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Assessment of habitat condition of forest habitat types in Sweden: A basis for reporting under Article 17 of the Habitats Directive (92/43/EEC) in 2025

Contents

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Summary

For Article 17 reporting in 2025, it is required to assess the habitat condition of forest habitat types by classifying the proportions of their areas as ‘good’, ‘not-good’, or ‘unknown’. Additionally, short-term trends of areas classified as being in ‘good’ condition should also be evaluated.

In Sweden, habitat condition has been assessed for a subset of areas within Natura 2000 as part of a ‘basic inventory’ conducted by County Administrative Boards, mainly during early 2000’s. Currently, systematic monitoring of forest habitat types is conducted by the Swedish National Forest Inventory (NFI) and National Inventories of Landscapes in Sweden (NILS). In these inventories, several variables reflecting habitat quality are recorded. However, an overall assessment of habitat conditions for Article 17 reporting has not yet been conducted.

This PM proposes and documents a methodology for assessing habitat condition and short-term trends for areas classified as being in ‘good’ condition for forest habitat types in Sweden. Following national guidelines for assessing the condition of Natura 2000 forest habitat types, we selected relevant variables from sample-based inventories (e.g., NFI, NILS) for habitat quality assessment. The criteria, developed in consultation with SEPA and SFA, are described alongside the resulting findings. Finally, we outline a framework for applying these results in Article 17 reporting, in line with SEPAs and SFAs requests.

Background

Article 17 reporting requirements

For Article 17 reporting in 2025, it is required to report the 'habitat condition' of habitat types, i.e. specifying areas in 'good', 'not-good' and 'unknown' condition, along with the short-term trend of areas classified as being in 'good' condition (DG Environment 2023). This should be done for each forest habitat type within each biogeographical region where it is present.

Short-term trends for areas in 'good' condition of specific habitat types should be reported for both the total area and the areas within the Natura 2000 network. Furthermore, these assessments should also include the trend direction (i.e., 'stable', 'increasing', 'decreasing', 'uncertain' or 'unknown') and the evaluation of the method used.

To achieve favourable conservation status, DG Environment (2023) recommends that at least 90% of the total area of a specific habitat type within a region must be in 'good' condition. This threshold may be adjusted by using a lower threshold for wide-ranging habitat types or a higher threshold for rare ones. However, such adjustments must be justified. If more than 25% of the area in a region is in 'not-good' condition, the status is considered unfavourable-bad. Furthermore, the short-term trend of the total area in 'good' condition must be 'stable' or 'increasing' to achieve favourable conservation status. The evaluation matrix used when assessing the conservation status of structures and functions is shown in Table 1.

DG Environment's (2023) guidelines refer to Maciejewski et al. (2016), who review general concepts for assessing the condition of habitat types at the stand scale (in Natura 2000 areas). In summary, assessing the condition of habitat types is a complex task that requires simplification. The assessment criteria should relate to habitat type definitions and should be adapted to the habitat type's characteristic features, but also consider negative pressures it is exposed to. Important structures and processes should be identified, and thresholds established to indicate transitions between 'good' and 'not good' conditions. When clear thresholds for specific variables are unknown, simple benchmarks (i.e. presence or absence of an indicator) may be used. Finally, the threshold for 'good' condition does not need to equate to the maximum level of naturalness, but rather represent a realistic target to achieve 'good' condition.

Monitoring of conditions in forest habitat types in Sweden

The requirement to report on the 'habitat condition' of habitat types was first introduced in the Article 17-reporting in 2019. Before that, habitat condition, based on specific criteria, had been assessed for a subset of areas within Natura 2000 as part of a 'basic inventory' conducted by County Administrative Boards, following the manual by Kellner (2007). This basic inventory started already in the early 2000s. However, the effort to assess habitat condition varied across habitat types and regions, resulting in many habitat types having the majority of their areas within Natura 2000 unassessed, thus making it difficult to draw any conclusions about the conservation status of specific habitat types in biogeographic regions (Berglund 2019) (See also summary in Table 2).

Currently, systematic monitoring of forest habitat types is primarily conducted by the Swedish National Forest Inventory (NFI) and National Inventories of Landscapes in Sweden (NILS). These are primarily sample-based inventories, and plot data is mainly used to estimate the total area of each habitat type at biogeographical regional scale. In the inventories, several variables suitable for the assessment of habitat conditions are recorded. However, an overall assessment of habitat conditions based on these inventories has not yet been conducted.

Use of NFIs variables for assessments of 'good' conditions

Sample-based inventories, such as NFIs, can provide valuable information on structural components of forests and indicators of biodiversity. Its potential use for monitoring forest biodiversity indices at the European scale has been discussed by several authors (e.g., Chirici et al. 2011). In the context of assessing conditions for habitat types listed in Annex I of the Habitats Directive, the use of NFIs has been encouraged, as it may facilitate better harmonisation among member states (Lloret et al. in prep.). Several sample-plot variables recorded in NFIs, such as forest stand age, deadwood, regeneration and ground vegetation have been identified as important indicators for biodiversity (Chirici et al. 2011, Alberdi et al. 2019).

However, since the last reporting in 2019, efforts have been made to align the assessment of habitat type conditions inside protected areas and in sample-based inventories, such as the NFI (see Appendix II – Investigations conducted 2020-2024). The conclusion is that using NFI's sample-plot data to classify habitat condition according to national guidelines (SEPA 2012) and criteria for inventories within formally protected areas (Kellner 2007) remains challenging. For example, as NFI sample plots are small, the inventory may not capture key structural characteristics (e.g., large-diameter dead wood, veteran trees) or pressures (e.g., drainage ditches), which limits the representativeness of site conditions. Further harmonisation is therefore needed to align the use of NFI with national guidelines (SEPA 2012) and methods used within protected areas (Kellner 2007).

Aim of this PM

This PM aims to document the methodology used to assess the conditions of forest habitat types as well as the short-term trends in areas classified as being in 'good' condition. The method is based mainly on variables recorded by NFI and NILS and aims to align as closely as possible with national guidelines (SEPA 2012) and criteria for inventories within protected areas (Kellner 2007). In addition, the PM documents the discussions with, and requests from Swedish Environmental Protection Agency (SEPA) and Swedish Forest Agency (SFA) that guided the final approach.

Methods

Indicators of 'good' conditions and selection of variables in NFI and NILS

According to SEPA's national guidelines (SEPA 2012) and the manual for mapping habitat types within protected areas in Sweden (Kellner 2007), the following variables are key indicators of 'good' conditions for forest habitat types:

1. Presence of old living trees or trees with conservation values
2. Occurrence of dead wood
3. A natural-like, uneven-aged and/or heterogenic living tree structure
4. Presence of red-listed species or other species of conservation concern
5. Minimal human impact

Below, we describe how these indicators are represented by variables recorded in NFI and NILS inventories (Hedenås et al. 2020, Hedenås et al. 2023, RIS 2025).

1. Presence of old living trees or trees with conservation values: In NFI, this variable is not directly registered. A proxy using tree age criteria (i.e. >180 years in northern Sweden, >150 years in southern Sweden (Skogsstyrelsen 2020)) based on sampled trees was considered but omitted, as it would likely identify only a very limited number of plots (Jonas Dahlgren, pers. comm.). In NILS, presence of trees of conservation value is registered (i.e. *värdeträd, skyddsvärda träd*), and presence or absence of these trees was included in the analyses.

2. Occurrence of dead wood: In general, linking plot data to stand-scale dead wood volumes is challenging (Appendix II – Investigations conducted 2020-2024). Therefore, the presence (versus the absence) of coarse dead wood within the sample can serve as a simple benchmark in both NFI and NILS data to determine whether a sample plot can be assessed as being in 'good' condition. However, NILS also registers dead wood volumes outside sample plots within 0,1 ha assessment areas, which may provide additional information about the presence of coarse dead wood.

3. A natural-like or uneven-aged living tree structure: In NFI, the variable *even-agedness* is used to assess the age structure of forest stands. According to NFI criteria, a sample plot (measured within a 20-m radius) is classified as even-aged if more than 80% of the stand volume falls within a 20-year age interval. Plots that do not meet this criterion are considered 'not even-aged'. Therefore, this category can serve as an indicator of uneven-aged stand structure in the assessments. In NILS, this variable is not recorded. Instead, 'multi-layered canopy structure' (i.e >1 canopy layer) is recorded and this variable can be used as a substitute.

4. Presence of red-listed species or other species of conservation concern: Neither NFI of NILS does record these species categories within sample plots classified as habitat types. Hence, this aspect of habitat condition cannot be assessed and must be excluded from the analysis.

5. Minimal human impact: In both NFI and NILS, some adverse effects are already considered in the criteria for identifying forest habitat types. For example, no forestry operation last 25 years is one of the criteria for inclusion of the sample

plot as a habitat type. Below, some other examples of negative influences are discussed.

Drainage for forestry: The NFI records the presence of ditches within 25 metres of the plot centre. For forest types on wet soils (e.g. 91D0; refer to the Appendix 1 for habitat type nomenclature), sample plots with functional ditches within this range are excluded and are not classified as a habitat type. For plots located further away from ditches, the exact position of the ditches and their impact on the habitat conditions is not recorded.

However, using a newly developed drainage ditch map developed with machine learning techniques (Laudon et al. 2022), a study by Ågren et al. (2024) identified significant effects of forest ditches on several important variables recorded in the NFI, such as *Sphagnum* moss coverage and tree growth within 100 metres of ditches. These effects are proposed to follow an exponential curve, with the most pronounced impact occurring closest to the ditch. Based on these findings, for forest habitat types and subtypes on wet soils, we propose a conservative 50-metre threshold for classifying sample plots as being in either ‘good’ or ‘not-good’ condition. This can be applied in both NFI and NILS inventories. For identification of the ditches around the sample plots, we used a vectorised version of the map (SEPA 2022).

Non-native species: In NFI, this variable includes a list of non-native tree and shrub species. For deciduous forests surveyed by NILS, a more comprehensive list of non-native species is recorded, including trees, shrubs, and herbaceous plants. Furthermore, it is important to note that while NFI classifies *Larix* species as native, NILS categorises them as non-native.

Ingrowth of Norway spruce: In both NFI and NILS, we propose a threshold of 30% spruce in basal area is used as a negative indicator in wet and alluvial forest habitat types dominated by deciduous tree species, as well as in broad-leaved deciduous forest habitat types.

Other adverse effects: For 9030 monitored by NILS, the proposed indicators include mainly various forms of anthropogenic effects found in coastal areas (e.g. built-up areas, forest harvest, roads and other infrastructure).

Preliminary analyses and guidance from SEPA and SFA

Based on the variables mentioned above, we conducted a preliminary analysis using NFI variables for the more common forest habitat types (9010, 9050). In practice, the criteria for ‘good’ conditions comprised two positive indicators: the presence of dead wood and an uneven-aged stand structure. The presence of non-native species and, for swamp coniferous forests within 9010, drainage ditches within 50 m were used as negative indicators. These indicators served as simple benchmarks for classifying plots as either ‘good’ or ‘not good’.

The findings were presented to SEPA and SFA. Initially, it was discussed whether requiring both positive indicators was too strict, and whether an OR operator should instead be used, so that the presence of at least one positive indicator would indicate ‘good’ condition. However, the outcomes varied markedly depending on

whether both variables were required (AND operator) or only one variable was sufficient (OR operator).

Following discussions on these findings, SEPA and SFA proposed adopting an intermediate approach, i.e. one that combines elements of both approaches (See Figure 1 for illustration). The requests regarding classification criteria, along with additional requests, are listed below (as communicated on 20 December 2024 and 28 April 2025).

1. For majority habitat types, apply two separate sets of criteria: one for classifying conditions as ‘good’ and another for ‘not-good’. All other sample plots are classified as ‘uncertain’.
2. Ensure that total areas are consistent with areas reported in SEPA (2024).
3. For short term trends or areas classified as being in ‘good’ condition, extrapolate trends from larger sample if data is insufficient.

(1) Classification criteria: For majority of habitat types, two distinct sets of criteria are applied for sample-plot classification: one for classifications of ‘good’ conditions and another for ‘not-good’ conditions. The conditions of all other plots are classified as ‘uncertain’ (See the criteria in Table 3).

In the Alpine region, specific criteria are applied for 9010 (See definition in Table 3), due to its extensive area, much of which lies on unproductive forest land, and where restoration is considered a lower priority.

(2) Consistency with SEPA (2024) and application of the results to A17 reporting: The sum of areas classified as ‘good’, ‘not-good’ and ‘unknown’/’uncertain’ must equal the total forest habitat type areas reported by SEPA (2024). NFI statistics (2018-2022, as used in SEPA (2024)) is used for the wide-ranging forest habitat types. NILS statistics (2020–2024) is used for deciduous forest habitat types. If the NFI/NILS sample size is low (< 5 samples), derive the proportions of area in ‘good’ and ‘not good’ directly from the database of protected areas (NNK).

(3) Assessment of short-term trend of areas in ‘good’ conditions: If the data are insufficient to statistically assess trends of the areas in ‘good’ condition, the trends may be extrapolated from a larger sample, or by using expert judgement.

The analytical approach

Criteria for estimation of areas in ‘good’, ‘not-good’, and ‘uncertain’ conditions

According to requests from SEPA and SFA, analyses for most habitat types were conducted using criteria to delineate areas as ‘good’, ‘not-good’, and ‘uncertain’. Sample plots that met the stricter criteria, as described above (AND operator), were classified as ‘good’, while those that failed to meet the less strict requirements (OR operator) were classified as ‘not good’. Plots that did not meet the criteria for either ‘good’ or ‘not-good’ conditions were classified as having ‘uncertain’ conditions.

More specifically, in the NFI, plots classified as being in ‘good’ condition had to meet the following criteria: presence of deadwood (diameter at breast height ≥10 cm) and uneven-aged stand structure, as well as absence of any negative indicators.

On the other hand, the absence of positive indicators, or the presence of negative indicators, such as drainage ditches or non-native species, indicated ‘not-good’ conditions (The criteria are listed in Table 3).

In NILS, the criteria for ‘good’ condition were adapted slightly to include the larger number of variables recorded in the inventory. ‘Good’ condition was defined by the absence of negative indicators, presence of a multilayered canopy structure, and at least one of the following: presence of deadwood in the sample plot (or > 10 m^3 within a larger assessment polygon) or presence of trees of conservation value. Sample plots classified as ‘not-good’ and ‘uncertain’ followed similar logic as above (The criteria are listed Table 4).

For some habitat types, conditions were assessed using only the presence or absence of negative indicators. These included e.g. presence of drainage ditches (91D0), presence of non-native species (9040), or presence of negative anthropogenic indicators (9030) (Table 3 and 4). In the Alpine region, 9010 was treated similarly to 9040 as described above.

Corrections for effects of drainage ditches

It has been noted that the digital drainage map performs rather poorly in northernmost parts of the country, particularly in the Alpine region (SEPA 2022).

Therefore, after completing the analysis with NFI data, we aimed to visually assess the ditch map’s accuracy using GIS tools. This was primarily done for 91D0, where presence of ditches was assessed as only important factor for assessment of habitat conditions. We inspected 50 m-radius circular plots around all georeferenced temporary NFI sample plots classified as 91D0 (2008–2020), using a DEM-derived hillshade to either confirm or reject each mapped ditch around these plots.

During the visual inspections we aimed to estimate the actual proportion of plots affected by ditches by identifying false positives (FP, i.e. a ditch was mapped, but not confirmed by visual check), true positives (TP, i.e. a ditch was mapped, and was confirmed by visual check) and false negatives (FN, i.e. a ditch was not mapped, but was confirmed during visual check). For illustration, see the figure associated with Table 7. We then calculated a correction factor, i.e. estimation of how the digital map of drainage ditches overestimated or underestimated presence of ditches in NFI data.

The correction factor (CF) was then calculated as:

$$CF = \frac{\text{Corrected number of plots with ditches (TP + FN)}}{\text{Number of plots with mapped ditches (TP + FP)}}$$

All sample plots in the Alpine and Continental regions were visually assessed. In the Boreal region, where sample sizes were much larger (n=2615), the correction factor was instead based on 100 randomly selected plots from each category (i.e., plots with and without mapped ditches).

For NILS estimates of 9080, 91E0 and 91F0, the corrections were applied prior to analyses, and the resulting area estimates reflect the presence of ditches more correctly (Åsa Ranlund, pers. comm.)

In the analyses of short-term trends of areas in 'good' condition, uncorrected NFI statistics was used. While the proportions of affected sample plots may not be fully accurate, the estimates were assumed to sufficiently capture the trends over time. Furthermore, no corrections were done for coniferous swamp forests, coded 9007 in NFI (i.e. sub-type of 9010) in the Boreal region, as these represent only a small fraction of total number of samples.

Assessment of short-term trend of areas in 'good' conditions

In this PM, short-term trends for areas in 'good' condition were assessed both for the total area of forest habitat types and for the areas within the Natura 2000 network. The method for assessing short-term trends is described in a separate document (Maňák and Berglund 2025). In addition to habitat type–specific short-term trends, we also analysed short-term trends in areas in 'good' condition for the entire group of broad-leaved forests (i.e. 9110, 9130, 9160, 9190, 9020, 9180), as these habitat types are not commonly represented in the NFI data.

Results

Areas in 'good', 'not-good' and 'uncertain' conditions

NFI

Here, we summarize results for the most wide-ranging habitat types, specifically 9010, 9040, 9050, 9080, and 91D0, which were sufficiently represented in the NFI data.

For 9010, the proportion of the area in 'good' condition was approximately 34% in the Continental region, 59% in the Boreal region and 100% in the Alpine region. The latter figure largely reflects lower criteria for this habitat type in the Alpine region (see Table 3). For 9050, the proportion of areas in 'good' condition ranged from 68% in the Boreal region to 84% in the Alpine region. For both habitat types, the proportion in 'not-good' condition was generally rather low. The exception was 9010 in the Continental region, where 22% of the area was in 'not-good' condition. The proportion in 'uncertain' condition was roughly 15–45% of the area for these two habitat types.

For 9080, the proportion of area in 'good' condition was generally lower and the proportion in 'not-good' condition higher compared to 9010 and 9050.

For 9040, almost the whole area was assessed as being in 'good' condition.

For 91D0, the proportion of the area in 'good' condition varied between 71% in the Continental region, 80% in the Boreal region and 86% in the Alpine region. However, see next sections for the corrections of these estimates.

The results are summarized in Table 5. See also Appendix I - Figures S1–S15.

NILS

For broad-leaved forest habitat types, proportions of areas in ‘good’ conditions ranged between ca. 50% to 100%. However, some estimates were based on relatively few sample plots. The proportion of areas in ‘not-good’ condition was generally low, while the proportion of areas in ‘uncertain’ conditions varied between habitat types.

For 9080, the results were similar to those from NFI, indicating low proportions of areas in ‘good’ condition and high proportions of areas in ‘not-good’ condition. Presence of drainage ditches within 50 m was the most common negative indicator for this habitat type. Furthermore, 91E0 also exhibited higher proportions in ‘not-good’ conditions, mainly due to presence of the negative indicators.

Finally, the analysis of 9030 indicated that around 80% of the estimated area was in ‘good’ condition.

The results are summarized in Table 6.

Corrections for bog woodlands (91D0)

The visual inspection, carried out using GIS tools, revealed both false positives and false negatives in the digital drainage map (SEPA 2022). Correction factors were therefore calculated (See results in Table 7).

For 91D0, the discrepancy was most pronounced in the Alpine region, where the correction factor was 0.24, indicating that the digital drainage map greatly overestimated the presence of ditches near NFI plots. In the Boreal and Continental regions, the correction factors were 0.8 and 1.2, respectively, indicating a slight overestimation of ditch presence in the Boreal region and an underestimation in the Continental region.

Consequently, these effects should be considered when assessing the impact of drainage ditches on habitat condition.

Assessment of short-term trends of areas in ‘good’ condition

Direction in total areas in ‘good’ condition

For 9 of the 30 assessed habitat-type-region combinations, the short-term trend was assessed as ‘stable’, i.e., no significant change was identified during the period 2010–2021 according to NFI statistics (Table 8). An ‘increasing’ trend was assumed for 91D0 in the Boreal region. The increase of areas classified as being in ‘good’ condition correlates with the increasing short-trend trend of the whole area of these habitat types (see Maňák and Berglund 2025). However, for 20 of 30 combinations, the trend was assessed as ‘uncertain’ or ‘unknown’.

Regarding the increase in 91D0 in the Boreal region, it is important to note that NFI estimates likely overestimate the negative effects of ditches in the region (see Table 7). As such, the magnitude of the increase should be interpreted with caution. (See Table 8, Figure S13).

Direction in areas in ‘good’ condition within Natura 2000 network

Short-term trends within Natura 2000 network could be assessed only for the most wide-ranging forest habitat types, e.g. 9010, 9040 and 91D0 (Table 9). For all of these, the trend was assessed as ‘stable’. However, in most cases, it was not possible to assess trends due to insufficient data and high uncertainty in area estimates.

Extrapolation of short-term trends from larger sample.

In line with SEPA’s guidance, and given that broad-leaved forest habitat types (i.e., 9110, 9130, 9160, 9190, 9020, 9180) are under-represented in the NFI (see Maňák and Berglund 2025), we also analysed short-term trends for these habitat types collectively.

When considered collectively, the broad-leaved forest habitat types show a ‘stable’ short-term trend in areas classified as being in ‘good’ condition in both the Boreal and Continental regions (Table 10, Figure S15). In Natura 2000 areas, the short-term trend could be assessed as ‘unknown’ in the Boreal region, but ‘stable’ in the Continental region. For further discussions see Manak and Berglund (2025).

The proposed use of the results in accordance with SEPA’s and SFA’s guidelines

To comply with the instructions and recommendations from SEPA and SFA, a set of rules was applied when proposing the areas in ‘good’, ‘not-good’, and ‘unknown’ condition:

In accordance with the requests, NFI statistics (2018-2022) was used for calculations of habitat types specific for NFI inventory. NILS statistics (2020-2024) was used for deciduous forest habitat types. When the number of samples in either of inventories was too low (<5 samples), information from NNK was used.

Further, similarly to SEPA (2024), best estimates (i.e. no min and max values) were used as indicative values for proportions of areas in ‘good’, ‘not-good’ and ‘uncertain’ conditions. Areas of ‘uncertain’ conditions were treated as ‘unknown’.

If the total area reported in SEPA (2024) exceeded areas recorded in NFI, NILS or NNK inventories, the surplus was classified as being in ‘unknown’ condition. Conversely, where SEPA’s reported total was lower than the inventory figures, the proportions of ‘good’, ‘not-good’ and ‘uncertain’ areas were proportionally adjusted to match SEPA’s total areas (See column ‘Inventory area vs area in SEPA 2024’ in Table 11).

Regarding the correction of the digital drainage map. The results were corrected for 91D0 in the Alpine region, reflecting that approximately 5% of plots are likely to be affected by drainage ditches in the region (Table 7). For the 91D0 in other regions, no correction was done, as it would not affect the overall results.

The results are summarized in Table 11.

Conclusions

This PM focuses mainly on estimations of areas of habitat types classified as being in ‘good’, ‘not-good’ and ‘uncertain’/’unknown’ conditions, respectively.

It is important to note that in many cases, the addition of areas classified as being in ‘unknown’ condition in accordance with SEPA’s and SFA’s guidelines, has led to an increased proportion of areas classified as ‘uncertain’ or ‘unknown’, compared to original NFI/NILS estimates. For some habitat types, this affected the assignment to categories in the evaluation matrix (i.e., favourable, inadequate, or bad) for the assessment of structures and functions.

Finally, ongoing work (Lloret et al. in prep.) aims to provide clearer guidance in the assessments of habitat conditions in the context of Article 17 reporting, which may lead to better harmonization of assessment of habitat conditions among countries in future reporting periods.

Acknowledgements

Earlier drafts and preliminary results were discussed with a reference group consisting of researchers, representatives from County Administrative Boards, NFI and NILS, as well as SEPA and SFA.

Estimates of areas classified as being in ‘good’, ‘not-good’ and ‘uncertain’ conditions were produced by the NFI and NILS. The selection of variables for deciduous forests was adjusted by NILS to include some additional relevant variables. For 9030, the NILS Seashore Inventory proposed the selection of variables.

Figures

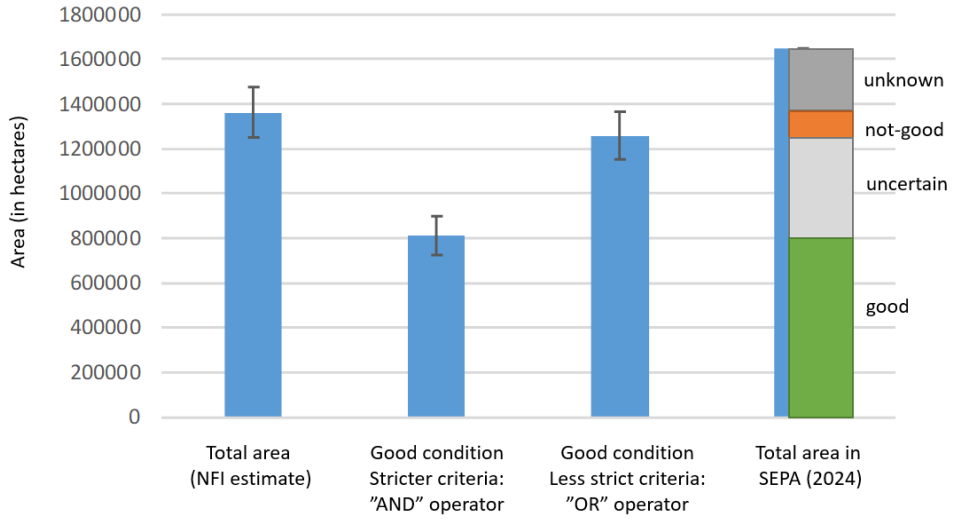

Figure 1. Preliminary results for habitat type 9010 in the Boreal region. NFI-derived estimates of total area and area in good condition under two criteria: stricter (AND = both positive indicators present) and less strict (OR = one positive indicator present). Error bars show 95% confidence intervals. The right-hand bar shows SEPA's (2024) total area of the habitat type (blue bar) and SEPA's approach to delineate areas into categories (bar segments: 'good', 'not-good', 'uncertain' and 'unknown').

Tables

Table 1 Evaluation matrix for assessing the conservation status of structures and functions, based on DG Environment (2022a). Italicized text originates from DG Environment's explanatory notes (2022b).

Favourable ('green')	**Unfavourable – Inadequate ('amber')**	**Unfavourable - Bad ('red')**	***Unknown (insufficient information to make an assessment)***
Structures and functions (including typical species) in good condition and no significant deteriorations / pressures.	Any other combination.	More than 25% of the area is unfavourable as regards its specific structures and functions (including typical species)*	No or insufficient reliable information available
Explanatory notes: *- At least 90 % of the area in good condition.* *- The trend in area in good condition must be stable or increasing* *- The typical species overall should be 'favourable' (not threatened)* *- Fragmentation or other conditions are not impacting significantly on ecological processes*	*Explanatory notes:* *- Less then 25 % of the area is in unfavourable ('not good') condition and; less than 90 % is in 'good' condition; and less than 75 % is in 'unknown' condition.*		*Explanatory notes:* *- More than 75 % of habitat area has 'unknown' condition*

* E.g. by discontinuation of former management, or is under pressure from significant adverse influences, e.g. critical loads of pollution exceeded

Table 2. Proportions of areas of forest habitat types within the Natura 2000 network, classified as 'good (G), 'not-good' (N), and 'unknown' (X), according to the database on formally protected areas (NNK). The database is described in SEPA (2023), and the most recent dataset was provided by Metria. Tentative results on conservation status are derived using the assessment matrix in Table 1.

	ALP G	ALP N	ALP X	Status	BOR G	BOR N	BOR X	Status	CON G	CON N	CON X	Status
9010	1.5	0.5	98.0	X	10.6	5.2	84.2	X	20.8	22.9	56.3	U1
9020					25.0	19.1	55.9	U1	46.8	23.4	29.8	U1
9030					40.6	3.7	55.7	U1				
9040	4.9	0.0	95.1	X								
9050	49.2	0.8	50.0	U1	24.3	16.1	59.7	U1				
9060					8.6	7.3	84.1	X				
9080					11.4	14.3	74.3	U1	32.1	27.8	40.1	U2
9110					55.1	14.5	30.4	U1	39.6	40.8	19.5	U2
9130					29.2	12.1	58.6	U1	39.6	34.4	26.0	U2
9160					15.8	19.1	65.1	U1	22.5	41.0	36.5	U2
9180					36.1	27.1	36.8	U2	25.0	47.3	27.7	U2
9190					38.4	19.7	41.9	U1	32.2	30.9	36.9	U2
9740	0.3	0.0	99.7	X	6.5	4.9	88.6	X	35.8	25.2	39.0	U2
9750	0.0		100.0	X	15.0	13.8	71.2	U1	30.2	46.1	23.7	U2
9760					3.7	10.0	86.3	X	21.0	53.4	25.6	U2
Total	3.4	0.2	96.3	X	10.9	5.6	83.5	X	34.6	35.8	29.5	U2

Table 3. Classification of habitat conditions as 'good', 'not-good' and 'uncertain' in sample plots identified as forest habitat types in the national forest inventory. See text for explanations of variables and criteria. In Table 3a, simplified overview of criteria delineating 'good' and 'not-good' conditions are outlined, and full descriptions of condition categories are given in Table 3b.

a)

Habitat types (regions)	Condition	Dead wood		Uneven-aged stand structure		Non-native species		Drainage ditches <50 m		Spruce >30%
9010, 9040 (ALP)	'Good'					0				
	'Not-good'					1				
91D0 (ALP, BOR, CON)	'Good'							0		
	'Not-good'							1		
9010, 9030, 9050, 9060 (BOR, CON), 9050 (ALP)	'Good'	1	*and*	1	*and*	0	*and*	0*		
	'Not-good'	0	*and*	0	*or*	1	*or*	1*		
91E0, 91F0, 9080 (ALP, BOR, CON)	'Good'	1	*and*	1	*and*	0	*and*	0	*and*	0
	'Not-good'	0	*and*	0	*or*	1	*or*	1	*or*	1
9110, 9130, 9160, 9190, 9020, 9180 (BOR, CON)	'Good'	1	*and*	1	*and*	0			*and*	0
	'Not-good'	0	*and*	0	*or*	1			*or*	1

* only for coniferous swamp forests (sub-type of 9010)

b)

9010, 9040 in ALP region

Not-good	'Non-native species are present'
Good	'Non-native species are absent'

91D0 in ALP, BOR, CON region

Not-good	'Drainage ditches within 50m are present'
Good	'Drainage ditches within 50m are absent'

9010, 9030, 9050, 9060 in BOR and CON regions; 9050 in ALP region

Not-good	('Dead wood is absent' **AND** 'Forest is even-aged') **OR** 'Non-native species are present' **OR** Only for 9007*: 'Drainage ditches within 50m are present'
Uncertain	('Dead wood is present' **OR** 'Forest stand is not even-aged') **AND** 'Non-native species are absent' **AND** Only for 9007: 'Drainage ditches within 50m are absent'
Good	('Dead wood is present' **AND** 'Forest stand is not even-aged') **AND** 'Non-native species are absent' **AND** Only for 9007: 'Drainage ditches within 50m are absent'

* 9007 is NFI's code for coniferous swamp forests, a sub-type of Western taiga (9010)

Table 3 Continued

Alluvial and swamp forests (91E0, 91F0, 9080)

Not-good	('Dead wood is absent' **AND** 'Forest is even-aged') **OR** 'Non-native species are present' **OR** 'Norway spruce comprises >30% of basal area' **OR** 'Drainage ditches within 50m are present'
Uncertain	('Dead wood is present' **OR** 'Forest stand is not even-aged') **AND** 'Non-native species are absent' **AND** 'Norway spruce comprises <30% of basal area' **AND** 'Drainage ditches within 50m are absent'
Good	('Dead wood is present' **AND** 'Forest stand is not even-aged') **AND** 'Non-native species are absent' **AND** 'Norway spruce comprises <30% of basal area' **AND** 'Drainage ditches within 50m are absent'

Broadleaved forests 9110, 9130, 9160, 9190, 9020, 9180

Not-good	('Dead wood is absent' **AND** 'Forest is even-aged') **OR** 'Non-native species are present' **OR** 'Norway spruce comprises >30% of basal area'
Uncertain	('Dead wood is present' **OR** 'Forest stand is not even-aged') **AND** 'Non-native species are absent' **AND** 'Norway spruce comprises <30% of basal area'
Good	('Dead wood is present' **AND** 'Forest stand is not even-aged') **AND** 'Non-native species are absent' **AND** 'Norway spruce comprises <30% of basal area'

Table 4. Criteria used for classifying habitat condition as 'good', 'not-good', and 'uncertain' in sample plots identified as forest habitat types in the National Inventories of Landscapes in Sweden (NILS) for deciduous forests and Seashore inventory (for forest habitat type 9030).

Alluvial and swamp forest habitat types (91E0, 91F0 and 9080)

Not-good	('Dead wood (d≥10 cm) is absent both in sample plot (r=10m) and in the assessment plot (0,1 ha)' **AND** 'Forest stand is not multi-layered' **AND** 'Trees of conservation value are absent') **OR** 'Non-native species are present' **OR** 'Drainage ditches within 50m are present', **OR** ('Forest stand is assessed as conifer of mixed-conifer forest stand, or Norway spruce comprises >30% of basal area in sample plot (r=10m)')
Uncertain	('Dead wood (d≥10 cm) is present in sample plot (r=10m) or in the assessment plot (0,1 ha)' **OR** 'Forest stand is multi-layered (>1 layer)' **OR** 'Trees of conservation value are present in assessment polygon (0,1 ha)') **AND** 'Non-native species are absent' **AND** 'Drainage ditches within 50m are absent' **AND** ('Forest stand is not assessed as conifer of mixed-conifer forest stand, and Norway spruce comprises less than 30% of basal area in sample plot (r=10m)')
Good	('Dead wood (d≥10 cm) is present in sample plot (r=10m) and/or >10m3 of dead wood is present in the assessment plot (0,1 ha)' **OR** 'Trees of conservation value are present in assessment polygon (0,1 ha))' **AND** 'Forest stand is multi-layered (>1 layer)' **AND** 'Non-native species are absent' **AND** 'Drainage ditches within 50m are absent' **AND** 'Forest stand is not assessed as conifer of mixed-conifer forest stand, and Norway spruce comprises <30% of basal area in sample plot (r=10m)'

Broadleaved forest habitat types (9110, 9130, 9160, 9190, 9020, 9180)

Not-good	('Dead wood (d≥10 cm) is absent both in sample plot (r=10m) and in the assessment plot (0,1 ha)' **AND** 'Forest stand is not multi-layered' **AND** 'Trees of conservation value are absent') **OR** 'Non-native species are present' **OR** 'Forest stand is assessed as conifer of mixed-conifer forest stand, or Norway spruce comprises >30% of basal area in sample plot (r=10m)'
Uncertain	('Dead wood (d≥10 cm) is present in sample plot (r=10m) or in the assessment plot (0,1 ha)' **OR** 'Forest stand is multi-layered' **OR** 'Trees of conservation value are present') **AND** 'Non-native species are absent' **AND** 'Forest stand is not assessed as conifer of mixed-conifer forest stand, and Norway spruce comprises less than 30% of basal area in sample plot (r=10m)'
Good	('Dead wood (d≥10 cm) is present in sample plot (r=10m) and/or >10m3 of dead wood is present in the assessment plot (0,1 ha)' **OR** 'Trees of conservation value are present in assessment polygon (0,1 ha))' **AND** 'Forest stand is multi-layered (>1 layer)' **AND** 'Non-native species are absent' **AND** 'Forest stand is not assessed as conifer of mixed-conifer forest stand, and Norway spruce comprises less than 30% of basal area in sample plot (r=10m)'

Table 4 Continued.

9030 (NILS Seashore Inventory)

Not-good	'Presence of negative land use' **OR** '>50% of the transect classified as exploited according to the County Administrative Board's inventory' **OR** 'Thinning for increased visibility is carried out' **OR** 'Non-native species are present' **OR** 'Coniferous portion of the forest is harvested'
Good	Absence of the negative indicators (above)

Table 5. NFI statistics on total number of sample plots and estimated areas classified as being in 'good', 'uncertain', or 'not-good' conditions (in hectares), their associated relative standard error (RSE) in percent, and their relative proportions, for forest habitat types across three biogeographical regions in Sweden. The criteria for defining sample plots as being in 'good' condition are outlined in Table 3. The statistics cover the 5-year period (2018-2022). A dash ('-') indicates that no estimates could be produced using NFI data. Note that for habitat types 9040 and 91D0, RSE was calculated only for the areas classified as being in 'good' condition; those in 'not-good' conditions were derived as the difference between total area and that in 'good condition'.

				Good		Uncertain		Not-Good		Proportions		
Code	Swedish name	Region	Nr. of plots	Area (ha)	RSE (%)	Area (ha)	RSE (%)	Area (ha)	RSE (%)	G	U	N
9010	taiga	ALP	627	770 349	7,7	-	-	0	0	1,00	-	0,00
9010	taiga	BOR	1600	845 470	5,5	507 154	6,0	90 629	10,6	0,59	0,35	0,06
9010	taiga	CON	8	1 035	100,0	1 379	62,0	672	72,5	0,34	0,45	0,22
9020	nordlig ädellövskog	BOR	6	1 430	63,1	645	73,1	165	100,0	0,64	0,29	0,07
9020	nordlig ädellövskog	CON	3	0	0,0	567	71,7	150	100,0	0,00	0,79	0,21
9030	landhöjningsskog	BOR	7	1 382	100,0	1 957	100,0	2 320	64,2	0,24	0,35	0,41
9040	fjällbjörkskog	ALP	979	1 326 189	6,7	-	-	2 268	na	1,00	-	0,00
9050	näringsrik granskog	ALP	83	81 316	18,5	13 148	30,9	2 846	58,7	0,84	0,14	0,03
9050	näringsrik granskog	BOR	81	57 459	16,9	25 548	24,1	1 307	72,0	0,68	0,30	0,02
9060	åsbarrskog	BOR	2	1 652	100,0	0	0,0	683	100,0	0,71	0,00	0,29
9080	lövsumpskog	BOR	31	4 673	40,0	7 412	28,5	4 374	38,1	0,28	0,45	0,27
9080	lövsumpskog	CON	18	728	72,0	3 337	39,7	3 643	35,9	0,09	0,43	0,47
9110	näringsfattig bokskog	BOR	3	668	100,0	1 159	100,0	0	0,0	0,37	0,63	0,00
9110	näringsfattig bokskog	CON	3	0	0,0	1 460	61,2	0	0,0	0,00	1,00	0,00
9130	näringsrik bokskog	BOR	1	0	0,0	0	0,0	218	100,0	0,00	0,00	1,00
9130	näringsrik bokskog	CON	4	406	100,0	1 008	72,0	634	100,0	0,20	0,49	0,31
9160	näringsrik ekskog	BOR	21	3 786	40,9	6 328	30,1	1 998	57,8	0,31	0,52	0,16
9160	näringsrik ekskog	CON	6	1 586	58,7	1 938	57,8	0	0,0	0,45	0,55	0,00
9180	ädellöv i branter	BOR	1	0	0,0	564	100,0	0	0,0	0,00	1,00	0,00
9180	ädellöv i branter	CON	0	-	-	-	-	-	-	-	-	-
9190	näringsfattig ekskog	BOR	5	2 076	57,8	509	100,0	547	100,0	0,66	0,16	0,17
9190	näringsfattig ekskog	CON	1			450	100,0	0	0,0	0,00	1,00	0,00
91D0	skogsbevuxen myr	ALP	176	162 048	12,6	-	-	26 357	na	0,86	-	0,14
91D0	skogsbevuxen myr	BOR	2516	1 582 225	3,1	-	-	399 103	na	0,80	-	0,20
91D0	skogsbevuxen myr	CON	44	15 594	22,7	-	-	6 271	na	0,71	-	0,29
91E0	svämlövskog	ALP	0	-	-	-	-	-	-	-	-	-
91E0	svämlövskog	BOR	10	1 017	58,6	1 343	78,9	1 299	54,5	0,28	0,37	0,35
91E0	svämlövskog	CON	3	0	0,0	479	100,0	1 177	70,8	0,00	0,29	0,71
91F0	svämädellövskog	BOR	0	-	-	-	-	-	-	-	-	-
91F0	svämädellövskog	CON	0	-	-	-	-	-	-	-	-	-

Table 6. NILS statistics on total number of sample plots and the estimated areas classified as being in 'good', 'uncertain', or 'not-good' conditions (in hectares), their associated relative standard error (RSE) in percent, and their relative proportions, for forest habitat types across three biogeographical regions in Sweden. The criteria for defining sample plots as being in 'good' condition are outlined in Table 4. The statistics cover the 5-year period (2020-2024). A dash ('-') indicates that no estimates were produced using NILS data.

				Good		Uncertain		Not-Good		Proportions		
Code	Swedish name	Region	Nr. of plots	Area (ha)	RSE (%)	Area (ha)	RSE (%)	Area (ha)	RSE (%)	G	U	N
9020	nordlig ädellövskog	BOR	44	3 358	29,8	542	77,1	65	78,2	0,85	0,14	0,02
9020	nordlig ädellövskog	CON	13	638	62,6	0	0,0	655	73,1	0,49	0,00	0,51
9030	landhöjningsskog	BOR	96	11 111	18,5	-	-	2 942	24,3	0,79	-	0,21
9080	lövsumpskog	BOR	93	6 371	27,1	1 166	42,0	21 460	34,8	0,22	0,04	0,74
9080	lövsumpskog	CON	22	344	56,9	98	70,6	2 303	43,3	0,13	0,04	0,84
9110	näringsfattig bokskog	BOR	25	2 615	51,0	629	98,2	55	87,8	0,79	0,19	0,02
9110	näringsfattig bokskog	CON	11	481	74,5	520	60,3	27	99,9	0,47	0,51	0,03
9130	näringsrik bokskog	BOR	1	47	99,7	0	0,0	0	0,0	1,00	0,00	0,00
9130	näringsrik bokskog	CON	18	1 685	53,2	15	100,0	241	99,9	0,87	0,01	0,12
9160	näringsrik ekskog	BOR	53	3 105	29,3	2 482	43,4	70	74,2	0,55	0,44	0,01
9160	näringsrik ekskog	CON	12	859	62,3	0	0,0	51	73,9	0,94	0,00	0,06
9180	ädellöv i branter	BOR	17	907	78,7	0	0,0	1	99,9	1,00	0,00	0,00
9180	ädellöv i branter	CON	4	20	71,7	127	99,7	12	100,0	0,13	0,80	0,07
9190	näringsfattig ekskog	BOR	21	2 537	35,6	518	62,6	53	100,2	0,82	0,17	0,02
9190	näringsfattig ekskog	CON	2	69	84,3	0	0,0	0	0,0	1,00	0,00	0,00
91E0	svämlövskog	ALP	0	-	-	-	-	-	-	-	-	-
91E0	svämlövskog	BOR	24	2 768	42,0	174	100,2	2 570	48,6	0,50	0,03	0,47
91E0	svämlövskog	CON	7	66	100,2	0	0,0	2 794	94,9	0,02	0,00	0,98
91F0	svämädellövskog	BOR	2	79	100,0	23	100,0	0	0,0	0,77	0,23	0,00
91F0	svämädellövskog	CON	0	-	-	-	-	-	-	-	-	-

Table 7 and associated figure. Correction factors for the effects of drainage ditches on Bog woodlands (91D0). The calculations are based on GIS-based visual inspection of temporary NFI plots classified as 91D0 from the period 2008–2020, complemented by a hillshade map derived from a digital elevation model (DEM), to differentiate between the presence or absence of ditches within a 50-metre radius around the plots. Note that in the Boreal region, the correction is based on randomly selected 100 sample plots for each category (i.e., plots with and without mapped ditches). Figure a) illustrates true positive (TP) i.e. the 50 m buffer around a sample plot correctly coincides with a mapped ditch (orange lines). Figure b) illustrates a false positive (FP), i.e. the 50 m buffer overlaps likely a natural watercourse, not a drainage ditch.

ID	Region	Mapped ditches				Visual assessment of ditches (<50m)			Applying correction factor (CF)	
		Total nr. of plots (N)	Plots with mapped ditch (<50m)	Plots with no mapped ditch	Proportion of plots with ditches (<50m)	False positives (FP)	False negatives (FN)	True positives (TP)	Corrected number of plots with ditch (TP+FN)	**CF = (TP+FN) / (TP+FP)**
91D0	ALP	174	33	141	19%	26	1	7	8	**0,24**
91D0	BOR*	2615	522	2093	20%	≈ 125*	≈ 21*	≈ 397*	418*	**0,80***
91D0	CON	34	10	24	29%	1	3	9	12	**1,2**

* In the BOR region, 24 % of sampled plots were false positives (ditch mapped but not observed), and 1 % were false negatives (ditch observed but not mapped), based on 100 randomly selected plots in each category.

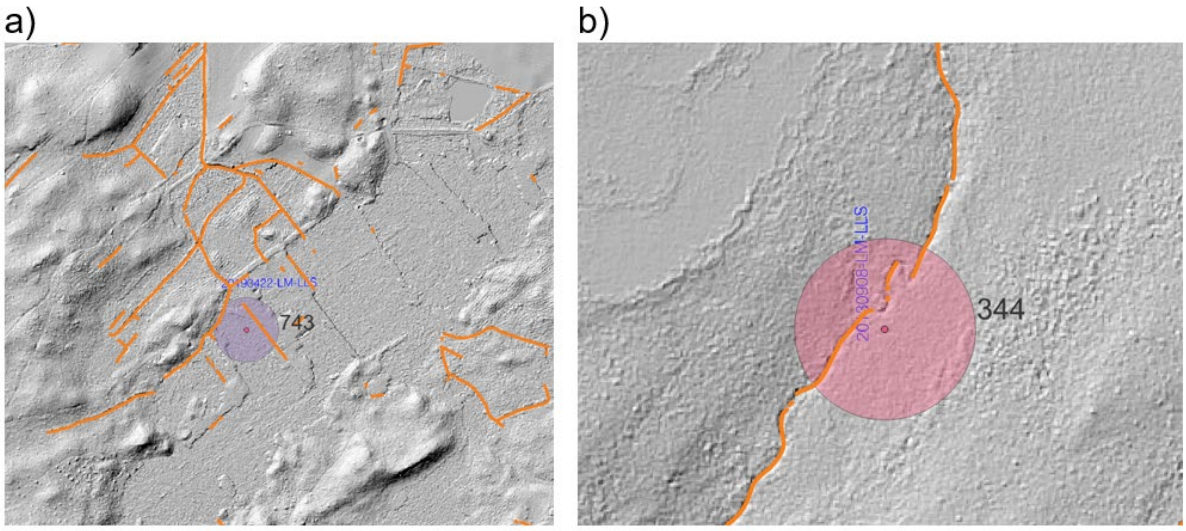

Table 8. Assessment of short-term trends for the total areas (in hectares) of forest habitat types classified as being in 'good' condition across the three biogeographical regions in Sweden. The assessment is based on a comparison of NFI estimates of areas in 'good' condition from two 5-year periods with mid years 2010 and 2021, or alternatively, two area estimates at least 10 years apart from each other (see Appendix I, Figures S1–S15). The criteria for habitat condition classification are outlined in Table 3.

ID	Swedish name	Region	Year_1	Year_2	$Area_{Year1}$	$Area_{Year2}$	RSE_{Year1}	RSE_{Year2}	Difference in area (±CI95%)	Direction	Method used
9010	Taiga	ALP	2010	2021	735 630	758 441	8,2	7,9	22 812 (-143 504, 189 128)	stable	a
9010	Taiga	BOR	2010	2021	847 878	876 289	6,1	5,3	28 411 (-107 736, 164 558)	stable	a
9010	Taiga	CON	2010	2021	916	1 035	70,9	100,0	119 (-2 277, 2 515)	uncertain	b
9020	Nordlig ädellövskog	BOR	2010	2021	2 449	1 250	52	70,7	-1 199 (-4 225, 1 826)	uncertain	b
9020	Nordlig ädellövskog	CON	2010	2019	464	399	100	100	-65 (-1 264, 1 134)	uncertain	b
9030	Landhöjningsskog	BOR	2010	2021	1907	1382	71,2	100,0	-525 (-4 322, 3 271)	uncertain	b
9040*	Fjällbjörkskog	ALP	2010	2021	260 837	213 013	10,5	11,4	-47 824 (-119 695, 24 046)	stable	b
9050	Näringsrik granskog	ALP	2010	2021	50 059	79 388	21,7	19,0	29 329 (-7 118, 65 775)	stable	a
9050	Näringsrik granskog	BOR	2010	2021	44 914	68 002	23,6	15,6	23 088 (-6 322, 52 498)	stable	a
9060	Åsbarrskog	BOR	2010	2021	2 385	1 652	78,4	100,0	-732 (-5 623, 4 158)	uncertain	b
9080	Lövsumpskog	BOR	2010	2021	5768	4 673	40,5	40,0	-1 095 (-6 955, 4 765)	stable	b
9080	Lövsumpskog	CON	2012	2021	601	728	100,0	72,0	126 (-1 437, 1 689)	uncertain	b
9110	Näringsfattig bokskog	BOR	2018	2021	668	668	100,0	100,0	-	unknown	d
9110	Näringsfattig bokskog	CON	-	-	-	-	-	-	-	unknown	d
9130	Näringsrik bokskog	BOR	-	-	-	-	-	-	-	unknown	d
9130	Näringsrik bokskog	CON	2010	2021	733	1 022	76,4	72,2	289 (-1 526, 2 104)	uncertain	b
9160	Näringsrik ekskog	BOR	2010	2021	2 137	4 896	57,5	35,6	2 759 (-1 420, 6 938)	stable	b
9160	Näringsrik ekskog	CON	2011	2021	659	2 246	100,0	50,8	1 586 (-997, 4 169)	uncertain	b
9180	Ädellövskog i branter	BOR	2010	2021	1 784	759	70,7	69,0	-1 025 (-3 703, 1 652)	uncertain	b
9180	Ädellövskog i branter	CON	2010	2016	852	349	100,0	100,0	-	unknown	d
9190	Näringsfattig ekskog	BOR	2010	2021	1 342	2 840	73,7	50,1	1 498 (-1 897, 4 893)	uncertain	b
9190	Näringsfattig ekskog	CON	-	-	-	-	-	-	-	unknown	d
91D0	Skogsbevuxen myr	ALP	2010	2021	142 211	150 378	12,6	12,6	8 167 (-42 931, 59 265)	stable	a
91D0	Skogsbevuxen myr	BOR	2010	2021	1 412 308	1 628 470	3,4	3,1	**216 162 (79 933, 352 391)**	**increasing**	a
91D0	Skogsbevuxen myr	CON	2010	2021	8 855	13 429	25,3	22,1	4 574 (-2 724, 11 871)	stable	b
91E0	Svämlövskog	ALP	-	-	-	-	-	-	-	unknown	d
91E0	Svämlövskog	BOR	2010	2021	684	1 017	74,6	58,6	333 (-1 205, 1 870)	uncertain	b
91E0	Svämlövskog	CON	-	-	-	-	-	-	-	unknown	d
91F0	Svämädellövskog	BOR	-	-	-	-	-	-	-	unknown	d
91F0	Svämädellövskog	CON	-	-	-	-	-	-	-	unknown	d

* For habitat type 9040, as no independent estimates for its entire area are available yet, the short-term trend for habitat in good condition is assessed based on estimates from a limited area below the mountain range.

Table 9. Assessment of short-term trends for the areas within Natura 2000 network (in hectares) of forest habitat types classified as 'good' condition across the three biogeographical regions in Sweden. The assessment is based on a comparison of NFI estimates of areas classified as being in 'good' condition from two 5-year periods with mid years 2010 and 2021, or alternatively, two area estimates at least 10 years apart from each other (see Appendix I, Figures S1–S15). The criteria for habitat quality assessment are outlined in Table 3.

ID	Swedish name	Region	Year_1	Year_2	$Area_{Year1}$	$Area_{Year2}$	RSE_{Year1}	RSE_{Year2}	Difference in area (±CI95%)	Direction	Method used
9010	Taiga	ALP	2010	2021	397 940	447 740	11,4	11,1	49 800 (-82 026, 181 626)	stable	a
9010	Taiga	BOR	2010	2021	93 792	96 976	16,6	15,0	3 184 (-38 588, 44 956)	stable	a
9010	Taiga	CON	-	-	-	-	-	-	-	unknown	d
9020	Nordlig ädellövskog	BOR	-	-	-	-	-	-	-	unknown	d
9020	Nordlig ädellövskog	CON	2011	2019	720	399	100,0	100,0	-	unknown	d
9030	Landhöjningsskog	BOR	2014	2018	754	754	100,0	100,0	-	unknown	d
9040*	Fjällbjörkskog	ALP	2010	2021	131 230	115 484	15,0	16,2	-15 746 (-69 021, 37 529)	stable*	b
9050	Näringsrik granskog	ALP	2010	2021	21 872	26 191	37,3	36,3	4 319 (-20 242, 28 880)	stable	b
9050	Näringsrik granskog	BOR	2010	2021	8 125	13 792	67,4	42,7	5 667 (-10 088, 21 423)	uncertain	b
9060	Åsbarrskog	BOR	-	-	-	-	-	-	-	unknown	d
9080	Lövsumpskog	BOR	2019	2021	736	736	100	100,0		unknown	d
9080	Lövsumpskog	CON	-	-	-	-	-	-	-	unknown	d
9110	Näringsfattig bokskog	BOR	-	-	-	-	-	-	-	unknown	d
9110	Näringsfattig bokskog	CON	-	-	-	-	-	-	-	unknown	d
9130	Näringsrik bokskog	BOR	-	-	-	-	-	-	-	unknown	d
9130	Näringsrik bokskog	CON	2011	2015	453	453	100,0	100,0	-	unknown	d
9160	Näringsrik ekskog	BOR	2017	2021	715	1 427	100,0	70,7		unknown	d
9160	Näringsrik ekskog	CON	2011	2021	659	1 326	100,0	70,7	667 (-1 580, 2 914)	uncertain	b
9180	Ädellövskog i branter	BOR	-	-					-	unknown	d
9180	Ädellövskog i branter	CON	2012	2016	349	349	100,0	100,0	-	unknown	d
9190	Näringsfattig ekskog	BOR	2018	2021	668	668	100,0	100,0	-	unknown	d
9190	Näringsfattig ekskog	CON	-	-	-	-	-	-	-	unknown	d
91D0	Skogsbevuxen myr	ALP	2010	2021	64 016	82 124	21,6	19,2	18 108 (-22 918, 59 134)	stable	a
91D0	Skogsbevuxen myr	BOR	2010	2021	62 125	78 265	15,8	14,9	16 140 (-13 741, 46 021)	stable	a
91D0	Skogsbevuxen myr	CON	2010	2021	1 275	80	71,9	100,0	-1 196 (-2 999, 608)	uncertain	b
91E0	Svämlövskog	ALP	-	-	-	-	-	-	-	unknown	d
91E0	Svämlövskog	BOR	2018	2021	381	381	100,0	100,0	-	unknown	d
91E0	Svämlövskog	CON	-	-	-	-	-	-	-	unknown	d
91F0	Svämädellövskog	BOR	-	-	-	-	-	-	-	unknown	d
91F0	Svämädellövskog	CON	-	-	-	-	-	-	-	unknown	d

* For habitat type 9040, as no independent estimates for its entire area are available yet, the short-term trend for habitat in 'good' condition is assessed based on estimates from a limited area below the mountain range.

Table 10. Assessment of short-term trends for the areas classified as being in 'good' conditions for broad-leaved deciduous forest habitat types as a group (9110, 9130, 9160, 9190, 9020, 9180) both for total areas and areas in Natura 2000 network.

	Region	Year 1	Year2	$Area_{Year1}$	$Area_{Year2}$	RSE_{Year1}	RSE_{Year2}	Difference in area (± CI 95%)	Direction	Method used
Total areas										
	BOR	2010	2021	7 713	9 654	30,8	25,8	1 941 (-4 809, 8 691)	stable	c
	CON	2010	2021	2 290	3 717	50,0	38,4	1 428 (-2 156, 5 011)	stable	c
N2000 areas										
	BOR	2017	2021	715	2 095	100,0	57,8	-	unknown	c
	CON	2011	2021	2 904	1 776	52,3	58,1	-1 128 (-4 728, 2 472)	stable	c

Table 11. Proposed estimated proportions of areas in 'good', 'not good', and 'unknown' condition (marked as G, N, U), in accordance with the requests from SEPA and SFA (see Methods section). Note that the areas are presented in km² according to reporting format. For a habitat type to be classified as Favourable (FV, green), at least 90% of the area must be in 'good' condition. If more than 25% of the area is classified as in 'not-good' condition, the status is considered Unfavourable-Bad (U2, red). If the proportion of 'unknown' condition exceeds 75%, the status is assigned as Unknown (X, grey). All other combinations result in an Unfavourable-Inadequate status (U1, yellow).

ID	Swedish name	Region	Data source	Total area in SEPA 2024	Inventory area vs area in SEPA 2024	Good	Not-Good	Uncertain (or unknown in NNK)	Unknown	G	N	U
9010	taiga	ALP	NFI	8904	<	7 703,49	0,00	0,00	1 200,51	0,87	0,00	0,13
9010	taiga	BOR	NFI	16481	<	8 454,70	906,29	5 071,54	2 048,47	0,51	0,05	0,43
9010	taiga	CON	NFI	46	<	10,35	6,72	13,79	15,14	0,23	0,15	0,63
9020	nordlig ädellövskog	BOR	NILS	111	<	33,58	0,65	5,42	71,35	0,30	0,01	0,69
9020	nordlig ädellövskog	CON	NILS	20	<	6,38	6,55	0,00	7,07	0,32	0,33	0,35
9030	landhöjningsskog	BOR	NILS	170	<	111,11	29,42	0,00	29,47	0,65	0,17	0,17
9040	fjällbjörkskog	ALP	NFI	13921	<	13 261,89	22,68	0,00	636,43	0,95	0,00	0,05
9050	näringsrik granskog	ALP	NFI	1055	<	813,16	28,46	131,48	81,89	0,77	0,03	0,20
9050	näringsrik granskog	BOR	NFI	945	<	574,59	13,07	255,48	101,86	0,61	0,01	0,38
9060	åsbarrskog	BOR	NNK	60	<	3,31	2,82	32,41	21,46	0,06	0,05	0,90
9080	lövsumpskog	BOR	NILS	211	>	46,36	156,16	8,49	0,00	0,22	0,74	0,04
9080	lövsumpskog	CON	NILS	75	<	3,44	23,03	0,98	47,55	0,05	0,31	0,65
9110	näringsfattig bokskog	BOR	NILS	47	<	26,15	0,55	6,29	14,01	0,56	0,01	0,43
9110	näringsfattig bokskog	CON	NILS	58	<	4,81	0,27	5,20	47,72	0,08	0,00	0,91
9130	näringsrik bokskog	BOR	NNK	9	<	1,25	0,52	2,50	4,73	0,14	0,06	0,80
9130	näringsrik bokskog	CON	NILS	44	<	16,85	2,41	0,15	24,59	0,38	0,05	0,56
9160	näringsrik ekskog	BOR	NILS	113	<	31,05	0,70	24,82	56,44	0,27	0,01	0,72
9160	näringsrik ekskog	CON	NILS	32	<	8,59	0,00	0,51	22,90	0,27	0,00	0,73
9180	ädellöv i branter	BOR	NILS	20	<	9,07	0,01	0,00	10,92	0,45	0,00	0,55
9180	ädellöv i branter	CON	NNK	1,4	>	0,35	0,66	0,39	0,00	0,25	0,47	0,28
9190	näringsfattig ekskog	BOR	NILS	40	<	25,37	0,53	5,18	8,93	0,63	0,01	0,35
9190	näringsfattig ekskog	CON	NNK	24	<	4,63	4,43	5,29	9,65	0,19	0,18	0,62
91D0*	skogsbevuxen myr	ALP	NFI	1856	>*	1 763,20	92,80	0,00	0,00	0,95	0,05	0,00
91D0	skogsbevuxen myr	BOR	NFI	20319	<	15 822,25	3 991,03	0,00	505,72	0,78	0,20	0,02
91D0	skogsbevuxen myr	CON	NFI	212	>	151,20	60,80	0,00	0,00	0,71	0,29	0,00
91E0	svämlövskog	ALP	NNK	10	>	0,00	0,00	10,00	0,00	0,00	0,00	1,00
91E0	svämlövskog	BOR	NILS	40	>	20,09	18,65	1,26	0,00	0,50	0,47	0,03
91E0	svämlövskog	CON	NILS	10	>	0,23	9,77	0,00	0,00	0,02	0,98	0,00
91F0	svämädellövskog	BOR	NNK	8	<	0,03	0,09	0,78	7,10	0,00	0,01	0,98
91F0	svämädellövskog	CON	NNK	0,4	>	0,08	0,21	0,10	0,00	0,21	0,53	0,26

*Note: For habitat 91D0 in ALP region, we applied a correction (derived from visual inspection of the drainage ditch map) indicating that roughly 5 % of the area is likely affected by drainage ditches.

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Appendix I - Supplementary figures

9010: Western taiga

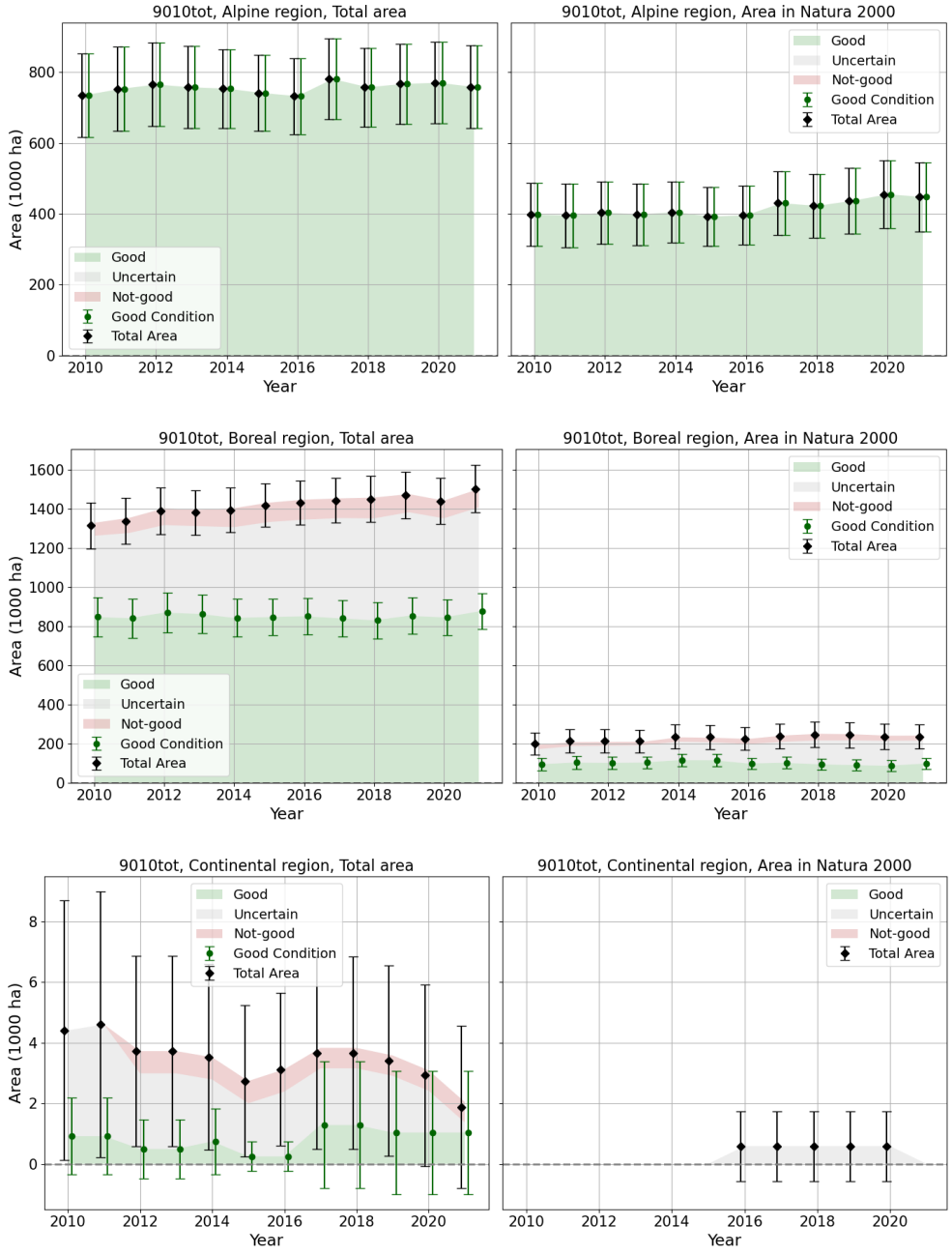

Figure S1. National forest inventory area estimates (in thousand hectares) for habitat type 9010: Western taiga. The figure shows total areas (black dots) and areas classified as being in 'good' condition (green dots), based on the specifications used in this study. 5-year moving averages with 95% confidence intervals for the period 2010-2021. Total area (left) and area within N2000 (right) in the Alpine, Boreal and Continental regions. In each panel, the coloured shading (green, grey and red) denotes the proportions classified as 'good', 'uncertain' and 'not-good' conditions, respectively.

9020: Fennoscandian hemiboreal natural old broad-leaved deciduous (*Quercus*, *Tilia*, *Acer*, *Fraxinus* or *Ulmus*) forests rich in epiphytes

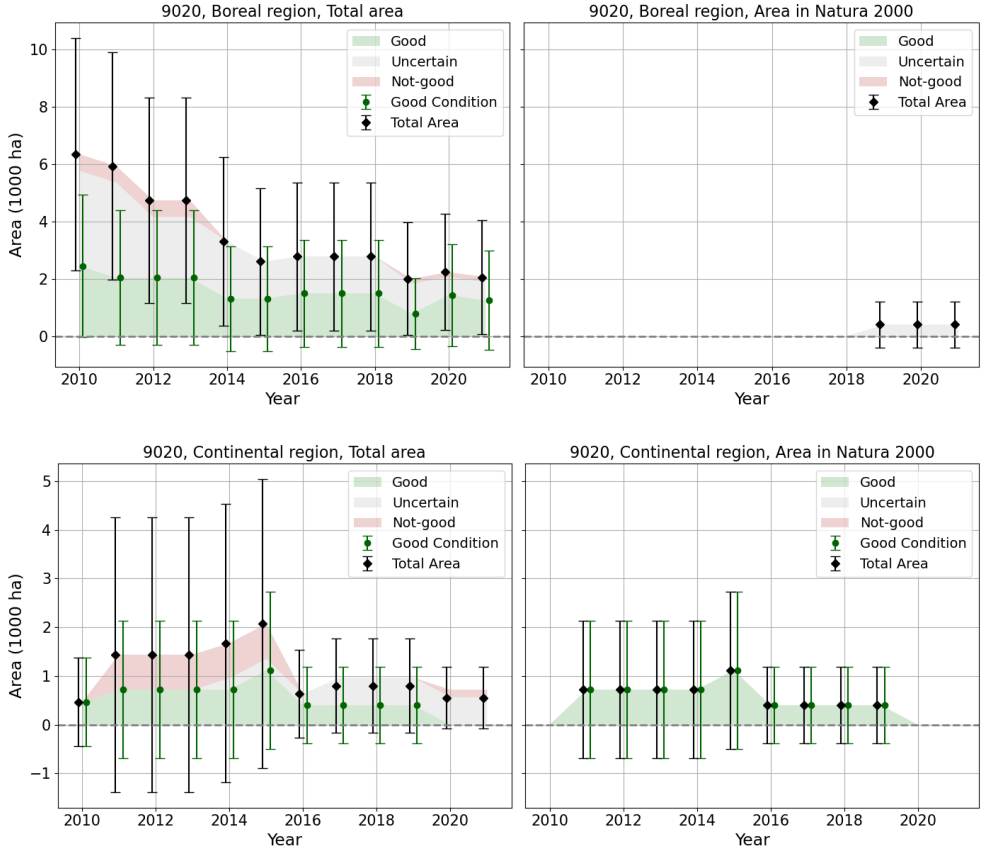

Figure S 2. National forest inventory area estimates (in thousand hectares) for habitat type 9020: Fennoscandian hemiboreal natural old broad-leaved deciduous (Quercus, Tilia, Acer, Fraxinus or Ulmus) forests rich in epiphytes. The figure shows total areas (black dots) and areas classified as being in 'good' condition (green dots), based on the specifications used in this study. It shows 5-year moving averages with 95% confidence intervals for the period 2010-2021. Total area (left) and area within N2000 (right) in the Boreal and Continental regions. In each panel, the coloured shading (green, grey and red) denotes the proportions classified as 'good', 'uncertain' and 'not-good' conditions, respectively.

9030: Natural forests of primary succession stages of landupheaval coast

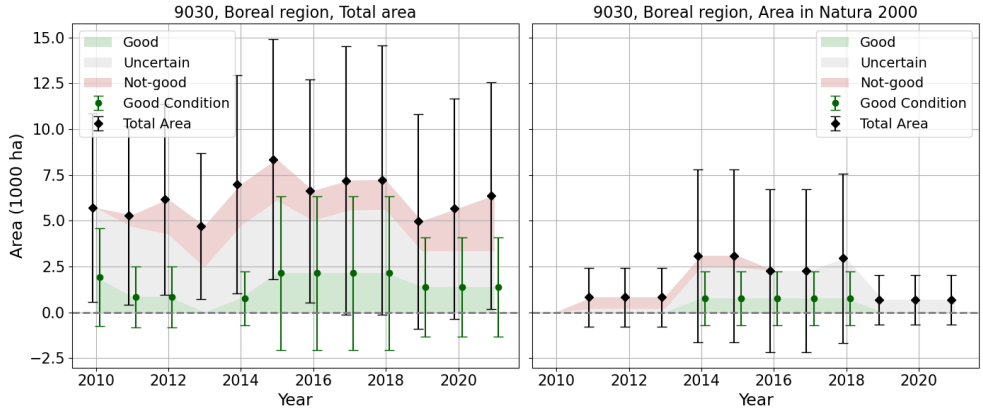

Figure S3. National forest inventory area estimates (in thousand hectares) for habitat type 9030: Natural forests of primary succession stages of landupheaval coast. The figure shows total areas (black dots) and areas classified as being in 'good' condition (green dots), based on the specifications used in this study. It shows 5-year moving averages with 95% confidence intervals for the period 2010-2021. Total area (left) and area within N2000 (right) in the Boreal region. In each panel, the coloured shading (green, grey and red) denotes the proportions classified as 'good', 'uncertain' and 'not-good condition', respectively.

9040: Nordic subalpine/subarctic forests with *Betula pubescens* ssp. *czerepanovii*

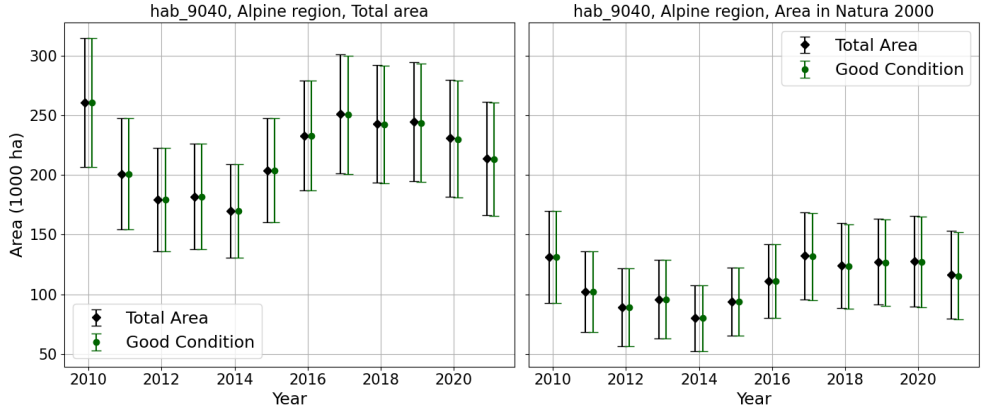

Figure S4. National forest inventory area estimates (in thousand hectares) for habitat type 9040: Nordic subalpine/subarctic forests with Betula pubescens ssp. czerepanovii. The figure shows total areas (black dots) and areas classified as 'good' condition (green dots), based on the specifications used in this study. It shows 5-year moving averages with 95% confidence intervals for the period 2010-2021. Total area (left) and area within N2000 (right) in the Alpine region. The short-term trend is assessed by comparing the mean and 95% confidence intervals of the first and last years in the time series. Note tthat the time series data are for 9040 habitat type situated below the mountain range.

9050: Fennoscandian herb-rich forests with *Picea abies*

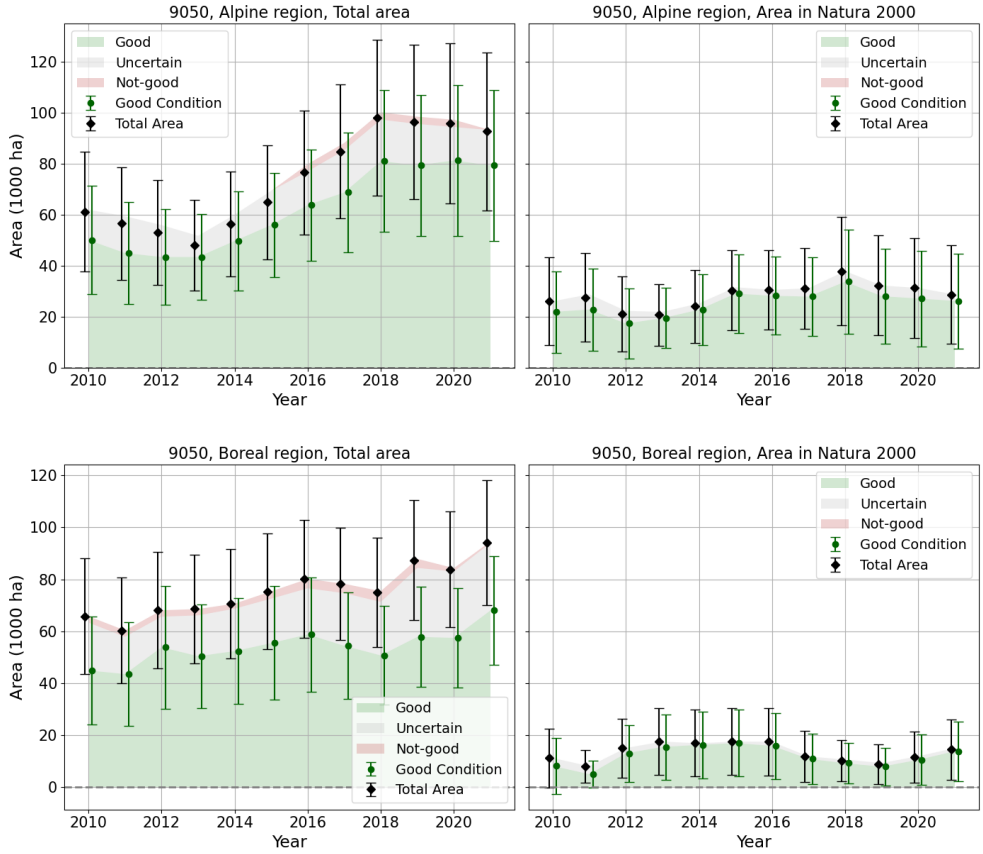

Figure S5. National forest inventory area estimates (in thousand hectares) for habitat type 9050: Fennoscandian herb-rich forests with Picea abies. The figure shows total areas (black dots) and areas classified as being in 'good' condition (green dots), based on the specifications used in this study. It shows 5-year moving averages with 95% confidence intervals for the period 2010-2021. Total area (left) and area within N2000 (right) in the Alpine and Boreal regions. In each panel, the coloured shading (green, grey and red) denotes the proportions classified as 'good', 'uncertain' and 'not-good' conditions, respectively.

9060: Coniferous forests on, or connected to, glaciofluvial eskers

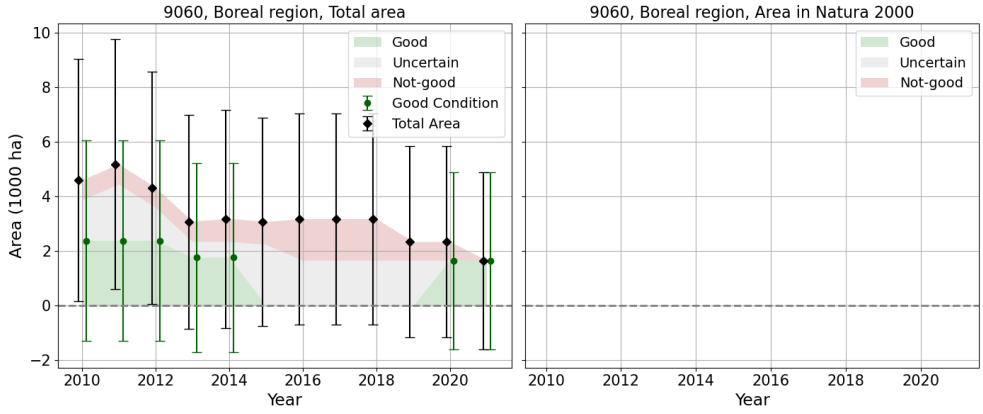

Figure S6. National forest inventory area estimates (in thousand hectares) for habitat type 9060: Coniferous forests on, or connected to, glaciofluvial eskers. The figure shows total areas (black dots) and areas classified as being in 'good' condition (green dots), based on the specifications used in this study. It shows 5-year moving averages with 95% confidence intervals for the period 2010-2021. Total area (left) and area within N2000 (right) in the Boreal region. In each panel, the coloured shading (green, grey and red) denotes the proportions classified as 'good', 'uncertain' and 'not-good' conditions, respectively. No NFI estimates were available for N2000 areas.

9080: Fennoscandian deciduous swamp woods

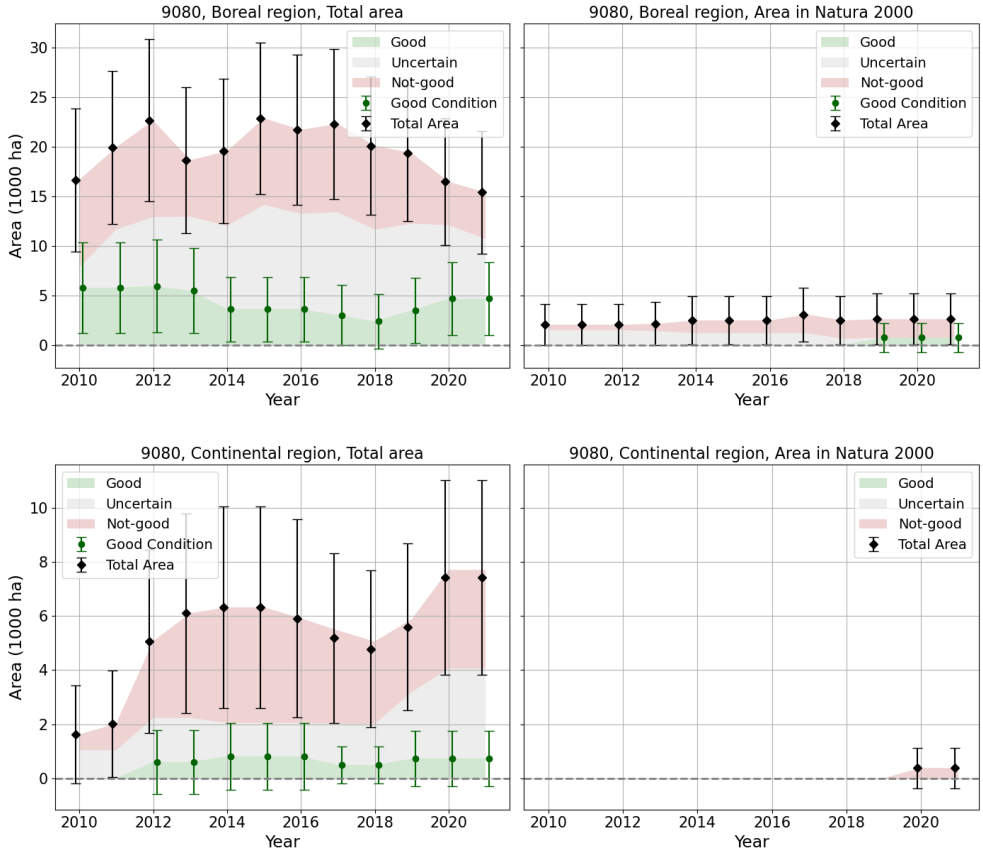

Figure S7. National forest inventory area estimates (in thousand hectares) for habitat type 9080: Fennoscandian deciduous swamp woods. The figure shows total areas (black dots) and areas classified as being in 'good' condition (green dots), based on the specifications used in this study. It shows 5-year moving averages with 95% confidence intervals for the period 2010-2021. Total area (left) and area within N2000 (right) in the Boreal and Continental regions. In each panel, the coloured shading (green, grey and red) denotes the proportions classified as 'good', 'uncertain' and 'not-good' conditions, respectively.

9110: *Luzulo-Fagetum* beech forests

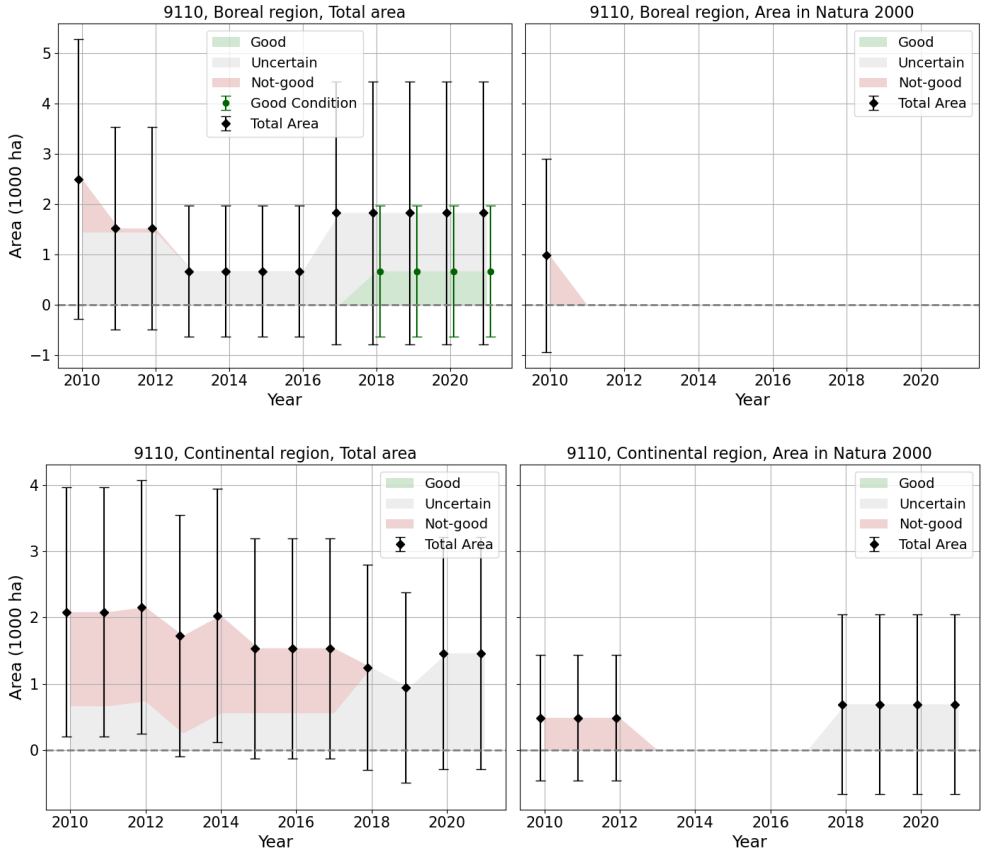

Figure S 8. National forest inventory area estimates (in thousand hectares) for habitat type 9110: Luzulo-Fagetum beech forests. The figure shows total areas (black dots) and areas classified as being in 'good' condition (green dots), based on the specifications used in this study. It shows 5-year moving averages with 95% confidence intervals for the period 2010-2021. Total area (left) and area within N2000 (right) in the Boreal and Continental regions. In each panel, the coloured shading (green, grey and red) denotes the proportions classified as 'good', 'uncertain' and 'not-good' conditions, respectively.

9130: *Asperulo-Fagetum* beech forests

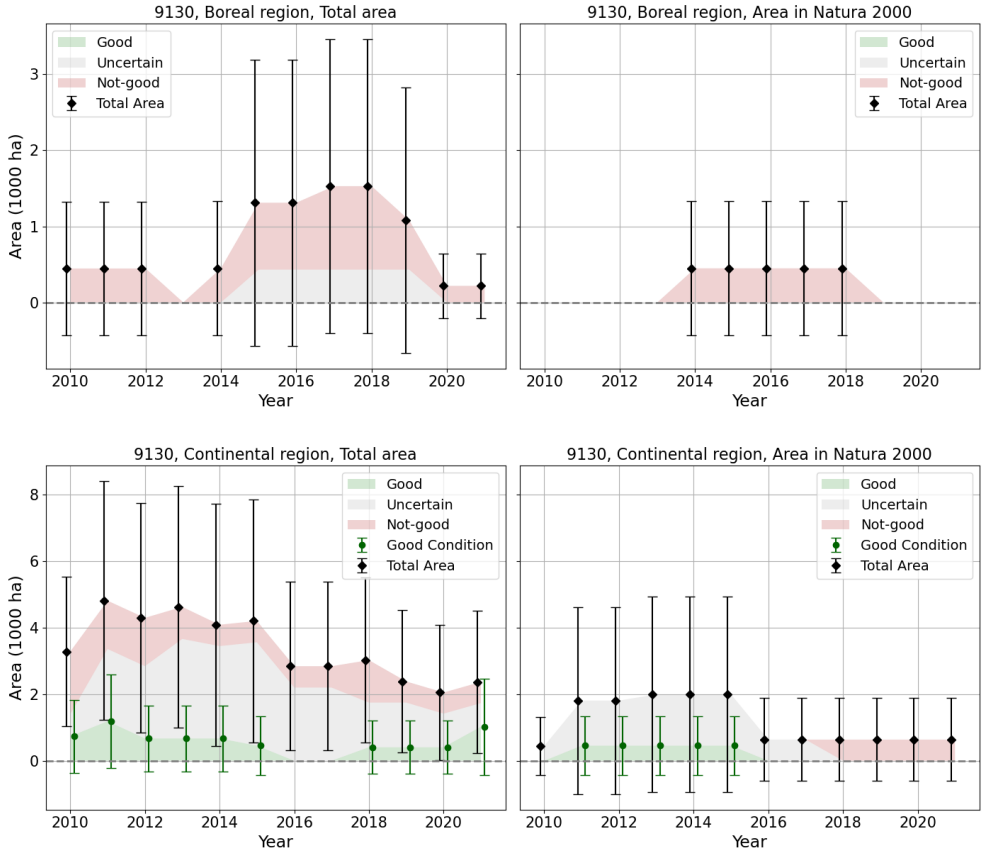

Figure S 9. National forest inventory area estimates (in thousand hectares) for habitat type 9130: Asperulo-Fagetum beech forests. The figure shows total areas (black dots) and areas classified as being in 'good' condition (green dots), based on the specifications used in this study. It shows 5-year moving averages with 95% confidence intervals for the period 2010-2021. Total area (left) and area within N2000 (right) in the Boreal and Continental regions. In each panel, the coloured shading (green, grey and red) denotes the proportions classified as 'good', 'uncertain' and 'not-good' conditions, respectively.

9160: Sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli*

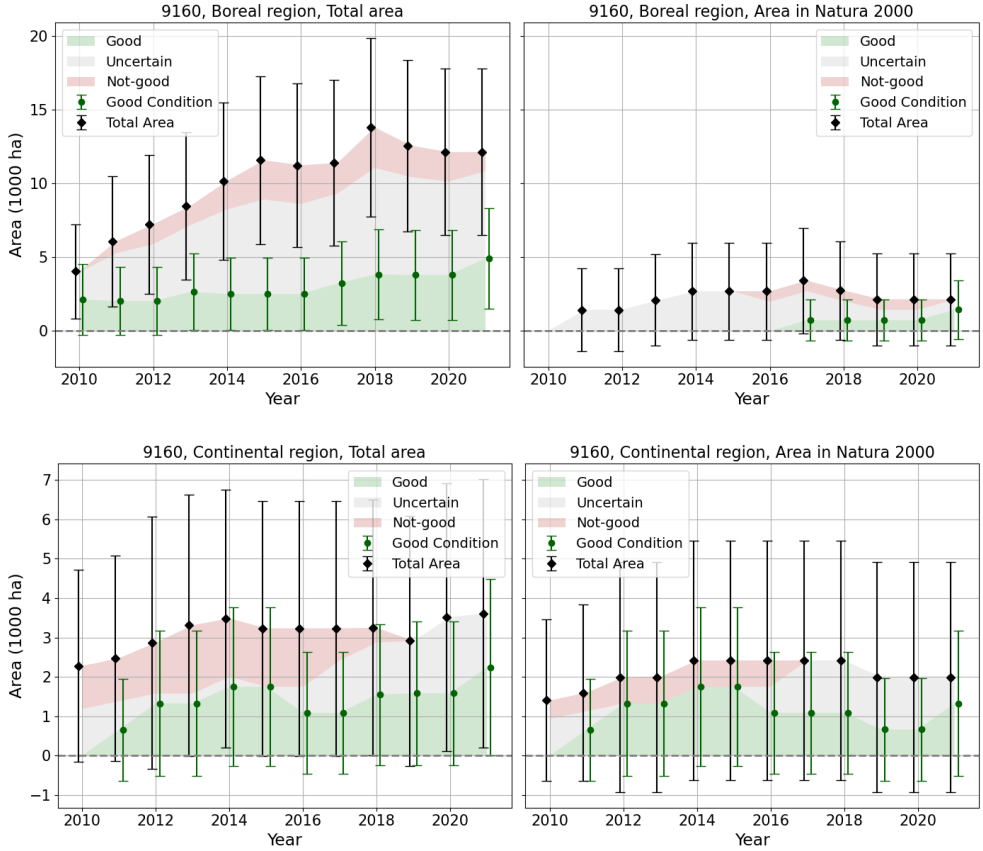

Figure S 10. National forest inventory area estimates (in thousand hectares) for habitat type 9160: Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli. The figure shows total areas (black dots) and areas classified as being in 'good' condition (green dots), based on the specifications used in this study. It shows 5-year moving averages with 95% confidence intervals for the period 2010-2021. Total area (left) and area within N2000 (right) in the Boreal and Continental regions. In each panel, the coloured shading (green, grey and red) denotes the proportions classified as 'good', 'uncertain' and 'not-good' conditions, respectively.

9180: *Tilio-Acerion* forests of slopes, screes and ravines

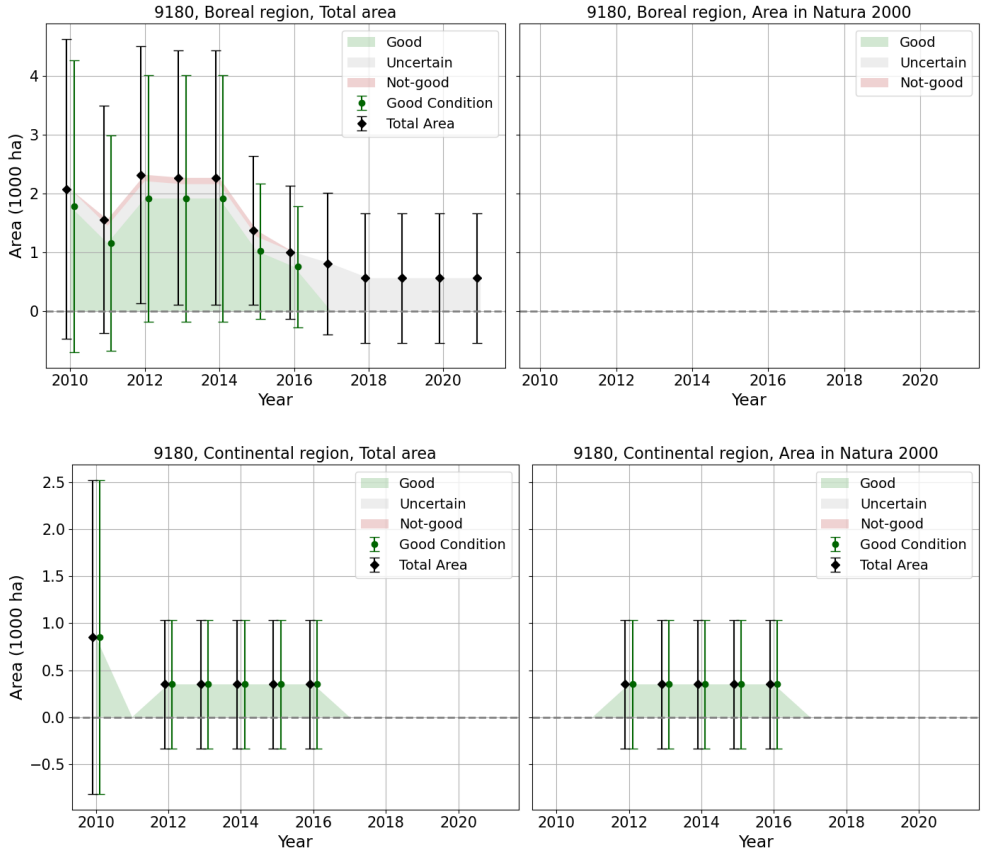

Figure S 11. National forest inventory area estimates (in thousand hectares) for habitat type 9180: Tilio-Acerion forests of slopes, screes and ravines. The figure shows total areas (black dots) and areas classified as being in 'good' condition (green dots), based on the specifications used in this study. It shows 5-year moving averages with 95% confidence intervals for the period 2010-2021. Total area (left) and area within N2000 (right) in the Boreal and Continental regions. In each panel, the coloured shading (green, grey and red) denotes the proportions classified as 'good', 'uncertain' and 'not-good' conditions, respectively. Note that no NFI estimates were available for N2000 areas in the Boreal region.

9190: Old acidophilous oak woods with *Quercus robur* on sandy plains

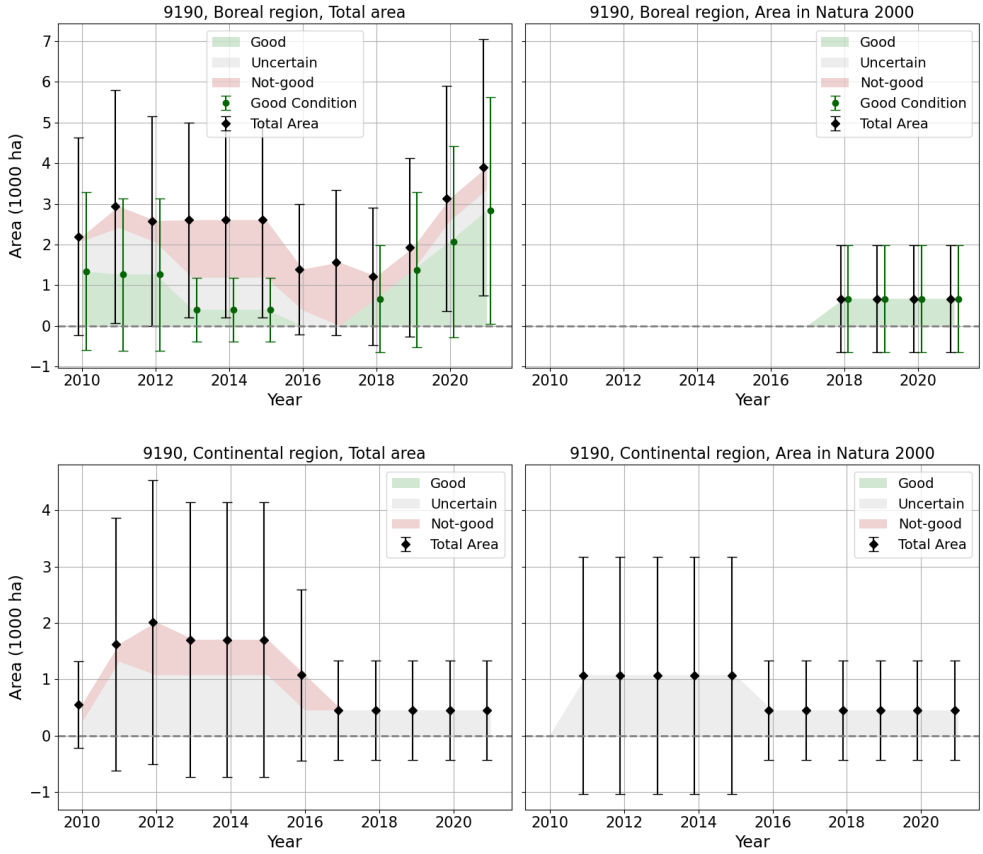

Figure S 12. National forest inventory area estimates (in thousand hectares) for habitat type 9190: Old acidophilous oak woods with Quercus robur on sandy plains. The figure shows total areas (black dots) and areas classified as being in 'good' condition (green dots), based on the specifications used in this study. It shows 5-year moving averages with 95% confidence intervals for the period 2010-2021. Total area (left) and area within N2000 (right) in the Boreal and Continental regions. In each panel, the coloured shading (green, grey and red) denotes the proportions classified as 'good', 'uncertain' and 'not-good' conditions, respectively.

91D0: Bog woodland

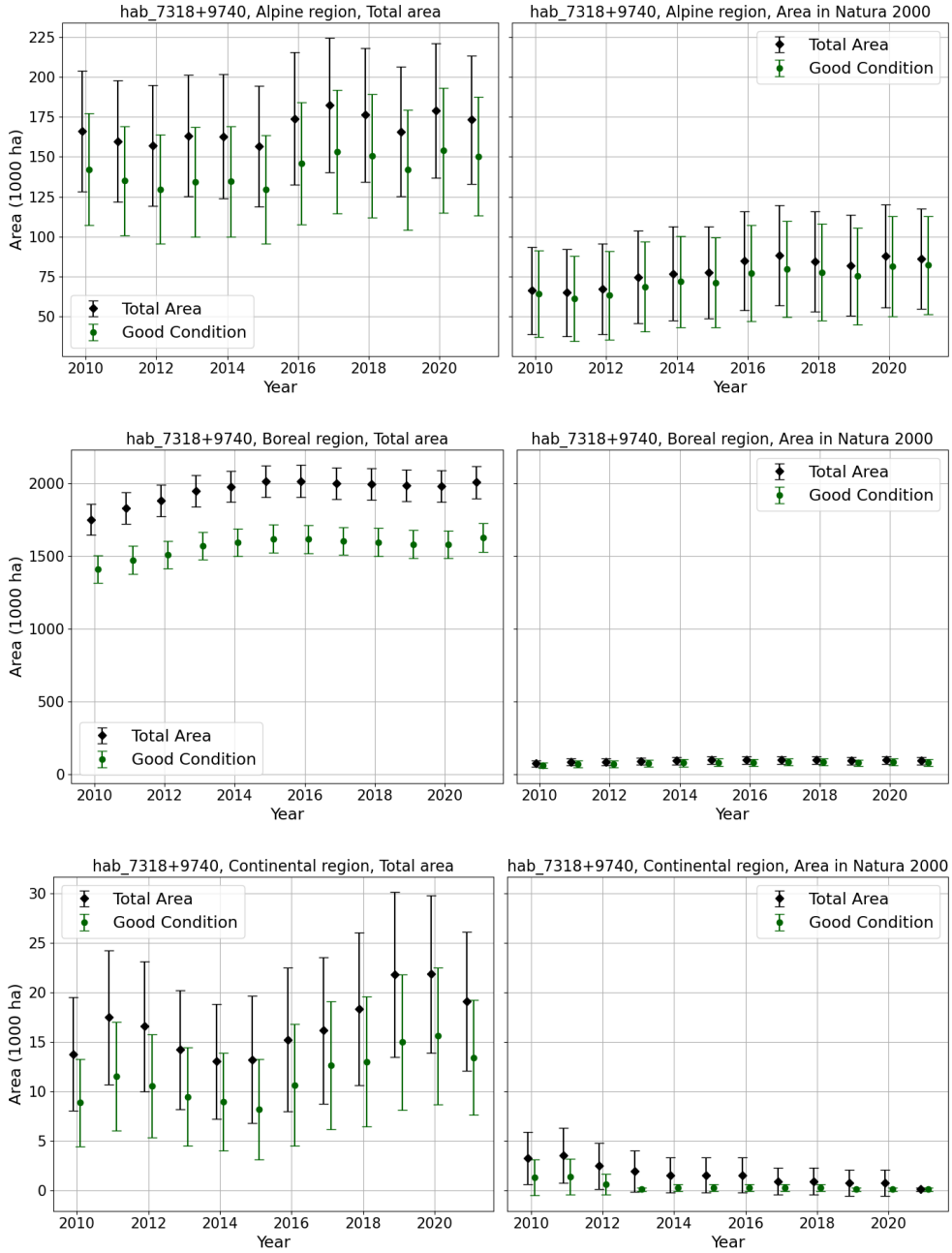

Figure S13. National forest inventory area estimates (in thousand hectares) for habitat type 91D0: Bog woodland. The figure shows total areas (black dots) and areas classified as being in 'good' condition (green dots), based on the specifications used in this study. It shows 5-year moving averages with 95% confidence intervals for the period 2010-2021. Total area (left) and area within N2000 (right) in the Alpine, Boreal and Continental regions. The short-term trend is assessed by comparing the mean and 95% confidence intervals of the first and last years in the time series.

91E0: Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*

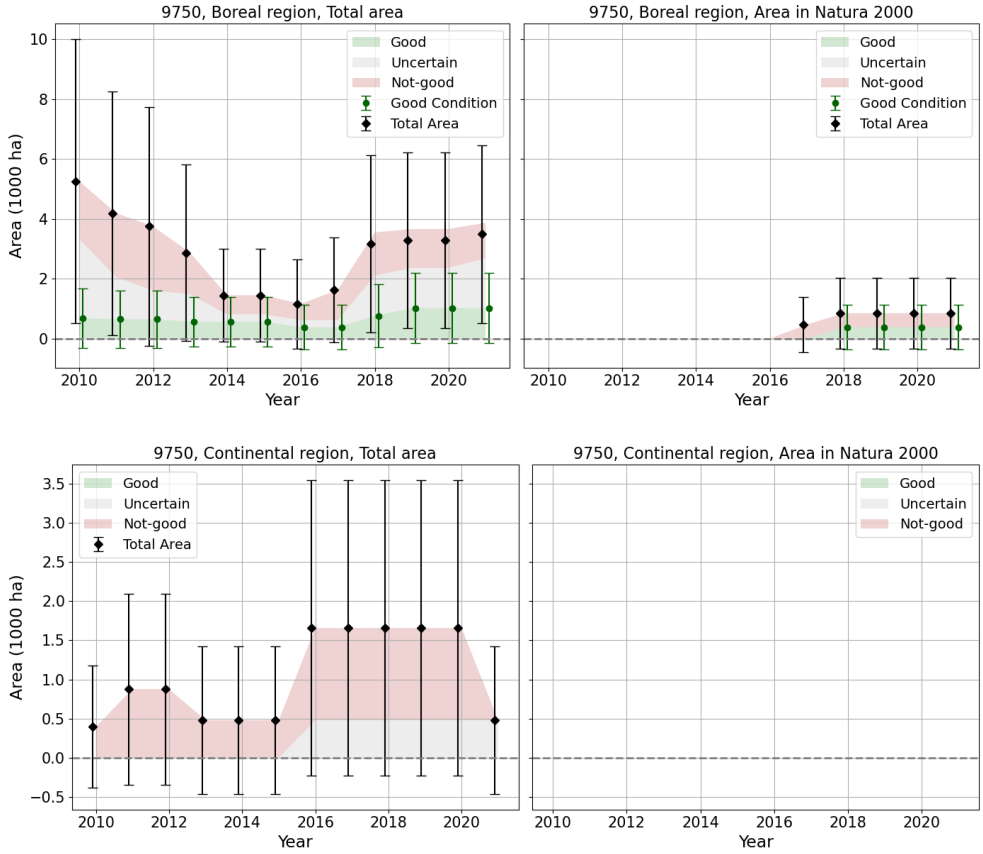

Figure S 14. National forest inventory area estimates (in thousand hectares) for habitat type 91E0: Alluvial forests with Alnus glutinosa and Fraxinus excelsior. The figure shows total areas (black dots) and areas classified as being in 'good' condition (green dots), based on the specifications used in this study. It shows 5-year moving averages with 95% confidence intervals for the period 2010-2021. Total area (left) and area within N2000 (right) in the Boreal and Continental regions. In each panel, the coloured shading (green, grey and red) denotes the proportions classified as 'good', 'uncertain' and 'not-good' conditions, respectively. Note that no NFI estimates were available for the Alpine region and N2000 areas in the Continental region.

Broadleaved forest habitat types grouped (9020, 9110, 9130, 9160, 9180, 9190)

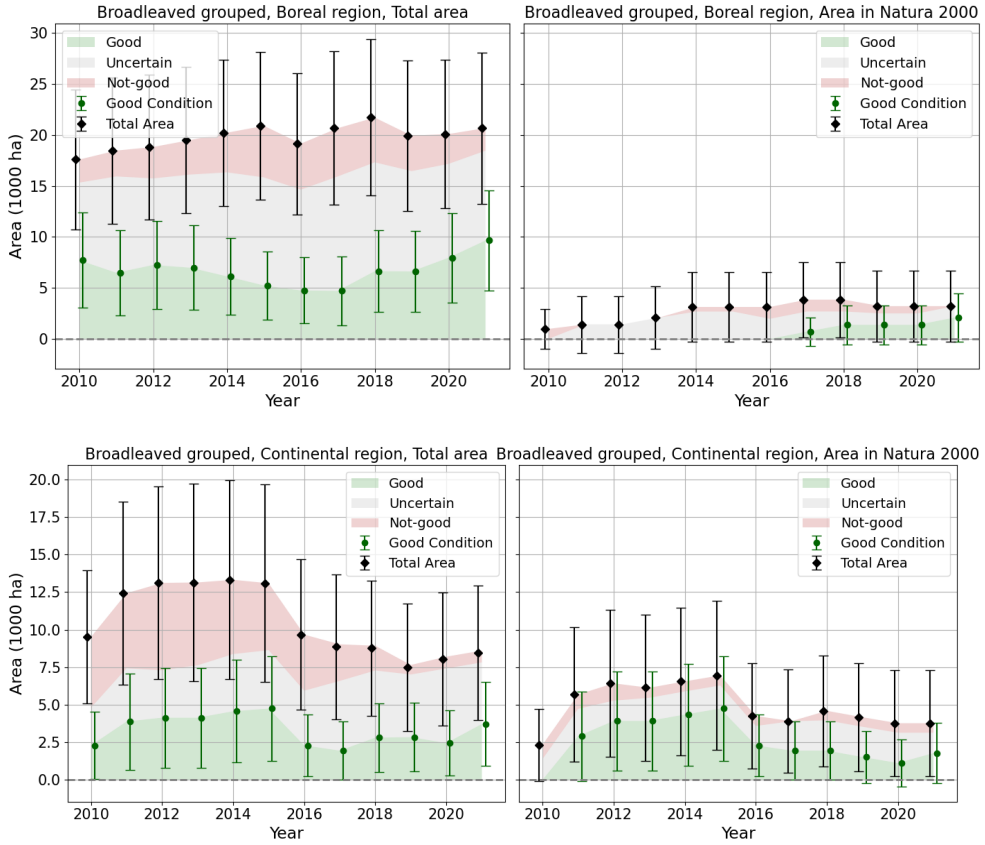

Figure S 15. National forest inventory area estimates (in thousand hectares) for all broad-leaved forest habitat types (9110, 9130, 9160, 9190, 9020, 9180). The figure shows total areas (black dots) and areas classified as being in 'good' condition (green dots), based on the specifications used in this study. It shows 5-year moving averages with 95% confidence intervals for the period 2010-2021. In each panel, the coloured shading (green, grey and red) denotes the proportions classified as 'good', 'uncertain' and 'not-good' condition, respectively.

Appendix II – Investigations conducted 2020-2024

After the Art. 17-report in 2019, the biogeographical monitoring of forest habitat types was reviewed (Berglund 2020). The review concluded that further investigation of methods for assessing 'habitat condition' of forest habitat types would be necessary before the next report in 2025. Although time for this work has been limited, understanding of these issues has improved through a series of smaller studies conducted in the interim (Table II-1). The following insights were made regarding the potential to classify habitat conditions in NFI plots:

1. Alignment with guidelines and methods used inside protected areas (PAs)
Future efforts should focus on aligning biogeographical monitoring based on NFI with guidelines (SEPA 2012) and methods (e.g. Kellner 2007) used inside formally protected areas (PAs). For over a decade, little has been done to improve guidelines and methods for inventorying, assessing and managing habitat types and conditions inside PAs. While significant efforts have been invested in biogeographical monitoring – such as classifying NFI sample plots into habitat types (Gardfjell & Hagner 2019) – the links between these efforts and the guidelines and methods used inside PAs remain unclear.

2. Traceable, automated classification instead of untraceable, field classification
Swedish NFI currently classifies plots into habitat types in the field. However, it does not record all variables that underlies this classification, making it difficult to trace the reasons for a plot's inclusion as a certain habitat type. This also hinders the ability to revise classifications and analyses if methods and criteria prove inaccurate. Future efforts should focus on developing automated classification methods for both habitat types and condition assessments (i.e. 'good' or 'not good') according to national guidelines (SEPA 2012) and PA inventory criteria (Kellner 2007). Finland's approach, which involves recording a few independent naturalness variables in the field and then automatically classifying plots based on these variables, could serve as an inspiration for Sweden.

3. Current limitations of NFI variables for habitat condition classification
NFI uses variables (e.g. ditch occurrence or forest stand age) measured at a smaller scale and applies stricter criteria than those used for delineating habitat types inside PAs. Moreover, the perspectives differ fundamentally. Classification of NFI sample plots focuses on vegetation and structural characteristics at the time of the inventory. Classification inside PAs focuses on conservations values and their management for future preservation. Future efforts should focus on developing NFI classification methods that better align with the perspective on habitat types in conservation practice and reality.

The criteria for including plots as habitat types are overly strict, and the scale of NFI measurements is too small to capture relevant patterns. In wetlands, NFI excludes plots as habitat types if ditches are present within 25 m of the plot centre. However, NFI will not identify 'not good' condition plots in ditched wetlands when ditches are located beyond 25 m, as these ditches are not registered. In forests, the small scale of NFI sample plots limits the ability to capture the spatial distribution of key processes and structures (e.g. old trees and deadwood) within forest stands. Although NFI tested registering deadwood at larger scale (circular plot with 20-m radius), no improvement was observed compared to standard plots.

These limitations makes it challenging to use NFI sample-plot data to classify habitat condition as 'good' or 'not good' according to national guidelines (SEPA 2012) and criteria for inventories inside PAs (Kellner 2007).

Table II-1. List and summaries of studies conducted during 2020-2024, focusing on methods for assessing 'habitat condition' of forest habitat types inside protected areas (PAs) and in NFI sample plots in Sweden and Finland.

Study	Objectives and conclusions
Berglund, H., Sundberg, S. 2020. Fördjupning och utveckling av indikatorer för våtmarker och skog inom översynen av delsystem våtmarker och skog. PM SLU.dha.2020.5.2-157. (2020-12-22; In Swedish)	– Data from NFI was analysed to determine whether variables registered in sample plots of the most wide-ranging habitat types (e.g. 7140 and 9010) could be used to classify habitat condition as 'good' or 'not good' according to national guidelines (SEPA 2012) and criteria for inventories inside protected areas (PAs; Kellner 2007). – Identifying thresholds and applying 'good' condition' criteria proven challenging because NFI variables (e.g. occurrence of ditches or deadwood volume) are registered at a very small scale (within 25 m or circular plots with radii of 7 or 10 m).
Berglund, H., Sundberg, S. 2022. Kunskapsuppbyggnad för biogeografisk uppföljning av bevarandetillstånd i våtmarker och skog (två pilotstudier). PM SLU.dha.2021.5.2-87. (2022-04-11; In Swedish)	– Sample plot data from NFI was matched with stand-level data from SEPA's map of habitat types inside PAs (NNK). This data was used to: 1) analyse the correlation between NFI sample-plot variables and NNK's stand-level classification of habitat condition, and 2) conduct field visits to classify the habitat condition of forests and wetlands, focusing on sample plots identified by NFI as wetland types (7140, 7310, 7230 and 91D0) and coniferous-forest types (9010, 9050 and 9060). – The correlation between NFI sample-plot variables and NNK's stand-level classification of habitat condition was generally weak. NFI sample-plot variables could not distinguish between 'good' and 'not good' conditions as classified in NNK. – The field visits indicated that NFI excludes plots as wetland habitat types in 'not good condition' if ditches are present within 25 m of the plot centre. By contrast, NFI includes plots as coniferous forest habitat types in both 'good' and 'not good' condition, as well as plots within stands with potential to develop into habitat types ('utvecklingsmark' according to Kellner 2007). However, it was found that the small scale of NFI sample plots limits their ability to capture the spatial distribution of key processes and structures (e.g. old trees and deadwood), as well as typical and red-listed species, within stands.
Berglund, H., Manak, V. 2022a. Ecological conditions in Western taiga (9010) – inventory methods used in Sweden. Draft report v1.0. SLU.dha.2022.5.2-83 (2022-12-20)	– The methods used for inventorying 9010 and other coniferous forest habitat types inside PAs (Kellner 2007) and in NFI sample plots (Gardfjell & Hagner 2019) were reviewed and field-tested to evaluate potential modifications for assessing habitat condition at stand and plot scales. Additionally, habitat conditions were classified in stands inside PAs where NFI plots had been excluded from habitat-type classification based on stand age or some other criteria (cf. Gardfjell & Hagner 2019) – Regarding the method used inside PAs (Kellner 2007), it was concluded that this method needs to be revised and updated with more clearly defined criteria while being harmonized with the corresponding method used in Finland. – Regarding the method used in NFI

	sample plots (Gardfjell & Hagner 2019), it was found to lack documentation on its development and to use variables (e.g. stand age) and criteria that are both different from and stricter than those used for delineating habitat types inside PAs (cf. Kellner 2007). Stand age, in particular, is given excessive weight, making it the key factor driving plot classification into habitat types.
Manak, V., Berglund, H.2022b. Naturtypsklassningen av västlig taiga (9010) i skyddade områden i alpin region i Sverige. Jämförelse mellan uppgifter från Riksskogstaxeringen och Naturtypskartan (NNK). Report. SLU.dha.2022.5.2-83 (2022-12-20)	– The inventory of 9010 inside PAs (Kellner 2007) and in NFI sample plots (Gardfjell & Hagner 2019) were analysed in detailed in the Alpine region. – For the inventory inside PAs, it was concluded that the resolution is too low, leading to area overestimation. This highlights the need for revisions to improve accuracy. – Conversely, the inventory in NFI sample plots was found to apply excessively high stand-age criteria, resulting in area underestimation. Adjustments are needed to include forests with lower stand ages as 9010 in the Alpine region.
Berglund, H. 2022. Draft report v1.0. Ecological conditions in Western taiga (9010) – inventory methods used in Finland. SLU.dha.2022.5.2-83 (2022-12-20)	– The Finnish methods used for inventorying 9010 inside PAs and in NFI sample plots were reviewed and discussed with Finnish experts. Comparisons were made with Swedish methods (cf. Berglund & Manak 2022a), focusing on differences, similarities and potential approaches to harmonize and improve these methods. – The method used inside PAs was found to be fairly similar to the Swedish approach, suggesting that harmonization between countries should be relative straightforward. In contrast, significant differences were identified in the method used for NFI sample plots. In Finland, the classification of plots as 9010 in 'good' or 'not good' condition is not done in the field, but is determined automatically based on registered naturalness variables (not specifically stand age). This approach warrants consideration for adoption in Sweden.
NFI 2023. Inventorying deadwood within different sample-plot radii; 20 m compared to 7/10 m. Draft report (unpublished).	– According to information from NFI (personal communication), a 2023 test involved registering deadwood within a circular plot with a 20 m radius, alongside the standard 7 and 10 m radius plots, to evaluate its effectiveness in capturing deadwood occurrence within forest stands. – Data analysis revealed no differences in deadwood occurrence between the larger 20-m plot and the smaller plots.
Berglund, H., Manak, V. In preparation. Analysis of habitat conditions in beech forest habitat types.	– Sample plot data from the County Administrative Board's monitoring of trees and epiphytes in beech forests was matched and analysed together with stand-level data from SEPA's map of habitat types inside PAs (NNK). – Preliminary results indicate that the density of key structures such as old-growth trees and dead high stumps of beeches

	correlates with the classification of the habitat condition in NNK.

References of pilot studies

Berglund, H. 2020. Biogeografisk uppföljning av terrestra naturtyper – en översyn av delsystem skog. PM SLU.dha.2020.5.2-157. (2020-12-22; In Swedish)

Gardfjell, H. & Hagner, Å. 2019. Instruktioner för habitatinventering i NILS och MOTH 2019. Version 2019-06-19. Inst. f. skoglig resurshushållning, SLU Umeå. (In Swedish)

Kellner, O. 2007. Manual för fältinventering i skogshabitat. Version 5.5. Naturvårdsverket.

SEPA Swedish Environmental Protection Agency 2012. Online: "https://www.naturvardsverket.se/vagledning-och-stod/skyddad-natur/natura-2000-i-sverige/"