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Connectivity forests contribute to the future green infrastructure in Sweden

In my thesis, I explored where to find *connectivity forests* and how they contribute to a functional *green infrastructure*. *Connectivity forests* are key forest areas that can potentially improve the connectivity between forest habitats but are currently unknown. To find the connectivity forests, I used *KubAI*, a new artificial intelligence model developed in 2022.

Sweden is renowned for its forest resources and landscapes. However, since the late 1800s when forest production became industrialized, human pressure on the Swedish forests has led to many consequences affecting both human society and species dwelling in forest environments. One common consequence is the loss of forest habitats, which in turn has led to decreased biodiversity.

To better preserve biodiversity and recreate ideal habitats, Sweden aims to establish green infrastructures across its entire forest landscape. *Green infrastructure* refers to a strategically constructed network of forest areas with high conservation values. In a functioning green infrastructure, habitats have sufficient size and quantity, while being well connected to each other so that species can move freely between different habitat areas and utilize the resources they need in the best way possible.

Unfortunately, today's green infrastructure does not work well enough to protect and connect habitats. To improve the situation, we can restore or increase the conservation value of key forest areas and add them to the green infrastructure. We call such key forest areas *connectivity forests* because they have the potential to strengthen the connectivity between habitats preserved in the green infrastructure. But where do we find these connectivity forests?

Technological advances in *artificial intelligence* (*AI*) give us new opportunities to address this question. *KubAI* is an AI model that can predict forests' conservation values across all of Sweden's forests. What makes KubAI "smart" is that the model gives each forest area an assessment score varying between 0 and 1, where 0 means no conservation value and 1 means the highest conservation value.

In my study, I used all the forest areas with an assessment score of at least 0.4 as connectivity forests and analysed how the future green infrastructure can possibly be strengthened by restoring these connectivity forests. My study was conducted on a large forest landscape of 1.3 million hectares in northern Sweden.

The results of my study show that there are many connectivity forests in the study area, which suggests a strong foundation for restoring the connectivity within the green infrastructure. By effectively restoring and increasing the natural value of these forests, the network of habitat areas in the green infrastructure can become larger and denser.

However, my study also revealed some challenges that we need to solve in the future. Above all, it is not enough to just add connectivity forests to create a 100% functional green infrastructure. Even with connectivity forests restored and added, there are still weak connectivity points in large areas with long-term intensive loggings, particularly in the middle and eastern parts of the study area. In addition, these weak points are particularly problematic in pine forests, which maintain unique living environments and resources that are invaluable to Sami culture and its people. Therefore, it is crucial to develop better habitat connections even in pine forests to create a more functional green infrastructure.

In conclusion, my study shows that improving the conservation value of connectivity forests can contribute to a stronger green infrastructure, but it is not sufficient to ensure biodiversity conservation. Therefore, we must explore and implement other solutions as well. One potential solution is to adopt a diversified forest management approach that emphasizes biodiversity conservation to reinforce the green infrastructure for the future.

It is crucial to keep in mind that models, such as KubAI, can make errors, and we should not solely rely on their assessments without conducting our own evaluations.

Keywords: boreal forest, conservation, restoration, connectivity, green infrastructure, GIS, Sweden

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Master degree project 30 credits in Geographical Information Sciences, 2023
Original title: Identification of restoration hotspots in landscape-scale green infrastructure planning based on model-predicted connectivity forest
Department of Physical Geography and Ecosystem Science, Lund University
Thesis nr 161