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Cutting edge: Sustainable management of riparian forests for healthy freshwaters

Headwater streams, the smallest streams in riverine networks, are among the most degraded ecosystems in the world. This is even more prominent in landscapes where land-use, such as forestry, has impacted most catchments, with Sweden as an evident example. Many headwater streams in Sweden are frequently affected by various forestry operations on the uplands, including e.g., harvesting, site preparation and/or ditching. The degradation of headwater streams and loss of biodiversity therein has been further associated with poor management of adjacent riparian forests. Yet, headwaters represent a disproportionate share of biodiversity within river networks and have critical influence on biogeochemical and ecological processes in downstream environments. Therefore, headwater protection should be prioritized, especially during forestry operations.

The most common contemporary strategy for protecting biodiversity and ecosystem functions of inland waters from negative forestry effects are riparian buffers. The idea is that leaving a strip of standing trees will be enough to prevent severe physicochemical changes that might become stressors for aquatic organisms if they exceed their natural range of variation. Many forestry jurisdictions, including Sweden, have adopted some level of riparian protection in order to prevent or mitigate forestry impacts and avoid stressors in freshwaters.

In this lecture I will present some of my recent research about forestry effects on the ecology of small streams in Sweden and how riparian buffers might help to mitigate those effects. I will describe that the interactive nature of multiple simultaneously operating stressors complicate our understanding of how different stressors affect aquatic communities and ecological functions together and in isolation. This lack of knowledge in turn hinders our ability to target the most detrimental stressors (and their combinations) with improved freshwater protection measures. I will show how contemporary forestry practices allocate riparian buffers along small streams in Sweden, and I will compare the Swedish practices to other forestry jurisdictions. Further, I will show how historical changes in forestry policies determined the status of today's riparian forests and what the current recommendations for buffers in the forestry sector are. Specifically, I will discuss the newly developed Strategic Management Objectives (SMOs) for environmental protection and identify some of their shortcomings. Finally, I will outline three main subject areas of my future research, which I find vital in order to improve freshwater protection in forestry dominated landscapes.

First, I will advocate that adequate understanding of multiple-stressor phenomena caused by forestry in our small streams is necessary to avoid the most detrimental stressors with targeted protection. Second, I will show that better targets for riparian protection through specific and measurable objectives must be included in the SMOs. Currently, the SMOs include unmeasurable and vague targets, leaving practitioners to rely on their own interpretation. Third, I will show several options for innovations in riparian buffer management. Those examples are inspired by practices in other jurisdictions as well as on our conceptual understanding of different management potentials. My future plans for testing some of these novel options in field trials will provide answers whether they are an optimal strategy to manage our riparian forests in sustainable ways.