

## Research Project

The ecological and socio-economic consequences of land transformation in alpine regions: an interdisciplinary assessment and VALuation of current changes in the Ursern Valley, key region in the Swiss central Alps.

### Third-party funded project

**Project title** The ecological and socio-economic consequences of land transformation in alpine regions: an interdisciplinary assessment and VALuation of current changes in the Ursern Valley, key region in the Swiss central Alps.

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**Project Website** <http://plantecology.unibas.ch/valursern/index.shtml>

**Project start** 01.04.2009

**Probable end** 31.03.2012

**Status** Completed

The European Alps are the most intensively exploited mountain region in the world, inhabited by 13.6 Mio people and visited by ca. 120 Mio visitors every year. Primary resources are agricultural production, landscape values (e.g. tourism, transportation corridors) and hydroelectric power. Agriculture has a 5000 year history in the Alps and left societal fingerprints in the landscape, which are about to disappear gradually, unless new incentives will emerge. Regardless of the intensive exploitation, the Alps still host Europe's largest pool of plant species in highly diverse landscapes of outstanding beauty. Ongoing transitions in land use, climatic change, air pollution and socio-economic processes (urbanisation, tourism) are affecting ecosystem goods and services of montane and alpine areas (provision of clean water, food and timber, flood-prevention, soil conservation, hydropower) with vital effects for the forelands (settlements, transport routes and water supply). Reduced farming activities have led to massive shrub encroachment and forest expansion into formerly open habitats, particularly at higher elevations. Forest area (incl. shrub land) has increased by 5-10 % above 1800 m a.s.l in the Swiss Alps during the last 12 years only, underpinning the dynamics of the present land cover transformation. Species-rich communities and diverse landscapes in alpine regions will decline with current trends in land use (cf. SNF/NFP 48). These land cover changes will affect evapotranspiration and runoff (both amount and quality), and thus, exert hydrological consequences for adjacent lowlands. Aim of this study These changes call for an ecological and economic evaluation, the aim of this project. In our test region, the Ursern Valley in the Swiss Alps, we will assess the status and current change of vegetation cover and plant diversity, soil characteristics, erosion potential, and their combined effects on the water balance and soil integrity. The results will be evaluated in an ecological, economic and historical context, integrating different space and time scales. The Ursern Valley is a highly suitable test region for this interdisciplinary assessment: (1) the valley is under communal authority control for more than 800 years, with an exceptional wealth of archive data, (2) increasing soil degradation at various slopes, (3) intense shrub encroachment into

formerly open grassland (4) a 2 km elevational range, including the full spectrum of high altitude biota, (5) a strong economic dependency on hydropower, and finally, (6) plans for mega-investment into new touristic infrastructure ('Sawiris' project). Through aggregation of biological, edaphic, meteorological, hydrological and economic data, we will scale from plot and plant community level to catchment wide implications. Key parameters will be specific water balances for each land cover type, the areal extent and degree of soil disturbance, and their combined hydrological consequences (water yield, discharge characteristics, sediment load) along with land use and land cover statistics of the Ursern Valley (GIS data, aerial photographs, soil maps). These key 'bio-geo-hydroscience' parameters will be assessed at different spatial (from the plot to micro-catchments) and temporal scales (from season to decades), and under contrasting land use regimes. For instance we will quantify the changes of the hydroelectric value of this catchment due to altered land use. Scenarios and projections for the next 50 years will take into account most likely trends in agriculture, tourism, and climate. By attributing monetary value to the 'bio-geo-hydroscience' data, we will assess the economic implications associated with these changes in relation to other facets of the region's economy. We will closely cooperate with historians, already working on local archive data, and we will capitalize on our long-term research experience in this area, existing infrastructure (alpine research station ALPFOR), field installations in part, and ongoing pilot projects on plant diversity, productivity, soil erosion, and the excellent contacts with stakeholders within our test region. Hence, we will translate the interdisciplinary data collation to immediate socio-economic and ecological consequences and longer term scenarios. Finally, we aim at providing 'tools' that will help policy to maintain land use in this region economically attractive, and to promote an integrated catchment management. We envisage the Ursern Valley to become a model region, representative for the ongoing transformations in most mountain regions across Europe.

**Financed by**

Swiss National Science Foundation (SNSF)

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