MANAGEMENT OF GROUNDWATER RESOURCES UNDER CONFLICTING INTERESTS:

BALANCING BETWEEN HUMAN WATER USE AND ECOSYSTEM NEEDS

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Introduction

A major weakness of integrated watershed management is a strong over-emphasis on surface waters and a neglect of the importance of groundwater resources. Groundwater resources are facing increasing quantitative pressure from land-use and consumption. This can result in reduced groundwater levels and threat to future groundwater resources and groundwater dependent ecosystems (GDEs). GDEs such as wetlands, springs, headwater rivers and lakes provide invaluable ecosystem services and unique biodiversity. Understanding of the groundwater systems should be approached in a holistic way where all water uses are seen in the context of socio-economic development and ecosystem protection. A re-balancing of water allocation between various human uses, as well as ecosystems, is needed.

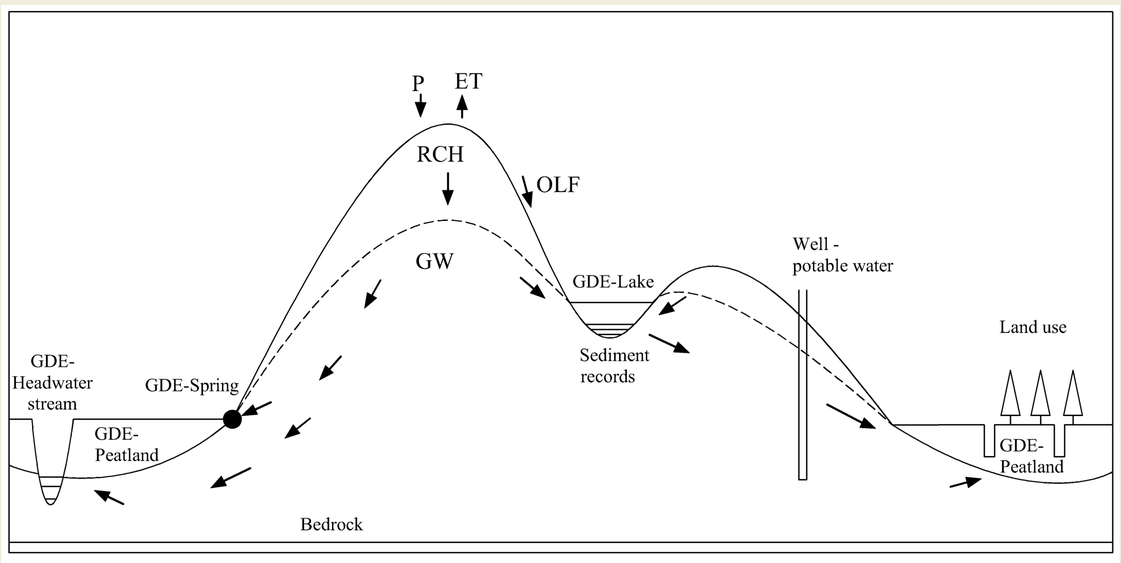

Fig. 1. Groundwater balance and ecosystems of an esker are maintained through natural recharge and disharge. Groundwater discharge into streams, lakes and wetlands through various hydrological pathways. Peatland drainage and groundwater extraction is a threat to ecosystems, and other water uses such as tourism and recreation.

Objectives

The main objective of this project is to study the groundwater systems in an integrated way, so that human needs and their environmental impacts and ecosystem needs are balanced. We will combine new concepts from hydrology and ecology with concepts of social sciences to better understand the chain of events that lead to changes in groundwater, groundwater dependent ecosystems and groundwater related socio-economic systems. The research will focus on the interaction between groundwater and surface water ecosystems such as springs, headwater streams, and kettle lakes.

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Fig 2. A lake at Rokua esker aquifer, groundwater seepage measurement to the lake and water sampling.

Methods

Project will be divided into three Work Packages (WPs):

- **Hydrology and modelling of groundwater and GDEs**
  - Groundwater interaction with dependent ecosystems
  - Conceptual models for groundwater: hydrology-ecology interaction
  - Numerical modelling of groundwater-surface water systems

The task is led by professor Björn Klöve

- **Biodiversity in groundwater-dependent ecosystems**
  - Structural and functional responses to variable flow and land-use stressors in groundwater-dependent ecosystems
  - Restoration of degraded springs: any benefits to biodiversity?

The task is led by professor Timo Muotka

- **Groundwater system management**
  - Adaptive co-management model
  - Vulnerability mapping and assessment
  - Integrated assessment of groundwater ecosystem services

The task is led by Dr. Timo P. Karjalainen

This research will also contribute to the understanding of the consequences that groundwater use has on the environment and how groundwater resources should be managed in a sustainable way.

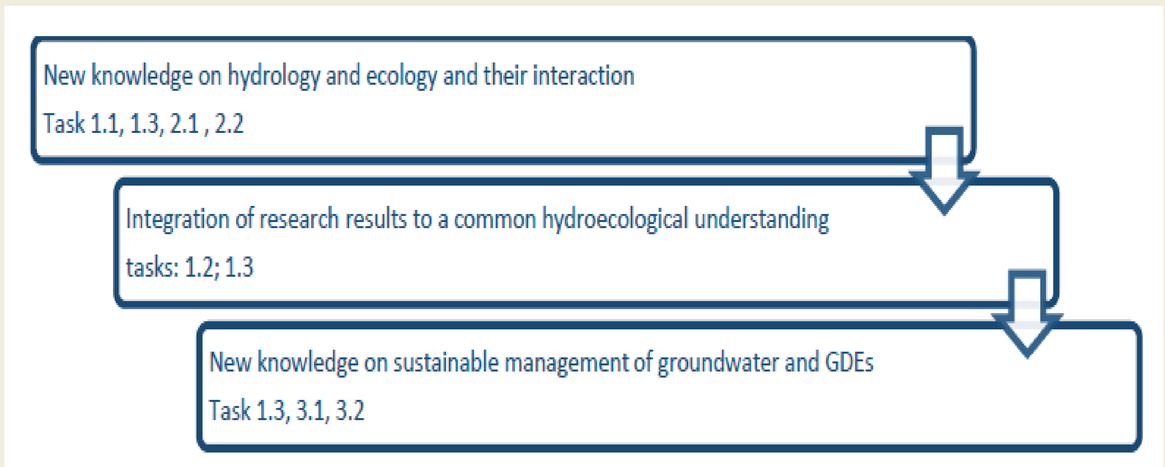

Fig. 3. The work on hydrology and ecology aim to understand the role of natural processes in groundwater systems. The management integrates process knwoledge for management decisions.

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