

ACTION A.3.1: Illustrating the potential habitat network of the Flying squirrel

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Aim of the study – Action A.3.1

- “The aim of this action is to illustrate configuration of habitat network for the Flying squirrel in a landscape scale using habitat maps”
- “Habitat maps will be based on predictive habitat models using country-specific forest data and knowledge of occupied locations of the Flying squirrel, and the predictions will be evaluated using field checks.”



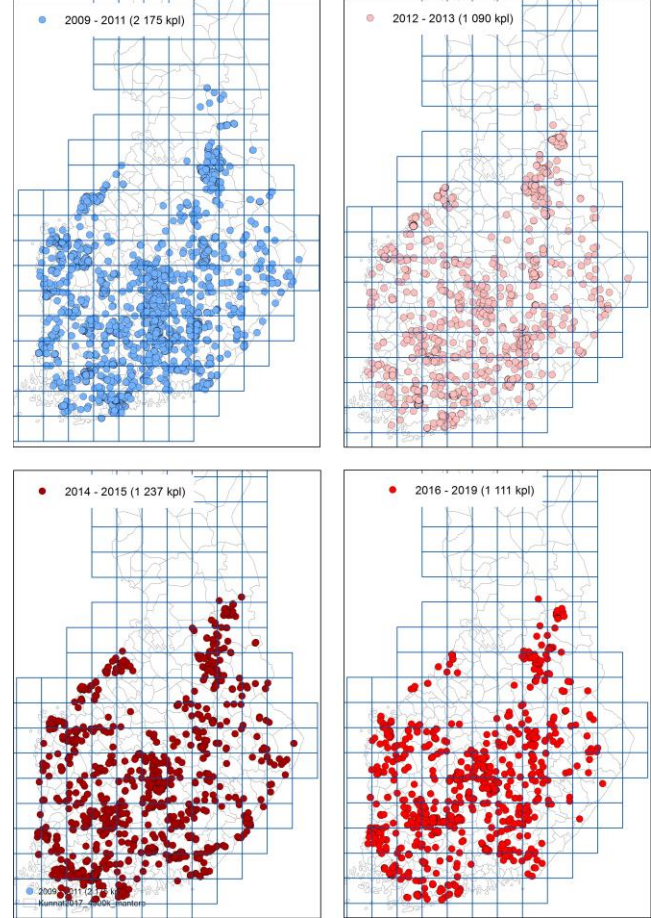
Why modelling approach?

- N. 59 000 observations of Flying squirrel in Luomus data base
 - Based on voluntary observations, research projects, official mappings
 - No systematic inventories covering the whole area of occurrence
 - Spatial bias and lack of information in data?
 - Still best available data!
- Flying squirrel short living species, 1-4 years
 - Natural variability in occurrence data
 - Model-based maps not dependent on the occurrence at some time point
- Protection of habitats basic principle in nature conservation



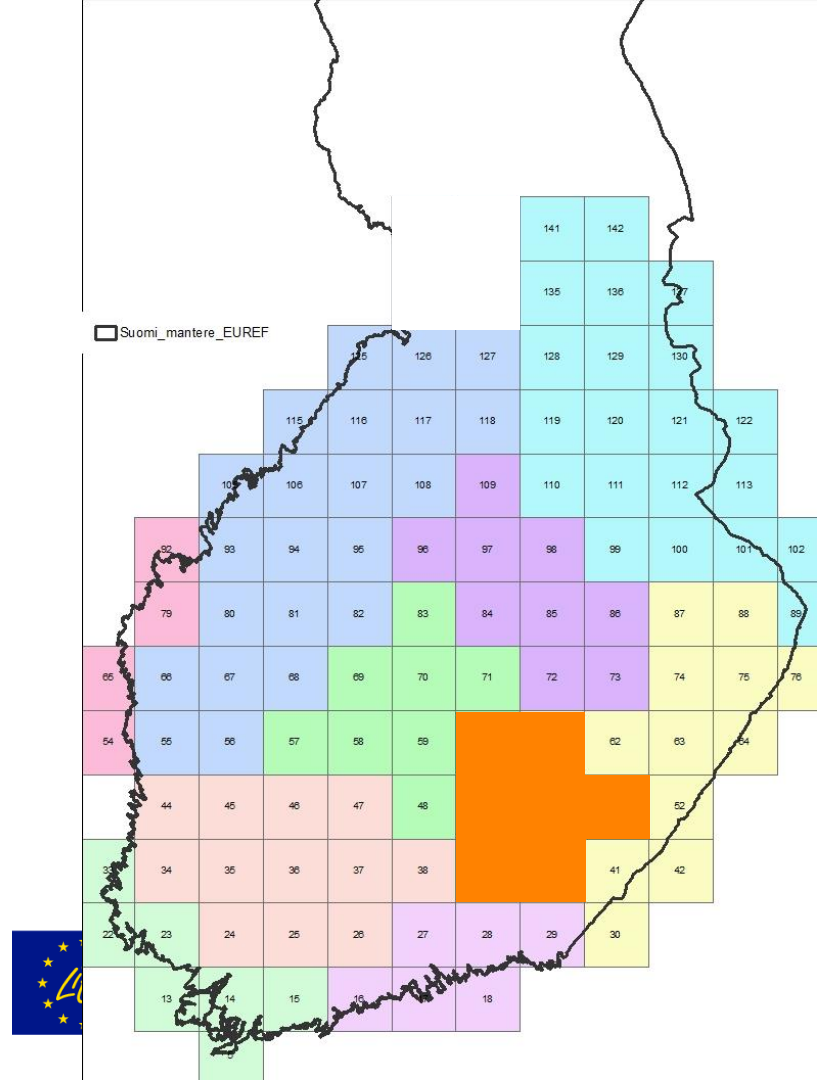
Flying squirrel data

- From Syke Eliölajit database
- 48490 lines of data, also habitats without observations of Fsq, covers data from 1980's till 28.8.2019
- Selecting Fsq data for modelling:
 - Data from 2009→
 - Removal of multiple obs from the same stand
 - Removal of obs from clear cut stands
- About 5400 observations for modelling



Division of areas used in modelling

- Combinations of 50 km × 50 km areas were used for classifying data and modelling
 - Several iterations with inclusion and exclusion of 50 km areas
- Final models were developed for 9 areas



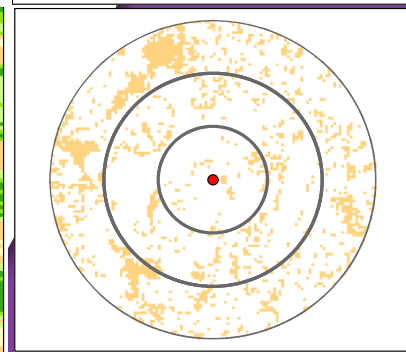
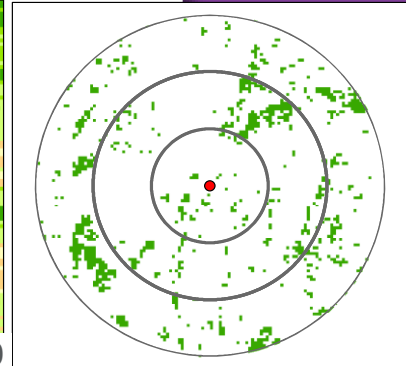
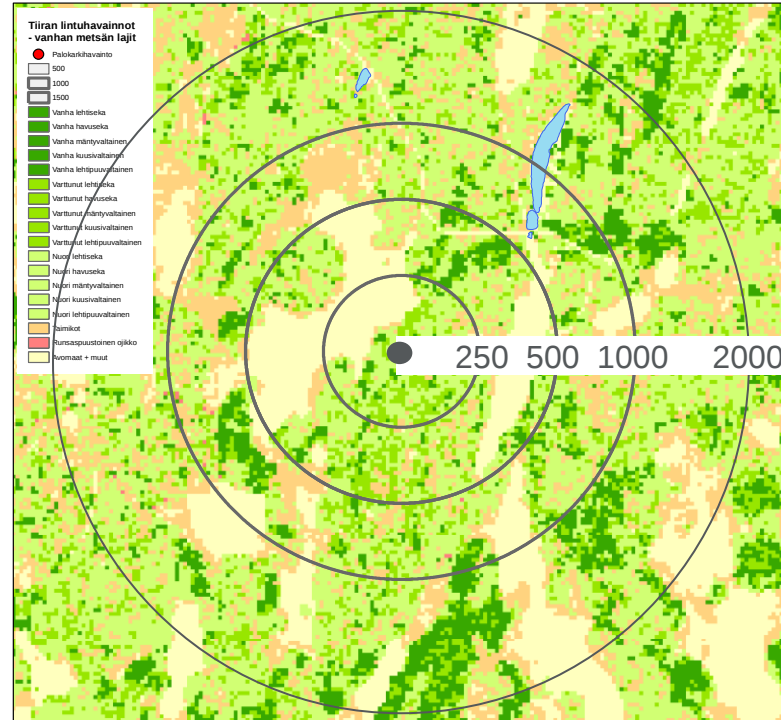
Forest and landscape data

- Multi-Source National Forest Inventory data (MS-NFI) from 2017 used
- Classification of data to
 - Flying squirrel breeding habitats (mature spruce with deciduous component)
 - Other mature and moving habitats (> 10 m high)
 - Open areas, plantations
 - Agricultural areas
 - Inhabited areas
 - Water



Landscape structure analysis

- Respective number of random points as there were Fsq points created for each area
- For each point, class and radii
 - %- of area (osuus, %)
 - Mean patch size (keskimääräinen laikkukoko, ha)
 - Patch density (laikkutiheys, kpl/100 ha)
 - Largest patch index (suurimman laikun osuus, %)



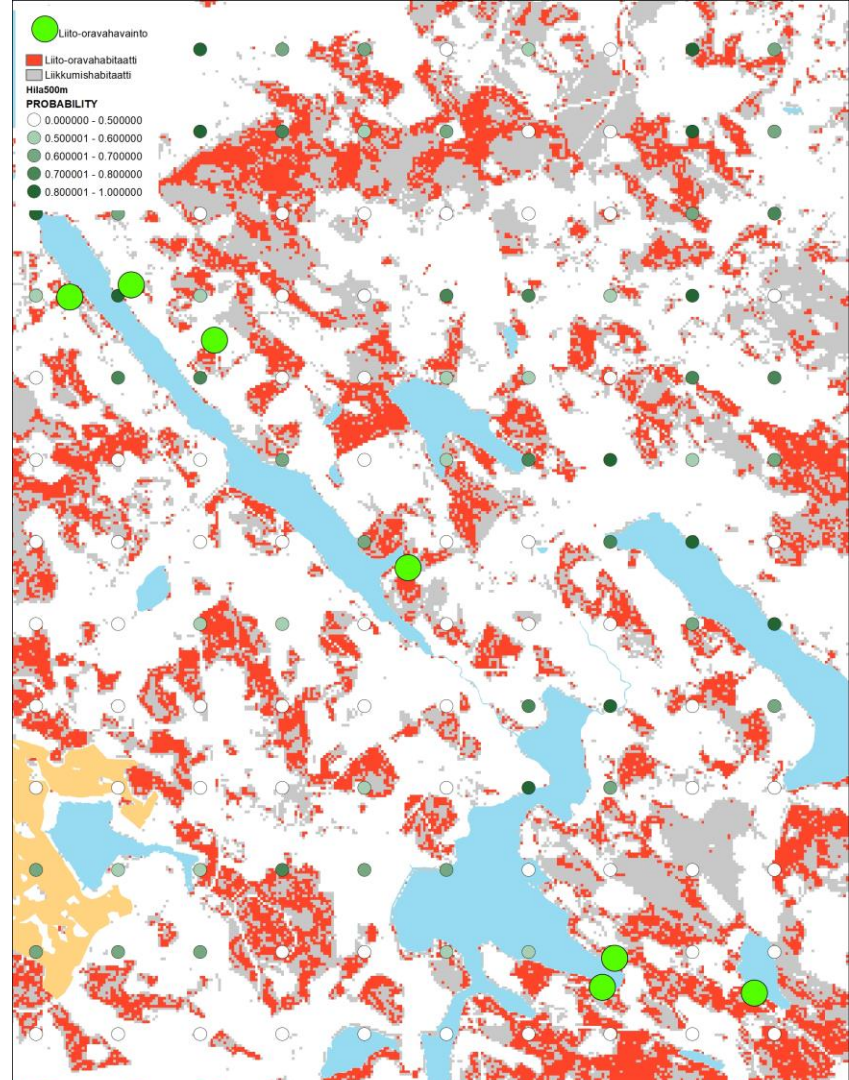
Statistical modelling with logistic regression

- In principle models presence-absence data (1/0)
 - Here we model presence vs overall landscape
 - Results in rather conservative models
- Result = probability for habitat suitability
 - No occurrence of species!
- Probability can be calculated to any point in Flying squirrel occurrence area

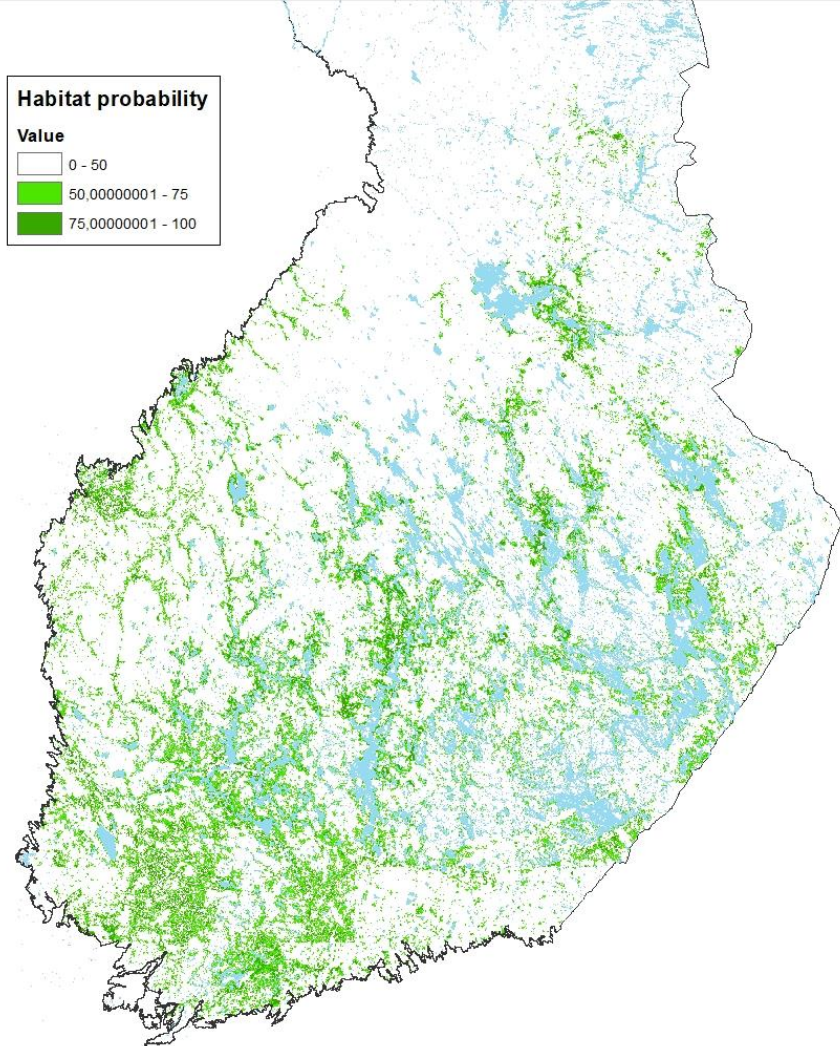
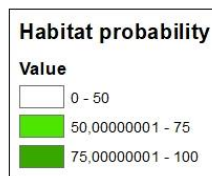


Model probabilities were calculated for every 500 m grid points for the whole area

- Probabilities further interpolated to 100 m cell size
- Can be interpolated to any cell size

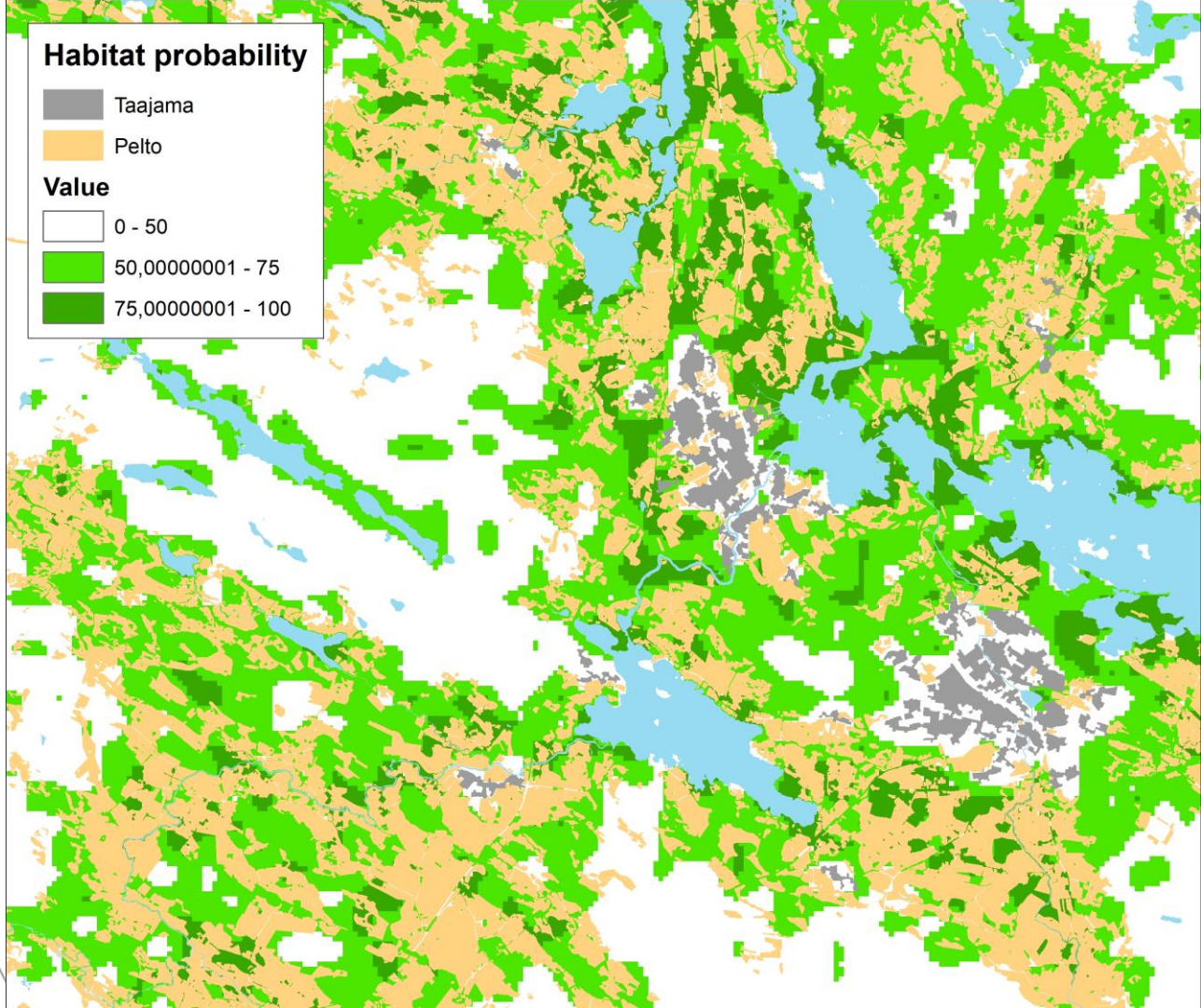


Wall-to-wall probability map



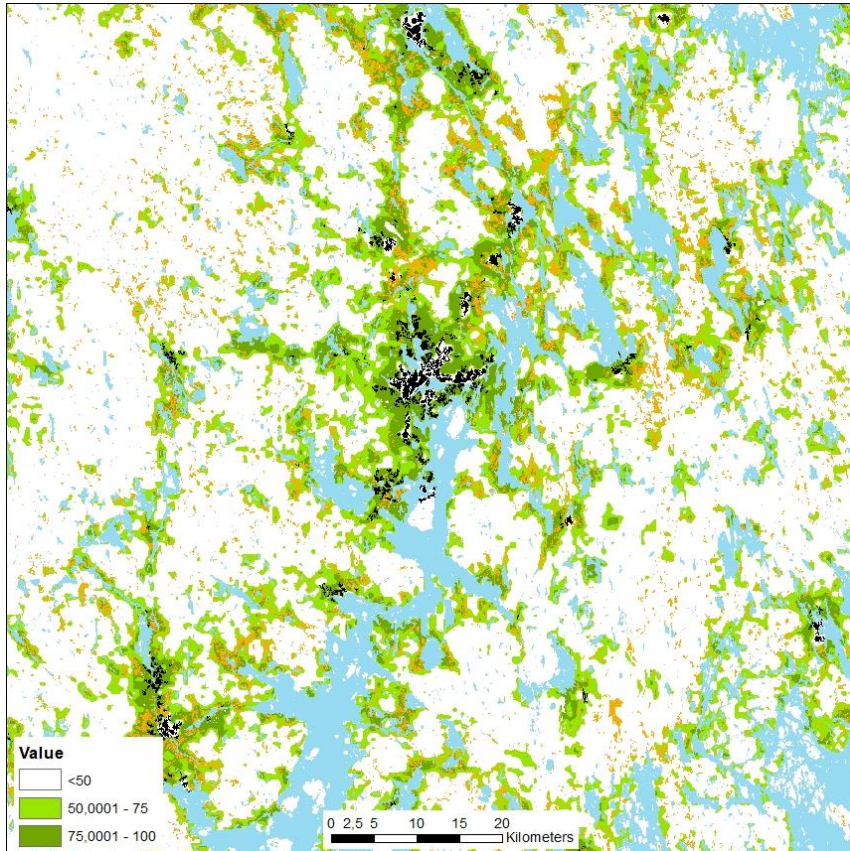
Probability map – close-up

- Built-up and urban areas from MML:n Maastotietokanta
 - Removed from modelling and predictions
- Waters removed from predictions
- Otherwise all 100 m areas with forest

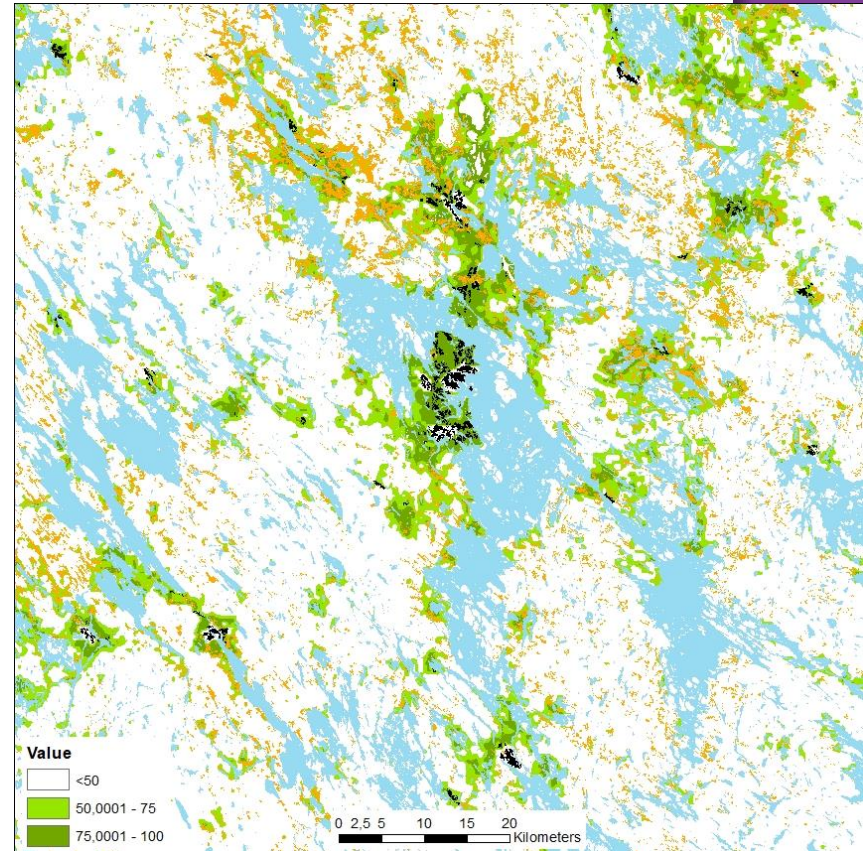


Model probabilities around some cities

Jyväskylä

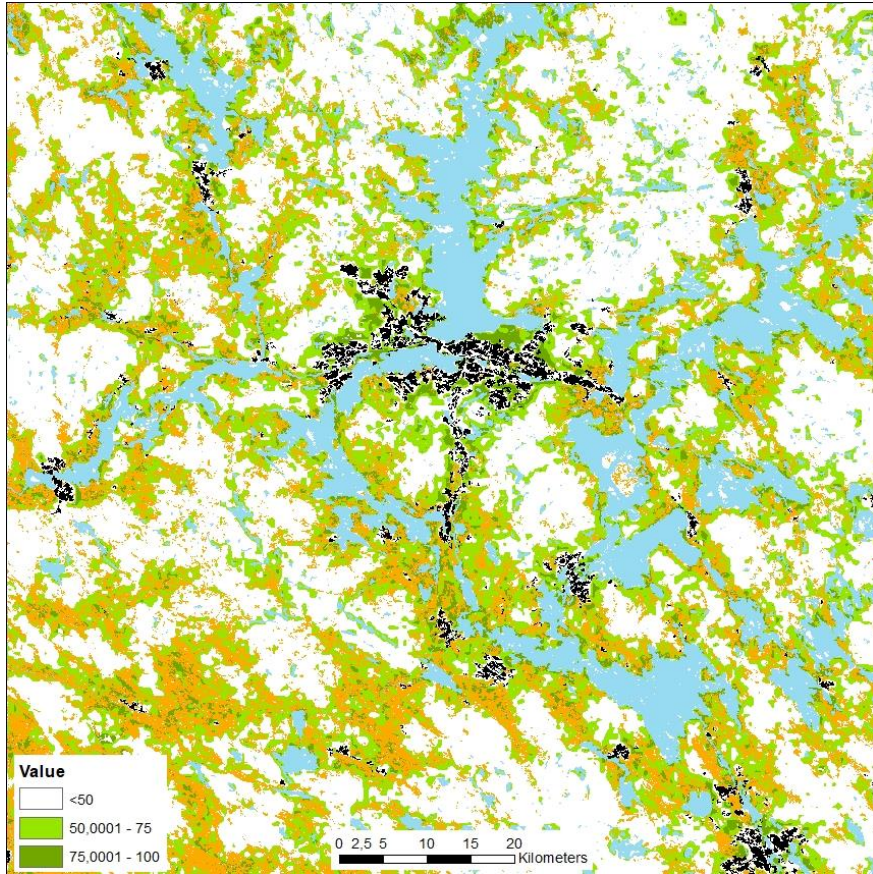


Kuopio

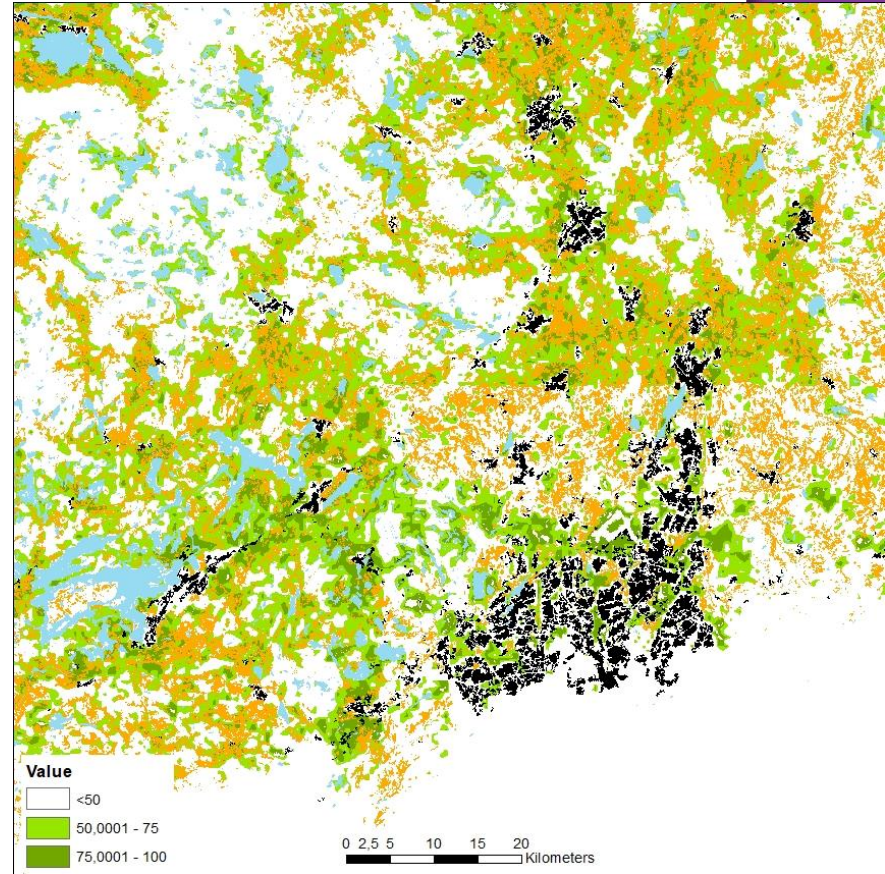


Model probabilities around some cities

Tampere



Espoo

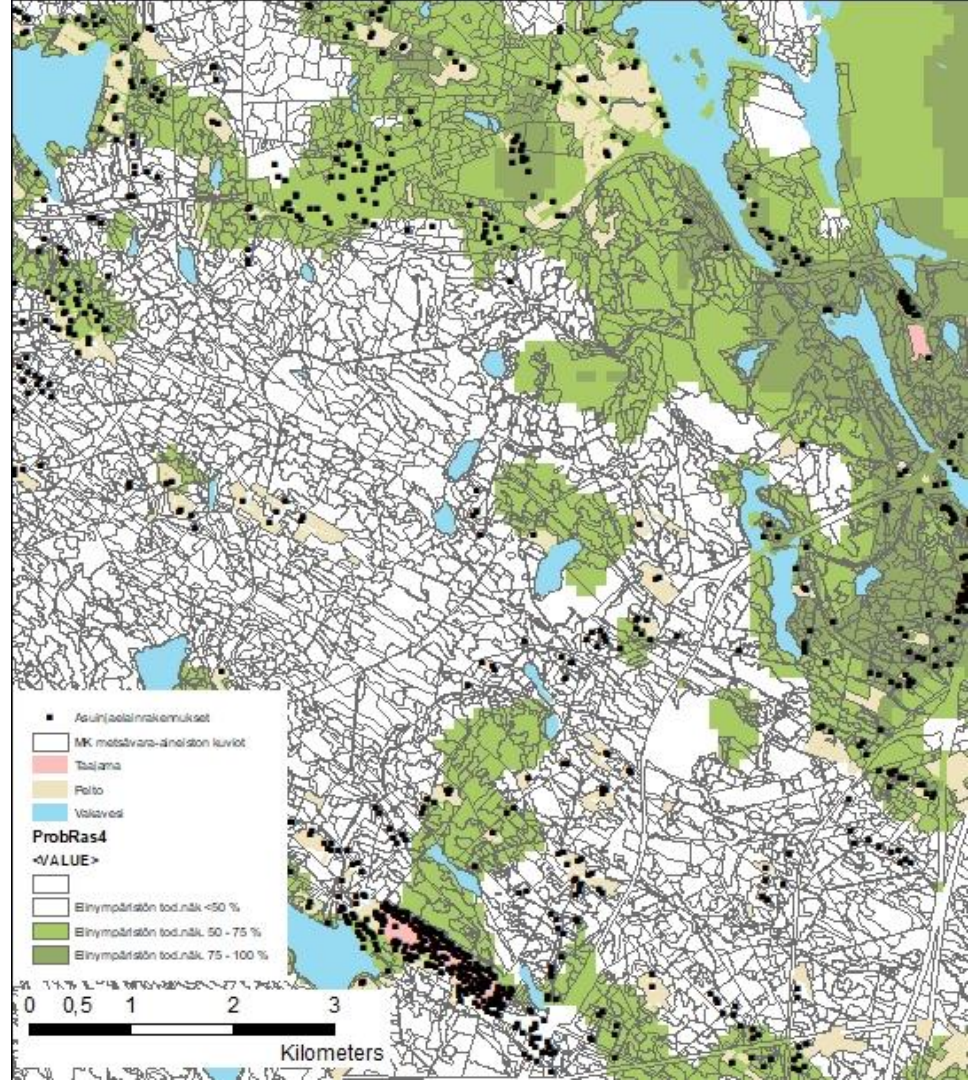


Predictive map and forest planning data

- Probabilities as part of multi-objective planning
- Dark green: prob $\geq 75\%$
- Light green: prob 50-74,999 %
- White: prob $< 50\%$

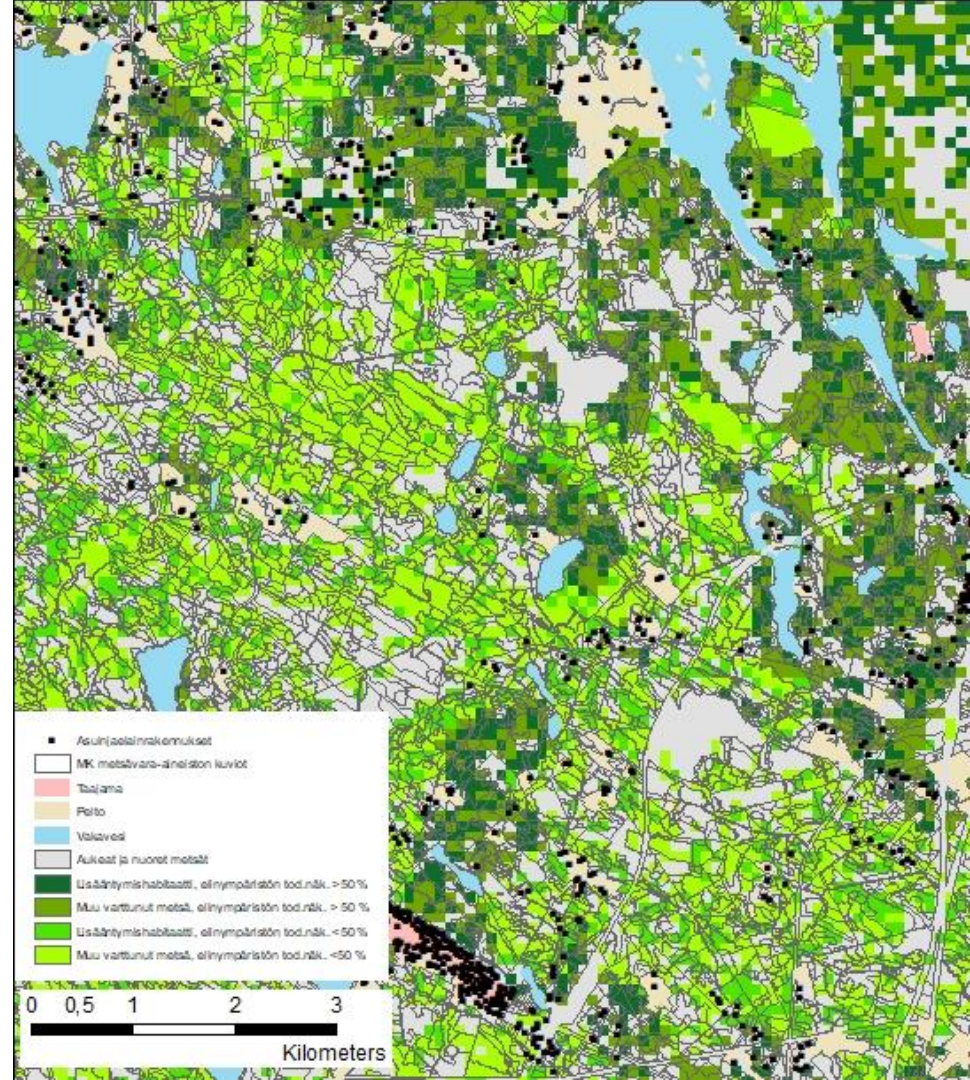


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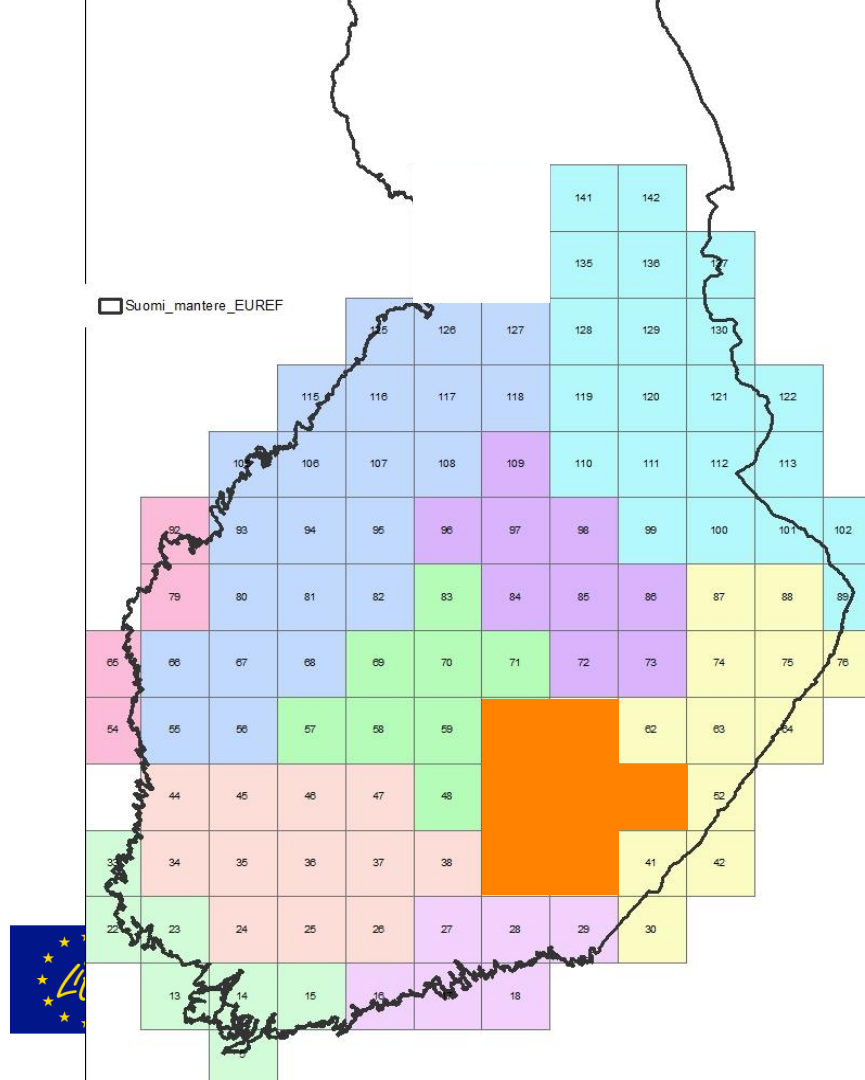
Linking habitat models with MS-NFI forest data

- Darkest green: **Forests** suitable for flying squirrel, $P(\text{model}) > 50\%$
- Second darkest green: **Forests** suitable for moving, $P(\text{model}) > 50\%$
- Darker light green: **Forests** suitable for FSq, $P(\text{model}) < 50\%$
- Lighter light green: **Forests** suitable for moving, $P(\text{model}) < 50\%$



Accuracy of models

- Overall accuracy, ROC-value 0,784-0,912
- Sensitivity 59,3 - 76 %
 - Predicts Flyins squirrel observations right
- Specificity 67,5 – 90,8 %
 - Predicts random points right



What model based maps can be used for?

- Large area planning
 - Green network infrastructures, other multi-goal planning
- Forest planning
 - As a part of multi-goal planning objectives
- Tool to monitor the development of Flying squirrel habitats in time
 - Requires repeated modelling with updated data
 - Understanding of the distribution of Flying squirrel habitata
- Targeted inventories of Flying squirrel
 - Field inventories still needed



Openness and availability of predictive maps

- Maps produced with public funding → open data
- Can be down loaded in GIS-format
 - Requires acceptance of licence and terms of use (=instructions)
- Does not contain any personal information
 - User responsible for linking personal data
- Description of data, methods, accuracy and other properties and terms of use are available

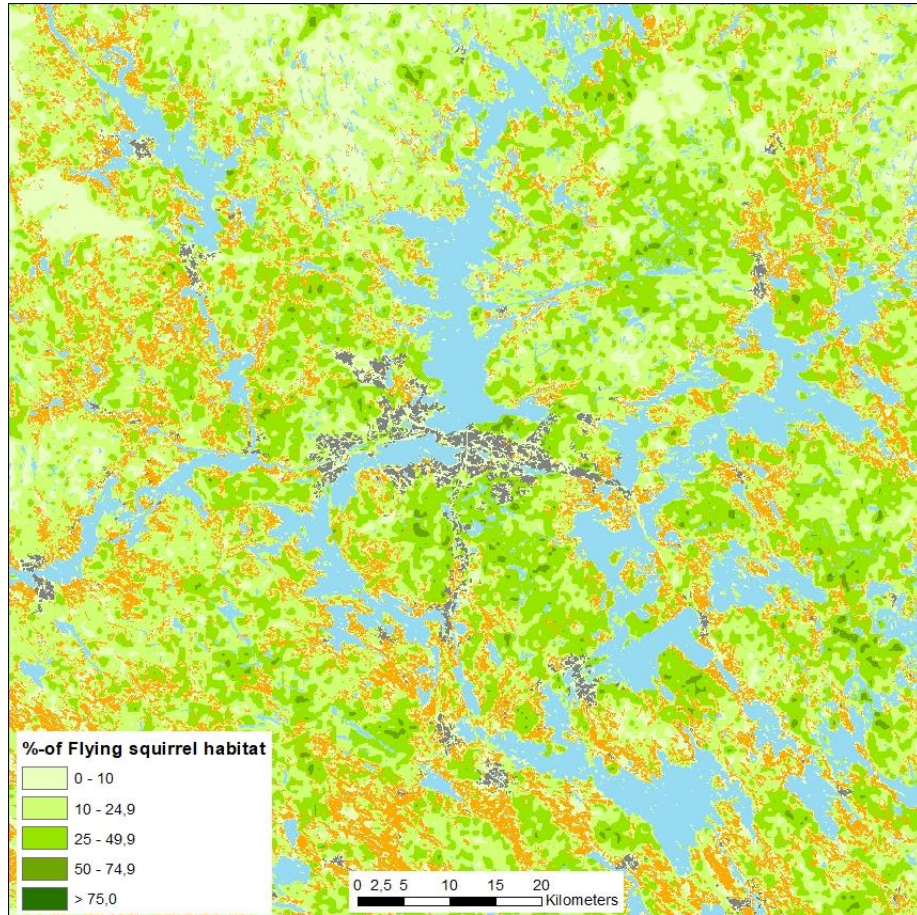


Thank you!

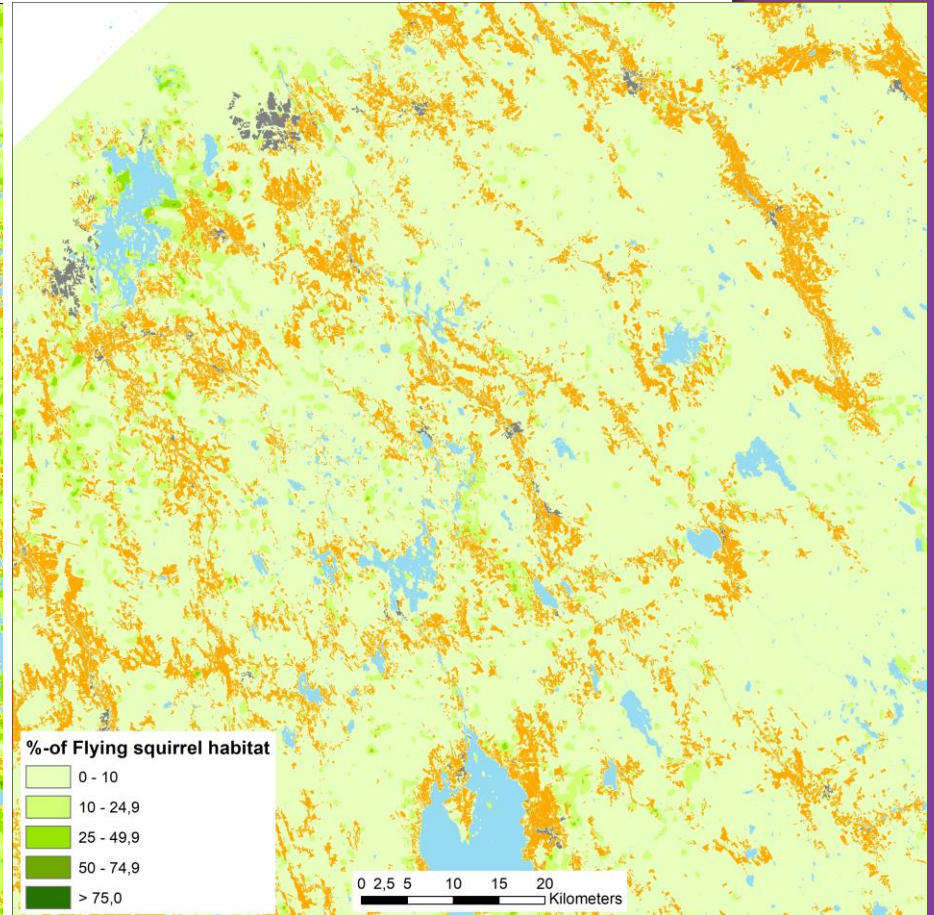


Proportion of Flying squirrel forests around some cities

Tampere



Kokkola



Proportion of Flying squirrel forests around some cities

Kuopio

Jyväskylä

