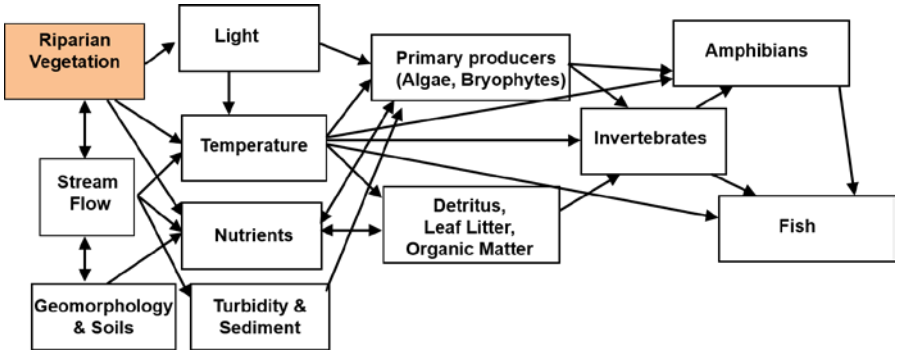
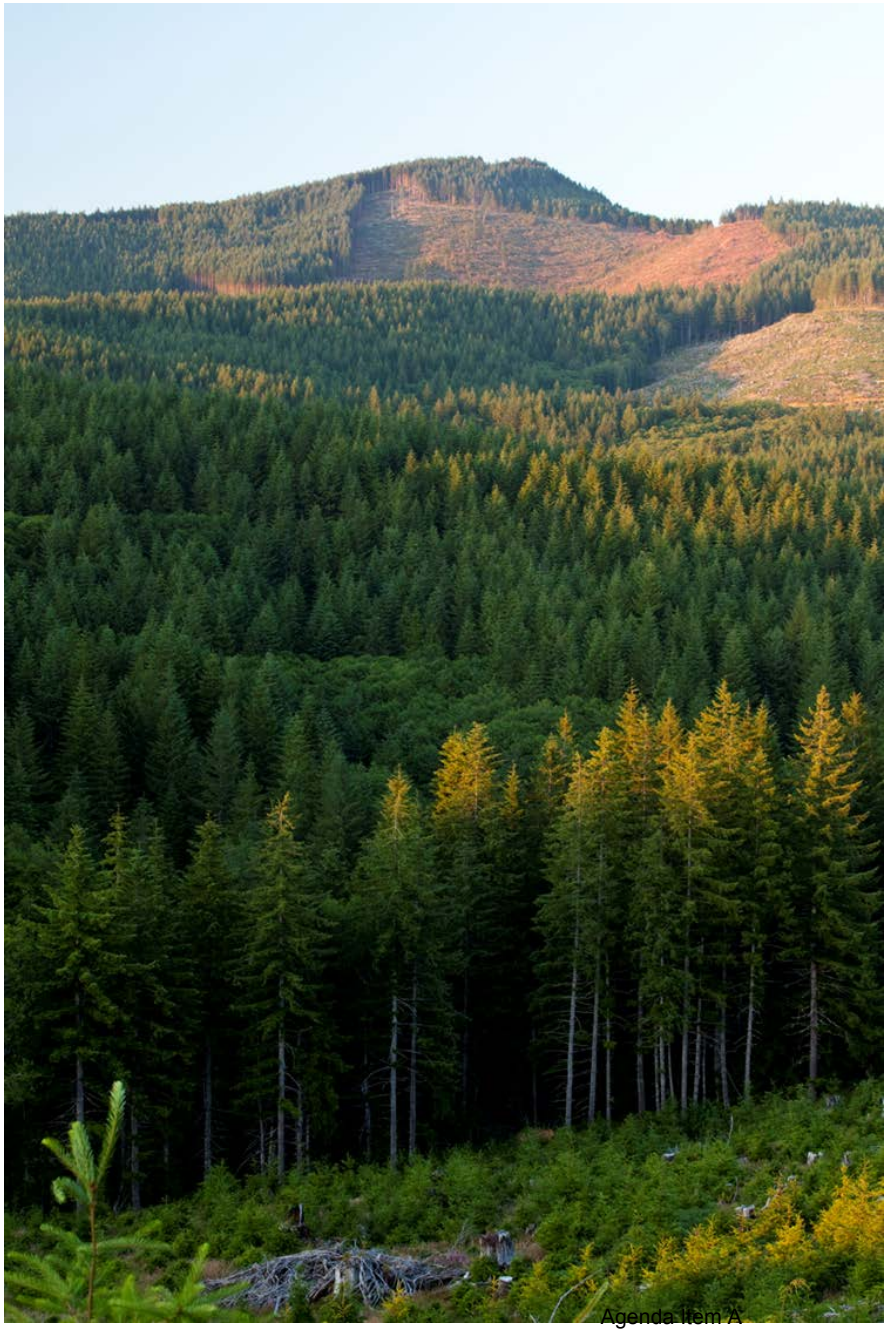
Trask River Watershed Study

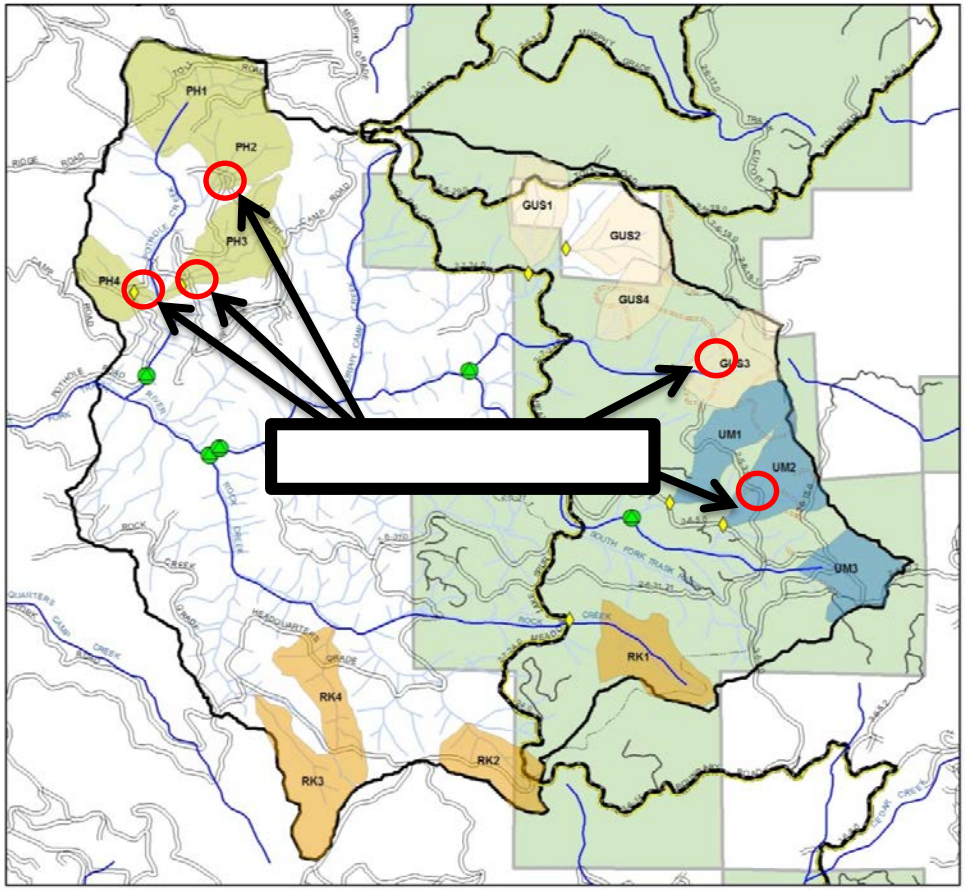
Preliminary findings





Trask River Watershed Study

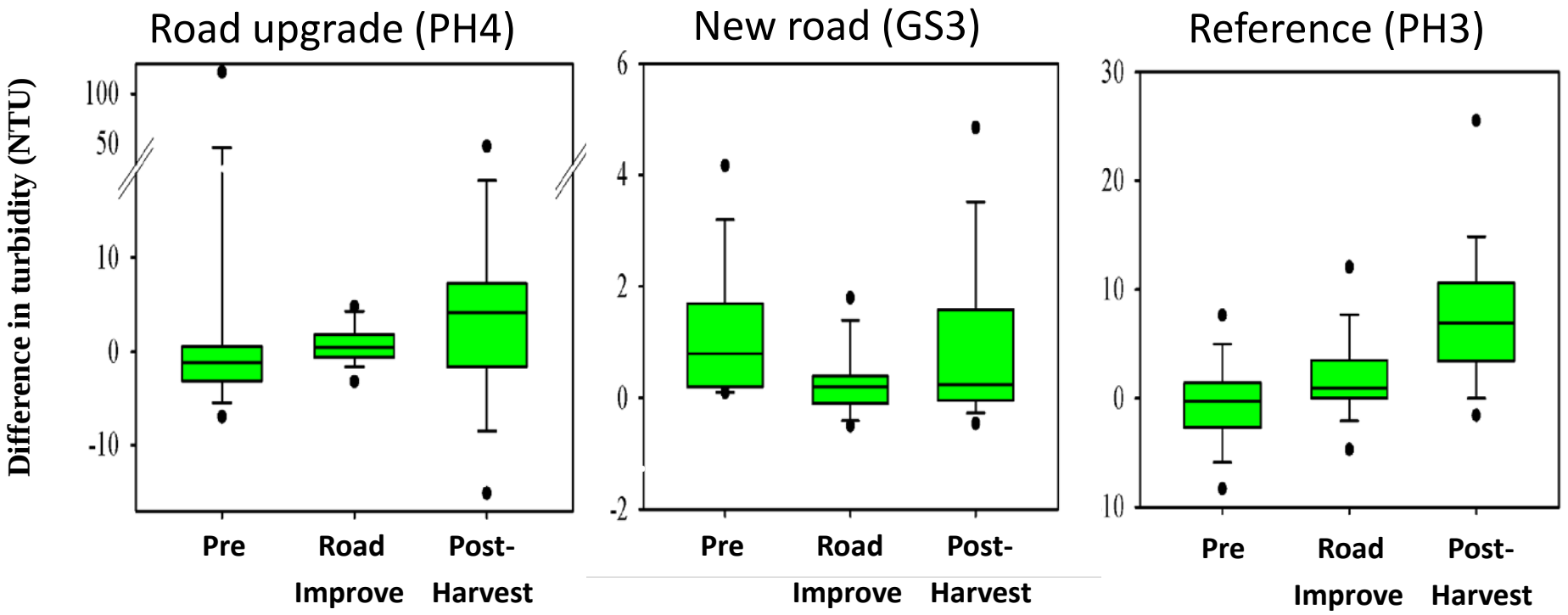
Suspended sediment above and below roads



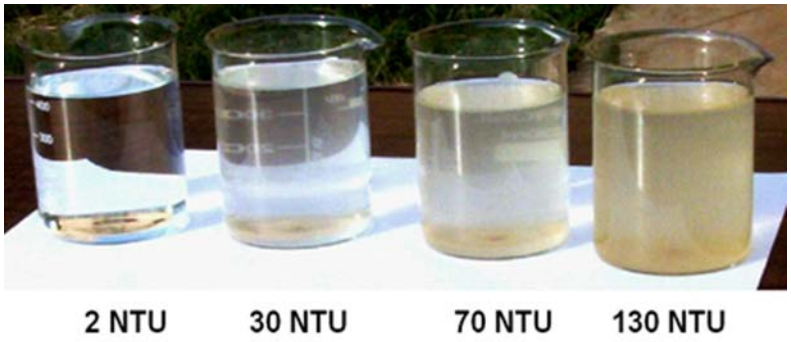
Other sites include road improvement PH2 & PH4 on State Forest and the reference site PH3.

Trask River Watershed Study

Suspended sediment above and below roads



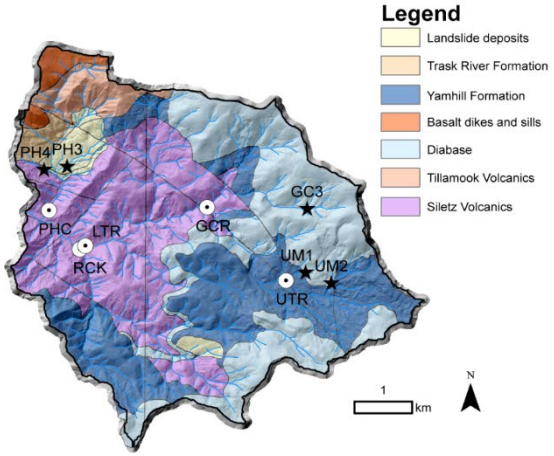
- **Minimal increases in sediment & turbidity**
- **Local disturbances important in headwaters**
- **Natural variability within/between streams**

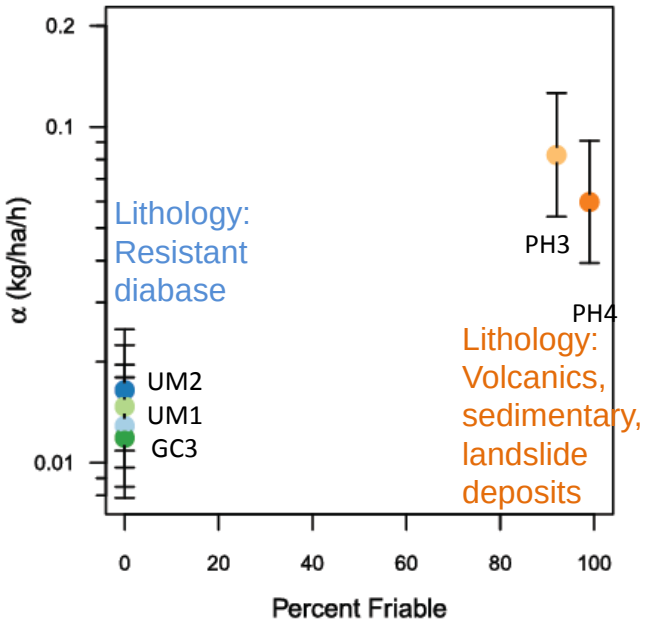


Arismendi et al. 2017, *Water Resources Research*

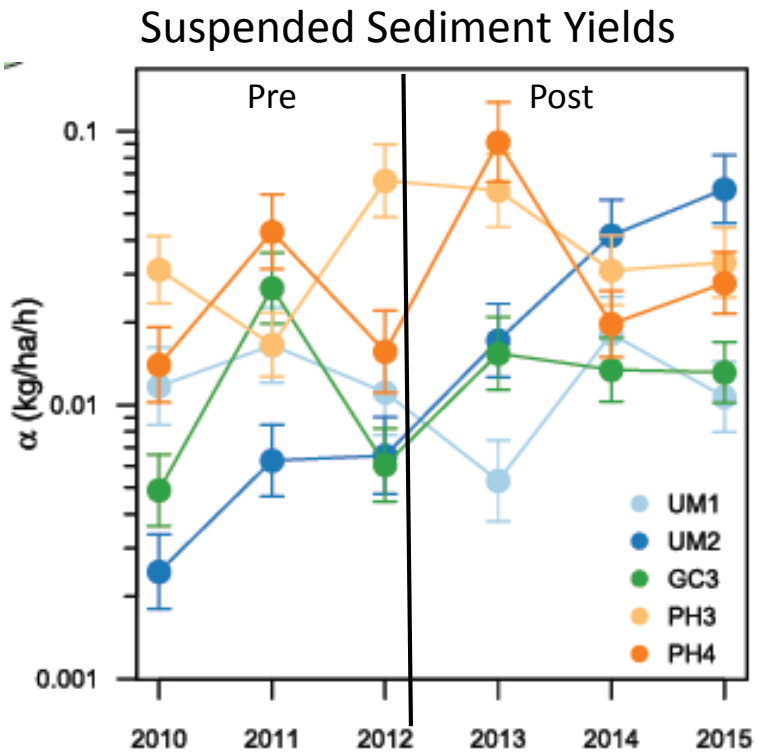
Trask River Watershed Study

Suspended sediment yields





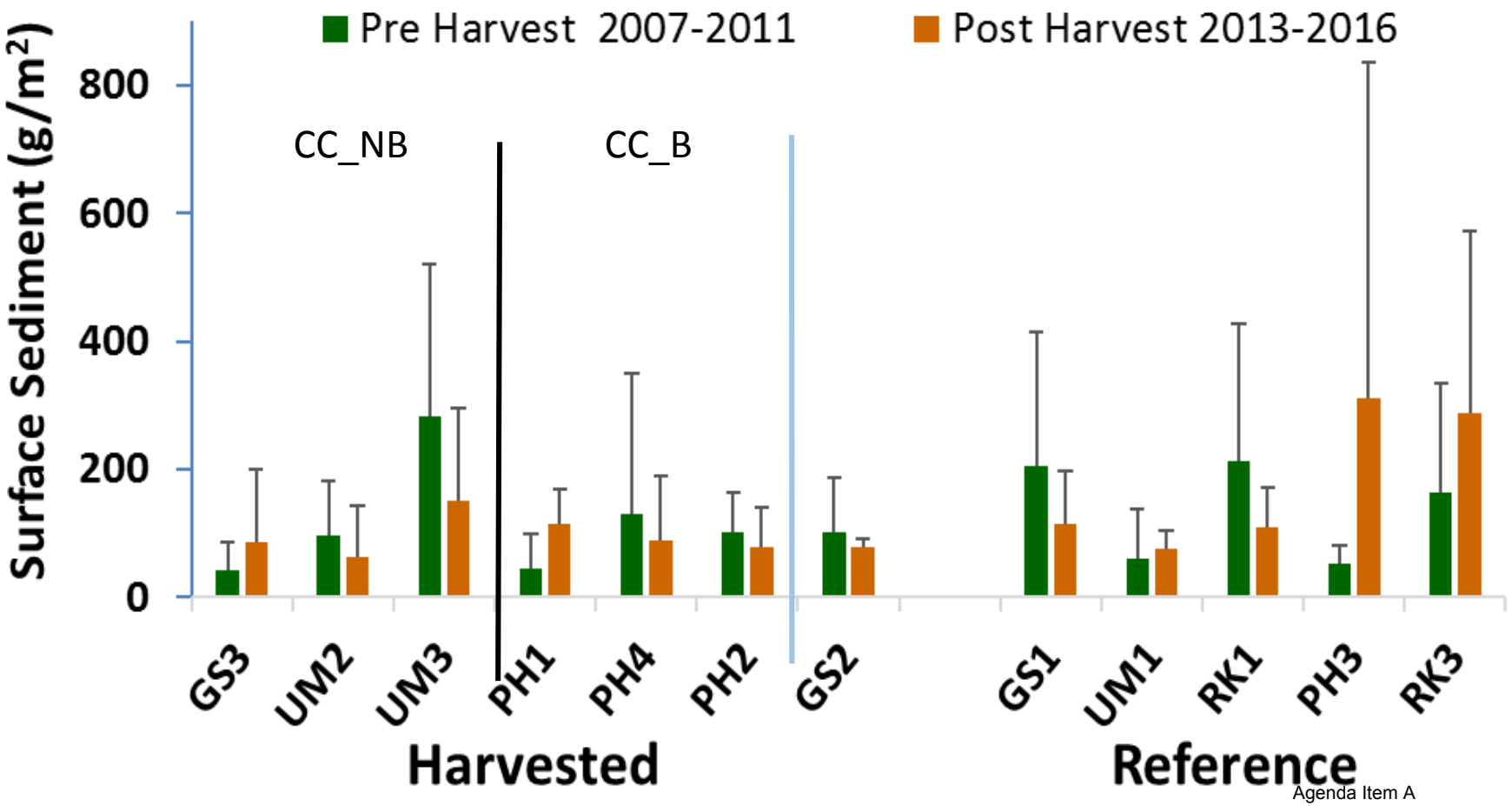
Variability in geology dominates background levels of sediment yields



Bywater-Res et al. 2017, *Journal of Hydrology*

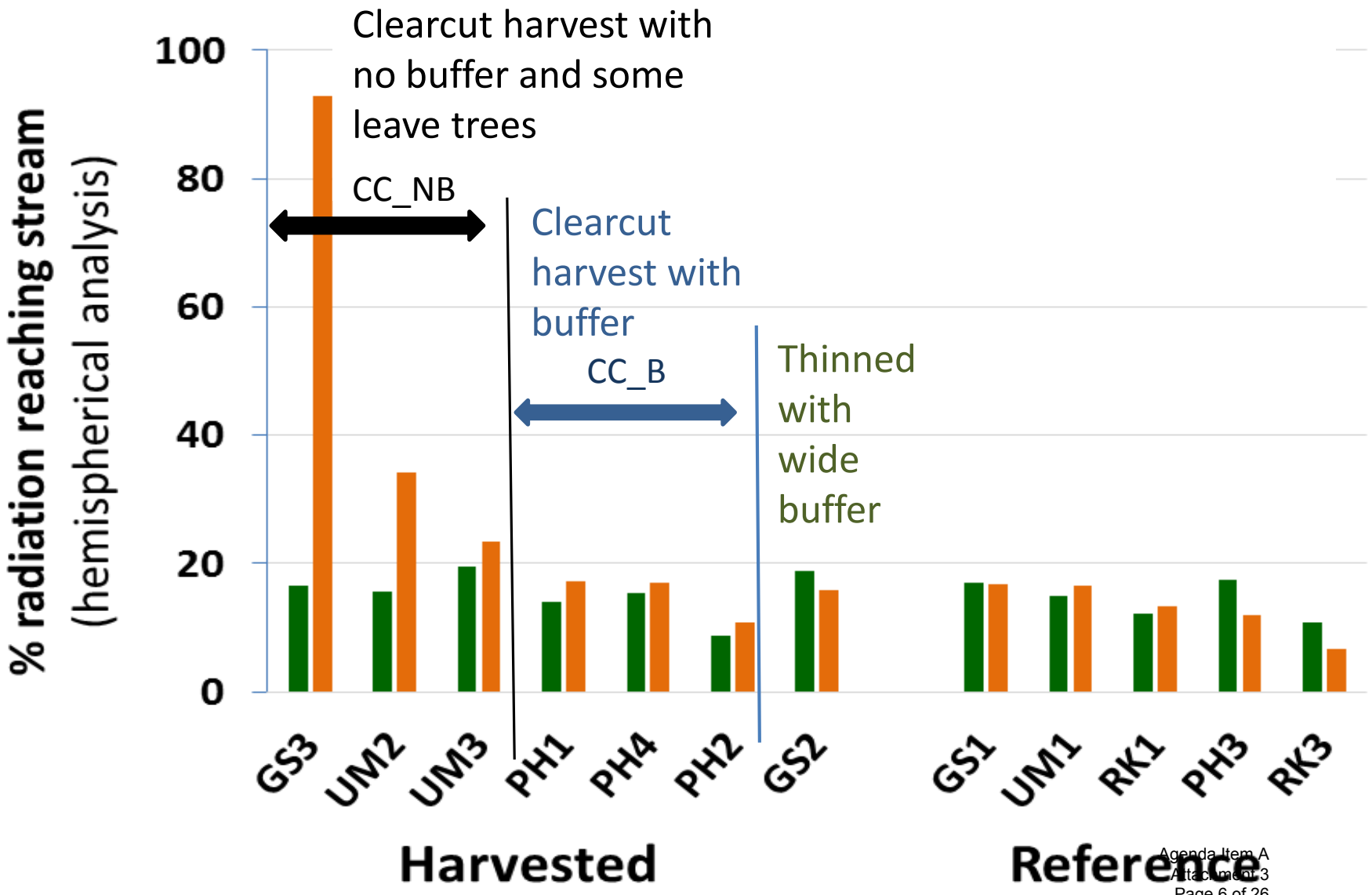
Trask River Watershed Study | Instream sediment

Deposited sediment on stream beds was not higher at harvested sites



Trask River Watershed Study

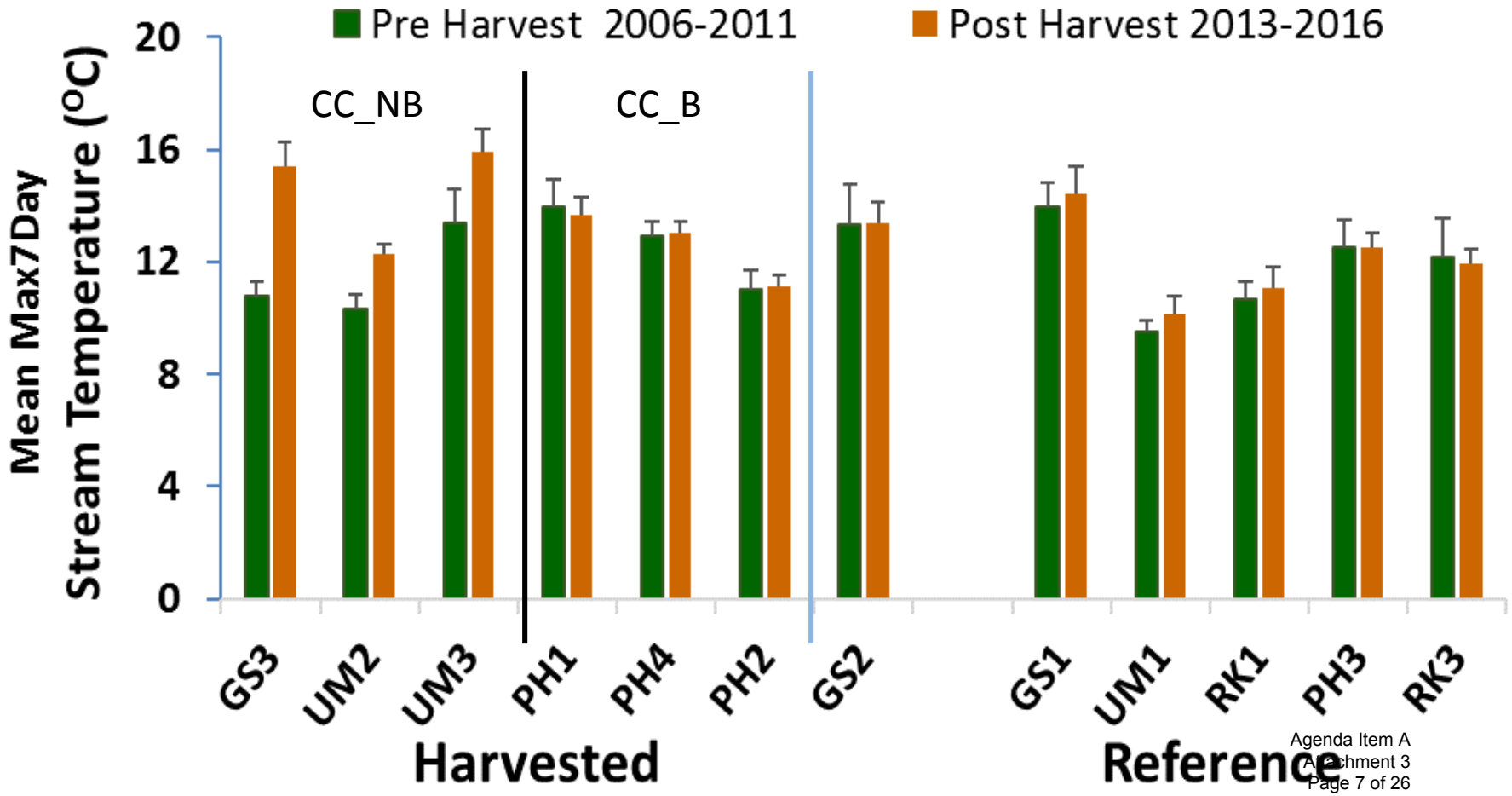
Change in solar radiation



Trask River Watershed Study

Stream temperature

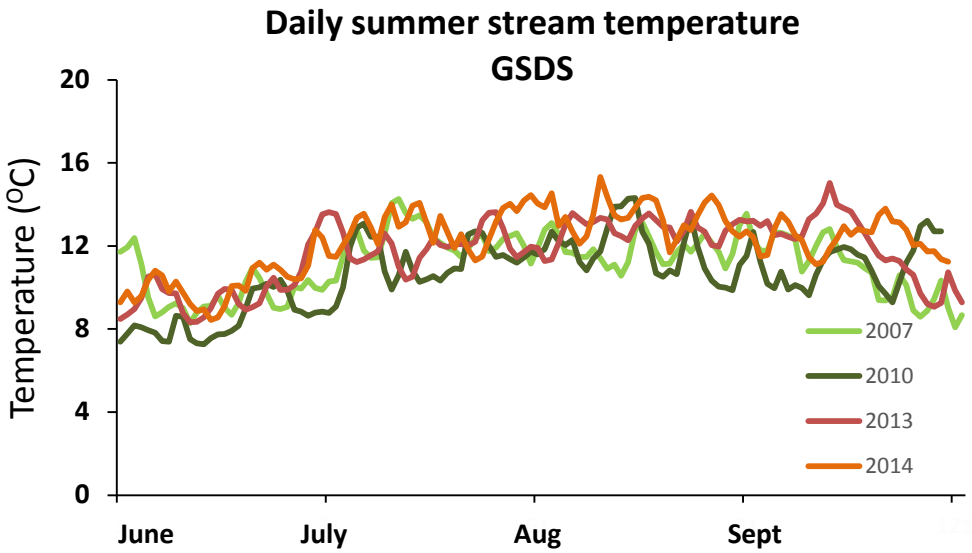
Increase in maximum stream temperatures at sites with reduced riparian cover

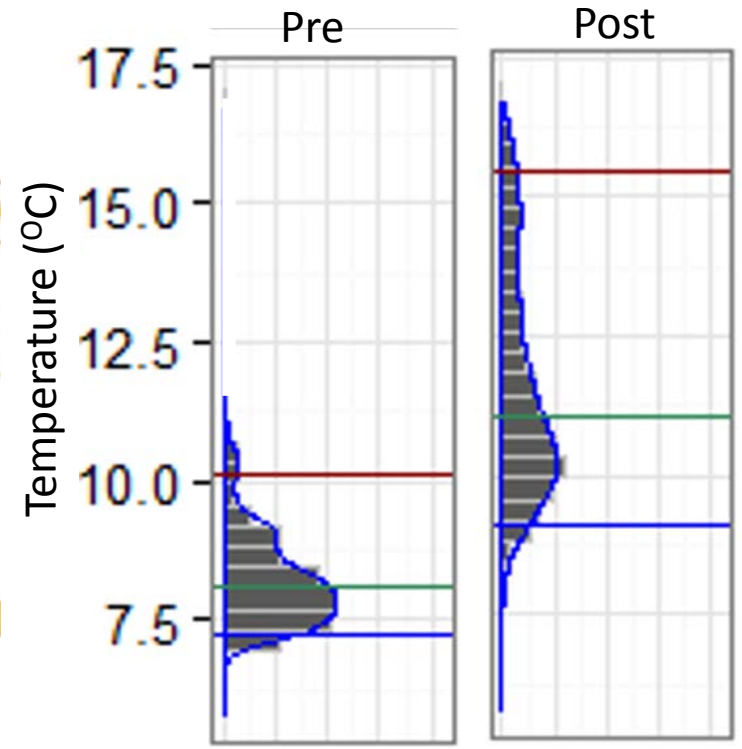


Trask River Watershed Study

Summer stream temperature

Distributions can be useful summaries for comparison of temperature across sites and time



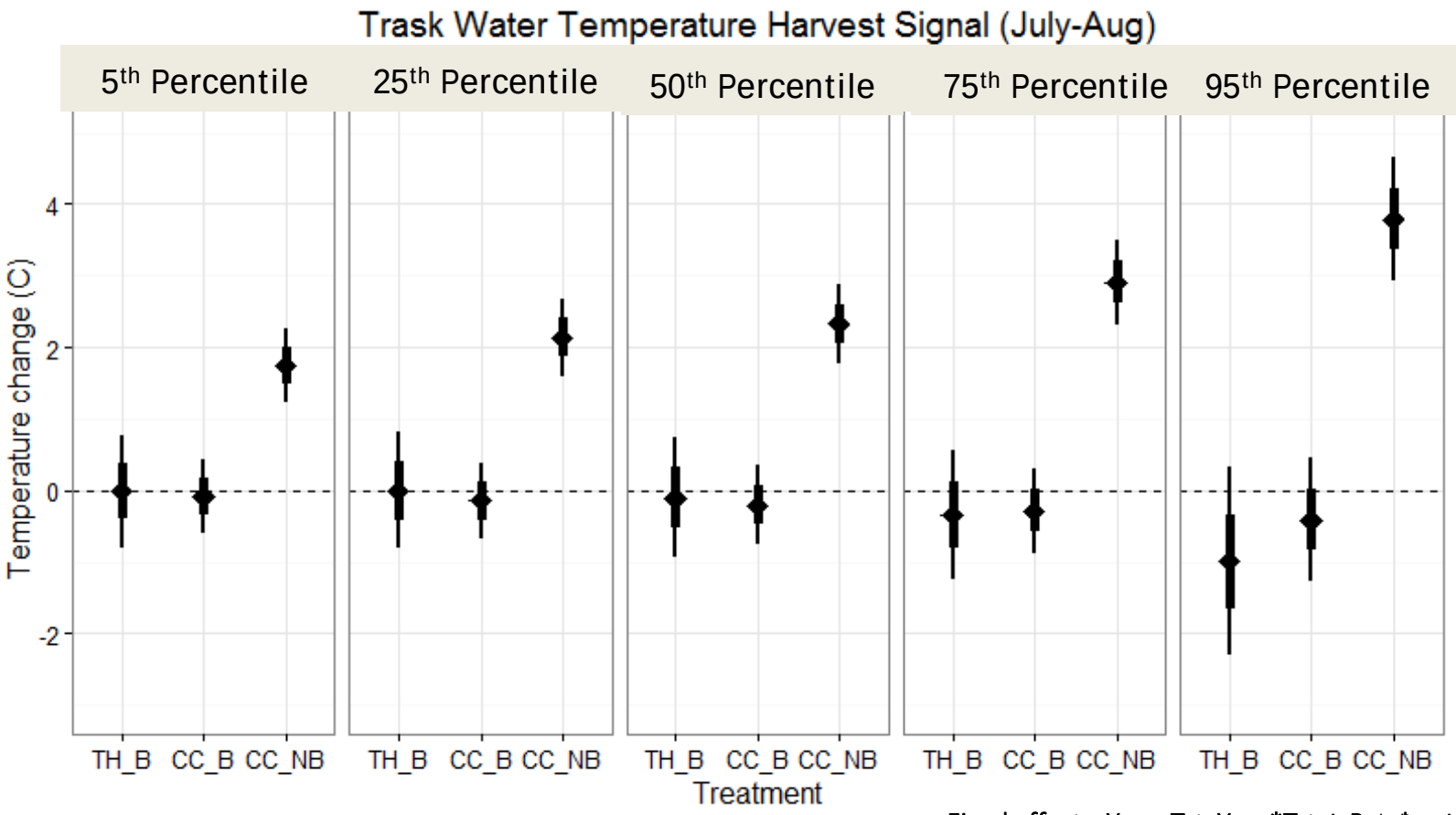


5th percentile median 95th percentile

Trask River Watershed Study

Stream temperature

CC with no buffer streams showed increases in all temperature groups



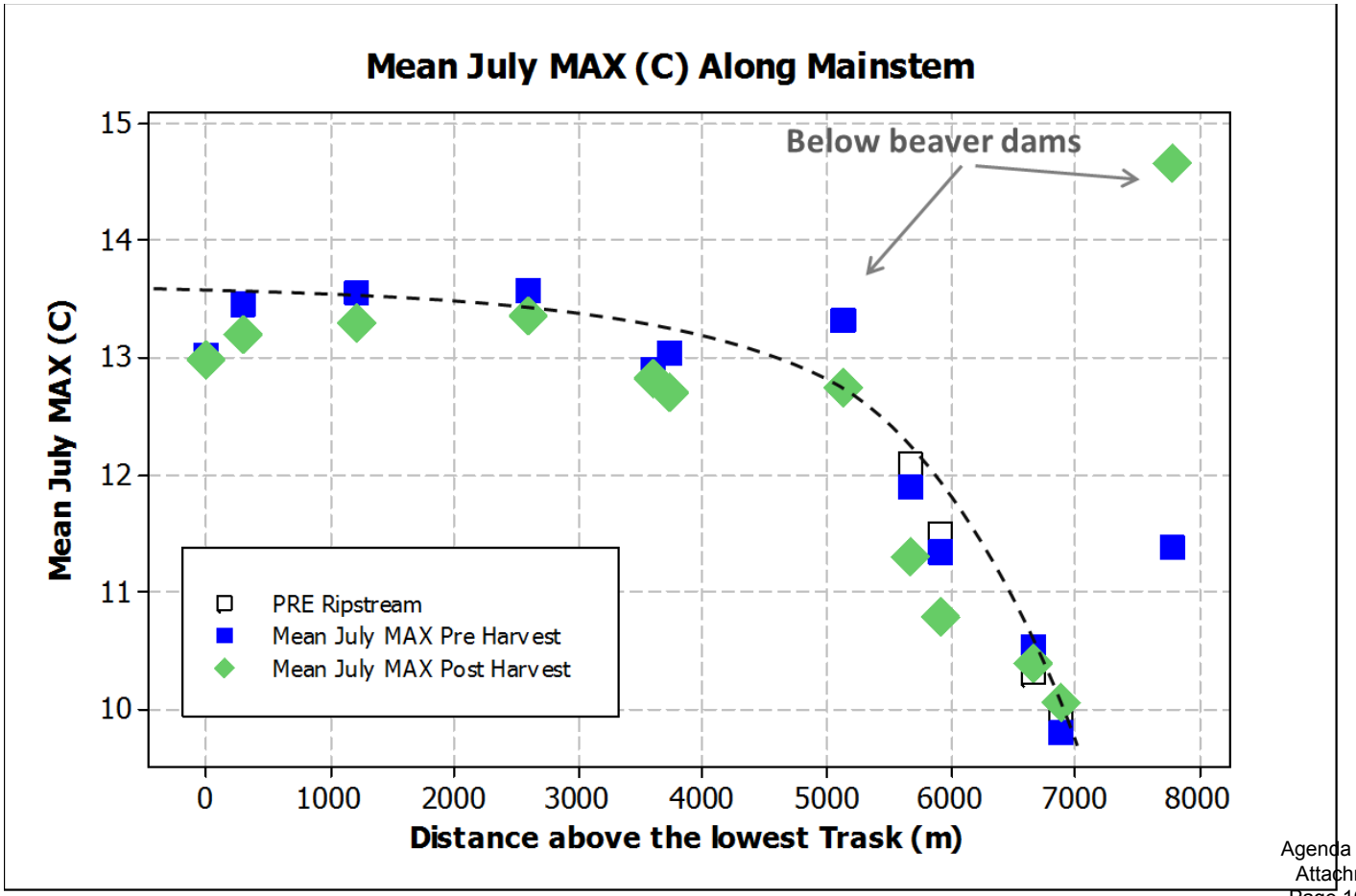
$$\left(\mu_{i,Trt,After} - \mu_{i,Trt,Before}\right) - \left(\mu_{i,Ctrl,After} - \mu_{i,Ctrl,Before}\right)$$

Fixed effects: Year, Trt, Year*Trt; Random effects: Site
Removed 2012 data, Included all Reference sites

Trask River Watershed Study

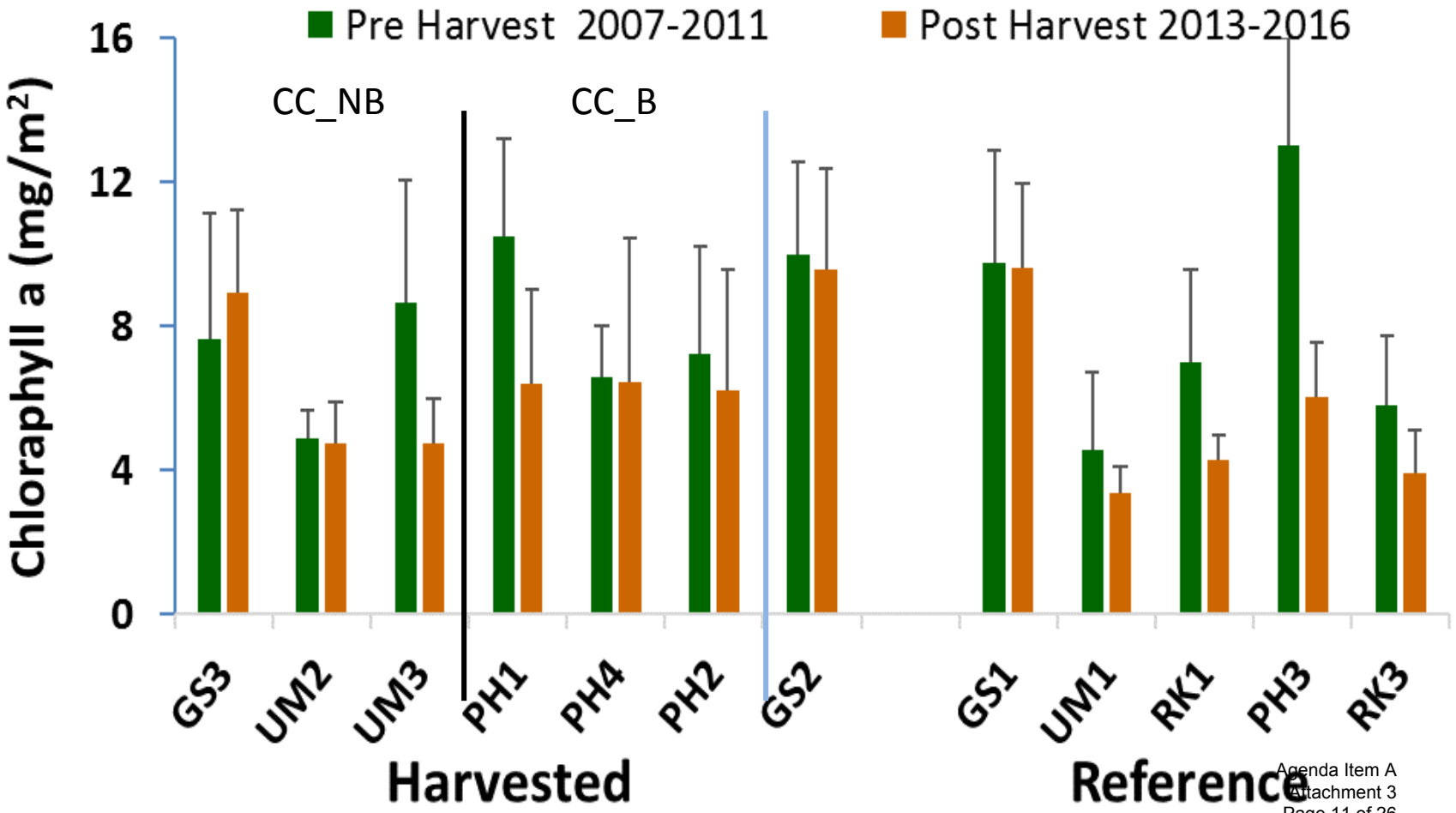
Stream temperature

Increased stream temperatures in headwaters did not result in increased temperatures downstream



Trask River Watershed Study | Instream primary production

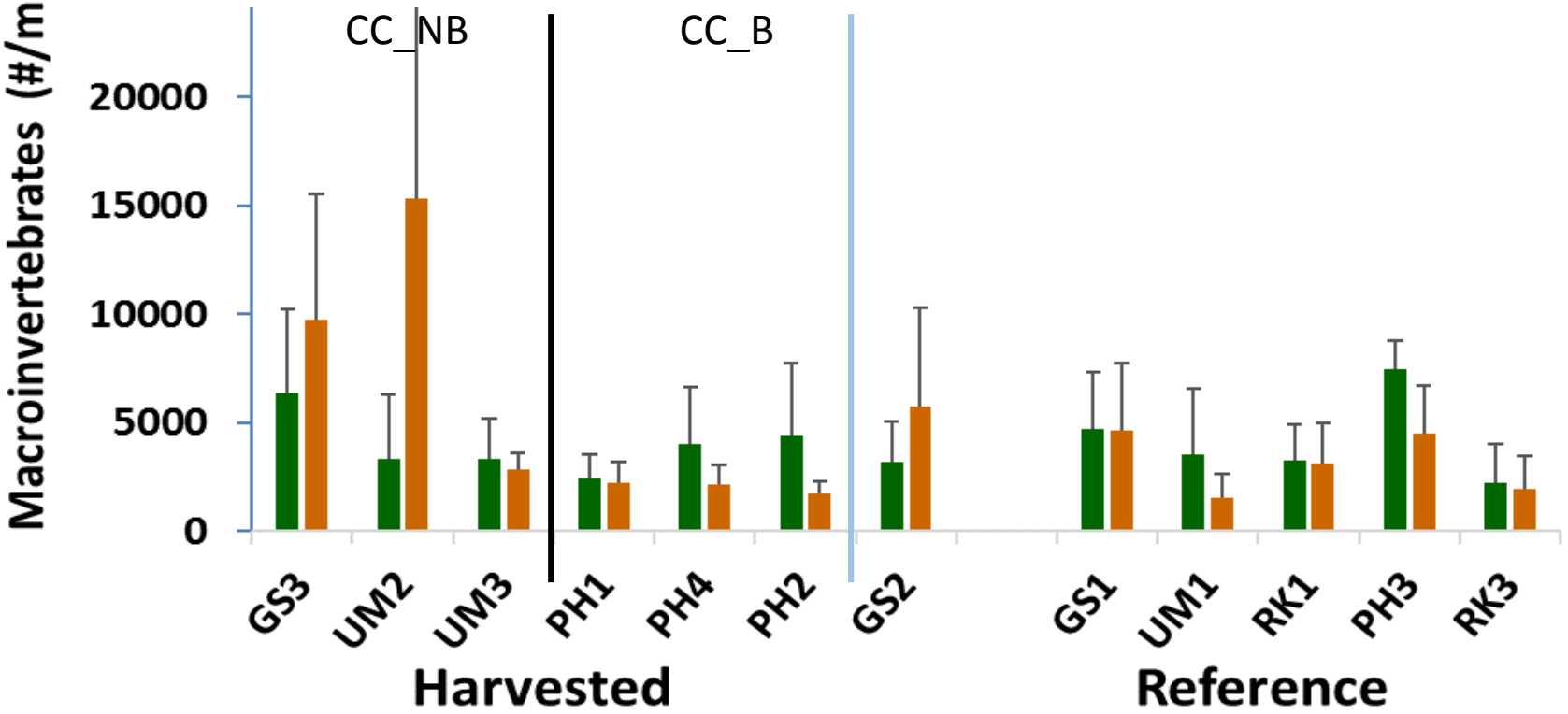
No increase in algae post harvest, even at streams with increased solar radiation



Trask River Watershed Study

Aquatic macroinvertebrates

Increase in density of macroinvertebrates at streams with most change in riparian cover



Trask River Watershed Study

Amphibians

Metrics:

- Abundance
- Growth and development
- Overwinter survival
- Movement

Trask River Watershed Study

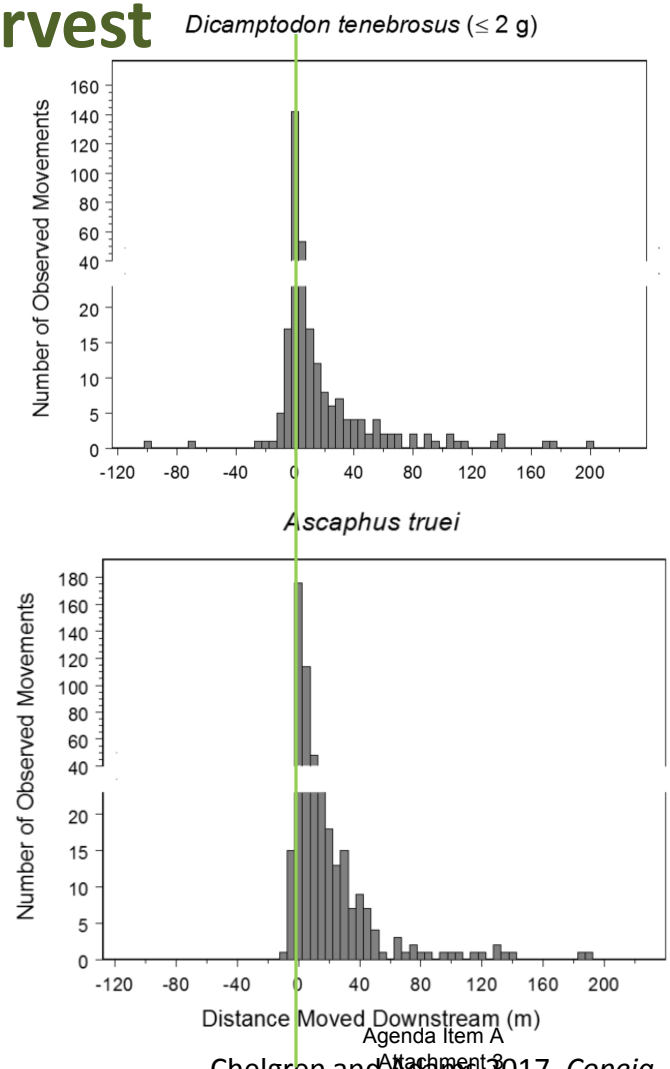
Amphibian species and movement

Downstream movement complicates quantifying amphibian responses to forest harvest

Coastal Giant Salamander
(Dicamptodon tenebrosus)

Coastal Tailed Frog
(*Ascaphus truei*)

Columbia Torrent Salamander
(*Rhyacotriton kezeri*)



Chelgren and Adams 2017, *Copeia*

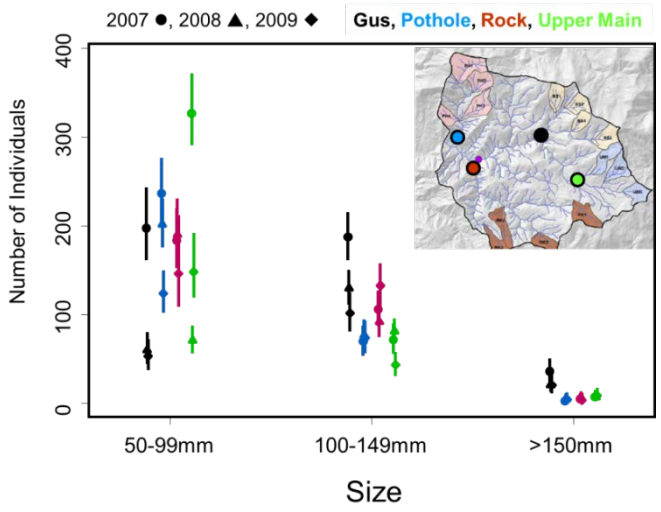
Trask River Watershed Study

Fish populations and growth

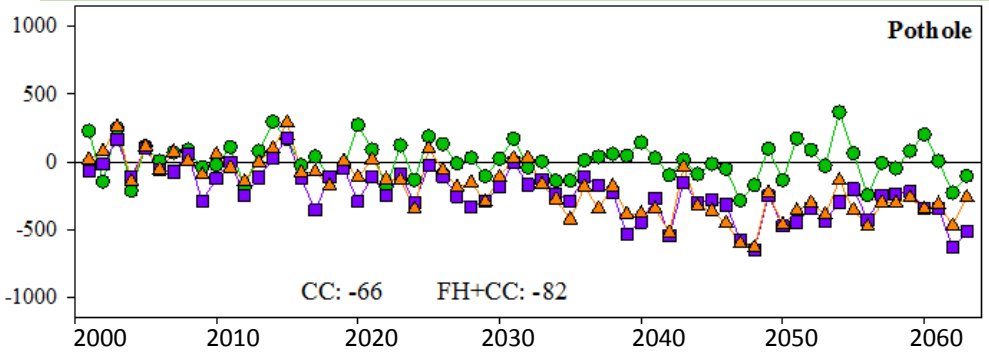
Focus on summer

Low flows + high temperatures + high fish densities + low food supply = ***Stressful conditions for fish.***

- High year to year variability in densities of young of year fish
- Largest number of adult fish in Gus CK



Model changes in Trout biomass to forest harvest, climate change, and combined scenarios show declines over time



Penaluna et al. 2015, *PLOS One, CJFAS*

Additional Trask studies:

- Stream nutrients pre and post harvest
- Particle size distributions (d50, d84)
- Invertebrate responses to suspended and benthic sediment
- Food web/trophic linkages using natural abundance isotopes as a tracer
- Peak flow and recession curve responses to harvest
- Sediment sources and fates in streams following disturbance
- Carbon fluxes and detritus dynamics after harvest
- Instream productivity and metabolism
- Fish growth and use of cover

Trask core funding has also leveraged additional onsite research:

- **Mercury bioaccumulation following forest harvest**
- **e-DNA for determining species distributions**

Trask River Watershed Study

Publications – Theses

Type	Year	Topic Area	Citation
MS Thesis	2008	In-stream fish cover	Anderson, H. 2008. Transferability of models to predict selection of cover by coastal cutthroat Trout in small streams of Western Oregon.
MS Thesis	2008	Landscape context for Trask WSS	Bax, T.V. 2008. Setting the landscape context for paired watershed studies in western Oregon.
MS Thesis	2010	Seasonal fish diet	Raggon, M. 2010. Seasonal variability in diet and consumption by cottid and salmonid fishes in headwater streams in Western Oregon.
MS Thesis	2010	Riparian forest structure	Haxton, Z. 2010. An examination of several methods of quantifying forest structure in headwater riparian forests of Western Oregon.
MS Thesis	2010	Songbird habitat selection	Jenkins, S.R. 2010. Post-breeding habitat selection by songbirds in the headwaters of the Trask River, Northwestern Oregon.
MS Thesis	2011	Fish species competition	Ramirez, B.S. 2011. Experimental analysis of intra- and interspecific competitive interactions between cutthroat trout and sculpins in small streams.
PhD Dissertation	2013	Modeling trout responses to forest harvest, and climate change	Penaluna, Brooke. 2013. New Insights on an Old Topic: Understanding the Effects of Forest Harvest on Trout in the Context of Climate.
MS Thesis	2017	Influences of fish growth	Jensen, L. R. 2017. Factors influencing growth and bioenergetics of fish in headwater stream subject to forest harvest.
MS Thesis	2017	Stream chemistry and variability	Steadman, C.L. 2017. Natural variability of nitrogen and phosphorus in a forested headwater stream system in the Oregon Coast Range.

Trask River Watershed Study

Publications- Journals

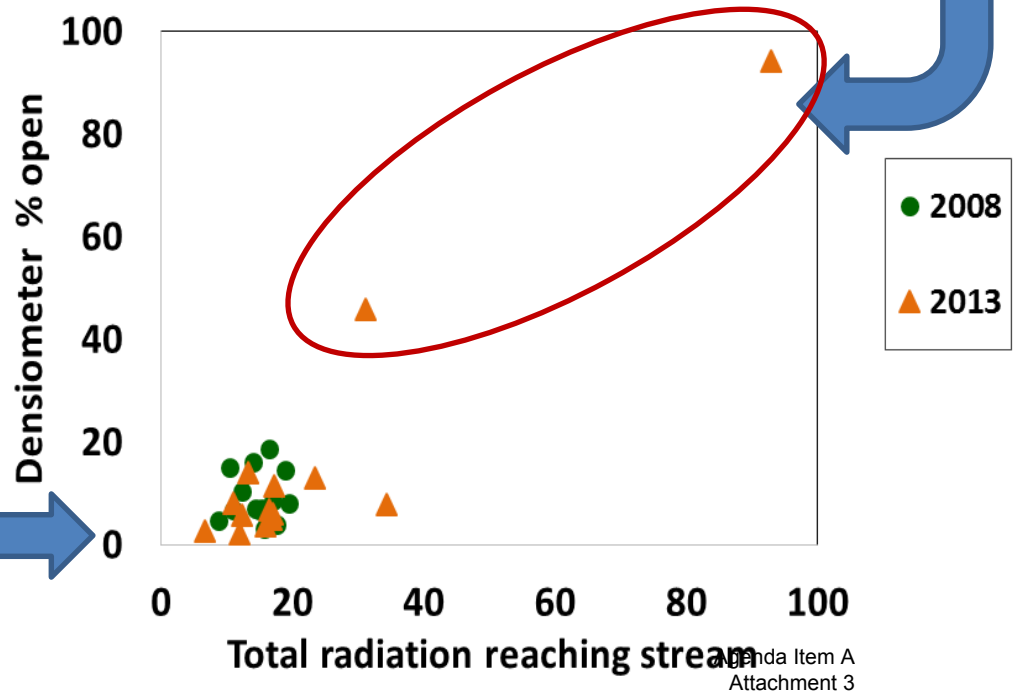
Type	Year	Topic Area	Citation
Journal	2011	Temperature response aquatic insects	Li, J.L., S.L. Johnson, and J. Sobota. 2011. Three responses to small changes in stream temperature by autumn-emerging aquatic insects. Journal of the North American Benthological Society 30(2): 474-484.
Journal	2012	Songbird diets in headwater forests	Hagar, J.C., J. Li, J. Sobota, and S. Jenkins. 2012. Arthropod prey for riparian associated birds in headwater forests of the Oregon Coast Range. Forest Ecology and Management 285:213-226.
Journal	2013	Songbird habitats in riparian areas	Jenkins, S. R., M. B. Betts, M. M. Husa and J. C. Hagar. 2013. Habitat selection by juvenile Swainson's thrushes (Catharus ustulatus) in headwater riparian areas, Northwestern Oregon, USA. Forest Ecology and Management 305: 88-95
Journal	2015	Modeling trout responses to environmental regimes	Penaluna, BE, S.F. Railsback, J.B. Dunham, S.L. Johnson, R.E. Bilby, and A.E. Skaugset. 2015. The role of geophysical template and environmental regimes in controlling stream-living trout populations. Can J. Fish. Aquat. Sci 72: 893-901.
Journal	2015	Modeling trout response to forest harvest and climate change	Penaluna, B.E., J. B. Dunham, S.F. Railsback, I. Arismendi, S.L. Johnson, and R.E. Bilby. 2015. Local variability mediates vulnerability of trout populations to land use and climate change. PLoS ONE 10(8): e0135334. doi:10.1371/journal.pone.0135334.
Journal	2017	Sediment delivery from forest roads to headwater streams	Arismendi, I, J. D. Groom, M. Reiter, S. L. Johnson, L. Dent, M. Meleason, A. Argerich, and A. E. Skaugset. 2017. Suspended sediment and turbidity after road construction / improvement and forest harvest in streams of the Trask River Watershed Study, Oregon. Water Resources Research 53: doi:10.1002/2016WR020198.
Journal	2017	Amphibian movement and forest harvest	Chelgren, N. C. and M. J. Adams. 2017. Inference of timber harvest effects on survival of stream amphibians is complicated by movement. Copeia 105 (4): 714-727
Journal	2017	Influence of lithology on sediment delivery to streams	Bywater-Reyes, S, C. Segura, and K. D. Bladon. 2017. Geology and geomorphology control suspended sediment yield and modulate increases following timber harvest in temperate headwater streams. Journal of Hydrology 548: 754-769.

Trask River Watershed Study

Preliminary findings

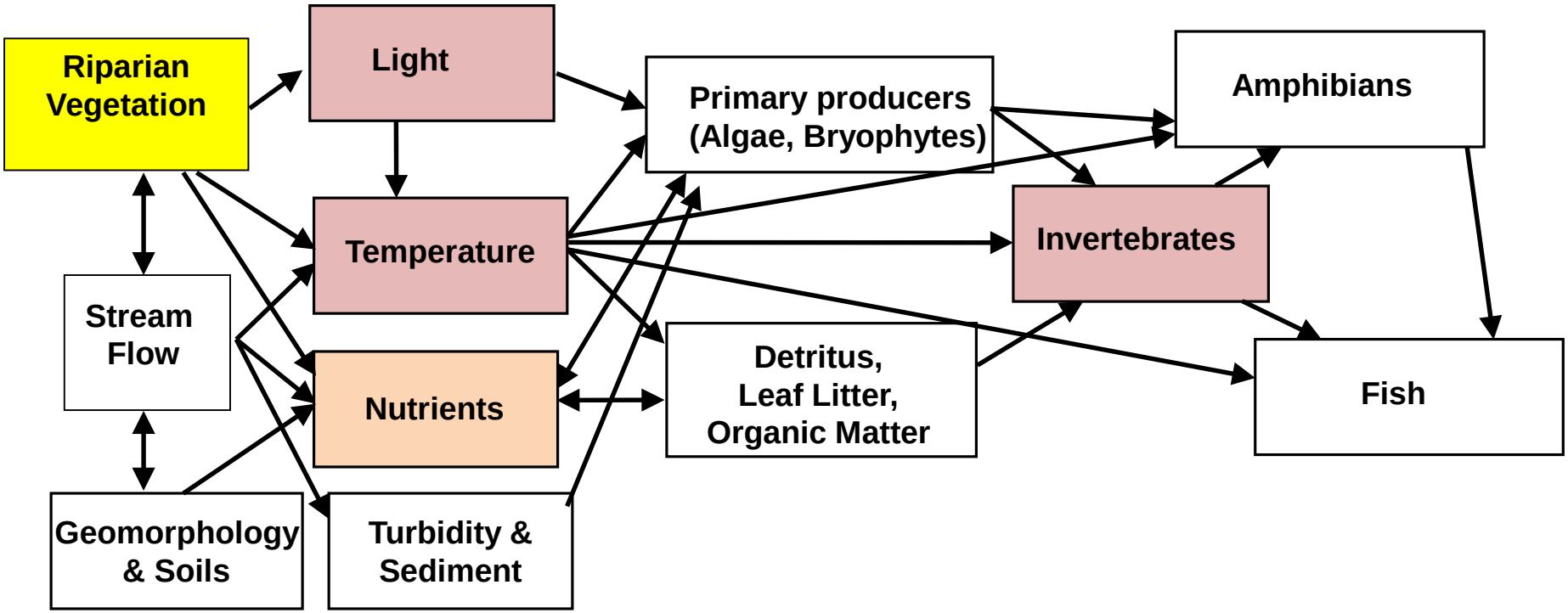
At 2 streams without buffers, we observed increases in light, stream temperature, nutrients, and shifts in macroinvertebrate community composition

Streams with buffers showed little to no changes in light, primary productivity, temperature, macroinvertebrates, and amphibians



Trask River Watershed Study

Preliminary findings

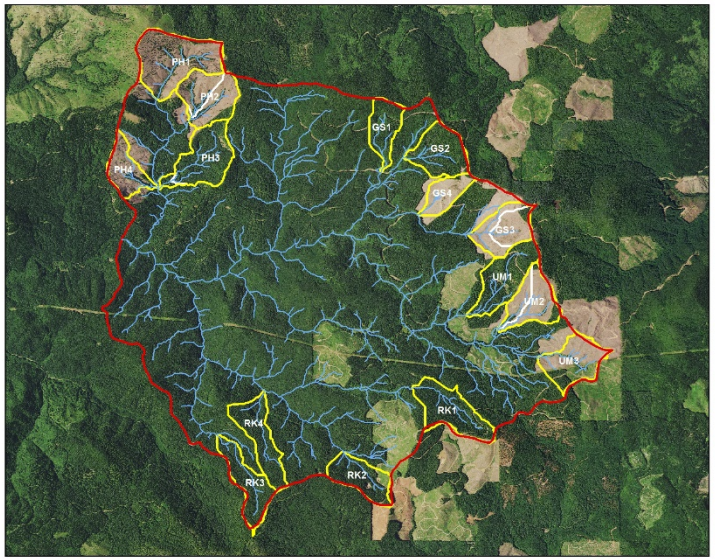


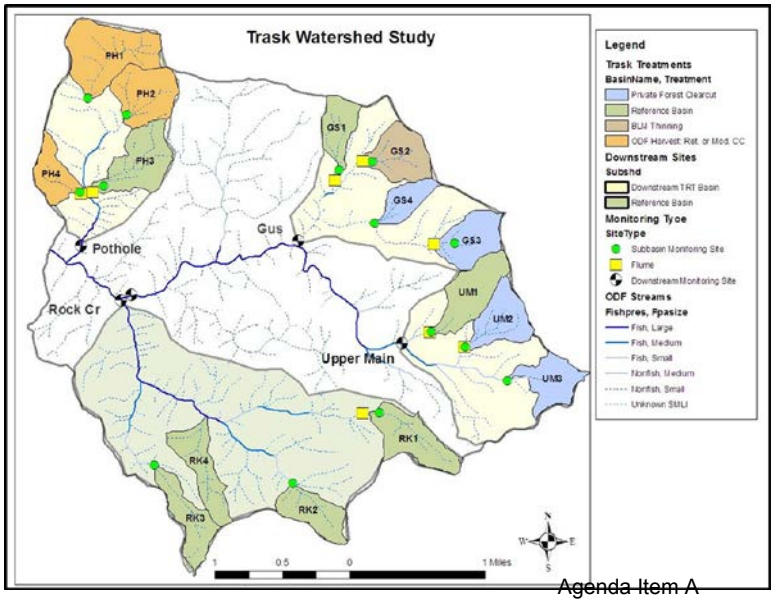






Trask River Watershed Study





Abiotic and biotic responses following forest harvest?

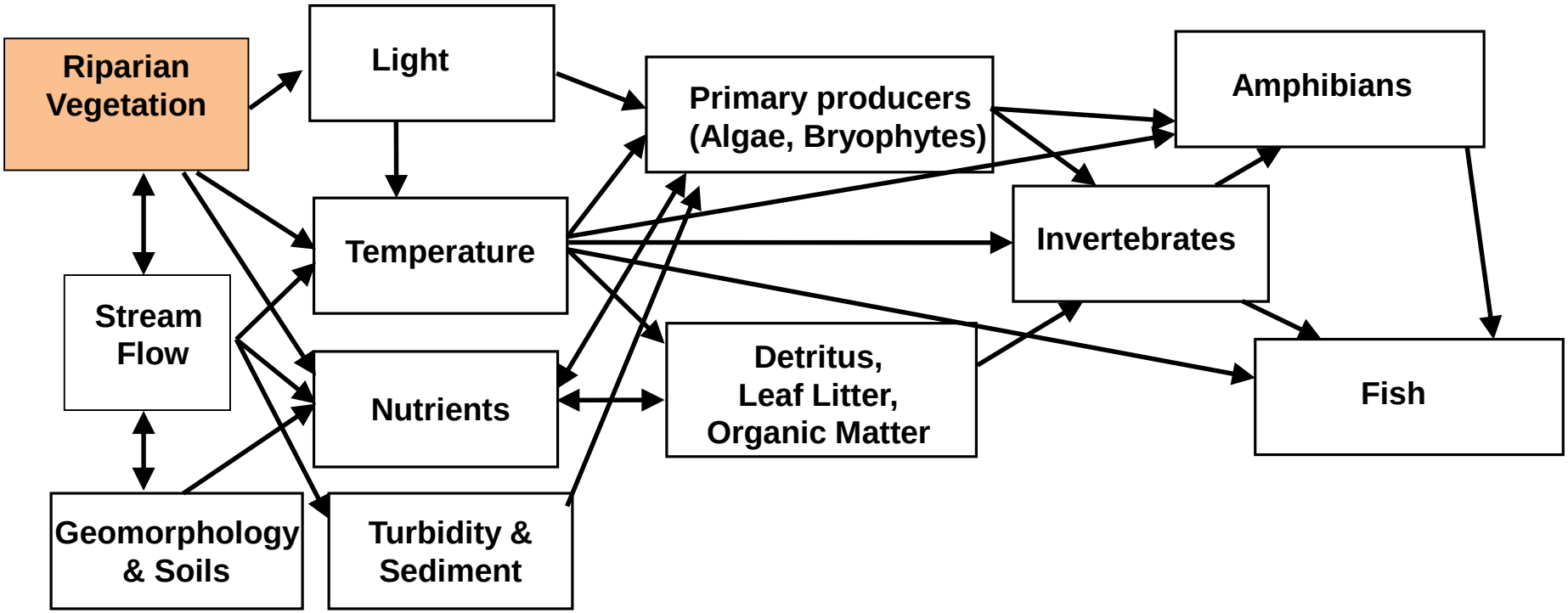
Preliminary findings:

- Streams with buffers showed little to no changes in light, primary productivity, temperature, macroinvertebrates, or amphibians

- Small increases in summer stream temperature and shifts in macroinvertebrate community composition occurred at sites without buffers or leave trees

Trask River Watershed Study

Study compartments and linkages



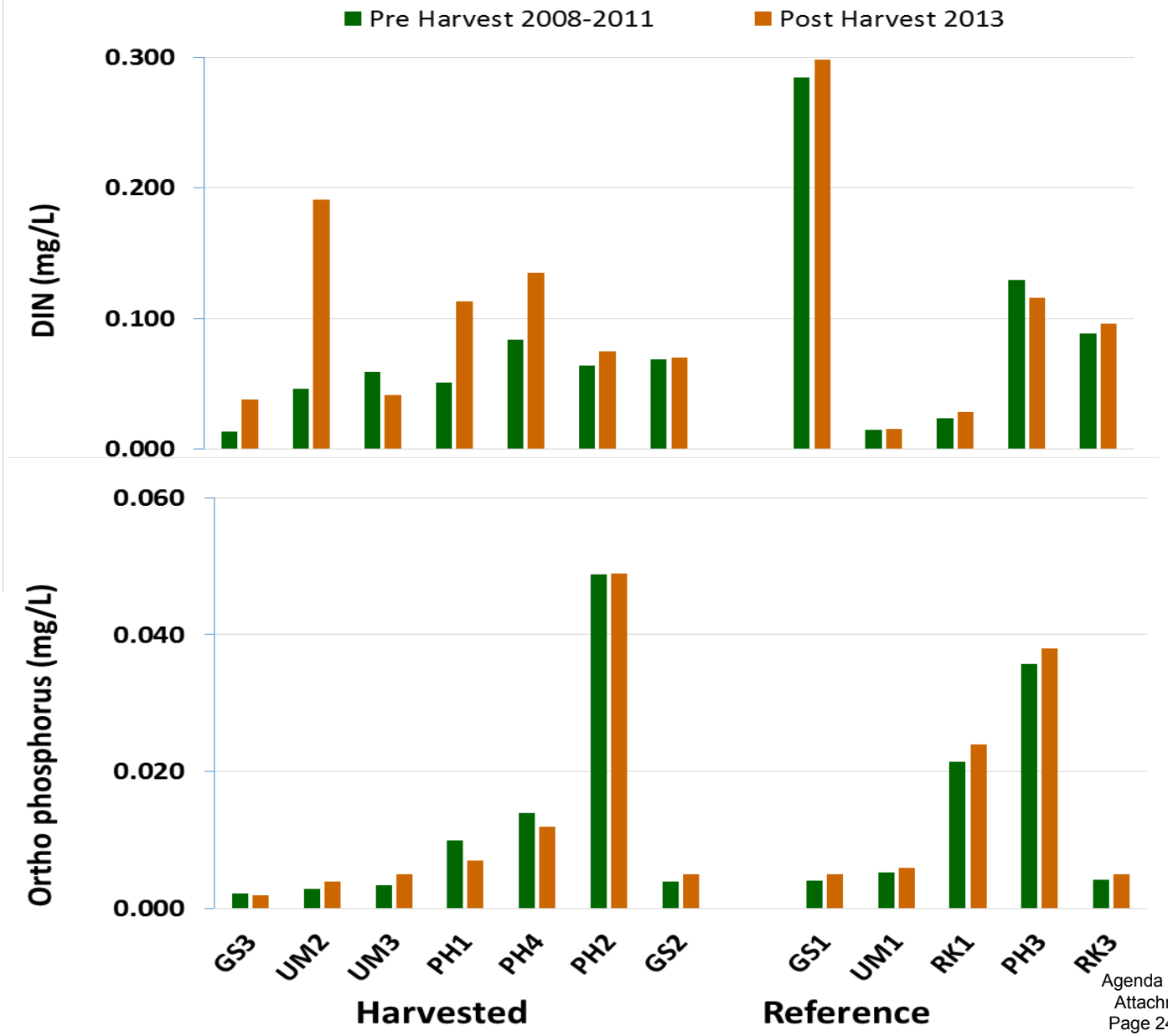




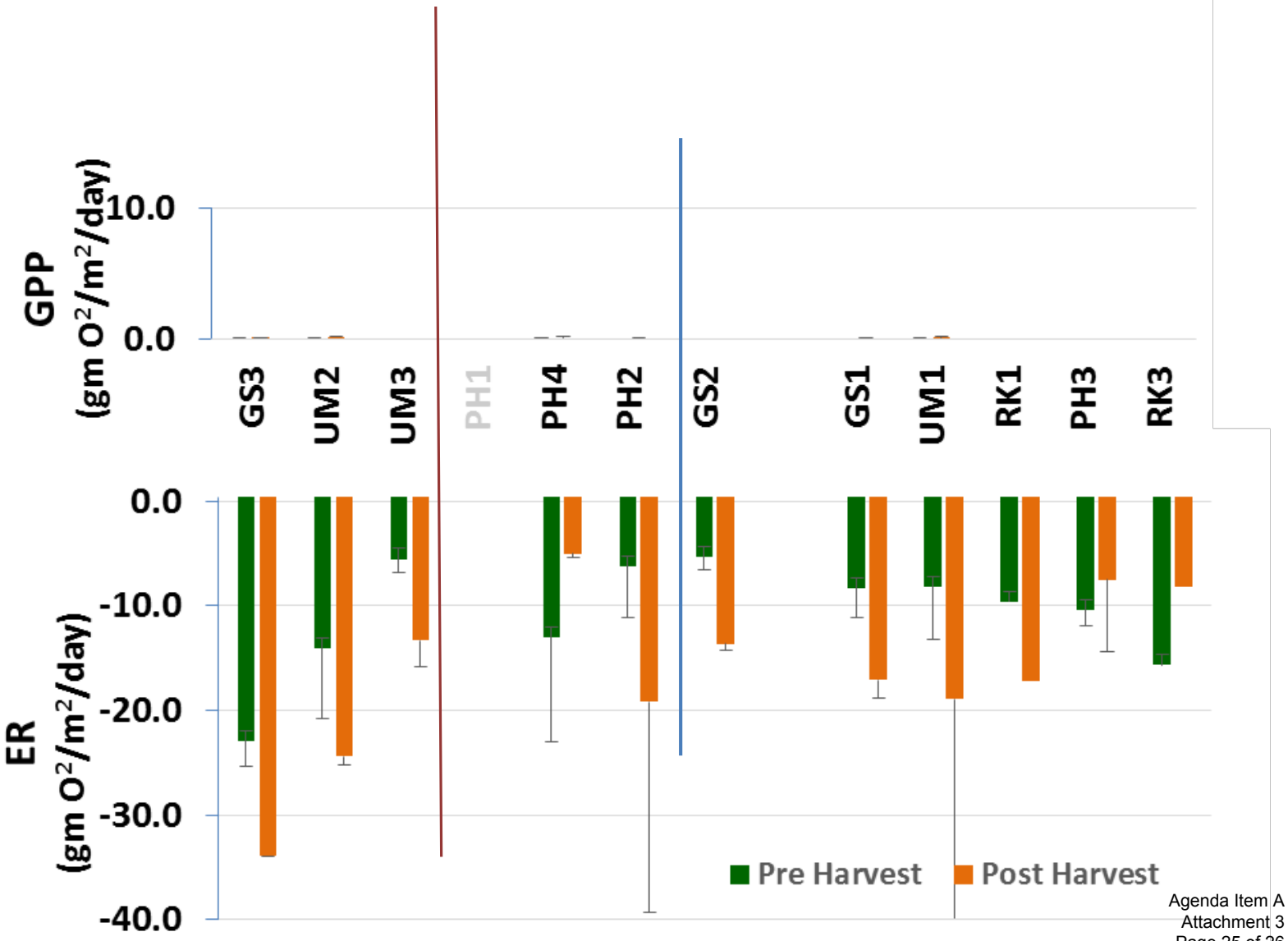


Trask River Watershed Study

Dissolved Nutrients



Very low primary production - Streams dominated by respiration



Objectives of Trask River Watershed Study

- Quantify effects of forest harvest on the physical, chemical and biological characteristics of small headwater streams

- Examine extent to which harvest in headwaters influences the physical, chemical and biological characteristics in downstream fish reaches

- Increase understanding of the major processes influencing aquatic ecosystems through forest-stream interactions