

Okanogan County Shoreline Inventory Characterization

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July 16, 2008

ENTRIX
ENVIRONMENTAL CONSULTANTS



Presentation

What did we propose to do?

What did we actually do?

What did we find?

What do we do next?

E N T R I X

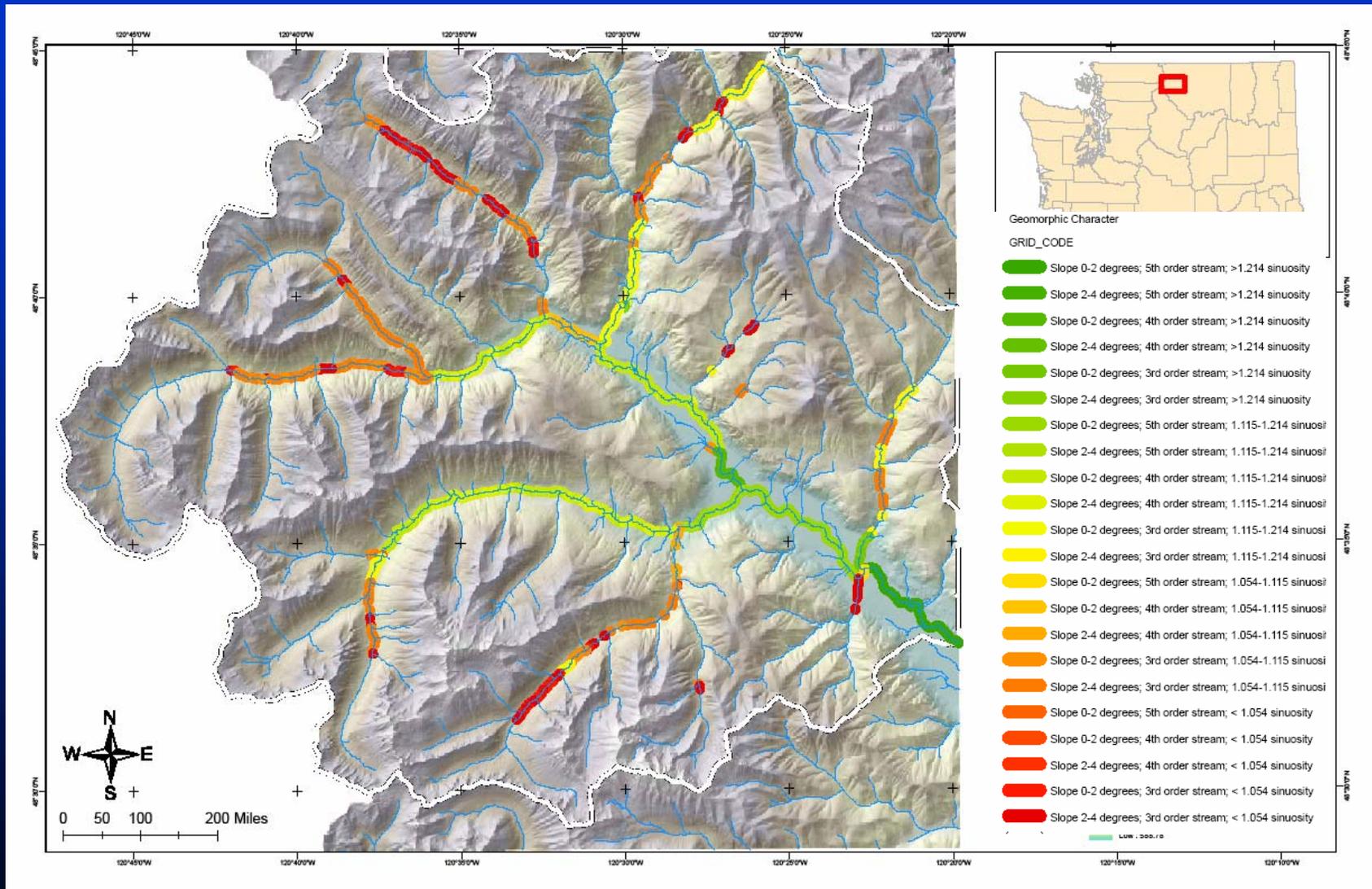
Environmental Consultants

Scientific Foundation

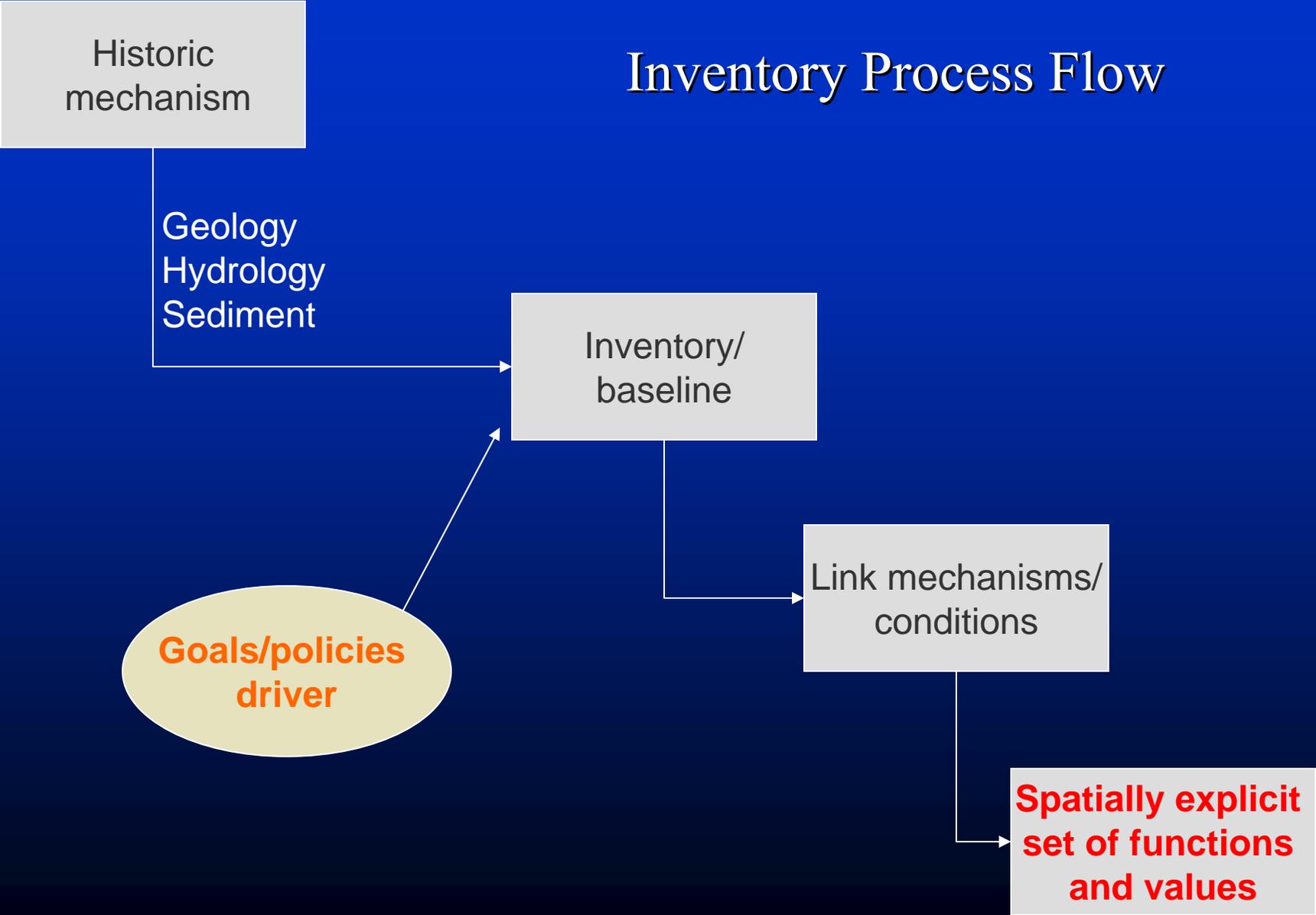
- Analysis units (AUs) based on geomorphic classification
 - Processes that govern function
 - Slope classes
 - Stream order
 - Sinuosity
- For lakes and impoundments
 - Bathymetry and vegetation signature



Geomorphic Character



Inventory Process Flow



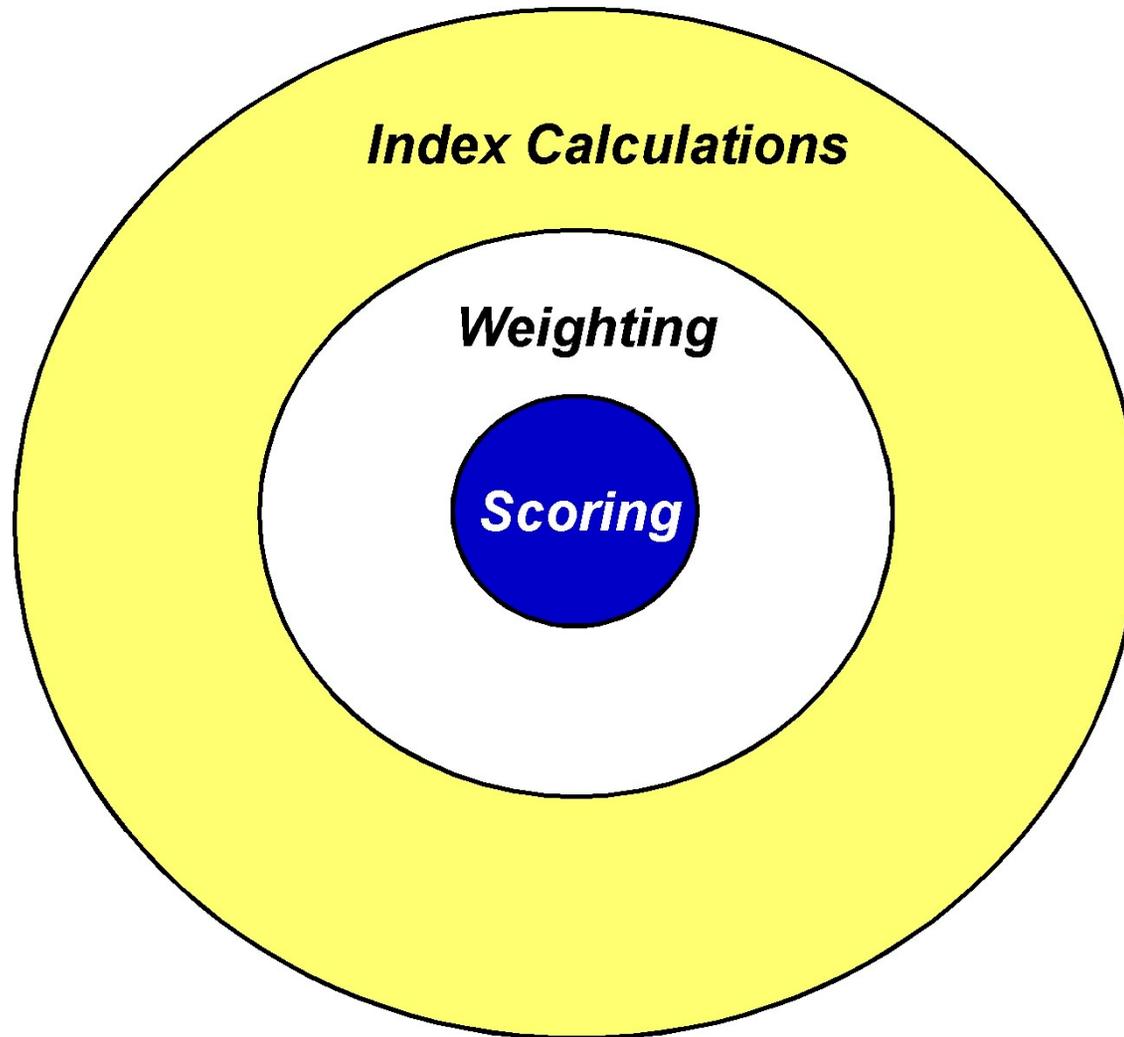
Analysis Unit Resources

- Aquatic Species
- Riparian Species
- Upland Species
- Salmon spawning/rearing habitat
- ESA critical habitat
- Wetlands
- Riparian vegetation
- Potential Channel Migration Zones

Analysis Unit Stressors

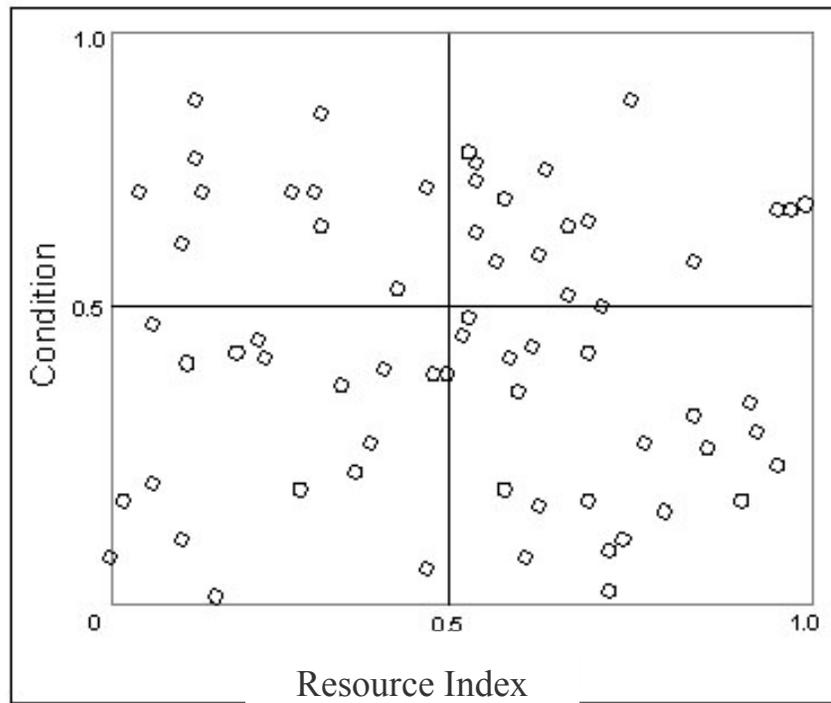
- Agricultural development-intensive
- Agricultural development dispersed
- Residential development
- Industrial development-light
- Industrial development-heavy
- Geologically hazardous areas
- Bank hardening
- Levees
- Bridges
- Overwater structures
- Culverts
- Boat ramps
- Facilities – Permitting
- Mines
- Rail
- Roads
- Water quality class

Analysis Unit Analysis – Generating data from data

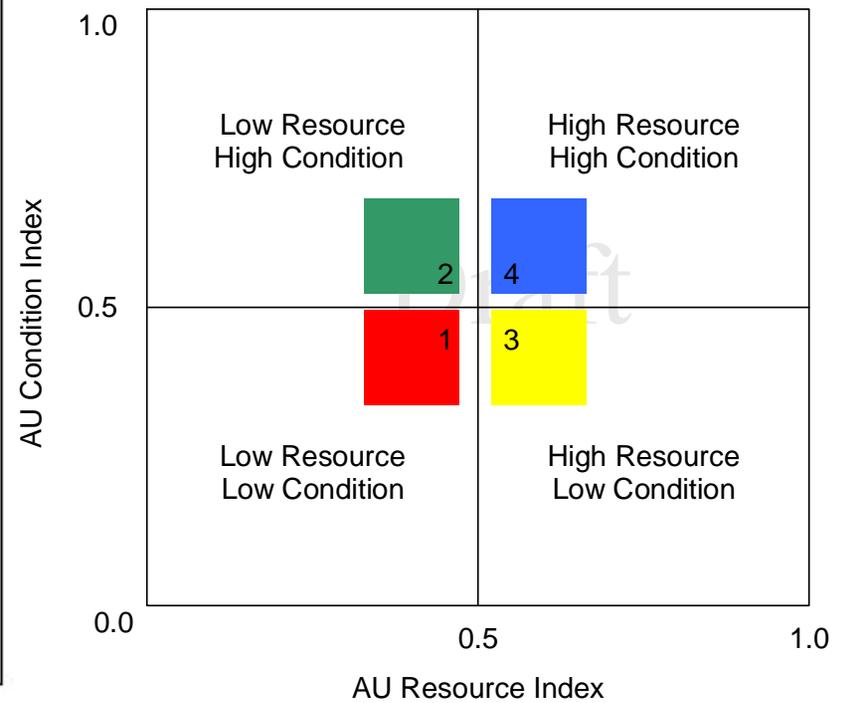


Concepts

Theoretical spread for large analysis area



Interpreting the spread...



Levels of Analysis

- 1. AU scale:** conditions vs. resources
- 2. Watershed scale:** compares AUs by watershed
- 3. Site Scale:** condition/resource screened by economic and demographic constraints
- 4. County scale:** cumulative effects

Accumulate effects of designations and restoration



Scoring Example: Stressors

AU Stressor	Scoring		Weight Low, medium, high
Water quality class	.00	No 303(d)-listed waterbodies	75
	.50	50% or less of AU listed 303(d)-listed	
	.75	AU confluence with a 303(d)-listed	
	1.0	Entire unit 303(d)-listed	
Bridges	.00	No bridges in unit	25
	.25	1 bridge in unit	
	.50	Up to 3 bridges in unit	
	.75	4 or more bridges in unit	
Overwater structures	.00	No overwater structures in unit	25
	.25	Up to 2 overwater structures in unit	
	.50	Up to 15 overwater structures in unit	
	.75	16 or more overwater structures in unit	
Mines	.00	No mines	25
	1.0	1 or more mines in unit	
Culverts	.00	No culverts in unit	50
	1.0	1 or more culverts in unit	

Remember, AUs with high stress have low condition indexes, and vice versa.

Weighting Examples

AU Stressor	Weight Rationale
Bank hardening	limits riparian function; disconnect floodplain; limits lateral movement of channel
Levees	limits riparian function; disconnect floodplain; limits lateral movement of channel
Water quality	Generally summer temp conditions; limits species lifestage use
Permitted facilities	Permitted facilities have known or suspected environmental impact as defined by the Washington Department of Ecology
Agricultural development- Dispersed	Low to moderate effect on riparian vegetation; Extensive effect; generally dealing with grazing and forestry

Conceptual to Spatial Scoring

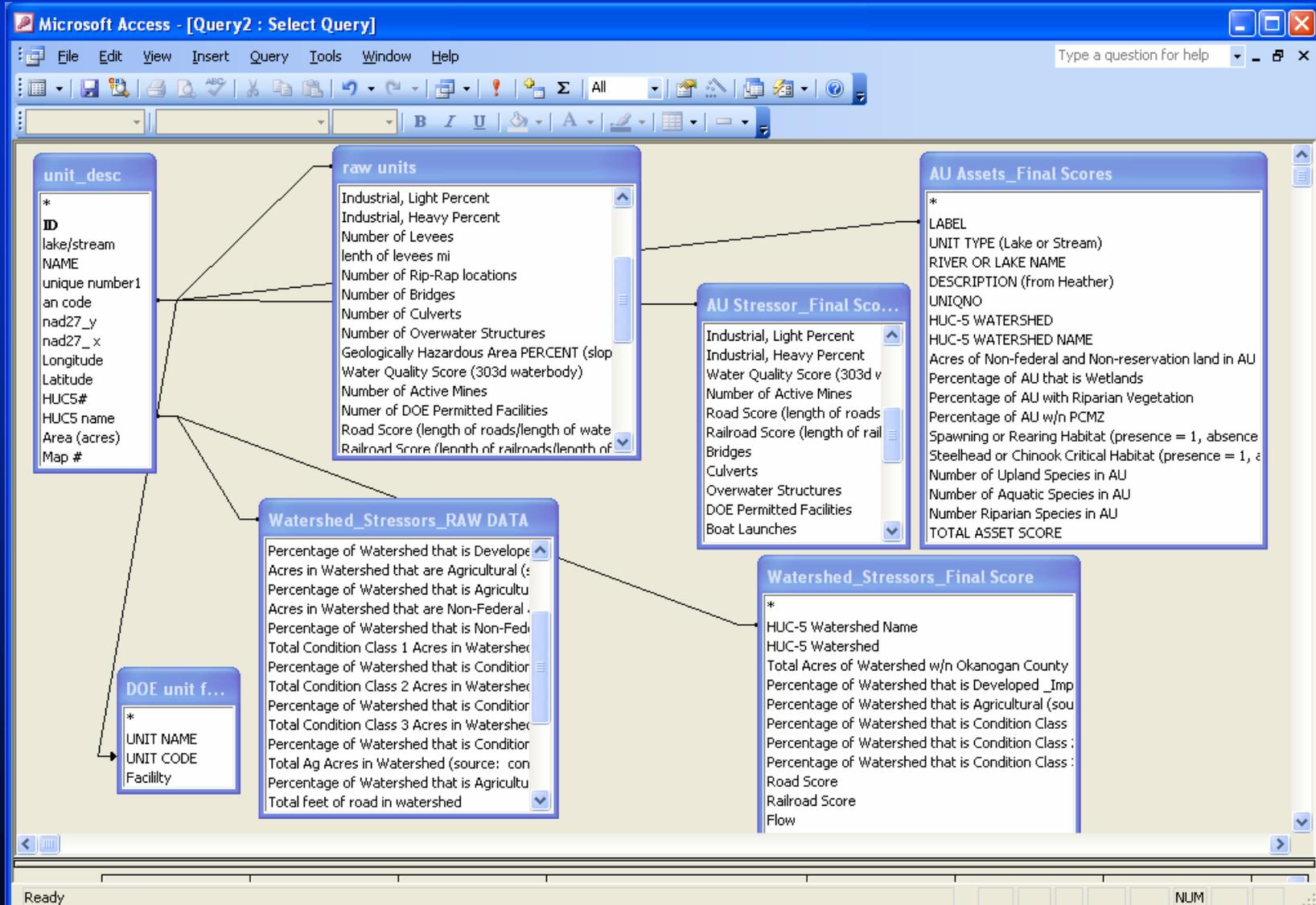
Stressor	Categorical weighting	Fractional weighting
Disperse Ag Percent	25	0.0286
Residential Percent	75	0.0857
Industrial, Light %	50	0.0571
Industrial, Heavy %	75	0.0857
Bridges	25	0.0286
Culverts	50	0.0571
Overwater Structures	25	0.0286
Boat Launches	25	0.0286
levees	75	0.0857
Riprap	75	0.0857
Geo- Hazardous Area	50	0.0571

Fractional weights add up to 1.0

Functional Index

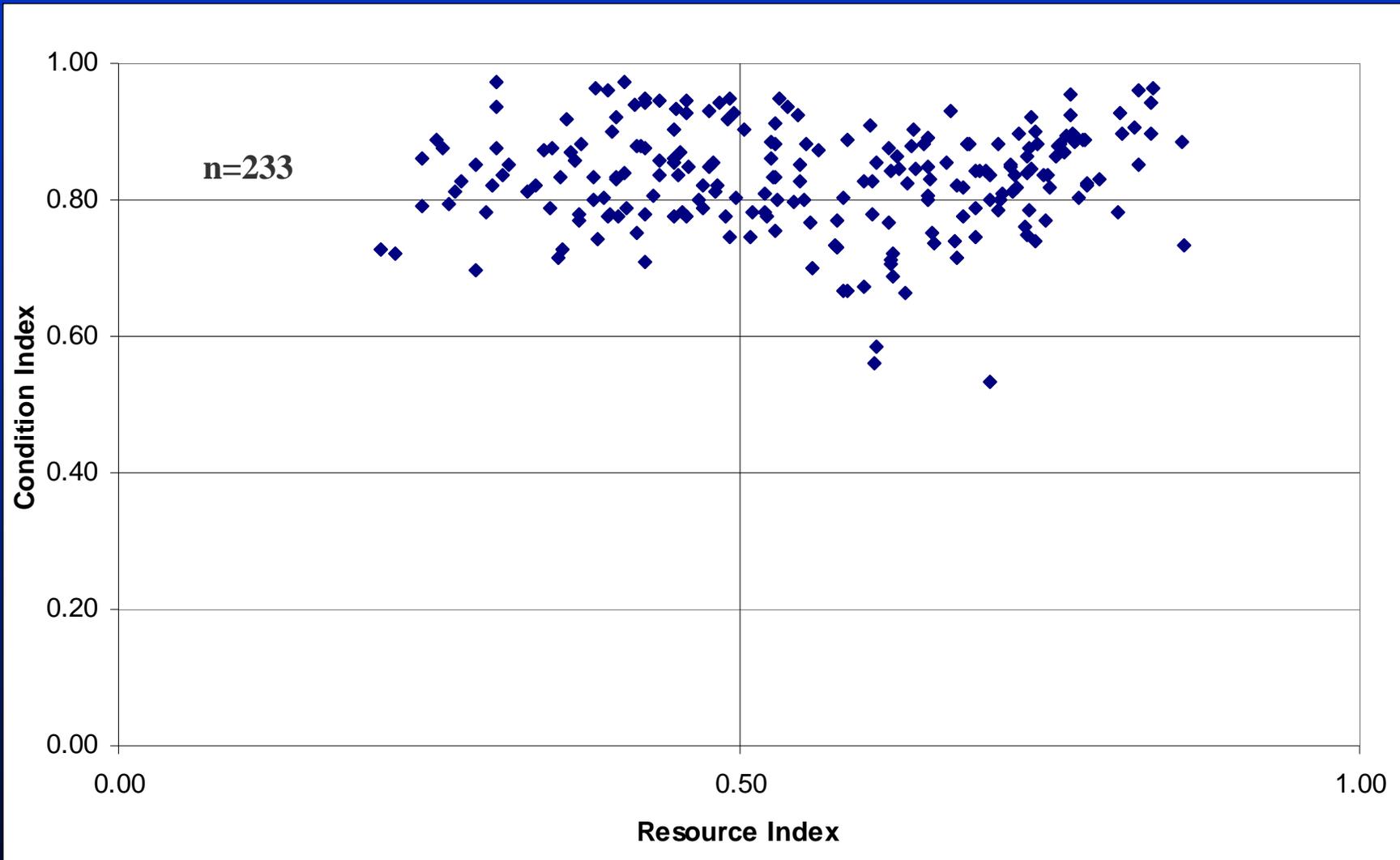
- \sum Weighted Stressor Scores = Inverse of function
- \sum Weighted Resource Scores = function
- Both of the AU scores are needed to tell the story

Database Structure

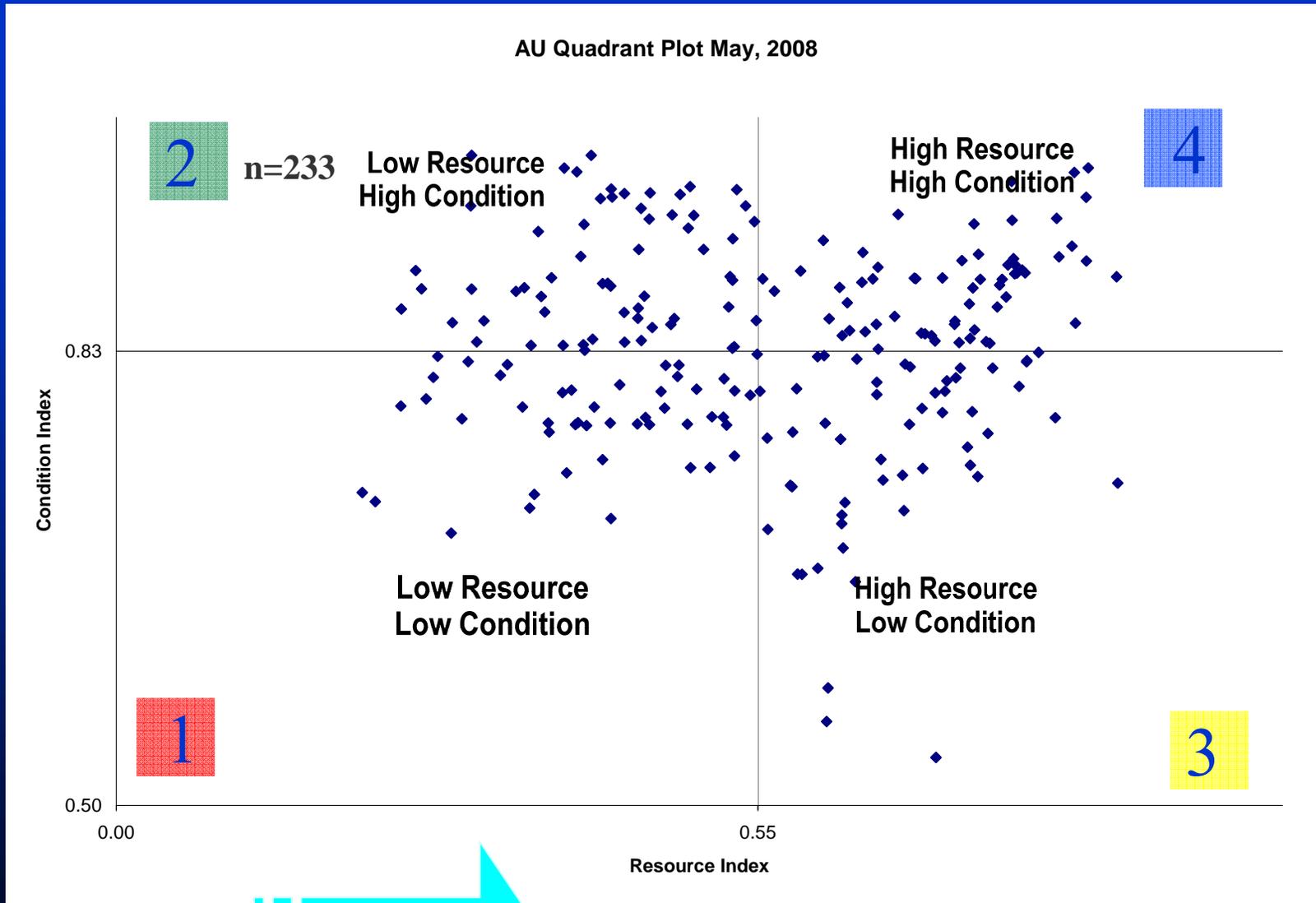


Results

Graphic Fit - Raw



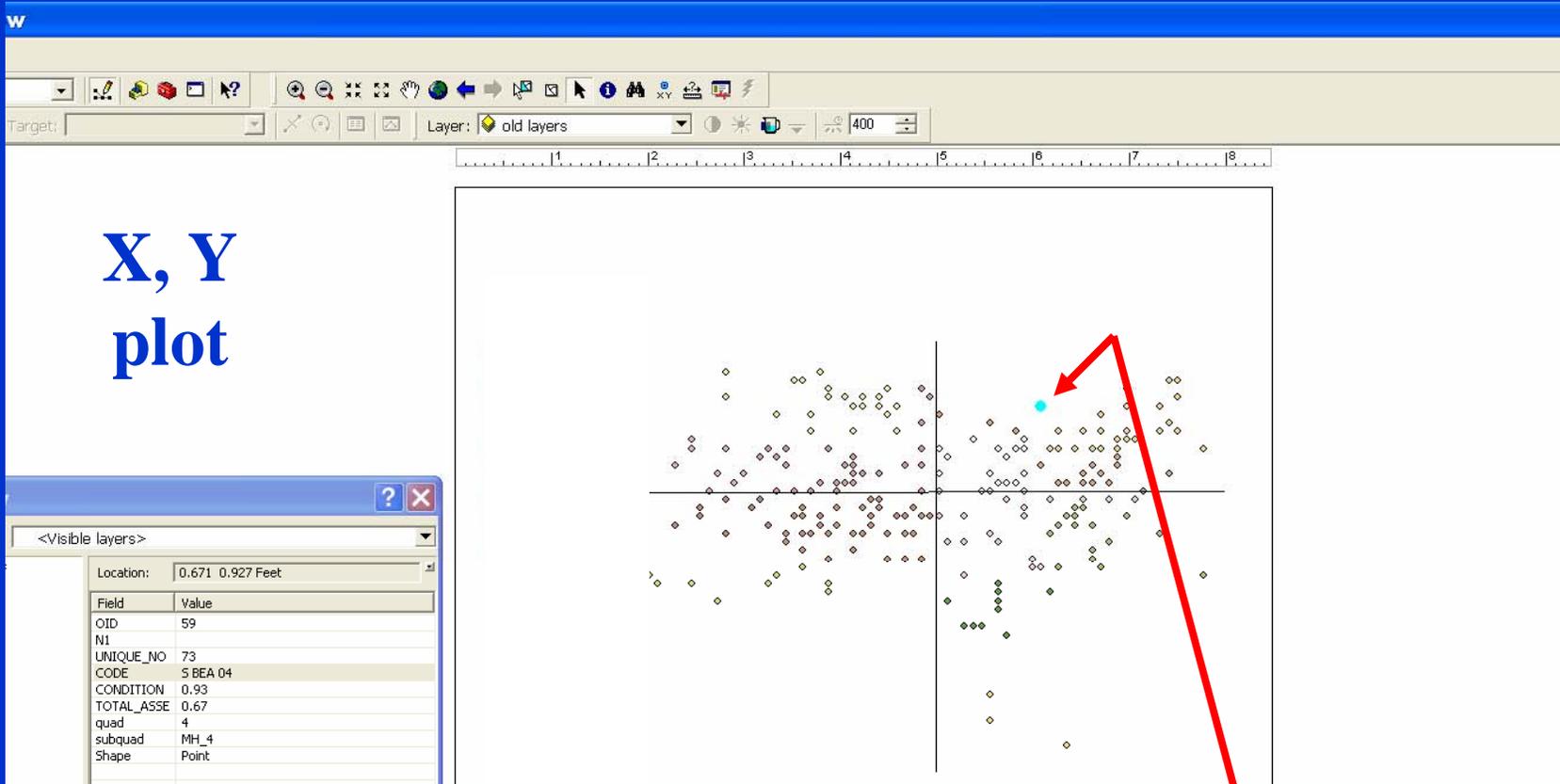
Median - Rescale



[Click to view results](#)

ArcMap GIS

**X, Y
plot**

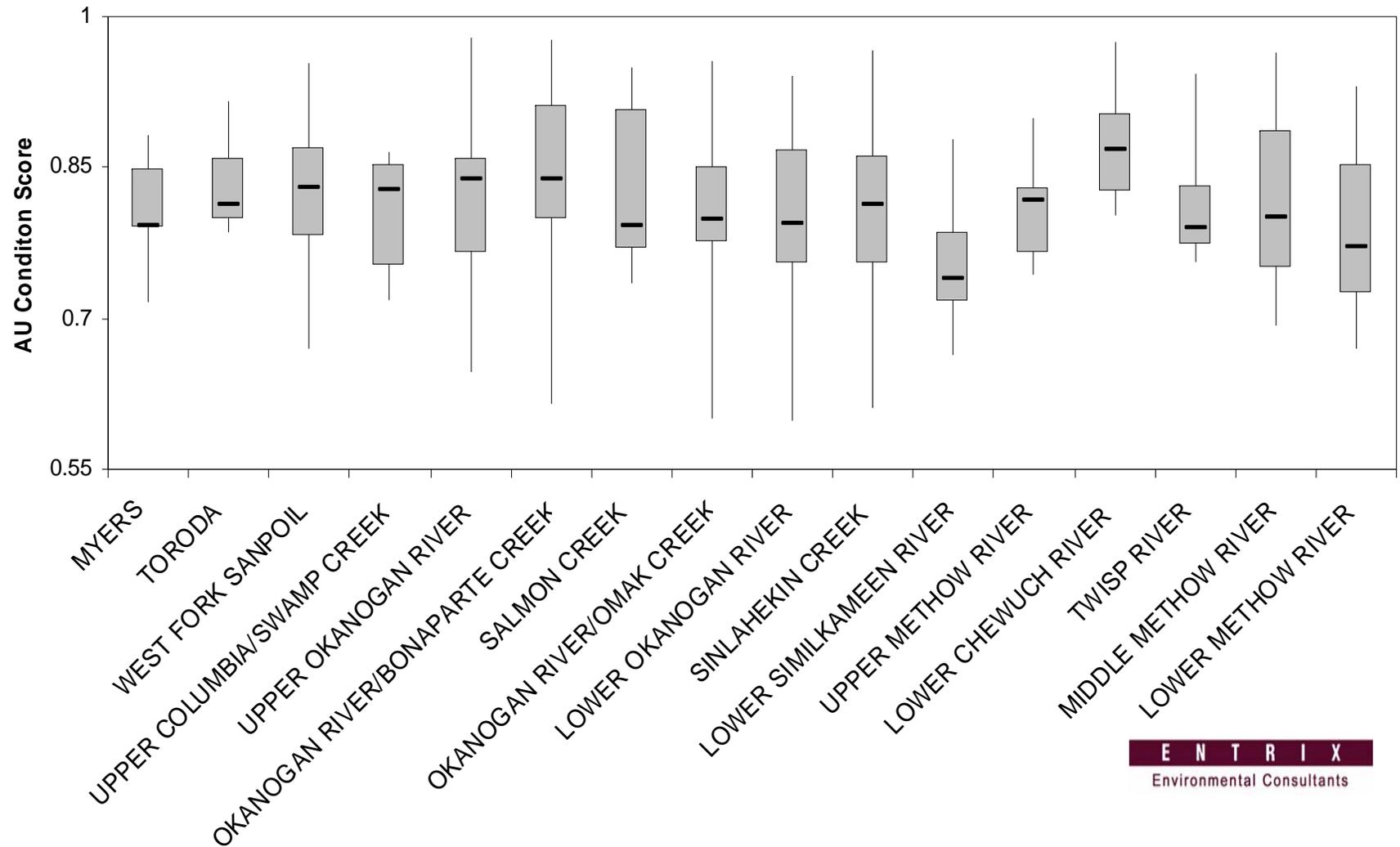


Field	Value
OID	59
NI	
UNIQUE_NO	73
CODE	S BEA 04
CONDITION	0.93
TOTAL_ASSE	0.67
quad	4
subquad	MH_4
Shape	Point

Attributes of AU QUADRANT 050508

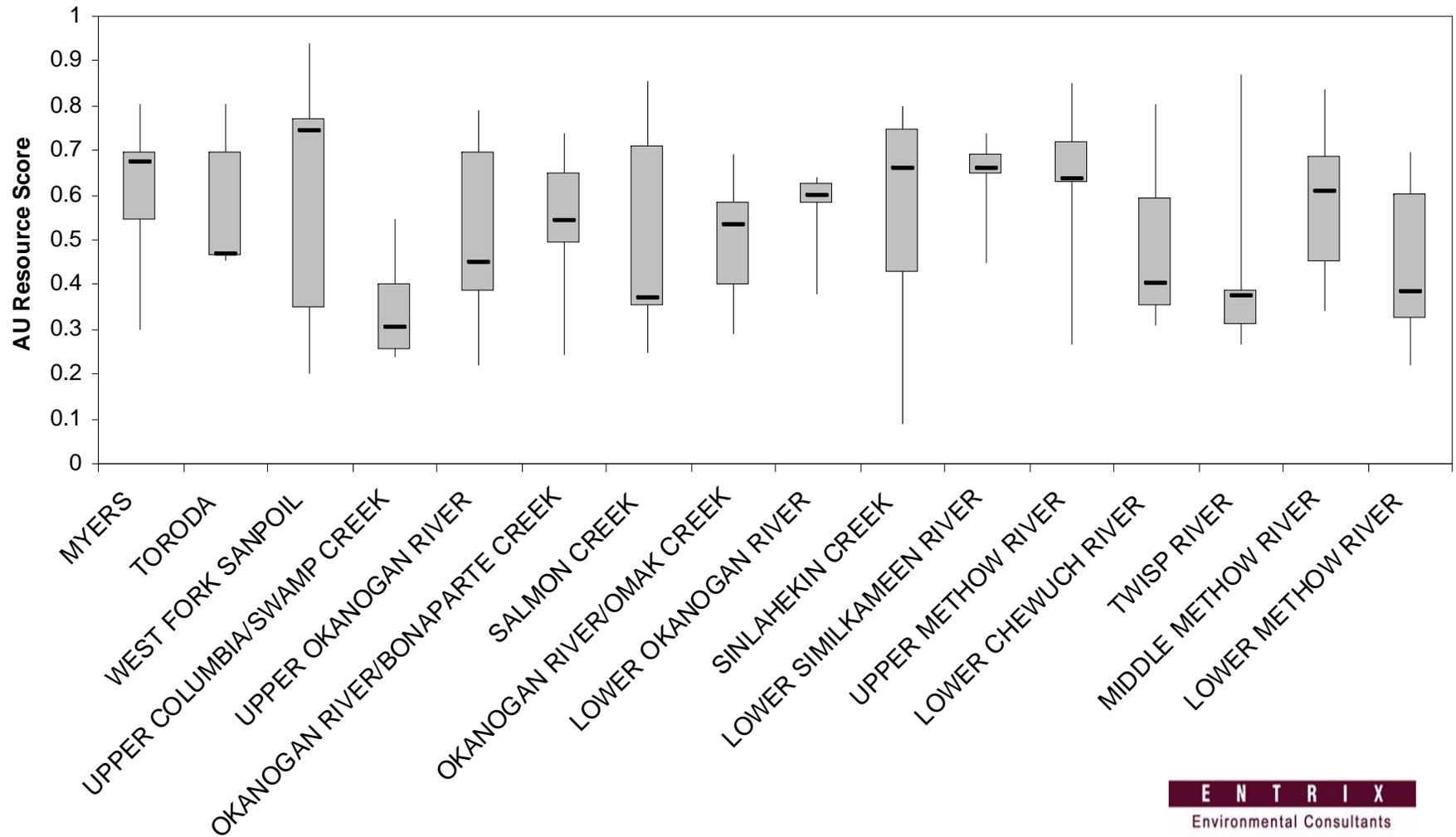
Analysis	AnalysisUnit	AnalysisU	Book4_Features.OID	AnalysisUnits	Book4_F	AnalysisUnits	Analysis	Book4_Featu	Book4_Featu	Book4_Features.COI	Book4_Features.TO	Bo
123.6958	-119.450941	48.941464	193	21381.38173		7830985.00976	S SIM 02	207	S SIM 02	0.7	0.56	
388.0072	-120.165071	48.369652	213	61095.839783		18800994.6968	S TVM 01	227	S TVM 01	0.78	0.81	
48.08891	-120.372553	48.35289	218	10952.050699		2966988.21687	S TVM 06	232	S TVM 06	0.82	0.78	
90.16029	-120.247517	48.487891	219	20488.140347		3939551.04247	S WOL 00	233	S WOL 00	0.79	0.73	
66.49857	-119.644933	48.905637	225	24338.343107		25646499.1081	L PAL 04	43	L PAL 04	0.9	0.69	
86.98295	-119.330402	48.602333	47	18047.451338		5254719.30465	L TAL 00	58	L TAL 00	0.88	0.55	
32.26925	-119.024952	48.761555	48	7596.311415		3259609.98907	L WAL 00	59	L WAL 00	0.87	0.56	
140.8598	-120.045284	48.374211	57	30053.147421		6135856.80229	S BEA 02	71	S BEA 02	0.88	0.68	
96.04301	-120.045212	48.397914	58	24008.78983		4680801.28616	S BEA 03	72	S BEA 03	0.89	0.65	
63.95595	-120.031027	48.429631	59	15997.866194		3087848.72769	S BEA 04	73	S BEA 04	0.93	0.67	
297.4902	-120.183742	48.506245	70	30829.827364		15435245.1345	S CHE 02	84	S CHE 02	0.91	0.82	
167.9351	-120.185749	48.537388	71	19704.39702		8429465.55492	S CHE 03	85	S CHE 03	0.95	0.77	
15.44037	-120.165748	48.591455	75	14176.754339		3257889.30734	S CHE 07	89	S CHE 07	0.89	0.77	
75.09757	-120.162672	48.604237	76	25805.121988		7287161.1543	S CHE 08	90	S CHE 08	0.96	0.83	

AU Condition Scores by Watershed, Okanogan County, WA



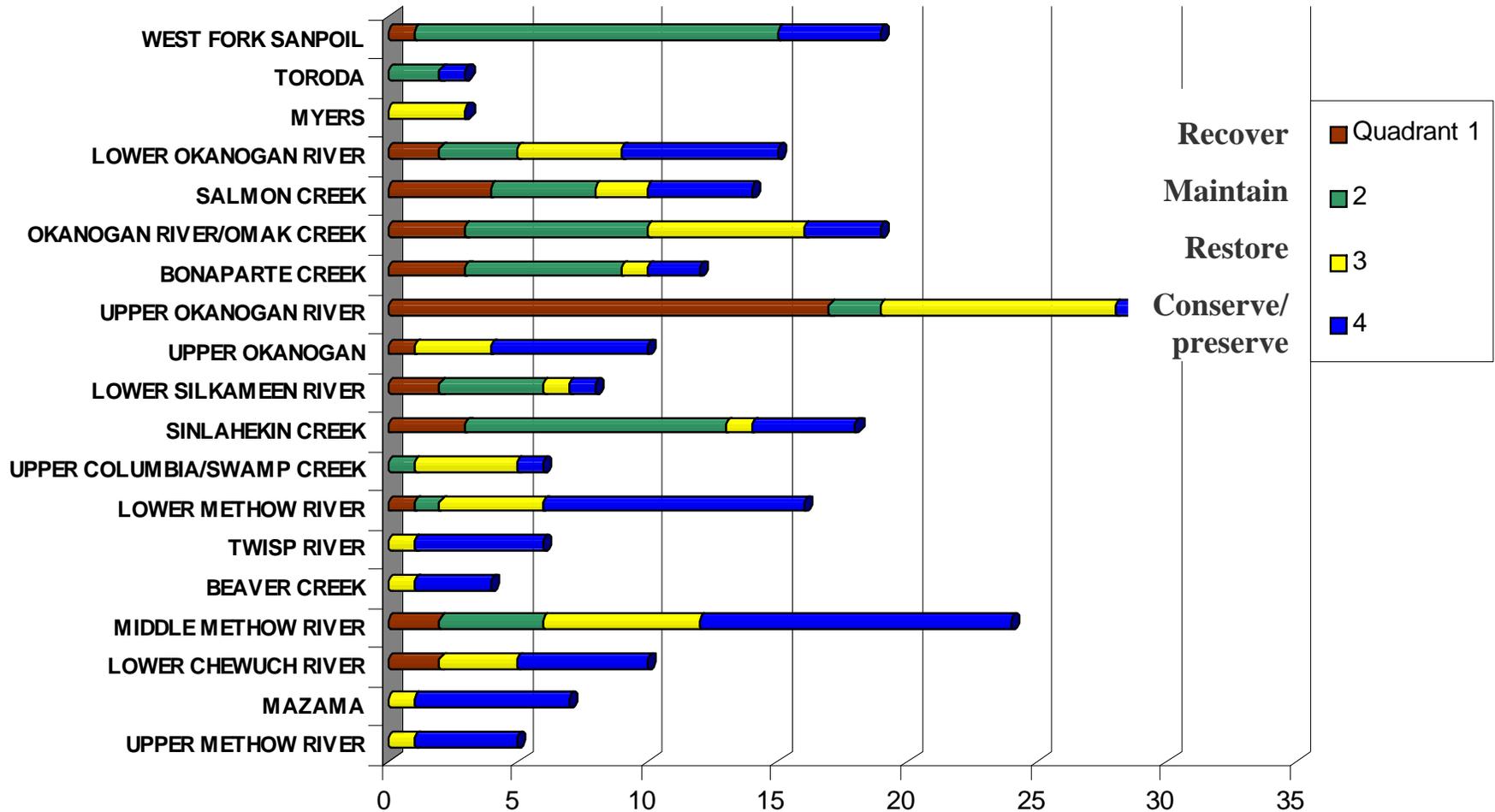
Number of AUs vary per watershed

AU Resource Scores by Watershed, Okanogan County, WA



Number of AUs vary per watershed

Quadrant results: number of AUs in each watershed



Data Catalog

Example

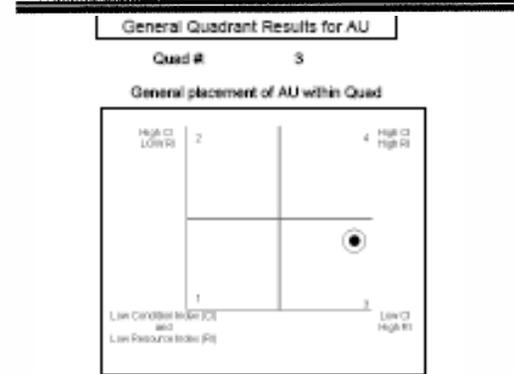
233 Analysis Units

Unique ID: 110
 Analysis Unit Code: S MET 23
 River / Lake Name: METHOW RIVER
 Coordinates Lat, Long: 48.347644 -120.102637
 Area (acres): 227.42
 HUC-10 Watershed: MIDDLE METHOW RIVER



AU Stressor	NORMALIZED, WEIGHTED SCORES	Raw Data	Resources	NORMALIZED, WEIGHTED SCORES	Raw Data
Bank hardening	0	no data	Aquatic Species	0.0438	8 #
Levees	0	no data	Riparian Species	0.0438	4 #
Permitted facilities	0.0086	14	Upland Species	0.01825	9 #
Agricultural development-intensive	0.0203	0.03	Salmon spawning/rearing habitat	0.14599	Yes
Agricultural development-dispersed	0	0.04	Steelhead/ Chinook Critical habitat	0.14599	Yes
Water quality	0	0.50	Wetlands	0	0 %
Residential development	0.0084	0.36	Potential migration zones	0.03185	0.87 %
Industrial development-heavy	0	0.00	Riparian vegetation	0.02503	0.67 %
Industrial development-light	0	0.00	Aggregate Resource index	0.45	
Bridges	0.0115	1.00			
Overwater structures	0.0144	0			
Rail	0.0345	0			
Roads	0.069	2.30			
Culverts	0	0.00			
Geologically hazardous areas	0.0223	0.10			
Boat ramps	0	0			
Mines	0	0			

Aggregate Condition Index 0.81



There are 14 DOE permitted facilities within this unit. The names of any permitted facilities are listed:

AMERIGAS TWISP, Barker Property, Chelan Co PUD No 1 S4-30055P, Hanks Food Center, KINGS TIRE SERVICE, Kevins Collision Repair, LLOYD LOGGING EQUIPMENT YARD, LLOYDS LOGGING EXC SOIL, OKANOGAN COUNTY FIRE DISTRICT 6, OKANOGAN COUNTY PUBLIC WORKS UST 5734, RED SHIRT MILL, TRAIN STATION MINI MART, TWISP STP, WA DOT TWISP

What does it all mean?

- A “significant” amount of shoreline area may be retaining function
- Distinctions between AUs are evident
- We have an objective, multiple-scale basis for planning and assigning environmental designations
 - Real world measurements
 - Independent characterization without political influence

Next Steps

- **Environmental Designation** – In Process
- **Restoration Planning**
 - Results intend to answer these questions:
 - Where are the restoration opportunities?
 - What stressors might be investigated?
 - What restoration actions are already underway?
- **Cumulative Effects**
 - assess the effects of SMA planning on shoreline function with potential future designations

Questions?

