Results from the 2017 forest inventory of large forest landscapes

FORESTRY AT THE EDGE

PROTECT THE FOREST

Abstract

During the summer of 2017, members from Protect the Forest made a large field survey of old-growth forest, above the mountainous forest border in north part of Vilhelmina municipality in northern Sweden. We recorded finds of red-listed species and indicator species in a 3,557 hectare forest landscape that has mostly remained untouched by clear-cutting forestry, and therefore still contains large areas of old-growth and semi-pristine forest. To make this assessment more interesting we also noted the presence of rare pristine forest patches. We also recorded patches of young tree stands—previously clear-cut—inside minor parts of the old-growth forest. In this area, the Swedish Forest Agency (SFA) has recently planned a new logging road without making a thorough field survey to assure that values for nature and culture are not destroyed. To investigate SFA's acting in this matter, we mapped the density of dead wood that is key in protection of valuable forest habitats, and spent extra time to record rare species around this new logging road.

Our species survey recorded 3,243 finds of red-listed species and SFA indicator species. Fifteen of the red-listed species are currently threatened and yet another 38 species are near threatened. We also sighted several birds listed in the Birds Directive Annex 1, and many other interesting species. Forests were in general spruce dominated and in most respect they consisted of old-growth forest with limited signs of previous forest management. Our survey of potential occurrences of truly pristine forest, revealed 16 patches of such rare forests which usually remained as small pockets inside otherwise sparsely logged forest. In the very south, a larger area of mainly pristine forest was found. Smaller areas of pristine forest are, however, affected by the newly built logging roads that reaches into recently unbroken forest land.

After comparing our results on dead wood and species records with SFA's own methodology, to find and delimit woodland key habitats, we found that the authority has acted carelessly, and hence that logging notices should be revoked, especially for a new section of the logging road that reaches into old forest with comparably high volumes of dead wood and many rare species. In near future, authorities and the Swedish Government should find ways to formally protect these large forest areas. Sweden's high profile in forest production in combination with our weak forest legislation will otherwise result in rapid destruction, and ultimately the disappearance, of these still intact and utterly beautiful forest landscapes.

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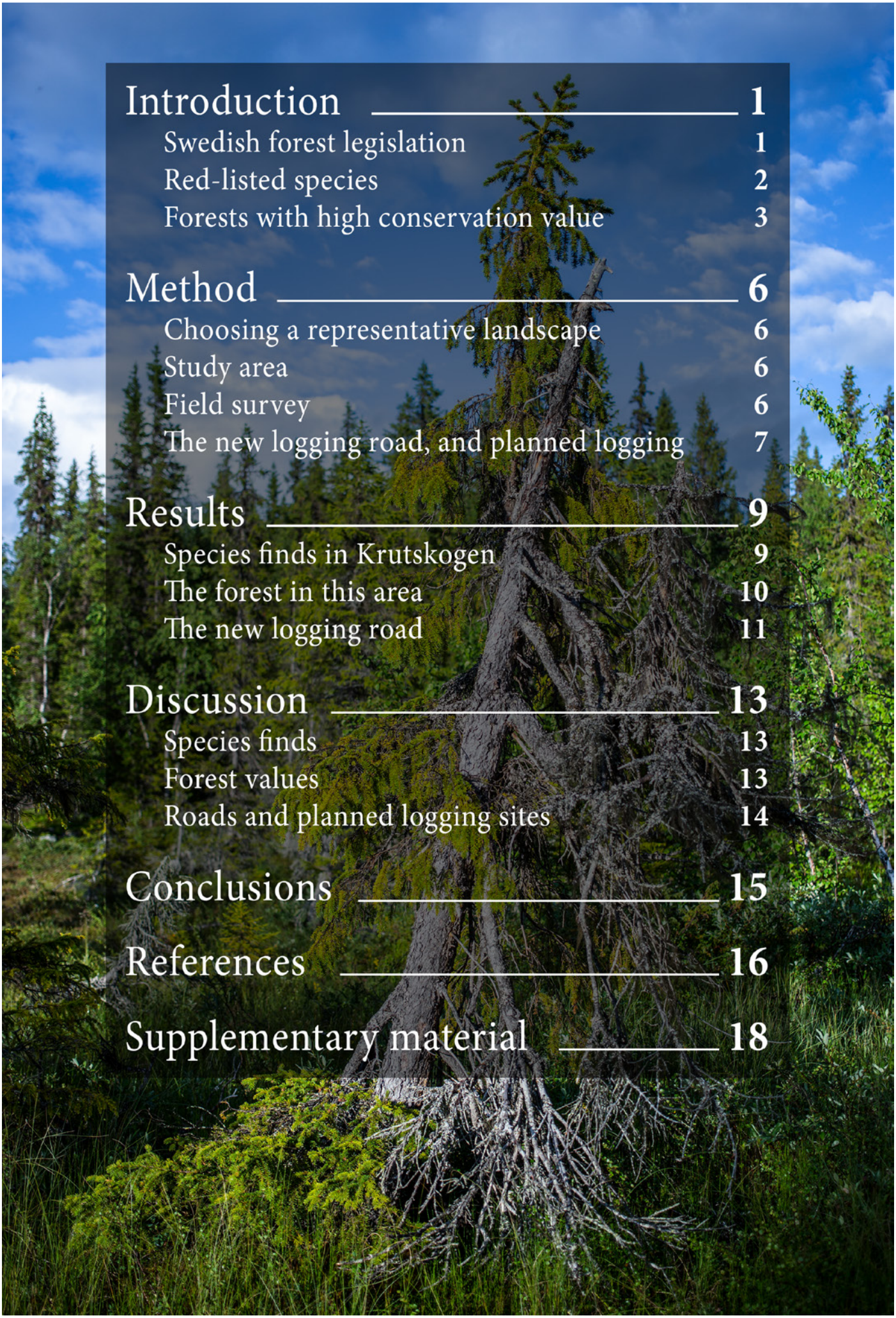
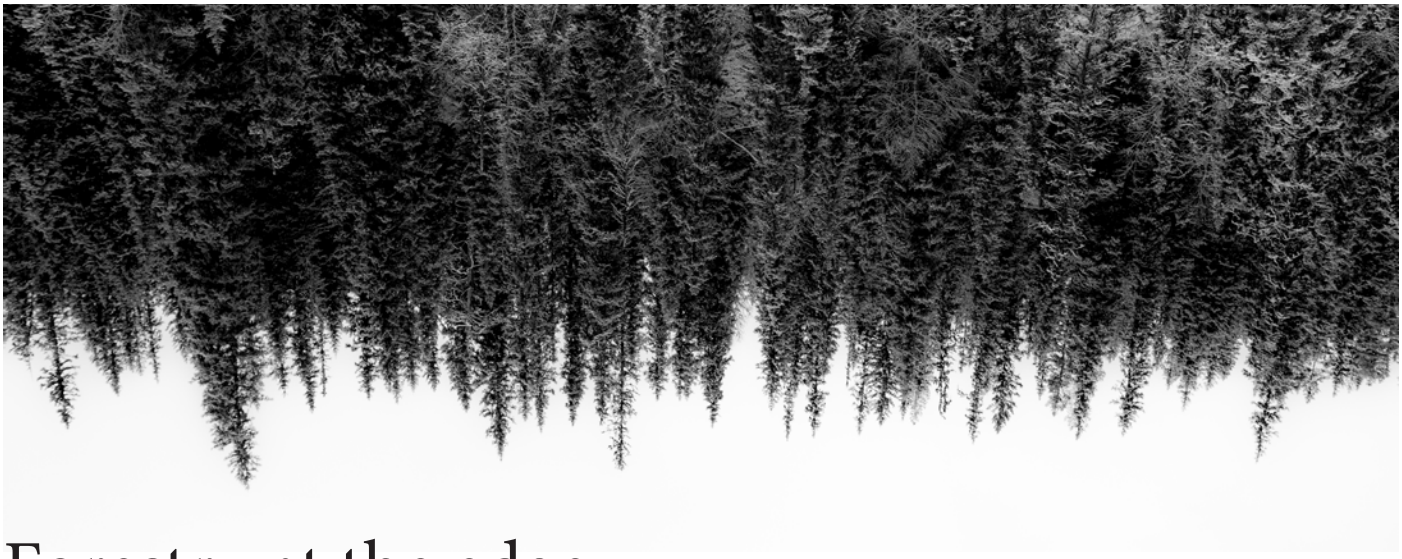
Cover photo
The turning area at the very end of a newly constructed logging road.





Forestry at the edge

"Ever since the first proto-Swedes settled on the Scandinavian peninsula, forests have given them fuel for heating during the cold winter nights and cooking, provided building material for shelters and given plentiful game for food. In short, Sweden's forest landscape is shaped by humans since the dawn of time, thus little is pristine, and plans to preserve our nature from further exploitation is unnecessary". This is one among many simple stories told by forestry representatives, to excuse logging in Sweden's last wilderness, the northern foothill forest of Dalarna, Jämtland and Lapland. And although large, road-less forest landscapes still exists, these areas are rapidly shrinking and becoming more and more fragmented due to continuous clear-cutting forestry. In this report, we highlight the value of these forests, and present an example of nature values that still exists in one of these wonderful parts of northern Sweden.

Introduction

According to Swedish definitions, about 70 % of the country's land area is covered by forest. Sadly, only 6-7 % of this area is formally protected, in national parks, nature reserves, and in forest biotope protection areas (Anon 2017). It is, however, estimated that another 5 % is voluntarily set aside by forestry companies and individual forest owners (Claesson & Eriksson 2017). Nevertheless, predictions made by the Swedish Environmental Protection Agency SEPA suggest that the area of forest with high conservation value, that is still unprotected against industrial forestry, may exceed one million hectares (SEPA 2017). With today's goal to protect another 150,000 ha by 2020 compared to 2012 (SEPA & SFA 2017), corresponding to about 19,000 ha per annum, it would take roughly 50 years to formally protect all this forest. Unfortunately, by that time, these patches of old-growth forest will already be long gone.

Very little of the forest is unharmed by recent and older cuttings, and estimations indicate that only 0.4 % of Sweden's forest land consists of truly natural forests, or so called pristine forest. Most of this ancient forest is thought to remain as small pockets inside mountainous old-growth forest in the foothills of northwestern Sweden, where now most of our country's remaining old forest is found (Nilsson & Cory 2017). Despite the scarcity of remaining natural forest, mountainous forest like the forest in the survey presented in this report, is still being harvested.

Swedish forest legislation

Swedish forestry must comply the Swedish Forestry Act (SvL). It states, among many other things, that forestry should avoid damaging rare and valuable biotopes and cultural heritage sites (Anon 2017a). However, it is said that only about 5-10 % of all notified loggings are subject to field visits by experienced personnel at the Swedish Forest Agency (SFA) prior cutting. These visits are mainly made when high conservation values are assumed to occur in forests notified for cutting. The rest is cut completely without field visits and prior knowledge of existing nature values. On company forest land, surprisingly, the companies themselves are expected to take full responsibility for existing natural values, i.e. authorities are not called on to make detailed assessments before logging. Also, thinning and selective logging is done without notifying the authorities, independent of forest age.

Above the mountainous forest border (see Fig. 1), the SFA cannot authorize cuttings if they are *incompatible with interests that are of essential value to conservation or cultural heritage* 18 § 2010:930 SvL (used the first time in 2014, precedent ruling in 2015). When such essential values are suspected, the SFA may conduct a field survey to determine the conditions. Thus, in theory, if high conservation values are confirmed, any submitted logging notices should be rejected. Further, regarding sensitive biotopes in 30 § 7:17 SvL (no convictions), *harm to e.g. older stands with a significant amount of deadwood or pendulous lichens, should be avoided*, and according to 30 § 7:19 SvL (no convictions) *damage caused by forestry management shall be prevented or limited in habitats and on substrates with prioritized species* (see next page on red-listed species and bird species in the Birds Directive Annex 1).

Besides adhering to the regulations stated in the SvL, all large Swedish forest companies have also joined the Forest Stewardship Council (FSC), which is a voluntary association with members from NGOs, unions, and forestry-associated industries (see Anon 2017b for an overview). FSC's main goal is to find ways to develop forestry methods that can both handle social factors related to forestry and at the same time work for forestry that is sustainable and environmentally sound. The Programme for the Endorsement of Forest Certification (PEFC) is another certification scheme (Anon 2017c). The aim of this certification is very similar to FSC, but the members are smaller players such as entrepreneurs, small companies, and individual forest owners. In Sweden, just over 120,000 km^2, and about 110,000 km^2 forest land is certified under FSC and PEFC respectively. The base for the certifications is a continuous and open dialogue between different stakeholders. Some of the larger companies are certified in both schemes.

Ever since the start, the criticism against Swedish FSC and PEFC has been harsh (e.g. Anon 2004). In 2010 the largest inde-

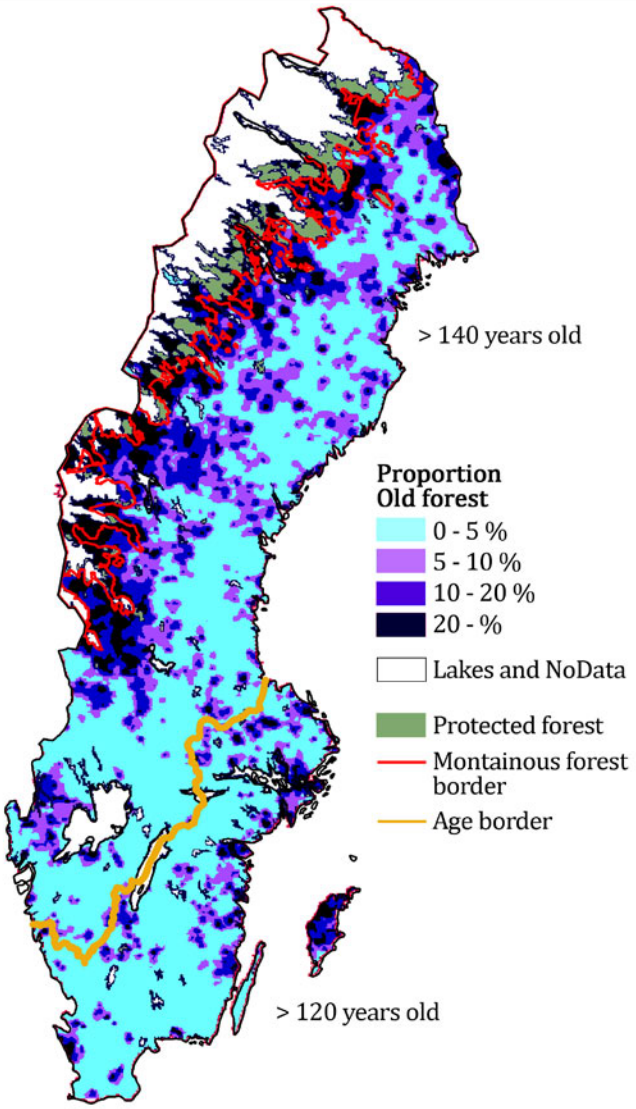


Figure 1. The proportion of old forest exceeding the age of 140 years and 120 years, north and south of the "age border" respectively (orange line), and also protected areas (green). Most old forest is concentrated to the west, below and above the mountainous forest border (red line). Redrawn from The Swedish National Forest Inventory© (2017).

pendent environmental association, the Swedish Society for Nature Conservation SSNC, left Swedish FSC in protest. The reason was said to be too many violations against the standard and a general lack of reprisals after breaking the rules (Anon 2010). However, SSNC is still members in FSC International. Other NGOs like WWF and Birdlife Sweden, the Swedish Ornithological Society (SOF) are still member of FSC. Currently, none of the environmental associations are members of the PEFC.

Most of the larger Swedish forestry companies, including the governmentally owned forest company Sveaskog, have received Major CARs (sharp warnings) from FSC due to violations against the standard (Dahl 2001; Elfström 2017). Nevertheless, only one company has so far temporarily lost its certification and when this happened, the company only lost its certification in a local district. A well-known and diligently used phrase when things go wrong is—we made a slight mistake, but we're making good progress! Since these mistakes are still occurring, it is highly questionable whether there will ever be a lasting change in the behavior of these big companies. Unfortunately, the rare forest species whose hope now depends on modest conservation efforts by certified companies, are likely tired of waiting for a better future.

Red-listed species

The Swedish national red-list strictly evaluates the risk of species going extinct in Sweden, without any other considerations, such as species attractiveness, usefulness or harmfulness to man. With a system of categories and criteria, the red-list has been developed by the International Union for Conservation of Nature IUCN to measure the conservation status of individual species (Fig. 2). The list is a powerful tool for making conservation prioritizations, but it has no juridical status. In Sweden, the red-list is produced by the Swedish Species Information Center at the Swedish University of Agricultural Sciences (SLU). The 2015 edition is Sweden's fourth red-list based on IUCN criteria.

The red-list may be viewed as a tool for research planning, exploitation prioritization and environmental assessments. The conservation status of individual species can also be estimated by using the data from the red-list. By using data for many species and groups of species, the list can also be used to monitor the fulfillment of the Swedish environmental objectives and the international environmental agreements ratified by Sweden in Nagoya 2010. For environmentalists, on the other hand, the red-list of threatened species has become an important tool in species surveys. By combining the information from the list with the result from species surveys, environmentalists may strengthen the argumentation against exploiters who sometimes lack knowledge on the local species stock, and otherwise are at risk of destroying important habitats for rare organisms.

Species associated with forest habitats are overrepresented in Scandinavian red-lists. In Norway for example, 48 % of all red-listed species are found in forests (Norwegian Biodiversity Information Centre 2017), and in Sweden and Finland the corresponding figures are 52 % and 36 % respectively (Swedish Species Information Center 2015; Rassi et al. 2010). The main reason is likely clear-cutting forestry that causes trivialization of forests, e.g. reduced diversity of tree species, lowered forest age, fragmentation and heavy reductions in the amount of dead wood (Esseen et al. 1997; Axelsson and Östlund 2001; Siitonen

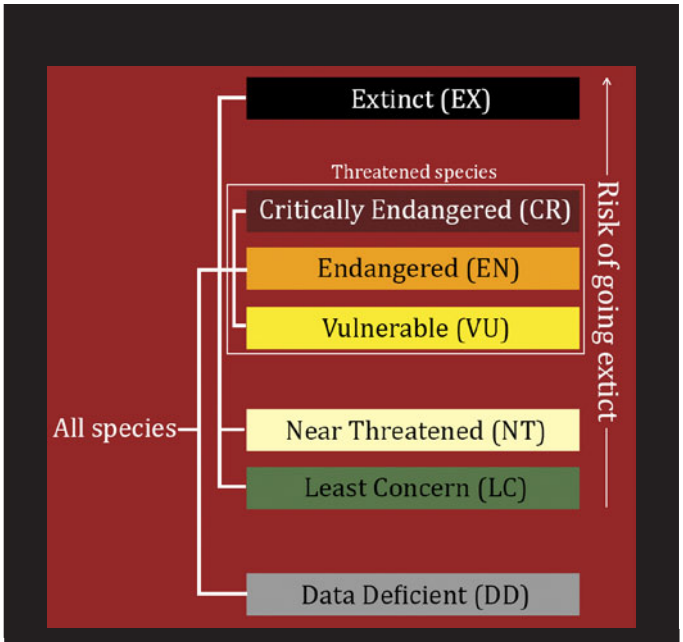


Figure 2. Each species found in the red-list is given rank based on its present conservation status, e.g. current range, change in population size, and population fragmentation. Each criterion is later matched against certain threshold-values and labeled according to one of seven different categories. For some species, data is lacking, and hence they cannot be evaluated according to the criteria. In Sweden, 4,273 species are red-listed and among these 2,029 are categorized as threatened. In total, roughly 36 % or 21,600 species have been assessed.

2001). Large proportions of Swedish forest land have been transformed from semi-natural forests to plantations of even-sized and mostly single-aged monocultures (Östlund 1993) that leaves little opportunities for specialized forest species. Unsurprisingly, as many as 80 % of the red-listed forest species are in some way dependent on dead wood, through their specialization on specific habitats like old and dying trees, snags or on logs (Berg et al. 1994).

Due to changes in forest structure and reduced abundance and diversity of substrates, the presence of many species is marginalized and confined to areas of remnant old-growth forest. As an example, Gustafsson (2002) found significantly more red-listed forest species in high conservation value forests than in the managed forest, and other studies largely conform with this result (Tikkanen et al. 2006; Berglund et al. 2011; Jönsson et al. 2016). Unfortunately, little is done to turn the trend around, and fragmentation of yet unbroken old-growth forest areas is still ongoing. In this precarious situation, still, Sweden's Minister for Rural Affairs, Sven-Erik Bucht, has repeatedly argued that Sweden needs to increase its forest production (e.g. Öberg 2017; Anon 2016; Bucht & Nordlund 2016). Hence, the situation may worsen.

The number of boreal species that have gone extinct is so far moderate, and scientists have long suspected that the rate of extinction is delayed by the inherent buffering in meta-populations (Hanski 2000). In landscapes that suffer great loss of natural habitats, the remaining patchwork of remnant semi-natural environments may harbor pieces of the naturally occurring species pool (Berglund & Jonsson 2005). This is because populations can survive as scattered populations, but only for as long as the migration distance between populations doesn't exceed the maximum dispersal distance (Aune et al. 2005). The progressive fragmentation of Scandinavian boreal forests is isolating remaining populations in space and time, and increases risk of extinction of small populations by chance. By lengthening this chain of events, we can expect higher extinction rates in the near future. Forestry representatives, however, often highlight that few local extinctions have occurred, but then ignore relevant research on the subject.

Forests with high conservation value

In 1993, the SFA, initiated a survey to find and delimit so called woodland key habitats WKH (Norén et al. 2014). A WKH is a well-defined forest area with particularly valuable habitats, where one can expect to find higher numbers of rare species than in surrounding forests (Wester & Engström 2016). The survey was done from 1993-1998 and was later supplemented through a second survey in 2001-2006. Since then, WKHs have been delimited sporadically, and mostly during field visits by the authority, prior to clear-cutting. Until 2015, about 100,000 WKHs were registered in SFAs database covering roughly 466,000 ha or 2 % of the Swedish forest land (Wester & Engström 2016). WKHs are generally small, and about 50 % has an area of 1.4 ha or less. At the time of writing, WKH-inventories are completely halted above the mountainous forest border, and forestry continues.

WKHs are not formally protected, but certified foresters are bound by the certification standard to not cut or sell timber from registered or un-registered WKHs. These habitats are also somewhat protected according to the Swedish Forestry Act § 30 SvL. Forestry companies can, however, clear cut all the way to the edge of registered WKHs. SFA's Alice Hagström told the magazine Land (Rolfsson 2016) that since the 90s, 549 WKHs were completely cut down, and yet another 3,500 WKHs were damaged by clear-cutting forestry. According to Hagström, an

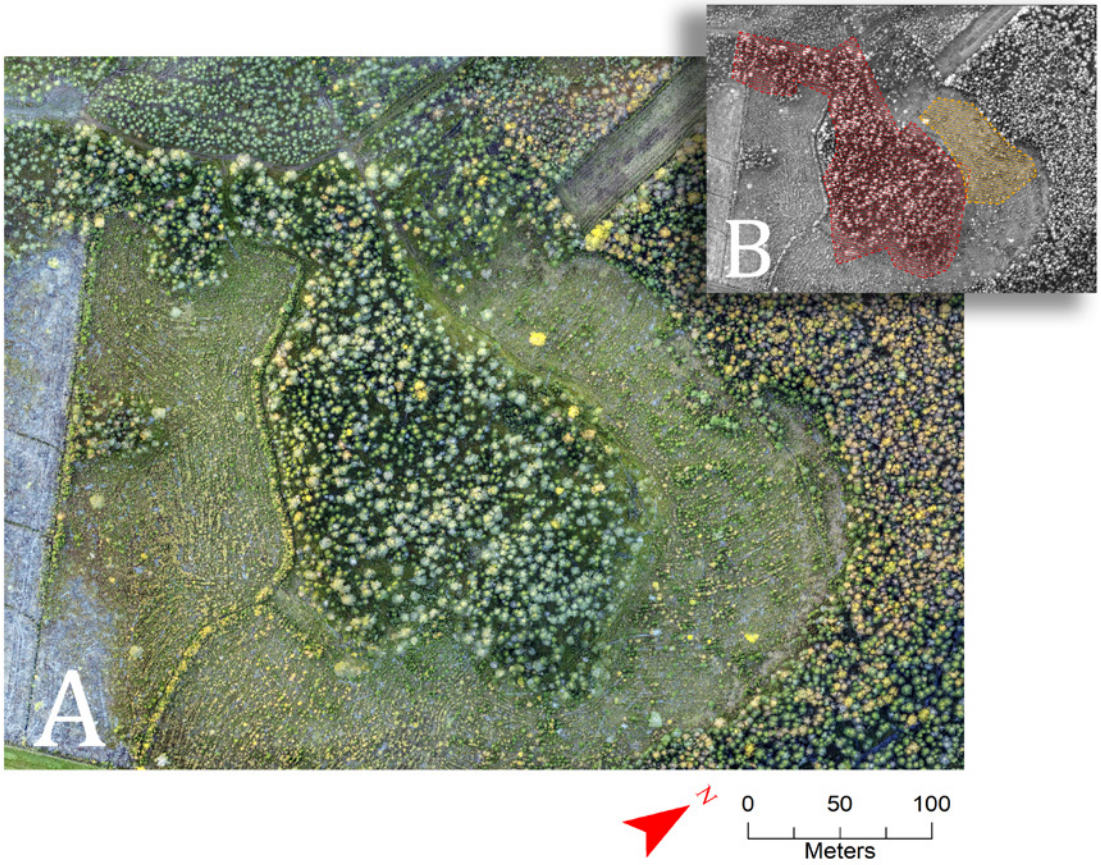


Figure 3. A five hectare WKH registered in September 2005, now more or less surrounded by a continuous clear-cut (A) and to the north of the WKH a completely erased nature value habitat. Depicted in the inset (B) is the border and shape of the WKH (red) and the nature value habitat (orange). If edge effects are considered, very little remains of the functional core area and thus the remaining habitat for forest interior species.

Figure 4. Clear-cutting to the edge of this woodland key habitat has created large volumes dead spruce inside the forest edge, but these substrates are usually quickly infested by trivial polypore species like *Tricaptum abietinum*, *Antrodia serialis* and *Fomitopsis pinicola*. Rare and red-listed species, on the other hand, are seldomly found on these locations.

average of 200 ha of WKH-classified forest is logged annually. Since many WKHs are rather small, damage from edge effects on sensitive organisms is thought to be extensive. In addition, another 2,000 ha of yet unregistered WKSs are harvested annually (Wester & Engström 2016). As an example, with small WKHs covering an area of about 1-3.14 ha, and clear-cuts extending 50-100 % around the remaining WKH-patch (see Fig. 3 & 4 for real-life examples), the occupancy of rare fungi species is predicted to decrease, while more common species will most likely increase in abundance (Reute et al. 2016). The same study concluded that buffering around small and isolated old-growth remnant forest is necessary to maintain biodiversity.

So, in contrast to the small WKHs of a few hectares delimited by the SFA, are there still really large areas of remnant old-growth forest left in Sweden's heavily managed forest landscape—say old-growth forest landscapes of several thousand hectares? For the most part, the answer is simply—no there isn't! In northern Sweden, however, and particularly in the montane forests of the eastern foothills of the Scandes, there are still large continuous areas with mostly old-growth coniferous boreal forest (Fig. 1). The lower exploitation pressure there is likely a consequence of lower productivity, harsh climate, increased distance from sawmills—paper and pulp industries along the coast—and also probably because of a higher proportion of governmentally owned land.

Two large-scale governmentally financed surveys have been

conducted to map natural, and semi-natural forest: Urskogsinventeringen 1978–1981 (Bråkenhielm 1982), and Skyddsvärda statliga skogar och urskogsartade skogar 2003–2004 (Naturvårdsverket 2004). Nationwide surveys like these two, however, have not been made since, but smaller inventories aimed to map such forests have been done by local County Administrative Boards. Much of the collected material has resulted in formal protection, many nature reserves and a few national parks; the majority above the mountainous forest border on governmental property. Still, despite all inventories and protection, large areas of semi-natural forest remain unprotected in these areas. Under ongoing forest management, they soon lose their old-growth characters, and become increasingly fragmented and trivialized. Since only fragments of natural environments now remain, especially from a European perspective, continuous loss of these remnant semi-natural forests should be halted.

Thus, the overall objective of our study was to investigate a large and continuous forest area above the mountainous forest border, and to specifically:

1. Survey species of cryptogams, plants, birds and mammals
2. Identify and delimit remnant pristine forest
3. Find patches with young and previously clear-cut forest

Figure 5. *Fomitopsis rosea* is classified near threatened in the Swedish 2015 red list. In our survey we found this species 117 times in most parts of the study area. Due to industrial forestry, however, *F. rosea* and many other typical forest species are nowadays rare in the Swedish inland and in coastal areas. Under the conditions found in our study area, nevertheless, such species are thriving and can be found almost everywhere if searched for.

Method

Choosing a representative landscape

We sought to survey a large and unprotected forest landscape with proportionally small area of previously identified conservation values. For this, we started by scanning digital map data from SEPA on forests previously untouched by clear-cutting forestry, (Metria 2016). The aforementioned data material depicts forests with a continuous crown cover since the 1950s, at the beginning of the clearcutting era, which hence provide a good starting point in the search for high-value conservation areas. Additionally, we also used high resolution satellite data to fine tune the searching. Data on formally protected forest was downloaded from SEPA's web-tool Skyddad natur©, and WKHs from the SFA's web service Skogsdataportalen©.

Study area

In the initial desk study, we found and delimited a 3,557 hectare study area located in northwestern Sweden (65°11'12.9"N 15°48'24.9"E), in Vilhelmina county, about 60 km east of the Norwegian border (Fig. 6). The forest constitutes mostly of old-growth Norway spruce *Picea abies* dominated stands with varying content of the two species of birch: downy birch *Betula pubescens*, and pendulous birch *Betula pendula*. Also, more rarely, scattered stands and single trees of trembling aspen *Populus tremula*, goat willow *Salix caprea*, and rowan *Sorbus aucuparia* is occurring throughout the area. In the dryer and rockier parts of the landscape, mixed stands of Scots pine *Pinus sylvestris*, birch and Norway spruce grow sparsely. Open patches, covered with rocks and large boulders, have likely stayed barren and untouched since the last ice age.

In the area there were three main owner categories. In large part, the forest was owned by Vilhelmina forest commons (for a definition of forest commons see Holmgren el at. 2010), but also by the National Property Board of Sweden (the state) and private forest owners.

Field survey

We visited the study area six times between June 16 and October 23 during the summer of 2017 (in total 69 workdays). In total, 24 people were partaking in the field work. This collection of people had different backgrounds, some specialists and consultants in forest ecology, and others with limited previous experience. By allowing novices to always follow a more experienced person, knowledge was distributed.

To ease the task of mapping such a large forest area, we first divided the lot into smaller units of about 100 ha. These sections were later uploaded to hand-held GPS-devices used in the field. This also helped to avoid overlapping work among different field workers.

During the survey, we noted and GPS-recorded all findings of red-listed plants, and cryptogams; lichens, fungi, and bryophytes. Also, we recorded species termed indicator species by the SFA. An indicator species is, according to the definition of the SFA, a species indicating high conservation value habitats. Indicator species and their occurrences in an area give a good picture of the area's protection values. Indicator species are used as a support and help tool when inventories are made in high conservation forests and woodland key habitats (Nitare 2000). Such species can also be red-listed, many are good indicators of high conservation value forest and they may also indicate presence of other red-listed species. Apart from cryptogams and plants, we recorded also sightings of birds listed in the Birds Directive Annex 1. Chew-marks of three-toed woodpecker *Picoides tridactylus* were also recorded (Fig. 10). This woodpecker is red-listed as near threatened and demands the continuous provision of dying and recently dead conifers. High densities of these conspicuous, and easily spotted chew-marks, thus usually indicate high incidence of self-thinning. Furthermore, grouse droppings were recorded, as well as tracks from mammal carnivores (only during the last visit in October after snowfall).

Forest structure was noted, but not entirely mapped. How-

ever, patches of pristine forest, here defined as pockets of forest where stumps could not be detected, were mapped and recorded in the GPS. In the same manner, young forest and patches of forest previously clear cut, was recorded. Larger adjacent forest areas, that were clear-cut after the 50s-60s, were excluded from the field survey. Data on species sightings are found in supplementary material, in the back of this report, and patches of pristine forest and old clearcuts are shown in Figure 6. Data collected by Nature and Youth Sweden in the same area, this same summer (Nature and Youth Sweden 2017) was incorporated in this report.

The new logging road, and planned logging

During the summer of 2017 a new logging road was constructed in the north part of the study area, at the forest covered slopes south of Dikanässjön. This new logging road section extends roughly 2km into previously unbroken forestland (Fig. 6). In the desk study of satellite image data around this road, we could neither see clear signs of previous logging activities nor signs of thinning that otherwise show up like thin lines in images. Hence, we had strong reason to believe that the forest was old and may contain high conservation values. To investigate these suspicions, one extra day of field work was done along the road. In the latter part of the field season another logging notice was filed to the SFA. The same extra procedure as for the logging road was added to the ordinary field work around the planned logging site. Species-data collected around the logging road was delimited by a 879 m radius circle (243 ha). Data for the road is listed and visualized in Figure 12, and species data for the logging site is found in Supplementary material S2.

To further investigate the situation around the new logging road (Fig. 7 & 8), we assessed the density of spruce logs; lying dead tree trunks of Norway spruce. These trees are easily spotted and recognized because of the typically pointed shape of the tree crown. The survey of dead wood was conducted with Unmanned Aerial Vehicle-technics UAV, specifically adapted for the survey. We used a **DJI Phantom 4 Pro©** drone to digitally map a 32.3 ha area extending 100m on both sides of the road. In the resulting 3 cm-resolution image, we counted and recorded with GIS point-shapes, all laying dead tree trunks of Norway spruce directly in the image. To structure counting, a 25 x 25 m overlay grid was added to the image, and one-by-one logs where counted in each individual cell throughout the whole grid. The resulting point-shape data was generalized by using a point density function in GIS-software (Fig. 13). Data on dead wood and

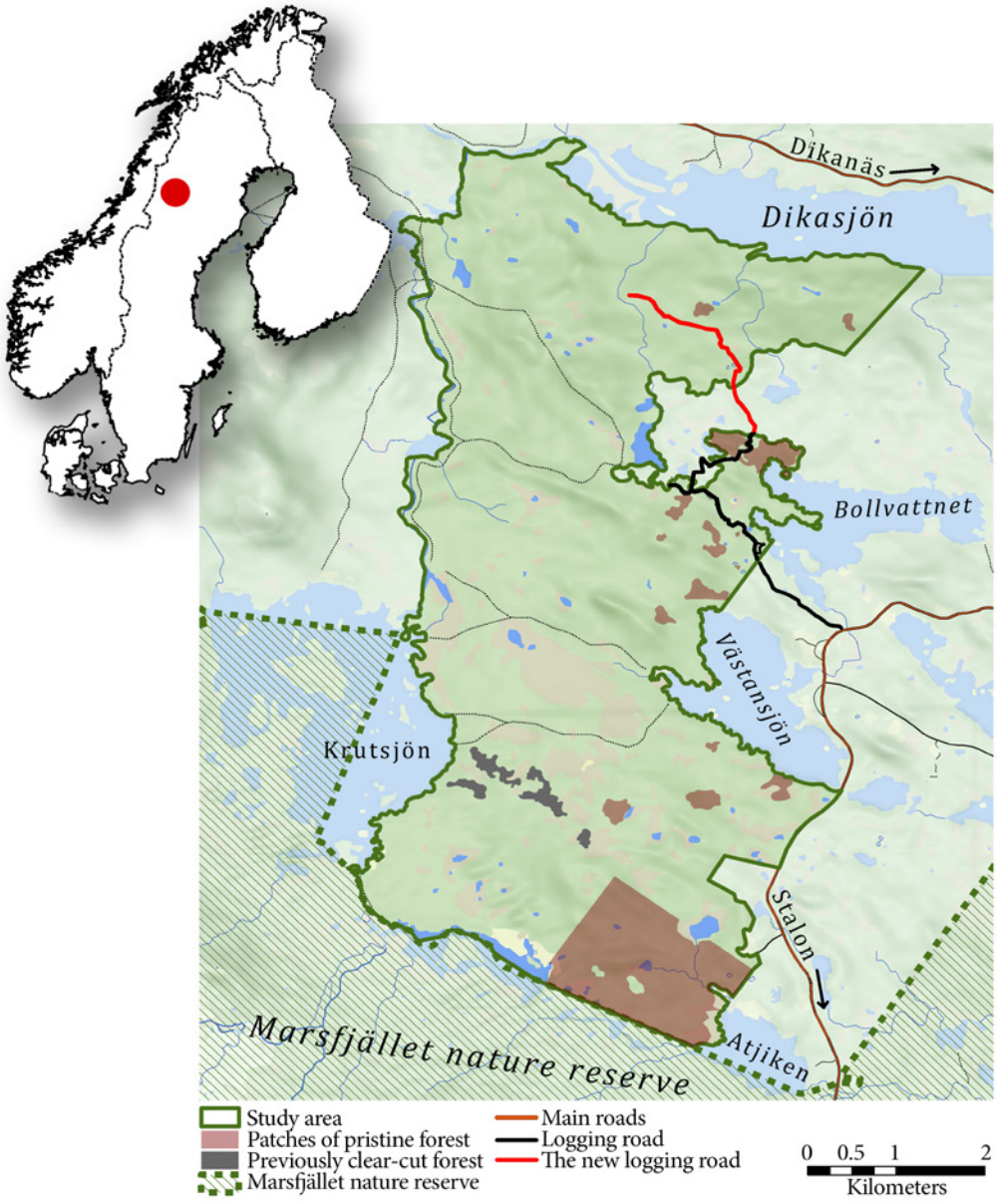


Figure 6. In the upper left corner, Scandinavia and Finland with the location of the 3,557 ha study area marked with a red dot. In the zoomed-in map to the right, the location of pristine and previously clear-cut forest as well as roads, waters (blue) and mires (light pink). The new logging road section (red line) is found in the upper part, about one km south of Dikasjön. The new logging site is not marked on the map.

Figure 7. Ongoing road construction through old-growth forest, mires and creeks. The caterpillar excavator can be seen digging in the lower middle section of the photo.

red-listed species finds were compared to SFA's WKH checklist for Norway spruce forest north of Limes Norrlandicus (Supplementary material S3). The relation between our dead wood density raster is visualized and discussed.

The forest and the logging road is located west of the mountainous forest border, thus the special circumstances mentioned in the introduction must be considered by the SFA. Therefore, we ordered all logging notices (public material) from new logging roads, and loggings already made, or planned in this area. Logging notices granted after the preceding ruling in 2015, that the NFA cannot allow cuttings if they are incompatible with interests that are of essential value to conservation or cultural heritage 18 § SvL, were of special interest. All documents are discussed in relation to current regulations, presented in Supporting information in the back of this report.

Figure 8. One of very many water-filled depression that are temporarily flooded after snow-melt and heavy rains. During dryer periods they can become completely dry. These spots are important for amphibians, toads and frogs. Here, however, one of these waters have been damaged by the logging road.

Results

Species finds in Krutskogen

We found 53 different red-listed species. Among these, 15 species (196 finds) were classified as vulnerable and 38 species (2,336 finds) as near threatened. Another 43 species (711 finds) noted during the survey are currently termed indicator species by SFA (Supplementary material S1). We also sighted seven species currently listed in the Birds Directive Annex 1. In the survey we also noted 112 other species not currently red-listed or termed indicator species by SFA. Among these, we spotted siberian jay *Perisoreus infaustus*, two-barred crossbill *Loxia leucoptera* and pine grosbeak *Pinicola enucleator* (Supplementary material S1).

Among lichens recorded during the survey, 12 were indicator species, 17 near threatened, and 2 vulnerable species. The most frequently spotted red-listed species was the cyano-lichen *Lobaria scrobiculata* (NT) with 300 finds. In this northern location, this species grows on deciduous trees such as trembling aspen, goat willow, rowan and the two occurring species of birch, pendulous birch and downy birch. In beneficial locations it may also attach to shaded boulders or the bark of conifers (see Figure 8). In parallel of the many sightings of *L. scobiculata*, the close relative, *Lobaria pulmonaria* (NT), was only found 30 times. Other lichen species with similar habitat requirements, that were frequently observed, were the three cyano-lichens *Nephroma bellum, N. resupinatum* and *N. parile*, seen 148, 62 and 78 times respectively. All three species are termed as indicator species. Less common lichen species like *Cyphelium karelicum* (VU) and *Hypogymnia austerodes* (VU) were seen 19 and 7 times respectively.

During our survey, great attention was given to find and identify species of wood decaying fungi. In total we recorded 48 such species, whereof 21 red-listed; 10 vulnerable and 11 near threatened. The most found red-listed polypore was the near threatened *Phellinus chrysoloma* (312 finds), followed by *Onnia leporina* (214 finds) and *Phellinus nigrolimitatus* (147 finds), both also near threatened. Among species classified as vulnerable, *Laurilia sulcata* and *Phlebia centrifuga* were the most common with 71 and 37 finds respectively. The least frequently observed species were *Junghuhnia collabens* (VU), *Diplomitoporus crustulinus* (VU) and *Rhodonia placenta* (VU) that were only sighted once. Although some of the fungi species were occasionally spotted on Scots pine, most of them are strongly related to dead wood of Norway spruce. However, in this forest survey, less attention was given to the more pine dominated areas where the terrain was very difficult. If these areas had been included in the survey, more species could likely have been added to the list.

Bryophytes and vascular plants were also searched for. The most frequently sighted bryophyte, being the indicator species *Hylocomiastrum umbratum*, was seen 36 times. Among red-listed bryophytes, we found *Lophozia longiflora* (18 finds) and *Anastrophyllum hellerianum* (3 finds), both near threatened. In nutrient rich patches with swamp forest, we found rich stands of wolfsbane *Aconitum lycoctonum* and occasionally also arctic sweet coltsfoot *Petasites frigidus*, seen 68 and 9 times respective-

Figure 9. *L. scrobiculata* (NT) growing on the bark of Norway spruce. On the same tree grew *Peltigera aphthosa* and *Nephroma parile*.

ly. Both species are indicator species, and did mostly appear in small and scattered populations. Other less frequently spotted plants were the indicator species alpine saw-wort *Saussurea alpine* and lesser twayblade *Listera cordata*.

The typical ring-like chew marks of the *P. tridactylus* (NT) was found on little over 300 different tree trunks; mostly on Norway spruce, but also on Scots pine. The bird itself, however, was only spotted twice during the whole survey, and breedings were not found. Our interpretation is that, although chew marks of three-toed woodpecker were frequently observed, the species is rare in this area. Chew marks from woodpeckers are accumulated over many years of activity, hence giving the impression that certain species, like *P. tridactylus* in this case, is very common. To confirm this theory, a thorough survey is needed. Other woodpecker species like the black woodpecker *Dryocopus martius* (NT) and the greater spotted woodpecker *Dendrocopos major* were also spotted.

Capercaillie *Tetrao urogallus* was sighted several times

Figure 10. Chew-marks on Norway spruce made by three-toed woodpecker. In total, we recorded over 300 trees with chew-marks.

throughout the survey, while black grouse *Tetrao tetrix* was only seen one time. Both species are listed in the Birds Directive Annex 1. These two species, and also willow grouse *Lagopus lagopus* and hazel grouse *Bonasa bonasia*, are common in this area. Hence, several lekking sites of capercaillie and black grouse can be expected in this large and diverse forest landscape. Since August 2017, Swedish foresters are not allowed to destroy capercaillie lekking sites during harvesting (Anon 2017d).

Few raptors and owls were seen during the survey. Nevertheless, in late June one osprey *Pandion haliaetus* was seen soaring over a small lake and in the beginning of August another individual was seen on high altitude, likely migrating. In early October, also, one pygmy owl *Glaucidium passerinum* was spotted south of Västansjön. The meager result in this respect is likely due to the field workers focusing on objects on the ground, like logs and tree-trunks, rather than on birds soaring above. Other interesting bird species were siberian tit *Poecile cinctus* (seen 3 times) and goldcrest *Regulus regulus* (seen and heard 9 times) both classified as vulnerable according to the Swedish 2015 redlist.

Lastly, droppings from brown bear *Ursus arctos* (NT), and track from wolverine *Gulo gulo* (VU) and pine marten *Martes martes* were seen. The two first-mentioned, are likely traveling through from time to time, while the Pine marten is more likely to breed in the area. Regardless, stumbling over the traces of large carnivores in the wild, increases the feeling of true wilderness.

The forest in this area

The forests seen during our field survey were in general dominated by old-growth coniferous forest, with rich availability of dead wood. In these forests we found a natural dynamic variation in forest structures. As such, general structures like tree density and tree size, tree species assembly, and further on, finer features like dead wood availability—self thinning and log-density—was highly dependent on productivity. In moist and fertile parts, usually in sinks in the terrain, trees were thicker and dead wood were common. In the dryer terrain, trees stood more sparsely, and dead wood occurred less densely. Rockier and even less productive areas were covered with sparsely scattered stands of Scots pine, Norway spruce and birches (Fig. 11). Nevertheless, dead wood of pine were sometimes easy to find in these very venturesome parts.

Our suspicion, that small patches of pristine forest are scattered in these sparsely exploited forests, was clearly confirmed. In total, 16 patches of such pristine forest, with a joint area of 301 ha, were recorded, whereof one single continuous piece constituted 236 ha, or nearly 80 % of the area. This comparably large patch was found in the south, on property of the National Property Board. Another continuous 24 ha piece, was also found in the center part, adjacent to formerly clear-cut forest. Unfortunately, in respect to this forest patch, a logging road now crosses straight through (Fig. 6).

In minor parts, fieldworkers found evidence of previous clear-cuttings. The existence of four young stands, seemingly been clear-cut in the past, were later searched for in old aerial photos. And thanks to these images clear-cuttings in the 50s-60s could be confirmed. Other young forest patches were seen, but former clear-cuttings could not be confirmed by viewing aerial data.

Figure 11. Large sections of the study area interior consists of low-productive forests. As seen in this image crossing these areas is cumbersome and requires great caution.

The new logging road

In the forests covering the area around the new logging road, we found no obvious difference to other sections of the surveyed forest. Similarly, the forest consisted of old-growth spruce stands, smaller pockets of pine and usually beneficial circumstances for dead wood species. The tree species goat willow and aspen occurred less frequently, and further to the east, outside the 243 ha circle however, signs of previous selective loggings became more evident, and dead wood scarcer.

Among the 53 red-listed species found throughout the survey, 32 (334 finds) were spotted inside the circle that was drawn along and around the logging road. Found inside were also 28 (141 finds) indicator species and 40 other species not currently red-listed or termed indicator species by the SFA. Among these, we spotted siberian jay (Fig. 12). Also, the drone-collected data provided insightful findings on dead wood density adjacent to the road.

The same general species patterns observed in other parts were repeated in this area. Near threatened polypore *P. chrysoloma* and *O. leporina* with 41 and 43 sightings respectively, were undoubtedly the most common red-listed species here. However, in contrast to the overall result, *L. scrobiculata* (NT) was less common with only 26 finds. Other frequently sighted species within the logging road circle were near threatened polypore species *Fomitopsis rosea* (Fig. 5), *Phellinus ferrugineofuscus* (17 and 16 finds), and lichens *Chaenothecopsis viridialba, Chaenotheca subroscida*, and *Hypogymnia bitteri* (14, 15 and 17 finds). The vulnerable species *Skeletocutis odora* and *L. sulcata* were spotted 6 and 8 times respectively. Also, the very rare *Rhodonia placenta* (VU) was found between the logging road and Dikanässjön. Many chew-marks of three-toed woodpeckers were seen, and during the last visit to the logging road, one individual was seen foraging on old spruce trunks along the road. For species found inside the newly planned logging site see Supplementary material S2.

Anastrophyllum hellerianum (NT), Meruliopsis taxicola (s), Fringilla montifringilla, Poecile montanus, Skeletocutis odora (VU), Tetrao urogallus, Phellinus nigrolimitatus (NT), Climacocystis borealis (s), Lactuca alpina (s), Cystostereum murrayi (NT), Rana temporaria, Cyphelium karelicum (VU), Alnus incana, Dichelyma falcatum, Hylocomiastrum pyrenaicum (s), Pseudobryum cinclidioides (s), Sarmentypnum exannulatum, Laurilia sulcata (VU), Hylocomiastrum umbratum (s), Breidleria pratensis, Tomentypnum nitens, Certhia familiaris, Rhodonia placenta (VU), Prunus padus, Sidera lenis (VU), Alectoria sarmentosa (NT), Arctous alpine, Pseudographis pinicola (NT), Lobaria scrobiculata (NT), Chaenotheca brachypoda (s), Aconitum lycoctonum (s), Parnassia palustris (s), Paludella squarrosa, Matteuccia struthiopteris (s), Scorpidium revolvens, Lophozia longidens, Anastrophyllum minutum, Dryocopus martius (NT), Chaenotheca laevigata (NT), Leptoporus mollis (NT), Moneses uniflora (s), Hydnum repandum, Chaenothecopsis viridialba (NT), Chaenotheca furfuracea, Gloeophyllum sepiarium, Fomitopsis rosea (NT), Chaenotheca gracillima (NT), Nephroma parile (s), Ribes spicatum, Rhodobryum roseum, Sphagnum warnstorfi, Cortinarius harcynicus (NT), Icmadophila ericetorum (s), Paris quadrifolia (s), Dicranum fragilifolium (s), Bryum weigelii, Lobaria pulmonaria (NT), Tritomaria polita, Phellinus chrysoloma (NT), Protopannaria pezizoides (s), Cinclidium subrotundum, Nephroma resupinatum (s), Troglodytes troglodytes, Amylocystis lapponica (VU), Chaenotheca subroscida (NT), Hypogymnia austerodes (VU), Rhytidiadelphus subpinnatus (s), Skeletocutis chrysella (VU), Marchantia polymorpha, Mnium spinosum (s), Regulus regulus (VU), Exobasidium vaccinia, Chaenotheca chlorella (s), Onnia leporina (NT), Bombycilla garrulous, Leptogium saturninum (s), Nephroma bellum (s), Selaginella selaginoides, Petasites frigidus (s), Tayloria lingulata (s), Phlebia centrifuga (VU), Lophozia longiflora (NT), Parmeliella triptophylla (s), Picoides tridactylus (NT), Sarmentypnum sarmentosum, Tortella tortuosa (s), Calliergon richardsonii, Phellinus viticola (s), Perisoreus infaustus, Barbilophozia attenuate, Rhytidiadelphus triquetrus, Phellinus ferrugineofuscus (NT), Sclerophora coniophaea (NT), Campylium stellatum, Crepis paludosa (s), Ischnoderma benzoinum, Hypogymnia bitteri (NT), Basidioradulum radula, Geum rivale, Valeriana sambucifolia

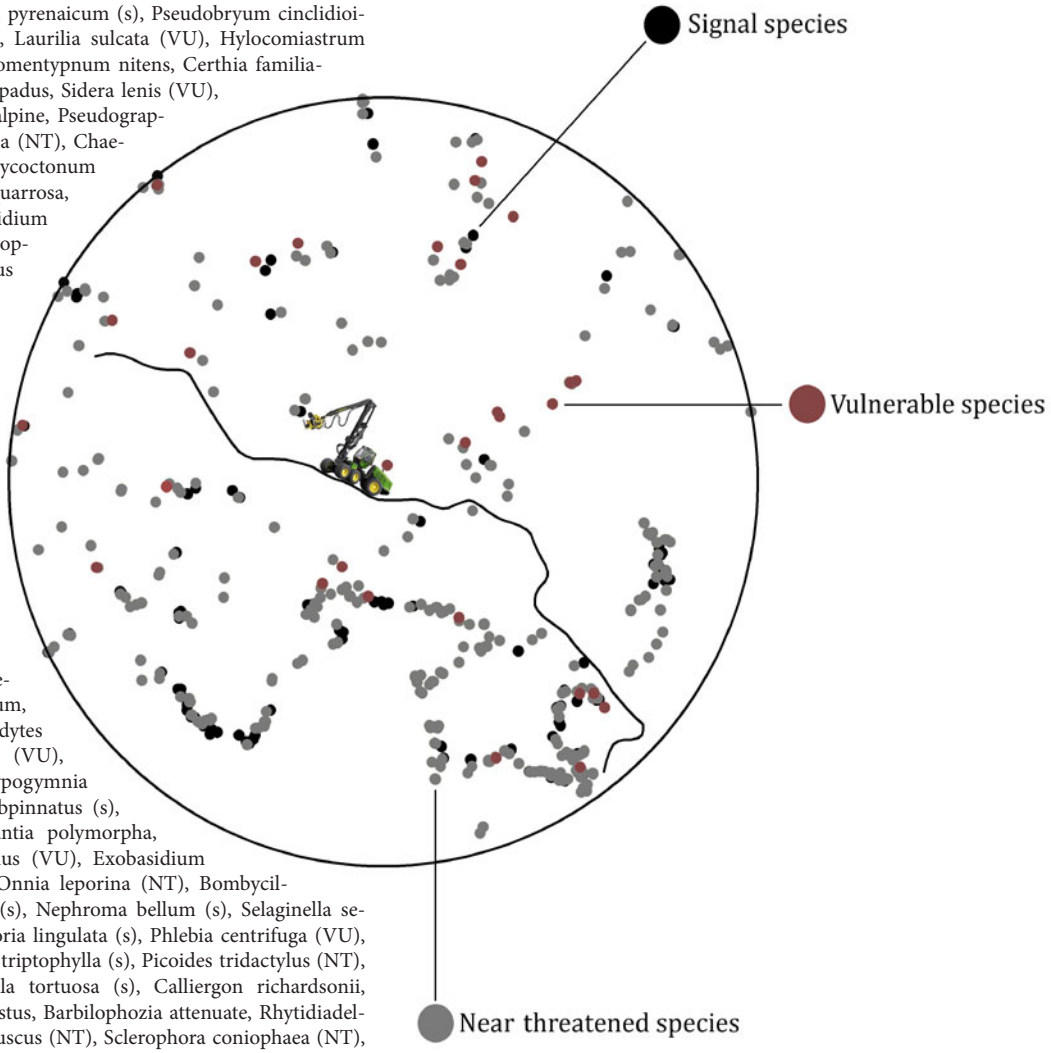


Figure 12. To the right a schematic view of the logging road and the 32 red-listed vulnerable and near threatened species, as well as the 28 SFA indicator species (s) found inside the 243 ha circle. To the left are the names of all species found inside the circle.

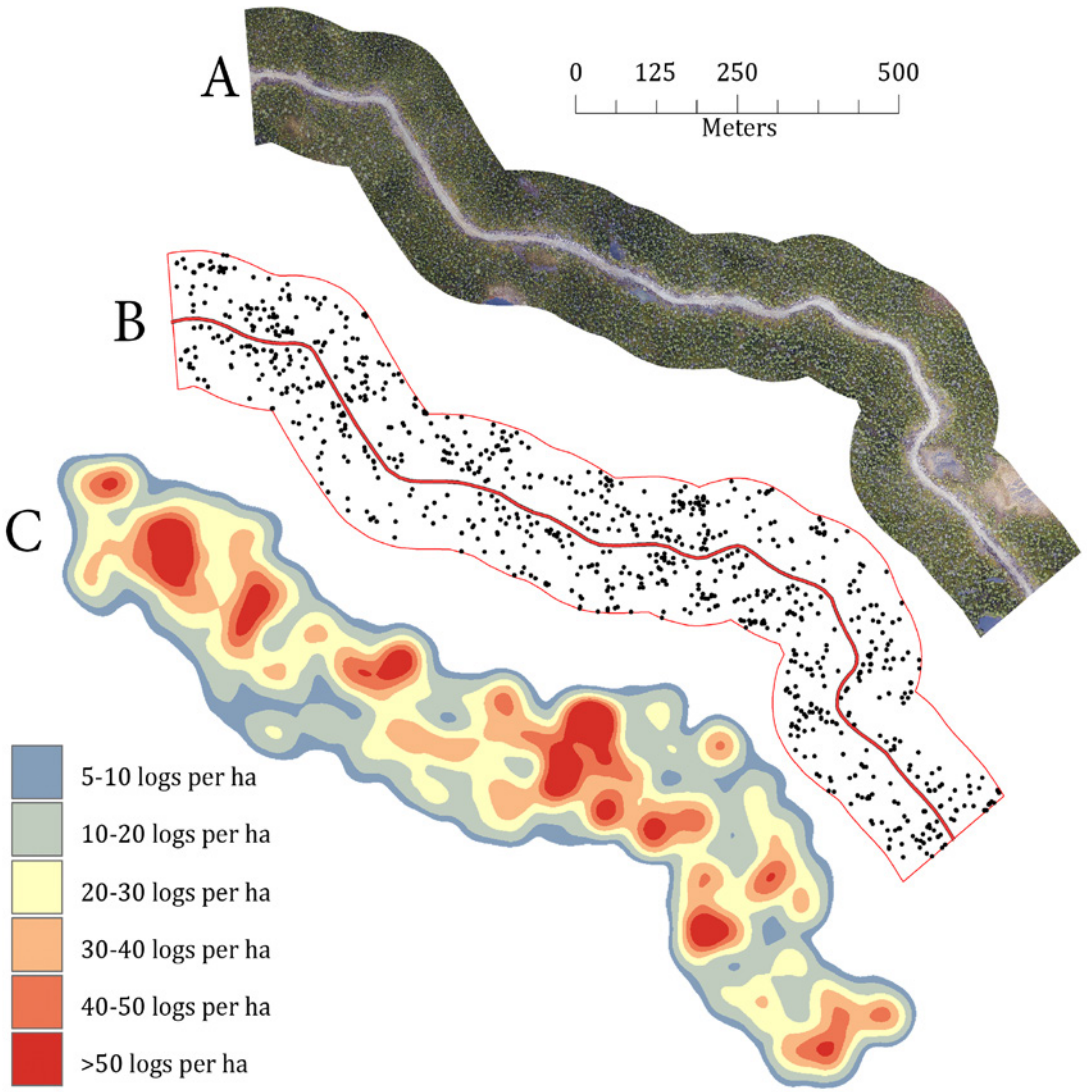


Figure 13. The ortophoto that was used to map Norway spruce logs (A) and all spruce logs as points inside the 100m buffer extending on both sides of the new logging road marked with a red line (B). In the bottom (C) the interpolated density of spruce logs in intervals of 10 logs per ha. Note that the planning of the road is seemingly unrelated to dead wood density. The low density in the outer part of the interpolation (C) is because no data was recorded outside the red line in panel B.

The dead wood survey revealed a mean dead wood density of 28,5 spruce logs per ha, and maximum densities of around 90 logs per ha (Fig. 13). Not surprisingly, density of spruce logs in most part coincided with standing volume of living biomass (Supplementary material S4). This result also confirms our general perception, that dead wood availability is highly dependent on productivity. The relation between dead wood density and the planning of the logging road is discussed below.

In the 9.5 ha logging notice in the very beginning of the first road section we found 14 red-listed species whereof one vulnerable (*L. sulcata*) and 14 near threatened (i.e. *F. rosea, Cystostereum murayi* and *H. bitteri*). Also, six indicator species were found, one singing hazel grouse was heard and traces of capercaillie seen. As in other parts, species occurrences largely coincide with presence of dead wood, and in turn these structures with productivity.

According to the logging notice and SFA's consultancy from December 2015 (Supplementary material S5) no proper field visit was made prior to constructing the new logging road. Hence, the new view on 18 § SvL was not considered, and more or less followed the same procedure seen in the logging notice from November 2014—the same technician planned the road without prior field visit (Supplementary material S6). The handling of the most recent logging notice from July 12 2017, considering final felling of the 9.5ha patch of old-growth forest, is yet to be seen.

Discussion

Our general interpretation of the results is that in this area, where forests have mostly remained undisturbed, structures crucial for boreal biodiversity, and hence the species that depends on these features, are flourishing. The multitude of red-listed species, that is a receipt of the elevated conservation value, should be a clear incentive for authorities to take action and protect these forests against destruction. In this section we strive to explain why protecting these last frontier forests is important. We also discuss the logging road and clear-cutting forestry in relation to current regulations.

Species finds

Many red-listed species are still common in old-growth forest, but are battling for survival in the managed landscape that completely dominates our country. Hence, single occurrences of red-listed species can be found in patches of old-growth forest, e.g. in WKHs and smaller nature reserves, but one rarely finds many red-listed species inside the same little patch. In the surveyed area, however, the forest is continuous and surrounded with similar habitats, which gives room for great variety in moisture, altitude and productivity. The diversity of habitat types, thus provide living space for many species—as seen in the result from this survey. This difference is due to the well-known species-area relationship (MacArthur & Wilson 1967), which states that bigger areas may harbor larger number of species than smaller ones. For similar reasons, the continuous fragmentation of Sweden's forest landscape has reduced population sizes of our most characteristic forest species, in this area being a heavy bulk of cryptogams, plants and insects.

Nonetheless importantly, typical forest interior species suffer more from patch size effects than generalist species (Bender et al. 1998; *cf*. Bowers et al. 1997 for mammals). In our study of a large forest landscape, the most common vulnerable species was *L. sulcata*. In the grid-like landscape were forest management reigns, however, this species is utterly uncommon outside remaining patches of old-growth forest, and even there it is not easy to spot. An even more elusive species, *S. odora* (VU), was also found surprisingly often in Krutskogen. On the value pyramid for spruce forest introduced by Karström (1992) *S. odora* is put on the very top, indicating its high value for nature conservation. Hence, these large areas might be viewed on as valuable sources for rare forest species.

Forest values

We have surveyed and detected areas with considerably large proportion of very high conservation values. Not the least is forest age and the occurrence of valuable structures obvious. We also stumbled on rare remnant pristine forest, some now sadly dug through and blasted in half with dynamite. Here, note that these bits and pieces of the natural world are very hard to find.

In the small-scale events of single harvested forest patches, the change is direct and obvious. However, on larger scale, the change comes creeping and stepwise until one suddenly realizes that the former landscape is completely altered. This fact becomes frighteningly evident when watching from above satellite images acquired from the 70s until present (for a visualization see the animation by Andersson 2015). Here, in this large-scale animation of clear-cutting forestry and logging road construc-

tions, we can appreciate the full effect of stepwise, relatively small-scale changes. The resulting situation is characterized by a trivialized patchwork of plantations in varying degree managed with further thinning, and later again clear-felling. Stretching through the patchwork is a fishnet-like network of logging roads. Novel ideas to restore smaller forest fragments in this situation is doubtlessly beneficial for marginalized populations of urging forest species, but they can never replace large continuous and unharmed forest landscapes. By letting the forest in our study area fall, the resulting image will be very similar to the 2013 situation in the animation.

Our 35 sqkm study area constitute a minor section of old-growth forest reaching between Marsfjället's nature reserve in the south and Dikasjön-Vojmsjön in the north (County Administrative of Board Västerbotten 2017). In this huge area, exceeding 100sqkm of land, forests, mires and small waterways are under urgent threat. New logging roads are constructed on the fly with little consideration when logging awaits, and new gaps in the formerly even crown cover opens up. All in favor of economy, and safeguarded by poor legislation. Also, old-growth forests, undisturbed by mechanized forestry, that thus have been storing CO_2 for millennia, will now be cut down and used as biofuels to magically "save the climate". The failed logic in this mission is rarely spoken of by Swedish politicians, however.

Roads and planned logging sites

Forests landscapes like the one described in this report can hardly be harvested in compliance with current regulations in 30 § 7:17 and 7:19 SvL. Neither was it wise of the SFA to authorize logging without a thorough field survey, as suggested in 18 § 2010:930 SvL. According to the forest owner, themselves perform no field surveys prior to filing logging notices (pers. comments), and leave it up the SFA to decide whether logging should be allowed. In this case, however, the law book seems to have been completely forgotten. But what about the definition of WKHs—if a proper survey had been conducted prior to the construction of this new logging road?

Comparing our result on species occurrences with the WKH-checklist (Supplementary material S3) for spruce, constructed by the SFA, revealed interesting features: In respect to red-listed species alone, the leftmost column "minimal requirements" 1-5 completely lack criteria on species finds, and hence, guides us to not move on to the next level "decisive criteria". Thus, without features like coarse tree trunks, age or dead wood, as minimal requirements, the survey stops right there; independent of numerous species finds. Nevertheless, with all the structures found in the survey, we undoubtedly hit the roof on the minimal criteria. So, let us move on to the decisive criteria 1-9. Here a minimum of two criteria needs to be fulfilled. As number one, reads "clear presence of wood fungi on spruce"—check! And the bottom row, i.e. number 9 reads "tall herb vegetation with e.g. *Matteuccia struthiopteris, Lactuca alpine*". The second of these two species were found a couple of times—check! The rest of the decisive criteria contain mostly structural features: age, dead wood and tree size whereof number 3, 4 and 5 are fulfilled in the circle around the road, and also number 7 if the entire study area is included. To the right is "supporting criteria" A-Ä, were 9 out of the 27 criteria needs to be fulfilled. On row R and S reads "occurrence of red-listed species", and "occurrence of indicator species" respectively. We found many of these even around the logging road alone—check! However, without structures, our massive species list would yield no WKH-classification. Luckily, structural components A-Q and Ä was easily checked, mostly even around the logging road.

Comparing the measured values around the new logging road, of red-listed species finds and dead wood density, gives further guidance. On average, there was 28,5 dead lying spruce trees per ha with several hotspots more or less packed with dead wood. Hence, dead wood density was far above what is required by the WKH-checklist. The mean number of dead wood decaying fungi, however, was only about 6 per ha. But then remember, the species survey only covered a tiny fraction of the 243ha circle and trivial species of wood fungi was not recorded. Thus, the true density can very well be several hundred per ha. Nonetheless, the SFA certainly did not classify the forest around the new logging road as very rich on any of the criteria in the checklist. According to the logging notice, instead, the SFA completely ignored the high conservation value and guided the road construction themselves (Supplementary material S5). The handling of the last logging notice from July 12, 2017 remains to be seen.

To the SFA's defense, this is not the typical nor the most suitable area to apply this checklist. It is made to survey small forest islands not large landscapes with a mixture of habitat types. Nevertheless, the checklist's overwhelming imbalance between criteria to record structures and criteria to highlight occurrence of rare species, is worrying—inventory specialists are risking overseeing high conservation values. In conclusion, if formal protection is not suitable, and the SFA is allowed to use their checklists inside large forest landscapes, as the one presented in this study, then severe fragmentation will likely be the outcome. The checklist encourages tunnel vision!

As an example of SFA-reasoning on the subject, in a recent explanation by SFA-represent Göran Rune (2017), the author concludes that it is not the occurrence of red-listed species that determines the conservation value of forests. Instead one should aim to evaluate the bigger picture—i.e. structures, forest and age altogether, and lastly the value of species finds. Nevertheless, we shall never forget that in nature conservation it is the species we are ultimately trying to preserve, not the structures nor the age of trees! And with many finds of rare red-listed species in an area, what is then left to ponder on?

§

Conclusions

The results of our survey clearly highlight the existence of remaining high conservation values in these large forest landscapes in northern Sweden. Furthermore, the results show that selective cuttings done 60-70 years ago have indeed affected parts of the forest negatively, due to reduction of valuable substrates, but despite past minor influences still contain high nature values. Also, our overall interpretation is that forest owners leave it up the authority, in most cases the SFA, to judge the future of these landscapes with varying result. In lack of time or interest, on behalf of the authority, forests are cut unknowingly of valuable species, structures, and habitats.

In respect to the scarcity of large continuous old-growth forest landscapes, from Swedish, and European perspective also, we suggest that Sweden prioritize mapping and protection of remaining conservation values in these large forest landscapes. Here, the value of size and continuity should be set before downgrading values of i.e. the presence of ancient stumps or minor sections of previously clear-cut forest.

Concerning our study area, we suggest that the SFA consider to withdraw the authorization of the new logging road. Here, obviously, the SFA made the wrong decision, neglected the urgent need to make a proper field survey, and sent a technician without knowledge on forest ecology to simply plan the road. Furthermore, the road should be removed and the ground restored to its original condition. In time new forest will retake what was wrongly removed. Also, regarding other loggings in this area and beyond, the SFA should always make a field visit after receiving filed logging notices.

Too many old-growth forests with high conservation values are furtively destroyed by selective cuttings each year, and later clear-felled because they then—in the shadow of the recent cutting—lack high conservation values. It is a dirty trick, but works well in a country with utterly relaxed forestry regulation. Therefore, to avoid these mistakes, just as final felling needs a formal logging notice, selective cuttings should be preceded by the same procedure.

Finally, we urge the State, and also the European Union, to take action to preserve these last unprotected frontier forests. By leaving these forests in the fate of our slumberous forest regulation these forests will soon be harvested and the result will stand as a sad reminder of past neglect and failure. Just preserve these last unprotected frontier forests!

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Supplementary material S1. All species and species counts from the filed survey in Krutskogen. The entire set of species are listed first according to red-list category with VU first and then NT. After these species comes SFA indicator species, Birds Directory Annex 1 species and lastly species that currently cannot be referred to any of these categories.

Category	Scientific name	Swedish trivial name	Count
VU	*Amylocystis lapponica*	Lappticka	11
VU	*Antrodia albobrunnea*	Fläckporing	2
VU	*Cyphelium karelicum*	Liten sotlav	19
VU	*Diplomitoporus crustulinus*	Sprickporing	1
VU	*Gulo gulo*	Järv	1
VU	*Hypogymnia austerodes*	Mörk blåslav	7
VU	*Junghuhnia collabens*	Blackticka	1
VU	*Laurilia sulcata*	Tajgaskinn	71
VU	*Phlebia centrifuga*	Rynkskinn	37
VU	*Poecile cinctus*	Lappmes	3
VU	*Regulus regulus*	Kungsfågel	9
VU	*Rhodonia placenta*	Laxporing	1
VU	*Sidera lenis*	Gräddporing	5
VU	*Skeletocutis chrysella*	Grantickeporing	6
VU	*Skeletocutis odora*	Ostticka	22
NT	*Alectoria sarmentosa*	Garnlav	82
NT	*Alloclavaria purpurea*	Purpurfingersvamp	1
NT	*Anastrophyllum hellerianum*	Vedtrappmossa	3
NT	*Asterodon ferruginosus*	Stjärntagging	13
NT	*Bryoria nadvornikiana*	Violettgrå tagellav	1
NT	*Calicium denigratum*	Blanksvart spiklav	10
NT	*Callidium coriaceum*	Bronshjon	2
NT	*Chaenotheca gracillima*	Brunpudrad nållav	11
NT	*Chaenotheca laevigata*	Nordlig nållav	5
NT	*Chaenotheca subroscida*	Vitgrynig nållav	65
NT	*Chaenothecopsis fennica*	Blågrå svartspik	1
NT	*Chaenothecopsis viridialba*	Vitskaftad svartspik	31
NT	*Chaetodermella luna*	Vitplätt	5
NT	*Cladonia parasitica*	Dvärgbägarlav	2
NT	*Clavariadelphus truncatus*	Flattoppad klubbsvamp	2
NT	*Cortinarius harcynicus*	Barrviolspindling	1
NT	*Cystostereum murrayi*	Doftskinn	59
NT	*Dryocopus martius*	Spillkråka	11
NT	*Fomitopsis rosea*	Rosenticka	117
NT	*Hertelidea botryosa*	Vedskivlav	5
NT	*Hypocenomyce anthracophila*	Kolflarnlav	4
NT	*Hypogymnia bitteri*	Knottrig blåslav	175
NT	*Leptoporus mollis*	Kötticka	30
NT	*Lobaria pulmonaria*	Lunglav	30
NT	*Lobaria scrobiculata*	Skrovellav	300
NT	*Lophozia longiflora*	Vedflikmossa	18
NT	*Odonticium romellii*	Nordtagging	2
NT	*Onnia leporina*	Harticka	214
NT	*Peltigera collina*	Grynig filtlav	1
NT	*Phellinus chrysoloma*	Granticka	312

NT	*Phellinus ferrugineofuscus*	Ullticka	123
NT	*Phellinus nigrolimitatus*	Gränsticka	147
NT	*Picoides tridactylus*	Tretåig hackspett	356
NT	*Pseudographis pinicola*	Gammelgransskål	155
NT	*Ramboldia elabens*	Vedflamlav	1
NT	*Sclerophora coniophaea*	Rödbrun blekspik	37
NT	*Trichaptum laricinum*	Violmussling	3
NT	*Ursus arctos*	Brunbjörn	1
indicator species	*Aconitum lycoctonum subsp. septentrionale*	Nordisk stormhatt	68
indicator species	*Arthonia spadicea*	Glansfläck	1
indicator species	*Bryoria fremontii*	Talltagel	2
indicator species	*Chaenotheca brachypoda*	Gulnål	4
indicator species	*Chaenotheca chlorella*	Kornig nållav	3
indicator species	*Climacocystis borealis*	Trådticka	14
indicator species	*Corallorhiza trifida*	Korallrot	3
indicator species	*Crepis paludosa*	Kärrfibbla	5
indicator species	*Cyphelium inquinans*	Sotlav	1
indicator species	*Dactylorhiza maculata sp.*	Fläcknycklar sp	1
indicator species	*Dactylorhiza maculata subsp. maculata*	Jungfru Marie nycklar	1
indicator species	*Dicranum fragilifolium*	Skör kvastmossa	3
indicator species	*Elymus caninus*	Lundelm	1
indicator species	*Hylocomiastrum pyrenaicum*	Grov husmossa	11
indicator species	*Hylocomiastrum umbratum*	Mörk husmossa	36
indicator species	*Icmadophila ericetorum*	Vitmosslav	56
indicator species	*Inonotus rheades*	Rävticka	1
indicator species	*Lactarius zonarioides*	Granriska	1
indicator species	*Lactuca alpina*	Torta	15
indicator species	*Leptogium saturninum*	Skinnlav	25
indicator species	*Matteuccia struthiopteris*	Strutbräken	1
indicator species	*Meruliopsis taxicola*	Blodticka	13
indicator species	*Mnium spinosum*	Taggstjärnmossa	3
indicator species	*Moneses uniflora*	Ögonpyrola	15
indicator species	*Neottia cordata*	Spindelblomster	19
indicator species	*Nephroma arcticum*	Norrlandslav	3
indicator species	*Nephroma bellum*	Stuplav	148
indicator species	*Nephroma parile*	Bårdlav	78
indicator species	*Nephroma resupinatum*	Luddlav	62
indicator species	*Nephroma sp.*	Njurlav sp	3
indicator species	*Paris quadrifolia*	Ormbär	10
indicator species	*Parmeliella triptophylla*	Korallblylav	1
indicator species	*Parnassia palustris*	Slåtterblomma	4
indicator species	*Petasites frigidus*	Fjällskråp	9
indicator species	*Phellinus viticola*	Vedticka	53
indicator species	*Philonotis fontana*	Källmossa	1
indicator species	*Protopannaria pezizoides*	Gytterlav	3
indicator species	*Pseudobryum cinclidioides*	Källpraktmossa	13
indicator species	*Rhytidiadelphus subpinnatus*	Skogshakmossa	13
indicator species	*Sarcodon imbricatus/squamosus*	Fjällig taggsvamp	1

indicator species	*Saussurea alpina*	Fjällskära	2
indicator species	*Tayloria lingulata*	Kärrtrumpetmossa	1
indicator species	*Tortella tortuosa*	Kruskalkmossa	3
Birds Directive A1	*Cygnus cygnus*	Sångsvan	1
Birds Directive A1	*Glaucidium passerinum*	Sparvuggla	1
Birds Directive A1	*Lyrurus tetrix*	Orre	1
Birds Directive A1	*Pandion haliaetus*	Fiskgjuse	2
Birds Directive A1	*Tetrao urogallus*	Tjäder	18
Birds Directive A1	*Tetrastes bonasia*	Järpe	3
Birds Directive A1	*Tringa glareola*	Grönbena	3
Other species	*Acanthis flammea*	Gråsiska	3
Other species	*Alnus incana*	Gråal	1
Other species	*Anas penelope*	Bläsand	1
Other species	*Anastrophyllum minutum*	Liten trappmossa	1
Other species	*Antrodia heteromorpha*	Tickmussling	7
Other species	*Antrodia serialis*	Knölticka	1
Other species	*Antrodia sinuosa*	Timmerticka	1
Other species	*Antrodia xantha*	Citronticka	4
Other species	*Arctous alpina*	Ripbär	1
Other species	*Barbilophozia attenuata*	Pigglummermossa	1
Other species	*Basidioradulum radula*	Piggplätt	1
Other species	*Bombycilla garrulus*	Sidensvans	4
Other species	*Breidleria pratensis*	Skrynkelfläta	2
Other species	*Bryum pseudotriquetrum var. pseudotriquetrum*	Kärrbryum	1
Other species	*Bryum weigelii*	Bandbryum	4
Other species	*Calicium trabinellum*	Gulkantad spiklav	2
Other species	*Calliergon giganteum*	Stor skedmossa	1
Other species	*Calliergon richardsonii*	Guldskedmossa	2
Other species	*Campylium protensum*	Sumpspärrmossa	1
Other species	*Campylium stellatum*	Guldspärrmossa	2
Other species	*Carex livida*	Vitstarr	1
Other species	*Carex pauciflora*	Taggstarr	1
Other species	*Cerrena unicolor*	Slingerticka	2
Other species	*Certhia familiaris*	Trädkrypare	1
Other species	*Cetraria* sp.	Islandslavar	1
Other species	*Chaenotheca furfuracea*	Ärgnål	1
Other species	*Cinclidium subrotundum*	Trubbuddmossa	1
Other species	*Columba palumbus*	Ringduva	1
Other species	*Convallaria majalis*	Liljekonvalj	1
Other species	*Corvus corax*	Korp	3
Other species	*Cyanistes caeruleus*	Blåmes	1
Other species	*Cyphelium* sp.	Sotlavar	2
Other species	*Dichelyma falcatum*	Klomossa	1
Other species	*Erigeron acris*	Gråbinka	1
Other species	*Erithacus rubecula*	Rödhake	1
Other species	*Exobasidium vaccinii*	Lingonsvulst	1
Other species	*Fomitopsis pinicola*	Klibbticka	1
Other species	*Fragaria vesca*	Smultron	1

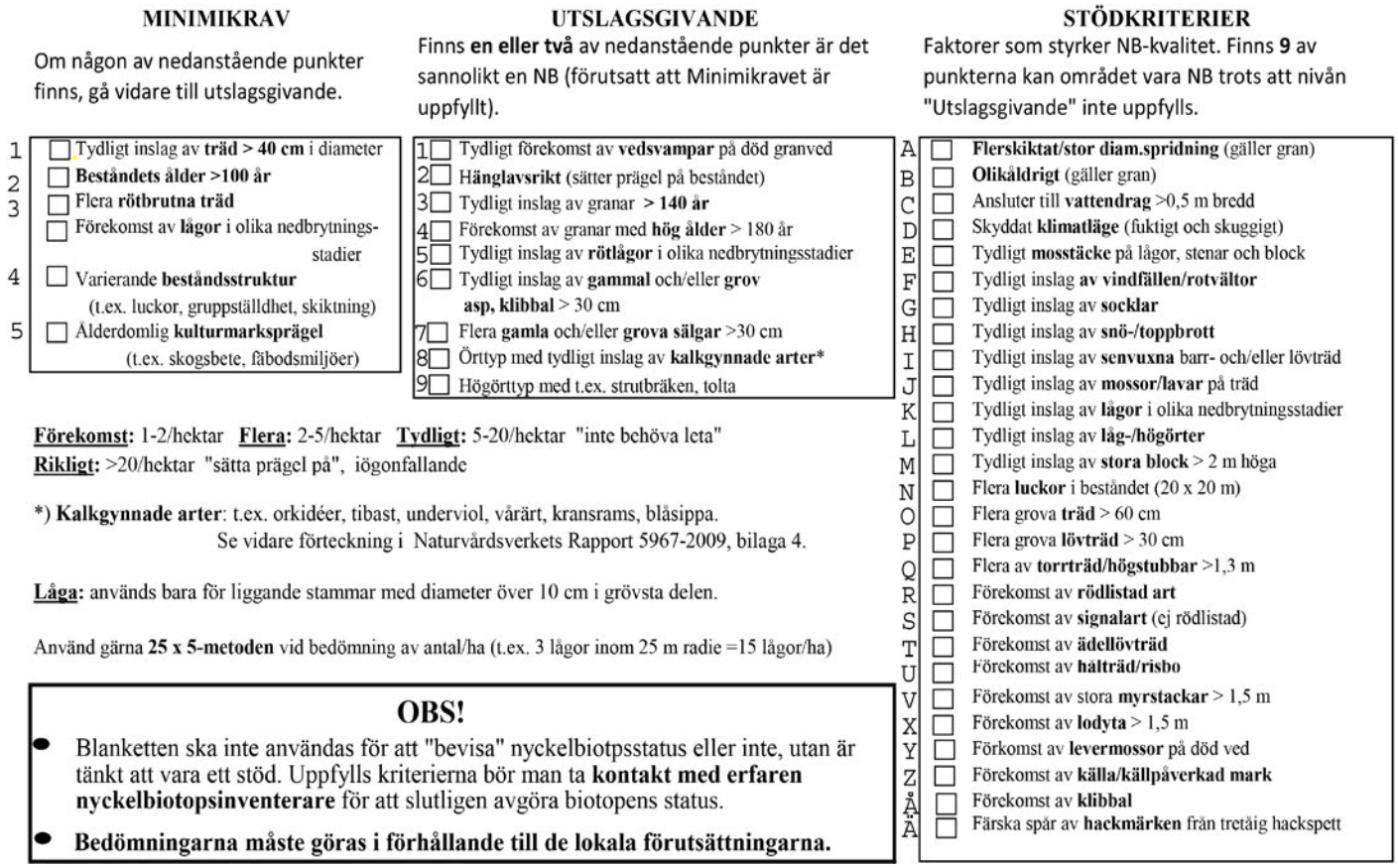
Other species	*Fringilla montifringilla*	Bergfink	1
Other species	*Geum rivale*	Humleblomster	11
Other species	*Gloeophyllum sepiarium*	Vedmussling	11
Other species	*Gloeoporus dichrous*	Tvåfärgsticka	2
Other species	*Gyromitra esculenta*	Stenmurkla	1
Other species	*Harpanthus flotovianus*	Stor måntandsmossa	1
Other species	*Heterobasidion annosum*	Rotticka	5
Other species	*Hydnum repandum*	Blek taggsvamp	4
Other species	*Hypocenomyce scalaris*	Flarnlav	3
Other species	*Icmadophila ericetorum*	Vitmosslav	2
Other species	*Inonotus obliquus*	Sprängticka	2
Other species	*Ischnoderma benzoinum*	Sotticka	13
Other species	*Lactarius deterrimus*	Blodriska	1
Other species	*Lactarius leonis*	Lejonriska	2
Other species	*Lagopus lagopus*	Dalripa	6
Other species	*Loeskypnum badium*	Mässingmossa	2
Other species	*Lophozia longidens*	Hornflikmossa	1
Other species	*Loxia leucoptera*	Bändelkorsnäbb	2
Other species	*Loxia pytyopsittacus*	Större korsnäbb	1
Other species	*Lycopodium complanatum*	Plattlummer	1
Other species	*Marchantia polymorpha subsp. montivagans*	Fjällungmossa	1
Other species	*Meesia triquetra*	Trekantig svanmossa	1
Other species	*Milium effusum*	Hässlebrodd	2
Other species	*Molinia caerulea*	Blåtåtel	1
Other species	*Muscicapa striata*	Grå flugsnappare	1
Other species	*Paludella squarrosa*	Piprensarmossa	2
Other species	*Perisoreus infaustus*	Lavskrika	16
Other species	*Phellinus conchatus*	Sälgticka	3
Other species	*Phellinus ignarius sp.*	Eldticka sp	1
Other species	*Phellinus laevigatus*	Valkticka	1
Other species	*Phellinus lundellii*	Björkeldticka	3
Other species	*Phellinus nigricans*	Svart eldticka	1
Other species	*Philonotis* sp.	Källmossor	2
Other species	*Phragmites australis*	Vass	1
Other species	*Phylloscopus collybita*	Gransångare	1
Other species	*Pinicola enucleator*	Tallbit	7
Other species	*Poecile montanus*	Talltita	11
Other species	*Pohlia wahlenbergii*	Bäcknicka	1
Other species	*Polypodium vulgare*	Stensöta	3
Other species	*Postia caesia*	Blåticka	4
Other species	*Postia stiptica*	Bitterticka	1
Other species	*Postia tephroleuca*	Mjölkticka	1
Other species	*Prunella modularis*	Järnsparv	1
Other species	*Prunus padus*	Hägg	2
Other species	*Pyrrhula pyrrhula*	Domherre	1
Other species	*Rana temporaria*	Vanlig groda	1
Other species	*Rhodobryum roseum*	Rosmossa	2
Other species	*Rhytidiadelphus triquetrus*	Kransmossa	13

Other species	*Ribes spicatum*	Skogsvinbär	4
Other species	*Rubus idaeus*	Hallon	1
Other species	*Sarcomyxa serotina*	Grönmussling	5
Other species	*Sarmentypnum exannulatum*	Kärrkrokmossa	1
Other species	*Sarmentypnum sarmentosum*	Blodkrokmossa	3
Other species	*Scapania uliginosa*	Purpurskapania	1
Other species	*Sciurus vulgaris*	Ekorre	1
Other species	*Scorpidium revolvens*	Röd skorpionmossa	2
Other species	*Scorpidium scorpioides*	Korvskorpionmossa	2
Other species	*Selaginella selaginoides*	Dvärglummer	5
Other species	*Spathularia flavida*	Spadmurkling	2
Other species	*Sphagnum subfulvum*	Brun glansvitmossa	1
Other species	*Sphagnum warnstorfii*	Purpurvitmossa	7
Other species	*Splachnum luteum*	Gul parasollmossa	1
Other species	*Stellaria nemorum subsp. nemorum*	Nordlundarv	1
Other species	*Stereum sanguinolentum*	Blödskinn	1
Other species	*Tomentypnum nitens*	Gyllenmossa	4
Other species	*Trichaptum abietinum*	Violticka	14
Other species	*Trichaptum fuscoviolaceum*	Violtagging	1
Other species	*Trichophorum alpinum*	Snip	2
Other species	*Tringa nebularia*	Gluttsnäppa	1
Other species	*Tringa ochropus*	Skogssnäppa	1
Other species	*Tritomaria polita*	Kärrlobmossa	1
Other species	*Troglodytes troglodytes*	Gärdsmyg	2
Other species	*Valeriana sambucifolia*	Flädervänderot	1
Other species	*Veluticeps abietina*	Daggskinn	2

Supplementary material S2. Species and species counts from the planned logging site. The entire set of species are listed first according to red-list category with VU first and then NT. After these species comes SFA indicator species, Birds Directory Annex 1 species and lastly species that currently cannot be referred to any of these categories.

Category	Scientific name	Swedish trivial name	Count
VU	*Laurilia sulcata*	Tajgaskinn	1
NT	*Cystostereum murrayi*	Doftskinn	1
NT	*Pseudographis pinicola*	Gammelgransskål	3
NT	*Phellinus chrysoloma*	Granticka	17
NT	*Phellinus nigrolimitatus*	Gränsticka	10
NT	*Onnia leporina*	Harticka	7
NT	*Hypogymnia bitteri*	Knottrig blåslav	2
NT	*Fomitopsis rosea*	Rosenticka	3
NT	*Sclerophora coniophaea*	Rödbrun blekspik	2
NT	*Lobaria scrobiculata*	Skrovellav	2
NT	*Asterodon ferruginosus*	Stjärntagging	1
NT	*Picoides tridactylus*	Tretåig hackspett	11
NT	*Phellinus ferrugineofuscus*	Ullticka	5
NT	*Chaenotheca subroscida*	Vitgrynig nållav	2
indicator species	*Nephroma parile*	Bårdlav	2
indicator species	*Aconitum lycoctonum subsp. septentrionale*	Nordisk stormhatt	3
indicator species	*Neottia cordata*	Spindelblomster	11
indicator species	*Nephroma bellum*	Stuplav	3
indicator species	*Phellinus viticola*	Vedticka	2
indicator species	*Moneses uniflora*	Ögonpyrola	2
Birds Directive A1	*Boanasa bonasia*	Järpe	1
Birds Directive A1	*Tetrao urogallus*	Tjäder	1
Other species	*Rhytidiadelphus triquetrus*	Kransmossa	1
Other species	*Cerrena unicolor*	Slingerticka	1
Other species	*Gyromitra esculenta*	Stenmurkla	1
Other species	*Poecile montanus*	Talltita	1

Supplementary material S3. The WKH-checklist with minimal requirements (left column), decisive criteria (middle column) and supporting criteria (right column) for spruce forest north of Limes Norrlandicus.



MINIMIKRAV

Om någon av nedanstående punkter finns, gå vidare till utslagsgivande.

1 ☐ Tydligt inslag av **träd > 40 cm** i diameter
2 ☐ **Beståndets ålder >100 år**
3 ☐ Flera **rötbrutna träd**
☐ Förekomst av **lågor** i olika nedbrytnings-stadier
4 ☐ Varierande **beståndsstruktur** (t.ex. luckor, gruppställdhet, skiktning)
5 ☐ Ålderdomlig **kulturmarksprägel** (t.ex. skogsbete, fäbodsmiljöer)

UTSLAGSGIVANDE

Finns **en eller två** av nedanstående punkter är det sannolikt en NB (förutsatt att Minimikravet är uppfyllt).

1 ☐ Tydligt förekomst av **vedsvampar** på död granved
2 ☐ **Hänglavsrikt** (sätter prägel på beståndet)
3 ☐ Tydligt inslag av granar **> 140 år**
4 ☐ Förekomst av granar med **hög ålder** > 180 år
5 ☐ Tydligt inslag av **rötlågor** i olika nedbrytningsstadier
6 ☐ Tydligt inslag av **gammal** och/eller **grov asp, klibbal** > 30 cm
7 ☐ Flera **gamla** och/eller **grova sälgar** >30 cm
8 ☐ Örttyp med tydligt inslag av **kalkgynnade arter***
9 ☐ Högörttyp med t.ex. strutbräken, tolta

STÖDKRITERIER

Faktorer som styrker NB-kvalitet. Finns **9** av punkterna kan området vara NB trots att nivån "Utslagsgivande" inte uppfylls.

A ☐ **Flerskiktat/stor diam.spridning** (gäller gran)
B ☐ **Olikåldrigt** (gäller gran)
C ☐ Ansluter till **vattendrag** >0,5 m bredd
D ☐ Skyddat **klimatläge** (fuktigt och skuggigt)
E ☐ Tydligt **mosstäcke** på lågor, stenar och block
F ☐ Tydligt inslag **av vindfällen/rotvältor**
G ☐ Tydligt inslag av **socklar**
H ☐ Tydligt inslag av **snö-/toppbrott**
I ☐ Tydligt inslag av **senvuxna** barr- och/eller lövträd
J ☐ Tydligt inslag av **mossor/lavar** på träd
K ☐ Tydligt inslag av **lågor** i olika nedbrytningsstadier
L ☐ Tydligt inslag av **låg-/högörter**
M ☐ Tydligt inslag av **stora block** > 2 m höga
N ☐ Flera **luckor** i beståndet (20 x 20 m)
O ☐ Flera grova **träd** > 60 cm
P ☐ Flera grova **lövträd** > 30 cm
Q ☐ Flera av **torrträd/högstubbar** >1,3 m
R ☐ Förekomst av **rödlistad art**
S ☐ Förekomst av **signalart** (ej rödlistad)
T ☐ Förekomst av **ädellövträd**
U ☐ Förekomst av **hålträd/risbo**
V ☐ Förekomst av stora **myrstackar** > 1,5 m
X ☐ Förekomst av **lodyta** > 1,5 m
Y ☐ Förkomst av **levermossor** på död ved
Z ☐ Förekomst av **källa/källpåverkad mark**
Å ☐ Förekomst av **klibbal**
Ä ☐ Färska spår av **hackmärken** från tretåig hackspett

Förekomst: 1-2/hektar **Flera:** 2-5/hektar **Tydligt:** 5-20/hektar "inte behöva leta"
Rikligt: >20/hektar "sätta prägel på", iögonfallande

*) **Kalkgynnade arter**: t.ex. orkidéer, tibast, underviol, vårärt, kransrams, blåsippa.
Se vidare förteckning i Naturvårdsverkets Rapport 5967-2009, bilaga 4.

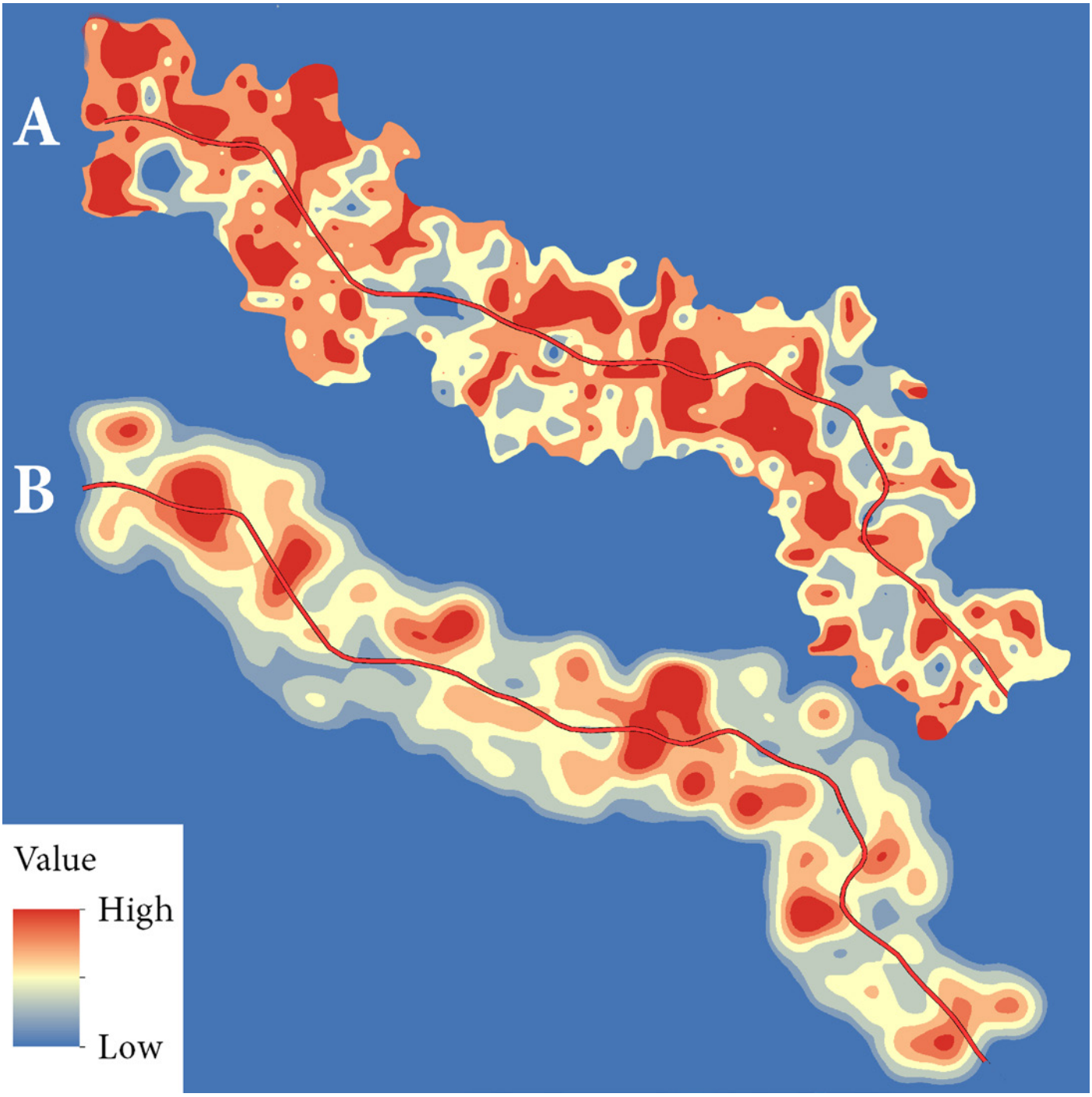
Låga: används bara för liggande stammar med diameter över 10 cm i grövsta delen.

Använd gärna **25 x 5-metoden** vid bedömning av antal/ha (t.ex. 3 lågor inom 25 m radie =15 lågor/ha)

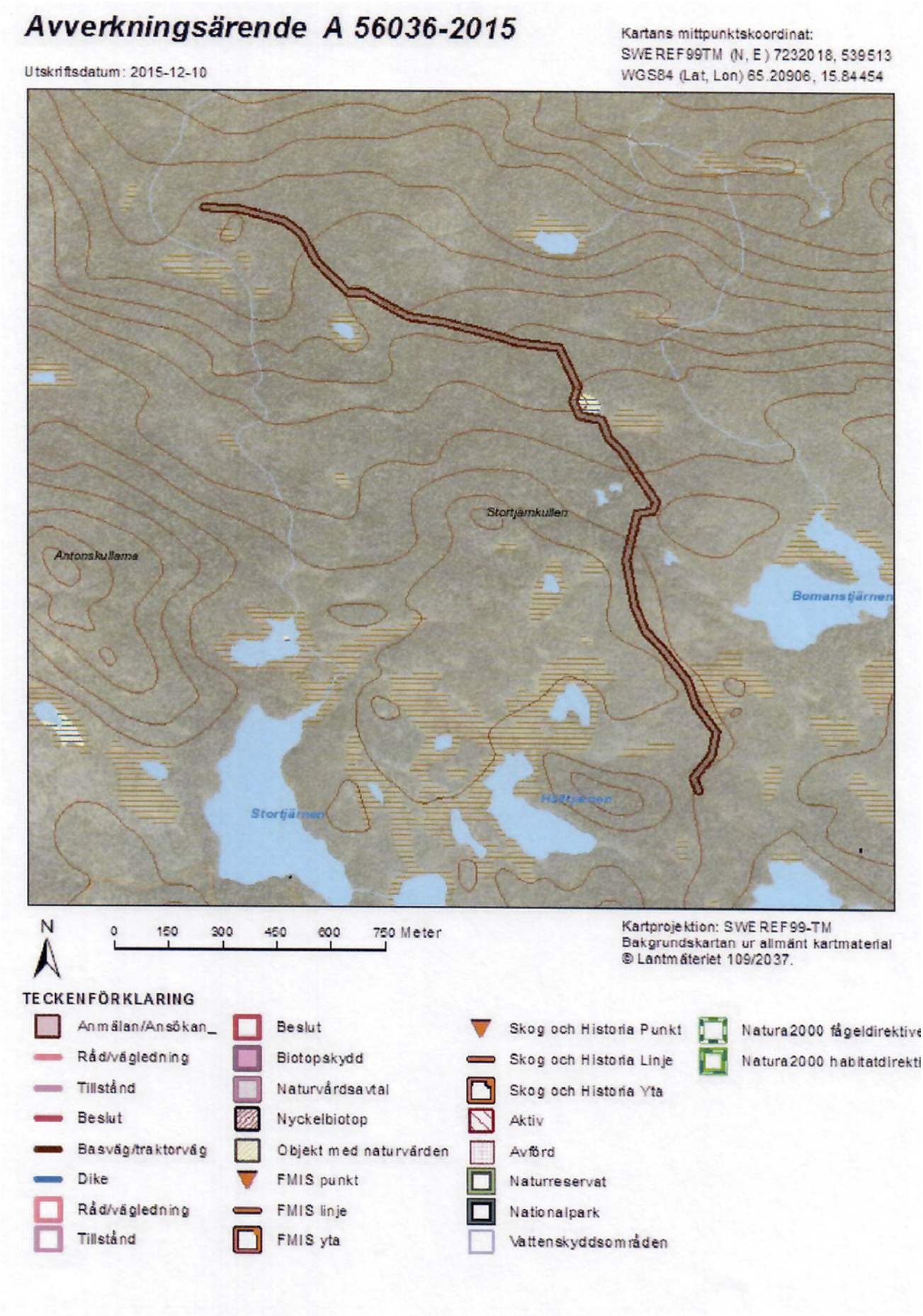
OBS!

- Blanketten ska inte användas för att "bevisa" nyckelbiotpsstatus eller inte, utan är tänkt att vara ett stöd. Uppfylls kriterierna bör man ta **kontakt med erfaren nyckelbiotopsinventerare** för att slutligen avgöra biotopens status.
- **Bedömningarna måste göras i förhållande till de lokala förutsättningarna.**

Supplementary material S4. Images representing the standing total volume of living wood biomass (A) and the density of spruce logs (B) around the new logging road. The interpolation of biomass is done over a larger area than the density of spruce logs, hence in the outer edges of the interpolation data is less comparable.



Supplementary material S5 part 1. A map from the 2015 approved logging notice showing the planned logging road, in this report "the new logging road".



Supplementary material S5 part 2. An excerpt from the 2015 logging notice for the new logging road. In field I 1 and 3 reads "planning made on snow-free ground" and "planned by the Swedish Forestry Agency's ...". The road was planned by staff from the authority. This was after the precedent ruling in 2015.

5. Hänsyn till mark och vatten

Jag avser att ta hänsyn för att förhindra eller begränsa

- ☐ Körskador
- ☐ Skador på allmänt nyttjade stigar/leder
- ☐ Skador på vatten vid terrängkörning
- ☐ Näringsläckage och slamtransport till sjöar och vattendrag
- ☐ Skador på vatten vid skyddsdikning och stubbskörd
- ☐ Försurning av mark och vatten vid uttag av grot och stubbar

Beskriv de åtgärder du planerar för att förhindra eller begränsa skador på mark och i vatten

☐ **Avverkningen berör en fornlämning som skyddas av kulturmiljölagen.**

H. Planerad hänsyn till rennäringen

Inom renskötselområdet är redovisningen obligatorisk.
Utanför de områden där renskötsel får bedrivas krävs ingen redovisning.

- ☐ Den berörda samebyn har fått möjlighet till samråd. (Bifoga skriftligt bevis)
- ☒ Samråd med berörd sameby har genomförts. (Bifoga protokoll)

Inom eller angränsande mot avverkningsområdet finns

- ☐ 26 Arbetshage
- ☐ 27 Beteshage
- ☐ 28 Flyttled
- ☐ 29 Rastbete
- ☐ 30 Uppsamlingsområde
- ☐ 31 Svår passage
- ☐ 32 Hänglavsbärande skog
- ☐ 33 Kalvningsland

Jag kommer att ta hänsyn genom att

- ☐ 34 Vinteravverka
- ☐ 35 Spara kantzoner
- ☐ 36 Spara hänglavsbärande trädgrupper
- ☐ 37 Anpassa hyggesstorlek
- ☐ 38 Ej koncentrera hyggen
- ☒ 39 Anpassa skogsbilväg
- ☐ 40 Markbereda skonsamt

Beskriv övrig hänsyn som du planerar att ta till rennäringen

I. Frivilliga kompletterande uppgifter

1. Skogsvårdsavtal och avverkningsplanering

☐ Det finns avtal om föryngringsåtgärder mellan skogsägaren och virkesköpande eller annat företag

Avverkningsplaneringen är gjord

- ☒ i fält på barmark
- ☐ i fält på snö
- ☐ på kontoret via bildmaterial

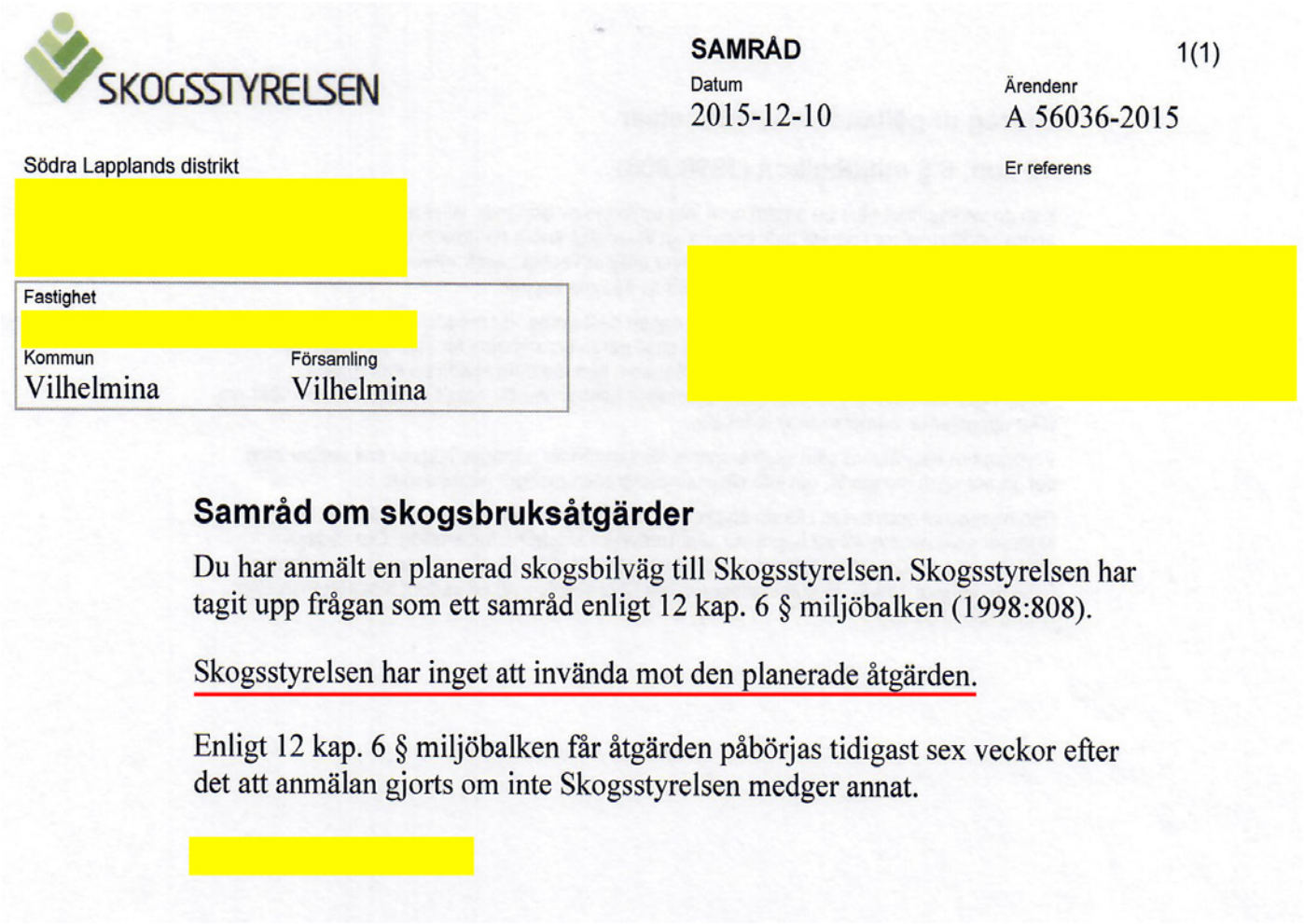
2. Markberedningsmetod

☐ Hög ☐ Fläck ☐ Långfläck ☐ Invers ☐ Harv ☐ Fräs ☐ Bränning ☐ Annan

3. Övriga upplysningar

PLANERAD AV SVO.

Supplementary material S5 part 3. An excerpt from the 2015 consultation agreement between the SFA and the forest owner. The SFA wrote "the Swedish Forest Agency has no objection against the planned arrangement". This was after the precedent ruling in 2015.



SKOGSSTYRELSEN

SAMRÅD 1(1)

Datum
2015-12-10

Ärendenr
A 56036-2015

Er referens

Södra Lapplands distrikt

[redacted]

Fastighet
[redacted]

Kommun
Vilhelmina

Församling
Vilhelmina

[redacted]

Samråd om skogsbruksåtgärder

Du har anmält en planerad skogsbilväg till Skogsstyrelsen. Skogsstyrelsen har tagit upp frågan som ett samråd enligt 12 kap. 6 § miljöbalken (1998:808).

Skogsstyrelsen har inget att invända mot den planerade åtgärden.

Enligt 12 kap. 6 § miljöbalken får åtgärden påbörjas tidigast sex veckor efter det att anmälan gjorts om inte Skogsstyrelsen medger annat.

[redacted]

Supplementary material S6 part 1. A map from the approved 2014 logging notice showing the planning of the older logging road.

Supplementary material S6 part 2. An excerpt from the 2014 consultation agreement between the SFA and the forest owner. The SFA wrote "the Swedish Forest Agency has no objection against the planned arrangement". With this, the land owner was free to build the road. This was before the precedent ruling in 2015, however.

SKOGSSTYRELSEN

SAMRÅD 1(1)

Datum
2014-11-06

Ärendenr
A 56167-2014

Er referens

Södra Lapplands distrikt

[redacted]

Fastighet
[redacted]

Kommun
Vilhelmina

Församling
Vilhelmina

[redacted]

Samråd om skogsbruksåtgärder

Du har ansökt om tillstånd för avverkning av väggata för planerad skogsbilväg till Skogsstyrelsen. Skogsstyrelsen har tagit upp frågan som ett samråd enligt 12 kap. 6 § miljöbalken (1998:808).

Skogsstyrelsen har inget att invända mot den planerade åtgärden.

Enligt 12 kap. 6 § miljöbalken får åtgärden påbörjas tidigast sex veckor efter det att anmälan gjorts om inte Skogsstyrelsen medger annat.

Max Göran Sehlström

Utdrag ur gällande bestämmelser

12 kap. 6 § miljöbalken (1998:808)

Kan en verksamhet eller en åtgärd som inte omfattas av tillstånds- eller anmälningsplikt enligt andra bestämmelser i denna balk komma att väsentligt ändra naturmiljön, skall anmälan för samråd göras hos den myndighet som utövar tillsynen enligt bestämmelser i 26 kap. eller bestämmelser som har meddelats med stöd av samma kapitel.

Regeringen eller den myndighet som regeringen bestämmer får meddela föreskrifter om att det inom landet eller en del av landet alltid skall göras en anmälan för samråd i fråga om särskilda slag av verksamheter eller åtgärder som kan medföra skada på naturmiljön. Regeringen eller den myndighet som regeringen bestämmer får också meddela föreskrifter om vilka uppgifter en anmälan skall innehålla.

Verksamhet eller åtgärd som skall anmälas för samråd får påbörjas tidigast sex veckor efter det att anmälan har gjorts, om inte tillsynsmyndigheten medger något annat.

Den myndighet som avses i första stycket får förelägga den anmälningsskyldige att vidta de åtgärder som behövs för att begränsa eller motverka skada på naturmiljön. Om sådana åtgärder inte är tillräckliga och det är nödvändigt för skyddet av naturmiljön, får myndigheten förbjuda verksamheten. Bestämmelser om rätt till ersättning vid ett sådant föreläggande eller förbud finns i 31 kap

Supplementary material S6 part 3. An excerpt from the 2014 logging notice for the older logging road. In field I 1 and 3 reads "planning made on snow-free ground" and "planned by the Swedish Forestry Agency". The road was planned by staff from the authority. This was before the precedent ruling in 2015, however.

3. Skyddszoner (markeras på karta)

Avverkningsområdet gränsar mot
☐ 21 Skogligt impediment ☐ 22 Vatten ☐ 23 Kulturmiljö ☐ 24 Bebyggelse ☐ 25 Öppen jordbruksmark

Jag avser att ta följande hänsyn

4. Träd, trädsamlingar och döda träd

Jag avser att ta hänsyn genom att lämna kvar

☐ Äldre barrträd	☐ Döda stående eller liggande träd	☐ Träd med brand-/kulturspår	☐ Naturliga högstubbar
☐ Äldre/grova lövträd	☐ Trädsamlingar	☐ Hassel, lind, lönn, ask, alm, rönn, sälg	☐ Tillskapade högstubbar
☐ Hålträd/boträd	☐ Ovanliga trädslag och buskar	☐ Vårdträd/bärande träd	☐ Andra träd

5. Hänsyn till mark och vatten

Jag avser att ta hänsyn för att förhindra eller begränsa

☐ Körskador	☐ Skador på allmänt nyttjade stigar/leder	☐ Skador på vatten vid terrängkörning
☐ Näringsläckage och slamtransport till sjöar och vattendrag	☐ Skador på vatten vid skyddsdikning	☐ Försurning av mark och vatten vid uttag av grot och stubbar

Åtgärder för att förhindra eller begränsa skador på mark och i vatten

☐ **Fornlämning som skyddas av kulturmiljölagen berörs av avverkningen**

H. Redovisning av planerad hänsyn till rennäringen

Avverkningen ligger
☒ inom året-runt-marker, redovisning av planerad hänsyn obligatorisk
☐ utanför året-runt-markerna men inom renskötselområdet, redovisning av planerad hänsyn frivillig

☐ Berörd sameby har beretts tillfälle till samråd. Skriftligt bevis bifogas.
☒ Samråd med berörd sameby har skett. Protokoll bifogas.

Inom eller angränsande mot avverkningsområdet finns

☐ 26 Arbetshage	☐ 28 Flyttled	☐ 30 Uppsamlingsområde	☐ 32 Hänglavsbärande skog
☐ 27 Beteshage	☐ 29 Rastbete	☐ 31 Svår passage	☐ 33 Kalvningsland

Jag avser att ta hänsyn genom att

☐ 34 Vinteravverka	☐ 36 Spara hänglavsbärande trädgrupper	☐ 37 Anpassa hyggesstorlek	☒ 39 Anpassa skogsbilväg
☐ 35 Spara kantzoner		☐ 38 Ej koncentrera hyggen	☐ 40 Markbereda skonsamt

Övrig hänsyn till rennäringen

I. Frivilliga kompletterande uppgifter

1. Skogsvårdsavtal och avverkningsplanering

☐ Avtal om föryngringsåtgärder finns mellan skogsägaren och virkesköpande eller annat företag

Avverkningsplaneringen är gjord
☒ i fält på barmark ☐ i fält på snö ☐ på kontoret via bildmaterial

2. Markberedningsmetod

☐ Hög ☐ Fläck ☐ Långfläck ☐ Invers ☐ Harv ☐ Fräs ☐ Bränning ☐ Annan

3. Övriga upplysningar

PLANERAD AV SKOGSSTYRELSEN