Skogssällskapet

Slutrapport

Projektrubrik: Naturvärdesbedömning i skog – fungerar den verkligen?
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Projektets löptid: 2016-06-01 – 2018-12-30

Populärvetenskaplig sammanfattning

Tillförlitliga och effektiva metoder för att identifiera naturvärden är viktiga för att utveckla en hållbar biobaserad ekonomi. Minst lika viktigt är att de områden identifierade som lämpliga för produktion inte hyser skyddskrävande arter. Av praktiska och ekonomiska skäl bedöms skogars bevarandevärde nästan uteslutande genom indirekta metoder där man istället för de skyddsvärda arterna inventerar olika indikatorer. I Sverige används sådana metoder för att bestämma vilka områden som ska undantas skogsbruk med syfte att bevara biologisk mångfald. Överraskande nog har den vetenskapliga grunden för de metoder man idag använder aldrig utvärderats. Eftersom användandet av indirekta metoder är utbrett innebär detta inte bara att stora resurser lagts på åtgärder vars värde inte är klarlagt utan också att det finns en risk att många skyddsvärda arters populationer hotas av skogsavverkning. Vi har i detta projekt undersökt hur sambanden ser ut mellan de poäng som sätts i en av de vanligast förekommande indirekta metoderna och förekomsten av så kallade signalarter (arter som utpekats av Skogsstyrelsen som indikatorer för skyddsvärd skog). Vad vi fann var att skogsbestånd med höga naturvärdespoäng också innehöll fler signalarter än skogar med lägre naturvärdespoäng. Detta var dock inte fallet för alla olika artgrupper om man tittar på dem var och en för sig. Om man vill hitta ett sätt att uppskatta antalet signalarter av mossor är det bättre att inventera tillgången på död ved. Metoden som idag används skulle alltså kunna förbättras om man kompletterade den med mätningar av mängden död ved. Hur man skulle utforma dessa mätningar återstår att analyseras närmare.

Resultat

Aims and methods

The project aimed to evaluate the effectiveness of biodiversity assessment conducted with the indirect method developed by Skogsbiologerna to capture biodiversity in forests. Furthermore, the goal was to assess if the occurrences of signal species or supply of structural variables such as deadwood is higher in Woodland Key Habitats ("WKHs") than in production forests. The biodiversity assessment aims to recognize important structural variables in the stand and scores the stand according to how many of the variables were found ("biodiversity assessment scores"). To compare the assessments, the same stands were inventoried to quantify the structures and occurrences of signal species. Only spruce-dominated stands were studied, as the occurrence of pine-dominated stands was too low. Altogether 39 WKHs and 39 production forests were inventoried, but the results here include 39 WKHs (19 WKHs in Västerbotten, 20 in Bergslagen) and 20 production forests (Bergslagen).

Differences between production forests and Woodland key habitats

In the inventories of signal species occurrences, 181 signal species belonging to vascular plants (25 spp), macrofungi (68), bryophytes (34) and lichens (54) were found. Significantly more signal species

(glm, p<0.001), in total 173 (20.1 ± 11.7, mean and sd), were found from WKHs in comparison to production forests (total 81 species, 9.3 ± 7.5), but the pattern was mostly driven by northern WKH stands (Fig. 1). The volume and count of deadwood was higher in WKHs in comparison to production forests (volume: 24.9 ± 21.6, 7.7 ± 5.4 m3/ha, respectively) (Fig. 2). WKHs obtained significantly higher biodiversity assessment scores in comparison to production forests (F=68.7, p<0.001), which indicates that the indirect assessment fairly well recognizes the WKHs from the production forests.

Biodiversity assessments scores in relation to signal species

There were significant positive correlations between biodiversity assessment scores and the occurrences of all signal species and all red-listed signal species (Table 1, Fig. 3.). Among different taxonomic groups the strongest correlations with biodiversity assessment scores were found in signal lichens and signal fungi, but also red-listed lichens strongly correlated with scores (Table 1, Fig. 4).

Biodiversity assessment scores in relation to structural variables

Among the structural variables, there was a significant positive correlation between biodiversity assessment scores and total deadwood volume and density (Table 2). Furthermore, a significant negative correlation was detected between the basal area of pine and biodiversity assessment scores.

The structural variables in relation to signal species

In the assessment of relationship between structural variables and the signal species, we found a positive relationship between deadwood variables (total volume and density) and the number of signal species, especially macrofungi and bryophytes (Table 3). There were also some weak correlations between living tree variables and signal species (Table 4). Most noteworthy is the negative correlation between the basal area of pine and indicator species across all taxonomic groups.

Conclusions

The correlation between the occurrences of signal species and biodiversity assessment scores was stronger than correlation between signal species and deadwood or living tree structural variables. Furthermore, the best model to explain the variation in signal species richness was the model that included both the biodiversity assessment scores and the density of deadwood objects (Table 5). This is due to the fact that the biodiversity assessment scores did not correlate well with all taxonomic groups, for example for bryophytes the deadwood volume was a better indicator than biodiversity assessment score. To get the most reliable estimate of biodiversity value in a forest stand, the biodiversity assessment scores could be complemented with deadwood inventories. Further analyses are required to assess which deadwood variables have the greatest explanatory power.

Målbeskrivning

Hereafter we present the goals of the project one by one and the main conclusions we achieved within each aim.

In this project we aimed to

1) evaluate how the most widespread method (Skogsbiologerna) used for biodiversity value assessment captures biodiversity in forest stands, and identify potential ways to improve the method.

We found out that forests with higher biodiversity assessment scores usually contained more signal species and red-listed signal species. On the other hand, the correlations between signal species and deadwood variables were not as high, although significantly positive. The woodland key habitats obtained significantly higher mean values than the production forests in biodiversity assessment scoring.

2) investigate the link between the indirectly assessed biodiversity value and measured substrate supply and/or occurrences of threatened species.
   The model containing biodiversity assessment scores and deadwood density in the stand performed best in explaining the variation in the richness of signal species. The living tree variables did not clearly correlate with species richness of any taxonomic group or biodiversity assessment scores.

3) investigate if the link varies in strength and character depending on species groups,and geographical location.
   We found out that the richness of lichens and macrofungi were highly positively correlated with biodiversity assessment scores. Instead, richness of signal bryophytes were more correlated with deadwood volume. The richness of signal species and red-listed signal species, as well as deadwood volume and count was higher in Västerbotten than in Småland.

4) identify the strengths and weaknesses of indirect biodiversity value assessment, and thereby identify ways to improve accuracy, objectivity and cost-efficiency of the method.
   Further analyses are needed to quantify the objectivity of the method and the importance of different categories in biodiversity assessment scoring. We conclude that biodiversity assessment scoring recognizes valuable forest stands with high precision, but we suggest that simple inventories of deadwood density could be done to improve the accuracy of biodiversity inventories.

We have achieved the goal of developing an evidence-base of Skogsbiologernas methods, and according to our study, the accuracy of the method could be improved by simple deadwood inventories. We recognized regional differences in biodiversity scores and will further investigate whether the method needs regional adjustments and how the objectivity could be improved. There are two manuscripts under preparation:
Hekkala AM, Strengbom, J, Kärvemo, S, Jönsson, M & Rudolphi J: Does indirect biodiversity assessment recognise the hotspots of boreal forests?
Hekkala AM, Strengbom, J, Kärvemo, S, Jönsson, M & Rudolphi J: Is the beauty in the eye of the beholder? An evaluation of the objectivity of indirect biodiversity assessment.

Kommunikation och nyttiggörande av resultat

Eftersom detta projekt delar frågeställningar med ett angränsande projekt, finansierat av Formas, pågår löpande kommunikation om såväl projektet som resultat som kommit och kommer från det. Vi har under senaste året deltagit i flera möten som Skogsstyrelsen kallat till med anledning av den revision av nyckelbiotopsinventeringen som pågår för nordvästra Sverige. Där har vi kunnat delge resultat från projektet och kunnat komma med värdefulla inspel i metodutvecklingen baserat på våra analyser och erfarenheter. Sedan ett par månader arbetar Vi fyra forskare i projektet: Anne-Maarit

Hekkala har ansvarat för analyser och det mest av skrivandet av den här slutrapporten och hon kommer att fortsätta arbeta under 2019 med att färdigställa de två vetenskapliga artiklarna som finns föreslagna i rapporten, Simon Kärvemo jobbar som postdoc med analyser av data som delvis är insamlat från detta projekt för vidare publicering i vetenskapliga tidskrifter; Joachim Strengbom är projektledare för det Formasfinansierade projektet och kommer tillsammans med Jörgen Rudolphi att arbeta med både Anne och Simon med publicerandet. Vi kommer också att publicera resultat i populärvetenskaplig form när vi kommit längre fram i projektet. Vad gäller presenterande av resultat i andra vetenskapliga sammanhang har delar av projektet visats på en internationell bevarandebiologikonferens i Jyväskylä, Finland under sommaren 2018 och framgent kommer material från projektet visas på fler vetenskapliga konferenser.