



Drivers of invertebrate community structure in unmodified streams

Do univariate and multivariate patterns relate?

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Background

- Much of biodiversity in streams accounted for by benthic invertebrates
- Invertebrates often used in biomonitoring
- Many metrics are used – criticisms
- Multivariate or multimetric?
- How much underlying natural variation?
 - Comparison with multivariate structure

Aims

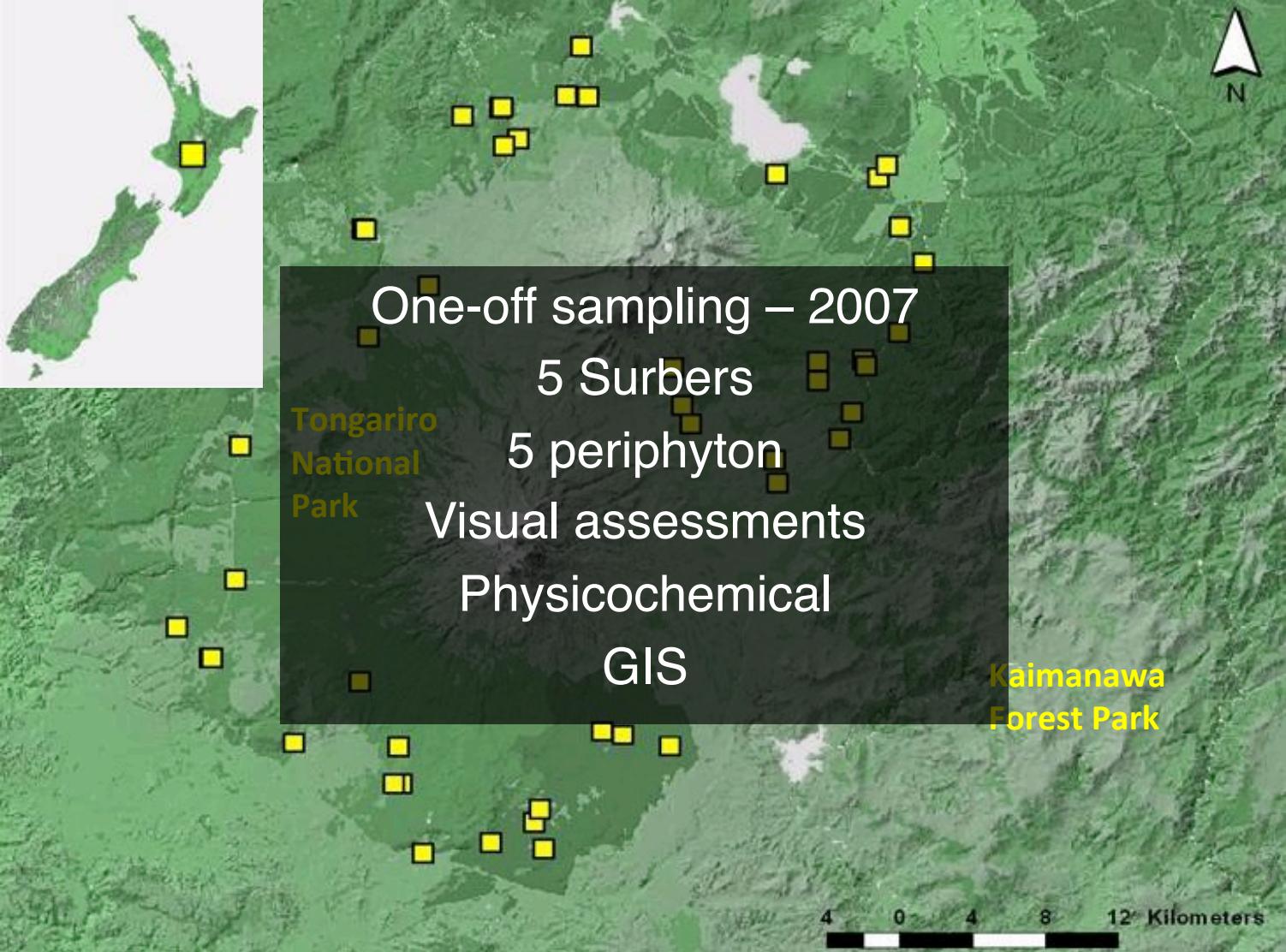
Environmental drivers in pristine streams

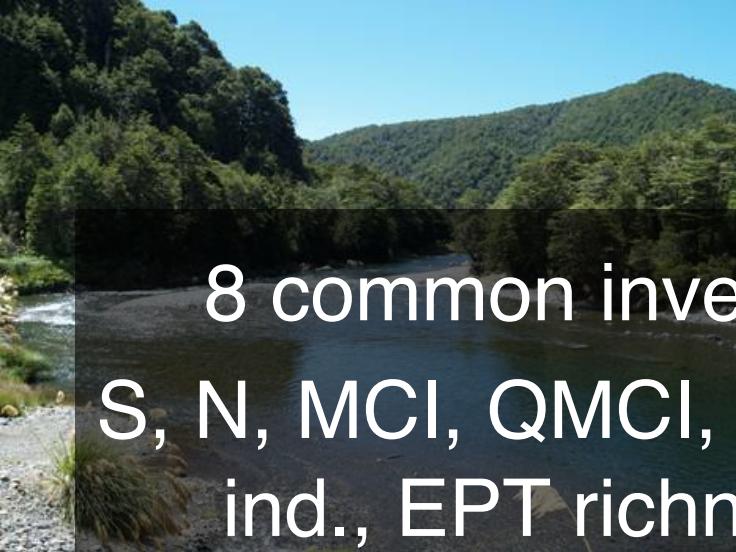
How well do invert. metrics work?

Drivers of uni- and multivariate structure
similar?

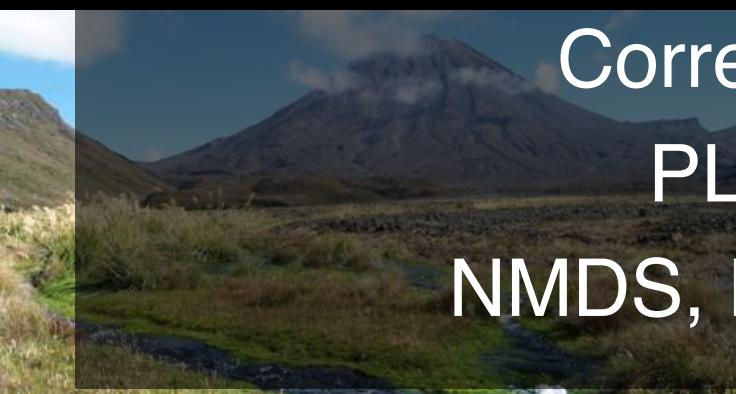
Sites

- 47 streams
- Mostly pristine streams
- Sites limited to:
 - < 10% pasture and urban L.U.
 - > 90% volcanic hard sedimentary geology
 - 1st to 6th order streams
- 10 sites with hydro schemes
- Some plantation forest streams
- Range of flow regimes





8 common invertebrate metrics
S, N, MCI, QMCI, %EPT taxa, %EPT
ind., EPT richness, Margalef's



Correlation
PLSR
NMDS, BIO-ENV



PLSR model variables

chl a, %bryophyte, %films, %filamentous,
%mats, %leaf litter, %macrophyte

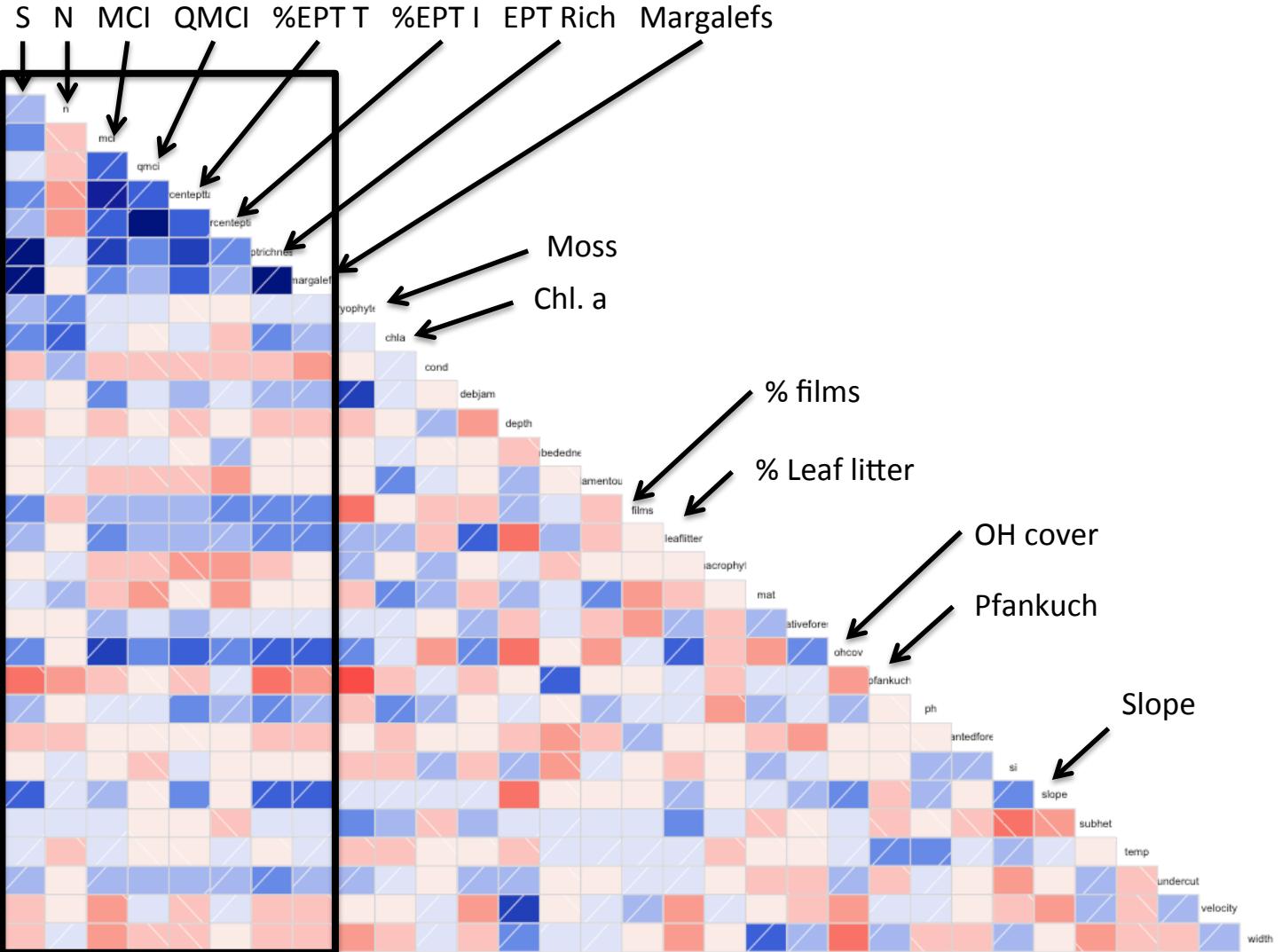
cond, debjam, depth, embededness, ohcov,
pfankuch, ph, si, subhet, temp, undercut,
velocity, width

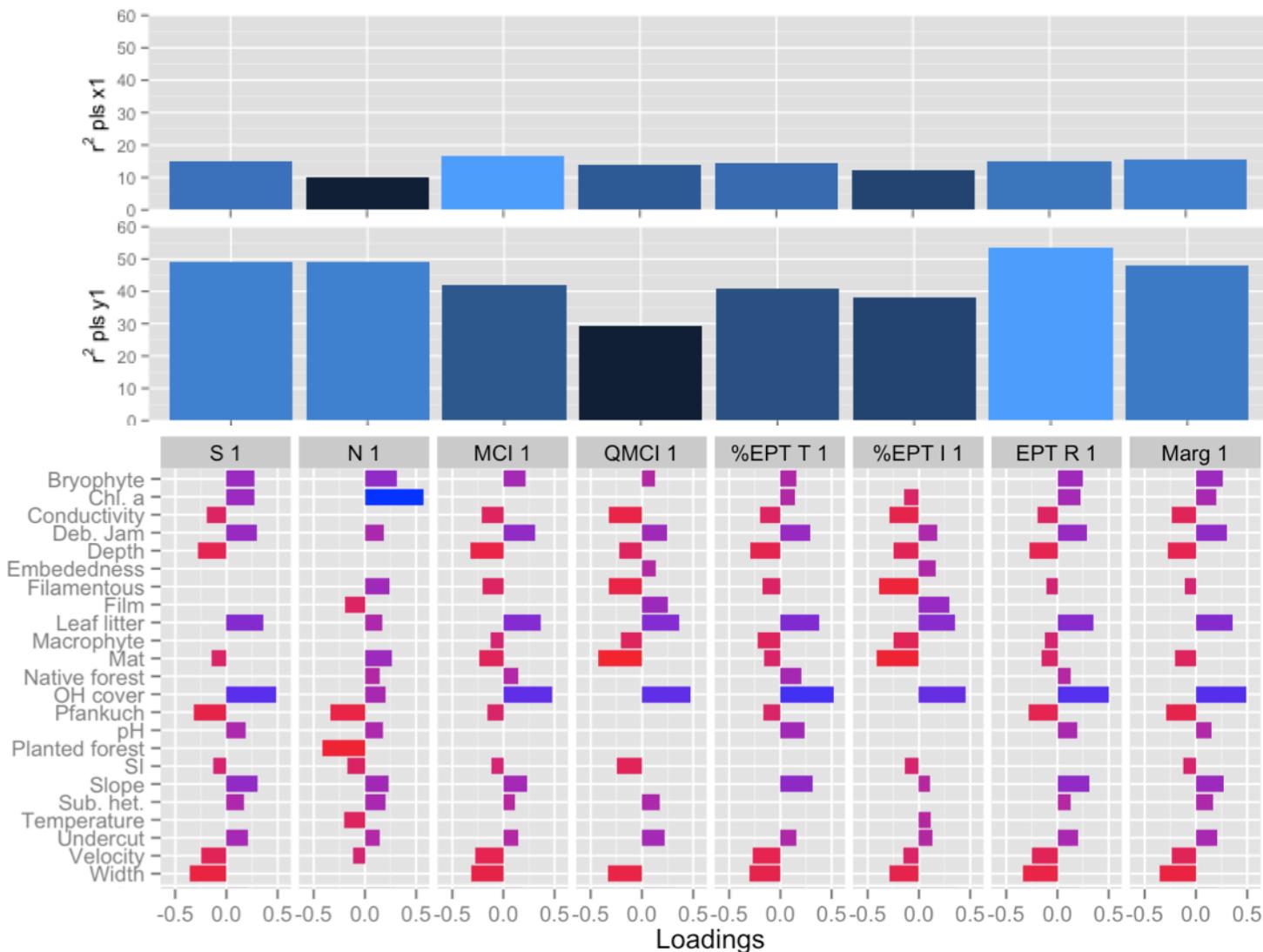
planted forest, native forest, pasture, slope

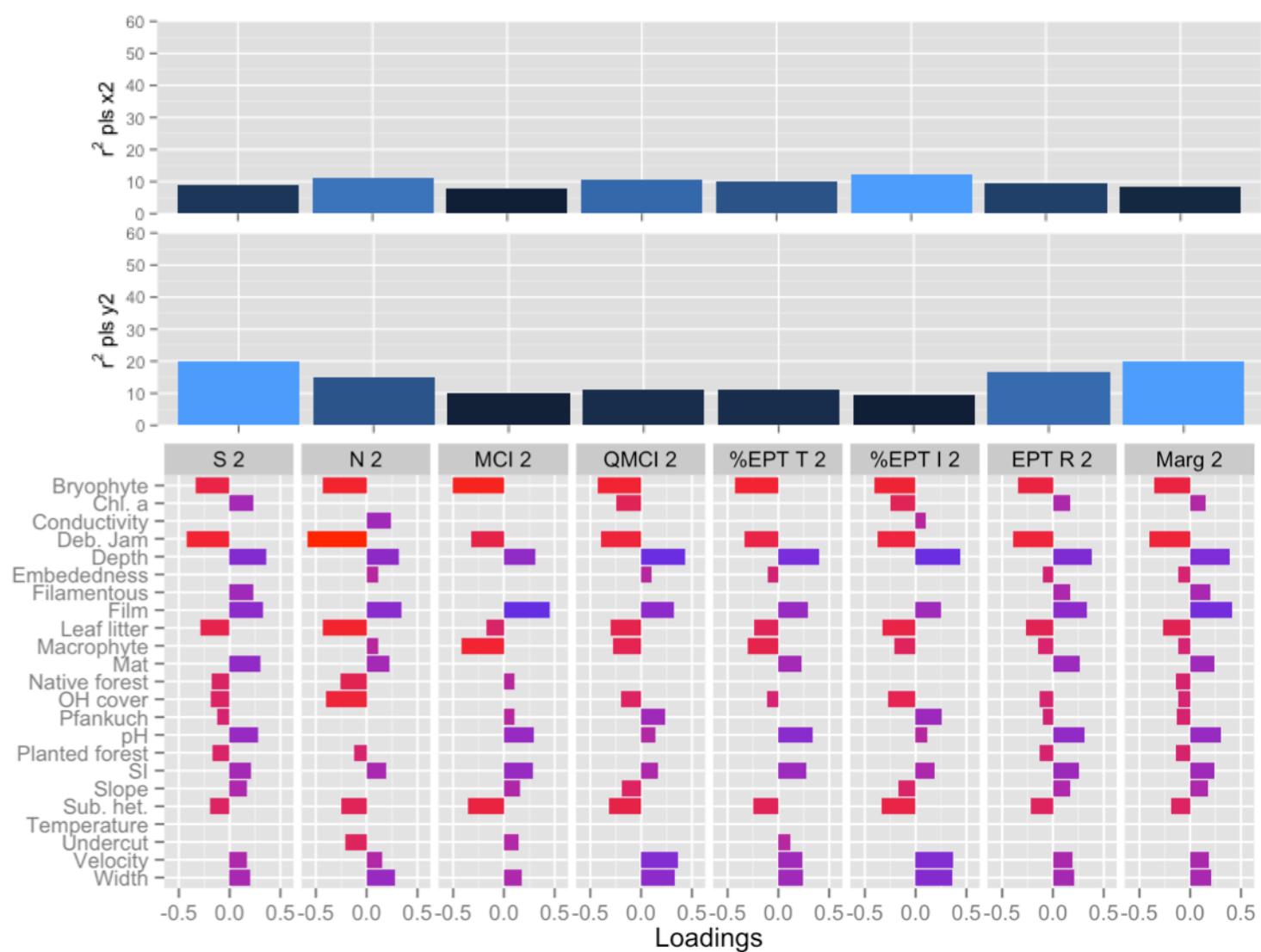
Composition

- 97 taxa
- Insects dominated
- 35 Trichoptera, 22 Diptera, 14 Ephemeroptera, 8 Plecoptera
- EPT and chironomids dominated numerically









BIO-ENV

1 variable

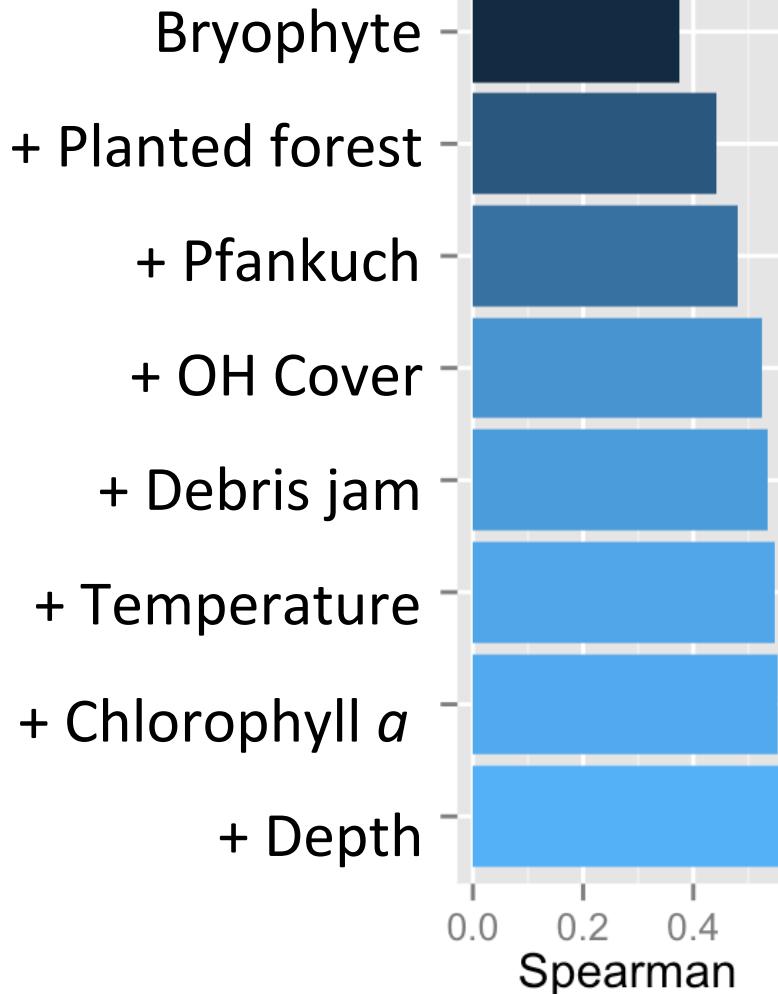
37.5%

4 variables

52.4%

8 variables

56.2%

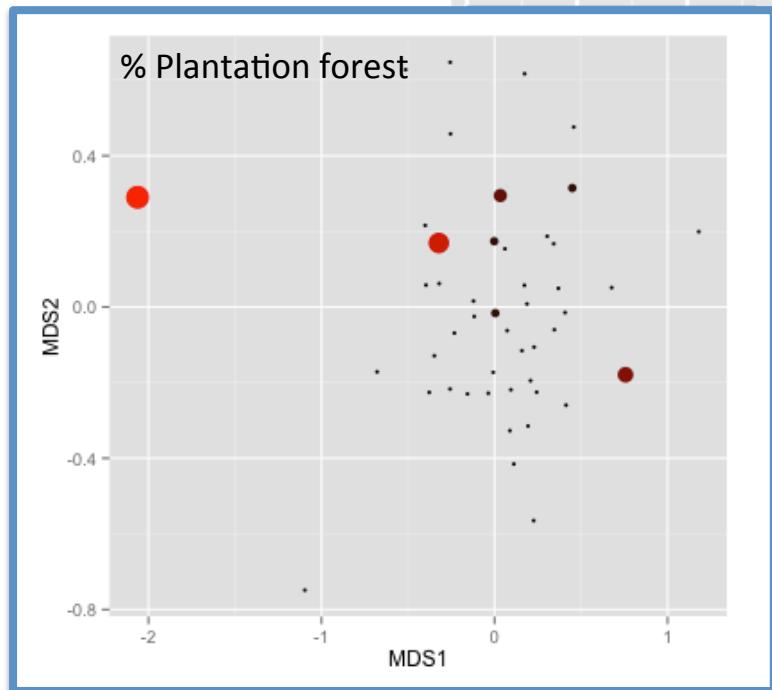
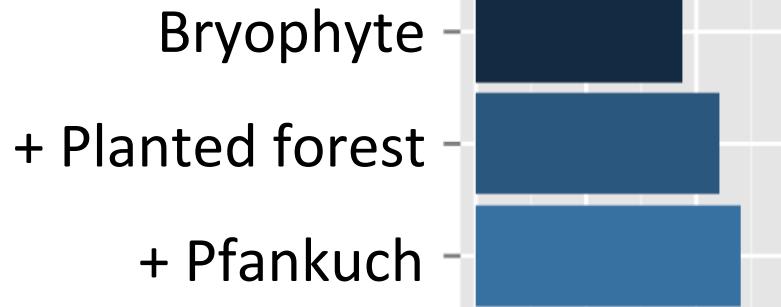


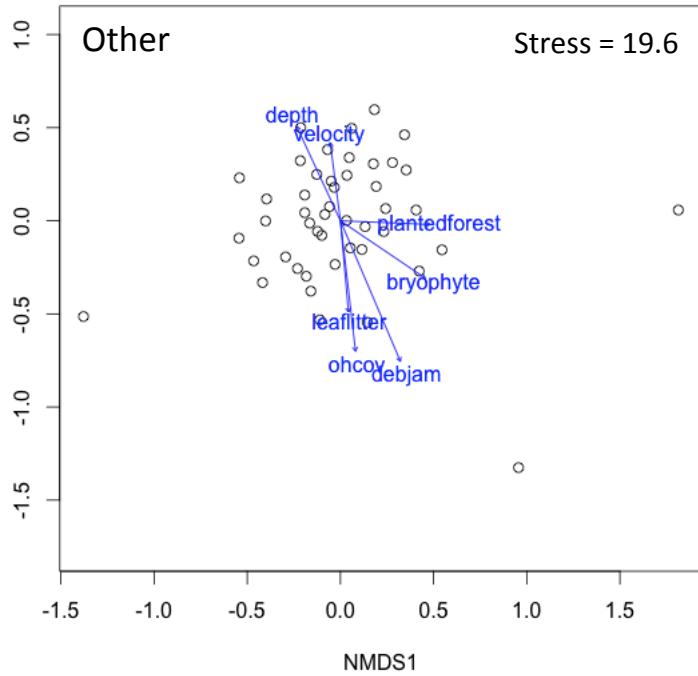
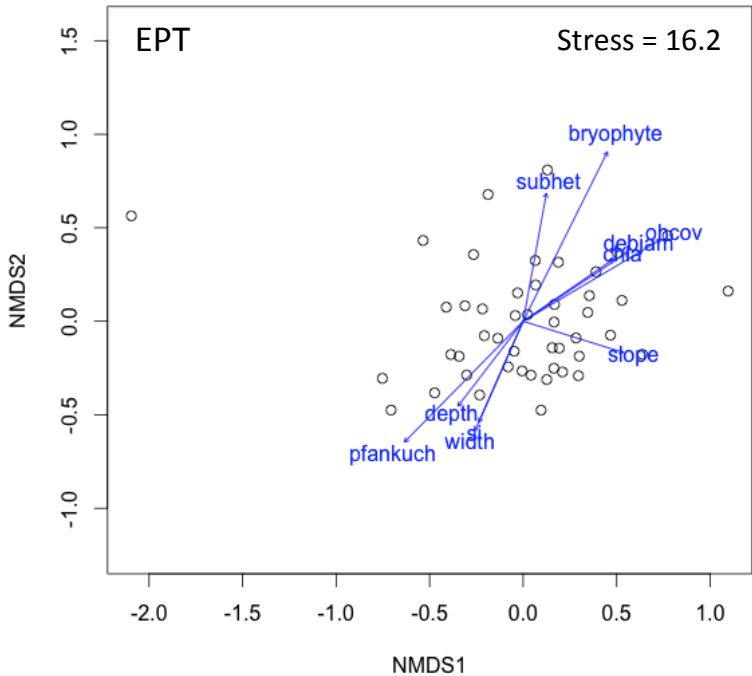
BIO-ENV

1 variable
37.5%

4 variables
52.4%

8 variables
56.2%





BIO-ENV

ohcov, pfankuch, chla, width, depth, temp, debjam, plantedforest, bryophyte, macrophyte

$$r = 0.59$$

ohcov, mats, pfankuch, cond, temp, debjam, embeddedness, nativescrub, plantedforest, bryophyte, slope

$$r = 0.47$$

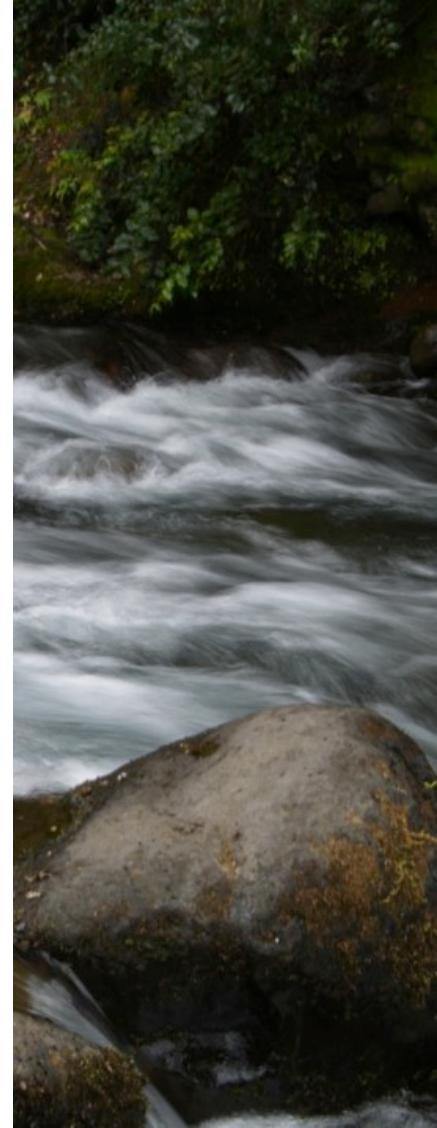
Concordance: Mantel – $r = 0.62, p = 0.001$

Conclusions

- Similarity in uni- and multivariate drivers
 - OH cover, moss, stability, debris jam, periphyton, size
- Planted forest only strong on multivariate
- Metric fit reasonable and representative
- But lots of unexplained variance in both uni and multi
- Poor fit of organic enrichment metrics

Where to?

- Natural variability should be accounted for
- Use multiple metrics (or multimetric) incl. functional and taxonomic
- OH cover crucial
- Larger scale multi-region
 - Variance partitioning





Thank you