Fluxes of Terminal Electron Acceptors

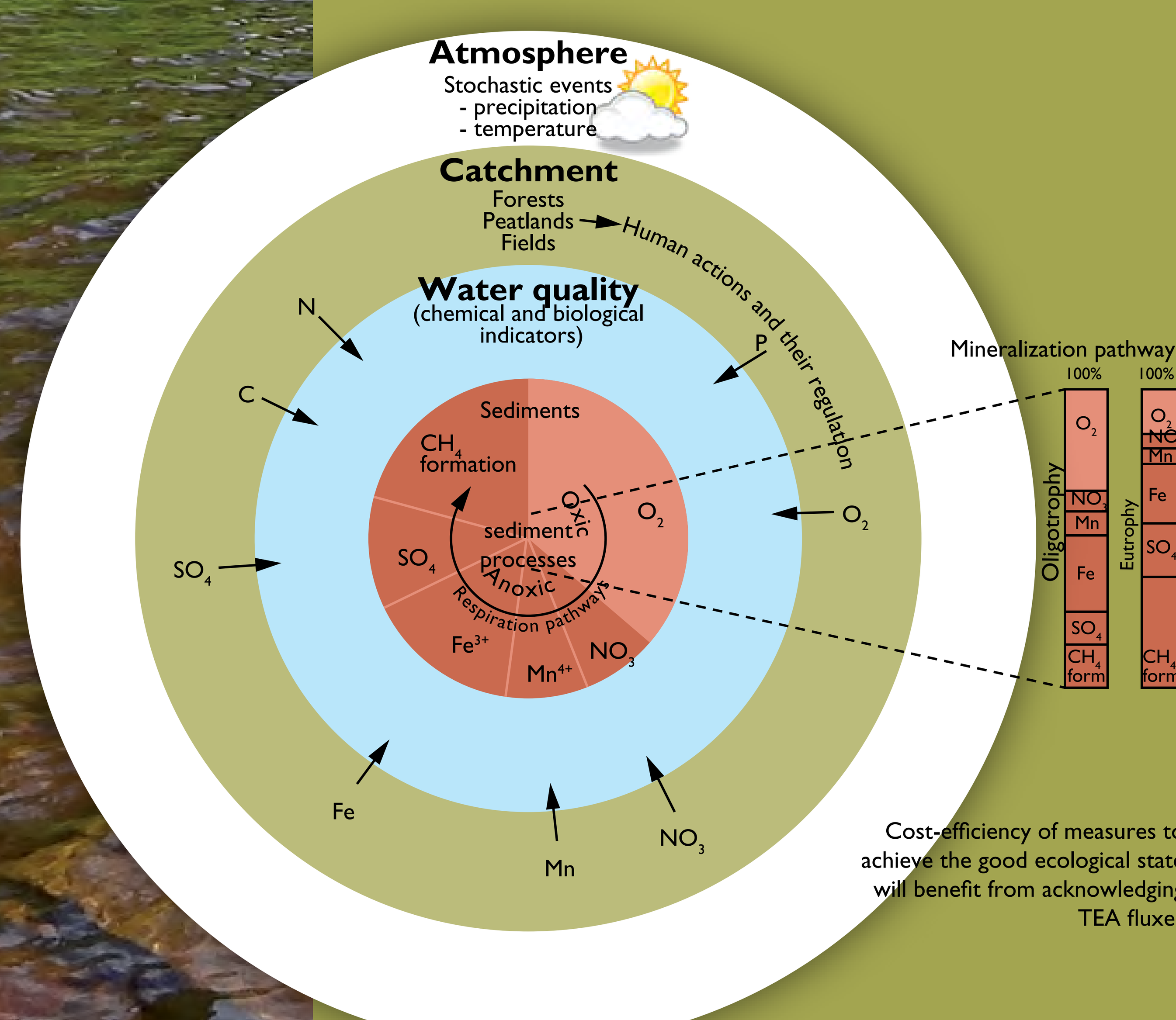
Linking Human Disturbance to the Health of Aquatic Systems (TEAQUILA)

Rationale

Despite continuous efforts to control eutrophication, there is still unexplained variability between nutrient loading and the ecological response of freshwater systems. We propose that the ecological state of aquatic systems is not only a function of the nutrient loading, but also reliant on the flux of terminal electron acceptors (TEAs) indirectly regulating the availability of nutrients. TEAs include a set of compounds, e.g., O_2, NO_3, Fe and Mn oxides and SO_4, which play a key role in mineralization. We aim to expand the current understanding about the impact of human exploitation of natural resources on aquatic ecosystems and include this new information in economic calculations identifying cost-efficient strategies to abate material fluxes to the water bodies.

Main hypotheses

1. Catchment characteristics and land use affect the fluxes of TEAs and factors affecting on TEA fluxes can be regulated by water protection measures
2. The ecological state of aquatic systems is controlled by the flux of TEAs
3. The flux of TEAs can be characterized by economic activities
4. Inclusion of TEAs affect the ranking of policy measures
5. The dynamic efficiency properties are altered if we allow the TEAs to determine the probabilities of regime shifts



Towards a more holistic approach. The arrows denote the fluxes of TEAs, C, N and P from the catchment. The sediment section in the middle includes the exchange of substances driven by the reductive-oxidative interactions that control water quality. The bars on the right describe the progress in mineralization pathways from oligotrophy to eutrophy.

Expected results

We challenge the present water protection programmes by producing new knowledge on the possibility to enhance or weaken the ability of the system to retain nutrients indirectly by controlling the fluxes of TEAs from the catchment. From this point of view, the present measures in the water protection programmes include a risk of being inefficient.

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Photo: Petri Ekholm. Layout: Erika Várkonyi / SYKE, 10/2012