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Comparison of open data and ecological survey results for establishing a conservation area on private property in Finland

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Abstract

National and international goals aim to increase the amount of protected areas to 30% of all lands. Private protected areas (PPA) play an increasing role in this endeavor and can also be important for conserving biodiversity, as biodiversity-rich areas are often found outside of state-owned lands. To identify and designate potential conservation areas ecological surveys are required. At the same time, there is a large amount of open data available. The aim of this study was to evaluate how well available open data can be used to identify the protection potential for a privately owned plot in southern Finland, as well as to compare the results from the open data with results from an ecological survey.

A selection of open data for the study area analyzed using QGIS and conclusions on the area's eligibility for different protection methods were made. An on-site ecological survey was done, and the results of the survey were compared to the conclusions drawn based on the open data. Results show that the study area has a high potential for protection, however not all natural values were identifiable form the open data. Modelled data on forest age, composition, habitat types and biodiversity values were in part quite accurate for the area, while some parts were missing or even incorrect. Species information for the area was not available in the open data at all. Based on the study, open data can give a good general idea of the nature in the area, however, on-site surveys are required to identify the actual natural values and conservation possibilities. Open data analysis can provide methods for identifying potential conservation areas in a larger area, that can then be further surveyed on-site.

Language: English

Key Words: Biodiversity, GIS, Ecological survey, Private protected areas (PPA)

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Abstrakt

Nationella och internationella mål syftar till att öka antalet skyddade områden till 30 % av all mark. Privata skyddade områden spelar en allt större roll i denna strävan och kan också vara viktiga för att bevara biologisk mångfald, eftersom områden med rik biologisk mångfald ofta finns utanför statligt ägd mark. För att identifiera och utse potentiella skyddsområden krävs naturinventeringar i området. Samtidigt finns det en stor mängd öppna data tillgängligt. Syftet med denna studie var att utvärdera hur väl tillgängliga öppna data kan användas för att identifiera skyddspotentialen för en privatägd tomt i södra Finland, samt att jämföra resultaten från de öppna data med resultaten från en naturinventering.

Ett urval av öppna data för studieområdet analyserades med hjälp av QGIS och slutsatser om områdets lämplighet för olika skyddsmetoder drogs. En naturinventering gjordes på plats, och resultaten av inventeringen jämfördes med de slutsatser som dragits baserat på öppna data. Resultaten visar att studieområdet har en hög potential för skydd, men alla naturvärden var inte identifierbara från de öppna data. Modellerade data om skogsålder, sammansättning, naturtyper och värden för biologisk mångfald var delvis ganska korrekta för området, medan vissa delar saknades eller till och med var felaktiga. Artinformation för området fanns inte alls tillgänglig i de öppna data. Baserat på studien kan öppna data ge en bra allmän uppfattning om naturen i området, men det krävs undersökningar på plats för att identifiera de faktiska naturvärdena och möjligheterna till skyddande. Analys av öppna data kan ge metoder för att identifiera potentiella bevarandeområden i ett större område, som sedan kan undersökas ytterligare på plats.

Språk: Engelska

Nyckelord: Biologiskt mångfald, GIS, Naturinventering, Privatägda skyddsområden

OPINNÄYTETYÖ

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Kansallisten ja kansainvälisten tavoitteiden tavoitteena on lisätä suojelualueiden määrää 30 prosenttiin kaikista maa-alueista. Yksityisillä suojelualueilla on tässä pyrkimyksessä yhä suurempi merkitys, ja ne voivat olla tärkeitä myös biologisen monimuotoisuuden säilyttämisen kannalta, sillä biologisesti monimuotoiset alueet sijaitsevat usein valtion omistamien maiden ulkopuolella. Mahdollisten suojelualueiden tunnistaminen ja nimeäminen edellyttää alueen luontoarvojen kartoitusta. Samaan aikaan on saatavilla suuri määrä avointa tietoa. Tämän tutkimuksen tavoitteena oli arvioida, kuinka hyvin saatavilla olevaa avointa dataa voidaan käyttää yksityisomistuksessa olevan Etelä-Suomessa sijaitsevan tontin suojelupotentiaalin tunnistamiseen, sekä verrata avoimesta datasta saatuja tuloksia luontokartoituksen tuloksiin.

Tutkimusalueen avointen aineistojen valikoima analysoitiin QGIS:n avulla ja tästä tehtiin johtopäätöksiä alueen soveltuvuudesta eri suojelumenetelmiin. Paikan päällä tehtiin luontokartoitus, jonka tuloksia verrattiin avoimen aineiston perusteella tehtyihin päätelmiin. Tulokset osoittavat, että tutkimusalueella on paljon suojelupotentiaalia, mutta kaikkia luontoarvoja ei kuitenkaan voitu tunnistaa avoimista tiedoista. Metsän ikää, koostumusta, luontotyyppejä ja biologista monimuotoisuutta koskevat mallinnetut tiedot olivat osittain melko tarkkoja alueen osalta, kun taas osa tiedosta puuttui tai oli jopa virheellisiä.

Tutkimuksen perusteella avoin data vo antaa hyvän yleiskuvan alueen luonnosta, mutta todellisten luontoarvojen ja suojelumahdollisuuksien selvittämiseksi tarvitaan kuitenkin paikan päällä tehtäviä tutkimuksia. Avoimen datan analyysi voi tarjota menetelmiä mahdollisten suojelualueiden tunnistamiseksi laajemmalla alueella, jota voidaan sitten tutkia paikan päällä.

Kieli: Englanti

Avainsanat: Biodiversiteetti, Luonnon monimuotoisuus, GIS, Luontokartoitus, Luonnonsuojelualueet yksityisellä maalla

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1 Introduction

Biodiversity loss and its consequences both for the environment, ecosystems, humankind, and economic activities are regarded as major global risks in 2022 (World Economic Forum, 2022). During the last 50 years wildlife population has decreased by 69% (WWF, 2022) and over 41 000 species globally are listed as threatened with extinction (IUCN, n.d.). Globally, the main reasons for biodiversity loss are changes to land-use and overexploitation due to human activities, as well as climate change (The Royal Society, n.d.). Establishment of conservation areas has been shown to be an efficient way of protecting habitats and reducing habitat loss, thus also protecting biodiversity in the area (Butchart, et al., 2012). Without the creation of the modern system of protecting areas, biodiversity loss could be even higher today (Watson;Dudley;Segan;& Hockings, 2014).

The need to combat biodiversity loss is recognized on both national and international levels. The UN sustainable development goals 14 and 15 state that ”safeguarding key biodiversity areas through the establishment of protected areas or other effective area-based conservation is essential” (UN, 2022), while the EU has set ambitious goals to legally protect 30% of its land and sea areas, where 30% of these are to be strictly protected (European Commission, 2020). Finland is currently preparing a new biodiversity strategy in accordance with the UN and EU targets. The strategy aims, among other things, to strengthen the protection of biodiversity and promote the recovery of weakened ecosystems (Ministry of the Environment, n.d. A).

To date, approximately 10% of the total area of Finland is protected. Most of the protected areas are on state-owned land, with only 9% of the protected areas on privately owned lands (Statistics Finland, 2022). Of all the state-owned lands 20% are already protected by law and another 15% are designated as wilderness areas (Metsähallitus, n.d.), with the majority of both located in Lapland and northern Finland. To reach the goal set by the EU the portion of protected areas on privately owned lands must be increased considerably. Private protected areas (PPA) have been shown to contribute considerably to the protection of biodiversity as a large portion of inadequately protected habitats and species

can be found on lands outside the state-owned areas. Strategic growth of PPAs can contribute considerably to increased ecological representation, especially in areas where state-owned lands are not present (Ivanova & Cook, 2020). In Finland this is especially true for areas in the southern part of the country, as most of both the state-owned lands and protected areas are found in the north (Metsähallitus, n.d., Natural resources institute Finland, 2019).

For landowners interested in protecting their lands there should be an easy way of assessing the protection potential of the land in question. While on-site visits and ecological surveys are needed to get an accurate idea of the environmental values of the area, there is a large amount of open data available that can be used to preliminarily assess the area. For this thesis I will investigate how well the open data corresponds to the actual environmental values of an area in Raseborg in southern Finland.

2 Research questions

To meet the protection goals of the UN and the EU that Finland has committed to it is obvious that private landowners must be actively involved as there are not enough state-owned lands. Especially in southern Finland, where most of the country's population is found, large natural areas are becoming more and more scarce so protected areas will be smaller. However, these areas while small in size, can still have a high biodiversity. While it can be said that nature benefits from all areas protected it is important to have knowledge of the species and composition of the areas protected so evaluations can be made to identify gaps in protection. The process of protecting lands for private landowners must also be made easy and attractive. Undoubtedly some landowners value their lands simply for their natural values while the economic value of the forest in form of timber is important to others. Even if the motivation to protect lands and the methods to increase this motivation is interesting, I will not cover these in this thesis. Instead, I will investigate the alternatives for protecting private lands, methods and consequences.

The opportunity to carry out this study came when Novia UAS was contacted by a private person interested in protecting a piece of land in Tenala in Raseborg, in the south of Finland. To protect the area, it must be surveyed to identify criteria for protecting it. As there are several different methods of protecting areas in Finland the alternatives were to be investigated to find the appropriate one for this specific study area. The person has a summer cottage on the land so the effect of the protection on the summer cottage should also be considered.

If the national goals for protecting nature are to be met, a considerable amount of land must be protected by 2030. The protection will also require a significant amount of work to map the species, habitats and nature. On-site work is always needed to verify the actual composition of a specific area, however, there is a lot of open data available in Finland so it is likely that at least some assumptions can be made by analyzing this data. An effective pre-analysis can give a good idea of the nature in the area, possibly making the on-site analysis quicker.

For the thesis I have selected the following research questions:

- What alternatives are there for protection of the area in question and how does the area fulfil the criteria? How does the protection affect the use of the summer cottage on the land?
- What open data can be found about the area and how can it be used to evaluate protection criteria? How well do these findings match the actual nature values found in the area?

The aim of the first question is to produce a practical solution for the landowner. This will consist of an ecological survey / mapping of the flora and fauna on the plot, identification of different methods available to protect private lands in Finland, assessment of the suitability of these as well as the possible effects of protecting the land on its recreational use as a summer cottage. The outcome of the work will be a report on the nature in the area, the different alternatives available for protecting the area as well as a recommendation on how to proceed with the protection.

The second question aims to analyze the area using open data and GIS to create assumptions about the natural values of the area and to compare the assumptions with observations made in the field. The outcome will be an analysis of the plot in question and cannot be generalized, however, it should give an idea on the possibilities and limitations of the open data available. Determining if general models or predictions can be developed from this data will be left to others.

Chronologically the work was conducted by starting with the GIS analysis of the area during early 2023, followed by field work on-site during the spring and early summer of 2023 and finally comparing the findings with the assumptions from the GIS analysis.

3 Background of biodiversity conservation in Finland

3.1 Biodiversity and biodiversity loss in Finland

The Merriam-Webster dictionary defines biodiversity as "*biological diversity in an environment as indicated by numbers of different species of plants and animals*" (Merriam-Webster, n.d.). In general, the more different species, the greater the biodiversity. The greater the biodiversity in an ecosystem, the better the resilience, i.e. resistance to and recovery from changes, in an area. If a species with an important role is affected, the ecosystem can suffer unless other species with similar functions replace them. High biodiversity increases the possibility of multiple species in an area having similar roles so the disappearance of one species will not have a significant effect on the functioning of ecosystem as a whole (Oliver, et al., 2015).

Biodiversity loss is the negative effect of human activity on biodiversity. The main reason is changes in land use, mainly for large scale food production, as well as overexploitation of natural resources (fishing, timber harvesting, hunting), which have been estimated globally to cause up to 50% of the biodiversity loss today (30% and 20% respectively). Climate change is on the rise as a cause for biodiversity loss and is estimated to become the leading reason for biodiversity decline in the coming decades (The Royal Society, n.d.). According

to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), 75% of all the land surface has been significantly altered, 66% of ocean areas are experiencing increasing impacts and over 85% of wetland area has been lost, all due to human activity. Biodiversity loss is projected to continue or worsen, in many cases due to human population growth and unsustainable exploitation (IPBES, 2019).

Biodiversity has been regularly assessed in Finland by the Ministry of the Environment and the Finnish Environment Institute. The latest assessment, done in 2019, evaluated 22 418 species out of a total of at least 48 000. The findings show that out of the evaluated species 2 667 species or 11,9% were threatened. The percentage of threatened species has increased from 10,5% in 2010.

Regionally, most threatened species are found in southern Finland. Most of the threatened species' primary habitats are in forests (31,2%) or rural biotopes and cultural habitats (24,4%). However, this can be partially explained as most species, overall, live in these habitats. The highest ratio of threatened species compared to all species in the specific habitat can be found in the alpine habitats (37,9% of all species in the habitat).

The causes for species becoming threatened have been identified. As there can be many threats to a species one main cause has been defined for each species along with multiple other minor causes. The main causes for biodiversity loss in Finland correspond to the most affected habitats, with changes to forests and rural biotopes and cultural habitats being the main causes (Figure 1). (Hyvärinen;Kemppainen;Uddström;& Liukko, 2019)

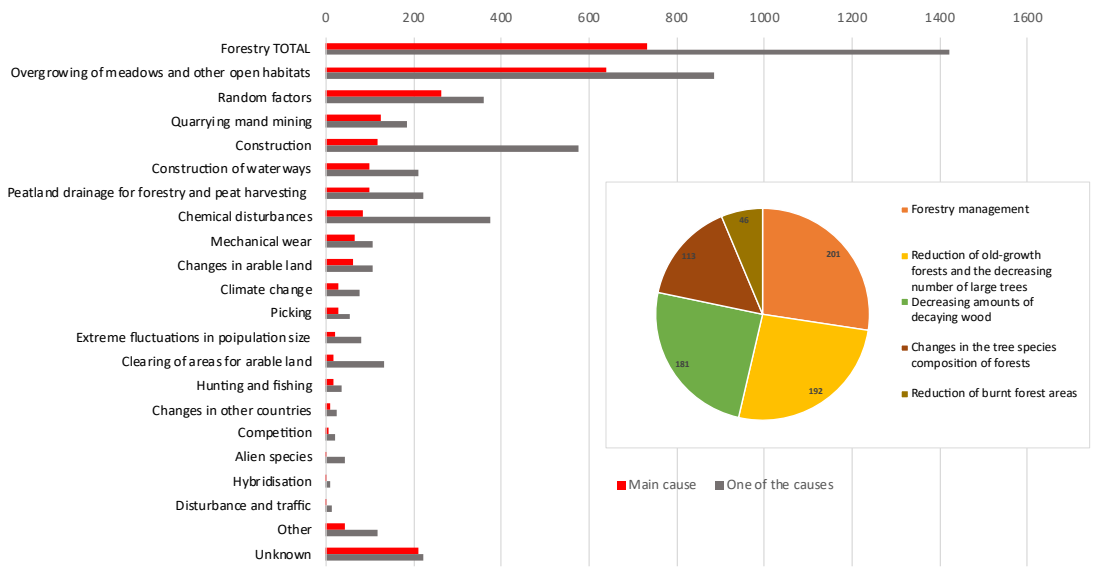


Figure 1: Causes of threat among threatened species (CR–VU), organized according to their frequency. The causes related to total forestry are specified more in detail in the pie chart

(Hyvärinen;Kemppainen;Uddström;& Liukko, 2019)

During the last 70 years silvicultural practices with mechanized logging have caused most of the forests to become intensively managed productive forestland. More than 90% of the productive forests in Finland are managed using the single cohort stands and clear-cutting harvest systems (Gustafsson;Kouki;& Sverdrup-Thygeson, 2010). This has led to significant changes in the forest age structure as well as composition, with old-growth variable composition forests being replaced by managed young production forests (Määttänen;Virkkala;Leikola;& Heikkinen, 2022). Since the 1950s the proportion of over 60-year-old forests has reduced from 63% to 44% and the reduction in over 100-year-old forests is even higher, from 29% of all forests to under 16% (Natural resources institute Finland, 2022)

Human activities are the cause for biodiversity loss so action must be taken if the loss is to be stopped. Biodiversity loss and the erosion of nature's carrying capacity has been defined as the most central megatrend of 2023 affecting not only the nature and environment around us, but also affects the economy, well-being, and equality (Dufva & Rekola, 2023).

Global communities and governments have acknowledged these challenges and have agreed to act. The UN Biodiversity Conference adopted a framework for addressing biodiversity loss and restoring ecosystems, among other things, in December 2022. To combat biodiversity loss the framework's targets include protecting at least 30% of the worlds land, coastal areas and oceans, restoring 30% of terrestrial and marine ecosystems and reducing loss of areas of high biodiversity importance and high ecological integrity to near zero (UNEP, 2022). The EU Biodiversity strategy outlines similar goals to fight biodiversity loss: to establish an EU-wide network of protected areas to cover 30% of land and sea areas as well as restoring degraded ecosystems across Europe (European Commission, 2020)

3.2 Protected areas in Finland

Protection of valuable nature areas has a long history in Finland. Protection goes back to pre-independence days, while Finland was a part of Sweden several initiatives for natural reserves were made and protection continued under Russian rule. The Punkaharju Esker Nature reserve is considered the first nature reserve in Finland and one of the oldest protected areas in the world, established in 1843. The landscape has been depicted by many Finnish artist and has become to be considered as the Finnish national landscape. After Finland became independent the National Protection Act was decreed in 1923, focusing on mainly protecting individual species and setting statutes on hunting and fishing. (Metsähallitus, n.d. A).

The first national parks in Finland were established in 1938, however some of these were located on lands lost to Russia after the Second World War. In 1956 seven new national parks were established, all on government owned lands. From the start the protection of nature has been strongly linked with cultural and patriotic values and nature was considered a natural heritage that should be protected, and this was further emphasized during the rebuilding of the nation after the second World War. In the beginning there were no laws to enforce how the areas should be managed, however, as popularity increased work on new national parks and legislation on their management was started in the 1970's,

resulting in the creation of 11 new national parks in 1982 (Metsähallitus, n.d. B). In addition to conserving nature, national parks are very popular for recreational activities such as hiking and camping. As of 2022, there are now 41 national parks in Finland, covering 10 146km^2 (Metsähallitus, n.d. C).

While national parks are important for conserving nature and biodiversity, they cover only a part of all the protected areas in Finland. Already in the Natural Protection Act of 1923 also private persons were given the possibility to apply for protection status for their lands, to conserve "natural beauty or otherwise important areas of nature" (Luonnonsuojelulaki 71/1923, 1923). Today, there are quite a few more laws that govern the protection of nature and protecting areas, however the core legislation can still be traced back to the Natural Protection act of 1923 (Kokko, 2017). The current main legislation includes the following laws:

- Environmental Protection Act 527/2014
- Natural Protection Act 1096/1996
- Forest law 1093/1996
- Wilderness Act 62/1991
- Water law 587/2011

In addition to the above-mentioned laws, there are several specific laws that affect certain aspects of nature, such as the Fishing Act (379/2015), Terrain Traffic Act (1710/1995), Rapids Protection Act (35/1987) and Land Use and Building Act (132/1999).

A new Nature Conservation Act was approved by the Parliament of Finland in December 2022. The new law will come into effect on June 1st, 2023. The new act provides stronger protection for certain habitats, enforces the role of the Finnish nature panel as an expert group in biodiversity and nature, as well as introduces ecological compensation as a tool for mitigating negative effects on natural value in some cases (Finnish government, 2022).

As of 2022 a total area of 2471 km^2 has been protected in Finland. Wilderness reserves, which are kept in natural state although not being protected *per se*, consist of an additional

1489 km^2. Overall, this corresponds to approximately 10% of the total area of Finland. Most of the protected areas are located on state-owned land, with only 364km^2 (9%) on privately owned lands or water. (Statistics Finland, 2022). The majority (73%) of the protected areas are in northern Finland, where most of the state-owned areas are. However, while considerably smaller areas, the majority (80%) of the privately owned areas are then again located in southern Finland. For biodiversity, variety is important, the size of the area is not always the most important criteria (Metsähallitus, 2022) (Natural resources institute Finland, 2019).

Overall, the Finnish state owns 30% of the total land area of Finland. Most of the land area is owned by private persons (60%) while municipalities, congregations or companies own 10% (Kokkonen, 2015). To meet the UN and EU goals of protecting 30% of land and water areas the proportion of privately owned protected areas must be increased considerably.

4 Methods for protecting private land in Finland

The Nature Conservation Act (Nature Conservation Act 9/2023, 2023) defines the criteria for nature reserves in Finland. These criteria apply to both state- and private-owned lands. At least one of the following criteria must be met for an area to be eligible for the creation of a nature reserve:

- An endangered, rare or threatened species, community of organisms, habitat type or ecosystem lives or exists in the area.
- The area has breeding or resting places for species requiring strict protection as defined in the EU Habitats directive appendix IV.
- An occurrence of a special or rare natural formation in the area
- Special scenic value of the area
- Achieving or maintaining of an appropriate conservation level of a habitat type or species requires it
- The area is of specific importance for habitat types or species to the effects of climate change.

- Otherwise representative, typical or valuable that its protection can be considered necessary for the preservation of natural diversity or beauty.

The law also lists the following habitat types automatically eligible for protection:

- Sandy beaches
- Forests with hardwood trees
- Hazel scrubs
- Alder forests
- Seaside meadows
- Leaf meadows
- Coastal forested dunes
- Inland floodplain forests
- Sun-exposed eskers
- Eelgrass meadows
- Sheltered bottoms with *Chara spp.*
- Limestone cliffs

The regional ELY centers are responsible for the decision for the creation of a nature reserve on private lands. The creation is mainly voluntary, based on the application of the landowner. In case the area is included in a nature conservation program approved by the Finnish government or a Natura 2000-area the ELY center can protect the area without an application from the landowner.

Private lands can be protected permanently or for a limited time, up to 20 years. The decision to create a private nature reserve done by the ELY center lists limitations to the use of the land due to the protection, as well as exceptions to these limitations (Nature Conservation Act 9/2023, 2023). For example, the maintenance or security of buildings and roads in the area can allow certain actions such as cutting down a tree or clearing an area, if they do not endanger the criteria for designation of the protected area.

While anyone can apply to protect their own lands by creating a nature reserve, several laws steer the use of land to protect valuable natural values such as habitats or species where they are present. In addition to the Nature conservation act the Forest law (Forest law 1093/1996, 1996) lists significant forests habitats that are to be preserved and secured. While these areas are not required to be protected, they must be left outside any logging activities in the area and be kept in a natural or near-natural state. The Finnish Forestry Centre has mapped these habitats and forest owners are required to take the significant

forest habitats into account when planning logging activities (Finnish Forest Centre, n.d A). The Water law (Water law 587/2011, 2011) also protects small water bodies such as brooks, streams, springs, small ponds, lakes and coastal formations such as flads and glo-lakes so that human activities should not cause harm or change these. The law includes not only the water area itself but also the surrounding areas and the endangering of the natural state of the areas is prohibited.

To facilitate the protection and restoration of habitats and species on private lands the Ministry of the Environment has created two programs aimed for private landowners for improving biodiversity: Metso and Helmi.

4.1 METSO program

The METSO program is a program launched by the government of Finland in 2008 aiming to stop the decline of forest habitats and species as well as turn the loss of biodiversity into an increase by 2025. The first period of the program was from 2008-2016, however, in 2014 another period was introduced lasting until 2025. The program aims to reach its goals by improving the network of protected areas, maintaining and improving natural management of economy forests, improving knowledge of assessing effectivity of actions and increase cooperation between different stakeholders. The program is mainly aimed at private land- and forest owners, providing an efficient way of assessing and protecting forests with diverse natural values and habitats. The program covers 10 different habitat types, favoring habitats in natural state or close to natural state. Areas are classified on a scale from 1-3 depending on their state, where classes 1 and 2 are prioritized for protection. The 10 habitat types in the METSO program are:

1. Groves
2. Heath forests significant for biodiversity
3. Marshes significant for biodiversity
4. Forests in proximity to watercourses
5. Flood meadows and forests

6. Forested cliffs, forests on rocky terrain, boulder rich areas
7. Calcareous rock and ultra-alkaline forested habitats
8. Sun-exposed esker forests
9. Forested cultural biotopes
10. Biodiverse coastal areas due to land rise

During the first part of the program the assessment methods and criteria to identify valuable areas for biodiversity suitable for the program were developed. These consist of both common and habitat specific criteria. The criteria, based on scientific knowledge, aim to identify forest features that are important for maintaining high biodiversity on the habitat level. To be eligible for the METSO program an area must promote the safeguarding of biodiversity and fulfill at least one of the common and one of the habitat specific criteria (Syrjänen, et al., 2016).

The common criteria for habitat assessment are listed in Table 1. In addition each habitat type has its own assessment criteria. The habitat specific criteria are not listed here but can be found in detail in a guide published by the Ministry of the environment (Syrjänen, et al., 2016)

Table 1: Common criteria for acceptance into METSO-program (Syrjänen, et al., 2016)

Criteria	Description
Habitat features and properties	Amount of dead and decaying wood, old-growth broadleaf and coniferous trees, hardwood trees, burnt trees, tree structure and crown holes, grove-like structure, ground water effect and proximity, marsh- or wetland-like area, natural of restorable watercourses
Geographical area	Number or area of same types of habitats in the area, connectivity, network of protected areas
Endangered species	Viable occurrences of either nationally or regionally endangered or threatened species

Burnt or damaged forests	Burnt forests with sturdy wood, areas close to protected areas or the eastern border with damaged old-growth forest, forestlands flooded by beavers or prone to beaver damage
Class 3 areas with developing properties or structure	Areas adjacent to class 1 or 2 Metso-areas with either naturally or due to restoration activities developing natural values
Location and size	Areas expanding current protection network in the region, cohesive forests over 10ha, areas with multiple habitats over 30ha, marshland-forest mosaics
Areas supporting economic, social or cultural well-being	Recreational and educational benefits from biodiversity, eco-tourism or restoration potential, scenic or cultural values

Forests qualifying into the METSO-program can be protected either permanently or temporary for 10 or 20 years. Permanently protected forests can be either sold to the Finnish state or remain in the landowner's ownership. In each case the owner is compensated depending on the level of protection and the land area. The compensation is tax-free (Metso-program, n.d.).

4.2 Helmi habitats program

The Finnish Ministry of the Environment has launched the Helmi-program in 2021 to strengthen biodiversity and ecosystems in Finland. The program aims mainly to restore and manage specific habitats, but also provides some methods for protecting areas.

The program is divided into five themes:

- Protecting and restoring mires
- Restoring aquatic bird habitats and wetlands

- Managing semi-natural grasslands
- Management of woodland habitats
- Restoration of aquatic and shore habitats

Through the program private landowners can get support, resources and financing to restore and manage habitats included in the program themes. While the lands themselves included in the program do not become protected by law the restoration and management protect the areas from further degradation and improves the ecological values, helping to stop biodiversity loss and threatened habitats and species (Ministry of the Environment, n.d B). Woodland habitats in the Helmi program can be included in the next Metso program period to increase the protection status of the area (Ministry of the Environment, n.d C).

5 Study area

The study area for this thesis and environmental study is a privately owned 3 ha plot of land in the village of Mälsarby, in Tenala in the municipality of Raseborg in southern Finland (**Error! Reference source not found.**).

The area is part of the Tenala-Bromarv cultural landscape in the Uusimaa regional land use plan designated as an area with valuable built-up cultural heritage (Nylands förbund, 2023).

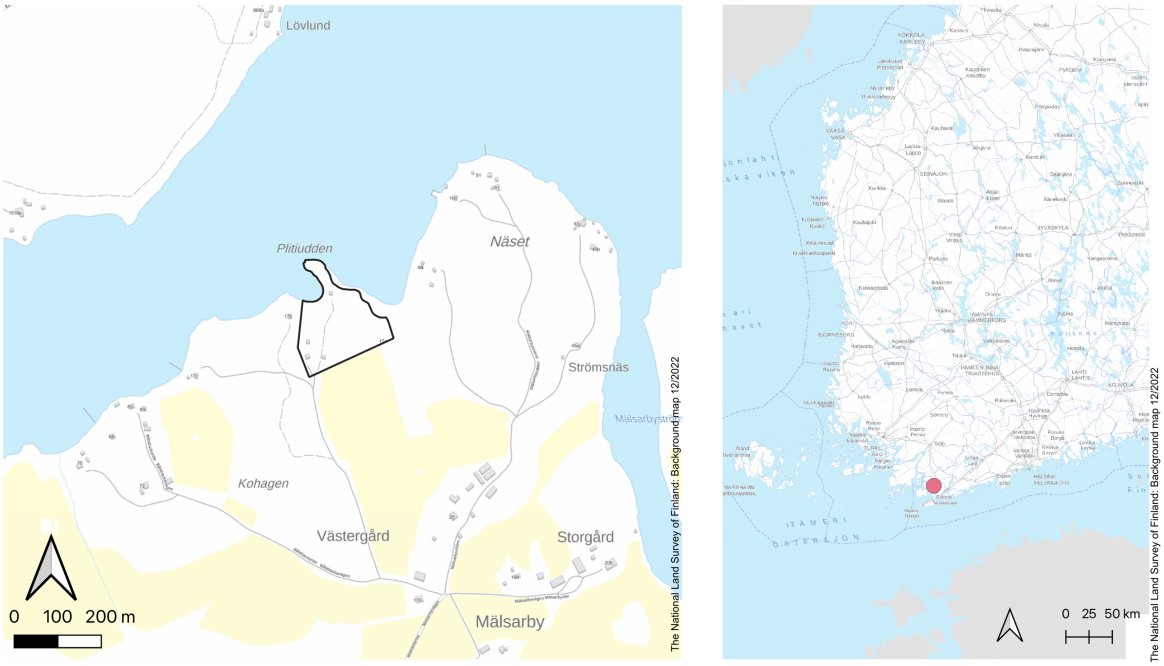


Figure 2: The study area (left, outlined in black) and its location in southern Finland (right, red point)

The area is mostly covered in forest, bordering to an agricultural field to the south, forest to the west and the Lindöviken bay to the north and east. The plot has approx.. 200m of shoreline towards the bay, with another 200m to the east towards old seafloor that has dried due to land rise. The bay is classified as a "Boreal Baltic Narrow Inlet" in the EU habitats directive (SYKE, 2020).

The area has been owned by the same family since the 1950's and used mainly as a summer cottage. There are three buildings located on the land, the main building, a log cabin built in the 1930's, a guest cabin built in the 1990's and a sauna by the shore in the bay. The main buildings are in the southwestern corner of the area, the rest of the land has been left mostly in natural state by the owners. Some firewood has been taken from the forest, mostly from fallen trees, but no commercial logging or similar has been done during the time the family has owned the area.

6 Methods

6.1 Data

There is a vast amount of ecological and environmental open data available for Finland that can be used to get acquainted with the characteristics of an area. The data includes models, reports, studies, surveys, species observations etc. and can be available anywhere from official instances to local voluntary organizations. This data is a valuable resource when preparing for an ecological survey as it can give good background information on an area and its wildlife. The information can be used to form an idea of what can be expected to be encountered during the actual ecological survey. The Finnish Environmental Institute has published a guide for ecological surveys with recommended topics for background information in preparation for an ecological survey (Mäkelä & Salo, 2021). From the guide the following themes were selected on the basis that they can provide information on the protection values of the study area by identifying the biodiversity level as well as vulnerable or threatened habitats and species.

- Earlier ecological surveys
- Habitat types
- Protected areas
- Threatened species
- Land cover use
- Modelled biodiversity values

The methods used to analyze the above listed data are described in the following sections.

6.1.1 Earlier ecological surveys

Earlier ecological surveys for the general area were searched for from multiple sources. The city of Raseborg has a web service (City of Raseborg, n.d.) for all its plans and often

ecological surveys are done as part of the planning process. Plans around the study area were studied for earlier ecological surveys and the surveys found were studied to get an idea of similar natural values in the study area.

As ecological surveys can also be done as part of the process of protecting areas an enquiry was sent to the Uusimaa ELY center for ecological surveys connected to the protected areas in the vicinity of the study area, however the ELY center did not have any information on possible surveys related to the protection applications. If any have been done, they have not been attached to the applications.

6.1.2 Habitat types

The threat assessment of Finnish habitat types of 2018 was downloaded from the Finnish environmental institute SYKE (SYKE, 2022 A). The data set contains occurrence data on 152 habitat types in a 10x10km grid. Occurrence data of habitat types in 10 km x 10 km grid cells is given in five classes: 0 = not occurring, 1 = occurring, 2 = occurring, northern fell area separated, 3 = certainly occurring, 4 = possibly occurring.

The data set is additionally divided into six different files according to the main divisions of habitat types: the Baltic Sea, rocky habitats, forests, inland waters and shores, mires and fell habitats, with marked polygon areas for potential habitat types. Fell and inland waters habitats were not selected to the data as they are not relevant.

The data was analyzed for the study area in QGIS. For underwater habitats the parts of the Lindöviken bay directly adjacent to the study area was included (SYKE, 2022 A) (SYKE, 2022 B) (SYKE , 2022 C) (SYKE , 2022 D).

The forest law (1093/1996, §10) outlines several significant forest habitats that should be cared for. The Finnish forestry centre has an online web service where these areas are defined. Occurrence of these significant forest habitats in the study area was checked from the service (Finnish Forest Centre, n.d B).

6.1.3 Protected areas

Data on protected areas was downloaded from the Finnish environmental institute SYKE. The data included all types of protected areas: state owned and private lands (SYKE, 2023 A) and Natura 2000 areas (SYKE, 2023 B). Protected areas near the study area were identified in QGIS, the information on the protection criteria of these was requested from the ELY center. The official applications and decisions for the PPAs were received from the ELY center and the protection criteria were obtained from these. State-owned protected lands are decreed by law and were retrieved from the finlex-database. Natura 2000 area factsheets were downloaded from SYKE.

The information on the protection criteria varies for each area, so the main criteria were identified as detailed as possible for each area.

6.1.4 Threatened species

The Finnish Biodiversity Information Facility (FinBIF) maintains the laji.fi website, an online open access data repository which consolidates data from multiple sources on biological life in Finland. The data contains observation records from professionals and amateurs all over Finland (Suomen Lajitietokeskus/FinBIF, n.d. A).

The laji.fi service includes pre-defined selections for filtering observations. Observations in the vicinity of the study area were downloaded using the following filters:

Observation date: 1.1.2013 – 16.1.2023

Regulatory status: Threatened species as per the Nature conservation decree (Luonnonsuojeluasetus 1997/160, attachment 4 2021/521)

Species under strict protection as per the Nature conservation decree (Luonnonsuojeluasetus 1997/160, attachment 4 2021/521)

EU Habitats Directive Annex IV

As the study area is quite small all observations within a 3km radius of the area were included in the analysis.

BirdLife Finland has mapped regionally important bird areas in Finland. The goal of the survey was to identify important gathering areas for birds as well as areas with significant amounts of nesting rare or endangered species. The national and regional areas were investigated to see if the study area is included in these areas (BirdLife Finland, n.d. B).

6.1.5 Land cover

Data on land use in Finland in 25 x 25m squares is available from the Finnish Environmental Institute. The data was downloaded in raster format (SYKE, 2018 A).

The Finnish Forest Research institute has developed a method for calculating forest inventories in Finland, called the multi-source national forest inventory (MS-NFI). The data from the latest MS-NFI is available from the Finnish Natural Resources Institute and covers a wide range of data. Data for forest age, tree height and tree density were downloaded as rasters from the online service (Finnish Institute of Natural Resources, 2021)

All rasters were opened in QGIS and clipped to the study area.

The “Raster layer histogram” and “Raster layer statistics” tools were used on the forest and tree data from the MS-NFI to analyze the data.

Land cover composition was analyzed using the “Raster layer unique values report” in QGIS, calculating the count and area of each unique value in the data set.

Historical and current aerial photos have been digitized by the National Land Survey of Finland and are available in a web service. Images for the study area were studied for information on changes in the land cover (National Land Survey of Finland, 2021). Screenshots of the aerial images were taken and georeferenced to the study area in QGIS.

6.1.6 Modelled biodiversity values

The Finnish Environmental Institute has created models calculating biodiversity value covering the whole of Finland. The goal has been to identify forest areas of potential high conservation value to support decision making in identifying new protected areas, especially on private lands. The result consists of a grid of 96x96m squares with calculated biodiversity scores. For the models six different analysis levels were developed so that each new version included everything that had been included in previous. The different levels are listed in Table 2 (Mikkonen;Leikola;Lahtinen;Lehtomäki;& Halme, 2018). Two sets of models were made, one on the national level and one on the regional level.

Table 2: Modelling levels for Zonation analysis of biodiversity (Mikkonen;Leikola;Lahtinen;Lehtomäki;& Halme, 2018)

Level	Content	Comment
1	Calculated dead wood potential	Forest value on a local scale showing areas with lots of large trees, many tree species or rare forest environments get high local value.
2	Level 1 + penalties for forestry operations with negative impact on biodiversity	Considers human activity, e.g. logging or drainage
3	Level 2 + connectivity based on ecological similarity, distance and quality between forest patches	Forest value part of a larger area. Includes connectivity values and presence of similar ecological areas.
4	Level 3 + observations of Red List forest species.	Red List forest species habitats emerge. Especially areas with rare species not found elsewhere are highlighted
5	Level 4 + connectivity to woodland key habitats protected by Finnish Forest Act 10 § (attenuation avg. 200m).	Value on a regional scale. Useful for analyzing the importance as part of a larger regional network
6	Level 5 + connectivity to permanent conservation areas (attenuation avg. 2km)	Regional landscape values. Can be used to identify areas and landscapes close to protected high biodiversity areas

The regional model results were downloaded in raster format from the SYKE open data service and clipped to the study area in QGIS. As the study area is quite small only three of

the 96x96m squares were included in the results (**Error! Reference source not found.**). The westernmost part was not relevant as the area contains the summer cottage buildings.

To analyze the variation of the modelled biodiversity values in the area the difference between the minimum and maximum values was calculated. A small difference would mean that the area is quite consistent, while a larger difference would indicate that there are larger differences in the modelled biodiversity values within the area.

To get an idea about the overall biodiversity value in the area the average value for levels 1-6 for the squares was calculated. All calculations were done using the "Raster layer statistics" tool in QGIS.

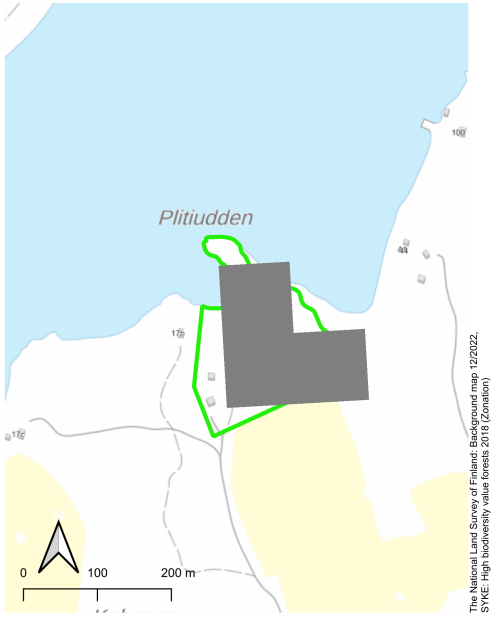


Figure 3: The resulting raster cells (grey) after clipping the data to the study area (SYKE, 2018 B)

6.2 Ecological survey

The Finnish Environmental Institute has published a guide for conducting ecological surveys (Mäkelä & Salo, 2021). The guide has been used as the main source when planning the ecological survey.

The goal of an ecological survey is to map and describe the natural characteristics of the surveyed area. An ecological survey can be either generic, looking at the area in general on a higher level, or they can be specific e.g. for studying certain features as specific endangered species environments. Furthermore, when applying for different permissions e.g. for buildings, roads or larger projects as well as general municipal planning, ecological surveys are required. These surveys focus more on specific effects of the plan or project on the area.

In ecological surveys special attention is paid to natural values important to biodiversity, especially threatened or endangered habitats and species. Other features of the area are usually described on a more general level (Mäkelä & Salo, 2021).

6.2.1 Habitats and species

There are several different classifications of habitats, often depending on the use and goals of the classification. The EU habitat directive, the Finnish Nature Conservation act, water law and forest law all list and describe different habitats. Common for these is that they only list threatened and endangered habitats. The Ministry of the Environment, together with the Finnish Environmental Institute, has published a more comprehensive classification, containing all habitats occurring in Finland, both endangered and common. In general this classification is recommended for ecological studies and will also be used in this thesis (Kontula & Raunio, 2019). However, the identified habitats will also be compared to the EU habitats directive and Finnish Nature Conservation act to check in case any of the habitats in the study area are listed in these.

Exact identification of individual species often requires expert knowledge and typically experts from different fields participate in ecological surveys. Birds are among the easiest groups of species to identify and monitor, and birdwatching is a common hobby. However, there are several species of mosses, butterflies, mushrooms and insects that are both difficult to identify and find without expert knowledge. Some species, especially insects and beetles live in places that cannot be accessed without damaging the environment (e.g. removing bark from dead trees), which is to be avoided. Additionally the time of the

ecological survey determines which species can be found, e.g. mushrooms are more common in the fall and certain plants can have a very short growing season. Since the number of species in Finland is large, usually only endangered or threatened species as well as species listed in the EU habitat directive appendices II and IV are examined in ecological surveys unless there is a more specific reason to focus on individual species. Without access to external experts an estimation of possible species can be done based on habitats or certain habitat characteristics, such as dead wood, limestone, wetlands or plants used as food (Mäkelä & Salo, 2021). In general the use of outside experts is outside the scope of this work, so species identification will mostly focus on plant species, however any animal species or traces found will be included even though definite identification might not be possible.

The 2019 Red List of Finnish species will be used to identify any endangered species found (Hyvärinen;Kemppainen;Uddström;& Liukko, 2019). The Finnish Biodiversity Information Facility's online database at www.laji.fi uses the same classification, additionally information on non-endangered species is available here so it will also be utilized (Suomen Lajitietokeskus/FinBIF, n.d. A).

6.3 Fieldwork

The goal of the fieldwork is to do an ecological survey of the area and to identify and gather material on habitats and species. The quality of the documentation is important, and photographs, map coordinates and other relevant information is to be included in the documentation (Mäkelä & Salo, 2021). For gathering data ArcGIS Field maps will be used. A base map with the study area outline was prepared and uploaded to ArcGIS Online.

A point layer for species observations and a line layer for habitat areas was added to the map. Both layers had only a description field for free text to be entered during the fieldwork, categorization etc. was done later in QGIS.

Two field visits were done during spring 2023: April 5th and May 31st. During the first visit the ground was still snow-covered and the focus was to identify the different habitats and

tree species. Mammal tracks were also well visible in the snow. The second visit was done in two parts, in the morning focus was on observing birds and in the afternoon the focus was on confirming the earlier observations about habitats as well as identifying plants in the area.

6.3.1 Habitats

The first part of the survey is to map and identify habitats present. General information on vegetation on different levels (ground, bushes, trees) as well as species and their abundance were documented. Species occurrence or population size was not counted specifically, rather a general level was used (single, some, common etc.). However, endangered species were counted explicitly if found. Forest age, composition, proportions of species and layers were also documented. The quality of the habitat (e.g. natural state, near natural, modified) and possible threats were also assessed (Mäkelä & Salo, 2021).

For biodiversity the amount of dead wood in forests is an important factor, as the lack of dead and rotted wood is one of the main reasons for biodiversity loss in forest habitats (Hyvärinen;Kemppainen;Uddström;& Liukko, 2019). Special attention was paid to the amount, type (standing / fallen) and type (hard, partly rotten, completely rotten) of dead wood (Mäkelä & Salo, 2021).

The habitats were outlined in ArcGIS Field maps by walking around the habitat edges while recording the track in Field Maps. Additional information was documented manually on paper as well as in photographs.

6.3.2 Species

A list of endangered species whose primary habitat was among the identified was used as a “short list” and special look out was kept for these species. Plant species were identified if possible. The app “Seek” was used to support species identification. “Seek” is an app developed by iNaturalist, a joint venture between the California Academy of Sciences and Natural Geographics, that uses smart phones and image recognition together with location

data to identify photographed species (iNaturalist, n.d.). As the image recognition is not completely reliable, the results were checked with data from the laji.fi portal, together with known observations to ensure the suggested species are found in Southern Finland.

Bird identification was done together with Stefan Heinänen, head of degree program at Novia UAS and an experienced bird observer. Birds were identified mainly from their songs but also visually if possible. The app “Merlin Bird ID” was also used as support. The app is developed by Cornell university and identifies bird species by comparing the song recorded on a smartphone to a vast database of bird songs (Cornell University, 2023). Observations were done by walking around the area circularly. Observations were marked on a map with the approximate location of the bird and the species.

Identification of mammal and insect species were attempted when found, but these were not systematically monitored. The presence of larger animals was identified mainly from tracks, droppings and traces from feeding.

All observations were photographed and documented either in the Field Maps app if location data was needed, or on paper.

An interview with the landowner was also done to gather information on sightings done at the site during his time there. Since the area has been used as a summer cottage for a long time, the owners have spent significant amounts of time in the area during different seasons and have had the possibility to see a lot more than what was possible during the short field work time. While these observations cannot be counted as scientifically reliable, they gave an idea of possible species in the area and were included in the listings, with a comment that they were based on second-hand information.

6.4 Reporting

The results of the ecological survey were compiled into a report that was delivered to the landowner. Habitat types were outlined in QGIS and combined with detailed descriptions and photographs in a report that was delivered to the landowner. The report was prepared

according to recommendations by Mäkelä & Salo (2022) and consisted of the following sections:

- Background and aim
- Methods and uncertainties
- General description of the area
- Natural values, habitats and descriptions
- Valuation
- Recommendations

The report was written in Swedish and delivered to the landowner.

7 Results

7.1 Analysis of study area based on open data

7.1.1 Earlier ecological surveys

A detailed shore plan has been made for the Grönkulla area, approximately 1,5 km to the east of the study area. An ecological survey has been done as part of that plan. According to the plan, the area consists mostly of forests that have been used for economic forestry for a long time, affecting the composition of the forests. However, some small old growth forests consisting of black alders (*Alnus glutinosa*), European white birch (*Betula pubescens*) and European bird cherry (*Prunus padus*). Evidence of the presence of the Lesser spotted woodpecker (*Dryobates minor*) was found. A survey for the presence of the Siberian flying squirrel (*Pteromys volans*) did not yield any results.

The Lindöviken is an important area for birds especially during molting and migration, with nationally significant amounts of Common goldeneye (*Bucephala clangula*), Tufted duck (*Aythya fuligula*), Smew (*Mergellus albellus*), Common pochard (*Aythya ferina*) and Greater scaup (*Aythya marila*). In addition Bean geese (*Anser fabalis*), Whooper swans (*Cygnus cygnus*), Northern pintails (*Anas acuta*) and Common redshanks (*Tringa totanus*) have been commonly found in the area.

Of the above-mentioned species the Common pochard is listed as critically endangered (CR), the Tufted duck and Greater scaup are listed as endangered (EN), the Bean goose as vulnerable (VU) and the Common redshanks as near threatened (NT) in Finland.

The ecological survey also identified nesting Eurasian coots (*Fulica atra*, endangered (EN) in Finland), Eurasian wigeons (*Mareca penelope*, VU) and Great crested grebes (*Podiceps cristatus*, NT) (Siitonen, 2012)

7.1.2 Habitat types

Several threatened forest and rocky habitats were present in the 10x10km grid for the study area (Table 3). However, as the gird area is quite large and covers a variety of different types of areas, some of the habitats can be dismissed for the study area. Regardless, the data can be useful in narrowing down possible habitat types during the on-site survey. The data contains only threatened onshore habitats and does not include marine habitats, so the possibility of other non-threatened habitats in the study area is not ruled out.

Table 3: Threatened habitat types occurring in the 10x10km grid for the study area (Kontula & Raunio, 2019)

Forest habitats		**Rocky habitats**	
Code	**Description**	**Code**	**Description**
M01_01	Herb-rich forests with deciduous (hardwood) trees	K01_01	Acidic rock outcrops on seashores
M01_01_01	Herb-rich forests with small-leaved lime	K01_02	Acidic rock outcrops on lakeshores
M01_01_02	Herb-rich forests with hazel	K01_03	Acidic rock outcrops on riverbanks
M01_01_04	Herb-rich forests with common ash	K01_04	Acidic rock outcrops with *Racomitrium lanuginosum*
M01_01_05	Herb-rich forests with Norway maple	K01_06	Acidic well-lighted rock faces
M03_01	Sun-exposed esker forests	K01_07	Acidic shady rock faces
M03_04	Forests on rocky terrain	K05_08_01	Siliceous erratic boulders, tors and stacks
M03_06	Heath forests with deciduous (hardwood) trees		

The more detailed habitat type data sets show that in the actual study area only one of the habitats can be expected to occur: Forests on rocky terrain. Additionally the area in the Lindöviken bay just outside the study area is most likely a benthic habitat characterized by *Najas Marina* or *Ptamageton spp. / Stuckenia spp.* (Figure 4)

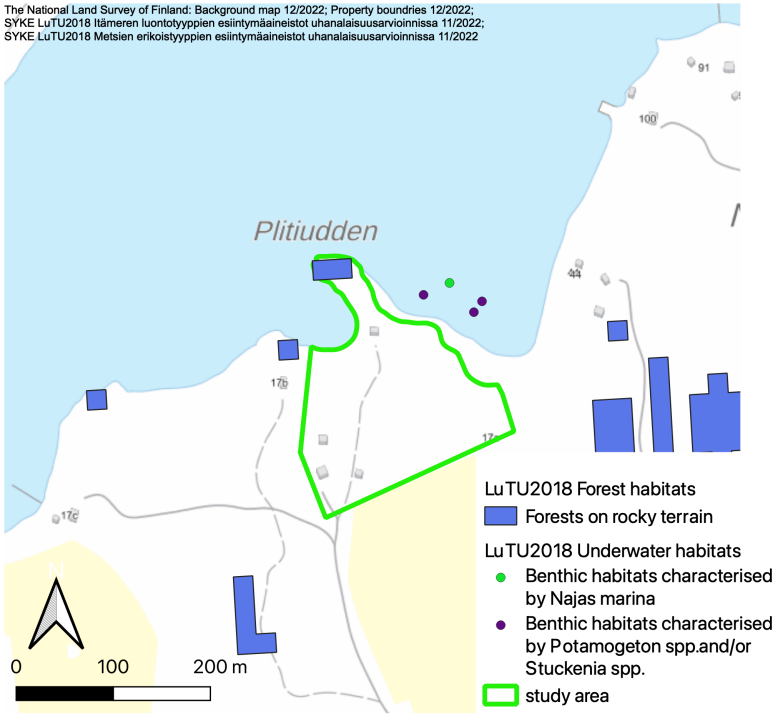


Figure 4: Potential forest and marine habitats modelled in the LuTU2018 data in and around the study area (SYKE , 2022 D; SYKE, 2022 B)

The study area does not contain any forest habitats specified in the forest law.

7.1.3 Protected areas

In the vicinity of the study area, there are nine protected areas on private land, one on state owned land and one Natura 2000 area in the vicinity of the study area. Four of the privately protected areas overlap with the Natura 2000 area (Figure 5). Most of the protected areas are established to protect the rich birdlife in the area, especially waterfowl habitats and resting areas, as well as marshy areas with broadleaved trees such as hazel (*Corylus avellana*) or black alders (*Alnus glutinosa*) (Table 4).

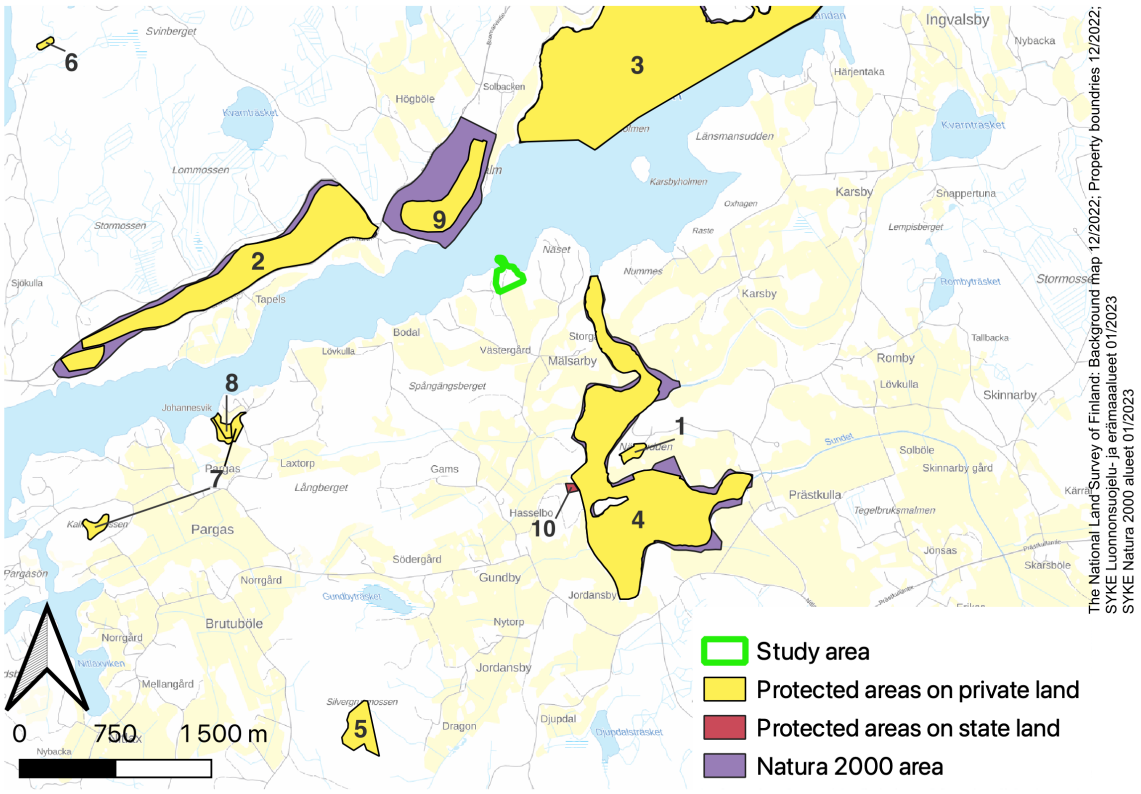


Figure 5: Private and state protected areas as well as Natura 2000 areas around the study area. Areas 2, 3, 4 and 9 overlap the Natura 2000 area (SYKE, 2023 A; SYKE, 2023 B)

Table 4: Private (P) and State (S) protected lands near the study area with protection criteria. The number in the table corresponds to the area number in Figure 5

#	Type	National ID	Name	Protection criteria	Source
1	P	LTA203869	Näseuddenin eteläinen pähkinäpensaslehto	Threatened habitat: herb-rich forests with hazel (VU)	(ELY-center, 2007 A)
2	P	YSA011917	Tapelåsenin luonnonsuojel	Valuable ridge landscape and -nature	(ELY-center, 1978)
3	P	YSA013394	Lindövikenin luonnonsuoje	Rich birdlife	(ELY center, 1993)
4	P	YSA203512	Heimlaxin luonnonsuojelualue	Area included in national protection program for waterfowl habitats	(ELY-center, 2007 B)
5	P	YSA207857	Silvergruvmossen	Pine barrens and marshes fulfilling METSO criteria, biodiversity	(ELY-center, 2013)
6	P	ERA239475	Seuko	*Vicia cassubica* (VU) occurrences	(ELY-center, 2017)
7	P	YSA253082	Kallnäs ja Johannesvik	Alder fen, a habitat protected by the Nature protection act	(ELY-center, 2021 A)

8	P	YSA253363	Johannesvikin luonnonsuojelualue	Alder fen, a habitat protected by the Nature protection act	(ELY-center, 2021 B)
9	P	YSA255730	Sattala naturskyddsområde	Valuable ridge landscape, habitat type western taiga, valuable geological and geomorphological formations	(ELY-center, 2022)
10	S	ESA300669	Bromarvin saarten luonnonsuojelualue	Part of the Bromarv islands nature reserve, protecting marshes, waterfowl habitats, old forests and archipelago nature	(Valtioneuvoston asetus Uudenmaan maakunnan luonnonsuojelualueista 332/2021, 2021)

The Natura 2000 area consists of three separate areas: the Tapelsåsen ridge, the Lindöviken bay and the Heimlax bay. The ridge area has significant geological and geomorphological formations, while the Lindöviken and Heimlax areas are important areas especially for waterfowl migration and molting. The area consists of mainly of the "coastal lagoons" type habitat, listed in the EU habitats directive. Other habitat types present from the EU habitats directive are Coniferous forests on, or connected to, glaciofluvial eskers, Fennoscandian hemiboreal natural old broad-leaved deciduous forests, Fennoscandian herb-rich forests with *Picea abies*, Western taiga and Fennoscandian wooded pastures (SYKE, 1996)

7.1.4 Threatened species

Most of the threatened species' observations in the 3km radius from the study area was of birds with 20 different species observed and reported in the last 3 years (Table 5).

Table 5: Observations within the last 10 years of threatened species in a 3km radius of the study area (Suomen Lajitietokeskus/FinBIF, n.d. B)

SPECIES	COMMON NAME	OBSERVATIONS	RED LIST STATUS
Birds			
Acrocephalus arundinaceus	Great Reed Warbler	1	VU (2019)
Emberiza schoeniclus	Common Reed Bunting	24	VU (2019)
Hirundo rustica	Barn Swallow	9	VU (2019)
Larus fuscus	Lesser Black-backed Gull	5	VU (2019)

Larus ridibundus	Black-headed Gull	19	VU (2019)
Lophophanes cristatus	European Crested Tit	58	VU (2019)
Saxicola rubetra	Whinchat	4	VU (2019)
Apus apus	Common Swif	14	EN (2019)
Carduelis chloris	European Greenfinch	25	EN (2019)
Delichon urbicum	Common House Martin	2	EN (2019)
Panurus biarmicus	Bearded Reedling	3	EN (2019)
Passer domesticus	House Sparrow	2	EN (2019)
Plectrophenax nivalis	Snow Bunting	1	EN (2019)
Poecile montanus	Willow Tit	26	EN (2019)
Birds - birds of pray			
Glaucidium passerinum	Eurasian Pygmy Owl	1	VU (2019)
Buteo buteo	Common Buzzard	6	EN (2019)
Buteo lagopus	Rough-legged Buzzard	2	EN (2019)
Birds - water fowl			
Aythya marila	Greater Scaup	1	EN (2019)
Melanitta fusca	Velvet Scoter	1	EN (2019)
Podiceps auritus	Horned Grebe	2	EN (2019)
Insects and spiders - hymenopteran			
Hybothorax graffii	N/A (type of bee or wasp)	7	VU (2019)
Mosses - Liverworts			
Riccardia multifida	N/A	1	EN (2019)
Trichocolea tomentella	N/A	1	EN (2019)
Vascular plants			
Ulmus glabra	Scots elm	1	EN (2019)
Vascular plants - insectivorous plant			
Galium verum	Lady's bedstraw	5	VU (2019)

The Lindöviken bay acts as a natural barrier in dissecting area for the observations selected, possibly affecting the spread of land-borne species and plants. Of the non-bird species the two liverwort species and the *Hybothorax graffii* wasp had been observed on the other side of the bay while both vascular plants had been observed on the same side of the bay as the study area.

No observations of species from EU Habitats Directive Annex IV were recorded in near the area.

Part of the Lindöviken bay is listed in the nationally important bird and biodiversity areas by BirdLife Finland. The areas listed are covered almost completely by the existing privately protected areas and the Natura 2000-area (Figure 6) (Leivo, et al., 2002)

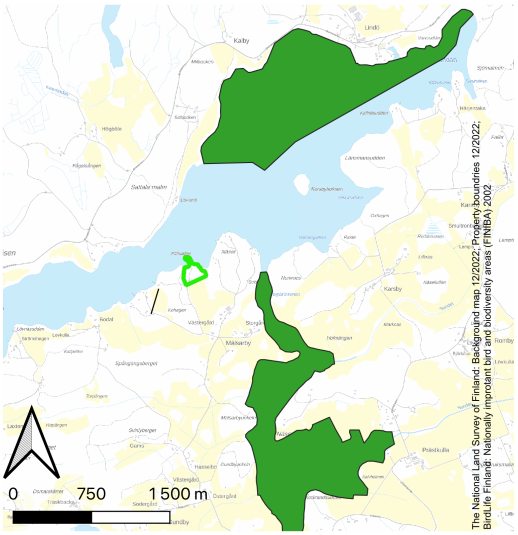


Figure 6: The nationally important bird and biodiversity area (FINIBA) of Lindöviken – Heimlax (BirdLife Finland, n.d. A)

While the area is not included in the regionally important bird areas of Uusimaa the Lindöviken bay's values especially for migrating birds receive a special mention in the report. It is an especially important resting area for the migrating graylag goose (*Anser anser*), though the amounts were not sufficient to include the area in the regionally important areas (Aintila & Ellermaa, 2018).

7.1.5 Land cover

Aerial photography shows that the study area is mostly covered by trees. Comparing the latest image with a historical image from 1950 shows that the western part of the area has been tree-covered already 70 years ago, while the eastern part was treeless. The images also show the effects of land rise on the Lindöviken bay just east of the study area, known as an accretion, where part of seafloor has become dry (Figure 7).

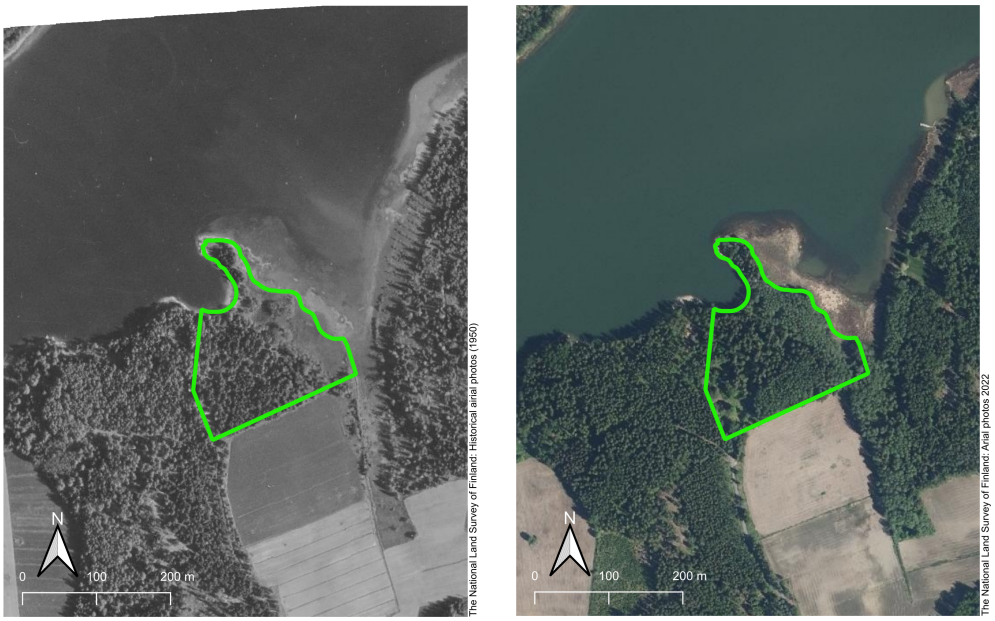


Figure 7: Historical (1950, left) and current (2022, right) aerial images of the study area (National Land Survey of Finland, 2021)

Tree age and forest height modelling support the assumption that the trees in the western part of the study area have not been cut between the taking of the aerial images. The western part of the study area has a considerable amount of old-growth forest, with patches of trees over 100 years old (Natural resources institute Finland, 2022). The same areas have also the higher trees, with the highest tops over being over 26m (Natural resources institute Finland, 2021) (Figure 8). Further analysis of the tree height shows that most of the raster grids are in the 16-22m interval. The forest age shows spikes in both the 40-50- and 70-80-year bins, with a high occurrence of rasters also in between the spikes (Figure 9). All this supports the conclusion that the study area is mostly older or old-growth forest with large biodiversity potential.

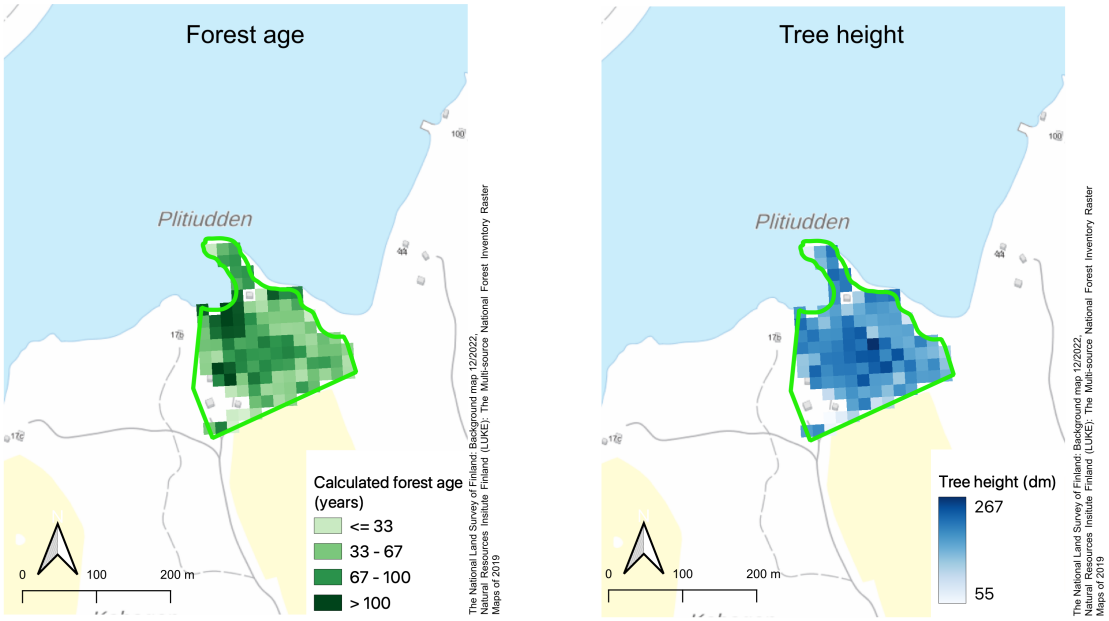


Figure 8: Forest age (left) and tree height (right) from the latest MS-NFI (Natural resources institute Finland, 2021)

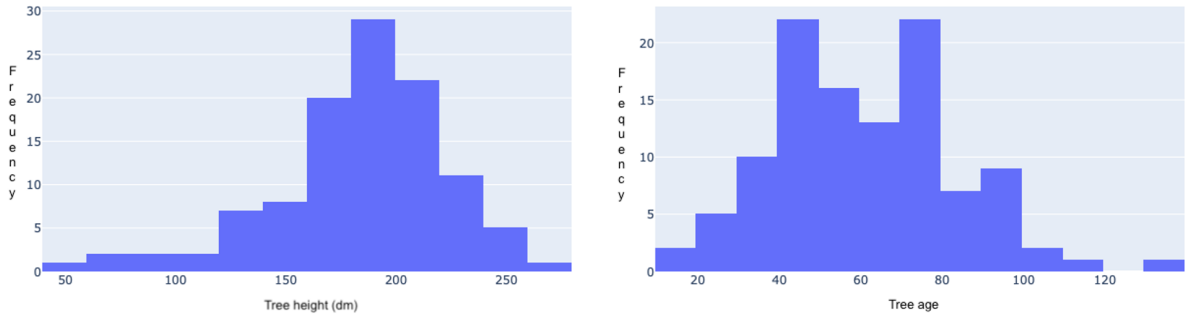


Figure 9: Tree height and age raster distribution for the study area (Natural resources institute Finland, 2021)

Data on tree density in the study area shows that the forested area is quite dense, with the density raging from 33 m^3/ha to 507 m^3/ha and the average density in the area being 474m^3/ha. The density distribution corresponds with the tree height distribution, with the densest areas in the middle of the study area and less dense areas at the edges (**Error! Reference source not found.**). The density is considerably higher than the average density of 148 m^3/ha of forests in southern Finland (Natural resource institute Finland, 2017).

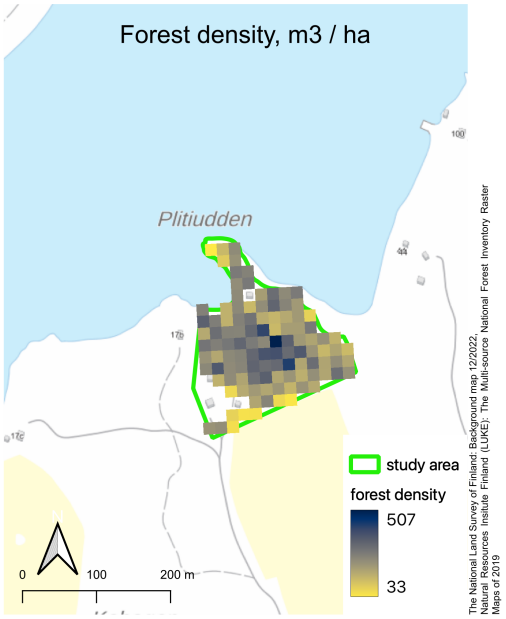


Figure 10: Tree density in the study area (Natural resources institute Finland, 2021)

Analysis of the land cover data in the study area gives further information on the composition of the forest in the area. The largest part of the area consists of coniferous forest (45% of the area) with areas of mixed forest (28%) and broad-leaved forest (16%). The coniferous forest corresponds quite well with the old-growth area in the western part of the study area, with the mixed and broad leaf forest in the eastern part and around the edges of the area (SYKE, 2018 A) (Figure 11).

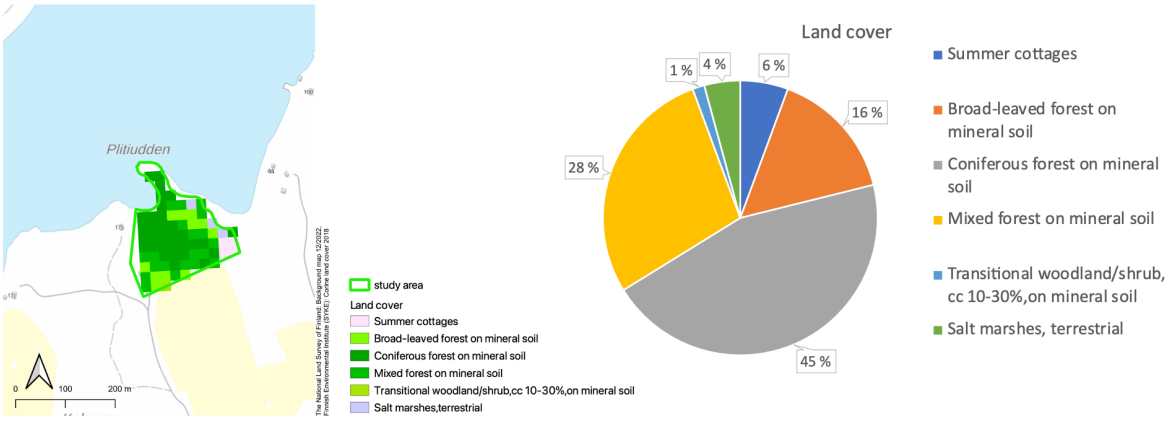


Figure 11: Land cover composition and proportions (SYKE, 2018 A)

The accretion area east of the study area can be assumed to be the cause for some of the land to be categorized as terrestrial salt marshes. Interestingly the south-eastern part of the area is classified as “summer cottages” even though the cottages are on the western edge of the area. This is a good reminder that the modelled data does contain some uncertainties and cannot be trusted to be a completely accurate representation of reality.

7.1.6 Modelled biodiversity values

Analysis of the biodiversity values in the study area show that the area has a potential for a high biodiversity (Table 6). The low variance between the minimum and maximum values for each category also indicate a high consistency in between the squares in the area. Modelling on level 2, including dead wood potential and human activity such as logging or drainage, receives the highest biodiversity score although levels 1-4 all have quite high scores. The high scores on levels 1-2 can be explained by the presence of tall old growth trees and the fact that the area has been in recreational use and therefore not used for economic proposes, having a large potential for dead wood and not being affected by human use. The high score on level 3 shows that that the study area’s ecology is of high-quality similar to the ecology of other areas nearby. This means that there is a high level of connectivity where species can more easily find habitats for themselves in the general area if one part is for some reason destroyed or changed. Level 4 indicates a potentially high

levels of red-listed forest species. While scores for levels 5-6 still are high, they are slightly lower than the lower levels indicating that the regional value for the study are is not as high. This can be explained, among other things, by the fact that the area is quite small and does not have any exclusive ecological values not found elsewhere. While the area still has a very high biodiversity score, it is not crucial on a regional scale as there are similar areas nearby, some having already been protected. However, overall the area can be said to be rich in biodiversity and have a positive effect on hindering the development of biodiversity loss.

Table 6: Biodiversity scores for the study area on a scale of 0-1. Descriptions on the different levels can be found in section 6.1.6 (SYKE, 2018 B)

Level	Minimum	Maximum	Variance	Average
1	0,9607	0,9837	0,023	0,9713
2	0,9737	0,9914	0,0177	0,9809
3	0,9692	0,9805	0,0113	0,9737
4	0,9677	0,9795	0,0118	0,9723
5	0,9301	0,9451	0,015	0,9357
6	0,9103	0,9263	0,016	0,9161

7.1.7 Conclusions of protection criteria based on open data

Based on the open data available several conclusions can be made of the study area. The area is mainly covered by old-growth coniferous forest in the western part and broad-leaf forest in the eastern part. The forested parts have most likely not been logged in at least 70 years, with the eastern coniferous part being even older, both parts being likely to have high biodiversity and containing dead or decaying wood, supporting many species. There are several significant instances of black alder (*Alnus glutinosa*) and hazel (*Corylus avellana*) in the region surrounding the study area, so it is possible that the broad-leaf forest area contains these species and can be good examples of typical habitats for these species, such as alder fens or herb-rich forests with hazel. The coniferous part of the forest can be expected to consist at least partly of the habitat type forests on rocky terrain.

Most likely the area will not contain any significant occurrences of endangered animals. While the bay outside the study area is known for its rich birdlife and consists of an important resting area for migrating birds, including endangered species, it is unlikely that any of these waterfowl will be found on land in the forest of the study area. However, the area just east of the study area might be a good nesting area for birds, making the eastern part of the study area valuable in protecting the nesting activities.

The bay itself is classed as a Boreal Baltic Narrow Inlet, a habitat listed in the EU habitats directive, so preserving the surrounding areas will help preserve the bay itself.

The area can potentially fill some of the criteria mentioned in the Nature conservation act (Nature Conservation Act 9/2023, 2023), for example endangered species or habitats such as hazel scrubs, alder fens, seaside meadows or leaf meadows. The area can also potentially fulfill the common METSO criteria regarding habitat features and properties, as well habitat specific criteria for heath forests significant for biodiversity or biodiverse coastal areas due to land rise. However, the size of the area can be of concern, as the Metso program prefers larger connected areas for protection.

Based on the data the area can nevertheless be expected to be biologically diverse and in natural or near-natural state. However, the presence of the summer cottage and recreational use of the area can have affected it in ways that are not visible in the data. Human presence can deter wildlife from the area, trees can have been cut down for firewood and the nature itself can be “worn” from human activities. The location of the buildings on the western edge of the study area can mitigate these effects, leaving the eastern part of the study area possibly in a more natural state.

To summarize, based on the available open data, the area can be expected to have a potential for protection, however, the validation of the data and some additional precision must be done on-site before any definite conclusions can be made. The results of the ecological survey are presented in the next section and the conclusions from the open data will then be compared to the actual ecological values.

7.2 Ecological survey

7.2.1 General

The study area can be roughly divided into three different parts: the western part (excluding the summer cottage) consists of old coniferous forest on a ridge, the eastern part is a low-lying wetland corresponding to the black alder fen habitat type and the northern part is a rocky headland sticking out into the Lindöviken bay. The area is mostly in natural or near natural state with little signs of human activity. In the western parts some wood has been taken as firewood for personal use, mainly from fallen trees. The northern part has a sauna and a small beach, but the areas are almost in a natural state with only narrow paths to the sauna. The wetlands part in the east can be said to be completely in natural state. Dead wood is abundant in the whole study area, both standing and fallen and in different stages of rot. The amount of dead wood in the western part is slightly less, however there were still several dead trees in this part too. The abundance of dead wood is a natural habitat for many species, both insects, mosses and fungi, which also provide food for several animal species. Marks from woodpeckers could be seen in many dead trees. Polypores such as *Fomes fomentarius* and *Fomitopsis pinicola* can be found on many trees.

The full report in Swedish with images is attached in Appendix 1.

7.2.2 Habitats

Seven different habitats (called “figures”) were identified during the fieldwork. The area around the summer cottages was marked as a separate (eight) area, but due to the human presence in the area it was excluded from the survey (Figure 12). A description of each figure is provided below, and all observed plant species are listed in the next section.

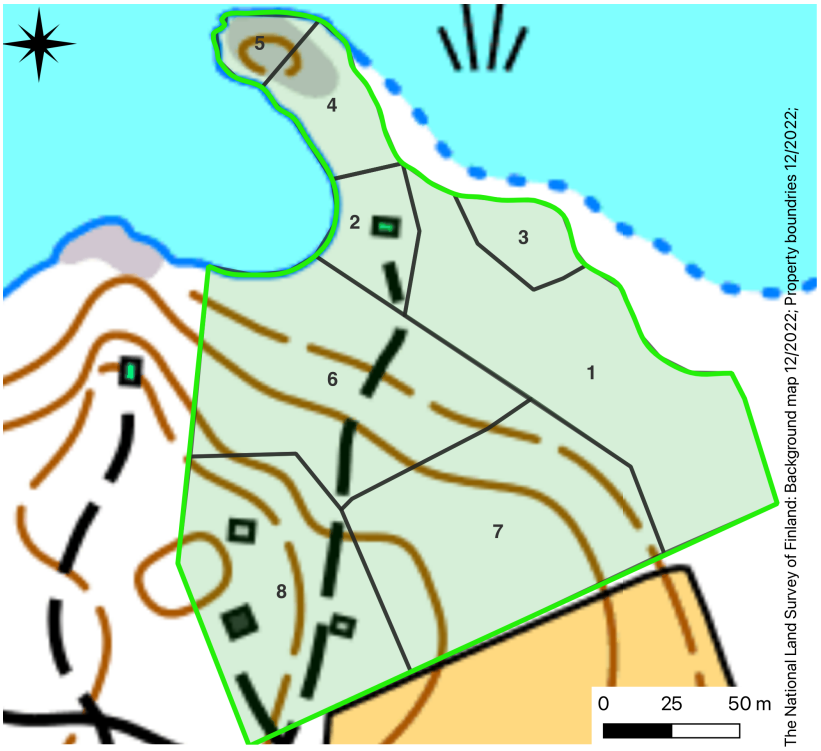


Figure 12: Identified habitats in the study area. 1=Alder fen, 2=Beachy area, 3=Spruce grove, 4=Forest on rocky terrain, 5=Rocky beach, 6=Pine barrens, 7=Grove like moss forest, 8=Cottage area

1. Alder fen in natural state with mainly black alders (Alnus glutinosa) of different ages, with bird cherries (*Prunus padus*) and young norwegian spruce (*Picea abies*). Abundant dead wood in different stages of rot, both standning and fallen. The area is very low and prone to flooding from the Lindöviken bay. The figure is the most biodiverse in the study area. Touch-me-not balsam (*Impatiens noli-tangere)* is abundant throughout the figure, and red campions (*Silene dioica*), common dog-violets (*Viola riviniana*) and arctic starflower (*Trientalis europaea*) can be found in the whole figure, most densly in the northern part. The southwestern part, towards the border of figure 7, is the driest part with a covering carpet of horsetail (*Equisetum sp.*) with oak fern (*Gymnocarpium dryopteris*), common nettles (*Urtica dioica*), currant bushes (*Ribes sp.*) and bird cherries (*Prunus padus*). The southeast part of the figure is the wettest, partly under water. In the area marsh thistle (*Cirsium palustre*), creeping buttercup, (*Ranunculus repens*), meadowsweet (*Filipendula ulmaria*), narrow buckler fern (*Dryopteris carthusiana*) and marsh

marigold (*Caltha palustris*) is commonly found. Towards the bay wood club-rush (*Scirpus sylvaticus*) is abundant. The middle parts of the figure are also partly under water, with less species in the field layer, mainly meadowsweet (*Filipendula ulmaria*) and marsh marigold (*Caltha palustris*) and a few marsh cinquefoil (*Comarum palustre*).

Moss grows abundantly on dead trunks, e.g. red-stemmed feathermoss (*Pleurozium schreberi*) as well as triangular thread-moss (*Hylocomiadelphus triquetrus*) and glittering wood-moss (*Hylocomium splendens*). In the trees there are several nest holes and feeding tracks of woodpeckers, a great spotted woodpecker's (*Dendrocopos major*) nest with young was observed in the middle of the area.

2. Beach area with older black alders (*Alnus glutinosa*), with bird cherries (*Prunus padus)*, norwegian maple (*Acer platanoides*) and young norwegian spruce (*Picea abies*). On the figure there is a sauna cabin, and the beach has been used for recreation, but for the most part the figure is in a nearly natural state. Near the sauna are large birch-leaved spirea bushes (*Spiraea betulifolia*) which are probably planted. Otherwise, the shrub layer consists of currant bushes (*Ribes sp*.) and wild raspberries (*Rubus idaeus*). The field layer consists of wood sorrel (*Oxalis acetosella*), red campions (*Silene dioica*), meadowsweet (*Filipendula ulmaria*), wood anemone (*Anemone nemorosa*), bilberry (*Vaccinium myrtillus*), touch-me-not balsam (*Impatiens noli-tangere*) and common dog-violet (*Viola riviniana*). On the beach there is also great wild valerian (*Valeriana excelsa subsp. salina*) and wood stitchwort (*Stellaria nemorum*)

3. Slightly elevated area with drier soil dominated by norwegian spruce (*Picea abies*) of different ages, but also containing bird cherry (*Prunus padus*), black alder (*Alnus glutinosa*), and silver birch (*Betula pendula*). Raspberry bushes (*Rubus idaeus*) in the shrub layer, the field layer includes flowers such as wood anemones (*Anemone nemorosa*), false lily of the valley (*Maianthemum bifolium*), red campions (*Silene dioica*) and arctic starflower (*Trientalis europaea*). There was also a raccoon dog's (*Nyctereutes procyonoides)* latrine with fresh droppings. Natural condition.

4. Forest on rocky terrain. The tree layer consists mostly of norwegian spruce (*Picea abies*) with glass birches (*Betula pendula*) as mixed wood and black alders (*Alnus glutinosa*) along the shore. The shrub layer consists of juniper (*Juniperus communis*) and rowan (*Sorbus aucuparia*), with occasional small currant bushes (*Ribes spp*.) in the inner parts. The field layer is dominated by bilberries (*Vaccinium myrtillus*). Dead wood in the form of several large standing spruces.

5. Rocky beach typical for the coastal area with scattered Norwegian maple (*Acer platanoides),* English oak (*Quercus robur*), bird cherry (*Prunus padus*), spruce (*Picea abies*), and black alder (*Alnus glutinosa*). On the cliffs biting stonecrop (*Sedum acre*) and meadowsweet (*Filipendula ulmaria)* grow, while cow parsley (*Anthriscus sylvestris*) is found in the soil covered areas, with occasional occurrences of birds-foot trefoil (*Lotus corniculatus*). On the alder, there were brackets (*Inonotus sp*.), but the identification was not certain due to the poor condition of the specimen. In the water, there are reeds (*Phragmites australis*) and bladderwrack (*Fucus vesiculosus).*

6. Coastal pine barrens forest consisting primarily of spruce (*Picea abies*) of different ages on higher ground. Some dead standing and fallen trees, with fallen trees used for firewood for personal use, but otherwise the figure is in a nearly natural state. The figure contains the tallest and oldest spruces in the area. The field layer consists mainly of bilberries (*Vaccinium myrtillus*) with some false lily of the valley (*Maianthemum bifolium*), arctic starflower (*Trientalis europaea*) and wood anemones (*Anemone nemorosa*). In the figure, something possibly resembling a mushroom of the *Lycoperdon sp.* was found, but the species could not be identified. The southern part of the figure has larger openings between the tree crowns where glass birches (*Betula pendula*), black alder (*Alnus glutinosa*), and rowan (*Sorbus aucuparia)* also grow. The field layer is also more varied, including species such as common bracken (*Pteridium aquilinum*), oak fern (*Gymnocarpium dryopteris*), and male fern (*Dryopteris filix-mas*). A path leads through the southern part to the sauna cabin.

7. Grove-like moss forest consisting primarily of spruce (*Picea abies*) with glass birch (*Betula pendula)* as mixed trees of all ages. Dead wood both standing and fallen. The trees are not as old and large as in figure 6. Some trees have been used for firewood, but this figure is also in a near-natural state. In the southwestern corner, towards the border with figure 8, there is a latrine. The field layer consists mainly of wood anemone (*Anemone nemorosa*), wood sorrel (*Oxalis acetosella*), false lily of the valley (*Maianthemum bifolium*), and some herb paris (*Paris quadrifolia*). Parts of the forest are densely packed with no vegetation in the field layer.

7.2.3 Species

All observed plant and tree species are listed in Table 7, together with the numbers of the figures they were found in. No red listed or invasive plant species were found in the study area.

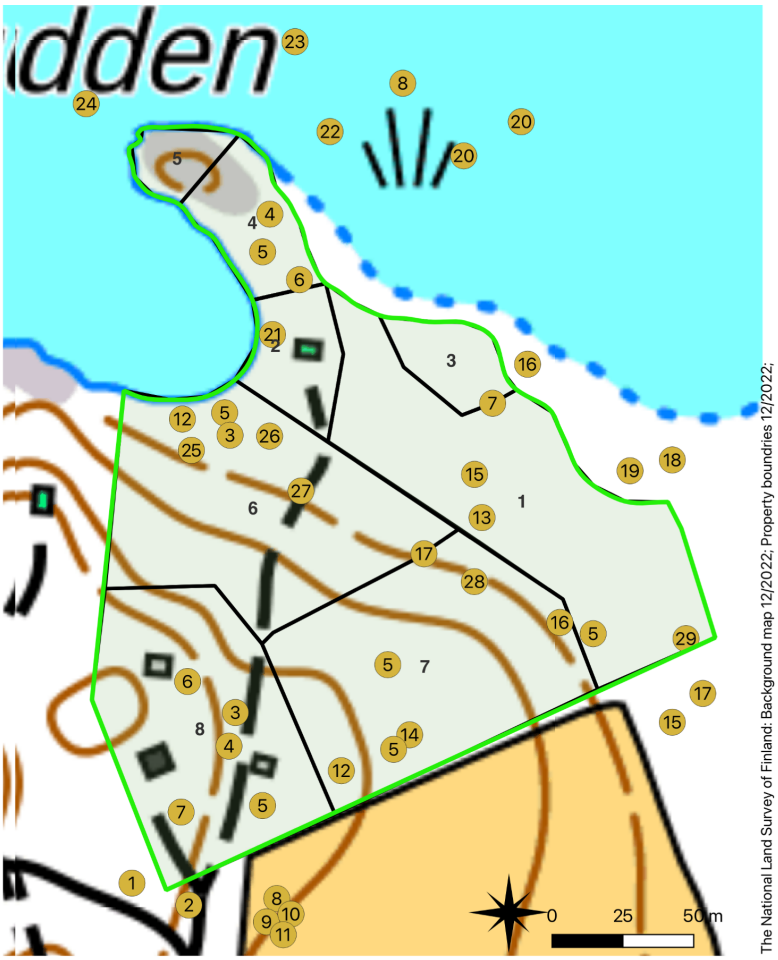
Table 7: Plant and tree species observed in the different figures. x=common, o=single or very few observations

Name	Scientific name	1	2	3	4	5	6	7
Norway maple	*Acer platanoides*		x			o		
Black alder	*Alnus glutinosa*	x	x	x	x	x	x	
Silver birch	*Betula pendula*		x	x	x		o	x
Common juniper	*Juniperus communis*				o			
Norwegian spruce	*Picea abies*		x	x	x	o	x	x
Scots pine	*Pinus sylvestris*					o		
Bird cherry	*Prunus padus*	x	x	x	o	x		
English oak	*Quercus robur*					o		
Wood anemone	*Anemone nemorosa*	x	x	x			x	x
Cow parsley	*Anthriscus sylvestris*	x				x		
Marsh marigold	*Caltha palustris*	x						
Marsh thistle	*Cirsium palustre*	x						
Marsh cinquefoil	*Comarum palustre*	o						
Narrow buckler fern	*Dryopteris carthusiana*	x	x					x
Male fern	*Dryopteris filix-mas*						x	
Horsetails	*Equisetum sp.*	x						
Meadow horsetail	*Equisetum pratense*	x						
Wood horsetail	*Equisetum sylvaticum*	x						
Meadowsweet	*Filipendula ulmaria*	x	x			x		
Tinder fungus	*Fomes fomentarius*	x					x	
Red-banded polypore	*Fomitopsis pinicola*	x						
Oak fern	*Gymnocarpium dryopteris*	x					x	
Triangular thread-moss	*Hylocomiadelphus triquetrus*	x		x	x		x	x

Glittering wood-moss	*Hylocomium splendens*	x		x			x	x
Touch-me-not balsam	*Impatiens noli-tangere*	x						
Alder bracket	*Inonotus sp.*					o		
Birds-foot trefoil	*Lotus corniculatus*					x		
Arctic starflower	*Trientalis europaea*			x			x	x
False lily of the valley	*Maianthemum bifolium*	x	x	x			x	x
Wood sorrel	*Oxalis acetosella*	x	x	x			x	x
Herb Paris	*Paris quadrifolia*							o
Red-stemmed feathermoss	*Pleurozium schreberi*	x	x		x		x	x
Common bracken	*Pteridium aquilinum*						x	
Creeping buttercup	*Ranunculus repens*	x						
Currants	*Ribes sp.*	x	x		x			
Raspberry	*Rubus idaeus*		x	x				
Wood club-rush	*Scirpus sylvaticus*	x						
Biting stonecrop	*Sedum acre*					x		
Red campion	*Silene dioica*	x	x	x				
Rowan	*Sorbus aucuparia*						x	
Birch-leaved spirea	*Spiraea betulifolia*		x					
Wood stitchwort	*Stellaria nemorum*		x					
Common nettle	*Urtica dioica*	x						
Bilberry	*Vaccinium myrtillus*		x		x		x	x
Great wild valerian	*Valeriana excelsa subsp. salina*		x					
Common dog-violet	*Viola riviniana*	x						

During the fieldwork several observations of tracks from foxes, hares, moose, deer, squirrels and other rodents were made, especially during the first visit when the ground was snow-covered. A raccoon dog latrine was also found on the area. However, no physical observations of larger mammals were made during the fieldwork. Both the racoon dog (*Nyctereutes procyonoides*) and white-tailed deer (*Odocoileus virginianus*) which was observed several times close to the study area, are listed as invasive species.

A total of 29 bird species were identified during the survey. Species and approximate locations are listed in Figure 13. Of the observed species two were red listed: the great crested grebe (*Podiceps cristatus)* is listed as near-threatened (NT) and the Black headed gull (*Larus ridibundus*) is listed as vulnerable (VU), however the gull was only observed passing over the area.



No.	Name	Scientific name
1	Tree Pipit	*Anthus trivialis*
2	Yellowhammer	*Emberiza citrinella*
3	Willow Warbler (2)	*Phylloscopus trochilus*
4	Pied Flycatcher (2)	*Ficedula hypoleuca*
5	Common Chaffinch (5)	*Fringilla coelebs*
6	Great Tit (2)	*Parus major*
7	Spotted Flycatcher (2)	*Muscicapa striata*
8	Common Crane (2)	*Grus grus*
9	Northern Lapwing	*Vanellus vanellus*
10	Fieldfare	*Turdus pilaris*
11	Common Gull	*Larus canus*
12	Goldcrest (2)	*Regulus regulus*
13	Eurasian Blackbird	*Turdus merula*
14	Great Spotted Woodpecker	*Dendrocopos major*
15	Common Wood Pigeon (2)	*Columba palumbus*

No.	Name	Scientific name
16	Eurasian Siskin (2)	*Carduelis spinus*
17	Blackcap (2)	*Sylvia atricapilla*
18	Eurasian Reed Warbler	*Acrocephalus scirpaceus*
19	Garden Warbler	*Sylvia borin*
20	Great Crested Grebe (pair) (2)	*Podiceps cristatus*
21	Eurasian Wren	*Troglodytes troglodytes*
22	Mute Swan (pair)	*Cygnus olor*
23	Common Tern*	*Sterna hirundo*
24	Black-headed Gull*	*Larus ridibundus*
25	Blue Tit	*Cyanistes caeruleus*
26	European Robin	*Erithacus rubecula*
27	Eurasian Treecreeper	*Certhia familiaris*
28	Black Woodpecker	*Dryocopus martius*
29	European Goldfinch	*Carduelis carduelis*

Figure 13: Observed bird species and their approximate location. Numbers after the species name indicate the number of observations in case there were several. Species marked with a star (*) were only observed passing the area.

7.2.4 Suitability for protection

Overall, the area is in natural or nearly natural state, except for the area around the main buildings (area 8 in Figure 12). There is a lot of old trees and dead wood in the area, which is important for biodiversity. The amount of old forests especially in Southern Finland had decreased significantly during the last 50 years as forests have been harvested for their lumber. At the same time the forests have become more monoculture-like, as single species of trees have been planted in cut forests. Old forests are important habitats for many species: approximately 25% of all species in Finland are dependent on dead wood. Old trees are also important habitats for many plant species such as lichens, mosses and polypores. Additionally, old forests function as coal sinks, as both trees and soil binds carbon from the atmosphere (IBC Carbon, 2023).

The coniferous forest parts of the study area fit into the “herb-rich heath forests” (area 7 in Figure 12) and “coastal spruce-dominated mesic heath forests” (area 6 in Figure 12) habitat types. Both habitat types are listed as vulnerable (VU) in Southern Finland, the main threats being forestry, clearing for agriculture and construction (Kontula & Raunio, 2019). Both areas can be suitable for protection through the METSO-program, both based on the habitat features and properties-criteria as well as fulfilling the “Heath forests significant for biodiversity” habitat criteria (see section 4.1 and Table 1 for METSO-criteria)..

Area 1 Figure 12 is an alder fen in natural state, which is one of the nine protected habitat types listed in §64 of the Nature Conservation Act (Nature Conservation Act 9/2023, 2023), and therefore is suitable automatically for protection. Alder fens especially along the coast, have significantly declined over the past 50 years and are classified as "near threatened" (NT) in Finland. The main threats to this habitat type are forestry practices and drainage. The habitat type is important for biodiversity due to the large amount of deadwood present in them, and they serve as important breeding areas for the Lesser Spotted Woodpecker (*Dryobates minor*), White-backed Woodpecker (*Dendrocopos leucotos*), and Three-toed Woodpecker (*Picoides tridactylus*) (SYKE, n.d.). In this case, the area also functions as a natural filter for nutrient runoff from the fields south of the area. The Natural Conservation Act habitat types also fulfill the criteria of the METSO-program.

8 Discussion and conclusions

The aim of this thesis was to investigate alternatives for the protection of the area and how the protection affects the use of the summer cottage as well as to investigate how open data can be used to evaluate protection criteria and the findings match the actual natural values of the area.

For the protection of private lands the METSO-program is the most suitable method. The ecological survey of the area identified several parts that would be suitable for the METSO-program: an alder fen and two different heath forest areas.

The alder fen part of the study area is in natural condition and due to the characteristics of the area it has not been used in any way by the landowners. Therefore the protection would not affect the use of the summer cottage in way. However, only approximately half of the alder fen is in the study area and the other half is on the neighboring plot, so if the landowner is willing to proceed with the protection it would be good to include the neighbor in the discussions so the whole alder fen can be protected.

While the heath forest parts of the study area also fulfill the criteria for the METSO-program their location and size can affect the feasibility of protecting them. The areas are located next to the summer cottage, and the latrine is in one of the areas. While this is not directly a criterion to dismiss protection, the decision to apply for protection should be considered carefully. For example, the area has been used to take some firewood for the cottage and protection can limit this. Another limiting factor can be the size of the areas, as usually heath forest areas protected for their biodiversity in the METSO-program tend to be larger, at least 2 hectares, or directly connected to other protected areas. However, smaller areas are not automatically excluded but evaluated case by case (Ministry of the Environment, n.d. A)

As there is no direct threat to the heath forest parts and the landowner has no plans on changing the use of the area, it can be more practical not to apply protection for these parts, but instead continue using the areas as before, i.e. mostly leaving them as they are.

The current use of the area is not a threat to the forest or it's biodiversity, as can be seen by the near natural state of the areas with old trees and plenty of dead wood.

Regarding the use of the available open data to evaluate the protection possibilities of the area and the comparison to the results of the actual natural values of the area the results are inconclusive. While some of the open data, such as forest age and composition, habitat types in the larger area and modelled biodiversity values, was quite accurate and matched the findings some important features were not available in the data or was even incorrect. The largest differences between the open data and the actual natural values were in the southeastern part of the area, where a large alder fen was identified. In the Corine land-use data the area was incorrectly marked as "summer cottages", while the alder fen-habitat type was not included in the threat assessment of Finnish habitat types done by SYKE (SYKE, 2022 A). As a matter of fact, the threat assessment does not include the Baltic Sea coast habitats at all, which in this case would have been most suitable.

Information on species in the available open data was limited to recorded observations from the laji.fi database maintained by the Finnish Biodiversity Information Facility, as well as information from previous ecological surveys in the area. This data focused more on special natural values, and while some information on the general nature could be retrieved from these, the only way to assess actual species is by fieldwork.

The conclusion of the comparison of the open data and actual observations is that even if the open data gives a good general idea of the nature in the area, it cannot replace the actual fieldwork. Analysis of open data can give good indications of the natural values of an area, however as the data can be faulty as seen in the case of the miss labeling of the southeastern part of the study area the actual values should always be verified in the field. While open data is not enough to evaluate the actual protection criteria of an area, it could be useful to identify potential hotspots in a larger area and narrow down a list of biodiverse areas that could be investigated further. As ecological surveys always require the permission of the landowner, landowners must be involved in any further discussions based on such results. One possibility would be for municipalities or other public sector organizations to do a biodiversity mapping of a larger area as part of a biodiversity project

and based on the results open discussions with interested landowners and act as a facilitator for any further actions.

While uttermost care has been taken in the work in this thesis, there are still uncertainty factors especially related to the results of the ecological survey. As species identification was done mainly by me (an unexperienced student, with the exclusion of bird identification where the identification was done by an experienced birdwatcher), there is a possibility of misidentification. Additionally, the identification focused mainly on plant species and many endangered species in Finnish forests are insects, there is a possibility of endangered or rare species in the area that were not observed in the survey. The timing of the survey also affects the results, as the fieldwork was done in the spring and early summer there can be species in the area that could only be identified later in the growing season. Nonetheless, despite the possible uncertainties the general results can be regarded as reliable as the identification of habitat types, which are the basis of the results, is not affected by the identification of individual species. For protection purposes the presence of a rare endangered species could have some effect, if one were to be found in the area.

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Appendix 1: Ecological survey report

Bakgrund, målsättning och metoder

På begäran av fastighetsägaren har en naturinventering gjorts för fastigheten Vårudd i Mälsarby by i Raseborgs kommun. Naturinventeringen har gjorts som en del av ett slutarbete för ”Sustainable Coastal Management” linjen i yrkeshögskolan Novia.

Målet med inventeringen var att kartlägga naturvärden i området på allmän nivå för markägarens intresse. För tillfället finns inga planer för området som skulle kräva en mer omfattande ”officiell” naturinventering av området.

Naturinventeringen baserar sig på Finlands Miljöcentral SYKEs publikation ”Luontoselvitykset ja luontovaikutusten arviointi - Opas tekijälle, tilaajalle ja viranomaiselle” [1]. Som bakgrundsmaterial har använts bland annat tidigare naturinventeringar i området, information om skyddade områden, artobservationer från laji.fi-databasen och den s.k. ”Rödlistan” över hotade arter och livsmiljöer i Finland. Signifikanta lokala naturvärden i närliggande området har beaktats kartläggningen.

Eftersom exakt artbestämning av många arter kräver ingående expertkunskaper i arten i fråga har inventeringen fokuserat främst på livsmiljöer (habitat) i området. Artidentifikation har begränsats främst till vegetation. Identifikation av arter har gjorts så noggrant som möjligt, men speciellt för flera arter som mossor, lavar, insekter, svampar mm. kan noggrann identifikation inte göras utan expertkunskaper. För identifikation och s.k. ”rödlistkategori” av livsmiljöer har använts en utvärdering publicerad av Miljöministeriet och SYKE [2].

Naturinventeringen gjordes under våren 2023. Området besöktes 5.4 och 31.5. Under det första besöket var marken ännu snötäckt och besöket fokuserade främst på att kartlägga olika naturtyper. Under andra besöket 31.5 gjordes en noggrannare kartläggning av växtarter i området och en skild fågelkartläggning tillsammans med Stefan Heinänen från Yrkeshögskolan Novia. Fågelkartläggningen baserade sig främst på sångidentifikation, en del identifikationer gjordes också visuellt. Som hjälp användes ”Merlin bird ID” applikationen som identifierar arten på basen av sången med hjälp av artificiell intelligens.

Osäkerhetsfaktorer i inventeringen relateras främst till identifiering och specialkunnande. Eftersom naturinventeringen har gjorts som ett studiearbete och baserar sig på den studerandes observationer och tolkningar kan det finnas osäkerhet i resultaten. På grund av detta har artidentifikationen främst fokuserat på växligheten. Speciellt för insektsarter och lavar krävs expertkunnande både för att hitta arterna och identifiera dem. Tidpunkten (våren / försommaren) på inventeringen kan även orsaka att en del senare arter inte observerats.

Allmän beskrivning av området

Fastigheten är belägen i Mälsarby by i Teanala, i Raseborgs kommun (Bild 1). Fastigheten gränsar mot en åker i söder, skog till väster och Lindöviken till norr och öster. Den är för det

mesta täckt av skog, flygfotografier ända från 50-talet tyder på att området varit mer eller mindre oförändrat de senaste 70 åren och till exempel ekonomiskogsbruk inte idkats (Bild 2). Fastigheten är dryga 3ha med ca 200m strandlinje med ytterligare ca 200m mot tillandning av Lindöviken. På fastigheten finns tre byggnader; i östra delen en huvudbyggnad från 30-talet av stock och en mindre stuga från 90-talet samt vid den lilla viken i norr en bastustuga. Vid huvudbyggnaden finns även ett större skjul / förrådsbyggnad. Fastigheten har varit i nuvarande ägarens släkt över 70 år och används främst som sommarstuga.

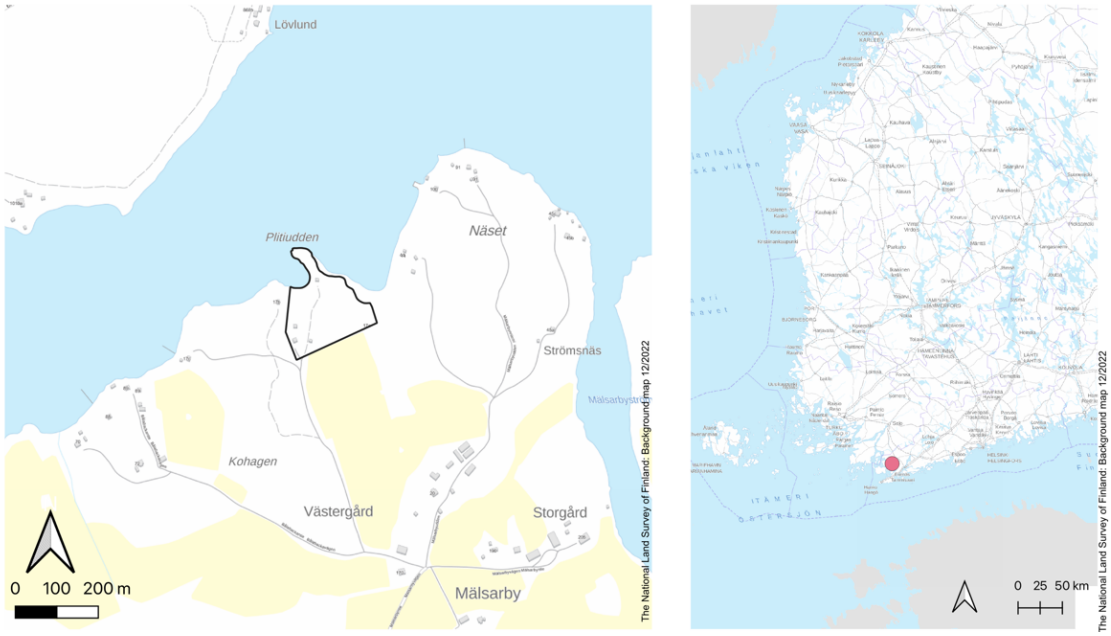


Bild 1: Inventerade fastigheten (t.v. med svart kontur)

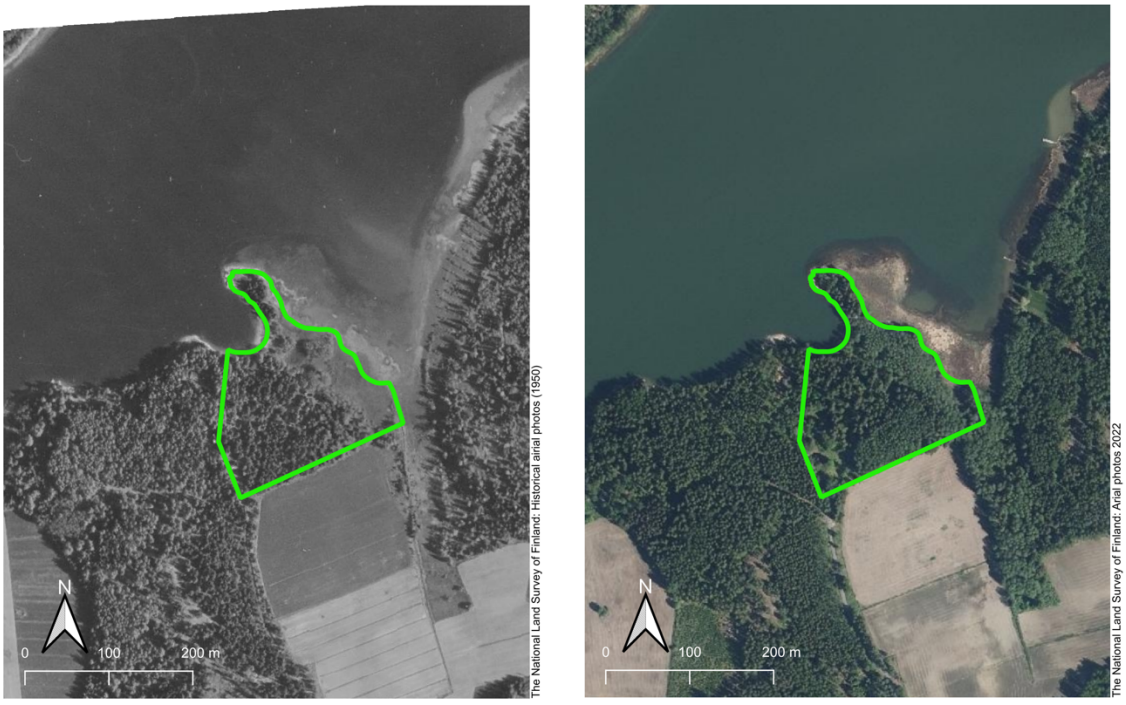


Bild 2: Flygfotografier från området, till vänster från 1950 och till höger från 2022 (Lantmäteriverket)

Området hör till Salpausselkä II – åsen som bildades under senaste istiden. Jordmånen i området är främst morän och lera med exponerad berggrund i strandområden [3]

Norra delen av Lindöviken och Heimlax hör till de nationellt värdefulla fågelområden (FINIBA) och är en viktig samlingsplats speciellt under höstflytten och sjöfåglarnas ruggning [4]. I området påträffas stora mängder knipor, vigg, salskrake, brunand och bergand. Även sädgås, sångsvan, stjärtand, grågås och rödbena träffas i området. Området är del av Tapelsåsen - Lindöviken – Heimlax Natura2000-området (FI0100002) [5] [6].

I närområdet finns även flera mindre privatägda skyddsområden av vilka flera består av klibbalskog som räknas till skyddade naturtyper enligt naturvårdslagens 64§ (bild 3) [7].

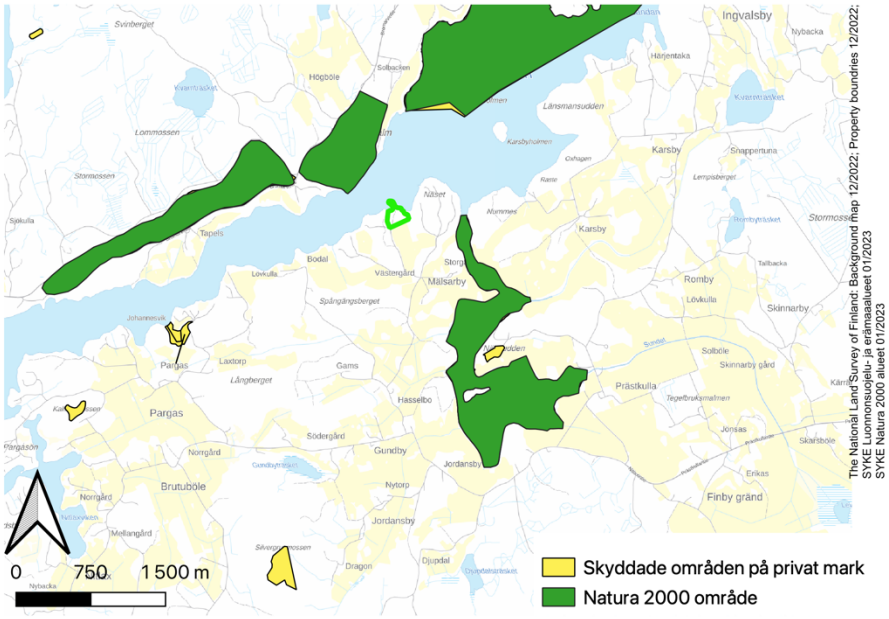


Bild 3: Skyddade områden i närområdet

I Västra Nylands etappslandskapsplan är området en del av Bromarv och Tenala kulturlandskap [8]. Inventeringsområdet bidrar dock inte väsentligt till kulturlandskapsvärden i området.

Inom kartläggningsområdet finns inga registrerade observationer av hotade arter. En lista av registrerade observationer i ett 3 km radie kring kartläggningsområdet finns i bilaga 2. Denna lista kan användas som riktgivande för potentiella hotade arter i området; den ska dock inte tolkas som uteslutande.

Resultat

Allmänt

Området kan delas i tre distinkta delar: västra delen är mo skog uppe på en ås ca 6-10m ovanför havsytan medan östra delen är lågtliggande, till stora delar våt eller

översvämningsdrabbad, under 1m ovanför havsytan. Norra delen av området är en låg klippudde som sticker ut i Lindöviken.

De sydvästra delarna av området exkluderades från naturinventeringen eftersom de kan räknas vara gårdsområde i mänsklig användning. För övrigt består västra delen av området av gammal skog i nära naturligt tillstånd, främst lundartad och naturlig mo (Bild 4). Trådskiktet domineras av gran med vårtbjörk och tall. Skogen är främst gammal skog med flera gamla (70+ år) granar. Vedtagning främst till eget bruk har skett i liten skala men annars är området nära naturligt tillstånd. Lavar (*Physcia sp.*) växer på många stammar. På öppnare platser finns unga granar. Buskskiktet är för det mesta glest, med enstaka rönnar och enbuskar. Fältskiktet har rikligt med blåbär, vitsippor och harsyra med rödblära, ekorrbär och skogsstjärna på flera ställen.

Bild 4: Moskog med höga, gamla granar och dött virke

Västra delen av området består främst av klibbal och markskiktet är delvis mycket vått, nästan sumpmark. Ett dike leder vatten till området frön söder, och den låga marknivån gör att havsvatten kan tränga in vid höga vattennivåer. Förutom klibbal finns hägg och en del mindre granar på torrare ställen. Buskskiktet består främst av vinbärsbuskar men fältskiktet har en bred mångfald av arter. Vissa områden domineras av springkorn och skogssäv, men bland annat brännässlor, bräken, kärrtistel, rödblära, revsmörblomma, älggräs och ängsvioler är vanliga. (Bild 5)

Bild 5: Klibbalskärr med rikligt dött virke

Norra delen av området är en klippig udde som sticker ut i Lindöviken. Södra delen av udden består av granskog med alar längs stranden. I buskskiktet finns flera enbuskar och fältskiktet domineras av blåbär (bild 6). Yttersta biten av udden är en klippig strand med enskild lönn, ek, hägg och alar. På klipporna växer gul fetknopp och älggräs och hundkäx hittas på de marktäckta områdena.

Bild 6: Granskog på klippig grund på udden

Öster om området finns en vassrand som en tillandning på grund av landhöjningen och kan ha stor potential för häckande sjöfåglar. I området observerades häckande knölsvan och trana och flera par simmande skäggdoppingar samt fisktärna och fiskmås. Vassranden hör dock inte direkt till kartlagda området utan till vattenområdet utanför.

På hela området finns mycket död ved, både stående och liggande, i olika grader av murkenhet. Trädbeståndet i olika åldrar och mängden död ved bildar goda livsmiljöer för en mängd olika arter, både insekter, svampar, mossor. Ätspår av spettar finns på många stammar. På döda stammarna växer bland annat klibbticka (*Fomitopsis pinicola*) och fnösticka (*Fomes fomentarius*) (bild 7 och 8). I hela området och på många döda stammar växer mossor, främst husmossa, väggmossa och kransmossa.

Bild 8: Klibbticka på död stam

Bild 7: Ätspår av större hackspett

Under inventeringen observerades spår av bland annat räv, hjortdjur, älg, hare ekorre och andra gnagare, speciellt under första besöket då marken var snötäckt. Både vitsvanshjort och rådjur observerades i närheten av området. I grandungen till öster (figur 3 i bild 6) observerades ett mårdhundsdass med färsk spillning.

Figurvisa beskrivningar

Nedan beskrivs de olika naturtyperna i området. En fullständig lista av de identifierade arterna finns efter den allmänna beskrivningen.

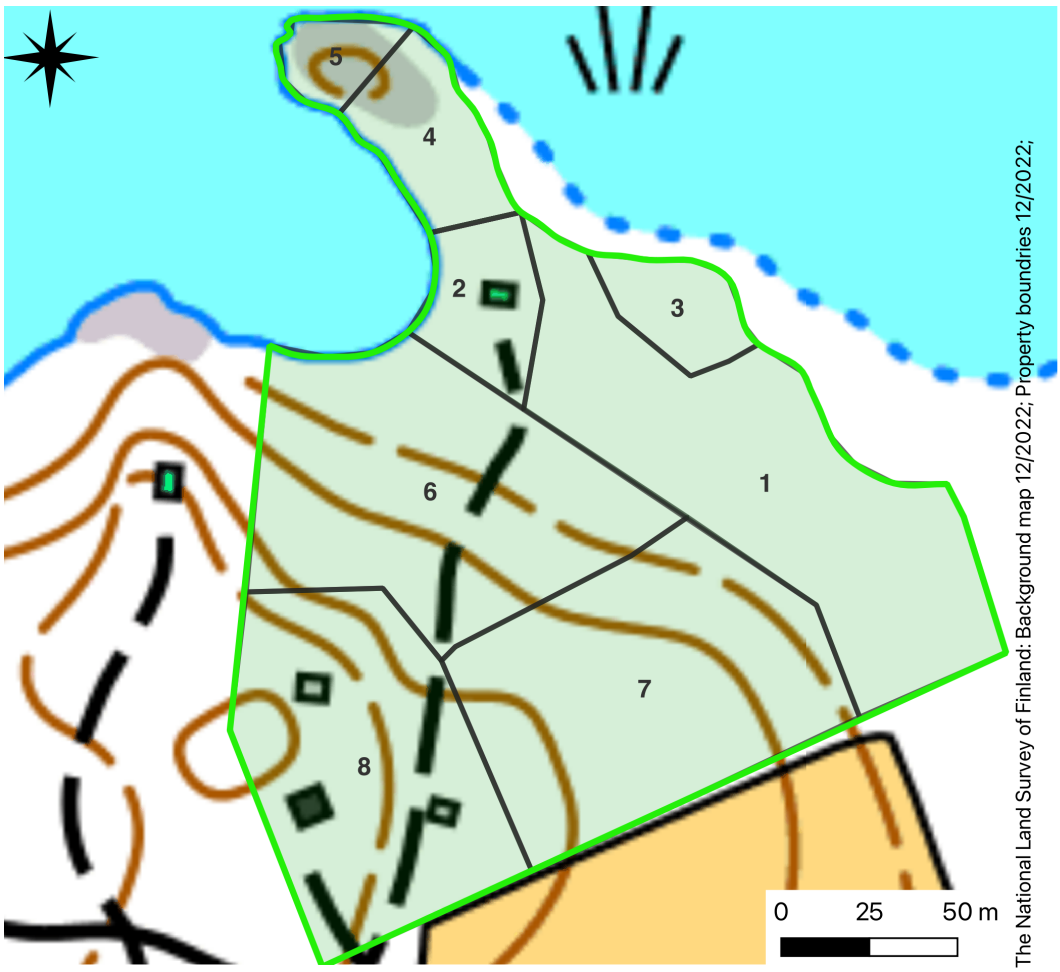


Bild 9: Figurvis fördelning av naturtyper

1. Klibbalskärr i naturligt tillstånd bestående främst av klibbalträd i olika åldrar med hägg och enstaka yngre granar. Mycket dött virke både liggande och stående i olika stadier av murkenhet. Lågt och översvämningsdrabbat vid högre vatten. Figuren är den artrikaste på området. Springkorn växer täckande över nästan hela figuren. Även rödblära växer så gott som i hela figuren, tätast i den norra delen tillsammans med skogsviol och skogsstjärna. Sydvästra delen, mot gränsen till figur 7, är den torraste delen med en täckande matta av fräken med ekbräken, brännässlor, vinbärsbuskar och hägg. Sydöstra delen av figuren är den våtaste, delvis under vatten. I området växer kärrtistel, revsmörblomma, älggräs, skogsbräken och kabbleka. Utåt mot viken dominerar skogssäv. Mittersta delarna är också delvis under vatten med fattigare fältskikt, främst älggräs och skogsbräken med ett fåtal kråkklöver.

   På döda stammar växer mossor, bland annat väggmossa samt fnös- och klibbticka. I träden finns flera bohål och ätspår av spettar, ett större hackspetts bo med ungar observerades i mitten av området.

2. Strandområde med äldre klibbalar, hägg, några lönnar och yngre granar. På figuren finns bastustuga och stranden använts till rekreation, men för det mesta är figuren i nära naturligt tillstånd. Nära bastun stora björkspirea buskar som antagligen är planterade. I övrigt består buskskiktet av vinbärsbuskar och skogshallon. Fältskiktet består av harsyra, rödblära, älggräs, vitsippa, blåbär, springkorn och skogsviol. På stranden växer även strandvänderot och lundarv.

3. Mindre upphöjning av torrare mark som domineras av gran i olika åldrar men även hägg, klibbal och björk. Hallonbuskar i buskskiktet, fältskiktet består bland annat av vitsippor, ekorrbär, skogsstjärna och rödblära. I figuren fanns ett mårdhundsdass med färsk spillning. Naturligt tillstånd.

4. Skog på klippig grund. Trädskiktet består mest av gran med björkar som blandved och klibbalar längs stranden. Buskskiktet består av en och rönn och enskilda mindre vinbärsbuskar i inre delarna. Fältskiktet domineras av blåbär. Dött virke i from av flera stora stående granar.

5. Klippig strand typisk för kustområdet med enstaka lönn, skogsek, hägg, gran samt klibbal. På klipporna växer gul fetknopp och älggräs och hundkäx hittas på de marktäckta områdena, även mindre förekomster av kärringtand. På alen växte tickor som antagligen är fjolårets al- eller rävtickor (*Inonotus sp.)*, men identifieringen var inte säker p.g.a. det dåliga skicket av exemplaret. I vattnet växer vass och blåstång.

6. Kustnära färsk moskog bestående främst av gran i olika åldrar på högre mark. En del döda stående och liggande träd, fallna träd har använts till ved för eget bruk men annars är figuren i nära naturligt tillstånd. Figuren innehåller de högsta och äldsta granarna i området. Fältskiktet består främst av blåbär med lite ekorrbär, skogsstjärna och vitsippor. I figuren hittades något som möjligtvis är en röksvamp (*Lycoperdon sp.)* men arten gick inte att identifiera. Södra delen av figuren har större öppningar mellan trädkronorna där det växer även björk, klibbal och rönn. Fältskiktet är också mer varierande, med bland annat örnbräken, ekbräken, och träjon. Genom södra delen leder en stig till bastustugan.

7. Lundaktig mo skog bestående främst av gran med björk som blandträd, i alla åldrar. Dött ved både stående och liggande. Träden är inte lika gamla och grova som i figur 6. En del träd har använts till ved men även denna figur är i nära naturligt skick. I sydvästra hörnet mot gränsen till figur 8 finns ett dass. Fältskiktet består främst av vitsippa, harsyra och ekorrbär, och lite ormbär. Delvis mycket tät skog där fältskiktet utan växtlighet.

8. Gårdsområde

Observerade arter

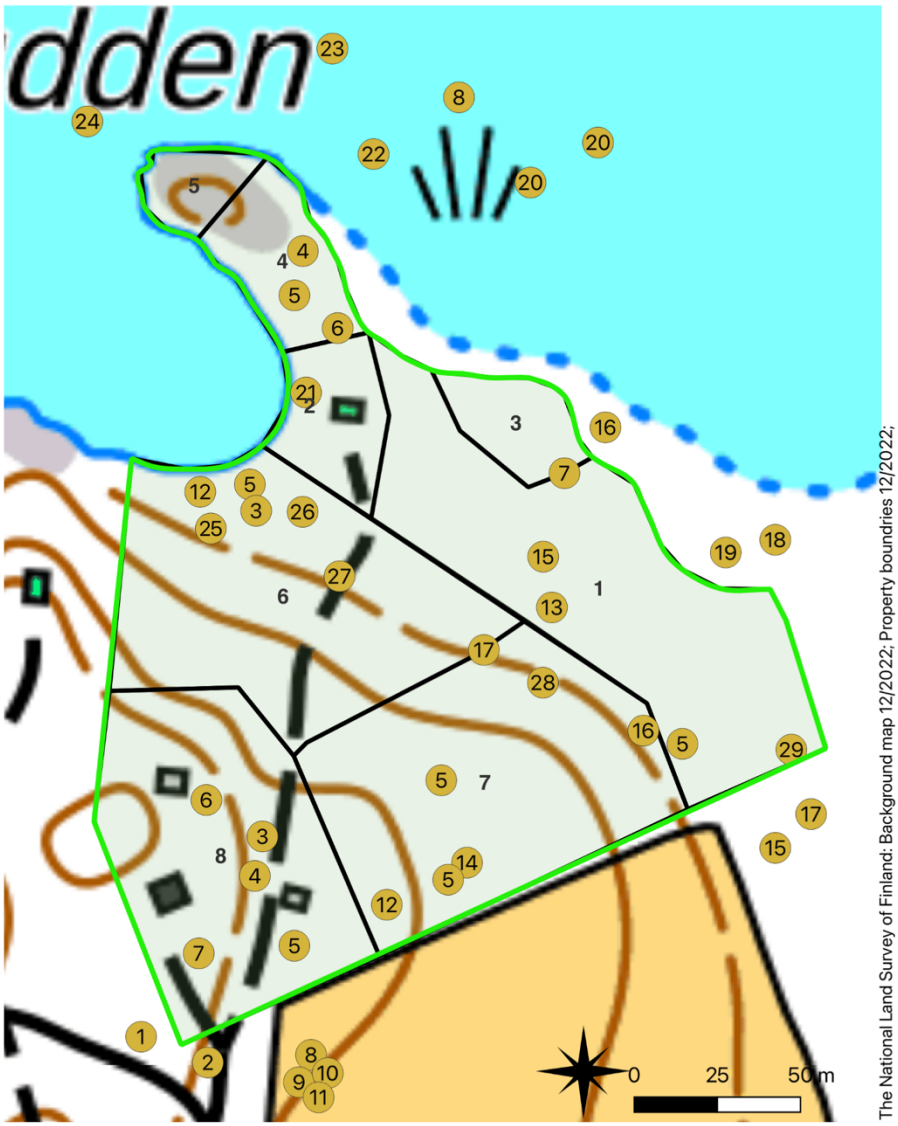
Tabell 1: Identifierade arter och de figurer de observerades i. x = vanlig o = enstaka

Svenskt namn	**Vetenskapligt namn**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Lönn	*Acer platanoides*		x			o		
Klibbal	*Alnus glutinosa*	x	x	x	x	x	x	
Vårtbjörk	*Betula pendula*		x	x	x		o	x
En	*Juniperus communis*				o			
Gran	*Picea abies*		x	x	x	o	x	x
Tall	*Pinus sylvestris*					o		
Hägg	*Prunus padus*	x	x	x	o	x		
Skogsek	*Quercus robur*					o		
Vitsippa	*Anemone nemorosa*	x	x	x			x	x
Hundkäx	*Anthriscus sylvestris*	x				x		
Kabbleka	*Caltha palustris*	x						
Kärrtistel	*Cirsium palustre*	x						
Kråkklöver	*Comarum palustre*	o						
Skogsbräken	*Dryopteris carthusiana*	x	x					x
Träjon	*Dryopteris filix-mas*						x	
Fräken	*Equisetum sp.*	x						
Älggräs	*Filipendula ulmaria*	x	x			x		
Fnösticka	*Fomes fomentarius*	x					x	
Klibbticka	*Fomitopsis pinicola*	x						
Ekbräken	*Gymnocarpium dryopteris*	x					x	
Karnsmossa	*Hylocomiadelphus triquetrus*	x		x	x		x	x
Husmossa	*Hylocomium splendens*	x		x			x	x
Springkorn	*Impatiens noli-tangere*	x						
Alticka eller rävticka	*Inonotus sp.*					o		
Käringtand	*Lotus corniculatus*					x		
Skogsstjärna	*Trientalis europaea*			x			x	x
Röksvamp	*Lycoperdon sp.*						o	
Ekorrbär	*Maianthemum bifolium*	x	x	x			x	x
Harsyra	*Oxalis acetosella*	x	x	x			x	x
Ormbär	*Paris quadrifolia*							o
Väggmossa	*Pleurozium schreberi*	x	x		x		x	x
Örnbräken	*Pteridium aquilinum*						x	
Revsmörblomma	*Ranunculus repens*	x						
Vinbär	*Ribes sp.*	x	x		x			
Skogshallon	*Rubus idaeus*		x	x				
Skogssäv	*Scirpus sylvaticus*	x						
Gul fetknopp	*Sedum acre*					x		

Svenskt namn	Vetenskapligt namn	1	2	3	4	5	6	7
Rödblära	*Silene dioica*	x	x	x				
Rönn	*Sorbus aucuparia*						x	
Björkspirea	*Spiraea betulifolia*		x					
Lundarv	*Stellaria nemorum*		x					
Brännässlor	*Urtica dioica*	x						
Blåbär	*Vaccinium myrtillus*		x		x		x	x
Strandvänderot	*Valeriana excelsa subsp. salina*		x					
Skogsviol	*Viola riviniana*	x						

Fågelobservationer

Totalt 29 olika fågelarter identifierades i och i närheten av området. Identifikationen baserar sig främst på sång, en del visuella observationer gjordes också. Flera arter observerades på flera ställen, bofinken var den vanligaste arten med sju olika observationer. Även sjöfåglar i vattnet direkt utanför området togs med i observationslistan. Skrattmås och fisktärna observerades endast flyga över området. Fågelobservationerna är presenterade i bild 10.



#	Namn	Vetenskapligt namn	#	Namn	Vetenskapligt namn
1	Trädpiplärka	*Anthus trivialis*	16	Grönsiska (2)	*Carduelis spinus*
2	Gulsparv	*Emberiza citrinella*	17	Svarthätta (2)	*Sylvia atricapilla*
3	Lövsångare (2)	*Phylloscopus trochilus*	18	Rörsångare	*Acrocephalus scirpaceus*
4	Svartvit flugsnappare (2)	*Ficedula hypoleuca*	19	Trädgårdssångare	*Sylvia borin*
5	Bofink (5)	*Fringilla coelebs*	20	Skäggdopping (par) (2)	*Podiceps cristatus*
6	Talgoxe (2)	*Parus major*	21	Gärdsmyg	*Troglodytes troglodytes*
7	Grå flugsnappare (2)	*Muscicapa striata*	22	Knölsvan (par)	*Cygnus olor*
8	Trana (2)	*Grus grus*	23	Fisktärna*	*Sterna hirundo*
9	Tofsvipa	*Vanellus vanellus*	24	Skrattmås*	*Larus ridibundus*
10	Björktrast	*Turdus pilaris*	25	Blåmes	*Cyanistes caeruleus*
11	Fiskmås	*Larus canus*	26	Rödhake	*Erithacus rubecula*
12	Kungsfågel (2)	*Regulus regulus*	27	Trädkrypare	*Certhia familiaris*
13	Koltrast	*Turdus merula*	28	Spillkråka	*Dryocopus martius*
14	Större hackspett	*Dendrocopos major*	29	Steglits	*Carduelis carduelis*
15	Ringduva (2)	*Columba palumbus*			

Bild 10: Fågelobservationer. Platserna är ungefärliga och baserade på varifrån sången hördes. Siffran inom parentes efter namnet anger antalet observationer ifall fågeln observerades på flera ställen. Arter markerade med stjärna (*) observerades endast som passerande

Naturvärden i området

Inga rödlistade växtarter hittades i området. Av de identifierade fåglarna är skäggdoppingen nära hotad (NT) och skrattmåsen sårbar (VU). Skäggdoppingen observerades i viken utanför området, men kan till exempel häcka på stranden i vassen så de togs med i listan. Skrattmåsen observerades flyga över området.

Inga invasiva arter observerades i området.

Över lag är området, förutom gårdsområdet (figur 8), i nästan naturligt tillstånd och har många höga naturvärden som är värda att värnas om. Antalet gamla skogar speciellt i södra Finland har minskat rejält på grund av ekonomiskogsbruk och skogarna har blivit enformigare. Gamla skogar är viktiga livsmiljöer för ett stort urval av arter: en fjärdedel av arterna i Finland är beroende av dött virke. Gamla träd är även viktiga växtunderlag för olika lavar och mossor. Gamla skogar fungerar även som kolsänkor; både träden och marken binder kol från atmosfären [9]. Speciellt i figurerna 6 och 7 finns mycket gamla träd och hela området innehåller både liggande och stående dött virke.

Klibbalskärr (figur 1) hör till en av de 9 skyddade naturtyper i naturvårdslagen (Naturvårdslag 5.1.2029/9 §64). Klibbalskärr speciellt på kusten har minskat betydligt under de senaste 50 åren och de klassificeras som nära hotade (NT) i Finland. Naturtypen hotas främst av skogsskötsel och dikande. Naturtypen är viktig för biodiversitet både p.g.a. stora mängden dött virke som förekommer i dem och de är viktiga häckningsområden för både mindre hackspett (*Dryobates minor*), vitryggig hackspett (*Dendrocopos leucotos*) och tretåig hackspett (*Picoides tridactylus*) [10]. I detta fall fungerar även området som ett naturligt filter för avrinning av näringsämnen från åkrarna söder om området

Både lundaktiga och kustnära färska mo skogar (figur 6 och 7) har minskat betydligt under de senaste 50 åren och klassificeras i södra Finland som sårbara (VU). Naturtyperna hotas främst av skogsskötsel och -förnyelse, ändringar i markanvändning och byggande. Mo skogar i naturnära tillstånd med mycket dött virke är viktiga livsmiljöer för ett stort antal artar, många som hotas av minskandet av livsmiljöerna [11] [12].

Rekommendationer

Gamla skogar med rikligt dött virke är viktiga för naturens mångfald. Skogarna i figur 6 och 7 är i nästan naturligt skick och innehåller många gamla träd och dött virke och det rekommenderas att dessa även i fortsättningen hålls som de är. Områdena kunde passa in i METSO-programmet, men närheten till gårdsområdet samt storleken kan vara en begränsande faktor. Eftersom det inte finns några planer att ändra användningen av området kan det vara praktiskt att inte skydda området, utan i stället fortsätta som förut och låta skogarna vara i naturligt tillstånd och lämna kvar eventuellt nytt dött virke.

Klibbalskärret i figur 1 är i naturligt tillstånd och området har verkar inte ha haft någon direkt användning. Området kunde mycket väl skyddas genom METSO-programmet utan att det har någon större inverkan på tomtens användning. Klibbalskärret begränsar sig dock inte till tomtgränserna, utan fortsätter på grannfastighetens sida. Ifall det finns vilja att skydda området skulle det rekommenderas att även grannfastighetens ägare tas med i diskussioner så att hela klibbalskärret kunde skyddas.

Området kan skyddas antingen för en bestämd tid eller permanent. I tidsbegränsade alternativet kan skyddet vara antingen 10 eller 20 år, och då förblir marken i markägarens ägo och NTM-centralen betalar en skattefri ersättning för skyddandet. I permanenta alternativet kan området antingen förbli i markägarens ägo som ett privat naturskyddsområde eller kan området säljas till staten som skyddar området. I båda fallen betalas skattefri ersättning till markägaren utgående från markens värde.

Mer information om skyddandet via METSO-programmet finns på internet: https://metsonpolku.fi/sv/

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Bilaga 1: Bilder

Figur 1


Klibbalskärr

Skogssäv, kabbleka

Spettars bohål

Springkorn, fnösticka, brännässlor, fräken

Figur 2

Naturen i figur 2 med bastustugan synlig bakom björkspireabuskarna

Björkspirea

Lundarv

Figur 3

Figuren är en mindre, torrare ”ö” mellan vassen och klibbalskärret

Mårdhundsdasset med färsk spillning till höger

Figur 4

Inre delen av udden är skog på klippig mark

Figuren har stora döda stående gran och tall

Figur 5

Yttre delen av udde, strandklippa med skogsek iförgrunden, i bakgrunden klibbal, hägg och en ung gran

Figur 6

Figuren har flera gamla grova tallar, fältskiktet i norr domineras av blåbär

Södra delen av figuren

Figur 7

Figuren är delvis mycket tät granskog med knapp växtlighet i fältskiktet

På ljusare platser växer vitsippa, ekorrbär och harsyra

Bilaga 2: observationer av hotade arter i närheten av området

I tabellen nedan listas observationer från laji.fi-databasen av hotade arter i en 3km radie runt naturinventeringsområdet under de senaste 10 åren.

ART	SVENSKT NAMN	OBSER-VATIONER	STATUS
Fåglar			
Acrocephalus arundinaceus	Trastsångare	1	Sårbar (VU)
Emberiza schoeniclus	Sävsparv	24	Sårbar (VU)
Hirundo rustica	Ladusvala	9	Sårbar (VU)
Larus fuscus	Silltrut	5	Sårbar (VU)
Larus ridibundus	Skrattmås	19	Sårbar (VU)
Lophophanes cristatus	Tofsmes	58	Sårbar (VU)
Saxicola rubetra	Buskskvätta	4	Sårbar (VU)
Apus apus	Tornseglare	14	Starkt hotad (EN)
Carduelis chloris	Grönfink	25	Starkt hotad (EN)
Delichon urbicum	Hussvala	2	Starkt hotad (EN)
Panurus biarmicus	Skäggmes	3	Starkt hotad (EN)
Passer domesticus	Gråsparv	2	Starkt hotad (EN)
Plectrophenax nivalis	Snösparv	1	Starkt hotad (EN)
Poecile montanus	Talltita	26	Starkt hotad (EN)
Rovfåglar			
Glaucidium passerinum	Sparvuggla	1	Sårbar (VU)
Buteo buteo	Ormvråk	6	Starkt hotad (EN)
Buteo lagopus	Fjällvråk	2	Starkt hotad (EN)
Sjöfåglar			
Aythya marila	Bergand	1	Starkt hotad (EN)
Melanitta fusca	Svärta	1	Starkt hotad (EN)
Podiceps auritus	Svarthakedopping	2	Starkt hotad (EN)
Insekter och spindlar			
Hybothorax graffii	Stekel (inget svenskt namn)	7	Sårbar (VU)
Mossor			
Riccardia multifida	Flikbålmossa	1	Starkt hotad (EN)
Trichocolea tomentella	Dunmossa	1	Starkt hotad (EN)
Kärlväxter			
Ulmus glabra	Skogsalm	1	Starkt hotad (EN)
Galium verum	Gulmåra	5	Sårbar (VU)