

National Biological Assessment
and Criteria Workshop

Advancing State and Tribal Programs



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LR 201

Idaho River Ecological Assessment Framework

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Beneficial Use Reconnaissance Program (BURP)

- Rapid bioassessment program
- Provides statewide consistency in nonpoint source reconnaissance monitoring
- Data used in 305(b) reports, 303(d) lists, and Subbasin Assessments (TMDL component)

BURP Modules

- Small streams (since 1993)
- Rivers (since 1997)
- Lakes and reservoirs (since 1997)

Parameters & Methods

General Components

- Work under classification framework
- Use reference sites to identify benchmarks
- Collect physicochemical and biological data
- Reconnaissance approach using combination of quantitative (Q) and subjective (S) methods

Diverse streams and rivers in Idaho



When does a stream become a river?

- Needed both a biological and operational distinction



When does a stream become a river?

- Average ratings by size

Water Body Size Category	Stream Order	Average Width at Baseflow (m)	Average Depth at Baseflow (m)	Rating
Rivers	≥ 5	≥ 15	≥ 0.4	3
Streams	< 5	< 15	< 0.4	1

River Overview

- Index period: August - October
- 2 visits: site reconnaissance, field work
- 1 Coordinator
- 1 crew (3 people) plus regional contact
- Central training
- Average 35 sites/year
- Equipment and safety issues

River Parameters

- Flow (Q)
- Width, Depth (Q)
- Bank condition (S)
- Riparian vegetation (S)
- Channel alteration (S)
- Floodplain disturbance (S)
- Substrate (S)
- Embeddedness (S)
- Gradient (S)
- Water Clarity (S)
- pH (Q)
- Dissolved Oxygen (Q)
- Temperature (Q)
- Conductivity (Q)
- Macroinvertebrates (Q)
- Bacteria (Q)
- Periphyton (Q)
- Fish (outside sources)

Periphyton Sampling Method



Macroinvertebrate Sampling



Fish Sampling

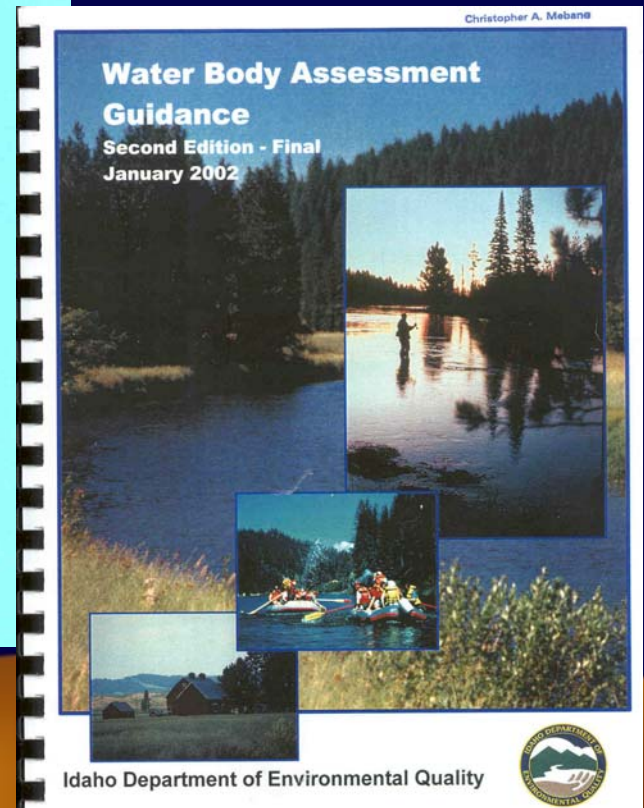
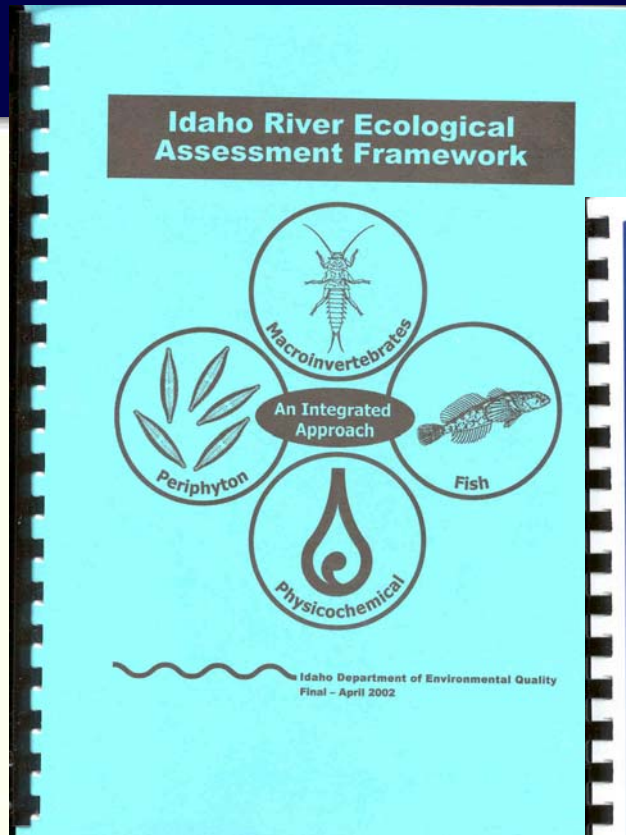
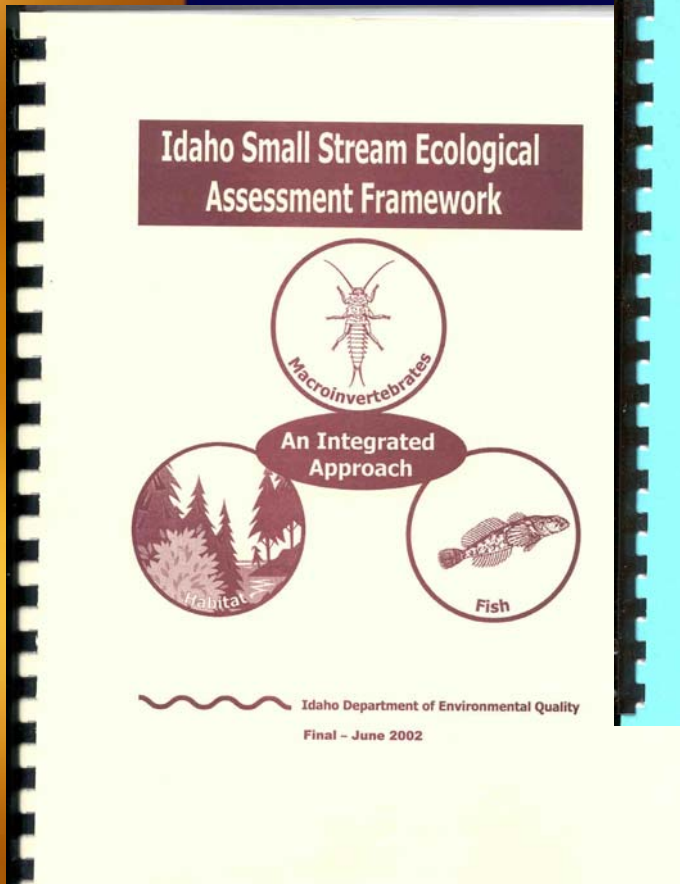
- Cooperated with USGS and EPA-EMAP for fish data from rivers



Data Management & Analysis

- Collect vouchers, identify to species
- Data housed in relational database
- QA/QC manual for data management
- Assessment methods - use multi-metric indexes (macroinvertebrate, fish, diatom, physicochemical and biology)
- Water Body Assessment Guidance - defines numeric criteria exceedances, uses, data integration

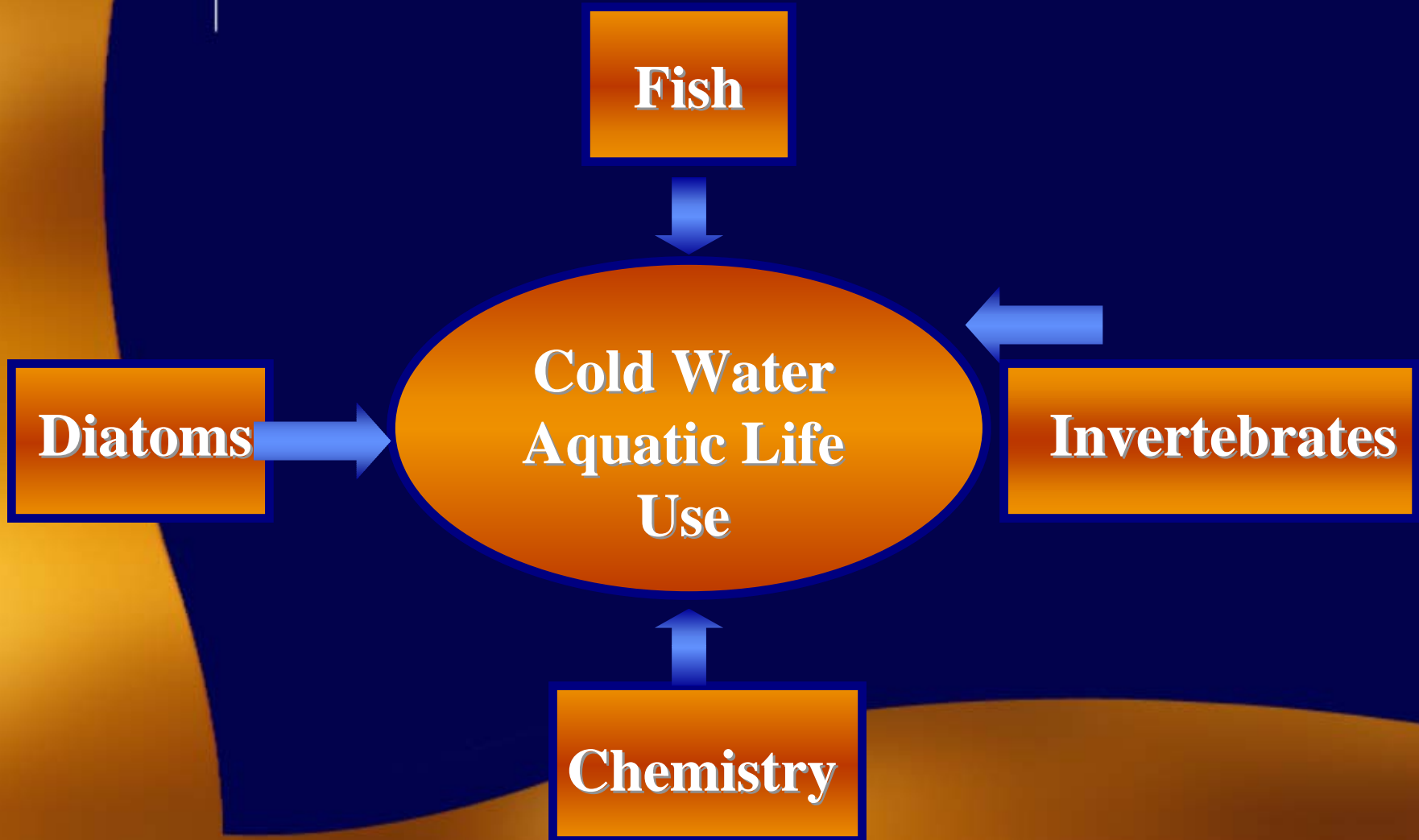
Assessment Frameworks



Ecological Assessment Approach (*Cold Water Aquatic Life Use*)

- Use biological indicators
- Developed several multi-metric indices
- Use indices in a lines of evidence approach

Lines of evidence approach



River Macroinvertebrate Index (*RMI*)

- ISU performed 4-year study under contract (1995-1999)
- Used a reference - disturbed site comparison approach
- Selected 22 sites statewide to develop macroinvertebrate index
- Tested 24 metrics
- Used 1, 3, 5 scoring system
- Selected 6 sites to validate the IRI

RMI Metrics

- Taxa Richness
- % Dominance
- % Elmidae
- % Predators
- EPT Richness

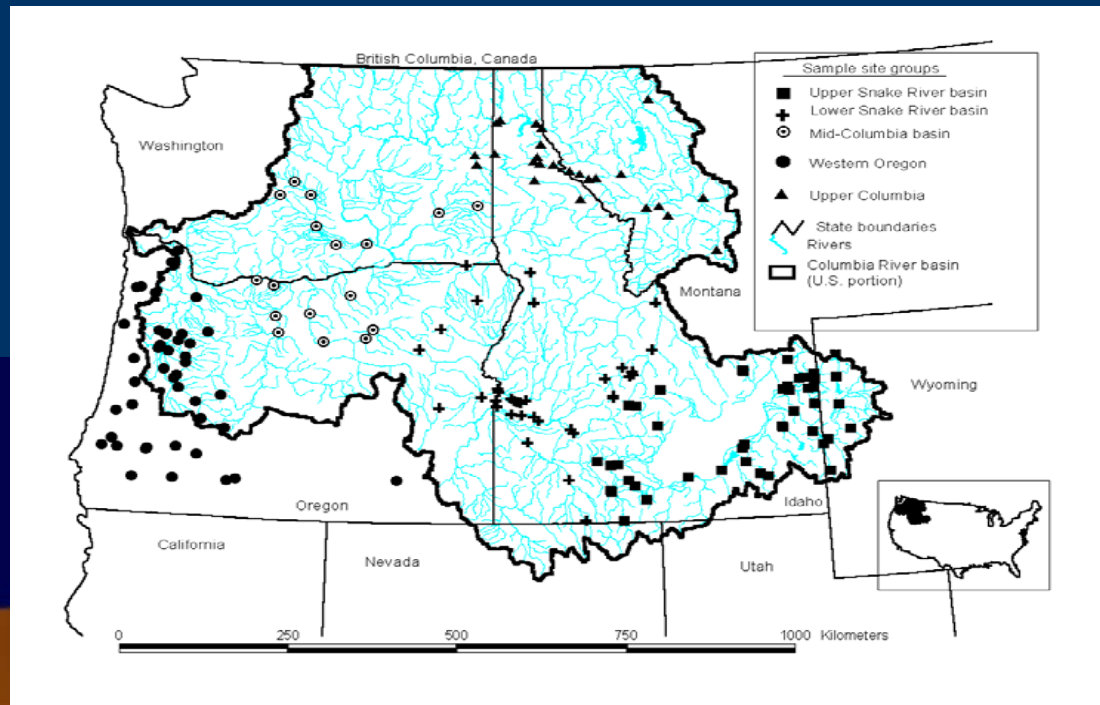
Royer, T. V., C. T. Robinson, and G. W. Minshall. 2001. Development of macroinvertebrate-based index for bioassessment of Idaho Rivers. *Environmental Management* 27:627-636.

River Fish Index (RFI)

- Used sites from one large river basin (Upper Snake) to develop multi-metric index.
- Used a reference - disturbed site comparison approach
- Tested 16 metrics used for cold water streams/rivers in the Northwest
- Used continuous scoring system, 0-100
- Validated the index with sites from other Pacific NW river basins

River Fish Index (RFI)

- Cost, difficulty of river sampling, limited reference sites argue for regional cooperation in monitoring and assessment
- Rivers do not respect political boundaries



RFI Metrics

- **# of Cold Water Native Species**
- **% Cold Water Individuals**
- **% Sensitive Native Individuals**
- **% Tolerant Individuals**
- **# of Non-Indigenous Species**
- **Presence of Carp**
- **% Sculpins (Cottids)**
- **# of Salmonid Age Classes**
- **# of Cold Water Individuals Per Minute of Electrofishing**
- **% of Fish with DELT Anomalies**

Mebane, C. A., T. R. Maret, and R. M. Hughes. 2003. An index of biological integrity (IBI) for Pacific Northwest rivers. *Transactions of the American Fisheries Society* 132:239-261.

River Diatom Index (*RDI*)

- Selected 59 sites statewide to develop index
- Identified 35 attributes and tested 86 metrics
- Instead of a reference - disturbed site comparison approach, tested human disturbance ratings
- Used 1, 3, 5 scoring system

Fore, L. S., and C. S. Grafe. 2002. Using diatoms to assess the biological condition of large rivers in Idaho (U.S.A.). *Freshwater Biology* 47:2015–2037.

RDI Metrics

- **% Sensitive Species**
- **% Very Tolerant Species**
- **Eutrophic species richness**
- **% Nitrogen heterotrophs**
- **% Polysabrobic**
- **Alkaliphilic species richness**
- **% Species requiring high oxygen**
- **% Motile species**
- **% Deformed cells**

River Physicochemical Index— *RPI*

- Application of the Oregon Water Quality Index using Idaho data
- Selected 10 sites to test the index
- Used OWQI regression for initial scoring
- Index results not directly used in aquatic life use assessments because non-biological; interpretive tool

Cude, C.G. 2001. Oregon water quality index: a tool for evaluating water quality management effectiveness. *Journal of the American Water Resource Association* 37:125-138

PCI Metrics

- Temperature
- Total Solids
- Dissolved Oxygen
- Ammonia + Nitrate Nitrogen
- Biochemical Oxygen Demand
- Total Phosphorus
- pH
- Fecal Coliform

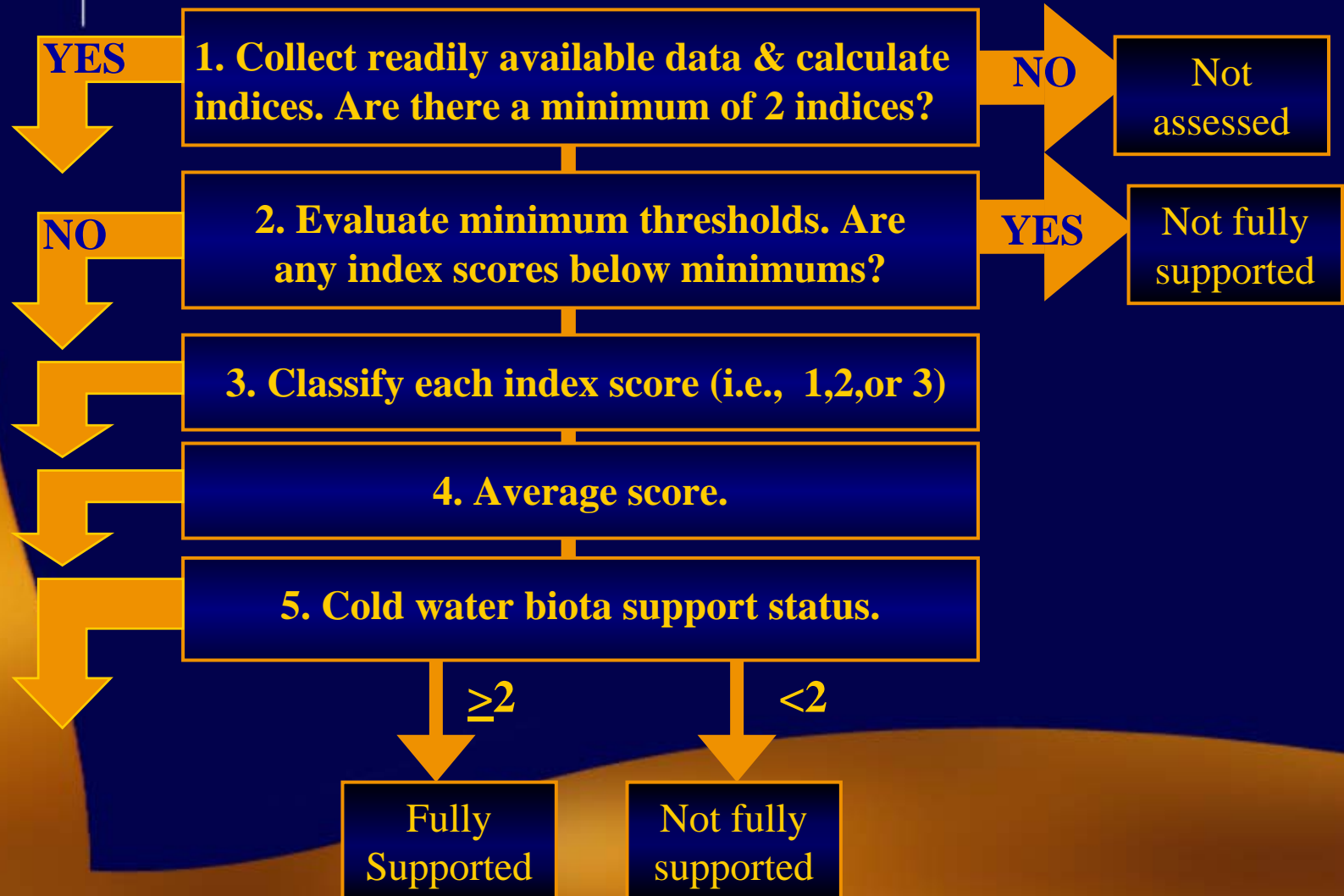
Index Integration

- Weight of evidence approach, except
- Set minimum thresholds for each index
- Normalize each index score to a 1, 2, or 3 rating based on deviation from expected condition
- Minimum of 2 index scores required to evaluate aquatic life use (ALUS)
- Average site score <2 , ALUS not supported; ≥ 2 ALUS supported

Normalizing Different Index Scores

	Minimum threshold	1	2	3
RMI (%-tile of reference)	< minimum reference score	min. – 10 %	10 – 25%	>25 th %
RDI (%-tile of all waters)	None	25 – 50 %	50-75%	>75 th %
RFI (%-tile of reference)	< 5 th %-tile	5 – 10 %	10 – 25%	>25 th %

River aquatic life assessment process



River index score results

Site	RMI	RDI	RFI
Payette River below city WWTP	15	16	21
Little Wood River near Carey	21	42	78

River condition ratings

Site	RMI	RDI	RFI
Payette River below city WWTP	2	1	<Minimum threshold
Little Wood River near Carey	3	3	3

Other plans

- Currently use the low end of the statistical distribution of scores to identify waters with impaired uses
- Perhaps the high end of the distribution could be used to identify “high quality” waters for antidegradation reviews