

TIPPINGPOND – Tipping points, biodiversity, resilience and ecosystem service: Pond as model systems

Ponds and shallow lakes are very important for regional biodiversity and strongly contribute to ecosystem services such as carbon storage, recreation and fish production. In addition, they are excellent model systems in ecology, and have played a key role in the development of theory on regime shifts in ecosystems, where initial resilience to environmental change leads to catastrophic regime shifts when a disturbance threshold is surpassed. Upon eutrophication or with temperature increase, ponds and lakes may show a shift from a clear-water to a turbid state with an associated decline in biodiversity and ecosystem services.

TIPPINGPOND engages in a combined survey and manipulative study to identify the link between extant biodiversity and resilience to disturbance in pond ecosystems and early warning signs of regime shifts that lead to a strong decline in biodiversity and ecosystem services. Field experiments and studies will take place in Belgium, France and Sweden, on natural lakes and ponds.

Our approach is fourfold. TIPPINGPOND will:

- 1) Engage in large-scale field experiments. Using enclosures, we will expose resident communities to well-defined disturbances (e.g. increases in nutrient concentrations and temperature mimicking the combined effect of eutrophication and climate change) and monitor ecosystem resilience as a function of biodiversity;
- 2) Monitor community and ecosystem dynamics in response to experimental disturbances to identify early warning signals;
- 3) Validate the experimental results on data from field surveys on natural as well as fish culture ponds in France, Belgium and Sweden, linking biodiversity to ecosystem functions;
- 4) Validate hypotheses generated from field data in highly standardized laboratory systems (Planktotrons).

The legacy of TIPPINGPOND will be: (1) Insights into the relationship between biodiversity and resilience to disturbance, providing key information to safeguard ecological integrity of freshwater habitats. These insights will be validated in a broad range of standing waters, informing predictions and generate policy value beyond ponds as model systems. (2) A deeper understanding of tipping points and early warning signs for regime shifts in aquatic systems. Stakeholders targeted by the project include policy makers, nature conservation organisations, and applied ecology institutes.



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