VACCIA

Vulnerability assessment of ecosystem services

for climate change impacts and adaptation

ACTION 7: ASSESSMENT OF IMPACTS AND ADAPTATION MEASURES FOR AGRICULTURAL PRODUCTION

Deliverable: DATABASE FOR THE INTERACTIVE DEMONSTRATION PLATFORM

Date: 29 December 2010

Introduction

The database consists of independently collected biophysical data on climate, hydrology, soils, land use, and biodiversity, as well as socioeconomic data on agriculture in Lepsämänjoki river basin. The Lepsämänjoki agricultural watershed is the demonstration area, which is used in VACCIA action 7 for the demonstration of impacts and adaptation to climate change in agriculture.

In this deliverable, the database is presented. The actual data are in variable formats of numerical data-files, and in virtual form embedded in larger national monitoring data, such as for example climate data collected by the Finnish Meteorological Institute FMI (a VACCIA partner). Many of the variables that will be used in the demonstration will be derived from grid data by interpolation.

An essential part of these data are already described in VACCIA deliverables, including descriptions of the methods and databases for the climate change scenarios from VACCIA/Action 3:

http://www.environment.fi/default.asp?node=24070&lan=en

and deliverable 3 from VACCIA/Action 2 (Vulnerability assessment of ecosystem services for climate change impacts and adaptation (VACCIA) action 2: derivation of gmes-related remote sensing data deliverable 3: indicator values derived from estimated time series, by Saku Anttila & Pekka Härmä, Finnish Environment Institute, 23.11.2010).

http://www.environment.fi/default.asp?node=24068&lan=en

Description of VACCIA/Action 7 and its earlier deliverables are available at:

http://www.environment.fi/default.asp?node=24075&lan=en

Helsinki 29 December 2010

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ACTION 7

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Location of the Lepsämänjoki river basin

The Lepsämänjoki river basin is located in the southern Finland. It is a tributary of a larger Vantaanjoki river basin, which discharges to the sea outside Helsinki (Figure 1).

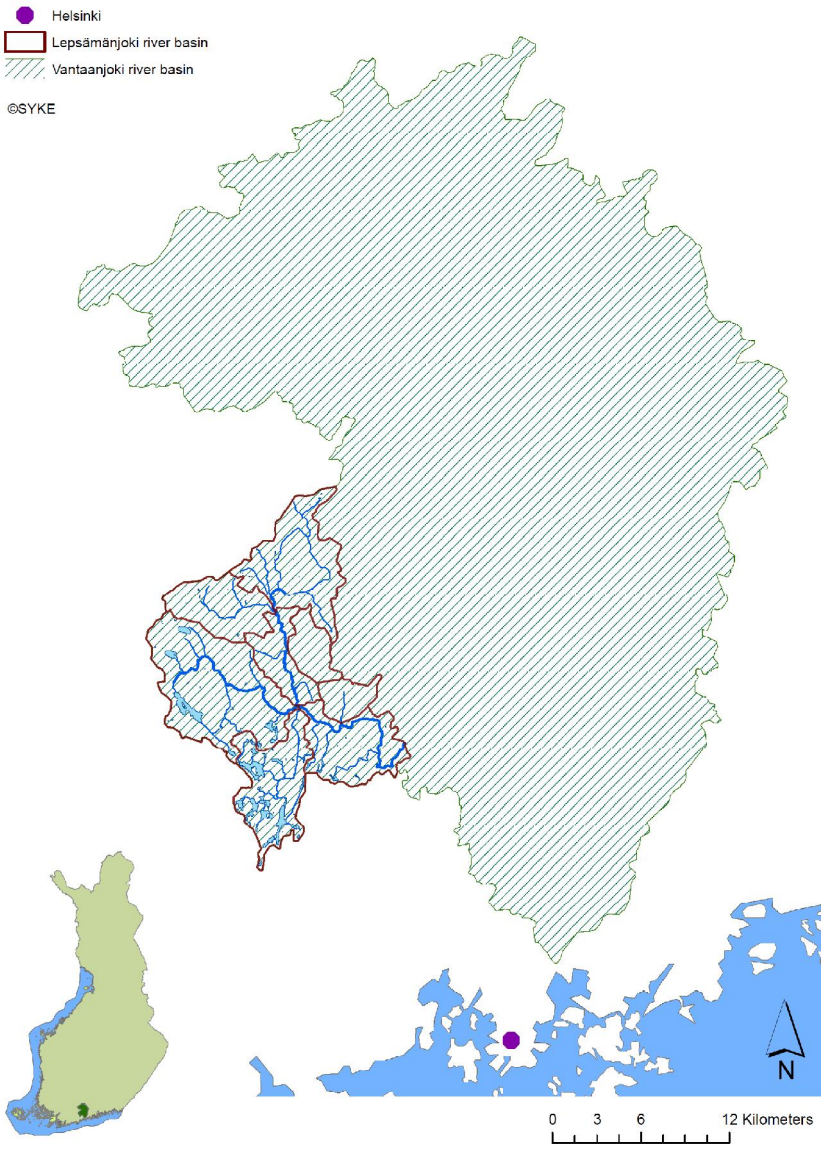

Figure 1. Lepsämänjoki river basin: location in southern Finland.

Data obtained from other VACCIA Actions

- **Climate change scenarios**

Climate change scenarios for VACCIA are produced in Action 3 by the Finnish Meteorological Institute. Details of the method and database are given at:

http://www.environment.fi/default.asp?node=24075&lan=en

and:

http://www.environment.fi/download.asp?contentid=108129&lan=en

- **Remote sensing data**

The remote sensing data for VACCIA are produced in Action 2, see:

http://www.environment.fi/default.asp?node=24068&lan=en

Methods and data sets used to derive interpolated and modeled EO based time series are provided in deliverables 1 and 2 of VACCIA/Action 2. Derived estimates include such as snow melt period, time period from NDVI (normalized difference vegetation index) minimum to maximum, estimated length of time period without snow or green vegetation (in days) for different land cover classes.

Data on land use

CORINE (http://www.eea.europa.eu/publications/COR0-landcover) land use data from years 2000 and 2006 is available in 25*25 m raster. Fields are located mainly on clay soils located in low land areas of the river basin (Figure 2).

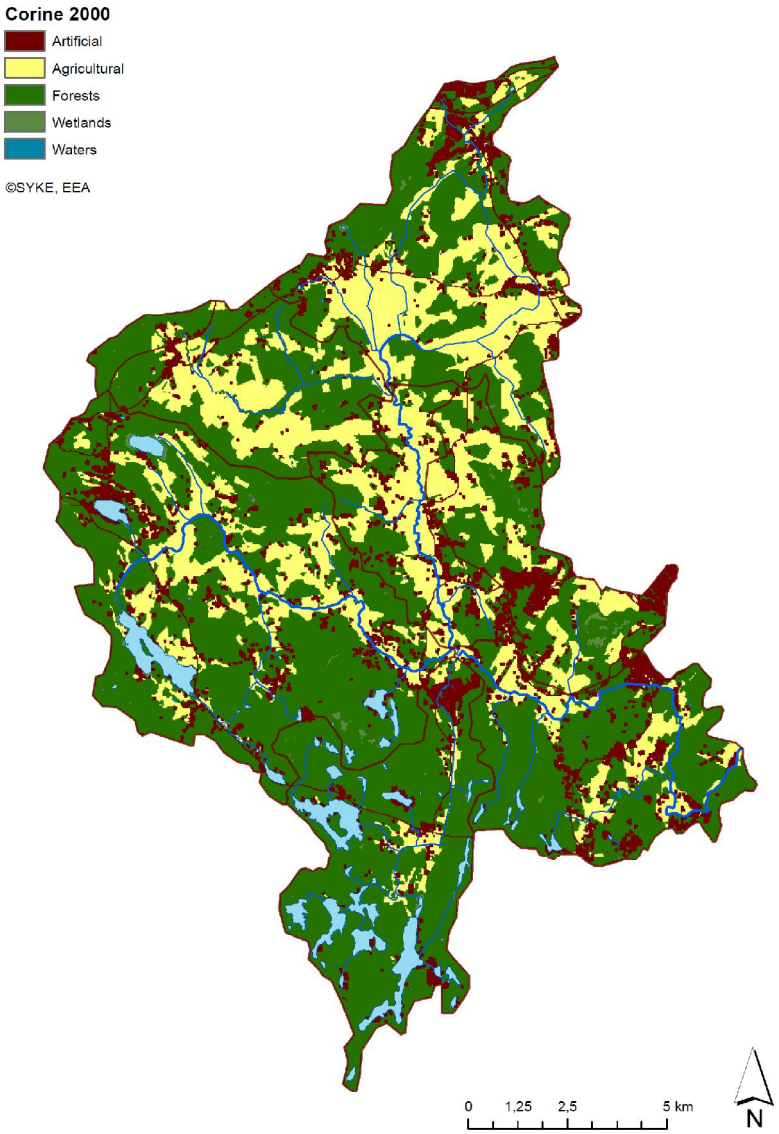

Figure 2. Land use in Lepsämä. CORINE 2000 land use data.

Data on soils, elevations and hydrology

These data are needed for demonstrations on both agricultural productivity and environmental impacts in form of nutrient loading and erosion.

Thematic GIS data of soil types (Figure 3) are provided by Agrifood Research Finland (MTT), Forest Research Institute (METLA) and Geological Survey of Finland (GTK). Elevation data are needed for, e.g. erosion risk estimation. Elevation of the river basin varies between 30 and 95 m (Figure 4).

In the Lepsämänjoki catchment there are two discharge measurement stations and several locations where water quality samples are taken (Figure 5). The Sandbacka discharge measurement station is located at the tributary of the river and the other one close to the outlet of the river Lepsämänjoki. Both discharge and water quality measurements (Figures 6, 7, and 8) are available via OIVA database at http://wwwp2.ymparisto.fi/scripts/oiva.asp

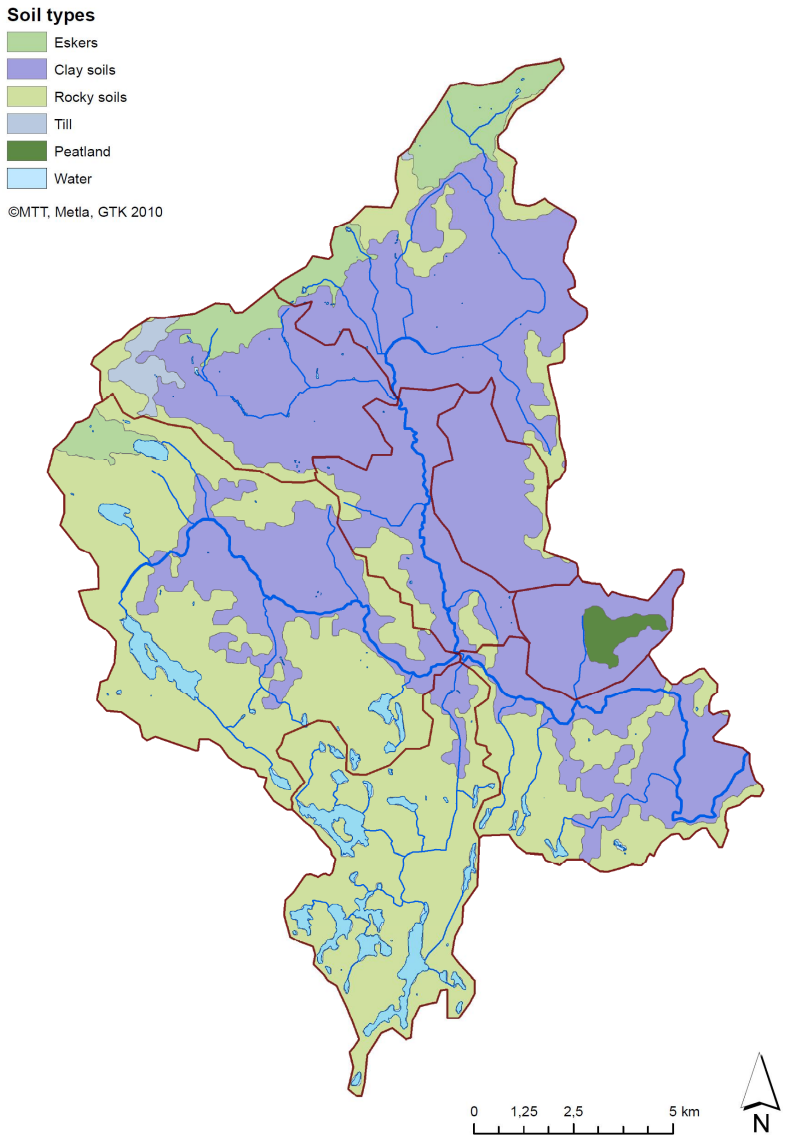

Figure 3. Soil types. Soil profile data.

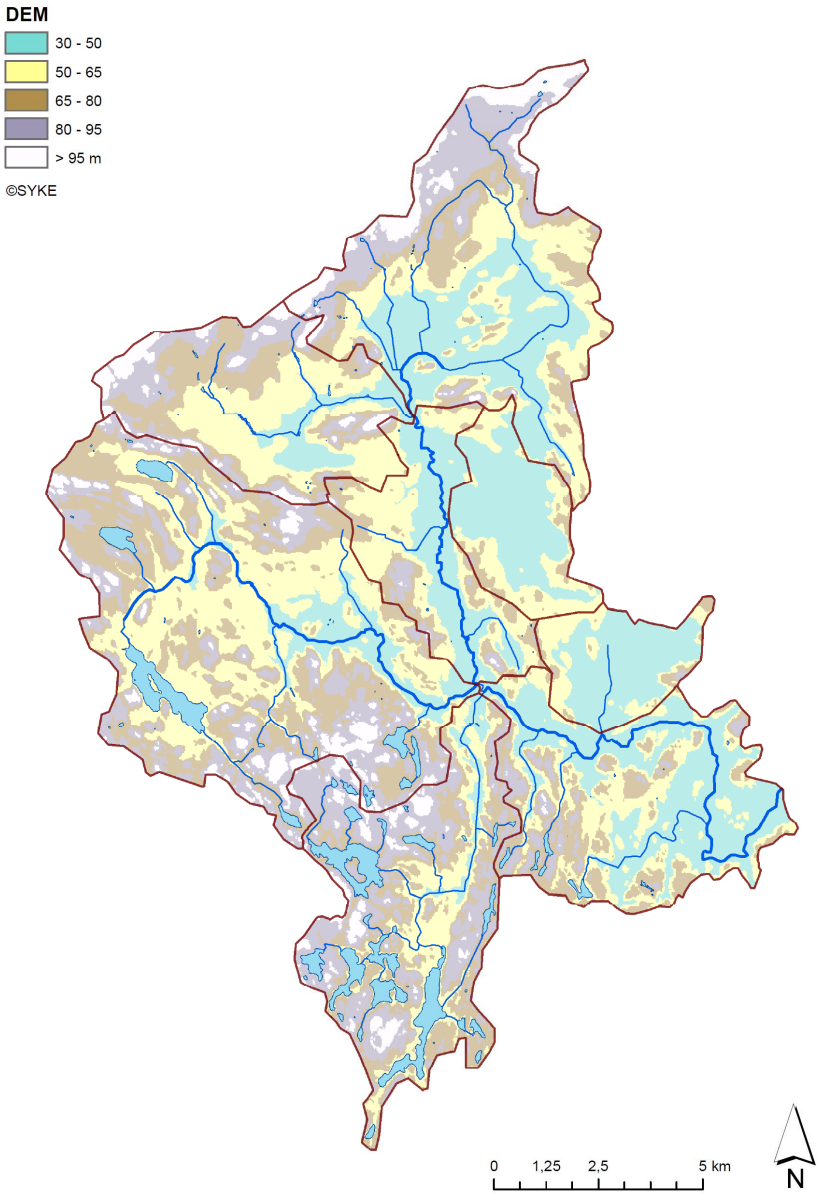

Figure 4. Digital elevation model data (DEM).

In general, discharge in the river Lepsämänjoki is highest during snow melting period in April and early May. Summer is typically low flow period, but discharge increases again in late autumn due to autumn rains and low evapotranspiration. Annual variation is large, for example in year 2007 the highest discharge peak occurred in December. In Figure 6 discharge of the year 2007 is presented together with long term minimum, maximum and mean discharge.

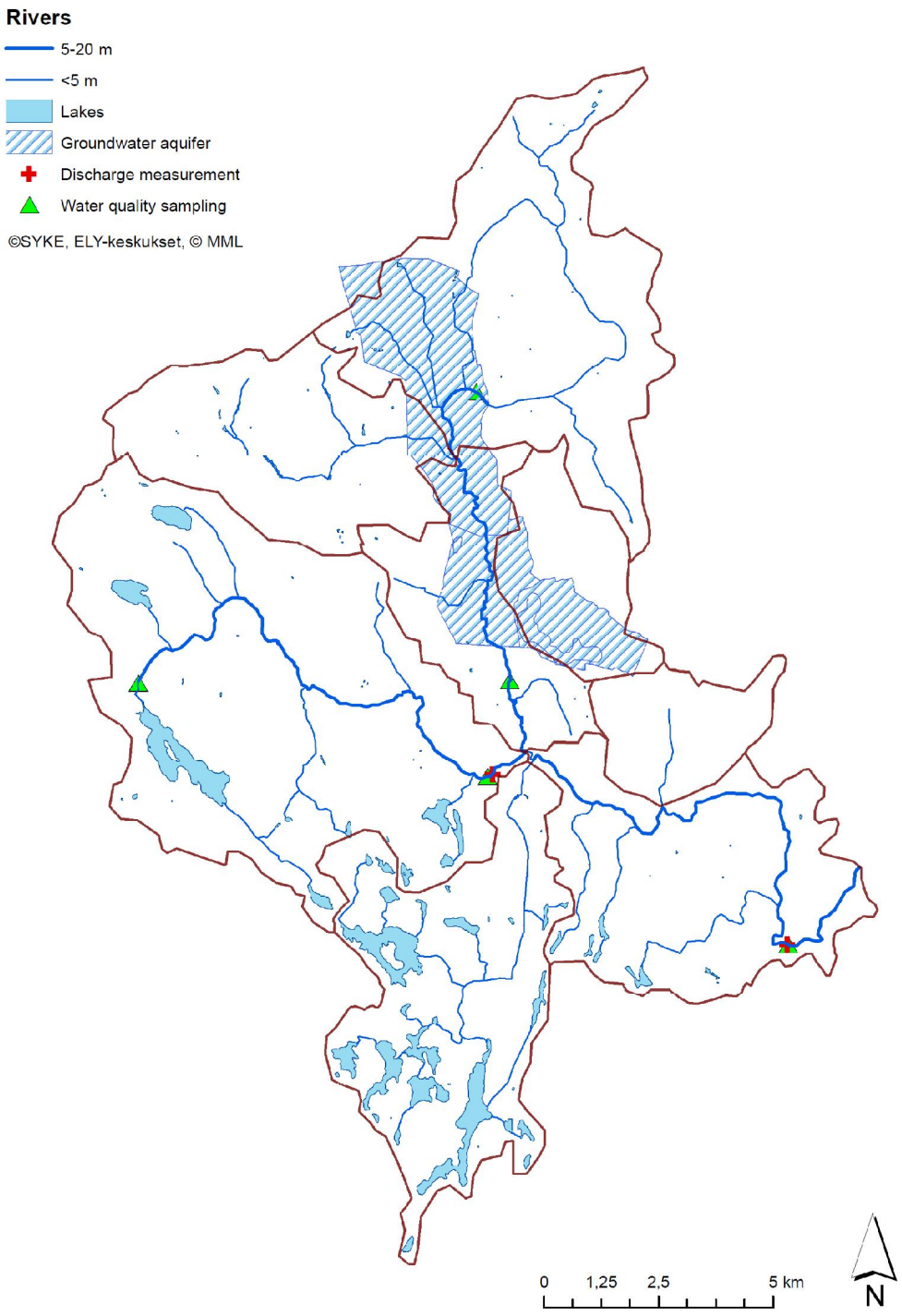

Figure 5. Main tributaries and water bodies in the Lepsämänjoki river basin.

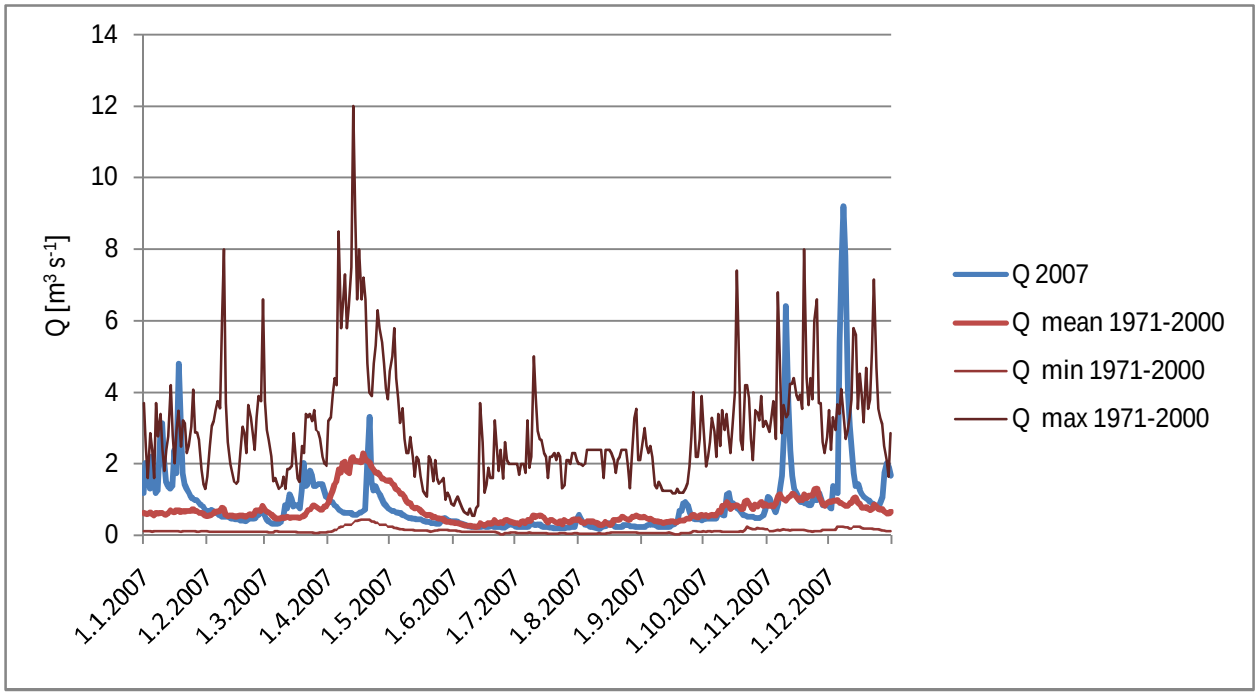

Figure 6. Observed discharge at the Sandbacka station in 2007. For comparison also long term minimum, maximum and mean discharge are presented. Katri Rankinen / SYKE

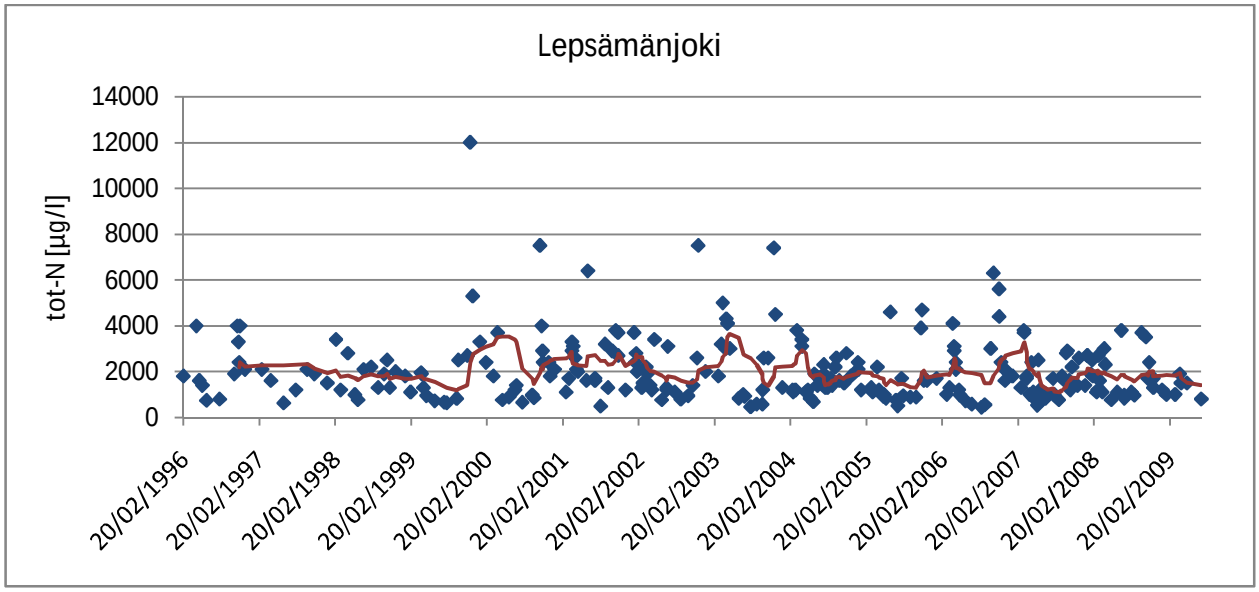

Figure 7. Observed total nitrogen concentrations at the outlet of the river Lepsämänjoki. Red line is the moving average of the concentrations. Katri Rankinen / SYKE

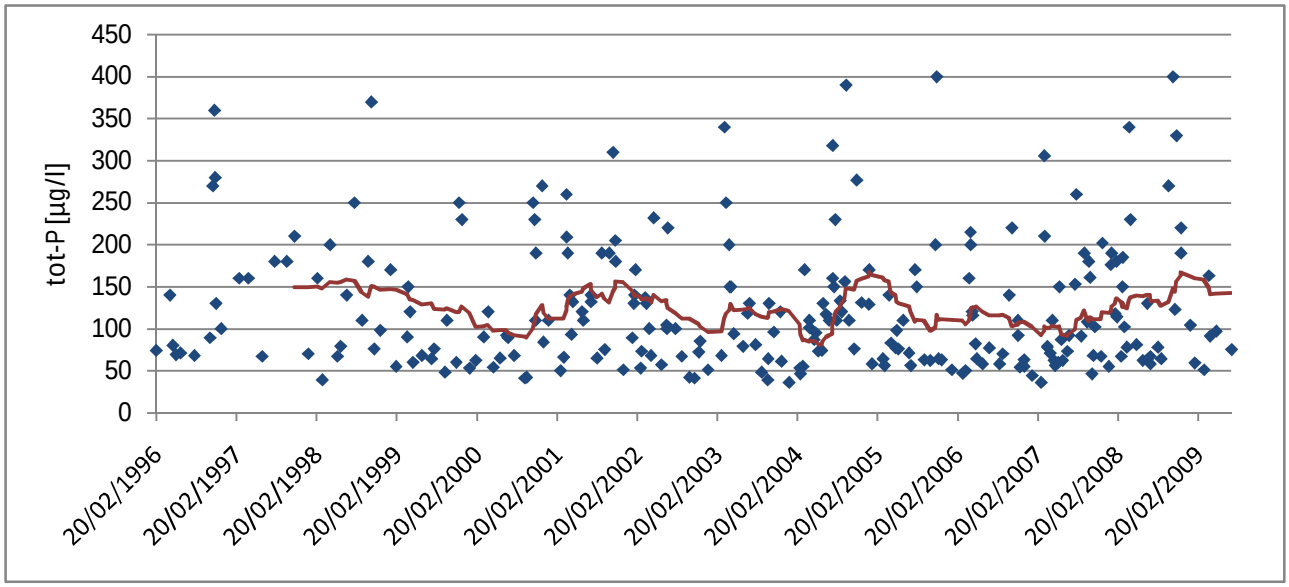

Figure 8. Observed total phosphorus concentrations at the outlet of the river Lepsämänjoki. Red line is the moving average of the concentrations. Katri Rankinen / SYKE

Diffuse load from fields is the largest source of nutrients to surface waters in the river basin. There are no decreasing trend seen in total nitrogen and phosphorus concentrations (Figure 7 and 8) despite of water protection methods implemented in the area.

Data on agricultural productivity

The action will include in the demonstration scenarios of future crop productivity and possible shifts in allocation of the arable area to the various crop species. Overview of the method and data sources are given in project ILMASOPU's (based on the same CC scenarios as VACCIA is using) publications, see:

https://portal.mtt.fi/portal/page/portal/mtt_en/mtt/research/projectdatabase/Projectdetail?p_kielikoodi=GB&p_hanke_seqno=72326&p_kysely_seqno=36387

Data on present allocation of arable area to crops and data on yields are arranged both as statistics and maps provided by Information Centre of the Ministry of Agriculture and Forestry, with official permission from the Finnish Agency of Rural Affairs MAVI

http://www.mavi.fi/en/index.html.

Data on farmland wildlife

The data originate from a long-term national monitoring study on the effects of the Finnish agri-environment support scheme MYTVAS, see

http://www.ymparisto.fi/default.asp?contentid=370763&lan=fi&clan=en#a5

Native and alien vascular plants were recorded in 2001, 2005, 2008, 2009, and 2010, in 31 transect lines each 50 m long and 1 m wide (with total monitored area of 50 m^2). The transect lines located in the centre of the habitat patch. The data of same 31 transects were monitored yearly since 2008 in order to increase the reliability of the results. The plots were placed in open and semi-open uncultivated habitats, such as field margins, forest margins, and meadows. These data include frequencies and cover estimates of 240 species (Figure 9).

Abundances of butterfly and day-active moth species have been monitored annually in Lepsämänjoki area since 2001. The data have been collected with line transect method ('Pollard walk') from five sites, each with a 1 km transect. Each transect has been counted 7 times per summer, with ca. two week intervals. These data include 20250 observations of 50 species in all (Figure 10).

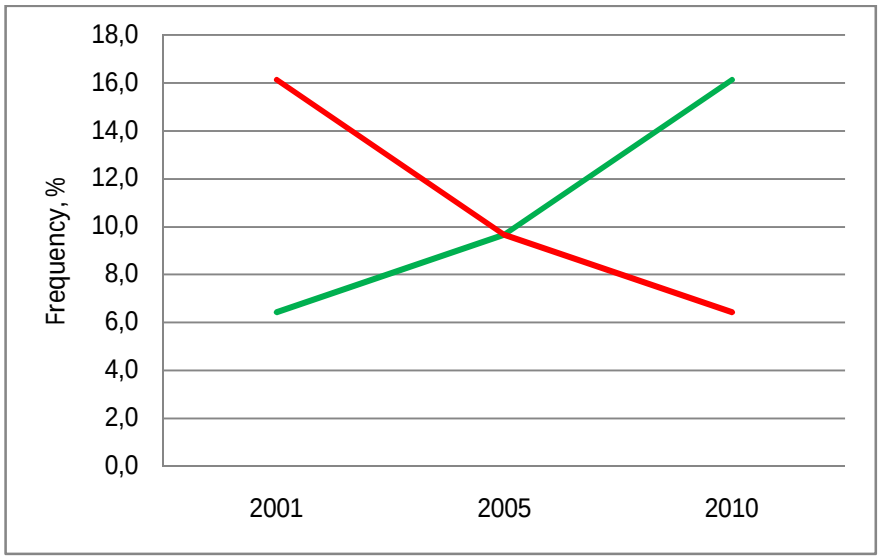

Figure 9. Examples of contrasting trends in frequencies of *Fragaria vesca* (increasing) and *Cirsium helenioides* (decreasing) in Lepsämä area.

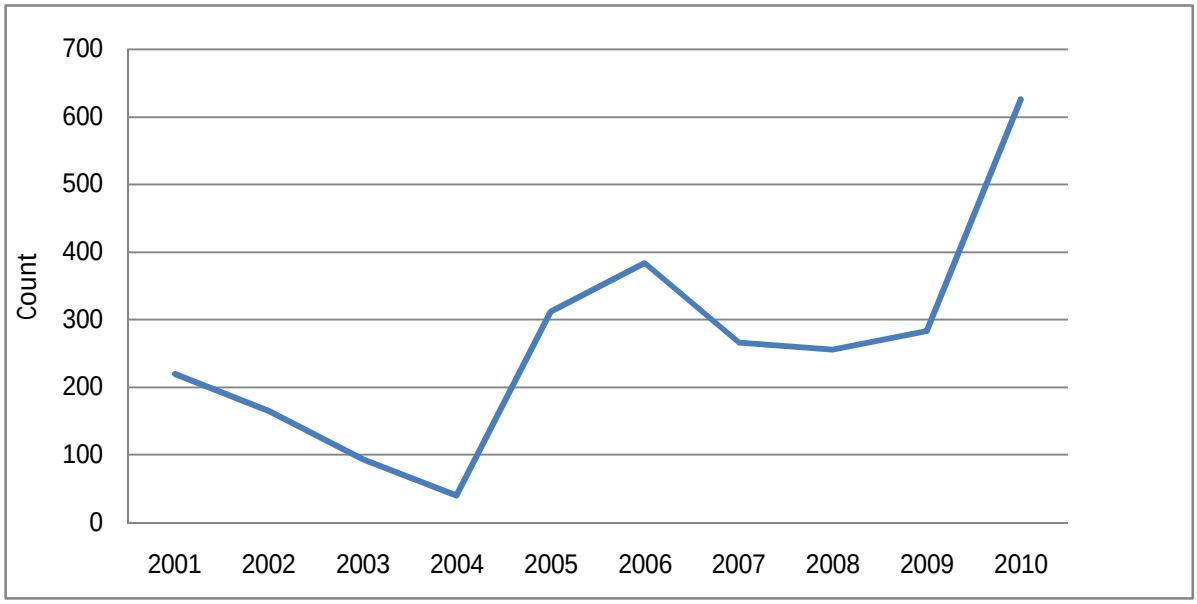

Figure 10. Example of trend of butterfly *Thymelicus lineola* in Lepsämä area. Janne Heliölä / SYKE

Agricultural census data

National agricultural census data is being extracted for use of VACCIA/Action 7, from the variable archives starting from 1910 census (National Archives) to 2000 (TIKE Information Centre of the Ministry of Agriculture and Forestry) in ca. 10 years intervals, excluding 1980, when no census was conducted.

A website is available for current censuses, conducted by Agricultural Statistics (Matilda) at: http://maataloustilastot.fi/en/description-farm-structure-survey_en

The contents of the data have evolved over the 100 years of censusing. Currently, statistics contain data on the number of farms, production sector, forms of ownership, land use, crop cultivation, livestock production, farmers and other labour force on the farm, working hours spent on agricultural work, additional off-farm employment, secondary businesses on farms, organic production, farm machinery and equipment, manure storage, and the area of land that requires irrigation.