Ecological Assessment: How EMAP fits into a State Monitoring Program

Rick Hafele
Manager, Biomonitoring Section
Oregon Department Of Environmental Quality
hafele.rick@deq.state.or.us

Ambient River Monitoring
Ground Water Monitoring
TMDL Monitoring/Assessment
Volunteer Monitoring
Coastal EMAP Monitoring
Stream EMAP Monitoring
Special Projects Monitoring

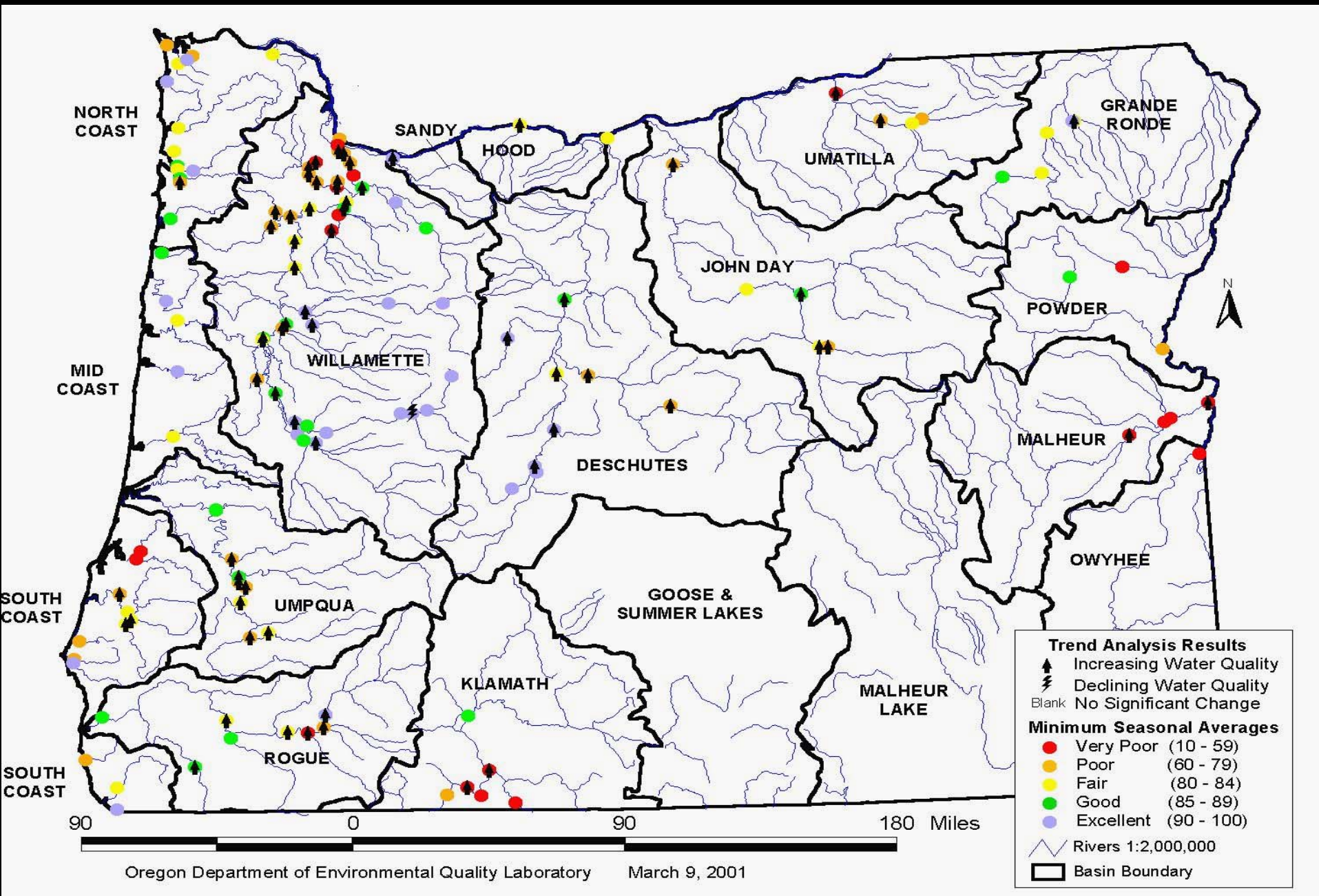
Goals of Oregon Water Quality Monitoring

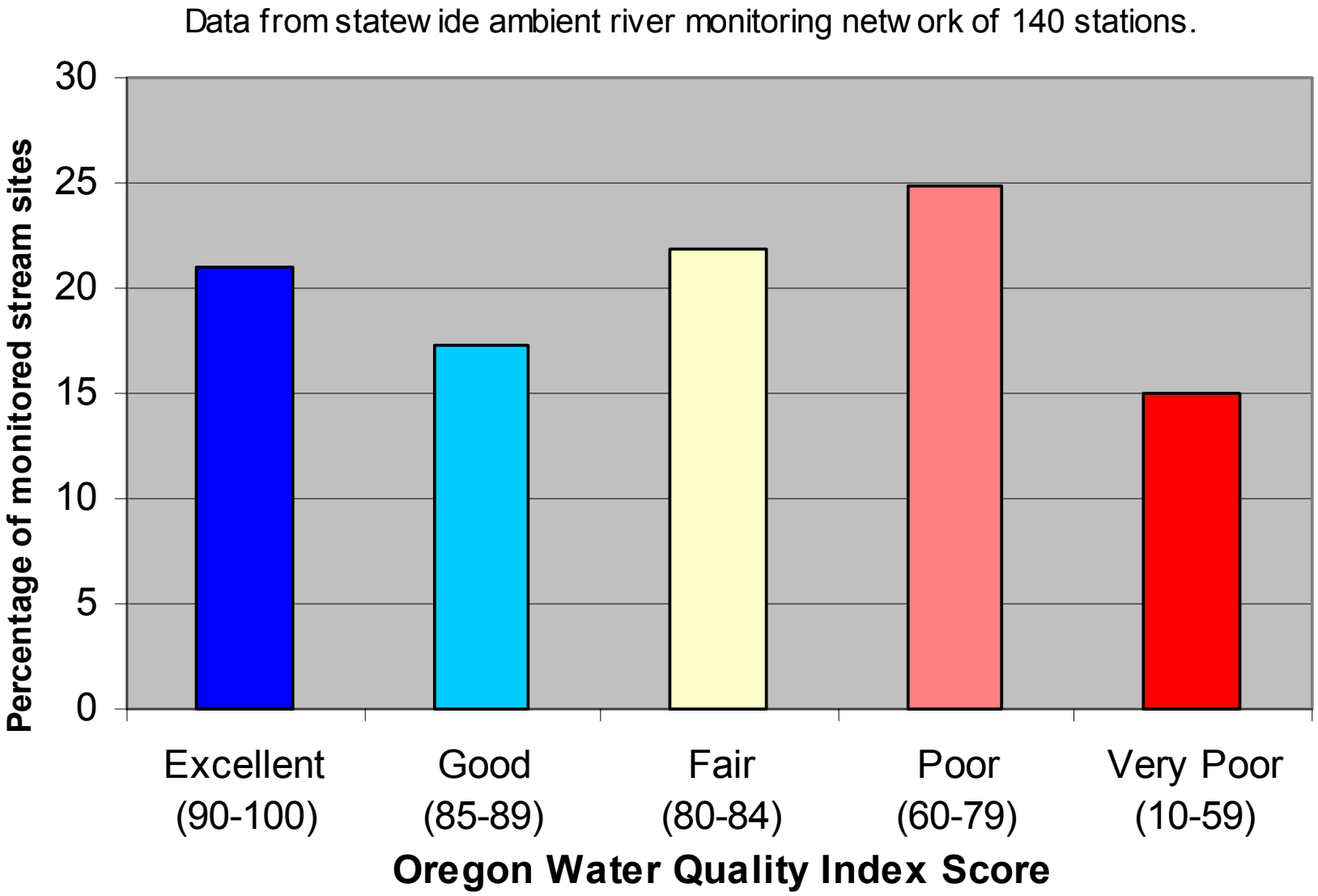
- Assess Status and Trends (Spatial and Temporal Variability)
- Characterize and Rank Problems
- Design and Implement Programs and Projects (TMDL's, GWMA's)
- Evaluate Program and Project Effectivenes
- Compliance
- Respond to emergencies (New Carissa)
- Water Quality = Physical, chemical, biological (stream health)

Status and Trends Of Larger Streams

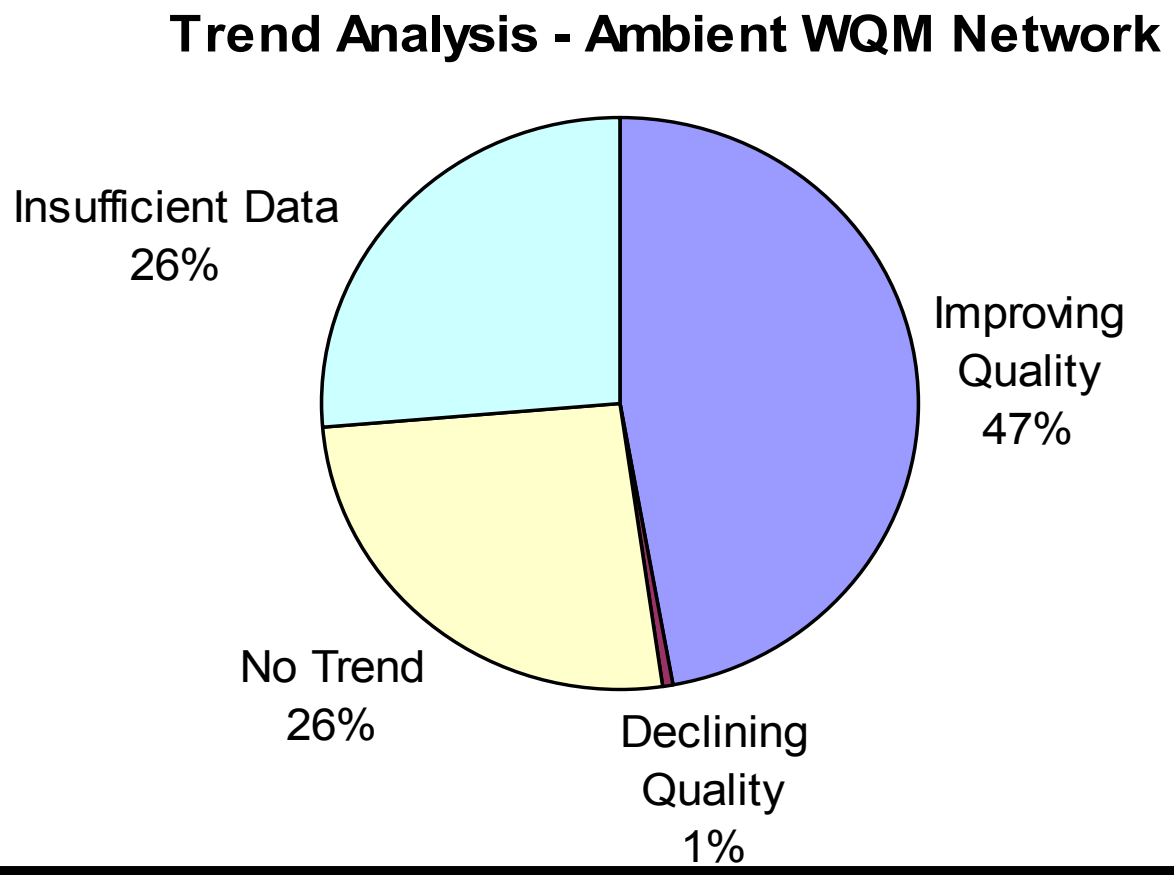
- 4th and 5th Order Streams
- Small Population
- Oregon Ambient Network of 142 sites
- One site for every 48 miles of Streams
- Excellent status and trends

Oregon Water Quality Index Results




State Water Quality Conditions Based on
Oregon Water Quality Index (WY '90-'99)
Data from statewide ambient river monitoring network of 140 stations.
Percentage of monitored stream sites
30
25
20
15
10
5
0
Excellent (90-100)
Good (85-89)
Fair (80-84)
Poor (60-79)
Very Poor (10-59)
Oregon Water Quality Index Score

Statewide Water Quality Info 140 Ambient Sites



Status and Trends of Smaller Streams

- Primarily 1st, 2nd, 3rd Order Streams - Wadeable
- Large Population
- EMAP Approach Excellent
- Probabilistic Sampling
- Small Number of Samples can Characterize a Large Population
- Unbiased, Statistically Supportable

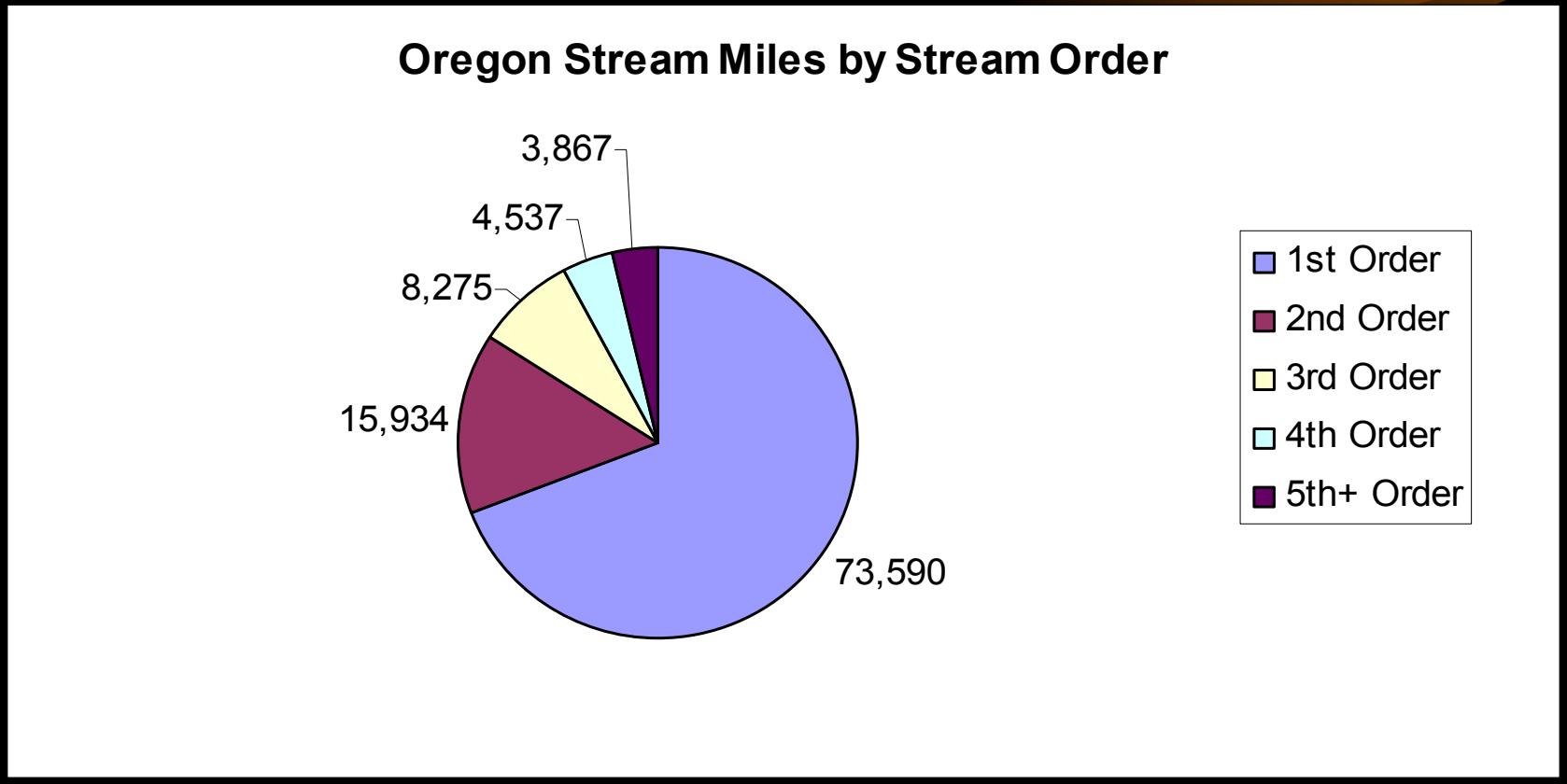
Examples of Stream Orders

1st Order

3rd Order

5th Order

Stream Orders



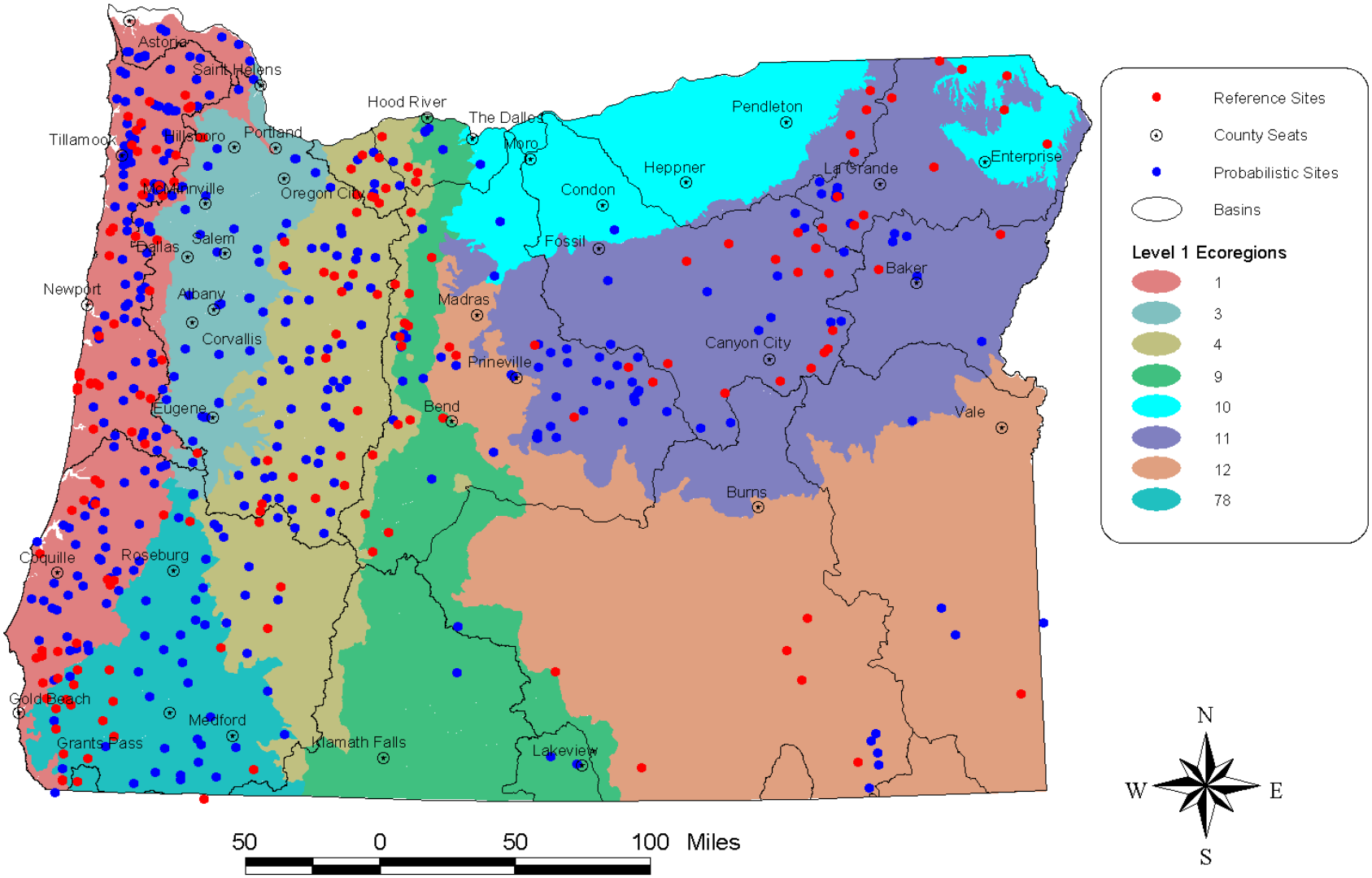
What are the Characteristics of your target population?

In Oregon Most Experience with REMAP

- Oregon Coastal Ecoregion 1994 -1996
- Upper Deschutes Basin 1997 -1998
- Western Cascades 1999 - 2000
- Western Pilot EMAP 2000 - 2005
- Coastal EMAP 1999 - 2004

Oregon DEQ Biomonitoring Sites

1996-2000



Studies Include

- Physical (habitat)
- Chemical
- Biological (Fish, invertebrates, periphyton)
- Wadeable Streams
- 1st, 2nd, 3rd order

Biomonitoring Indicators

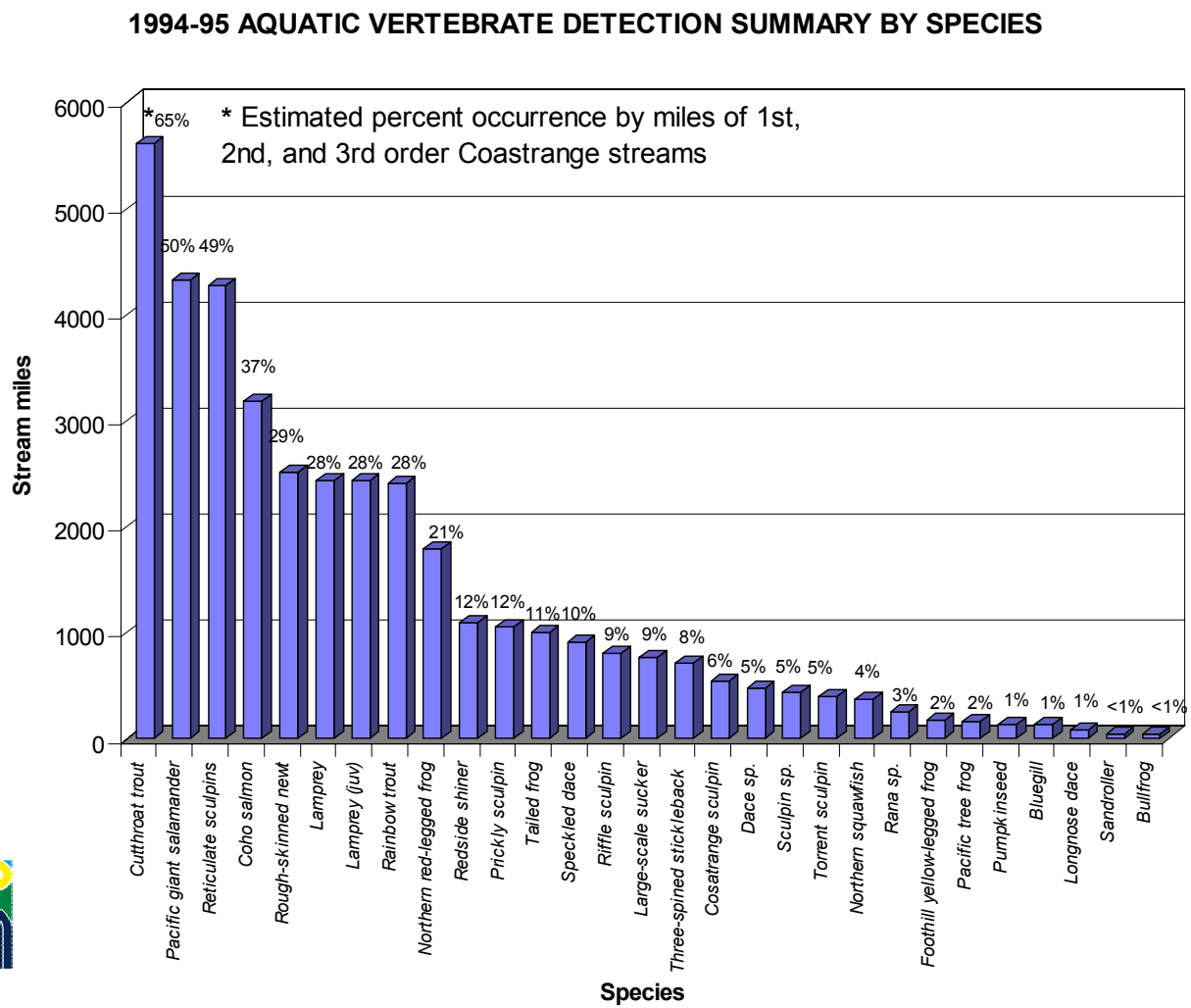
Index of Biotic Integrity (IBI)

- Presence or absence of specific aquatic Macroinvertebrate species.
- Abundance of macroinvertebrate species.
- Diversity of macroinvertebrate species.

Habitat Condition

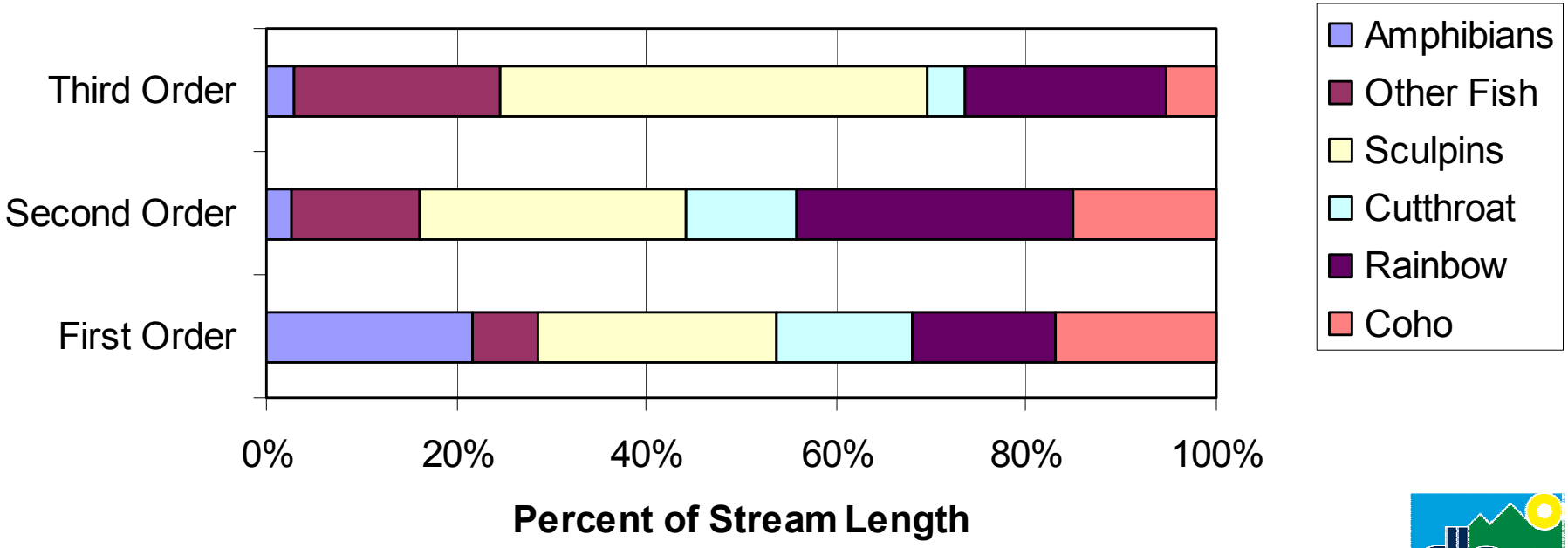
- Percent gravel
- Fines
- Width to depth ratio
- Large woody debris
- Shade
- Residual pool depth
- Riparian condition

29 vertebrate Species - Cutthroat Trout most widespread, found in 65% of stream miles

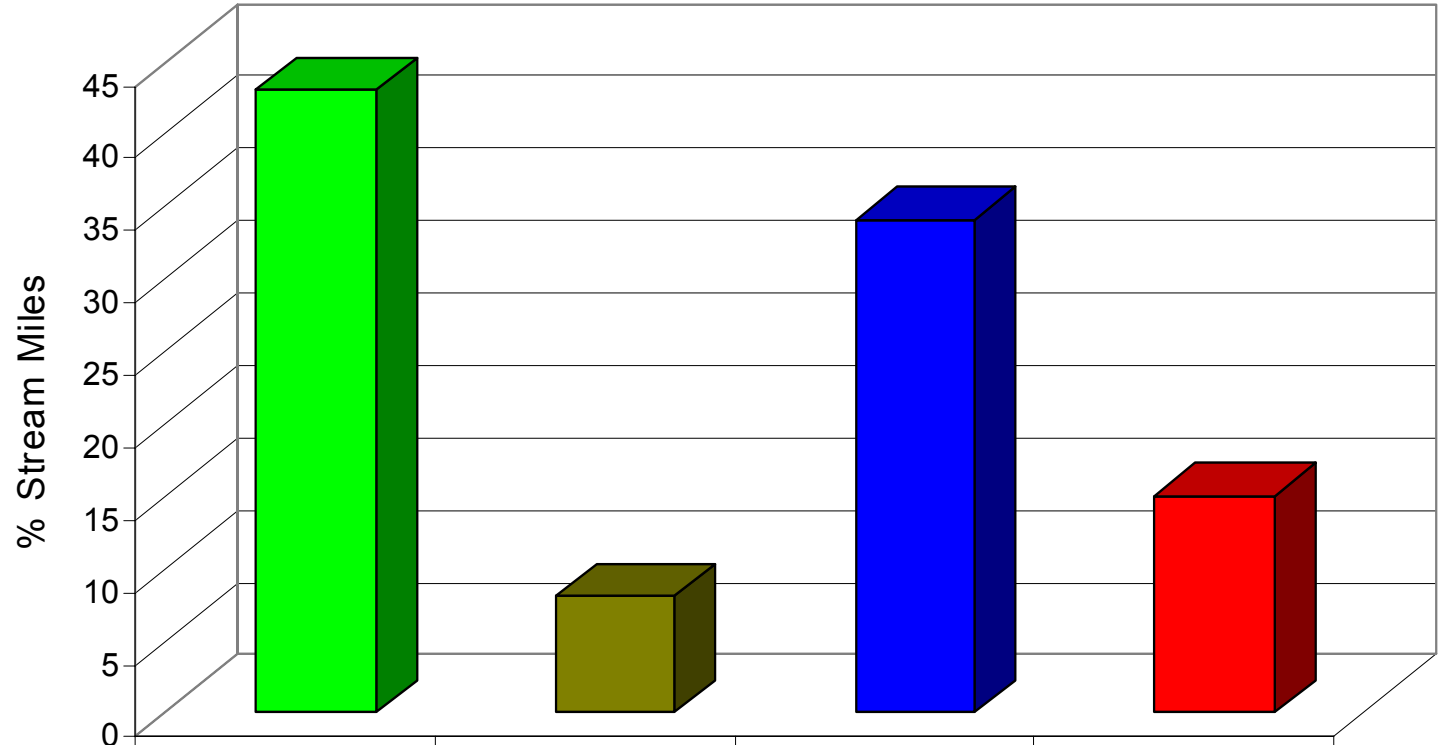


Sculpins were the Most Abundant Vertebrate Species

Figure 3 - Relative Abundance of Fish and Amphibians
Oregon Coast Range 1994/1995

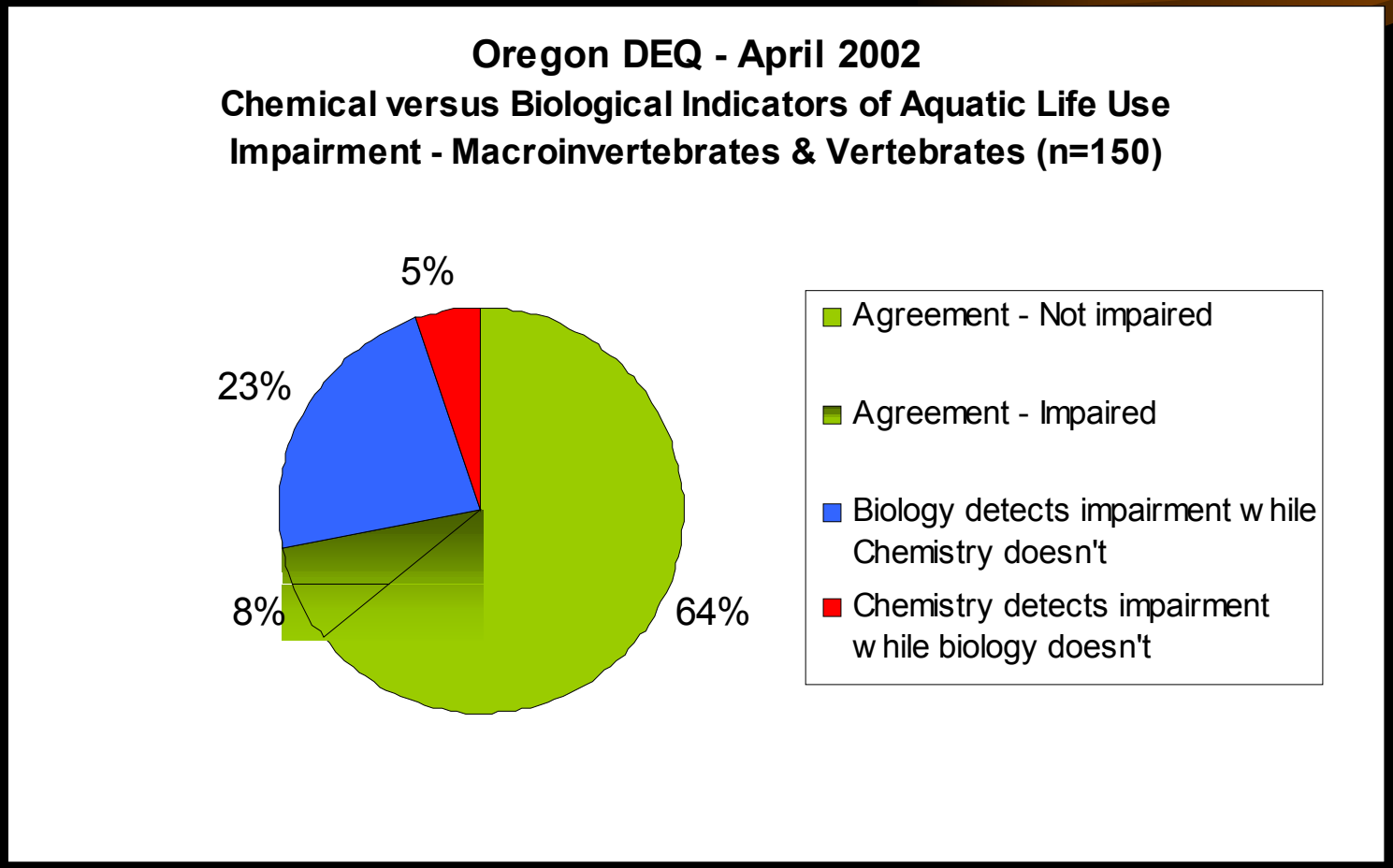


49% of Coastal Streams Showed Impaired Macroinvertebrate Conditions

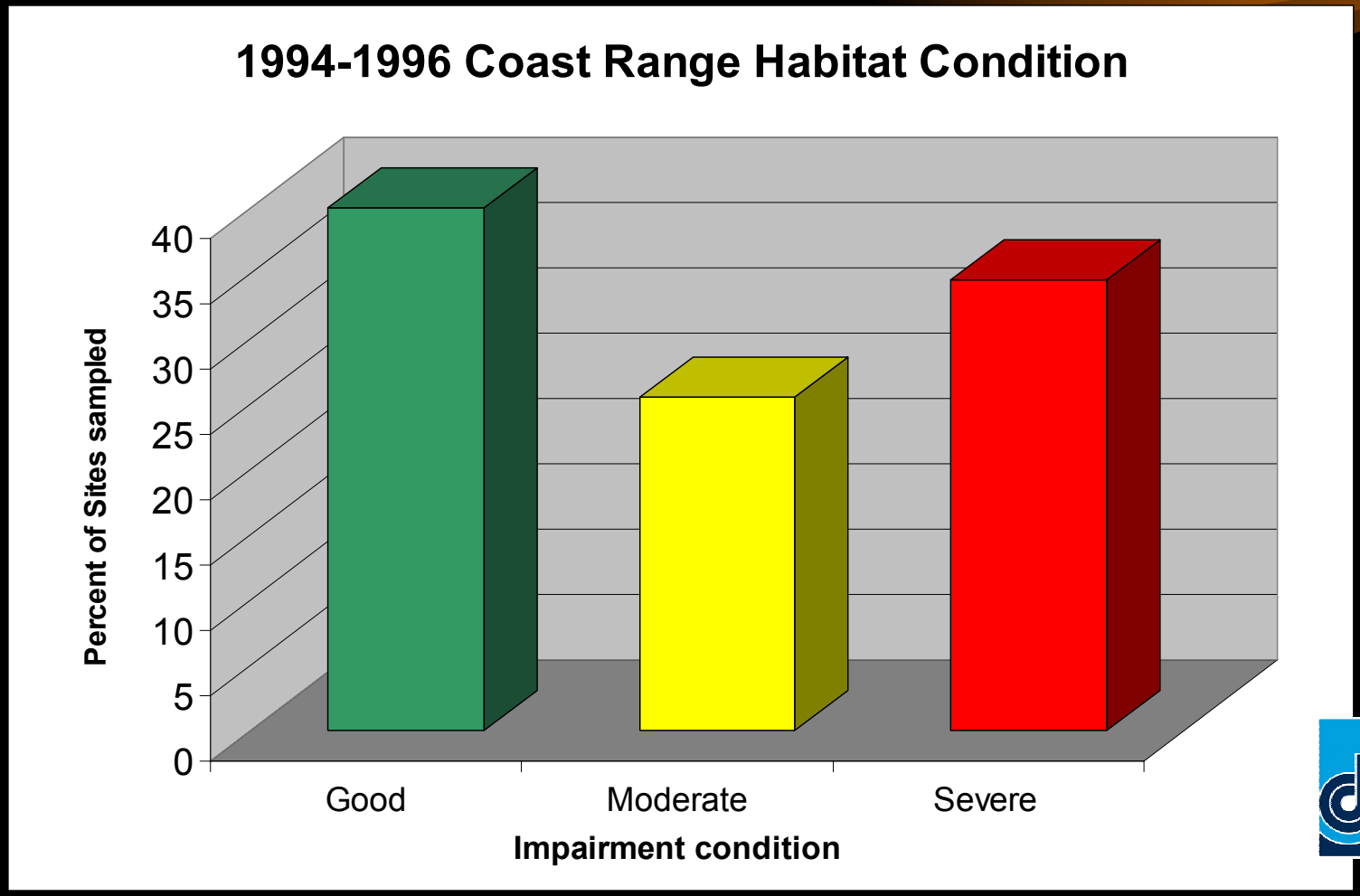


	No Impairment Detected	Borderline No/Moderate Impairment	Moderately Impaired	Severely Impaired
% Stream Miles	43	8	34	15

Biology Shows Higher Level of Stream Impairment than Chemistry Alone



Habitat Conditions



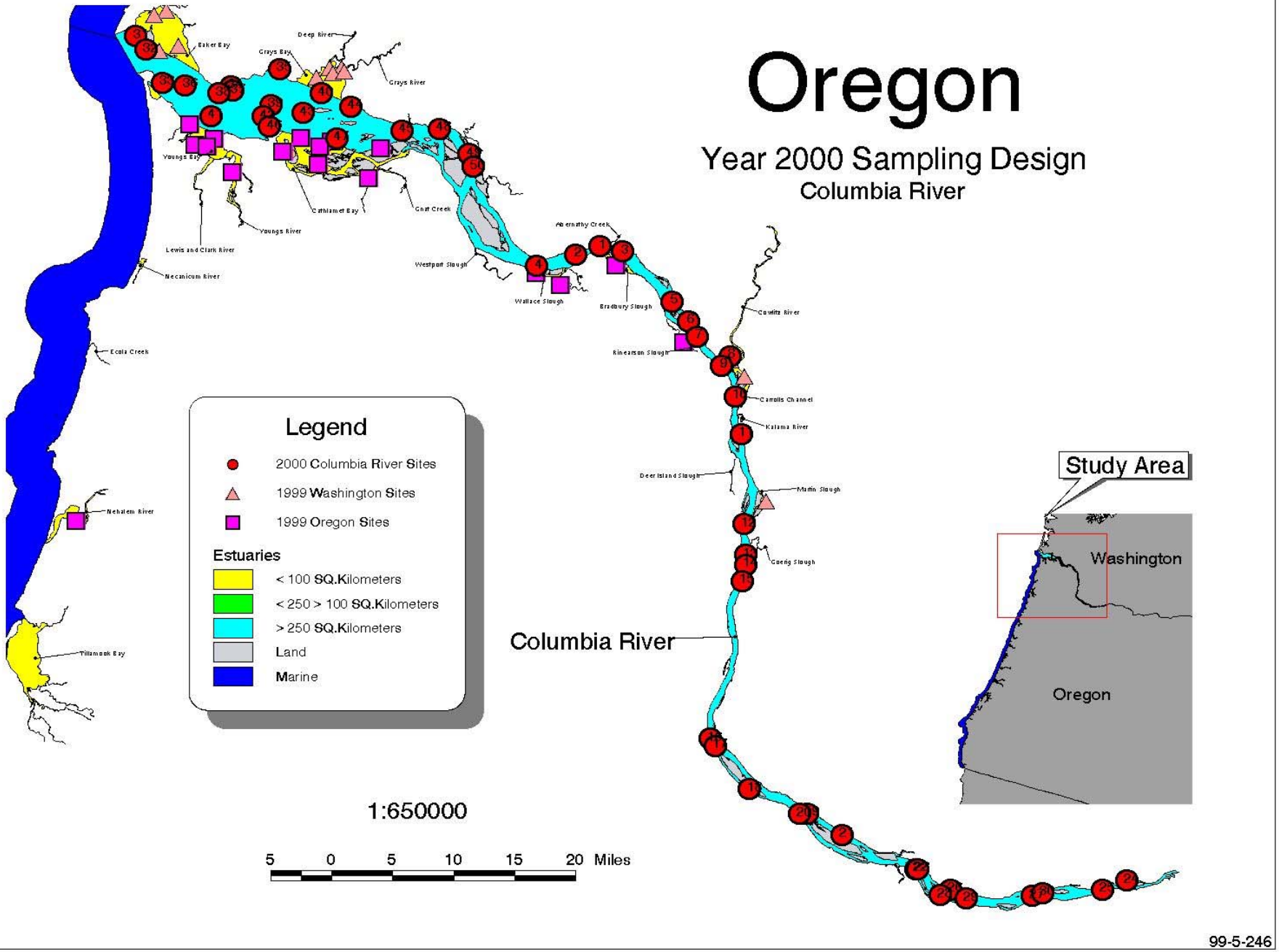
Analysis Identified Six Habitat Parameters that had the Greatest Correlation with Biological Condition

- Percent Course Substrate
- Riparian Canopy Cover
- Residual Pool Depth
- Percent Fine Sediments (decreased response)
- Shade
- Fish Cover

Coastal Environmental Monitoring and Assessment Program

CEMAP Schedule

- 1999 - 80 small estuarine sites (30 in Tillamook)
- 2000 - 50 sites in the Columbia to Bonneville
- 2001 - 32 estuarine sites excl. Columbia
- 2002 - 80 intertidal sites
- 2003 - offshore sampling (out to 15 miles)


Oregon
Year 2000 Sampling Design
Columbia River
Baker Bay
Deep River
Grays Bay
Grays River
Youngs Bay
Youngs River
Cathlamet Bay
Gnat Creek
Lewis and Clark River
Necanicum River
Westport Slough
Abernathy Creek
Wallace Slough
Bradbury Slough
Cowlitz River
Rinearson Slough
Ecola Creek
Carrolls Channel
Kalama River
Deer Island Slough
Martin Slough
Nehalem River
Goerig Slough
Tillamook Bay
Columbia River
Legend
2000 Columbia River Sites
1999 Washington Sites
1999 Oregon Sites
Estuaries
< 100 SQ.Kilometers
< 250 > 100 SQ.Kilometers
> 250 SQ.Kilometers
Land
Marine
1:650000
5 0 5 10 15 20 Miles
Study Area
Washington
Oregon
99-5-246

Oregon Plan For Salmon and Watersheds

- The Data Collected by Oregon DEQ in the Coast Range REMAP Project provided an initial data set and Monitoring Approach to build a Multi-Agency Monitoring Plan Around
- EMAP-like monitoring is now part of an overall state Salmon and Watershed Recovery Program

Monitoring Program Objective

"Evaluate the effectiveness of the Oregon Plan in restoring salmon populations and improving watershed conditions"

Know the contribution of Oregon Plan agency measures, programs, and restoration actions to habitat improvement and sustainable salmon populations

THE OREGON PLAN
for salmon & watersheds

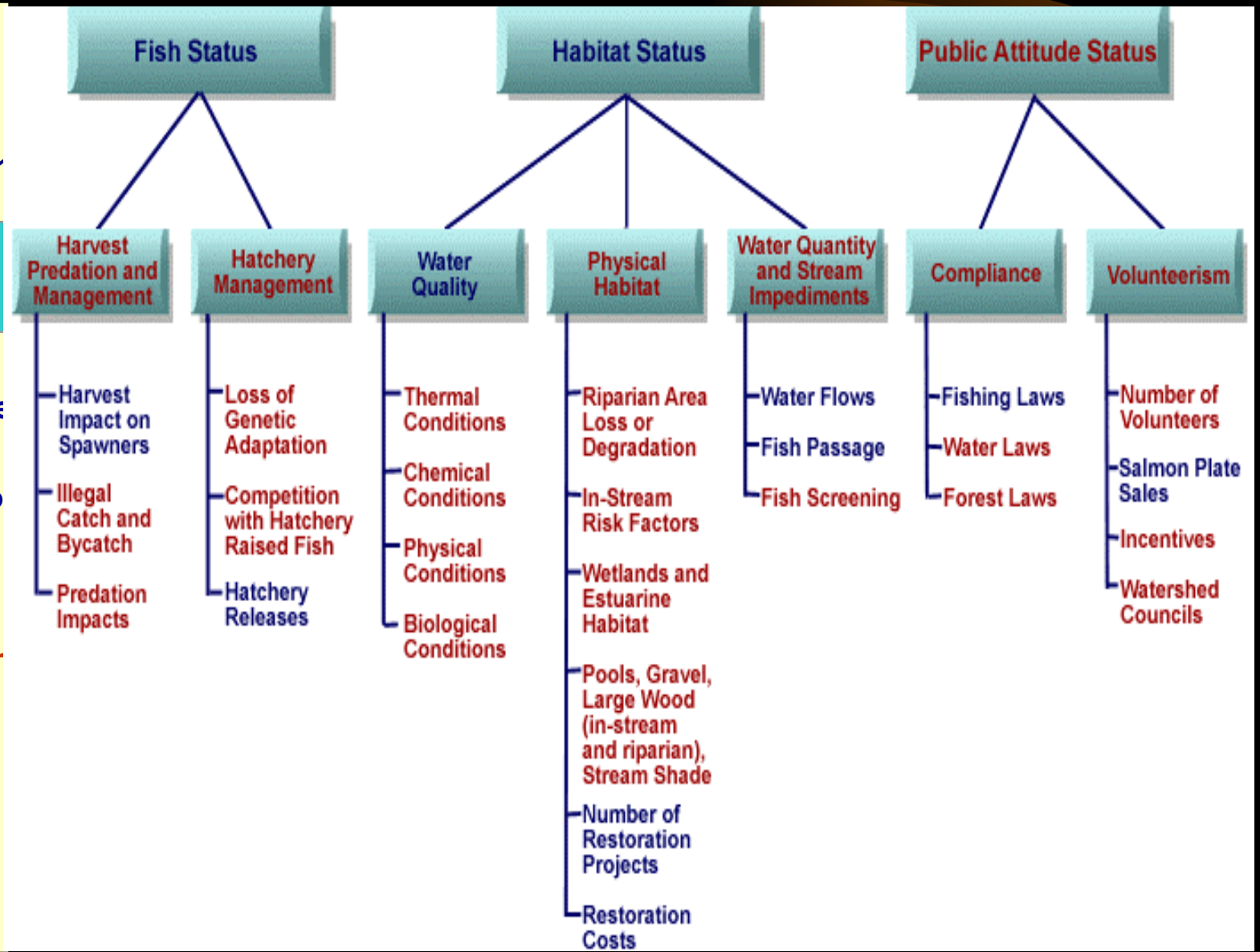
Common Questions

- *What are the significant trends in salmon populations?*
- *What is the productive capacity of aquatic habitats and watershed systems?*
- *What is the effectiveness of restoration actions relative to other factors?*

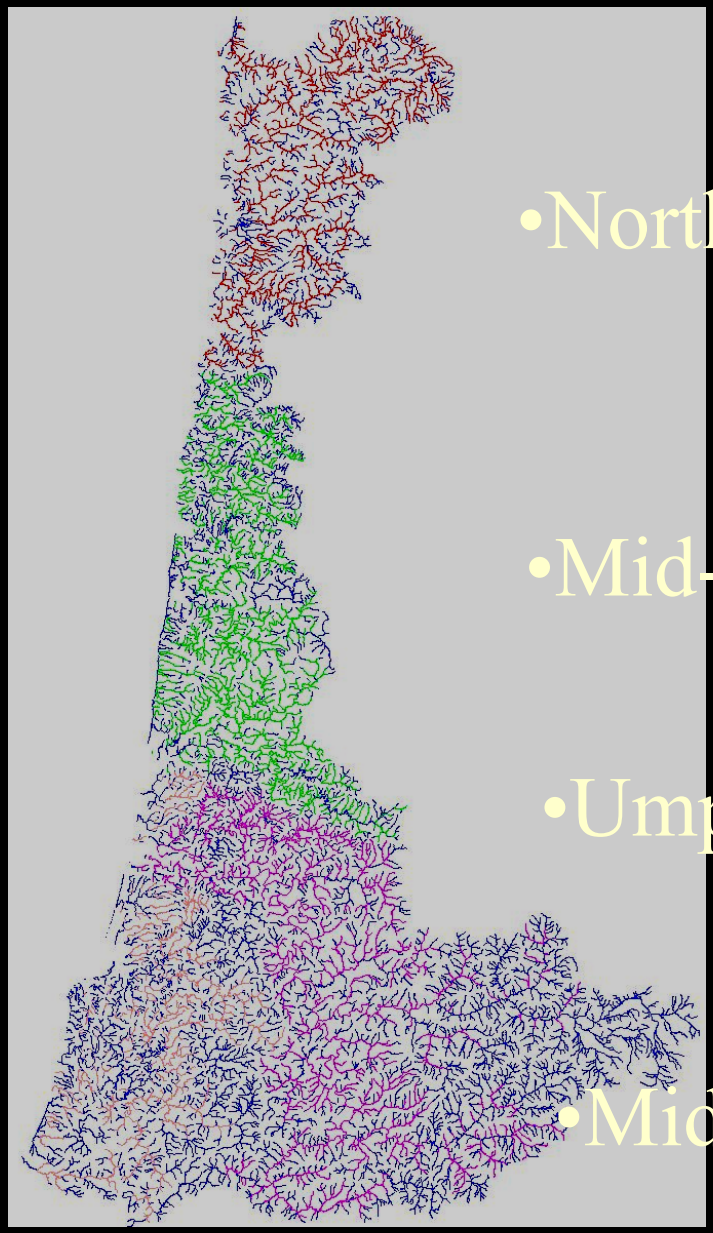
What Should We Monitor? What is the Right Scale?

Sustainable Wild Populations

- Abundance
- Distributio
- Diversity Genetic & Life Histor

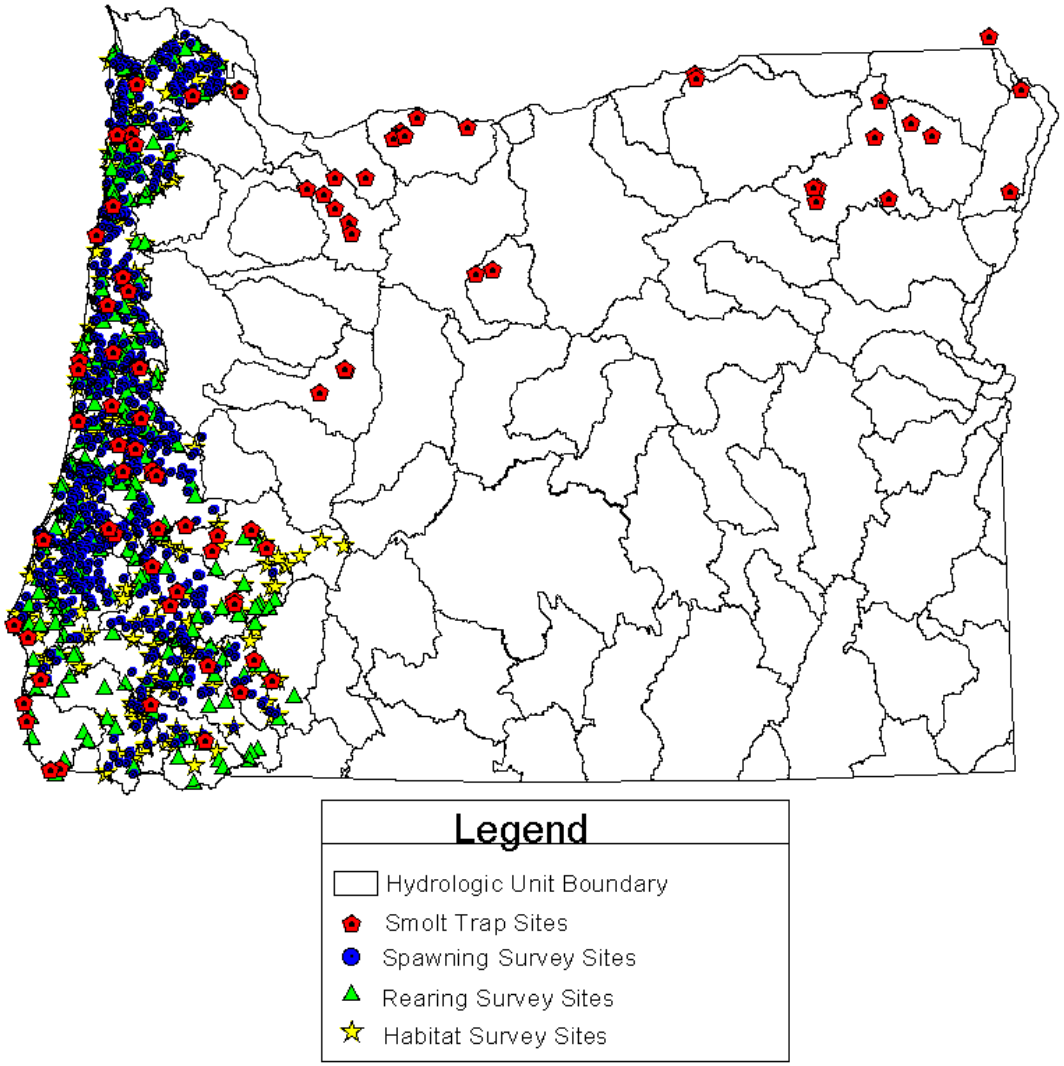


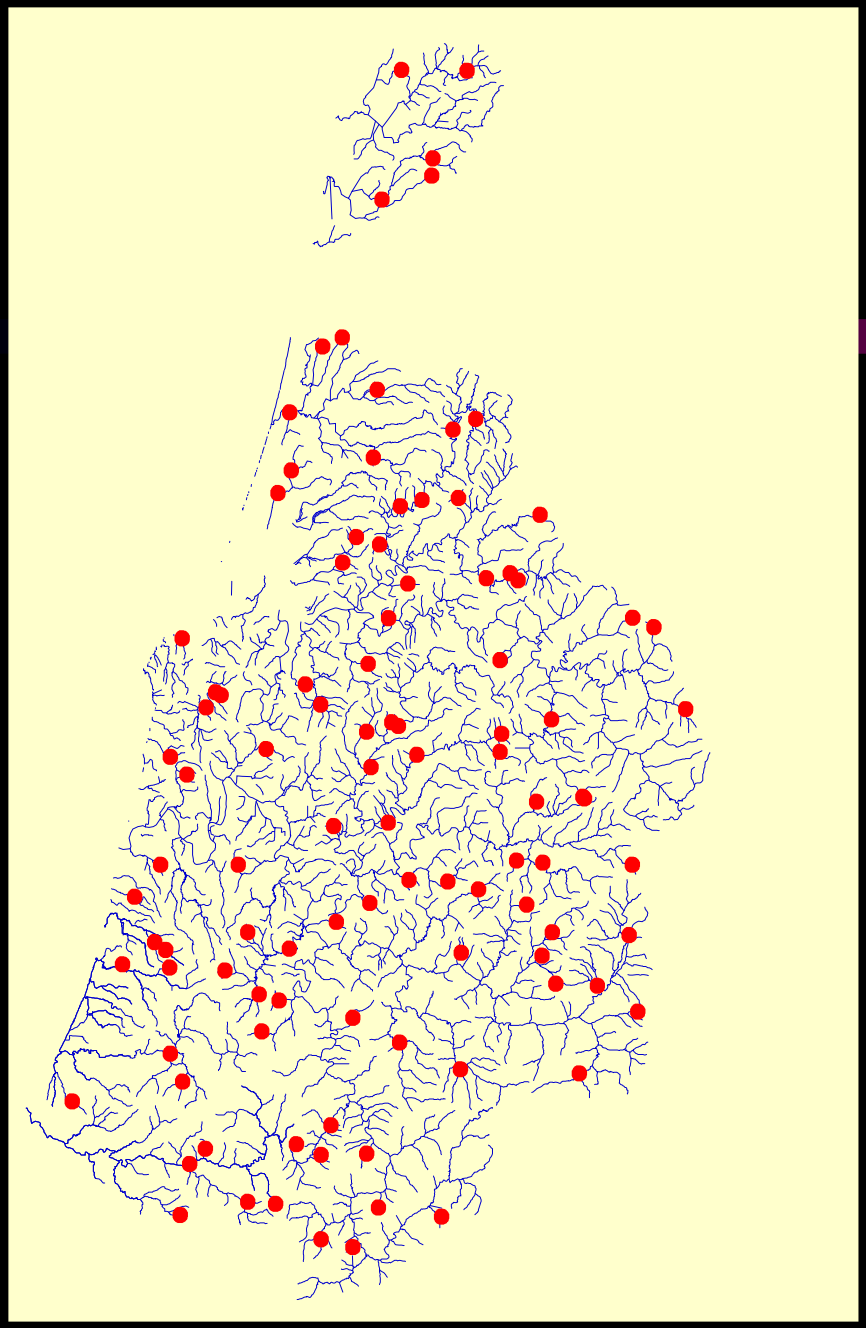
Assessment Areas



- North-coast 1,300 spawning miles
- Mid-coast 1,700 spawning miles
- Umpqua 1,900 spawning miles
- Mid-south 1,000 spawning miles

ODFW Oregon Plan Monitoring
Statewide Downstream Migrant Monitoring





EMAP APPROACH

- Provides a consistent sampling framework to integrate monitoring projects
- Sample sites are determined by a GIS-based spatially balanced random selection process
- Provides a statistically rigorous sampling design to analyze the status and trends in resources

The End