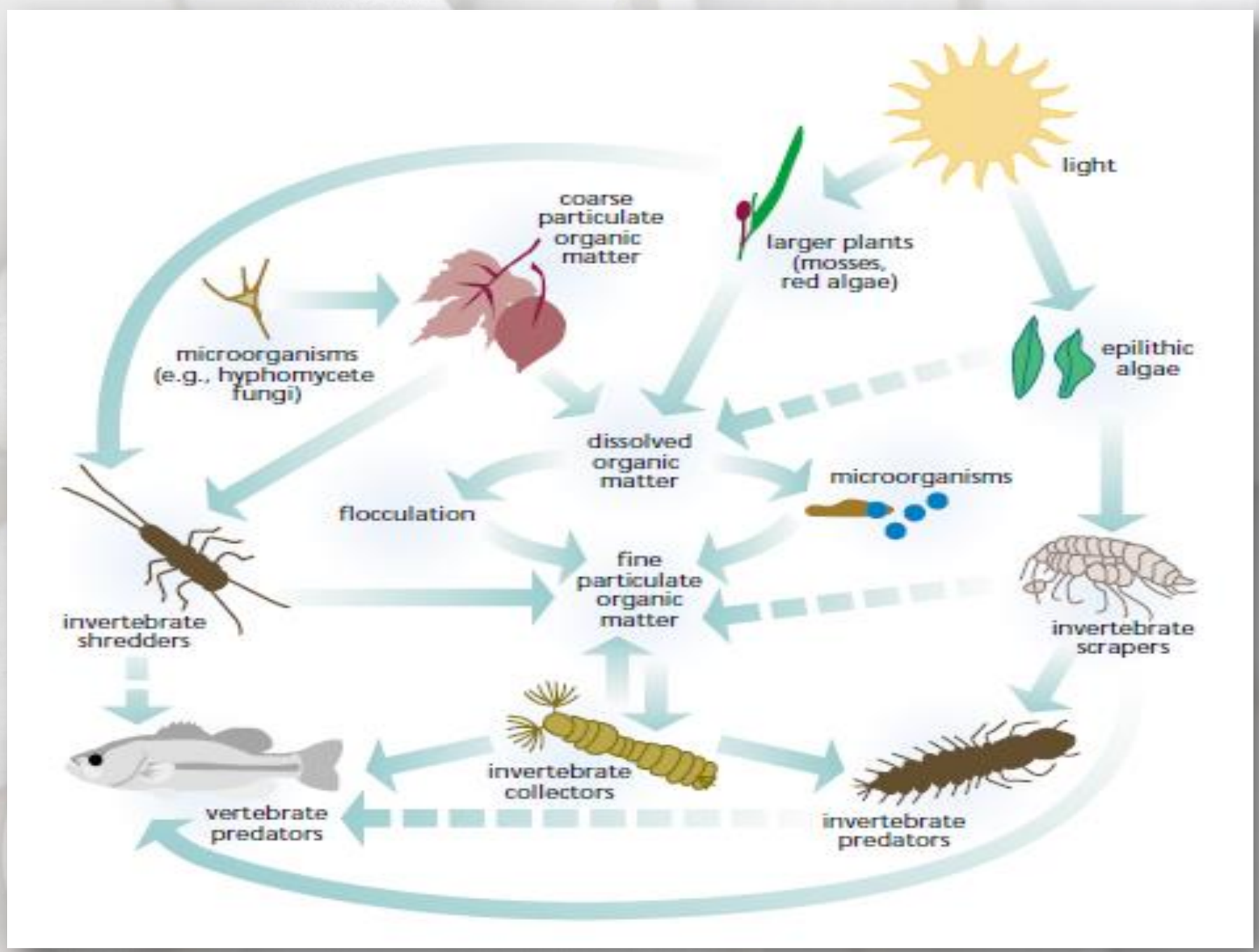
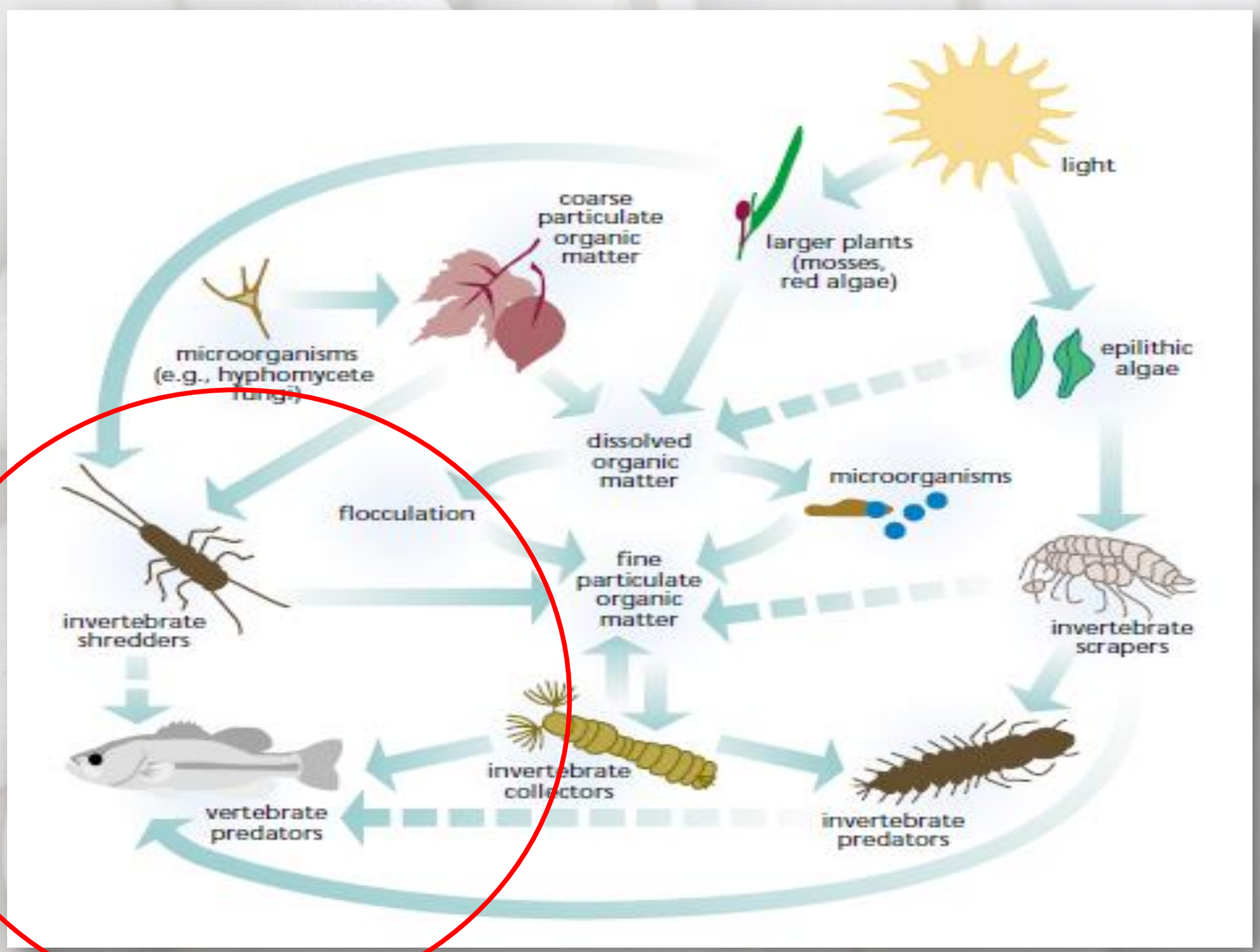

light
coarse
particulate
organic
matter
larger plants
(mosses,
red algae)
microorganisms
(e.g., hyphomycete
fungi)
epilithic
algae
dissolved
organic
matter
microorganisms
flocculation
fine
particulate
organic
matter
invertebrate
shredders
invertebrate
scrapers
invertebrate
collectors
vertebrate
predators
invertebrate
predators


light
coarse particulate organic matter
larger plants (mosses, red algae)
microorganisms (e.g., hyphomycete fungi)
epilithic algae
dissolved organic matter
microorganisms
flocculation
fine particulate organic matter
invertebrate shredders
invertebrate scrapers
invertebrate collectors
vertebrate predators
invertebrate predators

Examples of metrics

Category	Examples	Predicted response to increasing stress
Richness measures	Total No. taxa	Decrease
	No. EPT*	Decrease
	No. mayfly taxa	Decrease
Composition measures	% mayflies	Decrease
	% EPT*	Decrease
	% midges	Increase
	% dominant taxon	Increase
Tolerance/intolerance measures	No. intolerant taxa	Decrease
	% tolerant organisms	Increase
	Hilsenhoff Biotic Index	Increase
Feeding measures	% grazers and scrapers	Decrease
	% predators	Variable
Behavior measures	% clingers	Decrease

**EPT = Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies)*

Bioenergetics

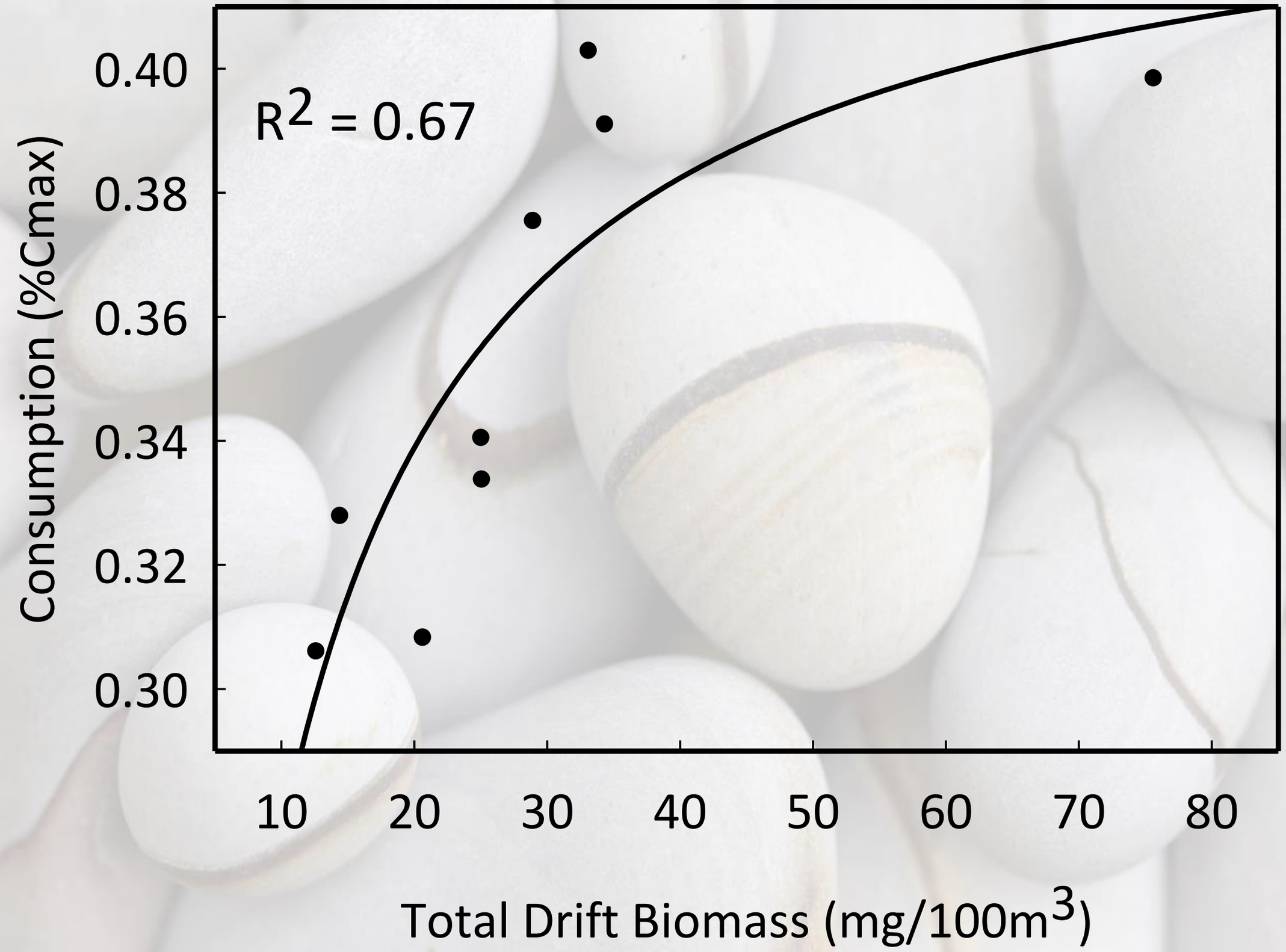
Consumption = Growth + Metabolism + Waste

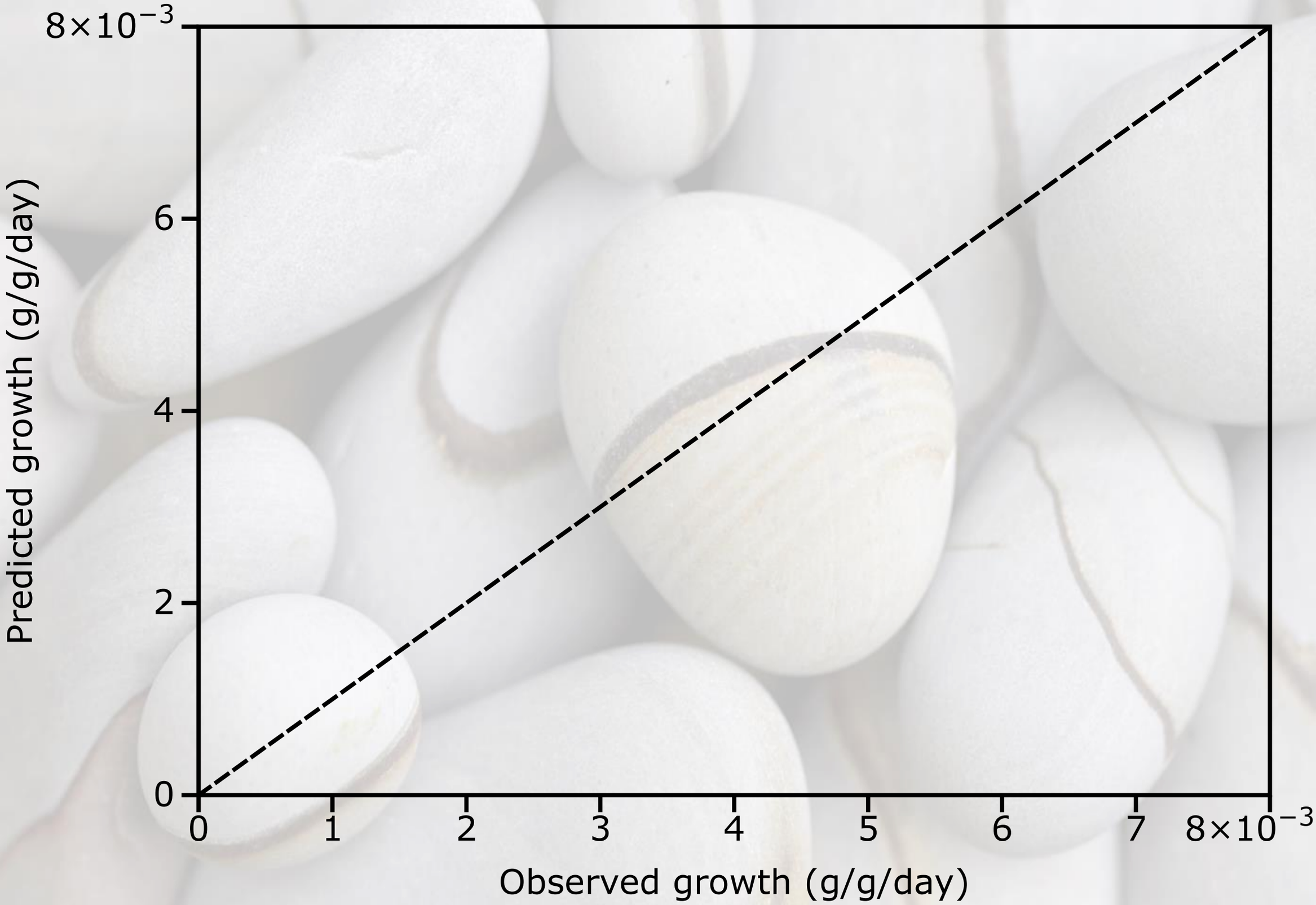
Metabolism

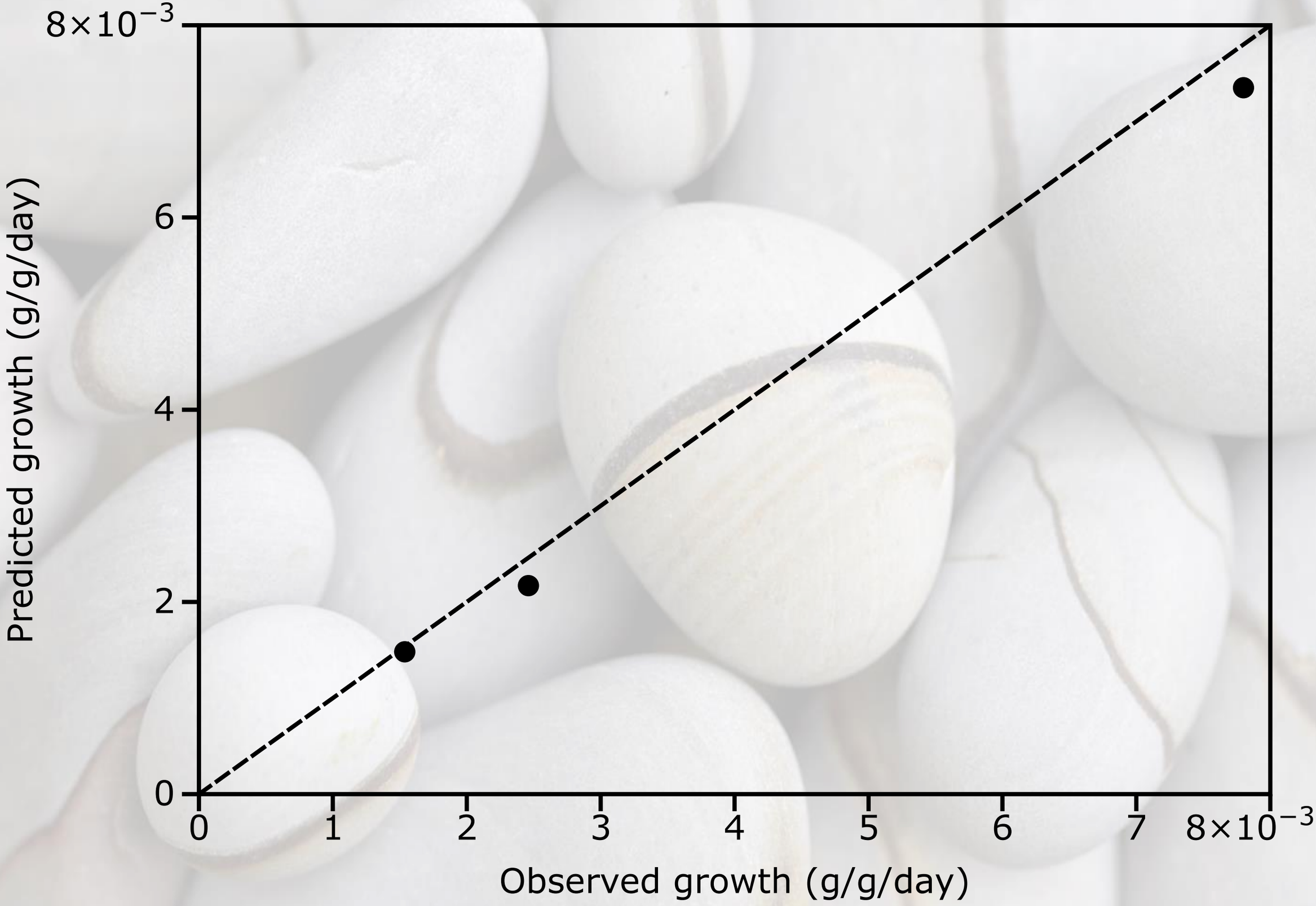
Consumption

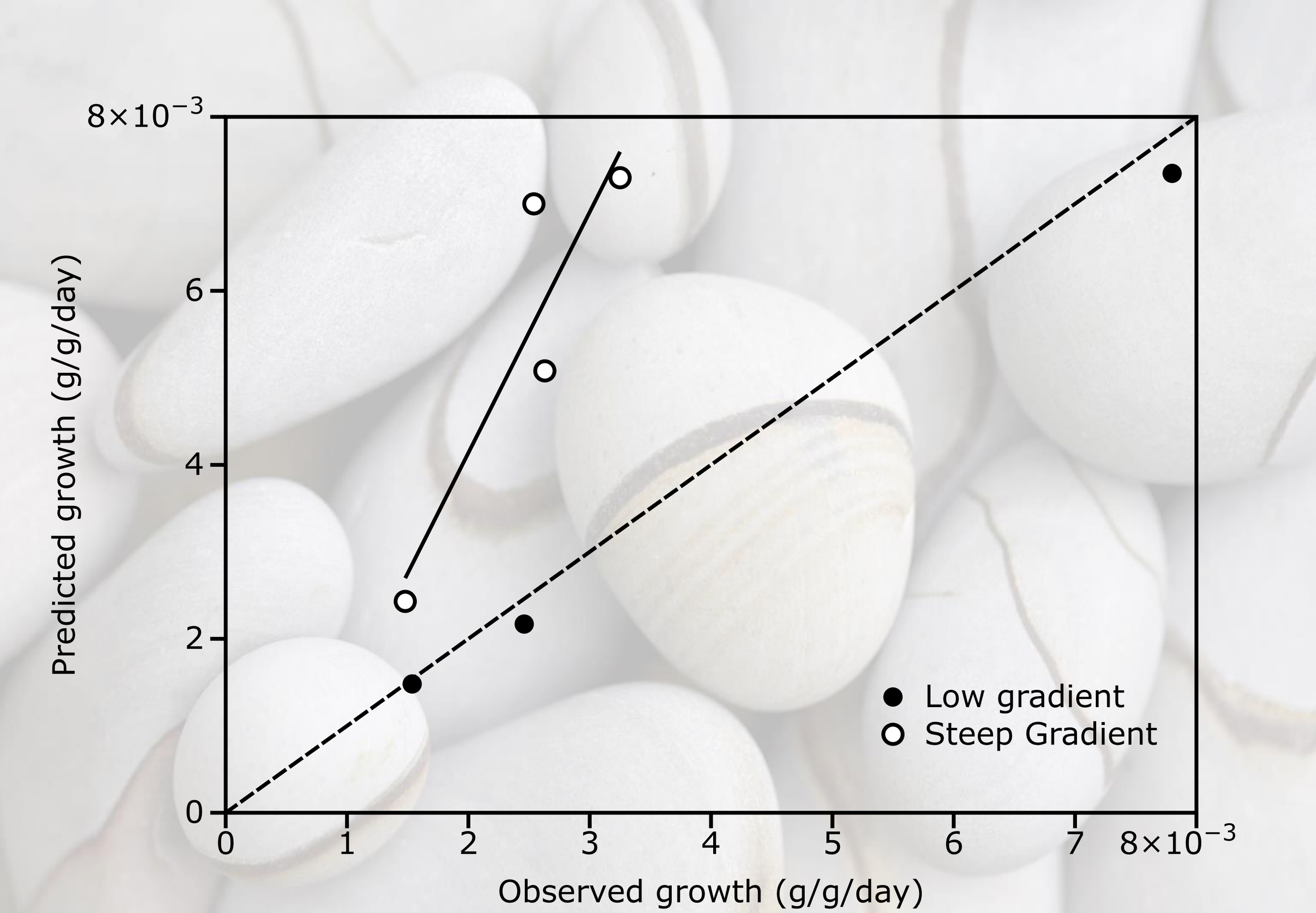
Waste

Growth

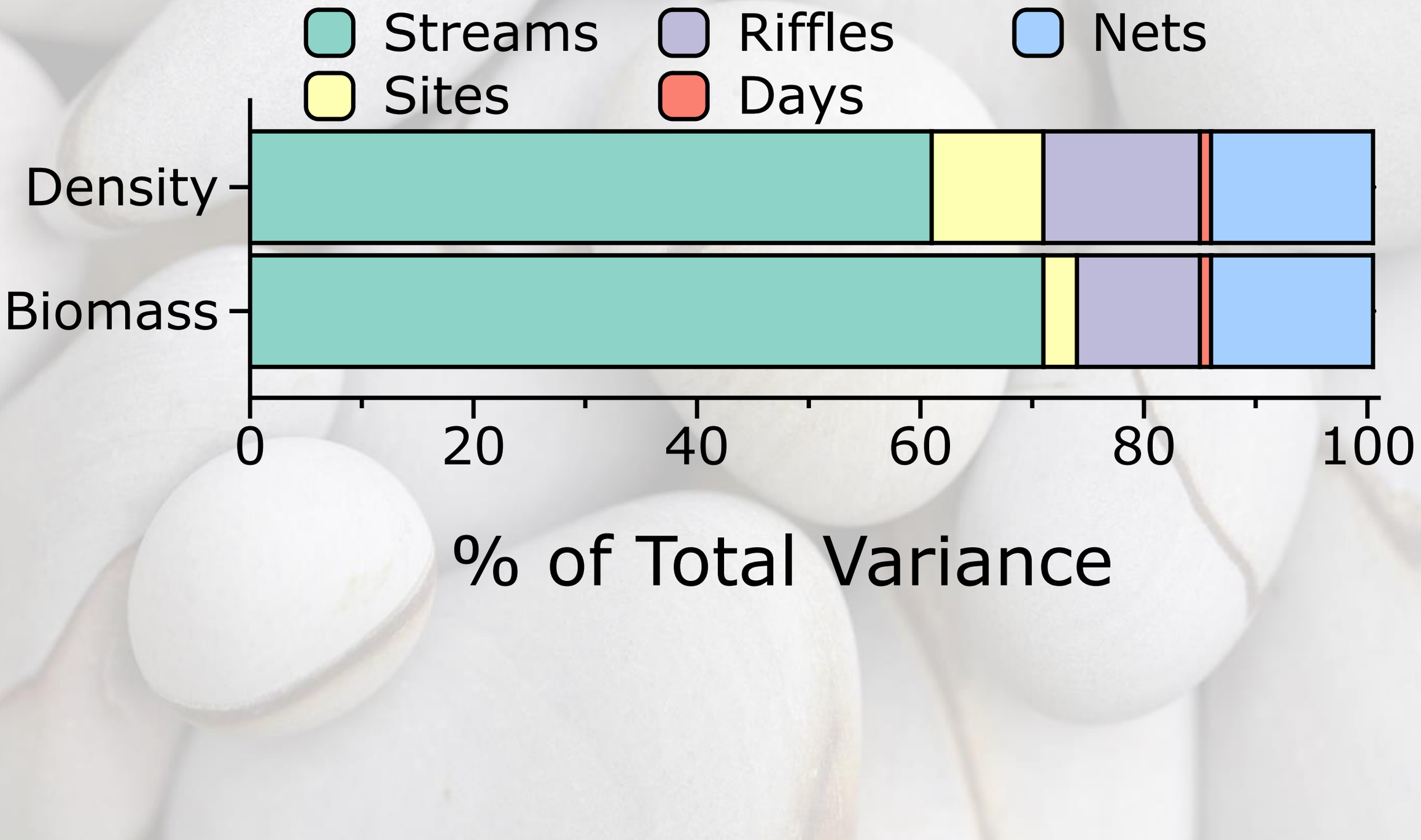

0.40
0.38
0.36
0.34
0.32
0.30
Consumption (%Cmax)
$R^2 = 0.67$
10
20
30
40
50
60
70
80
Total Drift Biomass (mg/100m^3)


8×10−3
6
4
2
0
Predicted growth (g/g/day)
0
1
2
3
4
5
6
7
8×10−3
Observed growth (g/g/day)


8×10−3
6
4
2
0
Predicted growth (g/g/day)
0
1
2
3
4
5
6
7
8×10−3
Observed growth (g/g/day)


8×10⁻³
6
4
2
0
Predicted growth (g/g/day)
0
1
2
3
4
5
6
7
8×10⁻³
Observed growth (g/g/day)
Low gradient
Steep Gradient

Drift Precission



CHaMP | Columbia Habitat Monitoring Program

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Home > CHaMP Program

Columbia Habitat Monitoring Program

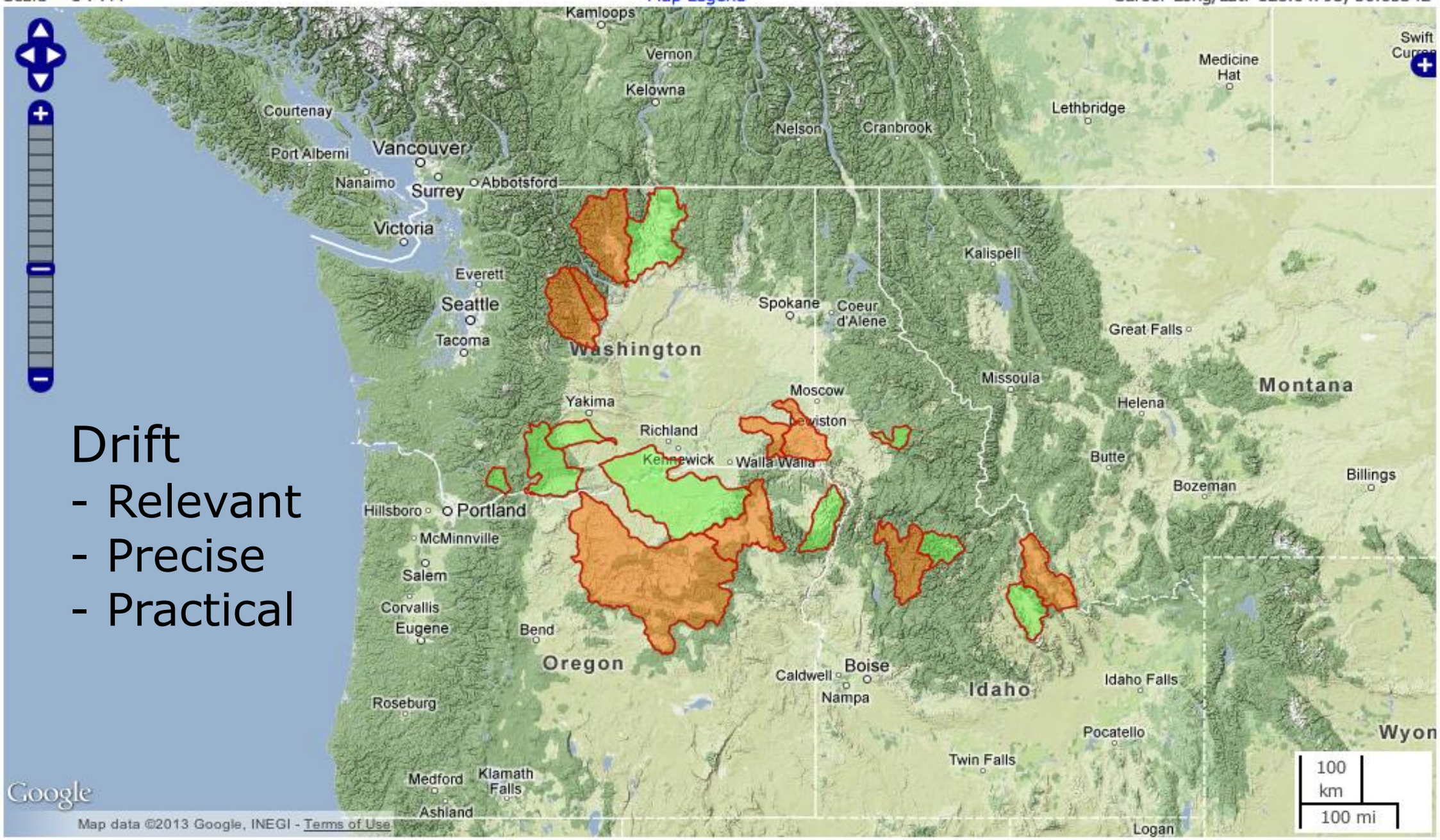
Overview | Map | People | Collaborators | Protocol | News & Announcements | Documents | Glossary

Scale = 1 : 7M

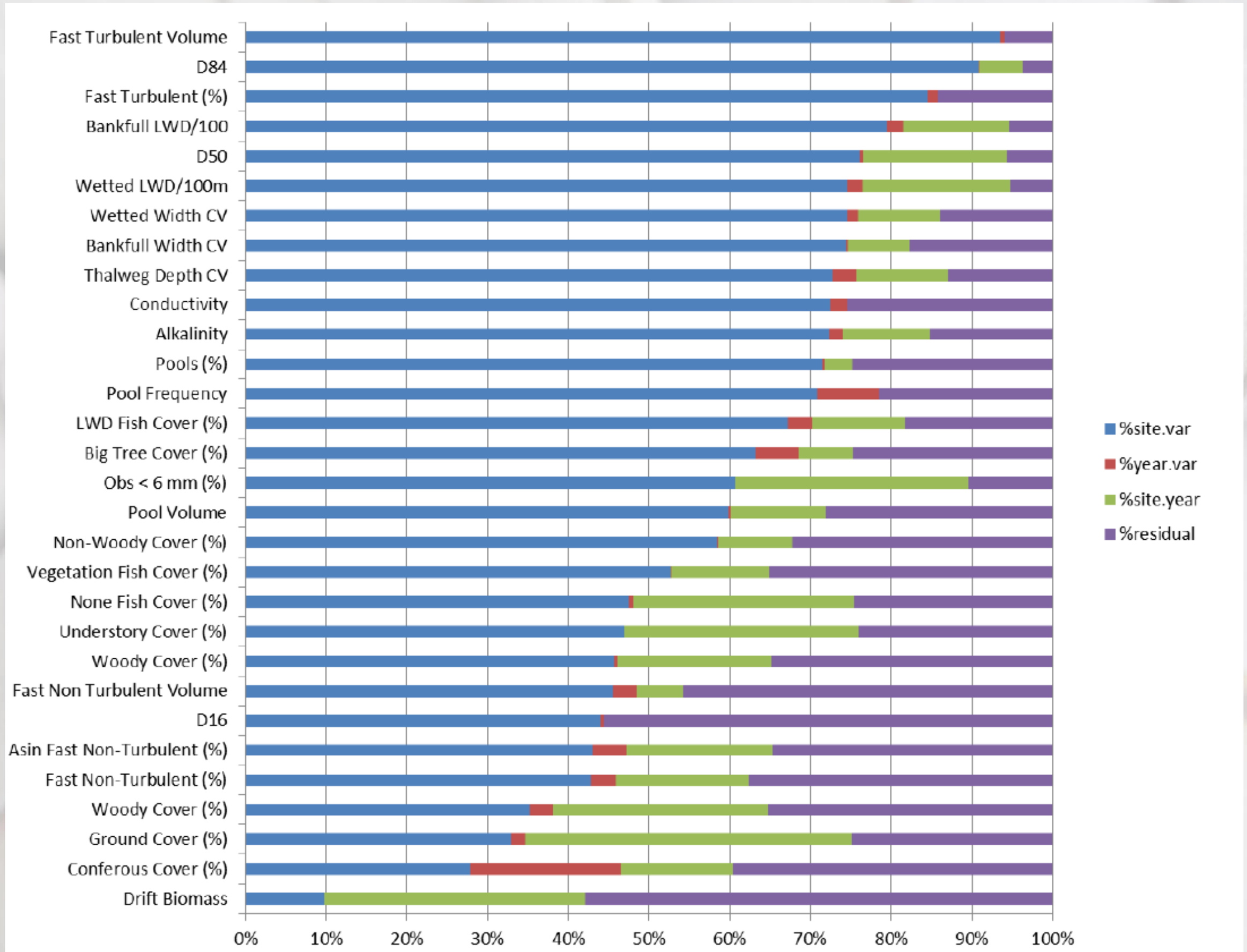
Map Legend

Cursor Long/Lat:-128.64795, 50.65342

Drift
- Relevant
- Precise
- Practical

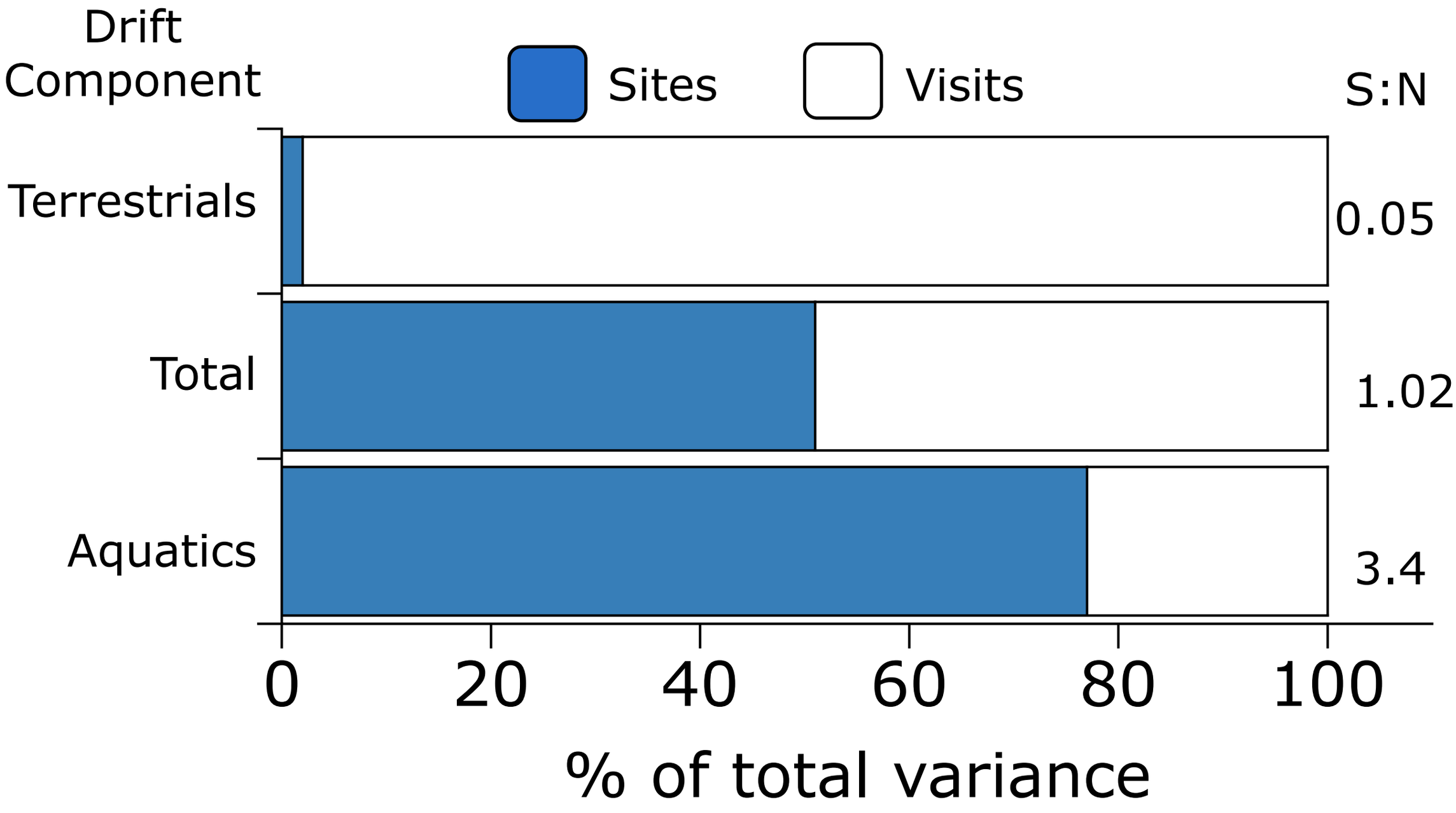


CHaMP 2011&2012



Drift Sample Variance

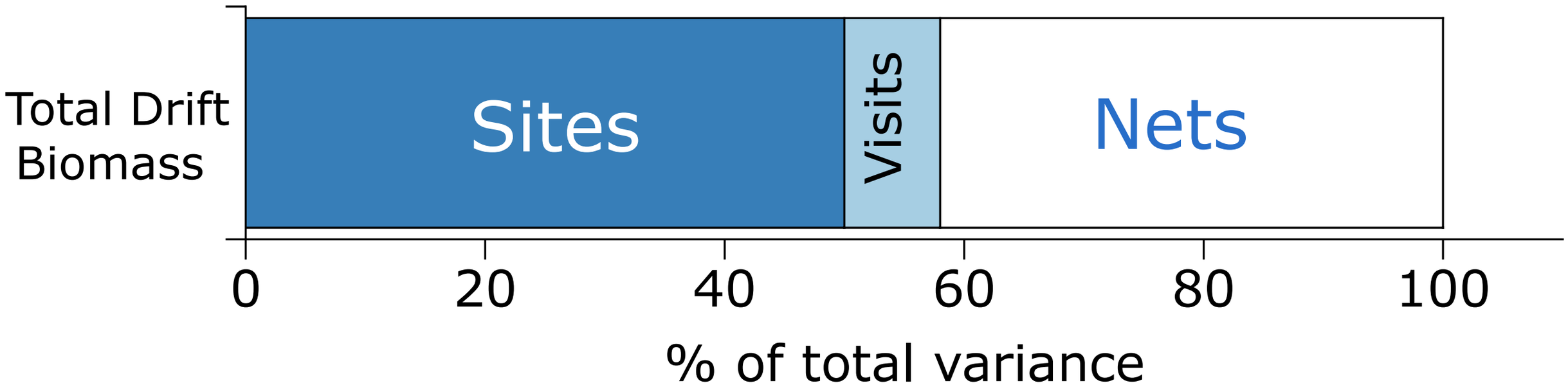
Terrestrial Drift



Drift Sample Variance

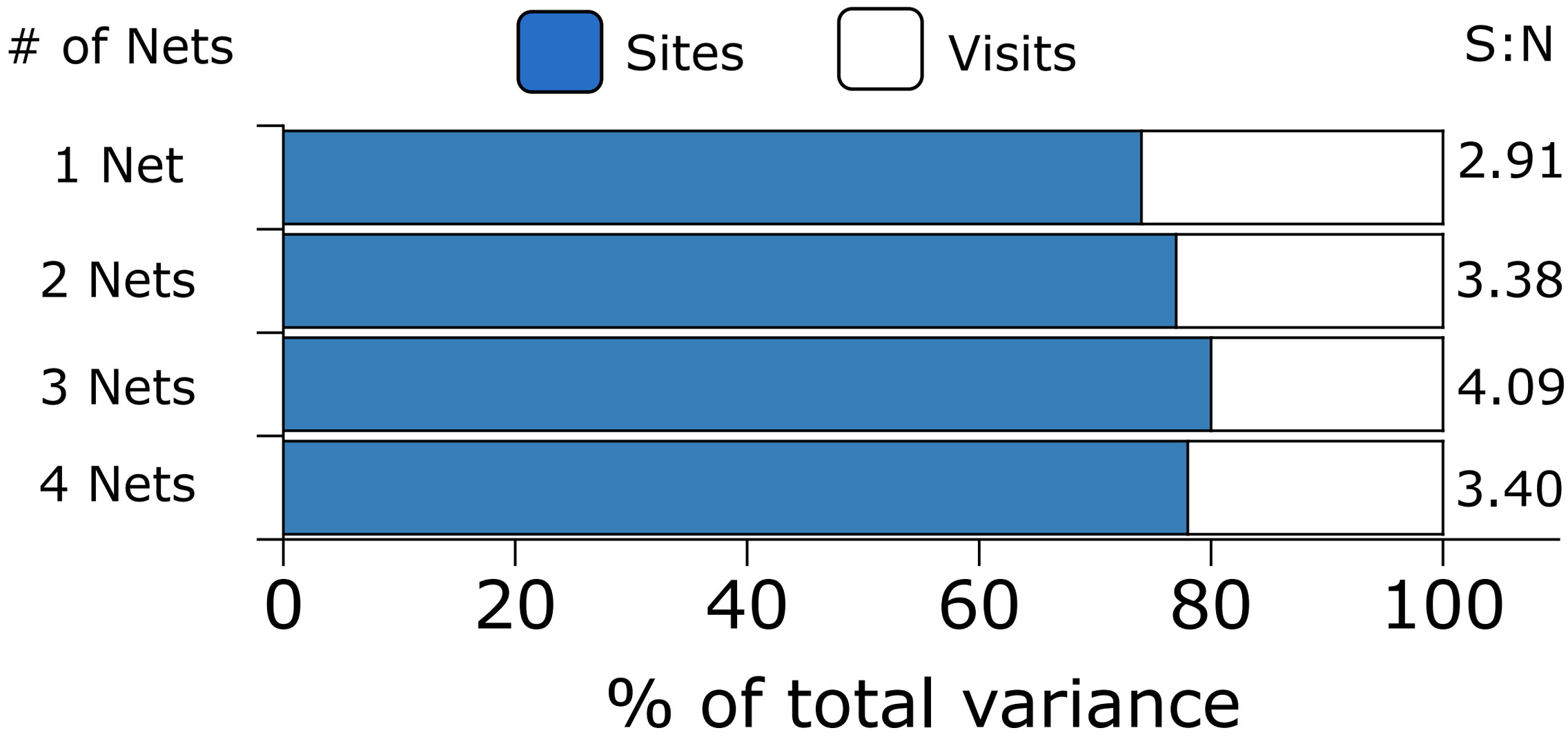
Variance Between Nets

S:N = 1.02



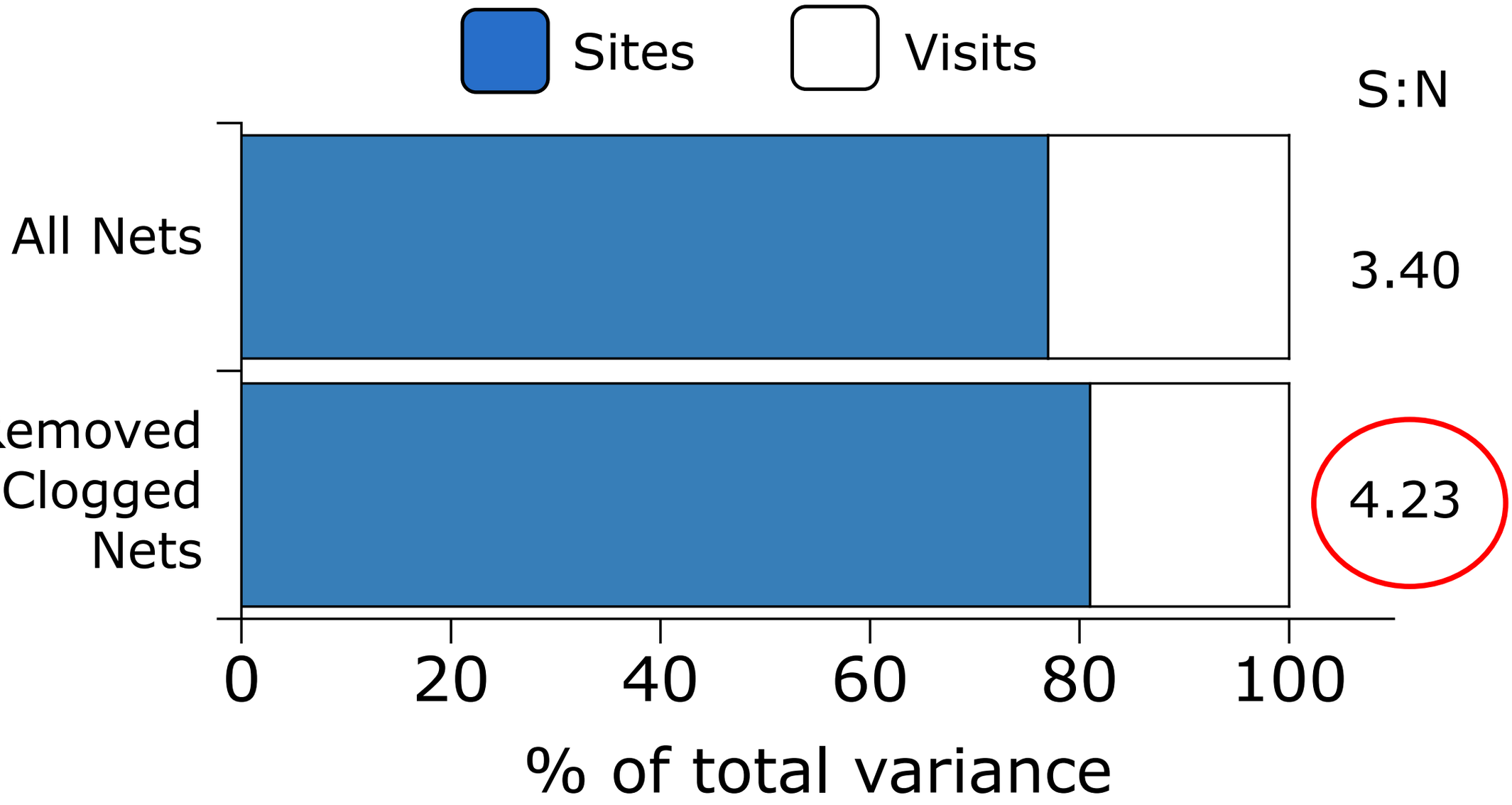
Drift Sample Variance

Pooling Drift Nets

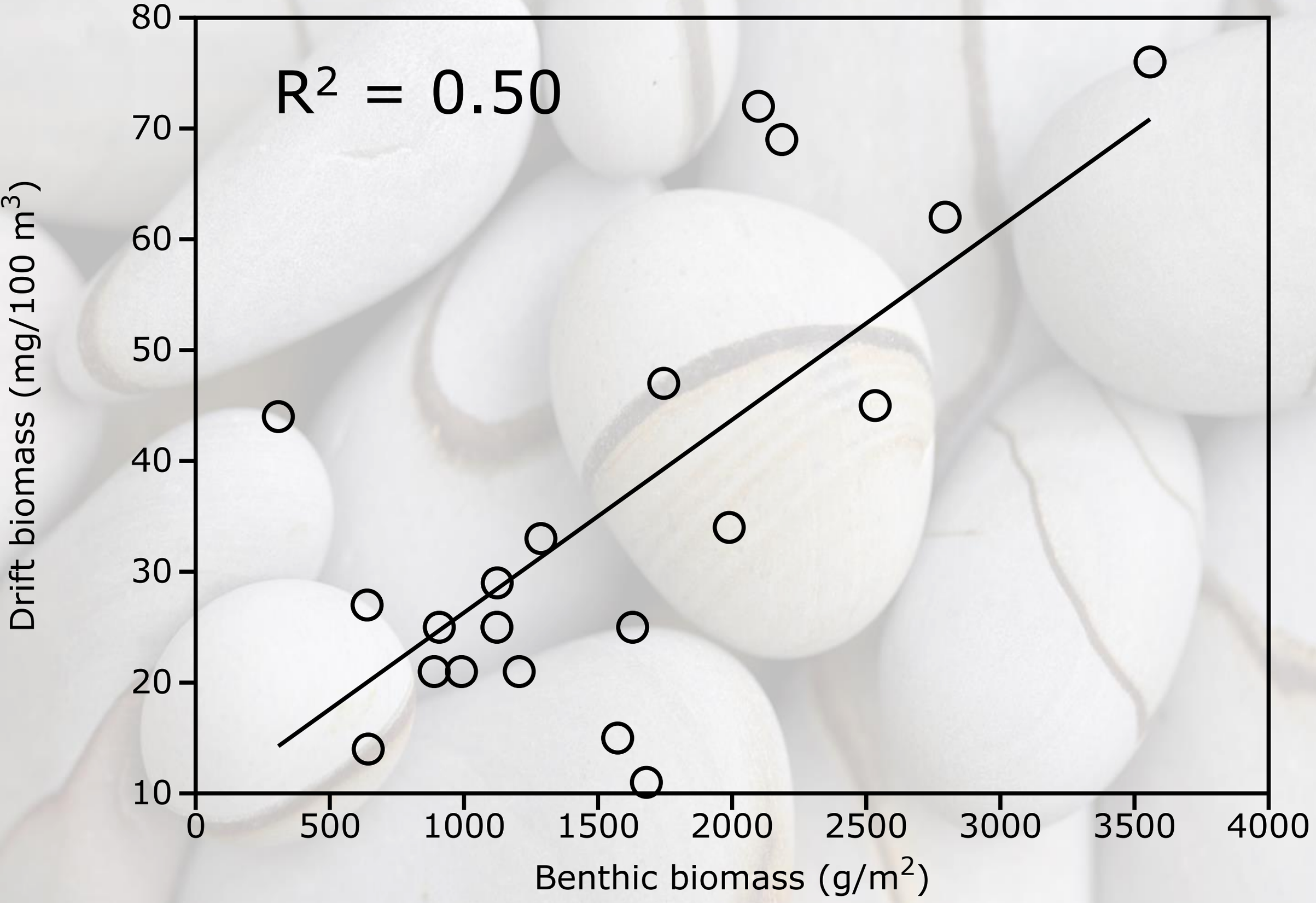


Drift Sample Variance

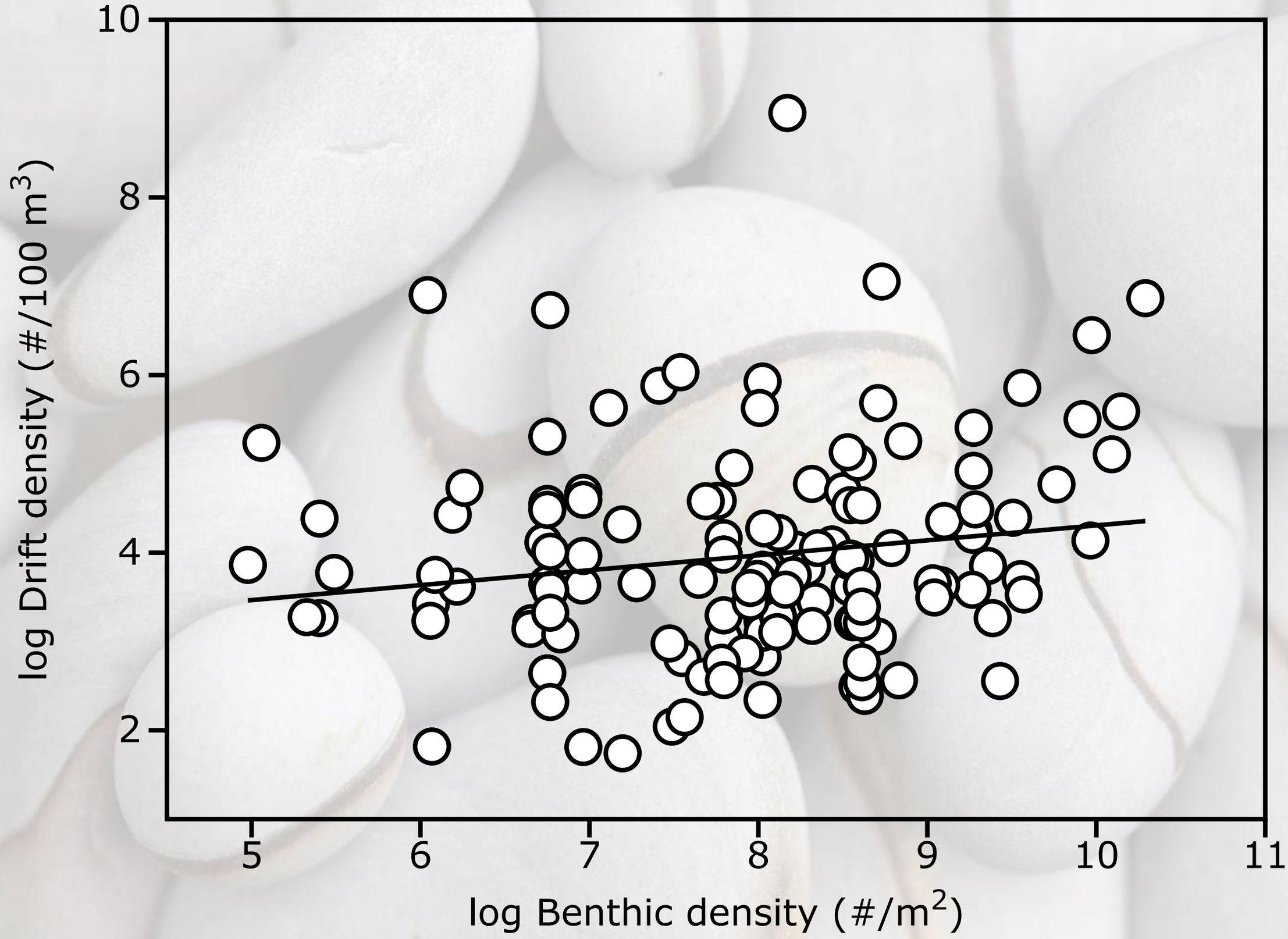
Net Clogging



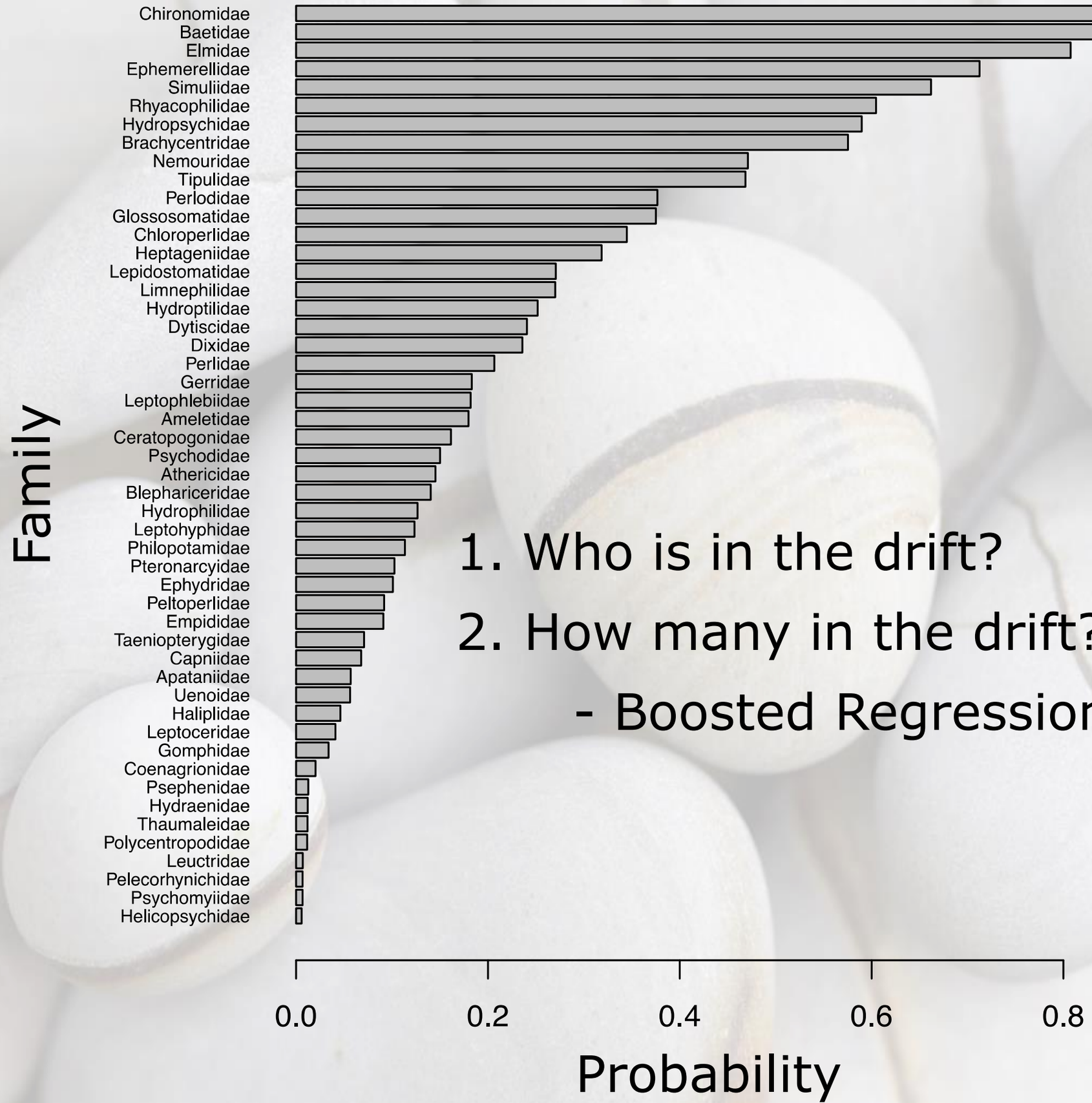
Drift vs Benthic



Drift vs Benthic

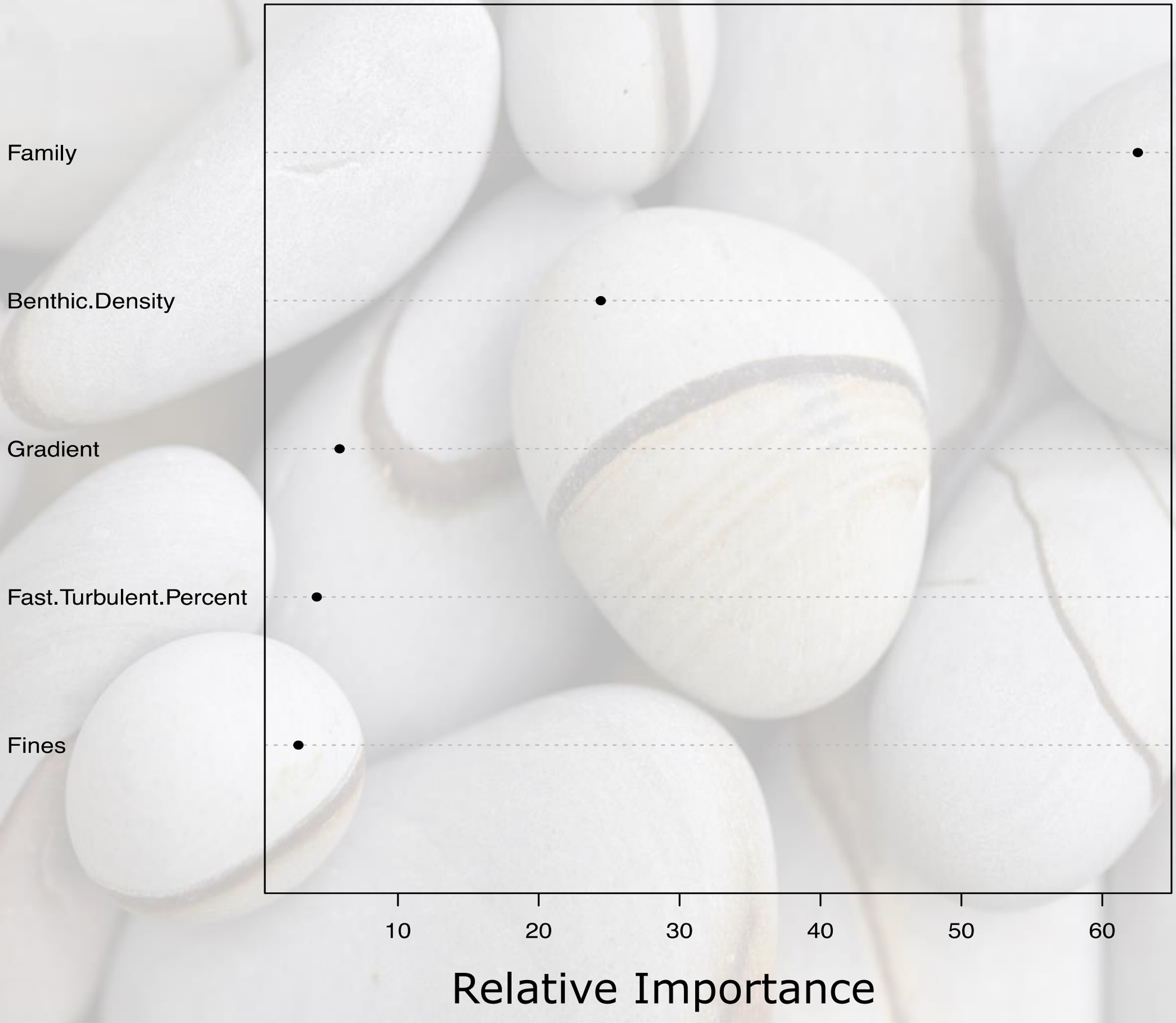


Probability occurrence in the Drift

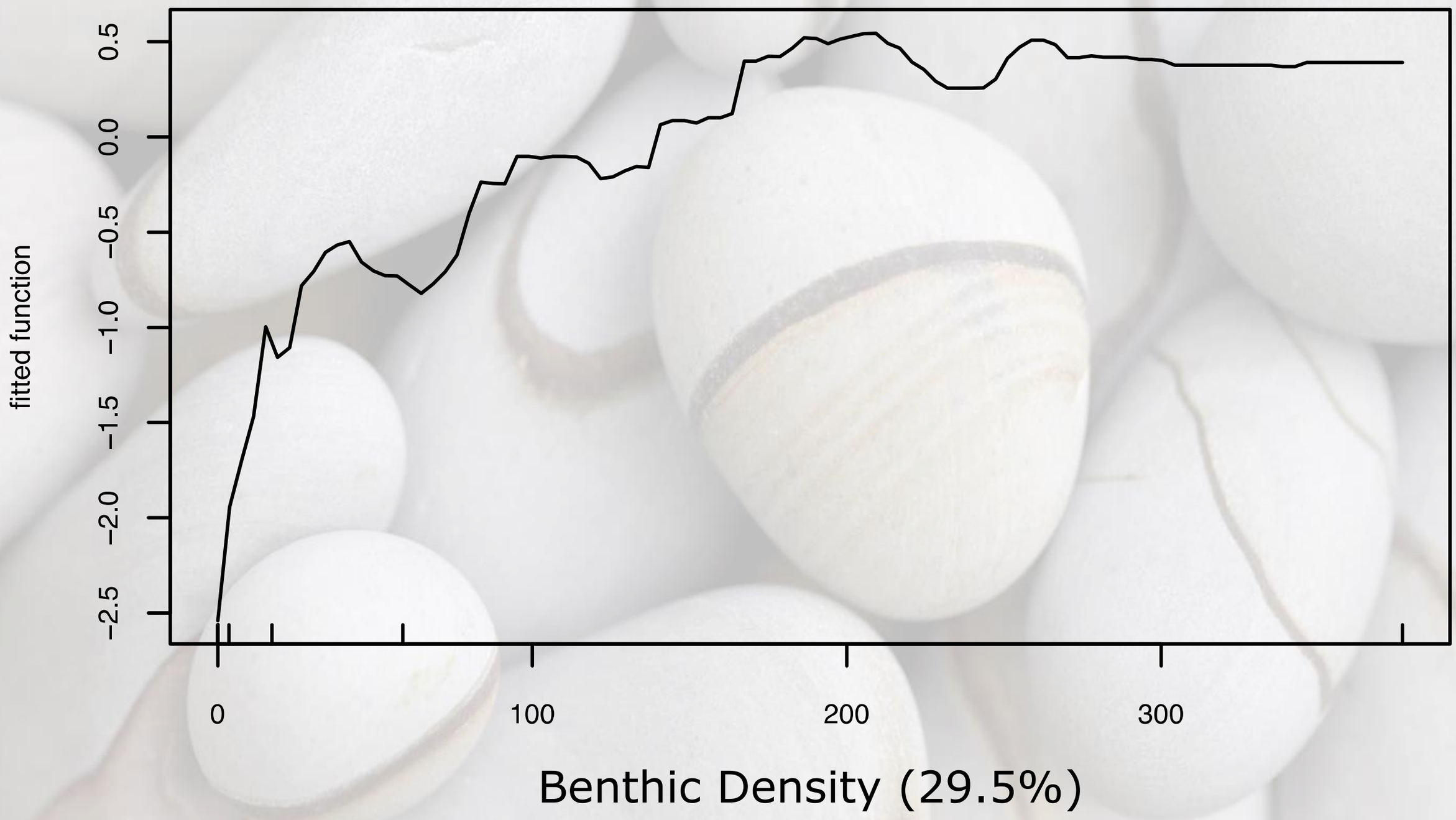


1. Who is in the drift?
2. How many in the drift?
   - Boosted Regression Trees

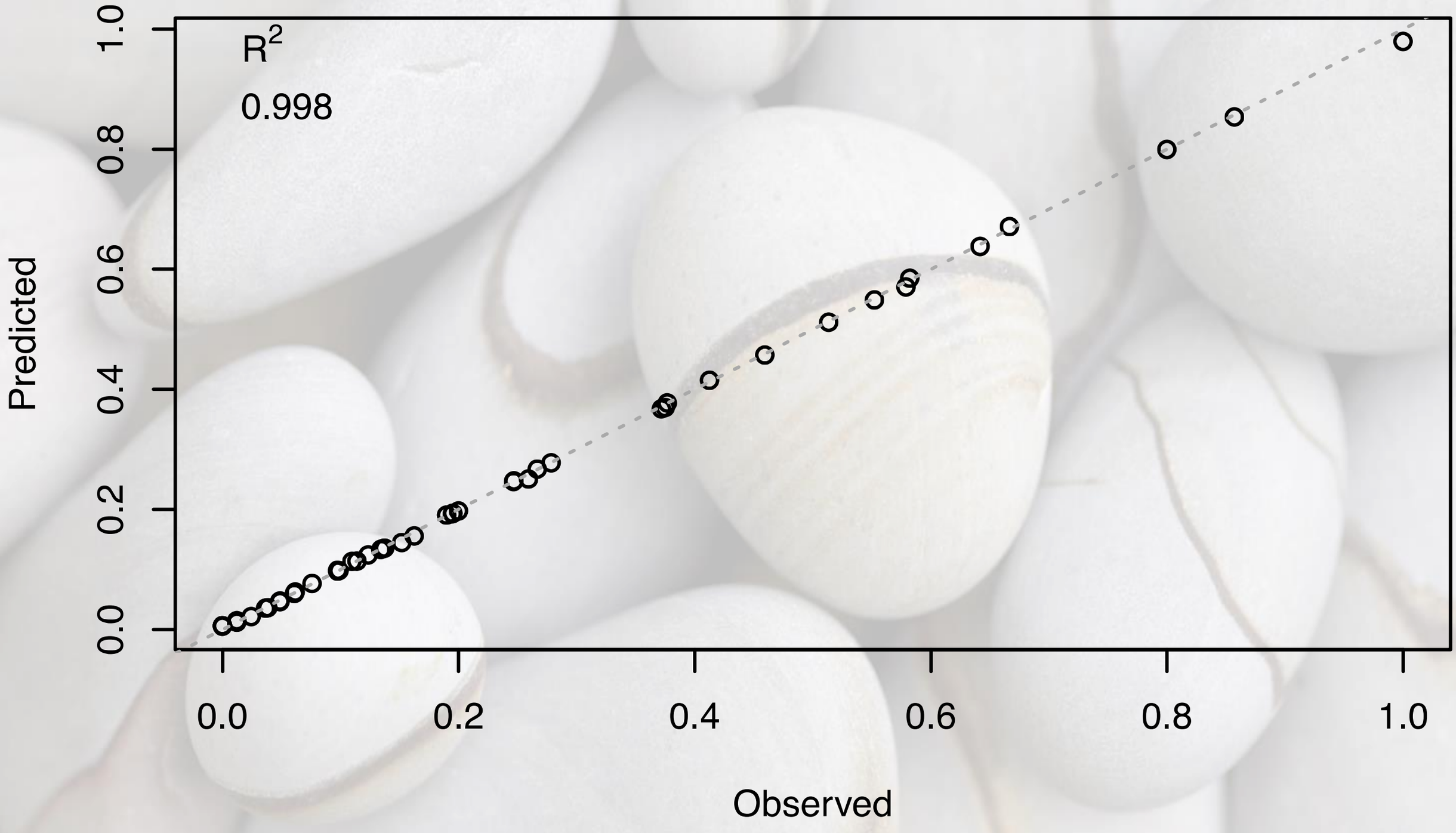
Probability in Drift



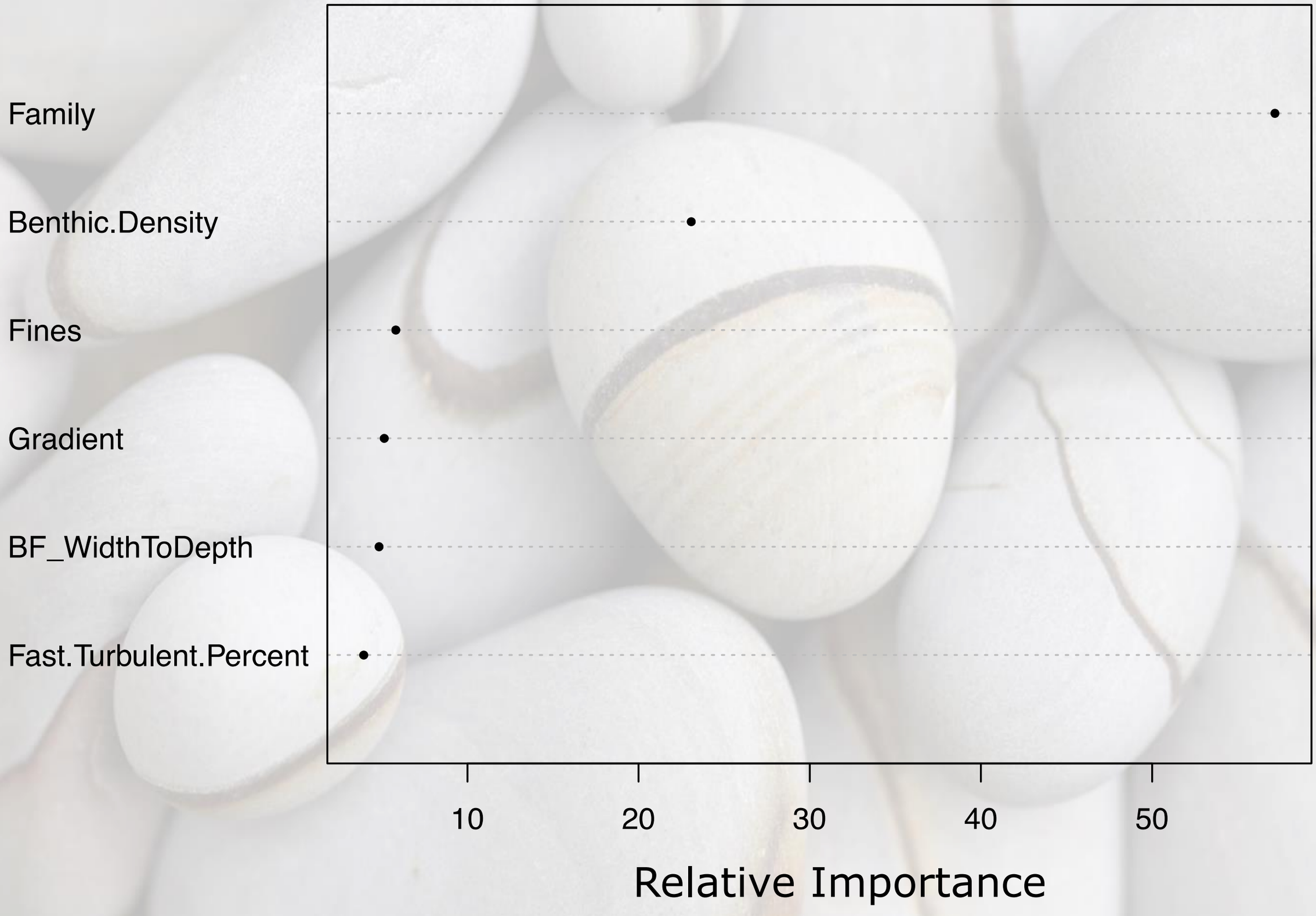
Probability in Drift



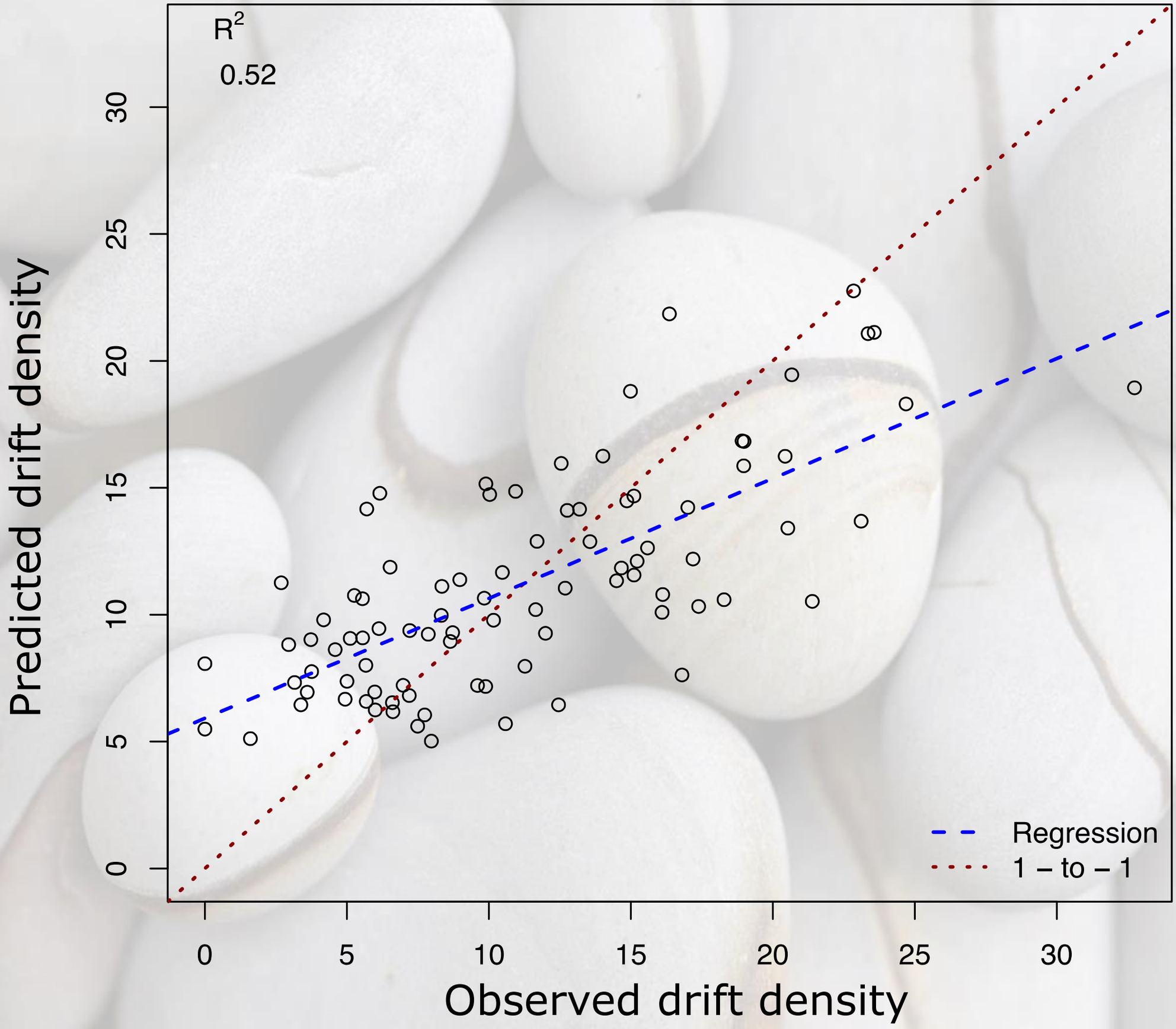
Probability in Drift



Abundance in Drift

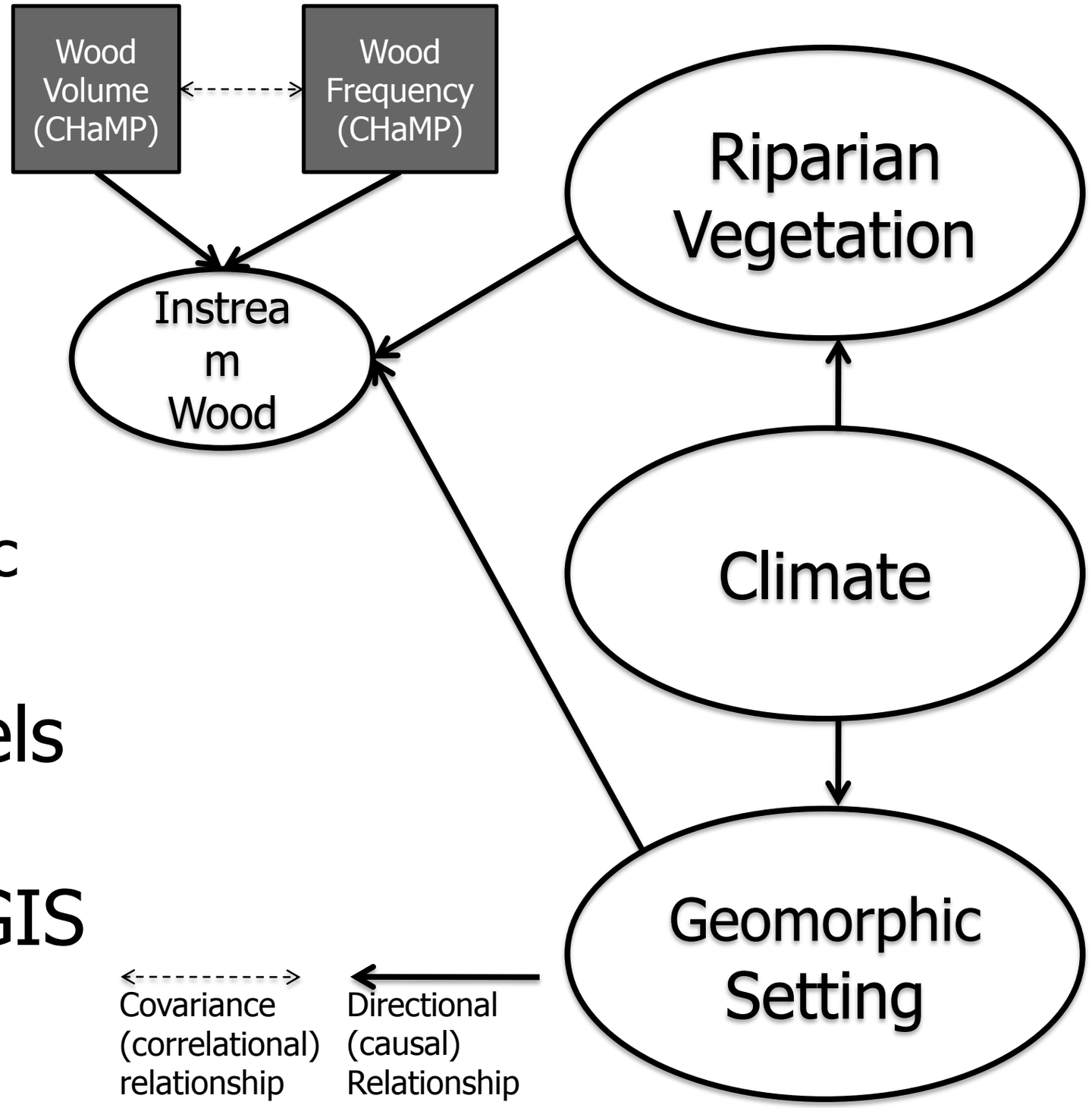


Predicted drift density



Modeling large wood

- What processes drive wood in CRB sub-basins?
  - Riparian vegetation
  - Stream attributes
  - Watershed geomorphic setting
- Can informative models be built using CHaMP data and watershed GIS analyses?



N

0 10 20 30 40 50 Kilometers

0 5 10 15 20 25 Kilometers

0 10 20 30 40 50 Kilometers

0 30 60 90 120 150 Kilometers

0 10 20 30 40 50 Kilometers

Elevation (m)

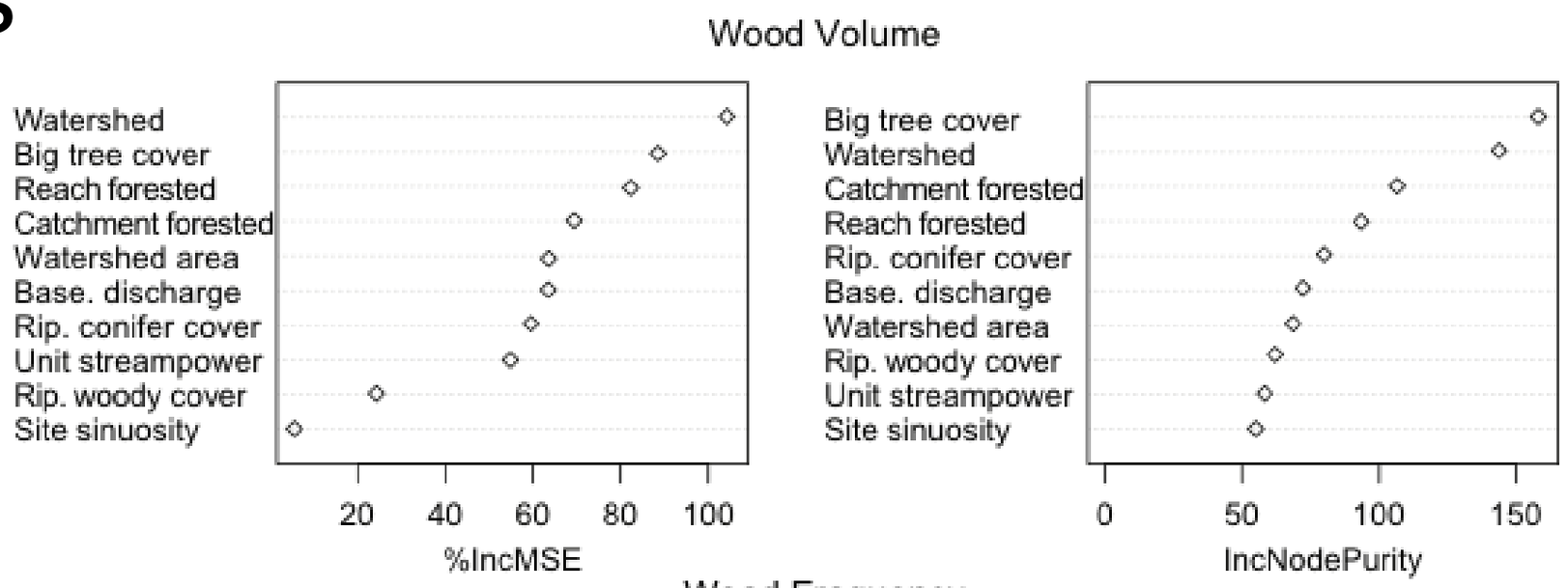
- High : 3454
- Low : 79

Large wood frequency

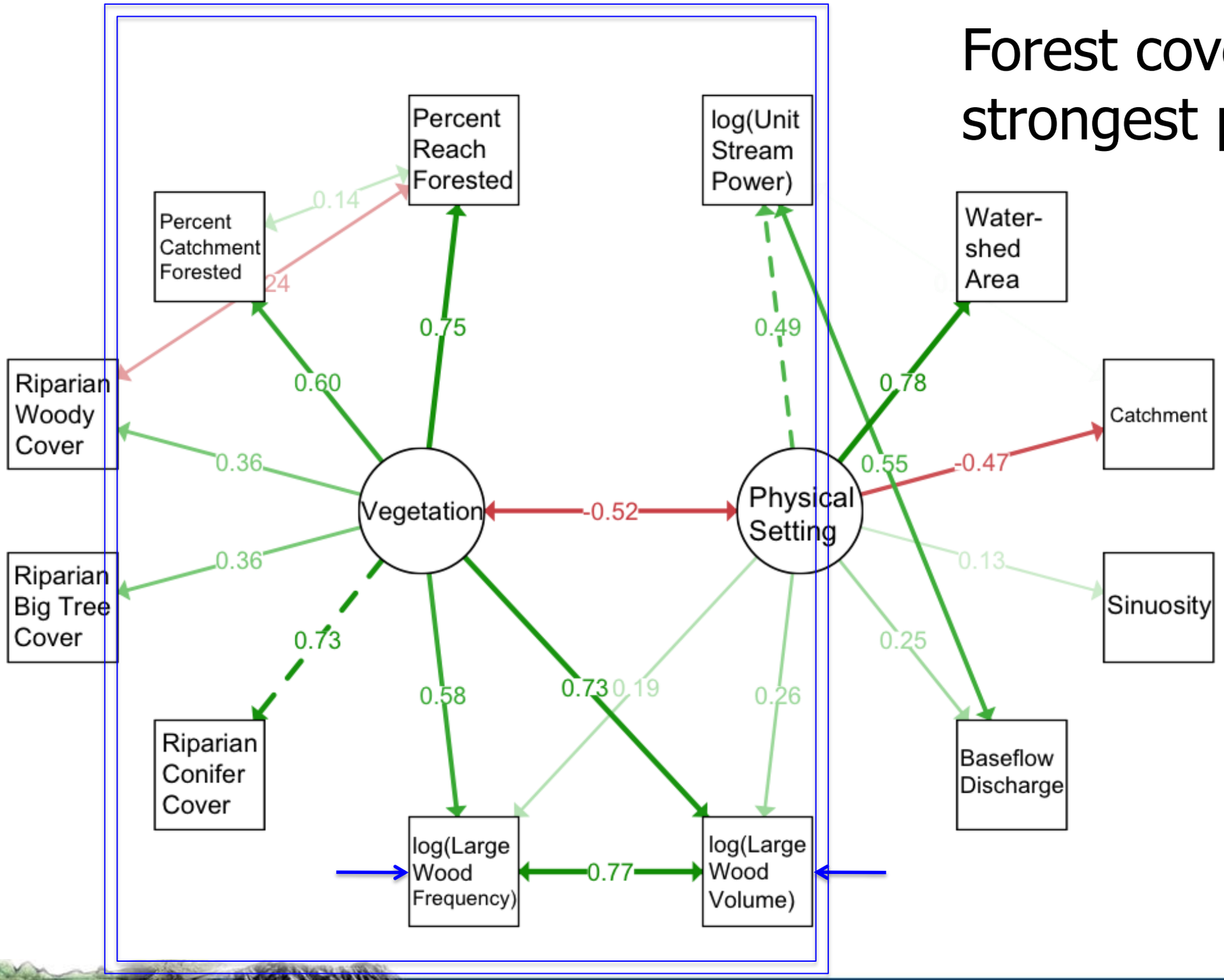
Streams

Drivers of wood in CRB sub-basins

- Specific sub-basins (climate)
- Riparian, buffer and catchment forest cover
- Stream power and associated processes
- Empirical evidence for predictive models to set restoration targets



Final model

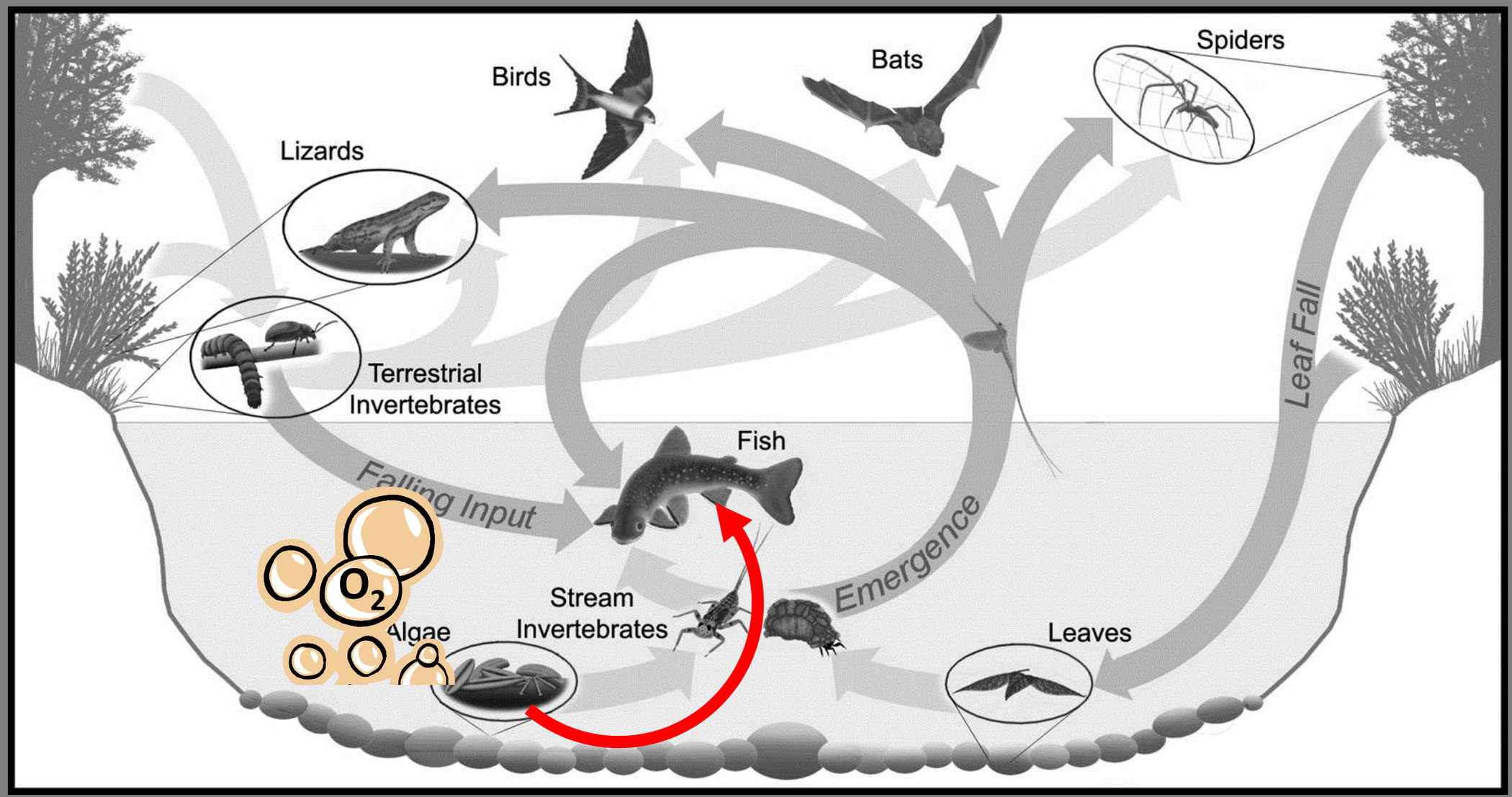


Forest cover strongest predictors!

Goals:

1) Determine feasibility of watershed scale measurements
2) Evaluate relationship between production and fish metrics
3) Develop watershed scale primary production model

Aquatic Prey Resources

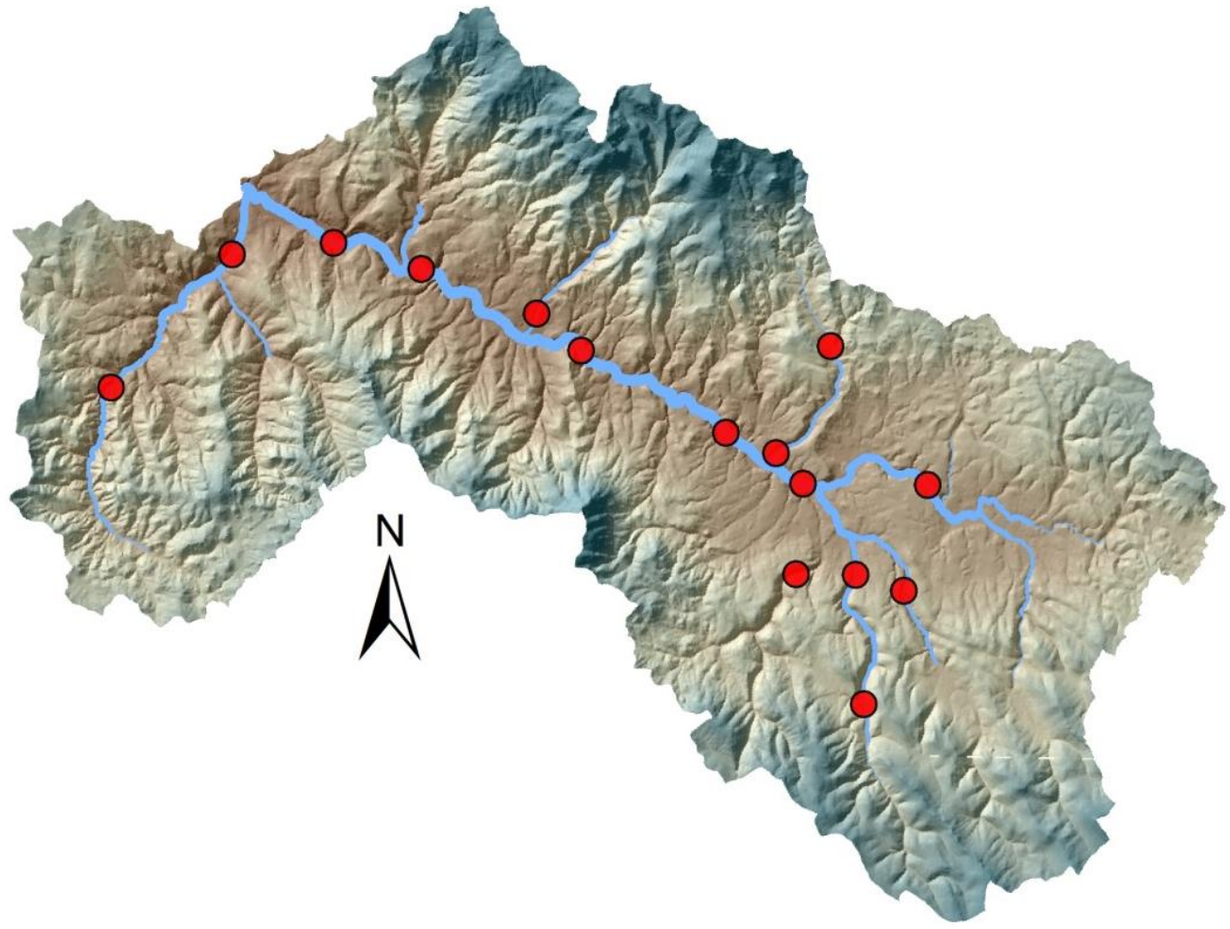


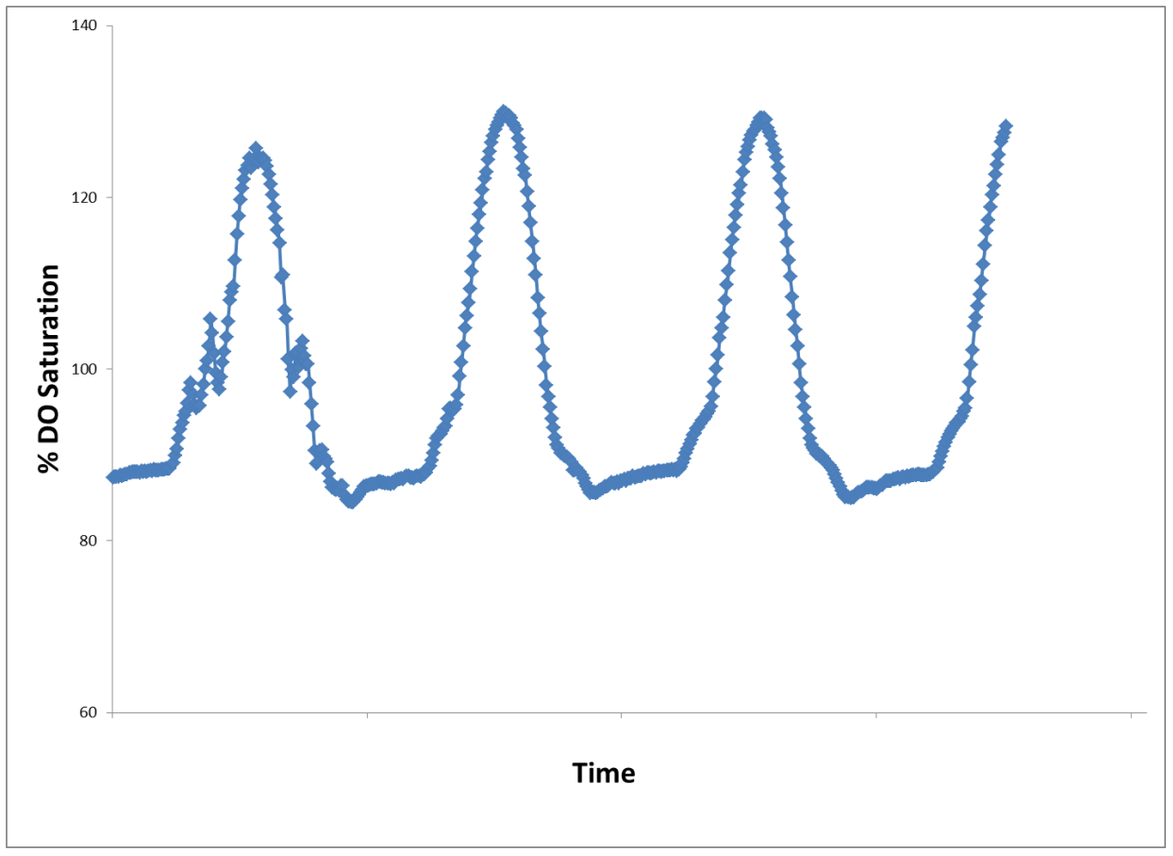
Sampling design

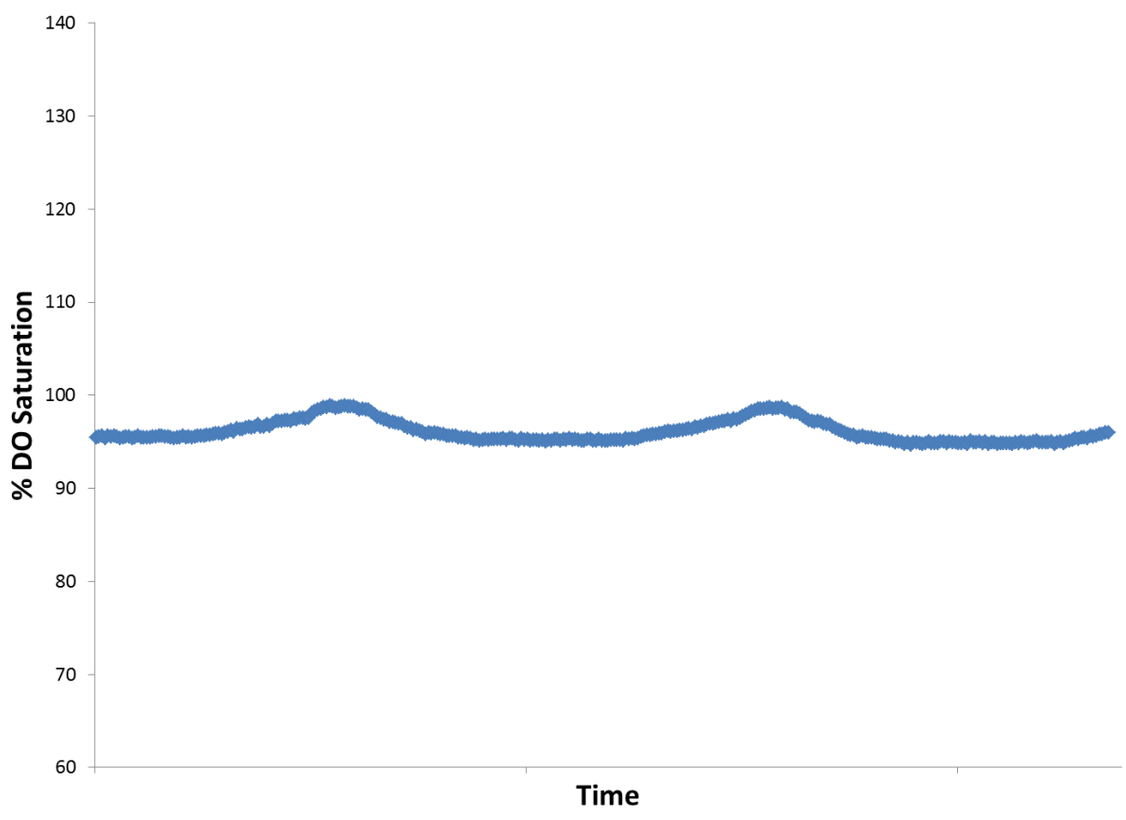
- Short and long-term deployment
  - 2-3 day
  - 21 day

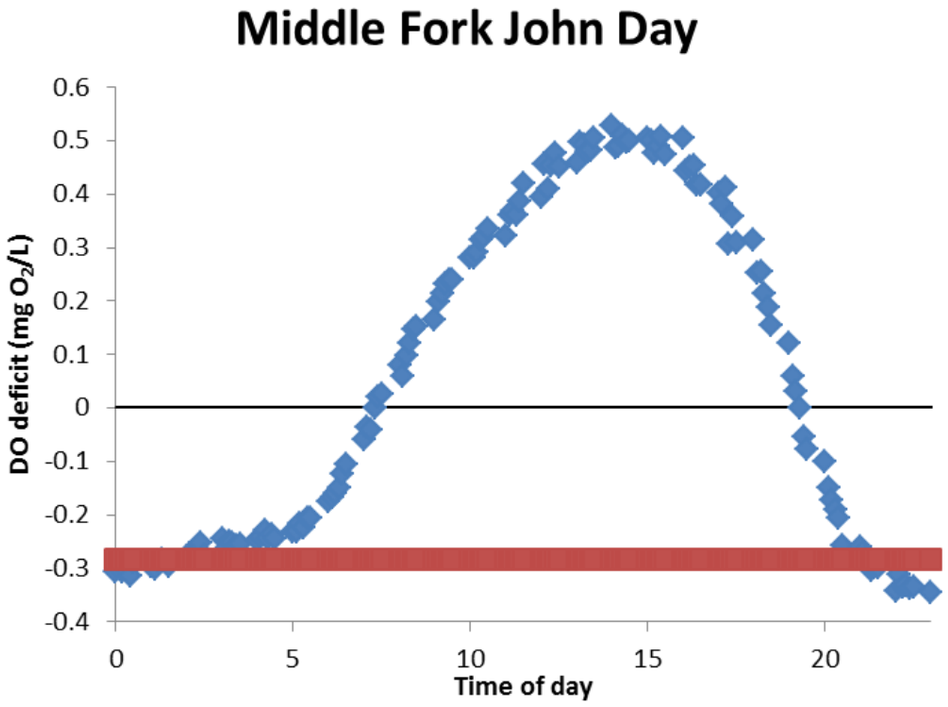
- 15 sites w/i Middle Fork John Day
  - Stratified by geomorphic classification unit

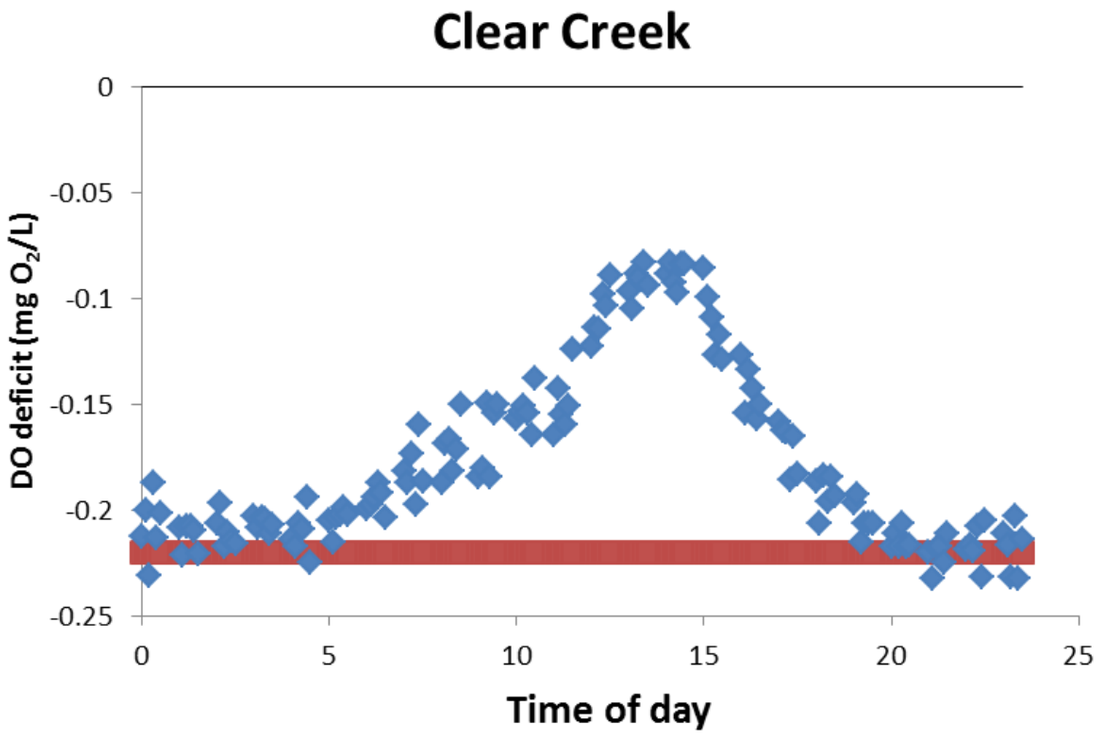
- Used PME miniDOT loggers




140
120
100
80
60
% DO Saturation
Time


140
130
120
110
100
90
80
70
60
% DO Saturation
Time


Middle Fork John Day
DO deficit (mg O2/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
0
5
10
15
20
Time of day


Clear Creek
DO deficit (mg O2/L)
0
-0.05
-0.1
-0.15
-0.2
-0.25
0
5
10
15
20
25
Time of day

Preliminary Results:

Tributaries

- Net production negative
- Gross production 0.55 – 5.12 mg O_2 m^{-2} d^{-1}

Mainstem

- Net production positive
- Gross production 11.66 – 24.5 mg O_2 m^{-2} d^{-1}

Preliminary Results:

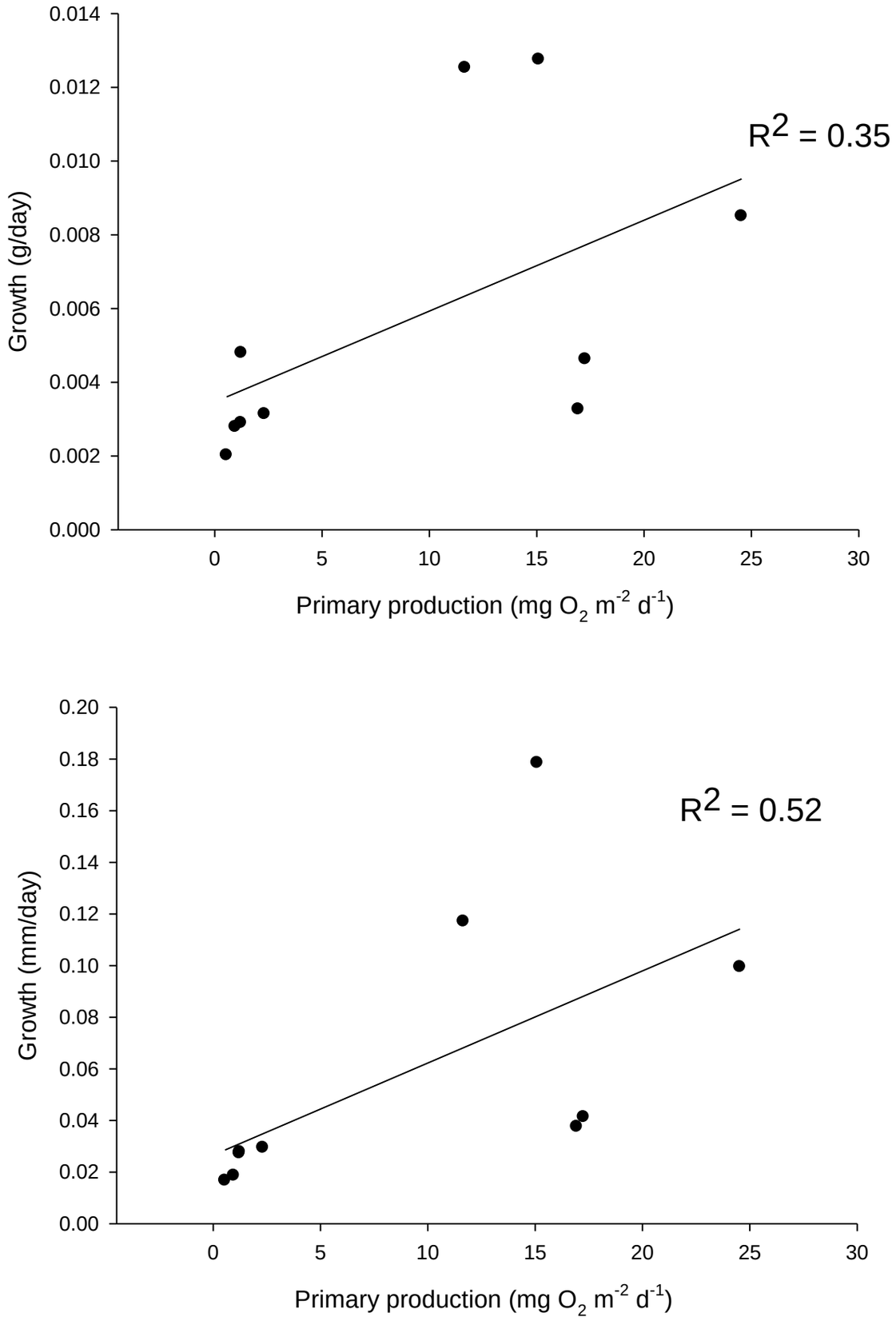
Tributaries

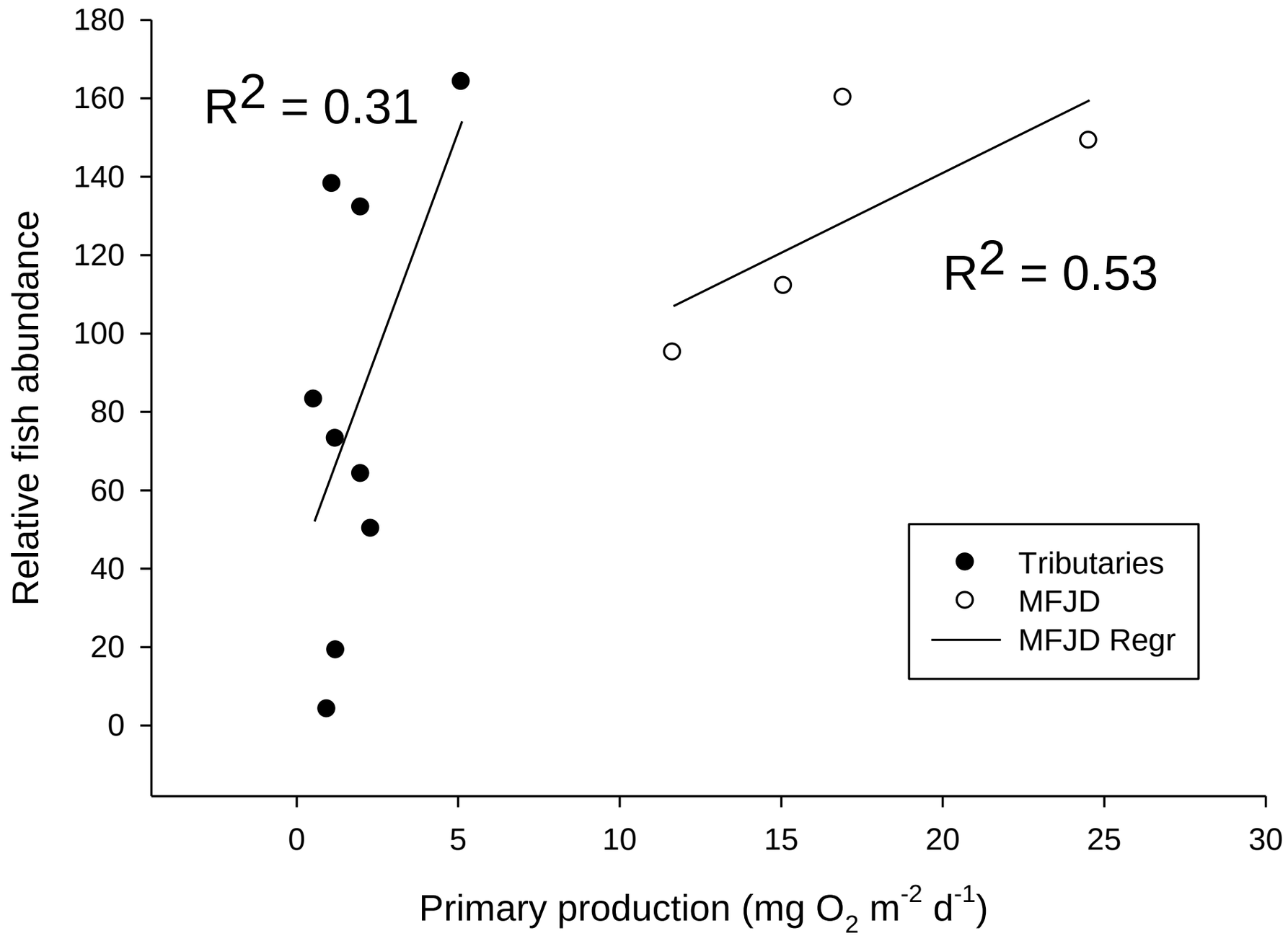
- Net production negative
- Gross production 0.55 – 5.12 mg O_2 m^{-2} d^{-1}

Mainstem

- Net production positive
- Gross production 11.66 – 24.5 mg O_2 m^{-2} d^{-1}

Across the watershed, Primary production along explained a significant portion of variation in fish growth





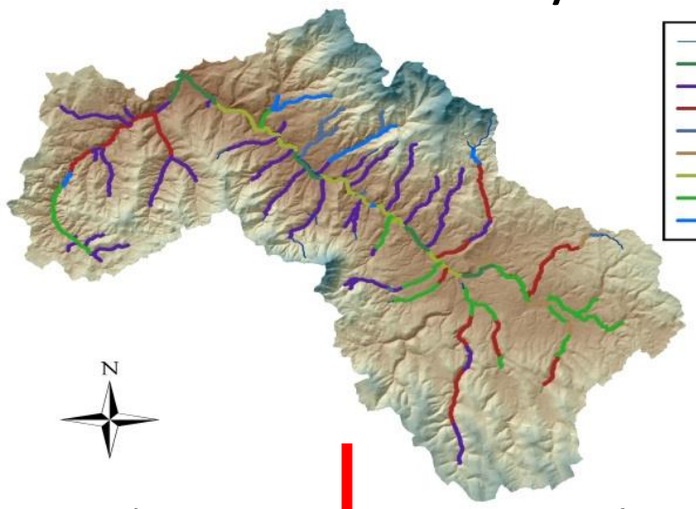
- Primary production also correlated with fish abundance, but more strongly in mainstem

Goals:

1) Determine feasibility of watershed scale measurements
    - monitor 12-18 sites in 10 d
2) Evaluate relationship between production and fish metrics
    - Power to explain variation in fish growth and abundance likely to increase when accounting for temperature and bioenergetics
3) Develop watershed scale primary production model

Watershed Scale Model of Primary Production

River Styles



Substrate

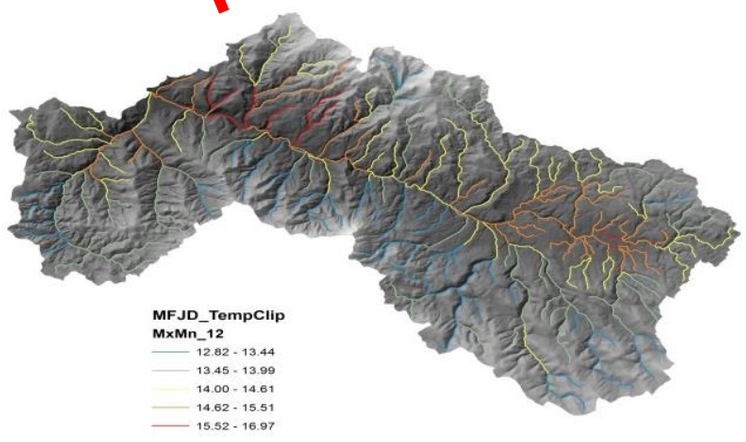
Vegetation

ht

Channel Morphology

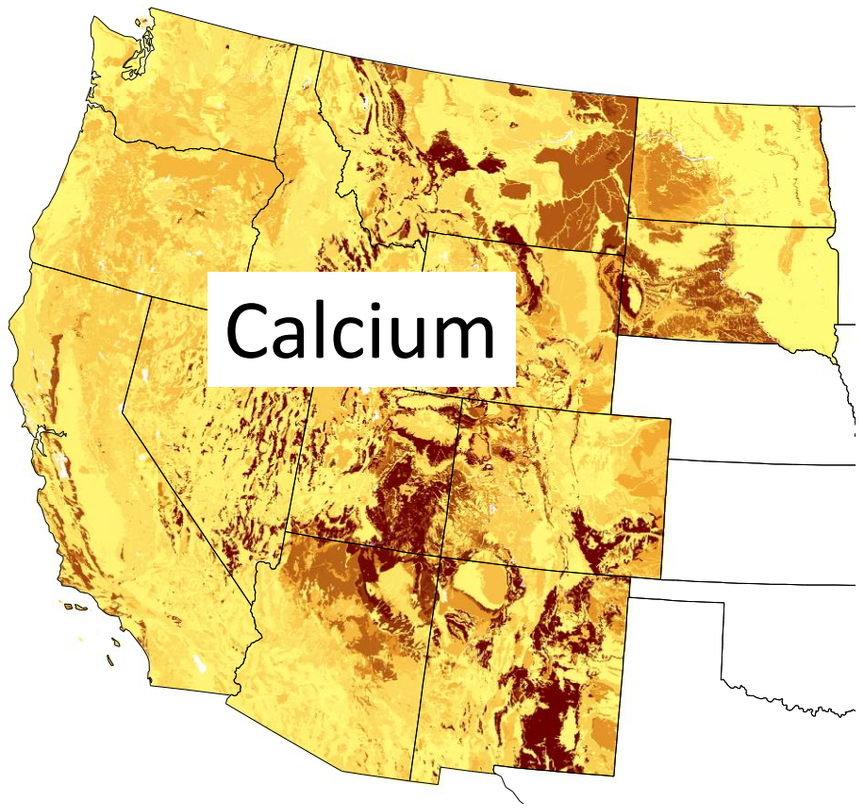
Primary Production

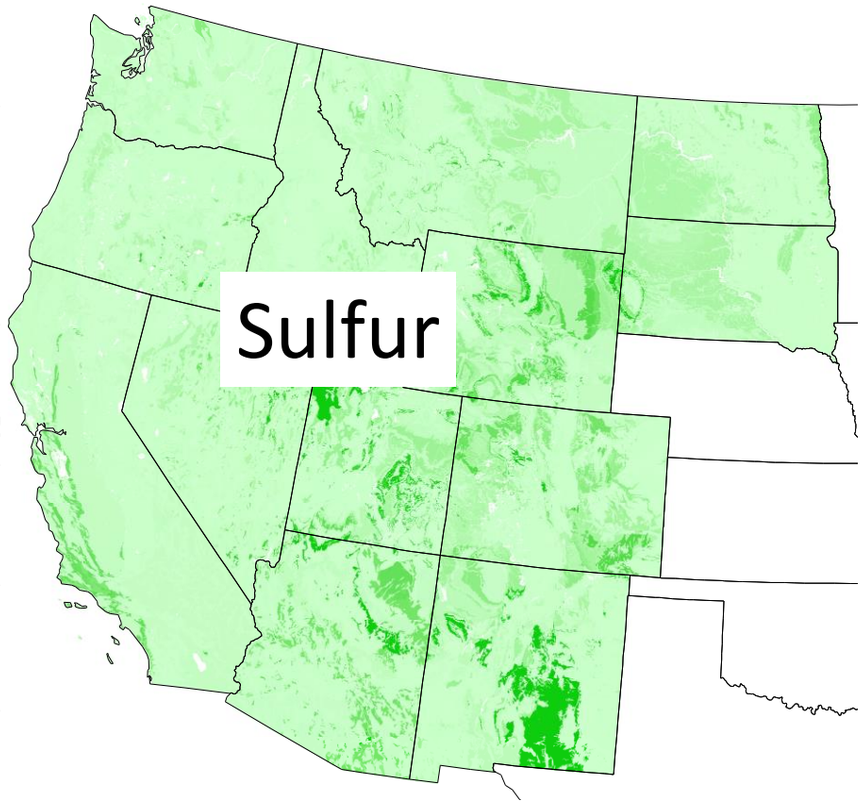
Nutrient Concentration

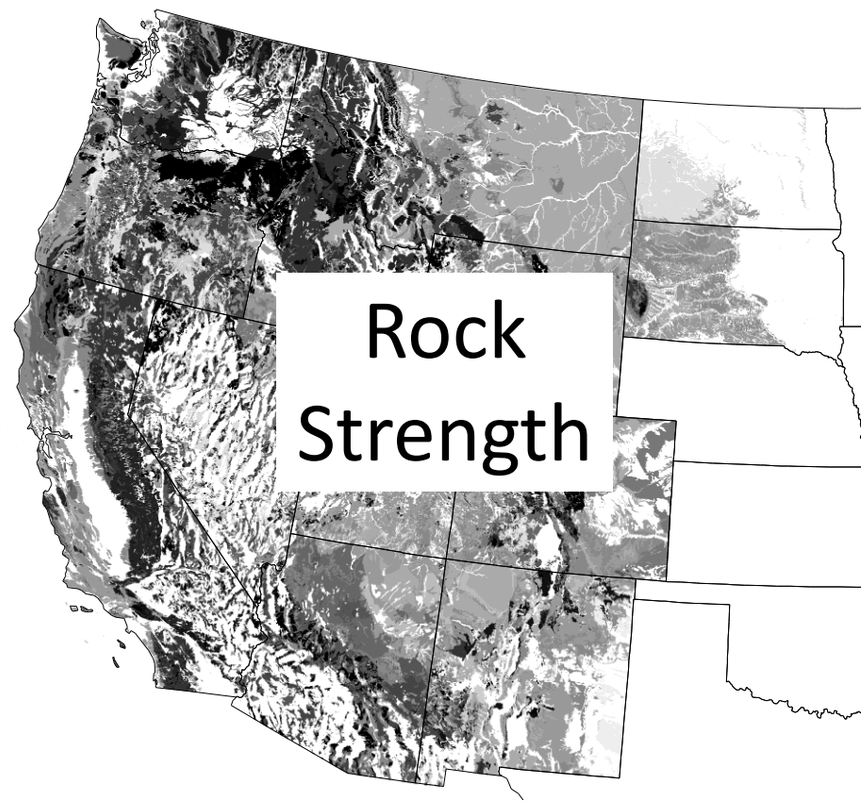


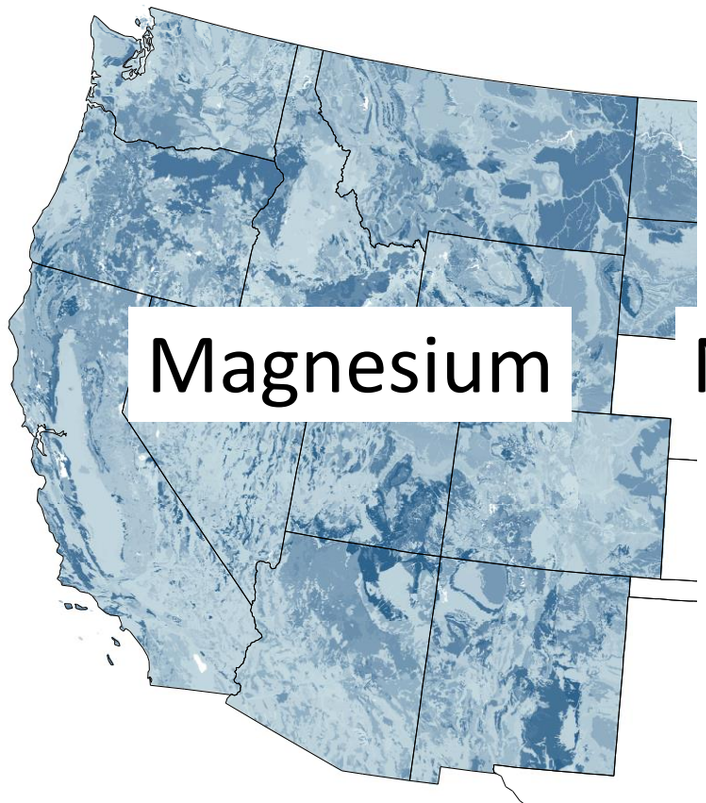
From John Olsen

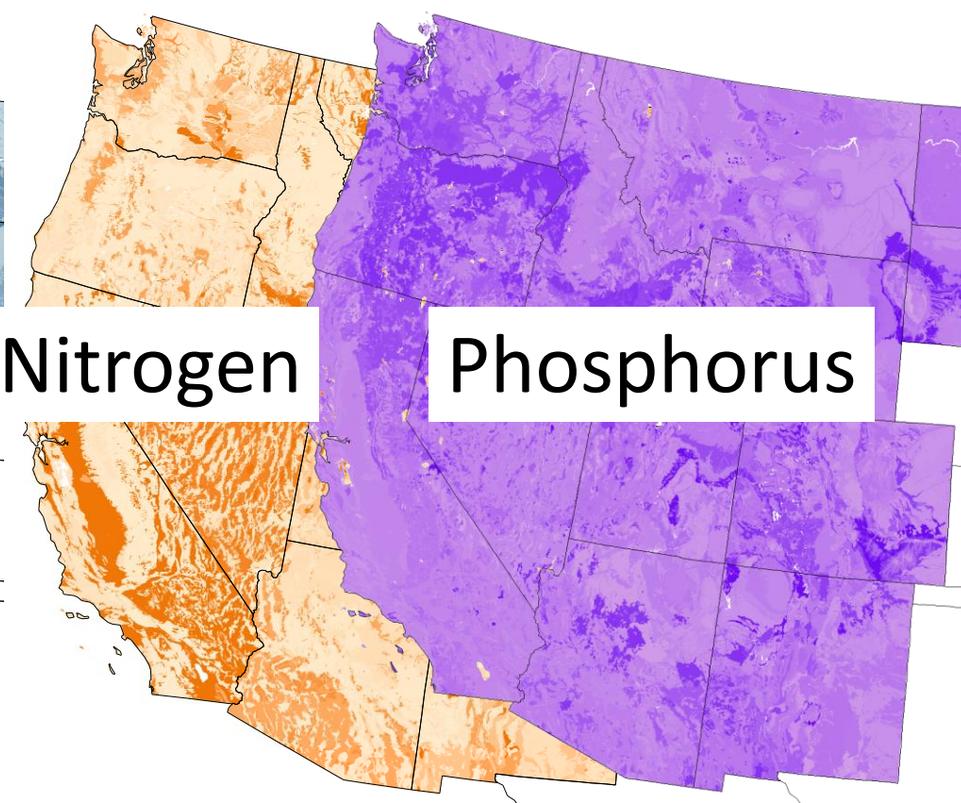
Characterizing Geology

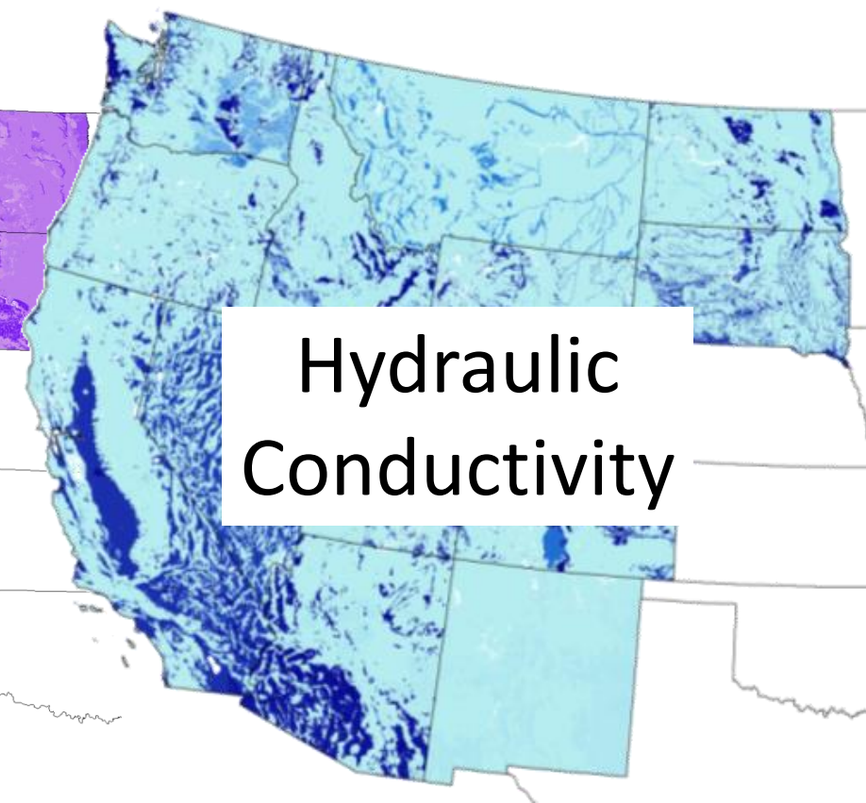












Goal: predict production throughout river network