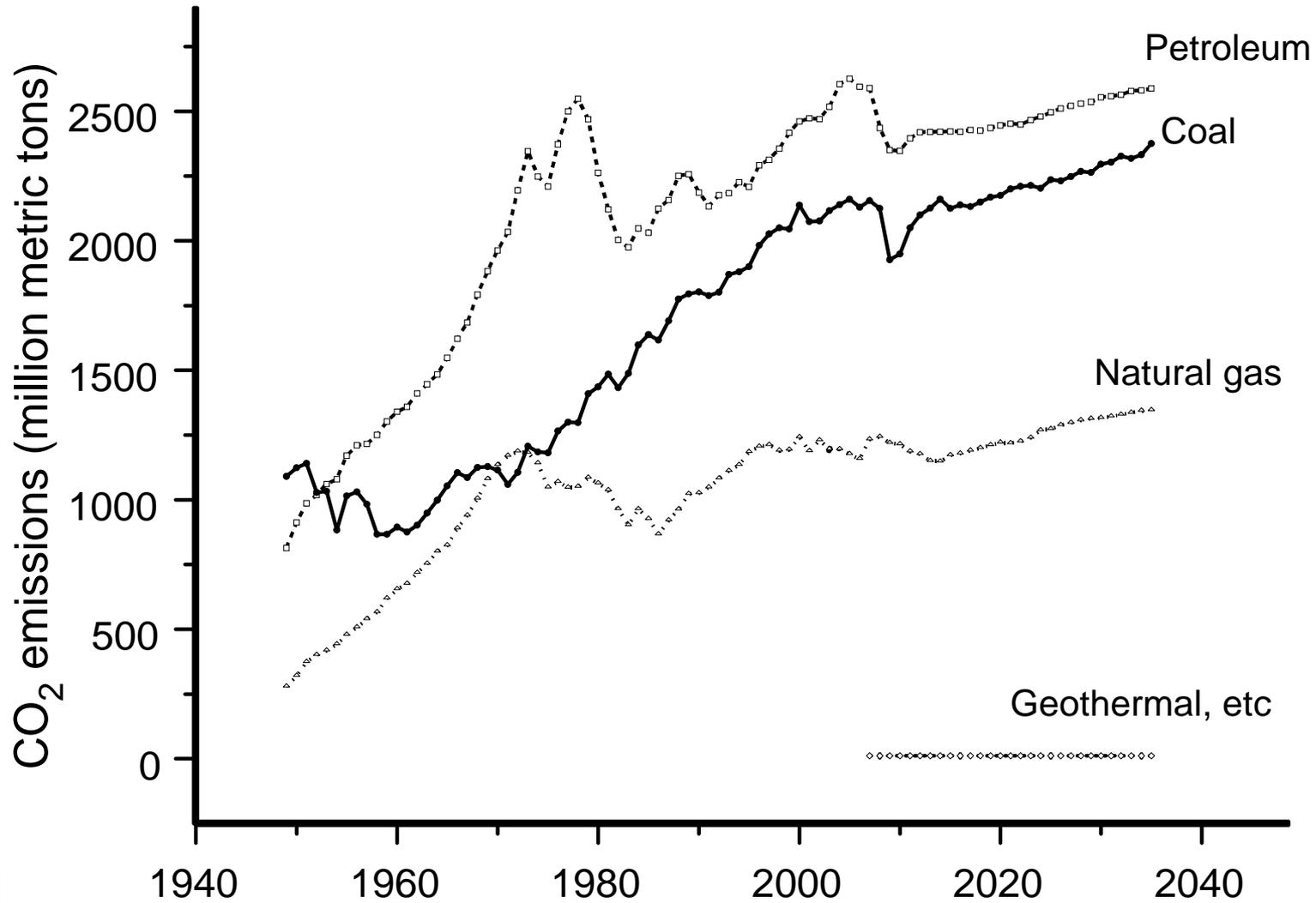


Export of detritus and invertebrates from headwater streams: linking mountaintop removal and valley fill coal mining to downstream receiving waters

Ken Fritz¹, Brent Johnson¹, & Rachel Price²

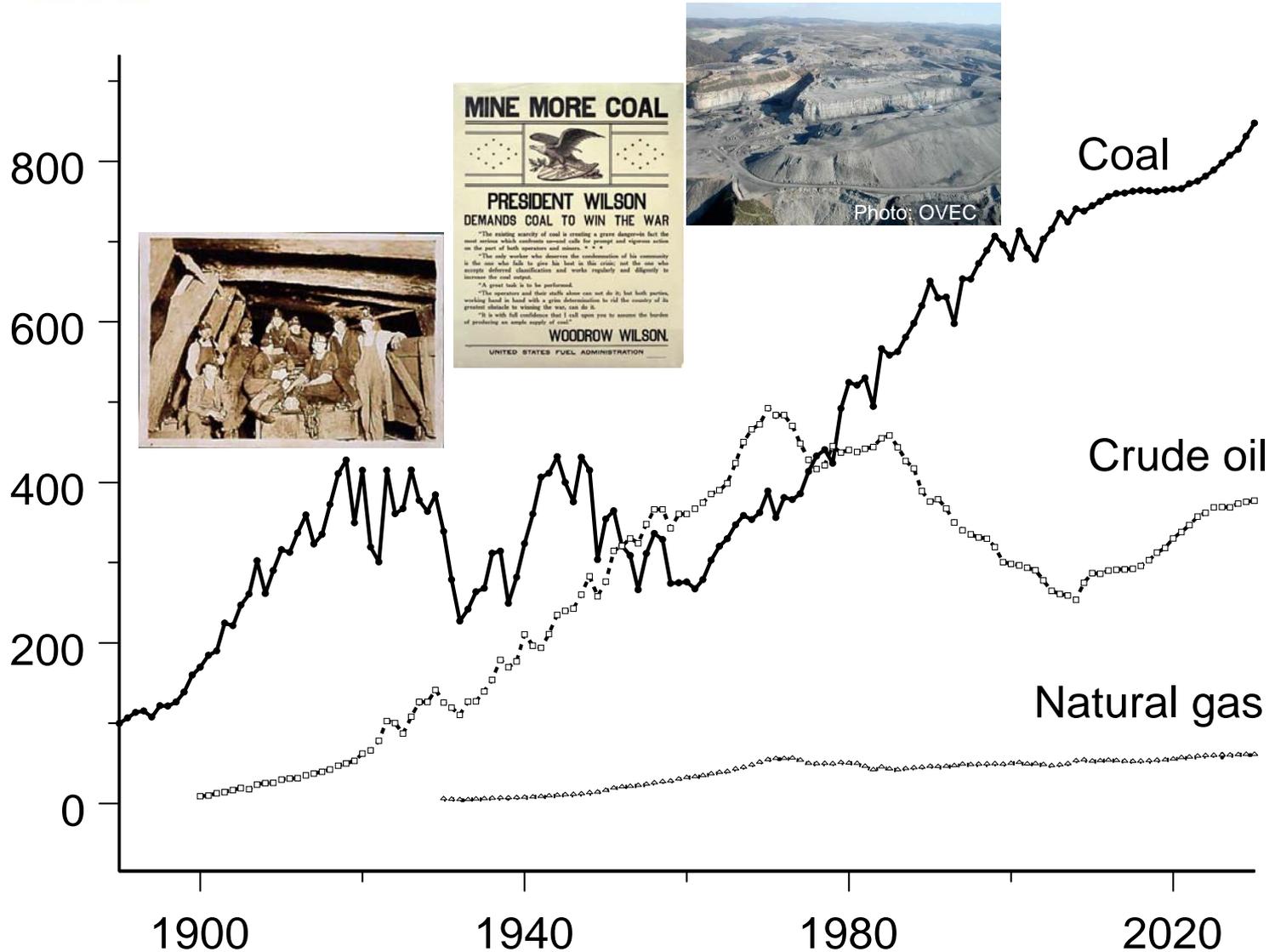


U.S. CO₂ emissions outlook



U.S. fossil fuel production outlook

Million tonnes of oil equivalent (Mtoe)



Mountaintop removal and valley fill (MTR/VF) coal mining

- Permanently buries headwater streams.
- Extreme watershed manipulation.
- Altered topography, hydrology & geochemistry.



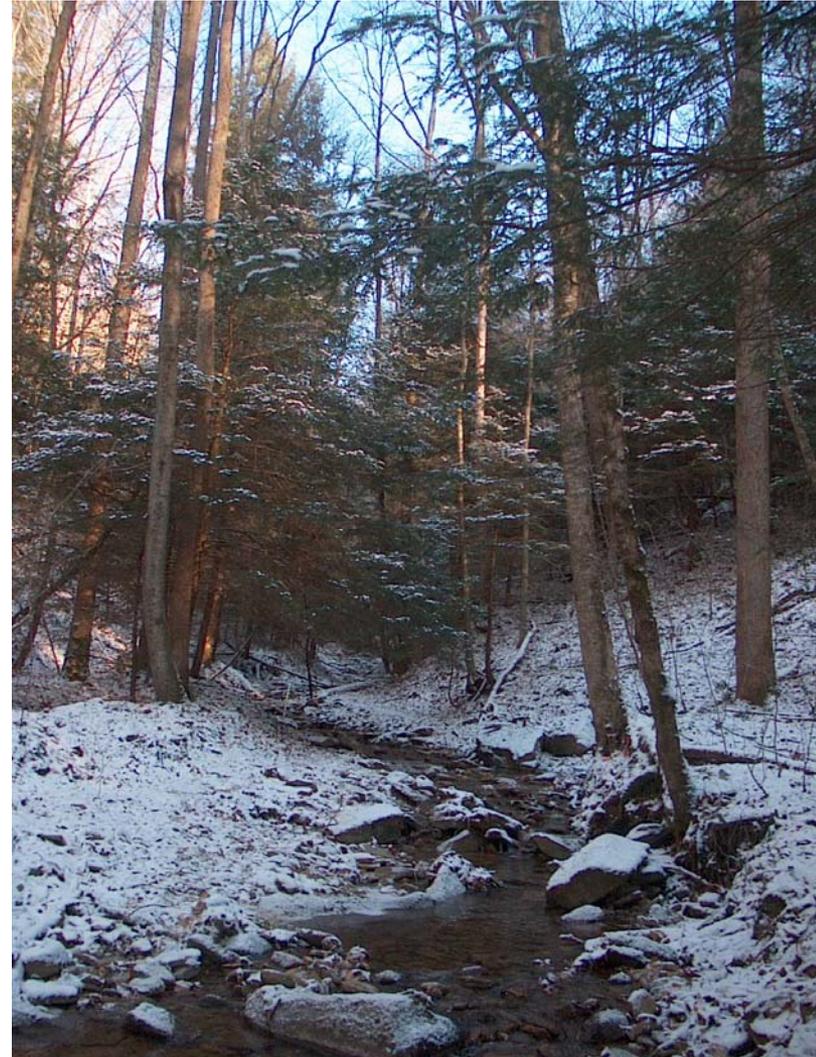
Photo: WVGES



Photo: WVMineSafety

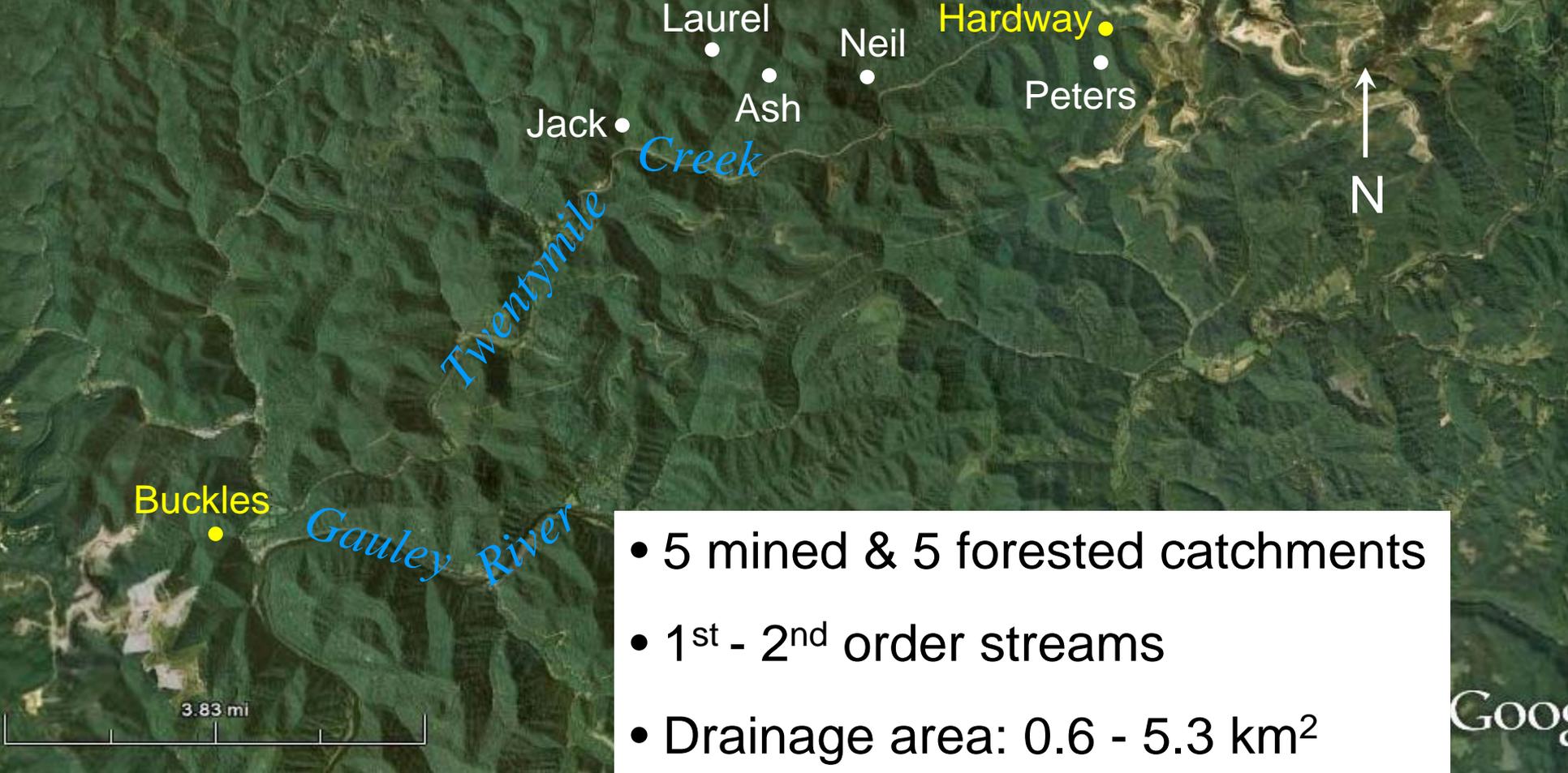
Objective

Compare detritus & invertebrate export from tributaries draining forested & MTR/VF mined catchments.





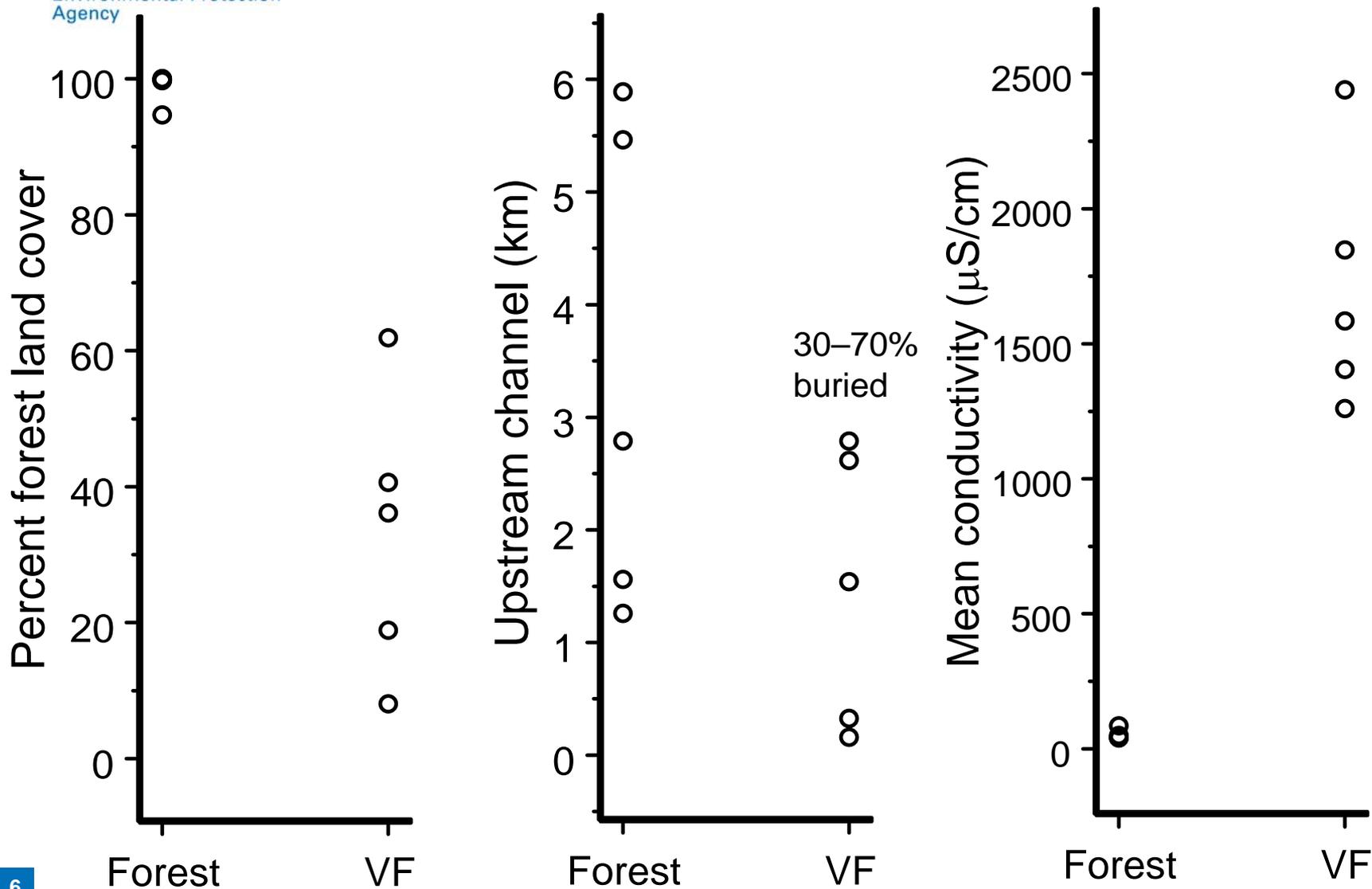
Study location



- 5 mined & 5 forested catchments
- 1st - 2nd order streams
- Drainage area: 0.6 - 5.3 km²



Study catchments



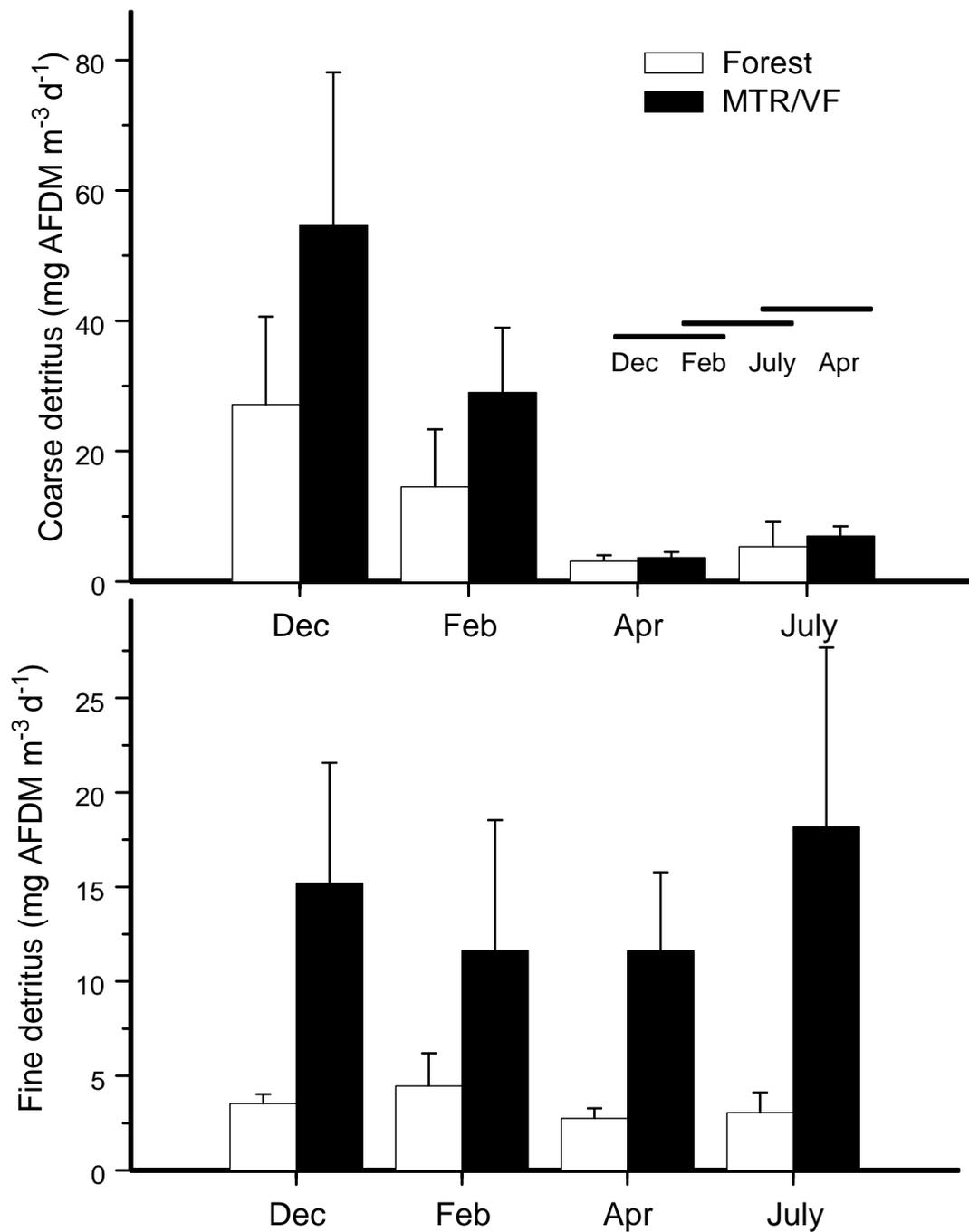
Methods



- Drift nets (250 μm)
 - Seasonally (Dec, Feb, Apr & July)
 - Deployed for $\sim 1\text{d}$ (0.71-1.06)
 - $85.2 \pm 2.3\%$ of discharge captured
- Fractions
 - Coarse detritus ($>2\text{ mm}$)
 - Fine detritus ($<2\text{ mm}$)
 - Sediment
 - Invertebrates (coarse + subsample)

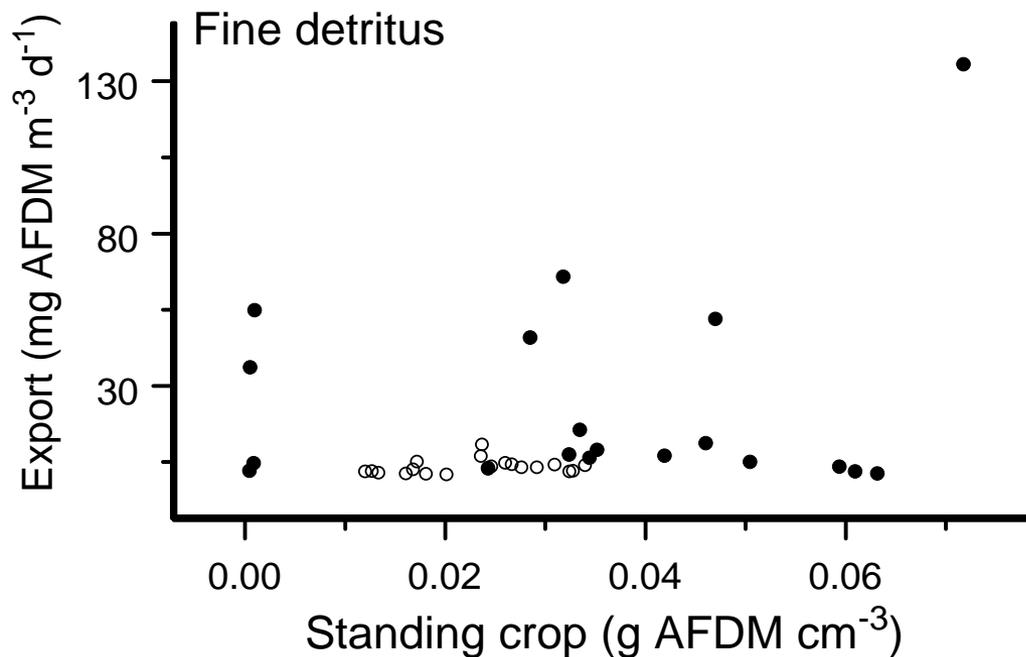
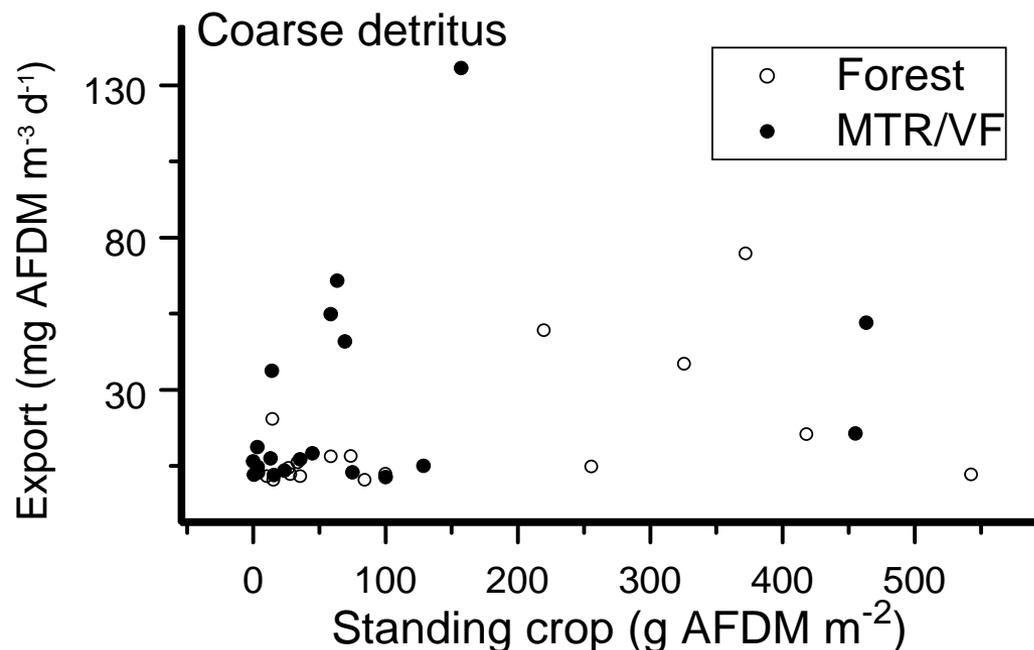
Detritus export

No catchment treatment differences, even when adjusting for black carbon (coal fines).



Detritus export

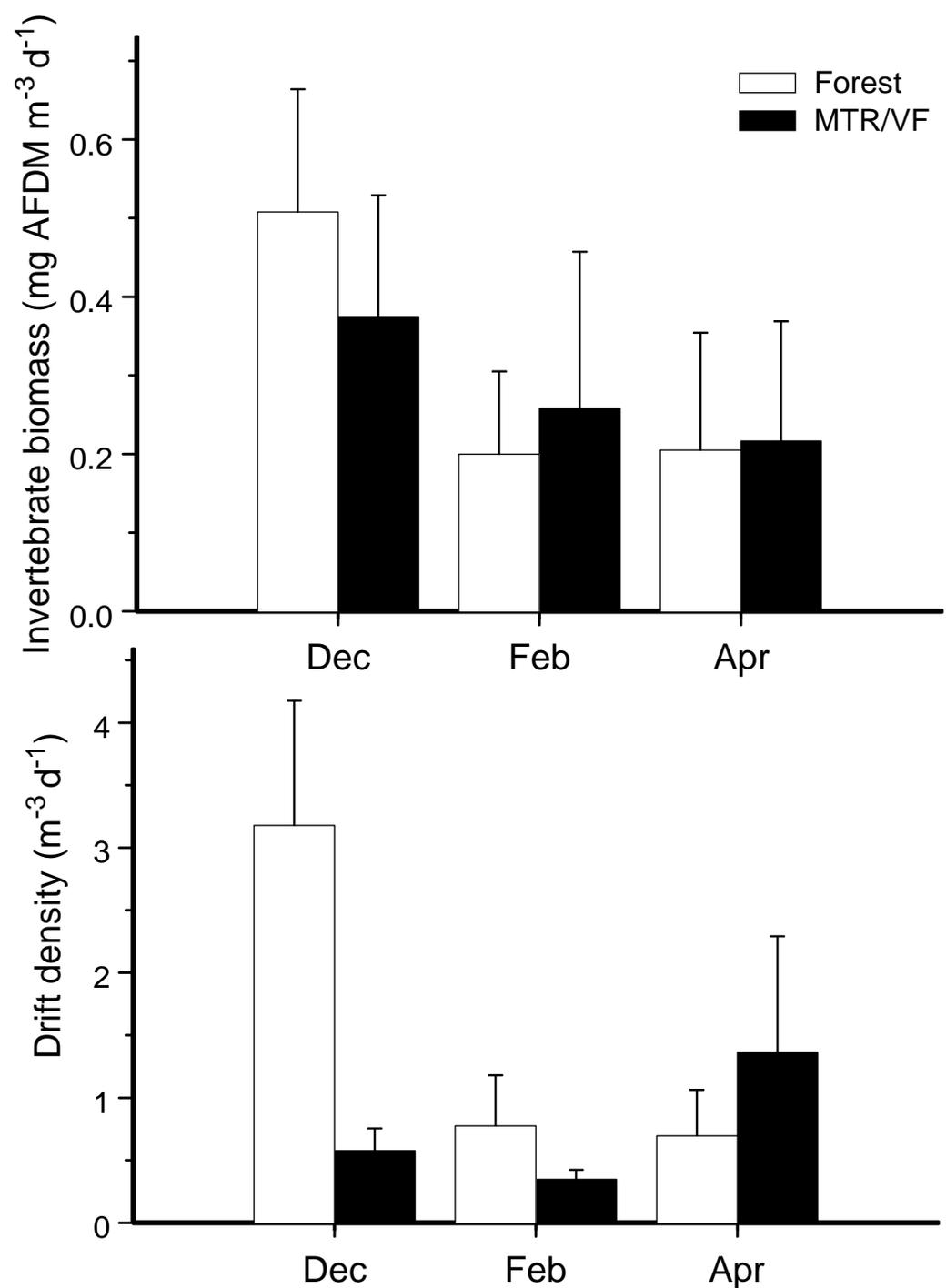
No relationships
between detritus
export and standing
stock.



Invertebrate export

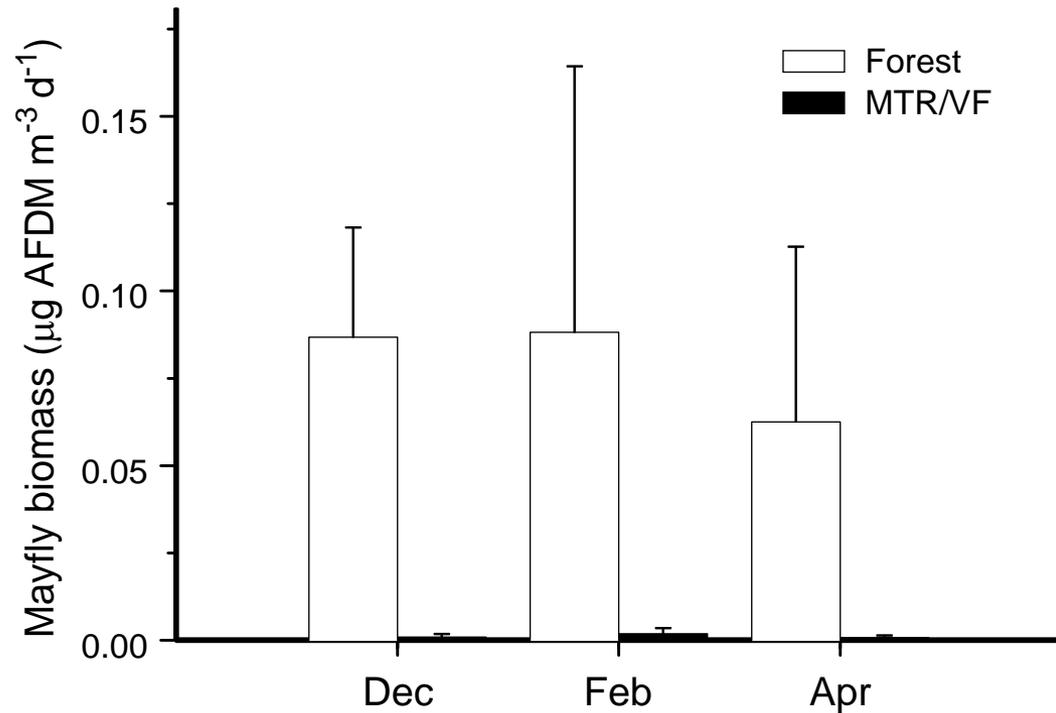
No catchment treatment differences (also for aquatic taxa only).

Significant interaction with time for drift density.



Invertebrate export

Mayflies: Forest > MTR/VF



Dominant groups by mass

| | Forest | MTR/VF |
|-----|---------------------|---------------|
| Dec | Plecoptera (49%) | Diptera (50%) |
| Feb | Plecoptera (51%) | Diptera (33%) |
| Apr | Ephemeroptera (51%) | Diptera (88%) |

Detritus and invertebrate import from headwater streams

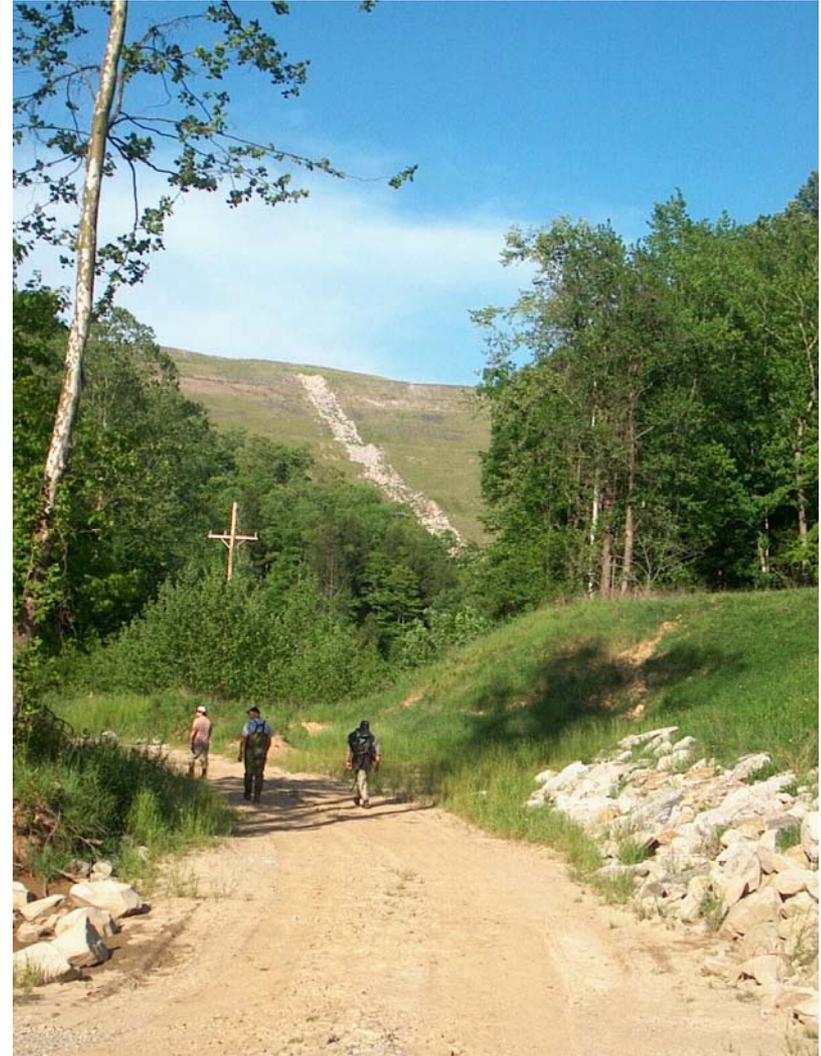
- Based on Wipfli & Gregovich 2002 ($I_{d/i} = E_{d/i} \times 2N$)

| Study | Location | I_d g km ⁻¹ d ⁻¹ | I_i mg km ⁻¹ d ⁻¹ |
|-------------------------|----------------------|---|--|
| Wipfli & Gregovich 2002 | SE Alaska | 78 (7 – 2120) | 1210 (12 – 18,210) |
| Present study | Twentymile Creek, WV | 76 (0.2 – 339) | 1237* (3 – 9616) |

* Does not include July data

Summary

- Detritus and total invertebrate quantities did not differ, however differences did exist in the taxonomic composition of invertebrate export.
- Headwater subsidies comparable to the substantial values estimated from forested headwaters in southeastern AK.
- Further research is needed to assess possible cumulative impacts of MTR/VF on downstream productivity and food webs.



Acknowledgments

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