

Small animals with big impacts:

Cumulative effects of invertebrates on river processes

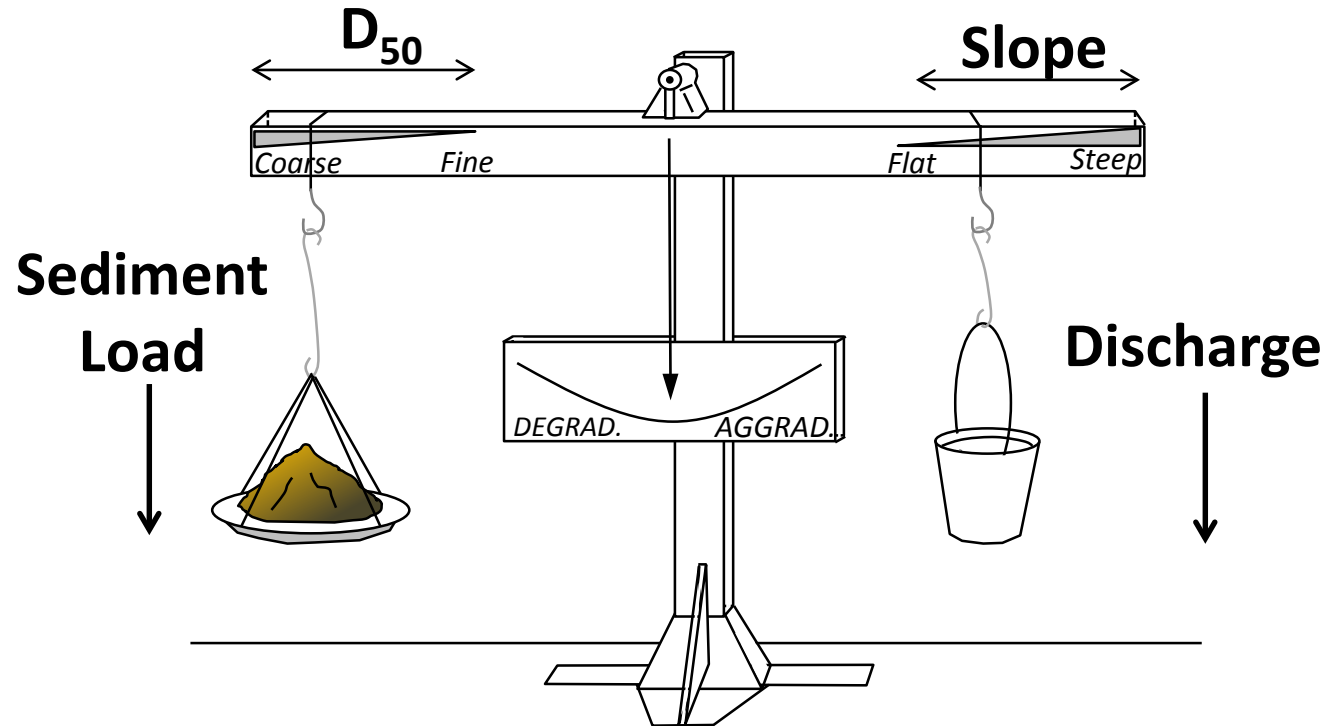


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Introduction

River Restoration should aim to be sustainable and promote ecological health



Biogeomorphology

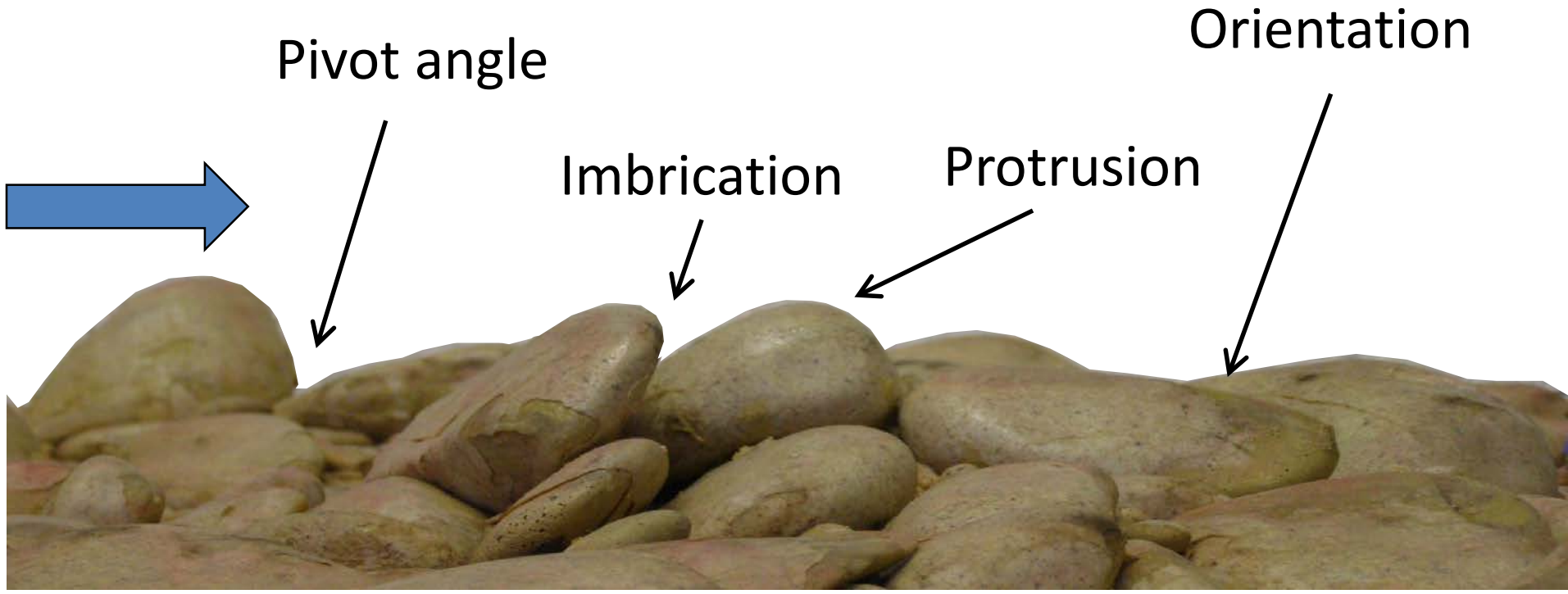
Many well known examples:



... but much less research on invertebrates

Sediment stability

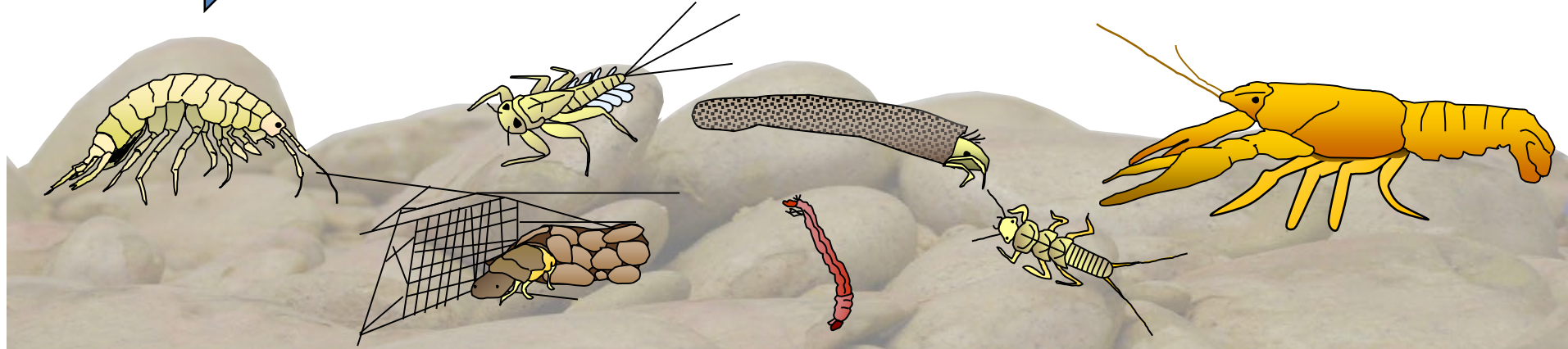
Sediment stability known to be related to grain-scale processes and geometry



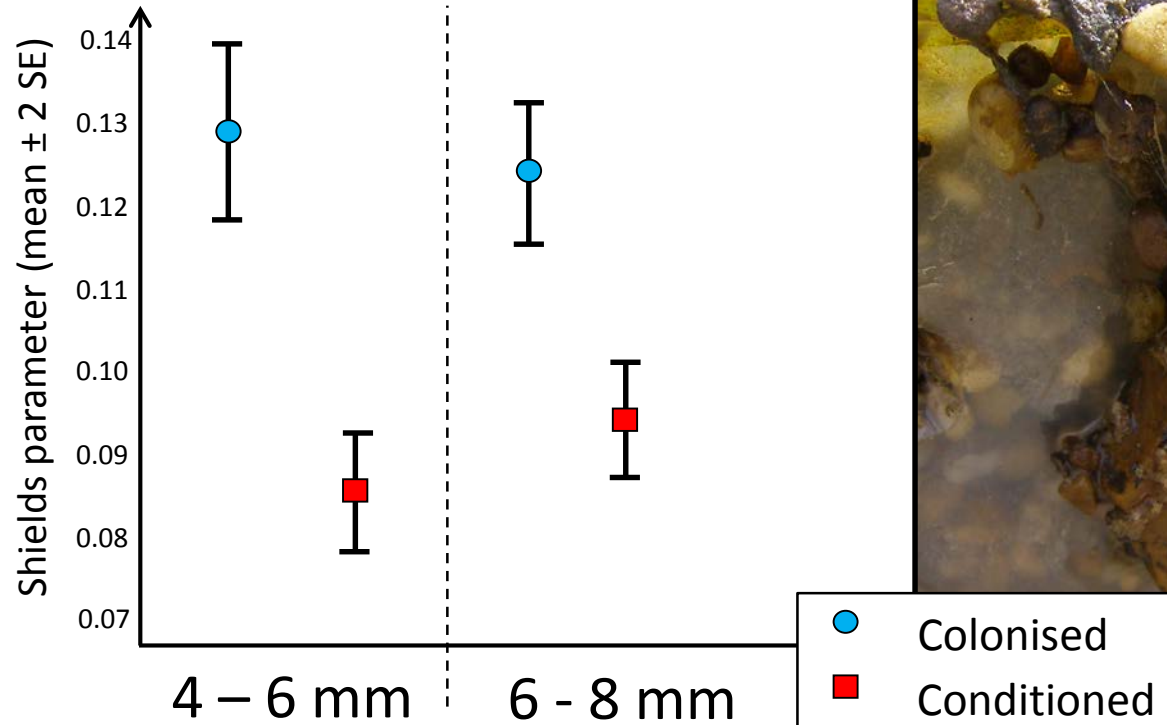
Sediment stability - invertebrates

Relatively little known about their impacts:

- Despite the known importance of grain-scale processes
- Despite their great diversity and abundance
- Despite their known significance elsewhere



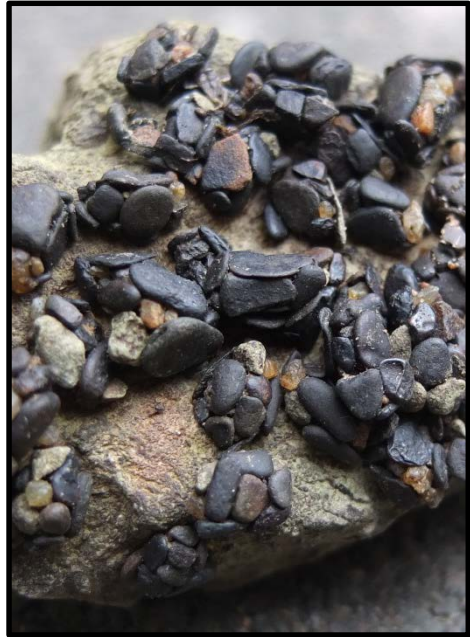
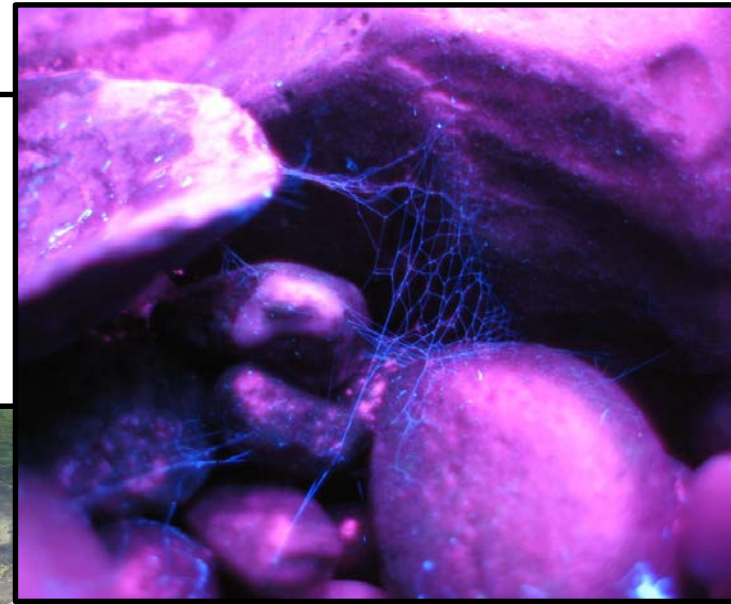
Caddisfly



33 – 45% increase in the shear stress needed to entrain fine gravels

Caddisfly

- Dominate biomass
- Densities: 1000s m^{-2}
- Km's of silk each year

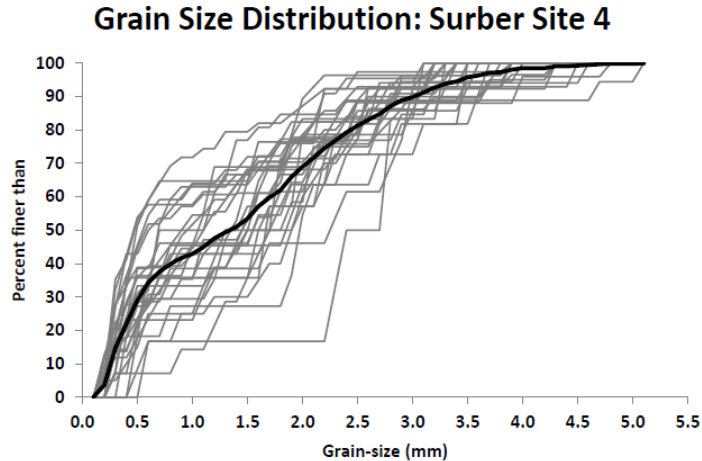


Caddisfly

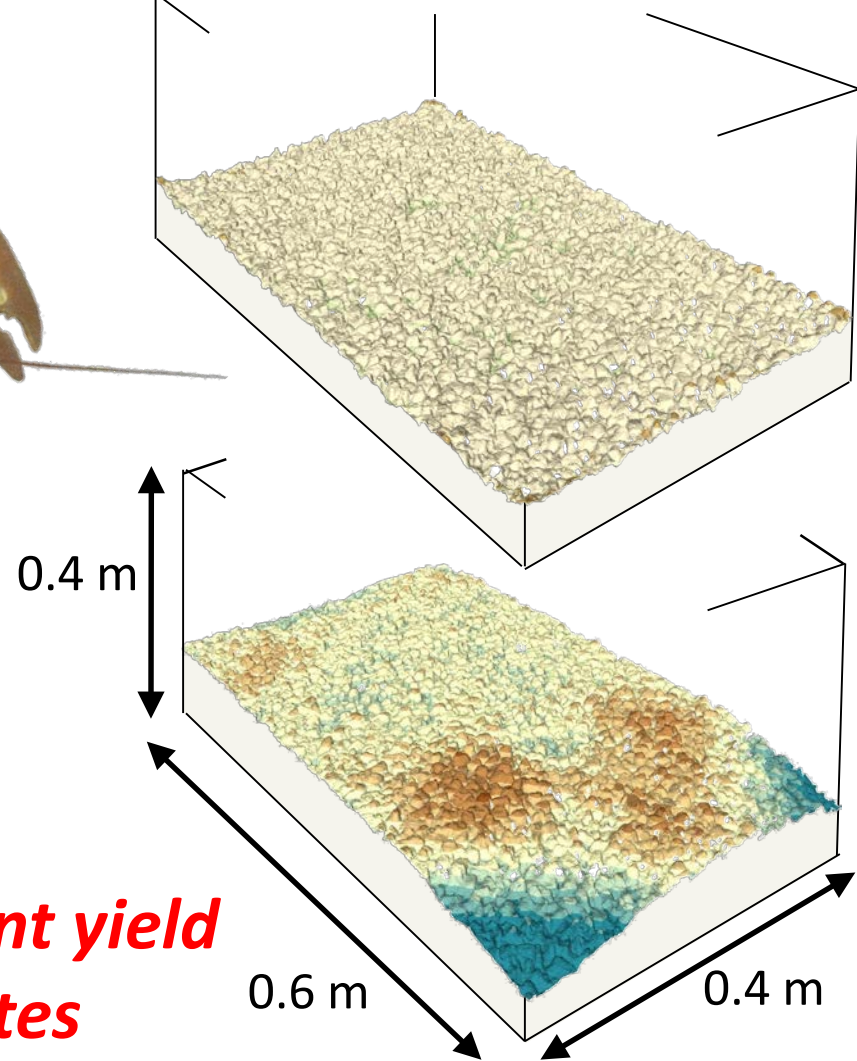
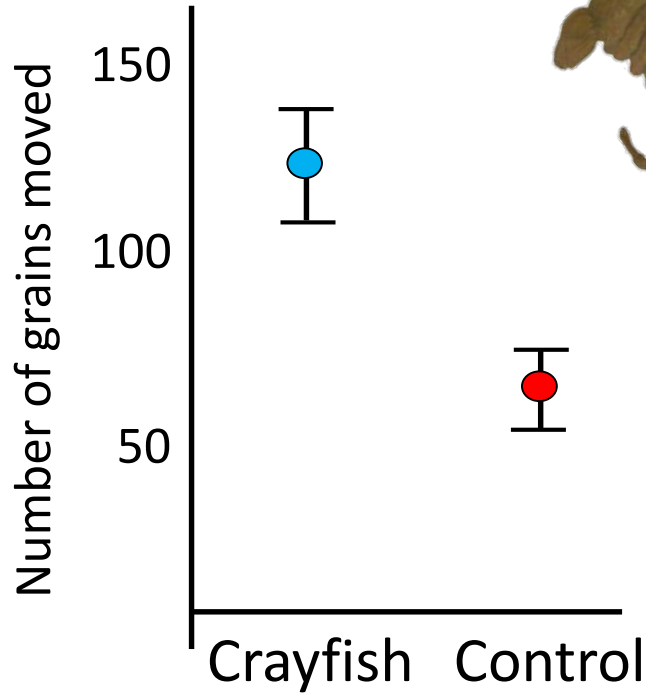
12 million cases estimated over
5 km stretch of river

240 million grains (0.2– 5 mm)

8 tonnes



Crayfish

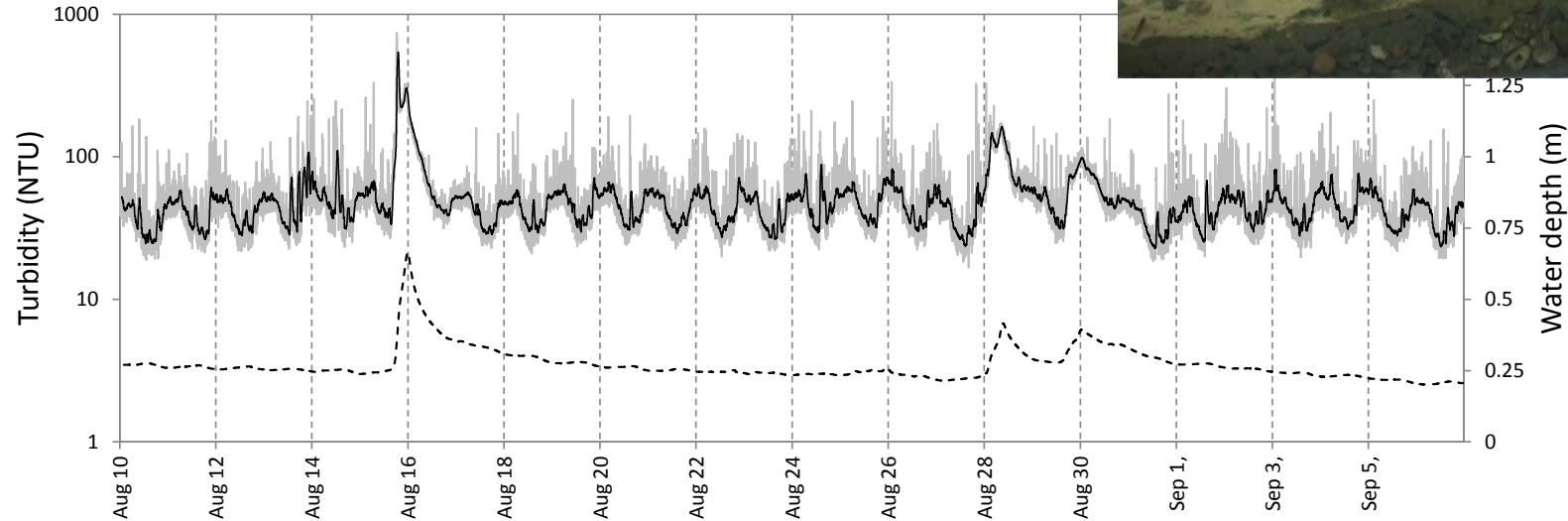


***6-hours activity doubled sediment yield
from water-worked substrates***

Crayfish

Nocturnal peaks in turbidity

Coincide with peaks in the activity of crayfish.

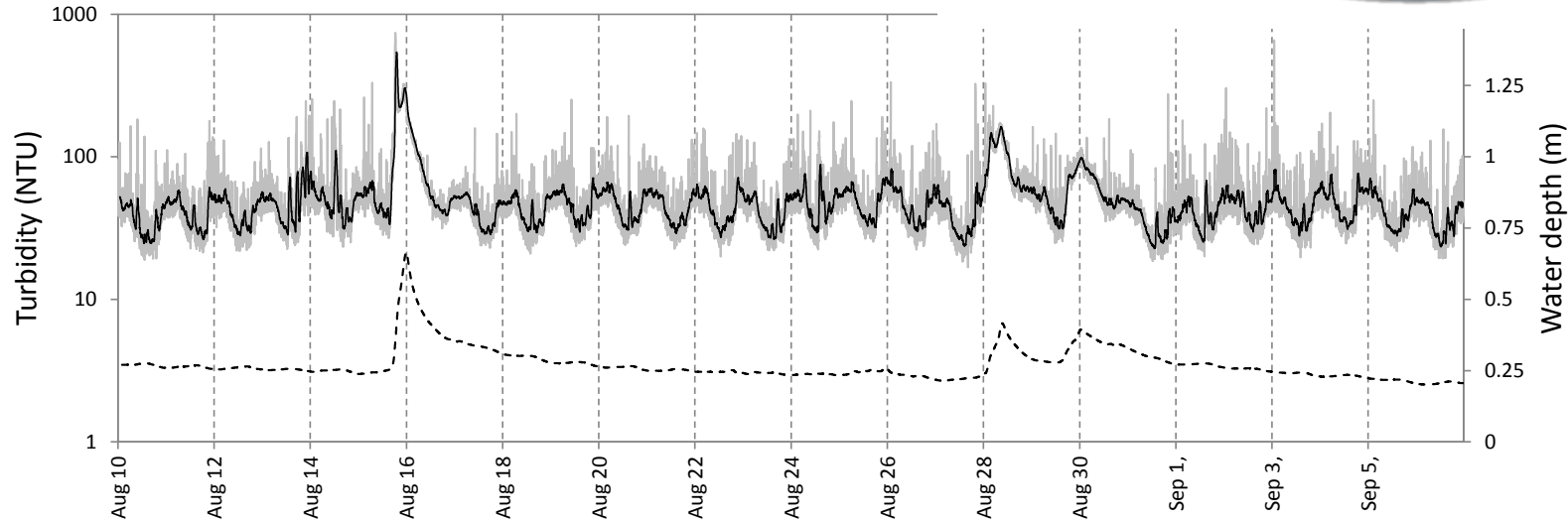
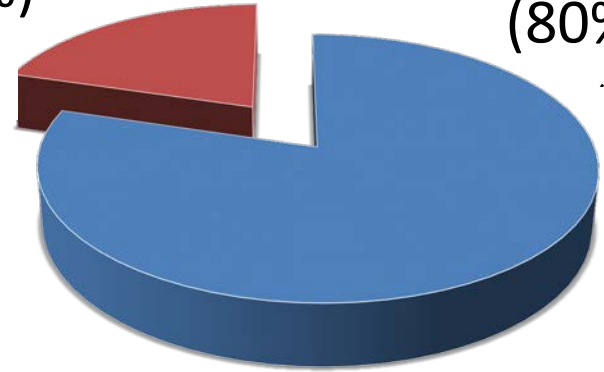


Crayfish

Extra due to
crayfish (20%)

Ambient yield
(80%)

***20 to 40% increase in fine
sediment transport
leaving the catchment***

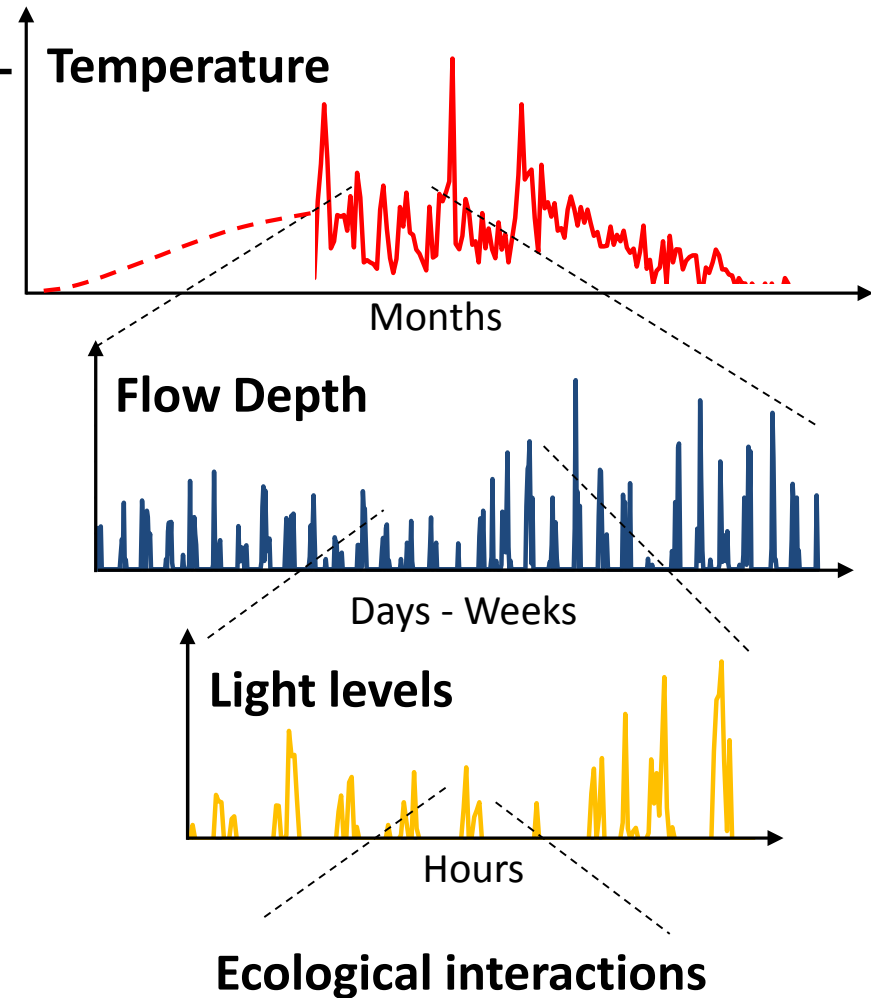


Timing of Impacts

Animal activity is not uniform through time or in space

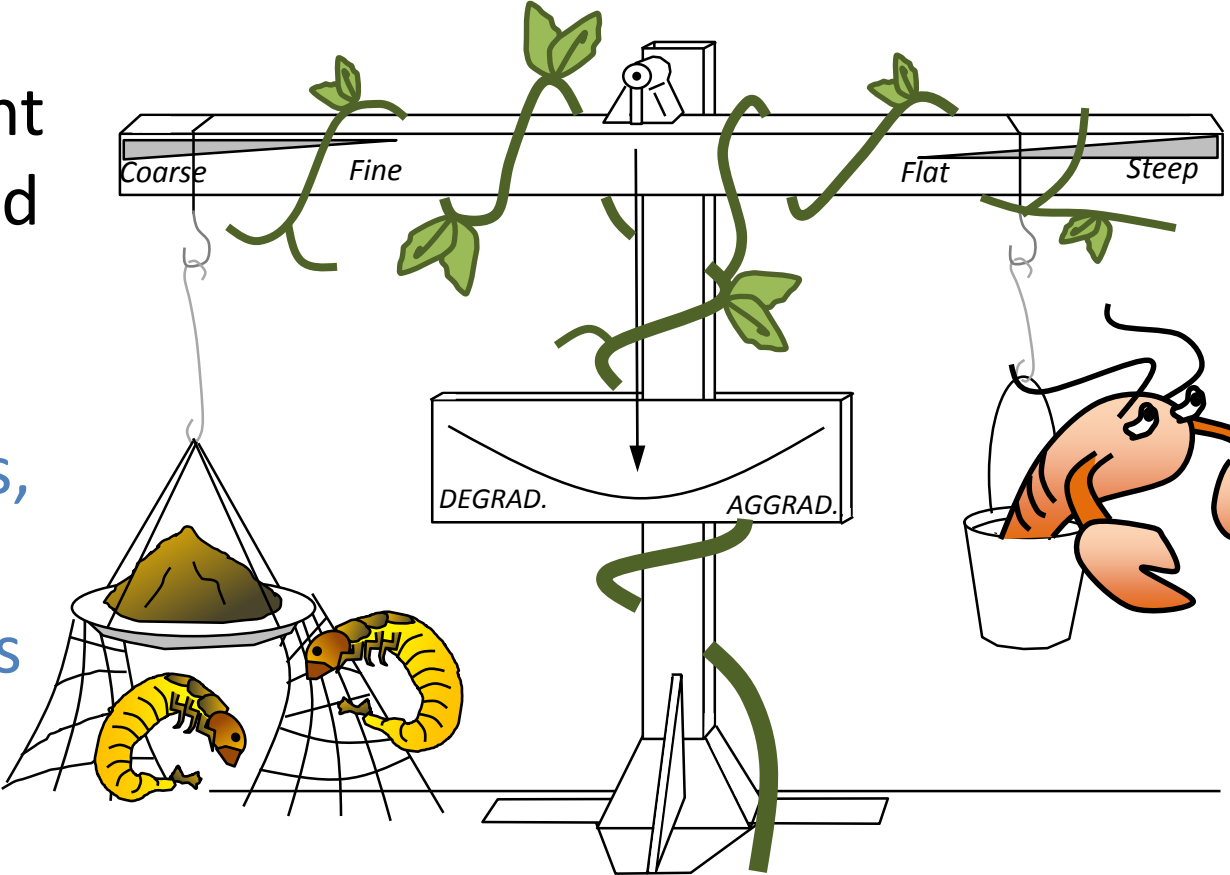
Particular periods and places where animals may be most significant

In summer, biotic energy could rival stream power



Response to biome change

Sediment
size, load
Silk,
Roots,
Mucous,
Algae,
Biofilms



Slope,
Discharge
Burrowing,
foraging,
redd
construction

Conclusion

Invertebrates could play an important role in river bed and bank stability

A natural biome should not only be a desirable outcome, but a necessary starting consideration

“Build it and they will come” ...

“They will come and build it”

Long-term sustainable design should include consideration of animal community

Thanks...

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