Habitat probability and corridor maps, habitat probability GIS layers (second landscape)

English summary

Flying squirrel LIFE (LIFE17 NAT/FI/000469)

Action D3, Ecosystem function restoration

Deliverable: Habitat probability and corridor maps, habitat probability GIS layers (second landscape): Case Syrjävaara

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As a part of the EU-funded Flying Squirrel LIFE Project, Natural Resources Institute Finland (Luke) conducted an evaluation in which ecosystem functions and structure were assessed by first mapping the Siperian Flying Squirrel, SFS habitats in Syrjävaara, Finland. The SFS habitat suitability was based on indexes describing the stand structure favorable for SFS nesting habitat.

Criteria for suitable stands for SFS were as follows: Stand had to be spruce dominated with strong deciduous component. Tree diameter, Dbh1.3 for aspen had to be at least 20 cm and 25 cm for birches. The age of the forest had to be at least 60 years. For potential SFS forests in simulation period responsible criteria were Dbh1.3 equaling or exceeding 15 cm for aspen and the minimum of 20 cm for birches.

The indexes were first built using the average characteristics of forest stands, which are commonly used in forest planning data. According to the classification criteria, there were no suitable flying squirrel habitats at the starting point (year 0) in Syrjävaara area. Further, most of the 30 year forest management optimization scenarios produced none or only a few suitable SFS habitat patches. However, the field observations indicated that SFS inhabited several parts of the case area.

To better match the forest stand characteristics to SFS observations a new landscape classification approach was developed. In the original classification, the average deciduous tree diameter at breast height (DBH) of forest stands did not fulfil the required width in any of the stands in order to be classified as suitable SFS nesting habitat. Therefore, a DBH frequency distribution of deciduous trees were calculated for each stand using the Weibull function. In the following step, the maximum DBH value from the frequency distribution was tested against the Dbh1.3 classification criteria. If the maximum Dbh1.3 value in distribution met the criteria, the stand was classified as suitable for SFS. When testing the resulting classification against field observation data of SFS from Syrjävaara, vast majority of the stands with SFS observations were also classified as suitable SFS stands.

Further, to account for connectivity, another set of indexes was calculated for each stand to describe stand's suitability as a corridor for the movements of SFS. Technically, the above-mentioned indexes were analyzed with Geographic Information System (GIS) methodologies and tools, and by applying a Least Cost Path, LCP analysis. The results of SFS suitability and connectivity are presented as thematic maps according to alternative management scenarios contributing SFS habitats with different intensity.

SFS suitability maps

Flying squirrels favor mature or old-growth Norway spruce-dominated forests with deciduous trees. Then, the occupancy of SFS in a stand is dependent on the amount of preferred habitat in the surrounding area. To account for connectivity, we calculated another set of indexes for each stand to describe stand's suitability as a corridor by applying a Least Cost Path, LCP analysis. To be able to assess the effect of alternative forest management regimes on SFS habitat availability and connectivity, we estimated stand projections and linked them with SFS habitat models describing favorable SFS habitats. Stand projections were produced according to Motti stand simulator to discover how they affect predicted suitable SFS habitats. In this report only two management

scenarios (consisting of stand projections) were applied and further analyzed: 1) Business-as-usual, **BAU** (thinnings and clearcuttings according to prevailing silvicultural guidelines, no attention to SFS habitats), 2) **OPTIMAL** (no cuttings were applied in SFS habitats, and only thinnings were allowed in corridor stands). We consider that these management scenarios represent extremes: one (BAU) ignoring SFS habitats totally and the other (OPTIMAL) improving SFS habitat availability with a magnitude which evidently results in lower cutting removals and thus a decrease in net present value. For BAU the annual cutting removal was 3.19 m^3/ha while in OPTIMAL it was 1.85 m^3/ha, indicating app. 42 % decrease in cutting removals. With regard to net present value, BAU outperformed distinctively OPTIMAL scenario: for BAU the NPV (according to 3% interest rate) was 2 204 €/ha, but in OPTIMAL the NPV was as low as 1 073 €/ha (a 51% decrease). However, the increase of suitable SFS habitats in OPTIMAL compared to BAU scenario was as much as 507 hectares (from 72 hectares in BAU to 579 hectares in OPTIMAL) at the end of 30-yr time horizon. This is a remarkable increase, given that the total forest area was 4 287 hectares. For simplicity, only the starting point (year 0, before any scenario is activated) and end point (at year 30) associated with both are chosen to be presented for SFS suitability maps.

Data availability

For more information about the data and its availability, please contact Anssi Ahtikoski (anssi.ahtikoski@luke.fi), Natural Resources Institute Finland.

Disclaimers

The producer of maps (Natural Resources Institute Finland) is not responsible for any damage or costs incurred due the use of maps to the user or any other party.

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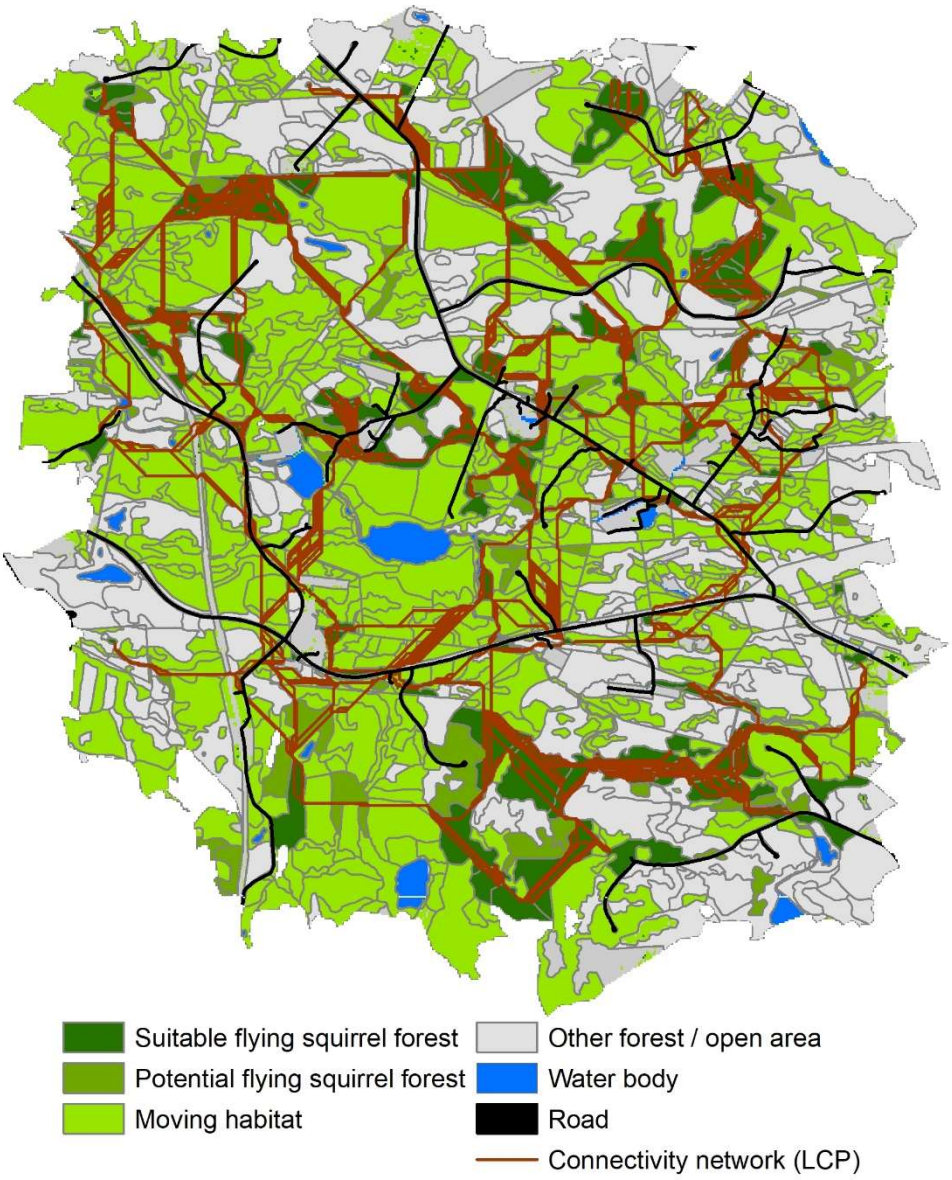
MAPS

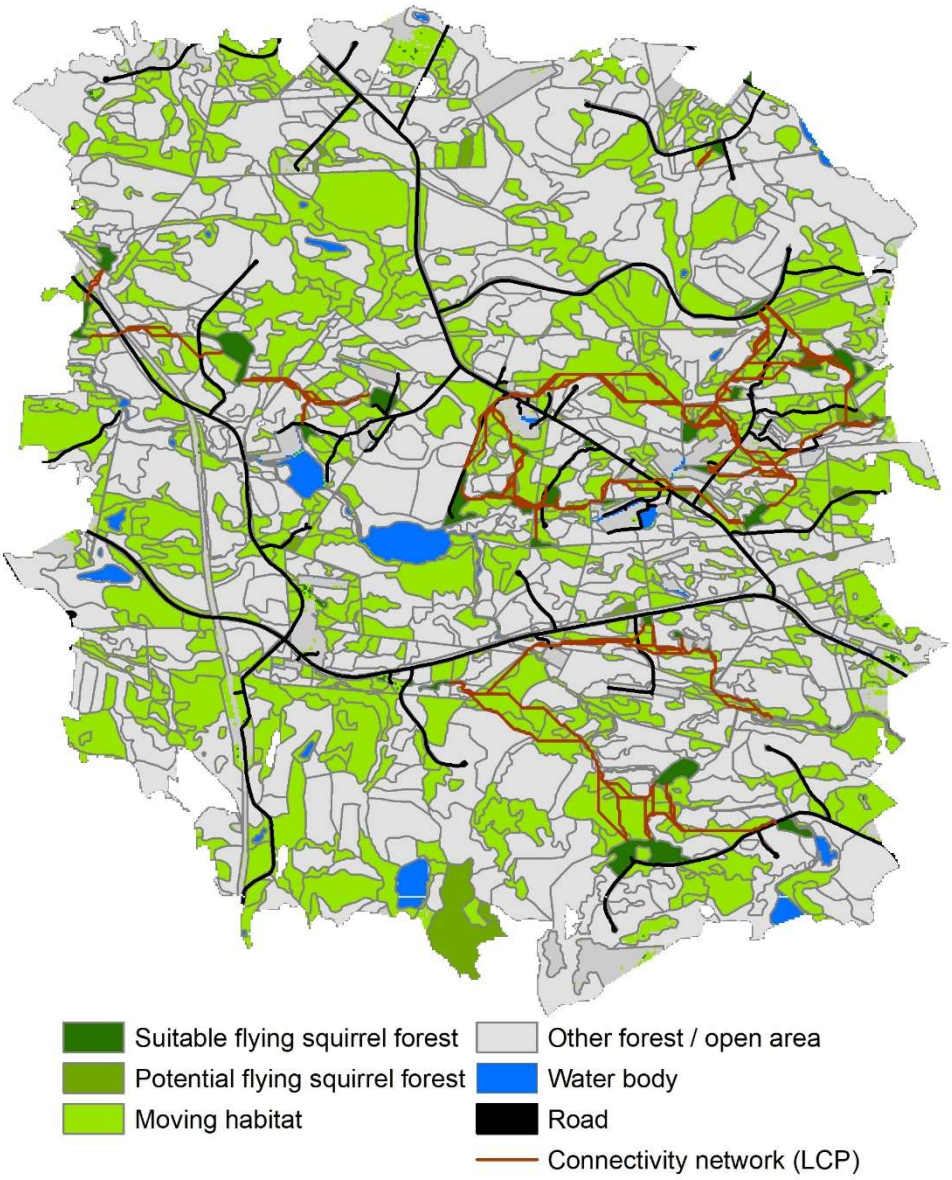
Map 1: Starting point (year 0 corresponding to calendar year 2021), a SFS suitability map of Syrjävaara. Total area 4 287 hectares.

Map 2: A SFS suitability map associated with BAU at end point, year 30.

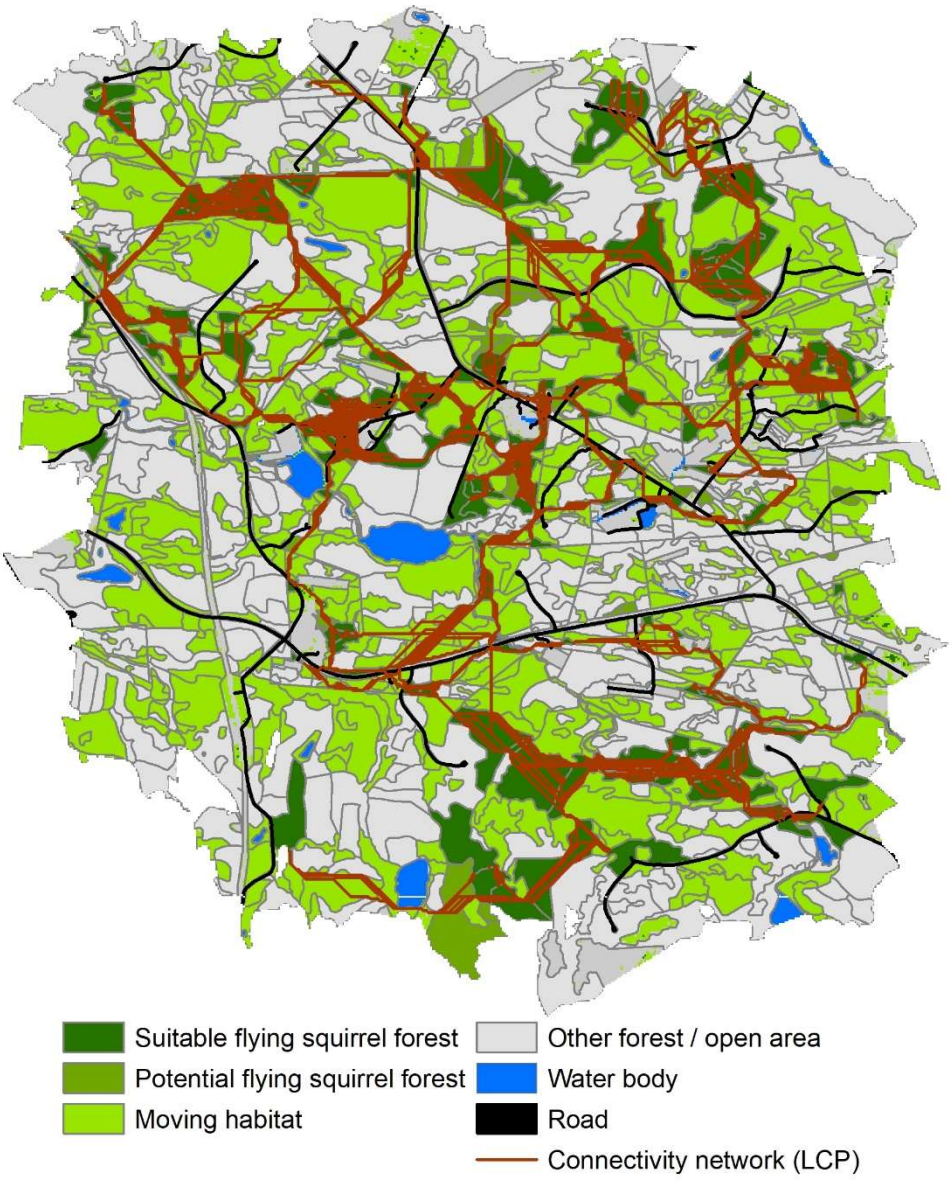
Map 3: A SFS suitability map of HMS4 management scenario, year 30.



Map 1: A SFS suitability map of Syrjävaara at starting point (year 0 corresponding to calendar year 2021). Total forest area 4 287 hectares. Connectivity network is based on Least Cost Path (LCP) analysis. (Note that this map applies to both scenarios since the scenarios are yet not activated at starting point).



Map 2: A suitability map associated with BAU management scenario at end point, year 30. In BAU there were no restrictions on management indicating that SFS habitats are ignored. Compared to the starting point (Map 1) a lot of connections has been lost. Also, the area suitable for SFS has decreased compared to the starting point.



Map 3: A SFS suitability map of OPTIMAL management scenario, year 30. In OPTIMAL management scenario no cuttings were allowed in SFS habitats, and only thinnings were allowed in corridor stands. Compared to the starting point (year 0) the area suitable for SFS has increased app. 507 hectares (from 72 to 579) within the 30-yr time horizon.