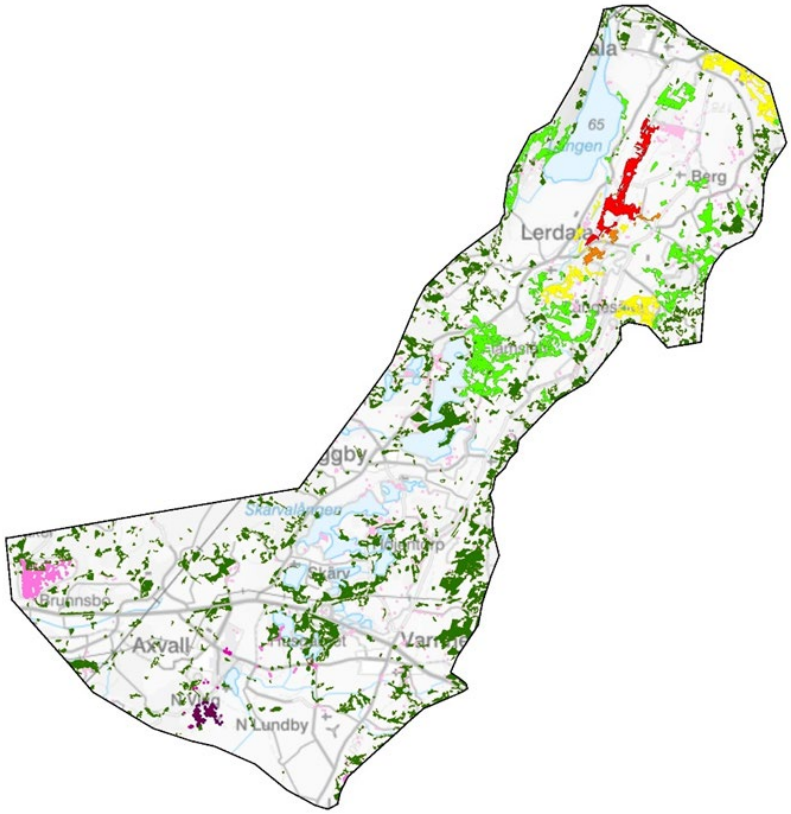
Länsstyrelsen
Västra Götaland

Identification of patches with high ecological importance of broadleaved forests and open lands with valuable trees in Valle

Using a biodiversity capacity landscape metric, combining area and connectivity, to examining management options



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Titel: Identification of patches with high ecological importance of broadleaved forests and open lands with valuable trees in Valle

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Foto: Valle area with broadleaved forests and open lands with valuable trees.

Utgivare: Länsstyrelsen Västra Götaland

Summary

This study is a complement to previous studies of regional action plans of green infrastructure in Valle (County Administrative Board 2016; County Administrative Board 2019). The aim was to identify the relative importance of biotope patches of broadleaved forest and open lands with valuable trees, respectively, in Valle for the maintenance and enhancement of biodiversity.

A testversion of the method *Biotope Biodiversity Capacity Indicator (BBCI)* was applied on the two biotopes of broadleaved forest and open lands with valuable trees in Valle. *BBCI* was developed within the project "*Landscape biodiversity capacity: a tool for measuring, monitoring and managing*" financed by the Swedish Environmental Protection Agency, Miljövårdsanslaget (2019-2021).

The results of the BBCI-analysis identified hotspots areas for the two studied biotopes in Valle, that is, areas with important patches for the sustainability of *BBCI*. For broadleaved forest, the northern part of Valle stands out as highly important and for open lands with valuable trees the south-southwest parts of Valle stands out as the most important area.

In this study, effects on *BBCI* from restauration of broadleaved forests to open land with valuable trees was evaluated. Calculations of *BBCI* shows encouraging results of an increased capacity for biodiversity of the biotope with open lands with valuable trees but not a significant decrease in biodiversity capacity of broadleaved forest, despite the area losses and fragmentation caused from the restauration. Both biotopes have *BBCI* values above one, showing that they are sustainable within a 100 year period.

The result can be used as support to management plans of nature reserves in a landscape setting and as recommendations or advice to private land owners. Moreover, the study was produced within the work of BIOGOV, where regional action plans for nature, tourisms, culture and small enterprises were under development.

Contents

Introduction

Research has highlighted the importance of putting ecological processes into a landscape context. For conservation purposes, only acting on the immediate local environment will not be enough (Uhl et al., 2020). The concept of green infrastructure is an answer to this need (Hilty et al., 2020). Green infrastructure includes a landscape approach involving local communities, landowners and organizations, in collaboration, to identify, design and conserve the landscape essentials to promote well-functioning ecological systems. To be able to practice green infrastructure, important areas and dispersal routes for species must be known, for the landscape in question, in order to conserve or improve ecological functionality and biodiversity.

In 2015, County Administrative Boards in Sweden was given the task to develop regional action plans of green infrastructure to enhance physical planning, applications and permission as well as in the strategical work performed by authorities in their work including land use change. The aim of the actions plans was to identify biotopes and structures on a landscape level that are of high ecological importance for management to maintain or improve the status of biodiversity and ecosystem services. Regional action plans are published for each county in Sweden. In the plan for the county of Västra Götaland (County Administrative Board 2019), the Valle-Billingen area is identified as a landscape with important high density of the broadleaved forest. This type of biotope (a specified biotic community) is of special interest and the green infrastructure action plan points out the importance to conserve and improve infrastructure for the broadleaved forest biotope in this area. However, there is also a rich biotope of valuable trees needing open land. And, since the broadleaved forest is a closed dense forest but the valuable trees need open land, these two biotopes could potentially compete for space. To examine how to solve this potential conflict, we here present a study using a holistic approach that takes into account biodiversity capacity and management for both biotopes at the same time in the area of Valle-Billingen (hereafter Valle), in Västra Götaland, Sweden.

This study is a complement to previous studies of regional action plans of green infrastructure in Valle (County Administrative Board 2016; County Administrative Board 2019). It is a collaboration with the project "*Landscape biodiversity capacity: a tool for measuring, monitoring and managing*" financed by the Swedish Environmental Protection Agency, Miljövårdsanslaget (2019-2021). This means that the used model "*Biotope Biodiversity Capacity Indicator (BBCI)*" was still under development during the study. Yet, the method had proved to be valuable for application, and thus, under the awareness that assumptions made in the model might be improved in newer versions, this study can still be of high value.

Aim of this study

The aim was to identify the relative importance of biotope patches of broadleaved forest and open lands with valuable trees in Valle for the maintenance and enhancement of biodiversity. Since previous studies have identified Valle as an important site for broadleaved forests, this study proceeded by addressing more detailed information on the importance of specific patches for landscape biodiversity and the complication of the simultaneous need to also conserve the open lands with valuable trees.

More precisely, we aimed to:

1. identify the patches most important for upholding biodiversity capacity
2. identify suitable areas for restauration actions to increase biodiversity capacity
3. evaluate the effects on biodiversity capacity of a planned restoration scenario that aims to increase the total area of open lands with valuable trees

The results can be used as support to management plans of nature reserves in a landscape setting and as recommendations or advice to private land owners. Moreover, the study was produced within the work of the EU-project BIOGOV BIOGOV (BIOGOV Action plan 2021-03-19), where regional action plans for nature, tourisms, culture and small enterprises were under development and discussed in collaboration with stakeholders. This study was added as knowledge base into the BIOGOV project.

Valle-Billingen study area

The area of Valle (Figure 1) is about 14 000 hectare and situated in the Southern coniferous region.

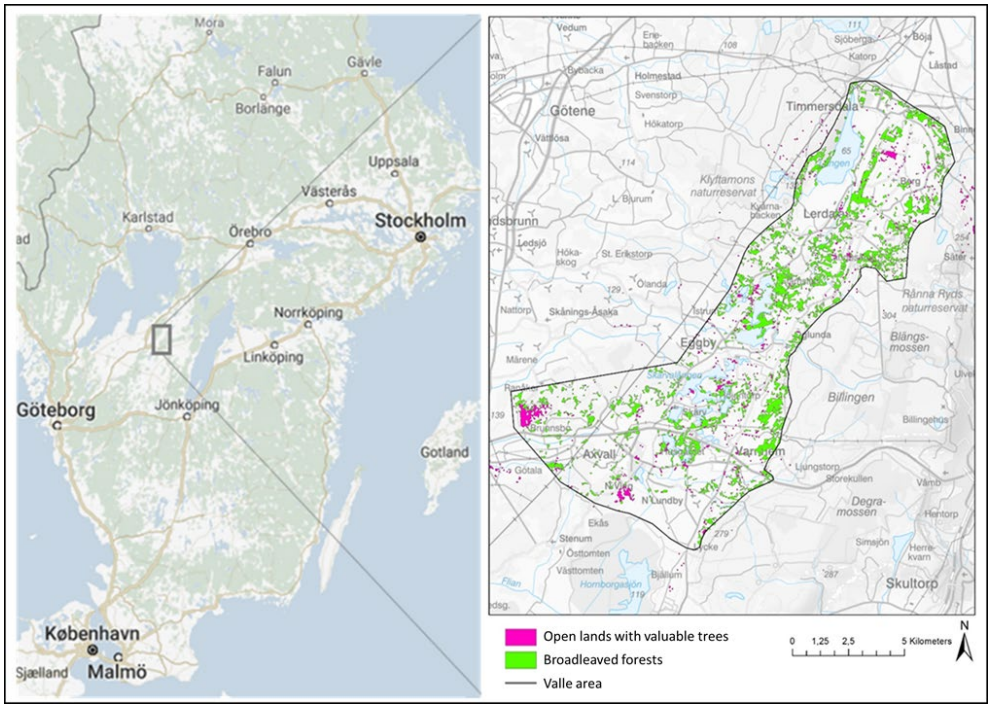

Figure 1. Broadleaved forests and open lands with valuable trees in the area of Valle, Västra Götaland, Sweden.

Valle is a well-documented landscape of national and international interest for natural, cultural and recreational values. The landscape is a pronounced kame landscape, with a mixture of ridges, hills and valleys. Next to Valle area, to the east, raises the table mountain Billingen. The plateau is covered with coniferous forest merging into broadleaved deciduous forests on the calcareous hillsides (Figure 2). The landscape is a mosaic of meadows, open grazing land and arable land intermingling with lakes and closed broadleaved deciduous forest and valuable tree areas (Figure 3).

Figure 2. Broadleaved forest in Valle-Nordbillingen with old felled trees, forest floor covered in wild garlic (Allium ursinum) and broadleaved trees with rare species such as Lobaria pulmonaria.

Figure 3. Valuable tree areas in Valle-Nordbillingen with broadleaved trees and rare species such as Sclerophora pallida.

Method

The Biotope Biodiversity Capacity Indicator (*BBCI*) evaluates the expected long-term persistence, over a specified time period, of biodiversity in a biotope fragmented into a system of patches, within a given landscape. Here, we have chosen a period of 100 year. The *BBCI* provides one value that can function as a biodiversity indicator. More specifically, it is a measure on how well a landscape′s structure support biodiversity for individual biotopes. In other words, the likeliness that the landscape holds a strong population of a focal species where the focal species act as an umbrella species and indicator of high biodiversity. This value can further be investigated by sensitivity or elasticity analyses to examine consequences of structural changes in the landscape.

Calculation of biotope biodiversity capacity

The index *BBCI* is calculated as the dominant eigenvalue, of a biotope matrix, *M*. It takes into account area of biotope patches and the degree of connection between the patches within the landscape. The higher the value the better the structural conditions are for supporting biodiversity. A value above one indicates a sustainable biodiversity capacity. To be comparable between landscapes with different number of patches *BBCI* is divided by number of patches.

The matrix, *M*, is based on a focal species′ perspective, where the focal species represents the organism community of the biotope under examination, that is, an umbrella species. The parameters included are dispersal capacities, *D*, and survival probabilities, *s*:

$$\mathrm{M} = \begin{pmatrix} s_1 & \cdots & D_{1n} \\ \vdots & \ddots & \vdots \\ D_{n1} & \cdots & s_n \end{pmatrix}$$

Each row and column in the matrix corresponds to individual patches of *n* number of the biotope. The degree of connectedness of a biotope is determined by the focal species movements in the landscape which depends on its dispersal ability. The connectivity forms the basis for supporting and upholding viable patch populations, thus contributing to biodiversity.

A matrix, *M*, has been constructed for the each of the two biotopes, broadleaved forest and valuable tree areas, in the Valle landscape. As the focal species we have used the butterfly high brown fritillary, *Argynnis adippe*.

Functions of survival and dispersal capacity have been theoretically developed (for further information contact the authors) and data for the butterfly have been found in literature (Polic et al 2019, Ellis et al 2019). Survival probability (*s*), that is the probability that a species remain in a patch during a period of 100 years, is dependent on patch area (Figure 4a). If a patch area is too small, by having an estimated carrying capacity smaller than one individual of the focal species, the patch will be removed in the calculations. Dispersal capacity is dependent on distances between leaving and receiving patches, measured as edge to edge distances, as well as areas of leaving and receiving patches (Figure 4b).

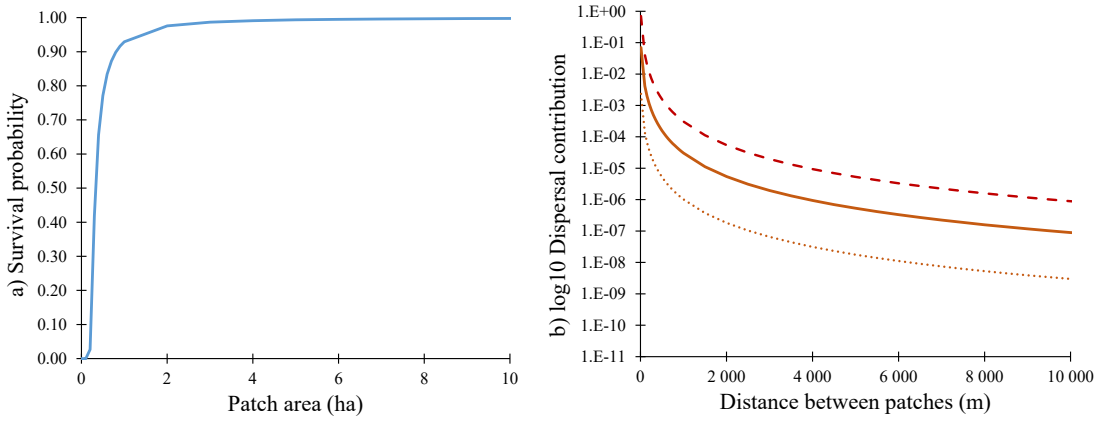

Figure 4. Survival (a) and dispersal (b) functions for the focal species high brown fritillary used in the calculations. In b) solid line represents the case in which leaving and receiving patches are of equal size, for dotted line leaving patch is smaller and for dashed line leaving patch is larger. Survival probabilities (as a function of carrying capacity and thus patch area) are based on Foley (1994).

Analysis to identify ecological important patches

To identify the patches that are the most important for upholding biodiversity capacity in the landscape we analyzed the effects of patch area reduction on *BBCI*. For each patch at a time, we reduced the area proportionally by 5% and calculated the new *BBCI*-value, a so called elasticity analysis. The larger the decrease in *BBCI* from an area reduction, the more sensitive the biotope biodiversity in the landscape is to a change in area of that specific patch. The resulting elasticity values are visualized in heat maps.

Restauration scenario

The County administrative board of Västra Götaland have identified areas within nature reserves in Valle that are suitable targets for restauration actions to increase open land with valuable tree (Figure 5). The main reason that these areas are suggested as restauration areas is because of the relatively high presence of valuable trees.

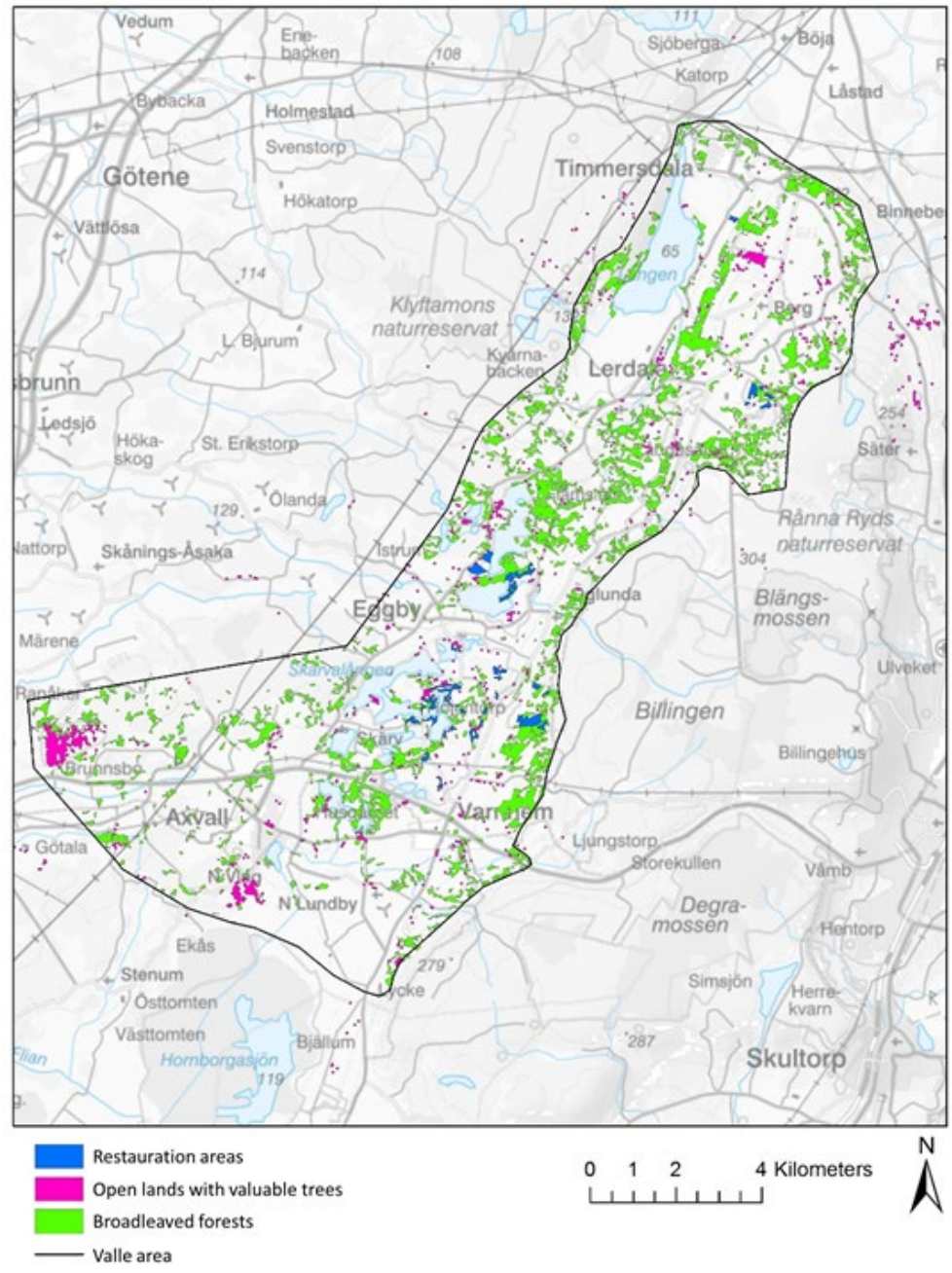

Figure 5. Broadleaved areas suggested for restauration (blue color) to increase the open land with valuable trees, in relation to the present distribution of deciduous forests and open land with valuable trees in Valle.

The management actions are suggested to be included in a revision of the management plans for the nature reserve. To realize this a certain amount of broadleaved forests will be lost. Here, we evaluate the impact from the suggested management actions on the biodiversity capacity of the two biotopes broadleaved forest and open lands with valuable trees. More specifically we calculate the changes in *BBCI* in the scenario representing the landscape after restauration compared to the present landscape.

Data and maps

Land cover data is essential when deriving *BBCI* but the indicator can easily be adjusted for the type of data available. Thus, there are no requirements of a standard unit of the land cover data. However, more detailed data, i.e. lower least possible descriptive unit (e.g. 10m^2, 1 acre, 1 ha) provides more solid data on which to apply ecological theory on, such as species survival and species dispersal distance. Hence, we used the most detailed biotope mapping of broadleaved forest and open land with valuable trees in Valle provided by the County administration board (see Figure 5). For the biotope open lands with valuable trees data included a buffer zone of 2 km surrounding the Valle landscape to reduce edge effects for this biotope. For broadleaved forest such data was not available. Patches of the same biotope that was within a maximum distance of 10 meter were aggregated to one patch. Using this approach, patches became representatives of ecological units rather than administrative units. Maps were created using ArcMAP 10.5. Using the function *calculate geometry*, the area (m^2) of each biotope patch was assessed. Distances between patches were calculated as the nearest edge-to edge distance using the tool *Generate Near Table*.

Result

Patches and areas most important for biodiversity capacity

Given the result of the elasticity analysis, we can visualize the magnitude of patch importance for upholding biodiversity capacity in heat maps for each biotope (Figure 6, see also Appendix A for detailed maps)). Hotspots will be the areas with the highest elasticity values, meaning areas where increase of biotope patch area will have the largest positive effect on biodiversity capacity, and also the other way around, where a decrease of patch area will have the biggest negative effect.

The identified hotspots for broadleaved forests and for open land with valuable trees are marked in Figure 6. For broadleaved forest, the northern part of Valle stands out as highly important, marked by a red oval. Increasing area of patches or add new patches with broadleaved forest within this oval would result in the highest increase in biodiversity capacity for the biotope. For open lands with valuable trees the south-southwest parts of Valle stands out as the most important, marked by a pink oval. Increasing area of these patches or add new patches within the oval would result in the highest increase in biodiversity capacity for open lands with valuable trees.

Management aiming at increasing biotope biodiversity capacity by increasing area of existent patches or add new patches within the ovals poses no major risk for trade-offs between the biotopes since their respectively core areas of importance are geographically distant from each other.

The restoration scenario

The County administrative board in Västra Götaland has identified areas which could be targets for restoration to open land with valuable trees. Figure 7 shows that almost all of these restauration areas are patches of broadleaved forests with low impact on *BBCI* if their area are changed. Only three patches in the northeast part of Valle have a relatively higher importance for *BBCI* and could potentially be reconsidered and excluded from the restauration areas (Figure 7).

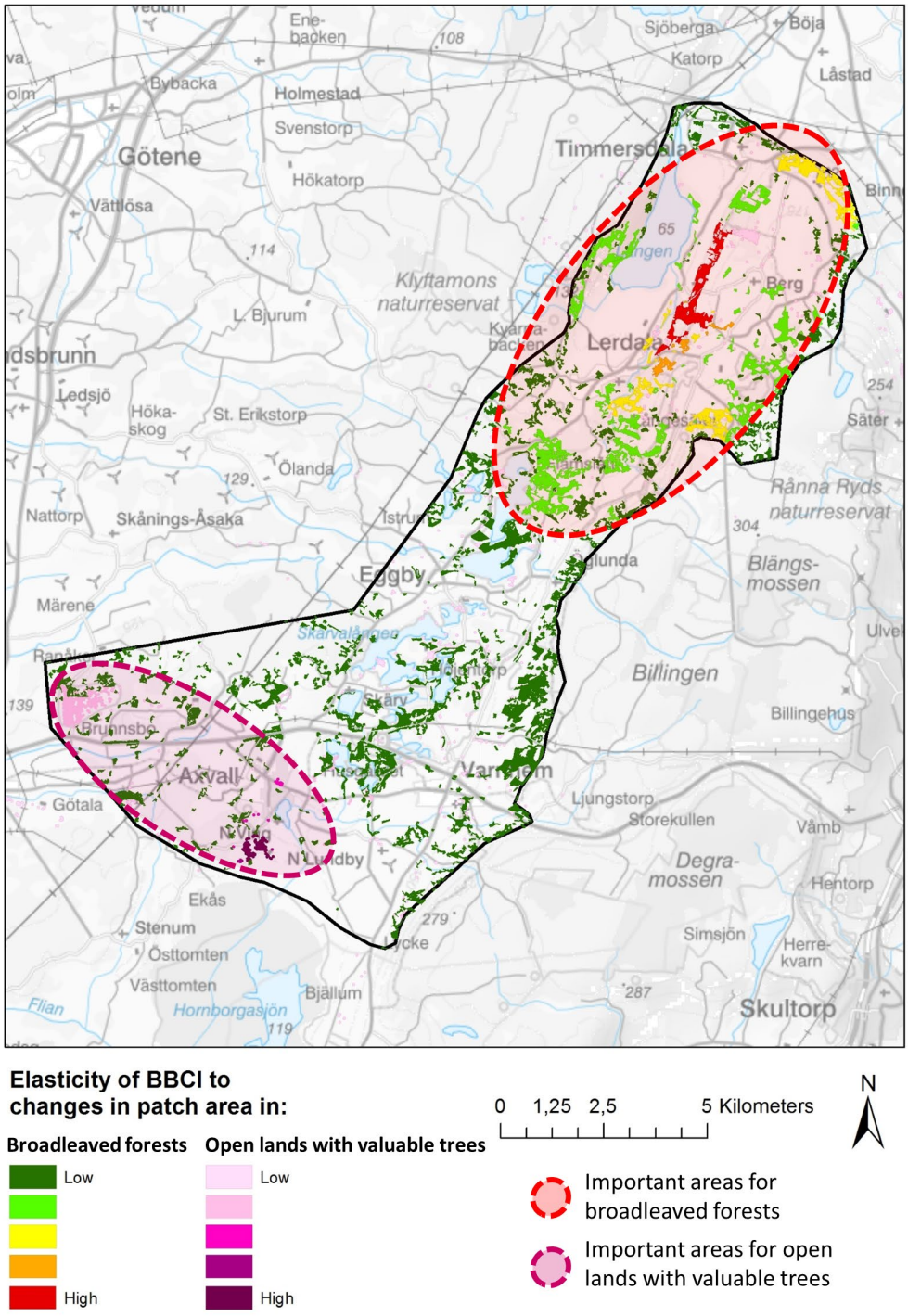

Figure 6. Elasticity of BBCI showing the effect of changes in patch areas. a) broadleaved forest, b) open lands with valuable trees. Ovals show important areas on the landscape level, for each biotope.

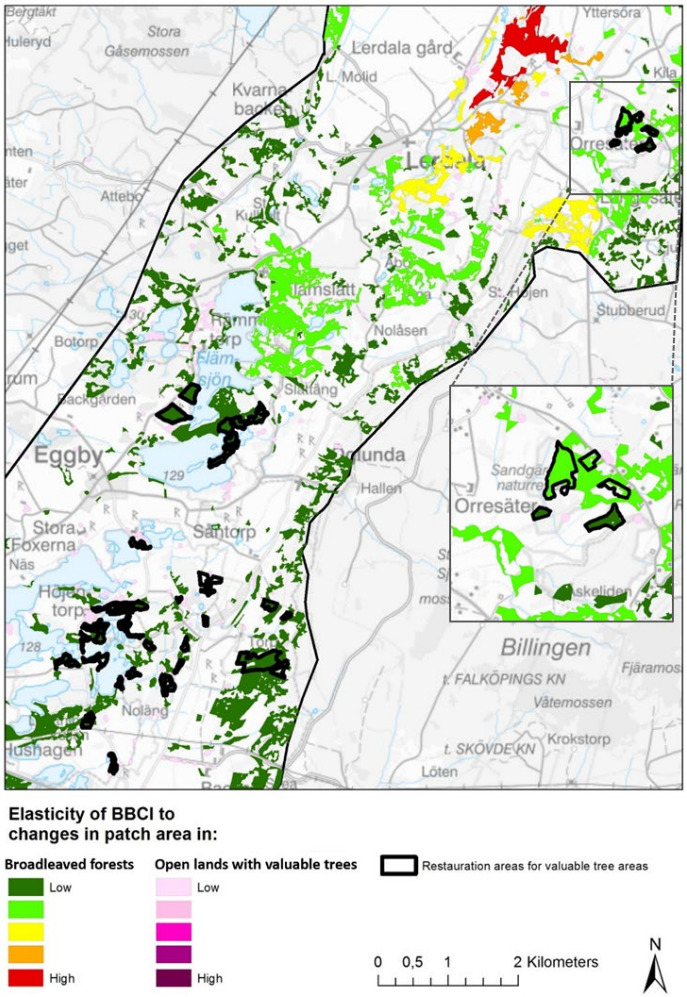

Figure 7. The majority of the areas that are suggested for restauration to open lands with valuable trees consists today of broad-leaved forests, with a low impact on BBCI, if their area is changed (dark green patches). In the northeast part of Valle, three restauration areas consist of broadleaved forest with a relatively higher importance for the BBCI (light green areas).

Comparing before and after restauration

General landscape characteristics at present and after restauration are presented in Table 1. After the suggested restauration the total area of broadleaved forest will have decreased by 68 ha and valuable trees increased by 82 ha. In addition to decreased total area, the broadleaved forest will be a little bit more fragmented, that is number of patches will have increased with 16. For the broadleaved forest there is 61 patches in the present landscape but 73 patches in the landscape after restauration that are too small for survival of the focal species. These patches were therefore removed in the calculations of biodiversity capacity, since they do not add to the system.

Calculations of *BBCI* shows encouraging results of an increased capacity for biodiversity of the biotope with open lands with valuable trees but not a significant decrease in biodiversity capacity of broadleaved forest despite the area losses and fragmentation (Figure 8). Both biotopes have *BBCI* values above one, showing that they are sustainable within a 100 year period. However, the biotope with open lands with valuable trees has a *BBCI* value very close to one, indicating extra vulnerability to loss of biotope area.

Table 1. Description of biotope area and number of patches before and after restauration, for broad-leaved forests (Broadleaved) and open land with valuable trees (Valuable trees).

	Total area (ha)	No of patches	Mean patch size (ha)	Min patch size (ha)	Max patch size (ha)
Present landscape					
Broadleaved	1682	796	2.1	0.001	75
Valuable trees	305	539	0.6	0.3	47
After restauration					
Broadleaved	1614	812	2.0	0.0002	75
Valuable trees	387	532	0.7	0.2	47

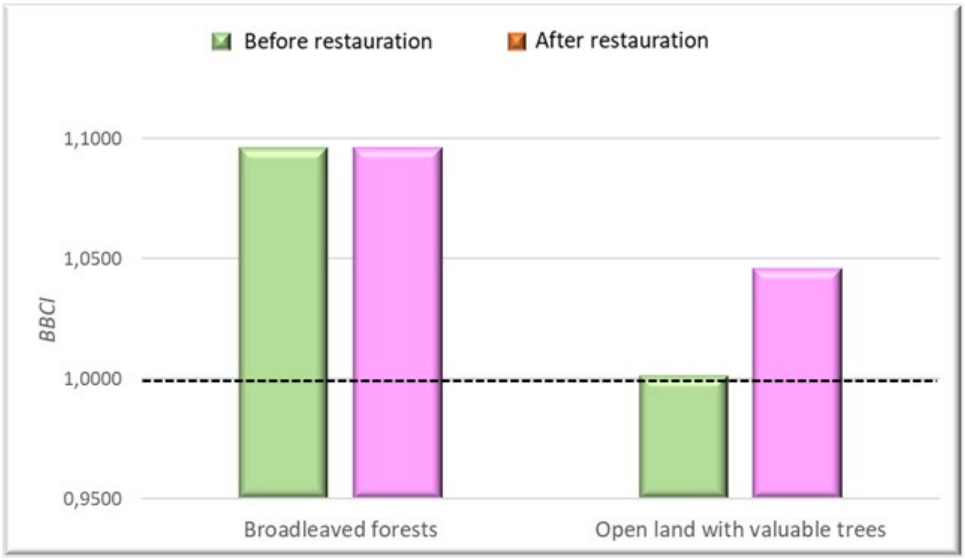

Figure 8. BBCI of broadleaved forests and open land with valuable trees, before and after restauration of open land with valuable trees. Dotted line shows BBCI equal to one, that is, the limit of sustainable biodiversity capacity. Due to different number of patches for the two biotopes, BBCI-values of the biotopes are not comparable between them, but can be compared within the biotopes regarding before and after restauration.

The effect of the restauration of open lands with valuable trees resulted in an increase of highly important patches, located in the middle parts of Valle (Figure 9 (see also Appendix B for detailed maps)). These new important areas adds to previous important areas in the southwest parts of Valle and creates a more robust landscape for the biotope of open lands with valuable trees. The three patches in the northeast part of Valle, suggested to be restored to open lands with valuable trees, did not increase importance of this biotope which thus still point out that these areas might be reconsidered and excluded from restauration (Figure 9, Figure 10).

For the broadleaved forests, only minor changes were observed. Here, broadleaved forests south and southeast of Lerdala and north of Berg has dropped in elasticity values (and hence in importance) and went from yellow areas to light green areas (Figure 9).

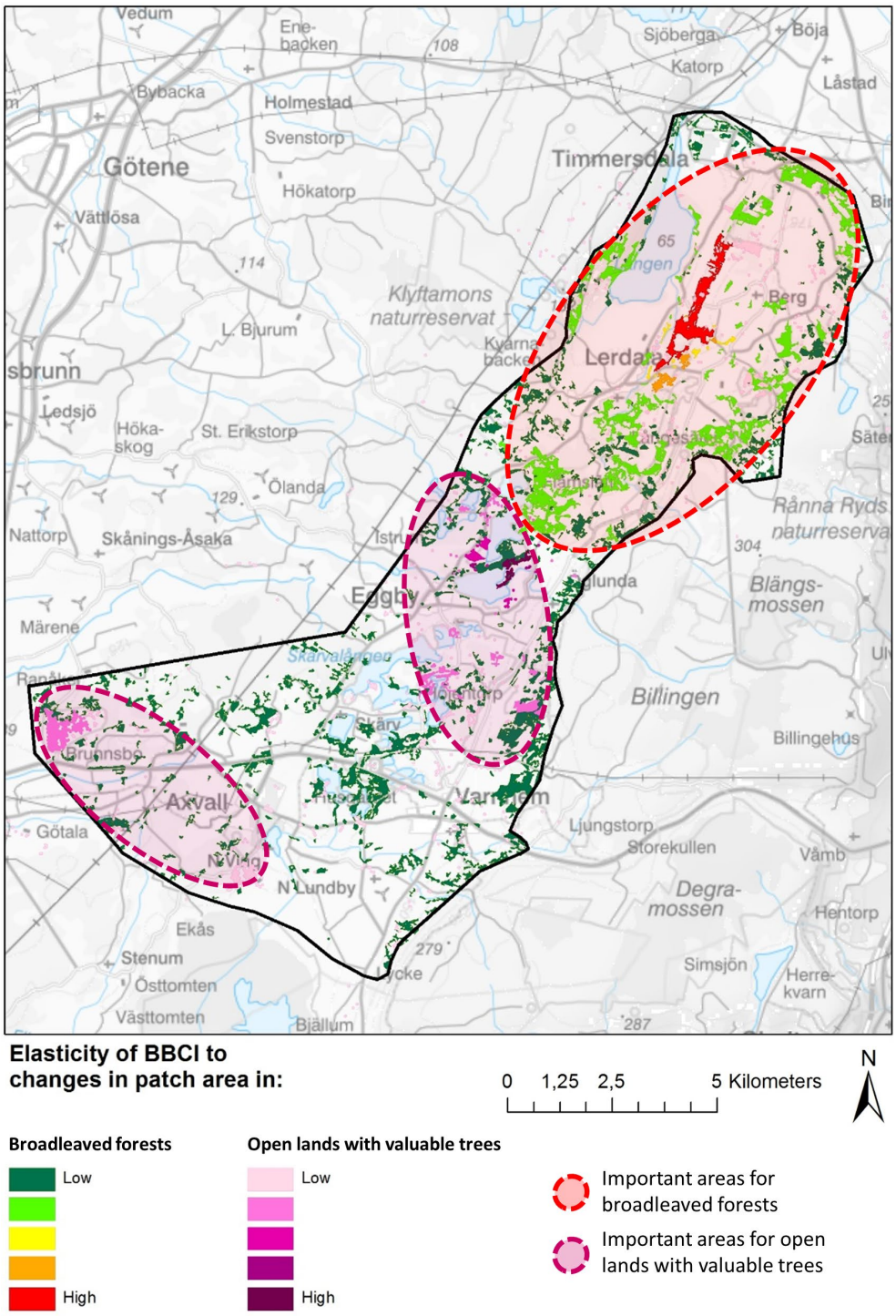

Figure 9. Elasticity of BBCI, after restauration of open lands with valuable trees, showing the effect of changes in patch area. a) broadleaved forest, b) open lands with valuable trees. Ovals show the important areas, for each biotope, at the landscape level.

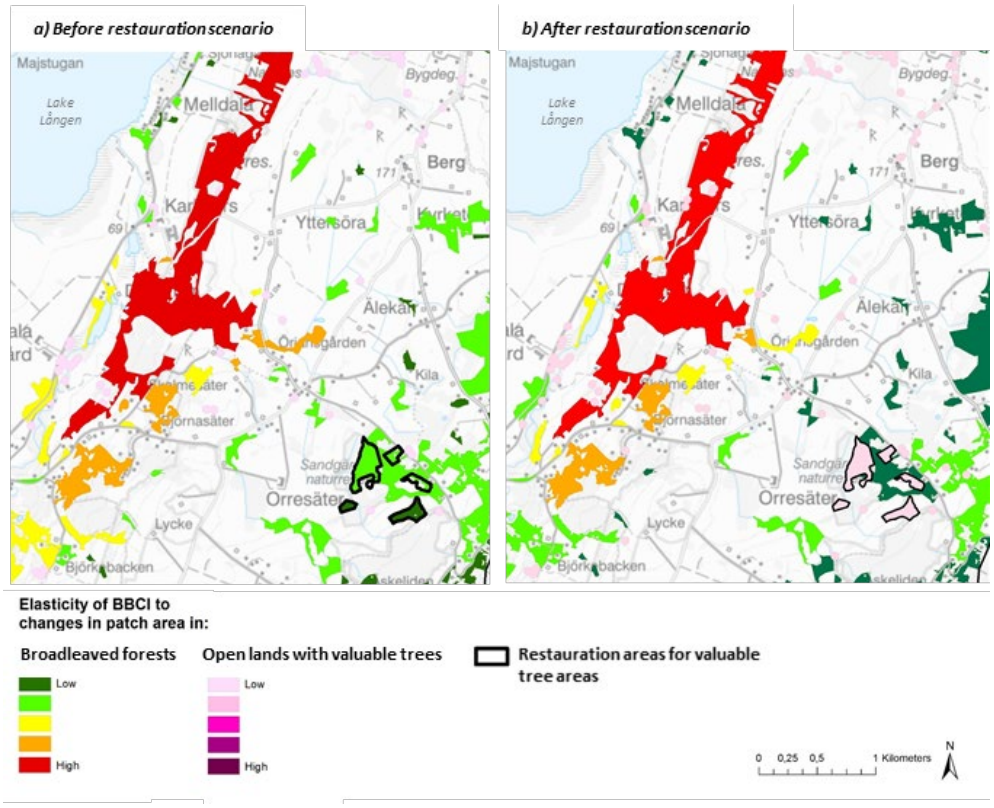

Figure 10. The figures shows the result of the BBCI elasticity analysis before (a) and after (b) restauration, in the area of Valle, east of Lake Lången. Three patches in light green with black borders in figure a are contributing more to the BBCI of broadleaved forests compared to how much the same three patches would contribute to the BBCI of open land with valuable trees (figure 11b), if they were restored to that biotope.

Discussion

Calculating landscape biotope biodiversity capacity by *BBCI* and examine its elasticities shows a way to objectively describe landscape effects and what impact management approaches of individual patches could have on biodiversity at the landscape scale. Assuming that the underlying assumptions in the method is valuable, rather specified management decisions can be given.

Areas important to be conserved and developed for the two biotopes, broadleaved forest and open lands with valuable trees, could be pointed out. The northern parts of Valle should thus, according to the results of this study, be areas for preservation of broadleaved forests. To further connect the northern parts of broadleaved forests with the middle and south parts of Valle, and enhance landscape biodiversity for this biotope, the east part of Valle with the slope of Billingen mountain, could be a potential area to develop. The west part around Eggby could also be of development interest. Depending on management possibilities, a further exploration of different scenarios might give additional useful information.

The comparison of the current landscape with the suggested restauration scenario for open lands with valuable trees provided good insight of the benefits for the biotope. The suggested restauration plan showed an effective way to increase important areas. The restauration also connects the southern parts of Valle with the middle parts. In addition, this examination also pointed out a suggestion of a minor change in the plan that could further preserve biodiversity at the landscape scale as a whole, by taking into account the conflict between the two biotopes. The suggestion is to exclude three patches of broadleaved forest from conversion to open lands. Restoring this three patches would not enhance biodiversity capacity of open lands with valuable trees as much as they today add to the broadleaved forest biotope (Figure 10).

Research has shown that too high levels of heterogeneity in a landscape might suppress biodiversity by having negative effects on specialist species (Redon et al., 2014). As a consequence of this, intermediate levels of heterogeneity may support more species in a landscape than very high levels of heterogeneity. In Valle, on the whole, comparing the two biotopes broadleaved forests and open lands with valuable trees the result shows that there are no large trade-off between the sustainability of the two biotopes. Ecological important areas of each biotope do not geographically overlap.

If the aim in Valle is to preserve or improve the biodiversity for the entire landscape, the best strategy would be to manage biodiversity capacity as a multi biotope landscape and not treat each biotope separately. In areas where one biotope has a more robust structure, part of this biotope area could be converted to another biotope with less robust structure. In Valle, the result from this study shows that this is the case for the two biotopes studied, that is, broadleaved forest could be converted to open lands with valuable tress, as suggested in the restauration scenario in this study.

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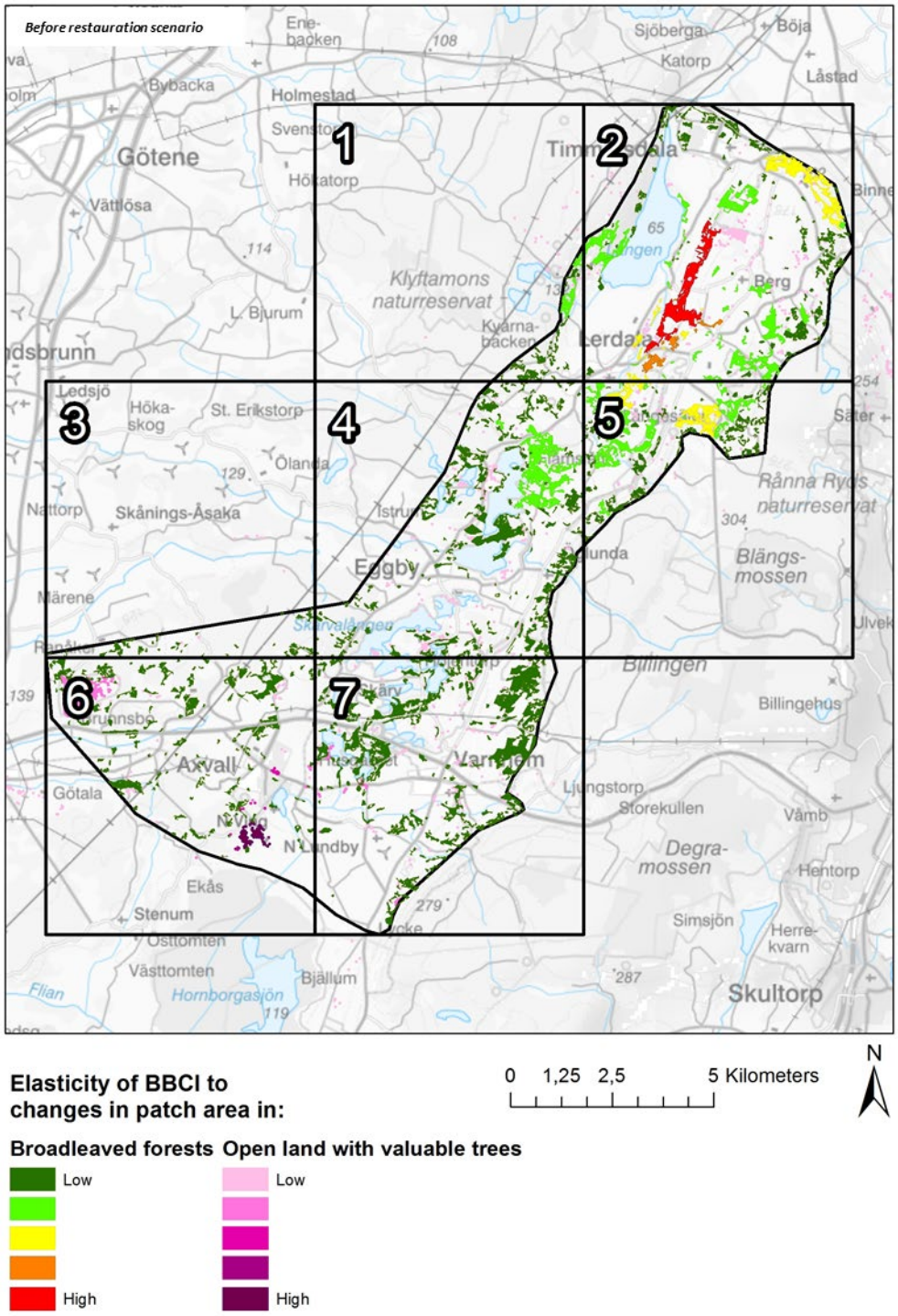
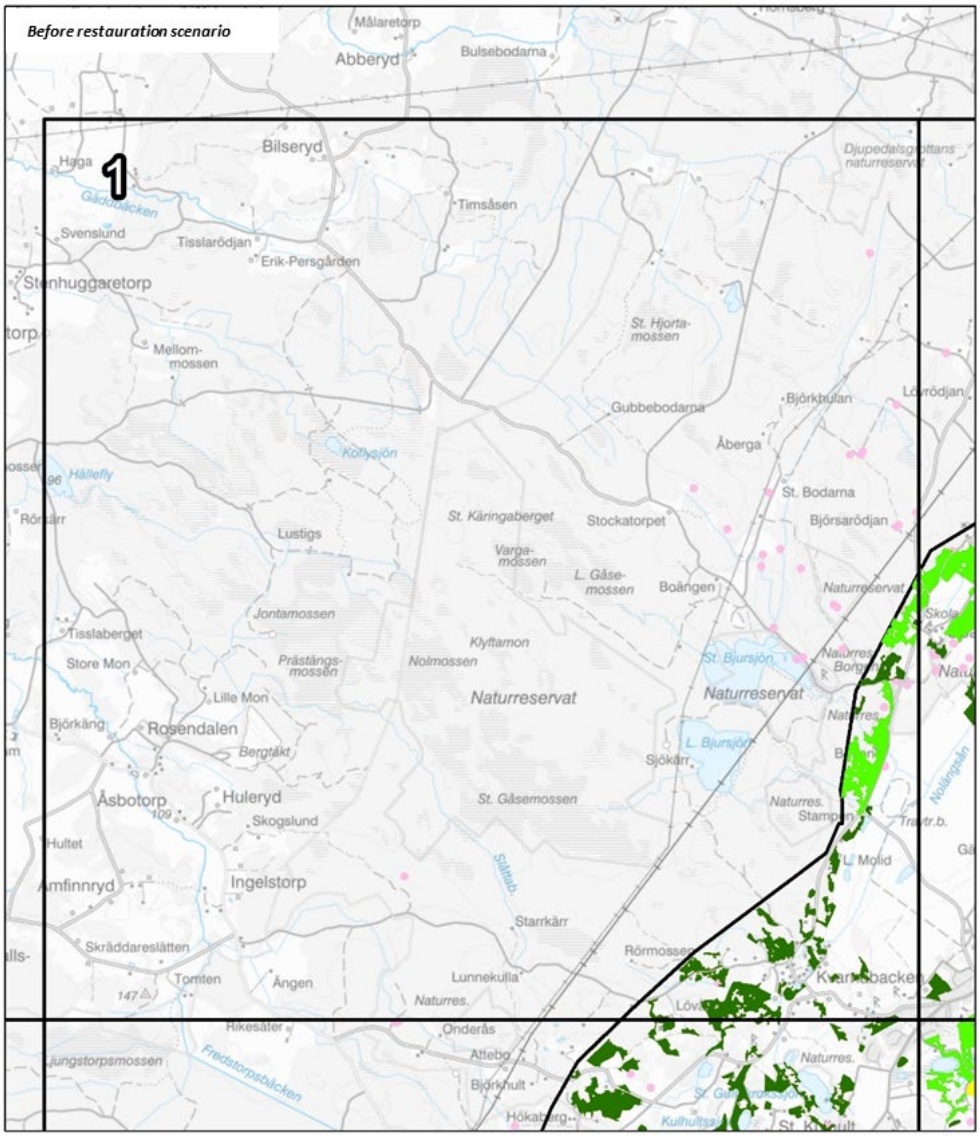
Appendix A – detailed maps with elasticity of BBCI *before* restauration of open land with valuable trees

Atlas showing the elasticity of biotope biodiversity capacity index (*BBCI*) to changes in patch area of broadleaved forests and open land with valuable trees, respectively.




Before restauration scenario
1
Målaretorp
Abberyd
Bulsebodarna
Bilseryd
Haga
Timsåsen
Svenslund
Tisslarödjan
Erik-Persgården
Stenhuggaretorp
Mellom-mossen
St. Hjorta-mossen
Djupedalsgrottans naturreservat
Gubbebodarna
Björkhulan
Lövrödjan
Åberga
Kölsjön
Hällefly
St. Bodarna
Björsarödjan
St. Käringaberget
Stockatorpet
Lustigs
Varga-mossen
L. Gåse-mossen
Boängen
Naturreservat
Jontamossen
Tisslaberget
Klyftamon
Store Mon
Prästängs-mossen
Nolmossen
Naturreservat
Lille Mon
Naturreservat
Björkäng
Rosendalen
Bergtäkt
L. Bjursjön
Sjökärr
Åsbotorp
Huleryd
St. Gåsemossen
Skogslund
Naturres.
Stampen
Hultet
L. Mölid
Ingelstorp
Amfinnryd
Starrkärr
Skräddareslätten
Rörmossen
Tomten
Ängen
Lunnekulla
Naturres.
Rikesäter
Önderås
Attebo
Naturres.
Jungstorpsmossen
Fredstorpsbäcken
Björkhult
Hökaberg
Kulhultsm.
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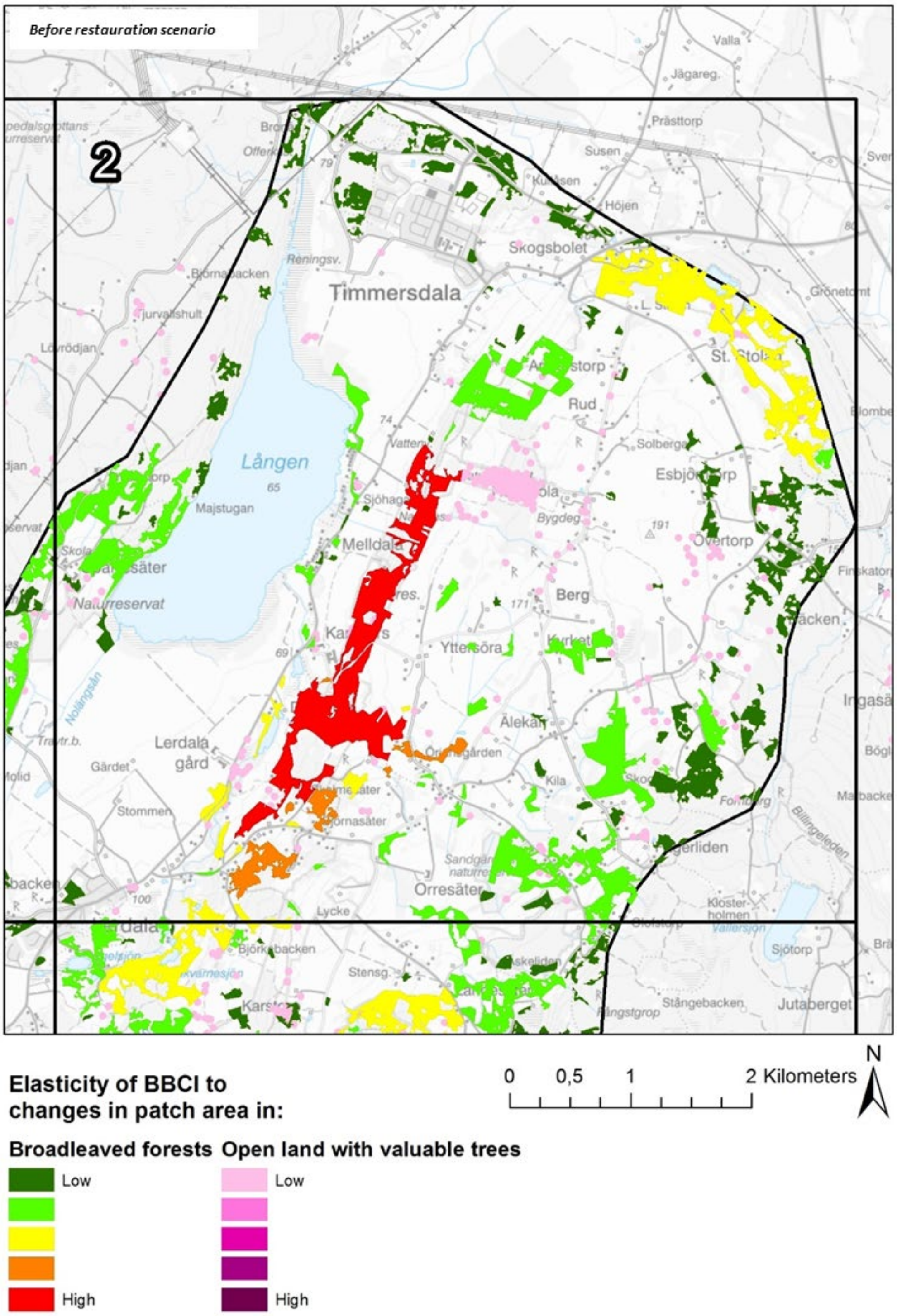
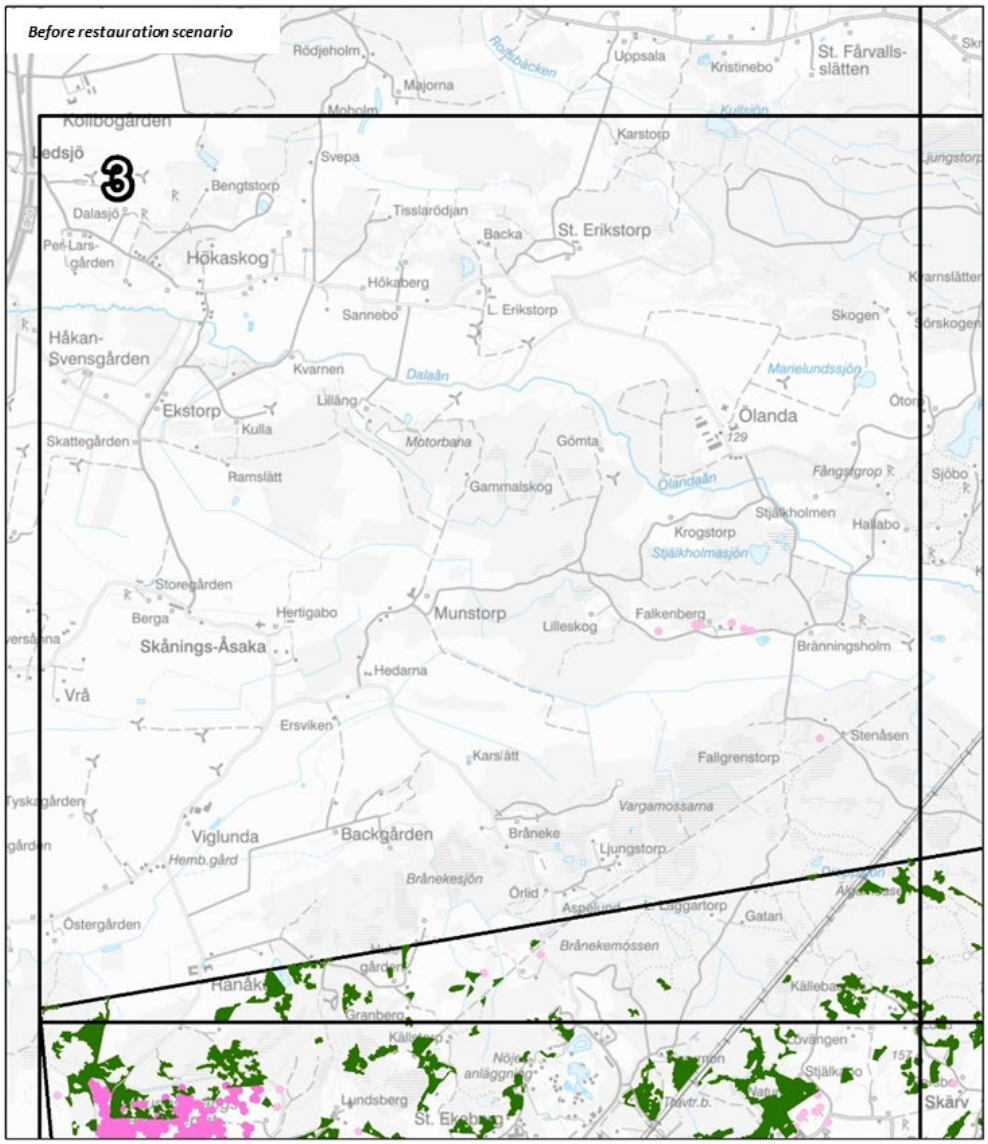
N
Elasticity of BBCI to changes in patch area in:
Broadleaved forests
Low
High
Open land with valuable trees
Low
High


Before restauration scenario
2
Timmersdala
Skogsbolet
Lången
65
Majstugan
Melldala
Lerdala gård
Gärdet
Stommen
Orresäter
Lycke
Björkabacken
Stensg.
Berg
Yttersöra
Älekärr
Kila
Rud
Solberga
Esbjörntorp
Övertorp
Naturreservat
Renings
Lövrödjan
Valla
Jägareg.
Prästtorp
Susen
Höjen
Grönetorp
St. Stola
Bygdeg.
Ingasä
Sjötorp
Jutaberget
Stångebacken
Klosterholmen
Vallersjön
Tråtr.b.
Forsberg
Billingeleden
Elasticity of BBCI to changes in patch area in:
0
0,5
1
2 Kilometers
N
Broadleaved forests
Open land with valuable trees
Low
High
Low
High



Elasticity of BBCI to changes in patch area in:

0 0,5 1 2 Kilometers

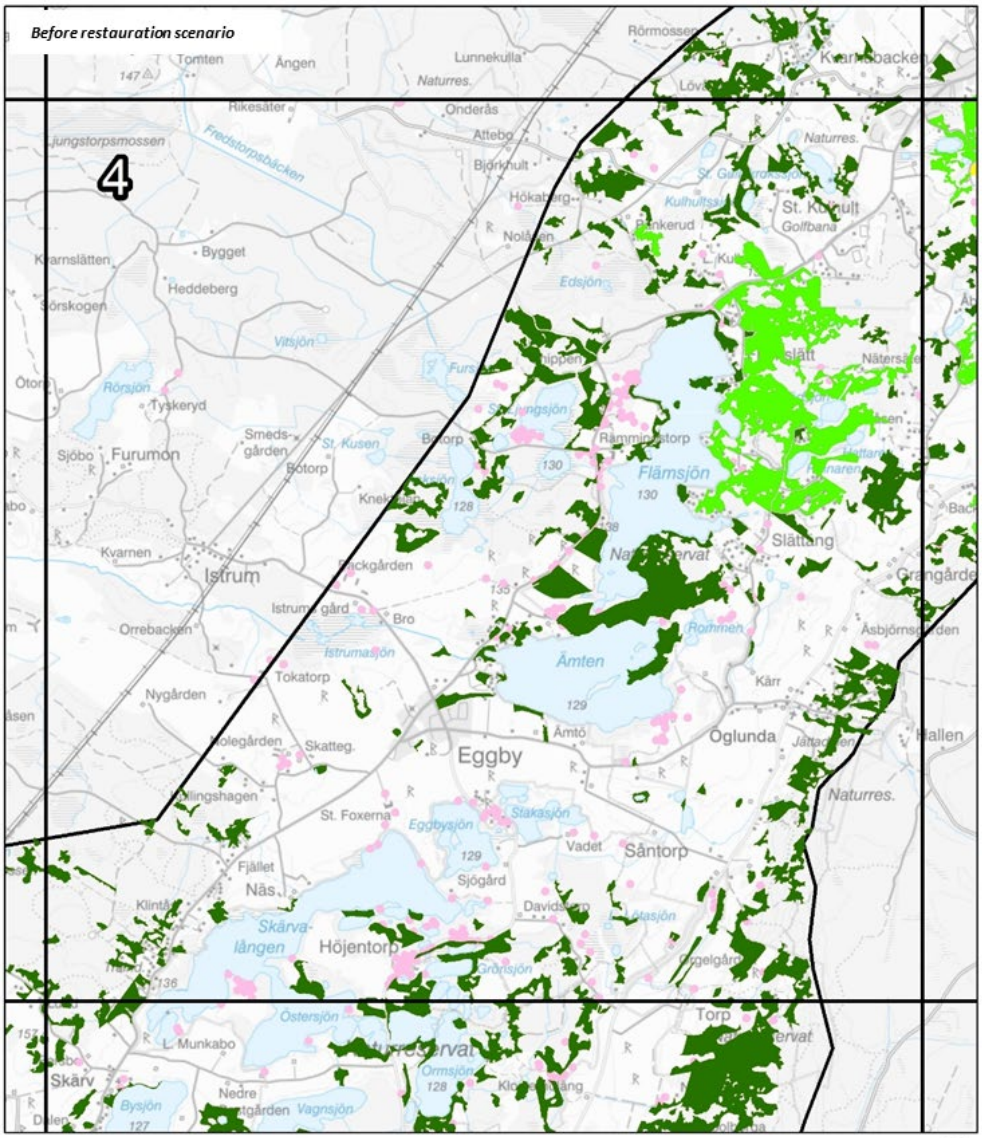
N

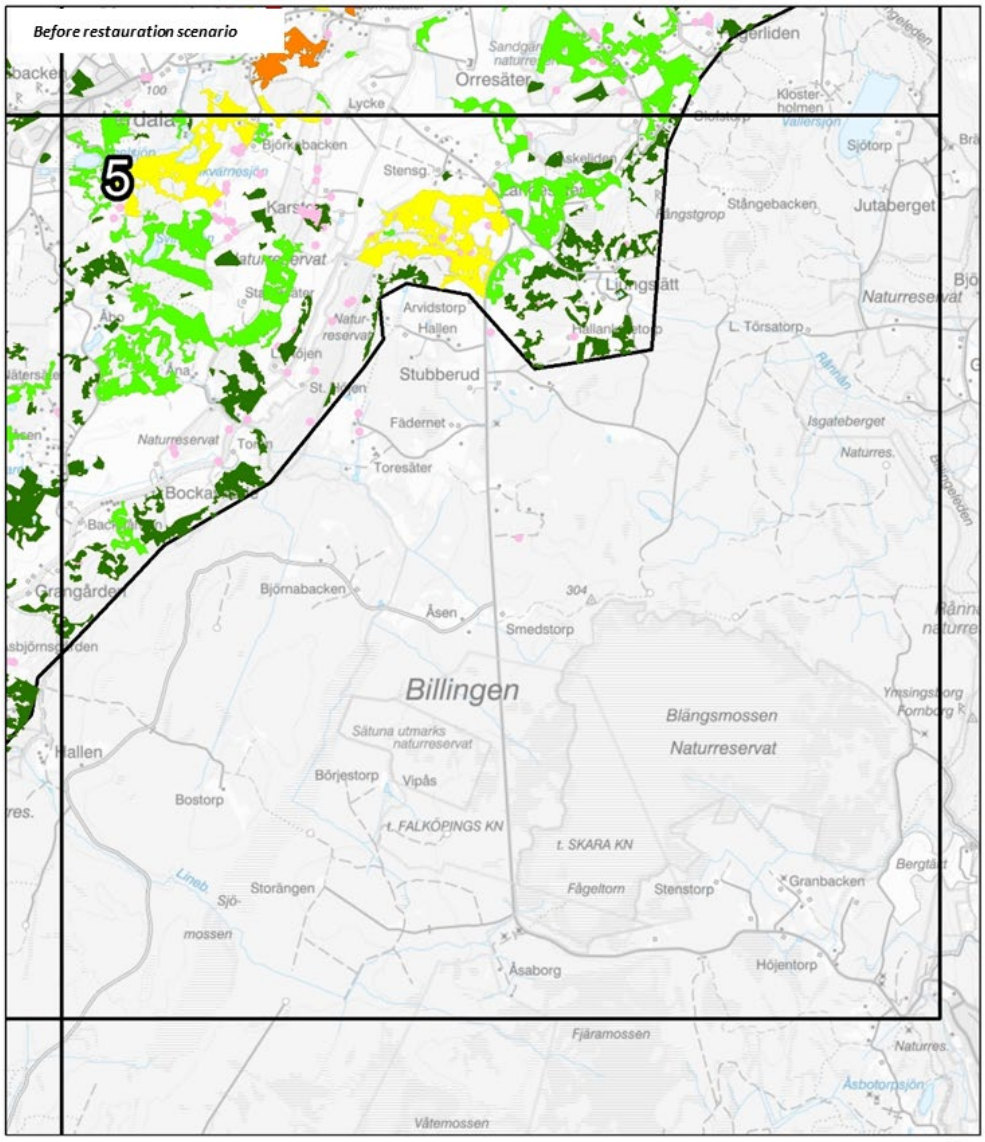
Broadleaved forests

- Low
- High

Open land with valuable trees

- Low
- High


Before restauration scenario
4
Tomten
Ängen
Lunnekulla
Naturres.
Rörmossen
Rikesäter
Onderås
Attebo
Björkhult
Fredstorpsbäcken
Hökaberg
Nolängen
Bygget
Heddeberg
Kvarnslätten
Vitsjön
Edsjön
Rörsjön
Tyskeryd
Furumon
Sjöbo
Smeds-gården
St. Kusen
Botorp
Rämmingstorp
Flämsjön
Kvarnen
Istrum
Orrebacken
Bro
Åmten
Tokatorp
Nygården
Kolegården
Skatteg.
Eggby
Ämtö
Oglunda
Slättäng
Kärr
Hallen
Naturres.
St. Foxerna
Eggbysjön
Stakasjön
Vadet
Sånторp
Fjället
Näs
Sjögård
Skärva-lången
Höjentorp
Östersjön
L. Munkabo
Skärv
Nedre
Vagnsjön
Torp
Ormsjön
Elasticity of BBCI to changes in patch area in:
0 0,5 1 2 Kilometers
N
Broadleaved forests
Low
High
Open land with valuable trees
Low
High



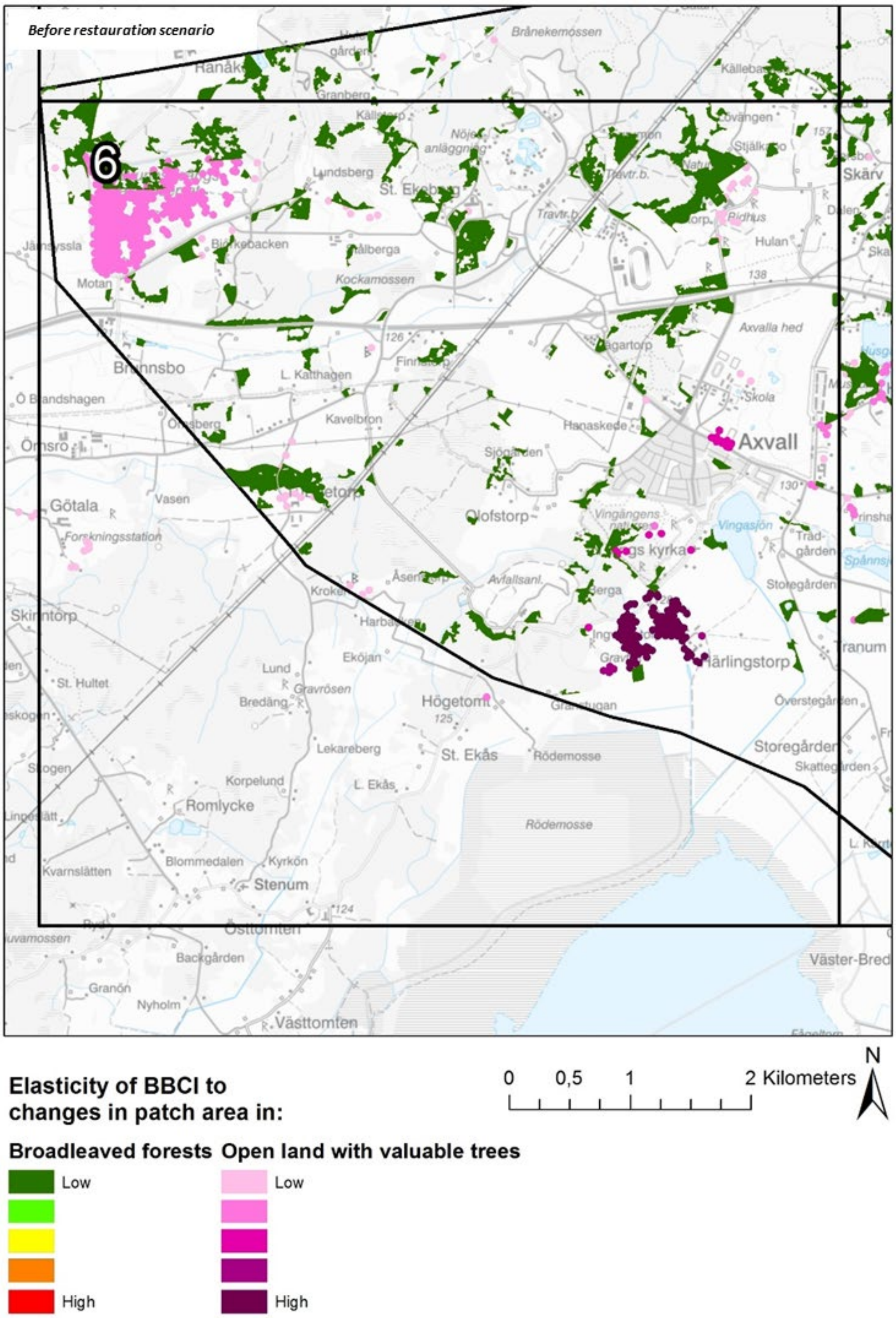
Elasticity of BBCI to changes in patch area in:

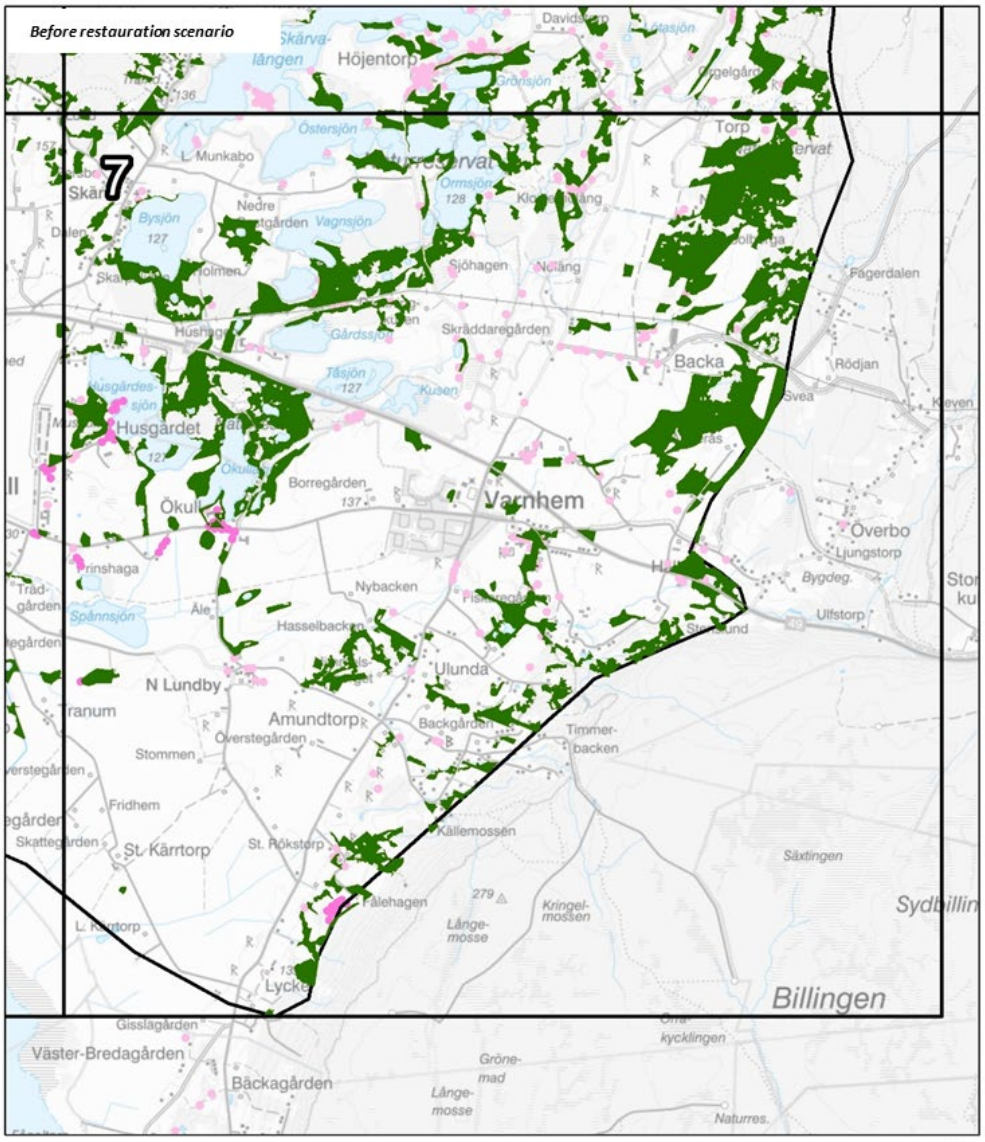
Broadleaved forests

- Low
- High

Open land with valuable trees

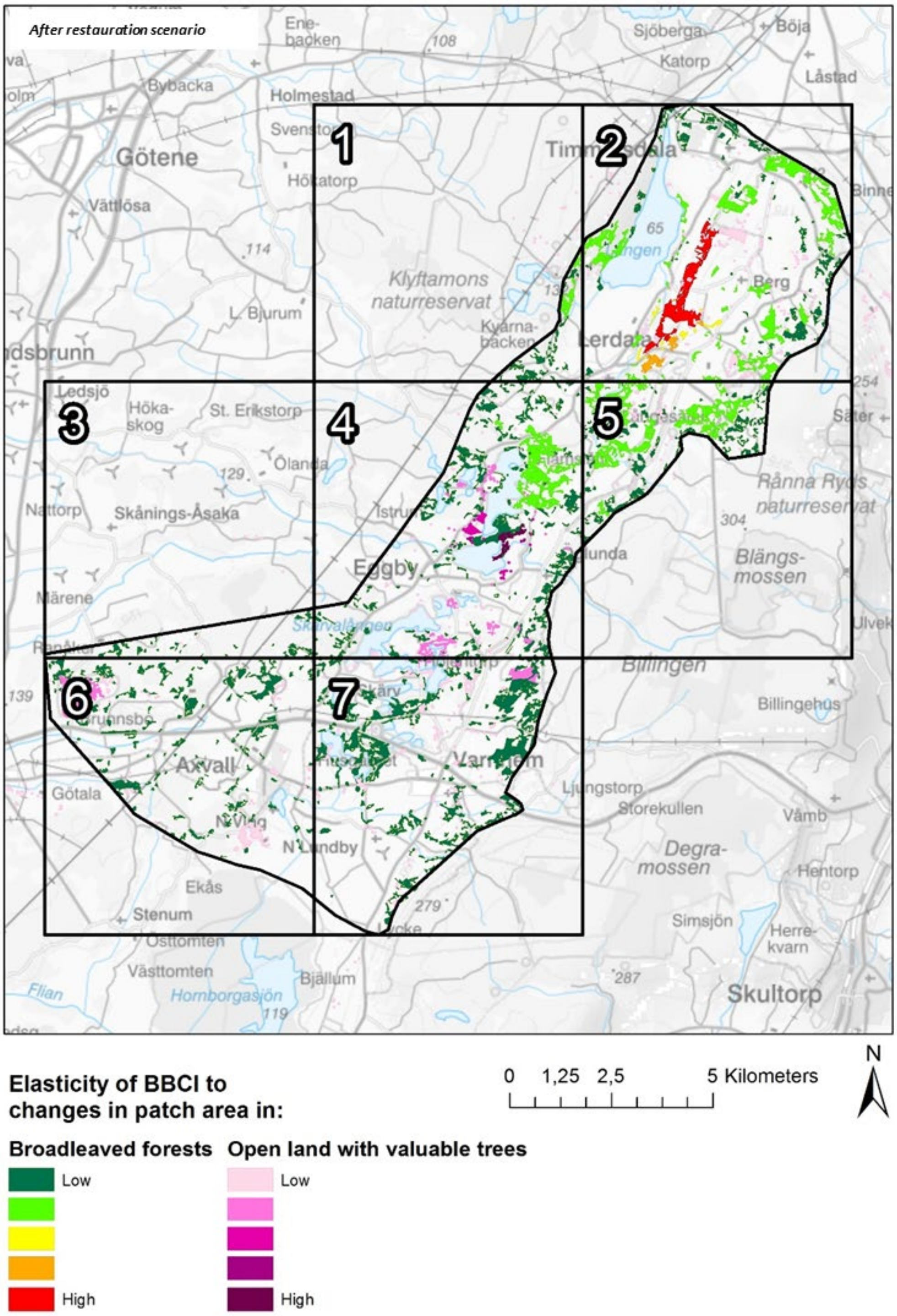
- Low
- High

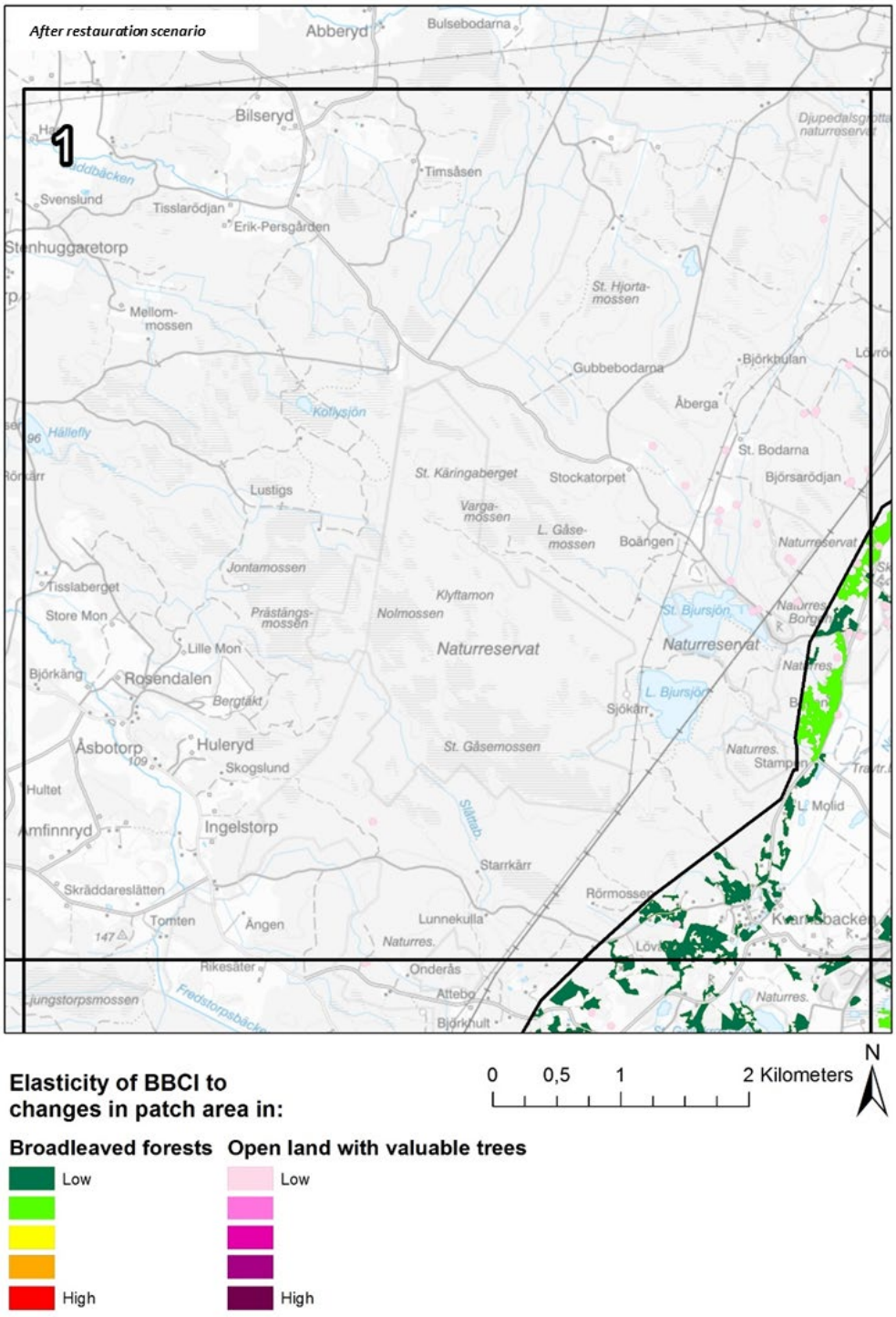

Before restauration scenario
6
Brånekemossen
Granberg
Källstorp
Nöjes anläggning
Lundsberg
St. Ekeberg
Travtr.b.
Stjälkatorp
Ridhus
Hulan
Skärv
Dalen
Järnsyssla
Motan
Björkebacken
Ålberga
Kockamossen
138
Axvalla hed
126
Brännsbo
L. Katthagen
Finnatorp
Ö Blandshagen
Skola
Kavelbron
Hanaskede
Axvall
Önsro
Sjögården
130
Götala
Vasen
Olofstorp
Vingångens naturres.
Vingasjön
Trädgården
Forskningsstation
Spånsjön
Åsentorp
Avfallsanl.
Storegården
Skinntorp
Kroken
Berga
Harbacken
Ranum
Eköjan
Härlingstorp
St. Hultet
Lund
Gravrösen
Bredäng
Högetomt
Överstegården
125
Lekareberg
St. Ekås
Rödemosse
Storegården
Skattegården
Korpelund
L. Ekås
Romlycke
Rödemosse
Kvarnslätten
Blommedalen
Kyrkön
Stenum
124
Östtomten
Backgården
Väster-Bredg
Granön
Nyholm
Västtomten
N
0
0,5
1
2 Kilometers
Elasticity of BBCI to changes in patch area in:
Broadleaved forests
Low
High
Open land with valuable trees
Low
High

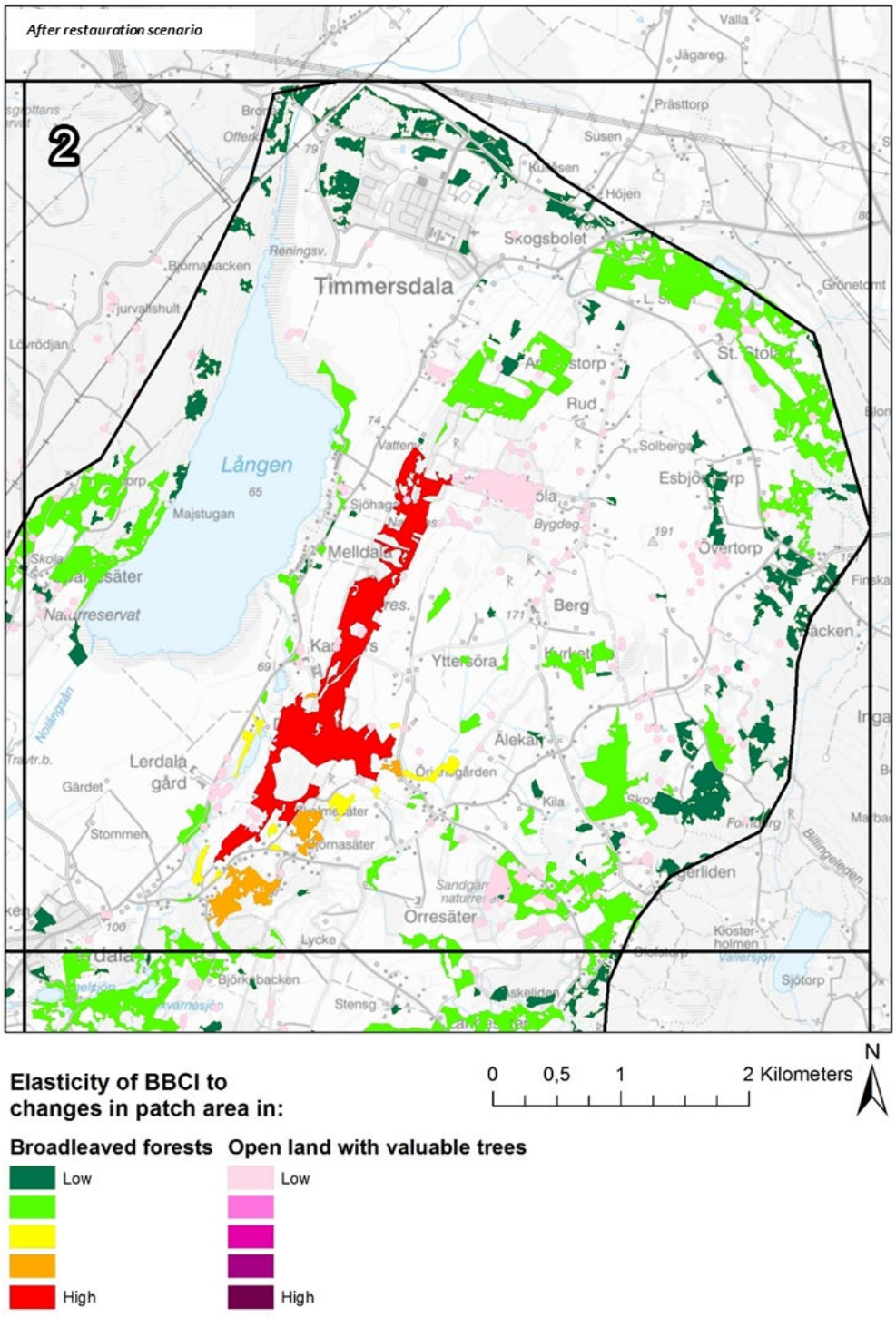

Before restauration scenario
7
Höjentorp
Skärvalången
Östersjön
L. Munkabo
Nedre Vagnsjön
Byssjön
Sjöhagen
Nolång
Fägerdalen
Skräddaregården
Backa
Rödjan
Svea
Husgärdet
Husgärdessjön
Tåsjön
Kusen
Borregården
Varnhem
Ökull
Överbo
Ljungstorp
Bygdeg.
Ulfstorp
Prinshaga
Nybacken
Hasselbacken
Spännsjön
Ulunda
N Lundby
Tranum
Amundtorp
Överstegården
Backgården
Timmerbacken
Stommen
Fridhem
St. Kärrtorp
St. Rökstorp
Källemossen
Säxtingen
Sydbillin
Tälehagen
Kringelmossen
Långemosse
Billingen
Lycke
Gisslagården
Väster-Bredagården
Bäckagården
Grönemad
Naturres.
0
0,5
1
2 Kilometers
N
Elasticity of BBCI to changes in patch area in:
Broadleaved forests
Low
High
Open land with valuable trees
Low
High

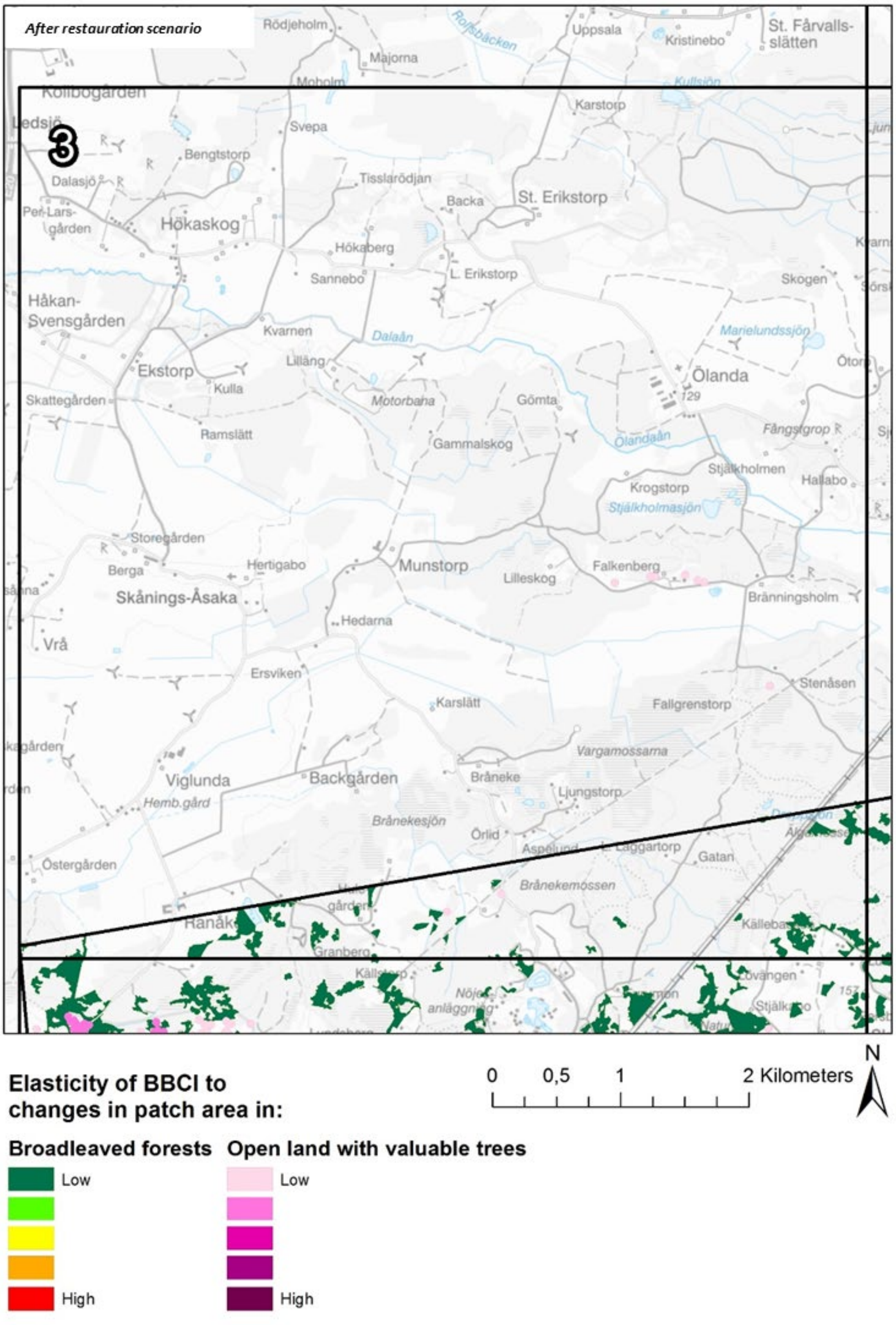
Appendix B – detailed maps with elasticity of BBCI *after* restauration of open land with valuable trees

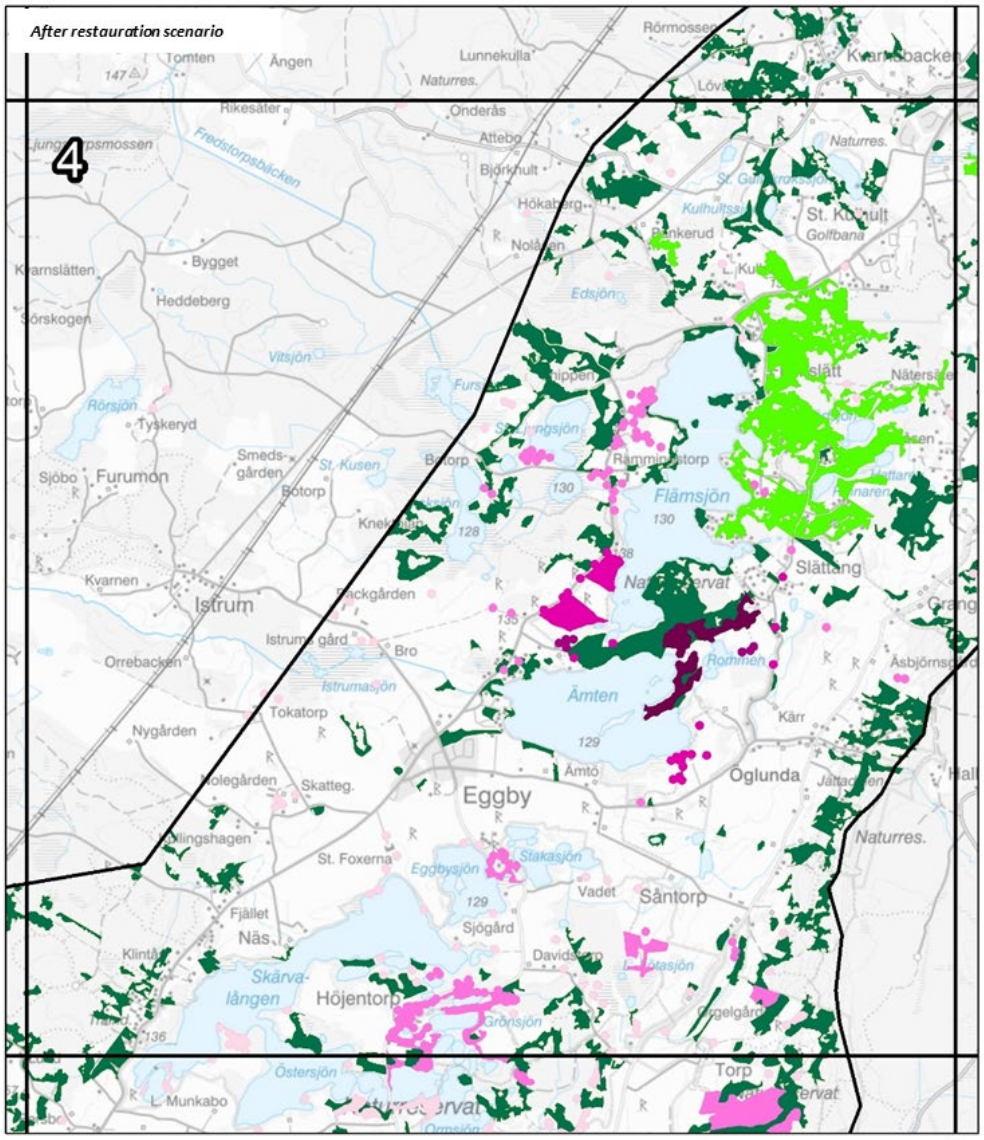
Atlas showing the elasticity of biotope biodiversity capacity index (*BBCI*) to changes in patch area of broadleaved forests and open land with valuable trees, respectively.

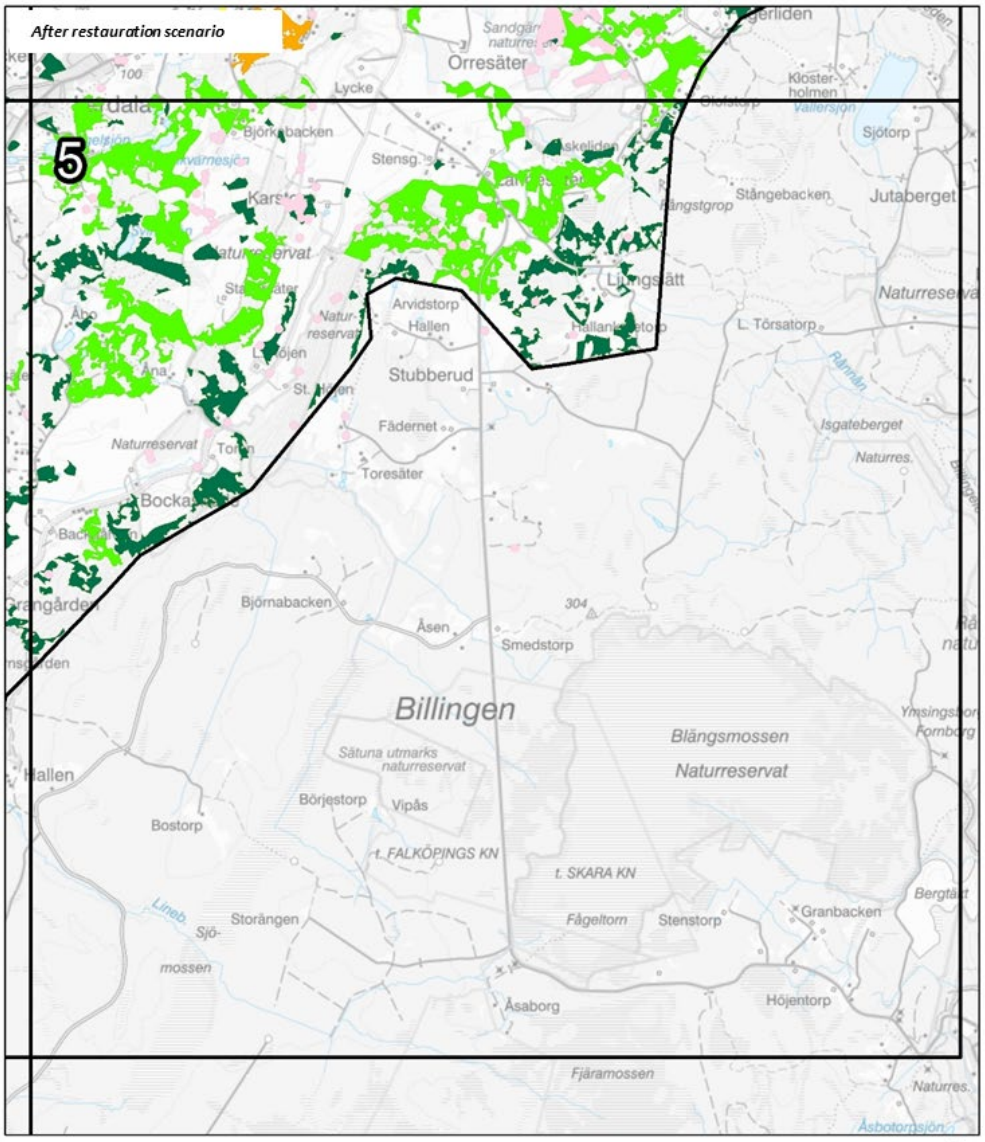



After restauration scenario
1
Abberyd
Bulsebodarna
Bilseryd
Timsåsen
Svenslund
Tisslarödjan
Erik-Persgården
Stenhuggaretorp
Mellom-
mossen
St. Hjorta-
mossen
Gubbebodarna
Björkhulan
Åberga
St. Bodarna
Björsarödjan
Kolhysjön
Hällefly
St. Käringaberget
Stockatorpet
Lustigs
Varga-
mossen
L. Gåse-
mossen
Boängen
Naturreservat
Jontamossen
Tisslaberget
Store Mon
Prästängs-
mossen
Nolmossen
Klyftamon
Naturreservat
Lille Mon
Björkäng
Rosendalen
Bergtäkt
Sjökärr
L. Bjursjön
St. Bjursjön
Åsbotorp
Huleryd
Skogslund
St. Gåsemossen
Hultet
Amfinnryd
Ingelstorp
Slättäb
Starrkärr
Skräddareslätten
Tomten
Ängen
Lunnekulla
Naturres.
Rörmossen
Rikesäter
Onderås
Attebo
Björkhult
Fredstorpsbäcken
Elasticity of BBCI to
changes in patch area in:
0
0,5
1
2 Kilometers
N
Broadleaved forests
Low
High
Open land with valuable trees
Low
High


After restauration scenario
2
Timmersdala
Lången
Skogsbolet
Rud
Melldala
Berg
Yttersöra
Orresäter
Lerdala gård
Timmersdala
Elasticity of BBCI to changes in patch area in:
Broadleaved forests
Low
High
Open land with valuable trees
Low
High
0
0,5
1
2 Kilometers
N

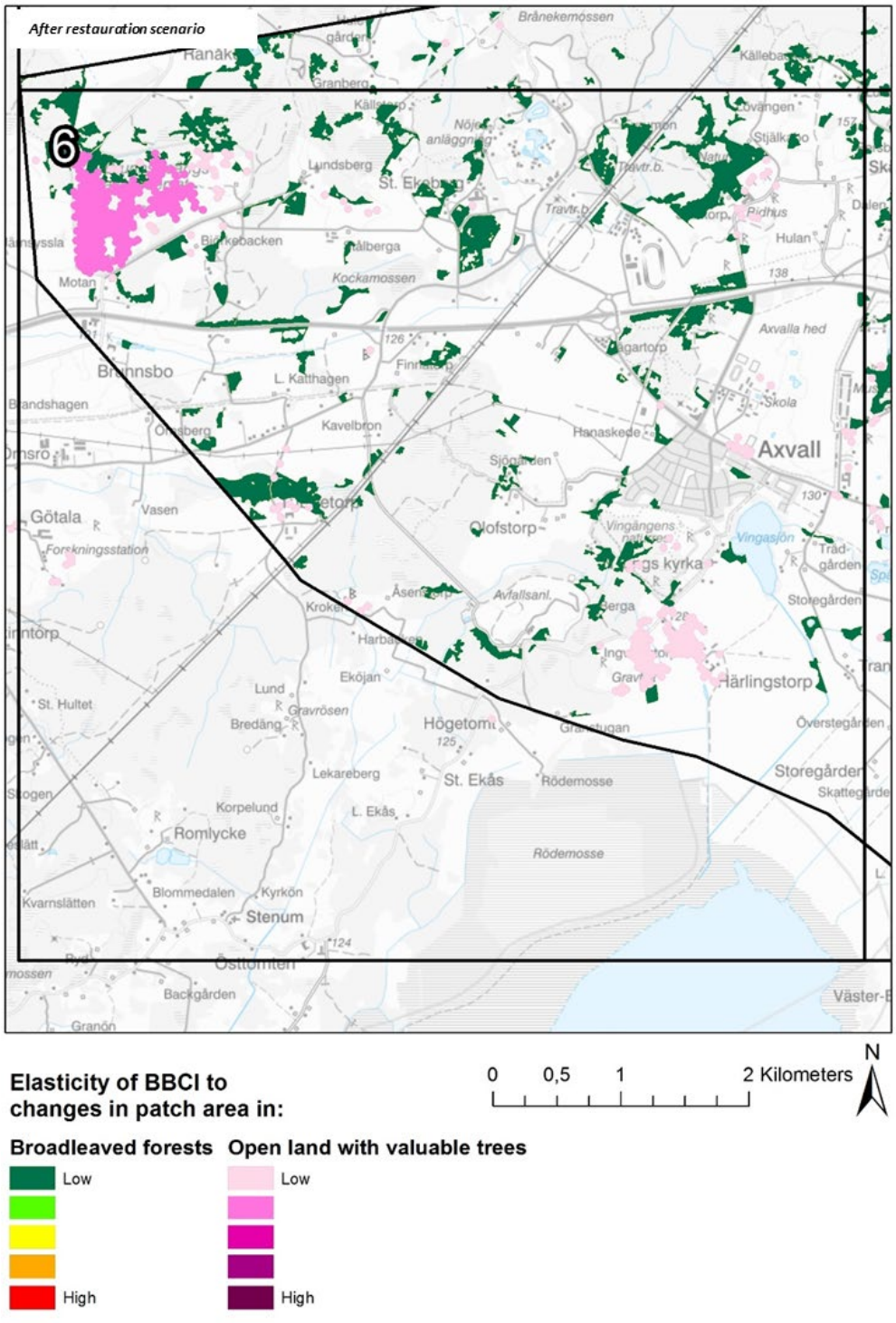

After restauration scenario
3
Rödjeholm
Uppsala
Kristinebo
St. Fårvalls-slätten
Majorna
Karstorp
Svepa
Bengtstorp
Dalasjö
Tisslarödjan
Backa
St. Erikstorp
Per-Lars-gården
Hökaskog
Hökaberg
Sannebo
L. Erikstorp
Skogen
Håkan-Svensgården
Kvarnen
Dalaån
Marielundssjön
Lillång
Ekstorp
Kulla
Ölanda
Skattegården
Motorbana
Gömta
Ramslätt
Gammalskog
Ölandaån
Fångstgrop
Stjälkholmen
Hallabo
Krogstorp
Stjälkholmasjön
Storegården
Berga
Hertigabo
Munstorp
Lilleskog
Falkenberg
Bränningsholm
Skånings-Åsaka
Hedarna
Vrå
Ersviken
Stenåsen
Karslätt
Fallgrenstorp
Vargamossarna
Viglunda
Backgården
Håneke
Ljungstorp
Hemb.gård
Brånekesjön
Örlid
Aspelund
Gatan
Östergården
Brånekemossen
Granberg
Elasticity of BBCI to changes in patch area in:
Broadleaved forests
Open land with valuable trees
Low
High
Low
High
0
0,5
1
2 Kilometers
N

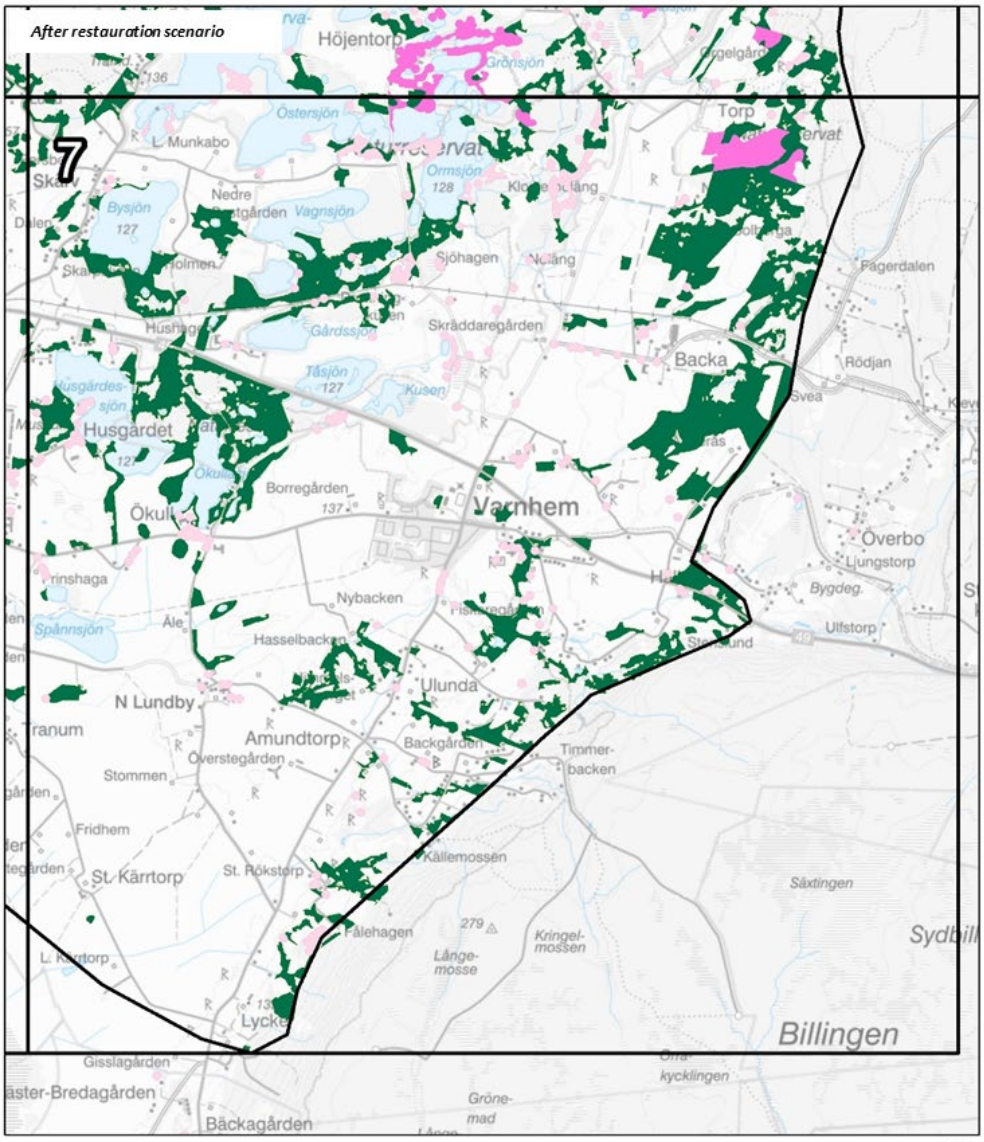

After restauration scenario
4
Tomten
Ängen
Lunnekulla
Naturres.
Rörmossen
Kvarnsbacken
Rikesäter
Onderås
Attebo
Björkhult
Fredstorpsbäcken
Naturres.
Hökaberg
Kulhultsån
St. Kullhult
Golfbana
Nolåsen
Pinkerud
Bygget
Kvarnslätten
Heddeberg
Edsjön
Vitsjön
Rörsjön
Tyskeryd
Sjöbo
Furumon
Smeds-gården
St. Kusen
Botorp
Rämmingstorp
Flämsjön
130
128
Kvarnen
Istrum
Bro
Orrebacken
Istrumasjön
Tokatorp
Nygården
Ämten
129
Ämtö
Öglunda
Kärr
Eggby
Skatteg.
St. Foxerna
Eggbysjön
Stakasjön
Vadet
Säntorp
Fjället
Näs
Sjögård
Skärva-lången
Höjentorp
Grönsjön
Östersjön
L. Munkabo
Torp
N
0
0,5
1
2 Kilometers
Elasticity of BBCI to changes in patch area in:
Broadleaved forests
Low
High
Open land with valuable trees
Low
High



Elasticity of BBCI to changes in patch area in:

Broadleaved forests	Open land with valuable trees
Low	Low
High	High


After restauration scenario
6
Bränekemossen
Ranäk
Granberg
Källeb
Lövängen
Stjälkmo
Lundsberg
St. Ekeb
Travtr.b.
Pidhus
Hulan
Björkebacken
Kockamossen
Motan
Axvalla hed
Brännsbo
L. Katthagen
Brandshagen
Kavelbron
Hanaskede
Skola
Axvall
Vasen
Götala
Forskningsstation
Olofstorp
Vingasjön
Trädgården
Storegården
Eköjan
Lund
Gravrösen
Bredäng
Högetorp
Härlingstorp
Överstegården
St. Hultet
Lekareberg
St. Ekås
Rödemosse
Korpelund
L. Ekås
Romlycke
Kvarnslätten
Blommedalen
Kyrkön
Stenum
Östtomten
Backgården
Granön
Väster-
0
0,5
1
2 Kilometers
N
Elasticity of BBCI to changes in patch area in:
Broadleaved forests
Low
High
Open land with valuable trees
Low
High


After restauration scenario
7
Höjentorp
Torp
Backa
Fagerdalen
Rödjan
Husgärdet
Varnhem
Överbo
Ljungstorp
Ulfstorp
Nybacken
Hasselbacken
Ulunda
N Lundby
Amundtorp
Timmer-backen
Fridhem
St. Kärrtorp
St. Rökstorp
Källemossen
Säxtingen
Fälehagen
Kringel-mossen
Långe-mosse
Billingen
Gisslagården
Bäckagården
Grönemad
Skräddaregården
Borregården
Ökull
Nedre
Sjöhagen
Ormsjön
Bysjön
Vagnsjön
Spännsjön
Stommen
Överstegården
Backgården
Svea
Bygdeg.
0
0,5
1
2 Kilometers
N
Elasticity of BBCI to changes in patch area in:
Broadleaved forests
Low
High
Open land with valuable trees
Low
High

Länsstyrelsen
Västra Götaland