USING REMOTE SENSING DATA TO PREDICT DISTRIBUTION OF RED-LISTED FOREST SPECIES

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1. INTRODUCTION

Essential Biodiversity Variables (EBVs) have been developed during the last decades. A critical aspect of EBVs is aiming to capture biodiversity changes. So far, six classes of EBVs have been defined but are still in development, while some variables are still rather conceptual. Due to the complexity of biodiversity, traditional biodiversity monitoring programs and ecological field studies have been seen as insufficient and spatially uneven. At the same time, biodiversity change is often detected when damage is already irreversible, such as when species become locally or regionally extinct. As such, it is imperative to improve our understanding on how natural and anthropogenic drivers determine the spatial and temporal trends of biodiversity.

Researchers and decision-makers are currently constrained by the lack of data and indicators to make EBVs operational. In this work, we focus on the potential of using remote sensing and machine learning as tools to bridge these gaps and advance our capabilities to understand biodiversity processes.

2. METHODOLOGY

The case study area is in Sweden, with research scope of Swedish forest ecosystems. We use data of forest-cover (f.ex. Forest type, and Forest age), soil and surface (f.ex. Surface-Albedo, Leaf-Area-Index, etc), land cover, and local climate data (such as Temperature and Precipitation) as independent variables; Red-listed species observation/occurrence data as the response variable.

To understand what are the key drivers and their synergistic interactions on species distribution, we use geostatistical techniques (machine-learning or deep-learning approaches such as Geographical Random Forest) to investigate the relationships between the various indicators and occurrence rate (Red-listed species data). These data mentioned above are used as training and testing data for machine-learning. When the links are established and key drivers are clarified, we work on the analysis of anthropogenic drivers vs nature drivers and recall the gaps of current EBVs development. We build a prediction tool based on how species-distribution responds to environmental variables to predict the distribution of red-listed species related to natural and man-made driving factors.

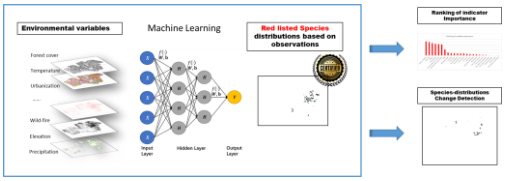

Figure 1. Methodology framework

3. CONDLUSIONS

The result of the research intend to show: the ranking on importance of environmental variables regarding to species occurrence; the primary impact factors that affect species richness; the grouping of man-made drivers vs. natural drivers; the response curves of variables to species occurrence/richness; the synergic effects of individual variables as alliances; and it can be a tool box to predict red-listed species distribution.

Through earth observation on the independent variable data (environmental and land use change), we can identify and predict species distribution. This research work can be useful for further research related to remote sensing for biodiversity change detection, and can be helpful for decision-making on biodiversity protection at an early stage.