National Biological Assessment and Criteria Workshop

Advancing State and Tribal Programs

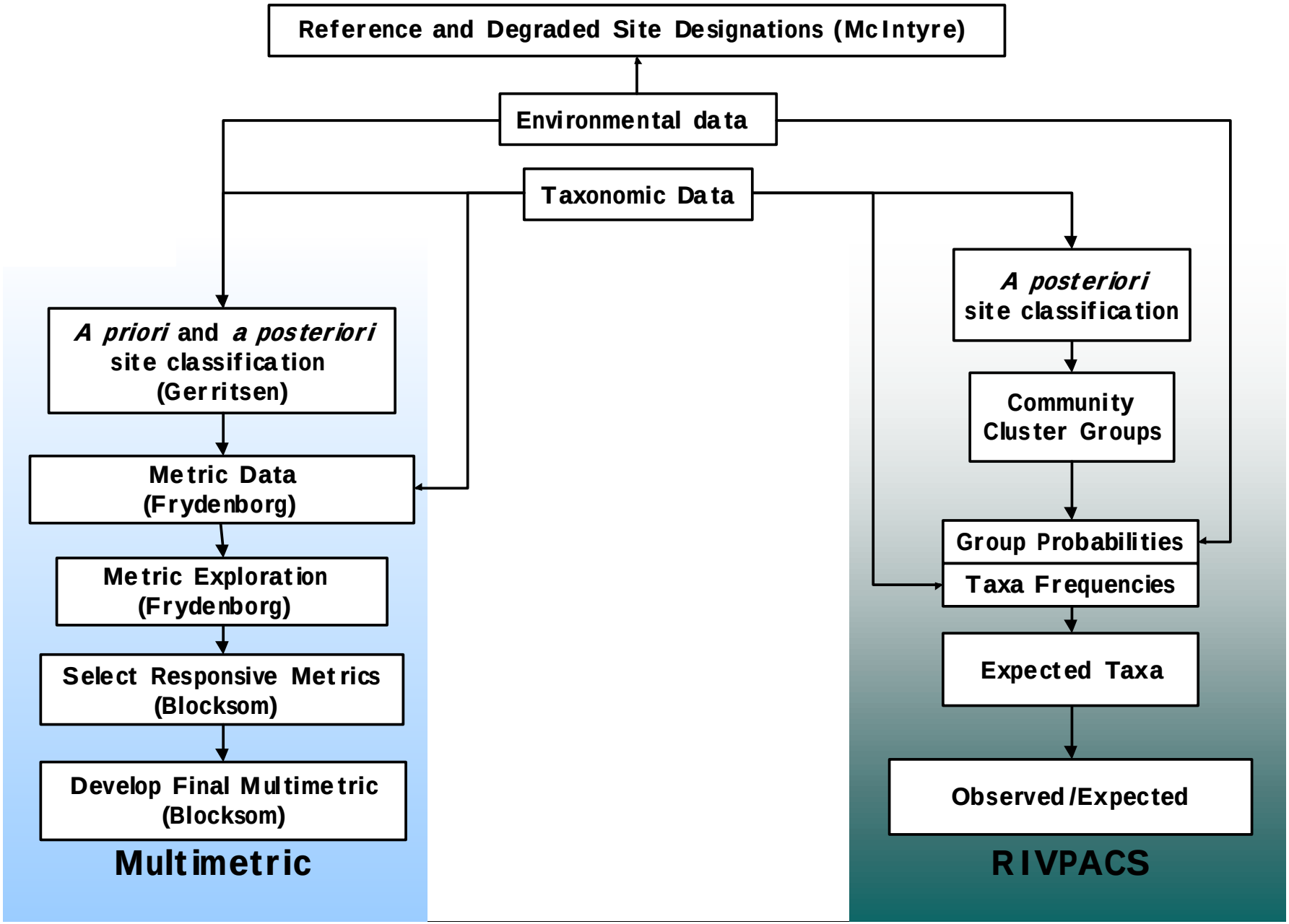
Coeur d'Alene, Idaho
31 March – 4 April, 2003

Index 201

Idaho's Index Development: Lessons Learned

Presented by

Michael McIntyre, Idaho DEQ


Reference and Degraded Site Designations (McIntyre)
Environmental data
Taxonomic Data
A priori and a posteriori site classification (Gerritsen)
Metric Data (Frydenborg)
Metric Exploration (Frydenborg)
Select Responsive Metrics (Blocksom)
Develop Final Multimetric (Blocksom)
Multimetric
A posteriori site classification
Community Cluster Groups
Group Probabilities
Taxa Frequencies
Expected Taxa
Observed/Expected
RIVPACS

Idaho is Diverse

Overview

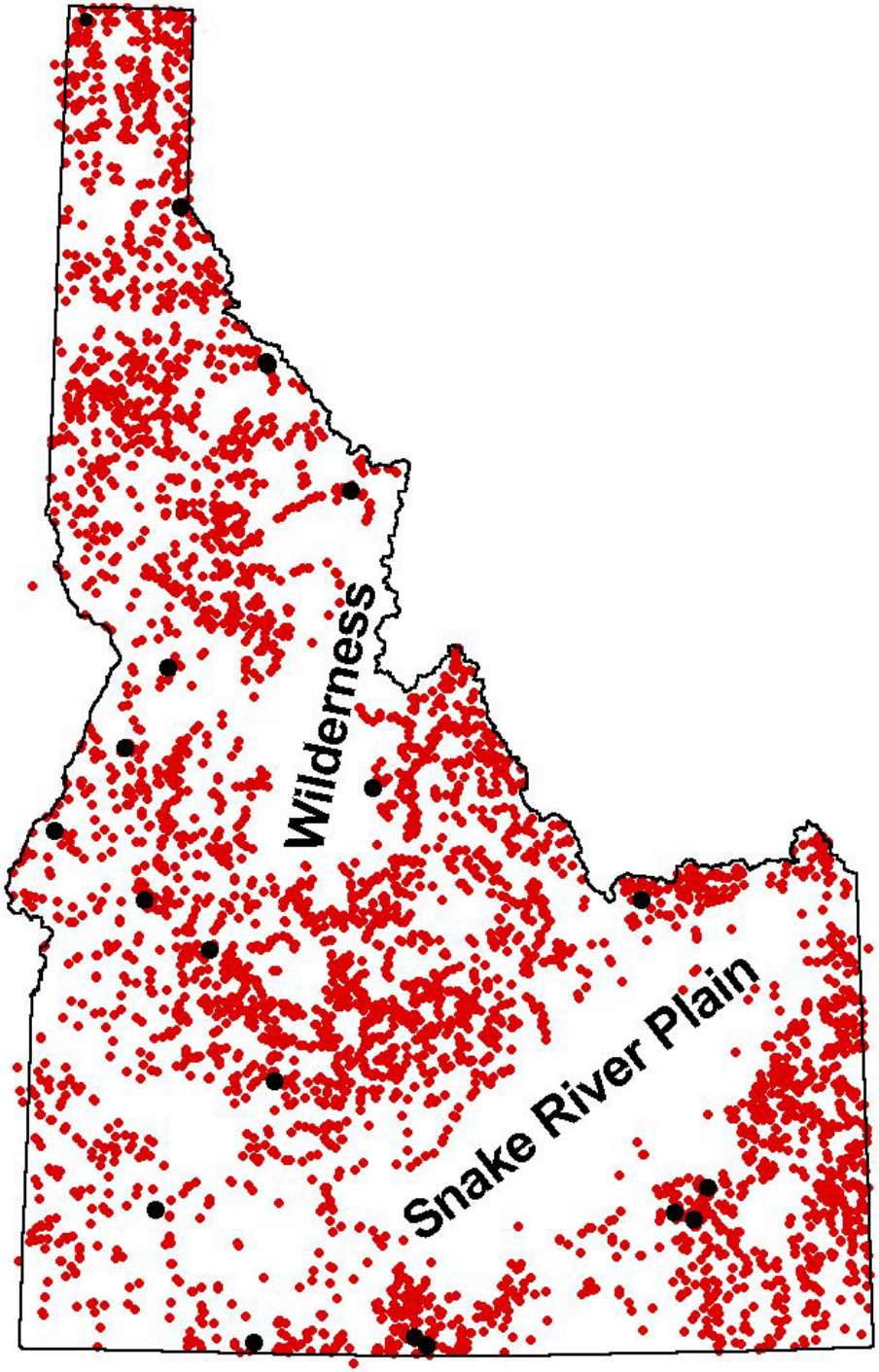
- Idaho uses bioassessment approach in water quality decision making
- Bioassessment results are used in 305(b) report, 303(d) list, and TMDLs
- Bioassessment process is based on multimetric approach which requires identification of reference condition

Clean Water Act & Bioassessment

- 1987, CWA re-authorization focused on non- point source pollution and introduced concept of bioassessment
- Prior to 1990, monitoring and assessment at DEQ was not structured or consistent
- In 1990, DEQ and many other states began to experiment with EPA's concept of rapid bioassessment (RBP)

BURP

- Early emphasis at DEQ was on monitoring and assessment, application of data came later
- Beneficial Use Reconnaissance Project (BURP) initiated in 1993, adopted statewide in 1994
- BURP monitoring based on RBP approach



BURP Sites

- 5,205 BURP sites (1993-2002)
- Range of conditions
- Established annual reference trend network

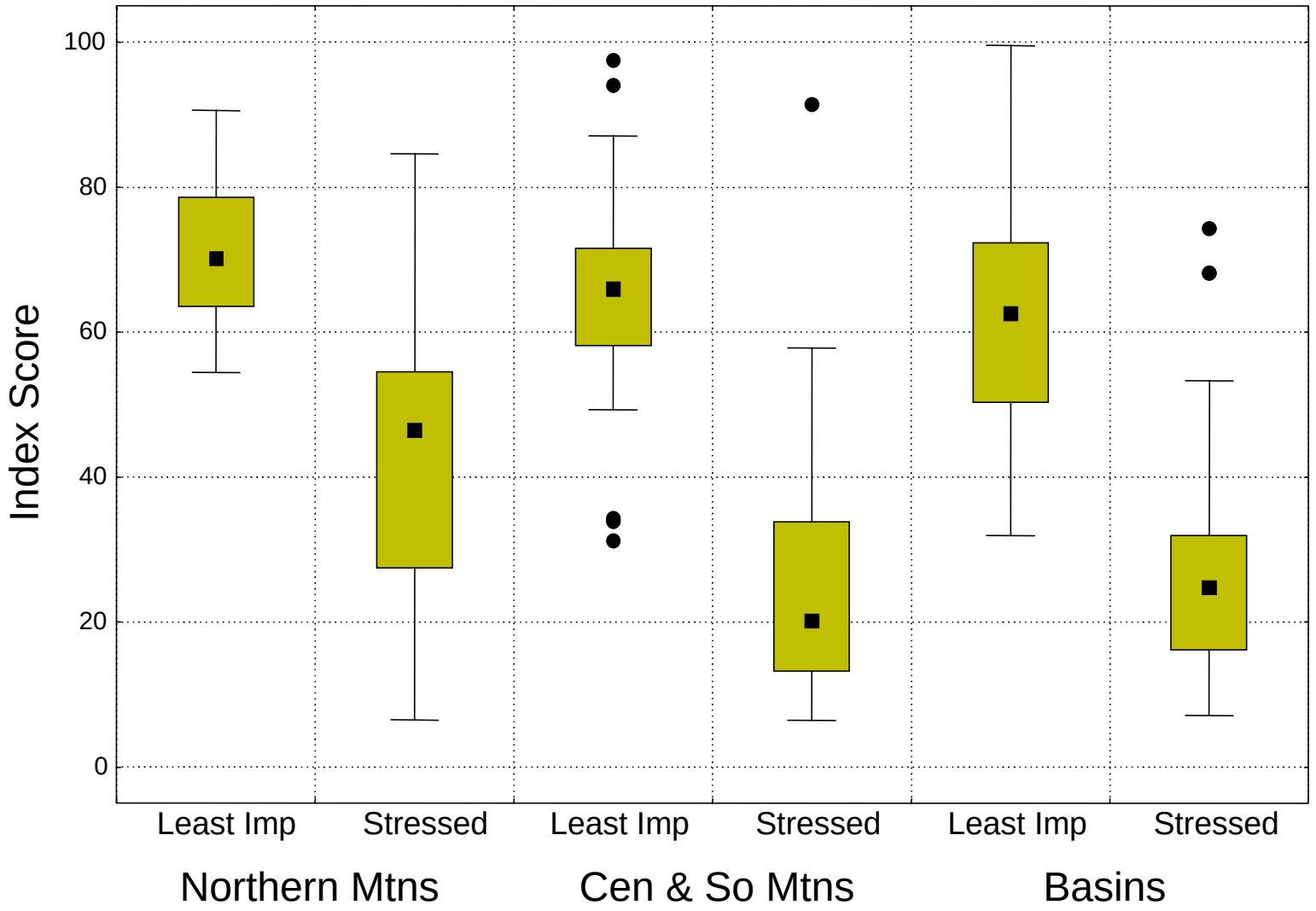
Outside Forces

- 1994-ICL et al. initiates lawsuit over Idaho 303(d) list
- Lawsuit focuses attention on how data collected and assessed for determining water quality
- Legal and regulatory ramifications of monitoring and assessment hits home for DEQ

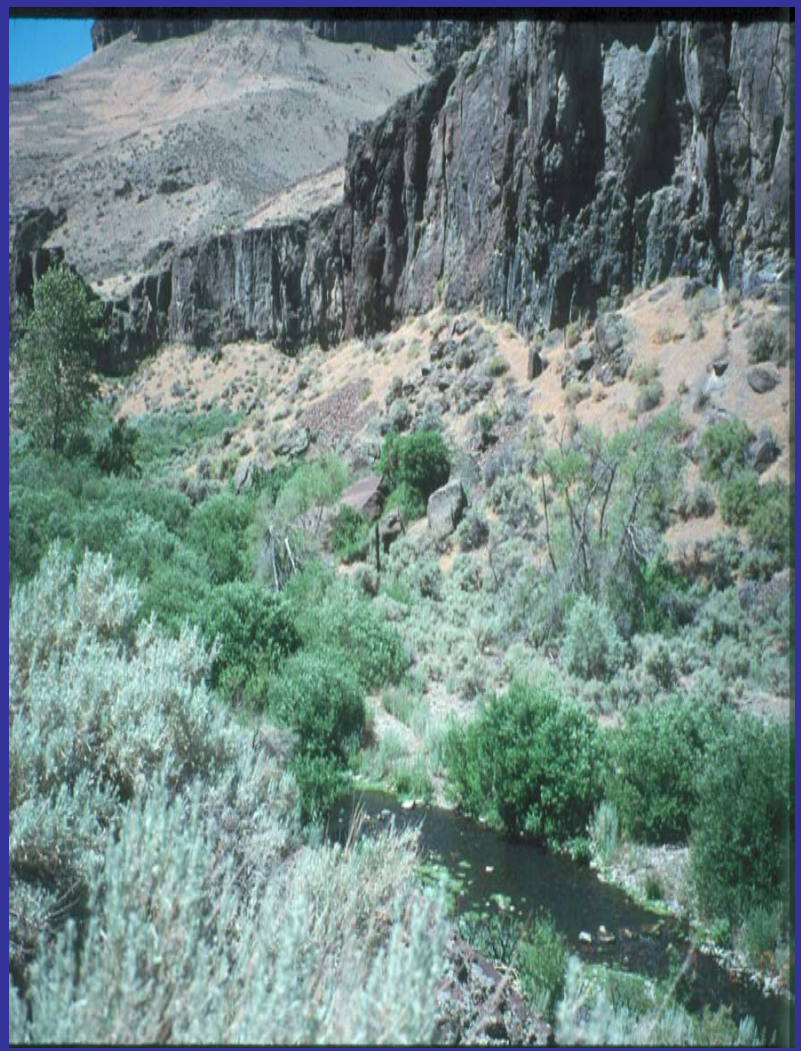
Importance of Reference

- **"The reference condition establishes the basis for making comparisons and for detecting use impairment" (Barbour et al. 1999).**
- **Karr and Chu (1999) and Hughes (1995) have also noted the significance reference condition plays in bioassessment.**

How Reference is Used

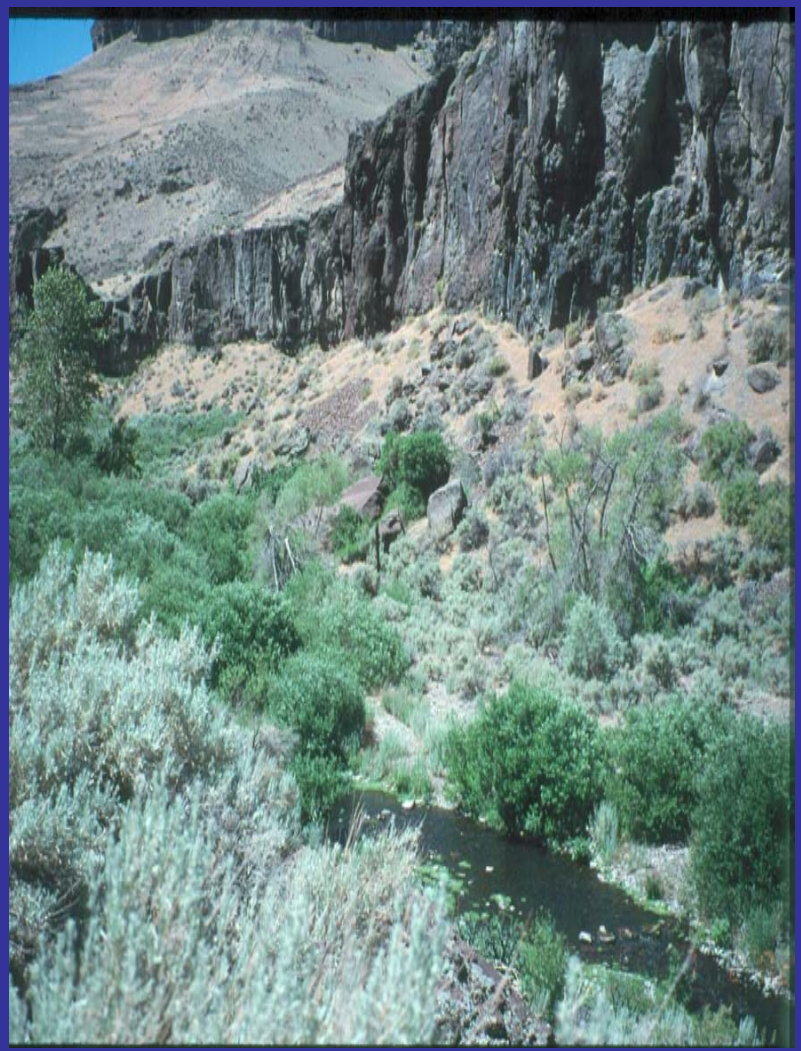


Early Index Development



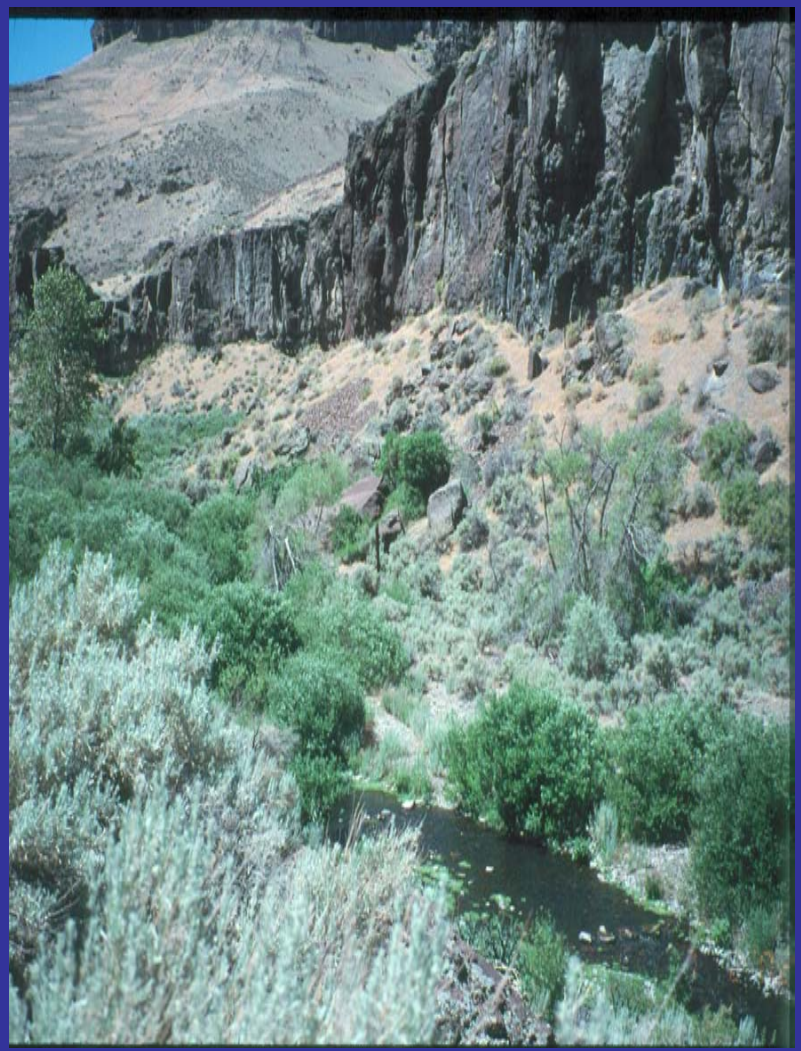
- 1989, contracted with Idaho State University (ISU) to develop a monitoring and assessment tool based on RBP model
- ISU used multiple sources to select reference: expert opinion, maps, and other resource professionals

Early Reference Selection



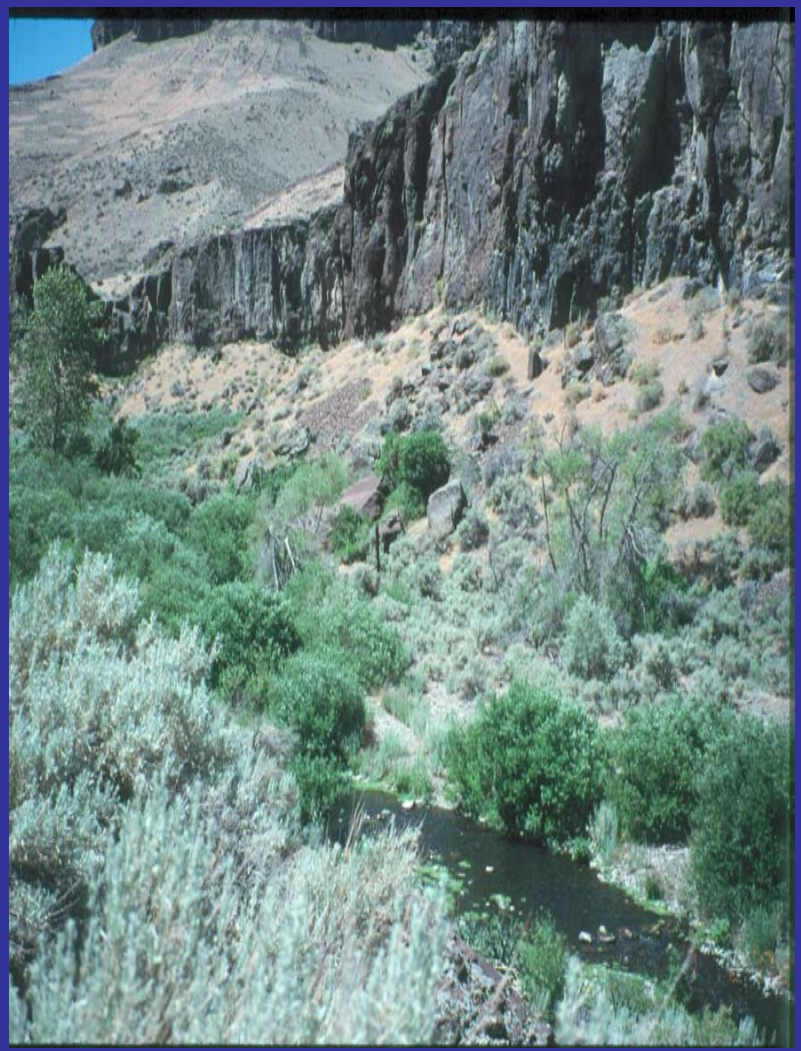
- ISU did field visits before monitoring to validate reference assumptions
- 1992, ISU delivers RBP tool
- Index based on macroinvertebrates
- Reference is for two ecoregions only (out of nine in the state)

Early Reference Selection

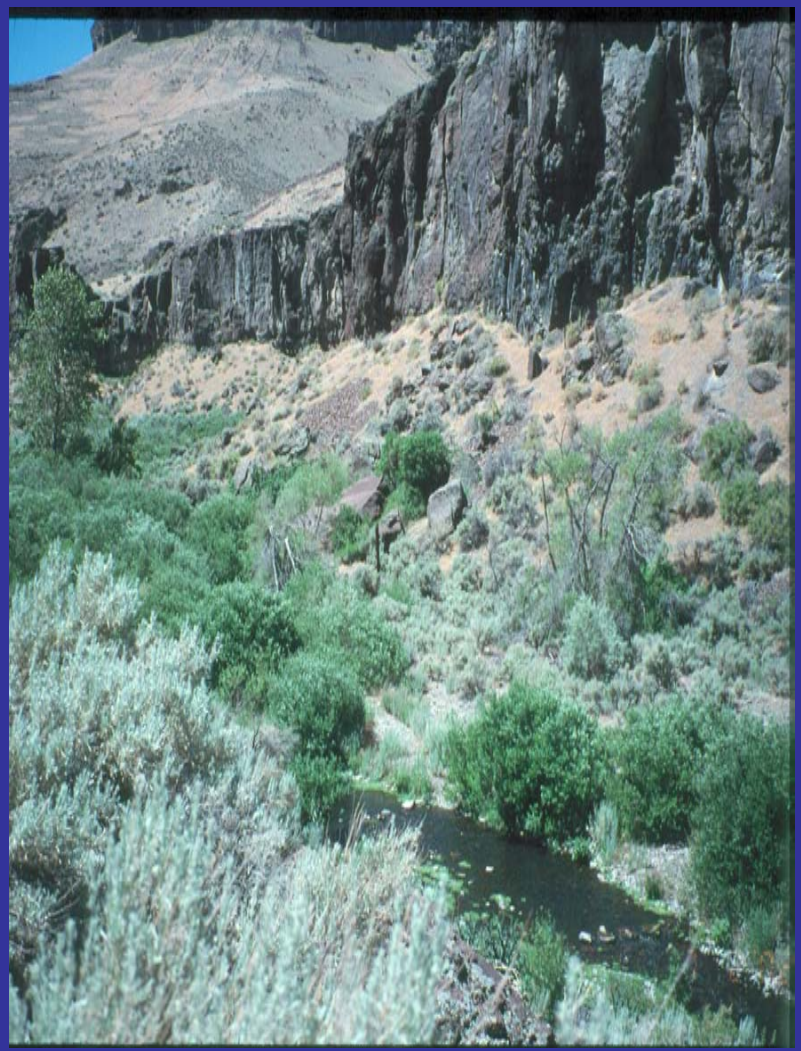


- 1995, limitations of ISU work becomes apparent as no reference sites exist for the other seven ecoregions
- DEQ selects reference using post hoc (*a posteriori*) approach from previously monitored sites
- Approach doesn't provide consistent or acceptable results. Statewide reference sites still questionable

Reference Selection: "Franken Stream"



- DEQ pushed to resolve reference question as 1996 305(b)/303(d) report/list imminent
- Choose an empirical model for determining reference
- Use the 95th percentile or best score for each of the seven metrics in the Macroinvertebrate Biological Index (MBI)



Reference Selection: "Franken Stream"

- Realize and accept that empirical model flawed- no one site consists of all the best values
- Now refer to this empirical model as the "Franken Stream" approach

Reference Selection: Next Attempt

- DEQ criticized internally and externally for "Franken Stream" model
- Moved to *a priori* approach incorporating regional staff expertise and Hughes (1995) reference methodology. Still draw from previously monitored sites

Reference Selection: Next Attempt

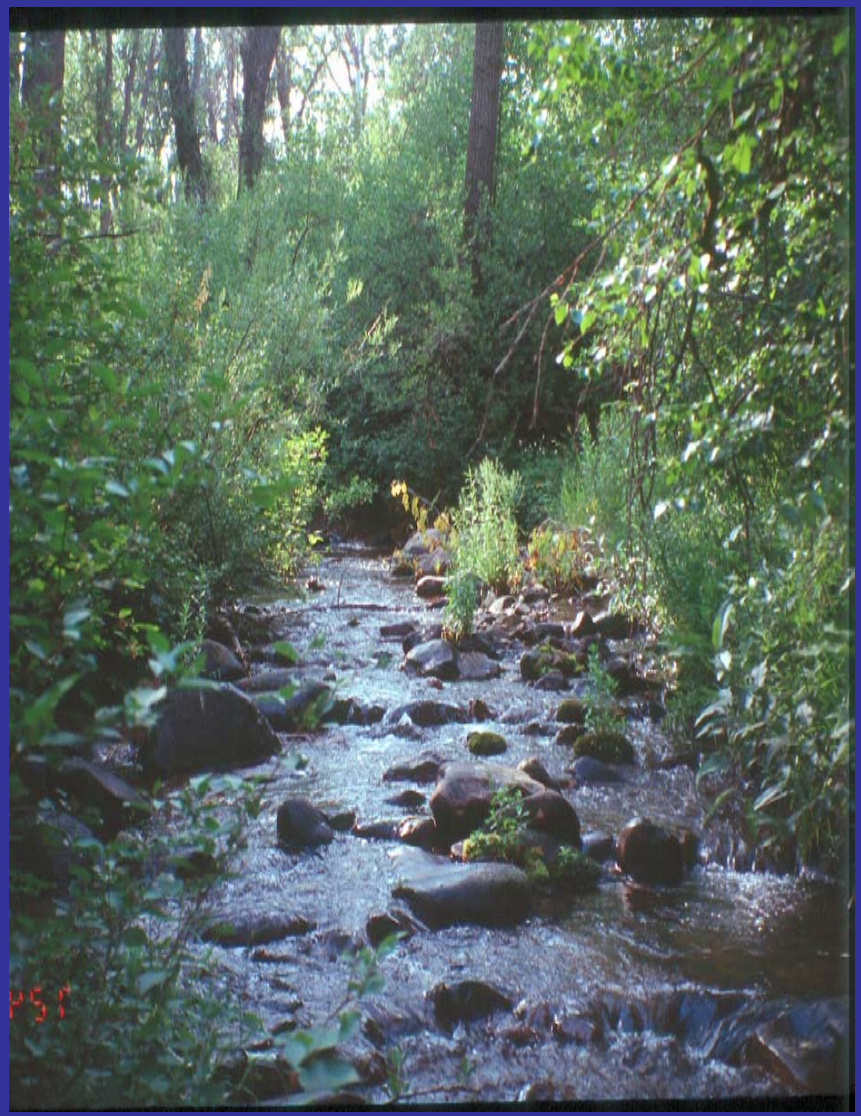
- *A priori* approach - not well defined
- Based on expert opinion
- No documentation of decision process
- Result: inconsistent definition of “reference” used by professionals

New Index Tool

- 1999, contract with Tetra Tech, Inc. to develop a new macroinvertebrate index
- Tetra Tech identifies “outliers” not only in the reference data set, but also in the impaired data set
- Site selection issue for both reference and impaired sites

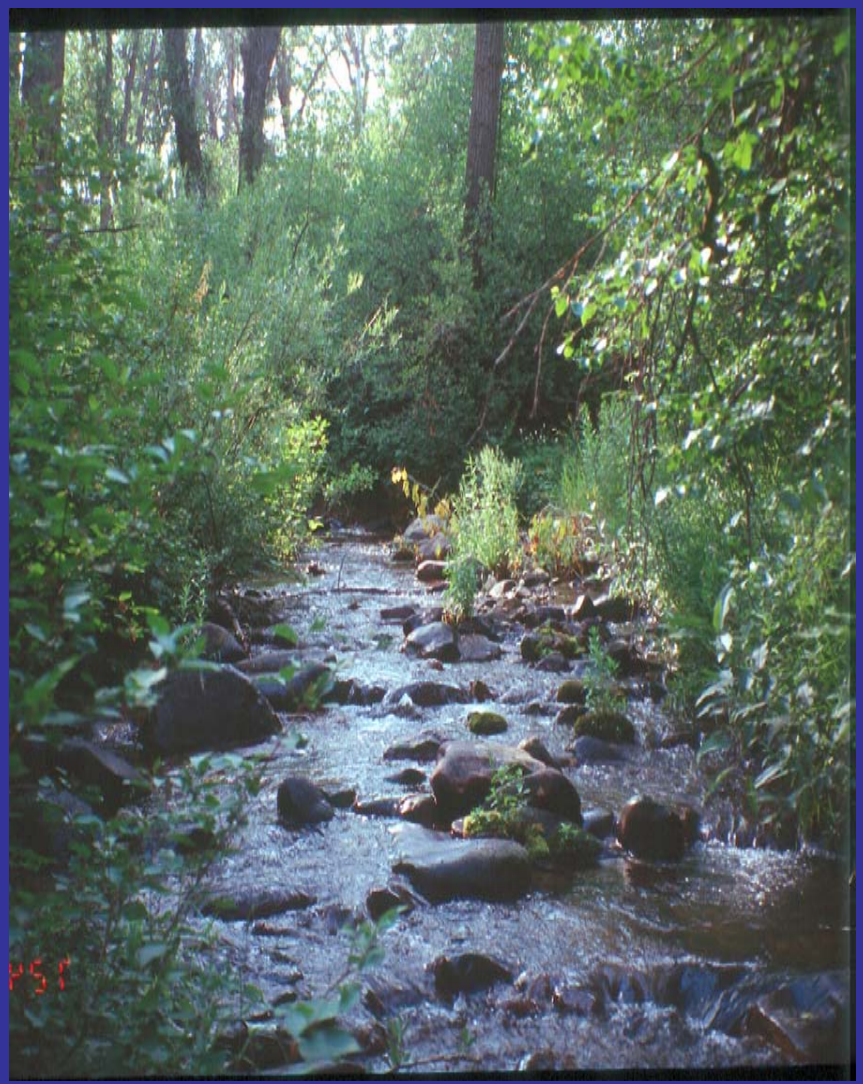
Reference Selection: Another Round

- *A priori* approach - provided better reference definitions and guidance
- Still based on best professional judgement
- Some documentation of decision process, but not consistent
- Result: better, but still inconsistent results and interpretations



Reference Selection: Most Recent Approach

- 2000, implement a more systematic approach (before monitoring!)
- Process involves:
  - definitive screening criteria
  - GIS filters for human impacts
  - independent field validation
  - documentation of all steps



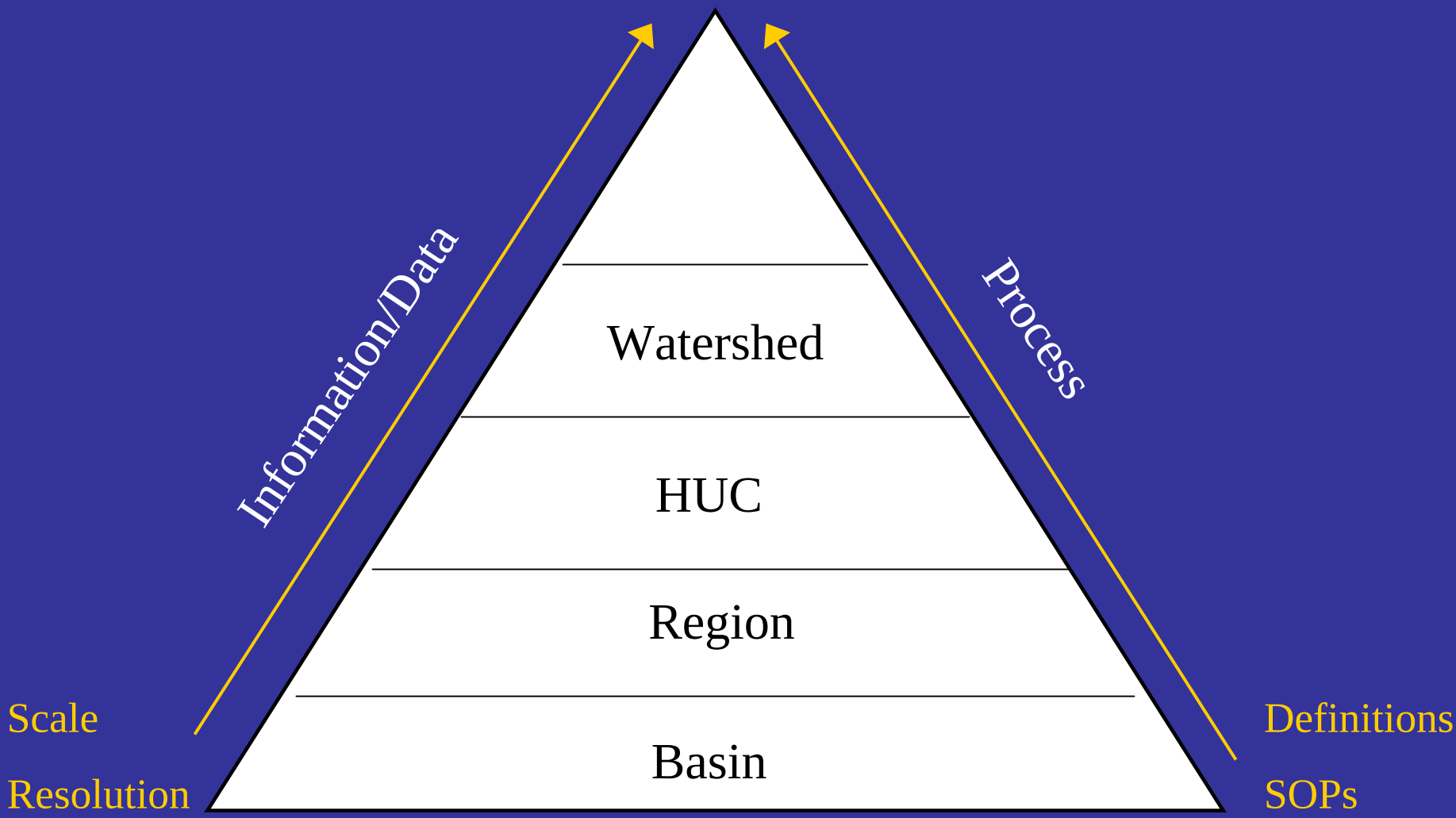
Reference Selection: Most Recent Approach

- Results reviewed by multiple regional staff and GIS tools used as checks
- Modify reference data set and index accordingly
- Refined reference set improves the discriminatory power of index significantly

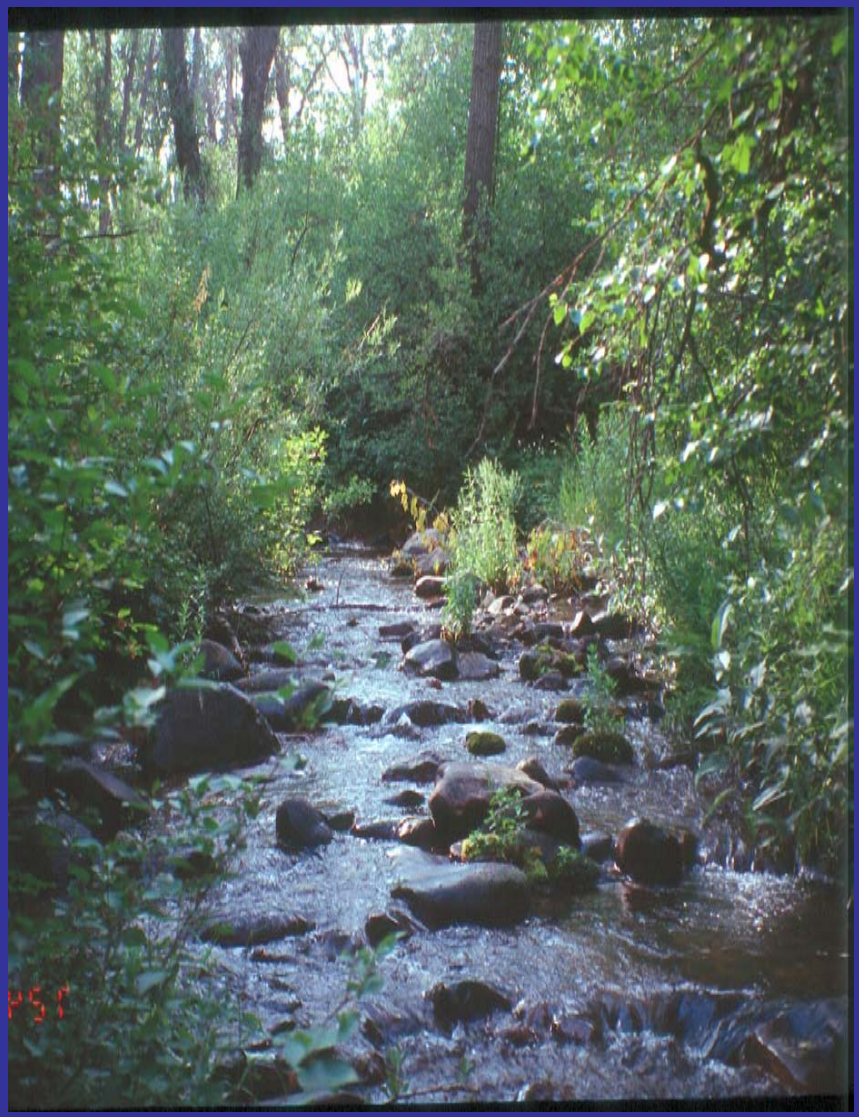
Current Criteria

- Roads, distant
- Riparian vegetation extensive, varied, mature
- Riparian structure complex
- Natural channel morphology, minimal shoreline modifications
- Channel complex
- Habitat structure complex
- Chemical stressor minimal
- Channel/flow manipulation minimal

Reference Condition



Conclusions



- Obviously, reference condition determination is critical and the foundation of index development
- Make a sound plan and stick with it, don't deviate
- Document decisions and assumptions throughout the entire process, start to finish