



Assessment of Aquatic Biological Communities Along a Gradient of Urbanization in the Willamette Valley Ecoregion, Oregon and Washington

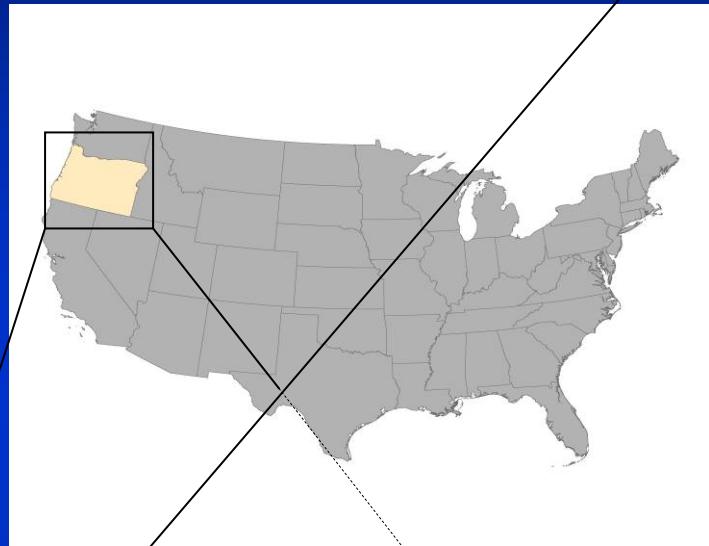
**Ian Waite, Kurt Carpenter, Andrew Arnsberg,
Frank Rinella, Steve Sobieszczyk, Ian Wigger,
Curt Hughes and Mike Sarantou**

National Water-Quality Assessment (NAWQA) Program

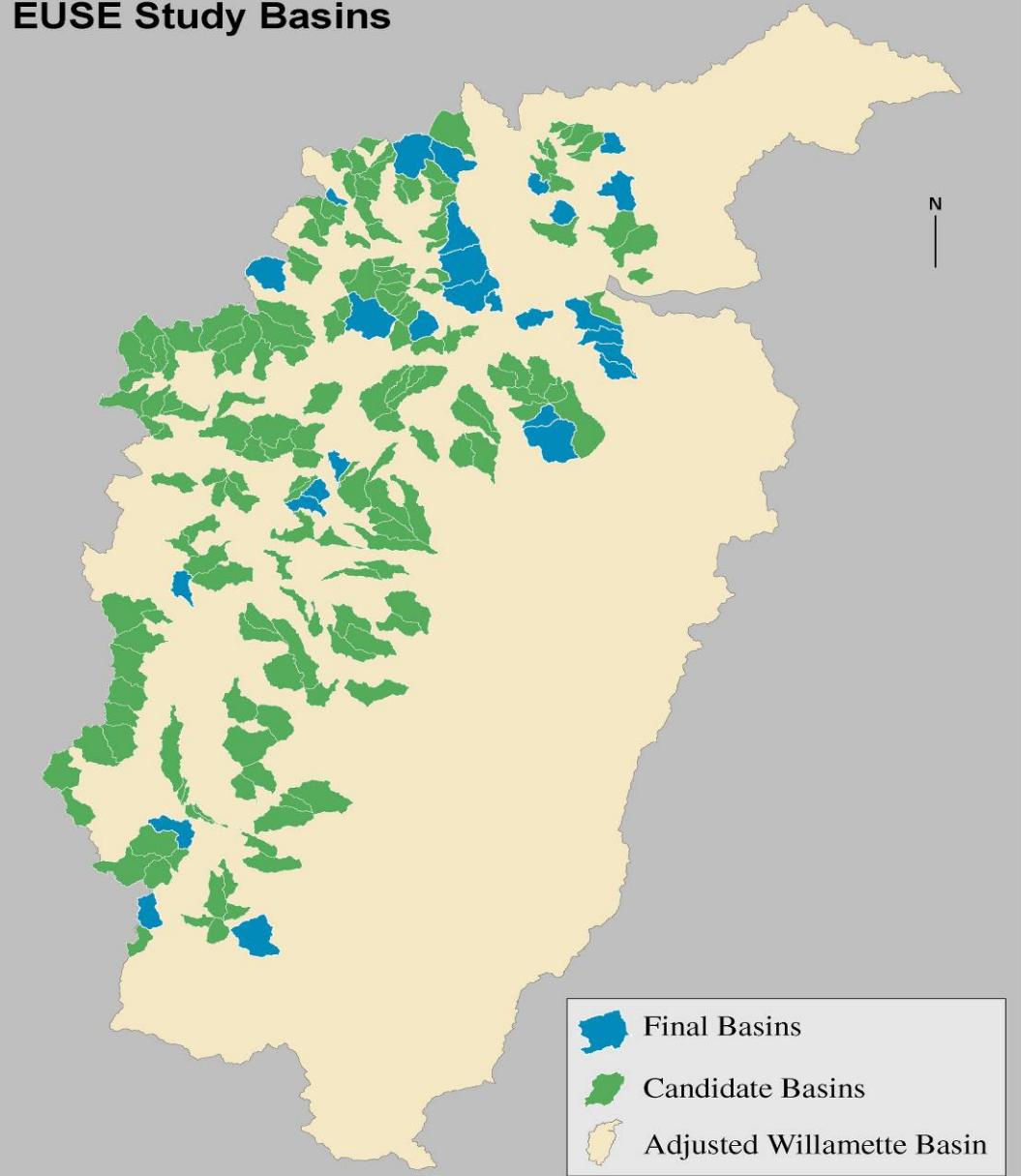


NAWQA Urban Gradient Studies

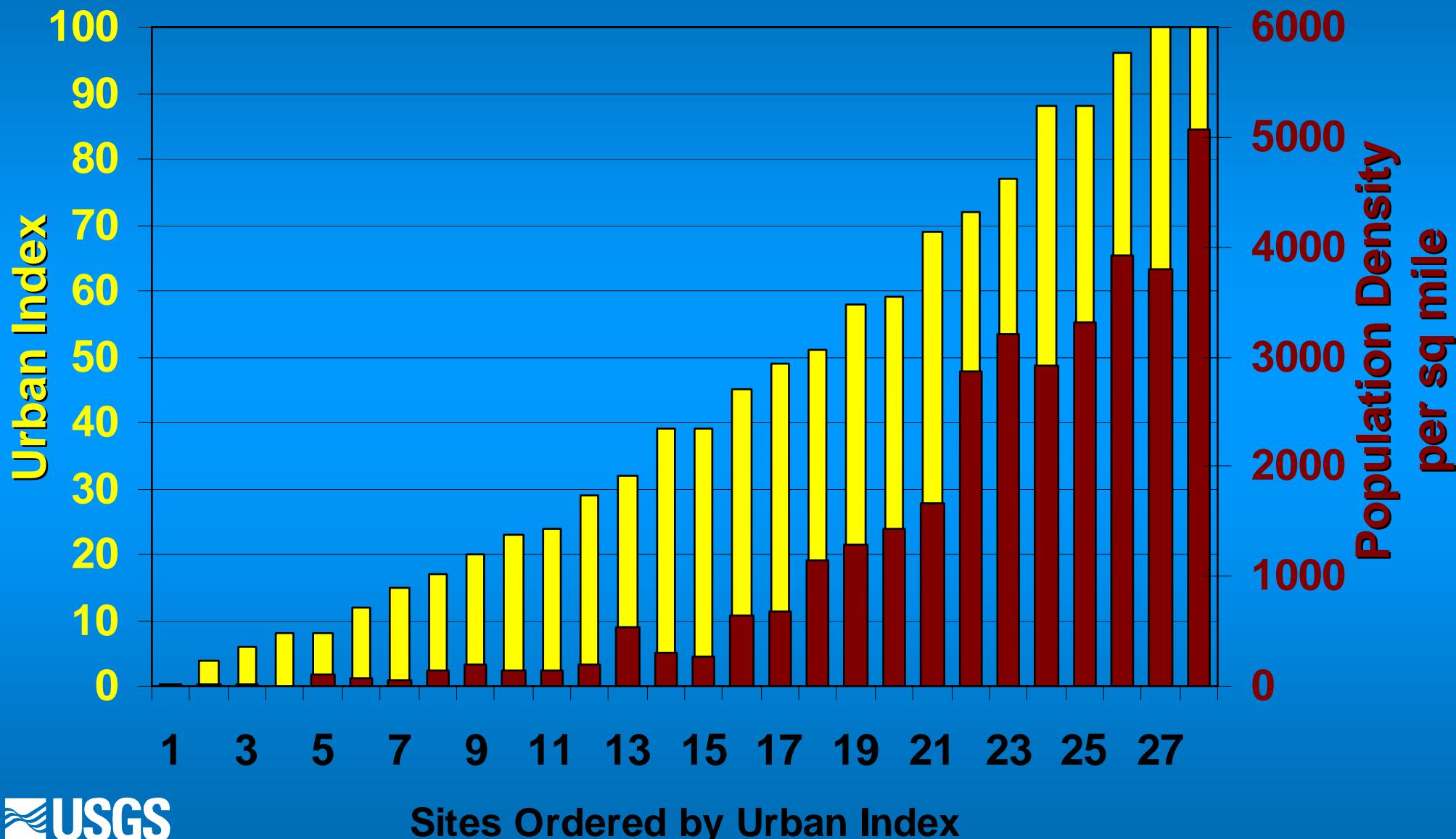
Willamette River Valley, Oregon



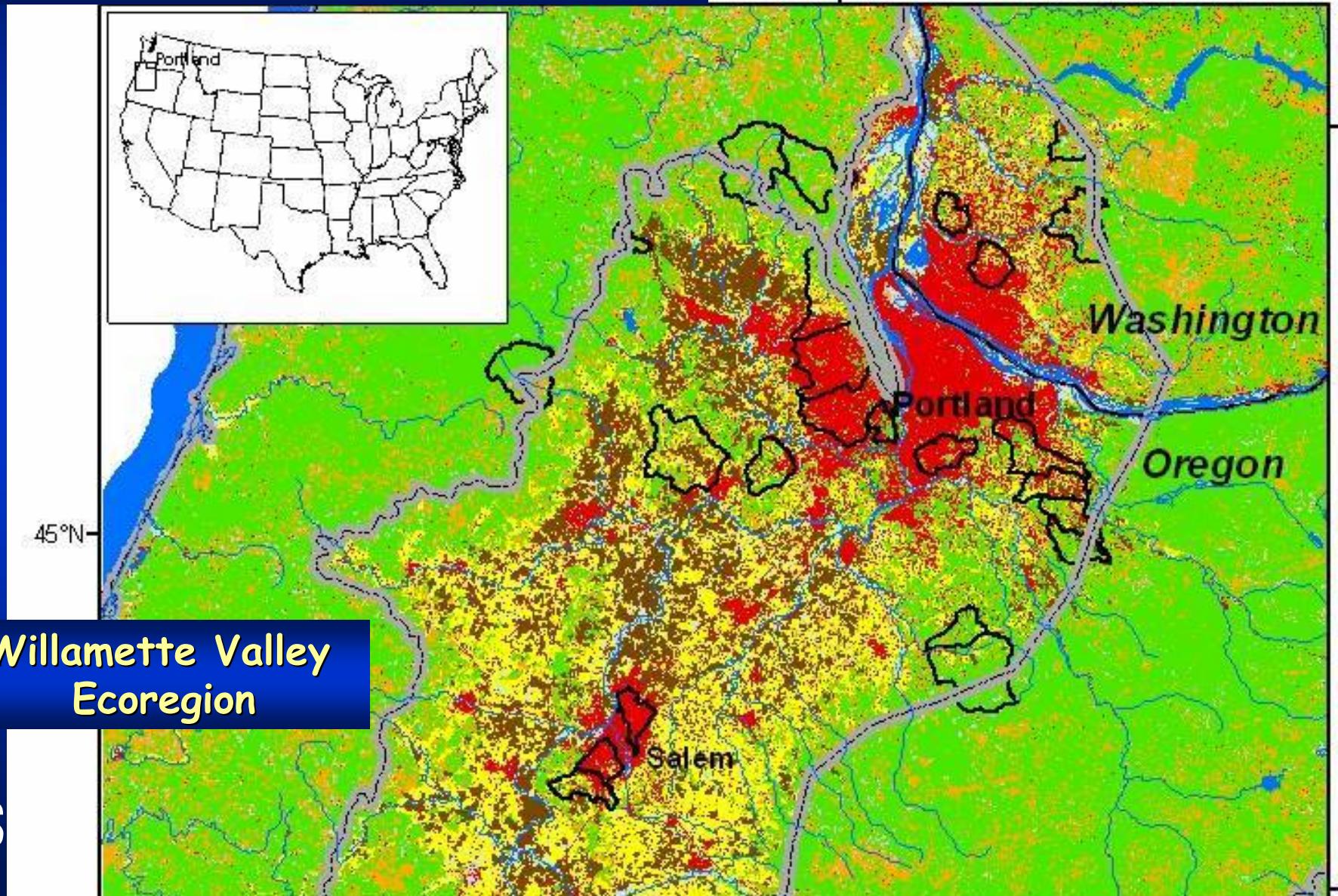
EUSE Study Basins



Willamette Urban Intensity Index



Willamette Urban and Ag



Tickle Creek near Boring, Oregon



Urban Index = 32

Urban Streams



Claggett Creek



Amazon Creek



Pringle Creek

Urban Index = 77 - 100



Invertebrate



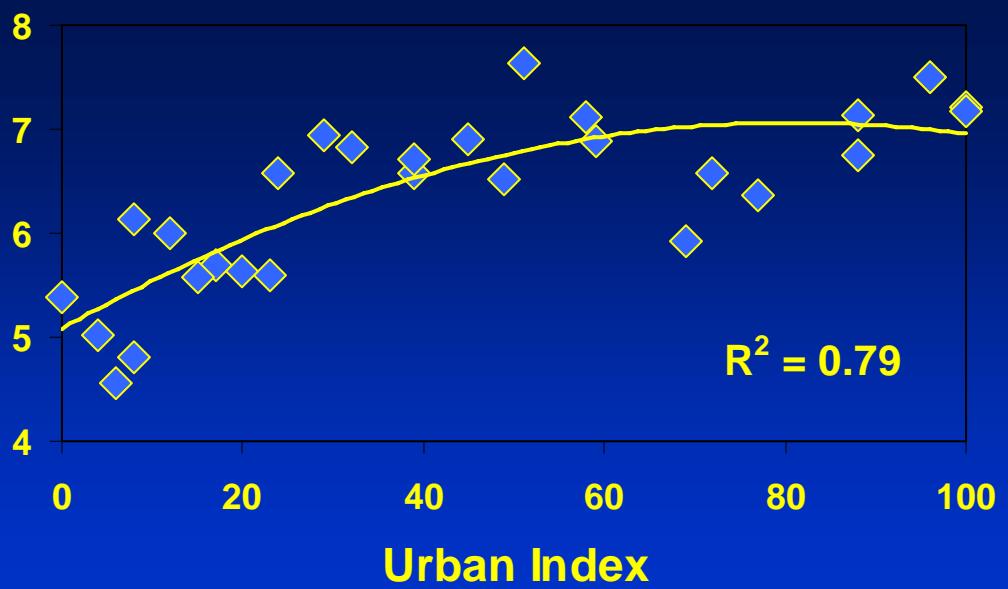
Water chemistry



Habitat



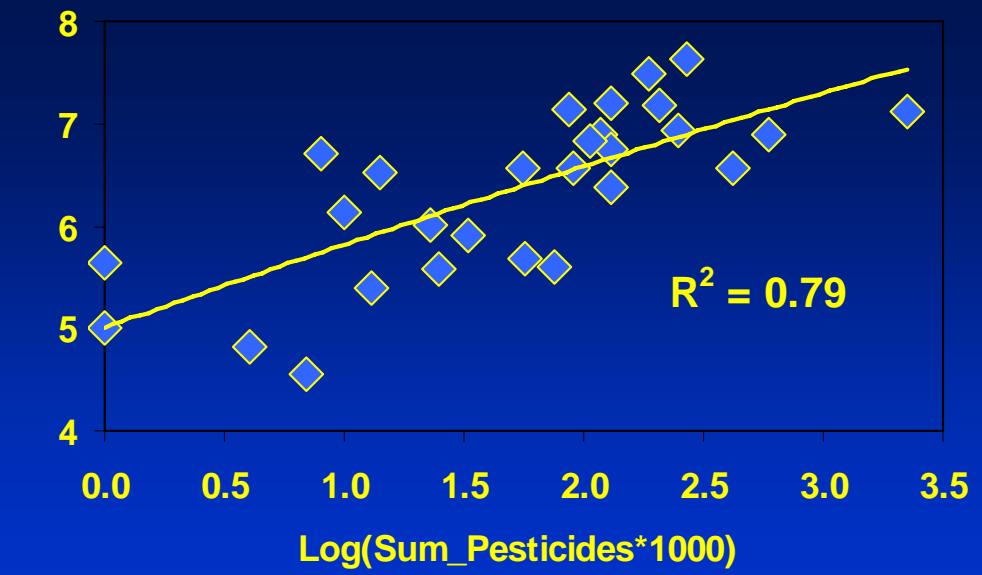




Urban Index

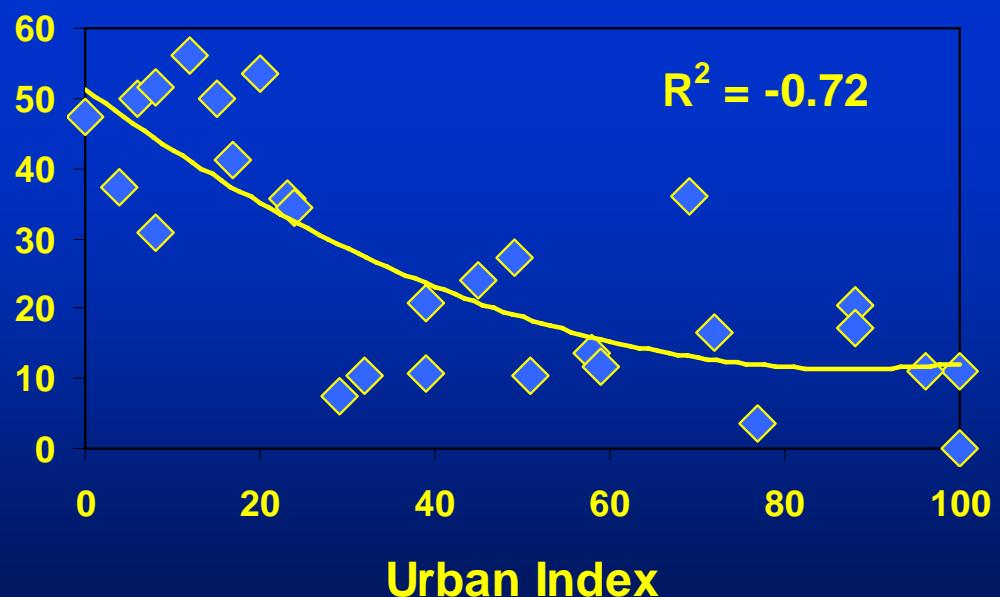
Y-Axis Invertebrate Tolerance (Weighted Abundance)

$R^2 = 0.79$



Log(Sum_Pesticides*1000)

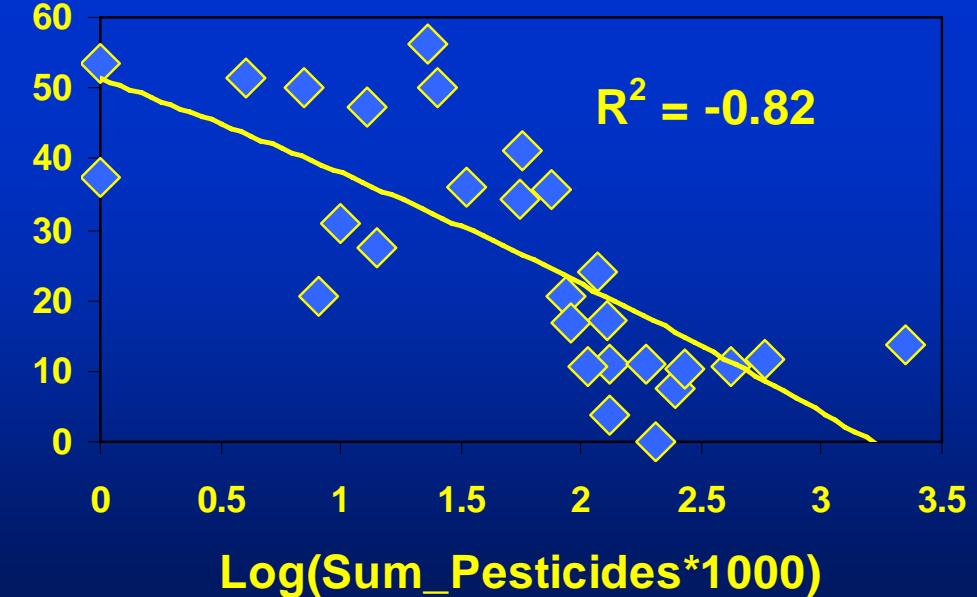
$R^2 = 0.79$



Urban Index

Y-Axis % Ephemeroptera Plecoptera Trichoptera Richness

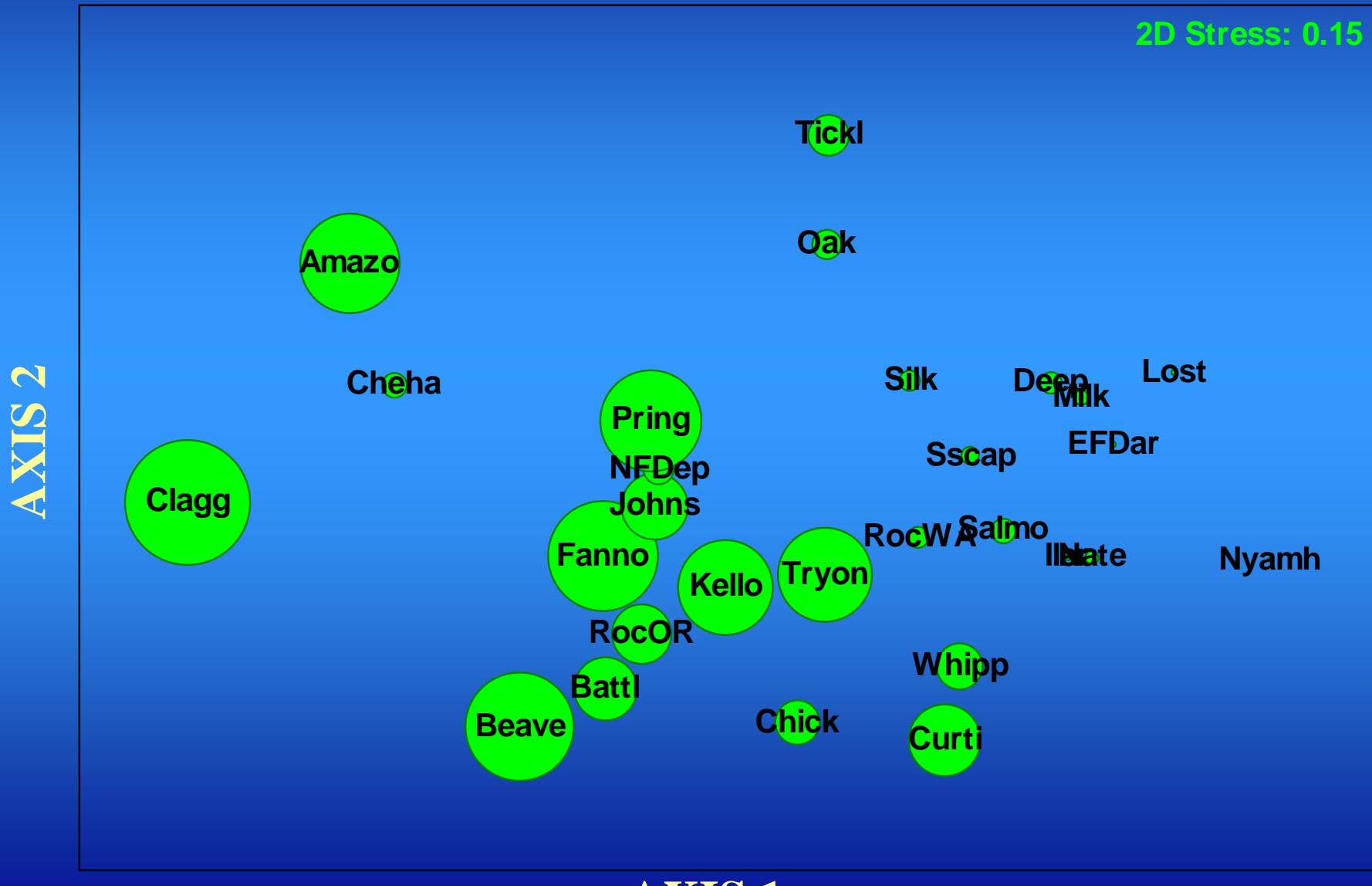
$R^2 = -0.72$



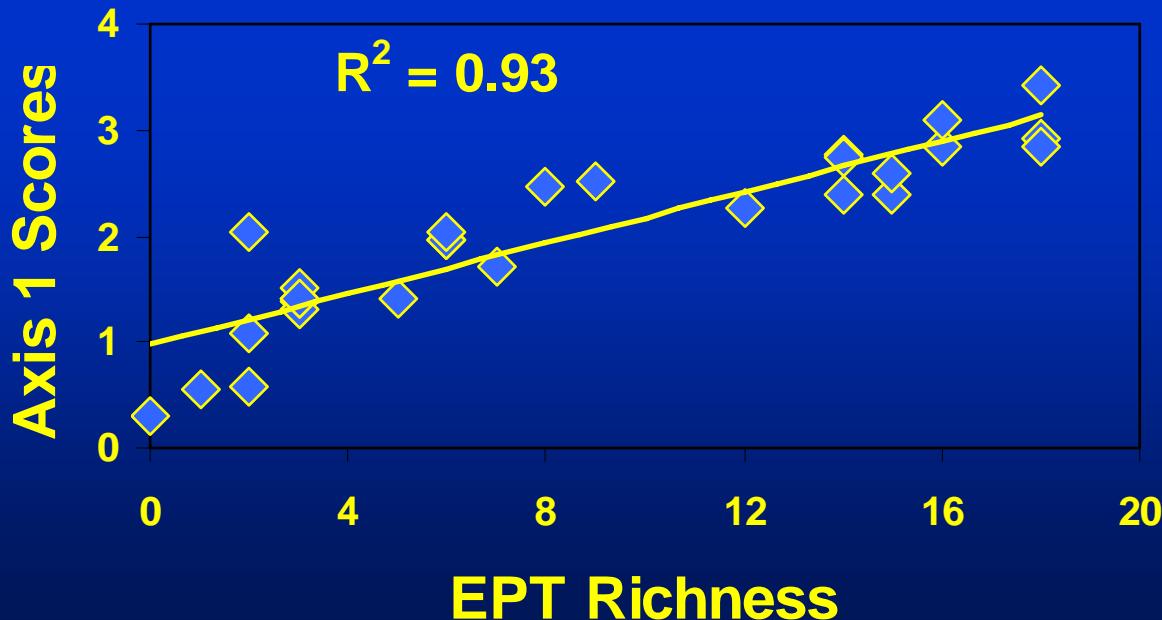
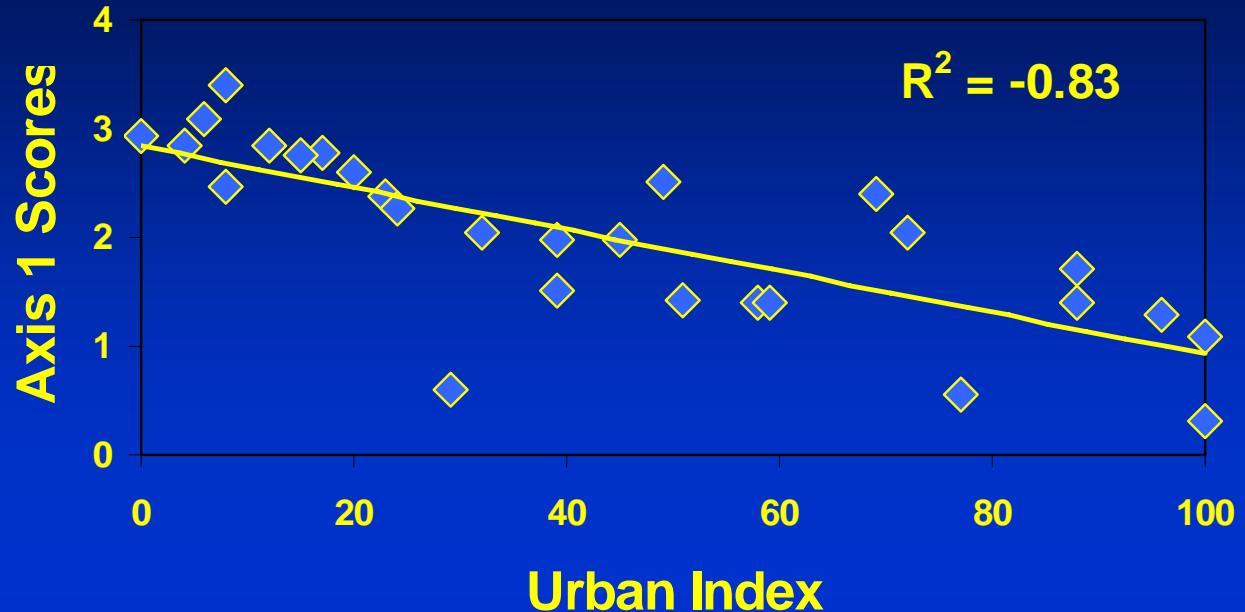
Log(Sum_Pesticides*1000)

$R^2 = -0.82$

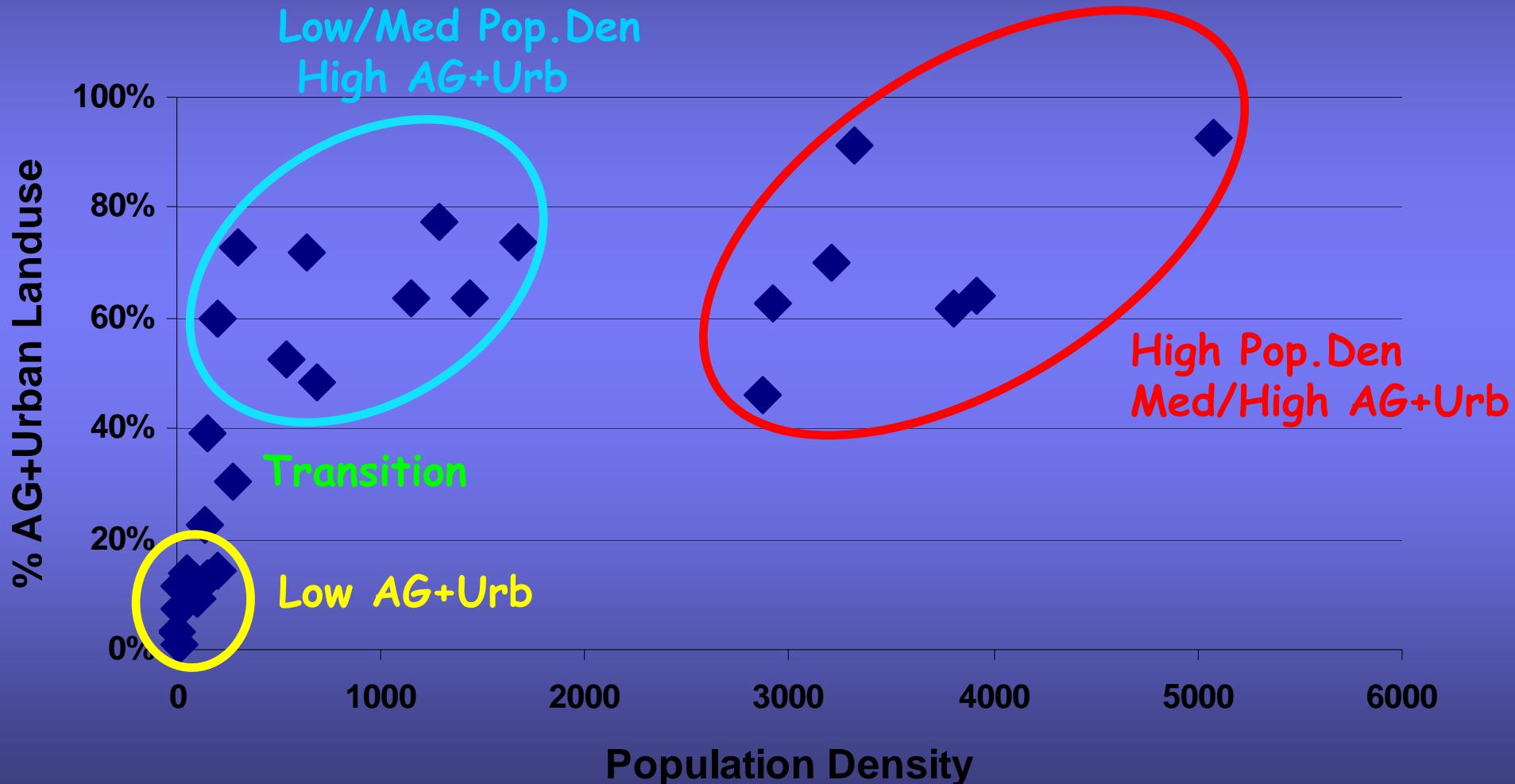
nMDS Ordination of Invertebrate Density (Log X+1) w/ overlay of Population Density



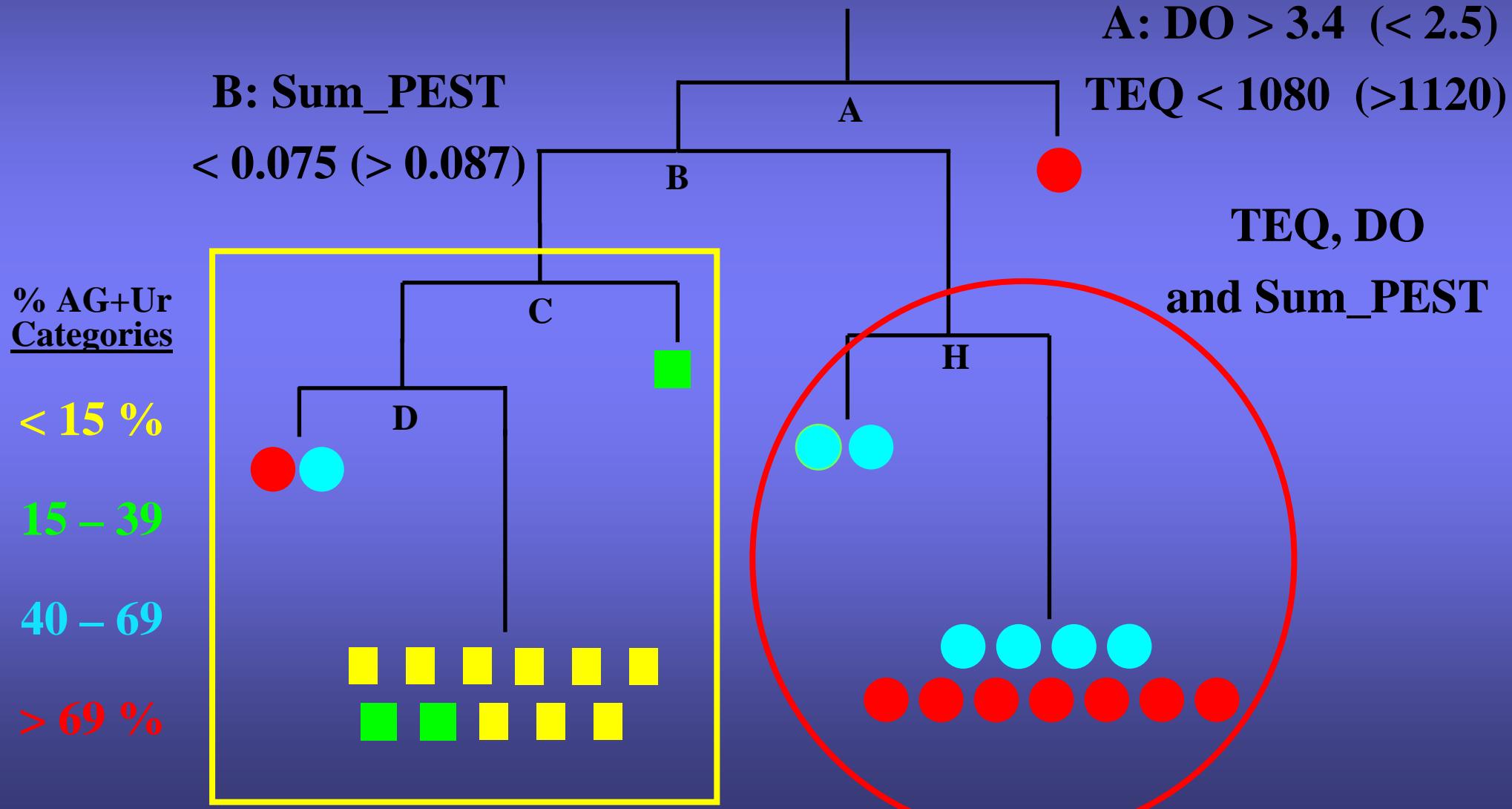
What variables are related to the Ordination Axis 1?



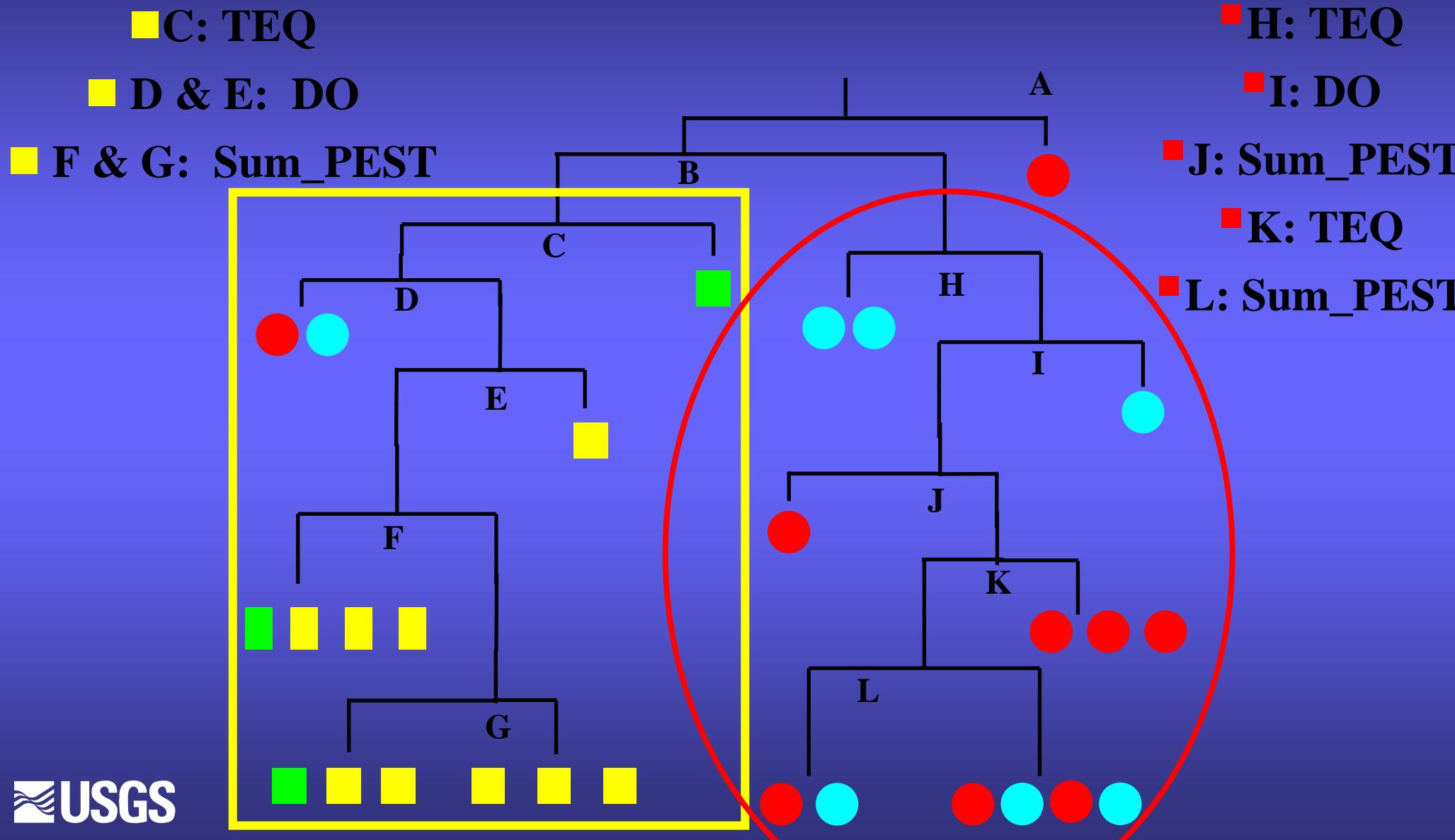
Plot of Population Density vs. % AG+Urban Land Use (% disturbance)

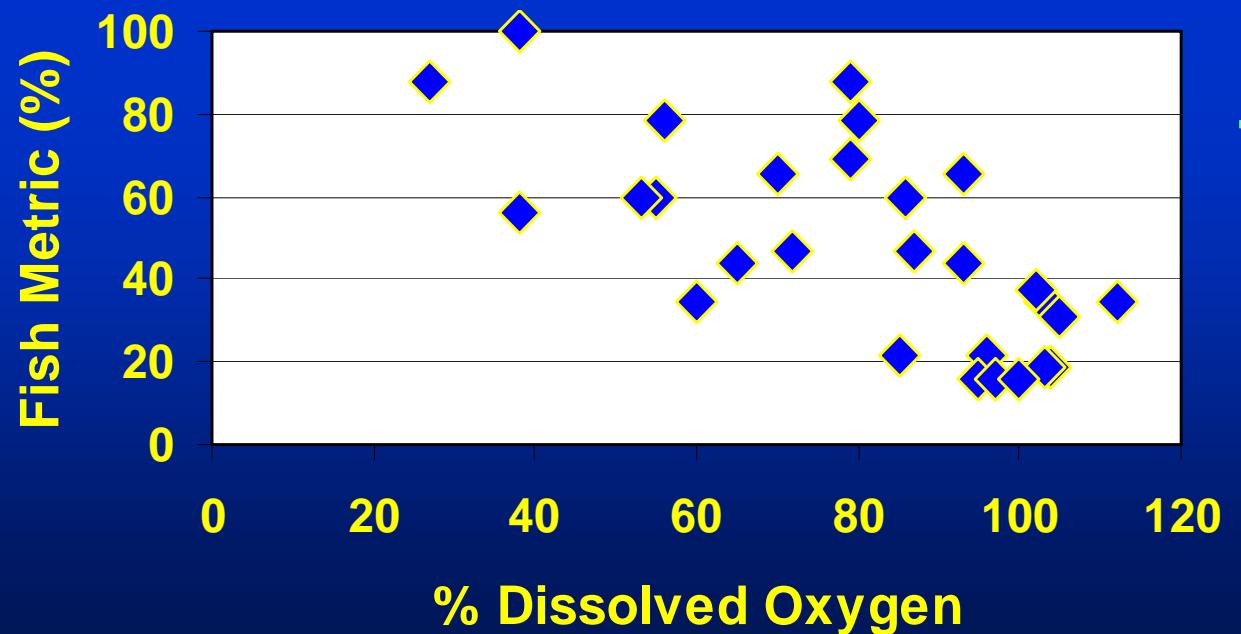
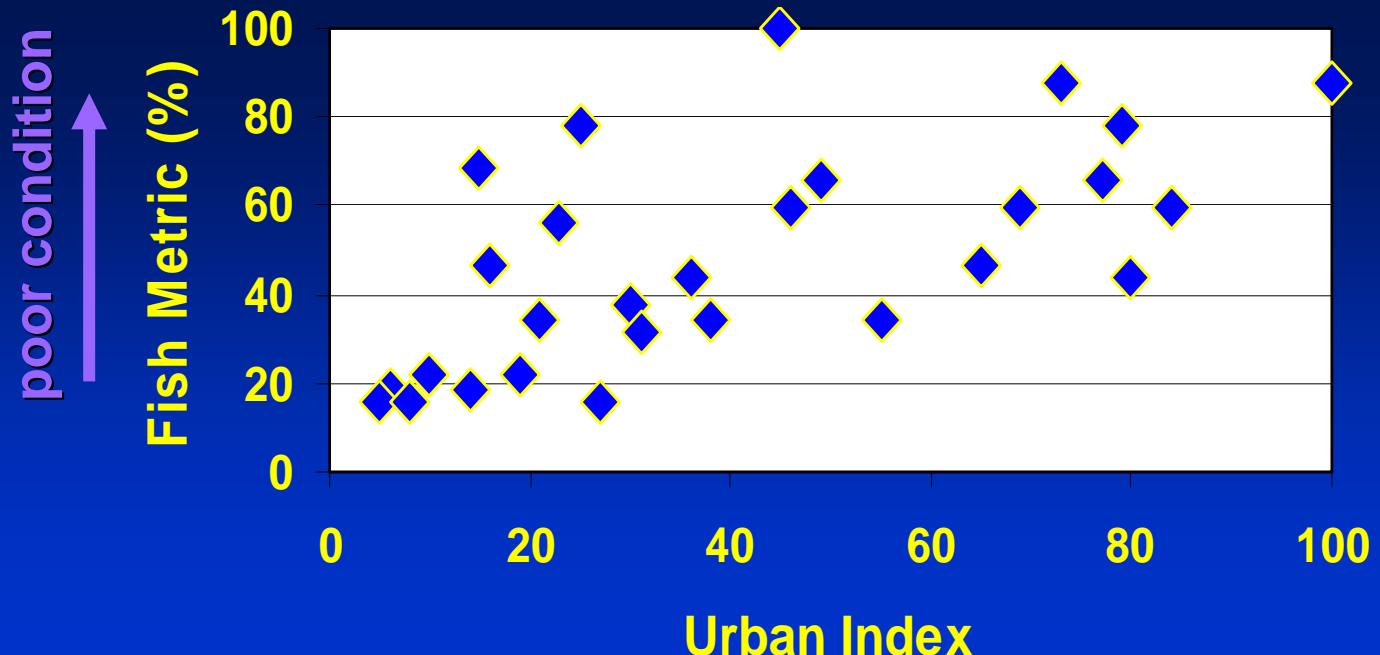


Multivariate Regression Tree (MRT: Primer) Linking Inverts to Environmental Data (coded by %AG+Urban)



Nonparametric Regression Tree Linking Inverts to Environmental Data (coded by %AG+Urban)





% Fish Metric
Includes 4 Metrics

- % Salmonids
- % Native (other species)
- % Reticulate Sculpin
- % Introduced or Exotic

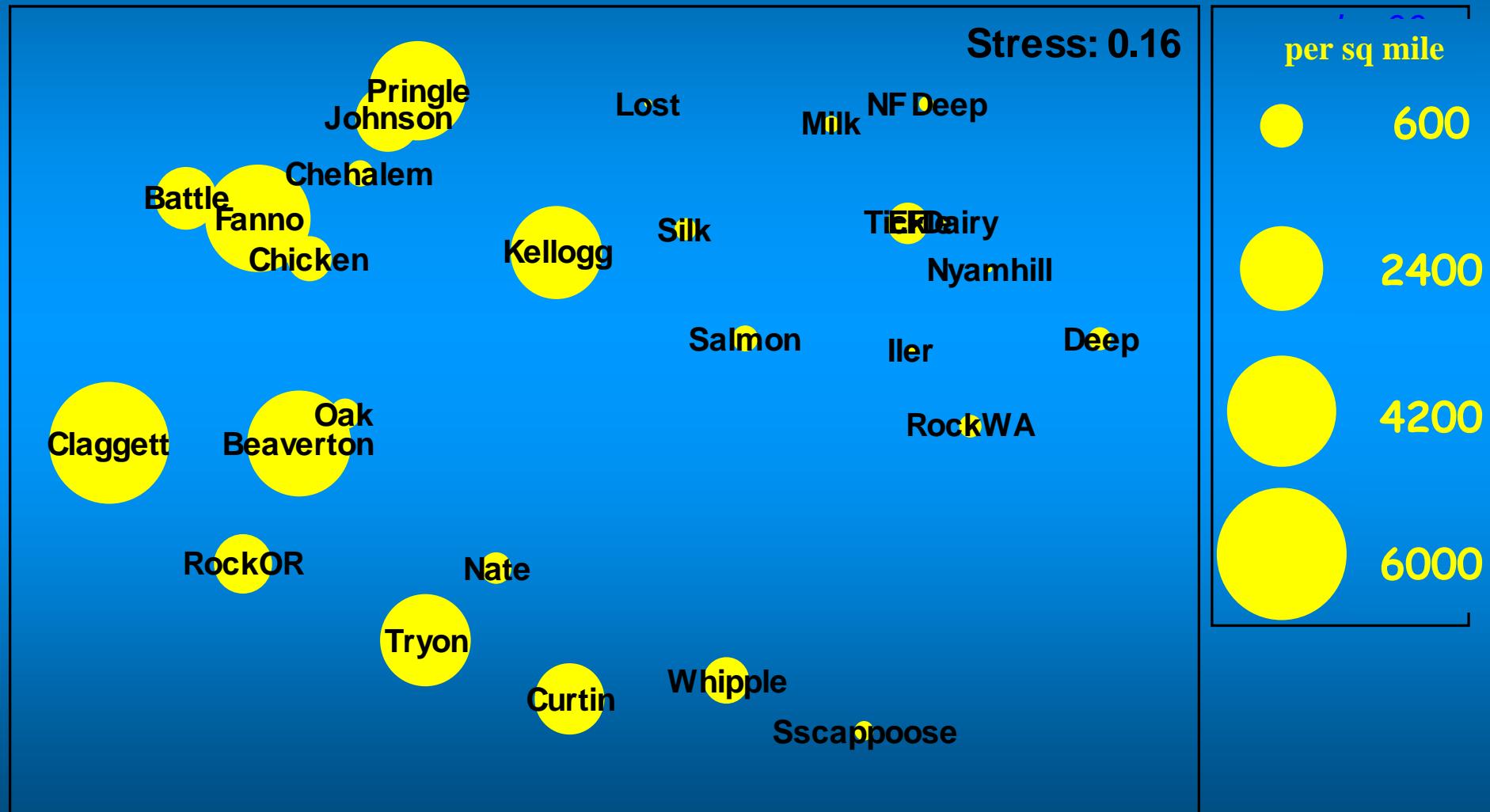


Exotic Species

“What do you
mean cooties,
no cooties on
me.”

FZ

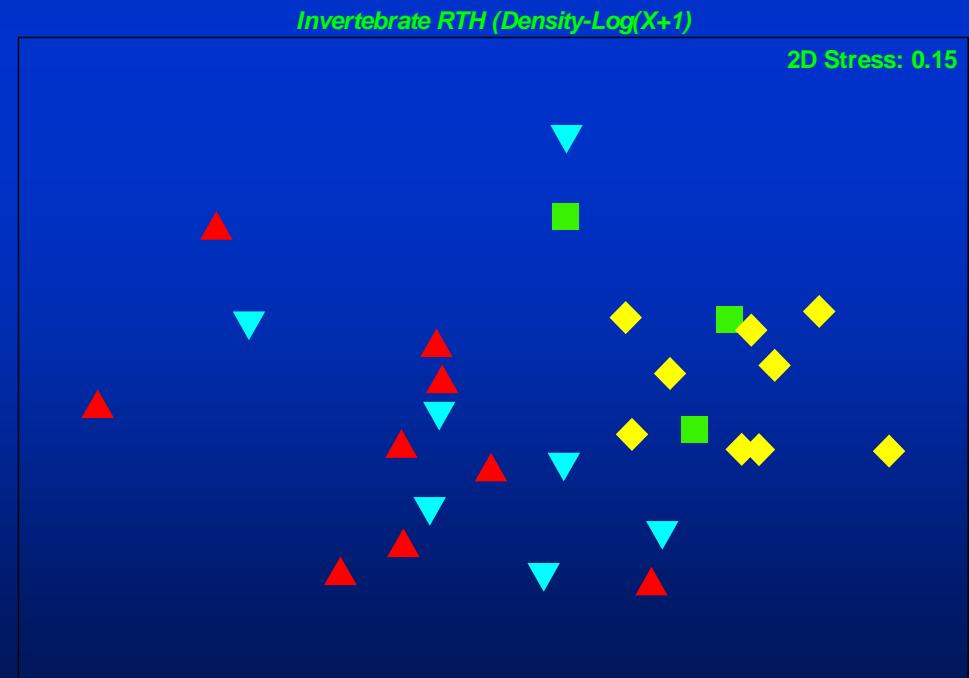
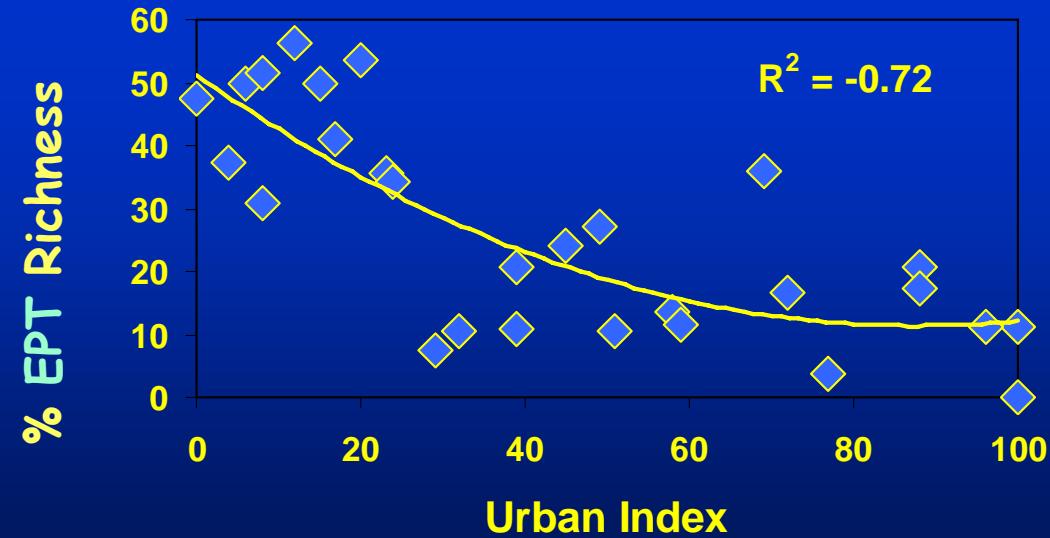
nMDS Ordination of Fish Abundance (Log X+1) with overlay of Population Density



Preliminary CONCLUSIONS



Fish Invertebrates showed a response as urban density increases based on individual metrics
Index values of ~25 or < 5-10% Impervious



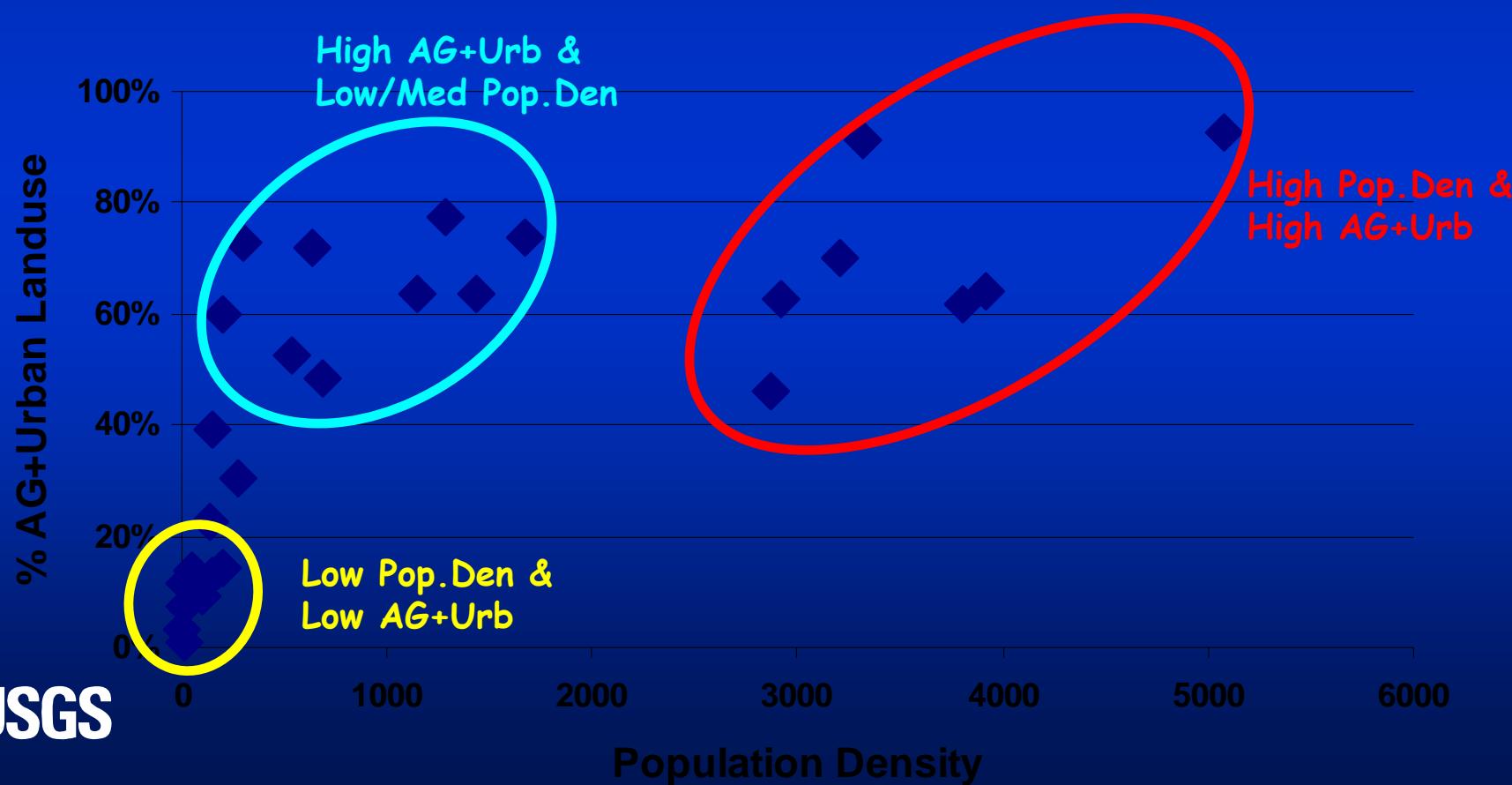
Preliminary CONCLUSIONS

- * Biotic assemblages were strongly related to differences in WQ among sites (e.g., TEQ, Pesticides, DO, and Water Temp.) likely due to Urban and AG land use disturbances - either singularly or in combination.



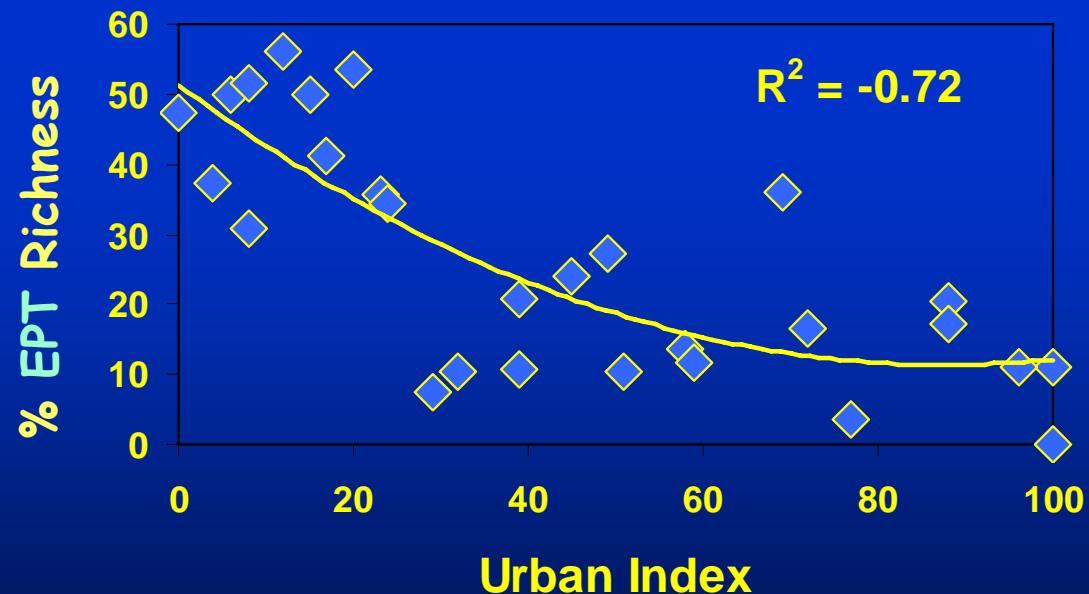
Preliminary CONCLUSIONS

- ❖ Little difference found in fish and inverts between High AG+Urban (% disturbance) and High Population Density sites



Preliminary CONCLUSIONS

- ❖ Prediction of invertebrate metrics at unsampled sites using the urban index will be attempted using EPA and/or ODEQ sites in Willamette Valley - still amassing the data





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Evaluating the Effects of Urbanization on Water Quality I - II

Concurrent Session F & G: Tues. 1 - 5 pm

Panel Discussion
Effects of Urbanization on Streams
Tuesday 7:00-9:00 pm
Meeting Room A8, SJ Convention Center

nMDS Ordination of Invertebrate Density

Sites coded by %AG+Urban

Invertebrate RTH (Density- $\log(X+1)$)

2D Stress: 0.15

%AG+Ur
Categories

< 15 %

15 - 39

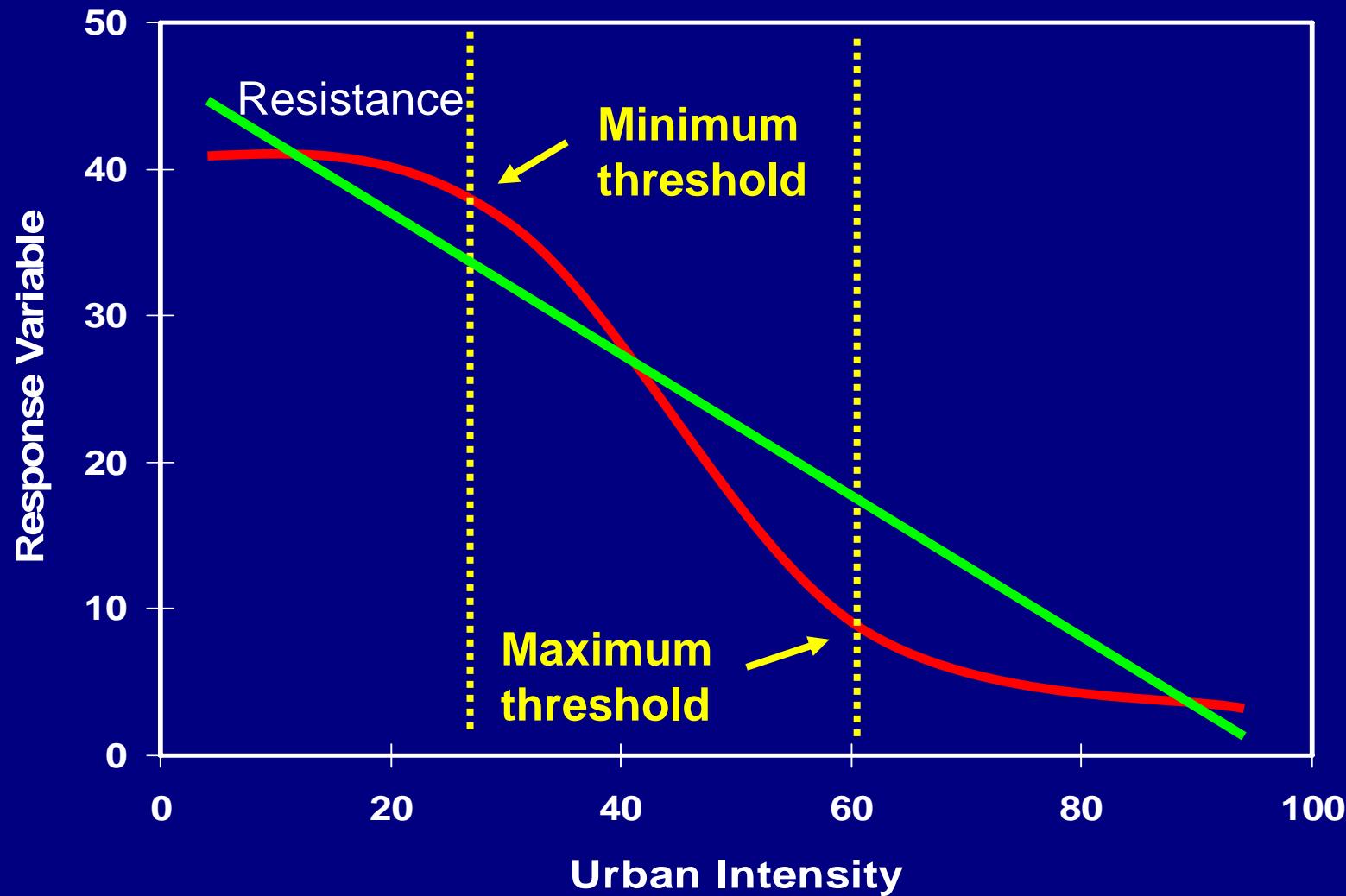
40 - 69

> 69 %

AXIS 2

AXIS 1

Hypothetical response to increasing urban intensity....threshold or linear or none?



Population Density

% Impervious 0.98

% Urban 0.98

Road Den. 0.95

Urban Index 0.98

Mean Watershed Elev. -0.88

Watershed Slope -0.81

3 Flow Stats 0.73

DOC 0.70, SO4 0.71

TN 0.81, TP 0.73

Pest. Tox. Index_Summer 0.70

Sum_Insecticide 0.70

TEQ 0.79

*Environmental Variables
usually surrogates for many
processes*