

Application and adaptation of NAIS approach for the management of protective forests of canton Jura (Switzerland)

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INTRODUCTION

Protective forests main purpose is the protection of people and constructions (freeways, roads, rail and buildings) against natural hazards. The Jura canton is mainly concerned with natural hazards such as landslides, floods and rockfalls. In our canton, forests play their most significant protective action against rockfalls hazard along transportation ways. In the Jura region these forests are characterized by site conditions essentially dominated by beech (*Fagus sylvatica*). Each year, around 1 Million of CHF are invested by public authorities to maintain the usefulness of these forests against natural hazards.

The delimitation of protective forests of the canton Jura is based on the SilvaProtect-CH project developed by Swiss Confederation (FOEN 2008). Additional areas were delineated on the basis of the areas of relevant processes in the forest. Sectors have been added as long as they meet the basic criteria (potential danger and damage), and their introduction in the delimitation has been documented (indicative hazard map, roads, railways...). In the canton Jura protective forests have been afterwards separated in two different categories: „priority protection forests“, where the forests contribute directly and significantly to the protection against natural hazards and „Other protective forests“. This category considers forests with recognized contribution to the protection against natural hazards, but where its contribution also associated with other objectives (timber production, biodiversity). About 30% of the cantonal forest area is defined as a protective forest (10'800 ha). This area includes priority protection forests (5% of the forest area, 1'900 ha) and areas classified as „Other protective forests“ (25%, 8'900 ha). Since 2009, a four-year planning about the priority of intervention in the protective forests was set

collaborating with cantonal authorities. The engineering company EcoEng Sàrl was charged to fix the intervention priority based on silvicultural analyses and risk consideration and to organize the intervention plan for the periods 2008-2011 and 2012-2015. The plan consists mainly in the treatment of the priority protection forest, often in collaboration with other offices, which are responsible for the implantation technical measures against natural hazards (dams, rockfall protection nets...).

METHODS

The protective function can be maintained permanently only with regular silvicultural interventions, that can ensure a good health status, stability of the trees and a continue renewal. The Swiss confederations adopt the NAIS guidelines (Frehner et al. 2005) to maintain this purpose. This approach is essentially based on the integration of hazard typology and station types in order to define a series of silvicultural characteristics that will permit to obtain a stable forest that can ensure a durable protection of the vulnerable objects. In the canton Jura, the direct application of the NAIS guidelines is not straightforward especially due to the presence of site conditions dominated by beech. To ensure an appropriate protection level in forests where the protection against natural hazards needs to be combined with other purposes (biodiversity, production) adaptation and a simplification of silvicultural constraints defined by NAIS is also needed.

In order to fill this gap and to dispose a detailed overview of the main information (significant hazard process, site type, owner and the third-party beneficiary) for the overall protection forests, detailed GIS and field analyses were conducted. First, based on published detailed (1:5'000) and

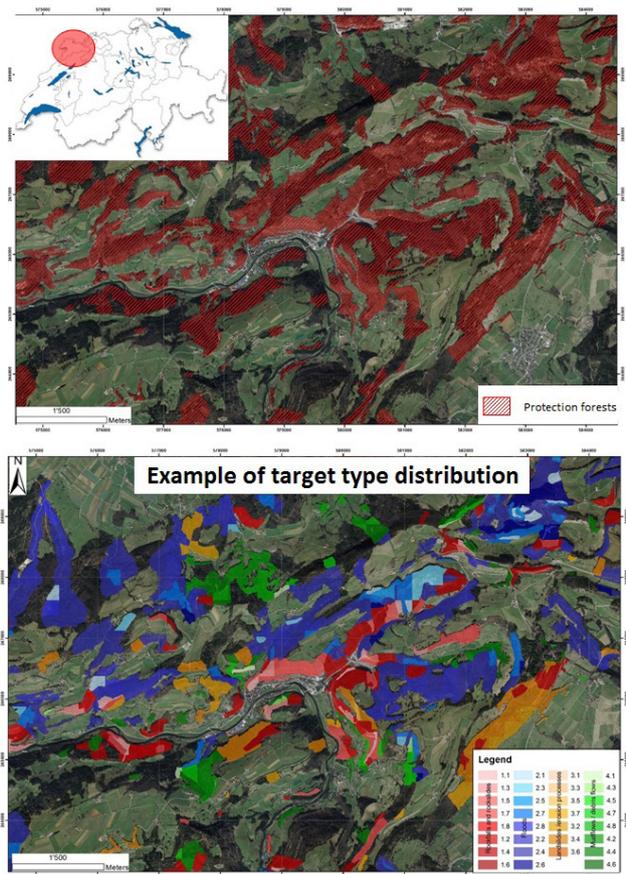


Figure 1. Example of target type distribution

indicative hazard map (1:50'000), the main and the secondary hazard processes were identified. Four different hazard processes were defined: rockfalls and rockslides, Floods, Landslide and erosional processes, Mudslides and debris flows. Then, based on detailed field mapping (1:5'000) and cantonal scale inventory, comprehensive map of the different site types were dressed for the whole protective forests. More than 50 site types were identified in the mapped areas. The target types were obtained by crossing the hazard type and the site type. In order to dispose of a treatment-oriented overview of the target types, the different site types were grouped in 8 classes based on their productivity rate and their typical mixture. This operation allows identifying and describing 32 „simplified“ target types.

KEYWORDS

Abstract; Protective forests; Natural hazards

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RESULTS

For each simplified target type, general stand, tree characteristics and minimal profiles were defined for both priority protection forests and other protective forests based on the recommendation defined by NAIS and field-based experiences. Moreover, in order to sensitize forest wardens to a correct management of their protection forests, practical recommendations about treatments, mixture typologies and regeneration approaches were also proposed.

Based on present-day conditions of the forest stands, the overall surface of protection forests and the potential damage, the surface that need to be annually treated to develop a durable management of the protection forest is defined. This is an essential information to define a reliable budget for the next years.

According to the results, costs for each type of intervention are defined, on a time schedule based on the next 12 years (2016-2027). This allows a calculation of the financial means for every year for the interventions. Costs are supported for 80% from the canton and 20% has to be covered from the third-party beneficiary. A monitoring system will be established to follow the evolution of the interventions. After the first intervention, the evolution of the forest will be followed by the engineering company, as well as by cooperating with local forester. Main goal is to appreciate the results of the intervention and adapt the following treatments.

CONCLUSIONS

This study allows obtaining detailed indications about the overall characteristics of the protection forests in the Canton of Jura and to fix the technical base for a durable management. Further analyses are needed to monitor the efficiency of the treatments and to promote the local know-how.