



Ecoparks – Forest landscapes in Sweden with emphasis on biodiversity conservation and recreation

C15

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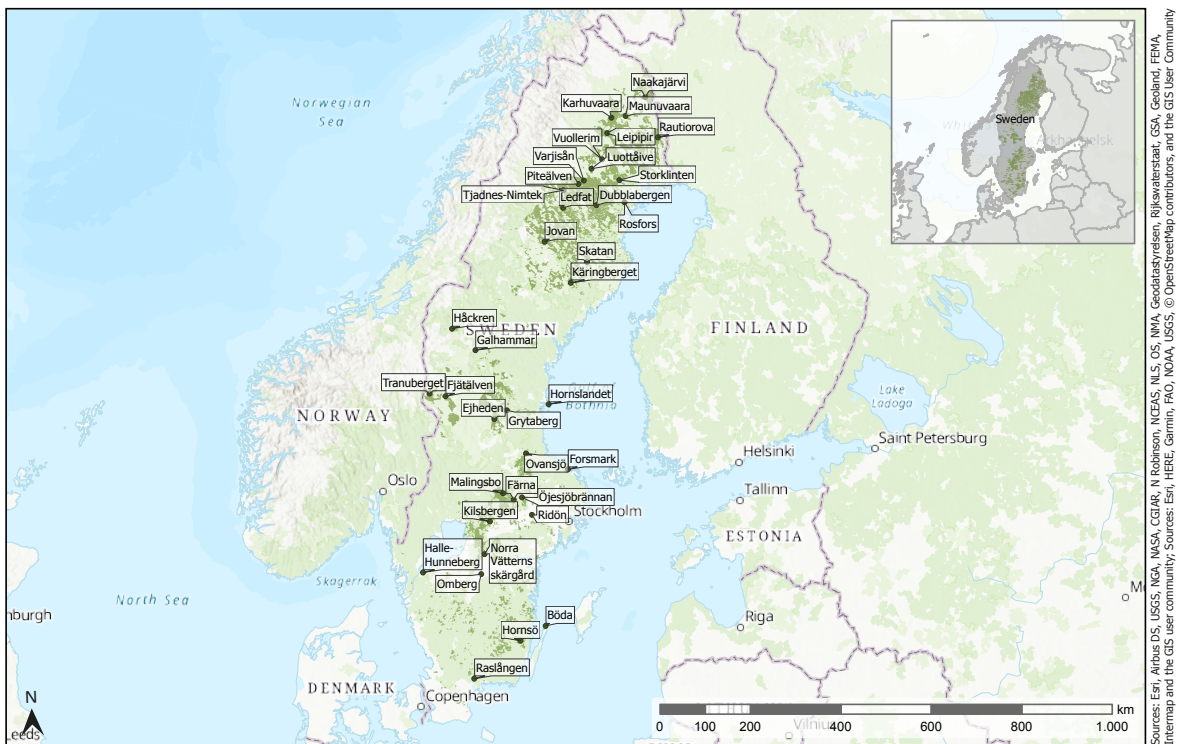
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Aim of paper

The purpose of this chapter is to characterise and explain the ecopark concept to an international audience engaged in conservation practices and

research. We describe why, when, and how ecoparks have been established, and how they are managed and monitored. We also reflect on the future of ecoparks and on possible applications of the concept in other contexts.



< Fig. C15.1. Burning forest area in Ejheden. Forest fires are frequent disturbances in Sweden (Photo: Sveaskog).

Statement

“Ecoparks have been established to host a rich biodiversity and offer opportunities for recreation in combination with a sustainable wood production at landscape scale.”

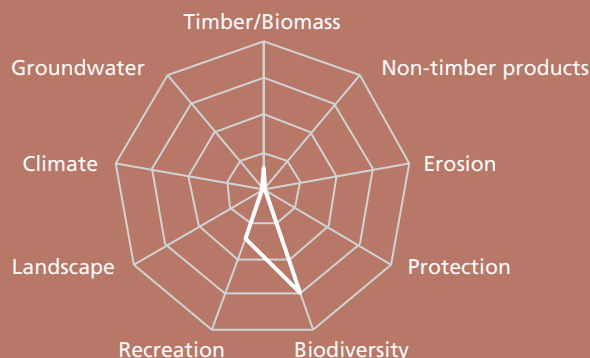


Table C 15.1. General information on the forests of the Swedish ecoparks.

Forest community	From boreal coniferous forests in northern Sweden to temperate broadleaved forests in southern Sweden
Total area of ecoparks	241 000 ha
Main management type	Free development or conservation-oriented management in conservation areas, clearcutting in areas designated for wood production.
Altitude	From 700 m in the north to sea level in the south
Ownership	State-owned
Protected area (total)	111 000 ha designated for nature conservation, including areas with conservation-oriented management
Natura 2000 (area)	21 000 ha

The state forest company Sveaskog

Sveaskog is a state-owned forest company and the largest forest owner in Sweden with a landholding of about 4.1 million ha (14 % of the Swedish forest land), and about 850 employees. Sveaskog’s forests are scattered throughout the country (fig. C 15.2). The overall mission of Sveaskog is to manage the Swedish people’s forests in a sustainable manner. The company supplies sawlogs to sawmills, pulpwood to pulp and paper mills, and biofuel to energy companies; the majority of customers are located in Sweden. The company also sells forest seedlings and silvicultural services. On average, about 70 % of the net annual growth is extracted per year with an annual delivery volume of about 11 million m³. In accordance with Sveaskog’s policies, nature conservation is the main priority in about 20 % of Sveaskog’s productive forestland (forests with potential annual production >1 m³/ha): 2.5 % designated as ecoparks; 10 % set aside for nature conservation as whole stands; and 7.5 % designated as eternity trees (live trees with special importance for biodiversity, retained beyond har-

vest), retention patches (patches of trees retained specifically for nature conservation), and special habitats (areas with specific conservation value) at final harvest.

Background

The first ecopark (Omberg) was inaugurated in 2003. The concept was introduced because there was a lack of large continuous forests with high value for biodiversity and recreation. A landscape perspective has long been recognised as essential in conservation and restoration (e.g. Crouzeilles *et al.* 2016), and large areas with structurally rich forests are often a prerequisite for long-term persistence of species populations (Woodroffe and Ginsberg 1998). Globally and regionally, there is a lack of large reserves (Cantú-Salazar and Gaston 2010). Also in Sweden, protected areas are typically small; only 3 % of national parks and forest reserves are >1000 ha in size and these areas are confined to the northernmost part of the country (Sveriges Officiella Statistik 2017). Areas voluntarily set aside

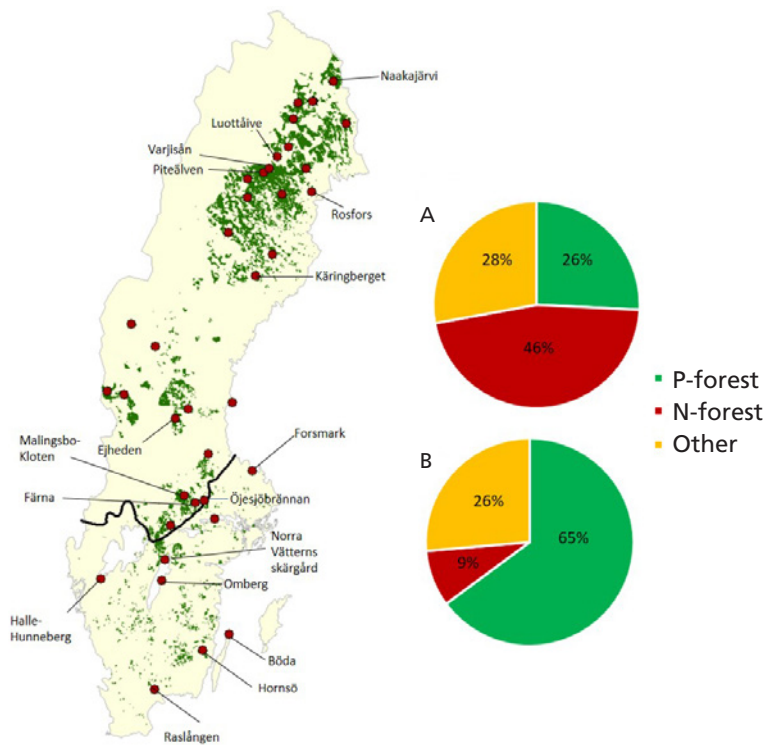


Fig. C 15.2. Map showing location of ecoparks and some statistics. Left panel: Sveaskog's landholding (green) and the 37 ecoparks (red dots). Names are given for ecoparks mentioned in the text. Right panel: Management categories within ecoparks (A) and outside ecoparks (B). N = nature conservation forest (red), P = production has highest priority (green). Other land (yellow) is non-productive forestland, water, mires, urbanised areas, or agricultural land.

by forest owners are considerably smaller, e.g. woodland key habitats have an average size of about 5 ha (Timonen *et al.* 2010). Nature-based tourism is one of the more rapidly expanding sectors within tourism in northern Europe (Fredman and Tyrväinen 2010), and the social functions of forests, not least recreation, have been increasingly highlighted in the last decades and have come up on the political agenda in many countries (Bell *et al.* 2009).

Thus, the ecoparks concept was launched to supplement the existing forest conservation area network in Sweden with a new component of forest landscapes, and with the aim to combine ecological, social, and economic goals. Since forests with limited anthropogenic impact have particular value for biodiversity (Paillet *et al.* 2010; Watson *et al.* 2018), one cornerstone of the ecoparks concept is to leave a number of stands unmanaged. Active restoration measures are taken in other stands to promote regeneration by broadleaved tree species, and to speed up recovery of old-growth structures such as deadwood. Promotion of structures of traditional agricultural landscapes

such as solitary old oaks is also important since certain rare and declining species are associated with such habitats (Sandström *et al.* 2015). Another objective of the ecoparks is to maintain and strengthen the opportunities for outdoor recreation. Wood production should be integrated into the ecoparks but is given a lower priority than on other parts of Sveaskog's forestland (fig. C 15.2).

The 37 ecoparks

The ecoparks represent a large variation in climate, geology, forest types, and human history, from boreal forests in the north to temperate broadleaved forests in the south (fig. C 15.2, C 15.3). In 2014, the two assumed last ecoparks, Varjisån and Piteälven, were established. A mega-fire occurred in south-central Sweden in 2014 (Gustafsson *et al.* 2019), and the part of the fire area that belonged to Sveaskog was set aside as ecopark number 37 (Öjesjöbrännan). The total area of ecoparks is 241 000 ha with sizes of individual parks ranging from 22 000 ha to 1100 ha, with an average size of 6500 ha. The for-

ests are different from the rest of Sveaskog's forest-land in that they have a considerably higher proportion of old forest; 52 % are >100 years old compared to 15 % outside the ecoparks.

Selection and planning

To be selected as an ecopark, a landscape needs to be dominated by forest, have a high value for biodiversity and recreation, and be >1000 ha in size in southern Sweden and >5000 ha in the northern Sweden. For Sveaskog, it has also been important to ensure that the ecoparks are located throughout Sweden, so as to capture the large latitudinal variation in flora, fauna, geology, and climate. Especially for the more densely populated southern Sweden, opportunities for outdoor recreation and

proximity to urban clusters have also been important criteria. To identify potential landscapes, a first screening was made by consulting Sveaskog staff, many of whom had valuable insight into natural conditions of the land. Advice was also obtained from external experts with knowledge on biodiversity, forest types, and habitats of importance to flora and fauna. Experts were also asked about where there were remnants of old-growth forests and sites with traces of traditional agricultural practices. An analysis of hotspots for rare and declining forest species was made early in the ecopark selection process, based on information on the occurrence of red-listed forest species retrieved from the Swedish Species Information Centre. This largely confirmed what had already emerged from

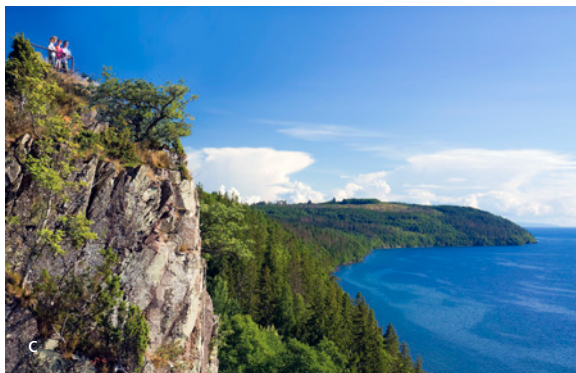


Fig. C 15.3. Examples of ecoparks. (a) Luottäive. This northern wilderness area is rich in mires, and old-growth forests still remain with 500-year-old Scots pine trees, and 300-year-old Norway spruce trees. (b) Ejheden. Forests shaped by natural fire dynamics dominated by Scots pine and broadleaved trees are the focus of this ecopark. The largest controlled fire to date in the country was carried out here in 2018. (c) Omberg, on the eastern side of Lake Vättern is one of the most visited ecoparks and has high recreational value. The area has a dramatic topography, large variation in forest types, rich biodiversity, and giant oaks. (d) Raslängen. This is the southernmost ecopark and the only one within the temperate zone. There is a large lake in the centre of the ecopark, and the area offers many opportunities for outdoor activities. Southern broadleaved forests, especially beech forests, are common and their maintenance is an important goal (Photos: Sveaskog).

expert consultations, but some unexpectedly rich areas were identified; for example, a significant region for broadleaved-associated species in the southeastern part of the country was set aside as Ecopark Forsmark (Angelstam and Bergman 2004).

An ecopark plan is produced following a number of steps, starting with a nature conservation inventory and resulting in goal setting of each stand regarding emphasis on nature conservation (N-forest) or wood production (P-forest) (figs C 15.4 and 15.5). About 64 % of the total ecopark forestland (N and P forests, fig. C 15.2) consists of N-forest, i.e. they are managed for conservation or are set aside without management; this compares with 12 % outside ecoparks (fig. C 15.2). The proportion forestland with nature conservation as highest priority varies widely among ecoparks, from 100 % of the burned landscape of Ecopark Öjesjöbrännan to 51 % of the Ecopark Halle-Hunneberg. Spatial aspects are key to the planning process and the ambition is to create as cohesive areas as possible with high conservation values and good connectivity. Consultations concerning the proposed plans take place with Swedish Forest Agency, the County Administrative Board, and local stakeholder groups, like organisations for recreation, botany and ornithology, and for the mountain region in north-western Sweden also reindeer herding representatives. Main goals are also formulated for whole ecoparks such as increasing the number of giant oaks to 5000 for Ecopark Omberg, retaining >50 trees per ha at logging in Ecopark Malingsbo-Kloten, and maintaining trees along roadsides in Ecopark Halle-Hunneberg.

Establishment

When a plan is completed (fig. C 15.4d), a nature conservation agreement ('naturvårdsavtal') between Sveaskog and the Swedish Forest Agency areas is established for the future management of N and P-forest (fig. C 15.2) in a 50-year perspective. Sveaskog, in contrast to small private forest owners with similar agreements, is not compensated for loss of revenue due to the adjusted management. For P-forest this means that the amount of retention at harvest is regulated in the nature conservation agreement while the N-forest (about 111 000 ha); has nature conservation as the only goal. In addition, all of Sveaskog's forestland is certified according to FSC (Forest Stewardship Council) as well as PEFC (Programme for the Endorsement of Forest Certification) standards.

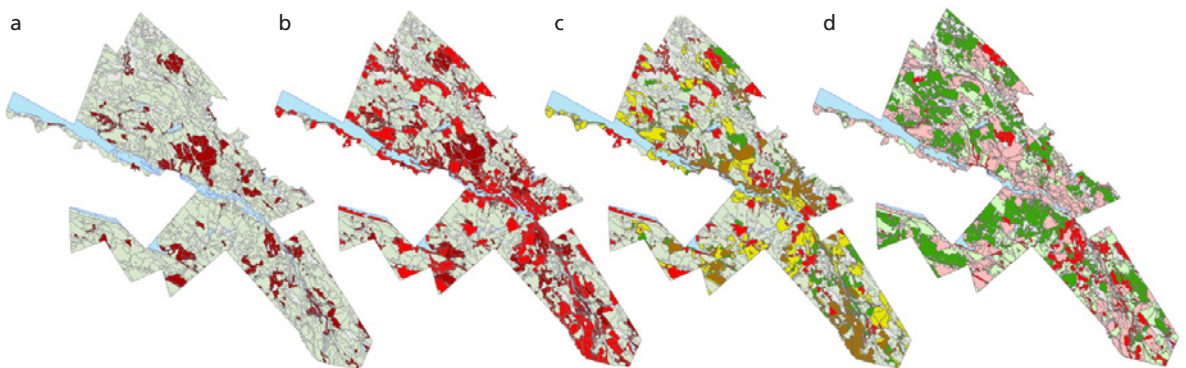


Fig. C 15.4. Development of an ecopark plan. (a) The first step is a nature conservation inventory of each stand using a standardised protocol developed by Sveaskog with indicators such as old trees, trees with special qualities, composition of tree layer, different kinds of deadwood, dynamics of deadwood, and identification of biotopes of particular importance to biodiversity. From this, stands with the highest conservation values are identified (dark red). (b) Information from the nature conservation inventory in combination with Sveaskog stand database information is used to map stands in need of biodiversity-oriented restoration (bright red). (c) Goals are set regarding forest types: dominated by Scots pine (brown), dominated by Norway spruce (green), mixed forest rich in broadleaved trees (yellow), broadleaved forest (red). (d) In the final plan, stands are classified into four categories, with nature conservation as the only goal (dark and light green), and production as the main goal (pink and red) (see fig. C 15.5 for explanation of dark/light green and pink/red colours).

Management for biodiversity

In the boreal region more focus is on the attributes of natural forests such as spatial and horizontal heterogeneity, variation in tree ages, old trees and high amounts of deadwood. Irrespective of the vegetation region, there is an ambition to increase the proportion of broadleaved trees since old broadleaved trees are a key resource for many rare and declining species (Sundberg *et al.* 2019), and such trees are scarce in Sweden today (Skogsdata 2019). A main measure in the south is to remove Norway spruce (*Picea abies*) and promote growth and regeneration of southern broadleaved tree species such as oaks (*Quercus petraea* and *Q. robur*), ash (*Fraxinus excelsior*), maple (*Acer platanoides*), elms (*Ulmus* spp.), and lime (*Tilia cordata*) (fig. C15.6a–f). Before human reshaping of forests, fire was an important disturbance factor in the boreal forest landscapes of northern Europe and

were important for regeneration of broadleaved trees such as birch (*Betula pendula* and *B. pubescens*), European aspen (*Populus tremula*), and salix (*Salix caprea*) (Granström 2001). Thus, prescribed burning is a way to recreate former ecological functions and processes, and conservation fires are regularly executed in northern ecoparks (figs C15.3b, C15.6c). Another important measure is to restore hydrological conditions by refilling drainage ditches, and thereby recreating wetlands and swamp forests (fig. C15.6d). Small-scale actions are also carried out, such as scarring of old pine trees to speed up production of terpenes and other protective substances, important to certain organisms (e.g. some species of lichen depend on the presence of old and hard deadwood; Santaniello *et al.* 2017). Conservation measures, such as green-tree retention, conservation burning, and flooding following hydrological restoration, increase tree mortality, which in turn increases the amount of deadwood. Creation of high stumps at final harvest (e.g. Jonsell and Weslien 2003) also contributes to increases in deadwood.

Management for social values

A principal aim of ecoparks is to increase opportunities for people to experience nature, and arrangements that facilitate recreation activities have high priority (fig. C15.7). Sweden's long tradition of right of public access implies that everyone can move freely in forests, which is also the case for ecoparks, although all visitors are expected to show concern for the environment. Visitors are free to pick berries and mushrooms. A pamphlet is available for each ecopark including maps, information on flora, fauna and sites of interest (also produced in English). Footpaths and resting places are available for hiking, and special trails are often prepared for mountain biking and horse riding. In many ecoparks, lakes and watercourses are popular for canoeing and other water activities, and there are picnic areas. The ecoparks contain good opportunities for fishing, and special fish conservation efforts are often taken. Individual visitors can buy fishing permits in many ecoparks. Hunting is allowed in various forms in ecoparks, and in most of them Sveaskog leases land to one or more hunting teams, while in some ecoparks, tourism companies arrange hunting activities. The visitation rate to some ecoparks is high; e.g. >500 000 visits per year for each of Omberg, Halle-Hunneberg, and Böda.

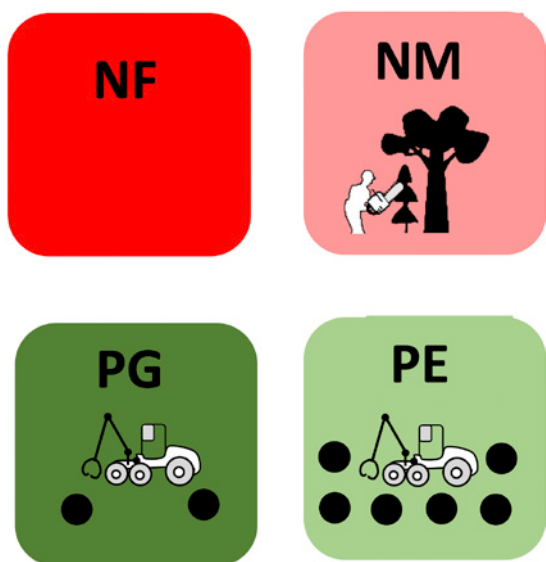


Fig. C15.5. Management categories for stands. A goal for long-term management is set for each stand, in one of four categories: (i) NF = Nature conservation, free development; (ii) NM = Nature conservation-oriented management, often implying restoration measures; (iii) PG = Production with general conservation concern (green-tree and deadwood retention for biodiversity at harvest, represented by black dots). The minimum level of retention is specified, and always >15 % of the harvested area; (iv) PE = Production with enhanced conservation concern. The proportion area of each goal-category as an average for all ecoparks is 35 % for NF, 26 % for NM, 21 % for PE, and 17 % for PG.



Fig. C 15.6. Examples of biodiversity-oriented management. (a), (b) Ecopark Färna: Norway spruce (*Picea abies*) is often removed in order to promote broadleaved trees, in this case European aspen (*Populus tremula*). (c) Ecopark Ejheden: Prescribed burning (conservation burning) is practiced in the boreal region to mimic natural fire dynamics. (d) Ecopark Halle-Hunneberg: Filling of ditches and other ways to slow down runoff water is a way to restore former hydrological conditions. (e) Ecopark Omberg: A log of oak (*Quercus robur*), not manageable by a wooden floor producer, has been relocated to the forest and positioned vertically as a way to create a coarse snag. (f) Ecopark Omberg: Clearing of overgrown, dense forest is made to liberate old broadleaved trees, in this case oak as a way to restore wooded pastures of traditional agricultural landscapes, most often in southern Sweden (Photos: Sveaskog).

Management for wood production

Of the area allocated to wood production or conservation (P and N forest, fig. C 15.2), 36 % are used for wood production areas in ecoparks compared with 88 % on other parts of Sveaskog's forestland. The prevailing harvest method is clearcutting but a higher retention level (17 %) than the average for Sveaskog forestland (10 %) is practiced. The annual harvest rate in areas allocated to wood production (P-forest) in ecoparks is only a fraction (10 %) compared to Sveaskog production areas outside ecoparks. To demonstrate balances between different ecosystem services, incorporation of wood production was a deliberate strategy at their initiation, although biodiversity and recreation are the main objectives. According to Sveaskog's mandate from the state, forests should provide a good financial return, and therefore a condition for establishing the ecoparks was that they would contribute, at least partly, to this aim. Combining goals of envi-

ronment and production distinguishes ecoparks from the nature reserves and national parks formally established by the state, in which nature conservation is the only goal.

Monitoring and research

The biodiversity status of the ecoparks is monitored. One example is the Effekt 20 project established in 2009, in which insect and bird populations will be monitored in six ecoparks for at least 25 years. The project aim is to assess the response of biodiversity to the conservation efforts in the ecoparks. Preliminary analyses indicate a positive effect of removing Norway spruce and thereby creating warmer and more open conditions. In Ecopark Hornsö for instance, the rare beetle *Tragosoma depsarium* is now regularly observed on old, sunlit trees of Scots pine (*Pinus sylvestris*). Currently, the time-series data are analysed in cooperation with Swedish University of Agricultural Sciences.



Fig. C 15.7. Outdoor activities are popular in ecoparks. (a) Local nature organisations teach biology to children – Ecopark Omberg. (b) Canoeing in Ecopark Norra Vätterns Skärgård. (c) Arrangements are made for recreation such as picnic places – Ecopark Rosfors. (d) Fishing permits can be purchased in most ecoparks – Ecopark Naakajärvi (Photos: Sveaskog).

Student project work, at levels from Bachelor to PhD, is also encouraged and regularly performed in different ecoparks.

Reflections

Ecoparks have attracted a large number of visitors and have contributed to development of local ecotourism. Monitoring has indicated that there have been positive responses with respect to biodiversity. However, there are still concerns about the future of ecoparks, and questions about their management have been raised from nature organisations, ecotourism representatives, and other actors. The demand for wood production has been questioned, and new and broader ecopark plans have been requested with deeper involvement from local stakeholders. Development of a new administrative ecopark organisation has been suggested. A major future challenge is to secure a continued high quality and efficient management for biodiversity and recreation with greater acceptance among stakeholders. Climate change and human population growth make adaptation of management essential, as conditions for biota and outdoor recreation will continue to change. It is very likely that the importance of forest landscapes that have a focus on conservation, such as ecoparks, will increase even more in the future, with growing contrasts to the surrounding landscapes dominated by intensively managed production forests (Felton *et al.* 2019).

Conclusion

Ecoparks represent a new type of large-scale conservation area with combined ecological, economic, and social goals at landscape level, unique within Sweden (Michanek *et al.* 2019). The landscape scale, emphasis on biodiversity conservation, restoration and recreation and a subordinate role for wood production, large size, landscape plans manifested in agreements with the Swedish Forest Agency and arrangements for outdoor activities distinguish them from other conservation areas. The ecopark concept depends on extensive, contiguous forest landscapes under single ownership and may, therefore, be most suitable for state forests or land of other large forest owners. In Sweden, for-

estry companies such as SCA and Holmen have recently introduced similar conservation concepts, demonstrating that there is an interest in the idea also among large private forest corporations. Prerequisites for continued good progress of ecoparks is long-term support in Sveaskog's future policies, and permanent and sufficient funding for their conservation-oriented management.

Statement

Ecoparks are a promising approach to landscape management for multiple goals emphasising biodiversity and recreation, filling a gap between smaller protected areas and landscapes designated for wood production. Among the most important qualities are systematically developed management plans with goal setting for each stand, formal agreements with the forestry authority, areas with free development mixed with restoration measures, and arrangements to encourage outdoor activities.

Links

<https://www.sveaskog.se/en/skog-och-virke/environment-and-nature-conservation/our-ecoparks>

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Fig. C 15.8. The Jovan ecopark in Storuman (Photo: Sveaskog).