Habitat probability and corridor maps, habitat probability GIS layers (third 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 (third landscape): Case Sipilänperä

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As 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 Sipilänperä, 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. According to the classification, at the starting point (year 0) there were only a few suitable flying squirrel habitat patches in the case area. Also, most of the 30 year forest management optimization scenarios produced only a few suitable SFS habitat patches. However, the Syrjävaara case area (second landscape) revealed that forest classification using the average stand characteristics was not the optimal classification method for SFS.

Therefore, the same classification method was applied to Sipilänperä case as was used in the second case. To better match the forest stand characteristics to SFS habitat requirements a diameter at breast height (DBH) frequency distribution of deciduous trees were calculated using the Weibull function. This method produced significantly more suitable SFS habitat. There were no SFS field observations in the third case area to verify the classification result. However, the Syrjävaara case showed that the new method produced more accurate results and the Weibull distribution should be used instead of average stand characteristics.

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 within the next 30 years was 4.81 m^3/ha while in OPTIMAL it was 3.38 m^3/ha, indicating app. 30 % decrease in cutting removals. With regard to net present value, BAU resulted in a better outcome than OPTIMAL scenario: for BAU the NPV was 3 606 €/ha, while for OPTIMAL the NPV was 2 418 €/ha (a 33 % decrease). However, the increase of suitable SFS habitats in OPTIMAL compared to BAU scenario was as much as 61 hectares (from 42 hectares in BAU to 103 hectares in OPTIMAL) at the end of 30-yr time horizon, given that at the start (year 0) the area of suitable SFS habitats was app. 42 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

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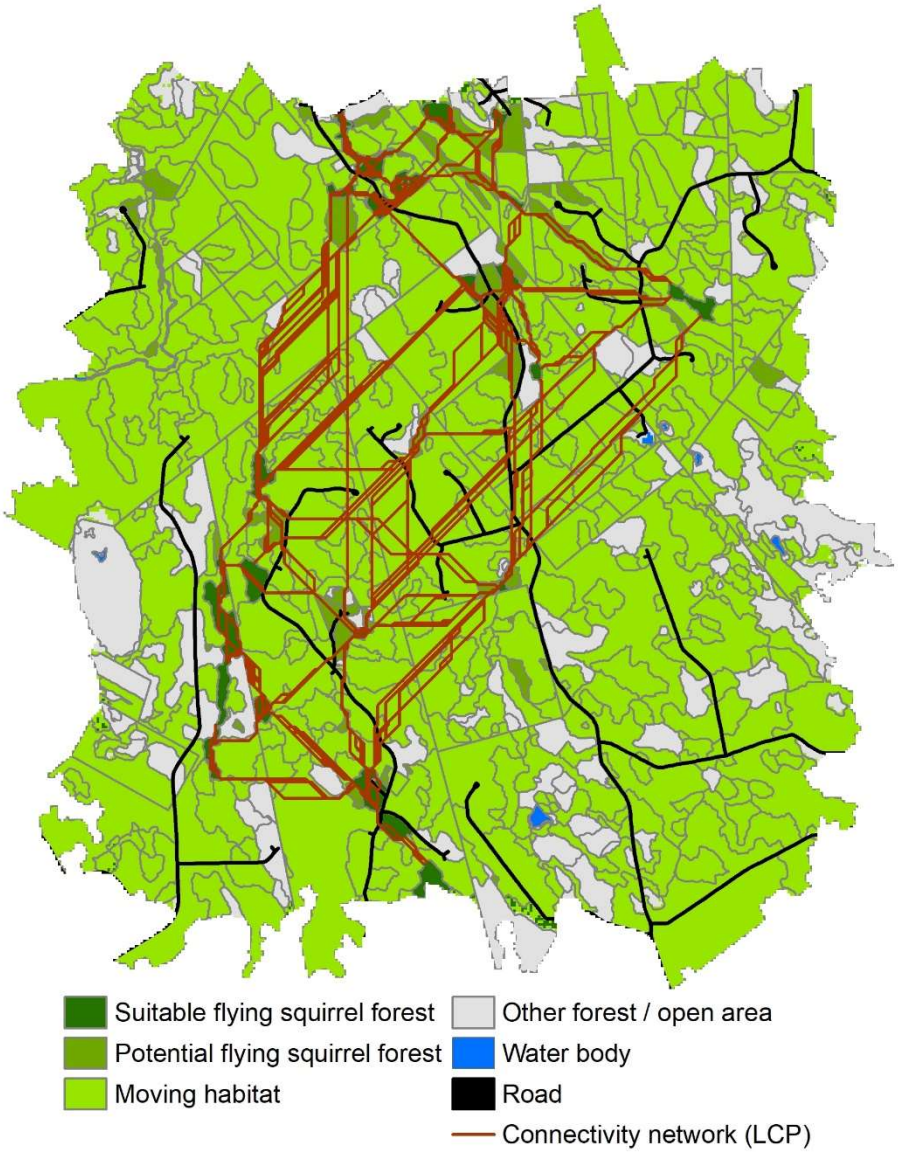
MAPS

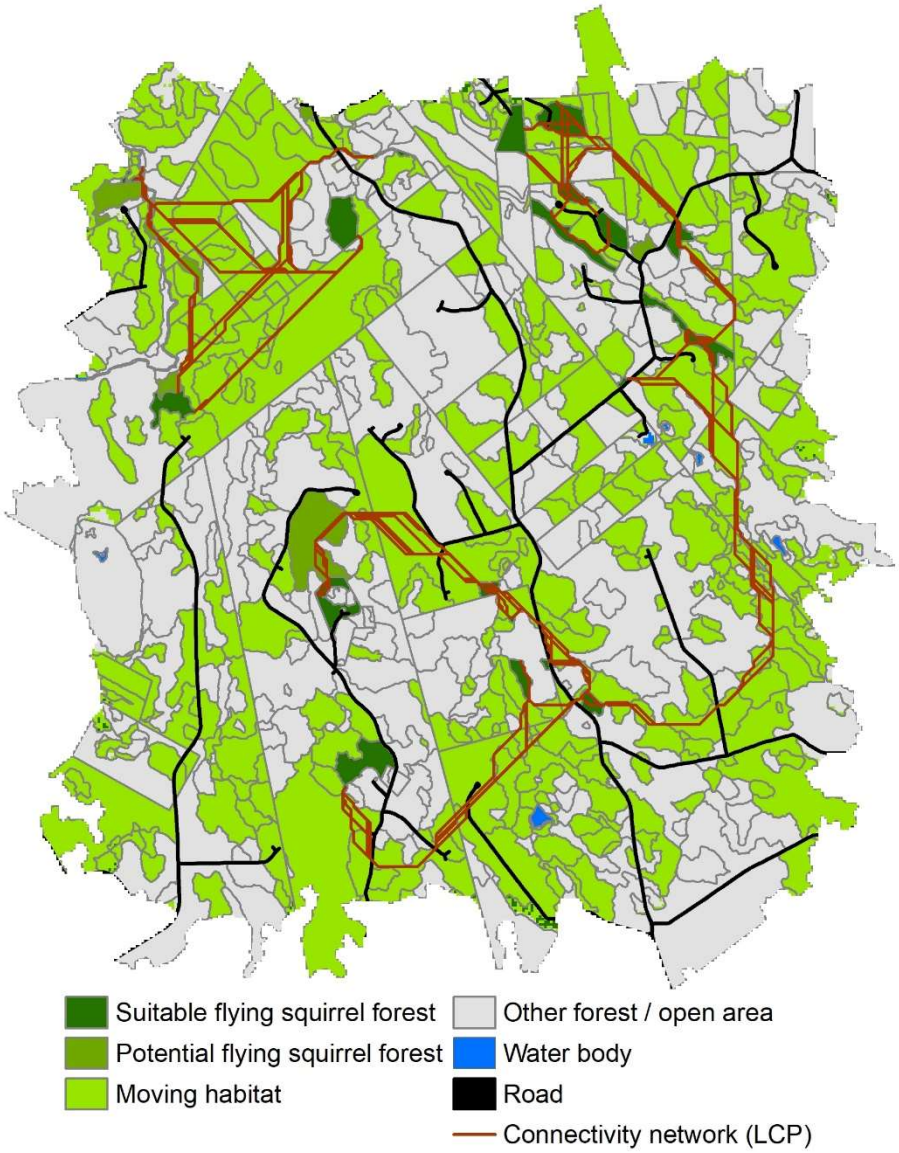
Map 1: Starting point (year 0 corresponding to calendar year 2021), a SFS suitability map of Syrjävaara. Total area 2 058 hectares.

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

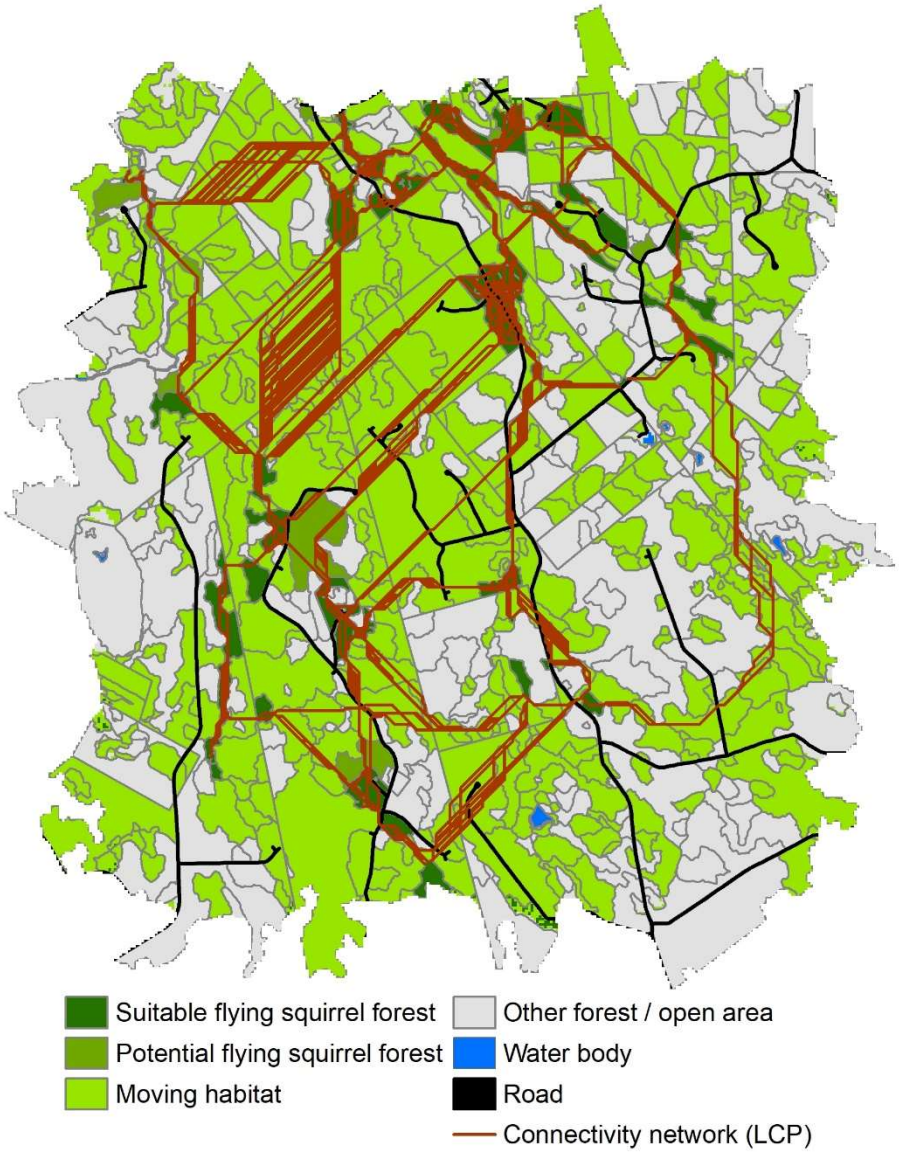
Map 3: A SFS suitability map of HMS4 management scenario, year 30.



Map 1: A SFS suitability map of Sipilänperä at starting point (year 0 corresponding to calendar year 2021). Total forest area 2 058 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 stands with large aspen. Compared to the starting point (year 0) the area suitable for SFS has increased app. 61 hectares (from 42 to 103) within the 30-yr time horizon.