

Physical habitat below a hydropeaking dam: Examining progressive downstream change

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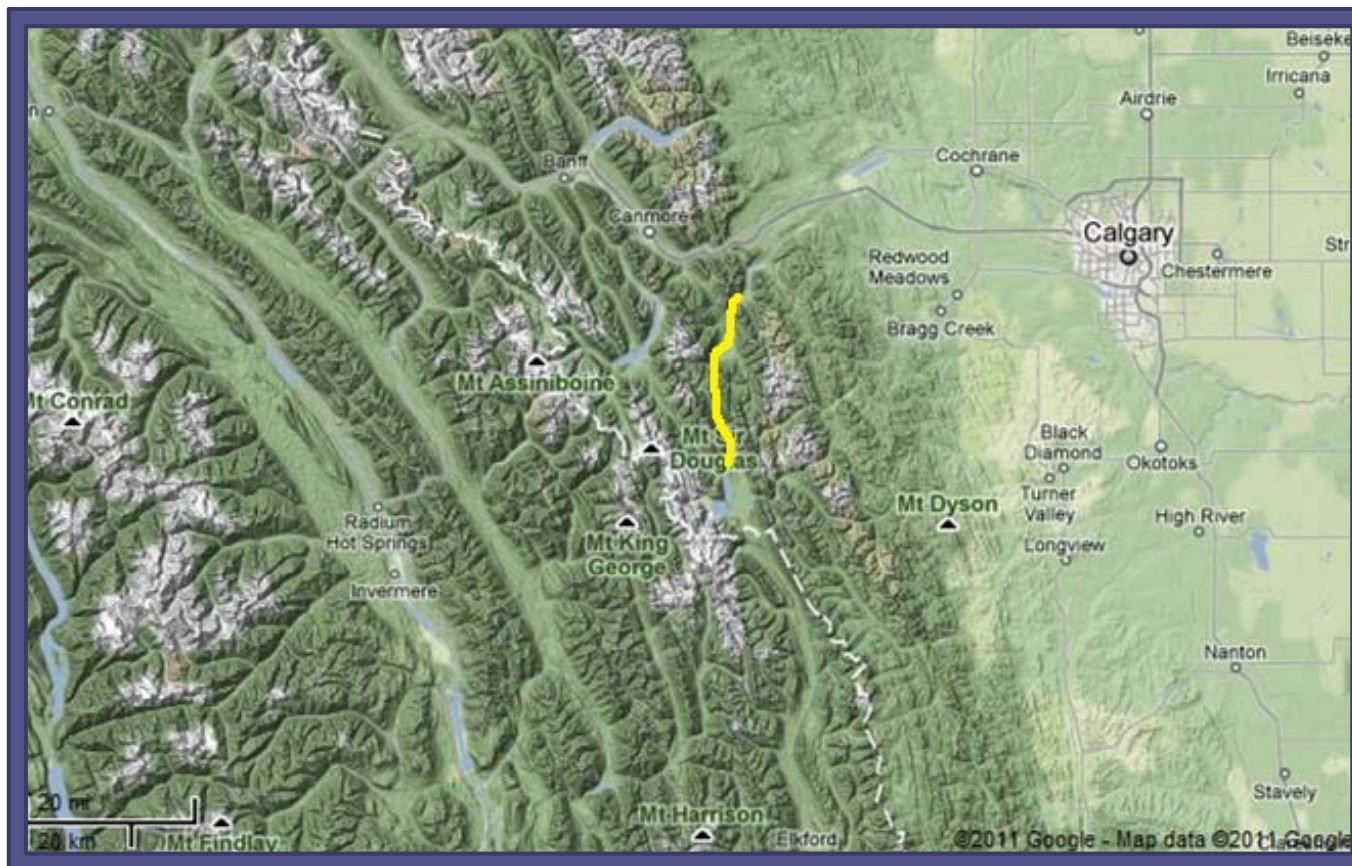




Research Question

- How do hydropeaking regimes alter available aquatic habitat and how are these changes moderated by tributary inputs.
 - Depths and velocities
 - Bed mobility
 - Invertebrate communities
 - Suspended sediment

Field Site: Kananaskis River & Pocaterra dam



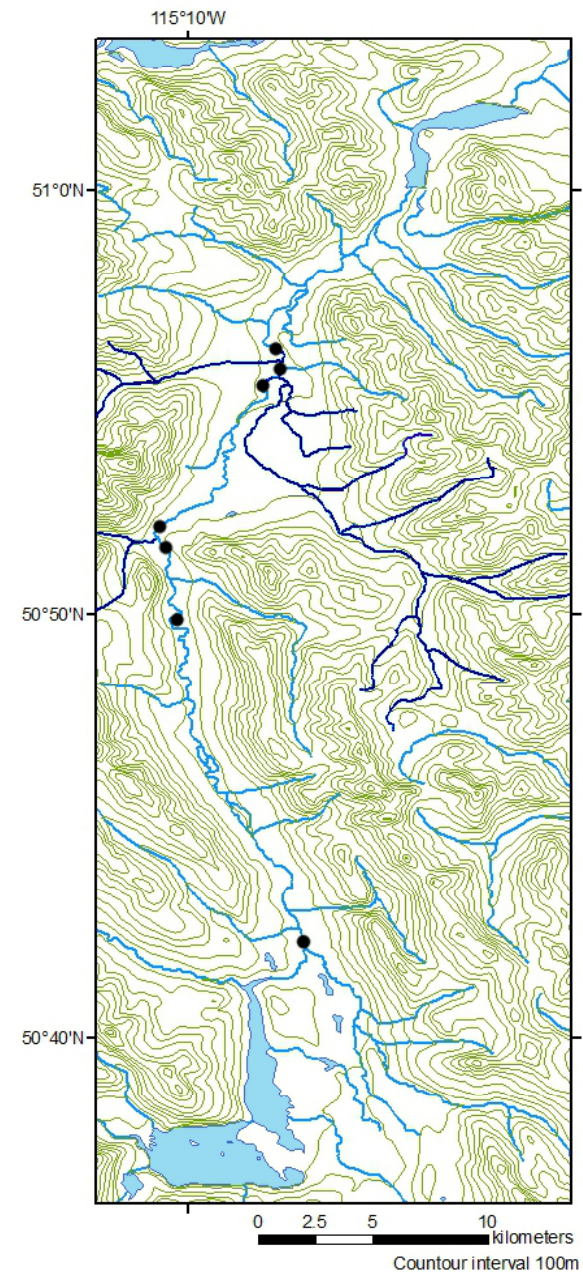
1904



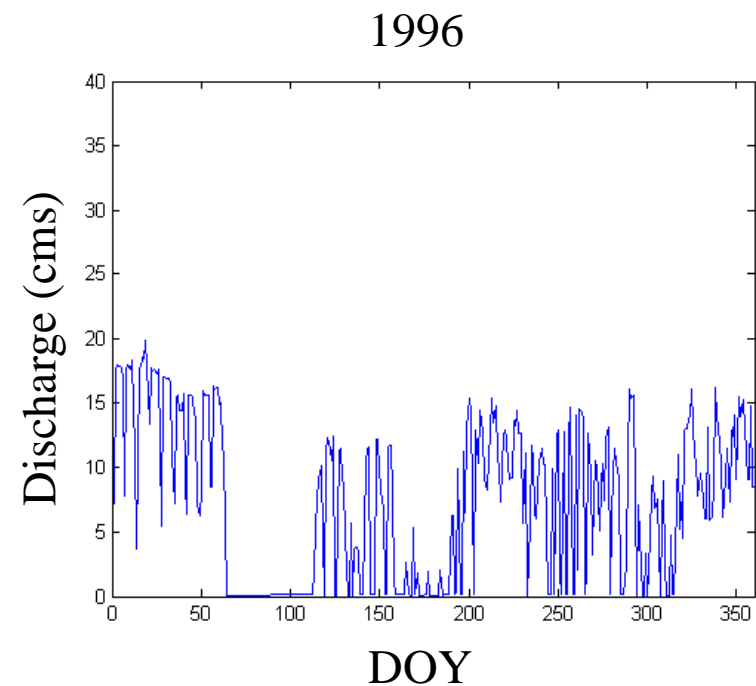
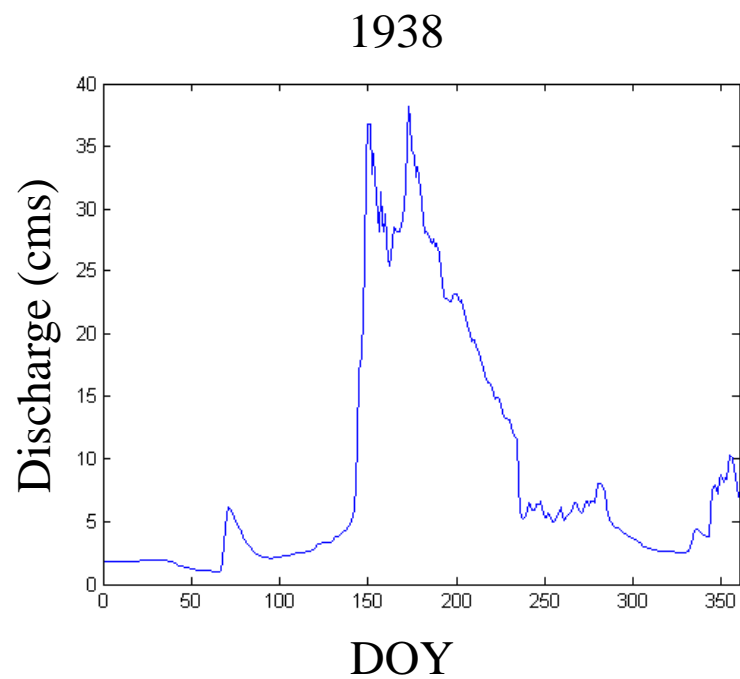
2009



Study sites



Kananaskis Discharge



Daily Temporal Variations



Low flow Q (1 cms dam release)

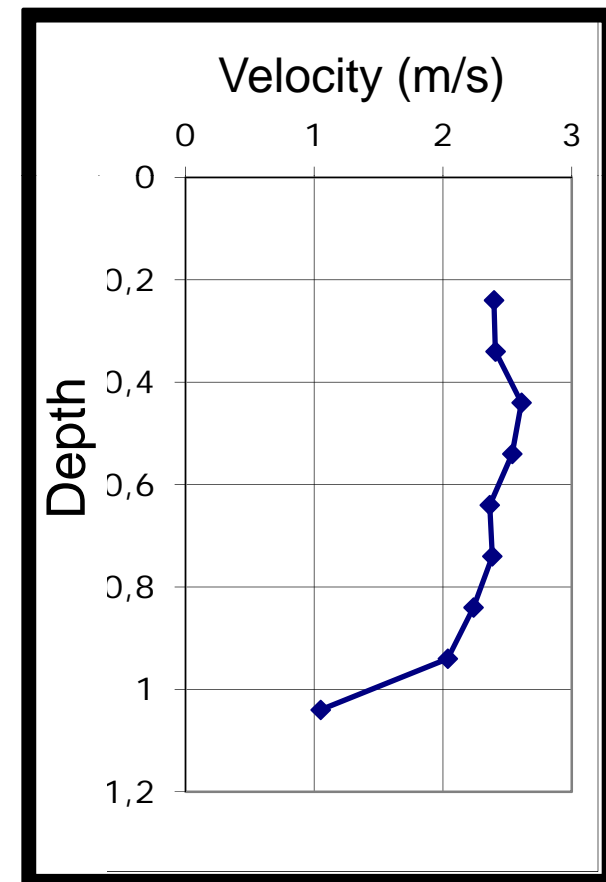
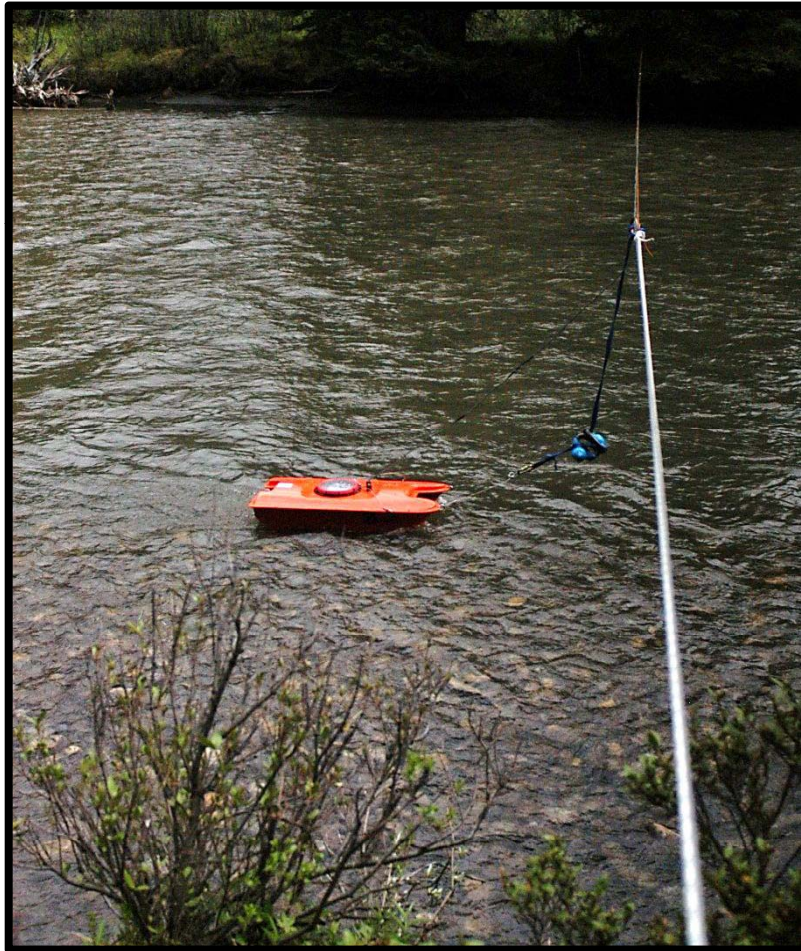


Bankfull flow (21 cms dam release)

Depth - water level loggers



Depth & velocity - ADCP



Total suspended sediments



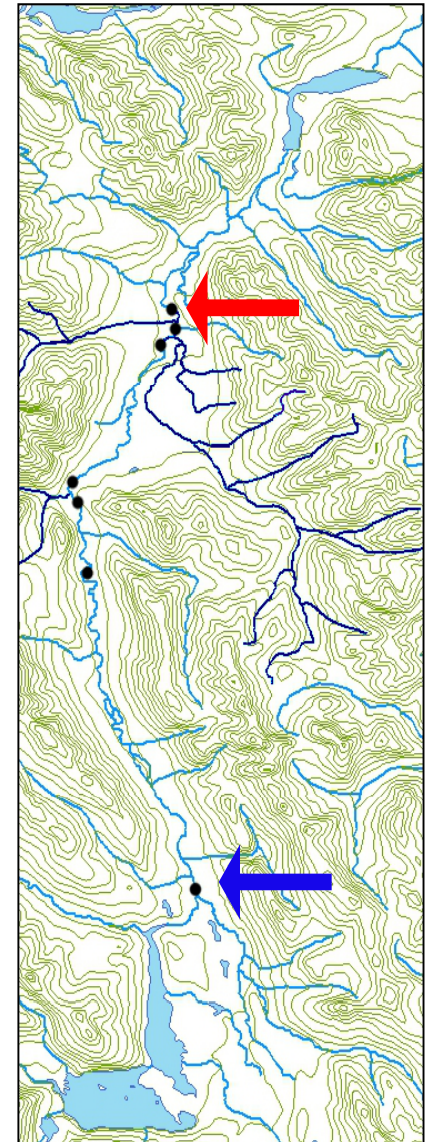
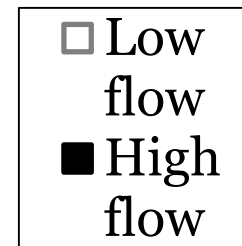
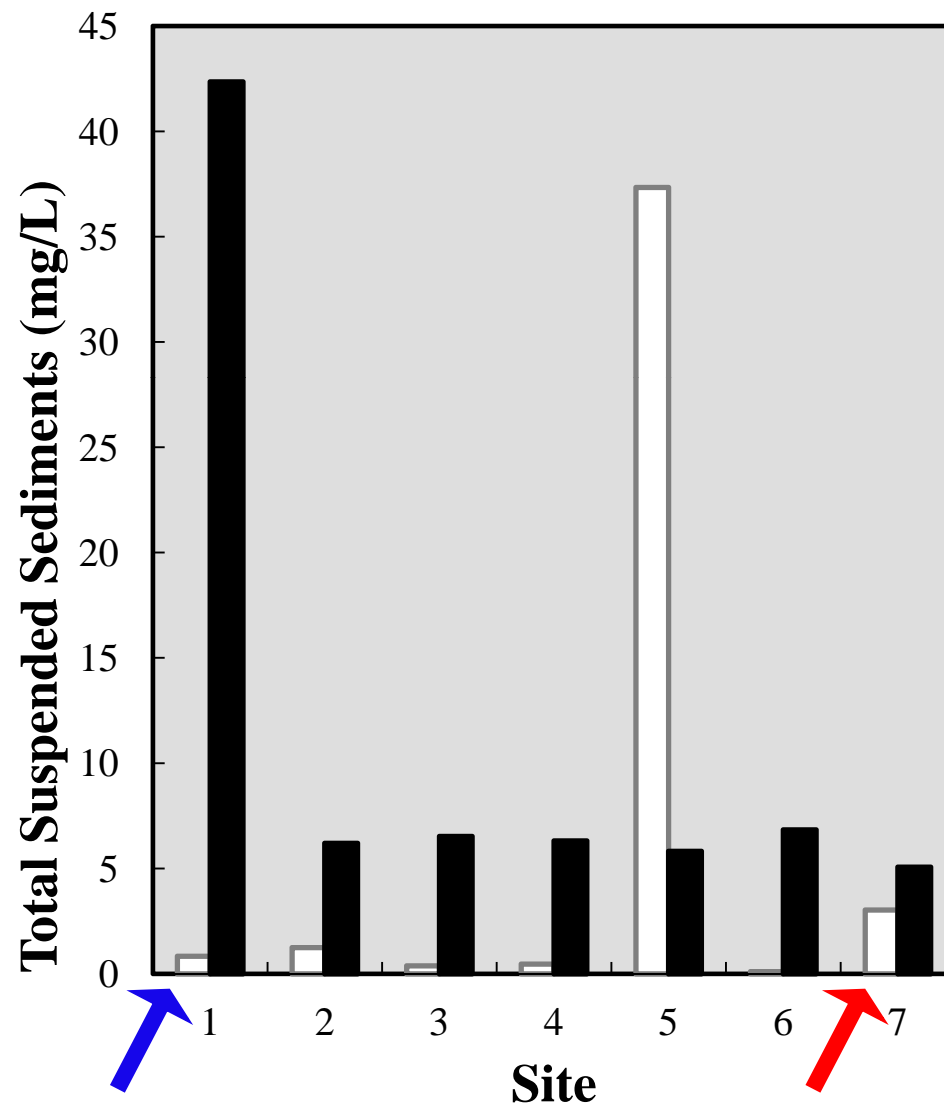
Bed mobility: tracer rocks



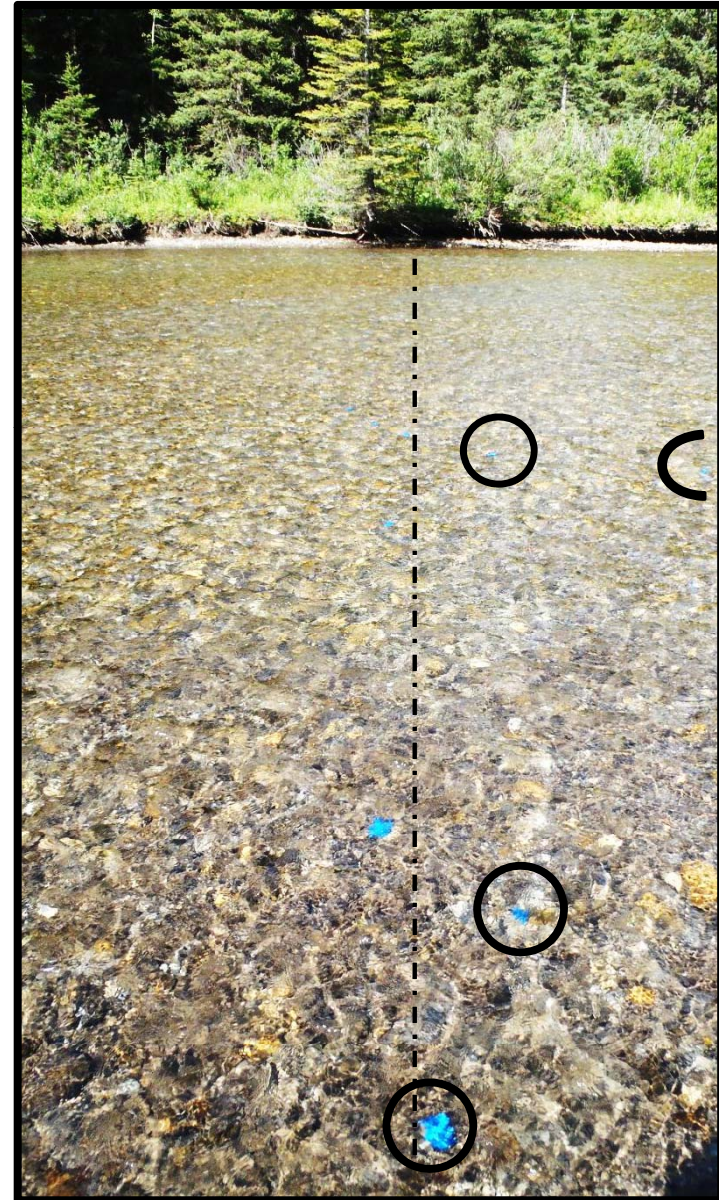
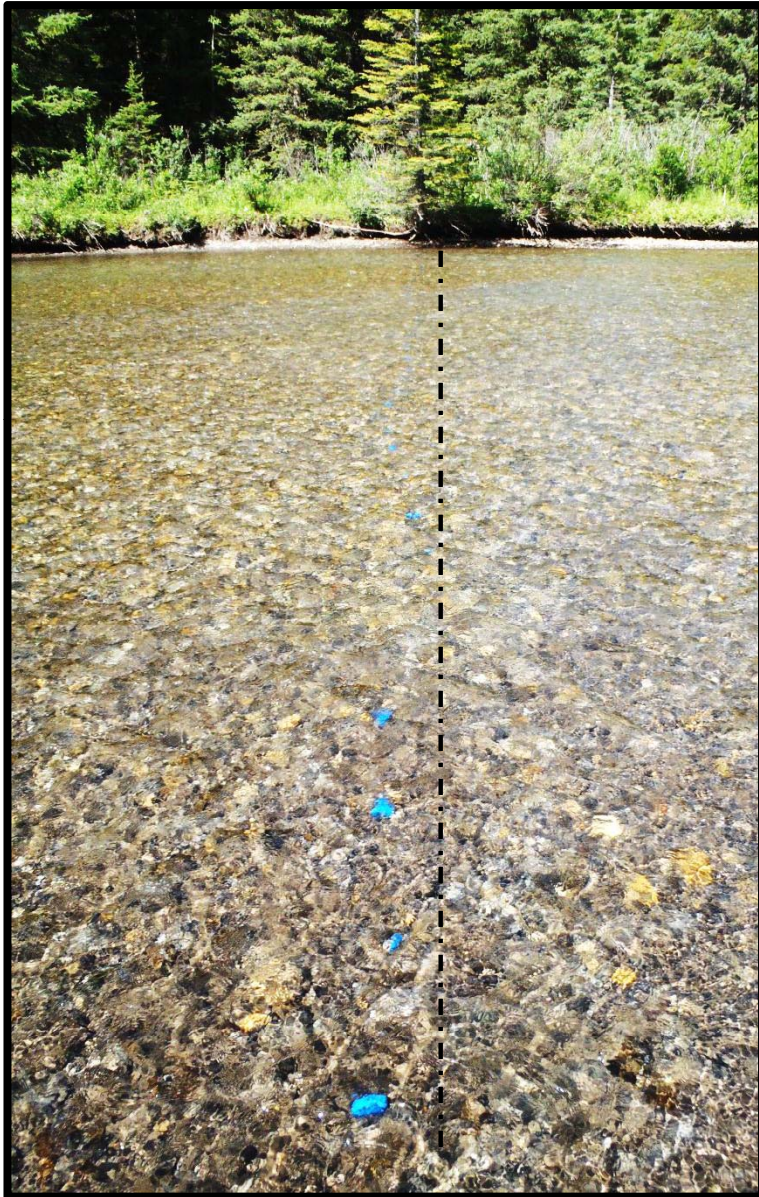
Invertebrate sampling



Results: Total suspended sediments



Results: Bed mobility

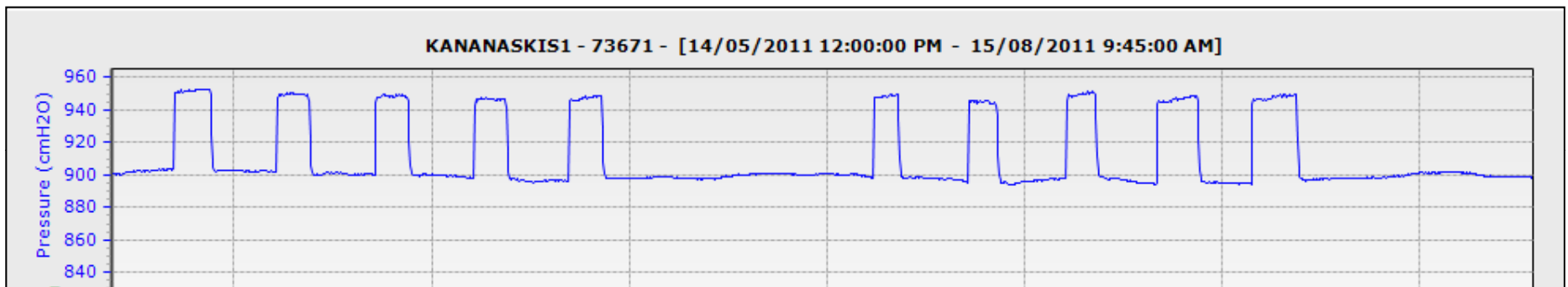


Tracer rocks

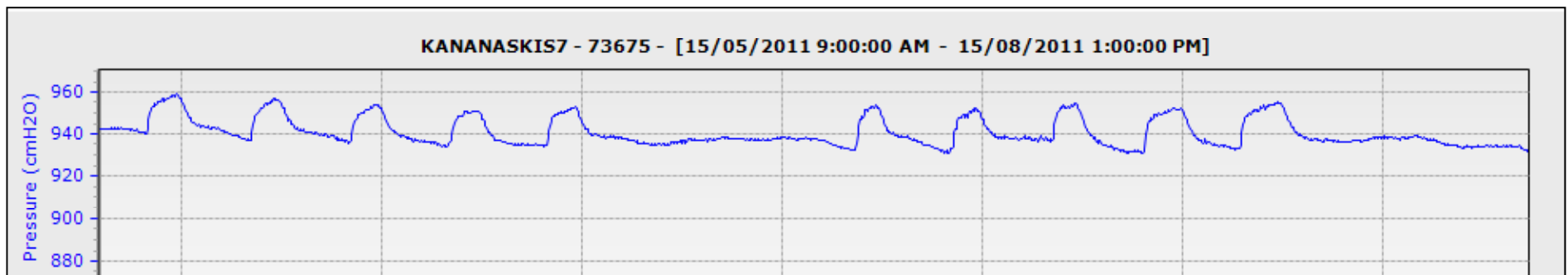
		1	2	3	4	5	6	7
Bed mobile?	High Q	✓	✓	✓	✓	✓	✓	✓
	Low Q	✗	✗	✗	✗	✗	✗	✗

Hydrographs

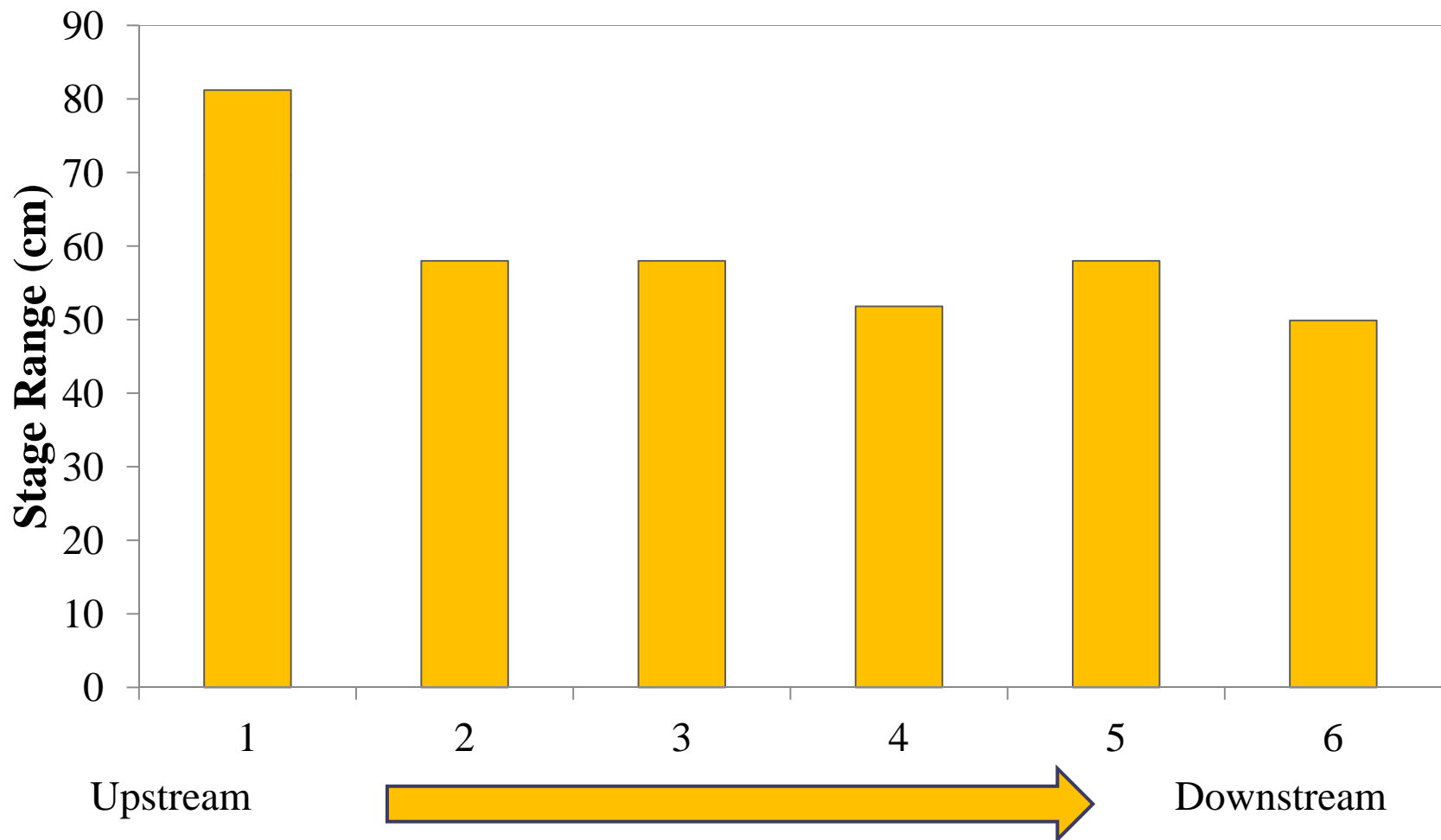
Near dam



~30 km downstream



Stage Fluctuations



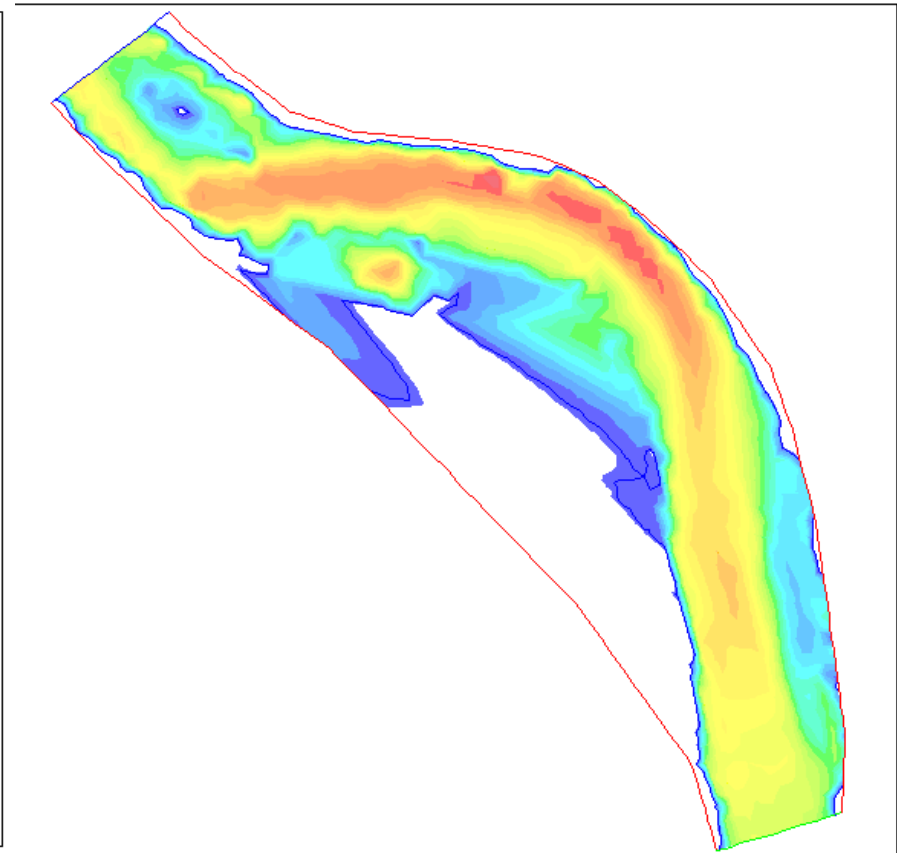
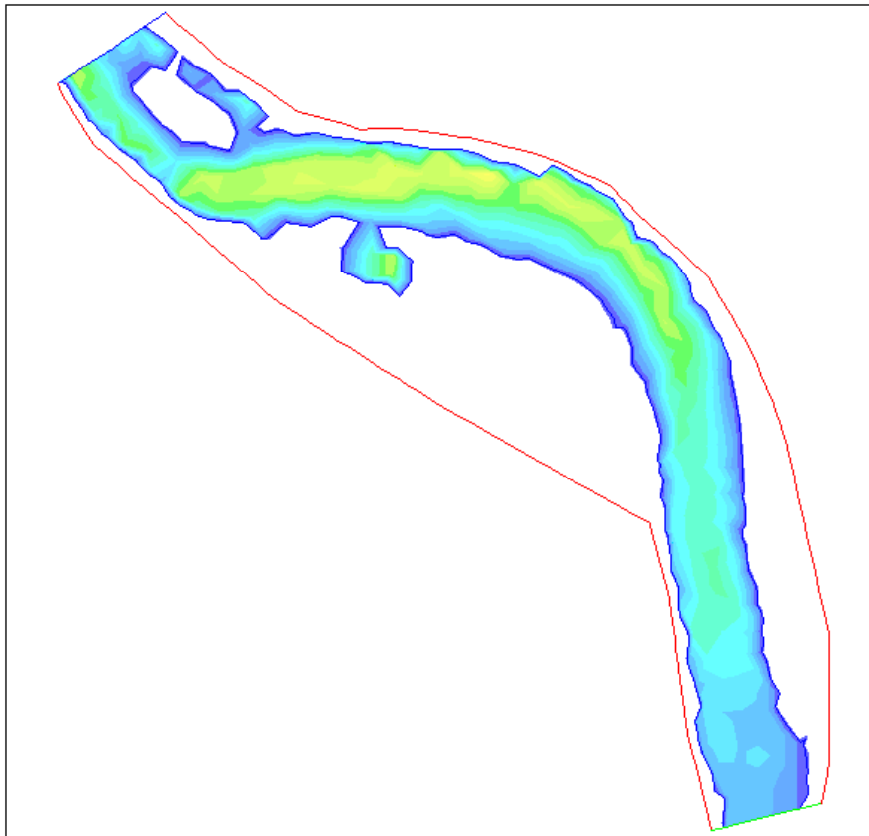
Depth Mapping: River2D

$Q = 1$ cms

$Q = 21$ cms

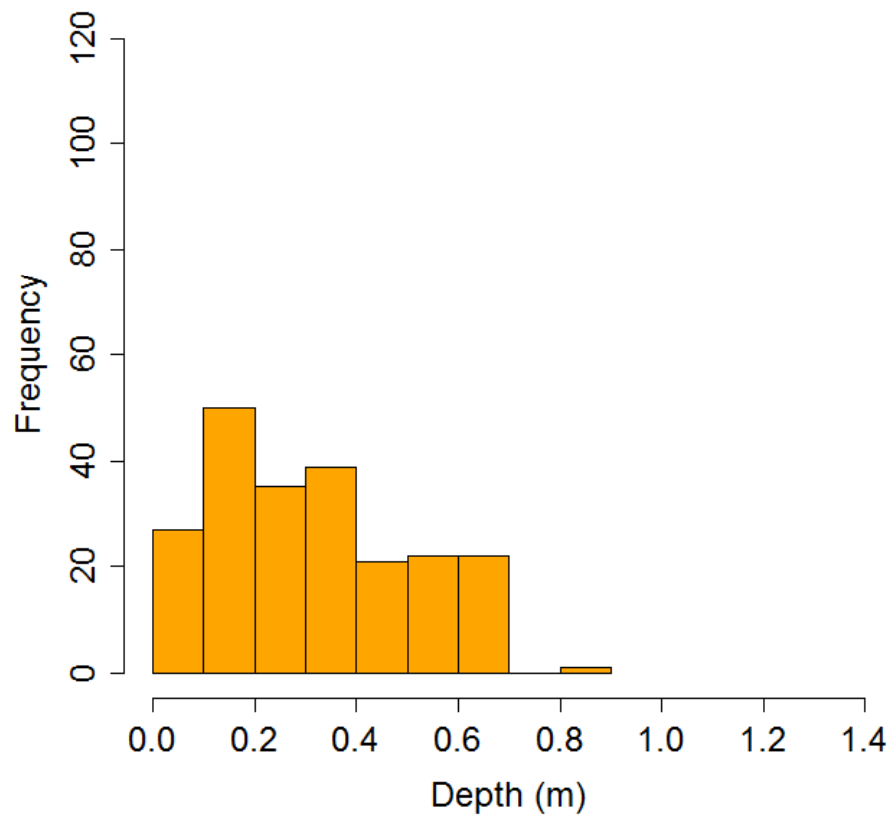
Depth

1.31
1.18
1.05
0.92
0.79
0.66
0.52
0.39
0.26
0.13
0.00

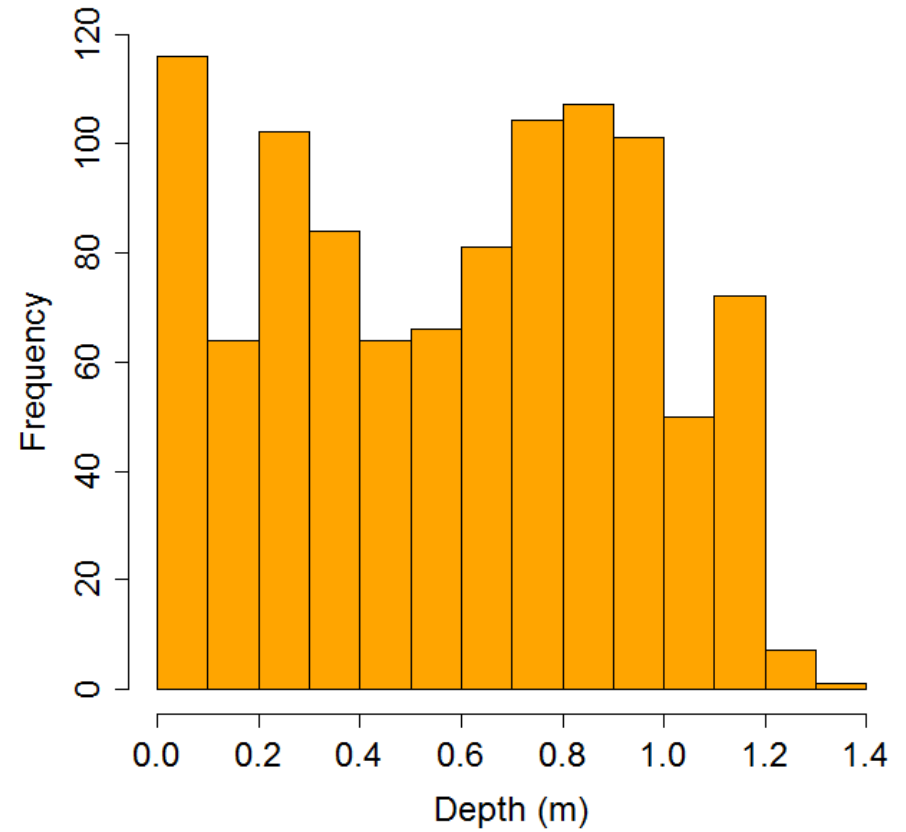


Depth distributions: site 1

Distribution of depths at 1 cms

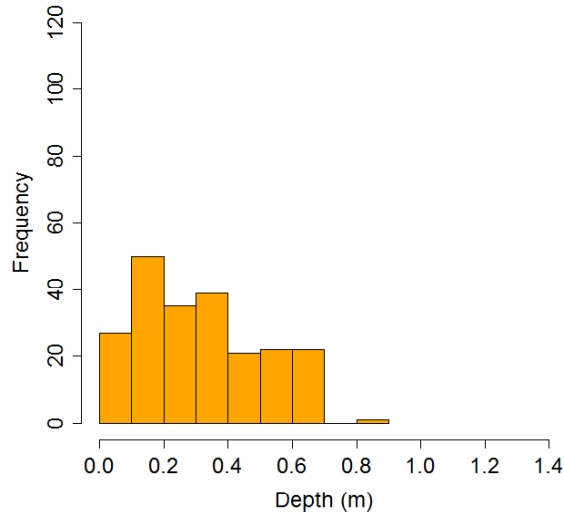


Distribution of depths at 21 cms

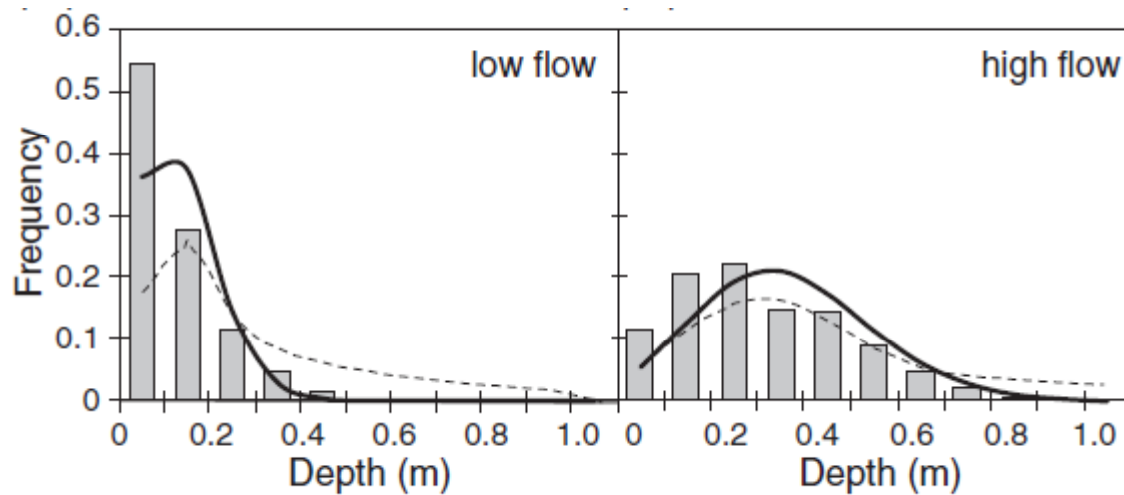
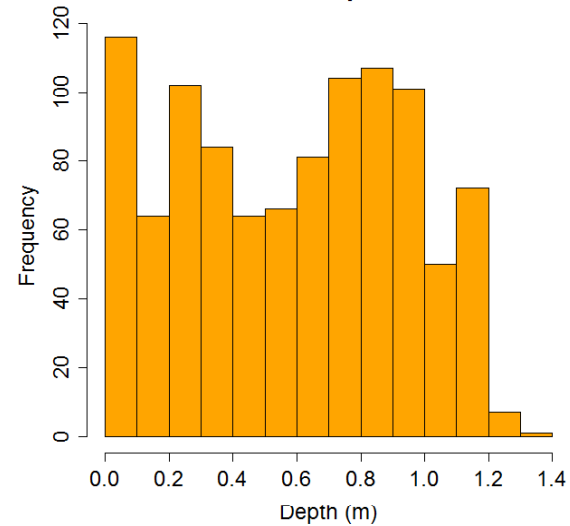


Depth distributions

Distribution of depths at 1 cms

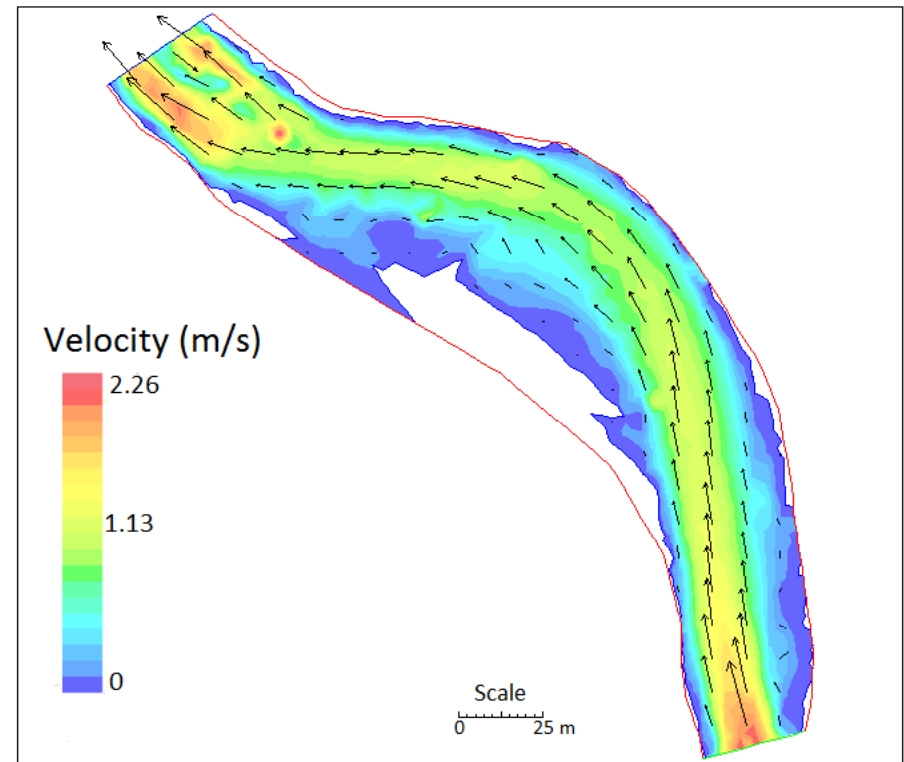
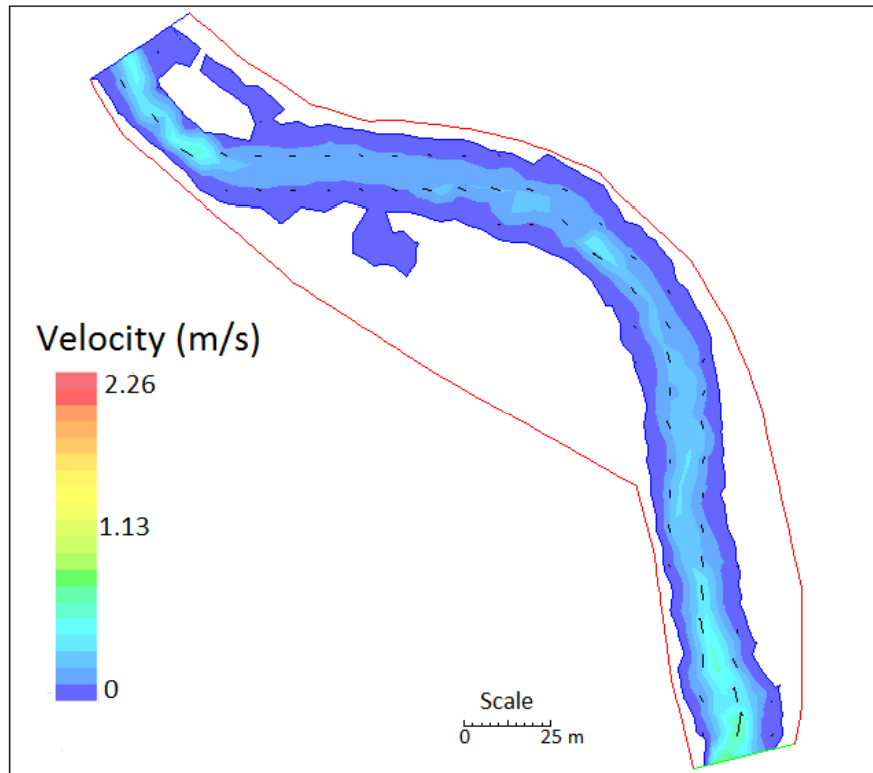


Distribution of depths at 21 cms



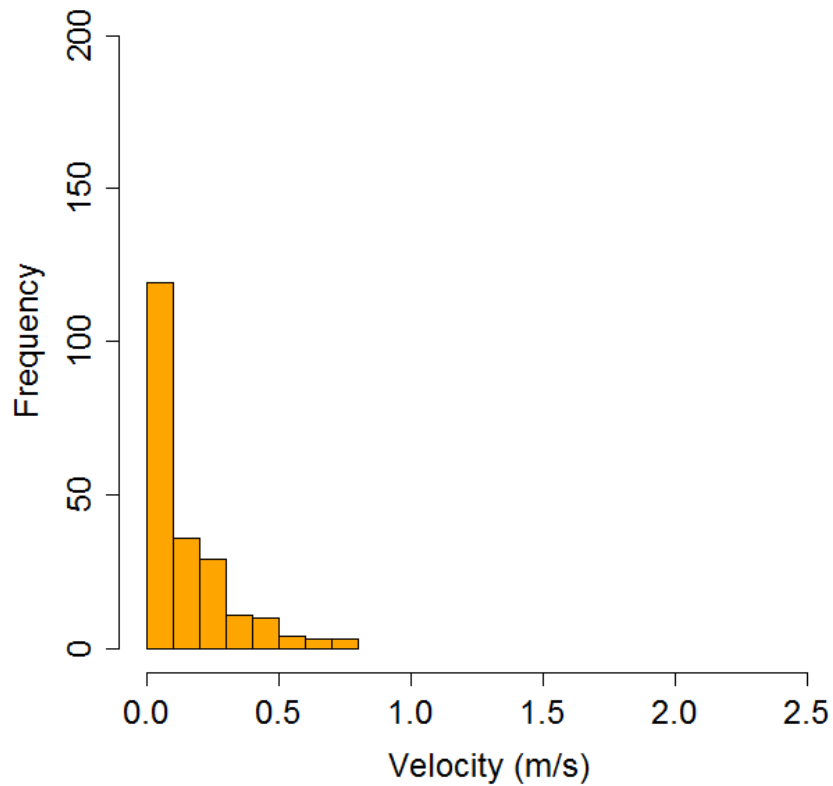
From Rosenfeld et al., 2011

Velocity Mapping: River2D

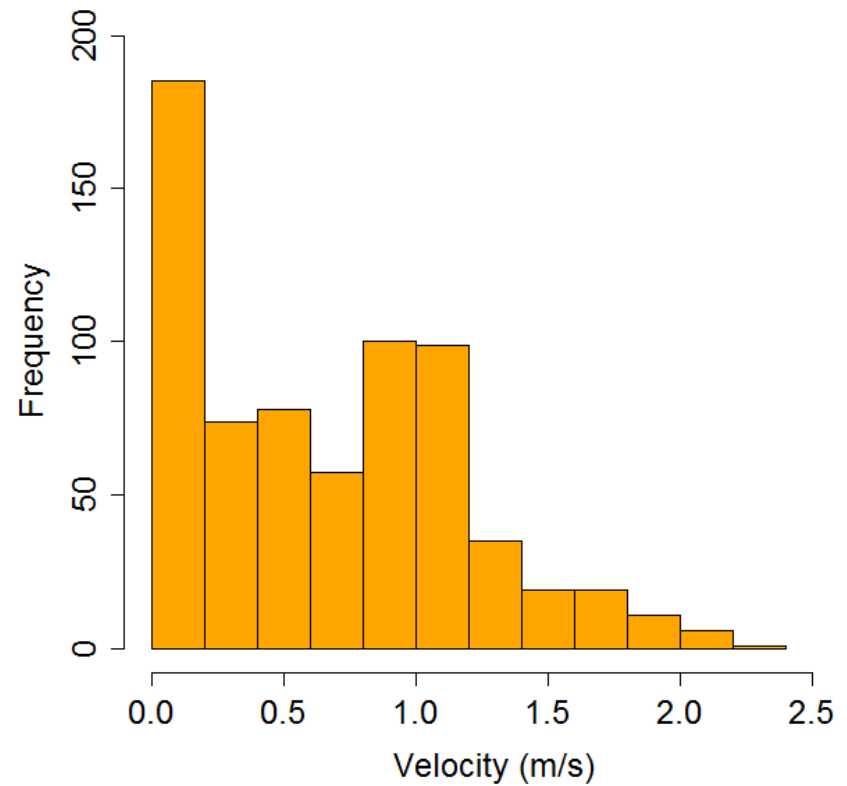


Velocity distributions: site 1

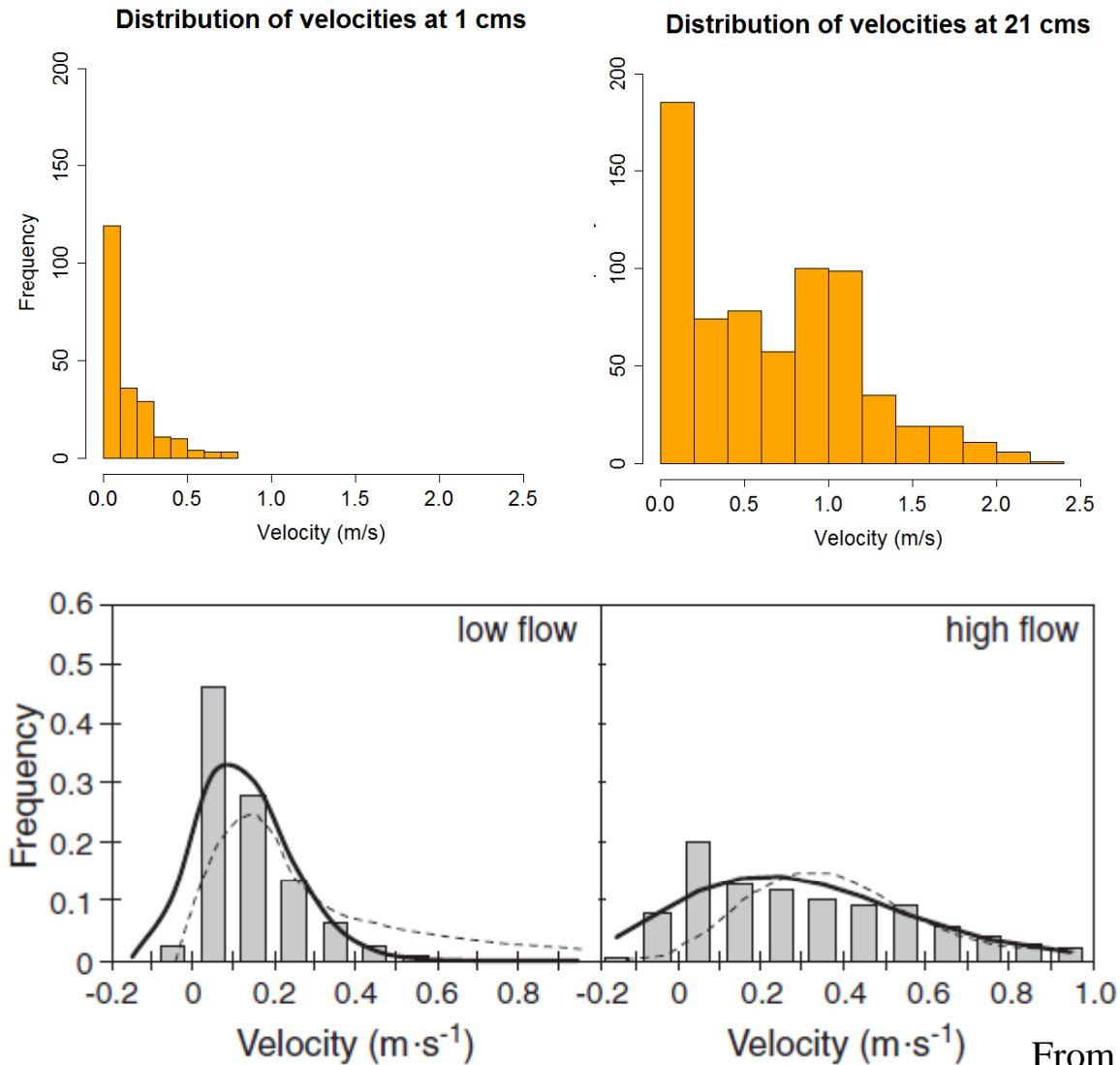
Distribution of velocities at 1 cms



Distribution of velocities at 21 cms



Velocity distributions



From Rosenfeld et al., 2011



Preliminary Conclusions

- Large difference between low and high flow conditions at upstream site.
- Some attenuation of characteristics downstream (stage, TSS)
- Depth distributions behave differently than expected. → implications for modelling

Further work

- Continue velocity and depth mapping
- Invertebrate analysis

