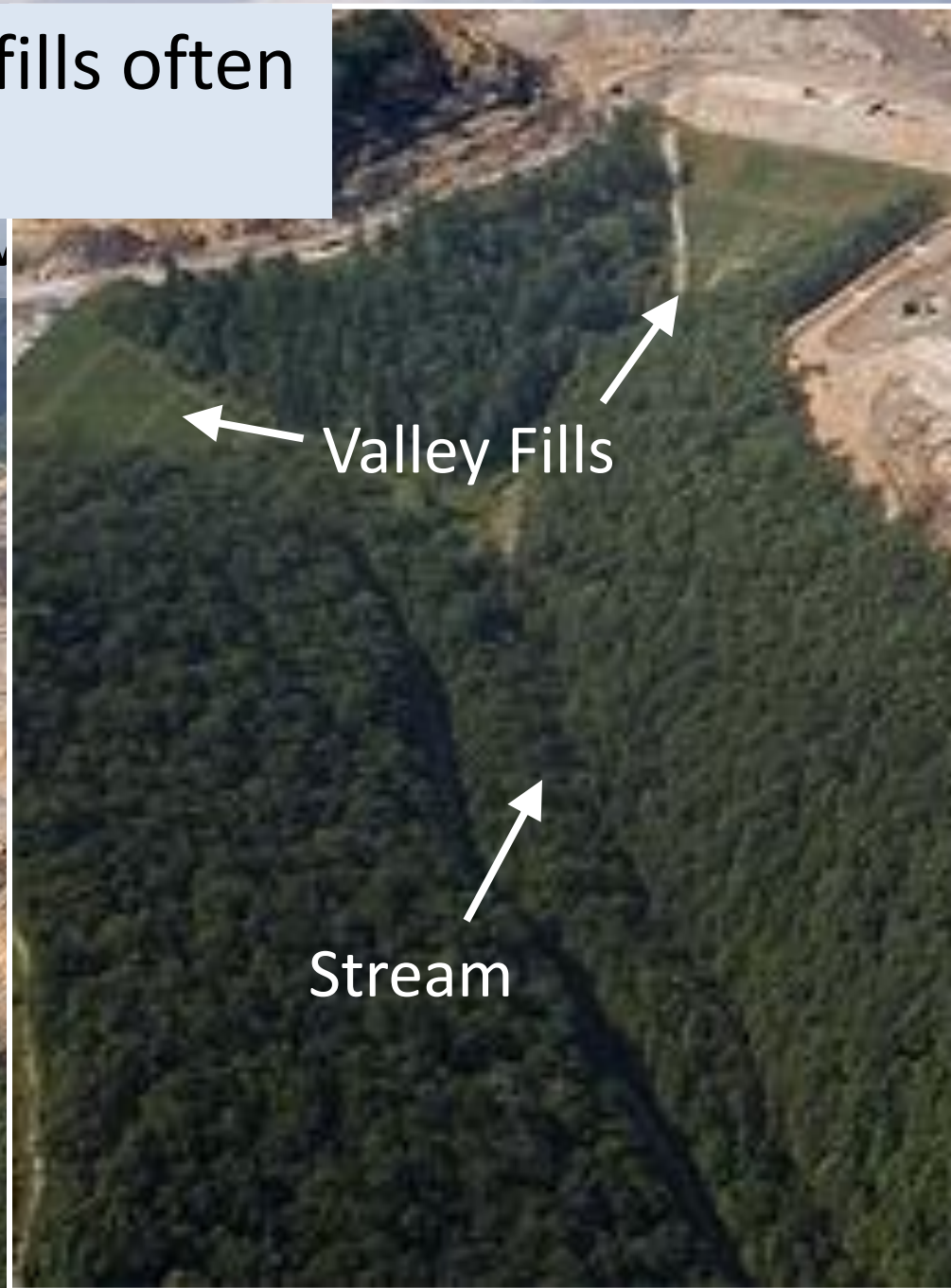


Detecting benthic macroinvertebrate assemblage characteristics using quantitative sampling

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Carl E. Zipper, PhD
Anthony J. Timpano
David J. Soucek, PhD
Beth Boehme

Streams draining valley fills often
have elevated salinity

Appalachian MTM/V



Specific Conductance (SC)

- Proxy for salinity/TDS
- Associated with composition of benthic macroinvertebrate assemblages
- In-stream data loggers record SC in 15 min intervals → Long-term trends



Quantitative sampling



1. Well-defined, precise and *known sample area*
2. Hess sampler collects only those organisms within the sampler

Lab

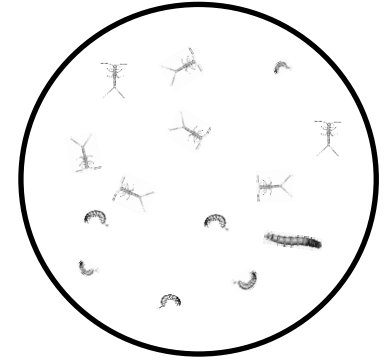
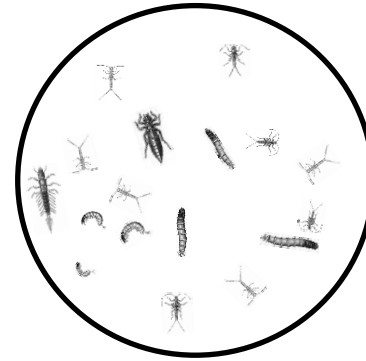
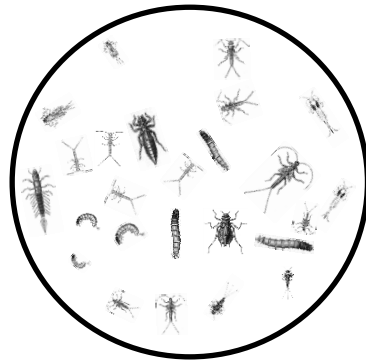
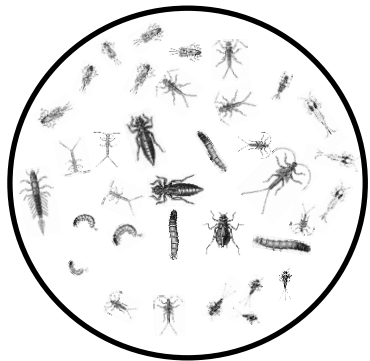
Count and identify the *entire sample*

Density = # individuals/area

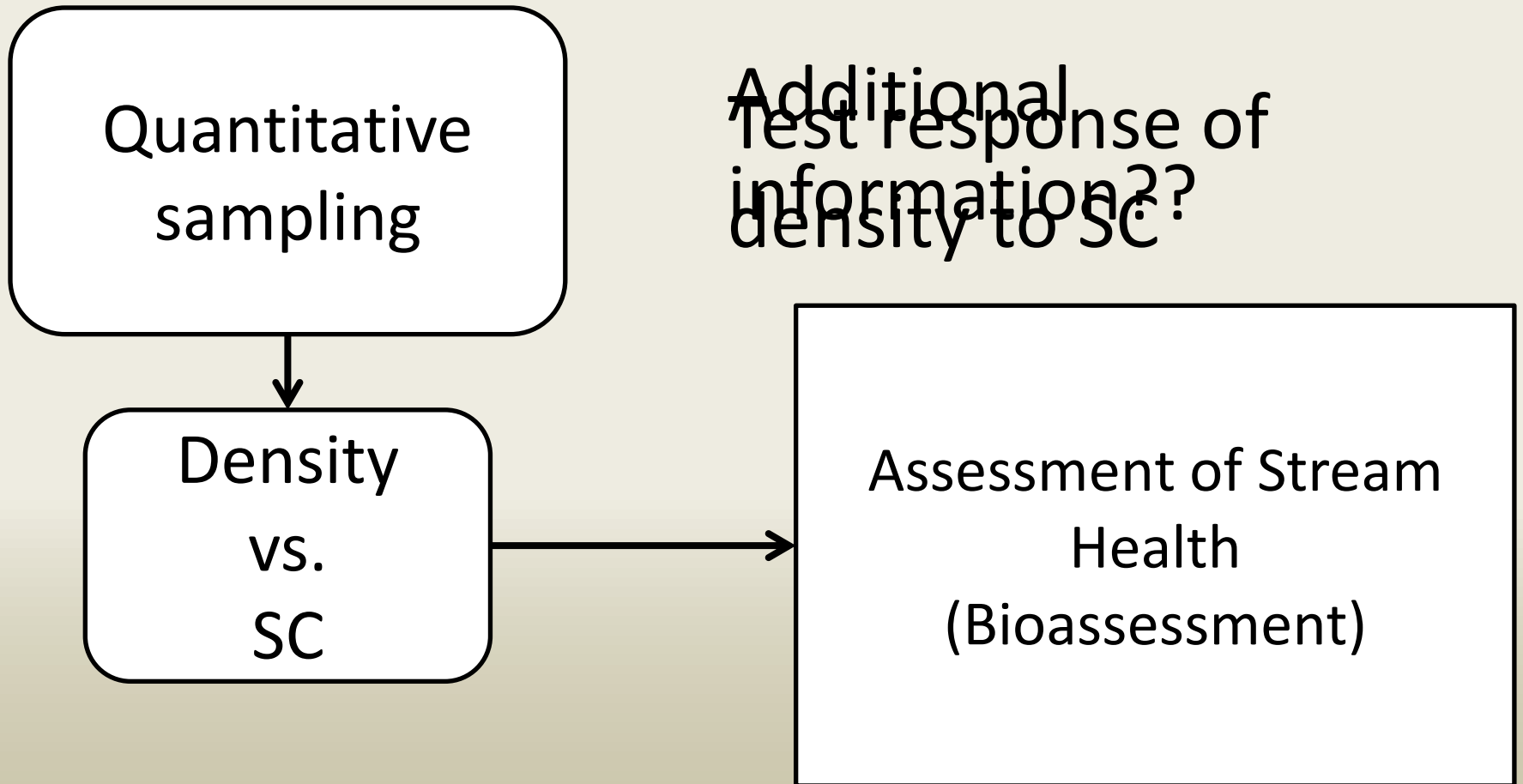
Supplement assessment with density data

In addition to composition, density can:

1. Detect how close population is to extirpation
2. Suggest possible diminished ability of population to provide ecosystem services

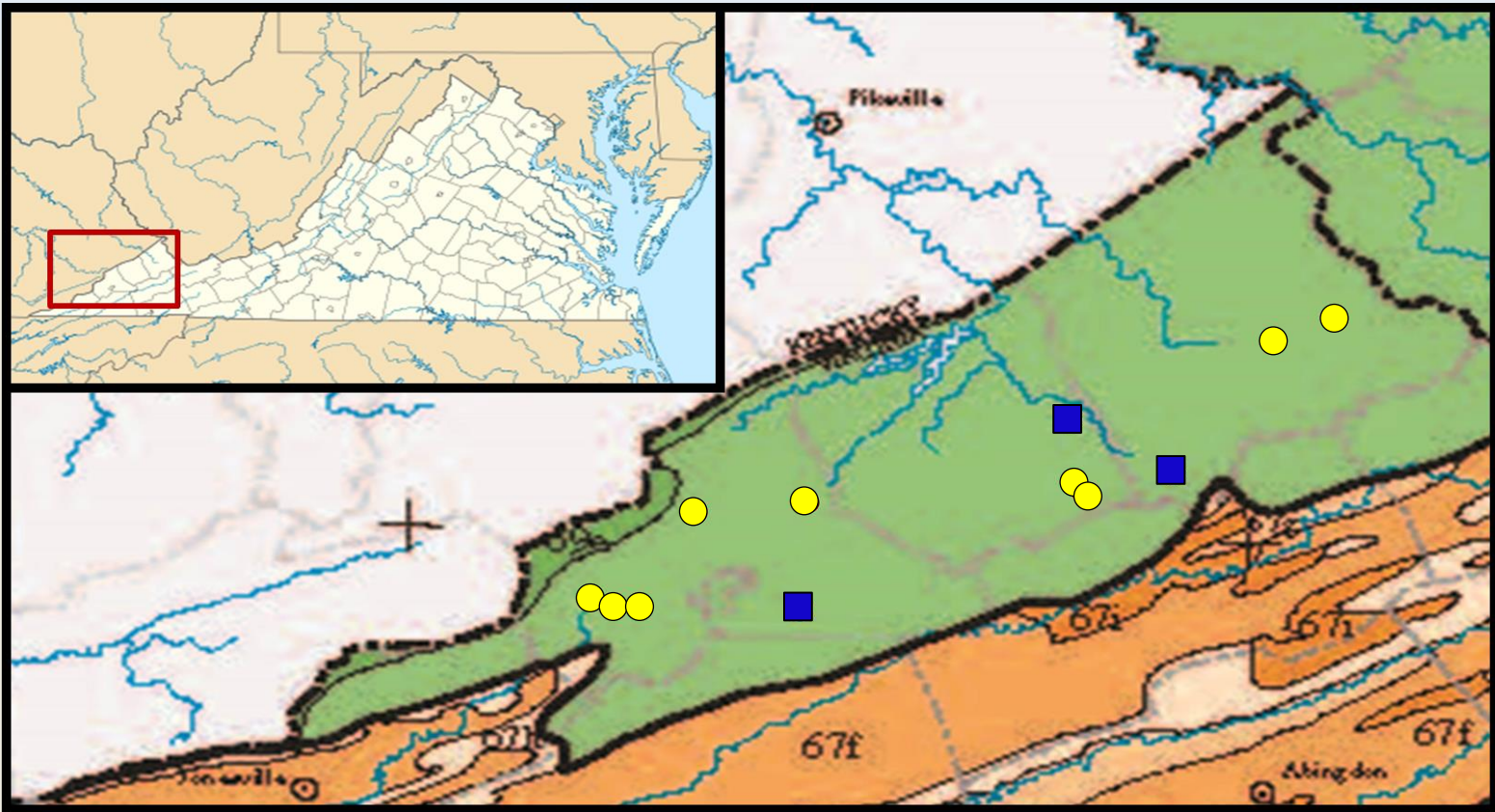


Objectives



Questions

1. Is there a significant response between benthic macroinvertebrate density and a gradient of SC?
2. Do extremely dominant and tolerant taxa mask the relationship between more sensitive groups and SC?



Source: U.S. EPA (inset: Wikipedia)

3 Reference streams (blue squares)
9 mining-influenced streams (yellow circles)

3. Similar habitat



Reference



Mine-influenced

Groups

EPT

Ephemeroptera
Plecoptera
Trichoptera

Functional Feeding Groups

Shredders
Filterers
Gatherers
Scrapers
Predators

Total Taxa

E - Baetidae

P - Leuctra

T - Hydropsychidae

Habit

Clingers
Sprawlers
Swimmers
Burrowers

**Total
taxa**

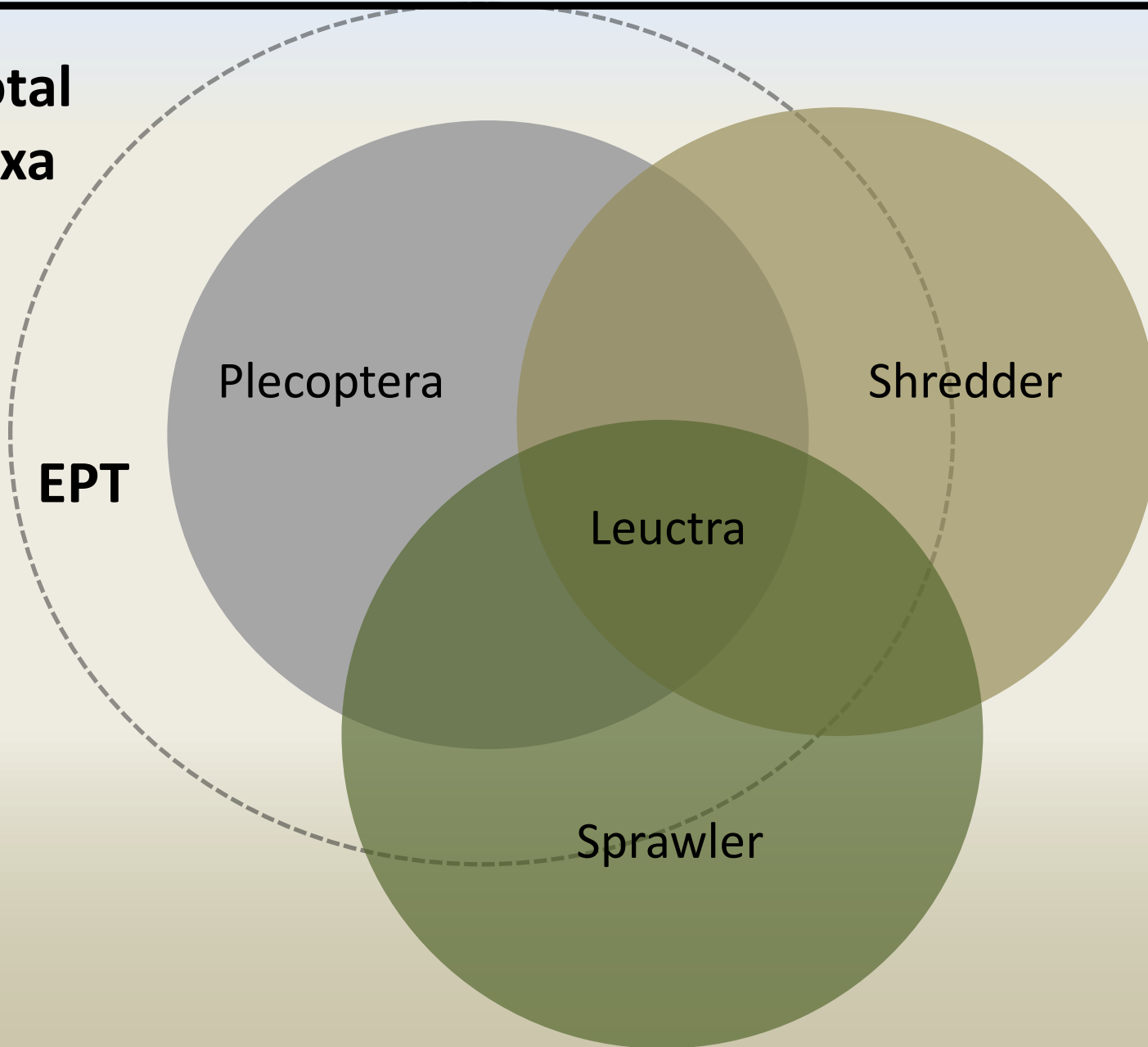
EPT

Plecoptera

Shredder

Leuctra

Sprawler



Question 1: Is there a significant response between benthic macroinvertebrate density and a gradient of SC?

Spearman correlations ($p < 0.05$)

Data:

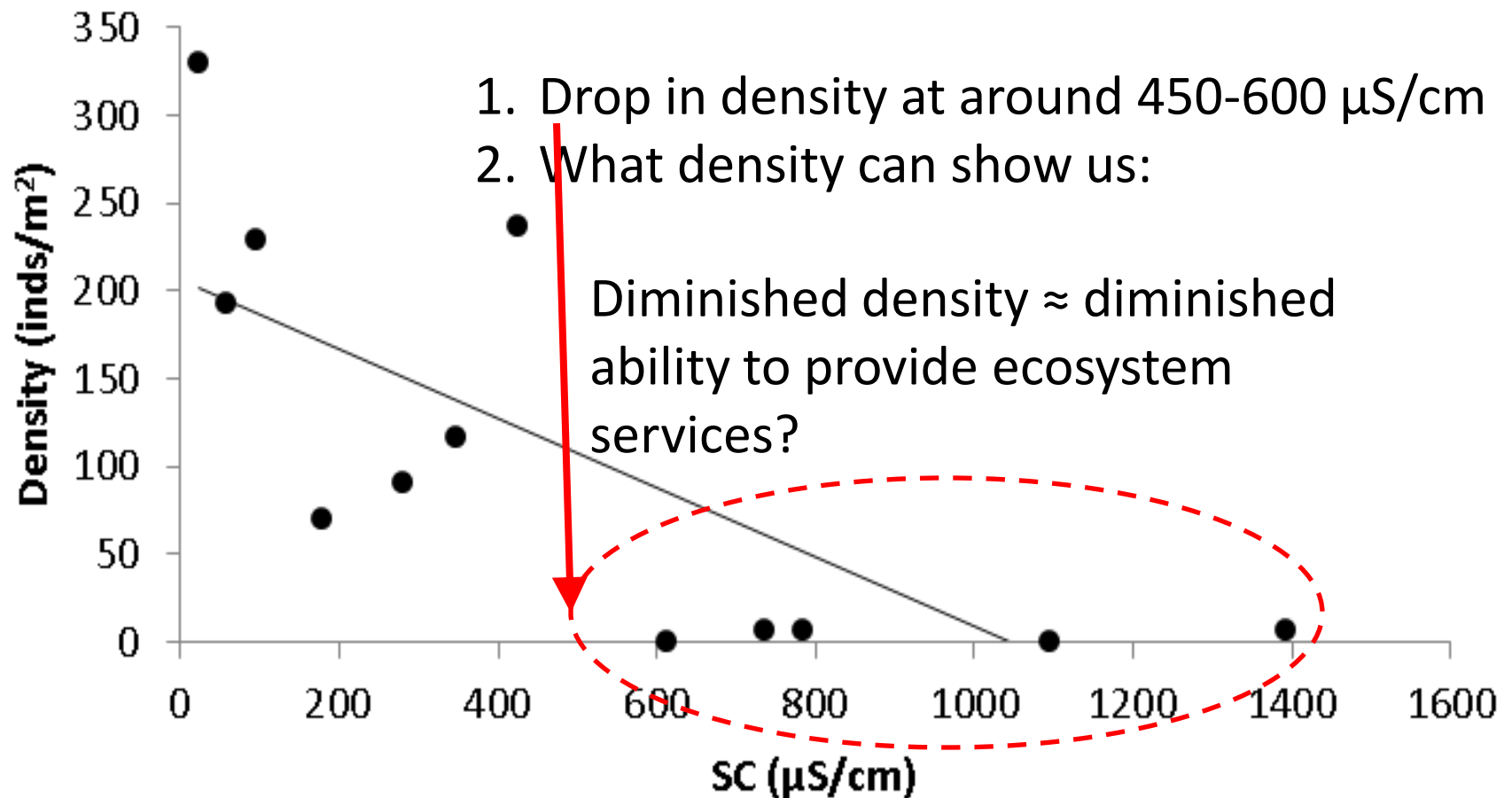
Spring (May 2013)

Spring list of significantly* correlated (w/SC) groups

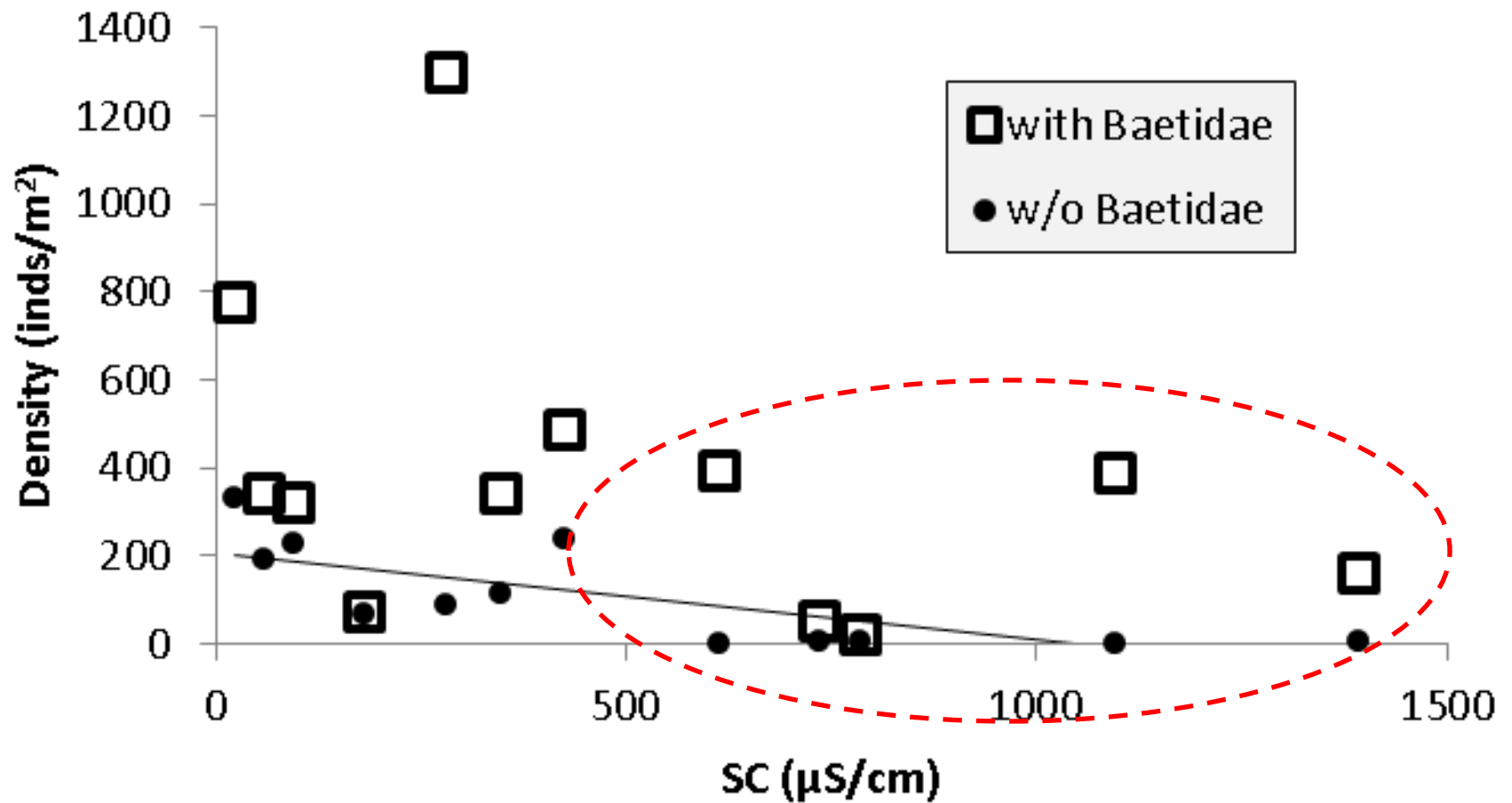
Group	Spearman r
E (w/o Baetidae)	-0.793
Leuctra	0.692
Shredders	0.692
Plecoptera	0.683
Sprawlers	0.671
Total Density	0.664
EPT	0.636

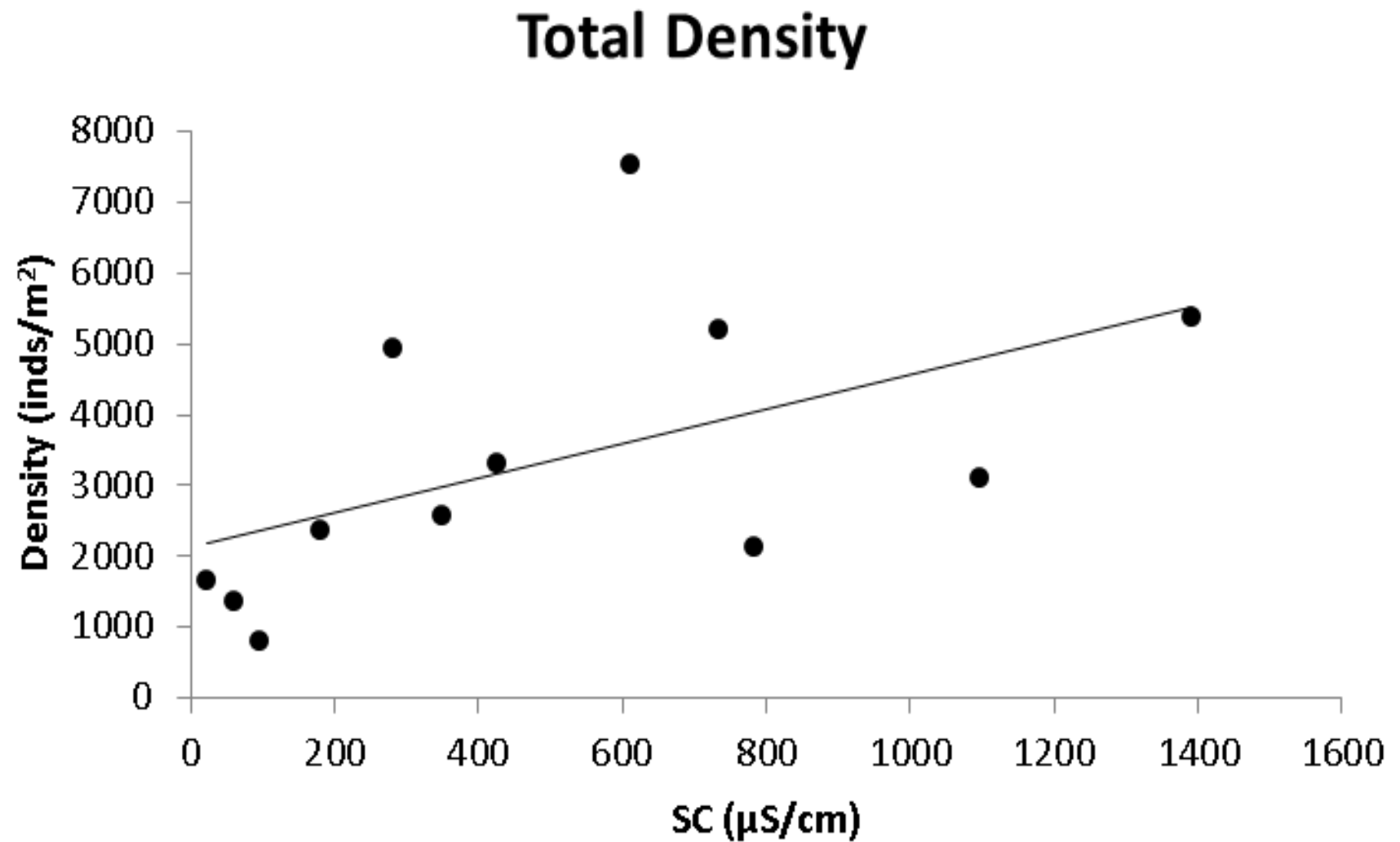
* $p < 0.05$

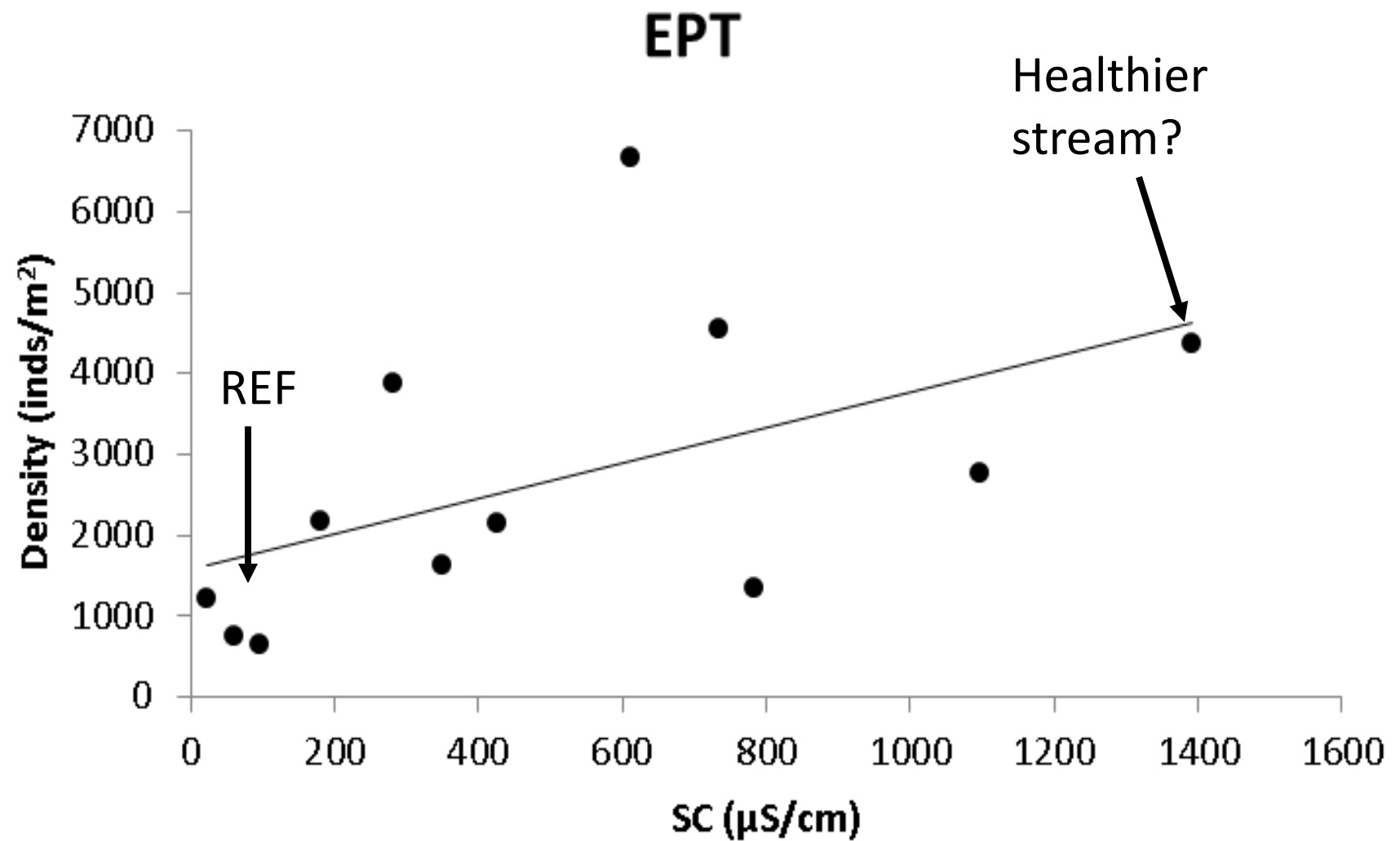
Ephemeroptera (w/o Baetidae)



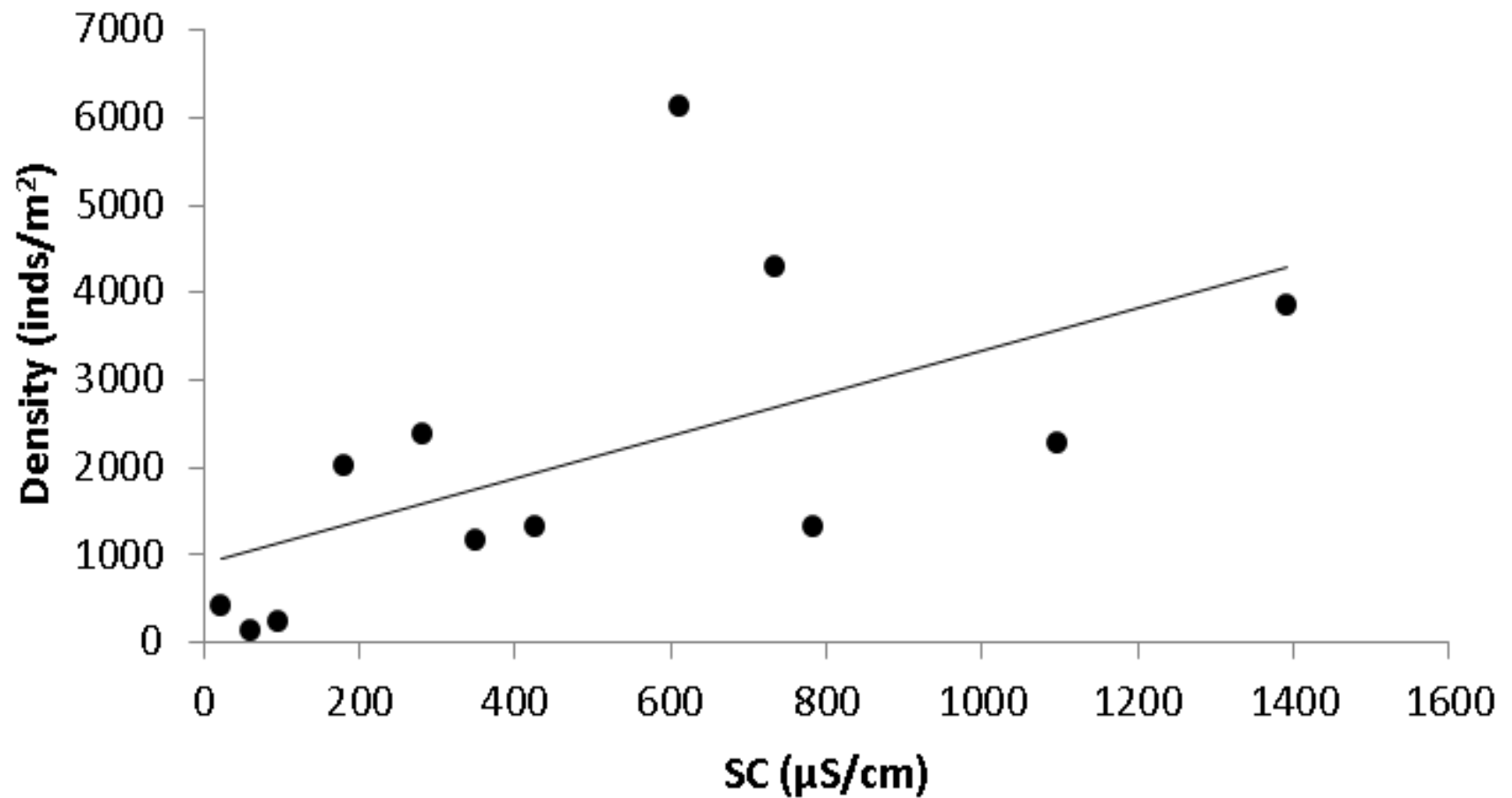
Ephemeroptera



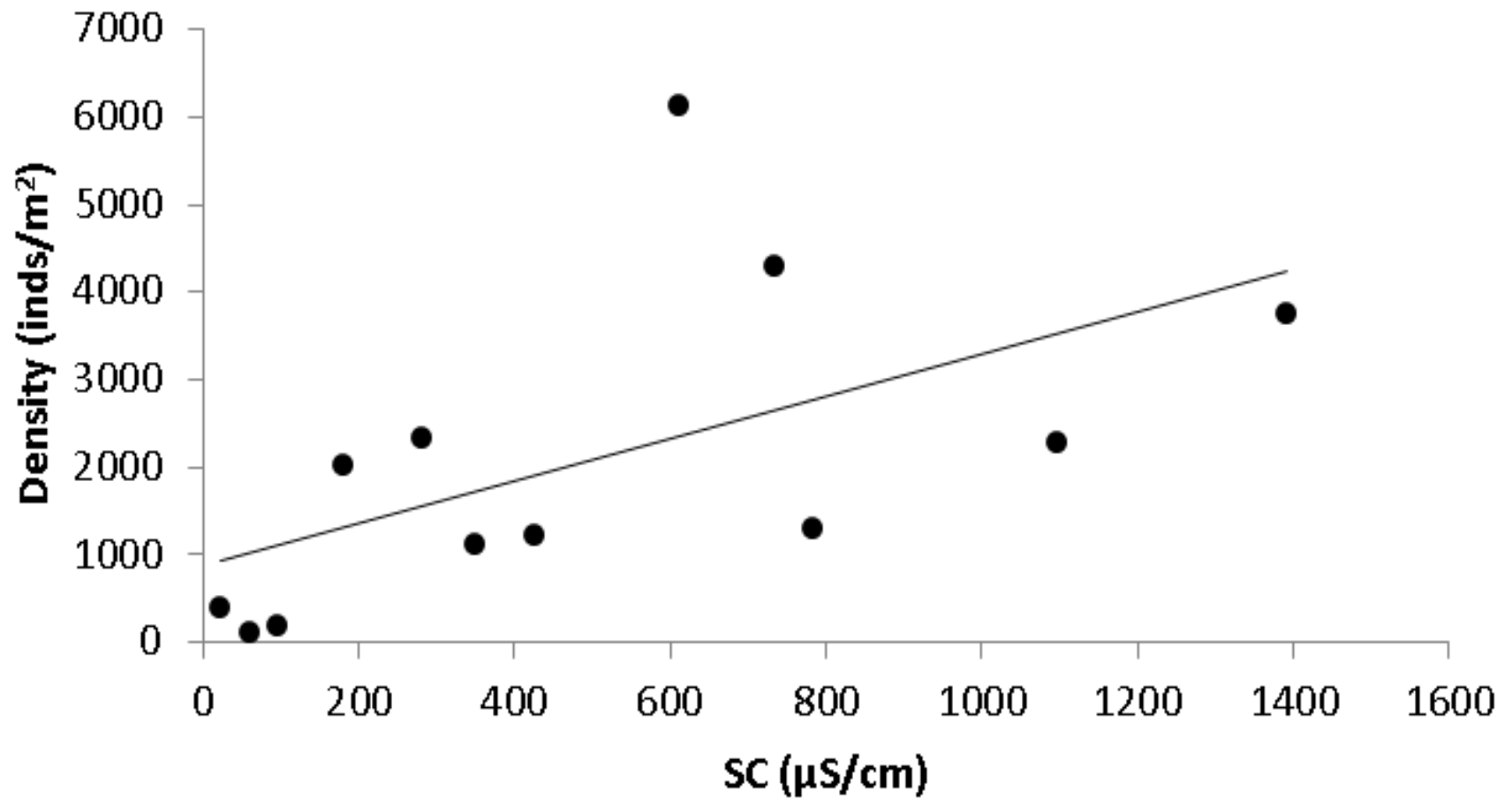




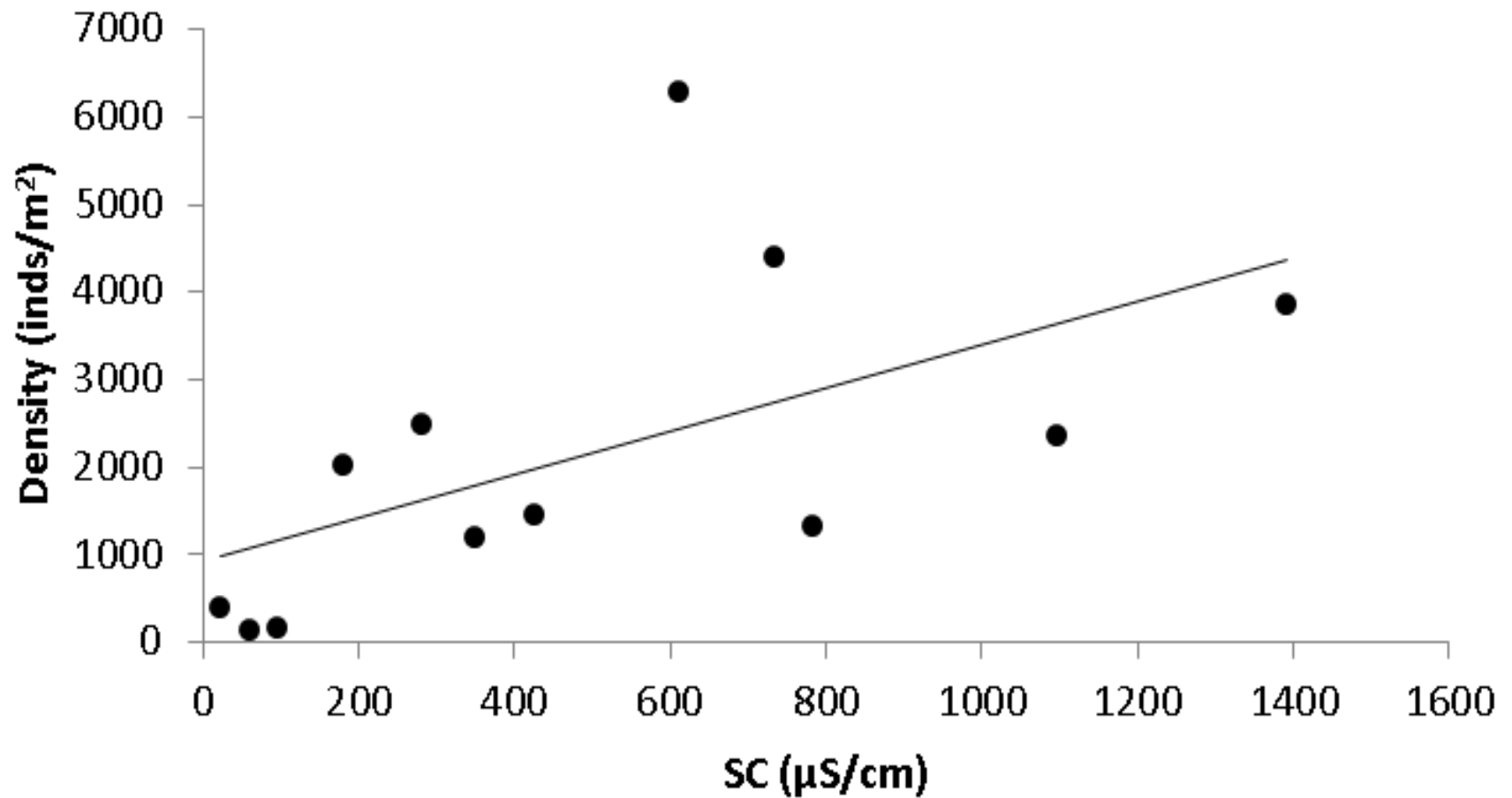
Plecoptera



Shredders

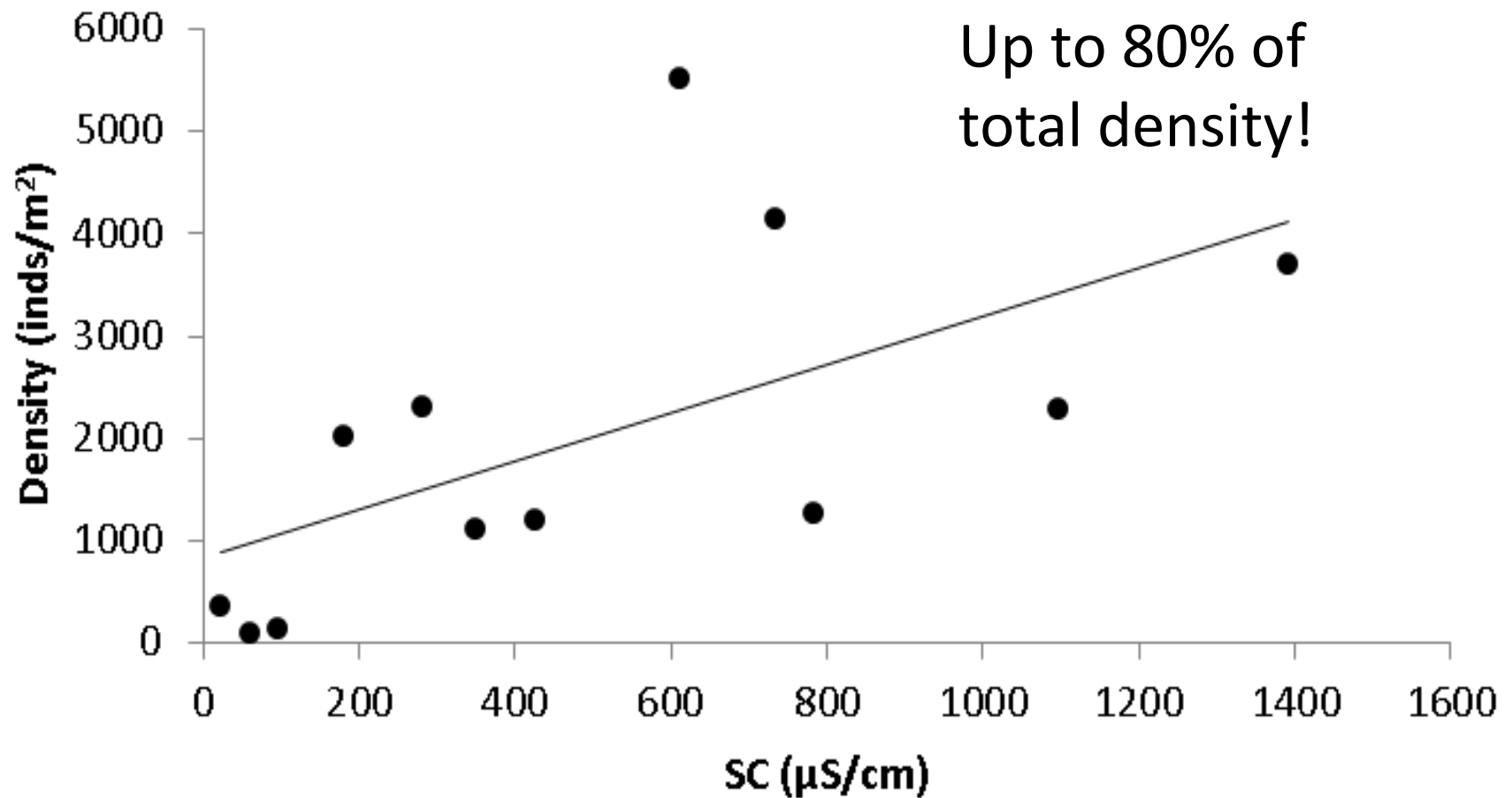


Sprawlers



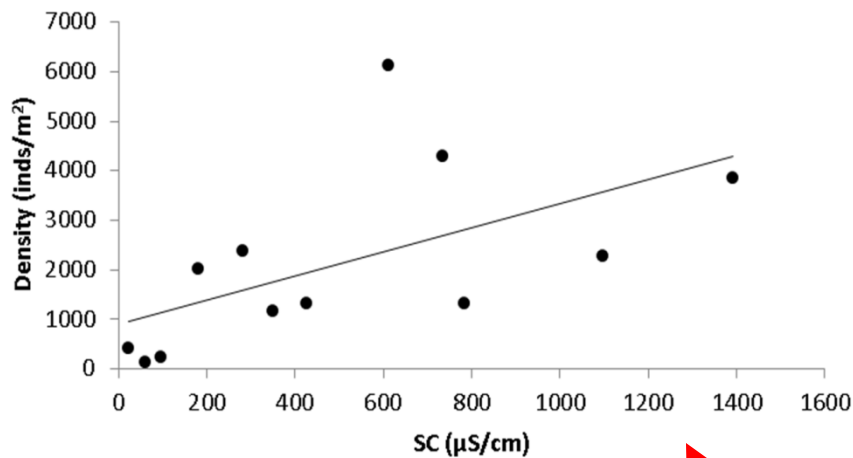
Leuctra

Up to 80% of
total density!

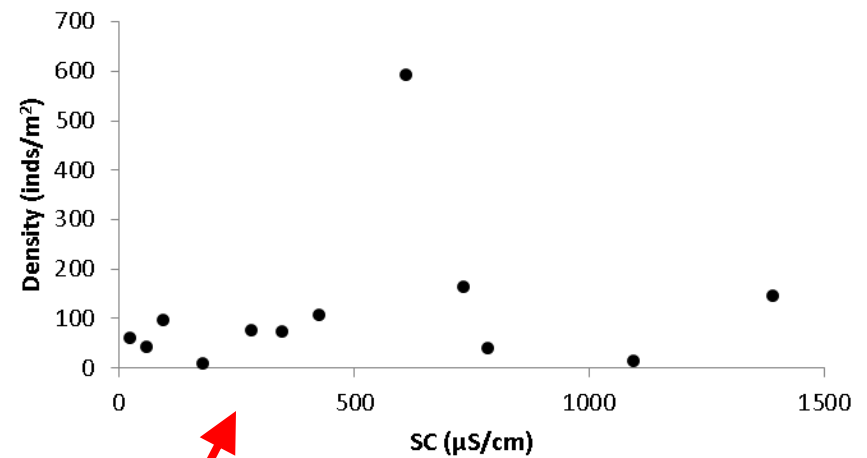


2. Do extremely dominant and tolerant taxa mask the relationship between more sensitive groups and SC?

Plecoptera

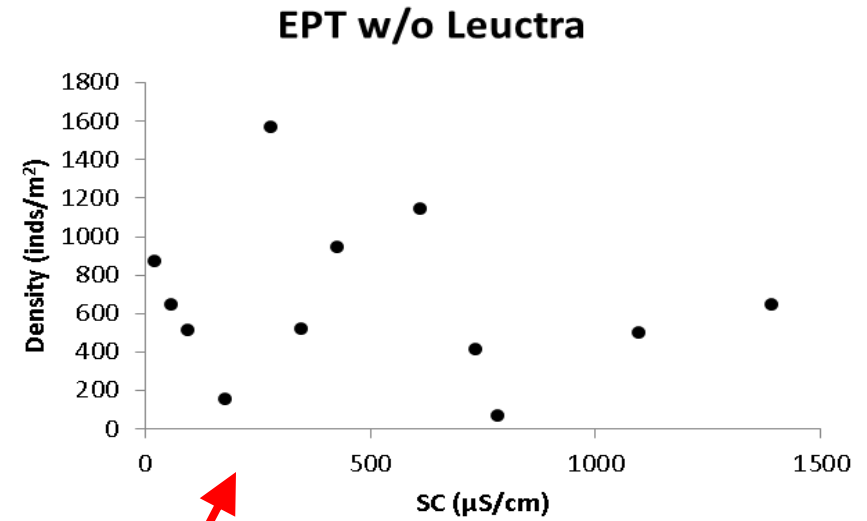
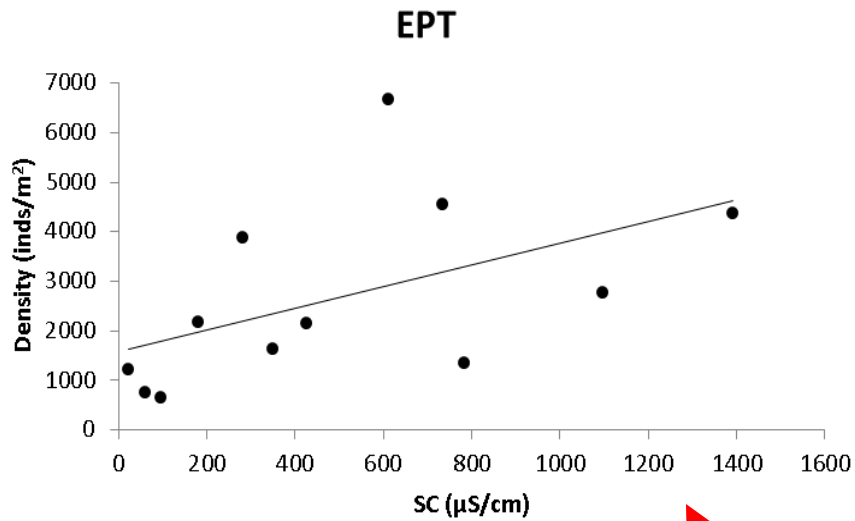


Plecoptera w/o Leuctra



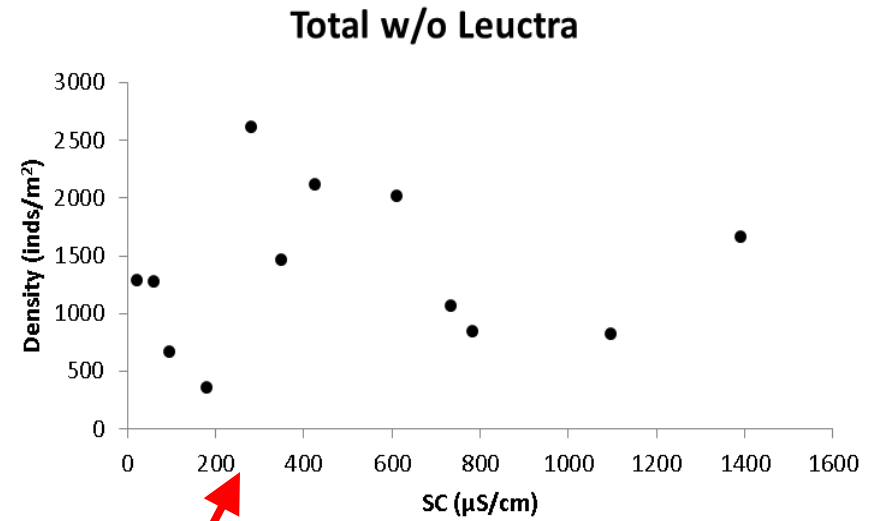
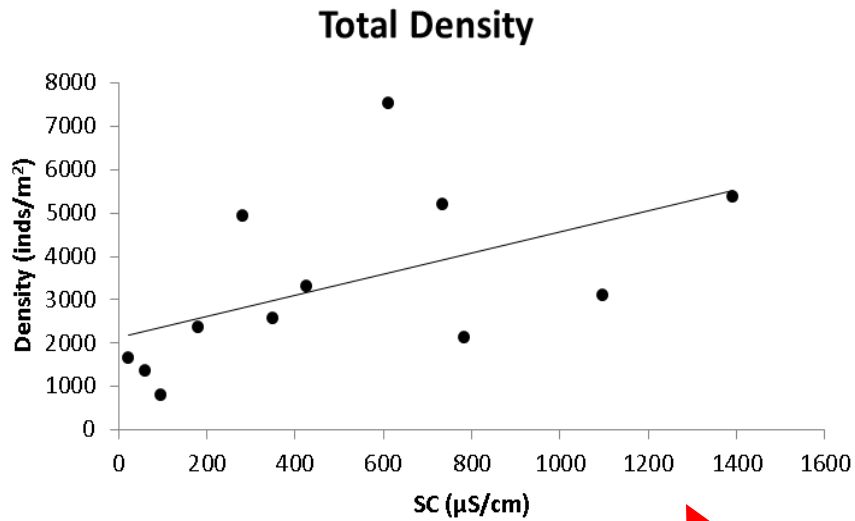
YES

May 2013



YES

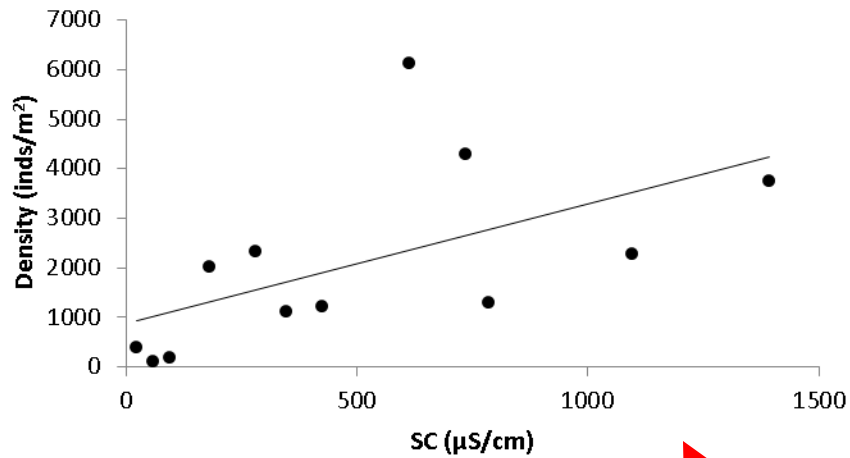
May 2013



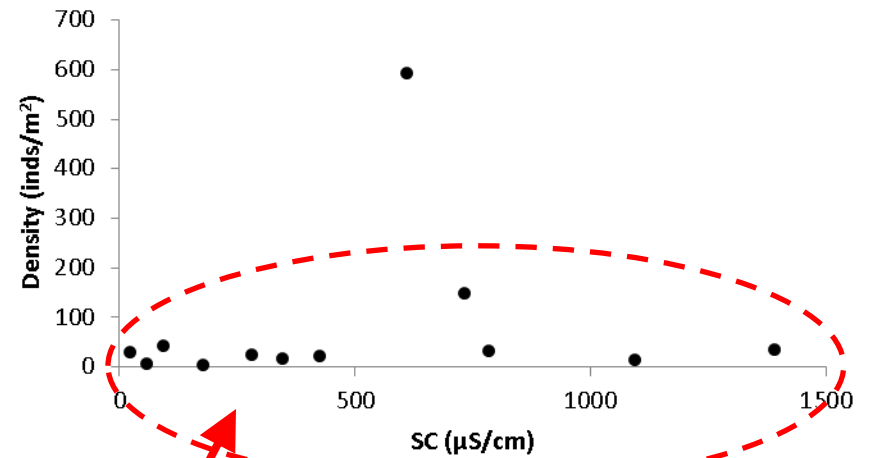
YES

May 2013

Shredders



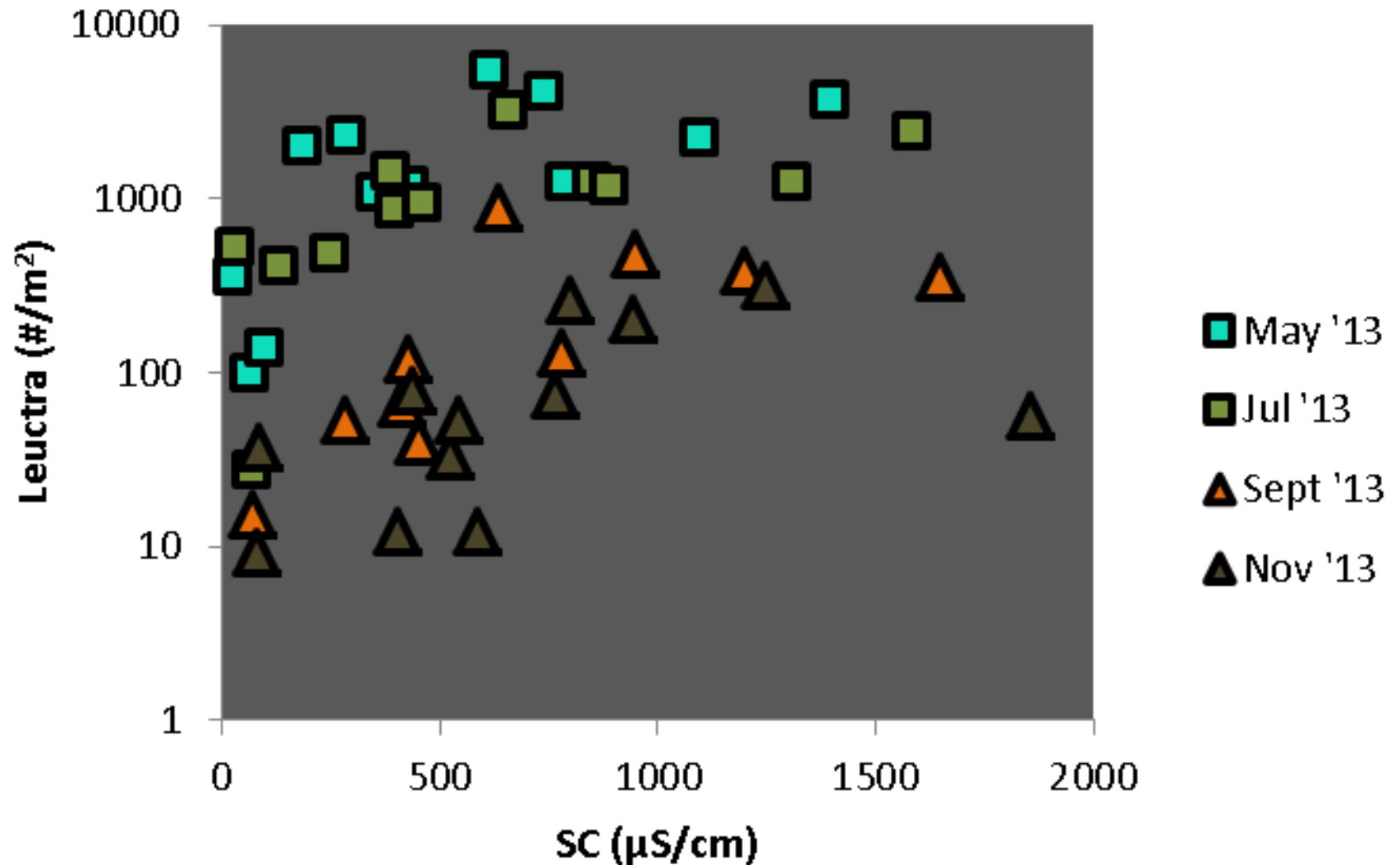
Shredders w/o Leuctra

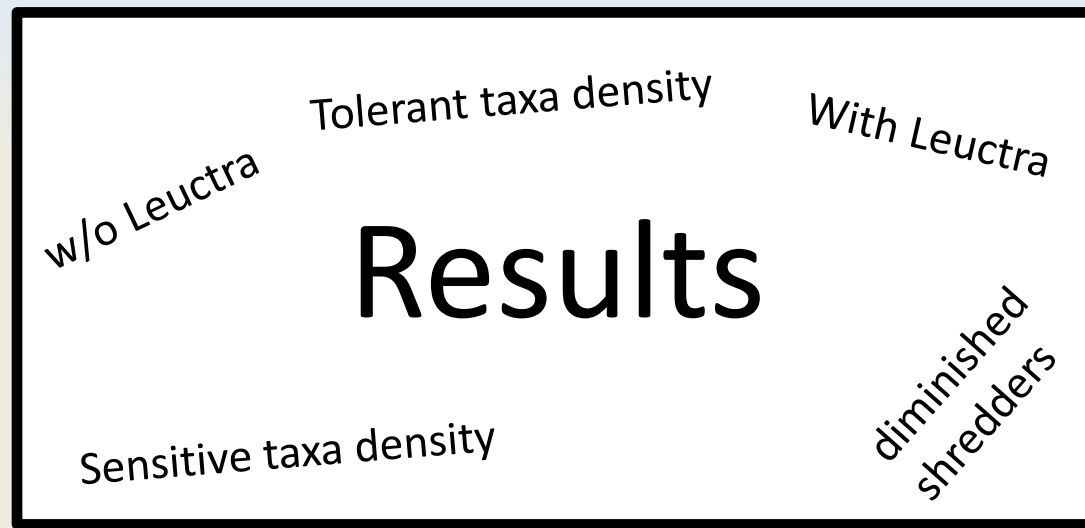


w/o Leuctra → diminished shredder population

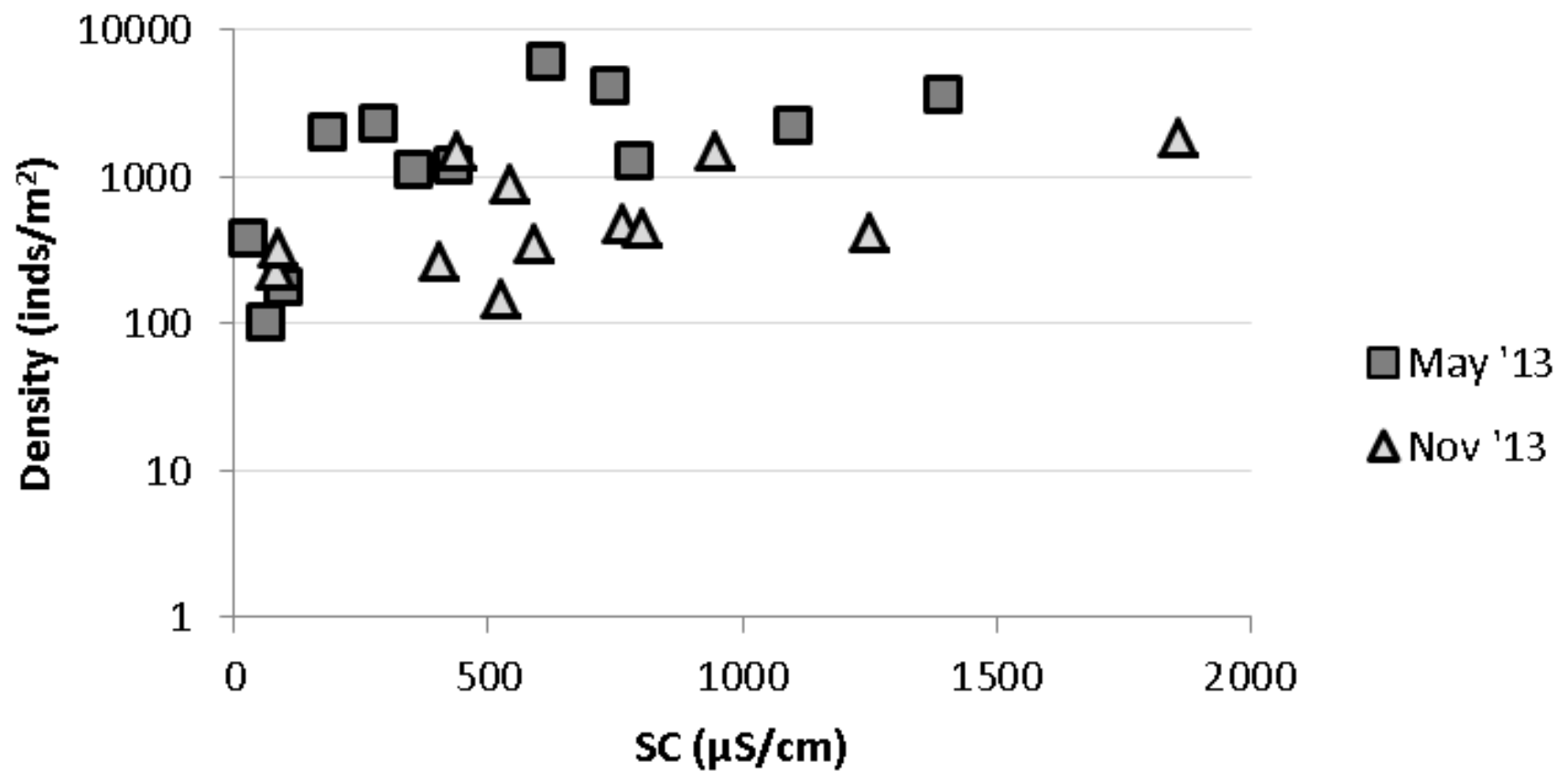
YES

Leuctra density and pattern across time



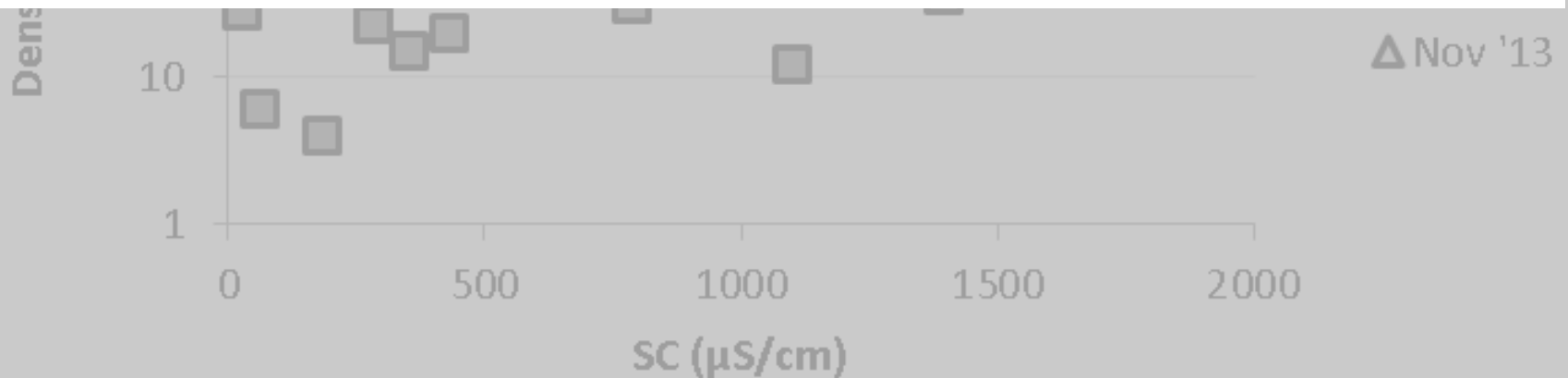


Shredders



Shredders w/o Leuctra

The conclusions about the given group rely on the decision to keep the tolerant taxon in the analyses, or to take them out.



Summary

1. Density can detect potential loss of taxa
 - e.g. Ephemeroptera, Shredders
 - Implies diminished ability to perform functions
2. Assessors should be aware that tolerant and influential taxa can obscure other results
 - e.g. stream assessment interpretation

These are both examples of information that can supplement assessments of stream health

We would like to thank our field/lab technicians Kyle Dost, Lindsey Nolan, Sam Hays, and Janelle Salapich for doing the job that nobody wants to do: sorting benthic macroinvertebrates

Thank You

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