**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

Action A6: Preparation of plans to maintain habitat network within managed forests
Deliverable: Forest plans for Finnish private and state-owned forests
Project publication
Date: 31.3.2025

# Forest use plans for private forests in Finland: maintaining habitat networks on private land

Action A6 within the Flying Squirrel LIFE project included 28 project sites located in private forests. This document contains summaries of the following:

- **Action A6:** Preparation of plans to maintain habitat networks within managed forests
- **Action C2:** Maintaining habitat networks in managed forests
- **Action D1:** Monitoring the conservation actions

These actions are linked to the project objectives *"Preventing the loss and fragmentation of habitats"* and *"Enhancing cooperation and developing operational models."* The project sites are not part of the Natura 2000 network and do not include Natura 2000 habitat types. Public summaries of 21 private sites are shown in this public summary. The project sites presented in the management plans serve as concrete good examples of how a forest structure favorable to the flying squirrel can be maintained in commercial forests, ensuring the preservation of essential habitats for the species well into the future. These summaries serve as examples of good forestry practices near flying squirrel habitats.

The responsibility of making forestry plans to private project sites was on the Finnish Forest Centre (Suomen metsäkeskus, SMK), although many professionals representing several project partners and nature conservation authorities participated a joint planning process that was developed for the project. Site plans were prepared during 2019-2021. At the beginning of the project, the lead planner identified the landowners' objectives and gathered forest data for each site. Simultaneously, a nature surveyor (an expert from the Finnish Association for Nature Conservation or an experienced entrepreneur for flying squirrel inventory) conducted baseline surveys for the flying squirrel in all sites, covering also close neighborhoods of them. The lead planner then began drafting the management plans, and input was also sought from the local ELY Centre (an authority for nature conservation legislation) to support the planning process. Drafts of the management plans were reviewed collaboratively, and adjustments were made as necessary. The drafts were refined in cooperation until they were, for the most part, approved by all project partners and the local ELY Centre.

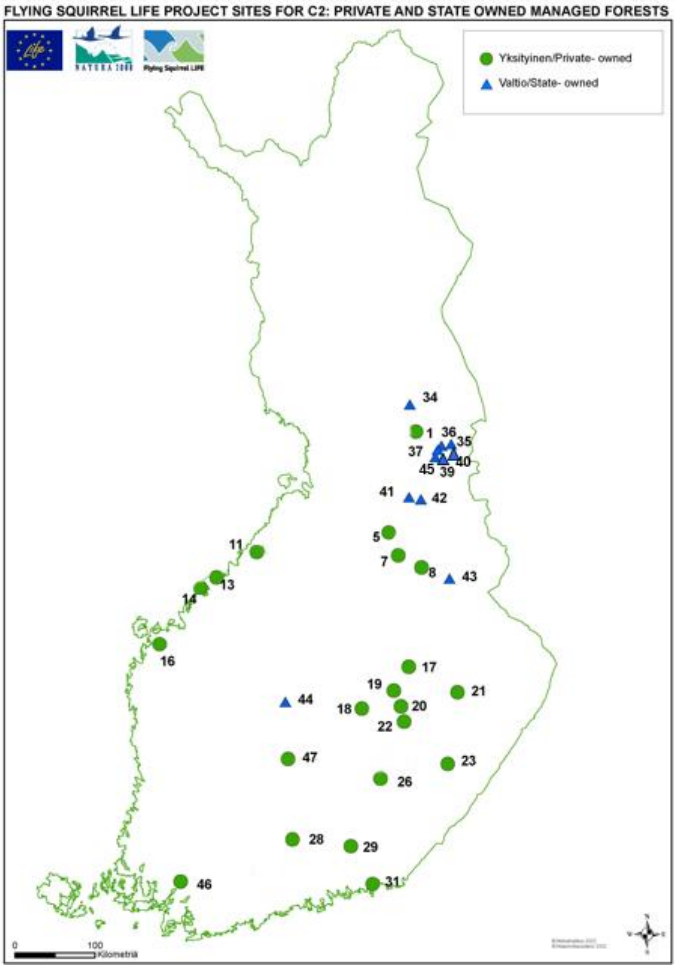
Site-specific solutions were designed to secure the flying squirrel's future, ensuring the availability of nesting sites, feeding areas, and movement corridors. Special care was taken not to destroy or degrade flying squirrel breeding or resting sites, thereby preserving their ecological functionality. Outside these key areas, various forestry methods were used but often with a more careful way than usual. In many cases, efforts also supported the long-term development of suitable habitats, for example, by encouraging the growth of aspen and other deciduous trees. At each area, the aim was to maintain several hectares of forest for the flying squirrel. Research findings suggest saving 4-6 hectares of forest for the flying squirrel but there are no official rules for the amount of hectares to be left unmanaged. The decisions for the flying squirrel are done case by case.

The finalized management plan was handed over to the landowner, who implemented the plan under supervision of SMK. Careful forestry measures were done in 19 private sites. Some project sites required no interventions, while in others, even voluntary METSO conservation agreements were adopted. In total, 6 sites were at least partly protected using temporal agreement of the METSO program. On 3 sites, no management was yet done during the project based on landowners' decisions. The plans covered about 508 hectares together.

After the baseline inventory, project sites have been monitored (D1) annually for flying squirrel presence and the effects of forest management during the project period until spring 2024. After the project, monitoring continues under the responsibility of the landowner. Observations made of the flying squirrel remain permanently in the national species data base, and will be considered in the future according to the nature conservation legislation.

## Project sites used in the action chain A6–C2

There were 37 project sites in this project action consisting of both private and state-owned sites. Seven sites are not public, so the map below shows 30 project sites. Public summaries of private sites are shown in this document, and summaries of state-owned sites are described in a separate publication. Project publications are found in the website of the Flying Squirrel LIFE project.



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There were 28 private project sites in the Action A6. The size of planning sites vary a lot. When possible, the aim was to maintain at least a few hectares of forest for the flying squirrel as a habitat but also for feeding areas and moving connections.

Summaries of plans at 21 sites are presented (7 sites are not public).

1 Taivalkoski
5 Paltamo
7 Kajaani
8 Sotkamo
11 Kalajoki
13 Kokkola
14 Luoto
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21 Liperi
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**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: TAIVALKOSKI

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **Opinmaa**
Municipality, region: **Taivalkoski, Northern Ostrobothnia**
Country: **Finland**
Size of the project area (ha): **47**
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

The Taivalkoski project site is currently owned and managed by Metsähallitus. The forest was included in the project as a private land site, and its planning has remained the responsibility of the Finnish Forest Centre. The project site covers approximately 47 hectares, primarily consisting of old forest with abundant deadwood. The area also includes some peatland and birch-dominated young forest.

An old flying squirrel observation was made in stand 1. In the surveys done in 2019 and 2020, no signs of flying squirrels were found on the site. In the spring of 2021, a significant amount of droppings were found in stand 3. The vegetation in stand 3 is dense and consists of sturdy spruce, birch, and aspen. Although no nests or trees with cavities were found, one is likely to exist on the site.

Suitable nest trees, particularly sturdy and old aspens and birches, are present in stand 3. Foraging trees are found throughout the project site, excluding the southern edge where there is little deciduous tree cover. Young alder, located along the edge of stand 3, could also serve as a foraging area. Future foraging areas include stands 12 and 14 on the east side of the forest road.

The nearest neighbour observations of flying squirrels are approximately 1 km northeast at the shore of a lake and 3 km to the north. These sites were empty in the 2019 survey.

## Forest Owner's Objectives

The goal for the vocational school was to conduct carefull thinning on the site. However, based on the additional inventories and observations there are significant conservation values on the site. Thus, no harvesting is proposed near current or past flying squirrel observations.

## Planned Measures - Action A6

Thinning and clear cutting were the selected forestry measures on the project site. Thinnings were done on the eastern parts of the site. The thinnings on birch-dominant stands were carefull as the goal was to enable the growth of smaller spruces to provide shelter for the flying squirrel in future. The thinning volume differs between 35-40 m3/hectare.

Clear cutting was planned to one mature spruce dominant stand to promote mixture of deciduous trees in the future. However, the Paula-storm in summer 2021 felled most of the trees on that particular stand and the clear cutting was changed to cutting the trees felled by the storm. Finnish Forest Damages Prevention Act requires removal of damaged trees when the amount on damaged spruce trees is more than 10 solid m3/hectare or if the amount of damages pine trees is more that 20 m3/hectare.

In removing the damages spuces and pines all birches were left to grow to enable mixture of deciduous trees to remain and regenerate on the area. After the removal of the damaged trees the forest compartment will be renewed by planting a mixture of spuce and pine trees. There are currently no aspen growing on the stand.

## Consideration of Flying Squirrel in Future Actions

No logging will be conducted in stand 19 as it serves as a moving connection to the east and neighbouring habitats. Other moving connections will be secured according to map 1. Forest owner will refrain from cutting forest stands with previous or current flying squirrel observations. In the future, mixed stands with deciduous and coniferous trees will be favored in forest management measures on seedling stands.

## Action C2

The plan had to be revised after Paula-storm in summer 2021. The storm hit the intended clear cut area, so the modifications to the plan were minimal. The intended clear cutting was changed to removal of damaged trees. The planned regeneration and forest management were possible even after the storm. The thinnings were carried out according to the plan created in action A6 in 2020-2021.

## Action D1

Annual flying squirrel inventories are carried out during the project in 2021-2024. Flying squirrel was present there during the 2021 and 2023 inventories.

## Monitoring after the project

Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conserva-tion effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

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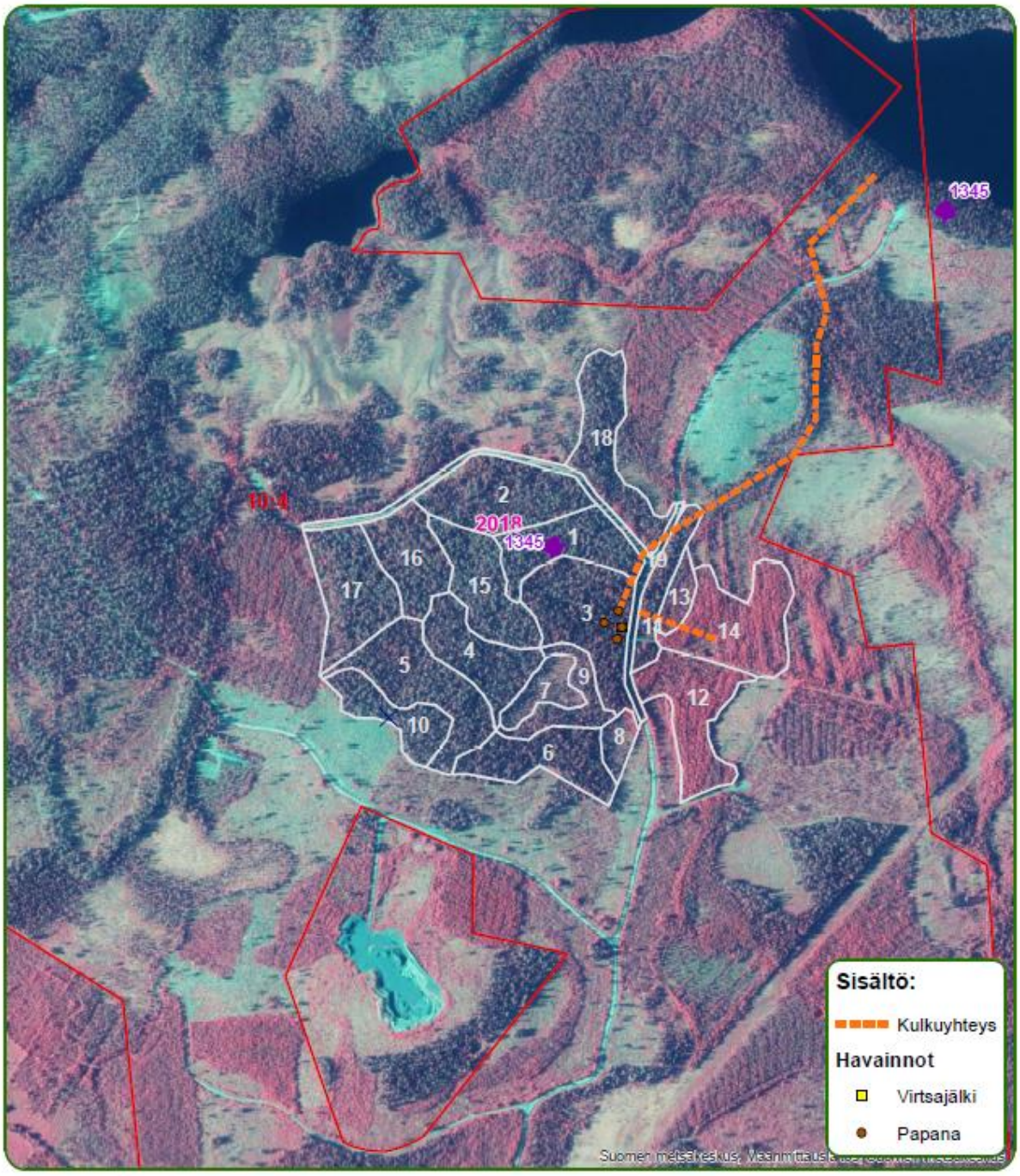


Liite 6. Vuonna 2005 kartoitetut naapurialueet ja puustoiset kulkuyhteydet (ilmakuva).

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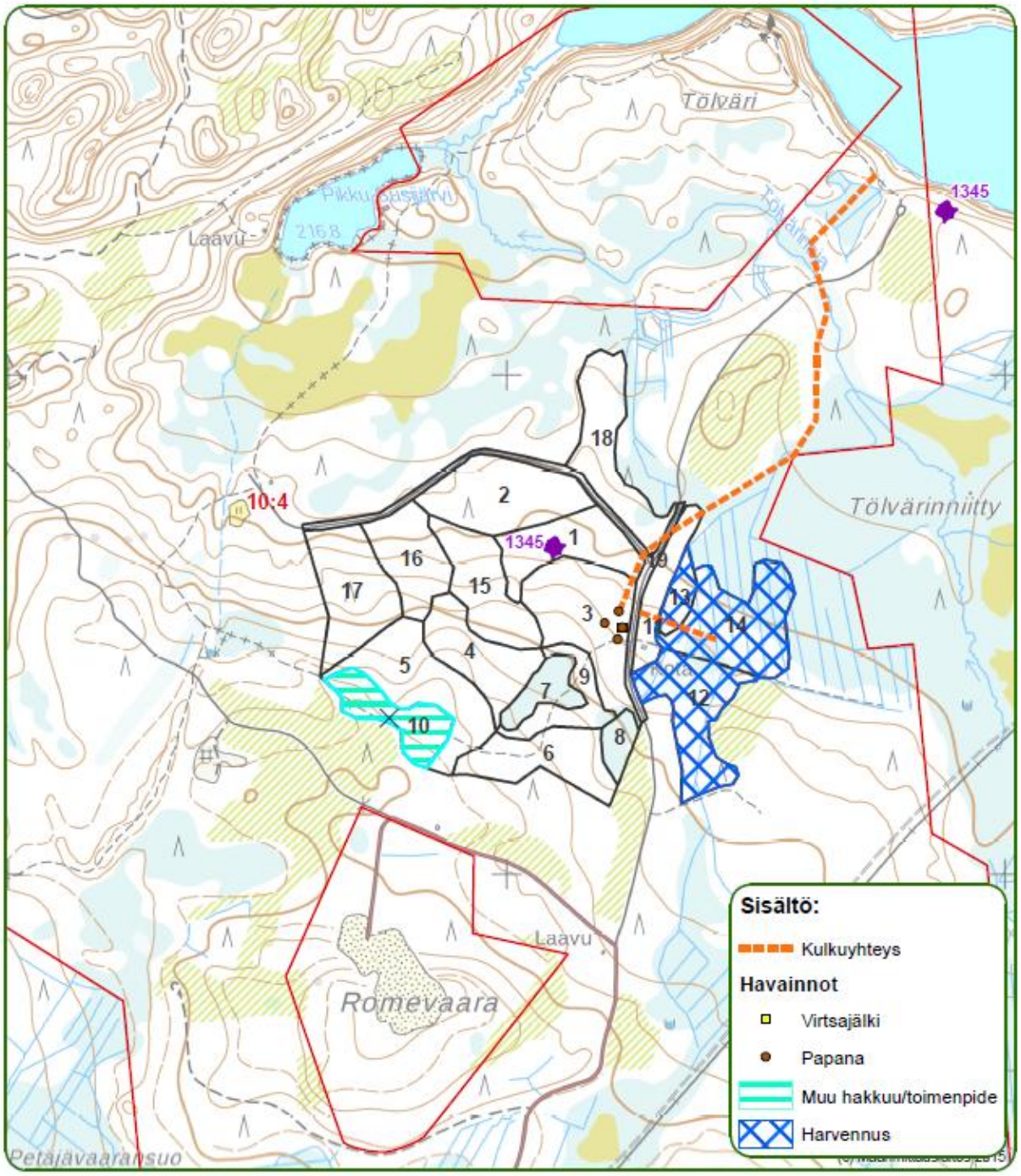


Liite 6. Vuonna 2005 kartoitetut naapurialueet ja puustoiset kulkuyhteydet (ilmakuva).

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**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: PALTAMO

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **Metsä-Kainuun yhteismetsä**
Municipality, region: **Paltamo, Kainuu**
Country: **Finland**
Size of the project area (ha): **1,4 ha**
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

The project site is located in Paltamo municipality, Kainuu, Finland. The site is a narrow and elongated 1.4-hectare wooded area situated between a lake and roads. The stand is an old mixed forest with some aspen and alders in the shoreline. The stand consists of diverse-aged and variable-sized trees, including large old spruces. There is abundant deadwood in the stand. The site's habitat is characteristic of a moderately-rich upland. The stand meets the significant criteria for a heath forest of Class I in the Metso program for biodiversity.

In the project site are two old flying squirrel observations from 2010 and 2011. In the 2019 survey, no fresh signs of flying squirrels were found, but traces of urine from previous years were observed on several logs. The stand also includes a brush nest, tree cavities, two nest boxes, and one open nest box. The area borders a conservation area to the south, where pellets was observed during the survey.

In the survey area nested Eurasian pygmy owl. According to the surveyor, the owl likely influenced the absence of flying squirrels in the area at present. Along the lake shore in nearby areas, there are numerous old observations of flying squirrels. The narrow forest strips along the lake form a corridor between the occurrence areas. To the east of the site, there are old flying squirrel observations 2-3 kilometers away.

## Forest Owner's Objectives

The landowner was aware of the old flying squirrel observations in the area and their restrictive impact on forest management. However, the landowner wants to utilize the area economically in some way. The options considered are logging and conservation. During a field visit, it was noted that due to the small size of the area, the presence of flying squirrel observations, and the sensitive lakeside location in terms of landscape and wind conditions, logging would be difficult and economically low-value. The landowner stated that conservation is the preferred option, but the logging option will also be explored.

## Planned Measures - Action A6

The options of conservation and logging were explored for the site. The landowner chose conservation. A temporary 10-year conservation via Kemera environmental support from the Forest Center. The temporary conservation is valid from 2020 to 2030.

Possibilities for Conservation

Two conservation options were considered for the area: permanent conservation according to the Metso program through the ELY Center or a ten-year temporary conservation through the Finnish Forest Center. When exploring the option of permanent conservation with the ELY Center, it was revealed that the area is unsuitable for the ELY conservation program mainly due to its small size. However, the Forest Center's temporary conservation is well-suited for the area in terms of its quality and size.

Logging Option

At present, there are no fresh signs of flying squirrels in the project site. However, the area is within the squirrel's habitat, serving as a moving corridor between habitat areas. The logging plan will be designed to maintain the area as a usable flying squirrel habitat and a potential breeding and resting area without deteriorating the connectivity between forest areas.

A potential logging area could cover approximately 1.1 hectares in the central and southern parts of the stand. The logging method will be selective cutting, where no more than half of the stand is removed. The focus will be mainly on pine and birch, with no species completely removed. The alder zone bordering the shore will be left untreated. There is age and size variation, especially in spruce, which will be preserved during logging. Aspen will be spared.

Tree cavities, nest trees, brush nest trees, and trees with traces of urine will be preserved and marked before logging. The basal area of the stand is 34.6 $m^2$, and the wood volume per hectare is 274 $m^3$/ha. The total wood volume of the stand is 372 $m^3$. Estimated logging volume: 150 $m^3$.

## Action C2

Landowner chose conservation, a temporary 10-year conservation contract. The temporary conservation is valid from 2020 to 2030. Loggings were not executed.

## Action D1

Annual flying squirrel inventories Were carried out during the project in 2021-2024. Flying squirrel occupied the area in 2019 and in 2023.

## Monitoring after the project

Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

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## Sisältö

- Papana
- Pot. pesä
- Virtsajälki
- Aikaisempi havainto
- Kulkuyhteys
- Luonnonsuojelualue
- Suojelu, korvattu

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: KAJAANI

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **Kajaani**
Municipality, region: **Kajaani,** Cajania
Country: **Finland**
Size of the project area (ha): 42 ha
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **No**

## General description of the area

The project area is bordered in the north by a power line, in the east by a road, and in the west by a recreational trail. In the eastern part of the area, there are a few buildings and small ponds. The area also features a golf course and outdoor trails.

A field survey was conducted at the site in May 2019. During the survey, several nests used by flying squirrels, droppings, urine marks, and feeding areas were found (Map 1). Both old and new droppings were discovered in the area. The Hertta database contained a total of five previous records of flying squirrels from the same location.

The data collected during the surveys was refined during a field on October 19, 2020, as well as during a field visit on November 17, 2020.

The surveys did not map neighboring habitats. The nearest Hertta records are located 600–1000 meters from the project area (Appendix 5). About two kilometers south of the project area, numerous flying squirrel observations have been made near the center of Kajaani.

In the north, the power line hinders the movement of the flying squirrel. The power line is approximately 24 meters wide near areas 12 and 13. Elsewhere, the width of the line is around 35 meters. The flying squirrel might be able to cross the line where the largest trees are located. For the future development of the area, it is important to preserve the wooded areas of sections 2, 13, and 14, as long as they do not pose a risk to the power line. Sections 10, 11, 12, and 23 are also important for crossing the power line.

## Forest Owner's Objectives

The project area is the teaching forest of the Kainuu College. The area serves as a recreational space for city residents and includes several trails, ski tracks, and a golf course. The site takes into account forestry management needs, the habitat of the flying squirrel, landscape, recreational use, and the educational needs of the college.

## Planned Measures - Action A6

No logging will be conducted at the site. Small-scale management measures will be carried out in the area. Below are the plot-specific restrictions on potential future management activities and considerations for the flying squirrel during these measures.

**Plots 22 and 24.1**

Plot 22 (approximately 1 ha) contains a breeding and resting area for the flying squirrel, as well as a corridor leading to a feeding area on the shore of a pond. The corridor is important for both the landscape and recreational use of the area. Plots 22 and 24.1 will be excluded from any interventions.

**Plot 27**

This 1.46 ha plot is dominated by spruce, with some pine and mainly downy birch as mixed species. In 2008, droppings and nests were observed along the stream. At that time, the ELY Centre issued a statement that logging in the area was not possible. During the 2019 survey, a few droppings were found in the plot, but no nests were discovered. The plot serves as a corridor for the flying squirrel towards the southwest.

The plot will be excluded from management activities in accordance with the ELY Centre's statement. Based on the statement, logging would only be possible in a small part of the plot. However, the landowner has decided to leave plot 27 entirely outside of any interventions.

**Plot 33**

A lakeside plot that serves as a feeding area for the flying squirrel. The tree stand is dominated by grey alder, with large spruces and downy birches farther from the shore. A trail leading to the golf course runs along the southwest shore of the pond.

For safety reasons, decayed grey alders will be felled along the trail. The felled deadwood can be left on the plot as decomposing wood. Healthy spruces and deciduous trees will not be removed.

**Plots 19, 28, and 29**

No logging is planned in the near term for plots 28 and 29, even though there are logging opportunities based on the tree stands. These plots are important as corridors for the flying squirrel, as well as from the perspectives of landscape and recreational use. Plot 19 contains a golf course and young forest.

On the boundary between plots 19 and 28, there is a dense, young grey alder thicket, which is marked on the map as a potential future feeding area. By thinning the alder thickets along the edge of the golf course, the development of feeding areas suitable for the flying squirrel can be promoted. This thinning can be carried out as student work using clearing saws at the vocational school. Elsewhere along the edges of the golf course, young grey alders are also growing, which could develop into suitable feeding areas.

### Action C2

Not all the planned loggings will be executed, landowner chose conservation partly.

### Action D1

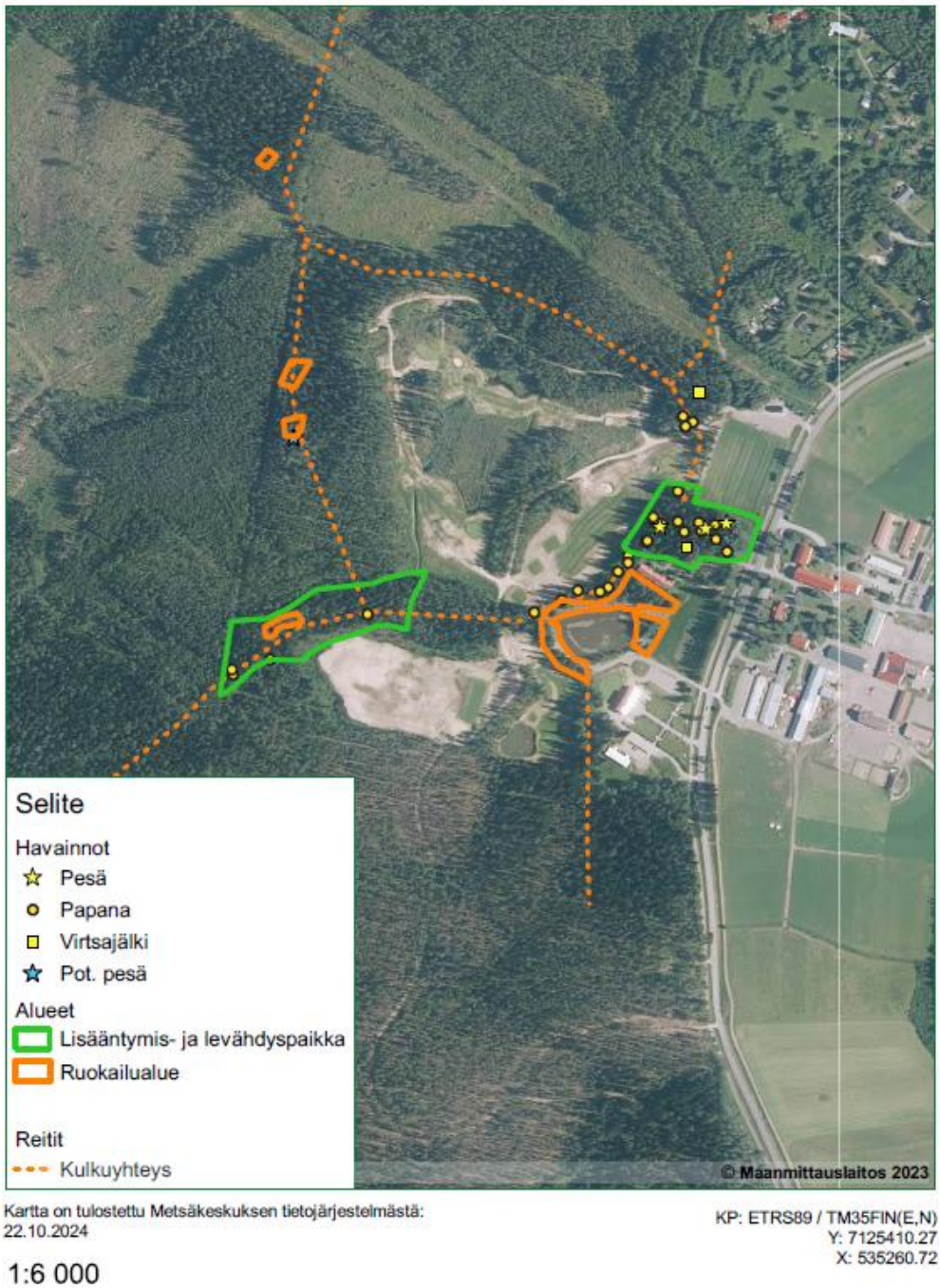
On base-line inventory there were marks of flying squirrel in the area. During the annual flying squirrel inventories in 2021-2024 there were no more findings.

### Monitoring after the project

Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

### Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.




Kartta on tulostettu Metsäkeskuksen tietojärjestelmästä:
22.10.2024

KP: ETRS89 / TM35FIN(E,N)
Y: 7125410.27
X: 535260.72

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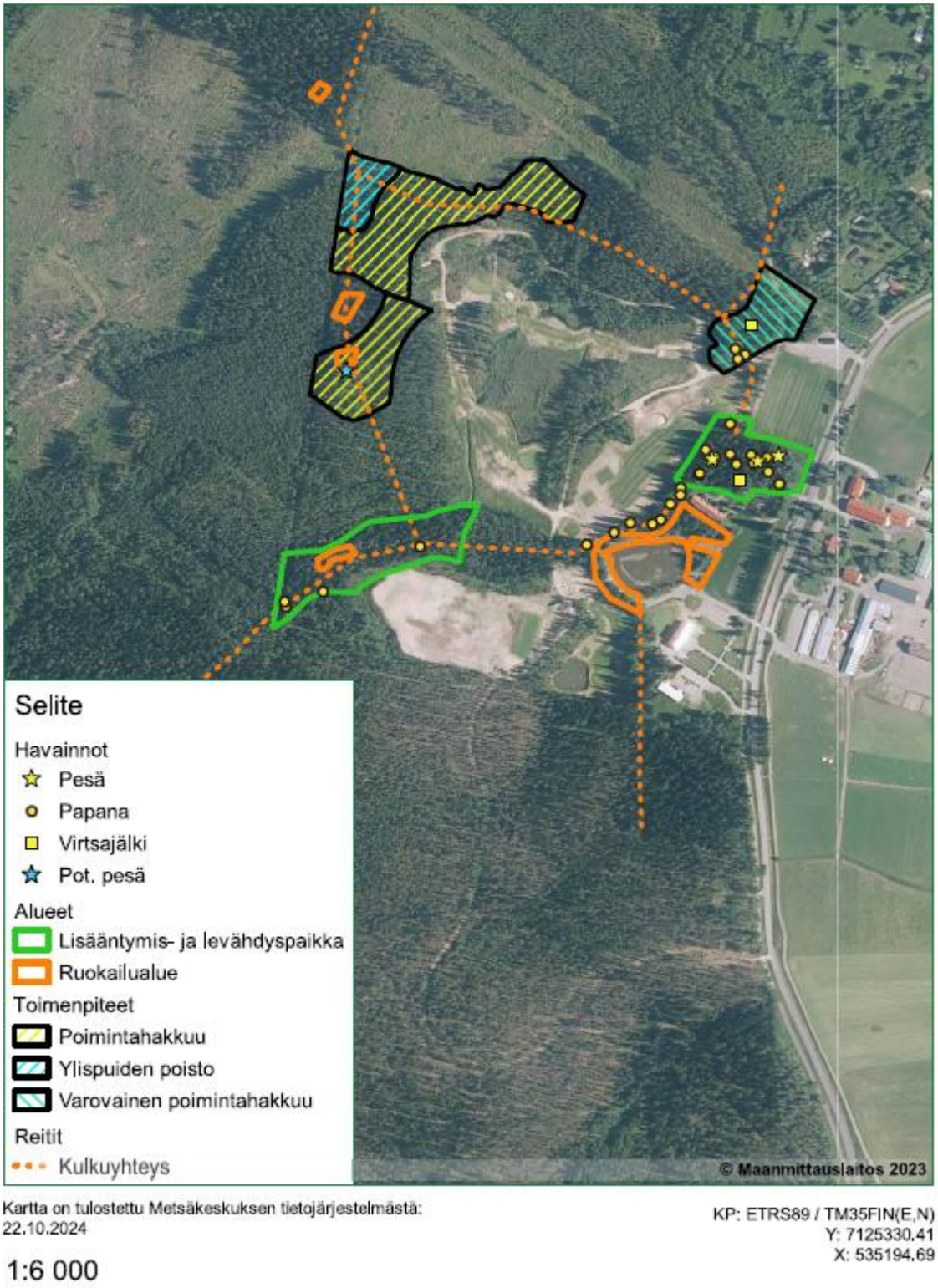
**Map 1. Flying Squirrel Observations and Movement Routes.**




Kartta on tulostettu Metsäkeskuksen tietojärjestelmästä:
22.10.2024

1:6 000

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**Map 2. Logging themes and moving routes**

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: SOTKAMO

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **8**
Municipality, region: **Sotkamo,** Cajania
Country: **Finland**
Size of the project area (ha): **34 ha**
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

Project site of a private forest owner in Sotkamo. A public road divides the selected plot for the project. A stream flows across the plot towards the nearby area. The plot has an area of approximately 34 hectares and is mostly surrounded by forested areas. The northern/northeastern corner of the plot borders a road and a field.

A field inventory was conducted at the site in May 2019. During the inventory, flying squirrel sightings were identified in the compartments located along the stream, namely compartments 95 and 106, as well as on the neighboring property to the north of the project site. Hollow trees where droppings were found have been marked on the maps as nesting trees, as have trees with a large amount of droppings. Hollow trees without droppings are marked as potential nesting trees on the map. Droppings are indicated as individual or minimal droppings found on specific trees.

Feeding areas were not located during the inventory. Areas suitable for feeding, based on the forest composition, have been added to the map following a field visit by Tea Heikkinen on November 24, 2020. The inventory did not map neighboring territories. The closest Hertta-registered sightings are six kilometers away from the project site. There are two earlier flying squirrel sightings from the Hertta database in 2012 in compartment 95.

Hertta sighting 1 (northern): Recorded on June 16, 2012. "Old spruce forest on both sides of the river near the main road, with hollow aspens among them. Droppings observed, hollow aspens."

Hertta sighting 2 (southern): Recorded on June 16, 2012. "Old spruce forest on both sides of the river near the main road, with hollow trees/aspens. Droppings observed at the roots of the spruces and hollows in the aspens."

The location accuracy for both sightings is 1 meter, but based on the text, it is unclear whether they refer to specific hollow trees or the area in general.

The road complicates the movement of the flying squirrel in the area. The road is about 35 meters wide at compartments 95 and 106. Elsewhere along the road, its width is about 29 meters. The road is forested on both sides at the project site, allowing the flying squirrel to cross. For the future development of the area, it is important to preserve large trees along the road, for example, by paying attention to the placement of retention tree groups to ensure movement corridors. However, the safety of the road area must be maintained, and trees should not be left too close to the road.

## Forest Owner's Objectives

The project area is private forest land. Thinning operations are planned for several compartments in 2021. Additionally, thinning and clear-cutting are relevant activities for the area. The measures will take into account both the forest management needs and the habitat conditions for the flying squirrel. The forest owner's goal is to maintain the plot for forestry use.

## Planned Measures - Action A6

The area of the site is approximately 34 hectares. Of this, 4.5 hectares will be clear-cut and 13 hectares will be thinned. An area of 14.1 hectares will be left untouched. Approximately 2.4 hectares of the site will be protected under a 10-year fixed-term Kemera environmental support agreement.

**First Thinnings**
**Compartments 97, 98, 102, and 104**
Pre-clearance work has been carried out in these compartments to prepare for first thinnings. The compartments are significant as movement corridors for the flying squirrel. Compartment 104 contains a birch stand of about 0.3 hectares suitable for feeding. No flying squirrels have been observed in this compartment. The height of the trees varies between 10 and 15 meters, which means that the flying squirrel can continue to use these compartments as travel routes even after the thinning. The first thinning will be carried out in accordance with forest management recommendations. One third of the tree stand will be removed. Parts of compartments 102 and 104 will remain untreated.

**Compartment 108**
A deciduous-dominated compartment that may serve as a feeding area for the flying squirrel. In the first thinning, 50% of the stand will be removed. If there are coniferous trees in the compartment, they will be retained to provide shelter for the feeding area.
**108 (1 ha)**

**Thinnings**
**Compartments 101, 103, and 108**
**101 (1.4 ha)** Thinning harvest in 2021. About one third of the stand will be removed.
**103 (0.6 ha)** Thinning harvest in 2021. About one third of the stand will be removed.

**Clear-Cuts**
**Compartments 96** (3,3 ha) **and 99** (1.2 ha) will be clear-cut. As the rest of the area remains forested, the clear-cutting of these compartments does not significantly impair the movement routes of the flying squirrel. A maximum number of aspens and deciduous trees will be retained as retention trees. A sufficient buffer zone will be left along the stream north of the compartments, which also serves as a movement corridor for the flying squirrel.

**Untouched Compartments**
Areas left untouched are not assigned a separate theme on the maps.
Parts of the first-thinning compartments 102 and 104 will remain untouched.
**107 (1.1 ha) and 110 (1.1 ha)**
These compartments will be left untouched. Clear-cutting may become relevant within five years. Special attention must be paid to maintaining movement corridors. It should be considered whether one of the compartments could be treated with thinning instead, which would better preserve the flying squirrel's movement route.
**94 (5.2 ha)** This compartment will be left untouched. First thinning may be relevant in 5–10 years. Important as a movement corridor for the flying squirrel.
**105 (1.4 ha)** North of the stream. No management actions needed in the near future. The compartment has large aspens that will eventually form cavities and feeding trees for the flying squirrel. The surrounding spruce forest provides shelter for the aspens. The compartment is significant as both a movement corridor and feeding area. The feeding area is marked on the map along the stream.
**109 (3.1 ha)** The compartment was thinned approximately eight years ago. No actions needed in the near future. Significant as a movement corridor for the flying squirrel.

**Flying Squirrel Compartments**
The landowner wished to conduct clear-cutting on mature compartments located near the stream. Due to flying squirrel observations, clear-cutting cannot be implemented.
**Compartment 95 (1 ha)**
Contains a small water body environment as defined in Section 10 of the Forest Act. Environmental support through Kemera will be applied for to protect the compartment temporarily. The terrain naturally protects the streamside from wind damage. The entire compartment is designated as a breeding and resting area for the flying squirrel.
**Compartment 106 (2.2 ha)**
The stand consists of mature spruce with large aspens intermixed. Several nest trees and potential nests are located within the compartment. The northern part near the stream meets the METSO program criteria due to the presence of over 10 $m^3$/ha of deadwood. Most of the compartment (1.4 ha) is designated as a breeding and resting area for the flying squirrel and will be protected under a 10-year fixed-term Kemera environmental support agreement.
The southern part of the compartment (approximately 0.8 ha) will be thinned. Large aspens and deciduous trees will be retained during harvesting. Spruce trees will be left near the aspens. The forest in compartment 109, located south of this area, provides wind protection.

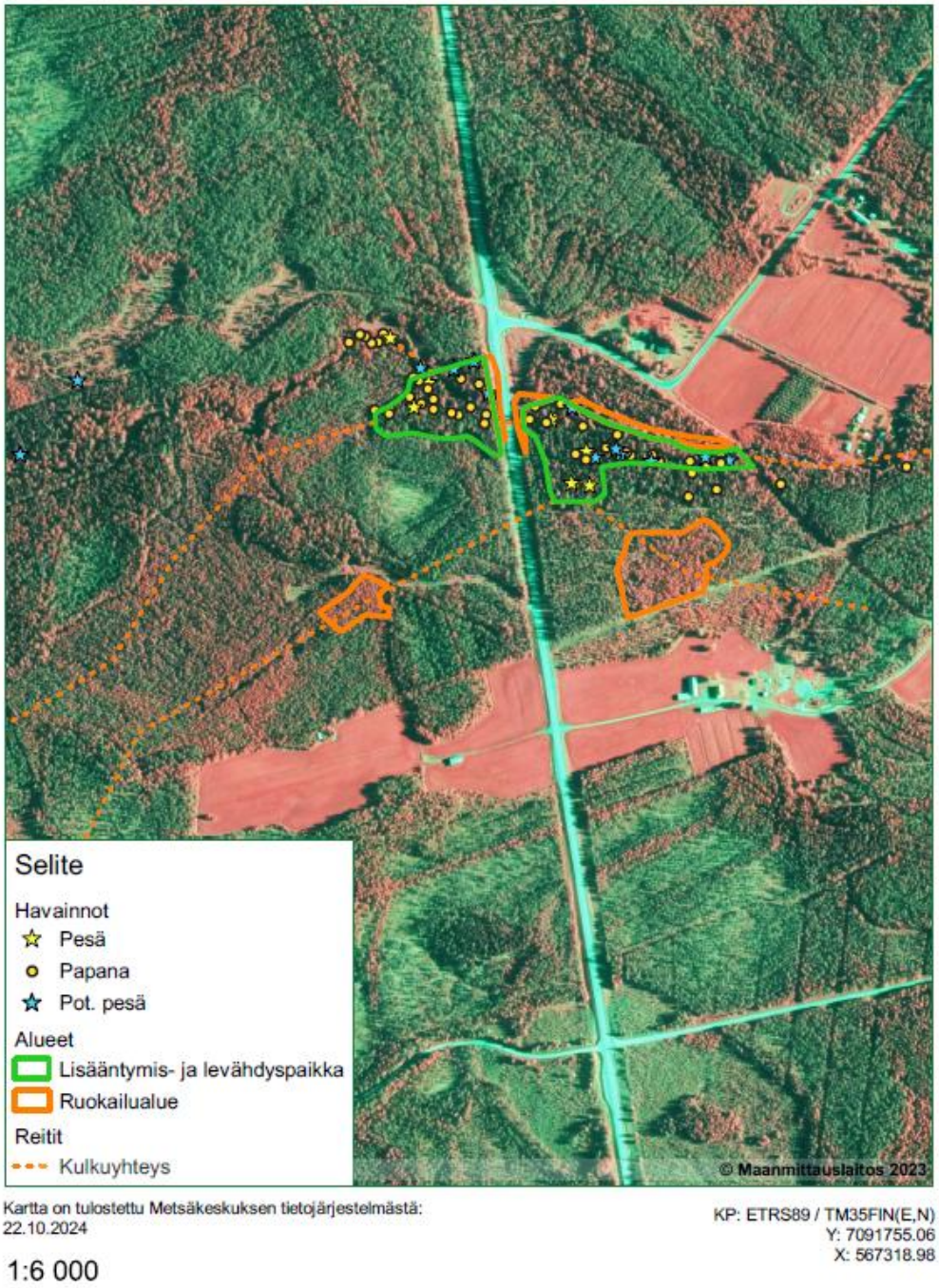
## Action C2
Loggings have executed partly in spring 2021.

## Action D1
On base-line inventory there were flying squirrel in the area. During the annual flying squirrel inventories in 2021-2024 there were marks of flying squirrel found every year.

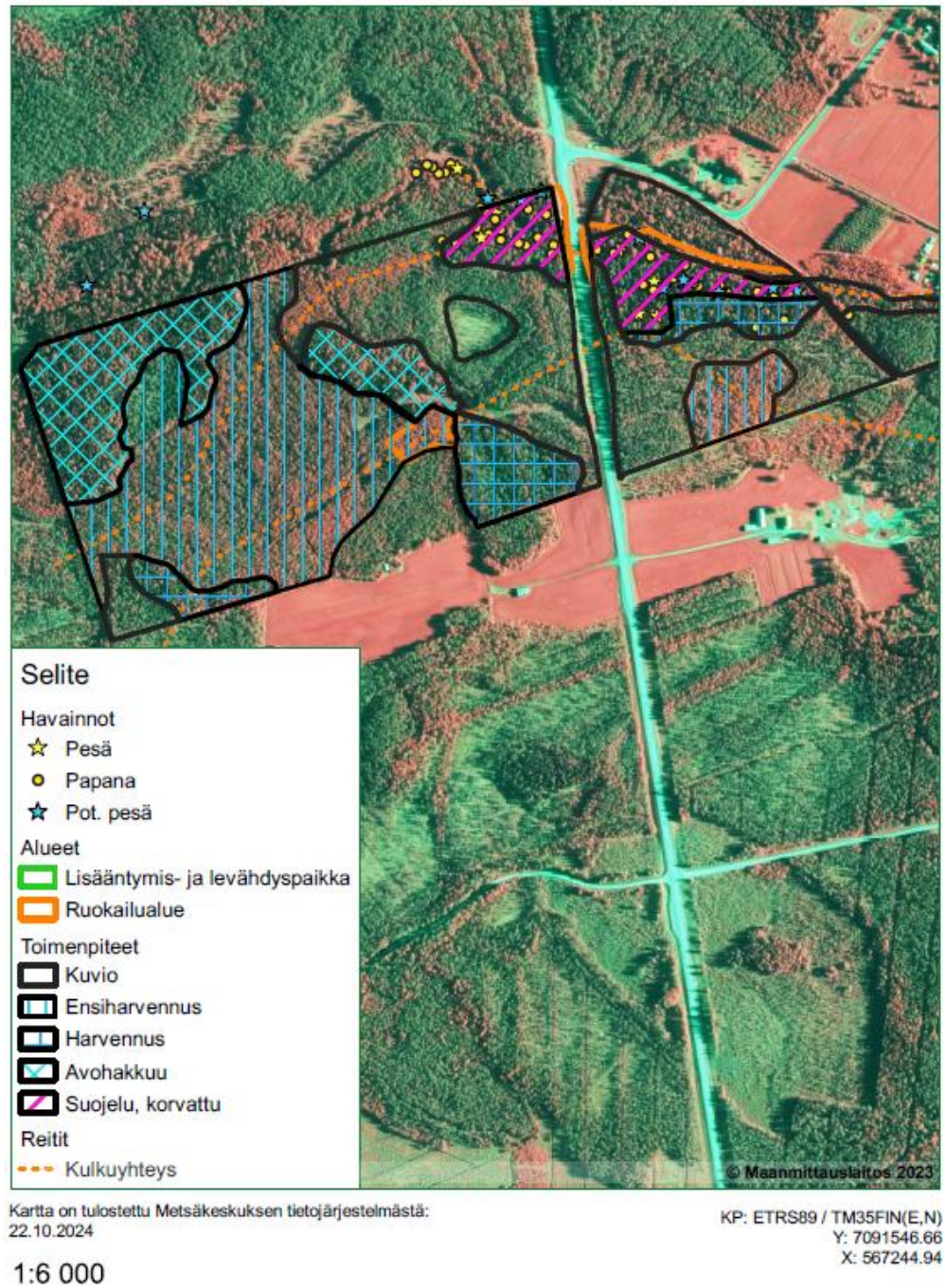
## Monitoring after the project
Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.




**Map 1. Flying Squirrel Observations and Movement Routes.**




Kartta on tulostettu Metsäkeskuksen tietojärjestelmästä:
22.10.2024

KP: ETRS89 / TM35FIN(E,N)
Y: 7091546.66
X: 567244.94

1:6 000

**Map 2. Flying Squirrel Observations and Logging Themes.**

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: KALAJOKI

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **Kalajoki**
Municipality, region: **Kalajoki, North- Ostrobothnia**
Country: **Finland**
Size of the project area (ha): **10**
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **No**

## General description of the area

The project site is located in Northern Ostrobothnia, in the municipality of Kalajoki, adjacent to the Siiponjoki River. A flying squirrel survey was conducted in the area on April 23, 2019. A field survey was carried out on May 17, 2019. Additional observations were made during the survey conducted in spring 2023. The flying squirrel observations in the plan are based on these field visits.

The project area covers approximately 10 hectares. The soil varies from the leafy coastal heathland to the more distant drained, fertile spruce mire. The forest in the area is predominantly a mixed forest dominated by downy birch, with a notable spruce undergrowth. Thinning cuts were carried out in 2014, leaving some parts of the area uncut due to flying squirrel observations.

## Forest Owner's Objectives

The area is highly productive forestland, characterized by drained, fertile soil, making it excellent for timber production. The landowner wishes to utilize the area for forestry and maintain the forests in good silvicultural condition while considering the habitat needs of the flying squirrel. The riverbank area is intended to be preserved in a wilderness-like state. Additionally, the area is used for hunting and recreation.

The site is largely peatland, so logging must be conducted in winter to avoid creating track depressions. The forest has high-quality spruce undergrowth, which must not be damaged during logging, so logging should be avoided during severe frosts.

According to the landowner's original wishes, the thinning and selective logging of the area would have been carried out at the intensity allowed by forest management recommendations. This could have been done without violating nature conservation laws. However, due to the presence of the flying squirrel, the logging intensity has been reduced, and the landowner has accepted this compromise.

## Planned Measures - Action A6

The project area is divided into forest stands, marked on maps with black boundary lines and numbering. The operations are themed accordingly. Multiple operational themes may exist within the same stand. After two rounds of comments, the ELY Centre has approved the proposed actions.

**Stand 77:**

This stand borders the Siiponjoki River. It is a dense forest dominated by downy birch, with spruce, pine, and aspen as secondary species. There is also spruce undergrowth and some alder near the riverbank. This area is important as a feeding ground and a corridor for movement. Several observations of flying squirrel droppings have been made. In spring 2023, an occupied nest was observed on the southeast boundary of the stand.

Action Plan 2021

Selective overstory removal, favoring smaller spruces. Larger spruces will be left standing. Aspens and alders will be preserved. The logging intensity will be reduced in the feeding area. Additionally, the connectivity to neighboring area N1 and across the river to the north will be maintained by leaving enough larger trees along the path. The riparian zone will not be managed. No more than one-third of the trees will be removed.

Action Plan 2023

The nest tree and the surrounding breeding and resting area will be marked with tape and left unmanaged.

Selective logging will vary in intensity. Near the breeding and resting area, more large trees will be preserved. Elsewhere, logging may be more intensive, removing larger trees to favor undergrowth and natural regeneration. Removal rate will vary between 30-60%. Aspens and alders will be preserved.

In the riparian zone, the PEFC guideline for selective logging in buffer zones will be followed. Trees will be removed evenly from all size classes, favoring deciduous trees. No more than one-third of the trees will be removed. Aspens and alders will be preserved.

Additionally, connectivity to neighboring area N1 and across the river to the north will be maintained by leaving enough larger trees along the path.

**Stand 86:**

A mixed forest of spruce and birch with some spruce undergrowth. The central part of the stand (0.5 ha) is almost pure, low-growth spruce. A single observation of droppings was made previously. In spring 2023, a new nest was found in a large hollow aspen on the boundary between stands 86 and 77. New droppings were also observed in the southeast part of the stand.

Action Plan 2021

The central part of the stand (0.5 ha) with low-growth spruce can be regenerated. Reserve trees will be left on the northeast edge of the stand to create distance from the nest site in the neighboring stand. The rest of the stand will undergo selective overstory removal, favoring spruce.

Considering the flying squirrel, the clearcut area across the entire planning area could be managed with selective logging. However, to prioritize forest management and logging profitability, clearcutting was chosen.

Action Plan 2023

The nest tree and the surrounding breeding and resting area will be marked with tape and left unmanaged. No flying squirrel observations have been made on the southwestern edge of the stand, which borders previously

thinned stand 87. A strip cut will be made along the entire length of the stand, adjacent to stand 87. The strip will vary in width between 30-50 meters, covering an area of about 0,9 ha.

Some reserve trees will be left in the widest part of the strip to promote regeneration and maintain flying squirrel connectivity. The squirrel can easily cross the narrower parts of the strip without jumping trees. The strip cut improves logging profitability and supports the continuity of deciduous trees in the planning area.

Reserve trees will be concentrated near the breeding and resting area. The rest of the stand will be managed with selective logging, favoring spruce.

**Stand 87:**
A thinned mixed forest of spruce and birch. Recent observations of flying squirrel droppings in the northern tip of the stand, in an area heavily thinned in 2014 (see attachment for photo from stand 87). No immediate silvicultural need for management.

**Stand 88:**
This stand borders the Siiponjoki River. It is a dense mixed forest dominated by downy birch, with spruce mainly as undergrowth. There is also aspen and pine. It is a breeding and resting place for the flying squirrel, with a nest in a hollow aspen and abundant droppings observed.

Action Plan 2021
The nest tree will be marked with tape and a 20-meter radius around the nest tree will be left unmanaged. The breeding area will be expanded by connecting it to the unmanaged riparian zone and the southeast droppings concentration. Selective logging will remove birch and pine, favoring spruce undergrowth. Old aspens, alders, and large spruces will be particularly preserved. No more than one-third of the trees will be removed.

Action Plan 2023
The nest tree will be marked with tape and a 20-meter radius around the nest tree will be left unmanaged. The breeding area will be expanded by connecting it to the southeast droppings concentration.

Selective logging will remove birch and pine, favoring spruce undergrowth. Logging intensity will vary between 30-60%. Old aspens, alders, and large spruces will be particularly preserved.

In the riparian zone, the PEFC guideline for selective logging in buffer zones will be followed. Trees will be removed evenly from all size classes, favoring deciduous trees. No more than one-third of the trees will be removed. Aspens and alders will be preserved.

**Stand 89:**
A mixed forest of spruce and birch, managed with overstory removal, with old birch over younger spruce. This area serves as a feeding ground. No direct flying squirrel observations have been made previously. In the 2023 survey, droppings were observed at the northern end of the stand.

Thinning/selective logging will target both spruce and birch. Logging intensity will be reduced in the feeding area. Additionally, connectivity to the breeding and resting area will be maintained by leaving enough larger trees between the areas. No more than one-third of the trees will be removed.

**Flying Squirrel Feeding Areas:**
The planning area contains two clear feeding areas: R2 in stand 77 and R1 in stand 89. Additionally, the entire length of the riverbank has diverse deciduous trees, and the entire planning area has abundant downy birch and some aspen.

**Neighboring Areas and Corridors:**
The neighboring area N1 is along the river, a few hundred meters southwest of the planning area. Connectivity to neighboring and feeding areas is maintained through corridors marked Y1, Y2, and Y3.

**Estimated Logging Yield:**
The original proposal estimated a logging yield of about 330 $m^3$ over an area of 4.6 hectares. The updated plan covers 3.9 hectares, with an estimated logging yield of 450 $m^3$.

## Consideration of Flying Squirrels in Future Actions

The landowner aims to use the area for forestry purposes and maintain the stands in good silvicultural condition while considering the living opportunities of the flying squirrel.

## Action C2

Loggings have not yet executed.

## Action D1

Annual flying squirrel inventories are carried out during the project in 2020-2024. In Base-line inventory 2019-20 there were found marks of flying squirrel on the project area. In 2022 inventory area was empty, but 2023-24 flying squirrel returned to the area.

## Monitoring after the project

Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

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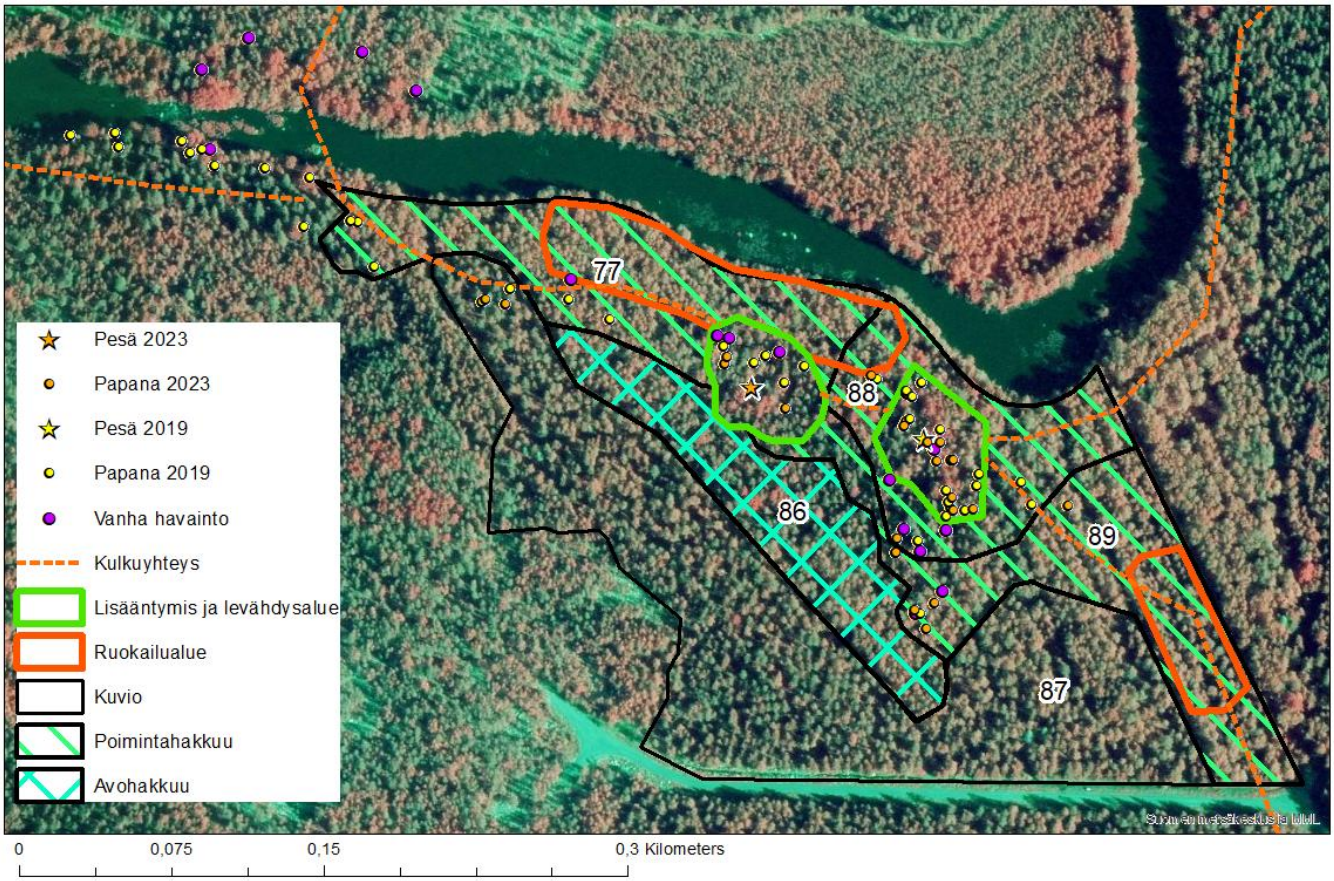
# Kalajoki




**Map 1. Flying Squirrel Observations and Movement Routes.**

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: KOKKOLA, TRULLEVEI

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **Kokkola, Trullevi**
Municipality, region: **Kokkola, North- Ostrobothnia**
Country: **Finland**
Size of the project area (ha): **47 ha**
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

In the Kokkola project site, there are many summer cottages, and it serves as a popular outdoor and recreational area for the city residents. The Trullev peninsula project area covers approximately 46 hectares. Of the forested area, 13% consists of openings, seed trees, young stands, or overtopped young stands. Young stands constitute 8%, mature stands 12%, and stands ready for regeneration 67%. The forest composition includes 10% pine, 64% spruce, 19% birch, and 7% other deciduous trees.

Within the area, 68% of the forest is over 80 years old, consisting of mature and old spruce-dominated forests that need regeneration in the coming decades. The area is significant for the flying squirrel population, as evidenced by the presence of nests even in the few existing outbuildings. The planning of logging operations considers various treatment options to secure breeding and resting areas for flying squirrels, as well as connectivity within the area.

A thorough inventory of flying squirrel breeding and resting area was conducted within the project area. Movement routes between nests and feeding areas were also observed. Besides, there are extensive alder and birch-dominated areas along the sea shores, serving as feeding grounds. Feeding areas outside the treatment area are presented in a separate map attachment. Additionally, the entire eastern shoreline of the peninsula is suitable feeding ground with alder and birch vegetation.

The project focus 14 different forest stands, identified as having either breeding and resting area or pathways connecting breeding and resting areas and feeding areas. Almost every stand included in the detailed examination exhibited varying degrees of basal rot in spruce. Fungal spores causing rot persist in the soil and spread through the roots to subsequent generations of trees. The only solution to this problem would be clear-cutting and changing the tree species. For instance, growing silver birch for one generation in these stands could solve the issue.

## Forest Owner's Objectives

The city of Kokkola joined the project with the aim of reconciling economically viable forest management methods with the preservation of flying squirrels in the area. The goal is to manage the selected forest stands through various treatments and harvests, ensuring the economic, social, and ecological sustainability of the forests, as well as the living and movement of flying squirrels in the area. Harvests and maintenance work will be carried out cost-effectively, contributing to the budgeted harvest revenues.

## Planned Measures - Action A6

Within the available time frame, 14 stands were selected from the project area for closer examination based on abundant flying squirrel observations from the inventory. The intention is to experiment with various logging options within the flying squirrel habitat. The increased risk of storm damage on treated stands is acknowledged, and the risk is mitigated through selective cutting, leaving untouched groups of trees and harvesting in groups. The operations will include both manual and mechanized logging. In selective cutting stands, particular attention is paid to leaving nest trees and their immediate surroundings undisturbed. The different logging methods for the project stands are presented in the action plan map.

The total area of the stands targeted for action is 17-18 hectares, and the planned harvest volume is approximately 800-1000 $m^3$.

**Selective Cutting**

**Stand 13** (0.7 ha) is a mature spruce forest. It is open, sparse, and has low tree density. The stand is primarily spruce, with a volume of 158 $m^3$/ha, equating to 118 $m^3$ for the stand. Basal rot is observed in the spruce. The selective cutting will remove the mature spruce, approximately 50 m3/ha, freeing up space in the understory. Birch trees will be retained if healthy. Attention should be given to the power line running south-north along the west edge of the stand.

**Stand 18** (0.8 ha) is a spruce- dominated forest with a mix of pine and birch. There is significant basal rot in the spruce. The stand volume is 162 $m^3$/ha, equivalent to 136 $m^3$ for the stand. **Stand 19** (2.0 ha) is a mature spruce forest, varying in age. The stand volume is approximately 190 $m^3$/ha, totaling about 380 $m^3$. The stand includes groups of trees, some of which are aspen. **Stands 18 and 19** will undergo selective cutting, removing the largest, mature trees (50-70$m^3$/ha). Some large trees will be left in groups. If aspens are removed, only individual trees, mainly along access routes. The inventory suggests thinning out the crowded intermediate layer of trees to facilitate flying squirrel movement. Potential nesting trees will be marked in the field just before logging. Pellets observations near the northern border of Stand 19 are on private property.

**Stand 30** (0.6 ha) is a mature spruce forest. The stands tree structure is varied and sparse. The stand volume is 132 $m^3$/ha, equal to 75 $m^3$ for the stand. Basal rot is observed in the spruce. In selective cutting, birch trees will be removed, making room for younger spruces. Two-thirds of the spruces and birches will be retained. The power line on the west edge of the stand needs to be avoided during logging.

**Stand 41** (0.7 ha) is a mature spruce forest, including a mix of mountain birch. The stand structure is varied and sparse. The stand volume is 211 $m^3$/ha, equal to 147 $m^3$ for the stand. The stand includes a resting and breeding area for flying squirrels. Nest trees and nearby trees will be marked with ribbon before logging. Saving neighboring trees ensures protection, nutrition, and facilitates landing. In selective cutting, birch trees will be removed to make space for well-established spruces. The alder and birch area along the shoreline, serving as a feeding ground, will be left untouched. Caution must be exercised around the power line on the west edge of the stand.

**Stand 104** (1.3 ha) is a mature spruce forest, including a mix of mountain birch. The volume is 254 $m^3$/ha, equal to 322 $m^3$ for the stand. Basal rot in spruce is highly probable. The stand includes a breeding and resting area for flying squirrels. Before logging, nesting trees and their nearby trees will be marked.

**Stand 118** (1.7 ha) is a mature spruce forest. The tree structure is uneven and gappy. Spruce basal rot is highly likely. Volume is 200 $m^3$/ha, or 337 $m^3$/stand. There is flying squirrels breeding and resting area. Nest trees and the surrounding protective and feeding trees are marked in the field before logging. In selection cutting, space is created for younger trees by removing mature dominant trees. About 70 $m^3$/ha will be removed.

**Small Opening Cutting**

**Stand 103** (0.25 ha) is a mature spruce forest. The stand is uneven-aged and gappy. Volume is 225 $m^3$/ha, or 560 $m^3$/stand. The stand has abundant flying squirrel pellets observations but no identified nesting trees. Thinning thickets and removing overtopping trees with selection cutting. Small openings of 0.1-0.2 ha are made at suitable intervals. The locations of small openings and jump spruces are defined and marked just before logging to ensure no nesting or resting places have appeared. Birch trees are preserved for feeding, along with large spruces at regular intervals. Logging removal is about 100 $m^3$/ha.

**Thinnings**

**Stand 16** (0.9 ha) is a young spruce-dominant plantation forest. The stand structure is sparse, gappy, and partly too dense. Volume is 126 $m^3$/ha, or 118 $m^3$/plot. Dense parts are thinned and overtopping birches are removed.

**Stand 46** (0.5 ha) is a mature spruce forest. Volume is 187 $m^3$/ha, or 98 $m^3$/stand. A standard forest thinning is carried out. The stand is entirely even-aged and of uniform density. No opportunity for special thinning in the upper or lower canopy.

**Stand 92** (0.7 ha) is a mature spruce forest. Volume is 163 $m^3$/ha, or 118 $m^3$/stand. Spruce basal rot is likely. The stand is thinned with both upper and midstory thinning. Small openings of 0.1-0.2 ha are also created. Approximately 80 $m^3$/ha is removed. The locations of small openings are delimited just before logging to ensure no breeding and resting areas have appeared. The thinning accumulation of the stand can be considered significant because ares is four and a half hectares. Sea shoreline thickets serve as a feeding area.

**Strip Cutting**

**Stand 31** (1.7 ha) is a slow-growing mature spruce forest. Volume is 177 $m^3$/ha, or 304 $m^3$/stand. Basal rot is possible. Strip cutting is carried out, removing trees to create a "lane" about 20-25 m wide within the stand, covering about 1/3 of the area. The direction is chosen to minimize visibility from the road. Gaps are left untreated. Individual birches are preserved. Regeneration of the lane is awaited for 2-3 years; if natural regeneration does not occur, spruce is planted.

**Other Logging**

**Stand 44** (0.9 ha) is a mixed-aged forest with various tree species, including aspen, black alder, grey alder, and silver birch. Forest is close to a beach. The flying squirrel moves along large aspens and birches near the shoreline. A breeding and resting area is identified in a aspen along the path. Nest trees are marked, and nearby trees are preserved to provide shelter, food, and facilitate landing. The stand borders a beach, ensuring safety by removing dangerous trees. However, enough alder and birch are left to form a feeding area on the shoreline. Thinning of spruce groups is carried out on part of the stands. Large aspens along the access route are preserved.

**Stand 79** (2.5 ha) is a young plantation forest. Volume is 57 $m^3$/ha, or 143 $m^3$/stand. The stand contains older tree generation aspens, rowans, and bird cherries. The stand has spruce- and birch-dominated areas in groups. The stand is located directly in the feeding area near the shore. Clearing is done while preserving deciduous tree dominance. In about ten years, the plot will form a large feeding area and a potential breeding and resting area. A targeted clearing operation will be conducted in some parts of the stand favoring spruce wherever it exists. Despite favoring spruce, the stand on the plot will remain deciduous tree-dominated. Overtopping birches in the plot are left to decay. The spruce thicket on the part of the plot near the shore is left untreated. Rowans and bird cherries from the older tree generation in the plot are preserved.

## Considering Flying Squirrel in Future Measures

Forest areas outside the focused stands on the project site can be managed according to the city's forest plan. More deciduous trees should be left in the project site area. The stands are developed from the beginning as mixed deciduous-coniferous forests. The evolving forest provides potential breeding and resting places for flying squirrels in the coming decades. There are 11 young plantations and seedling forests in the project site area and its immediate vicinity. Regeneration sites are planned for small openings, allowing natural afforestation. Due to the forested Trullev peninsula, well-targeted small and selection cuttings on selected plots do not pose a threat to the movement of flying squirrels between breeding and resting places and feeding areas. Observations of flying squirrel breeding and resting areas outside the analyzed stands are mostly in estate trees and are thus not within the scope of forest management. Any storm-damaged trees in the project plots must be removed according to the requirements of forestry laws.

## Action C2

Loggings have executed 2021.

## Action D1

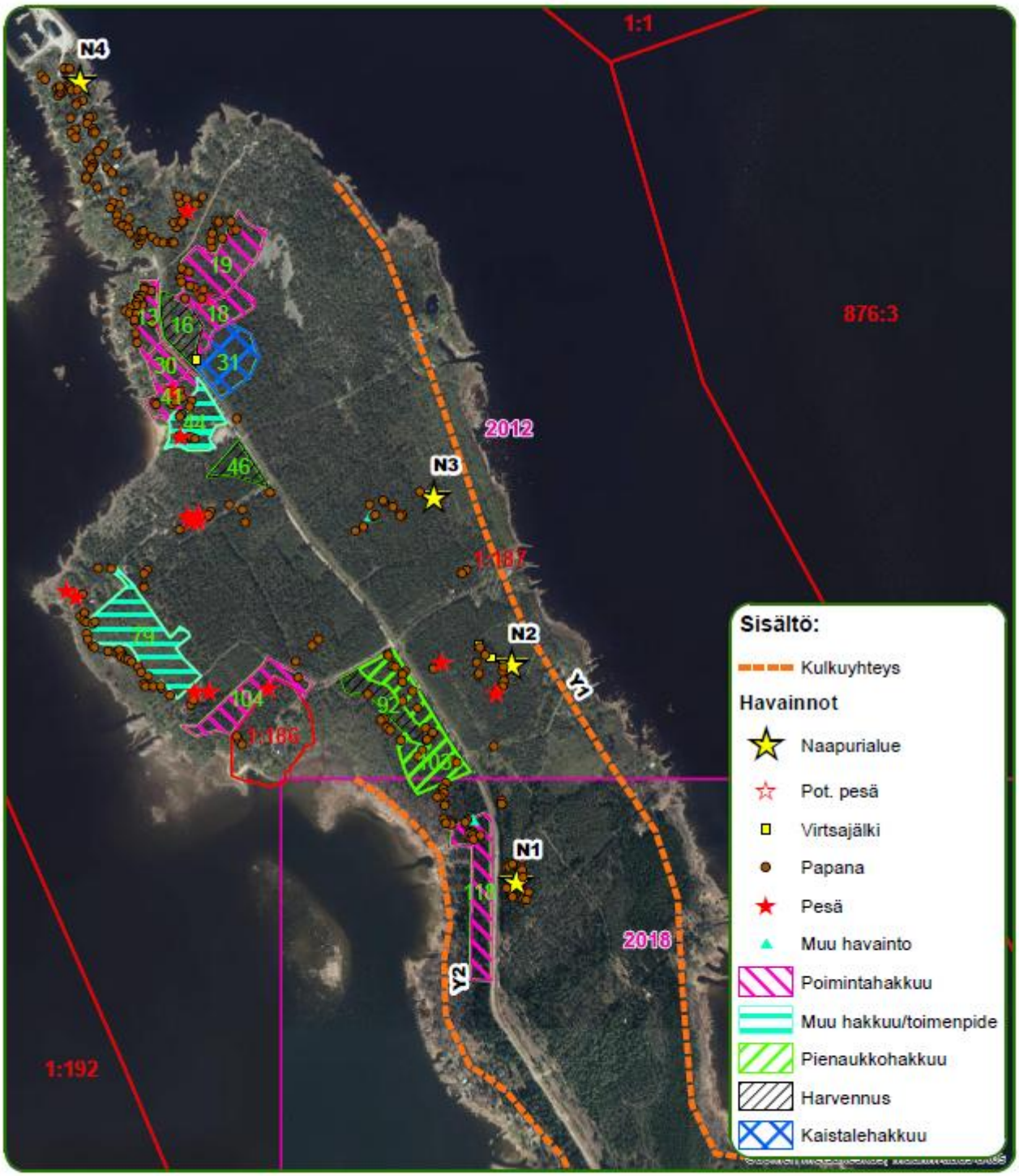
Annual flying squirrel inventories are carried out during the project in 2021-2024. Flying squirrel has occupied area whole time.

## Monitoring after the project

Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.




**Map 1. Flying Squirrel Observations and Movement Routes.**

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: LUOTO, FINNÄS GÅRD

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **Finnäs Gård**
Municipality, region: **Luoto, Ostrobothnia**
Country: **Finland**
Size of the project area (ha): **0,65**
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

The project site Luoto consists of two separate project areas. Planning for both areas focused on two stands of spruce at the age of finalfelling. The target stands are small and far away from each other. Juha Kinnunen, responsible for the inventory, clearly stated that both stands serve as pathways when moving from one area to another, and there are no breeding or resting places in them. The actions considered were based on these inventory results.

## Forest Owner's Objectives

The landowner joined the project because there were previous observations of flying squirrels on the property, which had complicated forest management in the observation area. The owner is interested in forest management methods and logging opportunities in the flying squirrel habitat.

## Planned Measures - Action A6

Thinnings were carried out in Luoto in stands that were ready for regeneration. Thinnings ensure the preservation of connectivity. The total thinning volume for the target stands is approximately 135 m3.

**Thinnings:**
**Stand 257.1** (0.15 ha) is almost pure spruce forest and ready for regeneration. There is flying squirrel observations but no breeding or resting area. The stand's trees act as a pathway to actual feeding areas. The stand is treated according to uneven-aged forest management. The adjacent stand underwent upper thinning and uneven-aged forest management, about 2/3 in the winter of 2018-19, similar treatment for a small project stand. Thinning is carried out, leaving a basal area of about 11-13 $m^2$/ha, sparing a few of the largest spruces as retention trees. The thinning volume for the 0.15 ha stand is 27 $m^3$. This approach preserves connectivity.

**Stand 190.4** (0.5 ha) is ready for regeneration. The stand had not been treated before the inventory. The stand mainly consists of old spruce and pine, with birch as mixed tree species. The inventory confirmed that the stand serves as a connection between the breeding area and the feeding site. There is no breeding or resting place in the stand. Thinning is carried out to leave a basal area of 11-13 $m^2$/ha. If desired, thinning can go down to the legal limit, i.e., a basal area of 9 $m^2$/ha. This would create conditions for natural regeneration. The estimated thinning volume for thinning to a basal area of 12 $m^2$ is approximately 106 $m^3$. The presentation considered the landowner's preferences for treatment and the guidance of forestry law. Intense thinning near the sea poses a significant storm damage risk to the trees in the future, so it is advisable to treat the stand with a more cautious thinning, leaving a basal area of about 16-18 $m^2$/ha. Juha Kinnunen, who conducted the inventory, marked trees with a yellow ribbon that are important to save in the planned thinning. The selection of other trees to be removed will be made by the holder of logging rights.

## Action C2

The loggings were carried out in Luoto 2022.

## Action D1

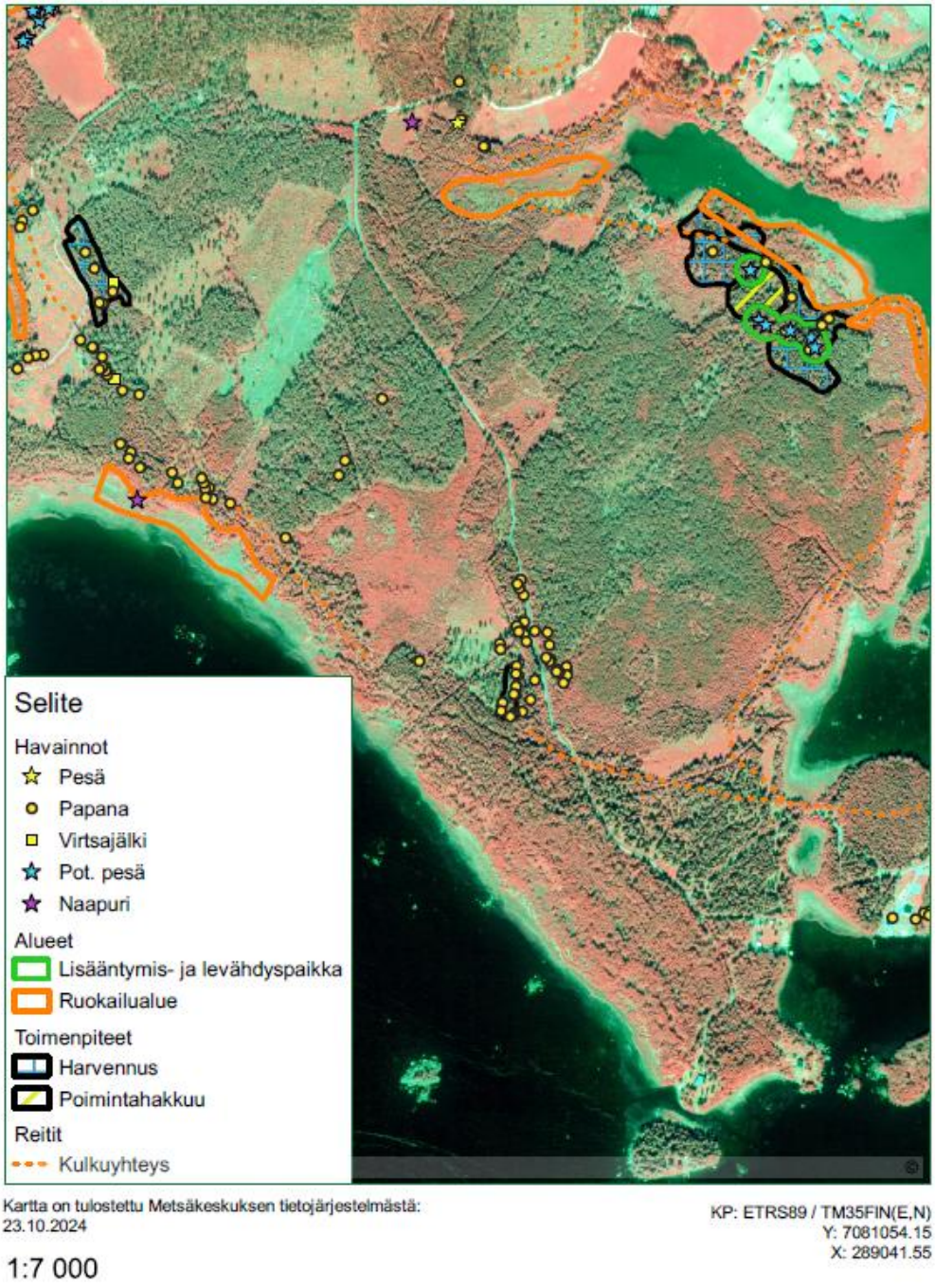
Annual flying squirrel inventories are carried out during the project in 2021-2024. Flying squirrel occupied the area every year, though in 2024 the pathway stand was empty.

## Monitoring after the project

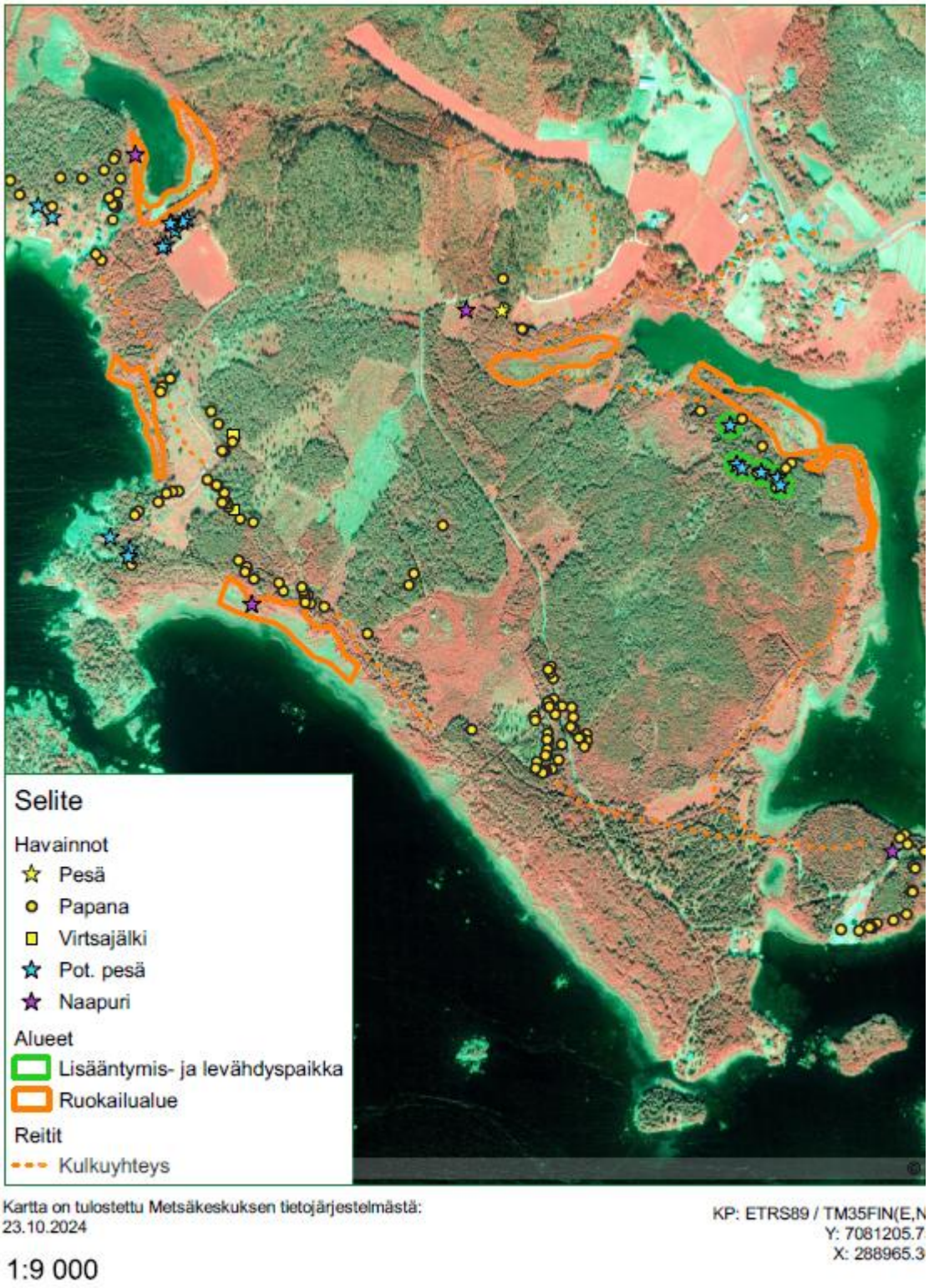
Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.




**Map 1. Flying Squirrel Observations and Logging Themes.**




**Map 2. Flying squirrel observations and logging themes**

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: VAASA, PILVILAMPI

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **Vaasa Pilvilampi**
Municipality, region: **Vaasa, Shouth Ostrobothnia**
Country: **Finland**
Size of the project area (ha): **8,4**
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

The Vaasa project site is located on the western edge of the Pilvilampi area in the city of Vaasa. The area is a popular outdoor recreation area, and the paths, roads, and other trails are available for use by city residents. The area also has a rich population of flying squirrels. The selected project area initially consisted of one 4.9-hectare clear-cutting-age stand. Later, the project area was expanded to include the feeding area and stands 15, 16, and 16.1 to the south of the area. These stands are even-aged spruce stands planted in the field.

To the north of the project area is a field, and a wide power line. Heading west is settlements. To the south and east, the area continues as a wooded area, providing excellent movement opportunities for flying squirrels across a wide area.

During the post-survey site visit, original stand was divided of three parts. One area (17.1) is an old clear-cutting-age spruce stand, another area is also an old mixed stand with ready-made windfall (17.3), and the third area is rugged, rocky, and uneven-aged spruce stand with many old birches (17). Instead of one large stand, three different management units were formed for the project area, along with the later added stands.

The original project site could serve as a voluntary Metso conservation area. The city of Vaasa wanted to participate in the project to explore different forest management options within areas inhabited by flying squirrels within the framework of the law. Therefore, establishing a Metso conservation site in the area is not an option within the project.

Inside the target area are resting and breeding places for flying squirrels, routes indicated by droppings, and a feeding area on the western edge and northern edge of the area, along the field border. Additionally, there are three potential breeding and resting places in the area.

## Forest Owner's Objectives

The city of Vaasa budgets a certain amount of logging revenue annually from its owned forests. The goal for this target is to create a plan that ensures timber sales revenue, preserves the flying squirrel population in the area, and enables enjoyable movement for city residents in the area.

## Planned Measures - Action A6

During the second field visit on October 29, 2019, representatives from the city of Vaasa and personnel from the Forestry Center went through the area's stands, considering different management options. As already mentioned, the original single stand was divided into three different stands due to different tree species and logging proposals, and stands 1, 15, 16, and 16.1 were added to the project area.

The harvesting of the stands will be carried out by forestry contractor. The combined volume of the stands in the project is approximately 2308 $m^3$, of which about 780 $m^3$, or 34% of the stand volume in the project area, will be removed through the planned harvests.

**Thinnings**

**Stand 15** (0.93 ha) is a rapidly growing and maturing 30-year-old planted spruce stand. The stand is even-aged and evenly sized, with no observations of flying squirrels. The volume of the stand is approximately 170 m3.
**Stand 16** (1.35 ha) is an evenly aged and sized planted spruce stand. The age is approximately 50 years. A flying squirrel route to the south was inventoried in the eastern part of the stand, but no other observations were made. The stand's volume is approximately 470 $m^3$. Stands 15 and 16 (2.29 ha) are overgrown spruce stands where thinning is significantly delayed. The stand is even-aged and evenly sized. These stands will undergo a normal thinning, leaving a basal area of 18-20 $m^2$. In practice, this means that about half of the current stand will be thinned. According to the inventory, there is a flying squirrel travel route to the south in Stand 16. The planned thinning do not endanger the movement of flying squirrels on this route. According to Vaasa city's own monitoring, flying squirrels also move around both the west and east sides of these stands when traveling to southern areas.

**Regeneration Harvest Stand**

**16.1** (0.26 ha) is a stand formed within Stand 16, with the same stand information as Stand 16. A 0.3 ha small opening will be created on this stand, which will regenerate naturally or be planted with deciduous trees. Winter harvesting is aimed for when the ground is frozen. Clearing the roads is important to prevent damage to the root system. There are no observations of flying squirrels in this area. The stand's volume is approximately 90 $m^3$.

**Stand 17.1** (2.0 ha) is an old and richly stocked spruce stand. The stand has a lot of varying degrees of decayed wood, and the ground is partly peatland, and partly rocky fresh terrain. According to the inventory, there is a flying squirrel travel route along the northern border of the stand, with pllets and urine observations. The volume of the stand is approximately 720 $m^3$. A strip cutting will be carried out in the stand in a horseshoe-shaped pattern, resembling a 15-20 m wide opening, like an expanded road. The outer edge of the cut follows the outer boundary of the stand about 20-25 meters away. The space between the outer boundary and the cut opening is left untouched, with at most individual selections made. Similarly, within the cut opening, "road," the existing birches and ready-made decayed logs are left intact. Leaving the untouched area ensures the movement of flying squirrels to the west from the stand, especially along the northern border. The inner part of the resulting horseshoe-shaped opening can be treated with selective harvesting if desired. The resulting opening will be planted with spruce or birch, depending on the amount of existing fungal-infected spruce in the stand. The area is shown on the map as stand 17.4. The estimated volume of the resulting opening is approximately 160 $m^3$.

**Stand 17.3** (1.6 ha) is a mixed spruce stand, reaching the age of final felling but with varying tree ages. The stand includes pine, some birch, and aspen as mixed species. There are numerous windfall trees, and a nearly complete small opening has formed on the eastern edge of the stand. The stand's volume is approximately 457 $m^3$. In the treatment, it is planned to leave larger retention groups than usual. It is proposed to leave eight retention groups, each measuring 25 m * 25 m, resulting in a combined area equivalent to a circle with a radius of 0.40 ha. Each retention group must have a few trees suitable as jump trees. The center points of the retained areas will be marked in the terrain with fiber tape. The windfall area will be utilized as an almost formed small opening, and it will be expanded. In the remaining part of the stand (1.2 ha), a clear-cutting will be carried out, leaving large aspens and jump spruces outside the retained tree groups. These trees will be marked in the terrain before harvesting. During and after harvesting, logging residues will be removed from the trail crossing the stand. The resulting opening will be planted with spruce, and the estimated yield from the stand is 230 $m^3$.

**Resting stands**

**Stand 1** (0.93 ha) is an overgrown spruce seedling stand, with birch and aspen as overgrowth. The stand includes a feeding area for flying squirrels. In the northeastern part of the stand, there is a more aspen-dominated area with a potential breeding and resting place, a hollow aspen. The stand will be left untreated. The volume of the stand is approximately 120 m3.

**Stand 17** (1.3 ha) is a rocky and stony hill. In the old spruce stand, there is mixed wood, including spruce, aspen, and individual pines. During the inventory, a flying squirrel nest was found on the southern edge of the stand; a box in a spruce. However, the nest box's roof is broken, so it is unlikely to function as a nest at the moment. There is a clear travel route from the nest to the western part of the stand and the northern side to the field edge, which serves as a feeding area. The stand's volume is approximately 280 m3. After consideration, it was decided to leave the stand untouched. An alternative option of selective harvesting was considered. The decision was based on the combined impact of potential nest trees, abundant droppings observations, and the challenging terrain on the profitability of logging.

## Action C2

Loggings were executed during 2021.

## Action D1

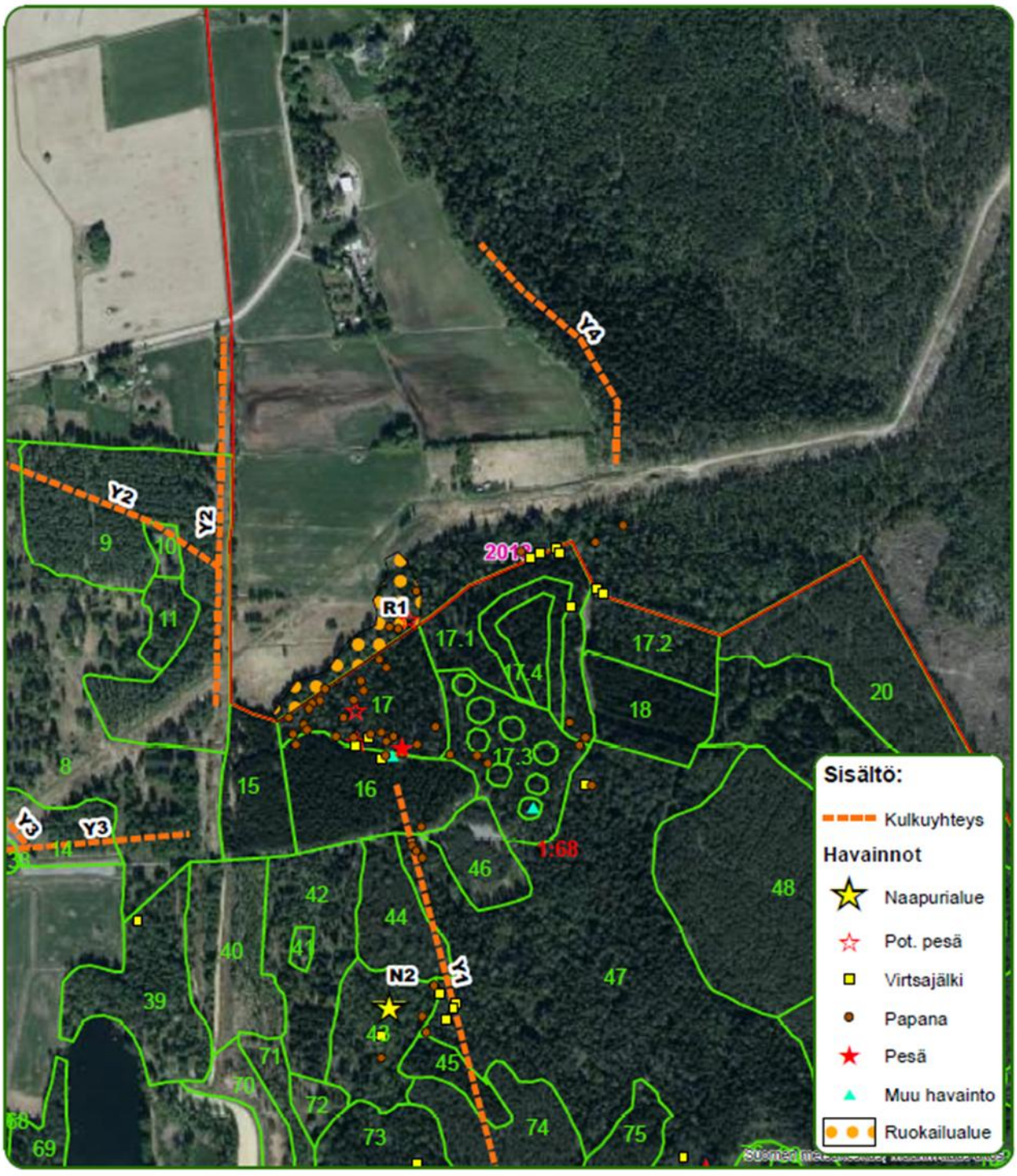
Annual flying squirrel inventories are carried out during the project in 2021-2024. No marks of flying squirrel was detected in these inventories. Only in base-line inventory in 2019, there was flying squirrel observed.

## Monitoring after the project

Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

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**Map 1. Flying Squirrel Observations**

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: KUOPIO, RIISTAVESI

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **Riistavesi**
Municipality, region: **Kuopio, Northern Savonia**
Country: **Finland**
Size of the project area (ha): **24**
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

The site is located in Riistavesi, Kuopio. The area is situated between the main road and the nature conservation area at the eastern end of Lake Suuri-Majoinen (approximately 24 hectares). The planning of actions focused on an area of just under ten hectares, predominantly consisting of old spruce-dominated forest. Some birch, pine, and also aspen are present as mixed tree species.

Flying squirrel inventory was conducted by Risto Sulkava on June 28, 2019. The timing of the inventory was slightly late, especially considering the heavy thunderstorms in the area before the field visit. Despite this, observations of both fresh and last year's droppings were made. Old flying squirrel observations were available as spatial data for the inventory area. The on-site observations coincided with the locations of the old observations. Nests and cavities were not actively sought, but a couple were found in the same locations.

The surveyor also visited the conservation area. Based on the droppings found there, it can be inferred that there are likely two female territories in the surveyed area. One is in the conservation area, and the other is in the intervention area and partially in the conservation area. Accessibility to the surrounding environment is challenged, particularly in the northern direction, due to the main road..

## Forest Owner's Objectives

The area is owned by Metsähallitus but is in the use of Savonia University of Applied Sciences. Through involvement in the project, the aim is to determine how logging can be carried out considering the presence of flying squirrels.

## Planned Measures - Action A6

Planning for the area was initiated in 2013 with a forestry notification for a special cut, intending to conduct a small gap harvest (the area between the drainage ditch and the conservation area). The delineation decision for the flying squirrel breeding and resting site, according to Section 72a of the Nature Conservation Act, was made by the Regional State Administrative Agency for Northern Savonia based on this notification.

The delineation decision is based on old flying squirrel observations and field inspections conducted on May 23 and August 28, 2013, where no signs of flying squirrels were found in the area. Flying squirrel observations from the area date back to an inventory conducted in 2006. While observations of flying squirrels were made within the delineated area during the 2019 inventory, they also extended to the border areas. To maintain the integrity of the habitat, the planned measures will exclude the intermediate areas from forestry operations. The delineated area and the area to be excluded from treatments fully meet the criteria required for METSO 1 sites. The delineated area and the area to be excluded from treatments consist of stands 6, 11 (ML 10§ drainage ditch), and 12. Stand 6 is excluded from treatment, especially because it hosts a particularly good deadwood center for biodiversity.

The planned measures will be implemented in stand 10 and logging will be carried out with small gap harvests in stands 10.1 (0.27 hectares) and 10.2 (0.19 hectares). There are already pre-established regenerating areas in these stands, and efforts will be made to preserve saplings as much as possible. Deciduous trees in these stands will be spared. If there is not enough soil disturbance during logging, regeneration could be promoted, for example, through spot scarification. Due to the small size of the stands and partial natural regeneration, it is not justified to perform machine scarification. A cautious selection harvest will be conducted on the remaining part of stand 10, targeting mature spruce and, especially, pine. Birch and small amounts of aspen will be spared. The stand has limited fiberwood-sized trees, with an estimated forest stock of about 225 m3/ha (pine 20%, spruce 70%, birch 10%). Approximately 30% will be removed (harvest volume from small gaps about 150 m3 and selection harvest about 150 m3). The stand already has established skid trails. Selection harvest is not recommended (or will be very minimal) in the area between stands 10.1 and 10.2 and to the east. Particularly, areas with trees extending to the power line on the east and west sides of stand 10.1 will be left untreated. The stand 10.3 is suitable as a storage site.

On the neighboring plot 25:152, a forestry notification for a thinning harvest in a growth forest (khl 03) was already made on November 12, 2020. Since the owner is the same as in the project area, stand 15 (0.23 hectares) will be included as a processing stand in the project. Special attention is given to maintaining a good (>20%) hardwood mix during logging.

The nearest known flying squirrel occurrences to the project area and the adjacent conservation area are approximately 3-5 km away according to SYKE data. The connection to the forest in the southwest may naturally be maintained through a mosaic of private properties. In the east, an active occurrence (approximately 3 km away) is challenging for flying squirrels to reach due to extensive farmland. For flying squirrels to move towards occurrences about 3 km to the northeast, they would need to cross the main road. Therefore, at least four potential crossing points will be preserved on the site by saving as much standing timber as possible along the roadside..

## Consideration of Flying Squirrel in Future Actions

The forest stand near the main road plays a crucial role in providing a theoretical opportunity for flying squirrels to cross the highway. It is advisable to preserve the forest stand and retain as many tall trees as possible near the junction. The connection to the forest stand comes from stand 10. In stand 8, pre-commercial thinning has been done, where, in retrospect, too much hardwood was unnecessarily removed. In the future, the preservation of

hardwood mix should be considered. The neighboring plot on the east has made a similar mistake in a relatively recent first thinning (removing birch close to the border, among others).

Attention should also be paid to maintaining hardwood mixes in stands 5 and 7 (regeneration areas of the neighboring plot bordering the project area). These stands implement layered cultivation of birch and spruce and have good potential to develop into a suitable habitat for flying squirrels.

Stands 6, 11, and 12 are recommended for permanent nature conservation (related to the Suuri-Majoinen conservation area).

## Action C2

Only one thinning area has executed, other loggings haven´t yet been made.

## Action D1

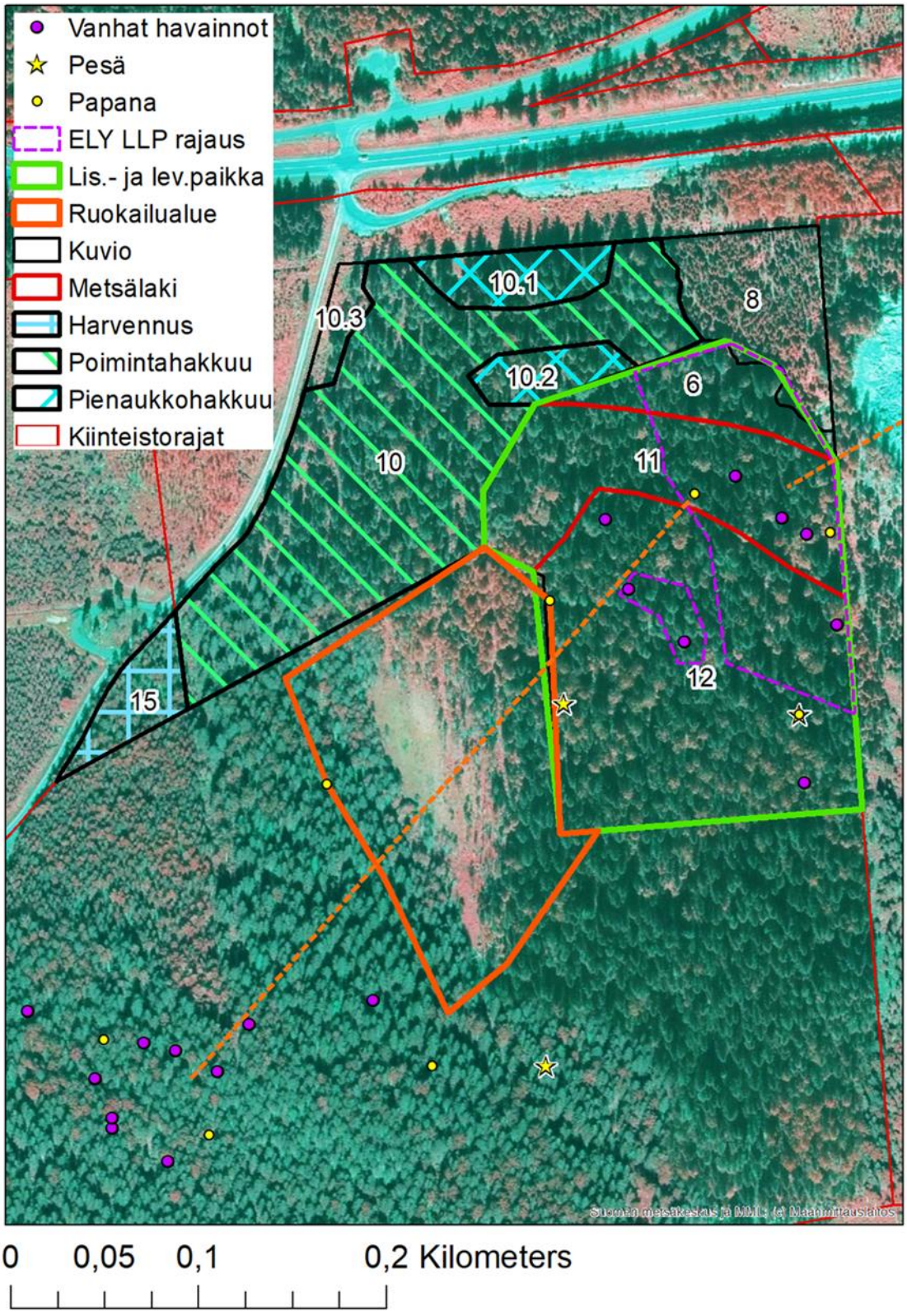
Base-line inventory was made 2019. Annual flying squirrel inventories were carried out during the project in 2021-2024. Flying squirrel occupied the project area only during the base-line inventory, but on neighboring areas it was found also 2023 and 2024.

## Monitoring after the project

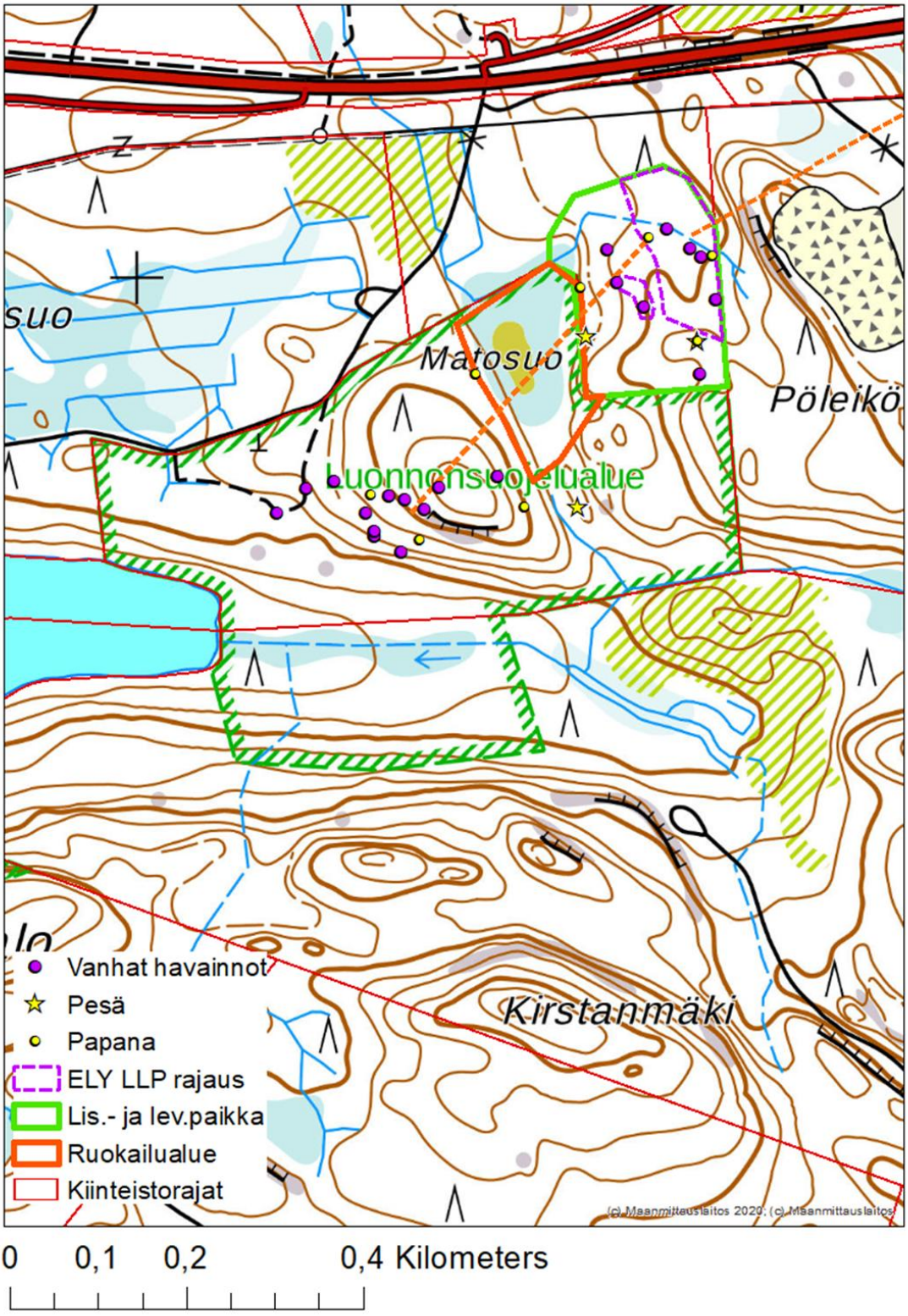
Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.




**Map1. Logging themes and the moving routes.**




**Map 2. Flying Squirrel Observations**

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: RAUTALAMPI, MYHINPÄÄ

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **Myhinpää**
Municipality, region: **Rautalampi, Northern**
Country: **Finland**
Size of the project area (ha): **18**
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

The project site is located east of Lake Myhinjärvi in Rautalampi. There are numerous old flying squirrel observations on the land between Lake Myhinjärvi and Little Soidinlampi. The surrounding areas of the observation hotspot consist of both old and younger forests. Observations focus on a 5-6-hectare patch of older forest on company and private land. The old forest is mostly surrounded by younger managed forests. The tree cover in the observation area is predominantly spruce-dominated mixed forest, with a significant amount of aspen.

There are two concentrations of flying squirrel observations near the project site. The first one is about a kilometer to the southwest along the shore of Lake Myhinjärvi. The second concentration is slightly less than four kilometers southeast in the bay of Lake Mehtiö. Practically, the connections to the west are hindered by Lake Myhinjärvi and Lake Korppinen, as the land between the lakes is cultivated land. Presumably, there are territories in the nearby area that are not known. The flying squirrel inventory was conducted on April 17, 2019, when there was still a considerable amount of snow in the area. Despite the conditions, the inventory yielded enough observations of flying squirrel droppings to adequately map the territory.

The concentration of old observations is situated on private land in a dense spruce forest, where droppings were also observed during the inventory. The inventory indicated that there is a significant amount of droppings and potential nesting sites on the company's land throughout the old forest stand. There were so many droppings during the inventory that not all potential tree bases were considered necessary to investigate. According to the inventor's opinion, there could be two female territories in the surveyed area, given the abundance of droppings. However, these territories cannot be clearly separated from each other.

## Forest Owner's Objectives

Representatives of the landowners aim to be involved in the planning of forest management activities, ensuring that flying squirrel breeding and resting areas are adequately taken into account. To facilitate monitoring, the owner is ready to implement planned logging and management activities in the area.

## Planned Measures - Action A6

### Thinning

Stand 335: The forest plan includes a regeneration in 2021. The stand has markings indicating the flying squirrel habitat. Observations are concentrated on this stand. The southern part of the stand, bordering private land, is considered the breeding and resting area for flying squirrels. There are aspens in the area and decaying wood (estimated at 15 m3/ha). A similar area is also in the northern part of the stand, with tree cavities in large aspens.

ACTION: Divide the stand, leaving substands 335.1 and 335.2 untreated. Selective harvesting of pines is possible but, to preserve the natural state, it is better to leave them untouched. Thinning harvest is conducted in the central part (stand 335). It's possible to perform small gap-type removals of trees near skid trails around regenerating groups. Thinning focuses on pines in intermediate areas. Aspen, birch, and the largest spruces are spared. The tree density is maintained to secure connectivity north-south. The mixed deciduous trees provides future feeding opportunities, even though the best feeding areas are outside the treated stand.

Stand 337: The forest plan includes thinning in 2022 . The stand is predominantly pine, with birch and aspen as mixed deciduous trees.

ACTION: Thinning is carried out, ensuring an adequate mix of deciduous trees, especially sparing aspens. The same action is taken in stand 363. The forest stands continue to safeguard the flying squirrel's routes to the north and northeast.

### Excess Stand Removal

Stand 336: The forest plan indicates thinning in 2020. The stand is pine-dominated, with birch, spruce, and aspen as mixed deciduous trees. Comprehensive 1-4 m spruce regeneration is present.

ACTION: Divide the stand into two during treatment. The northern part (336.1) is excluded from treatment (a wet depression with very large aspens). This area is a good feeding ground for flying squirrels and will provide nesting opportunities in the future if suitable cavities form in aspens. The excess stand is removed in the southern part (336) with the goal of preserving a viable plantation. Due to abundant vegetation, felling occurs along wide skid trails, which, due to the area's sensitivity to regeneration, are expected to naturally regenerate. Larger trees, especially aspens, are spared for feeding and route purposes. As aspens are evenly distributed, the saved trees can act as a route to the northwest. If the storage location between stands 336 and 338 is near a private road, the clearing must be planned to avoid disrupting the flying squirrel's passage between stands. Stand 336 forms a structurally diverse stand with a significant amount of stemwood in addition to developing regeneration to secure a passage route.

Stand 338: The forest plan includes thinning in 2020. Pine-dominated mixed forest. Aerial imagery shows deciduous trees areas, mainly consisting of aspen groups. The stand's soil is highly rocky. Underneath, there is a similar 1-4 m spruce regeneration as in Stand 336.

ACTION: The same procedure as in Stand 336. Separate the untreated area of aspen groups from the Stand, interpreted as the flying squirrel's breeding and resting area (336.1). Special attention is given to the preservation of other aspen groups. In general, aspen and deciduous trees are spared. Focus on creating a denser tree belt at the

eastern edge of the stand to form a suitable passage for flying squirrels to the north. The tree belt connects the passage possibility between stands 336.1 and 338.1. On the western edge of the property, there is a power line, so no retained stand is left there, as it poses a threat to the line. In storage locations between stands 336 and 338, ensure that the passage remains wide enough. In other words, storage sites and roads should not create too broad a treeless area that impedes the flying squirrel's movement.

**Small Gap Harvest**
Stand 367: The forest plan includes regeneration in 2020. Spruce stand with birch and aspen as mixed deciduous trees, and scattered pines. The northern tip of the stand is a resting and breeding area for flying squirrels. The stand also serves as a route to the west of the road.

ACTION: Create a small gap near the road (367.1). The gap is delineated so that an untreated tree belt remains between the gap and the former storage site to the south (372.2). Another gap is created on Stand 367.2 next to the power line, consisting only of spruces. This gap is primarily to safeguard the power line from potentially falling trees. The remaining part of the stand (367) is left untreated because it is interpreted as a breeding and resting area for flying squirrels. The most important large aspens for flying squirrels are located in the border zone, bordering Stand 366.

Stand 372: The forest plan includes regeneration in 2023 . The Stand has a diverse stand. At the southern end, there is a birch stand with extensive 2-5 m spruce regeneration (372.1). In some parts of the stand near the road, there is relatively young spruce. In the hilly area, there is a pine stand (372). Near the road, there is a small old storage site, where spruce regeneration is growing beneath conifers and other deciduous trees (372.2).

ACTION: Create a small gap in the hilly area of stand 372 for regeneration (0.2-0.3 ha). Similar to stand 367.2, remove the trees near the power line to prevent them from falling onto the line. At the southern end of the stand, a stand will be preserved on the border with Stand 370 to secure a passage route towards Pieni Soidinlampi. In Substand 372.1, remove the excess stand from the birch stand. Some birches are left unharvested. Special attention is given to the old storage site (372.2), developing into a good grove for the flying squirrel's feeding. "Edge remnants" of spruces and aspens in the original stand 372 are left untreated to secure the flying squirrel's passage to the west of the road in the north-south direction.

## Consideration of Flying Squirrel in Future Actions

Stand 370: Streamside stand. Nearly half of the stand consists of decaying wood, casualties of a beaver-induced flood. This area remains outside of the treatment boundaries.

Stand 371: The stand is dead, except for a strip along the northern edge of the ridge. This strip is preserved as a passage route, and thus, no treatments are applied.

Stand 369: A sparse 10-meter-tall spruce-birch regeneration. In the future, care will be taken to ensure an adequate mix of deciduous trees, also considering the flying squirrel.

Stand 366: Young birch stand approaching its first thinning. Extensive spruce regeneration underneath. Potential for developing into a two-story stand. Additionally, more mature birch trees are retained as reserve trees. This area can be developed into a suitable habitat for the flying squirrel, similar to Stands 342 and 339.

## Action C2

Cuttings were executed 2020 according to plan.

## Action D1

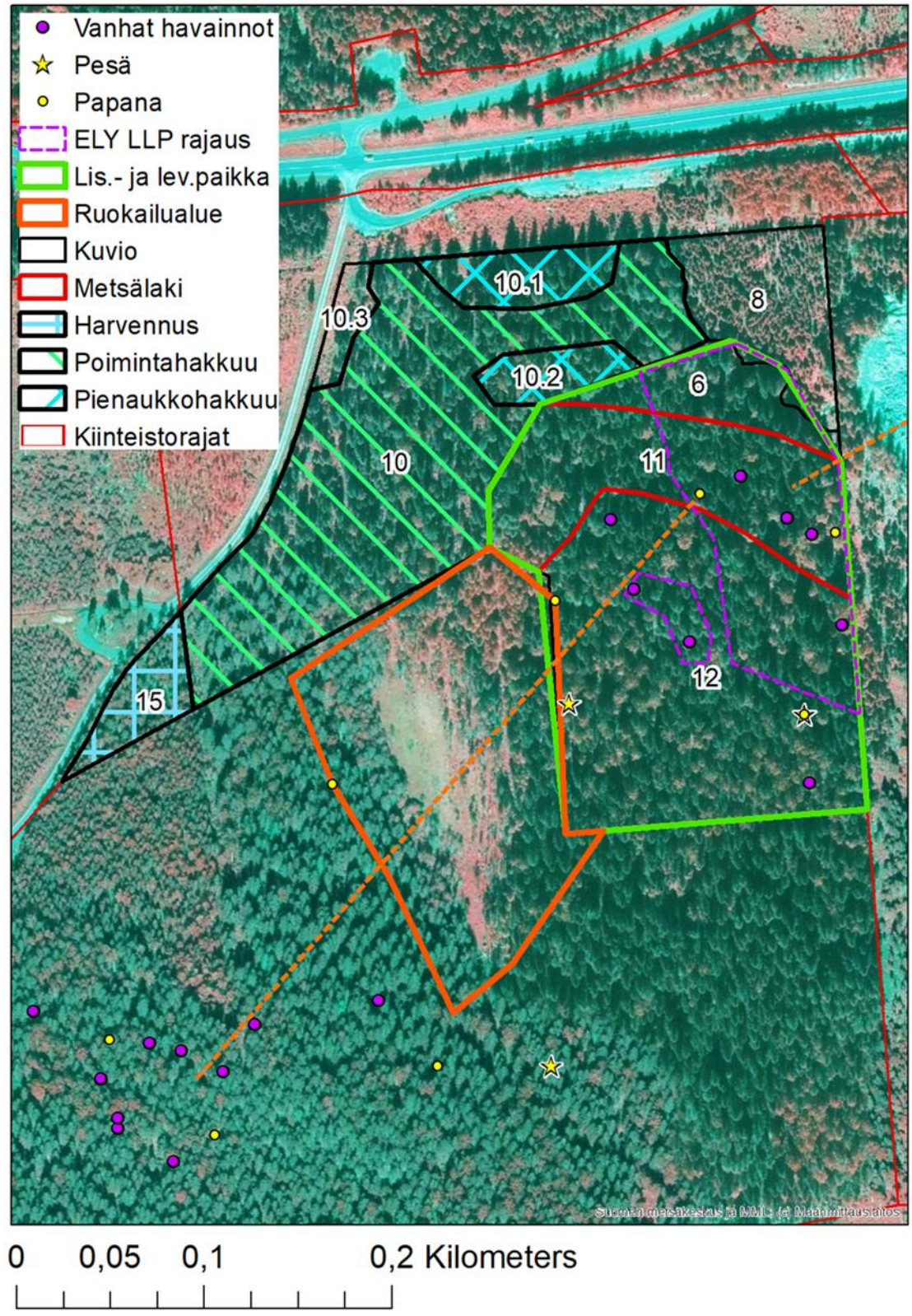
Base-line inventory was made in 2019. Annual flying squirrel inventories were carried out during the project in 2021-2024. Flying squirrel occupied the area during all inventories, except the last one.

## Monitoring after the project

Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.




**Map 1. Flying Squirrel Observations**

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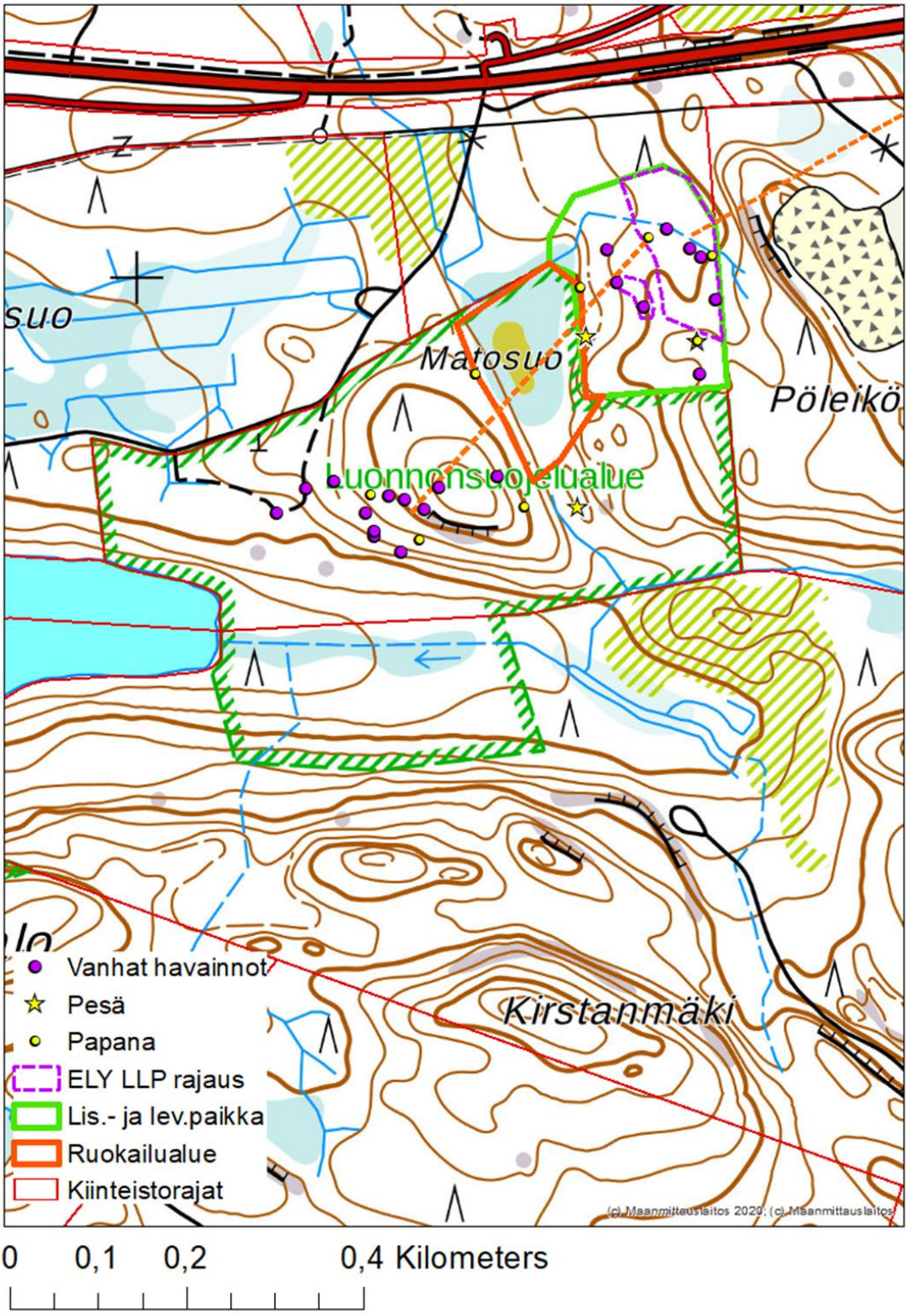



**Map 2. Flying Squirrel Observations**

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PRPJECT SITE: LEPPÄVIRTA, HUMALAMÄKI

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **Humalamäki**
Municipality, region: **Leppävirta, Northern Savonia**
Country: **Finland**
Size of the project area (ha): **20**
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

The Humalamäki project site is in Leppävirta. Next to the site runs Highway 5. In the area, there is a highway project, and the road alignment plan targets a part of this flying squirrel habitat. The action plan ignores the portion of the forest stand 11 (11.1) that falls under the road alignment.

Flying squirrel inventory was done by Risto Sulkava on May 17, 2019. The timing of the inventory was good, as the snow had just melted, making droppings clearly visible. In addition to fresh droppings, the inventory also searched for older droppings under the litter from beneath the best-looking trees. Prior to the inventory, the old observation points happened to be almost precisely in the same area as the droppings found during the inventory. Based on the observations, an active female territory was identified in the area.

## Forest Owner's Objectives

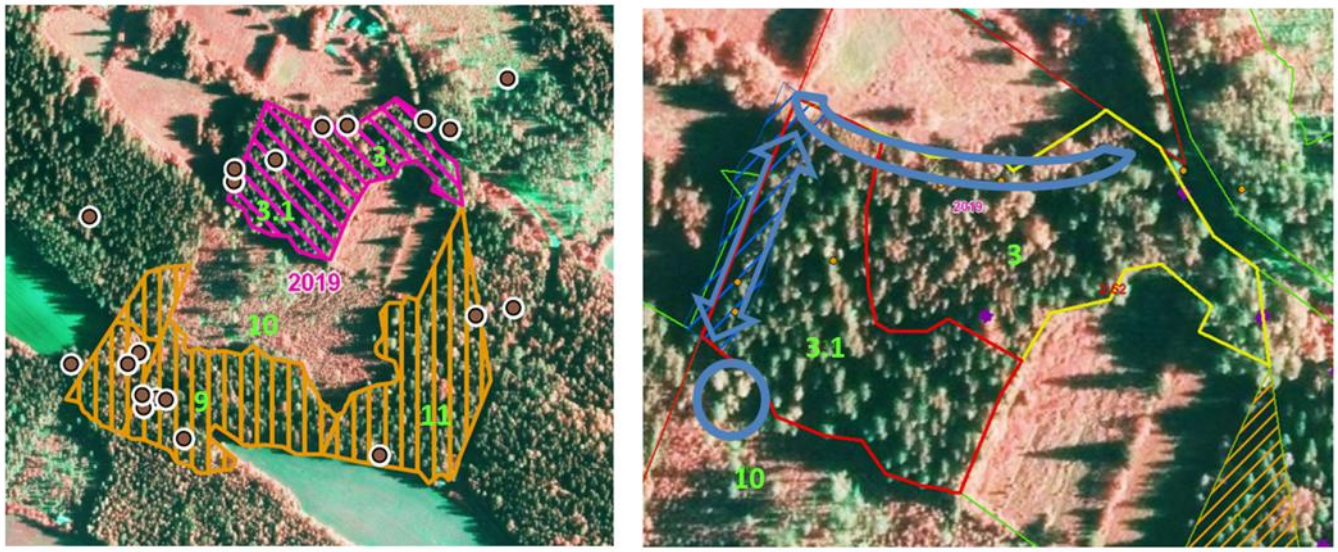
The landowner's primary focus in forest use is on economic considerations. Planned logging has been in the works for years on the project site. It took several years from signing up for the project to the actual project plan, during which the landowner managed to carry out logging in the nearby the actual project area in the winter of 2019-2020. The realized thinning did not target the area interpreted as the resting and breeding ground for flying squirrels. In the implemented thinning, emphasis was placed on preserving deciduous trees, birches, and especially aspens.

## Planned Measures - Action A6

During the first field visit, the designer, along with the landowner and his representative, inspected the site. After going through the site, the designer Hannu Lehtoranta suggested that the logging be carried out as a selective cut. The trees available for selection include very large spruces, which complicates logging for the preserved stand. The landowner and their representative later stated that they wanted more intensive forest management.

In the second phase, the designer Hannu Lehtoranta visited the site with a biologi from the ELY Centre. It was jointly concluded that the area interpreted as the breeding and resting ground for flying squirrels meets the criteria for Metso conservation. According to the ELY Centre, the breeding and resting area is included in stands 9, 11, and 3 (Conservation boundary on map 1). After the field visit, the designer suggested that the landowner contact the ELY Centre and request a quote for the conservation of the mentioned stands. During the field visit, it was noted that observations of flying squirrels made in stand 3 are not interpreted as a breeding and resting place for flying squirrels. Droppings observed at the edges of the field indicate the edge being used as a feeding area. Therefore, a 20-meter strip of untreated forest should be preserved along the property line. Outside the logging area, a deciduous tree border adjacent to the field in the northern part of the stand should also be preserved. In addition to these pathways, the potential significance of the large birches on the side of stand 10 as a pathway on the boundary of stand 3 is taken into account.

The landowner and their representative did not accept the selective cut proposal for the entire logging area. In January 2021, a forest use notice was submitted, stating that half of the area would be clear-cut (stand 3.1) and the other half (stand 3) would be thinned. The North Savo ELY Centre, in its statement on the forest use notice in January 2021, required the preservation of observed pathways during the field visit. The pathways are marked in blue on the map below. The northern deciduous tree border is marked with an arc. A 20-meter-wide strip of untreated forest is indicated by an arrow on the border. The large birches left outside the logging area are marked with a circle.




*Map 1 and 2: In the left aerial image, the orange area (3.78 ha) is the conservation area, and the red represents the selective cut according to the original plan. In the right aerial image, the selective cut area, where clear-cutting (0.81 ha) will take place, includes the spruce-dominated western and southern parts, stand 3.1. Thinning will be carried out in stand 3 (0.84 ha). Pathways observed during the field visit are marked with blue markings.*

The part of the thinning (stand 3) consists of dense spruce-birch mixed forest, with signs of regeneration in some areas. In the original plan, the area was intended for selective cutting, aiming to enhance regeneration by creating gaps and preserving existing seedlings, especially birches. Logging would be done with a focus on preserving birches, with minimal cutting near the road. Special attention will be given to preserving large spruces and nearby sturdy alders. The same principles apply to thinning, which is a lighter forest management method compared to selective cutting.

Possibilities for Conservation: The map above indicates areas considered for conservation with orange markings. The North Savonia ELY Centre has made an offer for permanent and temporary conservation. The possibility of temporary conservation, a 10-year environmental support agreement, was also examined for the same area by the Finnish Forest Centre. Temporary conservation emphasizes existing nature values, such as deadwood, natural forest structure, and natural water management. In spring 2021, environmental support could only be offered for stand 11, where enough biodiversity-enhancing features and deadwood were found.

## Consideration of Flying Squirrel in Future Actions

The future of the territory will be well-considered through the protection of the core area. Thinning carried out in 2019-2020, which spared deciduous trees (7.5 ha), has created suitable movement and feeding areas for the flying squirrel around the resting and breeding site. It is beneficial for the flying squirrel if suitable alders and other deciduous trees for food are preserved along the edges of fields. There is a disused field between the managed stand and the conservation area, with growing alders and a few suitable spruces in its ditches. If the field is afforested, it is recommended to plant birch and preserve the existing tree cover along the ditch banks as much as possible.

## Action C2

Loggins have executed according to this updated plan in 2022.

## Action D1

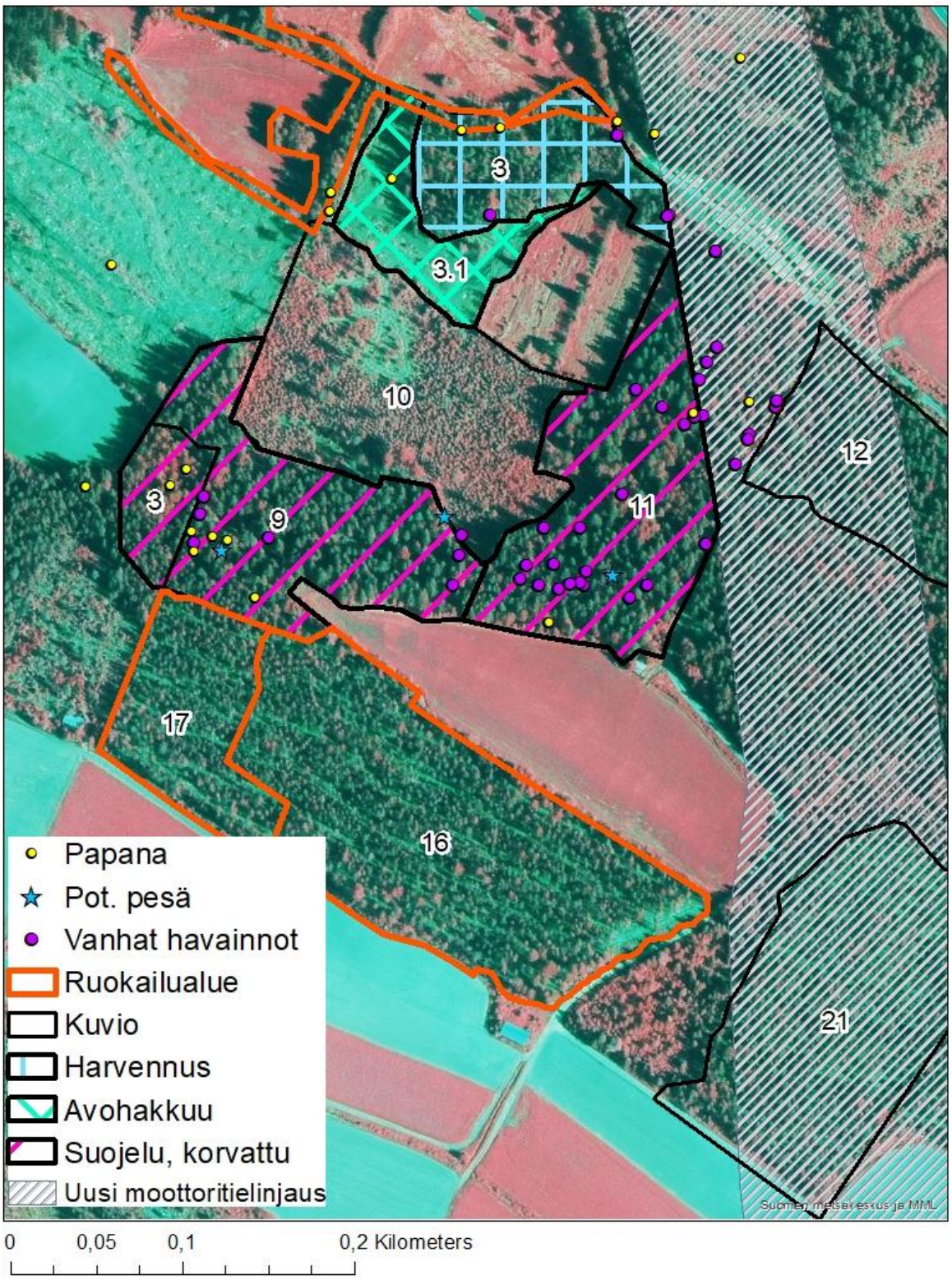
Base-line inventory was made in 2019. Annual flying squirrel inventories were carried out during the project in 2021-2024. Flying squirrel occupied the area only in 2019.

## Monitoring after the project

Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.




**Map 1. Flying Squirrel Observations**

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: LEPPÄVIRTA, UITUKANHARJU

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **Humalamäki**
Municipality, region: **Leppävirta, Northern Savonia**
Country: **Finland**
Size of the project area (ha): **20**
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

The project site Uitukanharju is located north of the Leppävirta urban area. Between the residential area and the forest, there is a narrow strip of rural housing and small fields. The area has about a dozen previous observations of flying squirrels. All observations are concentrated south of Hutronen Lake in an approximately three-hectare area.

In the muncipality's planning area and its environmental survey (approved in 2015, surveyed in 2013), the Hutrosen Lake area is designated as a valuable conservation area. Almost all old flying squirrel observations fall within this designation. There are no other known flying squirrel observations within several kilometers

There is a fitness trail on Uitukanharju that circles around Hutrosen Lake. Thinning and selective cutting were carried out in Uitukanharju in 2018. The logging areas are not located within known flying squirrel habitat.

The related survey for the project was conducted on May 14, 2019, under favorable conditions after the snow had melted. The survey found relatively few signs of flying squirrels. In the old concentration area south of Hutrosen, only old droppings were found under two trees. New droppings were found on both sides of the fitness trail, approximately 400 m southwest of Hutrosen's occurrence. Of the new droppings, only one pile was found, leaving uncertainty about the presence of a female territory. Based on the survey, it appears that Hutrosen's territory has temporarily been vacated. Both areas have natural-like tree cover, with no logging in recent decades. According to the interpreter, there could be two female territories in the observation locations.

Site visits were conducted with the municipality's forestry representative in June 2019. At that time and later by the planner, attempts were made to find additional signs of flying squirrels. No additional observations were

made. Therefore, there is no identifiable flying squirrel breeding and resting site in the survey area. However, the entire property is considered potential habitat for the species..

## Forest Owner's Objectives

The landowner's general goal for the area emphasizes recreational use, with some degree of timber production also taking place. After the recent thinning and selective cutting on fhe property, no new measures are planned.

## Planned Measures - Action A6

The situation of the old, at least temporarily vacant, territory is secured as the entire area is recognized as a valuable natural site, designated as conservation area. Positively for the flying squirrel, this designation also covers the extremely diverse stand of woods in the northwest part of Hutrosen (stand 15). The location is currently and in the future an excellent habitat for the flying squirrel.

The area with new droppings observations (stand 19.6, 3.1 ha) consists of dense, old spruce forest. There is also some pine and birch mixed in, along with a few sturdy aspens. The stand is estimated to have approximately 10 m3/ha of deadwood. The stand meets the classification criteria for Metso I class according to the Metso program. Continuing towards the Hutrosen area, there is stand 19.3 (1.5 ha) with less deadwood, classified as Metso II class. Stand 21 (1.0 ha) is also relevant for the flying squirrel, featuring complex tree structure and significance as a potential feeding area. As these stands, in addition to a potential flying squirrel habitat, also have significant importance for recreational use, no logging activities are proposed in this project. The municipality may consider incorporating the area through the Metso program, emphasizing recreational use, or potentially in future urban planning.

## Consideration of Flying Squirrel in Future Actions

If logging is desired in the area, it is recommended to aim for maintaining canopy cover. Methods include selective cutting and possibly regeneration through small openings. Along the edge of stand 20, regeneration through strip cutting is possible (good seedling growth under the birch stand in stand 20). Logging will preserve deciduous trees and the majority of the largest spruces, which are important for the flying squirrel's living conditions. Outside the flying squirrel stands, logging was carried out in 2018 following the aforementioned recommendations..

## Action C2

The landowner chose the option of conservation on the flying squirrel area.

## Action D1

Base-line inventory was made in 2019. Annual flying squirrel inventories were carried out during the project in 2021-2024. Flying squirrel occupied the area only in 2019.

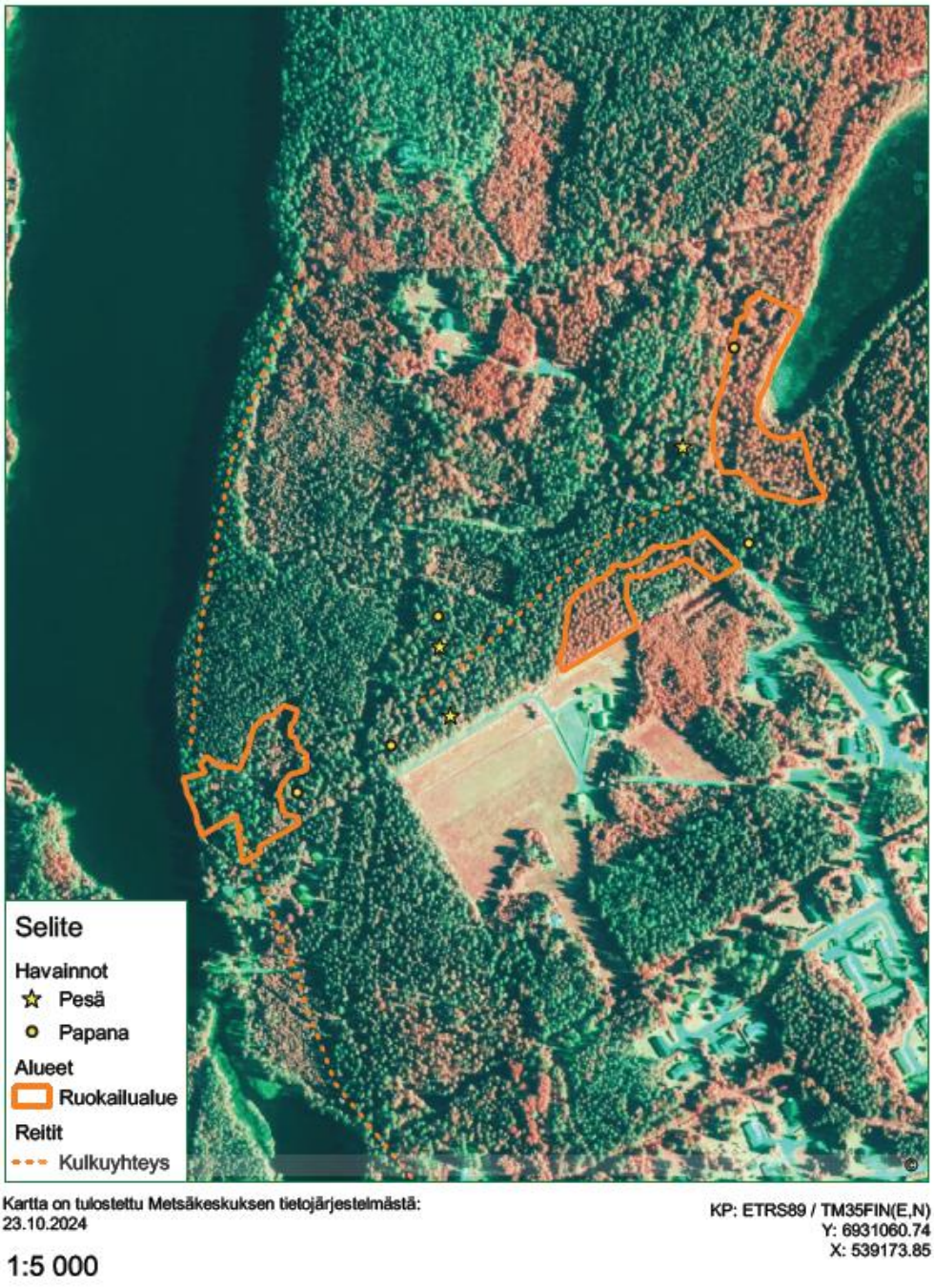
## Monitoring after the project

Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the

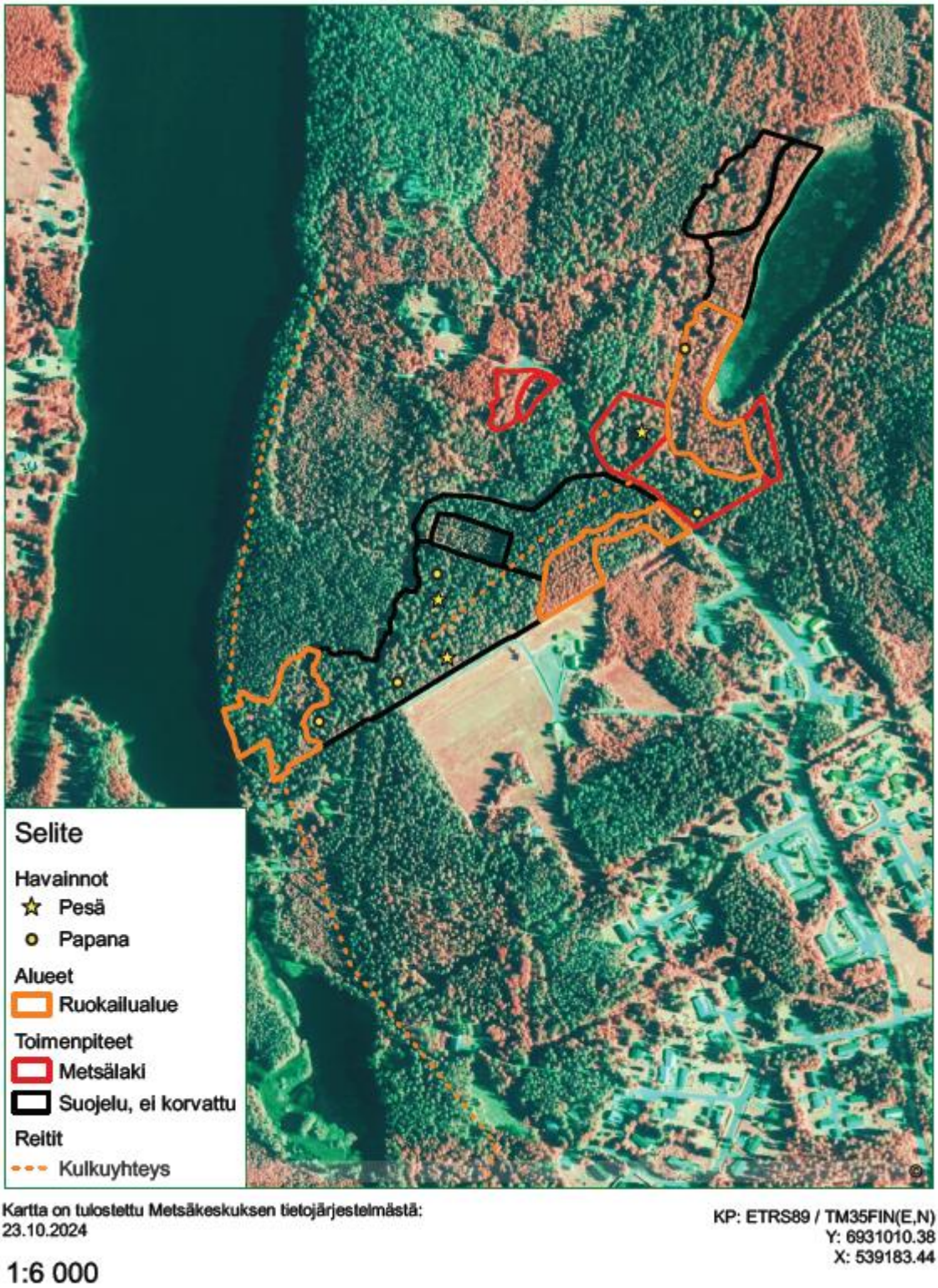
forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.




**Map 1. Flying Squirrel Observations and moving routes**




**Map 2. Flying squirrel observations and logging themes**

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: LIPERI

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **21**
Municipality, region: **Liperi, North Karelia**
Country: **Finland**
Size of the project area (ha): **100**
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

The project site of Liperi's northern and eastern sides are surrounded by farmland, with decreasing field sizes in the vicinity. There is some housing on the western side (no fields), and to the south, there are large uninhabited forest areas actively used for economic purposes.

The planing area contains stands with very mature trees, as well as young and mature cultivation forests. There are fewer saplings, and the tree population is mostly coniferous, but nearly all stands have a good mix of deciduous trees. The estate is notable for the abundance of exceptionally large trees, present both in old forests and areas treated with selective cutting.

Observations of flying squirrels come from the southern end of the estate's old forest. The survey was conducted by Risto Sulkava on May 24, 2019. It was interpreted that the current female territory and nesting site are in a new location south of the farm center. The old location has at least temporarily become vacant, and it was not possible to determine the core territory or breeding and resting place from there. Nevertheless, the area remains suitable for the return of flying squirrels in terms of its tree stock and accessibility. The current breeding and resting area for flying squirrels is interpreted to be on stands 34 and 35 at the boundary of the estate, each with a nest hole indicating residence. Additionally, the area includes a yard on the other side of the road.

## Forest Owner's Objectives

The landowners is engaged in firewood sales. According to the landowners, the focus of forest management in the near future will be necessary thinning cuts. While there are several areas suitable for clear-cutting, there are no immediate plans to carry them out.

Firewood harvesting targets thinning areas. Young forests have a good mix of deciduous trees as secondary species, allowing a suitable deciduous mix to be preserved despite harvesting. Mixed stands promote forest biodiversity and, at the same time, secure habitat opportunities for flying squirrels.

On another estate owned by the probate, a private 4.5-hectare conservation area has been established previously. The possibility of conservation on the planned area is suitable for the landowner.

## Planned Measures - Action A6

### Selective cutting

The current breeding and resting area of flying squirrels has already been taken into account at the beginning of the project. The harvest was carried out in winter on stands 34, 35, and 34.4, with a combined area of 4 hectares. In the 2018 forest utilization notice, these stands were initially marked for clear-cutting and planting with spruce. However, the logging was modified to a selective cutting, considering the habitat of flying squirrels. Due to the urgency of the operation, detailed planning could not be awaited. The focus was on preserving canopy cover, deciduous content, and, of course, saving nesting and protective trees.

The harvest volume from the 4-hectare area was 350 m3, equivalent to 88 m3/ha. The breakdown of timber harvested was as follows: pine logs 13 m3, pine pulpwood 13 m3, spruce logs and pulpwood 29 m3, spruce pulpwood 28 m3, and birch logs 10 m3. The guidance for the harvest was to spare birches, and skid trails were directed to avoid cutting them. Stand 34 had very few pines left, and a bit more spruce, including larger timber. In the mature stand, birch (dbh 1.3m, 15-30 cm) was the dominant species left. The plan is to continue developing Stand 34 as a covered stand. Possibilities to save spruce regeneration (2-7m spruces, almost 1000 trees/ha).

The same selective cutting was applied to Stand 35. The initial stand and the remaining stand were noticeably more spruce-dominated than in Stand 34. The trees in the remaining stand were still mature, with a significant portion of spruces over 30 cm (dbh 1.3m). There was only a small area of young aspen on Stand 35, left to grow into mature trees in the future. Future care will ensure that aspens have the chance to develop into merchantable timber. The spruce regeneration saved in Stand 35 is somewhat more clustered than in Stand 34.

Selective cutting was also performed on Stand 34.4. The remaining stand has a bit more pine than Stand 34 but is still birch-dominated. Sturdy aspen trees and large spruces were spared in this stand, and spruce regeneration was also preserved. Information on the post-harvest stands for the treated stands is provided in Annex 9.

All the mentioned stands have the potential for continued tree growth. A selective harvest can be repeated in about ten years. At that time, it is still essential to ensure the requirements of a suitable habitat for flying squirrels: saving aspens, maintaining deciduous content, and ensuring there are enough large spruces left in the area. For Stand 35, which is spruce-dominated, regeneration through small openings is considered during the subsequent harvest.

### Conservation area

On the old territory that was inventoried as vacant, there are still full opportunities for resettlement. The tree population in the area is spruce-dominated and very robust (dozens of spruces and pines with a diameter of 1.3 m and about 60 cm). The site meets the criteria required for the METSO conservation program. Investigation into the establishment of a private conservation area (YSA) will begin for Stands 52, 54, 54.2, and 44. The area covers approximately 5.7 hectares.

**Thinning**
Adjacent to the area, a first thinning will be carried out in the fall of 2019 on Stand 50. For the harvest, a conservation group has been marked on the border of Stand 50 and 51, consisting of deciduous trees and spruces. Large pines are spared during the harvest. Birches are favored, but emerging spruces are preserved to enable future layered forest growth. Deciduous stands in young forest Stands 50 and 42 secure the long-term travel route between known occurrence areas within the estate.

## Consideration of Flying Squirrel in Future Actions

The known habitats of flying squirrels on the estate will be considered in the measures already implemented and planned. A forest usage plan was created for the areas near the territories to ensure that flying squirrels have the opportunity for new territories, movement to new locations, and especially connectivity to the surrounding forest landscape.

Currently, the resident flying squirrels on the estate have good connectivity to the surrounding landscape. Inventory data indicates that flying squirrels also utilize the tree cover in the immediate vicinity of the house. The tree population is mainly robust mixed forest. To the west of the house, there is a good tree cover leading to an area surrounded by several houses. The small size of these properties almost certainly guarantees tree cover. To the west of the house, a southwest-northeast-oriented stream runs, and the preserved local tree cover secures movement from the current territory northwards. This travel route is supported by the fact that the next harvest in the spruce stand along the stream (Stand 9) is still a thinning.

The current nesting holes are almost on the border of the estate. A few sturdy aspens are on the neighboring property, on the edge of a pure spruce stand. The owner of the estate will be informed about flying squirrels and the importance of considering the nearby tree cover. Near the current nesting site, there is a suitable small forest law §10 area (Stand 33) with alder trees.

From the treated stands of the nesting area, there are good travel connections towards the south, both on this estate and the neighboring property. Young spruce stands with plenty of birch as secondary species allow preserving adequate deciduous content in future thinning (Stands 42 and 50).

The connections to the east and, consequently, to the north can be easily maintained through treated Stand 34.4. Stand 37, consisting of birches, also supports this connection. North of the road, maintaining connections can be achieved by utilizing forest law §10 stands (Stands 25 and 27.1).

## Action C2

Forest cuttings have executed in 2019 according to the plan.

## Action D1

Base-line inventory was made in 2019. Annual flying squirrel inventories were carried out during the project in 2021-2024. Flying squirrel occupied the area only during the first inventory in 2019, though the dropping were old and area was already disserted then. But also new droppings were found in 2019, 0,5 km north-west from the old place.

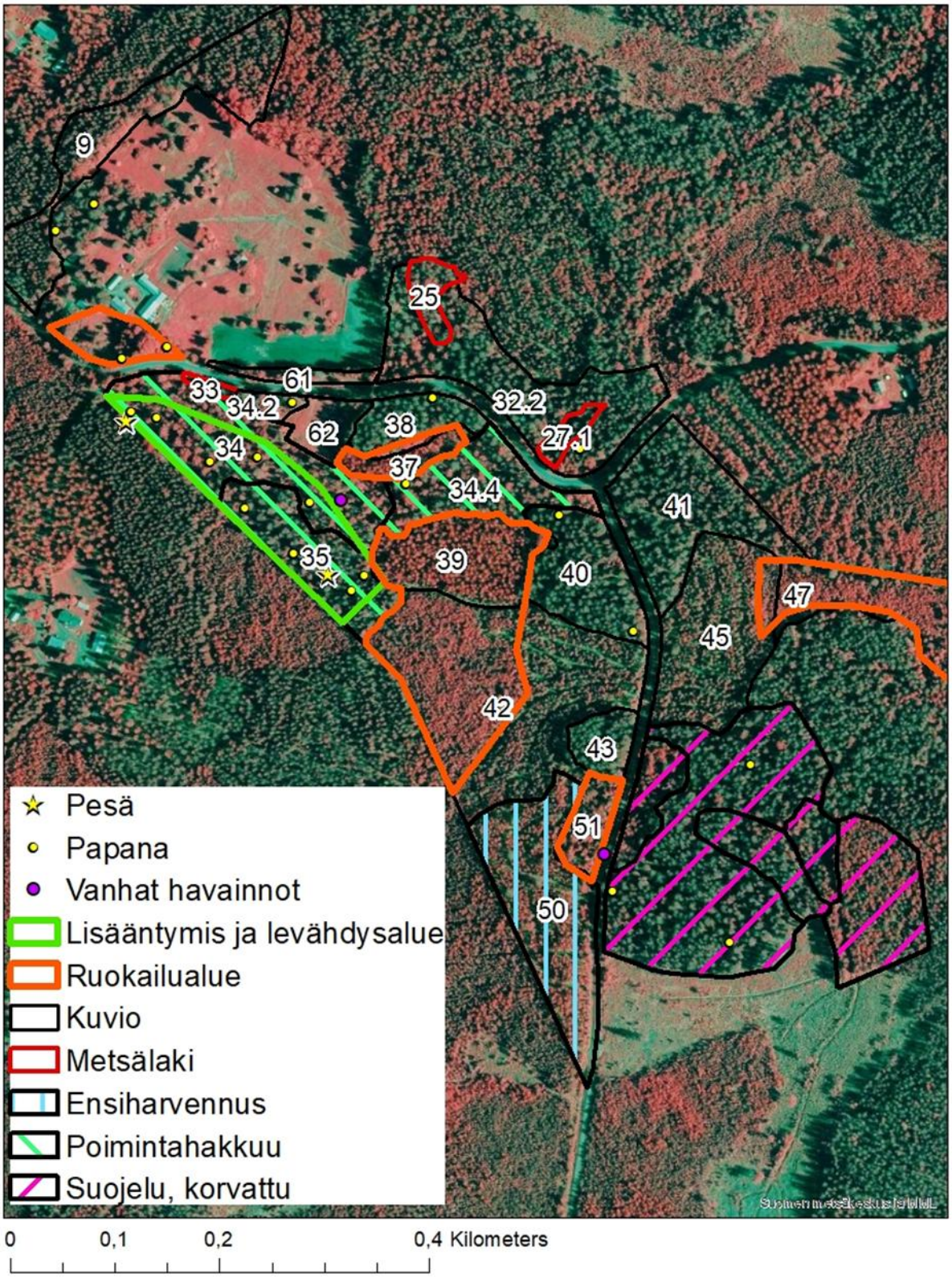
## Monitoring after the project

Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the

forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.




**Map 1. Flying Squirrel Observations and Movement Routes.**

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: VARKAUS

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **Varkaus**
Municipality, region: **Varkaus, Northern Savonia**
Country: **Finland**
Size of the project area (ha): **20**
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

The project site is located on the outskirts of Varkaus. The area is crossed by Highway 5, and to the east, there is a motor racing track. Surrounding the track area is a bordering forest with robust spruce, pine, and birch, including a significant number of aspen trees. To the west of the highway is a wooded area with skiing and snowmobile trails. Thinning and clear-cutting have been carried out in the western part of the area.

Flying squirrel inventory was conducted on spring 2019. At that time, there was still some snow in the area, and droppings were clearly visible during the inventory. In addition to fresh droppings, the inventory sought older droppings under the litter from beneath the trees that looked most promising. Prior observation points were concentrated north of the motor racing track and to the west of the highway. The inventory found plenty of fresh droppings from the same area north of the motor racing track as in the pre-existing data. In the same area, in-use nesting holes and twig nests were also found. Based on the observations, an active female territory was confirmed in the area.

To the west of the highway, only one fresh droppings observation was found during the inventory. Additionally, locations of droppings from the previous year were found nearby. Based on the observations, the inventory indicated that the female territory in the area might have been temporarily vacated. The fresh observation could be from a male squirrel moving through the area. The inventory report highlighted the observer's perception that crossing Highway 5 seems possible only from one location, near a rocky cut.

On the western side, clear-cutting and thinnings have been carried out as understory thinning. Aspen and birch have been preserved in the thinnings. The area can still be considered suitable as a flying squirrel habitat.


*Map 1: Observations from the 2019 inventory (fresh dropping locations marked with a red star, green circles represent nests/nesting sites, and older droppings indicated by a blue star). Additionally, older observations from the existing location data that were not in the aforementioned areas are marked with violet "squirrels".*

## Forest Owner's Objectives

As the representative of the landowner indicates, the areas are partly used for recreational purposes. Especially on the west side of Highway 5, there is an emphasis on economic use of the forest.

## Planned Measures - Action A6

During the field visit, it was determined that logging activities are not justified in the forest strips around the motor track. The only possibility would have been a selective cut targeting pines, but there was no reasonable justification for that either. The area serves as a breeding and resting ground for flying squirrels and is also significant as a local recreational area (motor track, its noise barrier, and snowmobile route).

The treatment area was sought from the west side of Highway 5, where there were old observations, and one recent observation during the inventory. The female territory in the area was assessed during the inventory to be temporarily vacant. The chosen area was plots 18 and 13.2 based on the landowner's proposal. The planned measures presented in the action plan have been implemented on four sub-plots (A, B, C, D) in this area, with detailed planning and instructions for each.

**Selective cutting**

Stand 18 and 13.2 are mainly dense spruce stands with some areas having dense spruce sapling groups. There are also some pine and birch trees in the stand, and a moderate amount of aspen. The objective of the treatment is to achieve a diverse stand through selective cutting. The focus is on freeing up the growth of good sapling groups and initiating new regeneration. There is not much pulpwood-sized timber in the area, complicating the formation of structural diversity. No suitable nests or nesting sites for flying squirrels were found in the treatment plot. The estimated harvest volume is about 100 m3/ha, approximately 150 m3 for the 1.4 ha area (mostly spruce and pine logs).

Sub-plot A: The plot is crossed by an illuminated jogging trail and a snowmobile route, with power lines also intersecting the routes. The stand is dense spruce, with birch and some aspen mixed in. In the western edge of the plot, there is also a dense pine stand. Throughout the area, there is an undergrowth of spruce saplings, forming dense groups in some places. The harvesting is done as a log operation, and only a few pines are left. The goal is to spare the best sapling groups, especially selecting spruce and pine logs on and around sapling groups. Birch and aspen are preserved. Harvesting paths and areas are chosen in the least sapling-covered areas. Paths are created, including on both sides of the power line, and the trees to be removed are chosen so that the remaining trees do not possibly reach the line when falling. Part of the harvest can be done manually from the paths. An area along the north/northwest side of the power line has been excluded from harvesting, forming a forest corridor to secure the flying squirrel's travel route to the south/west of the power line. After selective cutting, the remaining trees in the plot should consist of sapling groups, pulpwood-sized timber, spruce logs, and birch, aspen, and a few individual pines. The largest spruce trees are left next to good deciduous trees (not near the power line). Especially valuable trees are marked with red-yellow fiber tape.

Sub-plot B: The stand is dense spruce. There are a few birches and individual aspen on the edge of the area. There are no sapling-sized, but good, contiguous sapling groups yet. A selective cut targeting spruce logs will be implemented. The cutting will diversify the stand, and clear areas will be formed in the plot where regeneration will occur later. Birch and aspen will not be removed at all. Likewise, a couple of the largest spruces will be preserved. Some trees to be preserved are marked with red-yellow fiber tape.

Sub-plot C: The area is covered with spruce saplings, with timber-sized birch and a couple of aspen. There are also a few spruce logs on the plot. A selective cut will remove excess growth from the edges (about 40-50% of birch, except for those marked with red-yellow tape). Special attention is given to preserving aspens.

Sub-plot D: A stand of spruce logs, with minimal pulpwood-sized timber and birch. A selective cut targeting spruce logs will be carried out. Clearings will be created in the plot through paths and felling, and they will later regenerate. Half of the plot is mire-type soil, and the regenerative capacity seems reasonably good. All deciduous trees will be preserved..

## Consideration of Flying Squirrel in Future Actions

On the west side of Highway 5, the most suitable habitat for the flying squirrel appears to be the following areas:

An abandoned field used as a feeding area, with deciduous trees like birch, alder, and aspen along the ditches. On the eastern edge of the property, there is a strip of spruce, serving as protective vegetation.

Stand 7: A designated area under Forest Act §10, providing an excellent feeding spot right at the mouth of an underpass. Additionally, there are deciduous trees such as aspen and birch in the stand.

Stands 5 and 6: A forest strip between the feeding area and the road trail, mostly consisting of timber-sized spruce. Extended rotation period near the suitable area for the flying squirrel, also serving as landscape vegetation for the road and jogging trail.

Stand 4.1: A protective belt around the pond, primarily with deciduous trees, serving as an excellent feeding area and a pathway to the north for the flying squirrel.

Stand 10: A natural stand with unthinned natural mixed deciduous trees. Old, nearly completely overgrown ditches. Very wet. Some areas have abundant black alder. Interpreted as a natural wilderness, it is strongly recommended to leave outside forest management activities. Supports the flying squirrel habitat, at least as a feeding area.

Stand 12: A deciduous tree-covered wet hollow. Timber-sized spruce on the edges. A suitable feeding area for the flying squirrel. Excluded from forest management activities.

Stand 11: Dense spruce between two natural stands. A recreational trail divides the stand. Concentration of dead spruces at the northern end. Planned pathway preservation to the south in the logging for the flying squirrel project. No logging in the near future.

Stands 14 and 20: Pine forest treated with thinning a few years ago, with a small amount of birch. A potential flying squirrel crossing point over the highway at the rock cut. Ensure that there is also high-standing timber on the other side of the road.

Stand 19: A dense spruce forest between the snowmobile route and the recreational trail, with an excellent feeding area (birch and aspen) at the southern end. The stand is now left undisturbed as landscape vegetation for the recreational trail, and in future treatments, the aforementioned deciduous tree area must be preserved.

Stand 8: Thinned spruce-pine mixed forest with some deciduous trees like birch. No logging will be needed in the near future. Some regenerating spruce groups allow for alternative regeneration without clear-cutting if desired. Another potential flying squirrel crossing point over the highway at the southern end of the stand.

## Action C2

Forest cuttings were executed 2021 according to the plan. The storm hit the selective cutting area 2022 and changed the outcome.

## Action D1

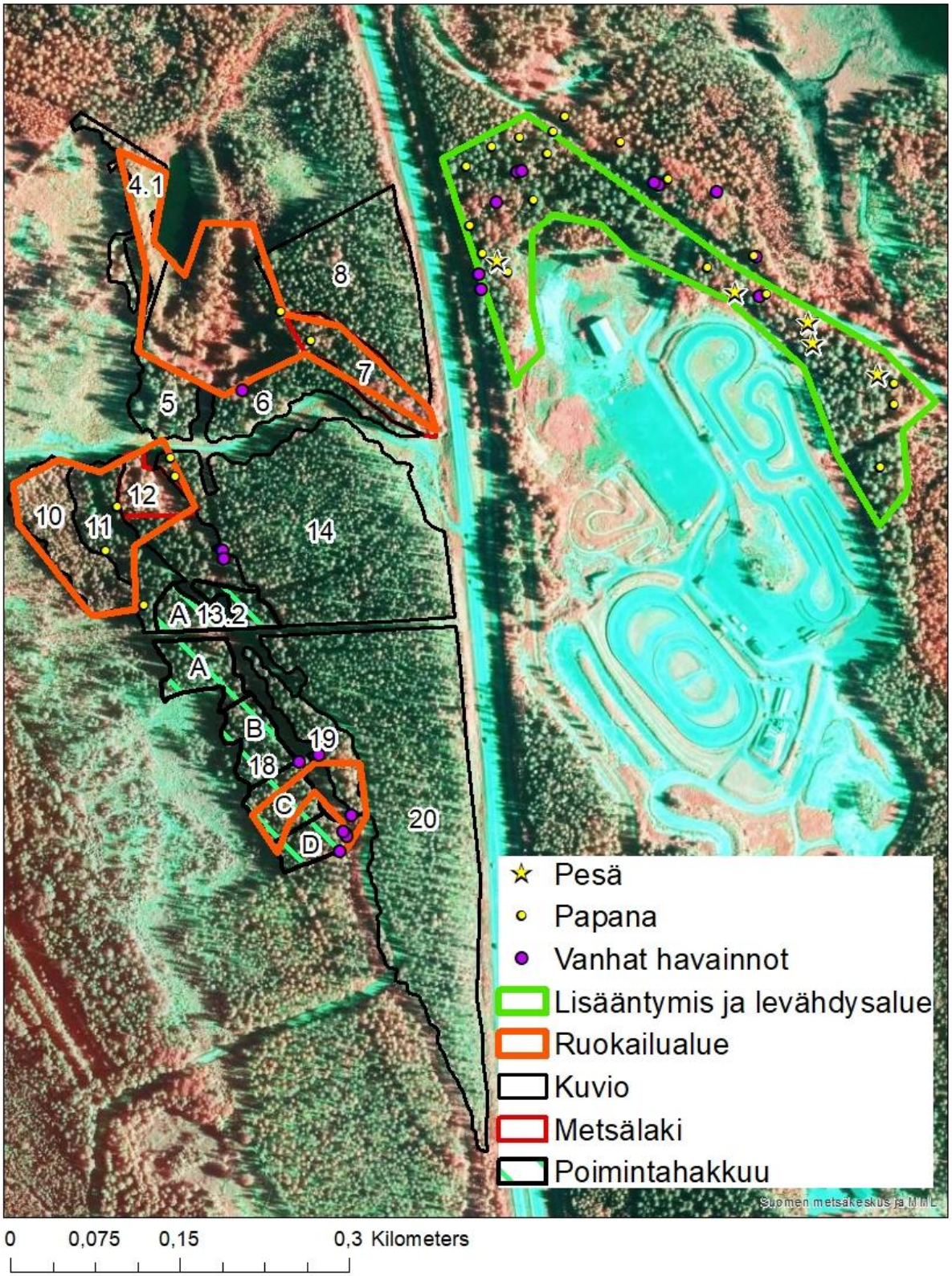
Base-line inventory was made in 2019. Annual flying squirrel inventories were carried out during the project in 2021-2024. Marks of flying squirrel were noticed in the area in 2019 and 2022.

## Monitoring after the project

Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.




**Map 1. Flying Squirrel Observations and Logging Themes.**

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: SAVONLINNA

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **23**
Municipality, region: **Savonlinna, Southern Savonia**
Country: **Finland**
Size of the project area (ha): **1,3 ha**
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

The forest property is located in Savonlinna, quite close to urban areas. There is an old observation of a flying squirrel nest from 2007 on the forest property. Further north, three observations were made in 2013. These observations are scat findings near a silver birch, based on which the more northern area was assumed to be a breeding and resting place for flying squirrels at that time.

The inventory related to the Flying Squirrel LIFE project was conducted in May 2019 at the site, but no signs of the flying squirrel were found in the area. The observation from 2007 is located in plot 1. Old observations are marked in violet in the attachment. The urine mark observations marked on the map are from 1-2 years ago.

Action plot 1 is a lush, mixed forest below a steep slope. The main tree species in the plot is pine, and in addition to that, there are spruces, firs, and deciduous trees such as aspen. The understory is quite abundant, consisting mostly of rowan, although in the southern part, there is a lot of fir understory. In the vicinity of the site, there is plenty of aspen, and deciduous vegetation is developing abundantly, theoretically providing good conditions for the presence of flying squirrels. However, the site has been vacant for several years. Measures are being taken to improve the site for the flying squirrel by providing deciduous trees (potential feeding trees). Action plot 2 has characteristics similar to action plot 1.

## Forest Owner's Objectives

The forest owner does not impose conditions or restrictions on the treatment options for the site

## Planned Measures - Action A6

Treatment for action plot 1 will be carried out as a combination of selective cutting and small opening harvesting. In the northern part, 50-60% of pines will be harvested, and further east, firs will also be harvested, with the main

focus on pines and spruces. In some areas, pre-commercial thinning is needed (at the bases of the trees to be removed). The lower layer of the forest will be preserved as undamaged as possible. Harvesting will not be directed at deciduous trees. Spruces will be removed from all canopy layers. After the treatment, the basal area of the plot will be approximately 14 hectares. The old flying squirrel nest tree area will be left untreated.

In the northern part, the understory of deciduous trees is abundant, mainly consisting of rowan. In the upcoming small openings, the deciduous understory will be cleared (1-2 trees in the widest part of the plot), otherwise the understory will be preserved. Further east, harvesting is hindered by dense spruce understory, which will be completely cleared. If an increase in logging volume is desired, action plot 2 can be treated with similar principles.

**Logging Volume**

The logging volume estimate is based on the Forest Center's forest resource data and the intensity of the treatment measures. The logging volume estimate is presented by plots and timber assortments. The logging volume for the spruces in plot 10 is classified under "MUK," other pulpwood. Although the treatment on plot 2 is optional, it has been included in the calculations.

| Kuvio | Ala [ha] | Kertymä [m³/ha] | Kokonaiskertymä [m³] | MÄT [m³] | KUT [m³] | KOT [m³] | MÄK [m³] | KUK [m³] | KOK [m³] | MUK [m³] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0,88 | 210 | 185 | 111 | 18 | 0 | 33 | 4 | 0 | 18 |
| 2 | 0,41 | 110 | 45 | 31 | 3 | 1 | 7 | 1 | 2 | 0 |
| | 1,29 | | 230 | 142 | 22 | 1 | 40 | 5 | 2 | 18 |

## Consideration of Flying Squirrel in Future Actions

Future actions have not been planned, and no specific goals have been set.

## Action C2

Loggings were executed according to the plan in 2021.

## Action D1

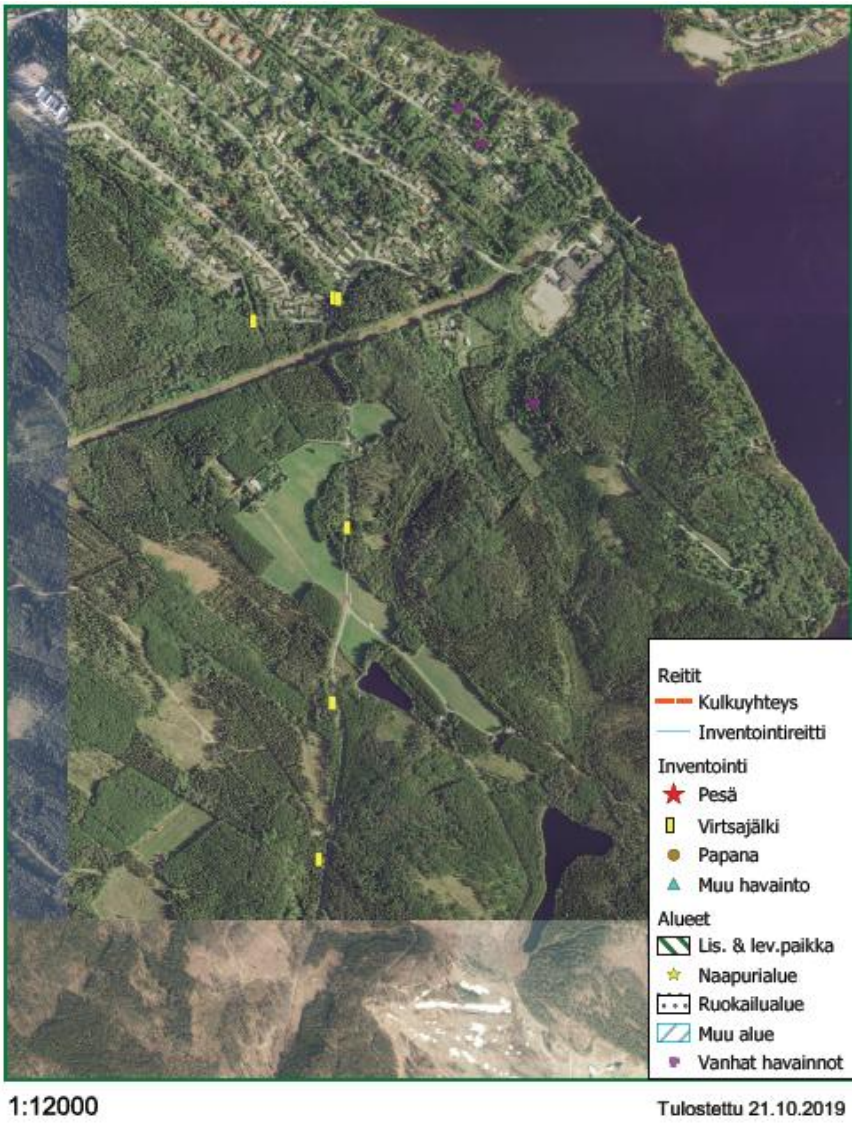
Base-line inventory was made in 2019. Annual flying squirrel inventories were carried out during the project in 2022-2024. Also, in March 2021 during the logging surveillance marks of flying squirrel were tried to discover. No marks of flying squirrel were detected on the planning area any year.

## Monitoring after the project

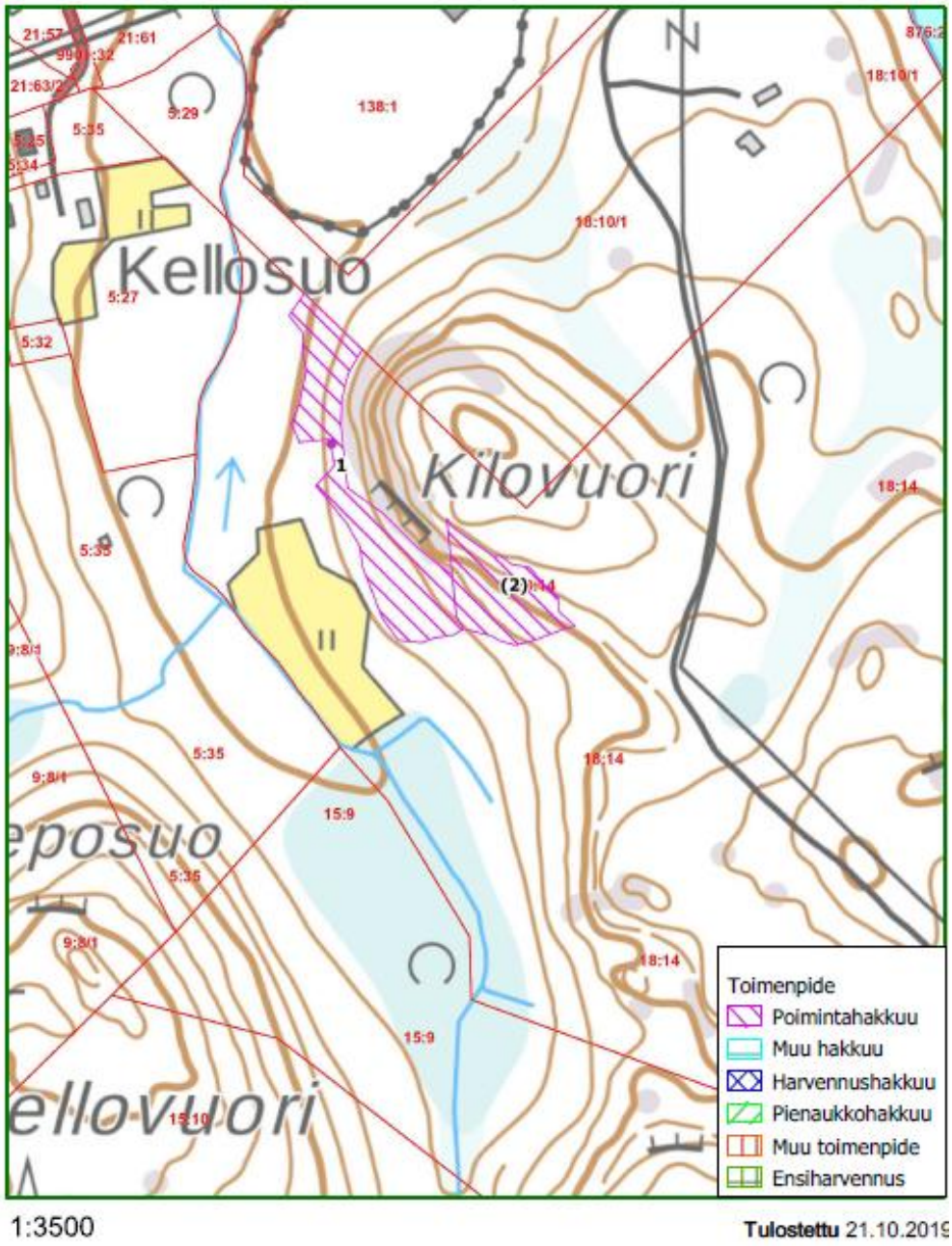
Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.




*Map 1. Flying Squirrel Observations and Movement Routes.*




*Map 2. Flying Squirrel Observations and Logging Themes.*

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: MIKKELI

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **26**
Municipality, region: **Mikkeli, Southern Savonia**
Country: **Finland**
Size of the project area (ha): **7,3 ha**
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

Mikkeli project area is located near ABC Pitkäjärvi and borders the east side of Highway 5. The area is surrounded by fields to the north and west. A field inventory was conducted in May, and although no recent tracks were observed, older signs of flying squirrels were found. The site still has favorable conditions to serve as a habitat for flying squirrels, and the connectivity to neighboring areas is also functional. The neighboring area N1 is currently inhabited.

The forests in the project area are mostly mature and dominated by spruce. The edge areas of the site have previously suffered from storm damage. In the more open areas created by storm damage, mostly spruce understory has developed, and in some places, there is also birch understory. The stand in compartment 5 is mostly even-aged, mature commercial forest with healthy-looking trees. In this compartment, there are a few groups of aspen trees that could be potential trees for flying squirrels, and previous scat observations have been made. These aspen groups are marked on the map with identifiers M1 and M2.

Most of compartment 6 is covered by dense cultivated spruce. Compartment 7, on the other hand, is currently a deciduous tree-dominated young stand that is approaching the dimensions of a young plantation. In the northern part of the site, there is a deciduous-dominated stand, almost resembling a grove, with plenty of aspen, gray alder, and birch. The potential feeding area for flying squirrels is located in compartment 2. The northernmost compartment, compartment 3, is a mature spruce stand, and the trees on the edge of this compartment serve as gliding trees to neighboring areas.

## Forest Owner's Objectives

The project area serves as a recreational space for city residents, and there are several paths observed in the area. The city's goal is to manage the forest in a way that preserves the recreational values of the site. At the same time, attention should be paid to the health of the tree stand when selecting management methods. The

primary aim is to treat the area with measures that maintain the forest cover, emphasizing the importance of preserving the natural canopy, typical for many recreational areas.

## Planned Measures - Action A6

Actions will spare all aspen trees and aim to enhance the potential deciduous tree population for the flying squirrel's food source. Robust spruce trees will be evenly retained throughout the entire project area to preserve optimal gliding possibilities for the flying squirrel. Particular attention must be paid to sparing edge trees to ensure the flying squirrel's travel routes are not compromised.

The largest compartment in terms of area and timber volume is Compartment 5. On the sparser eastern edge of the compartment, a selective cutting will be carried out to create opportunities for the existing spruce and deciduous understory to thrive. In the more evenly structured central area, a thinning cut will be performed to create conditions for new understory development and, on the other hand, prepare the stand for future small gap cuttings. Thinning will retain as much deciduous as possible. The post-harvest ground surface area will be above 1-2 m²/ha "law line." This approach preserves the area's coverage and recreational values, as there is a frequently used path running through the compartment. The actions are marked on Map 1 with numbers 1 and 5.

There is relatively abundant rowan understory in some areas, which may need to be removed to secure regeneration. Aspen groups M1 and M2 will be left untreated.

Action 2 is targeted at Compartment 4, which already exhibits characteristics of structural diversity. Storm damage has affected the edge forest, and spruce-dominated understory has developed in the created gaps. A selective cutting can be carried out in the compartment, expanding the existing small openings. The treatment will primarily target spruces, with some removal of spruces. The key is to evenly leave large spruces on the compartment.

Selective cutting will not be performed near the old flying squirrel nesting site, but some intermediate trees and spruces in the understory may be removed during clearing. The goal is to prevent the potential nesting site from becoming overgrown. The action is marked on the map with number 4.

For the cultivated spruce stand in Compartment 6, the first thinning will follow the thinning models. However, care must be taken not to include the environment around the old nesting tree of the flying squirrel in the thinning. The action is marked on the map with number 3.

Compartment 7 may undergo a young stand rehabilitation or an advanced mechanical thinning as part of other actions, if deemed necessary. The action could favor the establishment of a deciduous tree mixture, as there is potential for the area to become a feeding site for the flying squirrel. This action is marked on the map with identifier T1.

Action 6 is a nature conservation clearing (fresh grove) aiming to enhance the robustness of deciduous trees. The compartment is mostly gray alder- and aspen-dominated, although there is also downy birch. For example, clearings can be made in deciduous thickets, and some trees can be selectively cut. The preservation of large trees at the northern edge of the area is important to ensure the northward travel route. Alternatively, the compartment can be left untouched.

**Logging Volume**

The volume estimate is based on the Forest Center's forest resource data, which has been adapted to the indicative intensity of management models. The compartment-specific logging volumes are presented in Figure 2. The

total logging volume for the entire treatment area is estimated at 1,100 m³. The total timber volume for Compartments 4, 5, and 6 is 2,450 m³. Logging volumes were not calculated for Compartments 2 and 7, so they are not included in the overall timber volume sum.

| Kuvio | Ala [ha] | Kertymä [m³/ha] | Kokonaiskertymä [m³] | MÄT [m³] | KUT [m³] | KOT [m³] | MÄK [m³] | KUK [m³] | KOK [m³] |
|---|---|---|---|---|---|---|---|---|---|
| **6** | 0,5 | 80 | 42 | | 11 | 0 | 0 | 32 | 0 |
| **4** | 1,7 | 150 | 261 | 68 | 136 | 0 | 18 | 39 | 0 |
| **5** | 4,5 | 180 | 810 | 81 | 616 | 0 | 57 | 57 | 0 |
| | 7,3 | | 1113 | 149 | 762 | 0 | 75 | 128 | 0 |

## Consideration of Flying Squirrel in Future Actions

The area aims to be managed primarily with measures that maintain forest cover, and deciduous trees are favored where present.

## Action C2

Loggins were executed in 2022 according to the plan. The storm blew the thinning area later and changed the outcome of the logging.

## Action D1

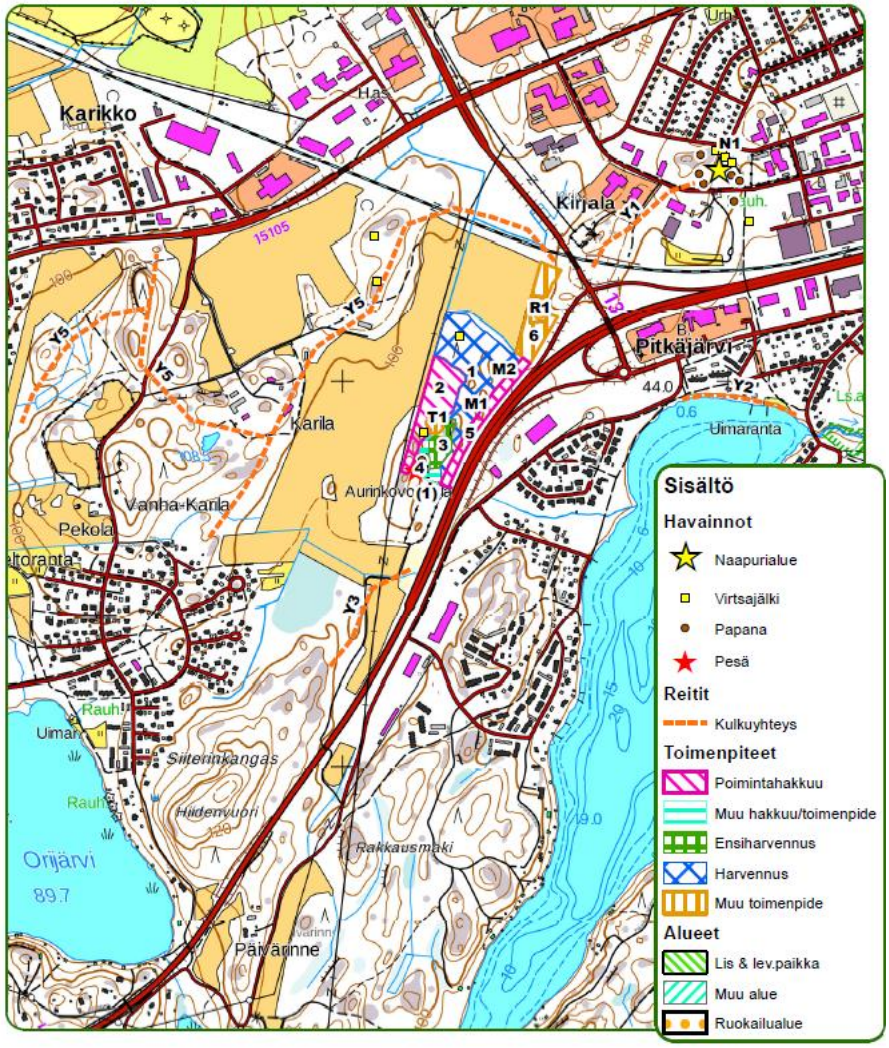
Base-line inventory was made in 2021. Then there were found only old droppings on the area, in the neighboring area there were also new droppings. Annual flying squirrel inventories were carried out during the project 2021-2024, but no marks of flying squirrel were found.

## Monitoring after the project

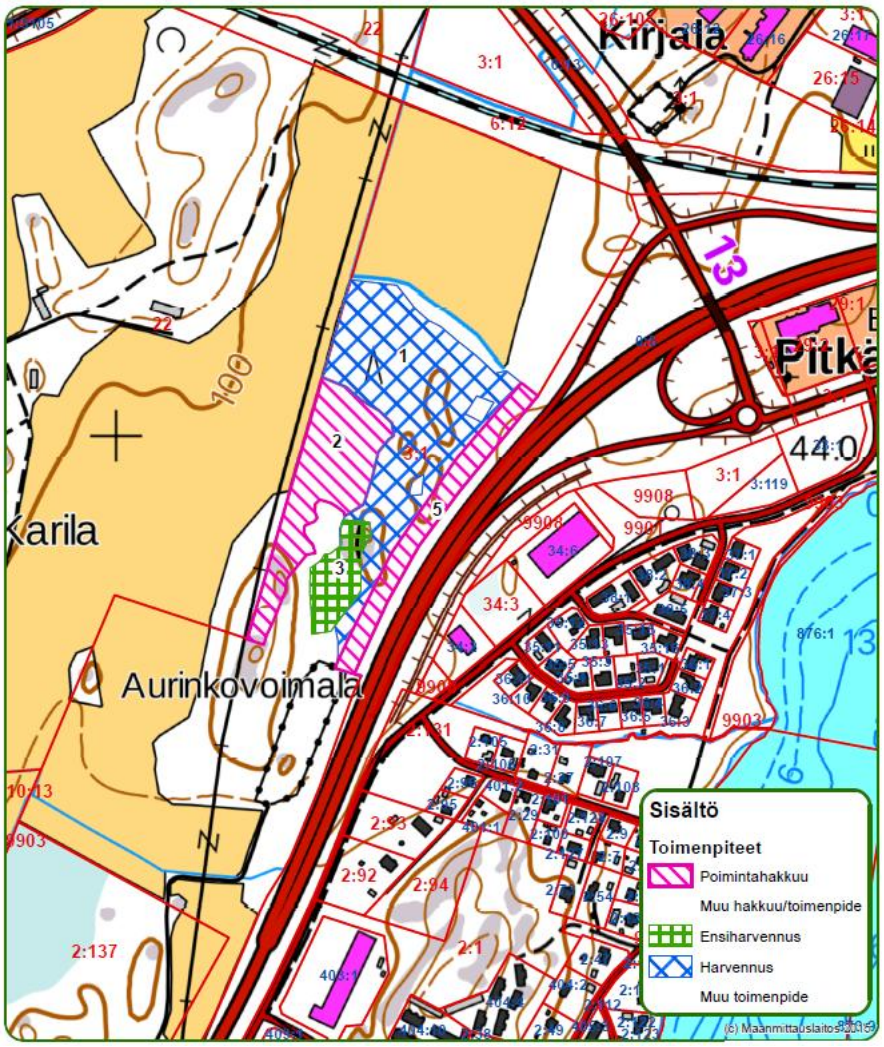
Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.




**Map 1. Flying Squirrel Observations and Movement Routes.**




**Map 2. Flying Squirrel Observations and Logging Themes.**

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: HOLLOLA

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **28 Hollola**
Municipality, region: **Hollola, Päijät-Häme**
Country: **Finland**
Size of the project area (ha):
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

Project Site 28 is located in Hämeenkoski, Hollola, and includes four forest compartments: 8, 5, 11, and 15. During the 2019 surveys, observations of flying squirrels were made in each of these compartments. The Finnish Environment Institute's data lists one old official observation made in 2005 in compartment 8. A new observation from the same location was also made, so the old observation is not shown in the attached maps.

Some compartments have active forest grazing by Eastern Finncattle and are part of the agricultural environmental support scheme.

Compartment 8 covers 0.9 hectares. It is a protected forest environment under the Forest Act: a fresh grove. The area is natural-like, small-scale, and clearly distinguishable from its surroundings. The soil is humus-rich, and the understory and shrub layers are dominated by grove vegetation, including Fly Honeysuckle, Red Currant, and Wood Dock. The eastern part of the compartment has a stream that is natural-like, with vegetation reminiscent of a moist grove, including an abundance of Ostrich Fern, Meadowsweet, Hogweed, and Marsh Fern.

Compartment 11 covers 1.7 hectares and borders a restored stream and power line to the north. The forest is dense and spruce-dominated, growing mainly on a steep, erosion-prone slope leading to the stream. The habitat varies between a grove and a grove-like heath forest. There is noticeable rootrot decay in the spruces. The area is used for forest grazing. Forest details are provided.

Compartment 15 covers 1 hectare and has a more mixed deciduous component than compartment 11, but is still spruce-dominated. To the north, it borders a small alder-dominated stream-side compartment 17, which is excluded from management. The middle of compartment 15 has large aspens suitable for nesting or feeding and individual grey alders.

No nesting trees or breeding and resting places of flying squirrels were found in the treatment area. Figure 1 shows observation points (droppings and urine marks), the primary feeding area, and connections to nearby forests.

Observations suggest that the flying squirrel uses the area mainly as a passageway, although it has the potential to be a habitat. Dropping observations (2) were made on large spruces, each consisting of a single dropping. Urine marks were found on three aspens and other large spruces. There is a possibility that the urine marks were left by regular squirrels.

Primary Feeding Area: Compartment 5.1 is alder-dominated deciduous forest with black alder, birch, and other deciduous trees. This area will be managed in the future by removing individual spruces and supporting the vitality of the deciduous trees but will be excluded from this project.

Secondary Feeding Areas: Compartments 17, 9, 13, 14.1, and 16 have feeding trees, mainly birch, except for compartment 17, which is alder-dominated. Compartments 9, 13, 14.1, and 16 will be managed in the future by thinning while maintaining the birch mixture. In compartment 17, the deciduous trees will be allowed to develop naturally.

## Forest Owner's Objectives

Forest owners have joined the project because flying squirrel observations have been made on their property. The forest owners aim to achieve economic returns from their forests while also considering landscape values and promoting biodiversity. In addition to forest grazing, the organic farm hosts various activities, such as open days and hiking, and the forests are used extensively for recreation.

## Planned Measures - Action A6

All measures are implemented by compartment: the measures are always tied to forest compartments 8, 5, 11, and 15. All project compartments are located on steep and erosion-prone slopes, which descend towards small water bodies. Logging in each compartment is carried out using a combination of chainsaw and harvester work so that the trees growing on the slopes are felled with a chainsaw and pulled to flat ground using the harvester boom. The work is carried out when the ground is frozen.

Trees where flying squirrel observations have been made are marked with tape in the field. Most of the observations have been made on spruces, so by marking these trees, it is ensured that these spruces and the surrounding trees are not selected for logging. A protective buffer zone of about 5 meters is left around the observation trees, where large spruces and deciduous trees are not removed.

The logging residues generated during the logging of project compartments are collected into piles and transported away from the site. This reduces the acidifying effect of the needle mass, especially in some compartments that are grove sites.

Areas at risk of erosion that belong to compartments 8, 5, 11, or 15 are left out of the treatment. These parts of the compartments are not marked for measures on the map. If the ground is properly frozen during the implementation of the measures, individual spruces can be selectively picked from the areas excluded from the treatment with special care and by leaving high stumps.

**Compartment 8**
For this forest law site, the forest use declaration must detail the planned measures and how the site's distinctive features will be preserved. This declaration is typically submitted before the planned measures begin. Thinnings in fresh groves must be carried out cautiously and selectively according to the law, and only when the ground is frozen. Fresh groves can be treated somewhat more gently than typical thinning models, by removing spruces and promoting a higher proportion of deciduous trees, thereby improving the habitat characteristics.

The compartment will be treated over an area of approximately 0.35 hectares. Trees will not be removed from the valley bottom near the stream, where moist grove vegetation prevails. Instead, an adequate buffer zone following the natural terrain will be left around the stream, and trees will only be selectively removed from the slope. The microclimate and light conditions in the immediate vicinity of the stream will not significantly differ from the surrounding area, as the eastern side is relatively open and dominated by pine trees.

Approximately 30% of the spruces will be removed evenly across all diameter classes in the treatment area of this compartment. The thinning aims for an uneven and natural-looking result, meaning natural gaps will not be treated at all. Instead, thinning will focus on tree groups and areas that are technically easiest to harvest.

**Compartment 5**
Compartment 5 is adjacent to Compartment 8, and the same principles will be applied to its treatment area, which is only about 0.1 hectares. The most erosion-prone spots will be avoided, and the treatment of the sunny slope will take the habitat characteristics into account. The sunny slope is not significant for the flying squirrel.

**Compartment 11**
About 30% of the trees will be removed from this compartment, with harvesting focused on areas that are technically feasible to handle. The treatment area is approximately 0.9 hectares. The steepest and most erosion-prone slopes will be excluded from treatment. Erosion risk is considered in all measures, and trees will not be removed from the slope below the stream. Thinning will be carried out unevenly, mimicking a natural distribution. Trees will be removed from both spruce zones and all diameter classes, but the largest and most densely branched spruces (with a diameter at breast height over 40 cm) will be saved. Deciduous trees, downed logs, and dead standing trees will be preserved and avoided during harvesting.

**Compartment 15**
This compartment will be treated over an area of approximately 0.8 hectares. From the flat areas at the top of the slope, about 50% of the spruces will be removed. Overall, around 30% of the spruces in the treatment area will be thinned with an uneven intensity. Erosion is evident in parts of the slope, so the steepest areas will be left untreated. Deciduous trees will be preserved, and small-diameter and unhealthy spruces will be removed from around them. Large, densely branched spruces and those near individual aspens or aspen groups will be retained to provide shelter for flying squirrels.

Logging Yield
The logging yield is largely dependent on technical harvesting conditions and which trees can be reasonably selected. Based on forest data, the estimated logging yield for the entire project area is approximately 240 $m^3$. The proportion of saw logs is expected to vary significantly across different parts of the harvest site.

## Consideration of Flying Squirrel in Future Actions

No flying squirrel nesting trees or breeding and resting places were found in the treatment area. However, the flying squirrel uses the area as a passage corridor and the area has the potential to serve as an actual habitat in

the future. The potential of the area to serve as a future habitat will be preserved. The feeding area will be managed in the future by removing individual spruces and supporting the vitality of deciduous trees.

### Action C2

Loggins were executed in March 2021 according to the plan.

### Action D1

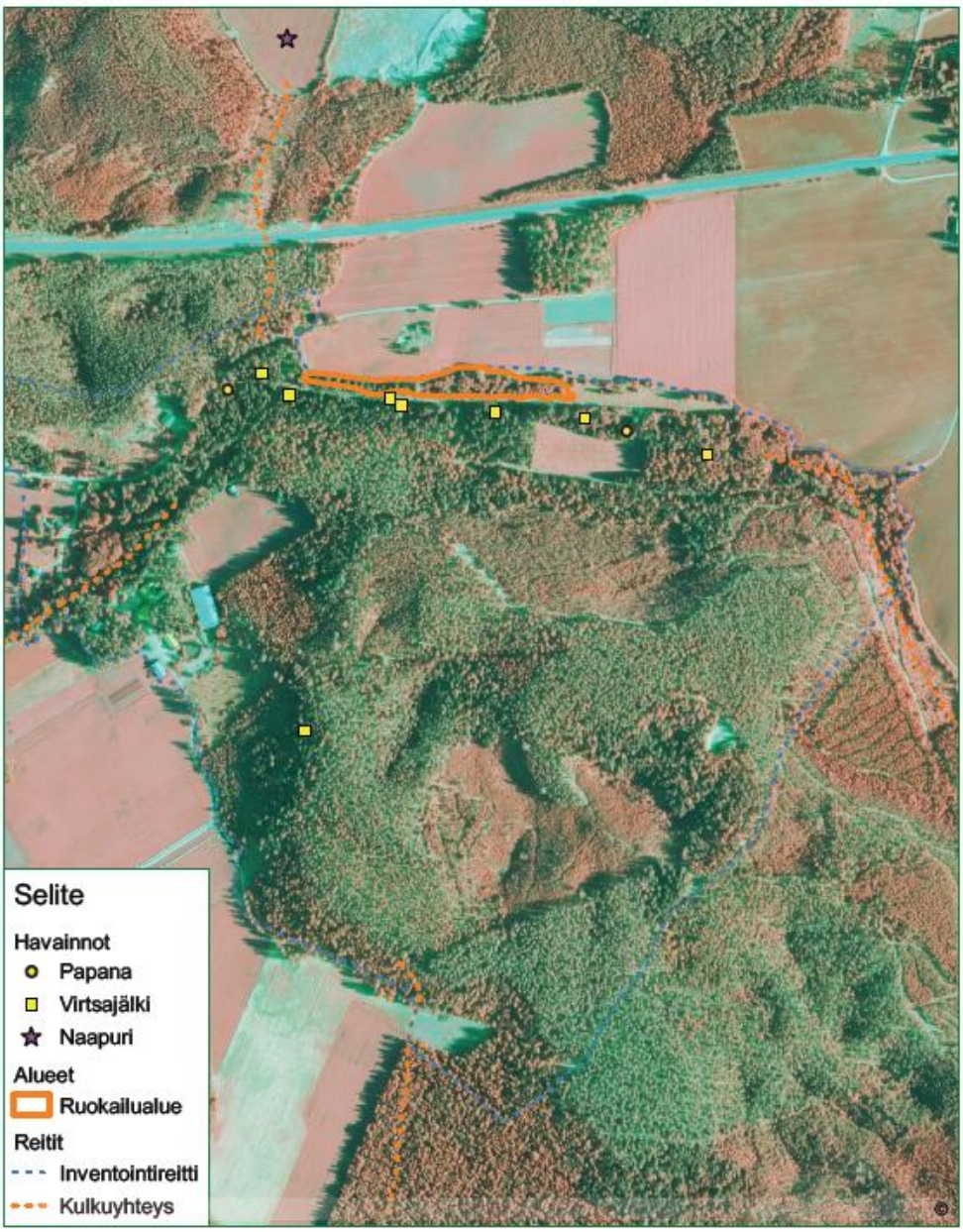
Annual flying squirrel inventories were carried out during the project in 2021-2024. Only in base-line inventory in 2019 there were marks of flying squirrel.

### Monitoring after the project

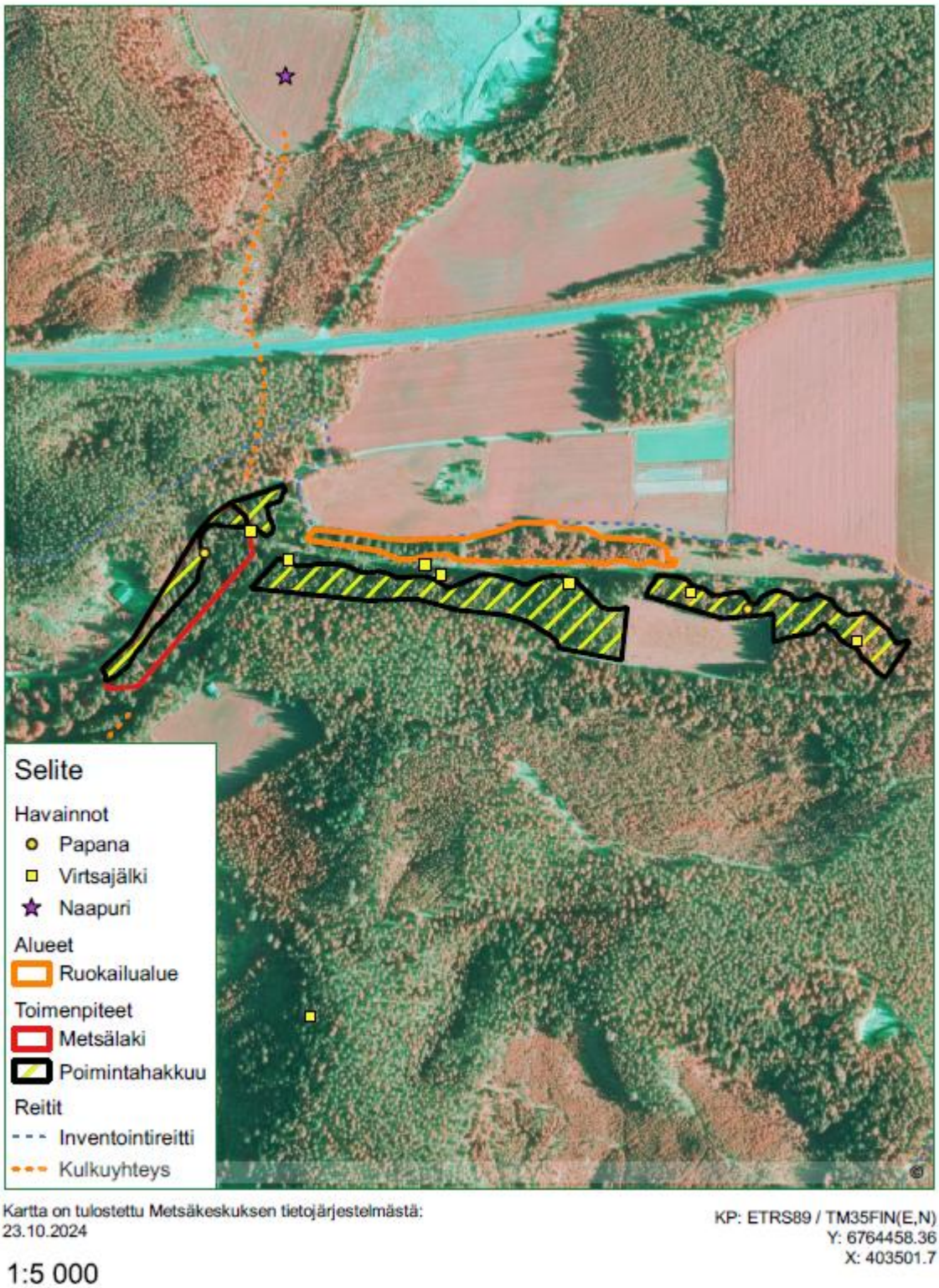
Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

### Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.




**Map 1. Flying Squirrel Observations and Movement Routes.**




**Map 2. Flying Squirrel Observations and Logging Themes.**

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: IITTI

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **29**
Municipality, region: **Iitti, Päijät-Häme**
Country: **Finland**
Size of the project area (ha): **9,5**
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

The property is located in the eastern part of the municipality of Iitti, bordering the municipality boundary between Iitti and Kouvola. The site was selected to be part of the Flying Squirrel LIFE project in 2016. The landowner made a conservation agreement with the Southeast Finland ELY Centre, and the agreement was signed on August 10, 2018. The Flying Squirrel LIFE project began its actual operations on August 1, 2018, so the site was protected during the project and thanks to its preparation.

The site consists of mature spruce-dominated forest, with groups of aspen and some pines in places as secondary trees. There is only a small amount of decayed wood, which has just begun to develop.

## Forest Owner's Objectives

The landowner has negotiated with the Southeast Finland ELY Centre and decided to sell the area to the state for the establishment of a conservation area.

## Planned Measures - Action A6

The site has been transferred to the management of Metsähallitus Luontopalvelut for conservation purposes, but the conservation area boundary is not yet visible on the map delineations. However, the new property boundaries are already visible on the maps (Figure 2).

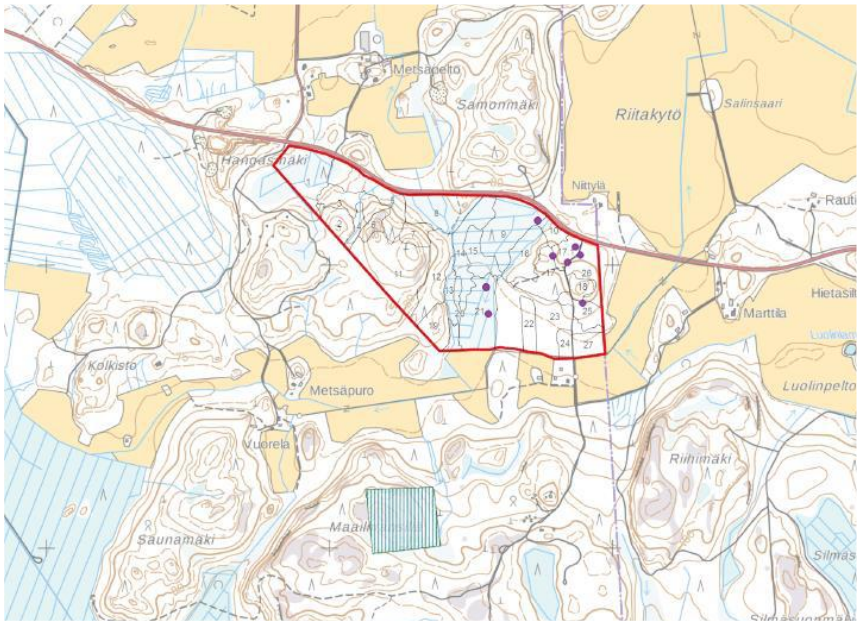



*Figure 1. The original property boundary of the site*

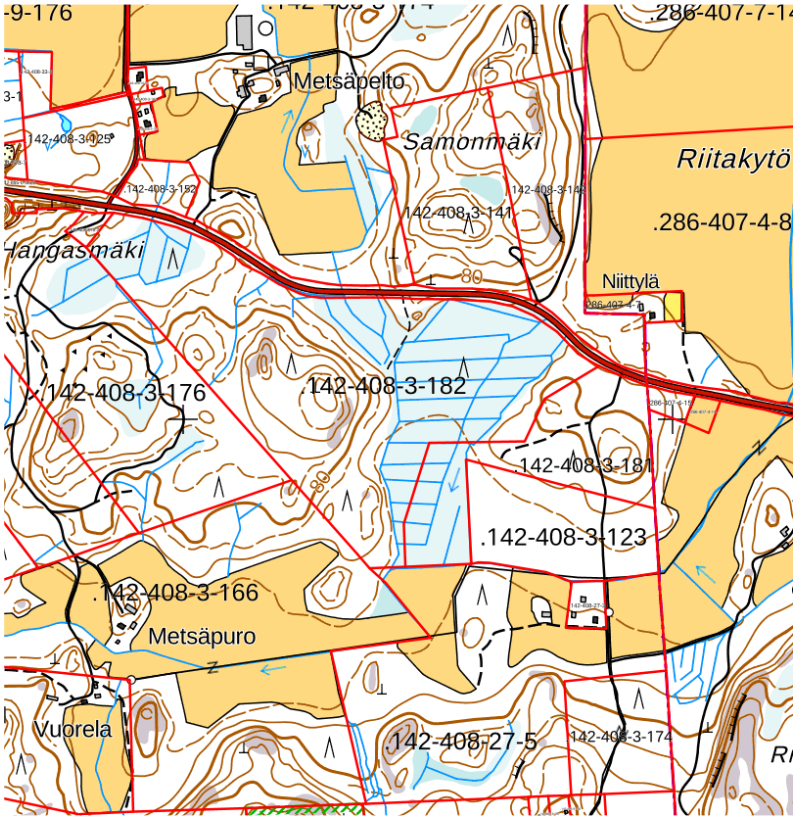



*Figure 2. The new property boundaries.*

## Consideration of Flying Squirrel in Future Actions

The site has been transferred to the management of Metsähallitus Luontopalvelut for conservation purposes.

## Action C2

The site has been transferred to the management of Metsähallitus Luontopalvelut for conservation purposes.

## Action D1

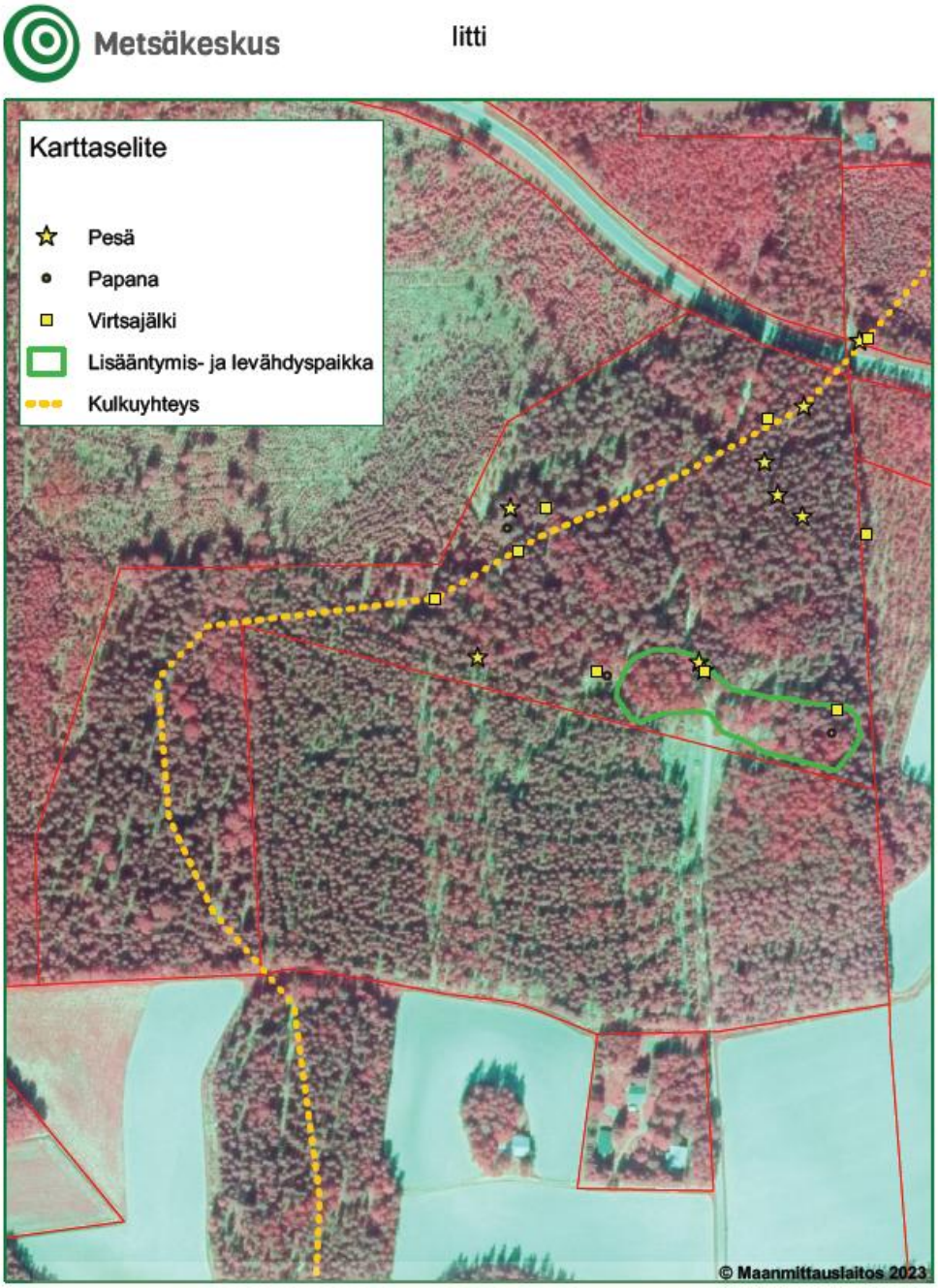
Annual flying squirrel inventories were carried out during the project in 2022-2024. Marks of flying squirrel were observed only in base-line inventory 2020.

## Monitoring after the project

Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.




**Map 1. Flying Squirrel Observations and Movement Routes.**

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: HAMINA

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **31 Hamina**
Municipality, region: Hamina**, Southern Kymenlaakso**
Country: **Finland**
Size of the project area (ha): **3 ha**
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **No**
Was action implemented in the same location than described in the proposal? **No**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

The project site 31 in Hamina is located in the port area of Hamina in South Poitsila and borders the shoreline to the east. The area is between the railway to the west, the wastewater treatment plant to the south, and a residential area to the north. The site is used for recreational purposes by nearby residents, featuring many trails and two trenches.

A field survey was conducted at the site in May 2020. During the field survey, several brush nests and many old droppings at the base of trees were found, but there were also fresh signs of the flying squirrel. The site has good potential to serve as a habitat for the flying squirrel, with effective connections to neighboring areas. Neighboring areas N1, 2, and 3 are key habitats, and the living environment within the project area supports them. However, it is kind of a dead end, and the forest is becoming dense for the flying squirrel to move through.

The forests on the site are mostly mature mixed forests, primarily spruce-dominated. The forest in operation plot 5 is clearly spruce-dominated, dense, and relatively old, but the trees appear to be healthy. The plot includes large pines, as well as some aspens and birches along the railway, which could be potential trees for the flying squirrel. A trench runs from the north to the south of the plot.

The area of operation plot 3 contains a dense, mature spruce-dominated forest. However, there are also many birches and some pines and aspens as secondary trees. There is a lot of trash and some wires attached to trees by those moving through the area. Additionally, there is a trench in this plot as well.

Operation plot 4 continues to have a similar dense, mature spruce-dominated forest. However, the proportion of birch in the basal area is significantly higher, almost as much as the spruce. This plot also has a lot of trash and wires attached to trees by those moving through the area.

Between the operation plots, there are fine alder forests

## Forest Owner's Objectives

The project area serves as a recreational area for city residents, and there are several paths and various types of litter observed on the site. There are also trenches in the area. The city's goal is to manage the forest in a way that preserves its recreational value. The area will be primarily managed with measures that maintain canopy cover and improve the living conditions for the flying squirrel.

## Planned Measures - Action A6

All aspens will be preserved, and efforts will be made to increase the size of deciduous trees for the flying squirrel to use as feeding trees. Large spruces will be evenly distributed throughout the project site to maintain good movement opportunities for the flying squirrel. Attention should be paid to preserving edge trees to ensure the flying squirrel's corridors are not compromised. Dense spruce areas will be significantly thinned to continue providing suitable habitats for the squirrel and to achieve a multi-layered forest structure. Potential nesting trees will be preserved and marked, and thinning will not occur around actual nesting trees. The operational map marks brush nests as potential nests and hollow trees and nest boxes as nesting trees.

**Operation Plot 5**

The forest here is quite uniform, spruce-dominated, and dense. The flying squirrel uses this plot as a corridor, so the forest should be thinned. The largest spruces and old pines will be preserved. The edge trees along the railway, which the squirrel particularly uses for movement, will also be preserved, especially the group of a few birches and aspens there. Two-thirds of the basal area of smaller spruces will be removed. The trench must be considered when planning the logging routes. There is also a very dense edge zone with aspens along the southern edge of the plot; some of these could be turned into artificial snags.

**Operation Plot 4**

This plot contains a very dense spruce-birch mixed forest with some individual pines. The largest spruces and pines will be preserved, but two-thirds of the smaller spruces and birches can be removed. This will improve the flying squirrel's movement opportunities in the area. Edge trees will be preserved on both the northern and southern edges of the plot. There is a lot of litter left by recreational users, and some trees have wires attached to them, which must be watch out during logging. These wires should be removed for the safety of the flying squirrel as well.

**Operation Plot 3**

Similar to the previous plots, this area is a dense, mature spruce-dominated forest with some birch, aspen, and pine as secondary trees. All pines will be removed. The largest spruces and birches will be preserved (the double-trunked spruce is a known squirrel tree), but half of the basal area of the medium-sized spruces and birches will be removed. All aspens and alders will be preserved. The trench must be considered when planning the logging routes.

**Alder Forest**

The alder forest (mainly groves and floodplain forests) is recommended to be left outside of management actions. It is a special natural site, and it will develop into a good source of decaying alder for the squirrel to use as nest trees over time. Additionally, there is a meadow-like younger aspen grove south of operation plot 5, which should also be left to develop and thinned as needed.

**Harvest Yield**

The yield estimate is based on data from the Forest Centre, adapted to the indicative thinning intensities. The harvest yields by plot are presented in Figure 2. The total harvest yield for the entire management area is estimated to be 706 cubic meters. The combined volume of trees in plots 3, 4, and 5 is 1,350 cubic meters.

| Kuvio | Ala (ha) | Kertymä ($m^3$/ha) | Kokonaiskertymä ($m^3$) | MÄT ($m^3$) | KUT ($m^3$) | KOT ($m^3$) | MÄK ($m^3$) | KUK ($m^3$) | KOK ($m^3$) |
|---|---|---|---|---|---|---|---|---|---|
| Tp 5 | 1,1 | 236 | 260 | 11 | 200 | | 4 | 45 | |
| Tp 4 | 1,4 | 240 | 336 | | 127 | 119 | | 46 | 44 |
| Tp 3 | 0,5 | 221 | 110 | 26 | 45 | 18 | 6 | 10 | 5 |
| | 3 | | 706 | 37 | 372 | 137 | 10 | 101 | 49 |

## Consideration of Flying Squirrel in Future Actions

The site will primarily be managed with measures that maintain canopy cover, and deciduous trees will be favored where possible.

## Action C2

Loggings haven´t executed.

## Action D1

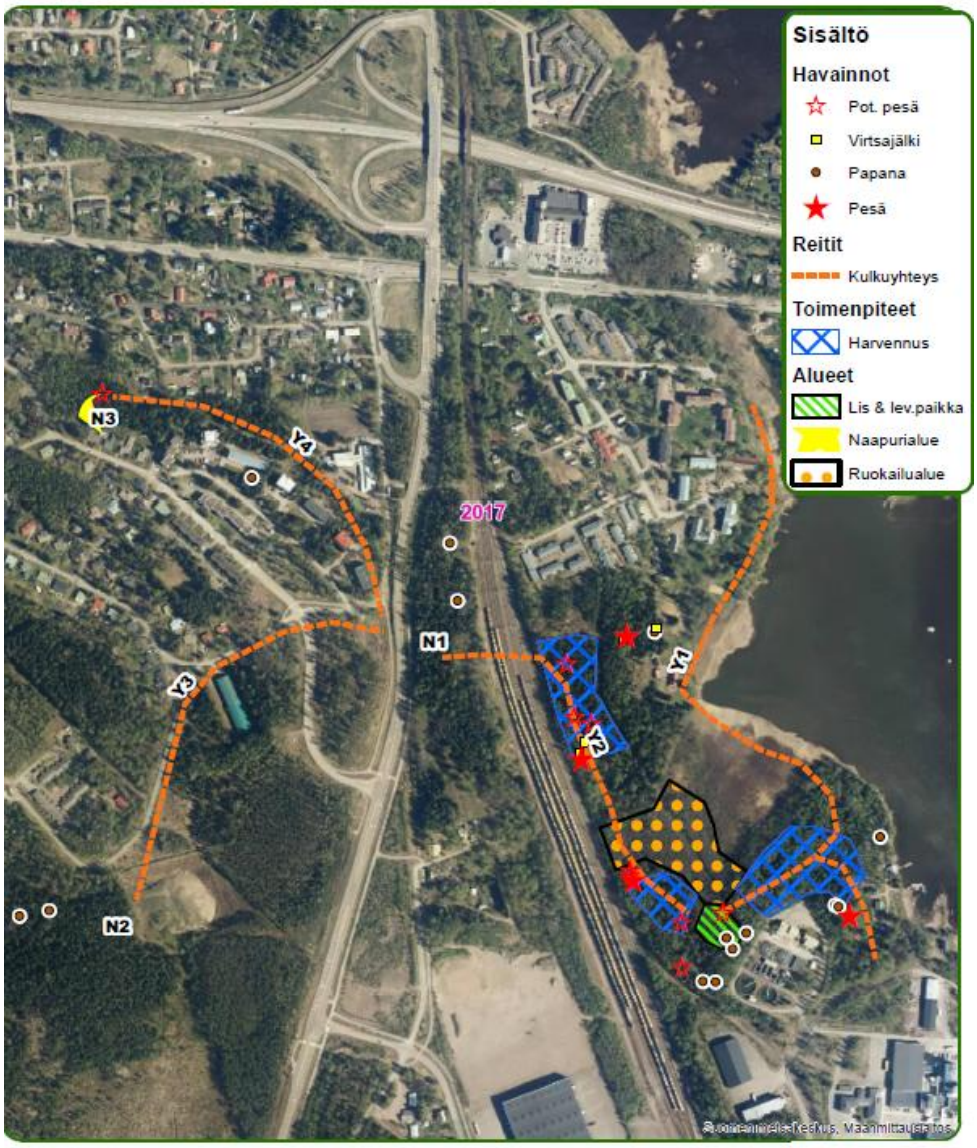
Annual flying squirrel inventories were carried out during the project in 2020-2024. Flying squirrel occupied the area every year, though some year all the droppings were old.

## Monitoring after the project

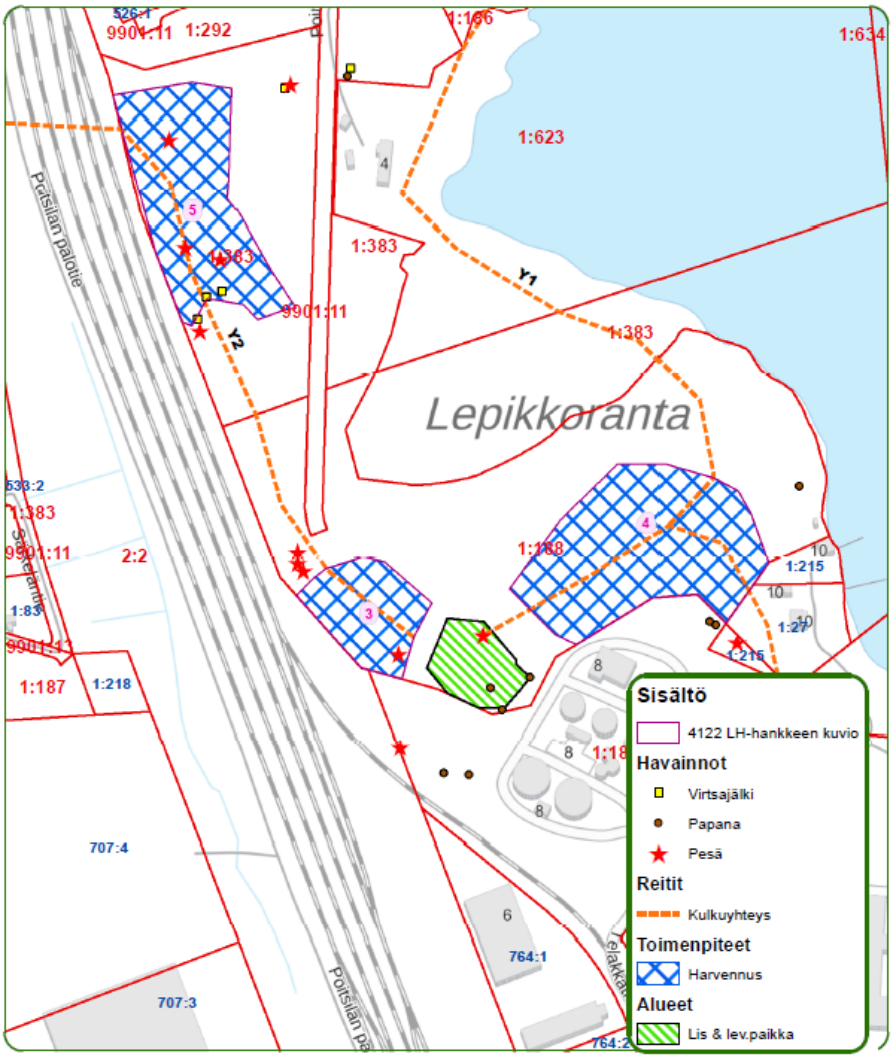
Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.




**Map 1. Flying Squirrel Observations and Movement Routes.**




**Map 2. Flying Squirrel Observations and Logging Themes.**

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: PAIMIO

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **46**
Municipality, region: **Paimio**
Country: **Finland**
Size of the project area (ha): 20 ha
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

Project site 46 is comprised of multiple estates owned by the city of Paimio. The project site covers almost 15 hectares and is divided into six forest compartments. Tree stands are conifer-dominated. The site is located next to a residential area with lots of detached houses, historical buildings including a summer theatre, and a small lake with a beach where one can swim.

A dog-assisted flying squirrel inventory was conducted in the area in 2021, and it was later complemented by a traditional inventory. There were three existing flying squirrel observations nearby but none in the estates owned by the city. However, the dog-assisted inventory confirmed that the city's estates were a part of the flying squirrel habitat as well.

Both droppings and potential nest trees were discovered within the project site. Additionally, one currently inhabited nest tree was pinpointed in the southwest corner of the site. Two aspens abreast had both cavities in them, and droppings were found under one of the trees. It was concluded that the forest patch surrounding the aspens was a flying squirrel breeding and resting site.

Based on the inventory, main feeding areas and forested access routes were located and evaluated. The project site's forests are conifer-dominated and there are few broadleaves. Cohesive feeding areas are in the neighboring estates. It is estimated that the flying squirrel uses the eastern part of the project site mainly for moving, since there are few suitable habitat structures. Access routes between the known breeding and resting site, feeding areas and neighboring flying squirrel sites are currently functional.

## Forest Owner's Objectives

The city's aim is to manage its forests in a way that improves forest health and growth, ensures public safety in recreation areas, and protects recreational values and the flying squirrel. Objectives include creating a park-like feel to the older parts of the forest and listening to the residents' wishes about cutting individual trees.

## Planned Measures - Action A6

Apart from the flying squirrel breeding and resting site and retention tree groups, the whole project site was harvested in 2021. All the mature forest stands were thinned from above and all the middle-aged stands thinned normally. All broadleaves, such as aspens and birches, were spared in the thinnings. Additionally, all existing deadwood was left in the forest. Where there was structural variation, the aim was to maintain it. The forest's canopy coverage remained after thinnings, and therefore the site continues to function as an access route to the flying squirrel.

## Consideration of Flying Squirrel in Future Actions

The accessibility within the project area will be maintained as the trees will only be thinned. In pine-dominated areas, dense-branched spruces will be left as mixed trees, which flying squirrels can use when moving. The flying squirrel will be considered in future actions as well, although a storm hit the breeding and resting area 2022, making nesting more difficult.

During the inventory of the project area, other potential habitats for the flying squirrel in the surrounding areas, so-called neighboring areas, were also mapped. Suitable forest for the flying squirrel can still be found nearby and in the immediate vicinity of the project area.

## Action C2

Loggings have executed as planned 2022.

## Action D1

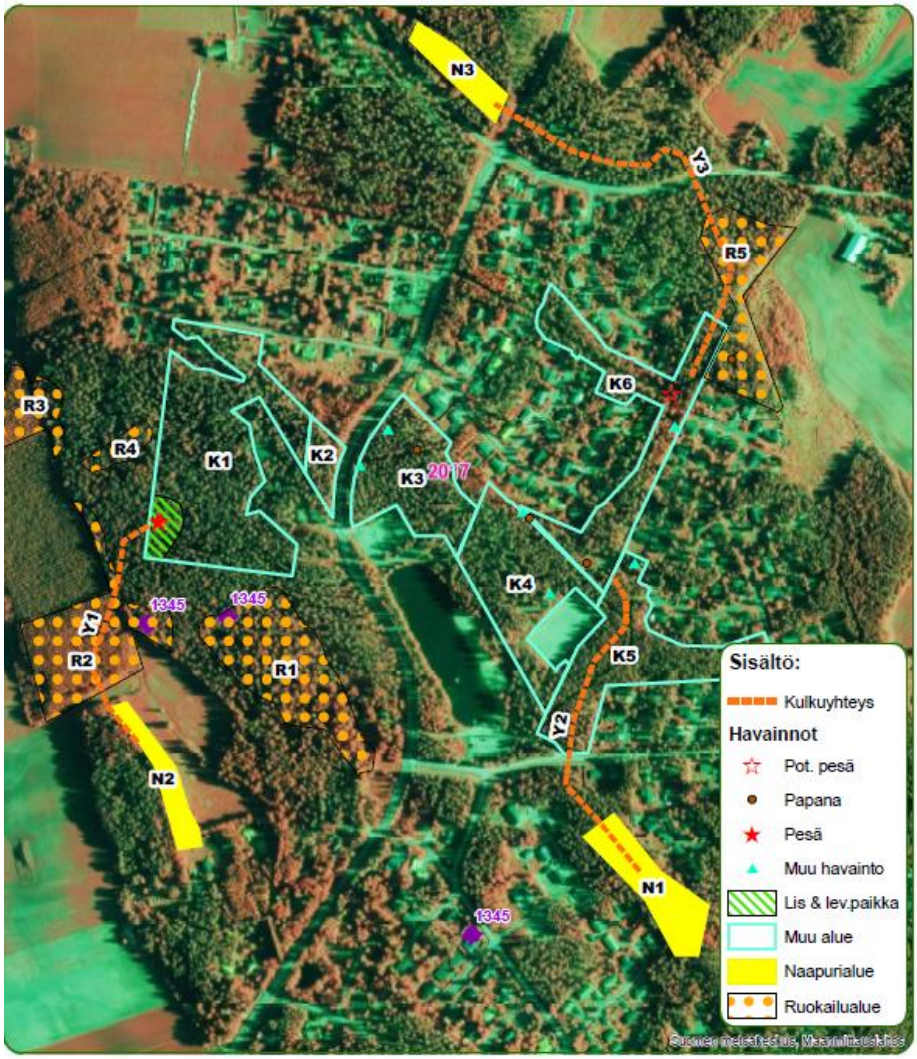
Annual flying squirrel inventories are carried out during the project in 2021-2024. Flying squirrel occupied the area during the first baseline inventory 2021 and then it was also present during the 2023 inventory.

## Monitoring after the project

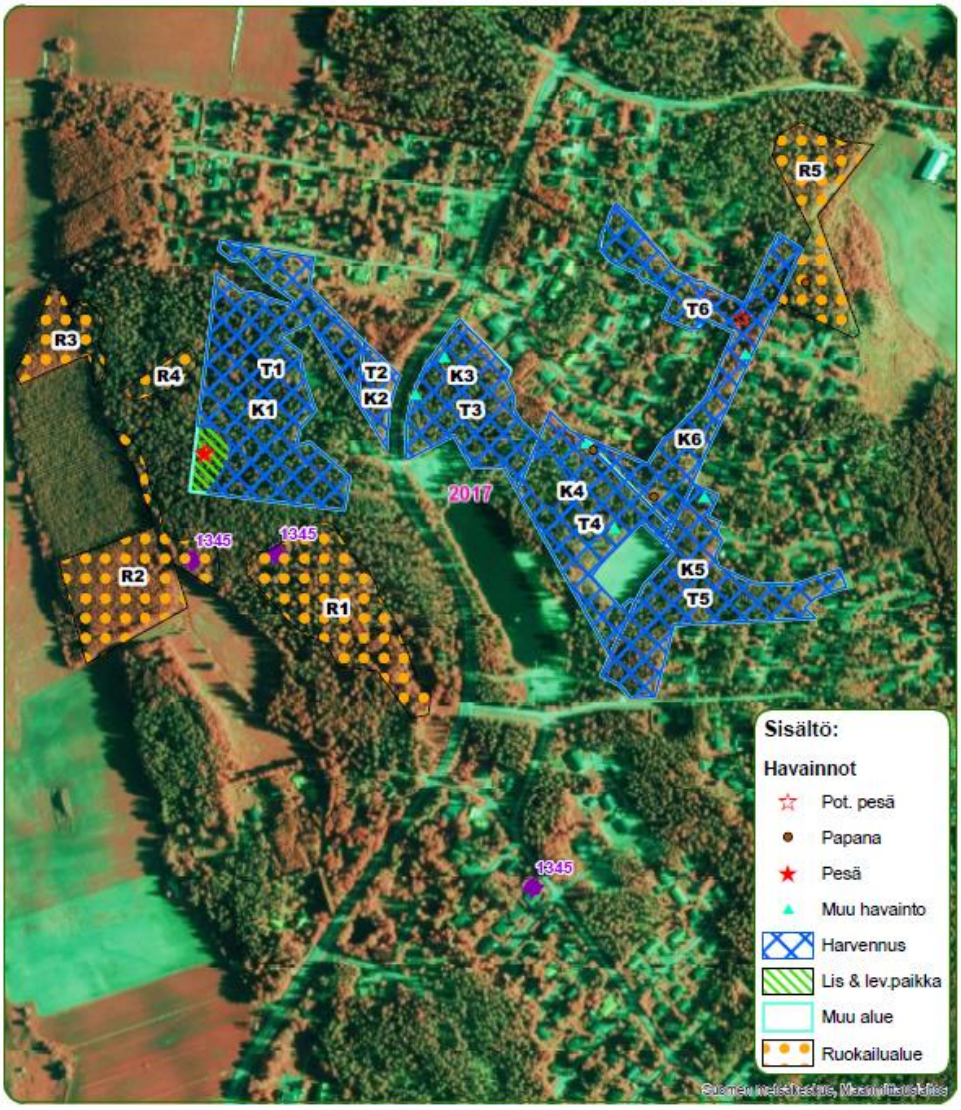
Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.




**Map1. Flying Squirrel Observations and Accessibility**




**Map2. Flying Squirrel Observations and Logging Themes**

**Flying Squirrel LIFE (LIFE17 NAT/FI/000469)**

# PROJECT SITE: JÄMSÄNKOSKI

## Summary of the following actions:

A6 Preparation of plans to maintain habitat network within managed forests
C2 Maintaining habitat network in managed forests
D1 Monitoring

Project site: **Jämsänkoski**
Municipality, region: **Jämsä, Central Finland**
Country: **Finland**
Size of the project area (ha): **8**
Responsible organisation(s): **Finnish Forest Centre**

Was action implemented as planned in the proposal? **Yes**
Was action implemented in the same location than described in the proposal? **Yes**
Was C-action implemented according to the A-action's plan? **Yes**

## General description of the area

The project site is located in Central Finland, between the Jämsänjoki River and the railway. The area is covered by the Jämsä urban subarea plan for 2030, where the project is designated as a local recreation area. A recreational route runs along the riverbank through the project area, there is a low birdwatching tower at the tip of the peninsula, and a fireplace is located in the northern part. Recreational values must be considered in the planning of the project.

Old maps and aerial photographs reveal that the area used to be farmland, which has decreased in size over the decades. In the late 1990s, cultivation was abandoned, and the open fields were planted with birch.


**Maps 1, 2, and 3: The first map is a map from 1963. The second map is from 1981, and the last aerial photograph is from 1995 when the fields were still in agricultural use.**

The first observation of the flying squirrel in the area is from 2005. At that time, it is suspected that the flying squirrel nested in the area. In the project, a flying squirrel survey was done in April 2021. The conditions were good as the snow was just melting. The core area of the habitat is an old forest, visible on the basic map from 1963, south of the house. The old forest is designated as a feeding area in the survey report. Young forest areas, except for the areas near the old forest, are interpreted as connectivity forests in the report.

## Forest Owner's Objectives

The project area is part of the Jokipuisto local recreational area developed around the Jämsänjoki River. The goal is to secure hiking trails and consider nature and landscape values. The landowner's objective is to thin the birch stands planted in the late 1990s. The dense birch stands have become spindly due to delayed thinning. The aim is to leave the most ecologically valuable areas outside of logging activities.

## Planned Measures - Action A6

The thinning will target the planted birch stand 4 (2.9 ha) and 7 (0.65 ha). Silver birch is the dominant species, with rowan and grey alder as mixed species. Old aspen-dominated stands 5 and 2.1 will be preserved outside the logging areas. Flying squirrel observations made in the area are found in stand 5. Below stand 5, there is a younger mixed deciduous tree forest (stand 7.2), which will not be thinned. It will form a good aspen continuity pattern.

Stand 4 serves as a connectivity route between old aspen-dominated stands. In the orange-marked area on the map, large rowans and birches larger than the dominant trees will be preserved. During thinning, grey alder will be preserved near stand 2.1. It is a preferred feeding tree for the flying squirrel. One-third of the mixed-species rowan will be left in the stand. Near the railway, there is a lot of rowan, and more can be removed than in the riverside part of the stand. The access routes will be designed parallel to the recreational route, minimizing landscape disruption. The recreational route will not be used as an access route.

**Table 1: Stand 4 (2.02 ha) is a grove with a field history. The development class is a young stand.**

| Species | Stems (per hectare) | Diameter at Breast Height (cm) | Height (m) | Age | Volume (m3) | Growth (m3) |
|---|---|---|---|---|---|---|
| Silver Birch | 19 | 17 | 18 | 26 | 162 | 9.3 |
| Rowan | 4 | 16 | 17 | 26 | 32 | 0.8 |
| Grey Alder | 2 | 16 | 18 | 26 | 17 | 0.6 |

In the thinning of Stand 7, larger trees near the shore will be left unthinned, and the few rowans in the stand will be preserved. A pathway will be maintained along the shore, enabling crossing of the railway and transitioning to the forest on the riverbank. The nearest flying squirrel observations are on the other side of the railway and the river. The surveyor believes that crossing the river is possible. The width of the river at the crossing point is approximately 50 meters.

**Table 2: Stand 7 is 0.65 hectares of grove with a field history. The young stand has a field history.**

| Species | Stems (per hectare) | Diameter at Breast Height (cm) | Height (m) | Age | Volume (m3) | Growth (m3) |
|---|---|---|---|---|---|---|
| Silver Birch | 22 | 13 | 18 | 26 | 198 | 9.3 |
| Rowan | 1 | 16 | 19 | 26 | 8.2 | 0.8 |

The area will be cautiously thinned due to the vulnerable, spindly birch stands prone to snow damage. The basal area will be dropped close to the recommended thinning model of 15 for birch. Some buffer will be left, and the thinning aims for a basal area of 17. The volume is 67 m3/ha for Stand 4 and 60 m3/ha for Stand 7. A total of 175 m3 of wood will be obtained from the thinnings.

## Consideration of Flying Squirrel in Future Actions

In the surveys conducted during the project, droppings were found near hollow aspen trees. Suitable hollow aspens are abundant in stands 5 and 2.1. The deciduous tree-dominated forest also ensures a food source. There are no large spruce trees acting as protective trees in the area. The connectivity of the area to nearby territories is challenging. Crossing the river is about 50 meters, and the railway area is almost 40 meters. It is crucial for the preservation of flying squirrels to maintain existing connectivity routes.

## Action C2

Loggings were executed according to the plan in October 2021.

## Action D1

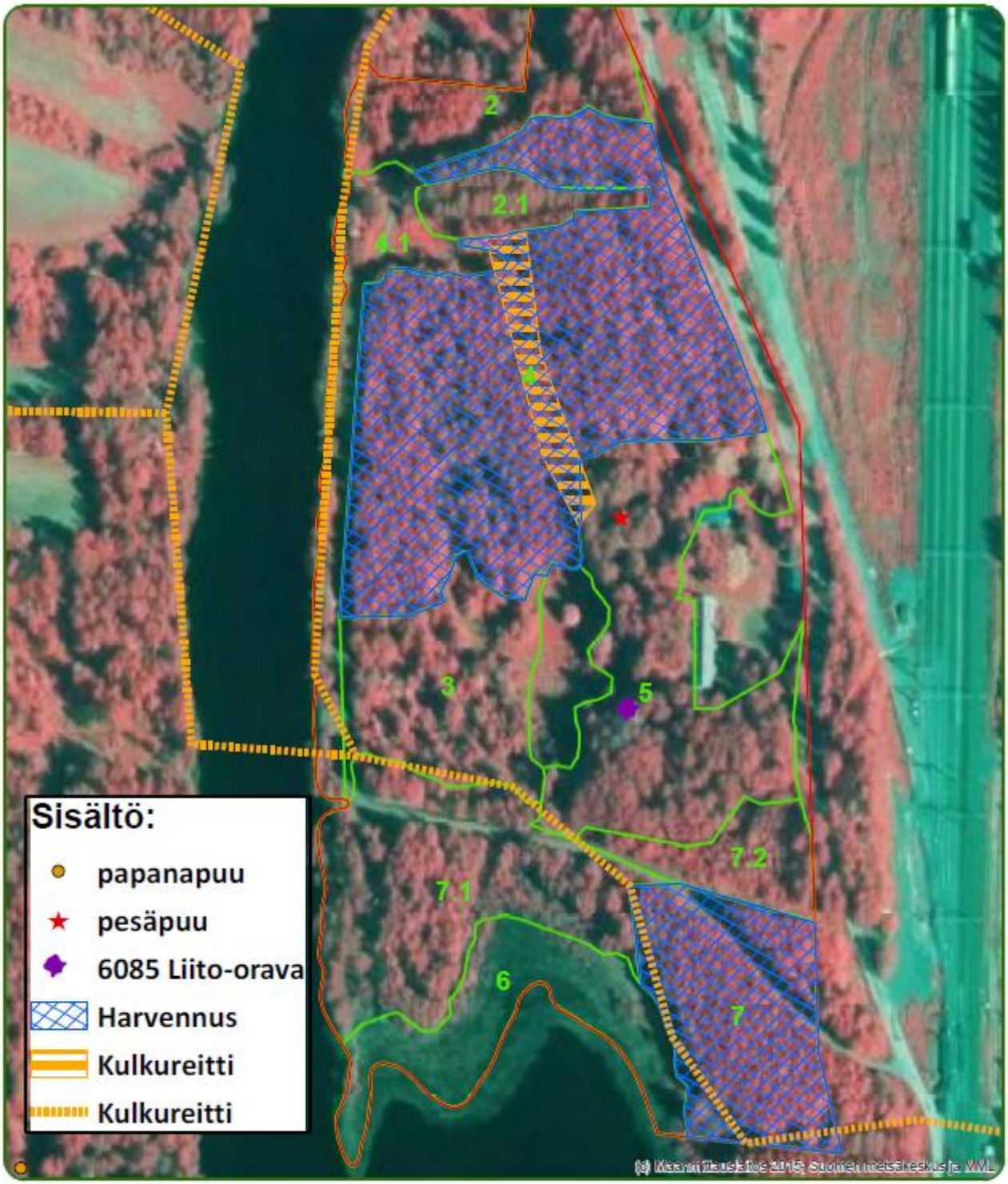
Annual flying squirrel inventories were carried out during the project in 2021-2024. Flying squirrel occupied the area during the base-line inventory in 2021. After that, during later inventories, the area was empty.

## Monitoring after the project

Finnish Forrest Centre will no longer carry out inventories of the areas after the project. Landowners may continue the inventories if they wish. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.

## Outcomes of the actions

Management aims to maintain ecologically functional areas for the flying squirrels as long-term conservation effects. The flying squirrel observation data for the sites will remain permanently in the forest resource data, and the flying squirrel will be taken into account in accordance with environmental legislation.




Kartta on tulostettu Metsäkeskuksen
metsätietojärjestelmästä: 14.6.2021

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**Map 1. Flying Squirrel Observations and Logging Themes.**

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