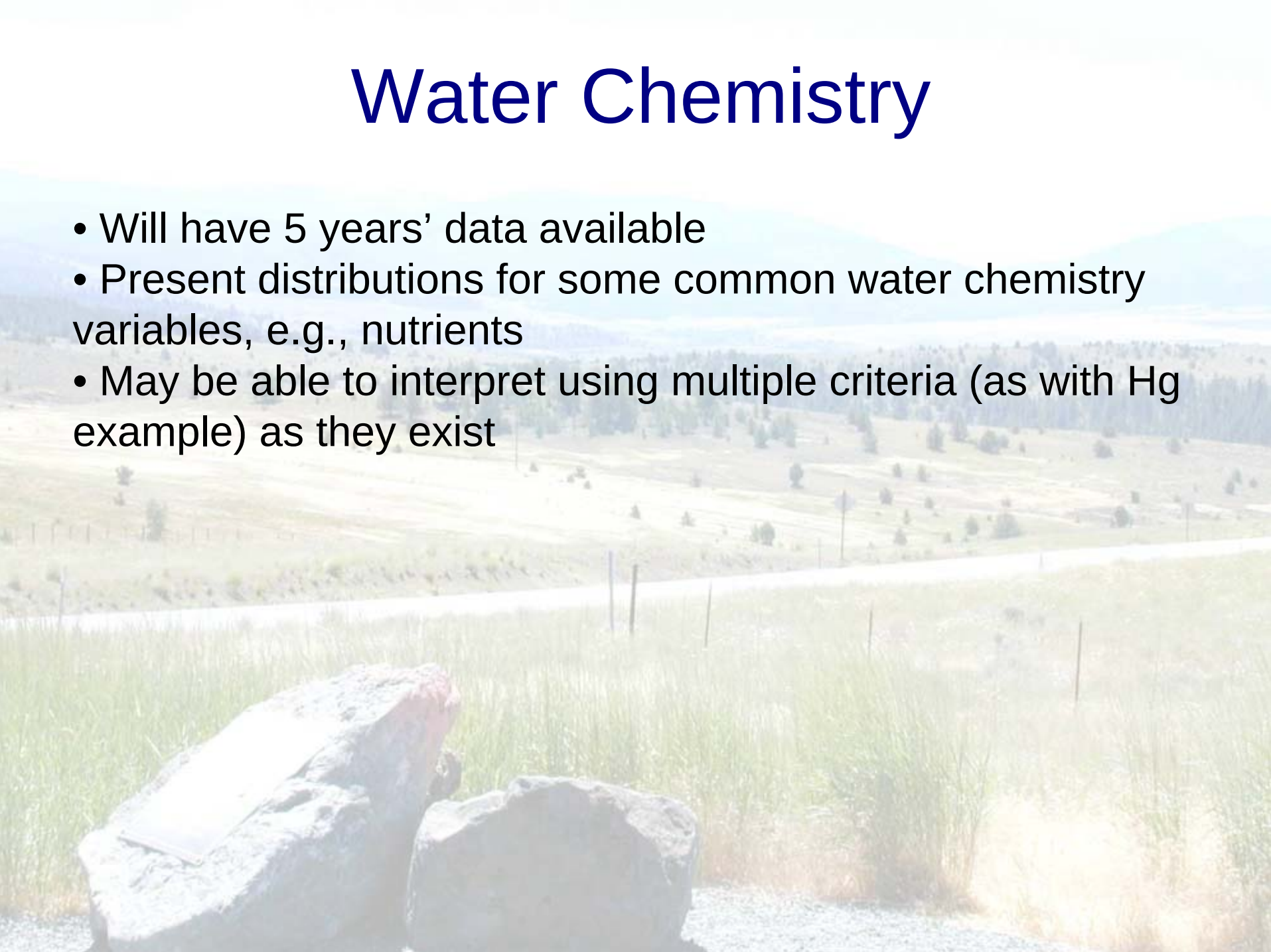


Fish Tissue Contaminants

- Will likely have 4 years' data for Hg, Pb, Zn. and Cd
- For metals with established criteria (e.g., Hg), can calculate population estimates for each (e.g., stream miles with Hg > 0.5 µg/g; 0.7 µg/g; 1.0 µg/g)—without endorsing any individual criterion
- Distributions can be presented according to size classes (large vs. small), trophic classes (piscivores, invertivores, omnivores), and some individual species

Water Chemistry

- Will have 5 years' data available
- Present distributions for some common water chemistry variables, e.g., nutrients
- May be able to interpret using multiple criteria (as with Hg example) as they exist



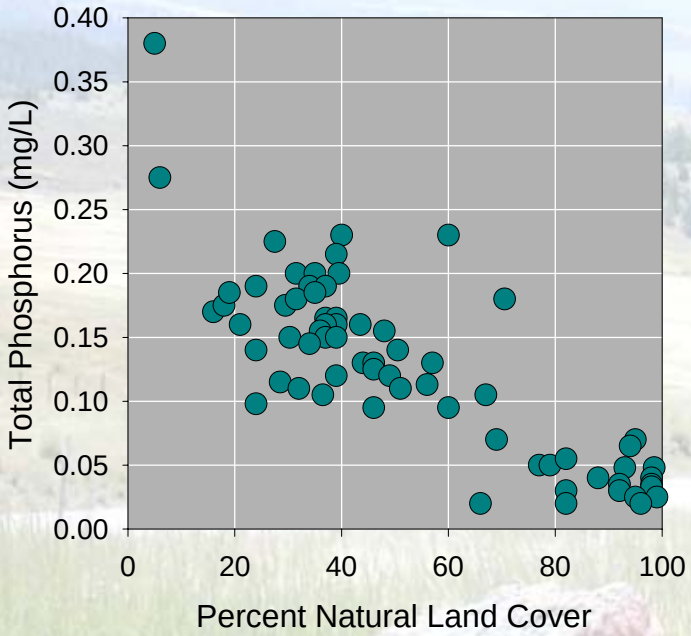
Physical Habitat

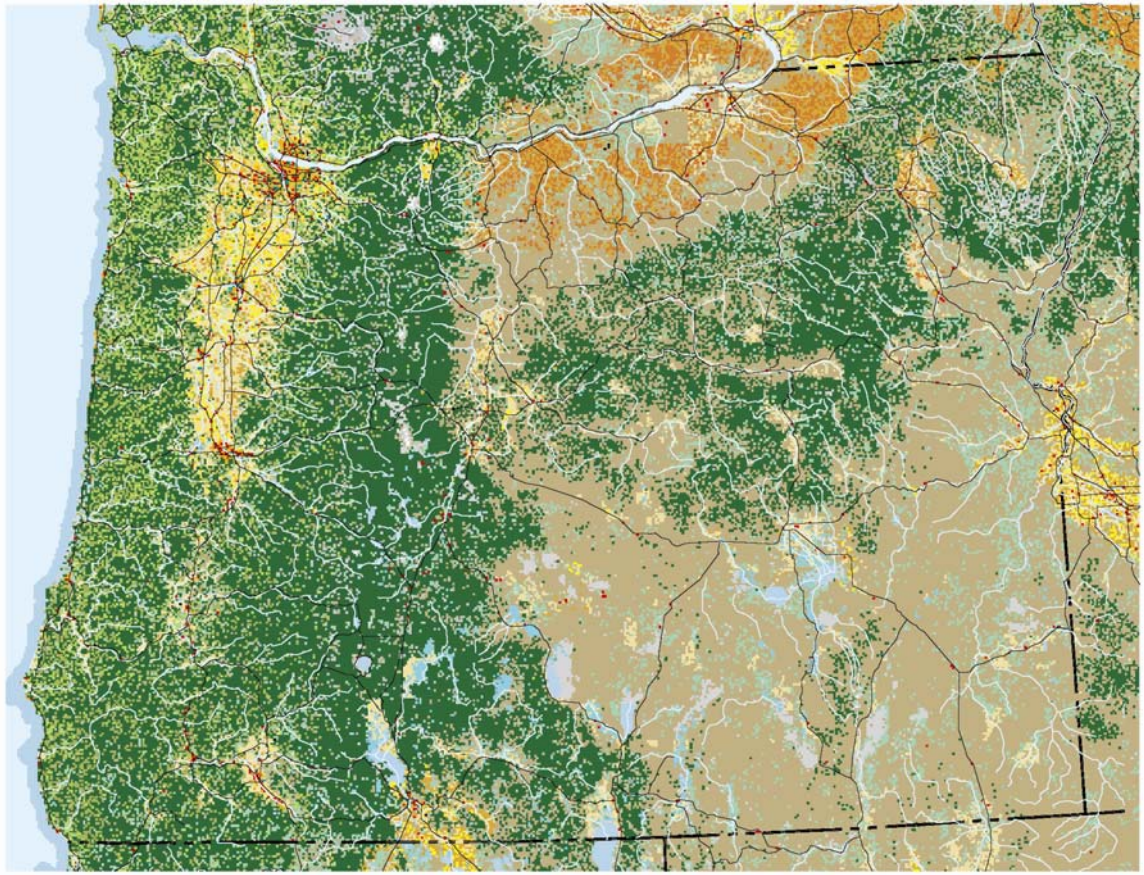
- Will probably have all 5 years' data available (including all reference sites)
- Anticipate complete assessment (including classes) for:
  - Relative Bed Stability (a.k.a. excess sediment)
  - Fish Cover (a.k.a. large woody material)
  - Riparian Disturbance
  - Riparian Vegetation
  - Stream Incision (least likely of these)

Watershed Characteristics

- Will likely have 4 years' watersheds delineated and landscape metrics calculated
- One Option:
  - Focus on short list of stressors that can be related to watershed metrics (e.g.: total phosphorus, total nitrogen, excess sediment, stream temperature)
  - Present maps of model predictions where possible (e.g., the Oregon Phosphorus example, with added complexity and extended west-wide)
  - Present associations between watershed variable and stressor (e.g., scatter plot of cattle density vs. excess sediment) and west-wide map watershed variable

Watershed Characteristics





Definitions of Reference Condition

For EMAP-W we recognize that multiple definitions exist, and that these 3 are especially pertinent:

- **Minimally Disturbed Condition** - condition of streams in the absence of significant human disturbance (e.g., "natural," "pristine" or "undisturbed")

- **Least Disturbed Condition** –found in conjunction with the best available physical, chemical and biological habitat conditions given today's state of the landscape - defined by a set of explicit criteria to which all reference sites must adhere

- **Best Attainable Condition** – this condition is equivalent to the ecological condition of (hypothetical) least disturbed sites where the best possible management practices are in use

EMAP-Westwide Assessment

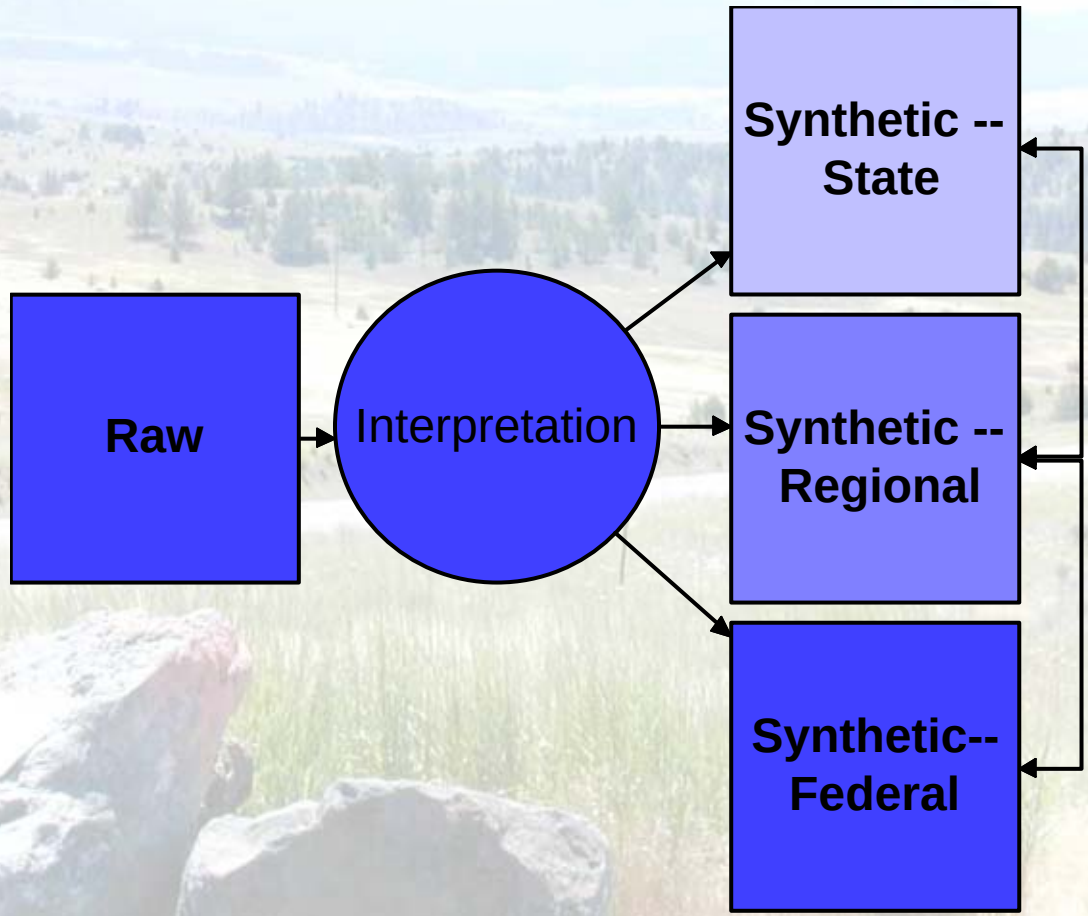
ORD has “Key” Deliverables

Initial Assessment is due September of 2005 with others to follow

You may think this is ORD’s problem, but:

- Tech. transfer from ORD to States will occur largely through cooperative effort on the West-wide Assessment
- Working groups for each ecological and major stressor indicator
- Will be developing/testing indices and metrics for eventual inclusion in assessments at all levels
- Major opportunity for States and Regions to influence how ORD looks at comprehensive assessments

Indicator Development – Multiple Organizations



Contact:

Paul Ringold

US EPA, Office of Research and Development

Western Ecology Division, Aquatic Monitoring and Bioassessment Branch

200 SW 35th Street

Corvallis, OR

541-754-4565

ringold.paul@epa.gov