1880

Practically no nature conservation

In USA the Yellowstone NP (898 000 ha) was created 1872

In Mongolia the Bogdo-Ula NR (54 100 ha) was created 1778

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1930

Nature conservation is developing in more and more countries

Magnifiscent sceneries

National emblems

National parks in many countries

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1980

The land use has become gradually more intensive

- wetlands have been ditched
- forests have been cut
- pastures have been cultivated and fertilised

https://www.natursidan.se/nyheter/nya-skogsstyrelsechefen-det-finns-inga-kalhyggen-langre/

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1980

The importance of systematical conservation of nature become more obvious

Special authorities for nature conservation are formed

The nation wide surveys in Sweden starts

The oldgrowth forest survey starts 1979

Photo Leif Andersson

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1990

The intensive modern forestry is more or less covering the whole country

Efficient nature conservation need comprehensive systematic surveys of major nature types

Wetland inventory

Inventory of meadows and pastures

WKH survey

https://www.maskinisten.net/viewtopic.php?f=80&t=292631&start=45&hilit=profil%2A

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Main tasks

How to locate areas with potentially high biodiversity values?

How to assess and rank located areas with potentially high biodiversity values?

Aerial photo - Estonia

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How to define high nature conservation value?

In most surveys this is sites contributing substantially to the biodiversity

How much will be important in the ranking

But we must be aware that there are also other values – recreational, educational, geological, aesthetical, etc

Photo Zydronas Sinkevicius

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Efficient survey work

Forests in Sweden are covering ca 25 milj ha

It is necessary to use an efficient survey method

There will not be enough well educated biologists available for the survey work to perform the survey within reasonable time

Photo Riina Martverk

Pro Natura

Two important tools were introduced to simplify the biodiversty value assessment

1) Indicator species

Photo Rando Omleer

Pro Natura

2) Key elements

These tools made it possible also for foresters to participate in the survey

Photo Rando Omleer

Pro Natura

Indicator species

In the beginning of the 1990-ties the Swedish Red Data book had been in place for some time.

Many redlisted species from forests are possible to identify rather easily

But there are also species sensitive to forestry which are not redlisted. And some of these are also possible to identify rather easily

Both these categories were included in the Swedish concept of indicator species

Photo Riina Martverk

Pro Natura

Key elements

The process of learning species can be rather hard for nonbiologists despite the choice of species easy to identify

In addition to the indicator species a number of components in the forests was selected as indicators. They are supposed to indicate the presence of sensitive forest species. They are a prerequisite for them, offering substrate and habitats.

Photo Leif Andersson

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Key elements

Snag

Biologically old tree

Log

Spring

Vertical rock

Photo various WKH-surveyors

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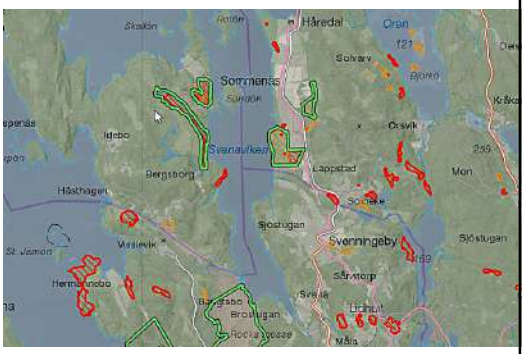
1998

The main WKH survey in Sweden was completed

Additional WKH surveys have been done until this very day



https://www.skogsstyrelsen.se/skogensparlor

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The WKH survey in the Baltic states

1997 – start i Latvia

1998 – start in Estonia

2001 – start in Lithuania

2003 – main survey completed and published in Estonia

2005 – main survey completed and published in Lithuania

https://www.dreamstime.com/political-map-baltic-states-flat-map-pointers-political-map-baltic-states-flat-map-pointers-vector-image111868268

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WKH survey – pros and cons

Pros

Transparency (putting a site on the map is half way to protection)

Systematic (sites are not randomly selected)

Cons

Stand level survey makes the size of fhe sites small (the consequence is often fragmentation, absence of landscape ecological aspects)

Forest owners and the forestry make pressure on the survey work

https://blueocean.ca/weighing-the-pros-and-cons-of-cross-trained-contact-center-agents/

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WKH in other countries

Similar work in Norway

Some attempts in Finland (more focused on oldgrowth forest surveys)

Method developed in Denmark

Mapping and assessment methods introduced to West Russia

https://geology.com/world/europe-satellite-image.shtml

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The Baltic states and Russia as a developing melting pot

The method development

SE: Indicator species – Key elements

LV: Indicator species / Habitat specialists

EE: Landscape Key elements – Biological Key elements

RU: Forest dynamics / Identification of forest massivs

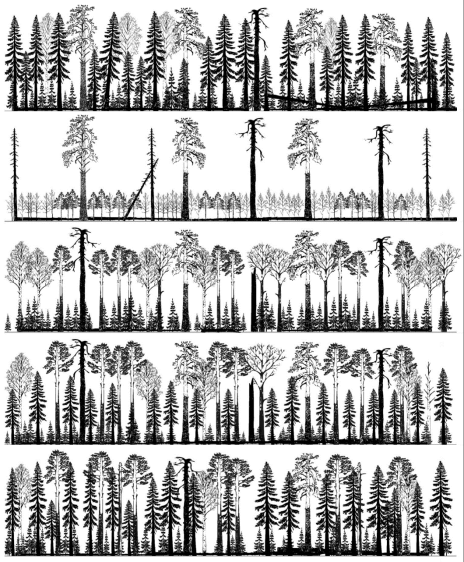

Illustration Eugene Poroshin

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2019

Several countries have made WKH surveys – or similar surveys

Solid databases are built up

Several editions of Red Data books have been processed

The protection of forest has continued

But:

The biodiversity in forests is still declining.

Many species seem extinct for ever?

http://www.digipics.se/tattingar/praktfaglar/blakraka/blakraka01.htm

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Important fact

Designating a site as a WKH does not mean that the site is protected.

Not in any legislation.

Voluntary set aside areas give (temporary) protection in some forest owners forests.

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2019 – looking forward

New tools to work at landscape scale

- density analyses
- connectivity analyses
- gap analyses (treshold analyses)

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Density analysis

Finding landscapes with important areas or clusters of areas of particular importance for a certain biotope.

These important areas can be based on presence of species connected to the biotope or core areas of the biotope.

The species can be all species connected to the biotope (ecological species pool) or part of the ecological species pool (e.g. focal species).

The core areas can be larger biologically valuable areas of the biotope (protected or not) and smaller sites (e.g. WKH).

Photo Claes Hellsten

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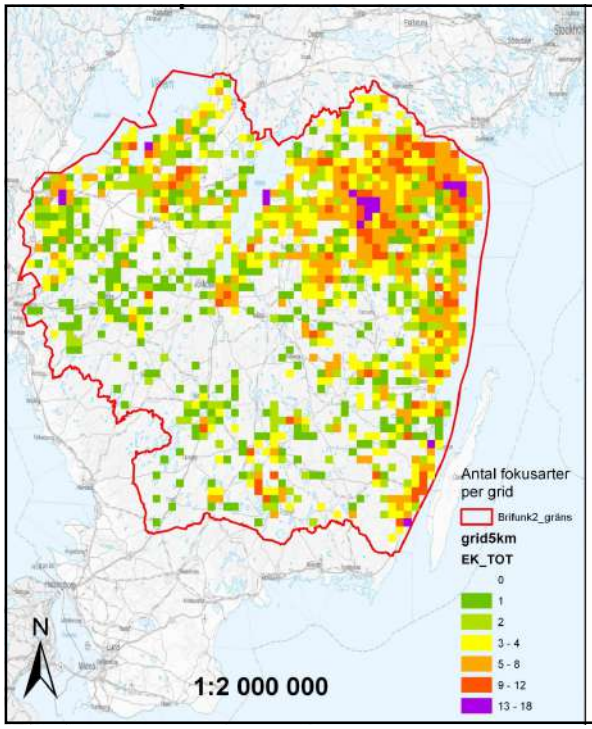


Number of focal species connected to oak per grid of 5 x 5 km.

A total of 23 focal species were used.

The species are strongly connected to oak.

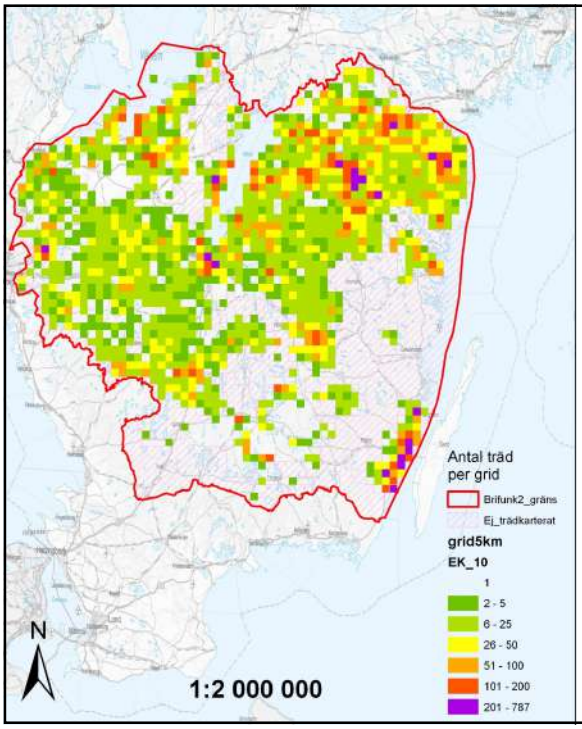
http://www.pro-natura.net/publikat-filer/Landskapsekologisk%20Brist-%20och%20Funktionalitetsanalys.pdf

Pro Natura

Focal species connected to oak used in the threshold/gap analysis

Vetenskapligt namn	Svenskt namn	Organismgrupp
Arthonia byssacea	ekpricklav	Lichen
Bactrospora corticola	liten sönderfallslav	Lichen
Bactrospora dryina	stor sönderfallslav	Lichen
Calicium adspersum	gulpudrad spiklav	Lichen
Chaenotheca hispidula	parknål	Lichen
Chaenotheca phaeocephala	brun nållav	Lichen
Cliostomum corrugatum	gul dropplav	Lichen
Dendrographa decolorans	grå skärelav	Lichen
Fistulina hepatica	oxtungsvamp	Fungus
Grifola frondosa	koralllticka	Fungus
Gymnopus fusipes	räfflad nagelskivling	Fungus
Hapalopilus croceus	saffransticka	Fungus
Haploporus tuberculosus	blekticka	Fungus
Hygrophorus russula	kremlevaxskivling	Fungus
Inonotus dryadeus	tårticka	Fungus
Lactarius volemus	mandelriska	Fungus
Lecanographa amylacea	gammelekslav	Lichen
Osmoderma eremita	läderbagge	Beetle
Perenniporia medulla-panis	brödmärgsticka	Fungus
Phellinus robustus	ekticka	Fungus
Piptoporus quercinus	tungticka	Fungus
Schismatomma pericleum	rosa skärelav	Lichen
Sclerophora coniophaea	rödbrun blekspik	Lichen

Pro Natura



Number of oaks with a diameter > 1 m per grid of 5 x 5 km

Some areas have not been surveyed of giant trees – these areas are hatched

http://www.pro-natura.net/publikat-filer/Landskapsekologisk%20Brist-%20och%20Funktionalitetsanalys.pdf

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Connectivity analyses

The landscape represent different possibilities for the species in a biotope to migrate to other sites.

The landscape or nature can be hostile or friendly at varying scales.

If the migration of a species between different sites is too small the populations become isolated. The impact of the fragmentation is real.

There are today GIS tools to calculate connectivity by giving different permeability values to different biotopes:

Requests:
1) Biotope map
2) Ecological knowledge of the speceis sensitivity to various biotops

Photo Claes Hellsten

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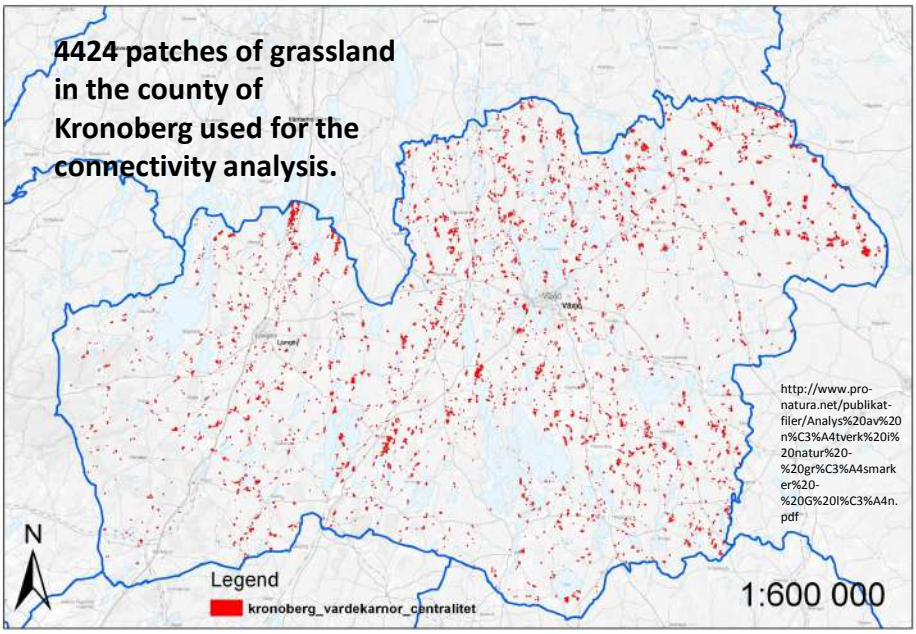

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A group of patches in small village

http://www.pro-natura.net/publikat-filer/Analys%20av%20n%C3%A4tverk%20i%20natur%20-%20gr%C3%A4smarker%20-%20G%20l%C3%A4n.pdf

Pro Natura

The same village and patches in a Least Cost Path (LCP) connectivity analysis using Linkage Mapper

http://www.pro-natura.net/publikat-filer/Analys%20av%20n%C3%A4tverk%20i%20natur%20-%20gr%C3%A4smarker%20-%20G%20l%C3%A4n.pdf

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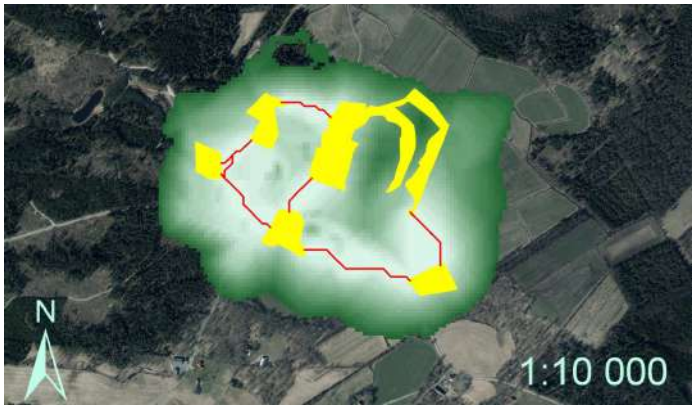
The same village and patches in a Least Cost Path (LCP) connectivity analysis (red lines) and corridors (white-green) using Linkage Mapper



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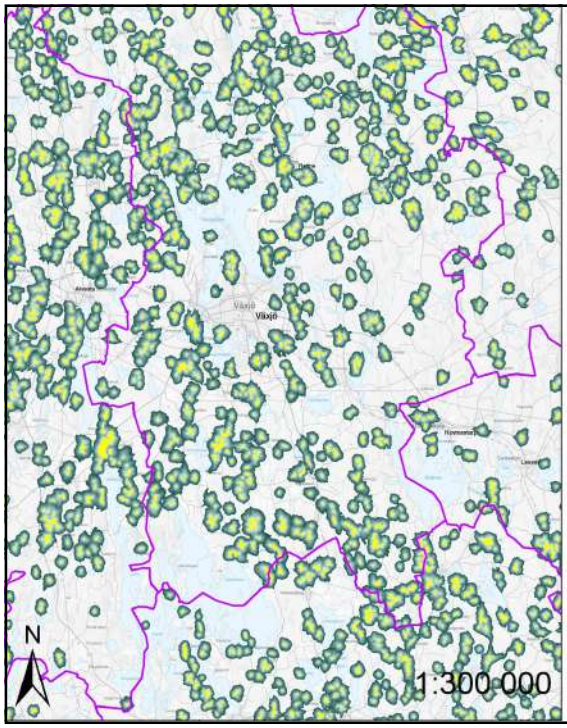

Connected patches of grasslands in Växjö municipality, Småland (South Sweden)

Patches are yellow, various degrees of connectivity are green. The darker, the less connectivty. No colour – no connectivity.

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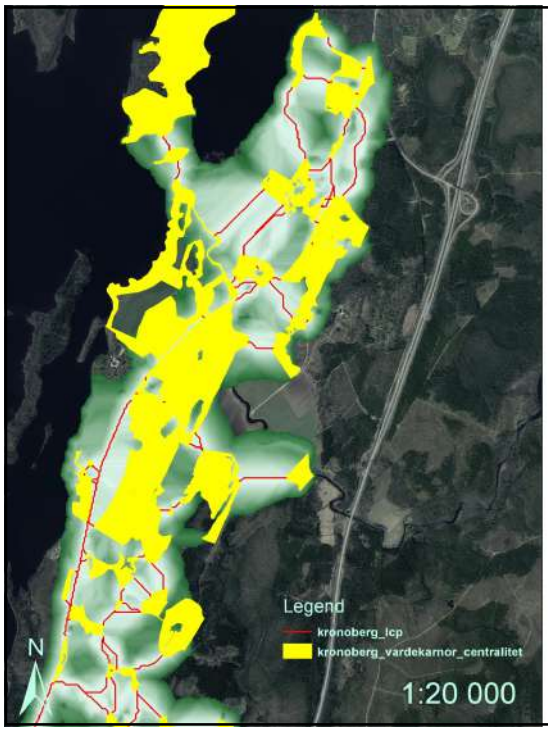

One network of connected area of patches of grassland in the county of Kronoberg, Småland (South Sweden).

Patches are yellow, various degrees of connectivity are green. The darker, the less connectivty. No colour – no connectivity.

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Gap analyses / threshold analyses

It can be assumed that there is a correspondence between the occurrence of a species and the amount of the species habitat in the landscape.

Hence it is possible to calculate a threshold for the probability of the existence of a species in a particular landscape.

Given the existence of good data of the species occurrence in the geography and good data of of the occurrence of the habitat.

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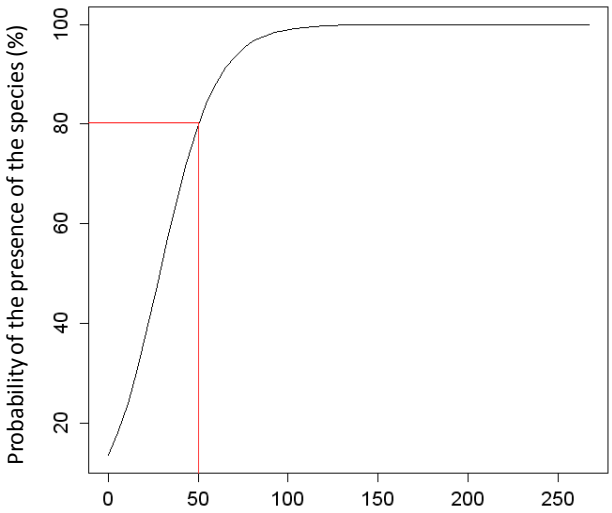
Probability of presence of a species related to the amount of its habitat



http://www.pro-natura.net/publikat-filer/Landskapsekologisk%20Brist-%20och%20Funktionalitetsanalys.pdf

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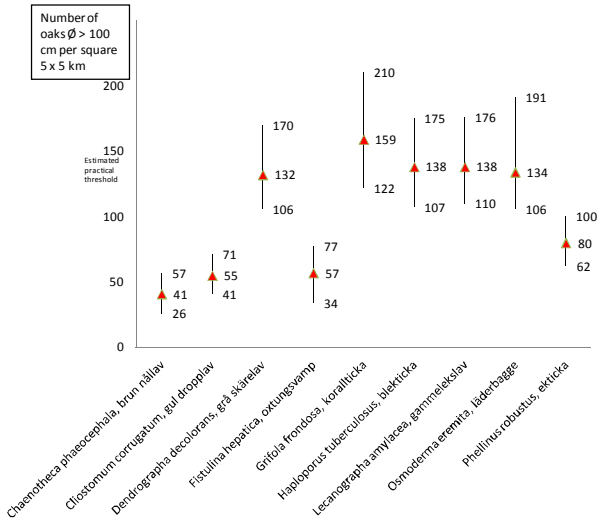
Thresholds of number of oaks with diameter > 1m for some focal species



http://www.pro-natura.net/publikat-filer/Landskapsekologisk%20Brist-%20och%20Funktionalitetsanalys.pdf

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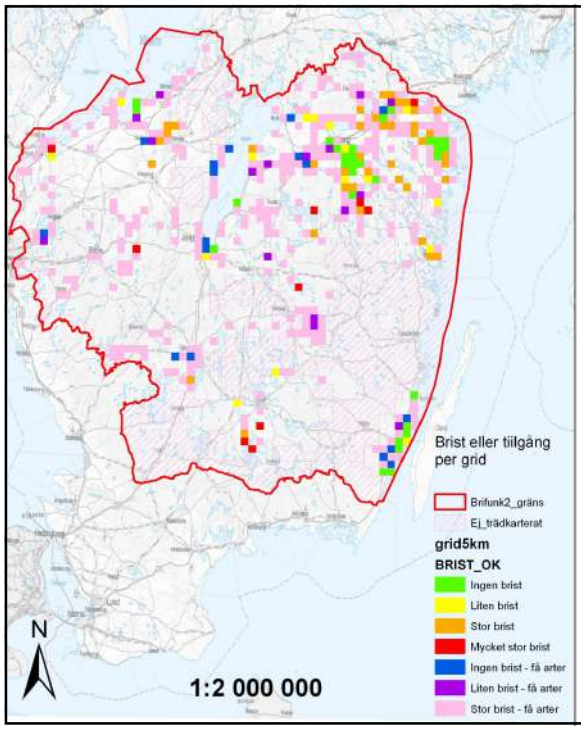

Are there enough oaks for the focal species in the landscape?

http://www.pro-natura.net/publikat-filer/Landskapsekologisk%20Brist-%20och%20Funktionalitetsanalys.pdf

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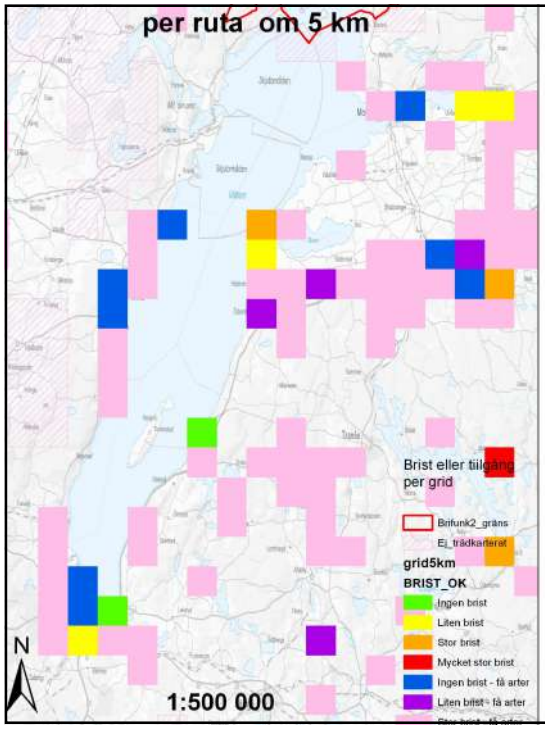

Close up of a landscape showing gaps and resources of oaks with diameter > 1 m.

http://www.pro-natura.net/publikat-filer/Landskapsekologisk%20Brist-%20och%20Funktionalitetsanalys.pdf

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The gap / threshold analysis will contribute to answer the questions:

How much of a biotope is needed in the landscape to preserve even the most demanding species?

Where shall we allocate the efforts to preserve or restore this biotope?

Photo Claes Hellsten

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Swedish Species Observation System

Artportalen

67 500 000 records

Photo Claes Hellsten

Pro Natura

Environmental Impact Assessment (EIA)

The EIA studies the impacts of the project on :

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soil, water, air, climate, vegetation, organisms, their mutual interaction, and **biodiversity**

One important step in project planning is to identify areas of special importance for biodiversity.

Biodiversity survey

Photo Claes Hellsten

Pro Natura

The Swedish Standard for ”Biodiversity survey – implementation, assessment and reporting”

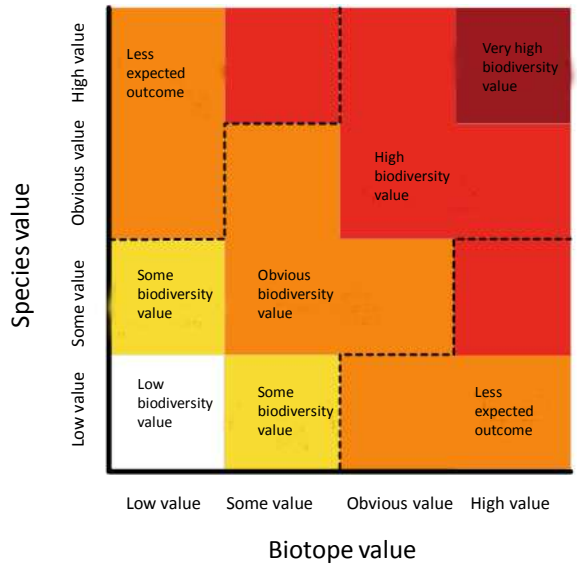
The main principles for assessment of the biodiversity value is based on the same ground as the WKH survey!

And this standard is aimed for all nature types, biotopes and landscapes in Sweden.

Photo Claes Hellsten

Pro Natura

Assessing biodiversity value



From SIS Swedish Standards Institute 2014: Naturvärdesinventering avseende biologisk mångfald (NVI). Genomförande, naturvärdesbedömning och redovisning. – Svensk Standard SS 199000:2014.

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