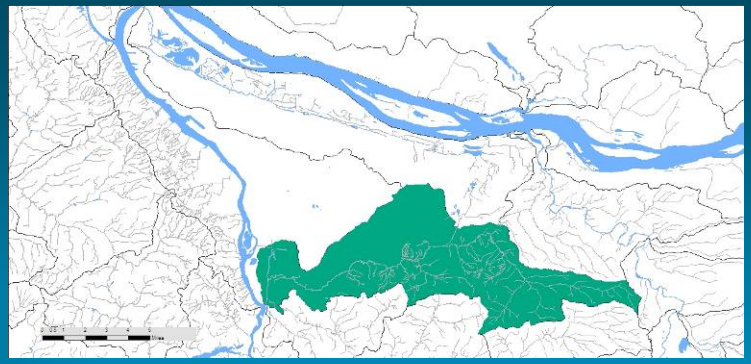
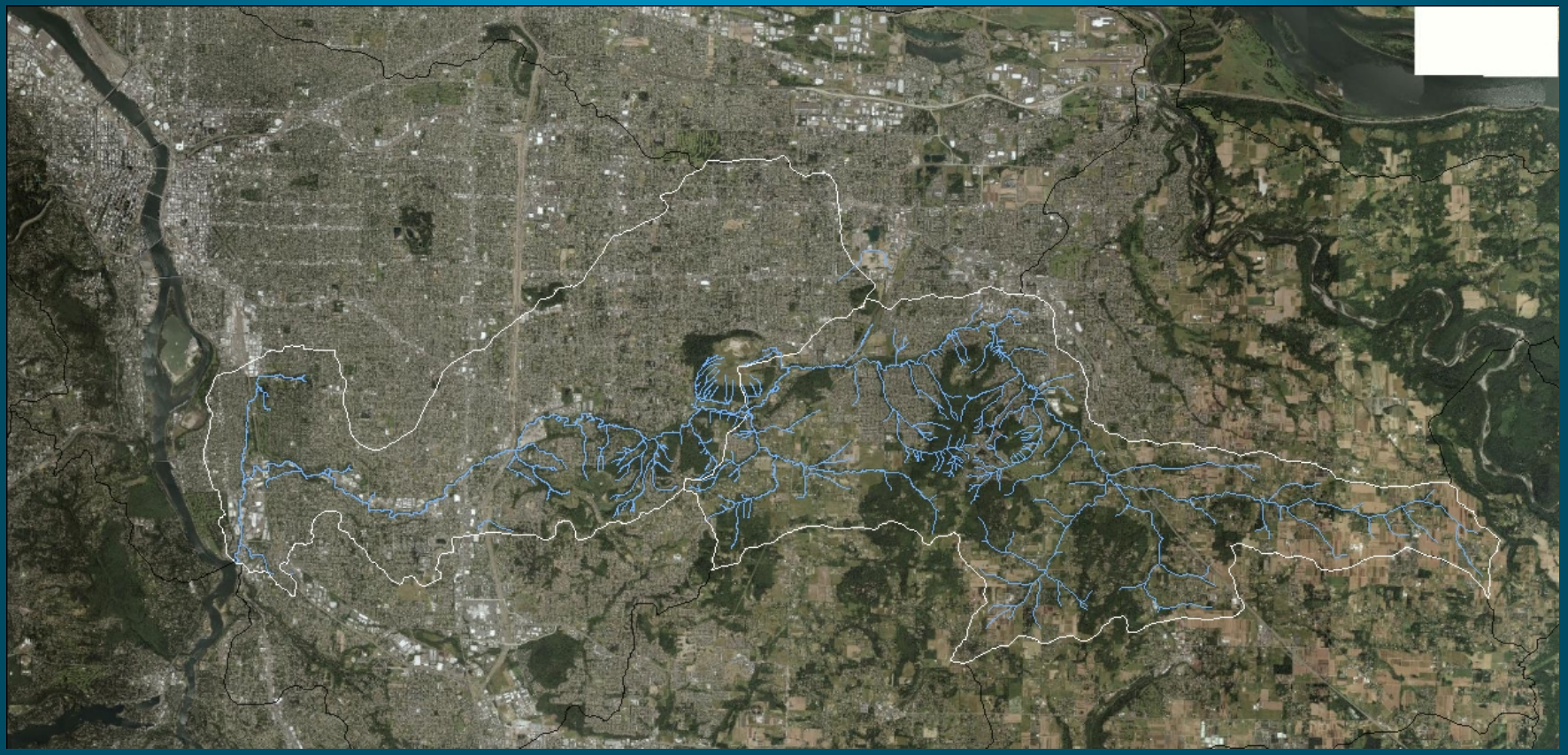
Watershed-wide Macroinvertebrate monitoring in Johnson Creek

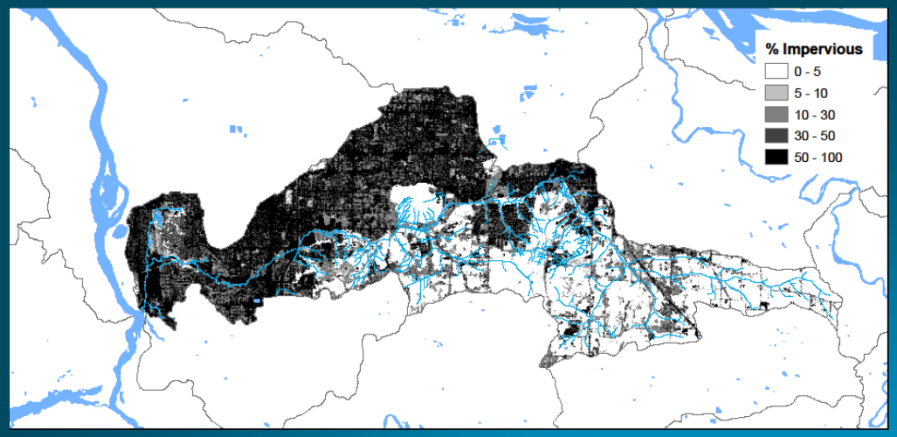
Inter-jurisdictional Committee of Johnson Creek
Roy Iwai - Multnomah County

April 2012
NWQMC

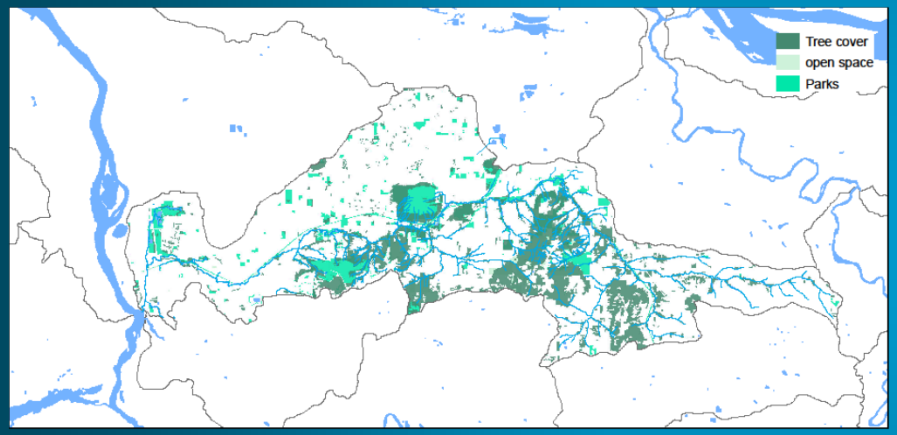
Portland
Salem
Eugene



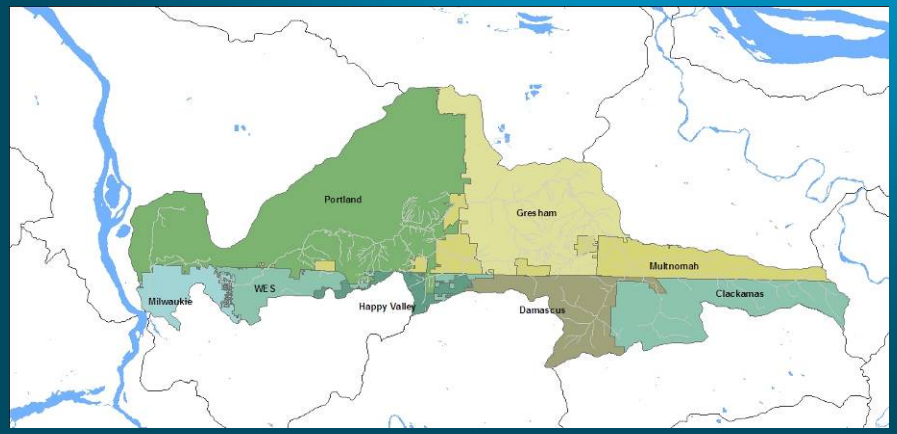




25 miles of mainstem
Area: 54 square acres
Population: 175,000
Elevation: 26 ft - 745 ft
Discharge: 10 - 2,200 cfs



79% Urban/Developed
13 % Forest/Open
8% Ag/Rural



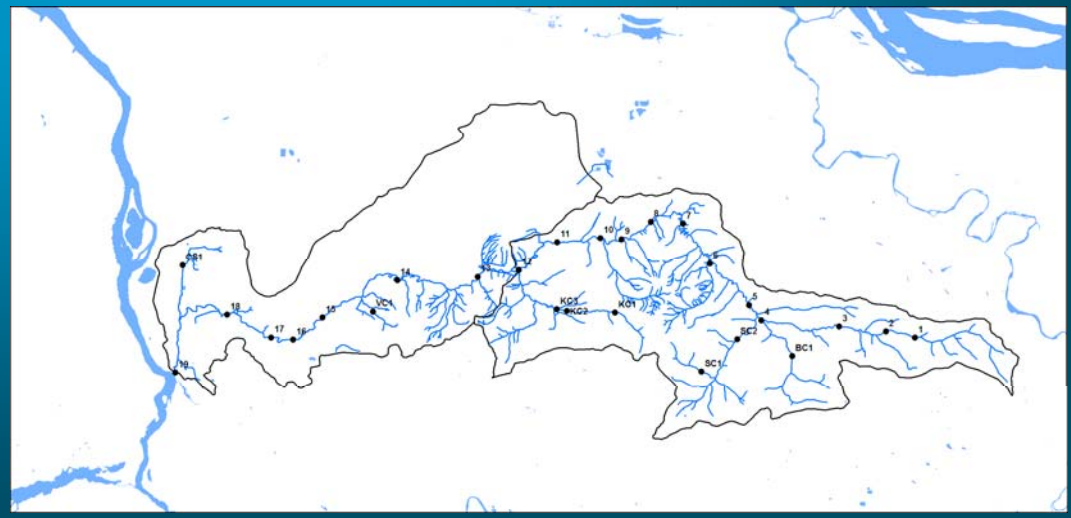
5 Cities and 2 County jurisdictions
Watershed Council
OR DEQ & Agriculture
Metro
East Multnomah & Clackamas SWCD
Friends groups

Survey design

Spatially balanced random sample using a GRTS design (Larsen et al)

- "Oregon Master Sample"
- Ordered list of sample points in which each successive point maintains spatial balance
- Probabilistic vs. targeted approach

Four year rotation –
preliminary results
27 sites, ~100 OTUs



Progress: First Two Years

Preliminary analysis of accumulated macroinvertebrate data and land-use data

- Does the macroinvertebrate community respond to changes in land-use in Johnson Creek?
- Does the response reflect an increase or decrease in biological integrity?
- Can we use these results to improve monitoring efforts and address management concerns?

Methods

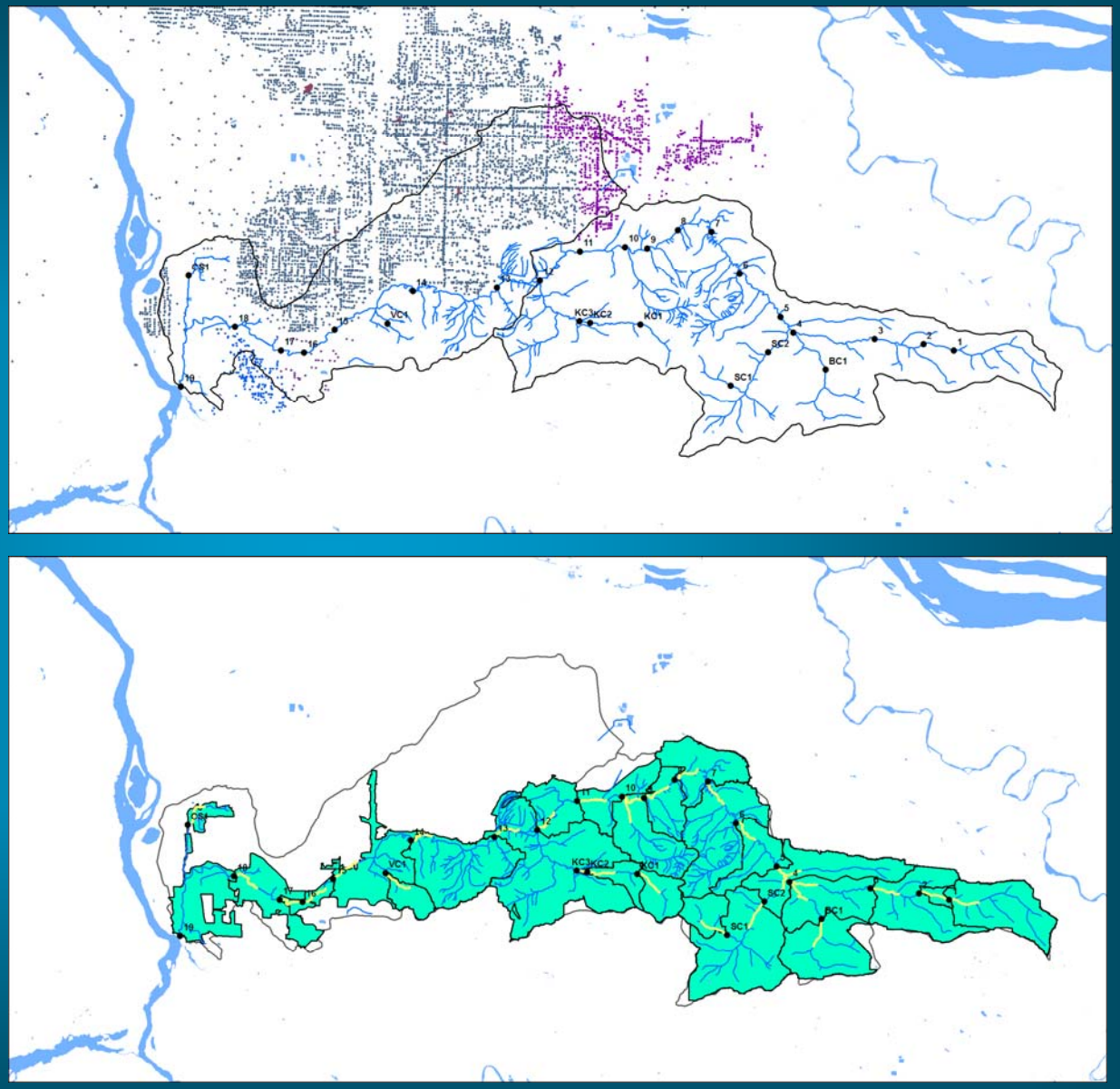
Variables used in the analysis:

Macroinvertebrate Metrics		Land-cover Variables
IBI	PREDATOR O/E	% Canopy
Total Richness	EPT	% Vegetation
Mayfly Rich.	% Shredders	% Impervious
Stonefly Rich.	% Scrapers	Road Density
Caddisfly Rich.	% Coll-Gath.	
# Sensitive	% Coll-Filt.	
# Sediment Sens.	% Predators	
Modified HBI		
% Tolerant		
% Sediment Tol.		
% Dominance		

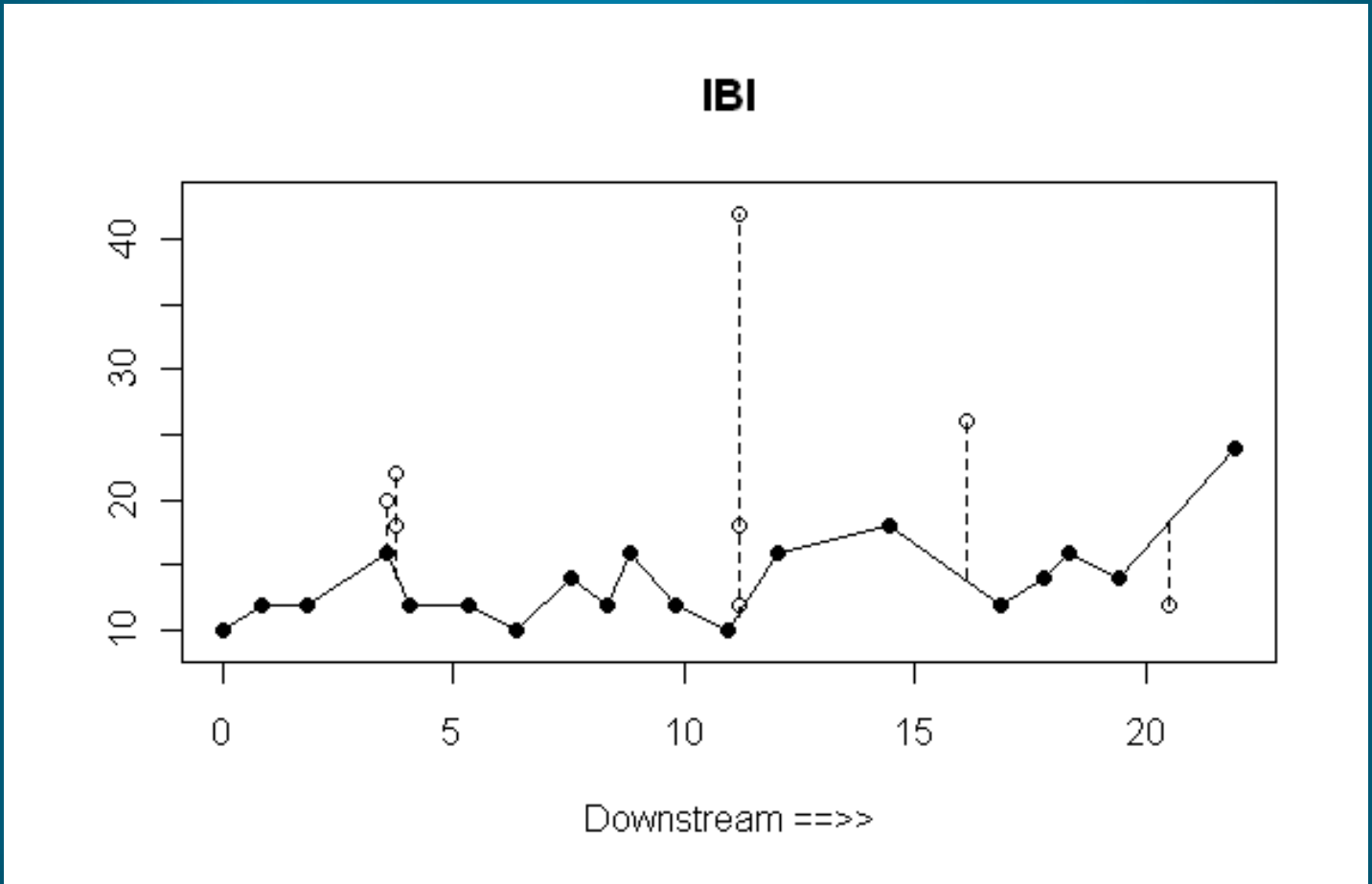
Methods

4 scales of analysis for land use variables:

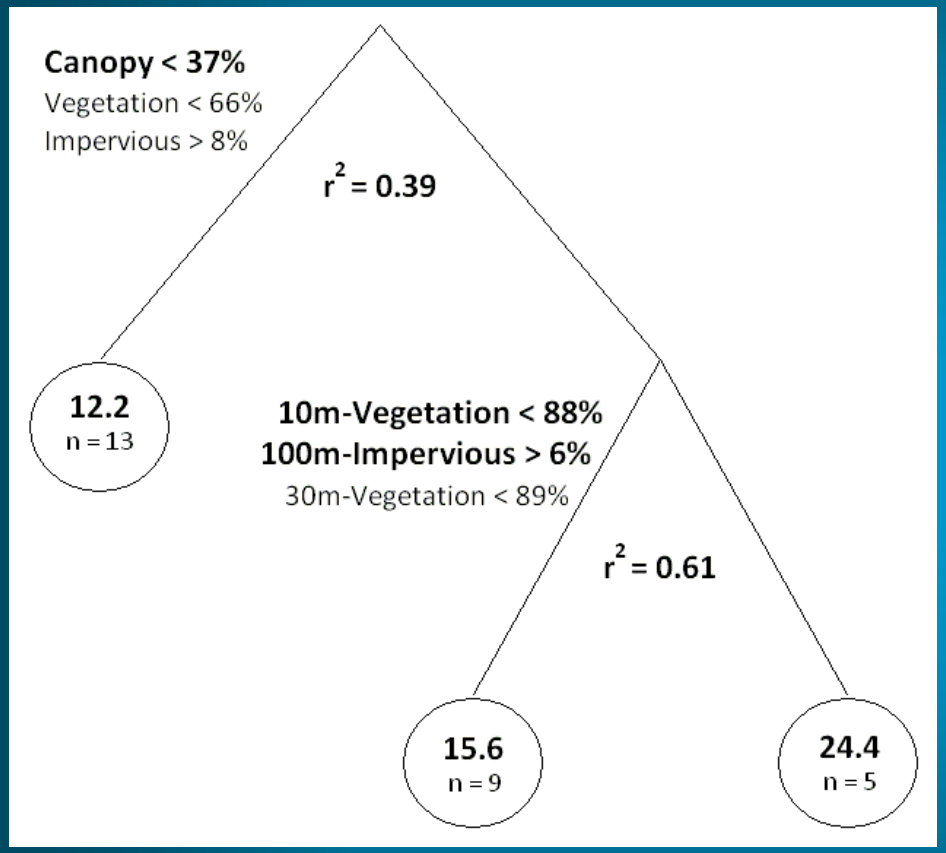
1. 10m buffer, 1km
2. 30m buffer
3. 100m buffer
4. Subbasin area

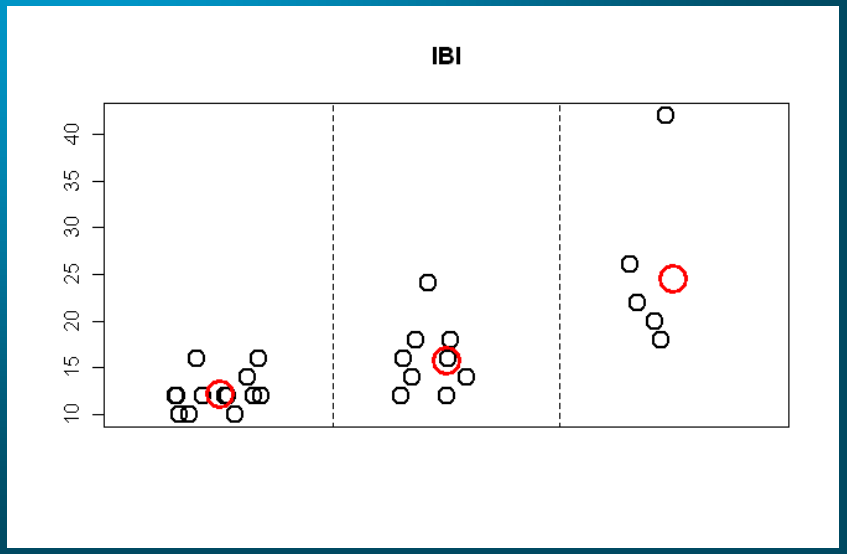


Index of Biotic Integrity

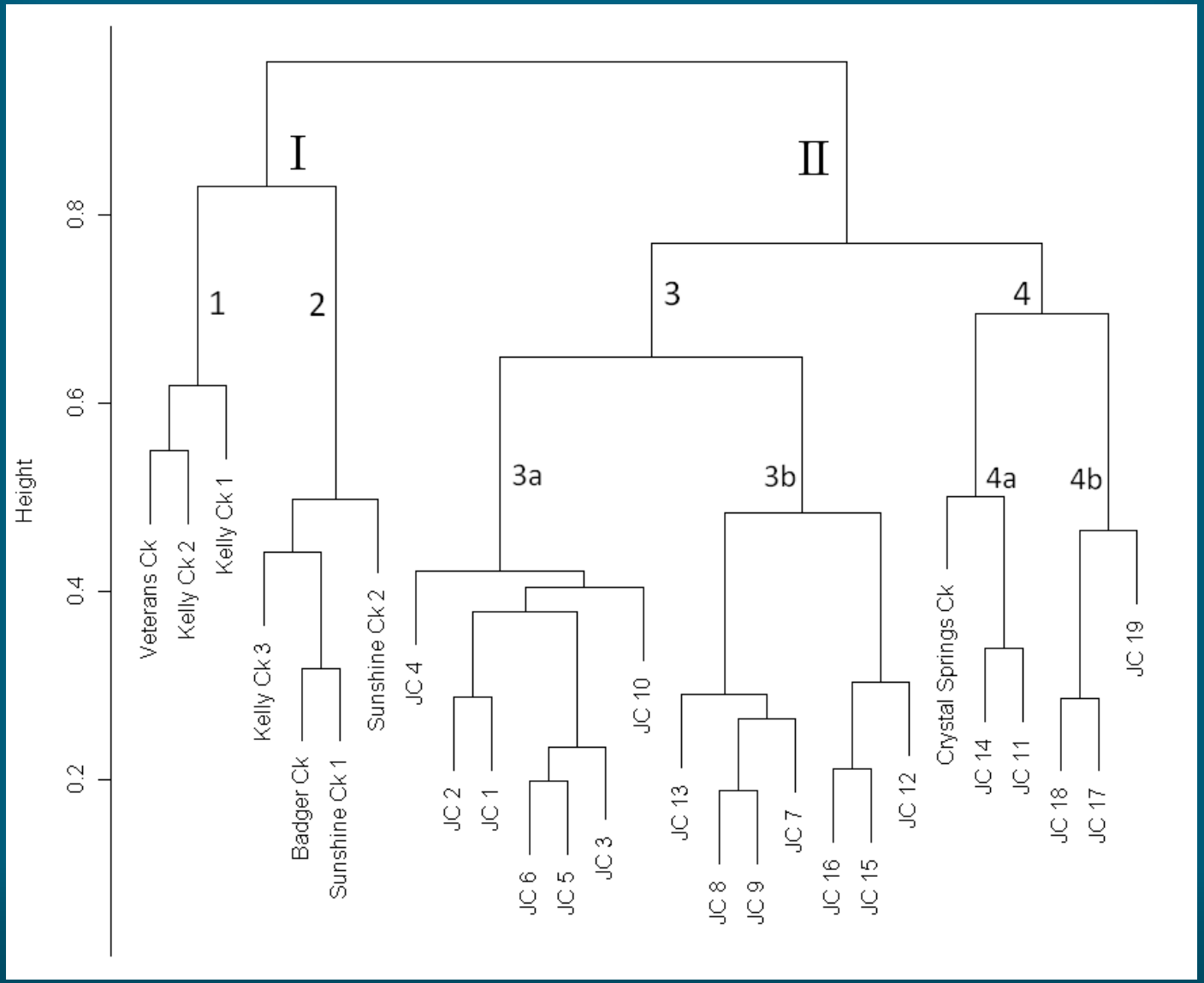


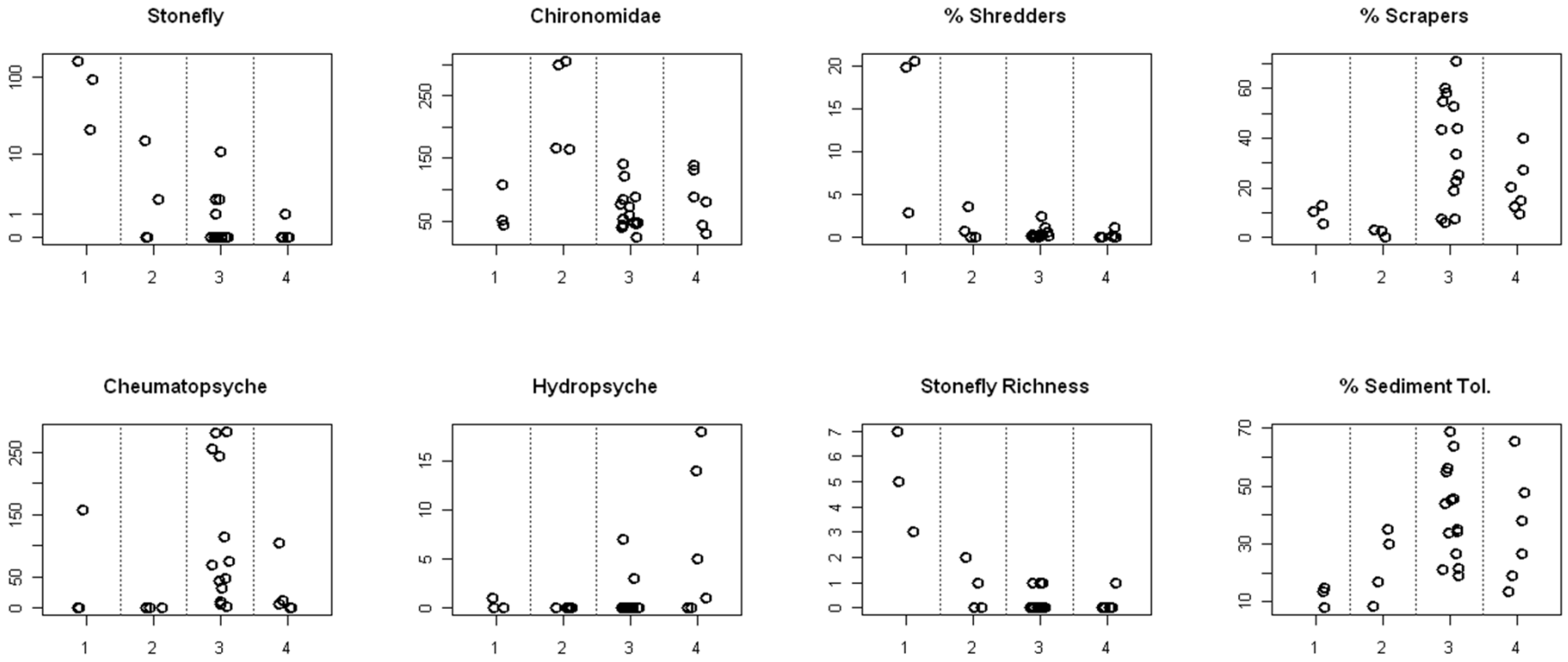
Classification And Regression Tree model (CART)



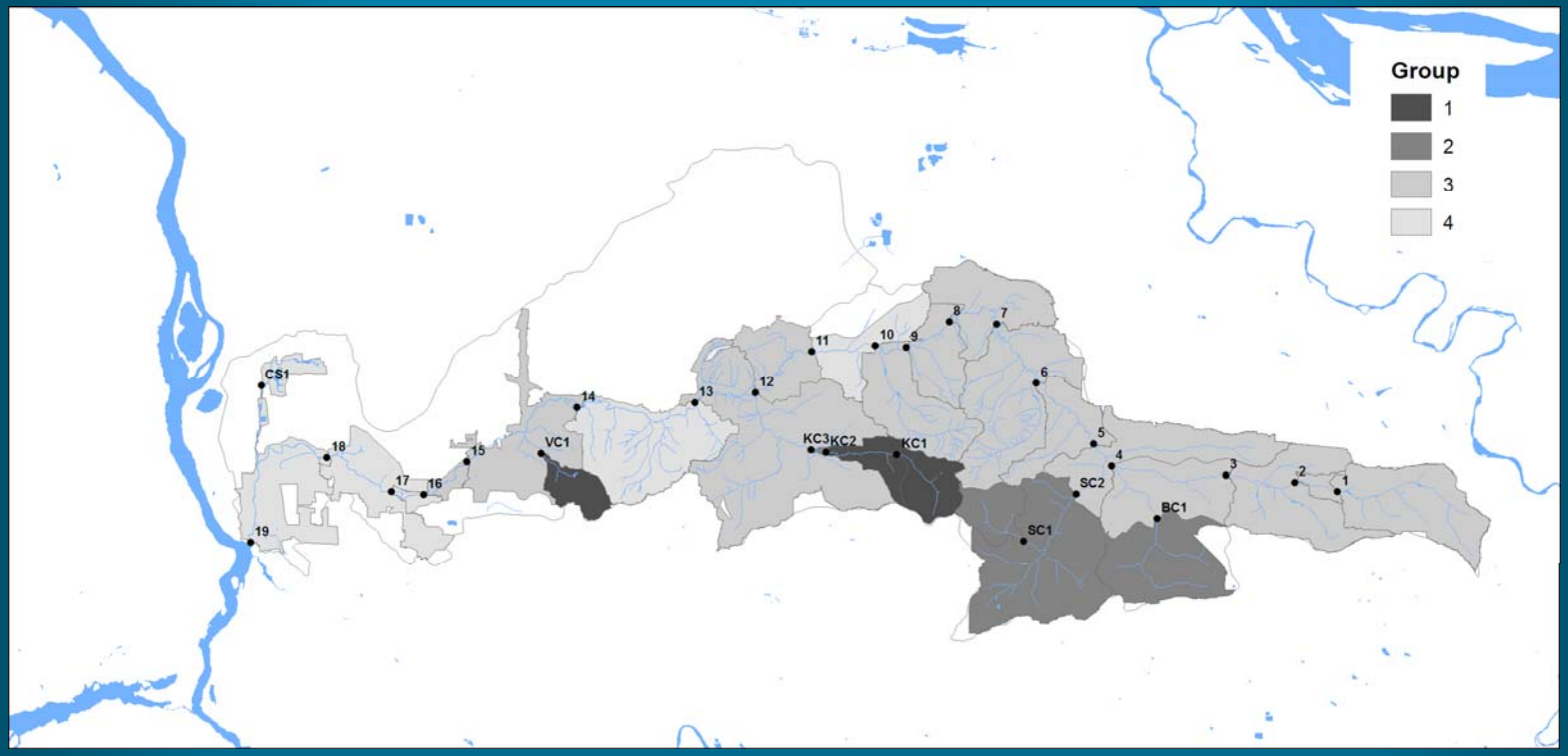


Cluster Analysis

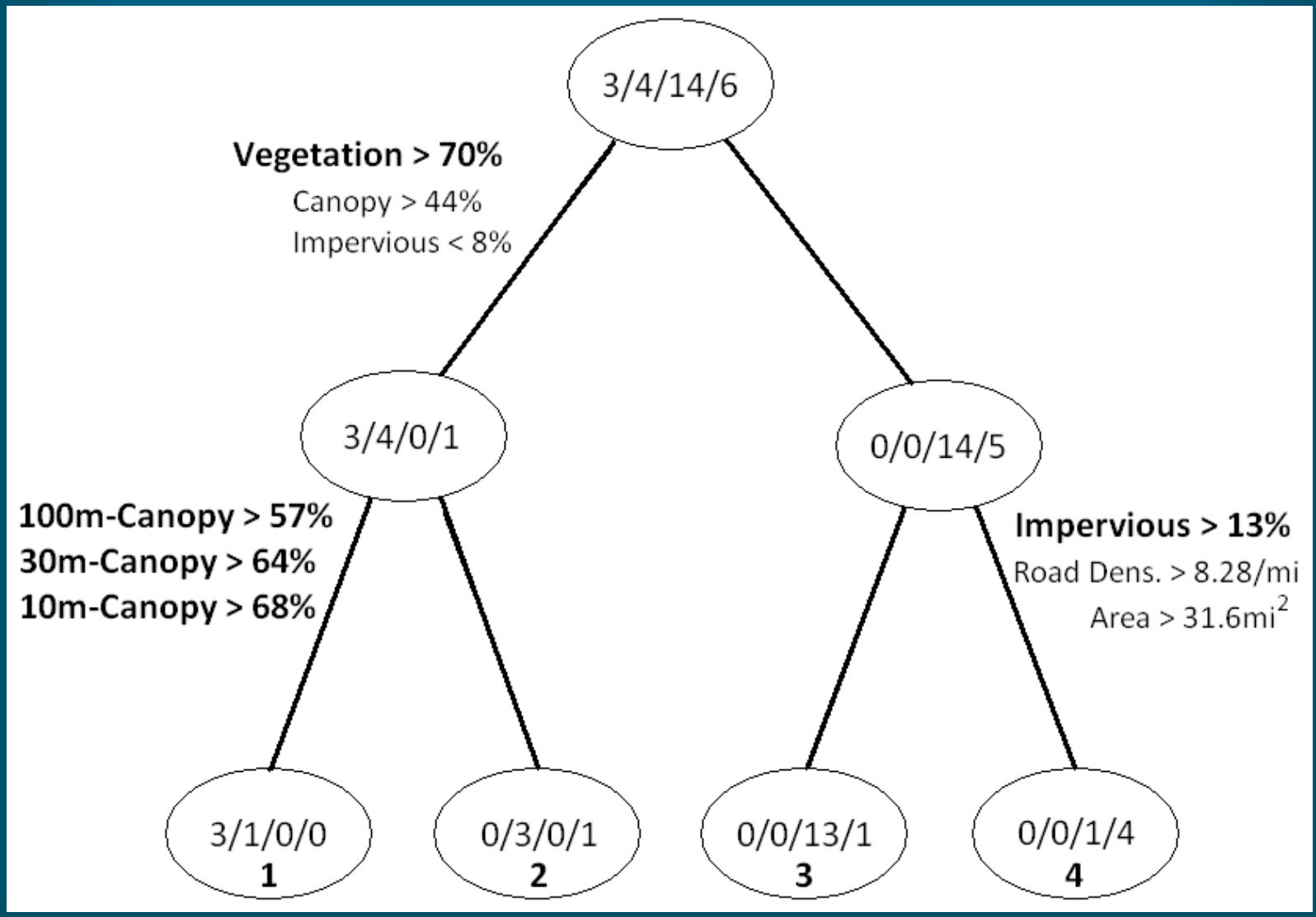


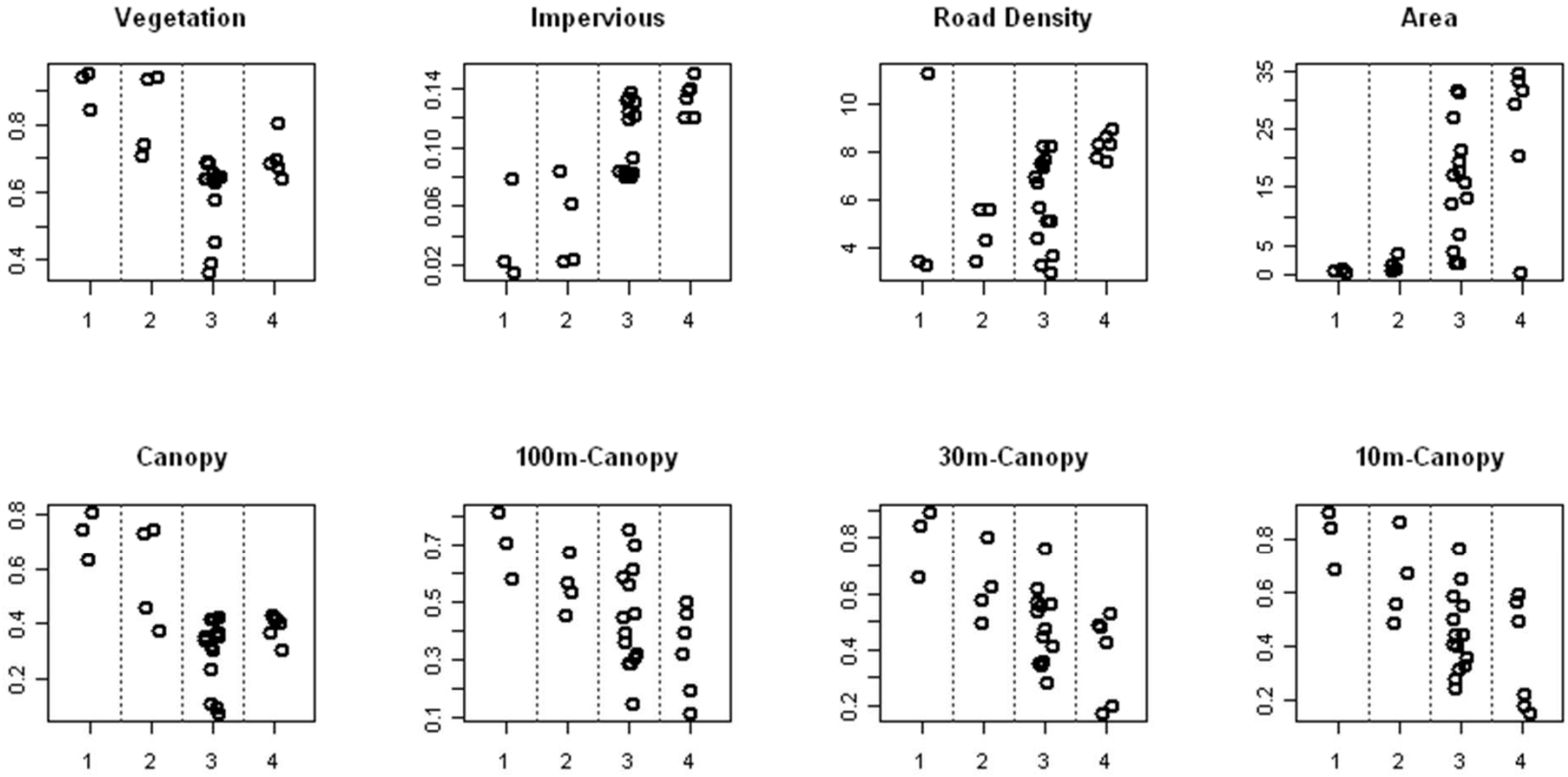

Stonefly
Chironomidae
% Shredders
% Scrapers
Cheumatopsyche
Hydropsyche
Stonefly Richness
% Sediment Tol.

Cluster groups

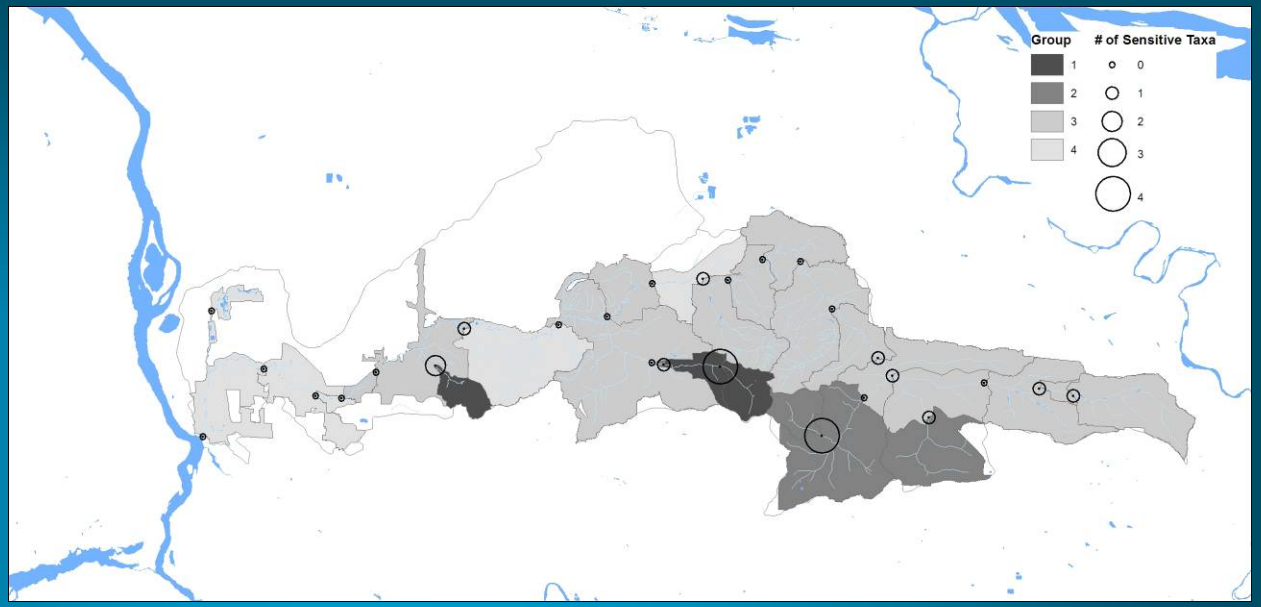


Classification And Regression Tree model (CART)

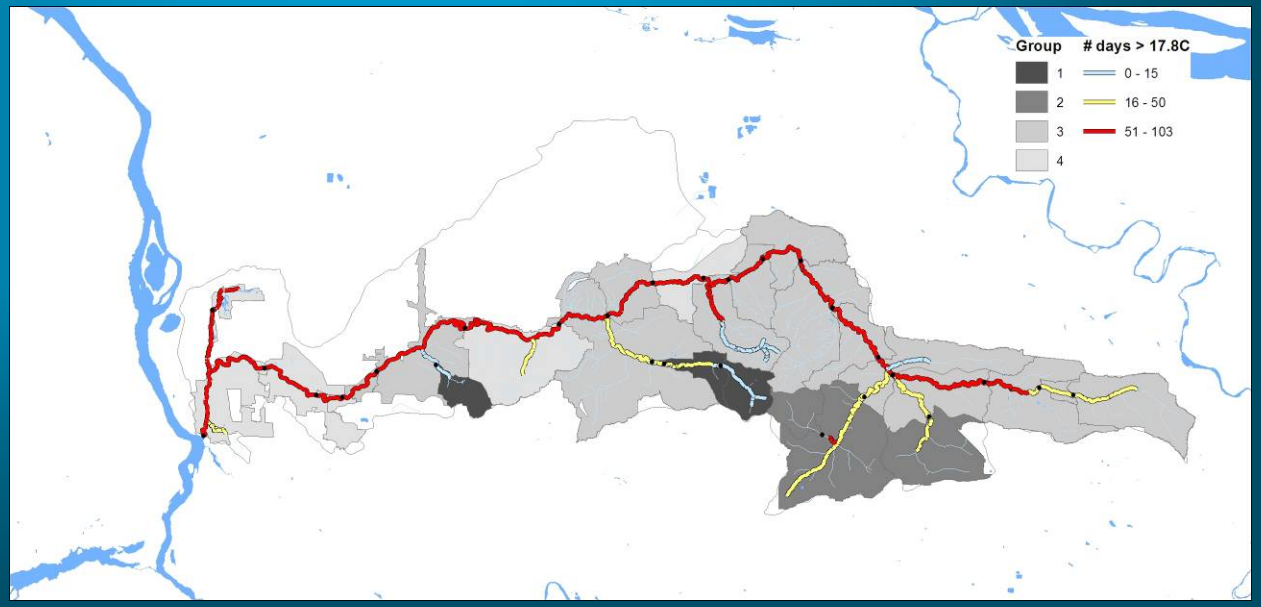


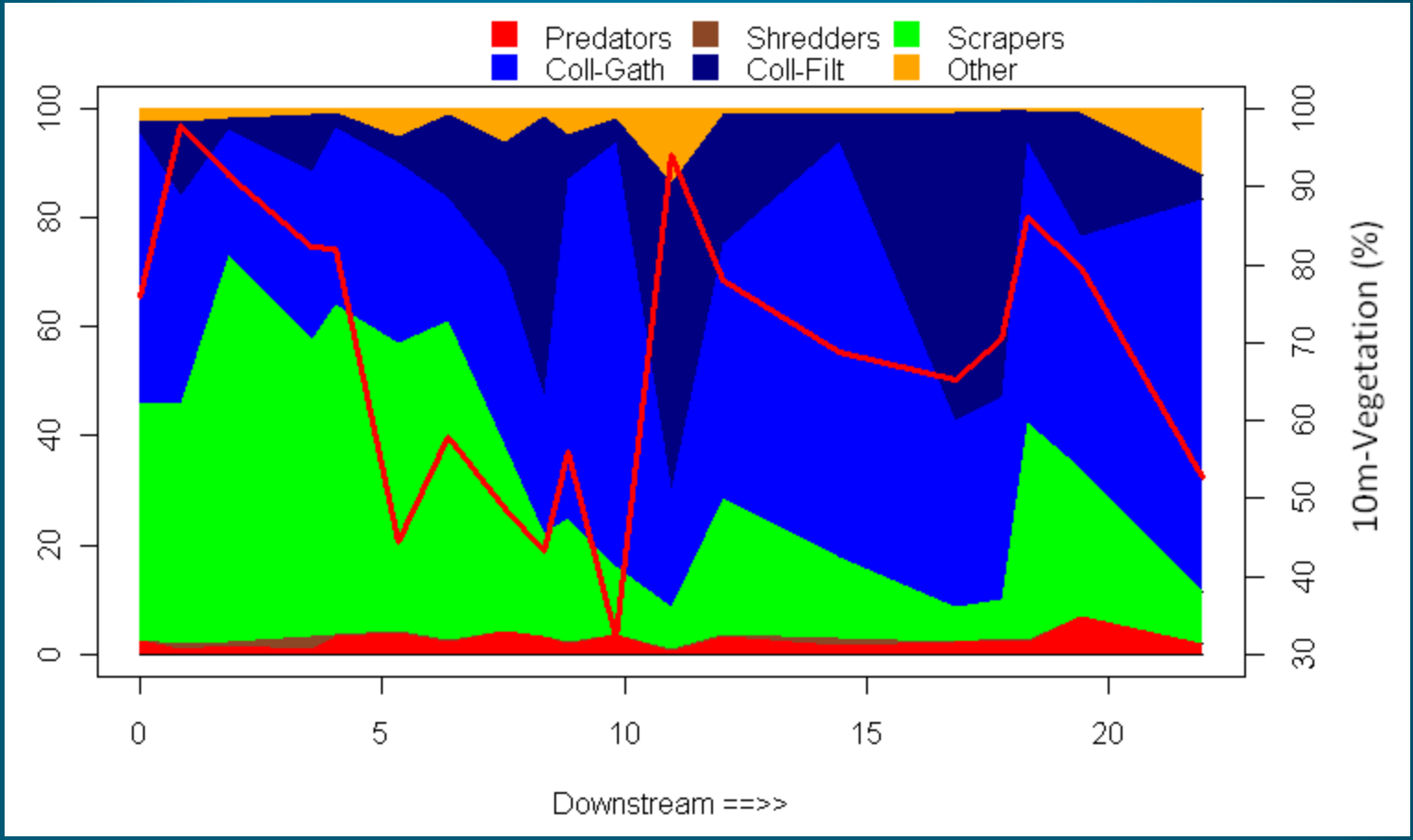

Vegetation
0.4
0.6
0.8
1
2
3
4
Impervious
0.02
0.06
0.10
0.14
1
2
3
4
Road Density
4
6
8
10
1
2
3
4
Area
0
5
15
25
35
1
2
3
4
Canopy
0.2
0.4
0.6
0.8
1
2
3
4
100m-Canopy
0.1
0.3
0.5
0.7
1
2
3
4
30m-Canopy
0.2
0.4
0.6
0.8
1
2
3
4
10m-Canopy
0.2
0.4
0.6
0.8
1
2
3
4

Sensitive Species



Temperature




Predators
Shredders
Scrapers
Coll-Gath
Coll-Filt
Other
0
20
40
60
80
100
30
40
50
60
70
80
90
100
10m-Vegetation (%)
0
5
10
15
20
Downstream ==>>

Conclusions

What do we learn from our preliminary analysis?

- Macroinvertebrate samples indicate severe disturbance in all but a few sites; differences between habitats and communities can be discerned
- Relationships with land-use may be confounded by correlations with a down-stream gradient
- Need for continued coordination for watershed-wide monitoring and assessments
- Further study can inform prioritization of strategies for watershed restoration

Thank you

Roy Iwai, Multnomah County
Jeff Meacham, PSU
Chris Prescott, City of Portland
Johnson Creek IJC members