The Influence of Large Woody Debris and Tributary Confluences on the Grain Size Distributions of the HJ Andrews Stream Network

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Outline

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Study Questions

How does the grain size vary longitudinally throughout the network?

How do LWD and tributaries influence the grain size distribution?
Hypothesis

- Grain size decreases with increasing downstream distance
  - Exponential decrease (1875, Sternberg)
  - Power function in coarse alluvial gravels (Brierley & Hickin, 1984)
- LWD associated with upstream fining and downstream coarsening
- Tributaries creating local scour leading to a finer sedimentation

(Benda et al., 2004)

(Knighton, 1980)
Methods

Data Collection every 50 meters:
- Pebble counts (Wolman)
- Wood survey (Czarnomski)
- Gradient survey

Analyses:
- Grain size distributions
- Longitudinal trends
- Bivariate Correlation
- Comparison to Knighton, 1980
  & Benda et. al 2004
Lookout Creek

Downstream Distance (km) vs Median Grain Size (mm)
Lookout Creek

LWD Proximity
red < 20 m  blue < 50 m

Median Grain Size (mm)

Downstream Distance (km)
Lookout Creek

Median Grain Size (mm) vs. Downstream Distance (km)

- Red: LWD Proximity < 20 m
- Blue: LWD Proximity < 50 m
Lookout Creek

LWD Proximity
red < 20 m   blue < 50 m

Downstream Distance (km)

Median Grain Size (mm)
Pearson’s Correlation

Bivariate correlation-

Pearson’s Correlation Coefficient:
Determine correlation between LWD and various percentiles of the GSD
Wood Volume vs. Downstream Grain Size

![Graph showing the correlation of wood volume with downstream grain size for different percentiles (d10, d16, d50, d84) and different creek types (Mack Creek, Middle Lookout Creek, Upper McRae Creek, Upper Lookout Creek, Lower McRae Creek, Central Lookout Creek, Lower Lookout Creek).]
Wood Volume vs. Upstream Grain Size

![Graph showing the relationship between Wood Volume and Upstream Grain Size.](image)
Step jams
- found in small channels with wide range of gradients

Meander jams
- found in large alluvial rivers

Bench jams
- found in small, steep channels

(Abbe et al., 2003)
Tributary Confluences

Middle Lookout Creek

![Middle Lookout Creek graph](image)

Lookout Creek

![Lookout Creek graph](image)

Mack Creek

![Mack Creek graph](image)

Mack Creek

![Mack Creek graph](image)
Conclusion

Did grain size change longitudinally?
- Grain size increased as downstream distance increased

How does wood influence changes in grain size?
- Minimal correlation with grain size & wood volume
- Influences likely have a smaller influence proximity than the 50 meter samples
- Channel characteristics (i.e. slope, width, confinement) determine types of logjams and thus type of influence

How do tributaries influence the grain size?
- Downstream coarsening & upstream fining was observed for Lookout & McRae junction
- Mack Creek-
  - Downstream coarsening of $d_{84}$
  - Downstream fining of $d_{50}$ & $d_{16}$
- Middle Lookout – contradicting observations
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Questions?
