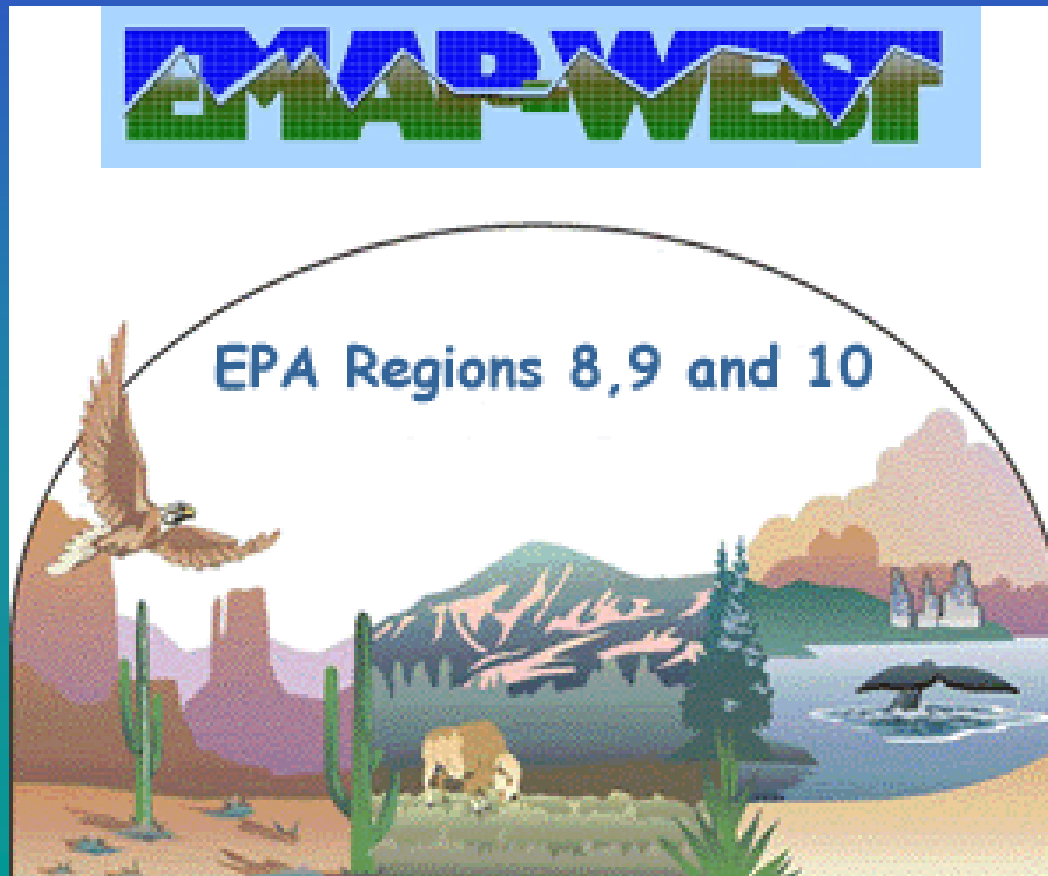


# ***Collaboration on EMAP Stream Condition Assessments in EPA Region 8***

***Thomas R. Johnson and Karl A. Hermann***

***EPA Region 8***



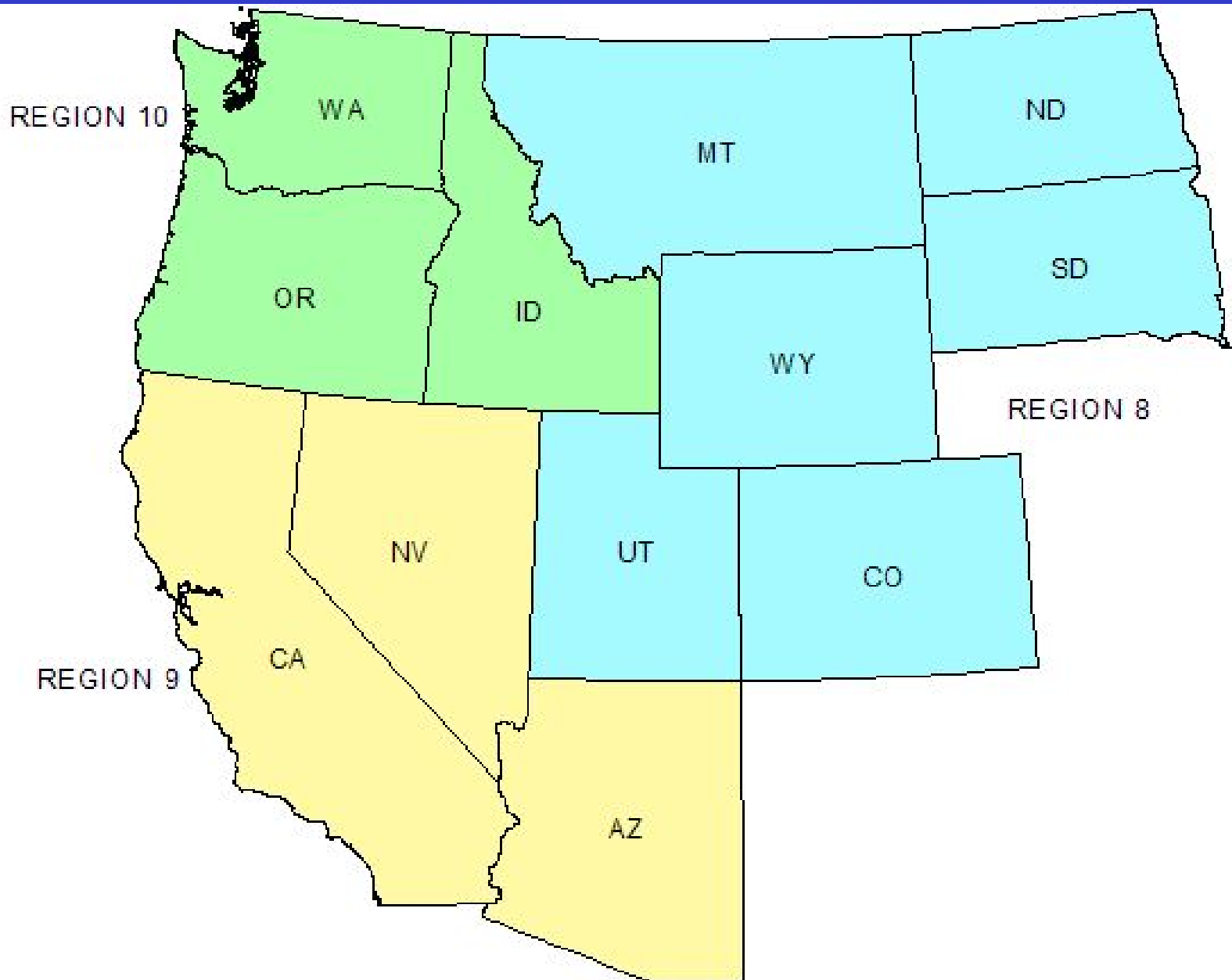
# *What is EMAP-West?*

*A demonstration of indicators and designs for assessing the ecological condition of streams*

- partnerships between EPA / States / Tribes
- estimates of ecological condition of streams and rivers
- comparative ranking of stressors
- tools for bioassessment
- supporting framework for 305b/303d process



# ***EMAP-West – EPA Regions 8, 9, and 10***



# *EMAP-West Indicators*

- *Fish Community Structure*
- *Macroinvertebrate Community Structure*
- *Periphyton Community Structure*
- *Physical Habitat (in-stream and near-stream)*
- *Ambient Chemistry (nutrients, major ions)*
- *Fish Tissue (mercury, some organic contaminants)*
- *Watershed Characteristics*

# *EMAP-West Sampling and Analysis*

- *EMAP sampling occurred from 2000 – 2004*
- *Most Laboratory Analyses are complete*
  - *Some remaining 2004-sampled macroinvertebrate data*
  - *Periphyton data are being completed*



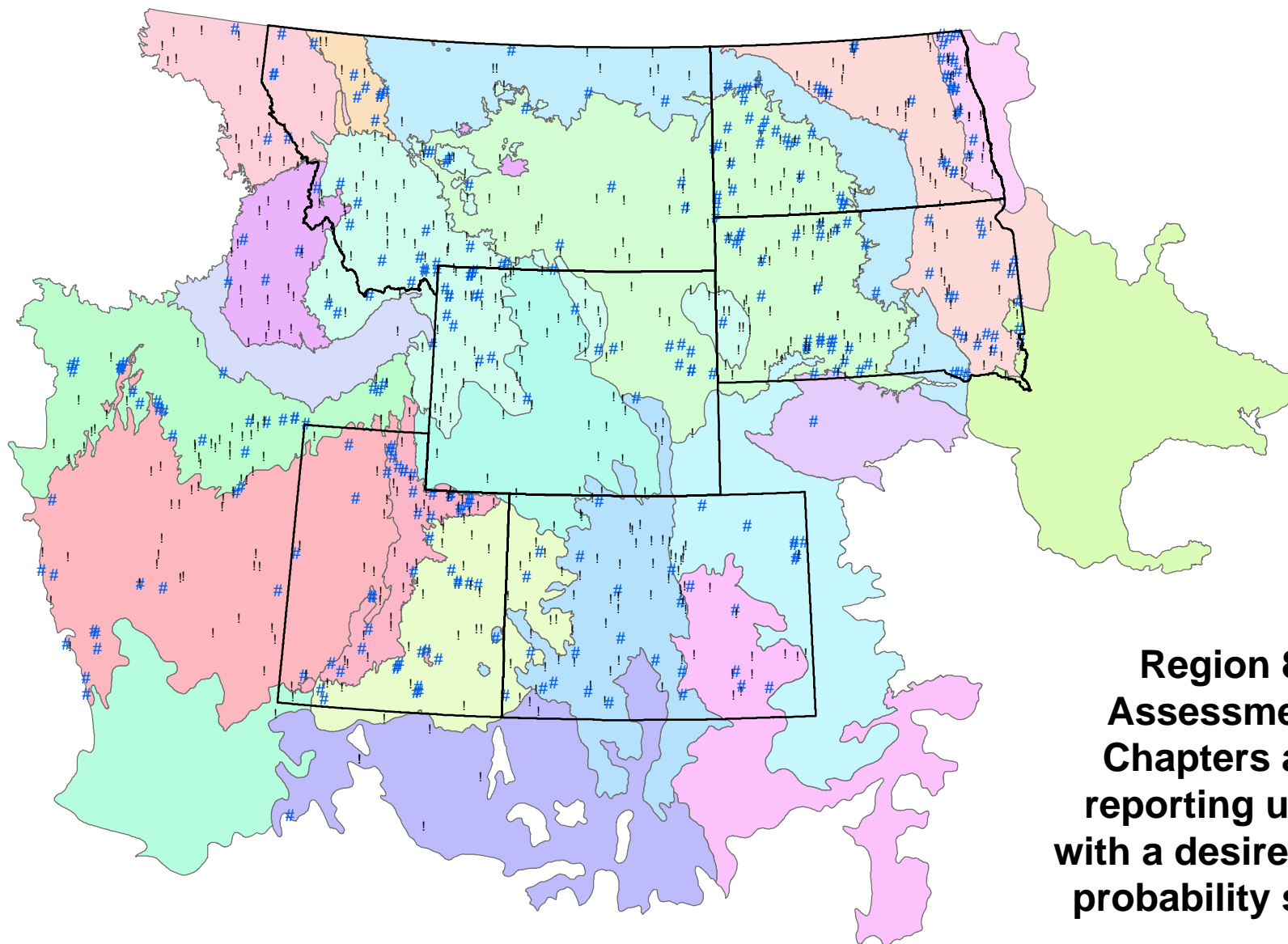
# *Region 8 EMAP Status and Plans*

- *Region 8 Assessment*
  - *Chapters (reporting / assessment units)*
  - *Chapter Content*
  - *Ecoregional / State Workshops*
  - *Reference Designation Refinement*
  - *Ecological Indicator (Multi-Metric and Predictive Models) Development*
  - *Threshold Setting*
  - *Landscape Models*





## EPA Region 8 Sampled Sites with Level 3 Ecoregions



**Region 8  
Assessment  
Chapters are  
reporting units  
with a desired 50+  
probability sites**

# *Region 8 Assessment Chapters: Reporting Units and Monitoring Data*

- **Upper Missouri Basin**
  - 210 Probability Sites Complete; 196 Usable
- **Middle Rockies** (Region 8 only)
  - 70 Probability Sites Complete; 66 Usable
- **Middle / Northern / Canadian Rockies** (Region 8 only)
  - 82 Probability Sites Complete; 79 Usable
- **Northwestern Great Plains**
  - 101 Probability Sites Complete; 90 Usable
- **All Rangeland Northern Plains**
  - 121 Probability Sites Complete; 108 Usable
- **All Cultivated Northern Plains**
  - 64 Probability Sites Complete; 59 Usable



# *Region 8 Assessment Chapters: Reporting Units and Monitoring Data*

- **Region 8**
  - **429** Probability Sites Complete; **404** Usable
- **Colorado**
  - **71** Probability Sites Complete; **67** Usable
- **Montana**
  - **82** Probability Sites Complete; **69** Usable
- **North Dakota**
  - **65** Probability Sites Complete; **63** Usable
- **South Dakota**
  - **81** Probability Sites Complete; **76** Usable
- **Utah**
  - **55** Probability Sites Complete; **55** Usable
- **Wyoming**
  - **75** Probability Sites Complete; **74** Usable

# ***Region 8 EMAP Assessment***

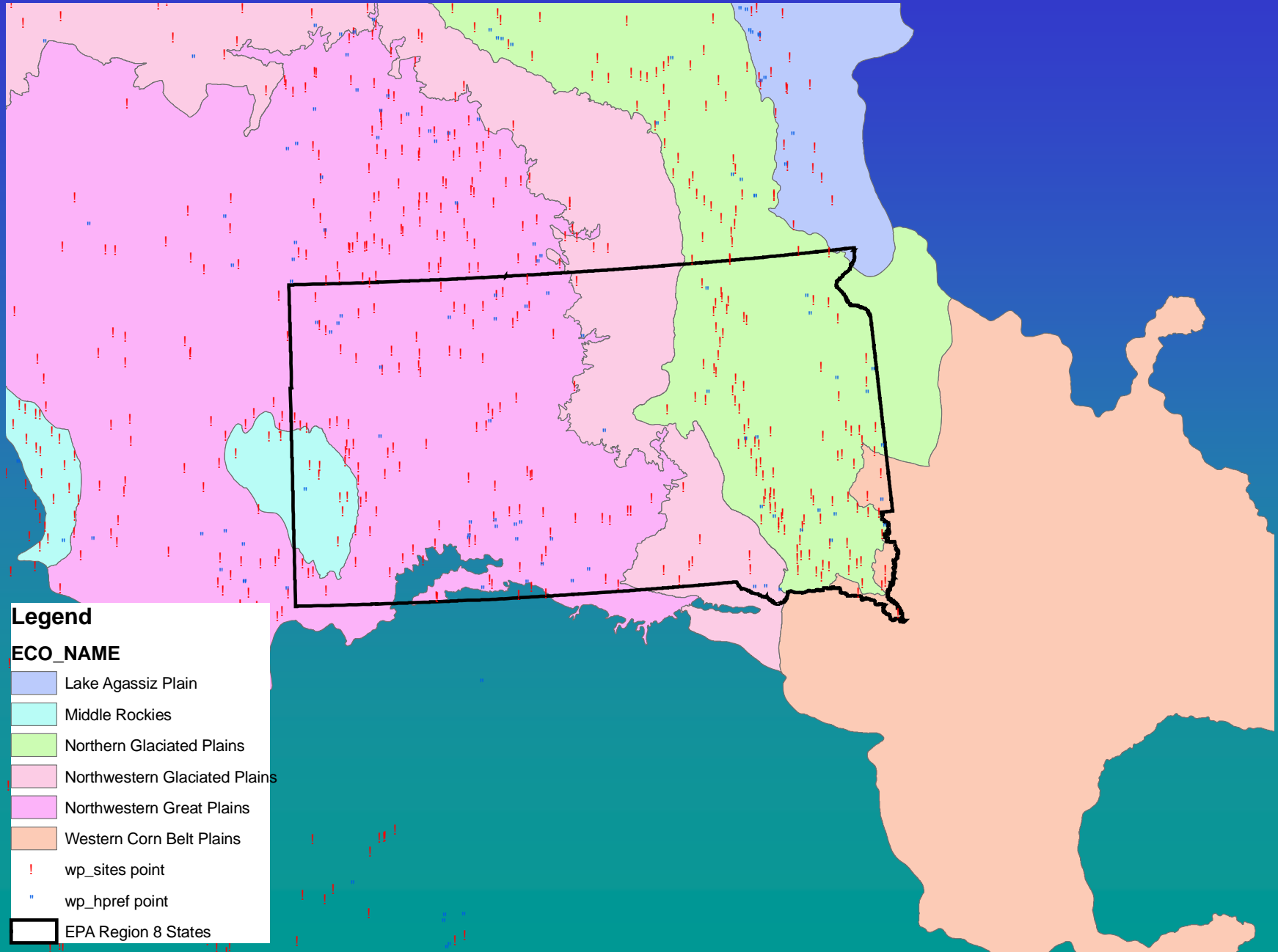
## ***Proposed Chapter Content***

- **Resource Characterization** (Extent Estimates)
- **Ecological Condition of Streams**
  - **Biological Condition** (Population Estimates)
    - Fish Assemblages
    - Macroinvertebrate Assemblages
    - Periphyton Assemblages
  - **Habitat Condition** (Population Estimates)
    - In-Stream Habitat
    - Riparian Habitat
  - **Chemical Condition** (Population Estimates)
  - **Stressors** (Chemical, Physical, Biological, Anthropogenic)
    - Extent
    - Stressor / Condition Association (Relative Risk)
    - Nutrient and Excess Sediment Landscape Models

# *Assessment Area Population Estimates*

- **Using Ecoregional Multi-Metric Indicators / Stressor Indicators:**
  - **Ecoregion Population Estimates**
  - **Done for Each Ecoregion in a State**
  - **Sum Ecoregional Results for State Total**
- **Using Predictive model values (O/E):**
  - **Sum weights directly for assessment area**

# South Dakota Reporting Example



# *Region 8 Ecoregion Indicators Workshops*

- **May 3 – 5, 2005 - Northwestern Great Plains**
  - Rapid City, SD
- **May 10 – 12, 2005 – Periphyton Workshop**
  - Nederland, CO
- **June 7 – 9, 2005 – Middle Rockies**
  - Sheridan, WY
- **July 26 - 27, 2005 – Southern Rockies**
  - Denver, CO
- **August, 2 – 3, 2005 - Wasatch and Uintah Mountains**
  - Salt Lake City, UT
- **Spring and Summer 2006**
  - *Virtual Ecoregion Workshops*
    - Web Broadcasts and Conference Calls
- **April 3 – 6, 2006 – Region 8 Bioassessment Workshop**
  - Logan, UT
- **April/May 2006 – Colorado Fish MMIs**
  - Denver, CO

# *Reference (and Stressed) Condition*

- *Identification of Reference (and Stressed) is Critical for:*
  - *Indicator Development*
    - *MMI and O/E Approaches*
  - *Final Assessment (Thresholds)*

# *Reference Designation Refinement*

- **Workshop Efforts** (ORD reference starting point)
  - **Plains** (Rapid City)
  - **Middle Rockies** (Sheridan)
  - **Southern Rockies**
    - Colorado – Mountains, Plains, Xeric (Denver)
  - **Wasatch Front**
    - Utah - Mountains, Plains, Xeric (Salt Lake City)
- **State Follow Ups**
  - MT DEQ, WY DEQ, NDDH, SD GF&P, SD DENR



# *Sources of Macroinvertebrate MMIs to be Used in Assessment*

## *EPA/USGS/State MMIs*

- Developed at (or result of) workshops using EMAP-West data.*

## *State MMIs*

- MMIs developed for State Use (State or TetraTech).*

## *ORD MMIs*

- Developed for use in EMAP West-wide Assessment (Mountains, Plains, Xeric).*

# *Predictive Models (O/E)*

*Complete for Colorado, Montana, and Wyoming.*

*Utah and South Dakota – Fall 2006.*

*EMAP west-wide models with full Region 8 coverage.*

*O/E values will be used in R8 assessment along with multi-metric Indicators.*



# ***Fish Indicator Status***



## ***Colorado***

*MMI Workshops April/May, 2006 – CDOW, CDPHE, EPA*

*Aquatic Gap 'Predictive Model' – CDOW*

## ***Montana***

*Plains Fish MMI - MT Eastern Plains REMAP Study*

## ***ORD-Corvallis***

*West-wide MMI Efforts (Plains, Mountains, Xeric)*

## ***Region 8***

*Examine Corvallis metrics for targeted Ecoregions*

*Develop Ecoregional Fish MMIs Where Possible*

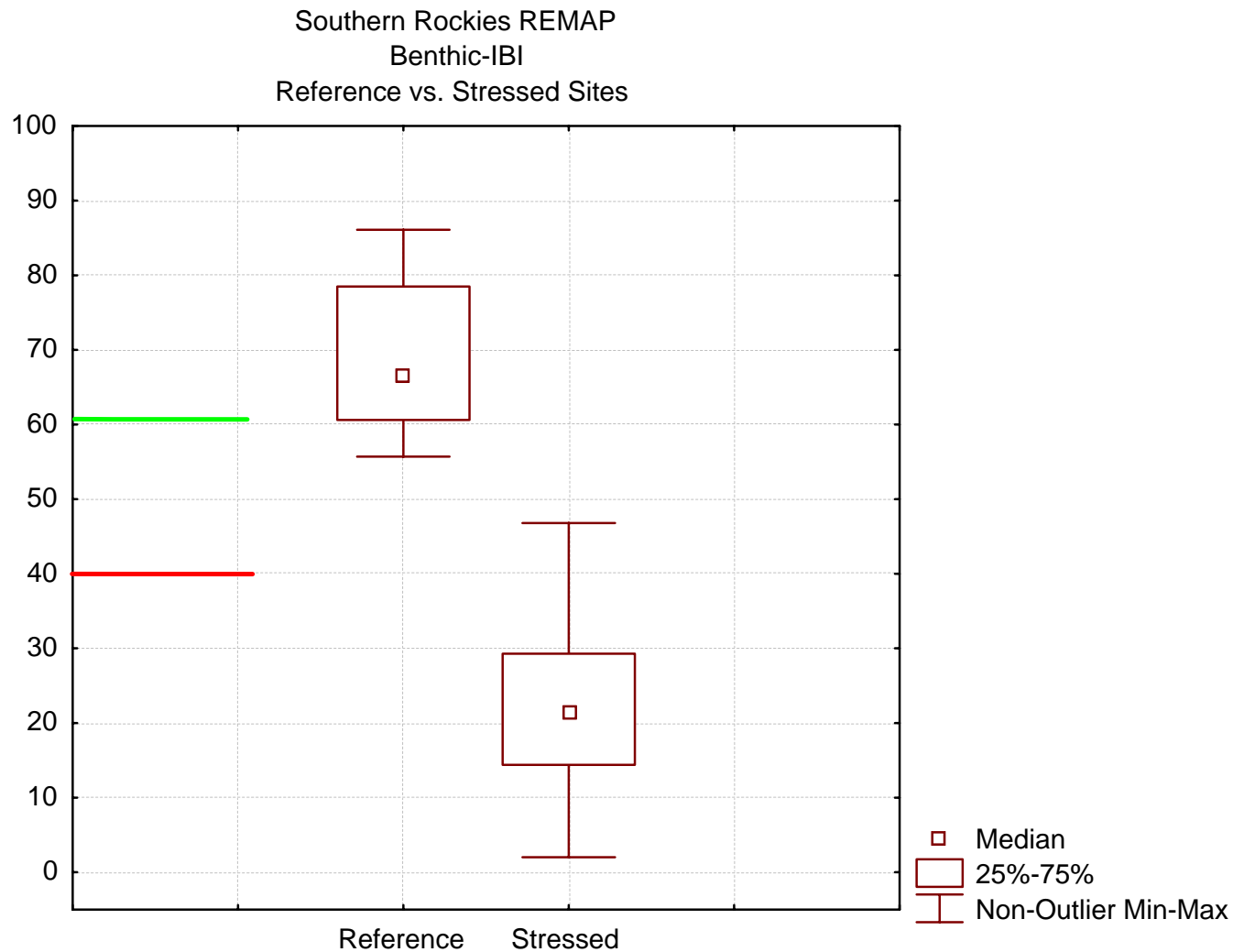
# *Threshold Setting for Stream Condition*

*To categorize the ecological indicators into 'Least Disturbed', 'Moderate', and 'Most Disturbed' Classes*

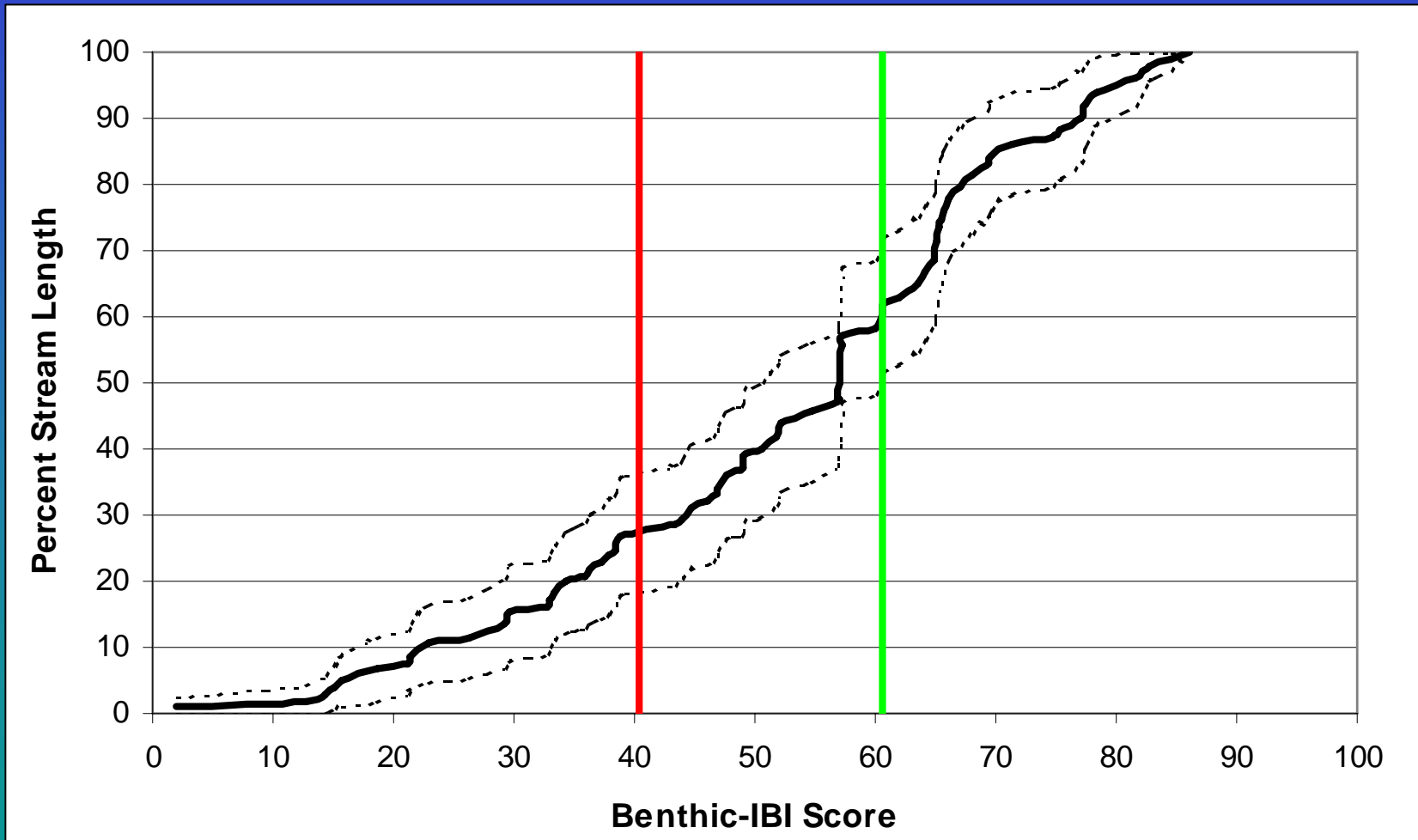
- Determine condition of streams in study based on biological measures, chemistry, physical habitat, and landscape indicators*
- Determine condition for the same indicators for least disturbed sites*
- Set Thresholds for population based on least disturbed condition*

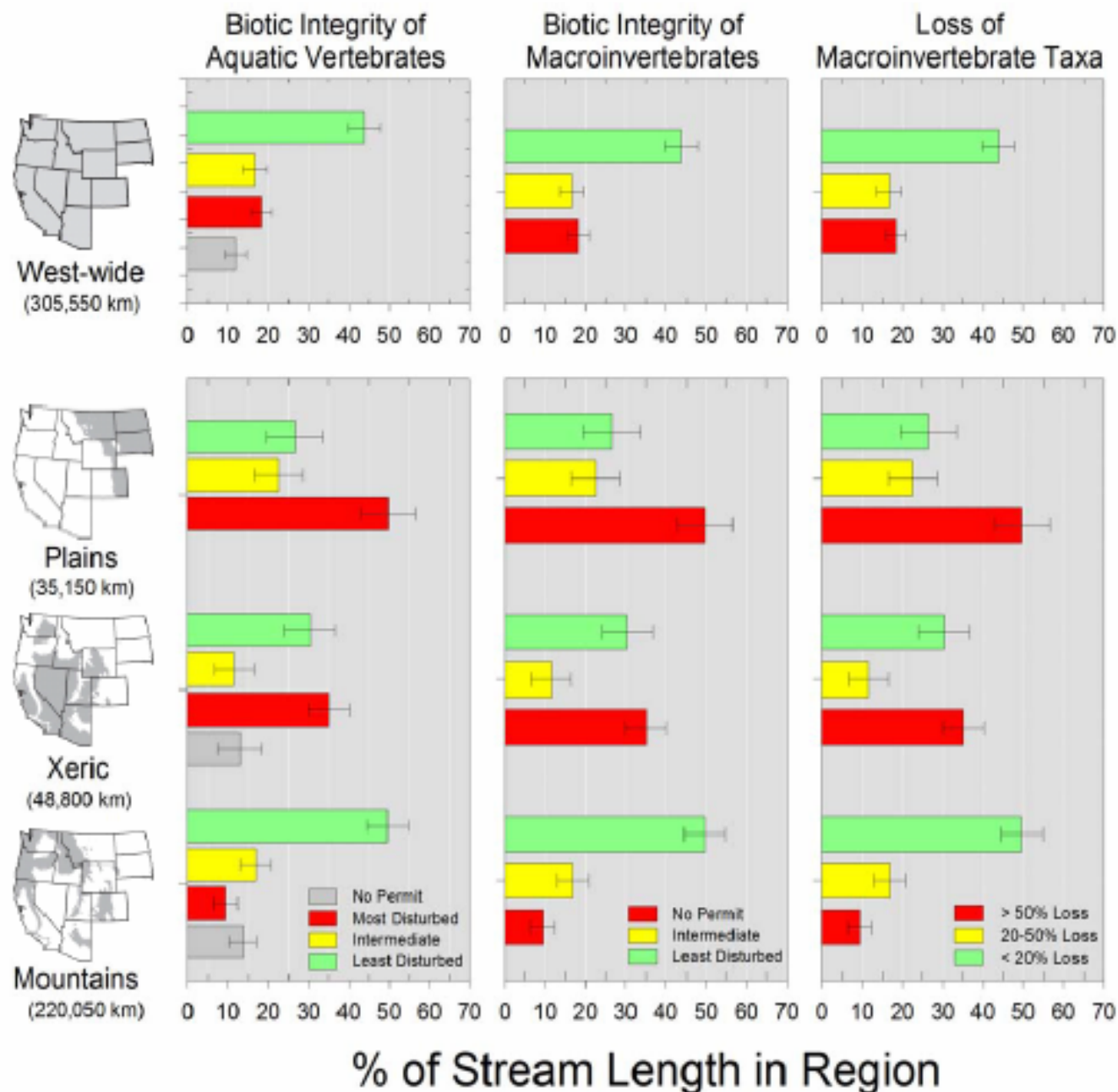
# Macroinvertebrate MMI

## “Reference” vs “Stressed”



# *Macroinvertebrate MMI Cumulative Distribution*

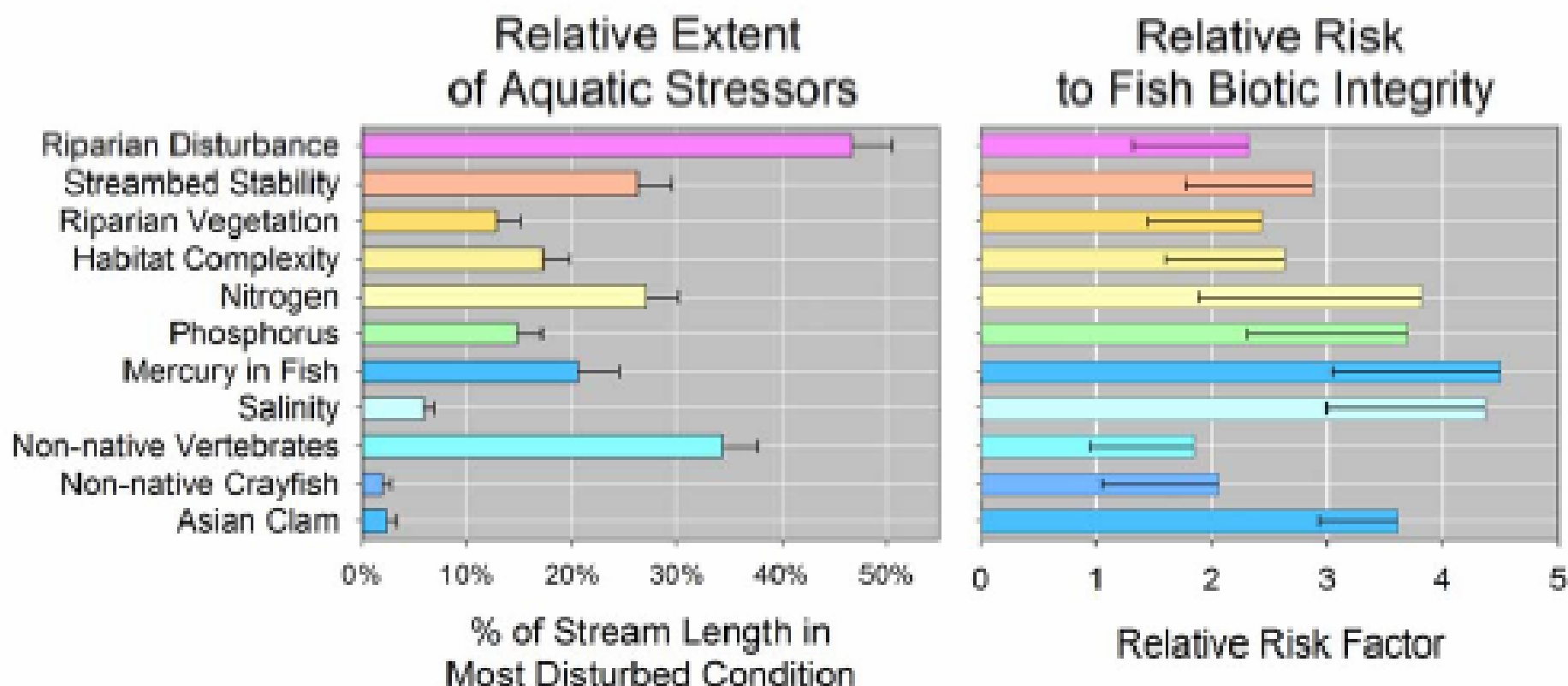






# Relative Extent and Relative Risk

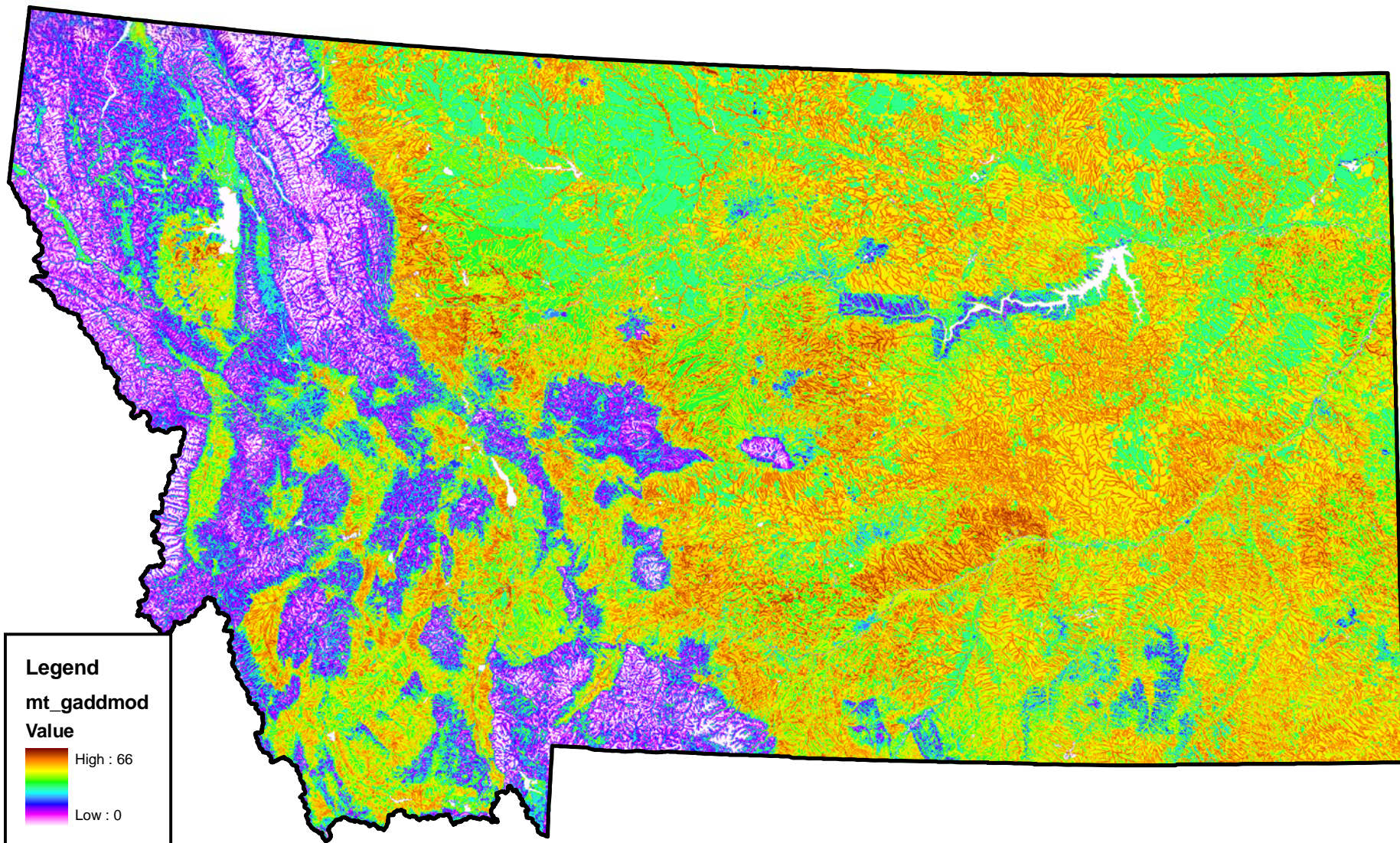
## An Ecological Assessment of Western Streams and Rivers



# *Region 8 EMAP Landscape Indicators*

- ***Potential Grazing Impact Model***
  - *Region 8 version of Montana complete*
  - *ORD version for Utah complete*
  - *Need to decide on model version and apply*
- ***Nutrient Models (N and P)***
- ***Excess Clean Sediment Models***

# Montana – Potential Grazing Impact Model





# Questions?

