Streams and their biota are inherently linked to riparian vegetation in forested systems: when we alter streamside vegetation we are altering streams. In the Pacific Northwest (PNW) of the United States, riparian forests have undergone a drastic shift in the past half century. Decades of heavy harvesting have given way to our current state of dense second-growth vegetation as a result of contemporary forest management practices. With dense vegetation comes a reduction in light availability to streams on the forest floor and subsequent light limitation of benthic primary production. Because higher trophic levels are disproportionately supported by algae, a shift in this basal resource can have a substantial effect on biota. Earlier research has shown that relieving light limitation by clear-cutting riparian forests can result in an increase in stream primary and secondary productivity, as well as increases in stream temperature, but clear cutting along streams is no longer a common practice in the Pacific Northwest. Now forests are in the early stages of stand regeneration with dense homogenous canopy cover. As forest succession continues natural disturbances and tree mortality will increase canopy heterogeneity through the introduction of gaps. To understand how aquatic food webs respond to an increase in light associated with canopy gaps, we investigate the response of macroinvertebrates and fish feeding to canopy-opening manipulations.

Stream light availability is an important driver of aquatic food webs. In the PNW, stream algal production is highly light-limited, and an increase in light often enhances benthic algal growth, which in turn increases food availability for secondary consumers in the stream such as macroinvertebrates. Macroinvertebrates play an important role in assimilating and transducing energy to higher trophic levels such as insectivorous fish and other vertebrate predators. Because macroinvertebrates play such a crucial role in mediating food web interactions, understanding their community dynamics can provide insight into broader ecosystem functioning.

­­Clear cutting has been shown to have a definite impact on stream food webs, but local changes in light availability (on the meter scale) have much more variable impacts on trophic interactions. Light can enhance algal growth, acting as a bottom-up driver of secondary production, but it can also increase foraging efficiency of fish, imposing a top-down pressure on macroinvertebrates.

Understanding the impacts of small canopy gaps, rather than large clear cuts, will be important for dictating future management practices.

What, if any, is the impact of gaps on stream invertebrate communities?

Does changing light conditions cascade through the food web?

Methods

*Study location*

The study consists of 5 reach pairs on five separate streams in the western Cascade Mountains of Oregon. Two of the reach pairs (W-100, W-113) are located on private Weyerhaeuser Co. land, and three (LOON, CHUCK, MCTE) are located on U.S. Forest Service land, one of which (MCTE) is situated in the HJ Andrews Experimental Forest. The western Cascades of Oregon have a Mediterranean climate, with stream flows declining during the hot and dry summer months (July-September), when this study was conducted.

Sampling lasted two years with pre-treatment data gathered during summer 2017 and post-treatment data gathered during summer 2018. Canopy gaps were cut in the treatment reach during the winter of 2017-18 to permit adequate time for response to the canopy manipulation. The reach pair design is intended to account for inherent environmental variation among streams

All of the streams are wadeable, fish-bearing streams with bankfull widths of 1-8 meters. The streams run through 40-60-year-old forests that had previously been harvested without leaving a riparian buffer. Stream-side vegetation predominantly consists of red alder (*Alnus rubra*) and douglas fir (*Pseudotsuga menzesii*).

*Data Collection*

*Data Analysis*