**Title:** *DREAM*ing of a better future: How forestry has changed the wetland – forest landscape and ways forward

**Popular Science Description:**

If you have walked through a Swedish forest, you have most certainly jumped over or waded through a ditch or small stream and probably not thought much about it - beyond hoping not to get a boot stuck! In my docent talk, I will help you to pause, look closer, and maybe even appreciate all of these waterways as the lifeblood of Sweden. These small waterways make up the capillaries of the landscape; through flora, fauna, and flow, they connect forests, peatlands, and other wetlands. Once called “Aqua Incognita” (hidden water) because modern maps did not include them, we recently estimated that nearly 1 million kilometers of small waterways run through Sweden. Most of these waterways were created to drain wetlands and increase forest production. This disturbance has had widespread impacts on the overall extent of peatlands by transitioning them to forest and has more than tripled the length of the network of waterways in Sweden. We are just beginning to understand the effects of this on biodiversity, water quality and quantity, and other ecosystem structures and functions. My research focuses on uncovering the hidden properties of these waterways to ensure that they are managed properly for future generations to jump over - and hopefully not get stuck in.

The most common method to protect freshwater and riparian ecosystems is to leave a forested riparian buffer along their edge. Still, recent statistics from the Swedish Forest Agency found that about a third of all waterways in Sweden do not have buffers. The least protected waterways are the smallest natural streams and waterways that are made (ditches) or modified by humans (naturalized Ditches or straightened stREAMS – called “*DREAMs”* here). How these small waterways are labeled makes a remarkable difference in their management and has the potential to have cumulative effects to downstream water quality and ecology. Ditches can be maintained to ensure continued drainage, while streams should have forested buffers. Regardless of the ‘naturalness’ of waterways and their wetland forests, they may be refugia for wetland plants and likely harbor unique combinations of species with vital ecological and biogeochemical roles. However, these waterways have not been taxonomically described, leading to policies and forestry practices that harm their ecological functions. I currently lead a project that aims to do just this along a latitudinal gradient in Sweden.

Another aspect of my research has been to summarize the different biogeochemical, hydrogeomorphological, and ecological effects that forest management has on ditches, streams, and *DREAMS.* In my research and collaborations, I have combined long-term data sets to better understand the effects of drainage on nitrogen, phosphorus, and carbon concentrations in water. I also manage an [ongoing catchment-scale study](https://www.slu.se/en/departments/forest-ecology-management/forskning/trollberget/#:~:text=We%20call%20this%20area%20%E2%80%9CTrollberget,for%20cleaning%20of%20forest%20ditches.) where we are studying the effects of different management options for ditches: blocking (rewetting), cleaning, or leaving them unmanaged. This research includes monitoring sediment export, forest and ditch plant diversity, aquatic macroinvertebrate diversity, as well as evaluating the effects on hydrology, nutrient export, and dissolved organic carbon.

As ditches age, ditch cleaning may be required to sustain drainage and adequate timber production, but balancing this with other climate and biodiversity goals is a challenge, making ditch cleaning questionable. In my future work, I am looking forward to studying the costs and benefits of using continuous cover forestry (CCF) to manage forested wetlands and riparian zones. Alternative forest management practices, such as CCF in drained forests, can manage the water table without the risk of cleaning to water quality, but this has yet to be studied in a Swedish context.

Finally, forest management is having to adjust to the increasing demands we put on it to provide not only timber, but also climate mitigation, biodiversity, recreation, water security, and more. To find ways to balance these often competing goals, interdisciplinary strategies for decision support are needed. A better understanding of policy and economic drivers alongside societal and biodiversity demands will be important to ensure results from my research in the natural science realm gets broadly applied. Thus, I will explore these interdisciplinary drivers of forest management in the future, and expand my work with political scientists and economists.