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THE EFFECTS OF INTENSIVE FOREST BIOMASS REMOVAL ON STREAM ENVIRONMENTALS & BIOTIC ASSEMBLAGES

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Introduction

- Intensive forest biomass removal for use in bio-energy production.
- Involves removal of all or most of the logging residues (i.e. branches, twigs, fine woody debris, treetops and stumps).
- Biomass left on site replenish the soil nutrients and act as a substrate for biota.
- This practice of removing logging residues (LRR) has its *pros* (i.e. CO₂ neutral) and *cons* (i.e. environ damage).

Rationale for the study

- 3 million m³ of LR collected in 2006, but the target is 13 million m³ by 2015 (Finnish MAF 2006).
- Despite this 4-fold increase there has been virtually NO impact studies on stream ecosystem.
- Ultimately, this study will try to contribute to the discourse about balancing climate change mitigation (i.e. CO₂ neutral), energy policy (i.e. bio-energy) and biodiversity conservation.

Collection



Collection and bundling



At Roadside storage

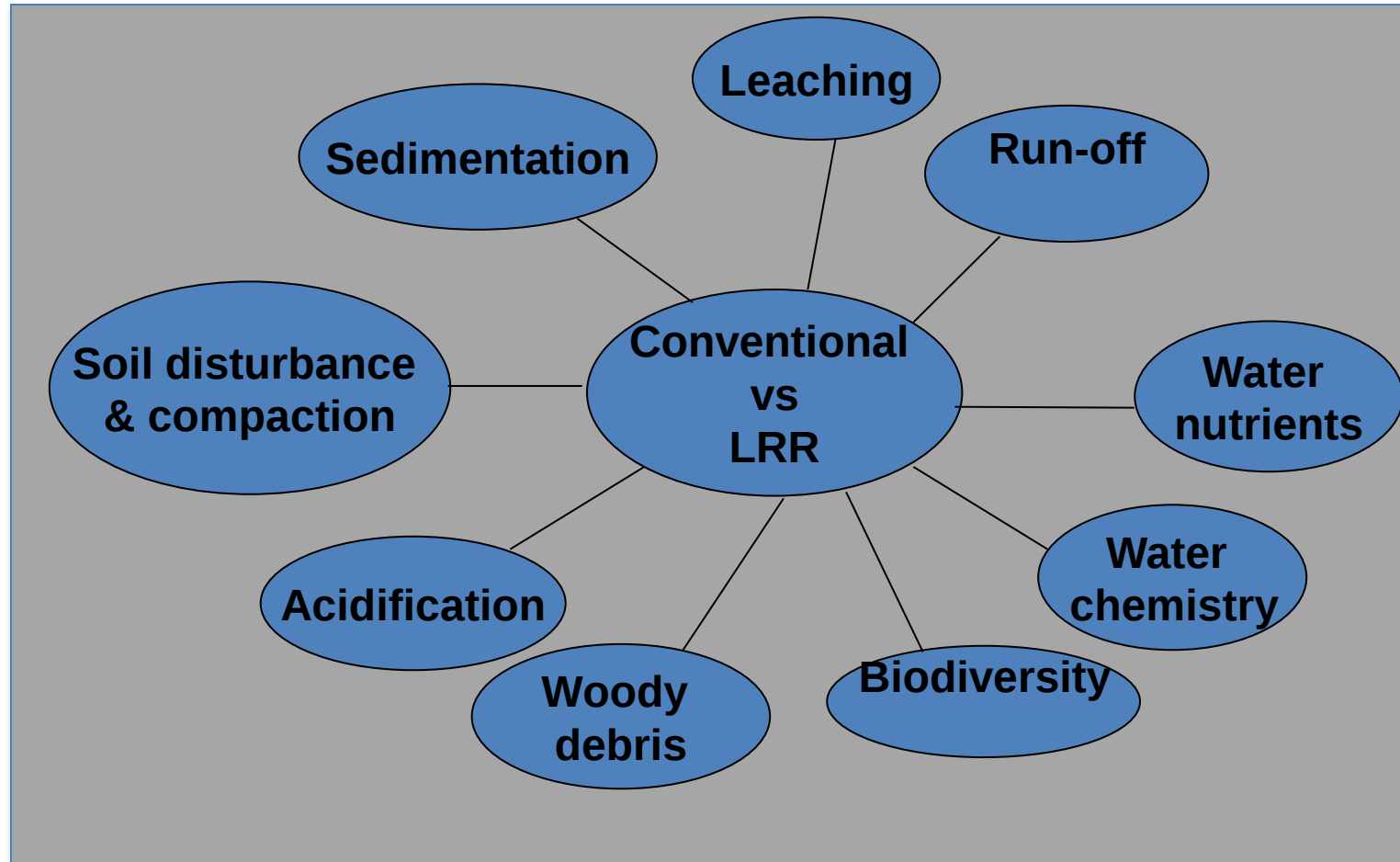


At the power plant





Aquatic processes likely to be effected by the LRR



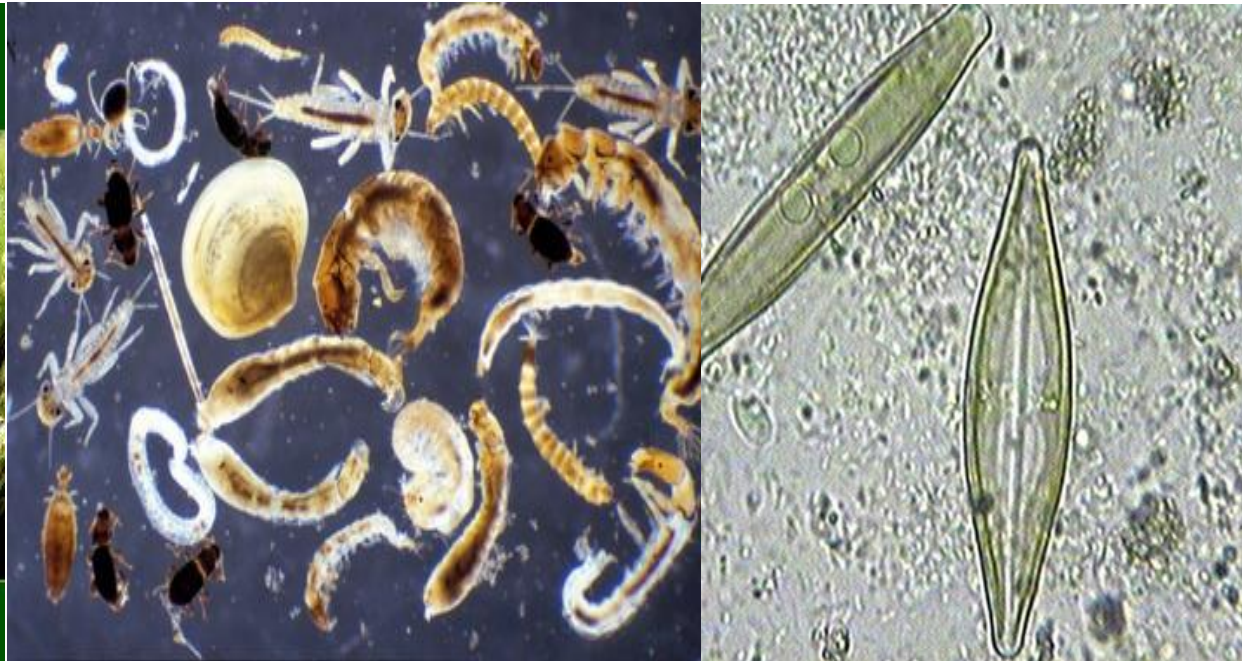
- Mosaic nature of forestry; only small patches are harvested at any one time thus creating a mosaic of different age classes



Key questions

- What are the effects of LRR on stream organisms (MI, chironomids, diatoms, bryophytes and plants).

BRYOPHYTES



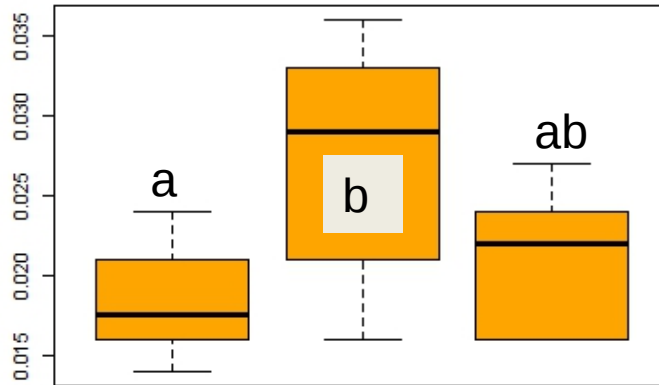
- Specifically, 1) what is difference in biodiversity?
2) what is difference in environmental?

Study set-up

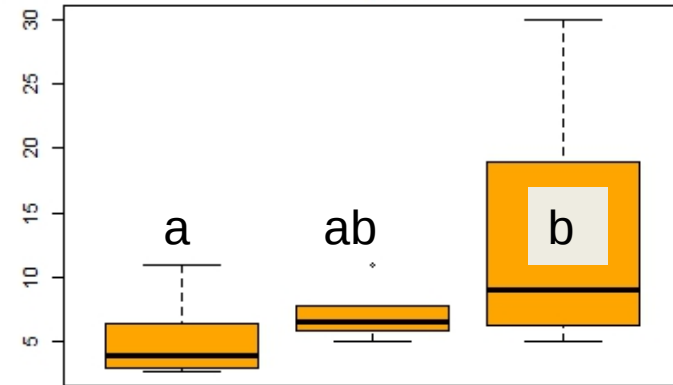
- 1) No LRR, no conventional logging = natural
 - 2) No LRR, only conventional logging = conventional
 - 3) LRR present(both stumps & residues) = LRR
-
- Each treatment had a minimum of 6 sites.
 - Each site was independent (i.e. one treatment in each stream).
 - Sampling took place in central Finland, around Jyväskylä.

Results: Environmental variables

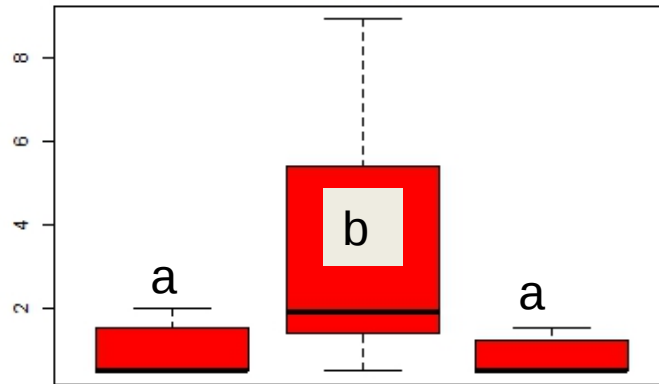
Total dissolved Solids



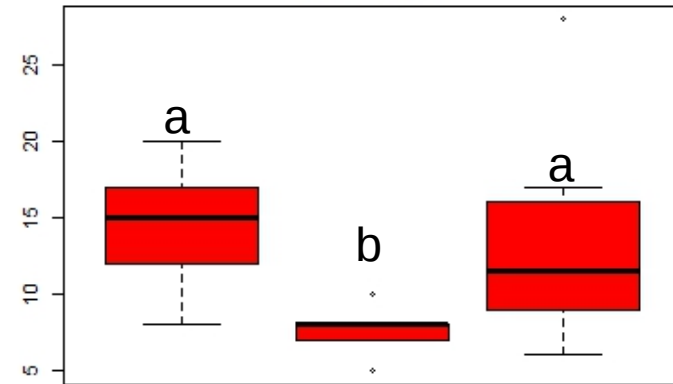
Phosphate



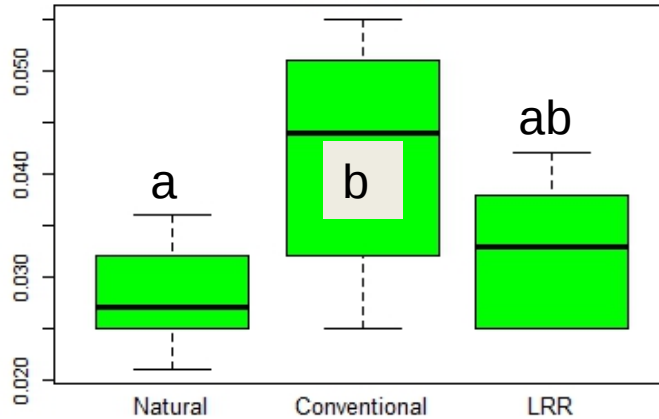
Solid Ash



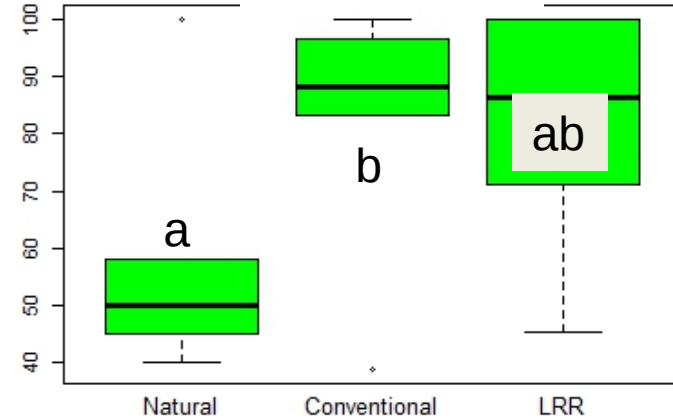
Water depth



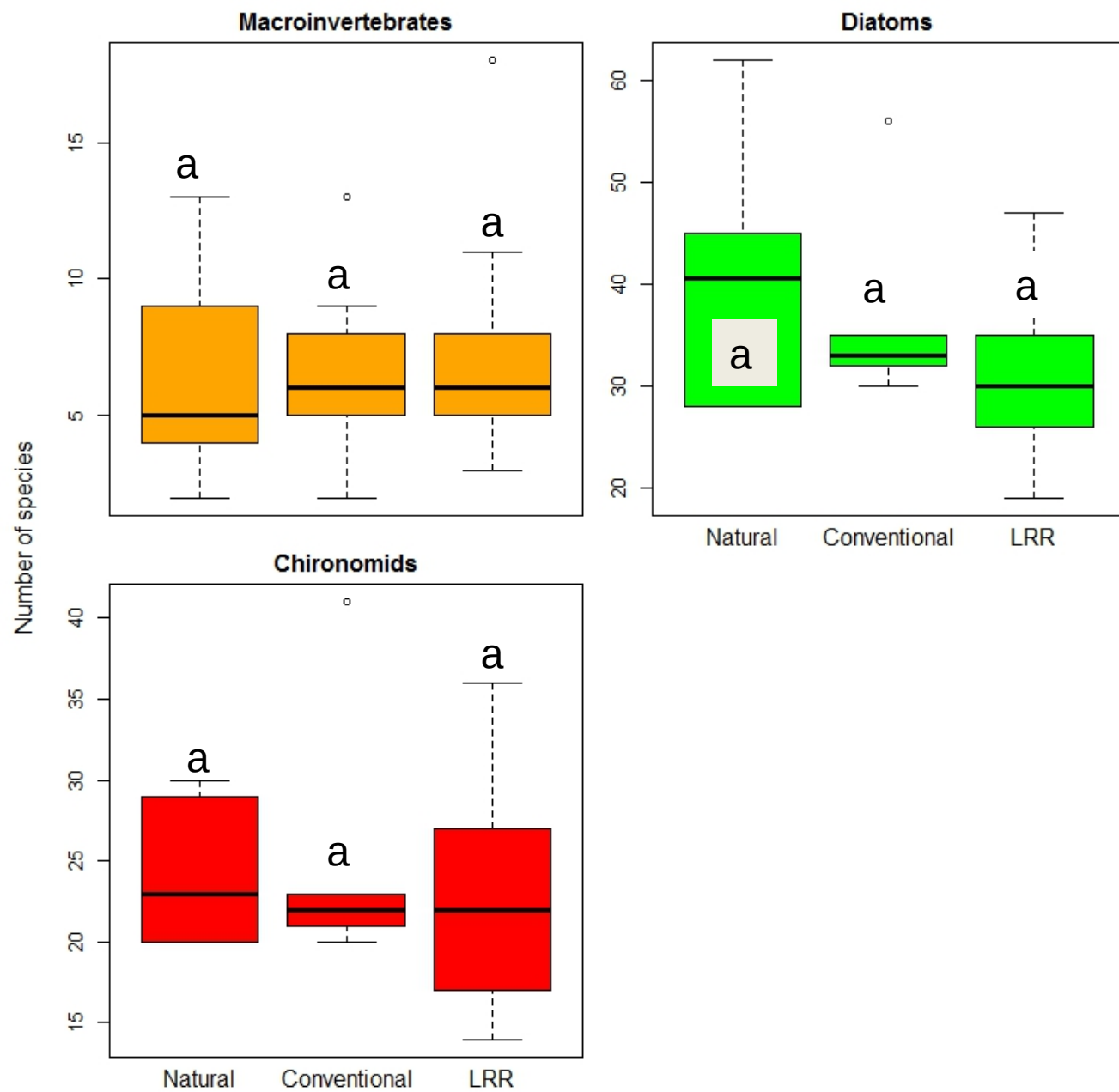
Conductivity

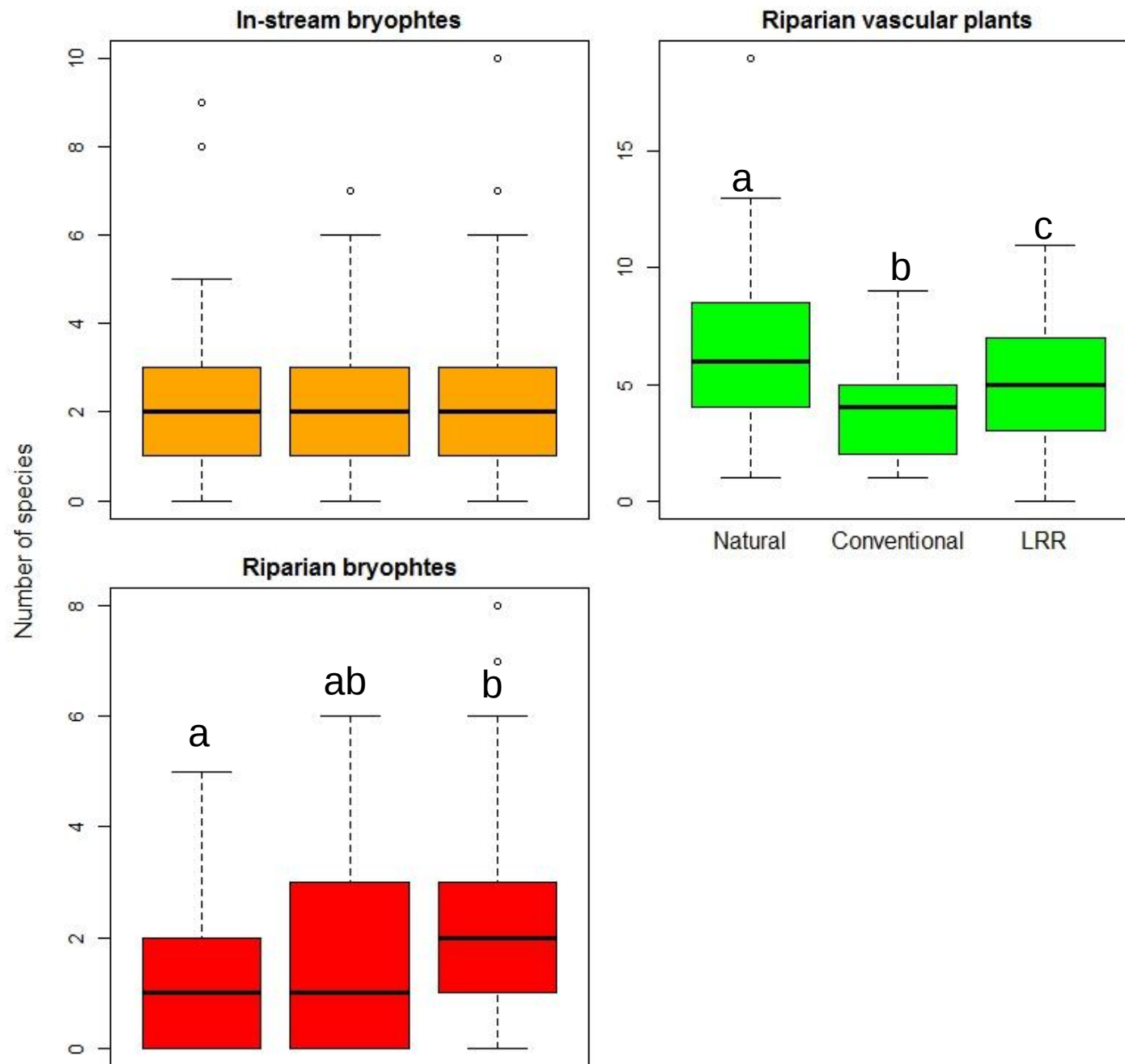


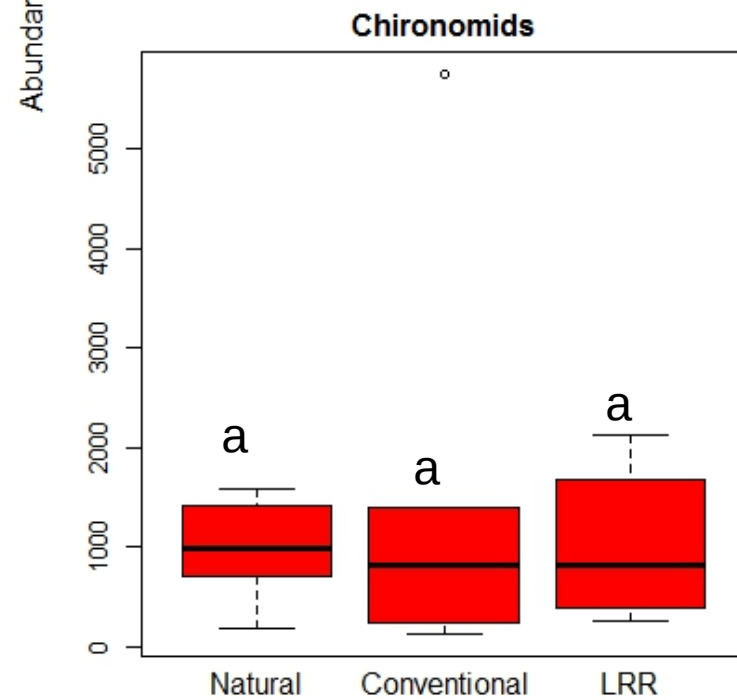
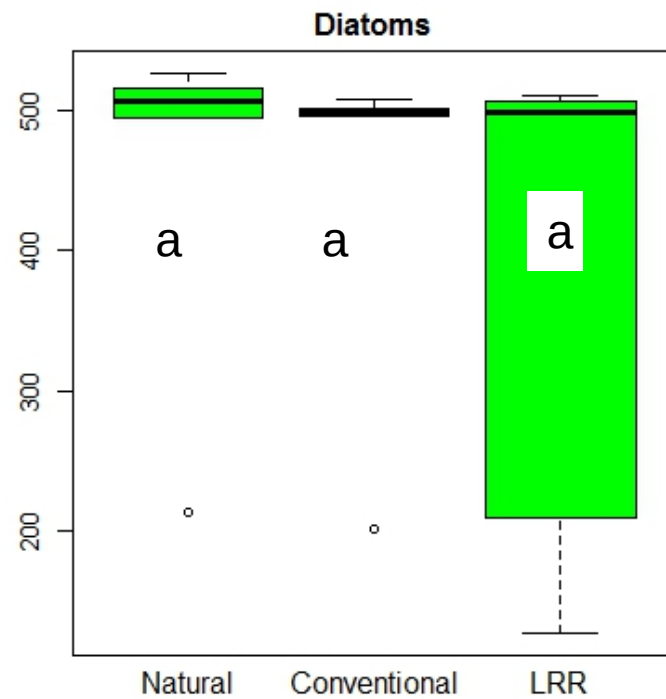
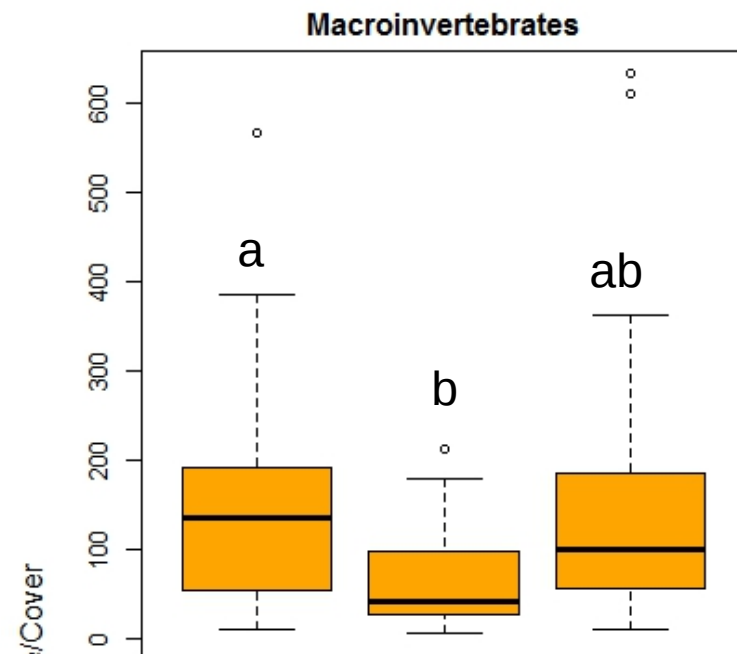
Organic matter

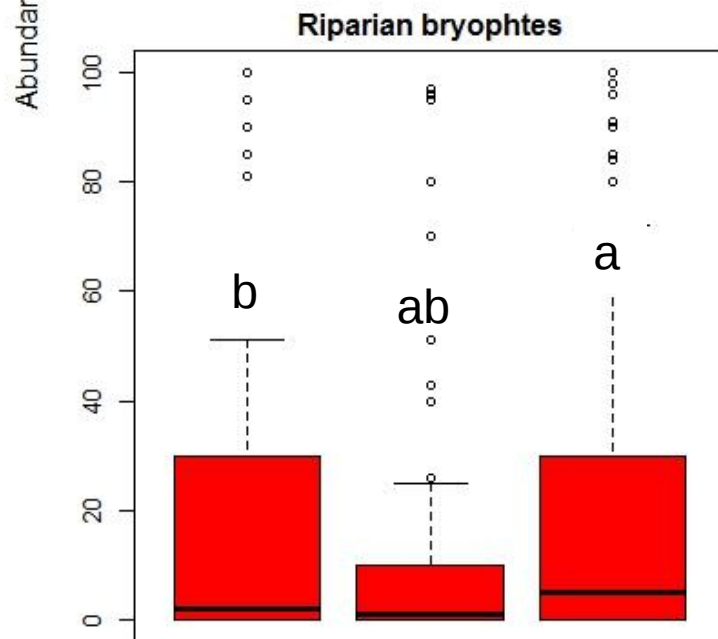
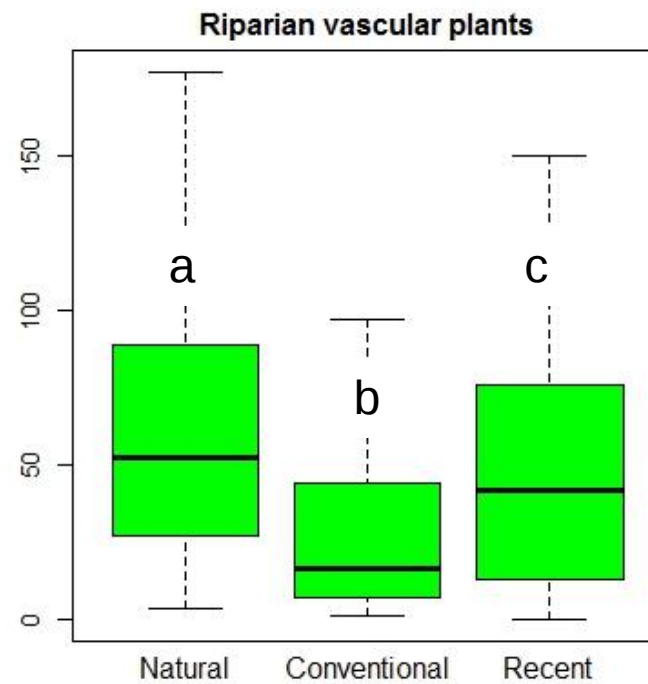
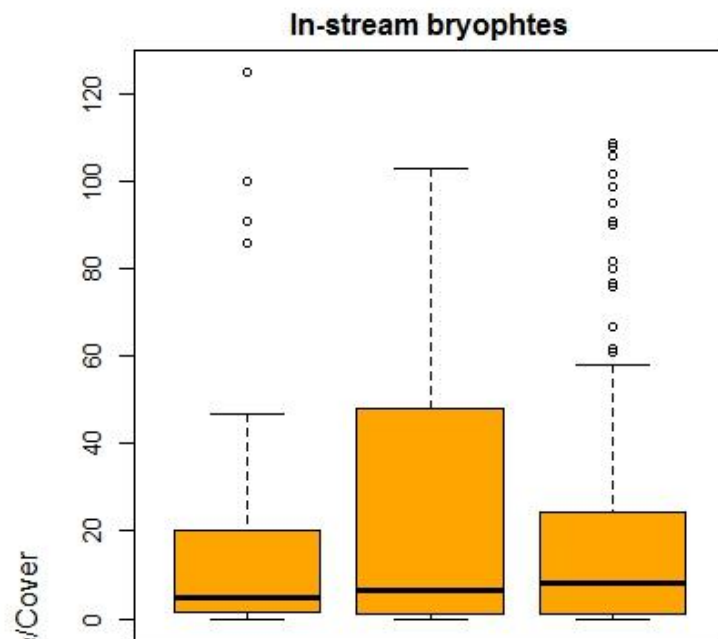


Biotic organisms









Conclusions

- Conventional logging tends to differ with natural, while LRR is not.
- This pattern appears with both environmental variables (TDS, cond & OM) and biotic organisms (MI).
- Vascular plants showed the strongest response, while diatoms, chironomids & in-stream bryophytes the least.
- R. bryo. LRR had higher diversity than natural, while Conventional was not.

Acknowledgements

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