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Theme 4: Development of a conceptual framework to assess the effects of intensified forestry on aquatic ecosystem services and biodiversity in Norway – based on a literature review

General hypothesis. Intensification of forestry as an effective climate mitigation measure affects freshwater biodiversity and ecosystem functioning through changes in natural resources for aquatic ecosystems. These changes will be highly dependent on management practices, forestry types and biogeographical context (e.g. acid sensitive areas).

Literature review. Best management practices were generally mitigating the impact of forestry but were not systematically implemented. The effects of (intensification of) forestry on aquatic ecology have only been investigated on short time scale during the logging period. So far, most studies focused on simple indicators to estimate ecological responses. These indicators were not very sensitive, and the ecological responses were very variable between studies, suggesting a more mechanistic and context dependent approach was needed.

General framework. We developed a general causative framework amenable to Bayesian Belief Network to quantify the probabilistic effects of forestry activity on aquatic ecology through context

dependent factors and the use of our general knowledge. Two ecological concepts were found useful to structure the Bayesian Belief Network: (i) cross-ecosystem material and energy flows and autotrophs–heterotrophs interactions, (ii) meta-ecosystems and resilience across spatial and temporal scales.

Recommendations.

- The implementation of the Programme for the Endorsement of Forest Certification (PEFC 2016) should be assessed for small streams and ponds, particularly dependent on the riparian forest.
- Current bioindicators are known to have very low sensitivity. The recommendation is to use a context dependent general and causative framework using our general knowledge.
- Most experiments and studies focused on short time scale prior to and immediately after logging. More studies need to consider the whole rotation period, and quantify flows of material, energy and species across ecosystems.

Reference: Demars B, Persson J, Friberg N. 2020. Development of a holistic conceptual framework to assess the effects of intensified forestry on aquatic ecosystem services and biodiversity in Norway. NIVAnote, 20 pp.

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SURFER – Surface waters: The overlooked factor in the forestry climate mitigation debate.