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Habitat	Harvest	Disease & Predation	Regulatory Mechanisms	Other Natural or Human
Channel form	Marine	Disease	NW Forest Plan	Drought
Substrate	Recreational	Predation	Forest Practices	Floods
Roughness	Scientific		Dredge and Fill	Ocean Conditions
Estuaries			Water Quality	Artificial Propagation
Wetlands			Ag Practices	
Riparian Areas			Urban Growth	
Water Quality				
Streamflows				
Passage				
Habitat Elimination				

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Integrated State Agency Monitoring Plan

Oregon Plan Monitoring Team: All State natural resource agencies – WRD, DSL, ODA, ODF, DEQ, ODFW (+ OSU and Federal agencies)

Key Monitoring Objectives

- Identify and assess status and trends of important environmental conditions (factors for decline) and fish populations.
- Evaluate implementation and effectiveness of management actions.
- Help prioritize and evaluate restoration activities.

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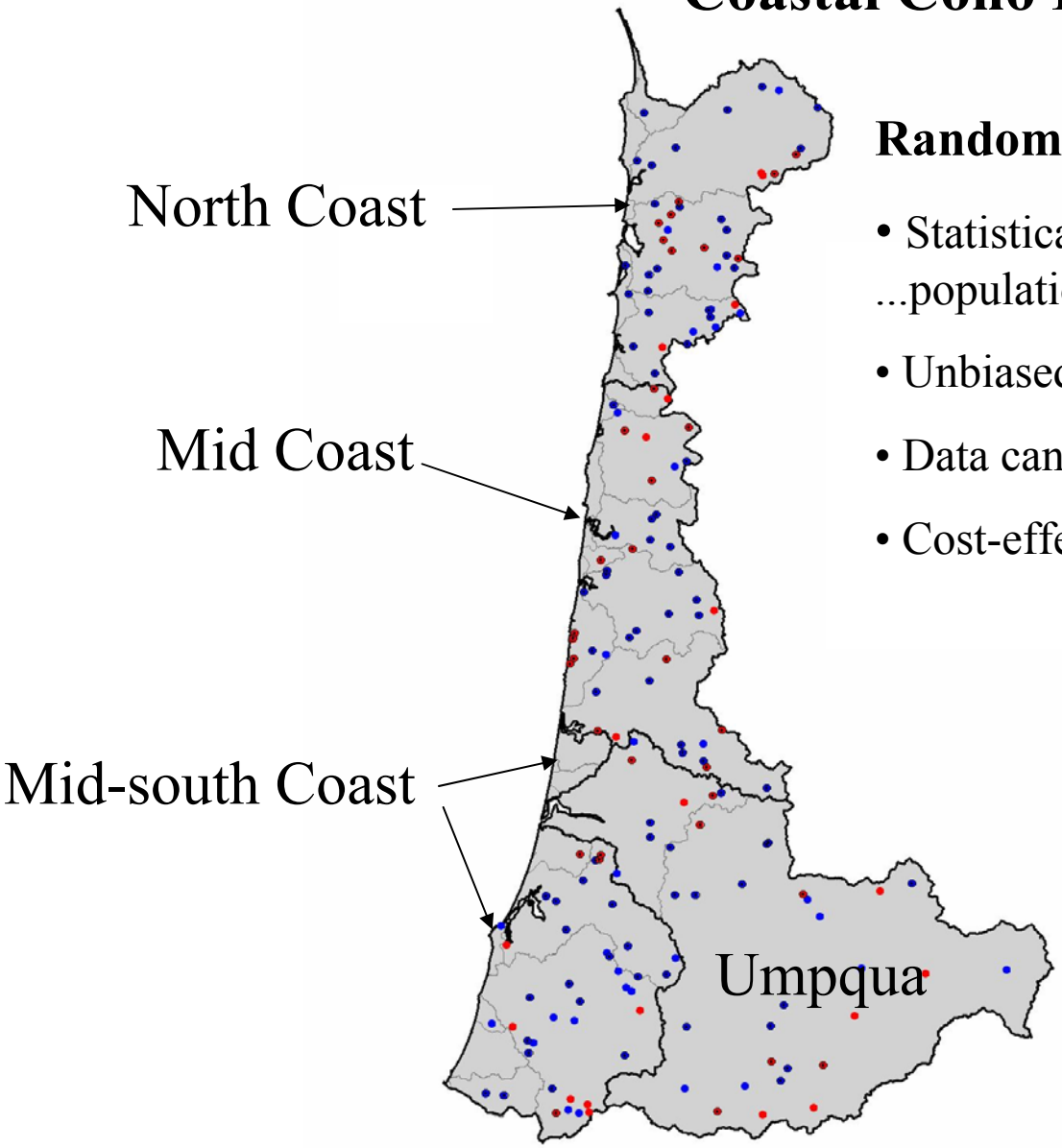
Monitoring Design

Coastal Coho ESU



Random or Probabilistic Design Allows:

- Statistically-based sampling of large ...population of stream miles (>6,000 miles)
- Unbiased and representative sample
- Data can be aggregated from different scales
- Cost-effective

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This Presentation

Report on WQ Factors for Decline

- Status & Trends
- Which factors pose greatest risk to watershed & stream conditions (= Coho)

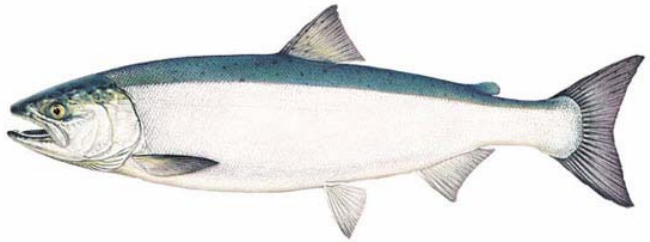
Physical/Chemical Indicators

- Water temperature
- Fine sediment
- Dissolved oxygen (DO)
- pH
- Nutrient

Biological Indicators

- Aquatic Macroinvertebrates
- Fish & Amphibians (Aquatic Vertebrate Assemblage)

} *Integrate overall stream condition (physical & chemical parameters) & are important to Coho survival*



ODFW/ODF Factors for Decline

- Stream Habitat
- Riparian Conditions
- Passage

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MONITORING DATA USED BY DEQ:

- **Ambient River Monitoring –** Fixed sites on large rivers (>4th order streams). Chemical data only.
- **Wadeable Stream Sites** – Randomly selected sites on wadeable streams (1st – 3rd order = >80% of stream miles in ESU). Chemical, physical, and biological data.
- **Reference Sites –** Hand-picked sites that represent streams with no or minimal human disturbances. Chemical, physical and biological data.
  - **Estuary Sites**
  - **Volunteer Monitoring Data**
  - **Other: TMDLs, Permits**

✓ Large amount of data summarized for presentation
✓ Focus is on key points
✓ Lack time for details of sampling & analysis methods
✓ Report will provide details

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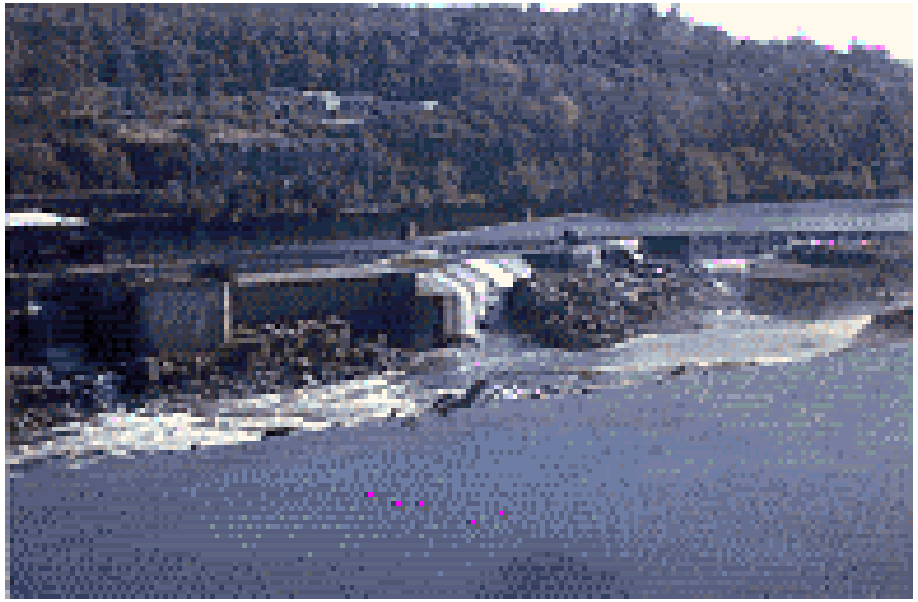
Examples of Stream Orders

1st Order

3rd Order



5th Order

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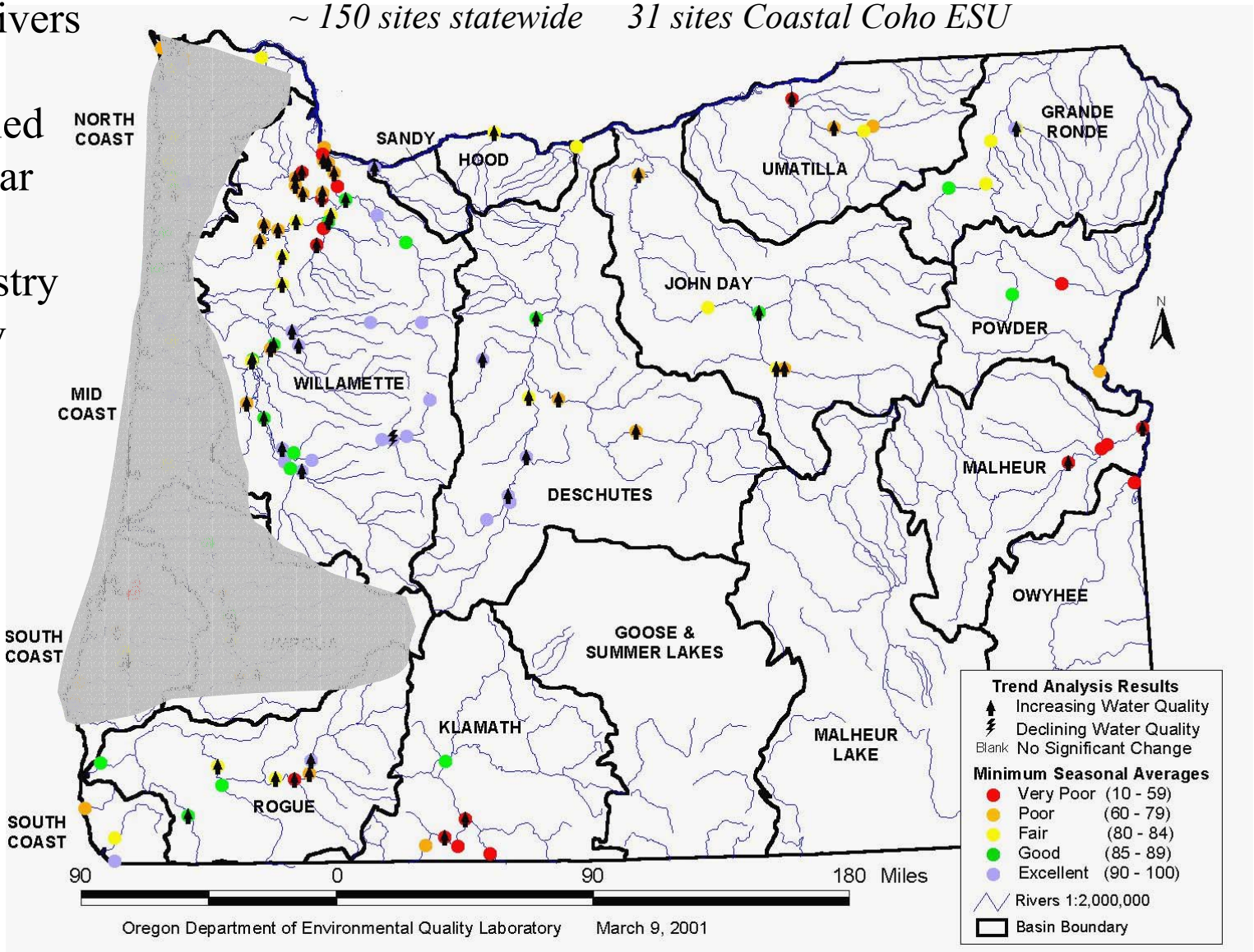
Ambient River Monitoring Sites

Large Rivers

~ 150 sites statewide 31 sites Coastal Coho ESU

Sampled 6x/year

Chemistry only



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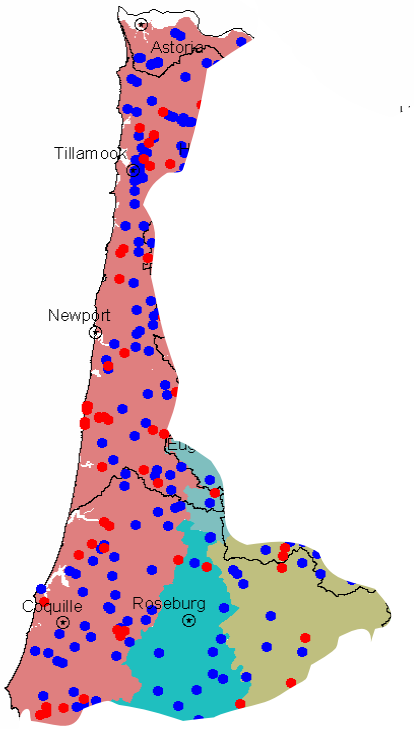
Random and Reference Sites

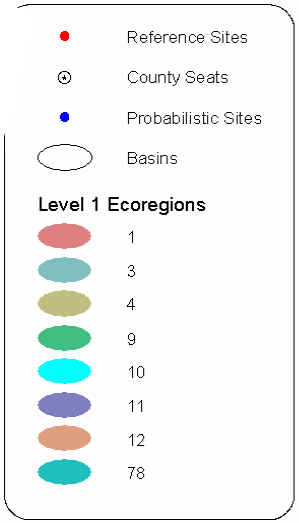
Wadeable Streams--Sampled 1x, summer low flow--Chemistry, Habitat, & Biology

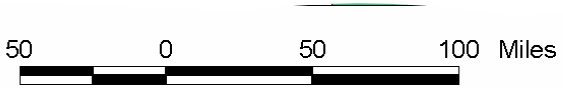


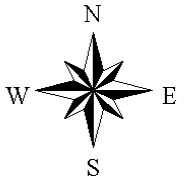
Within Coastal Coho ESU:

~200 Random sites

~60 Reference sites







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Evaluating Conditions – How do we set benchmarks to determine status of stream conditions?

1. Water quality standards (e.g. 8.0 mg/l DO)
2. Reference sites

   - Sites in watersheds free from or with minimal human disturbance (GIS & streamside information used to identify and select reference sites)
   - Establishes an attainable benchmark of stream condition for comparison of ecological indicators in specific regions or basins.

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DEQ Random and Reference Site Comparisons

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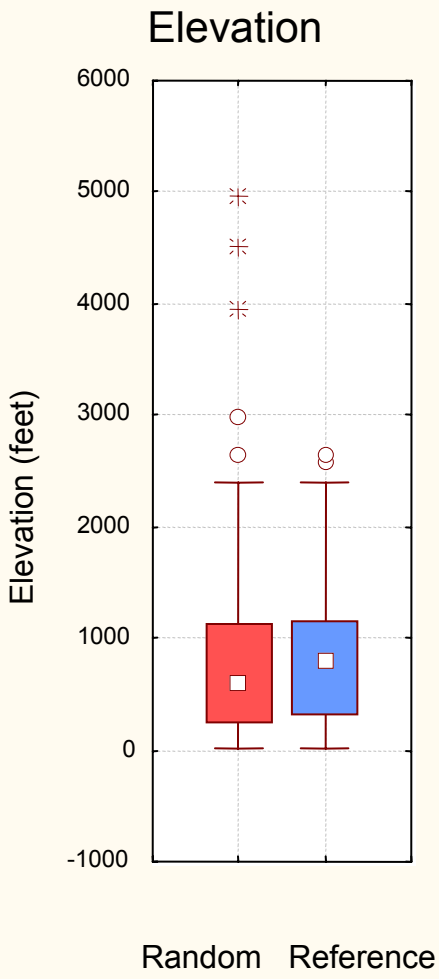

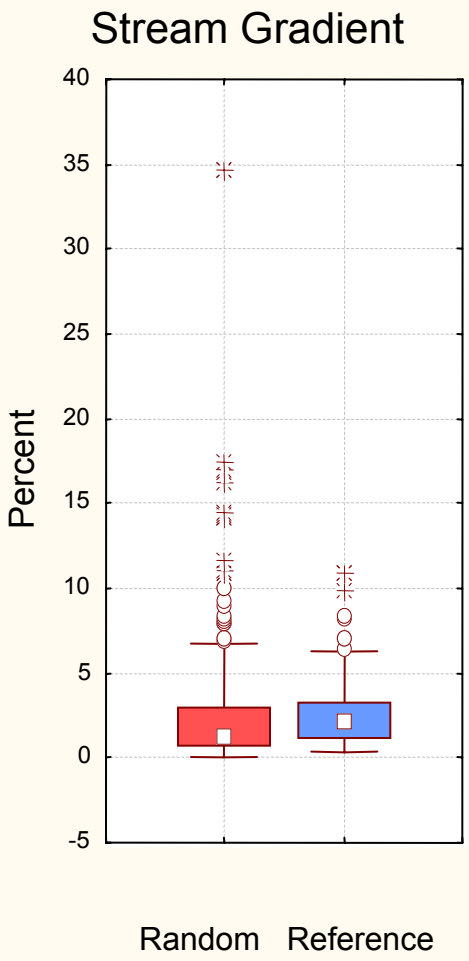

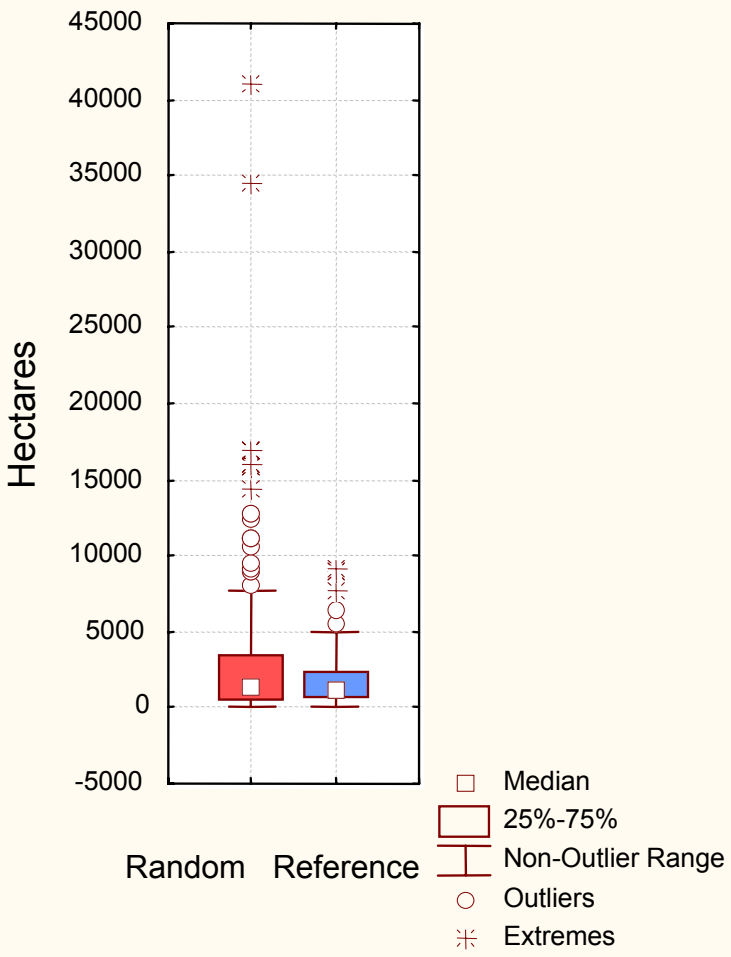

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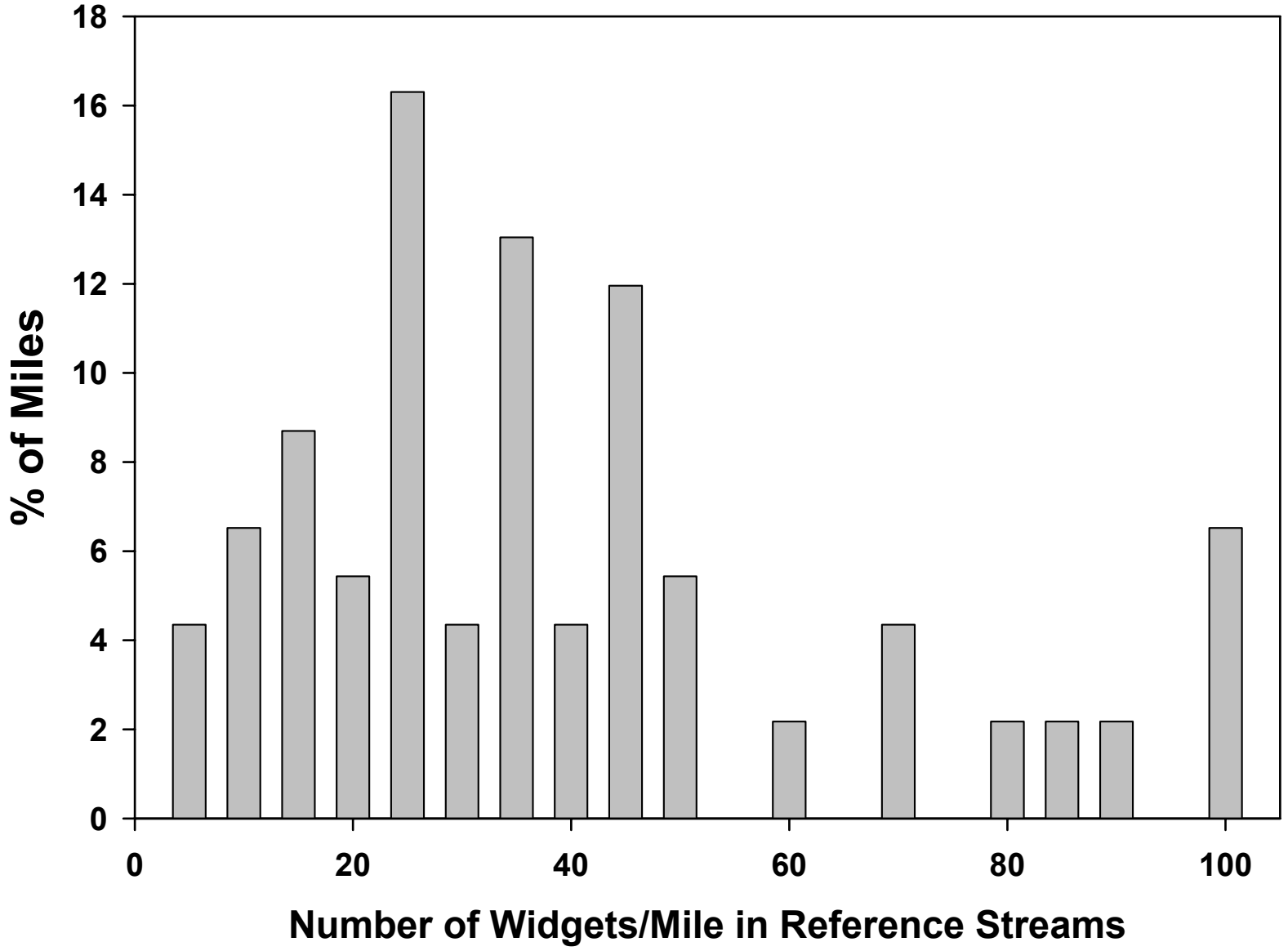
Example of Frequency Distribution



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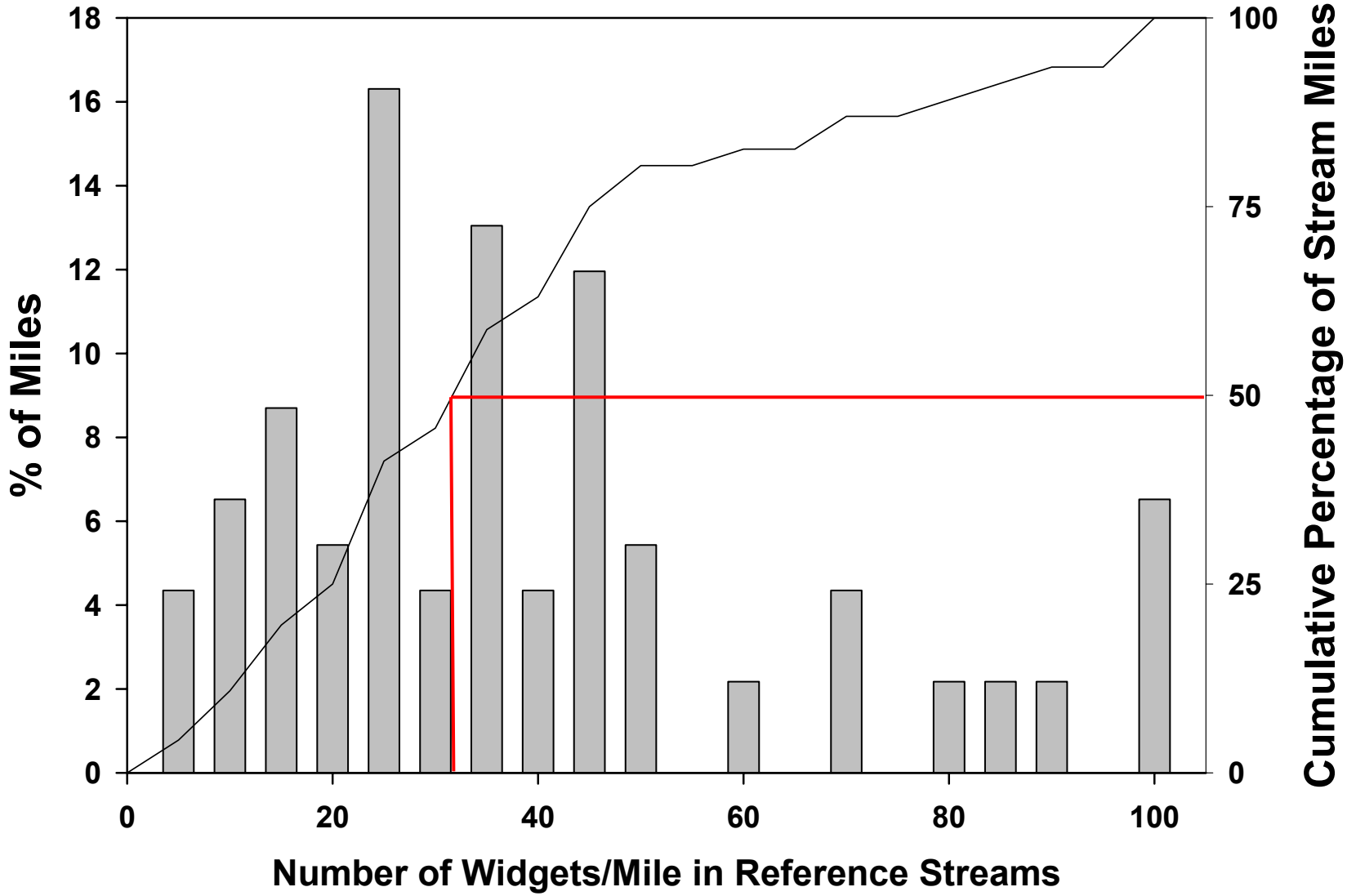
Example of Cumulative Frequency Distribution



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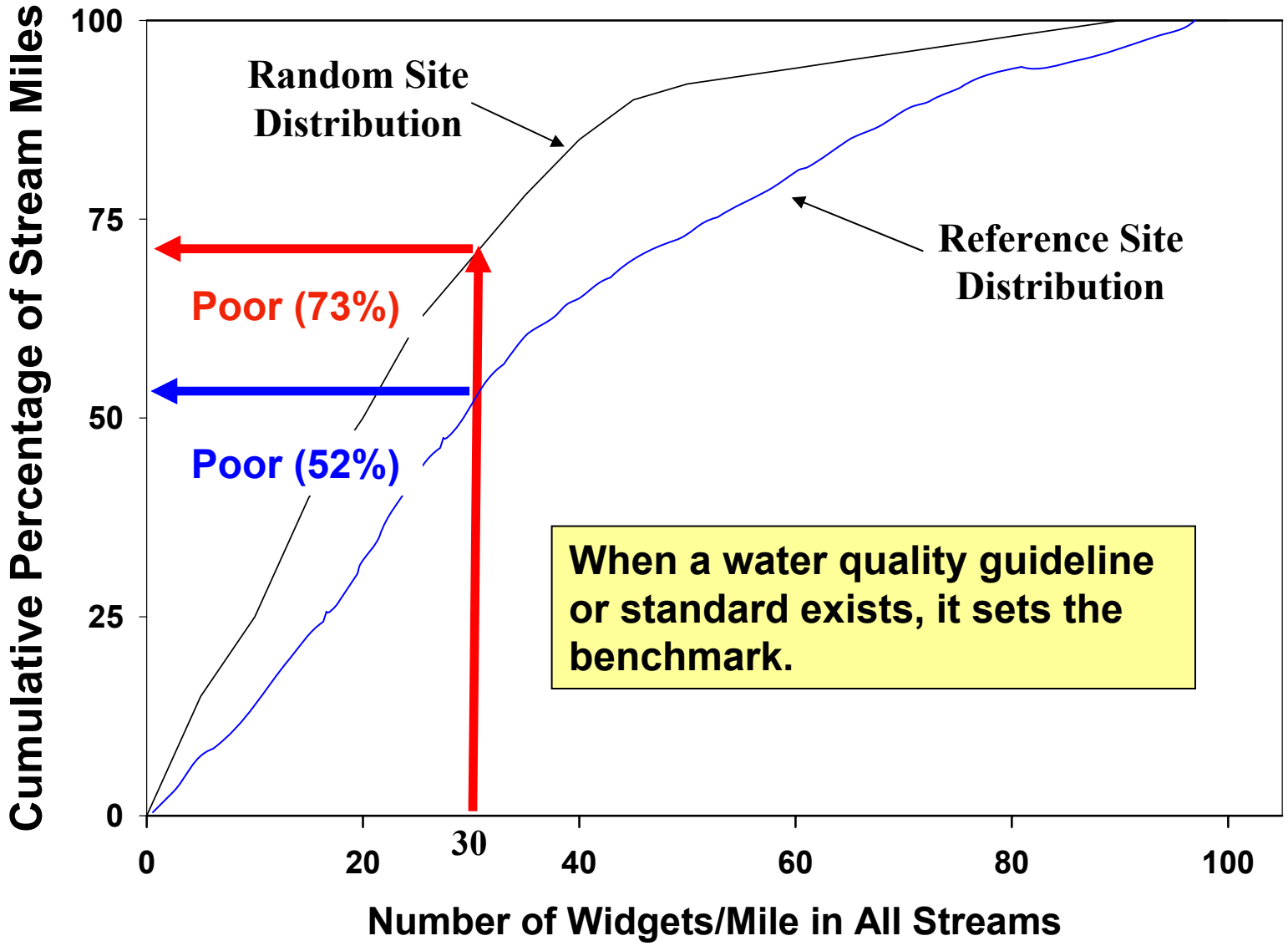
Defining "Poor" Conditions cont.



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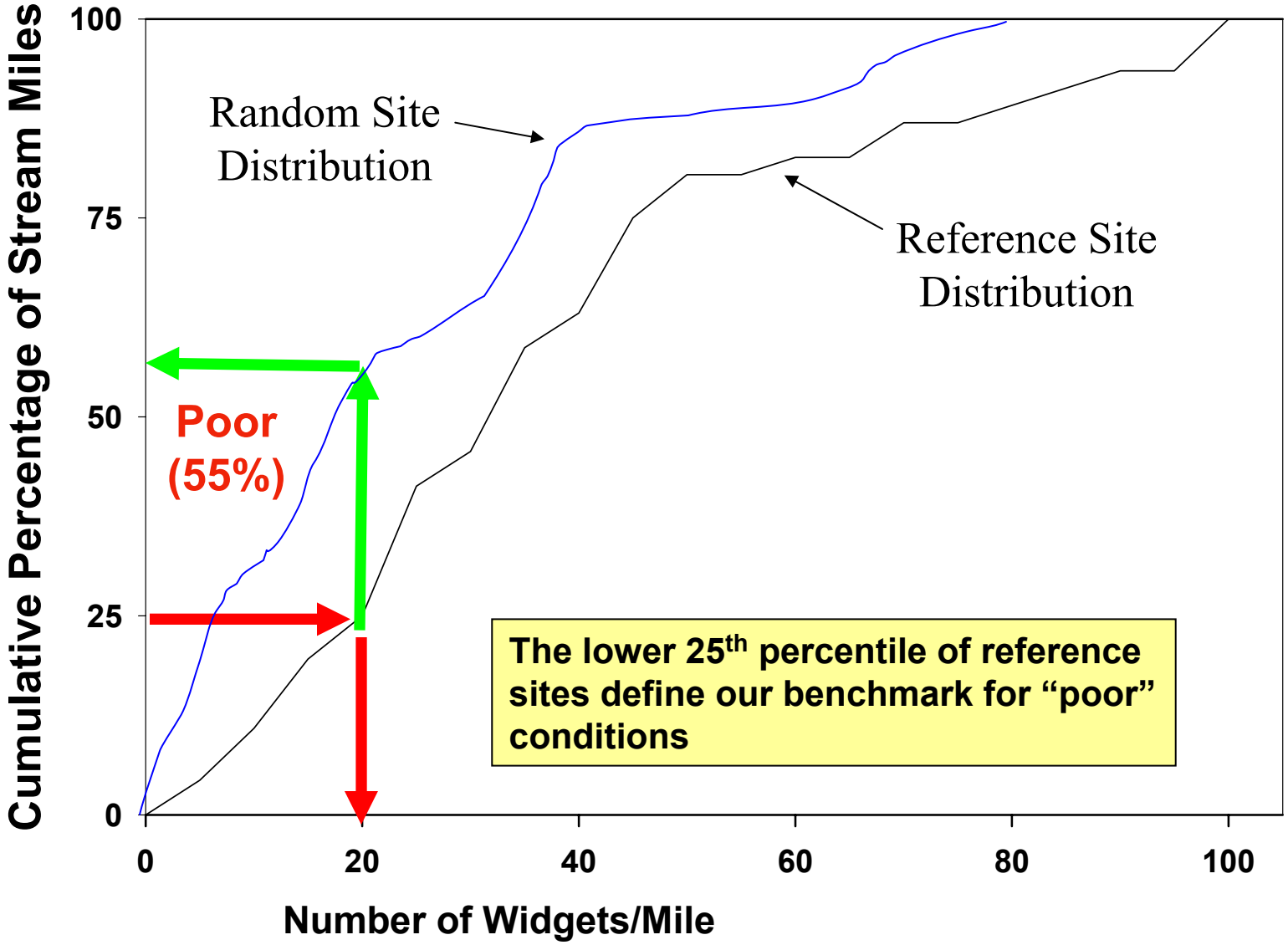
Defining "Poor" Conditions



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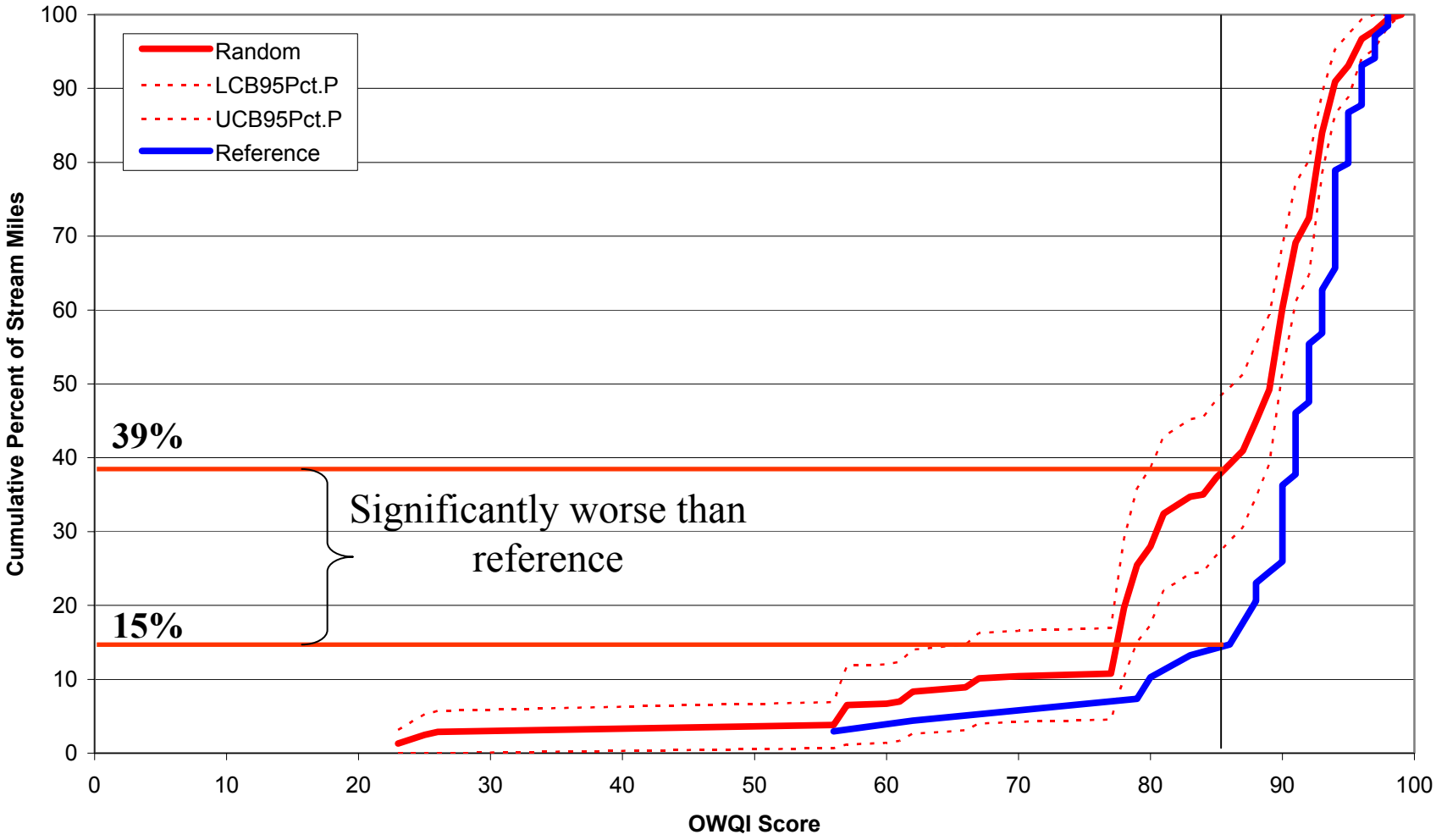
OREGON WATER QUALITY INDEX SCORES (OWQI)
Cumulative Distribution Frequency Curves (CDF)
Random & Reference (Coho distribution streams)



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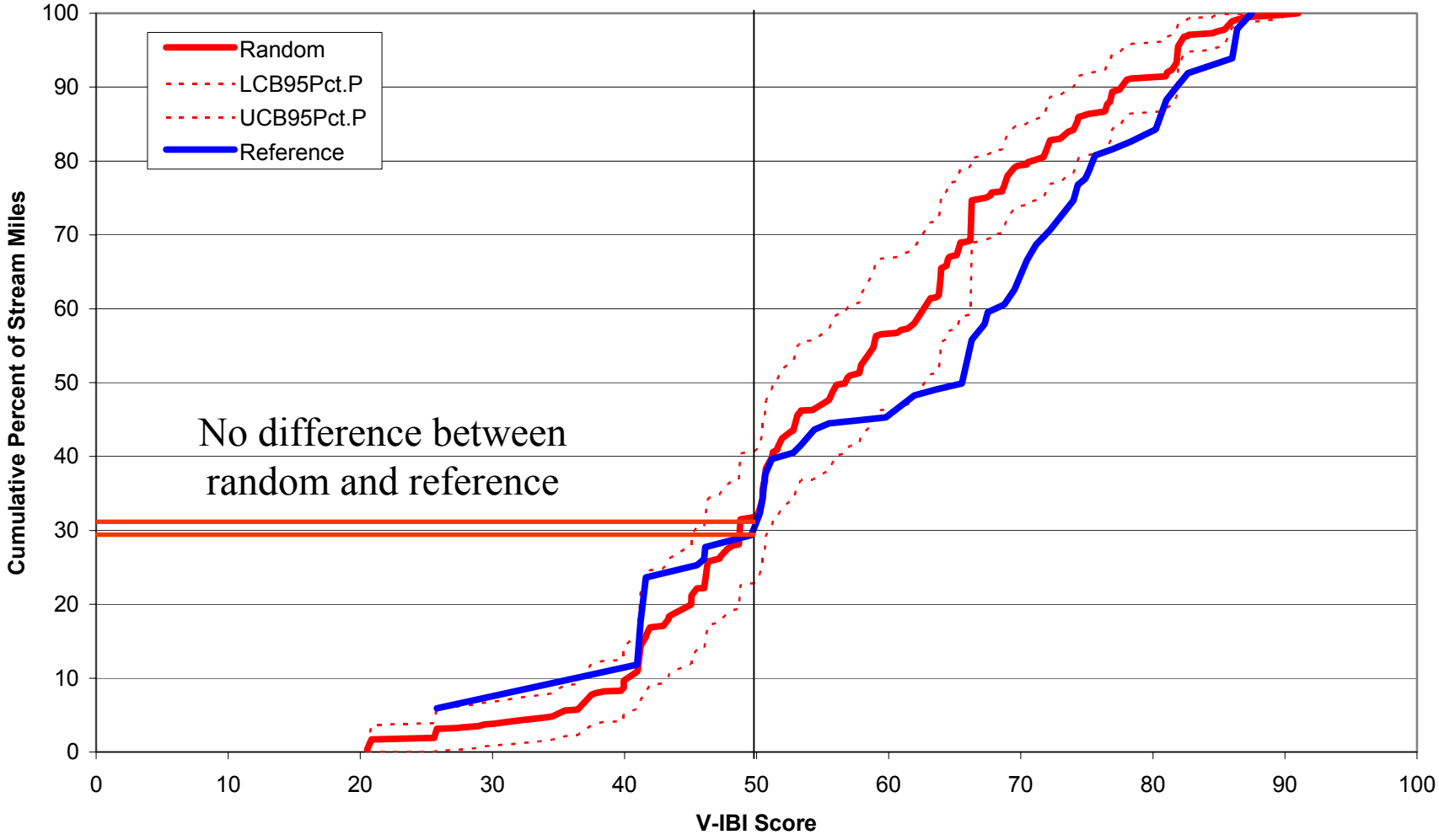
OREGON VERTEBRATE COMMUNITY SCORES (V-IBI)
Cumulative Distribution Frequency Curves (CDF)
Random & Reference (Coho distribution streams)



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DEQ Parameter Cut Points

Parameter	Poor	Basis for Break Point
Vertebrate Community Score	<50	25th percentiles of reference sites.
Macroinvertebrate Assemblage Score	<0.9	25th percentiles of reference sites.
Fine Sediment	> 30%	Aquatic life use protection (Drake 2004).
Water Temperature	> 16 C	Colder water habitat. Numeric standard.
	> 18 C	Cold water habitat. Numeric standard.
Dissolved Oxygen concentration	< 8.0 mg/L	Numeric standard.
Dissolved Oxygen percent of saturation	< 90%	Numeric standard.
Total Inorganic Nitrogen	> 0.25 mg/L	25th percentiles of reference sites.
Total Phosphorus	> 0.03 mg/L	25th percentile of reference sites.
Oregon Water Quality Index	< 85	Water quality for contact recreation and aquatic life use Cude, 2001.
Biochemical Oxygen Demand	> 9.0 mg/L	25th percentile of reference sites.
Total Solids	> 70 mg/L	25th percentile of reference sites.
pH	<6.5 or >8.5	Numeric standard.

26-Aug-04

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RESULTS?

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Ambient River Monitoring Sites

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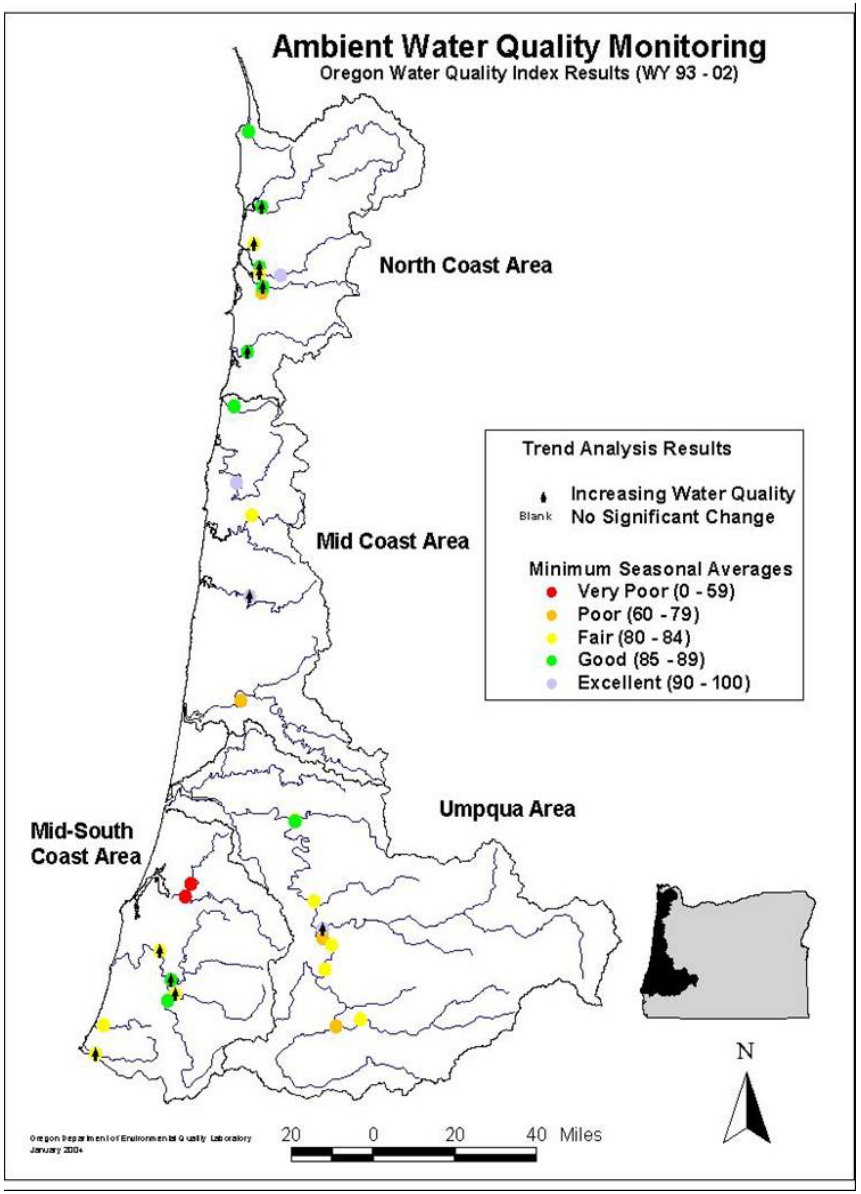
-Status & Trends in Water Chemistry-



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Ambient River Monitoring Sites

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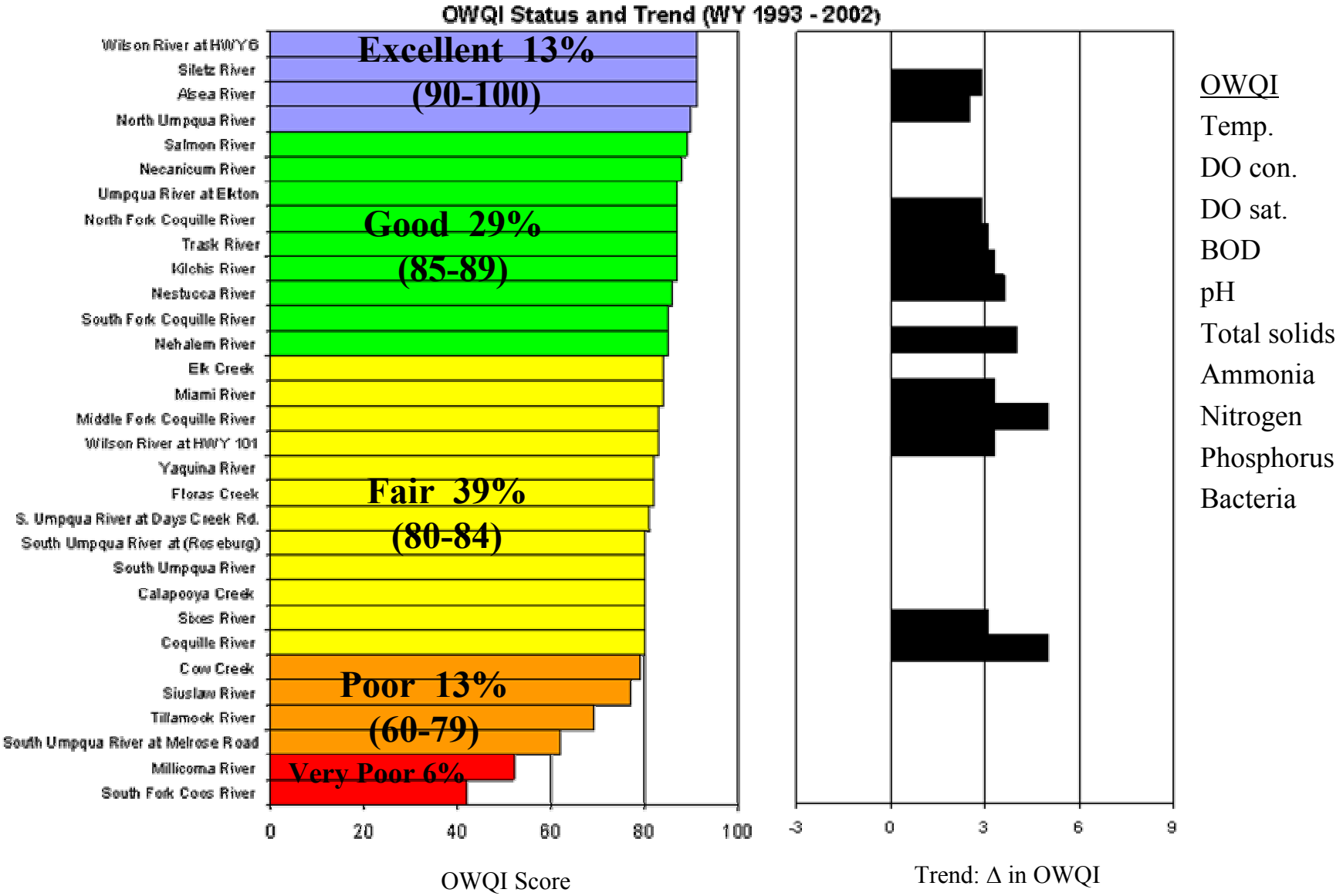
-Status & Trends in Water Chemistry-



Note: *Ambient site results reflect conditions at monitoring sites only.*

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Ambient River Monitoring Sites

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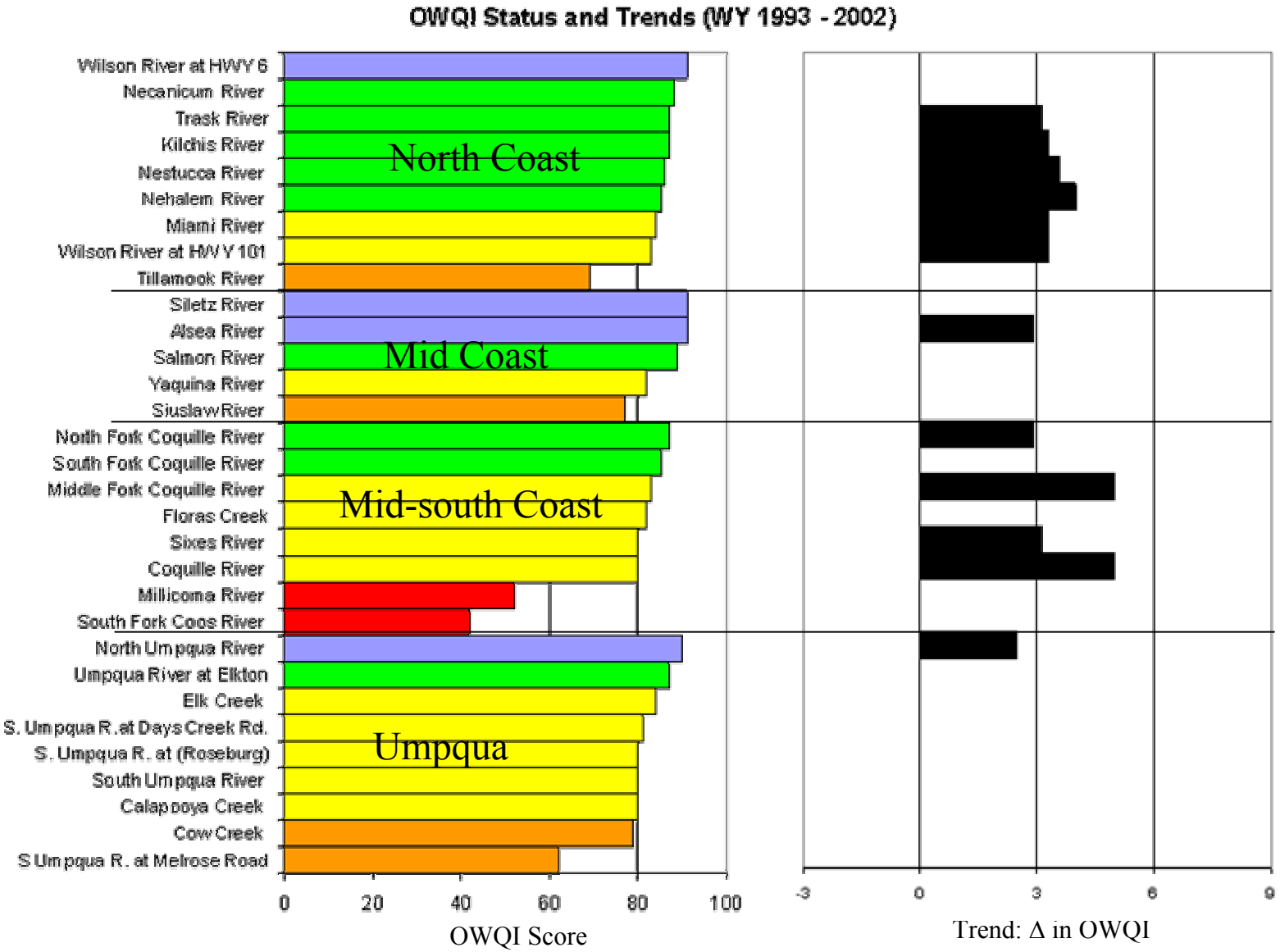
-Status & Trends in Water Chemistry-



Note: *Ambient site results reflect conditions at monitoring sites only.*

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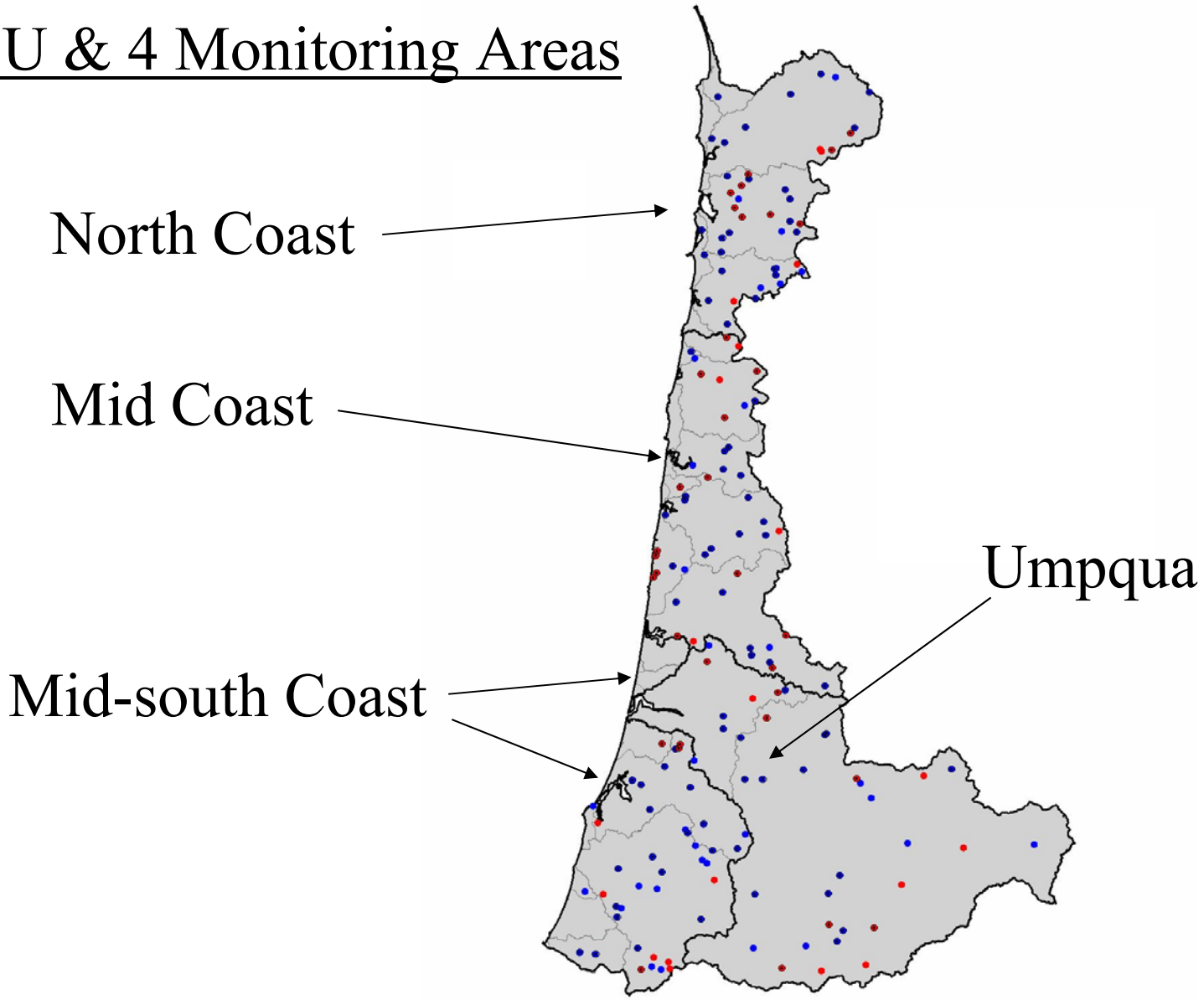
Random Site Results
for ESU & 4 Monitoring Areas



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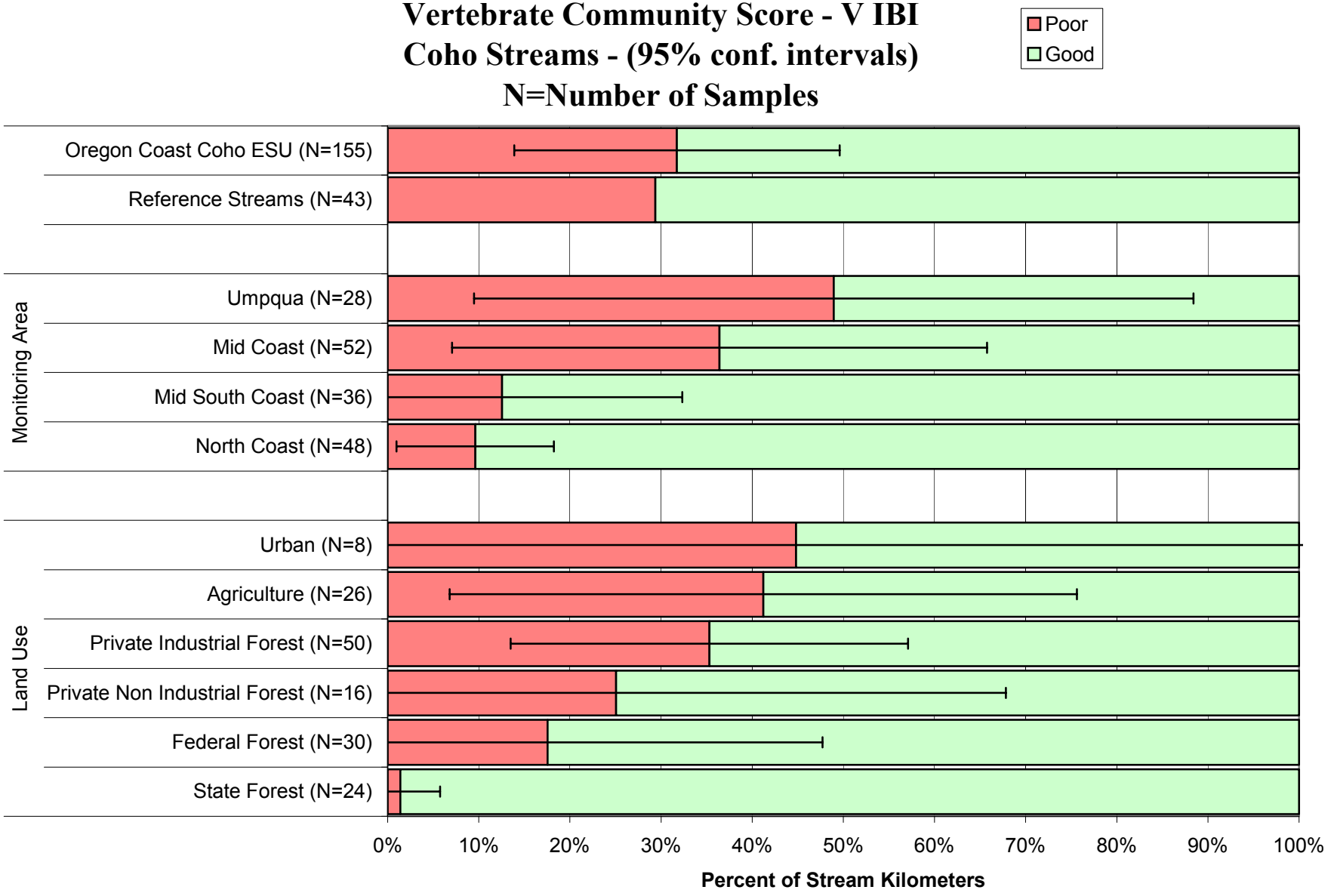
Vertebrate Community Score - V IBI
Coho Streams - (95% conf. intervals)
N=Number of Samples



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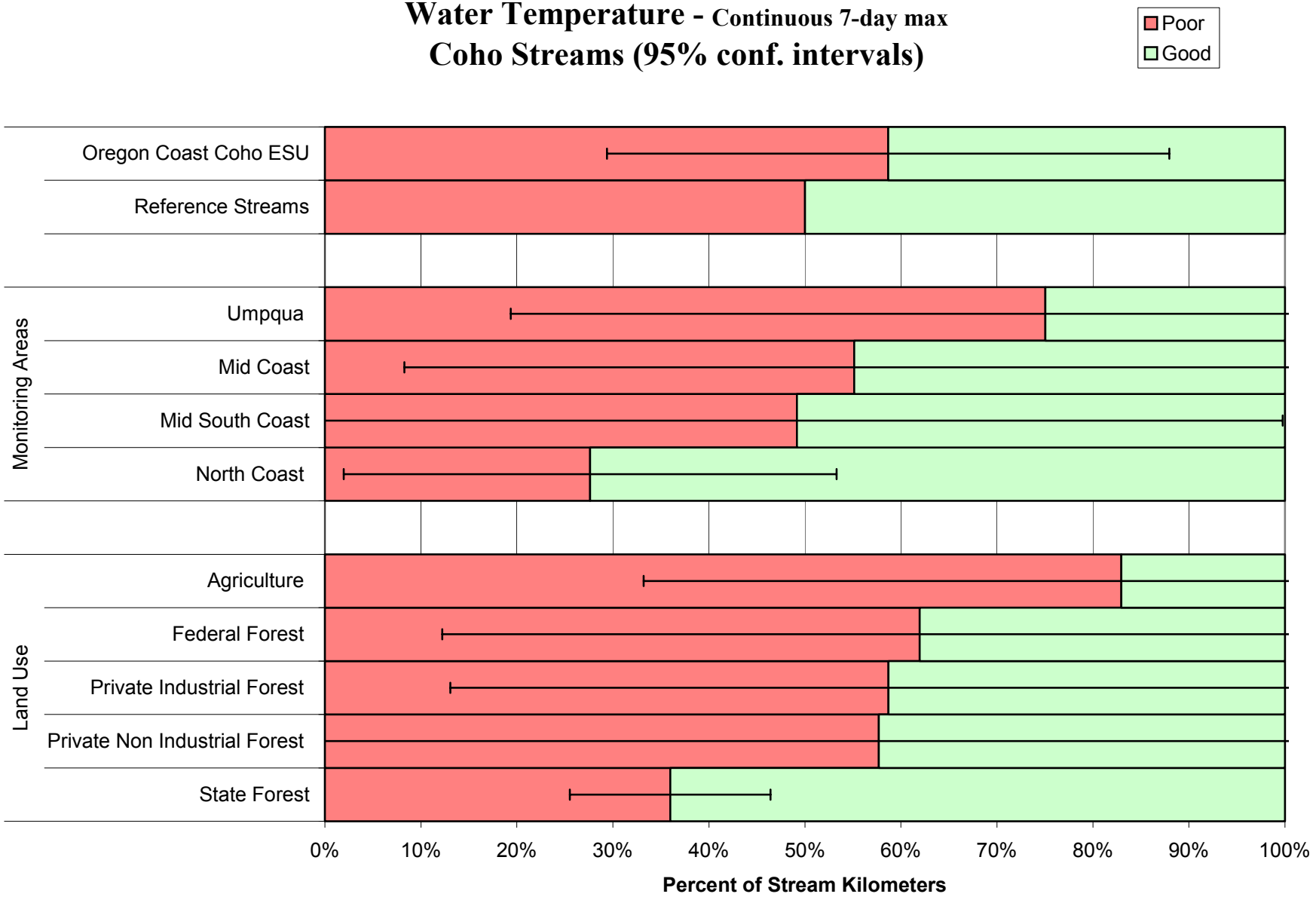
Water Temperature - Continuous 7-day max
Coho Streams (95% conf. intervals)



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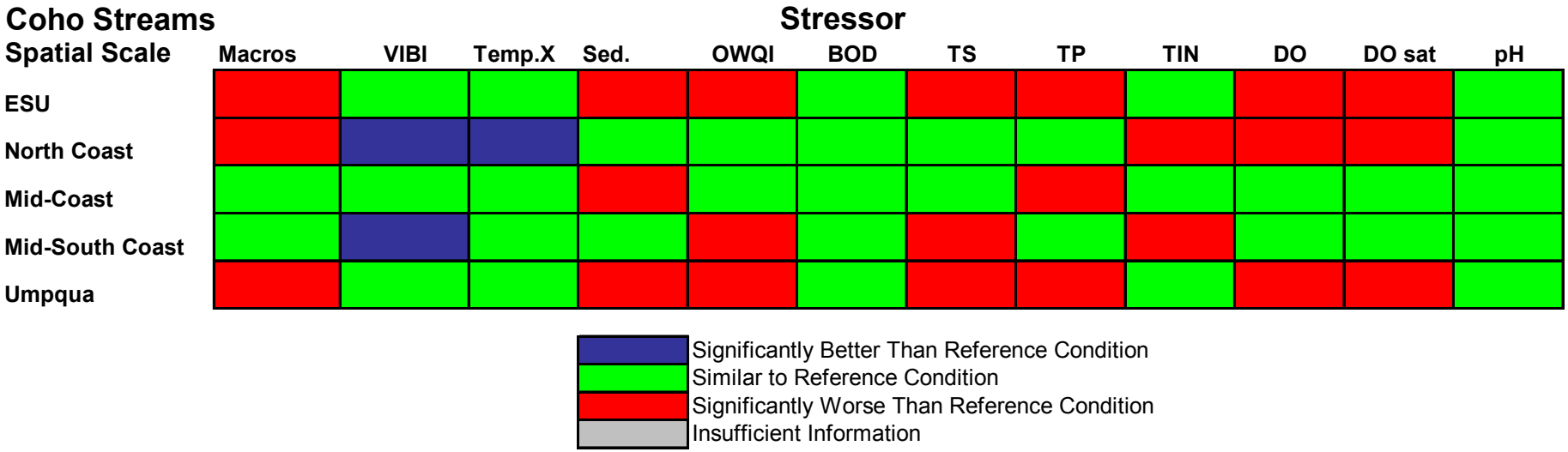
Water Quality Condition Summary

ESU & Monitoring Areas

For streams within Coho distribution only



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What Stressors To Focus On?

- How can we determine which stressors pose greatest risk aquatic life factors for decline (fish and macroinvertebrate communities)?

- Which stressors should be the major focus for restoration & protection?

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Relative Risk Calculation

		Smoker	
		No	Yes
Lung Cancer	No	48	7
	Yes	2	43
Total %		50	50

Smokers are 21.5 times more likely to get lung cancer than non smokers.

Yes/Yes total	43/50	.86
Yes/No total	2/50	.04
Relative Risk	.86/.04	**21.5**

Relative Risk Score

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Relative Risk Calculation

> 90 % = GOOD		DO Sat (% of stream length)	
		Good	Poor
Macroin-vertebrate Score (% of stream length)	Good	52	8
	Poor	16	24
Total %		68	32

Poor /Poor total	24/32	.75
Poor/Good total	16/68	.24
Relative Risk	.75/.24	**3.26**

Relative Risk Score

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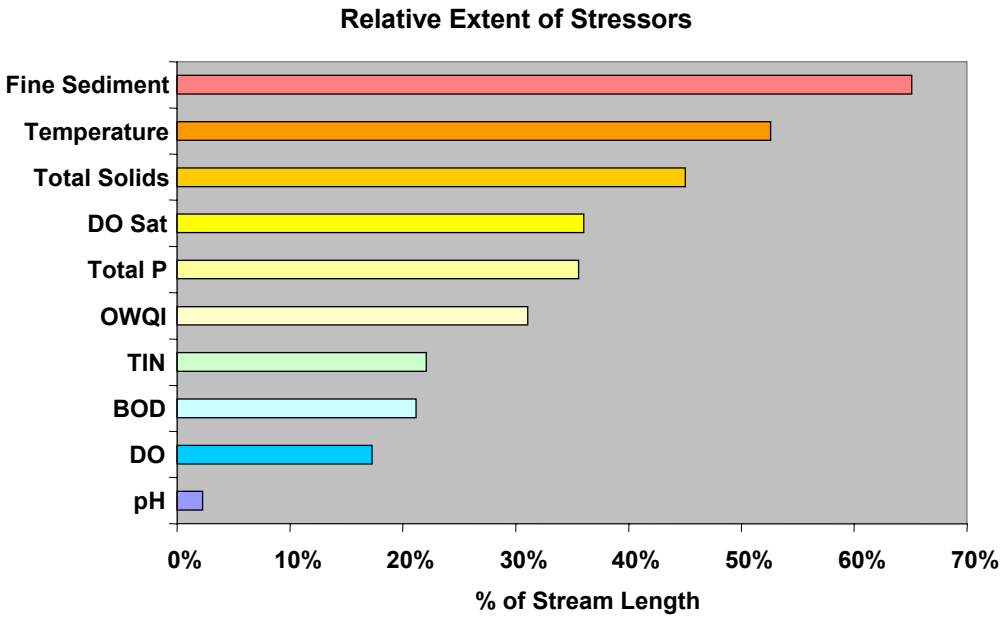
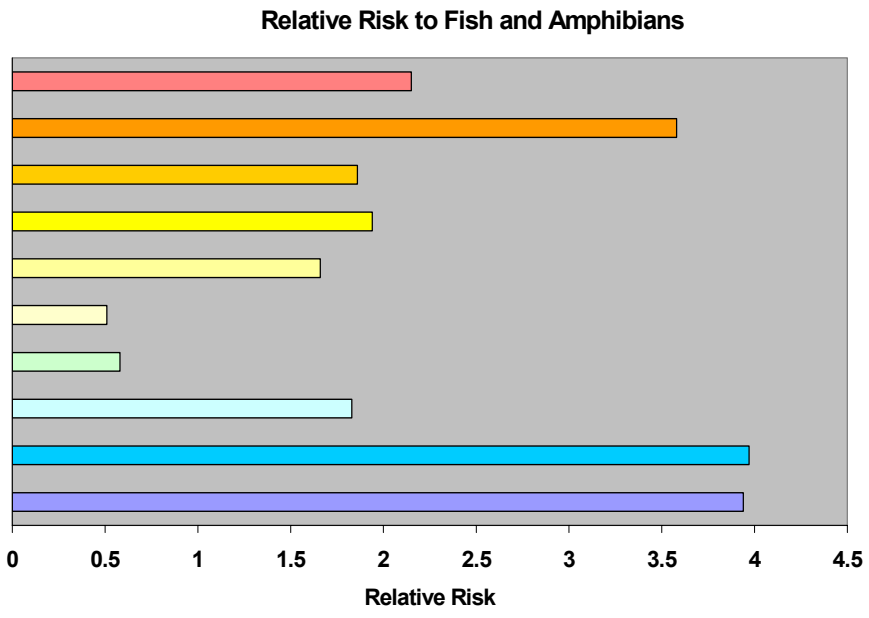
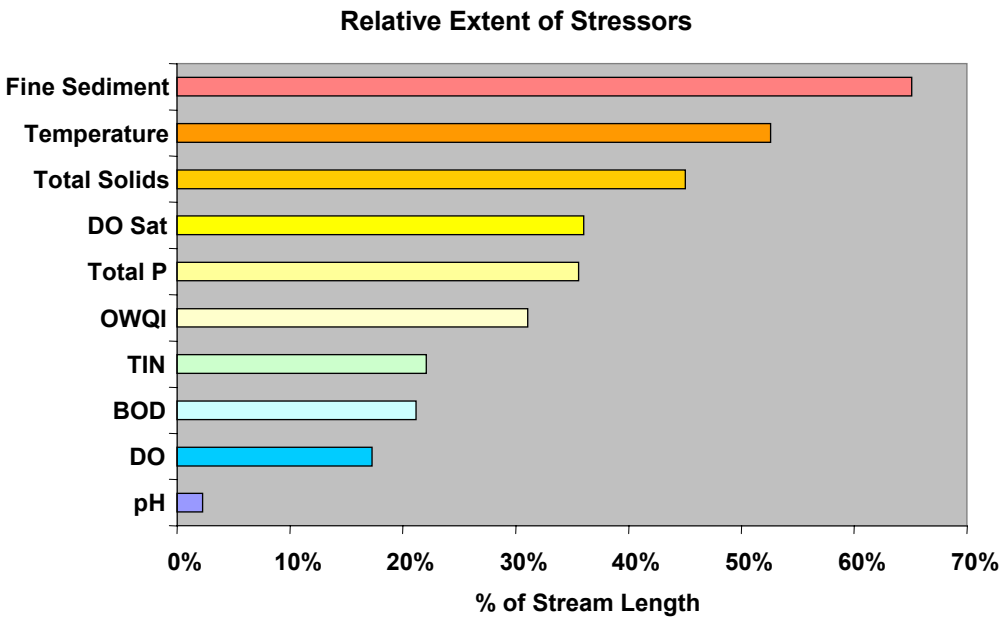
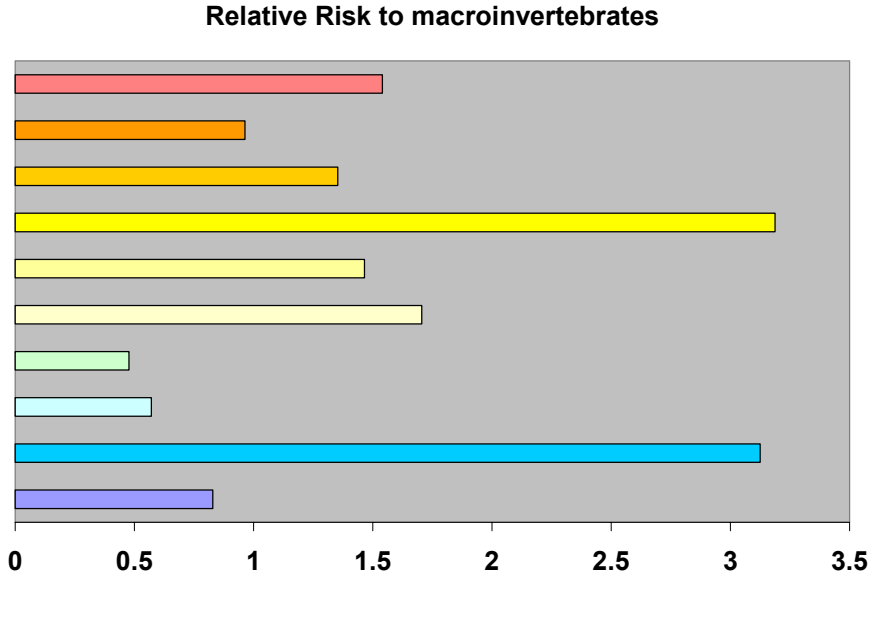
Extent and Relative Risk of Stressors









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Relative Rank of Stressors
Extent x Risk – Water Quality

Higher Risk

Lower Risk

Fish Community	Macroinvertebrates
Temperature	DO Saturation
Fine Sediment	Fine Sediment
Total Solids	Total Solids
DO Saturation	DO Concentration
DO Concentration	Total Phosphorus

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Summary of Results

Based on Large River Ambient Sites

- ~ 42% of large river sites have excellent to good water quality.
- ~ 58% of large river sites have fair to poor water quality.
- ~ 39% of large river sites show improving water quality trends.
- ~ 0% of large river sites have declining water quality trends.

Based on Random Wadeable Stream Sites

- Primary stressors to biological communities are:
  temperature, fine sediment, dissolved oxygen, & total solids
- Temperature conditions at random sites are similar to reference sites across ESU, Monitoring Areas and landuses.
- Public lands have lower sediment levels and better water quality (similar or better than reference) than private land (worse than reference).