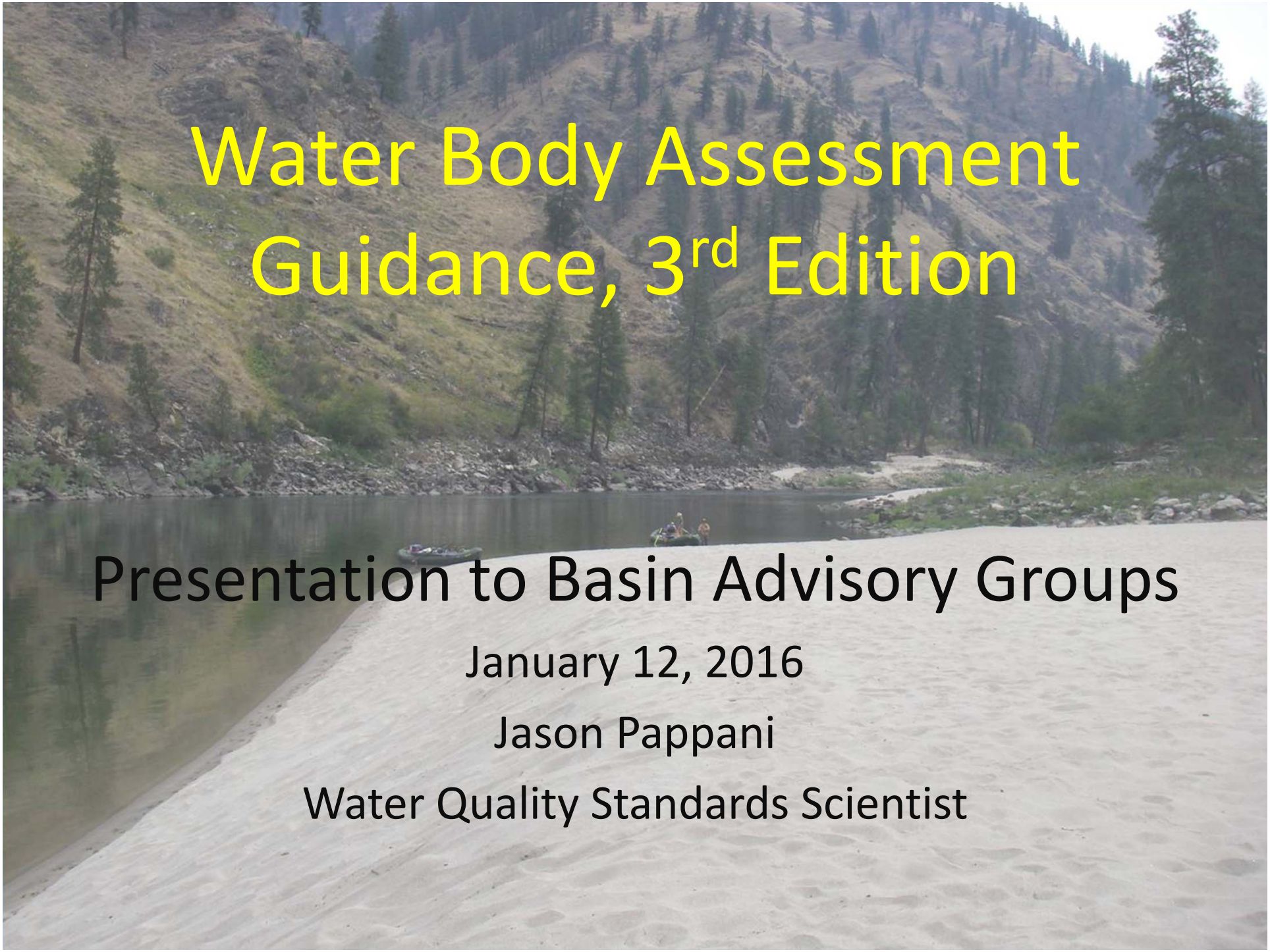


Water Body Assessment Guidance, 3rd Edition

Presentation to Basin Advisory Groups

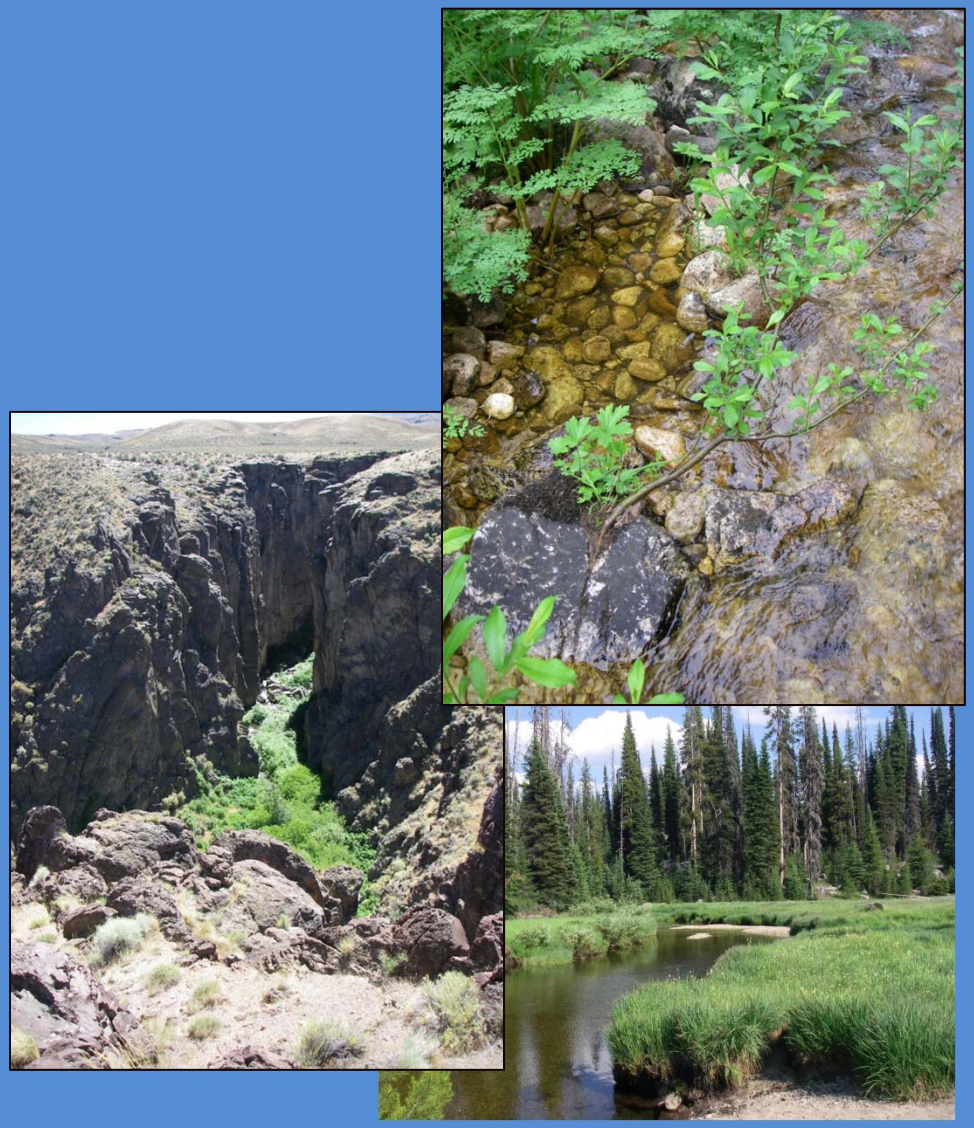
January 12, 2016

Jason Pappani

Water Quality Standards Scientist

Goals

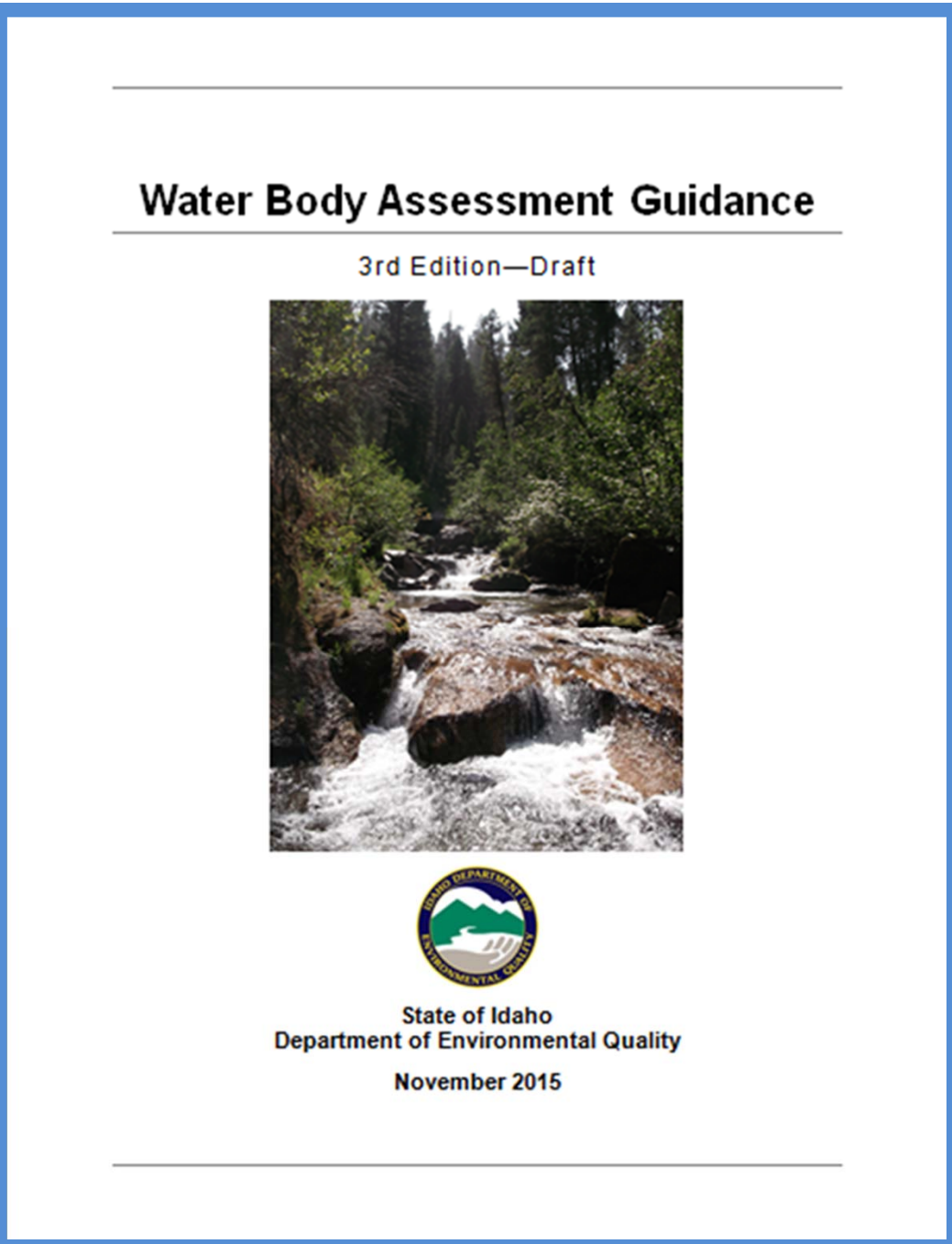
- Overview of WBAG
- Describe DEQ's assessment process
  - Scientific basis
  - Request feedback



Presentation Outline

- Introduction
- Water Body Assessment Guidance (WBAG) Overview
  - Biological Assessment Frameworks
    - Reference, Site Classification, and Index Selection
  - Assessment Thresholds
- Assessment example
- Next steps and schedule for implementation

- What is WBAG?
- Why revise?
- What's new in this edition?


Water Body Assessment Guidance

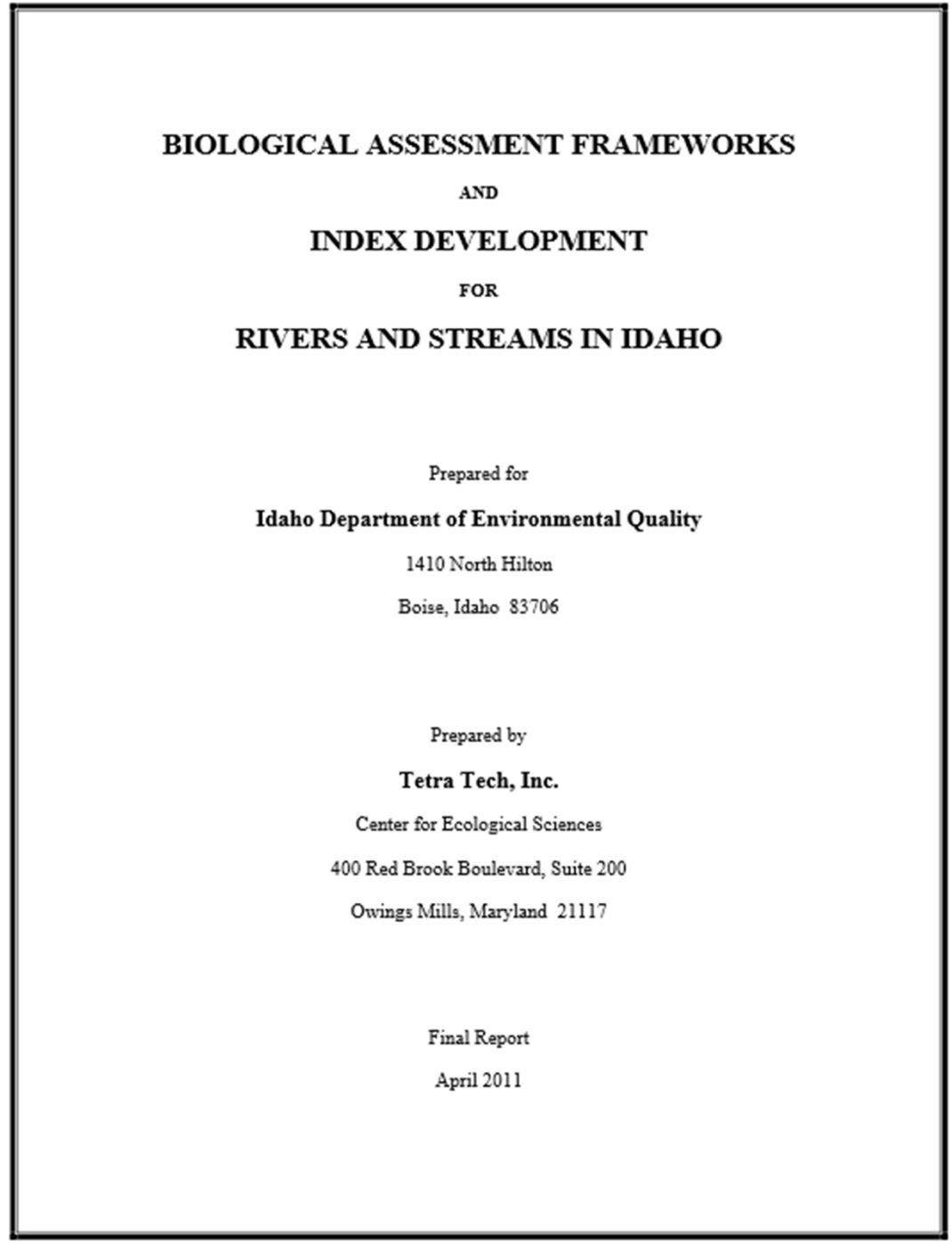
3rd Edition—Draft

State of Idaho
Department of Environmental Quality

November 2015

What's new?

- Reorganized to better flow with assessment process, clarify where needed
- Clarification of relationship between salmonid spawning and cold water aquatic life
- Updated taxa list for coldwater obligate macroinvertebrates
- New section on toxics



BIOLOGICAL ASSESSMENT FRAMEWORKS

AND

INDEX DEVELOPMENT

FOR

RIVERS AND STREAMS IN IDAHO

Prepared for

Idaho Department of Environmental Quality

1410 North Hilton

Boise, Idaho 83706

Prepared by

Tetra Tech, Inc.

Center for Ecological Sciences

400 Red Brook Boulevard, Suite 200

Owings Mills, Maryland 21117

Final Report

April 2011

What's new?

- Assessment Framework
  - Reference
  - Classification
  - Metrics and Indices
- Assessment Thresholds

What's New?

- Implement the latest science
- Take advantage of 10+ years of additional data
- Address issues and concerns of stakeholders and implementers
- Improved accuracy of assessments

WBAG, 3rd Edition

1. Water Body Assessment Guidance Overview
2. Water Body Types and Assessment Units
3. Beneficial Use Identification for Assessments
4. Monitoring Design and Data Policy
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7. Contact Recreation Use Support Determination
8. Water Supply Use Determination
9. Wildlife Habitat and Aesthetics Use Support Determination

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Aquatic Life Use Support Determination

- Use ecological indicators and numeric water quality criteria to assess aquatic life use
  - Generally, *cold water* and, where appropriate, *salmonid spawning*

Ecological Indicators – General Principles

- Macroinvertebrates, Fish, and Habitat
- Use Multimetric Indices (MMI) of ecological integrity

Ecological Indicators

- Reference-Site approach
  - Use conditions at sites that have limited human impact to set expectations
- Site Classification
  - Classify sites to account for natural variability
    - Apples to Apples comparisons

MMI Development – General Process

1. Reference
2. Classification
3. Metric Selection
4. Metric Combination
5. Set Thresholds

1. Reference

2. Classification

3. Metric Selection

4. Metric Combination

5. Set Thresholds

Identifying Reference Sites - Streams

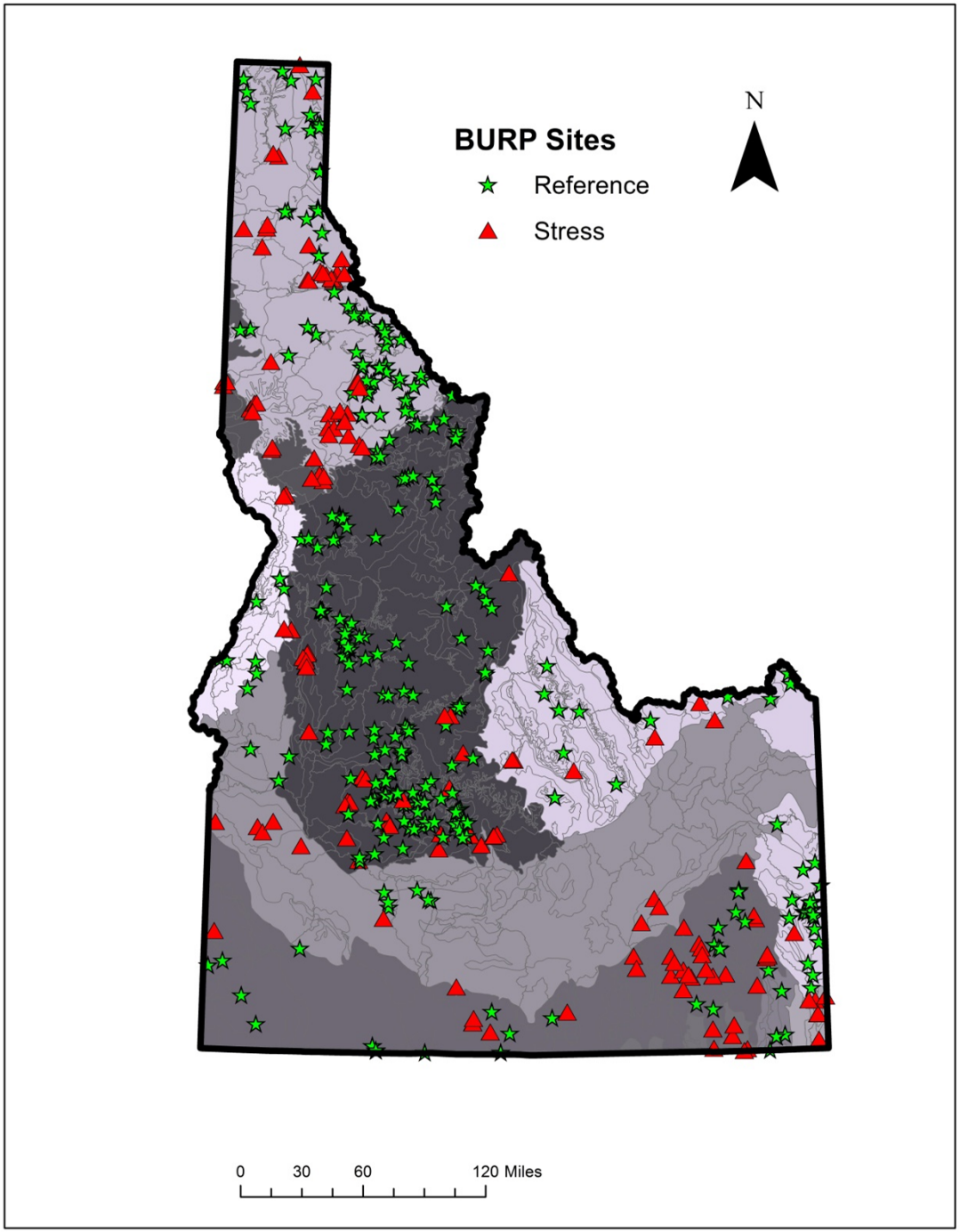
- Approach:
  - Using existing data, look at the range of human disturbance, establish reference and stressed criteria
- Consider:
  - Target even spatial distribution, among ecoregions
  - Target of 10% reference and 10% stressed in each ecoregion

Reference Criteria

Description	units
Land Disturbance Index (LDI), an index of land use intensity (Brown and Vivas 2005)	index units
Percent natural land uses (excluding agricultural and developed uses)	%
Density of roads	km/km^2
Proportion of stream length within 100 meters of roads	km/km^2
Population density	$\#/km^2$
Density of mines, weighted by mine size	weighted $\#/km^2$
Density of water diversion rights	$\#/km^2$
Disruptive pressure observed in riparian zones	rating; 1-20
Grazing activity at the site	presence/ absence

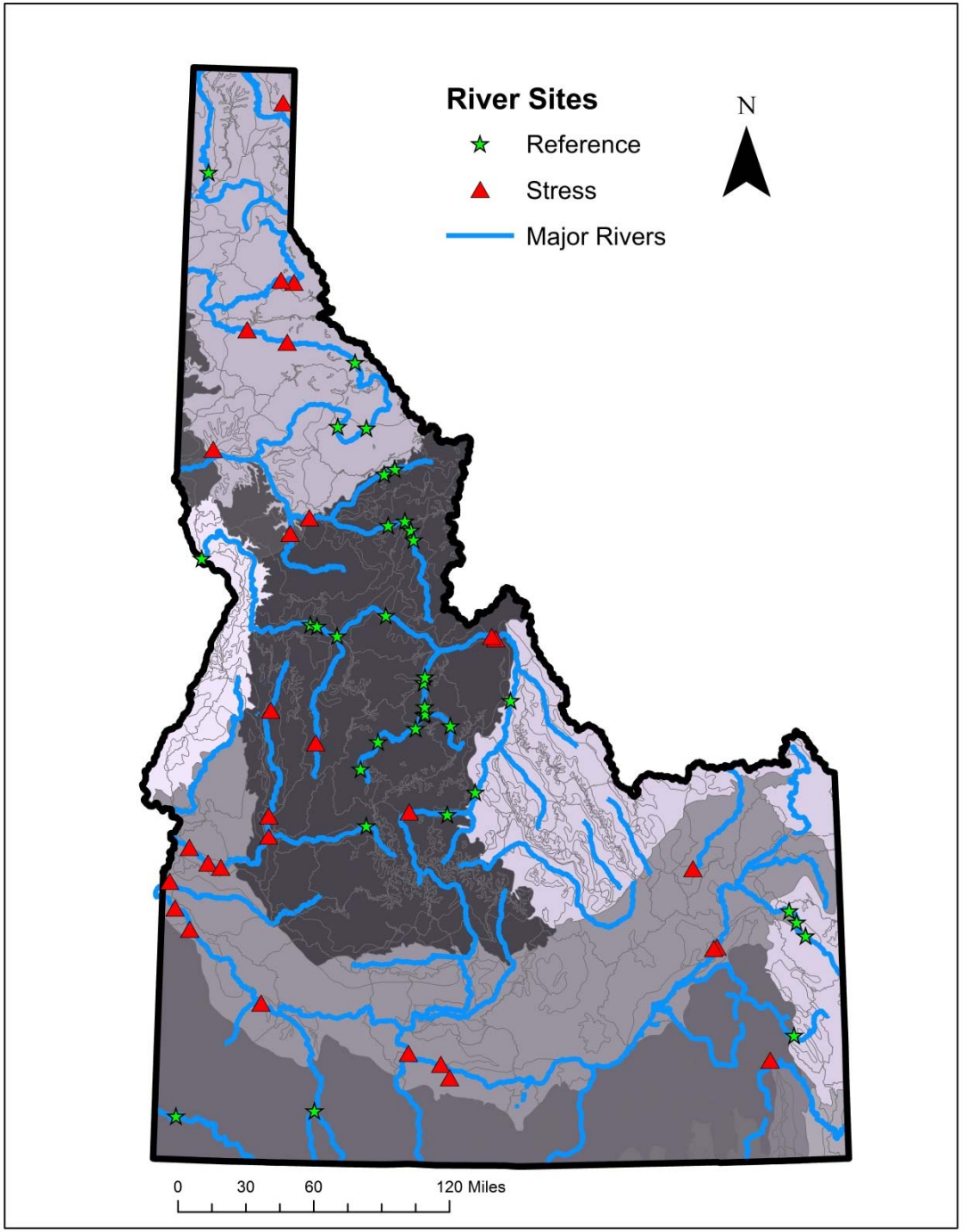
Reference - Streams

- 381 Reference (green)
- 154 stressed sites (red)



Reference - Rivers

- 34 Reference (green)
- 29 stressed sites (red)



1. Reference

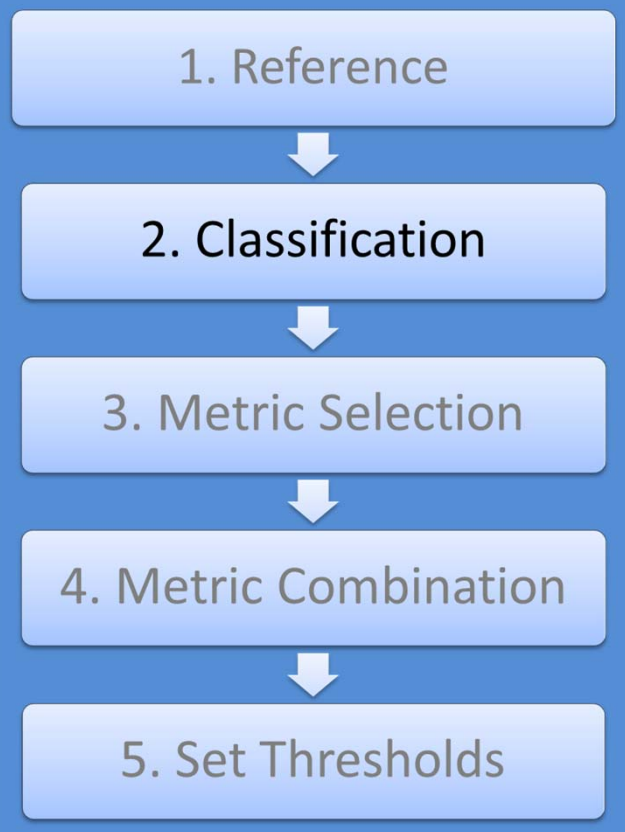
2. Classification

3. Metric Selection

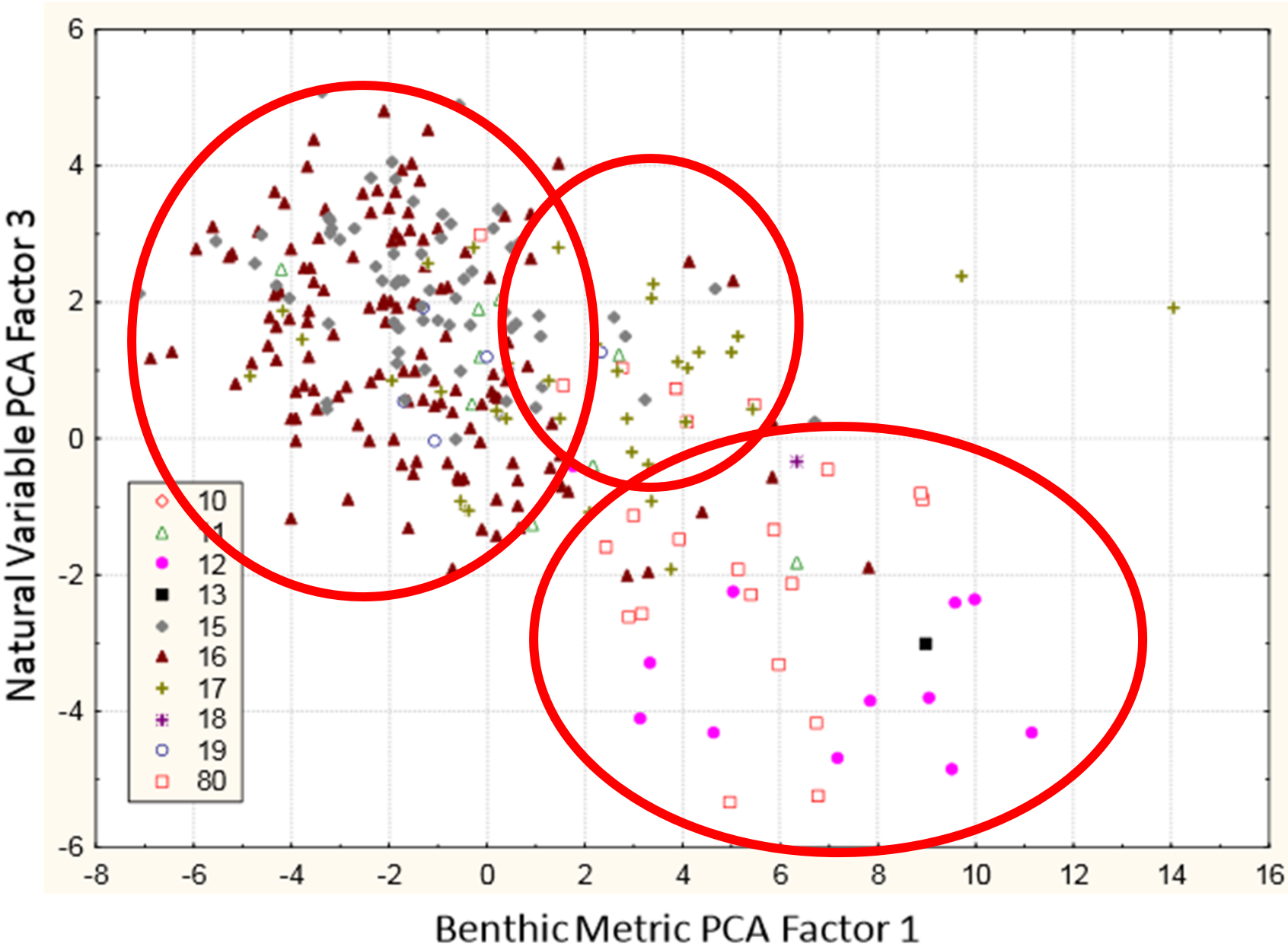
4. Metric Combination

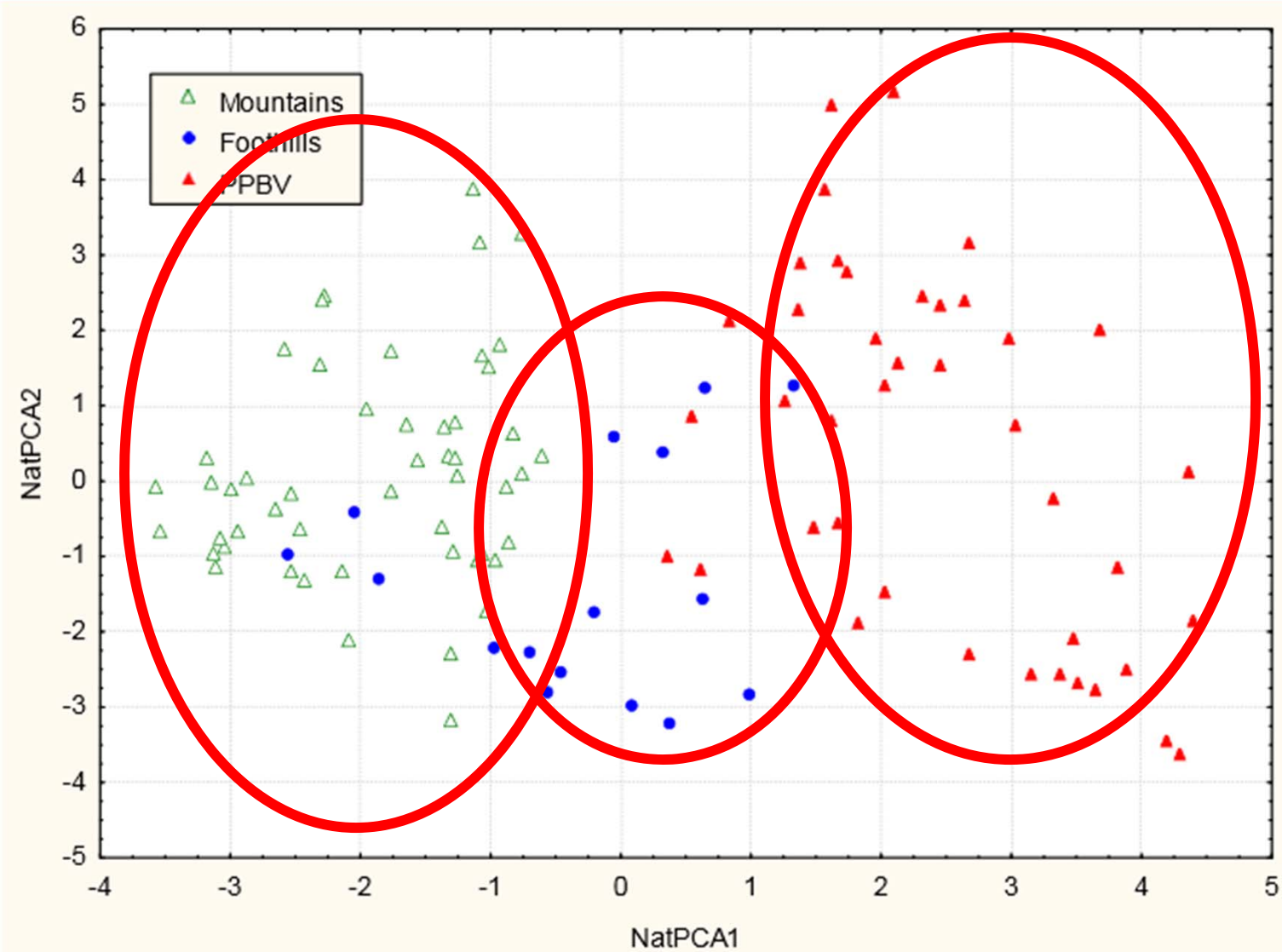
5. Set Thresholds

Classification Approach



- Environmental Factors
- Statistical methods to identify groups – Cluster Analysis


Natural Variable PCA Factor 3
Benthic Metric PCA Factor 1
6
4
2
0
-2
-4
-6
-8
-6
-4
-2
0
2
4
6
8
10
12
14
16
10
11
12
13
15
16
17
18
19
80


Mountains
Foothills
PPBV
NatPCA2
NatPCA1
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-4
-3
-2
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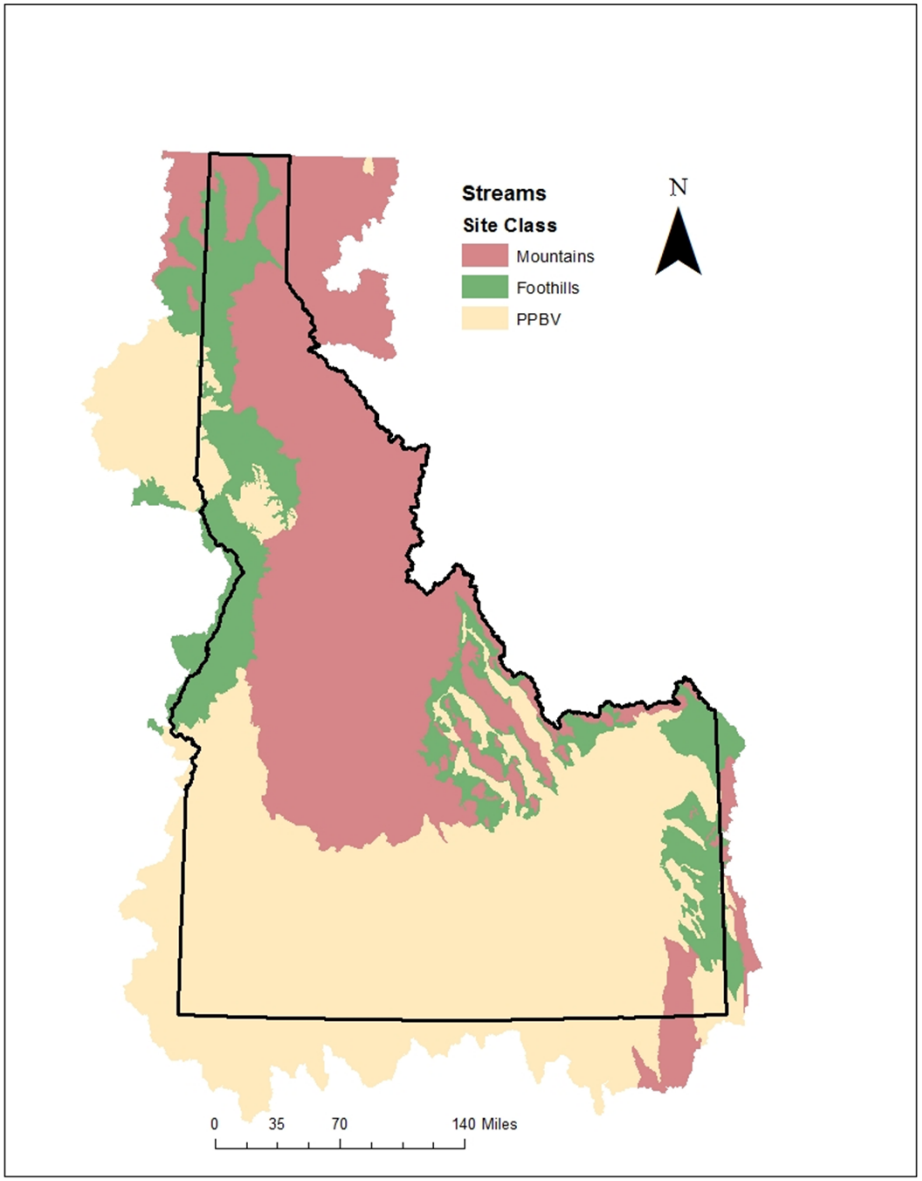
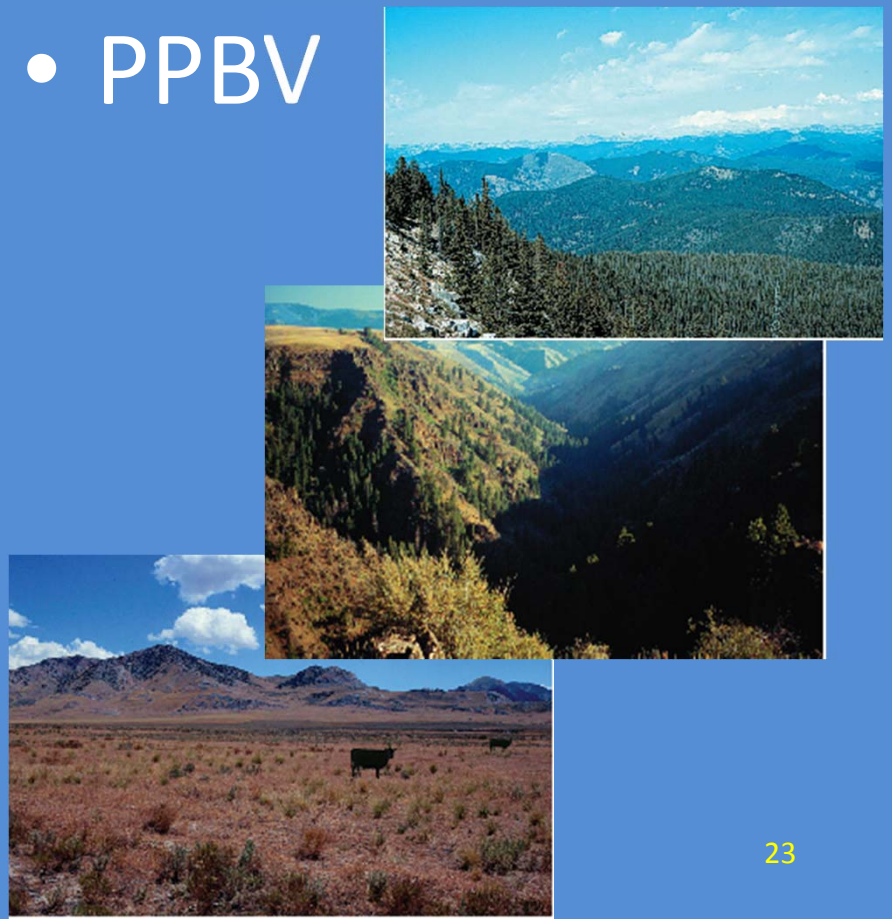
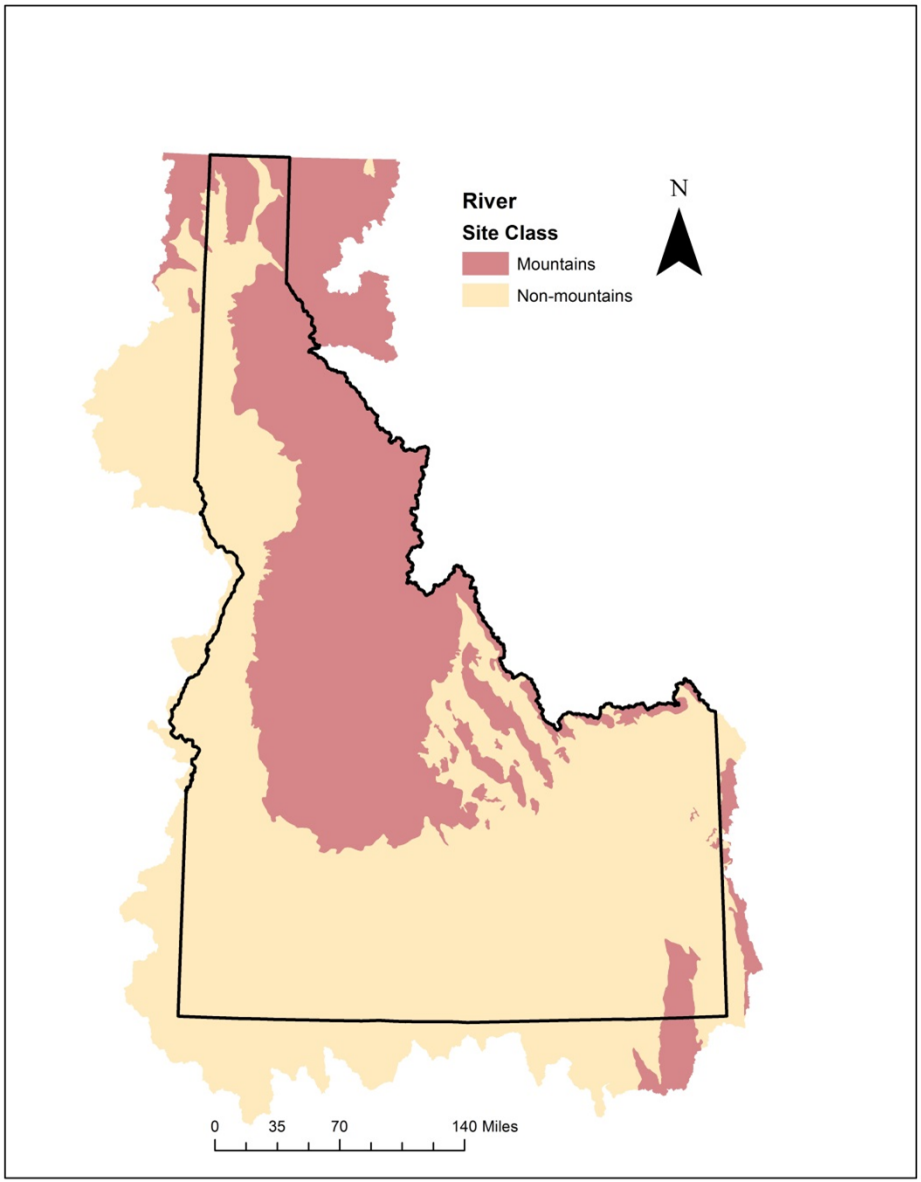
0
1
2
3
4
5



Site Classes - Streams

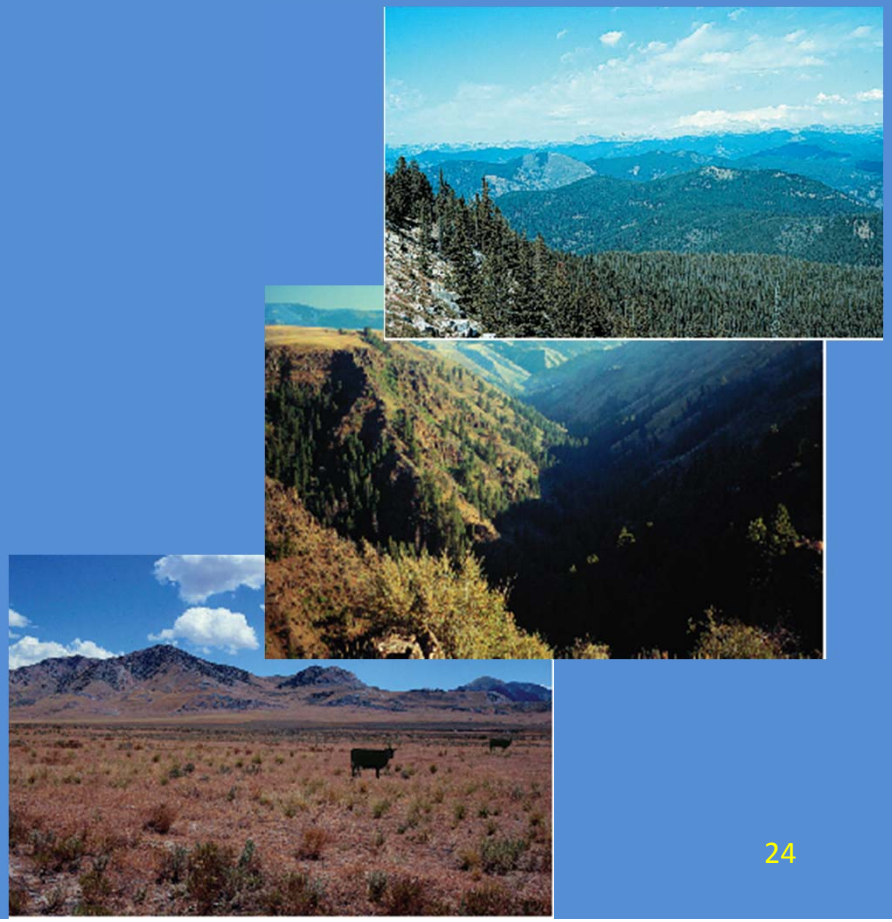
- Mountains
- Foothills
- PPBV





Site Classes - Rivers

- Mountains
- Non-Mountain



1. Reference

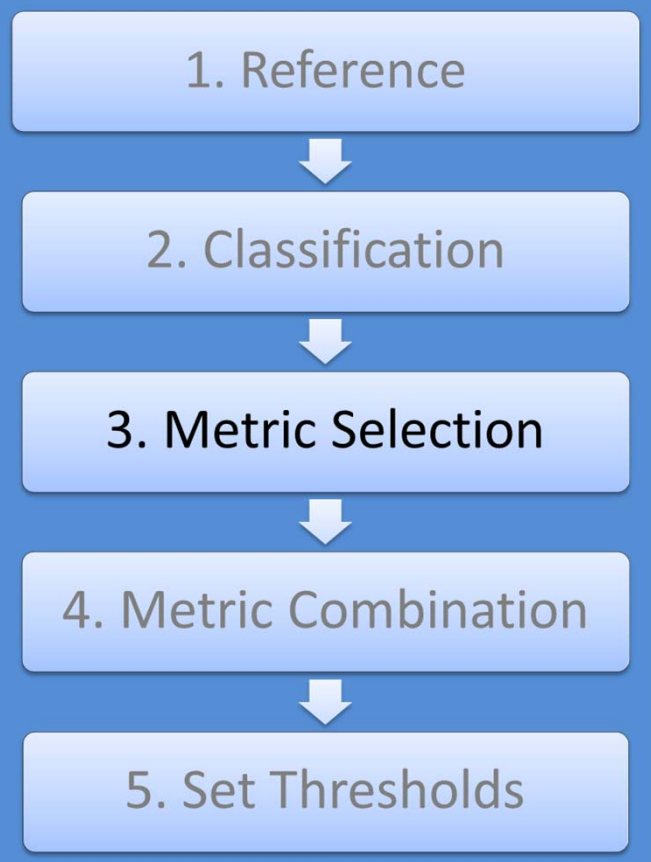
2. Classification

3. Metric Selection

4. Metric Combination

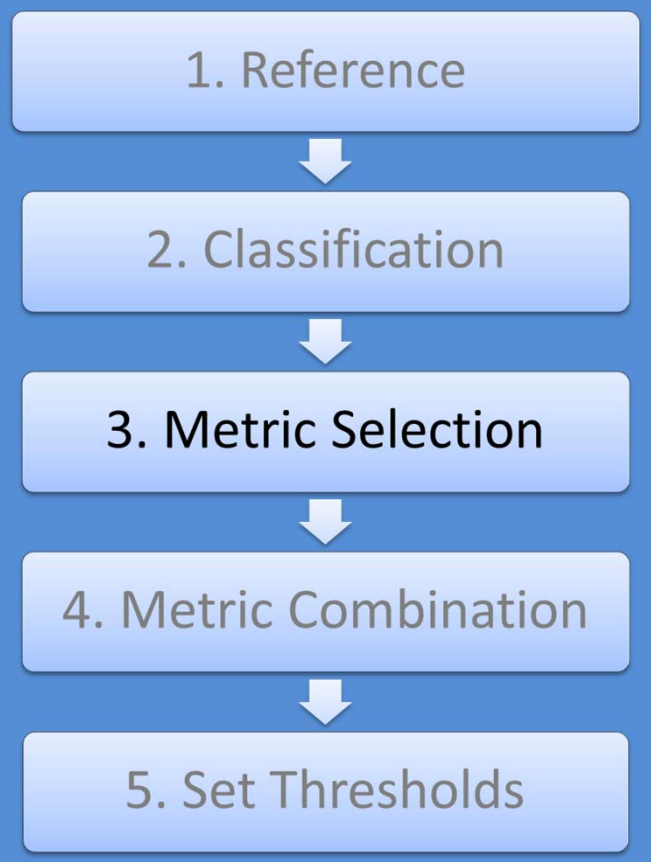
5. Set Thresholds

Metric Selection



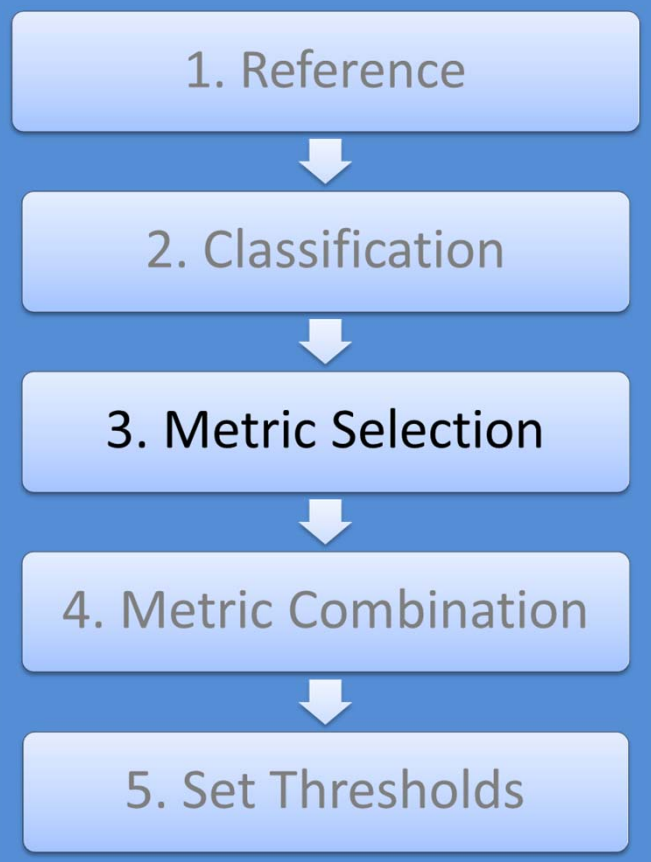
- Metric
  - Something that can be measured
    - # Of Different Species
    - % Trout

Metric Selection



- Select candidate metrics that:
  - discriminate well between least and most disturbed sites
  - ecologically meaningful (mechanisms of responses can be explained)

Metric Selection



- Metric categories: metrics that represented different community properties
  - Richness
  - Composition
  - Feeding Group
  - Tolerance
  - Voltinism

1. Reference

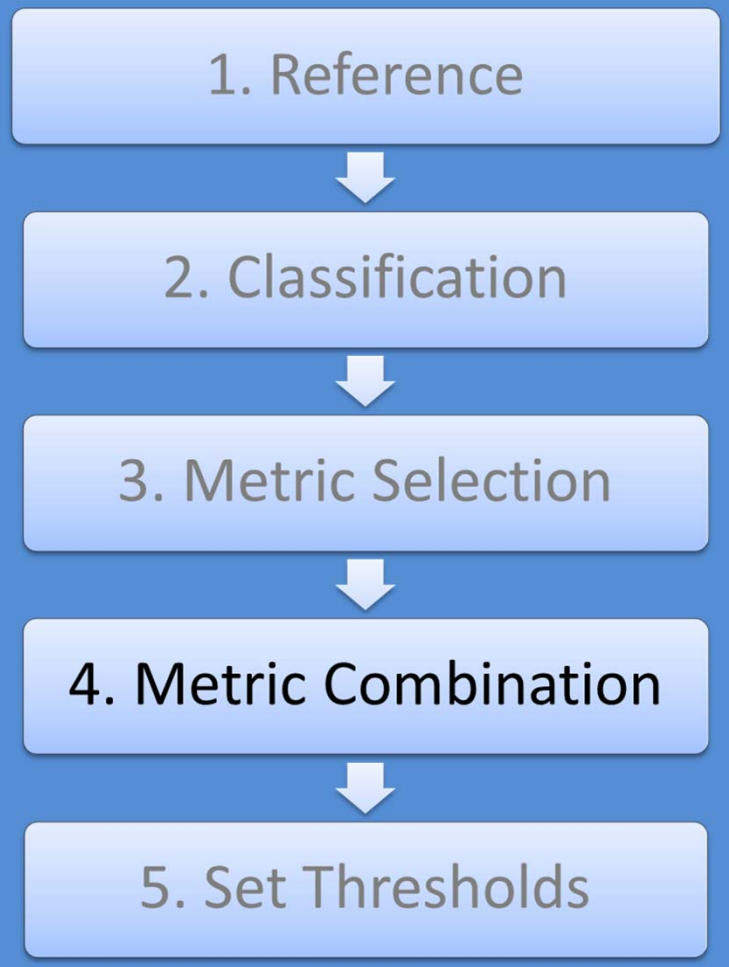
2. Classification

3. Metric Selection

4. Metric Combination

5. Set Thresholds

Combining Metrics



- Multiple metrics should give better confidence in assessments
- Represent diverse types of information (multiple metric categories)
- Select metrics that are not redundant with other metrics in the index

Indices

Indicators	Streams	Rivers
Macroinvertebrates	SMI2	RMI2
Fish	SFI2	RFI2
Habitat	SHI2	

1. Reference

2. Classification

3. Metric Selection

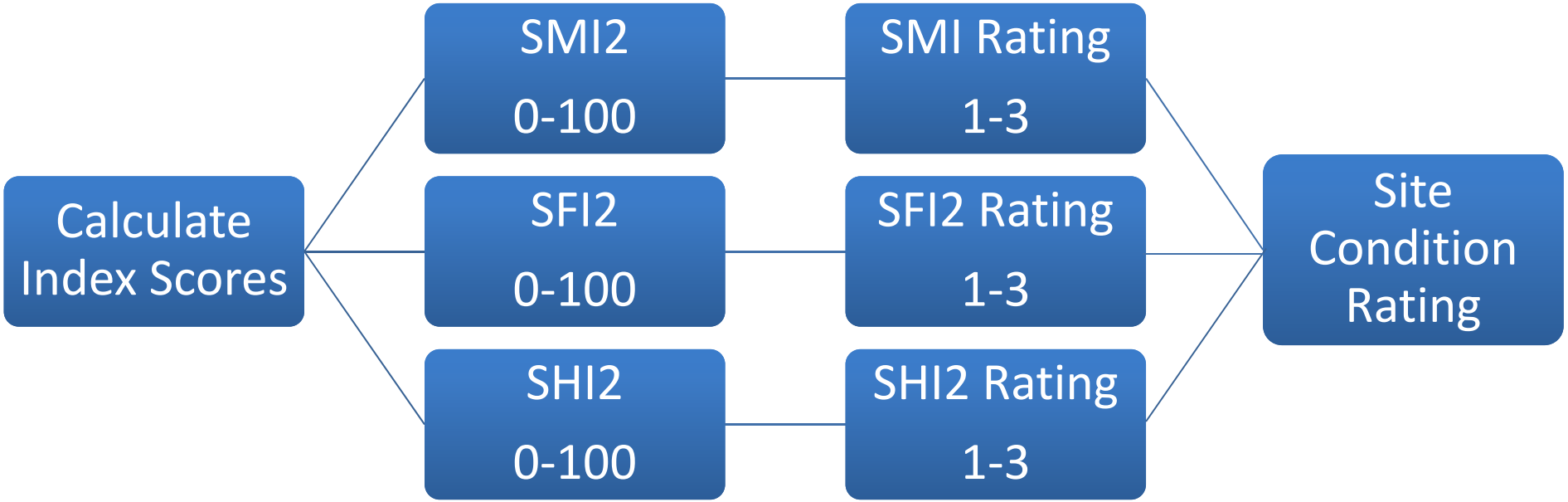
4. Metric Combination

5. Set Thresholds

When do we consider a waterbody impaired?

- Each Index scored 0-100
- Each assigned an index rating (1-3) based on how compares to reference condition *within site class*
- Average index ratings
- Site Condition Rating ≥ 2 indicates full support, < 2 indicates impaired

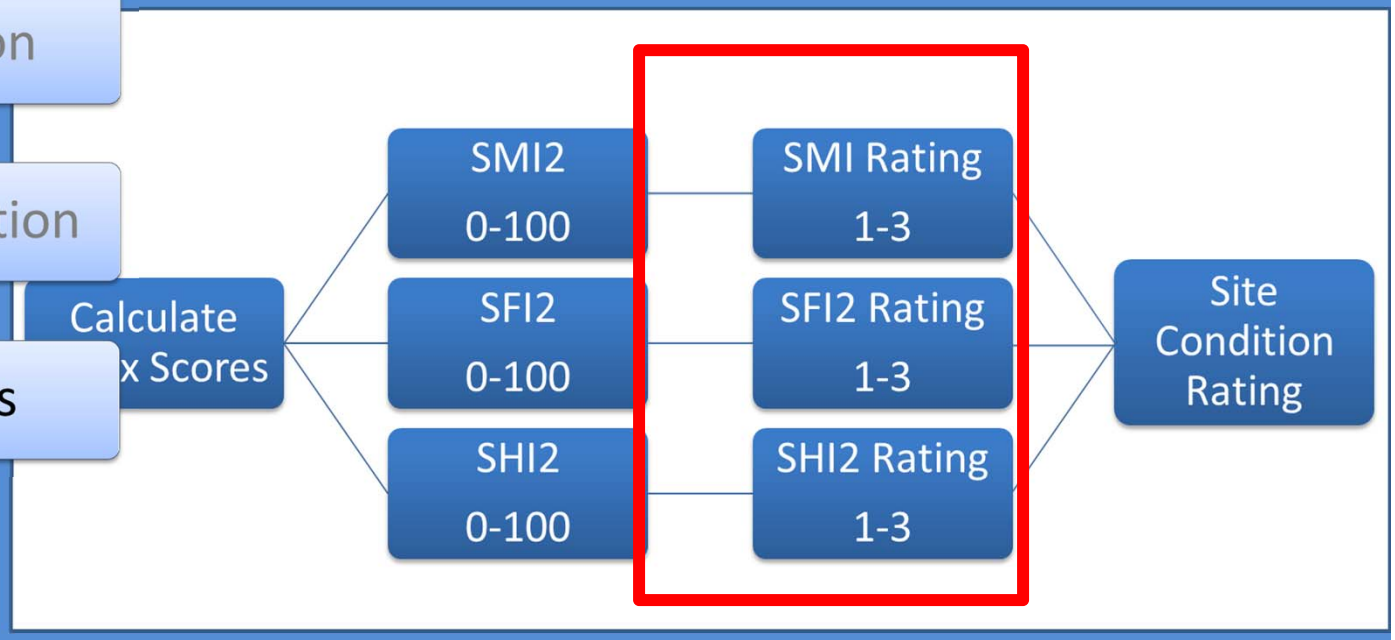
When do we consider a waterbody impaired?



Index Rating

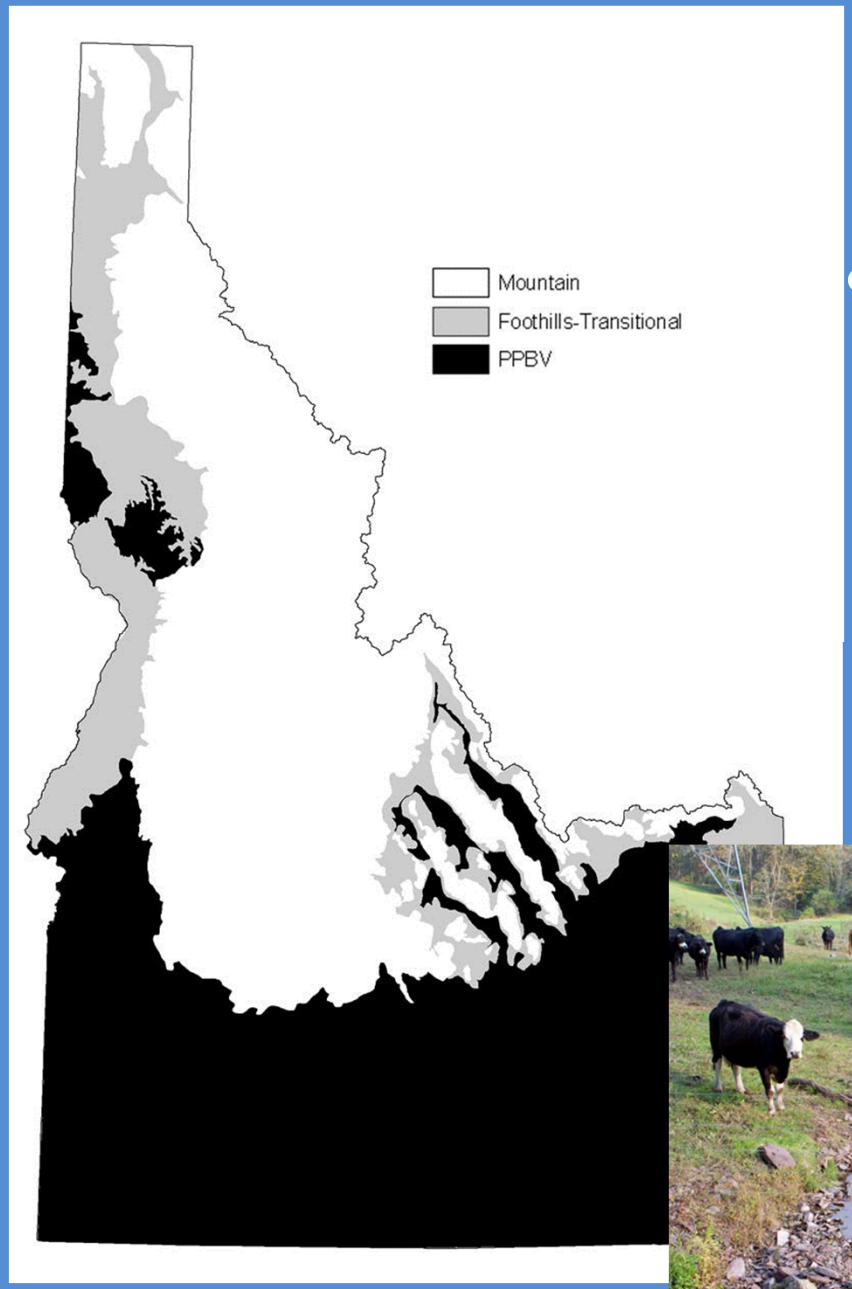
1. Reference
2. Classification
3. Metric Selection
4. Metric Combination
5. Set Thresholds

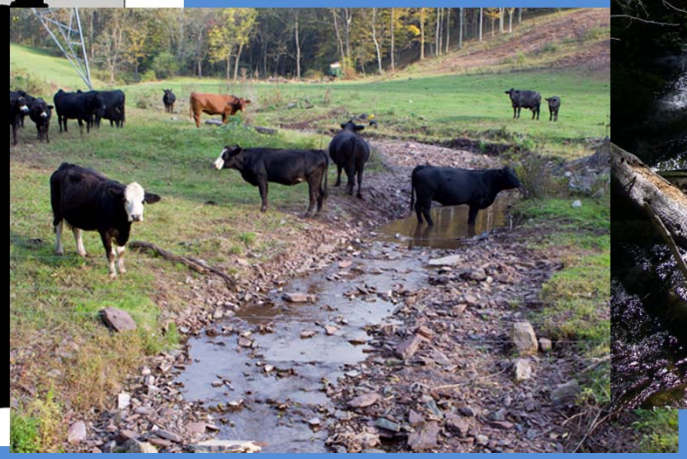
- Where do we set the threshold for assigning index rating of 1,2, or 3?

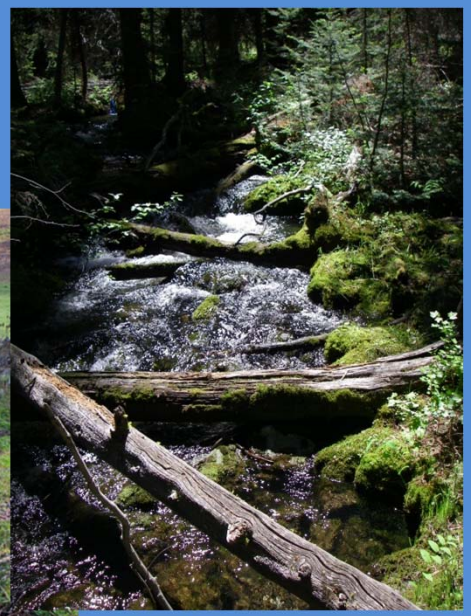


Index Rating: Considerations

- Range of disturbance among site classes
  - Mountains vs. PPBV







Index Ratings

- Evaluated different thresholds based on "% Correct Assessments"

Index Rating	Streams		Rivers
	Mtn/FH	PPBV	
3	>50th %ile	>50th %ile	>50th %ile
2	10th-50th %ile	25th-50th %ile	10th-50th %ile
1	<10th %ile	<25th %ile	<10th %ile

% Correct Assessments

Streams			
	Mountain	Foothill	PPBV
Reference	88	87	77
Stress	76	79	88

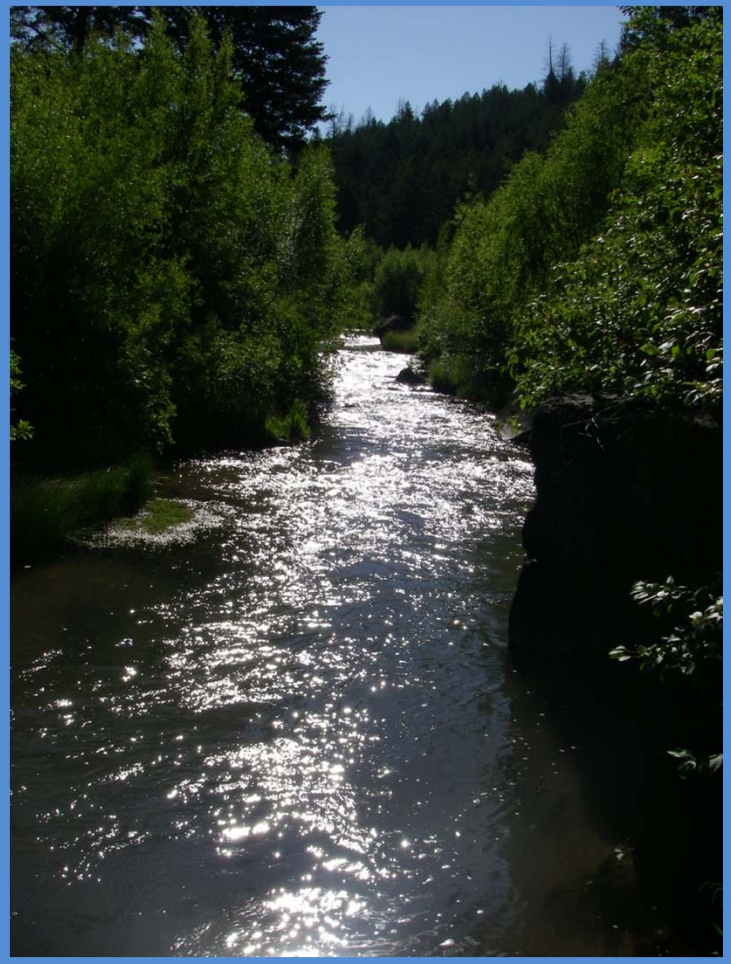
Rivers		
	Mountain	Non-Mountain
Reference	87	80
Stress	92	81

Why different for PPBV?

- Reflection of confidence in reference condition

Streams			
	Mountain	Foothill	PPBV
Reference	88	87	77
Stress	76	79	88

- In Mountains and Foothills, pretty sure reference is FS, less confident in PPBV



Assessment Example

Grimes Creek

Location

Region
BOI

County
Boise

Latitude
43.75978084

Longitude
-115.97903739

Location (relative to landmark)

200 M UPSTREAM OF CLEAR CREEK

Status

Stream Condition Factors
Sampled

Map Legend

Site Condition:

- Sampled
- Dry
- Other Condition

Steps in the Assessment Process

1. Water Body Assessment Guidance Overview
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Identify Water Body Type

Water Body Size: River or Stream

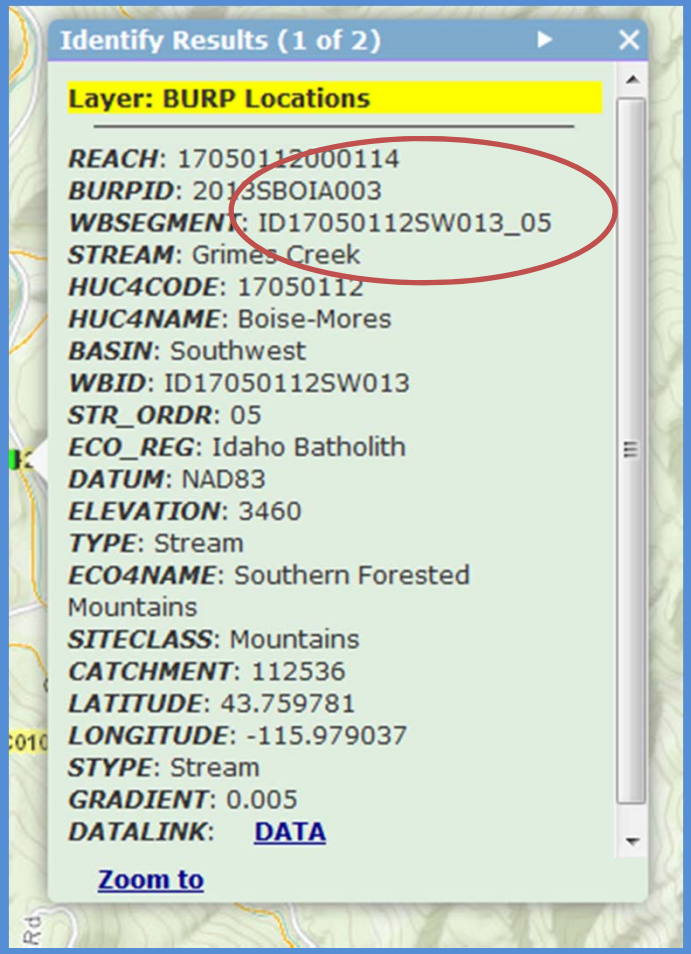
✓ >5th Order

Average Width <15m

Average Depth <0.4m

Assess as Stream

Assessment Unit



- Assessment Unit = ID17050112SW013_05
- WBID = ID17050112SW013

WB Type and AU	Uses to Assess	Support Status
Stream		
AU: ID17050112SW013_05		

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Determine Beneficial Uses to Be Assessed

Table 2. Idaho beneficial uses of water for Clean Water Act purposes (from IDAPA 58.01.02.100).

Beneficial Use Category	Subcategory	Water Quality Standards Abbreviation
Aquatic Life		
	Cold water	COLD
	Salmonid spawning[a]	SS
	Seasonal cold water	SC
	Warm water	WARM
	Modified	MOD
Recreation		
	Primary contact	PCR
	Secondary contact	SCR
Water Supply		
	Domestic	DWS
	Agricultural[b]	—
	Industrial[b]	—
Wildlife Habitats[b]	—	—
Aesthetics[b]	—	—

[a] Although SS is a separate subcategory of aquatic life use, it is treated as a subcategory of COLD.
[b] These uses are designated for all Idaho water bodies.

Designated Uses

- What designated uses apply to this water body unit (WBID)?
  - Refer to WQS to identify designated uses for aquatic life and recreation

    *Agricultural and Industrial Water Supply, Wildlife Habitat and Aesthetics are designated for all Idaho Waters

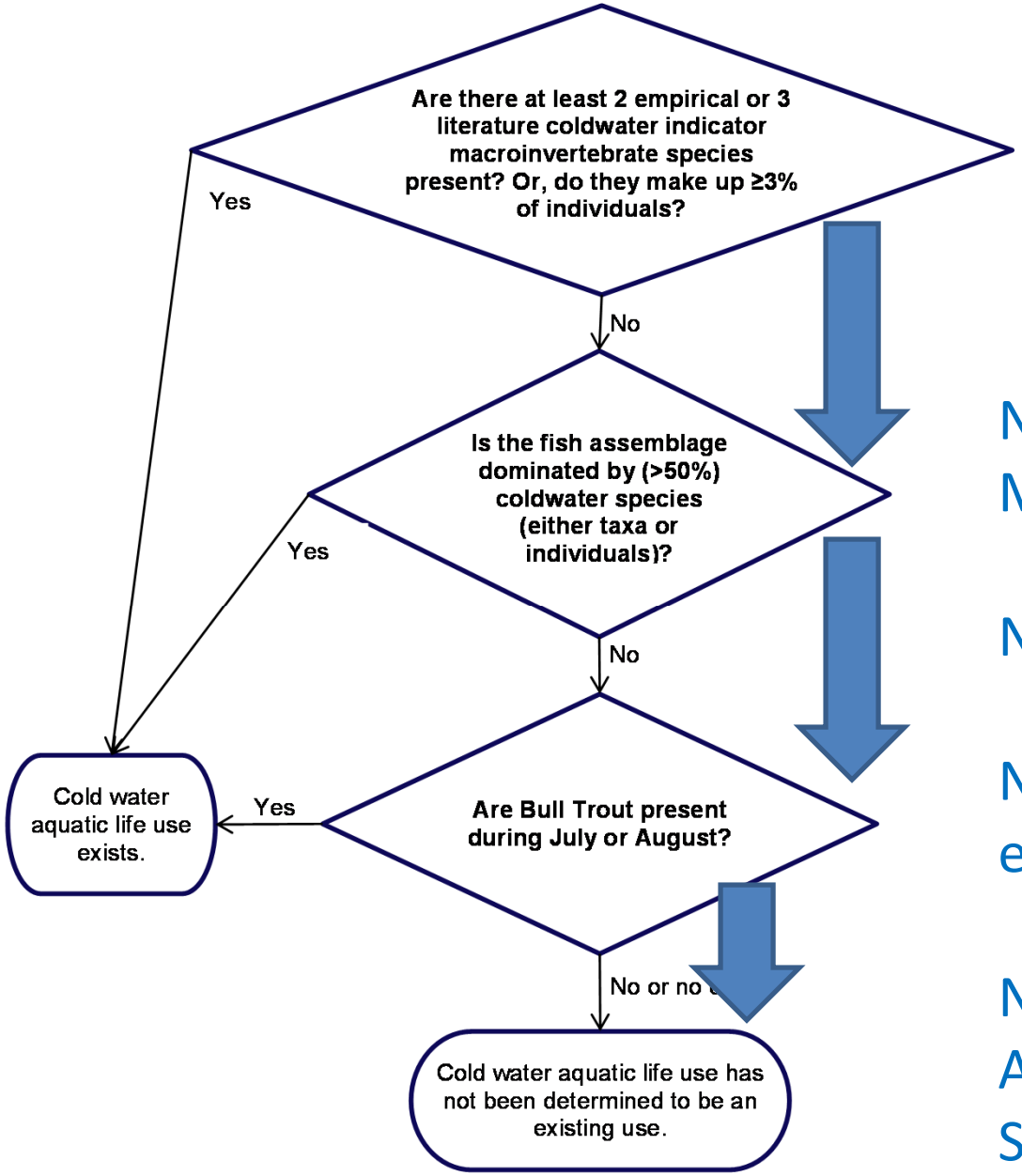
10. Boise-Mores Subbasin. The Boise-Mores Subbasin, HUC 17050112, is comprised of seventeen (17) water body units.

Unit	Waters	Aquatic Life	Recreation	Other
SW-1	Lucky Peak Reservoir (Boise River)	COLD SS	PCR	DWS
SW-2	Arrowrock Reservoir (Boise River)	COLD SS	PCR	DWS
SW-3	Grouse Creek - source to Arrowrock Reservoir			
SW-4	Boise River - confluence of North and Middle Fork Boise Rivers to Arrowrock Reservoir	COLD SS	PCR	DWS
SW-5	Sheep Creek - source to mouth			
SW-6	Brown Creek - source to mouth			
SW-7	Cottonwood Creek - source to Arrowrock Reservoir			
SW-8	Deer Creek - source to Lucky Peak Reservoir			
SW-9	Mores Creek - source to Lucky Peak Reservoir	COLD SS	PCR	DWS
SW-10	Smith Creek - source to mouth			
SW-11	Thorn Creek - source to mouth			
~~SW-12~~	~~Elk Creek - source to mouth~~			
SW-13	Grimes Creek - source to mouth			
SW-14	Granite Creek - source to mouth	COLD	PCR	
SW-15	Macks Creek - source to mouth	COLD SS	PCR	
SW-16	Daggett Creek - source to mouth			
SW-17	Robie Creek - source to Lucky Peak Reservoir	COLD SS	PCR	

Designated Uses

- No Aquatic Life or Recreation uses are designated for this WBID
- Agricultural and Industrial Water Supply, Wildlife Habitat and Aesthetics are designated

Existing Uses: Aquatic Life



No Coldwater Indicator Macroinvertebrates

No Coldwater Fish Species

No Juvenile Salmonids or evidence of spawning

No evidence Cold Water Aquatic Life, Salmonid Spawning are existing uses

Existing Uses, cont'd

- No evidence that Domestic Water Supply is an existing use

Presumed Use Protection

- *Undesignated waters shall be protected for… cold water aquatic life and primary or secondary contact recreation…*

Beneficial Uses to Be Assessed

- Designated:
  - Agricultural and Industrial Water Supply
  - Wildlife Habitat, Aesthetics
- Existing:
  - Insufficient information
- Presumed:
  - Coldwater Aquatic Life, Secondary Contact Recreation

WB Type and AU	Uses to Assess	Support Status
Stream	Aquatic Life Cold Water: Presumed	
AU: ID17050112SW013_05	Recreation SCR: Presumed	
	Water Supply Agricultural: Designated Industrial: Designated	
	Wildlife Habitats	
	Aesthetics	

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Assemble Available Data

- Internal data: BURP site

  2013SBOIA003

  E. coli

- No external data to evaluate

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Evaluate data to determine exceedances

- No water quality data (nutrients, toxics, pH, etc.) to evaluate
- *E. coli* sample results:
  - 63.5 CFU/100 mL

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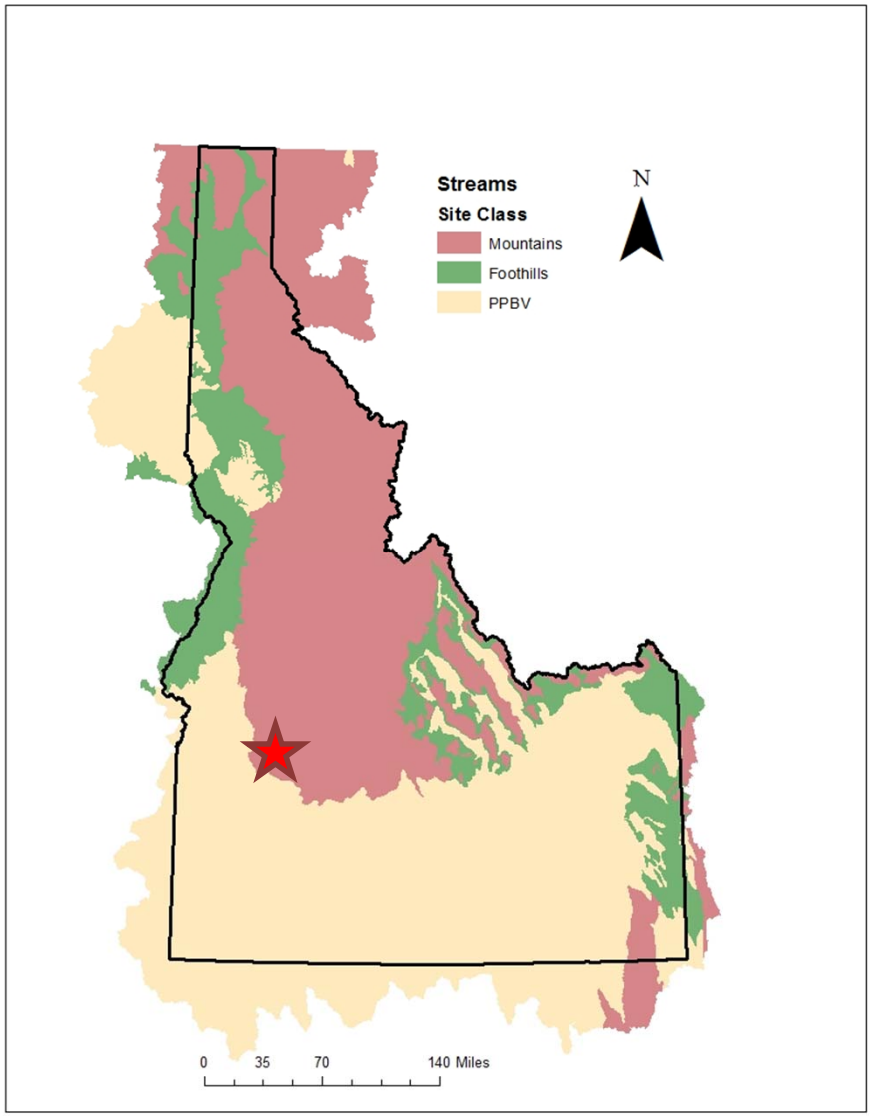
Determine Aquatic Life Use Support Status

- Identify site class:

  Mountains



Determine Aquatic Life Use Support

Index	Index Score
SMI2	49
SFI2	76
SHI2	56

- Compare Index Scores to Reference Condition, Assign Condition Rating

	Description	SMI2	SFI2	SHI2
3	Above median of reference condition	>69	>87	>77
2	From 10th quantile to median of reference condition	51.5–69	72–87	63.7–77
1	Lower than the 10th quantile	<51.5	<72	<63.7

Index	Index Score	Index Rating
SMI2	49	1
SFI2	76	2
SHI2	56	1

Site Condition Rating:
1.33 = Not Full Support

WB Type and AU	Uses to Assess	Support Status
Stream	Aquatic Life Cold Water: Presumed	Not Full Support
AU: ID17050112SW013_05	Recreation SCR: Presumed	
	Water Supply Agricultural: Designated Industrial: Designated	
	Wildlife Habitats	
	Aesthetics	

Steps in the Assessment Process

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Determine Recreation Support Status

- Single sample does not exceed secondary contact recreation threshold of 406 CFU/100 mL
- AU is Full Support for Contact Recreation

WB Type and AU	Uses to Assess	Support Status
Stream	Aquatic Life Cold Water — Presumed	Not Full Support
AU: ID17050112SW013_05	Recreation SCR — Presumed	Full Support
	Water Supply Agricultural — Designated Industrial — Designated	
	Wildlife Habitats	
	Aesthetics	

Steps in the Assessment Process

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Agricultural and Industrial

- *Absent evidence to the contrary, DEQ will presume agricultural and industrial water supply uses are fully supported.*

WB Type and AU	Uses to Assess		Support Status
Stream	Aquatic Life		Not Full Support
	Cold Water	Presumed	
AU: ID17050112SW013_05	Recreation		
	SCR	Presumed	Full Support
	Water Supply		
	Agricultural	Designated	Full Support
	Industrial	Designated	Full Support
	Wildlife Habitats		
	Aesthetics		

Steps in the Assessment Process

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4. Monitoring Design and Data Policy
5. Water Quality Criteria Evaluation and Exceedance Policy
6. Aquatic Life Use Support Determination
7. Contact Recreation Use Support Determination
8. Water Supply Use Determination
9. Wildlife Habitat and Aesthetics Use Support Determination

Wildlife Habitat and Aesthetics

- *Absent evidence to the contrary, DEQ policy is to presume these uses are fully supported*

WB Type and AU	Uses to Assess		Support Status
Stream	Aquatic Life		Not Full Support
	Cold Water	Presumed	
AU: ID17050112SW013_05	Recreation		
	SCR	Presumed	Full Support
	Water Supply		
	Agricultural	Designated	Full Support
	Industrial	Designated	Full Support
	Wildlife Habitats		Full Support
	Aesthetics		Full Support

Assessor Discretion

- Example assumes limited data
- Often, assessors have additional information
- Weight-of-evidence approach

Summary

- Revision of WBAG
  - Two major components:
    - Assessment Framework- science
    - WBAG document- application of science
- Reflects advancement in science of bioassessment
- Uses additional data

Next Steps

Date	
1/12/ 2016	BAG Consultation Begins
2/12/2016	BAG consultation period ends
2/29/2016	Draft released for public review
4/29/2016	Public comment period ends
5/27/2016	Final draft complete and approved

Next Steps

BAG comments due:

February 12, 2016

Submit to:

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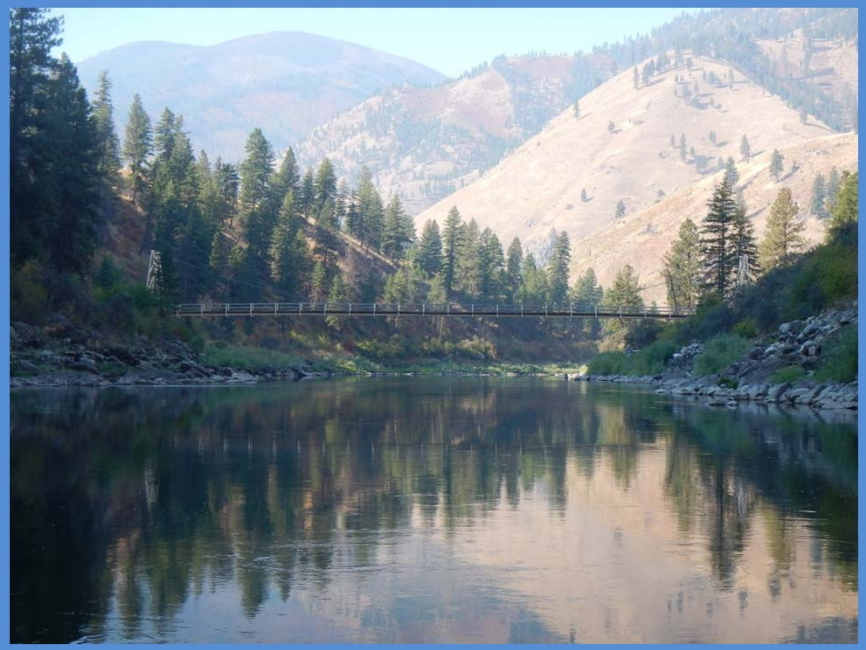
Questions?