Ecosystem management by local steward associations
A case study from "Kristianstads Vattenrike", the Swedish MA

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Abstract

Recent research indicates that involvement of a diversity of stakeholders in ecosystem management may be beneficial in many respects. Management plans that involve local resource users and stewards create stronger incentives for ecosystem management in the community. In addition, local ecological knowledge in steward associations can provide unique information about local conditions and ecosystem dynamics.

In this study, which is part of the Swedish sub-global Millennium Ecosystem Assessment, we have carried out a *social-ecological inventory* of local steward associations in the lower parts of the Helge River basin, southern Sweden. We assess ecosystem services and existing management systems behind these services. We identify steward associations in the landscape, key individuals in these associations, their ecological knowledge and their management practices. We analyze the potential contribution of the associations to adaptive co-management in the area. Methods included interviews, participatory observations and various forms of written material.

The assessment reveals a rich diversity of steward associations that manage a range of ecosystem components. It also reveals local ecological knowledge among the members of these steward associations considering species and their biology, ecological processes and functions, and how ecosystems are linked across scales. For example, farmers contribute to bird habitats and other wetland services by letting cattle graze by the river shore**,** forest owners apply management practices that support

the ecological functions of the forest, hunting and fishing associations improve habitats for fish and game, and village associations maintain management practices that enhance biodiversity. Furthermore, regional and national organizations contribute by engaging people in the landscape in monitoring, management and conservation of ecosystems and their services. A municipality organization, the Ecomuseum Kristianstads Vattenrike (EKV), coordinates many of these efforts in a shared vision for the region. This coordinating team fosters an ecosystem approach to landscape management, builds on and generates local knowledge (by combining scientific and practical knowledge) and engagement and links efforts to higher scales. In this way the EKV manages to bridge epistemologies as well as scales.

Designing ecosystem management based on social-ecological inventories has the potential of improving the management system and thereby strengthening the capacity of actors to sustain desired ecosystem services. Local steward associations could provide long-term monitoring of ecosystem changes, local ecological knowledge, extensive local networks, and facilitate links across scales. They can be crucial in adaptive co-management systems and a coordinating team like the EKV can facilitate such processes.

Introduction

Strengthening an ecosystem's capacity to provide ecosystem services requires at least three levels of analyses and understanding: One regards the ecosystem, including its functions, its dynamics and its links to other ecosystems. Another regards management practices, utilization of ecosystem services, and impacts of these activities on the ecosystem. A third one regards the social mechanisms behind ecosystem management, which are of crucial importance for creating functional feedback loops in social-ecological systems (Berkes and Folke 1998, Berkes et al. 2003). If any one of these levels is missing in an effort to strengthen ecosystem capacity and managing ecosystems sustainably, it runs the risk of failure.

Research on improving ecosystem management has until recently mainly focused on the first and the second of these levels, i.e. ecosystem dynamics and appropriate management and utilization of them. Ecosystem management is commonly initiated by ecological inventories that identify vulnerable and valuable areas. Ecological inventories form the basis of most conservation plans in many areas, and nature is often considered to be best protected through reserves, where human actions are constrained or excluded. Although the need to involve local users and land owners in management is widely recognized (eg Gadgil et al. 2003, Chambers 1994), processes of producing management plans are still often bureaucratic-scientific endeavors. They rely heavily on scientific knowledge of ecosystem type or species diversity. Local resource users and landowners are at best counseled in meetings when the plan is developed, to ensure smooth implementation (Pretty 1995). The influence and variation of social conditions such as willingness and ability to participate in ecosystem management, existing management practices and local ecological knowledge, are often disregarded.

A current example, discussed by Hiedanpää (2002) is the introduction in Finland of the EU-wide protected areas network known as Natura 2000. When introduced in the

municipality of Karvia, it caused severe controversy and four landowners even went on hunger strike in protest against the reserve network. Hiedanpää's results show that simply informing stakeholders about a set plan, and asking for opinions, grossly underestimates the social consequences. In some cases, interest groups become highly positioned and invited representatives feel excluded from the actual decision-making process. In other cases, local inhabitants renounce participation because they lack interest in the special issues discussed. In both cases, management runs the risk of becoming vulnerable, in spite of extensive scientific knowledge about how ecosystems should be managed. The reserve may become a source of conflict instead of a source of collaboration for management of ecosystem services.

Improving ecosystem management

How can ecosystem management improve by considering the social processes behind successful management? Recent research indicates that involvement of a diversity of stakeholders in ecosystem management may be beneficial in several respects (eg Berkes and Folke 2002). Management plans and strategies that involve local resource users and stewards seem to create stronger incentives for ecosystem management in the community. In addition, local ecological knowledge in steward associations can provide unique information about local conditions and ecosystem dynamics (Gadgil et al. 1993, Olsson and Folke 2001, Berkes and Jolly 2002). Intentions to involve communities and stakeholders are already stated explicitly in several official documents and agreements on ecosystem management and conservation. Examples range from the international level (e.g. Malawi principles for the Ecosystem approach adopted by the Convention on Biological Diversity[1]) and the regional scale (e.g. the European Union Water Framework Directive[2]) to national (e.g. "Local participation in nature conservation" report by The Swedish Environmental Protection Agency[3]) and local scales (e.g. Working methods of the National Board of Forestry[4]).

Humans as a potentially positive force in ecosystem management

The Natura 2000 implementation in Finland illustrates that many policy-makers still consider human activities as inherently negative to biodiversity and ecosystem services and employ a top-down ecosystem approach. Stakeholders are considered to be exclusively the users. In this article, we show that local residents can have a positive impact on their environment, acting as stewards of the land. In addition, local ecological knowledge in steward associations can provide unique information about local conditions and ecosystem dynamics (Olsson and Folke 2001). We propose that

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[1] See http://www.biodiv.org

[2] Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
http://europa.eu.int/comm/environment/water/water-framework/index_en.html

[3] "Lokal förankring av naturvård genom deltagande och dialog" Rapport 5264-0, januari 2003.
http://www.naturvardsverket.se/bokhandeln/pdf/620-5264-0.pdf (Swedish only)

[4] See http://www.svo.se/minskog/templates/Page.asp?id=11482

management and conservation should take advantage of and include existing engagement. Areas to be protected could be chosen not only based on ecological inventories, but also on a map of management already taking place – a social-ecological inventory.

Objectives
The paper intends to provide insights on how desired management systems can be initiated and sustained through a combined understanding of social and ecological processes. It aims at contributing to improved ecosystem management by complementing an inventory of ecological values with an inventory of management and landowners in a municipality of Southeast Sweden; a *social-ecological inventory*. We identify local steward associations and individuals operating at the scale below municipalities, actively involved in ongoing conservation, management and monitoring of ecosystems and their services. The social-ecological inventory provides a basis for an analysis of the potential for adaptive co-management with an ecosystem approach. We discuss how existing management by steward associations could be a positive force in ecosystem management, and how their contribution can be enhanced.

The first part of the article describes the study area and methods for identifying local steward associations. We then present the results as a list of organizations and associated ecosystem components, and two figures showing their contribution to two different ecosystem management projects. We discuss the potential of including local steward associations in the ecosystem approach and stress the significance of teams that connect local stewards and their associations to organizations and institutions at other scales. Further, we discuss how adaptive co-management involving local steward associations can bridge scales and knowledge systems for improved management och ecosystem services.

Study area

The study was conducted in a wetland area in Southeast Sweden, Kristianstads Vattenrike. The name roughly translates as Kristianstad's Water Realm and represents both a geographical area and a municipal initiative for ecosystem management. The area is defined by political and hydrological borders, covering the catchment of Helgeå River within the Municipality of Kristianstad. The 1100 sq km includes Sweden's largest wet grassland landscape used for grazing and hay-making. Many of the unique values of the area are associated with these social-ecological systems, which require active management and annual flooding to be sustained. Other habitats include two shallow lakes, large beech forests on the slopes of the Linderödsåsen ridge and wet forests and willow bushes in the lowlands. Much of the area is agricultural land; the sandy and clay soils around Kristianstad have been and still are important for agricultural production and the area is one of the most productive in Sweden. There are sandy grasslands with unique flora and fauna. The area also holds the largest groundwater reserve in northern Europe, and the city Kristianstad with 23,000 inhabitants. For a detailed description of habitats and natural values, see Olsson et al. (in press).

The main management organization is the Ecomuseum Kristianstads Vattenrike (EKV). EKV was established in 1989 to help the Municipality of Kristianstad to manage the wetland landscape and it reports directly to the municipality board, like a municipality administration. However, it is not an authority and has no power to make or enforce rules. Through EKV, the Municipality of Kristianstad collaborates with international associations, national, regional and local authorities, non-profit associations and land owners to maintain and restore the natural and cultural values of the area. EKV plays a key role as a facilitator and coordinator in local collaboration processes. EKV is also involved in developing policy, designing projects, and developing goals for KV. For a thorough analysis and description of EKV, please refer to Hahn et al. (manus).

This study was conducted as part of the Swedish subglobal assessment within the Millennium Ecosystem Assessment.

Methods

Focus of inventory

Information about ecosystem management and conservation administrated by official agencies are easily accessed in Sweden, due to the principle of public access to official records. Informal or in-official management is less known, and there is no systematic assessment of these activities in Sweden. Therefore, our study focuses on the management performed outside the official management plans. It does not include management that is forced upon landowners and steward associations, but rather focuses on management that is conducted on a voluntary basis, in addition to the mandatory requirements and responsibilities.

The inventory includes organizations and individual landowners with management practices that directly or indirectly involve ecosystem services or the capacity of the ecosystem to provide these services. In addition, we have mapped organizations and individuals that monitor the landscape and respond to ecosystem changes. We call the groups “local steward associations”, and in order to exemplify how they can contribute in ecosystem management, we mapped the involvement of different actors in two projects: the Vramsån creek project and the Sandy grasslands project.

Identifying steward associations and groups

The local steward associations and groups were identified using a combination of sources. The inventory started by interviewing individuals at the EKV. Being a key coordinating organization in the network of ecosystem managers, they were asked to give us names of groups and individuals involved in practical management of the KV. This led us to a number of farmers, two fishing associations, two village associations, the Bird society of NE Scania and the local branch of the Swedish Society for Nature Conservation. Then these organizations and individuals were asked to provide more examples, according to the snowball method, until saturation was reached (Biernacki and Waldorf 1981).

We also used a map of land-use in Kristianstad, to capture stewards not explicitly involved in the EKV network, but listed activities that could take place in the area, such as hunting, fishing, forestry and farming. Then, we listed the ecosystem services

produced in the area to be able to discuss with the different actors what management was required to sustain these services. Together with a map of landowners, this information gave us the largest landowners, and landowners with key habitats or ecosystems. We also contacted the largest environmental and conservation NGOs in Sweden to get information about locally active members. In addition, we looked in Municipality archives and registers of associations in Kristianstad. A search on the Internet revealed no new groups, but a large proportion of the groups already identified had their own websites or were mentioned on other websites. The social-ecological inventory is not complete, but the selection of groups and individuals interviewed represents the diversity of stewards that may be found in the landscape.

The network involved in the sandy grasslands projects was mapped through interviews with the groups and the EKV. The network of the Vramsån creek project was mapped by a run-through of the projects' development step by step, documented on the WWF website.

Key informants and interviews

Within each group, we asked for individuals knowledgeable about nature and the organization's management activities. In some cases, this key individual was the chairman, at other times the person had taken part in forming the association. One of the interviewees was chosen for being active in several organizations. The interviews were semi-structured and open-ended, using a combination of the interview guide approach and informal conversation (Patton 1980) and were conducted after an initial phone call, where our research was presented.

The interviews were centered around a few themes: One was local ecological knowledge, and this was revealed through questions about a) management practices ("Describe what you do in this biotope during a year" and "How come you do it like that?") to gather information on tacit knowledge, and b) explicit knowledge about the result of the practices "What do you expect the results to be?", "How is this species important?". Another theme was connections and cross-scale interactions, both vertical and horizontal, where questions were asked about cooperation with other organizations and landowners. To understand how the work of these groups can be facilitated, a third theme regarded the development of management and the motives for continuing and posed questions like "How did it start?", "What makes you continue?" and "How do you envision the future of your group?". All interviews were tape recorded and transcribed. Each interview lasted for one to 2.5 hours, depending on the amount of information provided and the time needed before this information begun revealing. In cases where the interviews did not give satisfactory amount of information, we conducted participant observations (Jørgensen 1989), at sites and meetings. Annual reports, protocols and websites provided additional information on activities carried out by the groups.

Results

Interviews with the stewards revealed a range of management activities taking place in the area (table 1). In addition to active management, local steward associations provide detailed and long-term monitoring of species and ecosystem conditions, in some cases on

a daily basis. The groups are also interacting with individuals and organizations across scales, including landowners, official agencies on different levels and other steward associations (figure 1 and 2). In several cases, the activities of the steward associations complement the ecosystem management on other levels, but they are not always recognized and actively supported by official management.

The motives for maintaining management differ between groups. People engage in conserving nature for its intrinsic value, or to get grants, or to be able to hunt or fish, or for aesthetical values or the satisfaction in learning about nature etc.

Farmers constitute the largest group of local stewards, with management practices that structure the wetland landscape. The EKV cooperates with several farmers to keep the floodplains grazed. For a detailed description, please refer to Hahn et al (manus). Anglers and hunters also have steward associations in KV, involved in monitoring and management of the resources and supporting ecosystems. In addition, some forest owners were involved in a participatory management project initiated by the National Board of Forestry[5] and funded by the EU.

Two conservation associations have local groups in the area, performing a range of management practices, mainly to improve and conserve biodiversity. In addition, one village association was found to have management practices that enhanced ecosystem services. Once a year they cut grass with scythes to give habitat to rare plant species.

The contributions of the different local stewards and their associations can be summarized in five categories: Active management, monitoring and response, cross-scale links, local ecological knowledge and strengthening interest in nature. Each is presented below.

Active management

Farmers' and forest owners' management practices structure the landscape (table 1). Flooded meadows, sandy grasslands and key habitats in deciduous forests depend on management by these groups. Volunteers from the Bird Society of NE Scania (BS), the Society for Nature Conservation in Kristianstad (SNC) and a village association contribute by improving habitats for certain birds, plants and frogs. Hunters and members of fishing associations improve habitats for game and fish, and manage the populations through flexible harvest quotas etc. They also engage in feeding animals during harsh conditions. Some efforts are put into saving individuals animals. For instance, the Society for Nature Conservation in Kristianstad saves up to 150 goshawks a year from being put to death, through an agreement with local pheasantries to fetch and release them from their traps.

[5] LIFE-environment project "Local Participation in Sustainable Forest Management based on Landscape Analysis", http://www.svo.se/minskog/templates/svo_se_vanlig.asp?id=8001

Local stewards	Examples of management	Favored ecosystem component	Examples of associated ecosystem services
Farmers	Grazing of flooded meadows, manual removal of hawthorn bushes	Flooded meadows along Helgeå river	Biodiversity, Recreation, Aesthetics, Quality fodder, Nutrient retention, Flood buffer
	Harrowing the sandy grasslands in a traditional fallow farming cycle	Sandy grasslands, unique in Europe	Biodiversity of flora and pollinating insects, aesthetical values
	Adjusting potato farming to decrease nutrient leakage along creek Vramsån	Water quality	Biodiversity of flora and fauna in the creek, fish production
Forest owners	Saving key biotopes	Diverse habitats in deciduous forests	Biodiversity, timber production
	Thinning or planting forest along creek Vramsån for appropriate proportions of light and shadow	Fish and flora habitats along the creek	Biodiversity, fish production
	Thinning the forest to provide fodder for game	Elk and deer	Meat production, recreational values
Fishermen associations	Improving fish habitats, adjusting fishing to the population	Fish	Fish production, recreational values
Hunting associations	Feeding game. Keeps the populations down of vermin.	Hare, deer, pheasants	Meat production, recreational values
Bird society of NE Scania	Putting up nesting boxes, feeding birds of prey during winter.	Birds	Biodiversity, seed dispersal
	Helping clear up land to improve habitats.	Flooded meadows	Biodiversity, Recreation, Aesthetics, Nutrient retention, Flood buffer, Part of Kristianstad's identity
	Suggesting and working for bird conserv. projects, eg the Stork project.	A range of habitats suiting different birds	Biodiversity, Recreation, Aesthtics, Education, part of Kristianstad's identity
Venestads byalag	Cuts the grass for hay-making according to trad. mgmt practices	Flora species associated to the traditional agricultural landscape	Biodiversity of flora and pollinating insects, Recreation, Aesthetics
Society for Nature Conservation in Kristianstad			
Flora cons. group	Initiated the sandy grasslands project and other conservation projects.	A range of habitats suiting different plants.	Biodiversity of flora and pollinating insects, Recreation, Aesthetics, Education
	Cutting grass for hay-making according to trad. mgmt practices	Flora species associated to the traditional agricultural landscape	Biodiversity of flora and pollinating insects, Recreation, Aesthetics
Frog conserv. gr.	Restoring and creating frog habitats.	Habitats for rare frog species	Biodiversity, indicators of ecosystem health
Bird conservation	Winter-feeding of White-tailed eagles.	White-tailed eagles	Biodiversity, aesthetics
	Fetches and releases 70-150 Goshawks a year caught by pheasantry owners.	Goshawks	Biodiversity
	Involved in the Stork projekt,	Storks	Biodiversity, symbol of Scania

Table 1. Local stewards perform a range of management practices, favoring different ecosystem components and enhancing different ecosystem services. The table shows a few examples derived from the social-ecological inventory.

Memory, monitoring, response and protection

While the farmers' management practices structure the landscape and form the basis for biodiversity, the monitoring of results in population changes are mainly conducted by the Bird Society of NE Scania and the Society for Nature Conservation in Kristianstad. These associations include knowledgeable people that live in the area and spend a lot of time in the landscape. They conduct inventories both on their own initiative and on request. They also have networks to respond to changes. The Bird Society of NE Scania have made inventories in KV since 1976 and documented the results. They have also set up a field station, involved in scientific studies and ringing of birds. The flora group has conducted regular inventories of the same spots during 20 yrs. They have protocols from most excursions and they have conducted 140 of these since 1983. Hunters also participate in inventories, e g of grouse, and monitor the health and numbers of game: "If we see that the game's health is deteriorating, we alert the regional and national Hunting association." (hunter, pers. comm.). Fishing associations assist for example in measuring and reporting caught catfish (protected by law) before releasing them back into the wild. In addition, the local stewards are knowledge carriers of historical management practices and long-term changes in the landscape. Forest owners and farmers also have clear

memories of how the landscape has changed and how populations of different species have fluctuated. The village association contributes by documenting local knowledge and local history through literature and story telling by elders. The village association has even produced a book about the local history and a videotape illustrating a year on the meadows.

Some groups act as alarm-bells. The flora group guard habitats for IUCN of red listed species, and the frog group visits the frog habitats regularly. In case of threat, e.g. by construction plans, they notify officials and central conservation organizations to save the habitats. They have succeeded several times in stopping projects this way.

Cross-scale links and local networks

There are a number of conservation and management projects going on in the area. Around ten of them are coordinated by the EKV and two of those are mapped in figure 2 and 3. Ecosystem management project in the area involves several organizations operating at different scales. Another meeting point is The Consultancy group for Nature Conservation, who advise the EKV and assembles representatives from the county board, different municipality organizations and eight local associations three times a year. The County board regularly sends proposals for counseling to the different groups. In addition, the local stewards and steward associations have their own networks, often including national and international contacts. Many farmers are members of the National farmer's association. They also have continuous contacts with the County Board Administration regarding subsidies.

The hunting association, the Bird Society of NE Scania and the Society for Nature Conservation in Kristianstad are all local branches of national organizations. They take part in national and international inventories, and they can also get larger support for their work through these mother organizations. The Bird Society of NE Scania has contacts with Denmark within the Stork project. They also exchange experiences and knowledge with a twin association in Latvia, funded by the Swedish Development Agency.

Several groups underline the collaborative atmosphere in KV, and say they forestall conflicts with good communication, between land owners, hunters, members of fishing associations, forest owners and conservation associations. They are also aware of the importance in having this participatory approach: “Everybody that is affected by a decision should be called personally to participate in a discussion. Participation is not to make decisions smooth. Local people know about ecology, and they don't accept being overrun. Natura 2000 created a huge problem. Some landowners weren't even informed after their land was appointed a reserve!” (member of several organizations, pers. comm.)

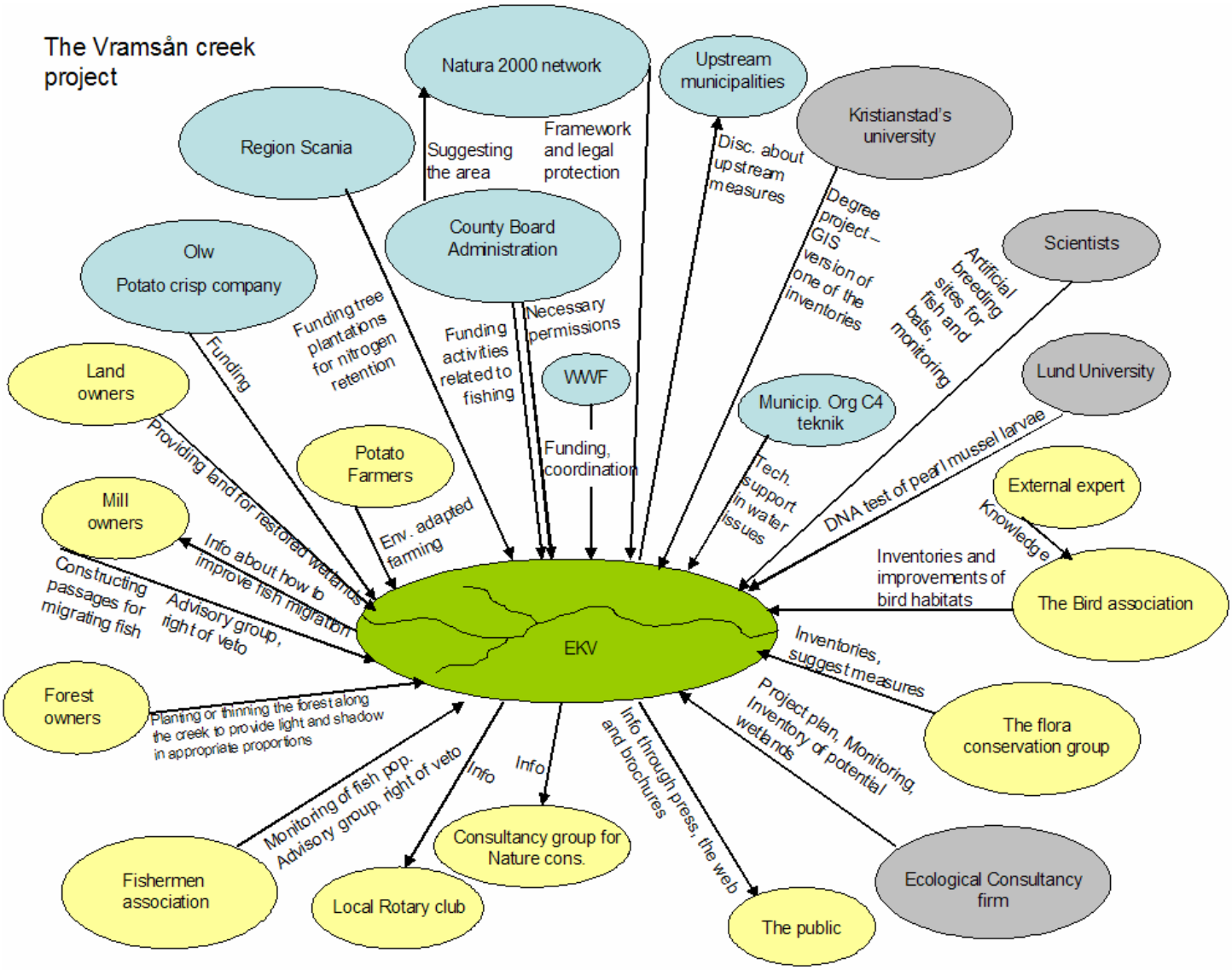

Figure 2. An example of a project involving organizations at different levels, all contributing different components in ecosystem management, coordinated by the EKV and the WWF. Yellow represents local stewards. Many of them are connected to higher scales through national and international networks. Grey represents scientific organizations, blue represents organizations on higher scales. The Vramsån creek project aims at restoring ecological values and functions of a creek.

Local Ecological Knowledge – content and origin

The interviews revealed a range of conceptions of ecosystem functions, connections and components. The local stewards develop their knowledge in school, in study circles, in

seminars with invited scientists and through journals, radio, TV and the Internet. They also exchange information and experiences in contact with older colleagues and each other, within and outside their own fields. Ecosystem management projects are monitored and management practices are adjusted according to the results. As the chairman of Bird Society of NE Scania puts it, "It takes knowledge about the birds' life histories to improve their reproduction sites." The knowledge is thus a combination of scientific and practically generated knowledge. They have specific conceptions about habitats, species and links in local ecosystems, but they can also describe general ecology. In addition, actors can describe population fluctuations and the reasons behind them. A forest owner says "the areas between the forest and the arable land are often very rich, but they don't give much in production. If they were preserved they could function as migration corridors. Another way of increasing diversity is to remove only the older trees, to get a stand with mixed ages. Solitary pines on bogs should be left, since they give habitat to the black woodpecker, who in turn constructs habitats for a range of other bird species. Some species can not live without the forest, such as some insects, mosses and lichens. No one knows what would happen if they disappeared. Some organisms keep others down, that would be harmful to us. Others increase production by nitrogen fixation. Others again might have functions we don't know of. Keeping a rich nature will be beneficial to us in the future."

The methods for conducting inventories are learnt from generally accepted books, published by the National Environmental Protection Agency. There is a general notion that ecosystems are complex and fragile, and that changing them forever is easy. "You can do as many Environmental Impact Assessments as you like. You will always have consequences you had not predicted. (---) You can never get back what you once have exterminated." (member of several associations, pers. comm.) There is also a large awareness of cross-scale interactions, such as effects of land-use change in the migratory bird's winter habitats on migration patterns and survival. "Reserves are good, but they are not enough. You have to consider surrounding areas as well." (member of several associations, pers. comm.) The argument for focusing on rare species is that they are indicators or symbols of certain habitats with associated functions and services.

Strengthening interest and sense of nature

In addition to active management, monitoring, protection, networks and local ecological knowledge, the local steward associations are important in strengthening interest and sense of nature, both among members and the public. The Bird Society of NE Scania and the Society for Nature Conservation in Kristianstad arrange excursions and study circles, and interviews with hunters, members of fishing associations, forest owners and farmers reveal that being part of ecosystem management projects increase their interest in nature.

As is described in Olsson et al. (2004) and Hahn et al. (manus), the EKV also put a lot of effort in strengthening the public's interest and sense of nature, through outdoor exhibitions, an informative website, regular meetings with local media, the nature school and other activities.

Motives for ecosystem management

Generally, the main motive for engaging in ecosystem management is not money. Aesthetical and recreational values, such as the beauty and peace in flooded meadows,

colorful flowers and flying birds are appreciated by farmers and forest owners as well as bird watchers and flora group members. The associations also have a social function; the members enjoy doing things together. The chairman of the Bird Society of NE Scania states that in order to keep the members "it is important that they feel welcome". As is stated in Hahn et al. (manus), ecosystem management also gives self-esteem to farmers who in other contexts are considered environmental rascals. Another important aspect for all groups interviewed is the joy in learning. "The more you learn about nature, the more interesting it gets". Finally, the groups see the importance in what they do for ecological functions and for sustainability. They recognize the threats against ecosystem health, and the responsibility they have in averting or mitigating them.

In many of the interviews, it is stated that you do not expect to earn from your work in nature, but at least you want to have no other expenses than your time. For farmers keeping cattle, grants from the EU and the government are an important income, generating up to 50 % of the receipts. For the individual volunteers in conservation associations, it is important to have e.g. fuel costs covered when they do inventories and monitoring. Usually, these expenses are covered by member fees, some support from the municipality, donations and compensation from projects.

Different roles

In Kristianstad, the EKV acts as a coordinator of ecosystem management (Olsson et al. 2004, Hahn et al. manus). They rely heavily on local participation, and in this section the sandy grasslands projects is described, to illustrate the roles of different stewards and their associations (figure 2). For another example, please see The Vramsån creek project, described in figure 1.

The sandy grasslands project was initiated when the flora group suggested that the grasslands would be restored, and this catalyzed the realization of an idea that had been around for several years. According to EKV, the flora group possesses botanical knowledge and local knowledge about habitats in the area. They also have an important network of members through which they can inform about the reasons behind harrowing the beautiful sandy grasslands. Through guided tours and other activities, they increase interest and sense of nature. They are sometimes involved in active management, and sometimes in long-term monitoring. However, for the initial inventories of interesting fallow areas the EKV employed an expert from the group, to make sure results would be delivered on time. "It is not a matter of quality, they are competent enough to do good inventories, but we do not want to sponge on them or take advantage of volunteer work. You can not demand results from volunteers on a deadline, so sometimes initially it is better to employ an expert."

Farmers provide the practical knowledge. The EKV are currently compiling knowledge about the fallow farming through interviews with several farmers in the area, to document management practices and get an overall picture of the sandy grassland and the fallow areas in NE Scania.

The EKV helps raise funding and they will apply for grants from the Local nature conservation funds, or Region Scania. They also put the project in a larger context, linking it to other societal goals. Since the initiation in 1989, the EKV aim at combining nature conservation and development. "We have to consider many different interests in our decisions. Some local steward associations have an important role in always being on

nature's side and demanding that nature values are considered before short-term development goals. We have to compromise in order to move forward, but that is easier when other organizations guard the nature conservation interests. We are the mediators, but they represent one of the opinions we have to mediate between."

Just as several steward associations, the EKV put a lot of effort into in informing the public about nature values, through media, the outdoor museum, guided tours etc. They also provide the link between scientists and local inhabitants, making sure that research results are fed back to the area.

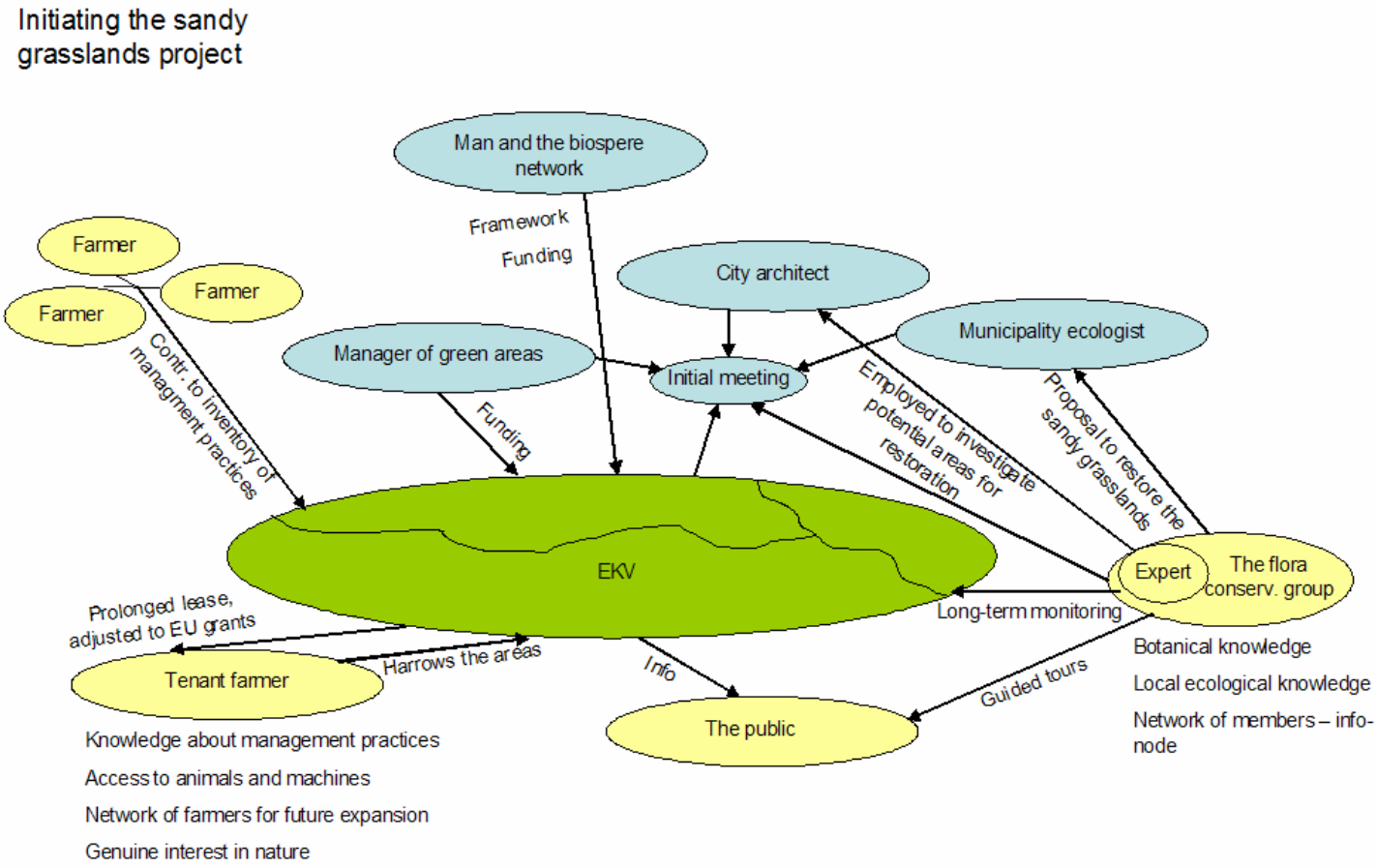

Figure 3. Associations involved in the initial phase of the sandy grasslands project, aiming at reintroducing traditional management practices to restore sandy grasslands, a habitat that is disappearing in Europe. Yellow represents local stewards and inhabitants.

Discussion

The social-ecological inventory shows a rich diversity in local stewards and steward associations, both in terms of focus, motives, knowledge and networks. They all contribute in different ways, and even if some may seem to have a narrow focus, aiming at favoring certain habitats or species, their activities often have positive side-effects. For

example, biodiversity can improve ecosystem functions (Elmqvist et al, 2003), local ecological knowledge is developed that can improve ecosystem management (Berkes and Folke 1998, Olsson and Folke 2001, Berkes et al. 2003), and social networks form that can be mobilized in conservation projects (Olsson et al 2004).

When trying to incorporate local steward associations in a broader ecosystem management context, two questions arise: "how can they contribute?" and "how can their contributions be enhanced? One challenge is to analyze strengths and weaknesses in the different groups' capacity to contribute. Another is to analyze their different motives and obstacles, in order to be able to facilitate their work. As stated earlier, local stewards and their associations provide local ecological knowledge, long-term and detailed monitoring, fast response to changes, and new initiatives. They can help strengthening interest in nature, and act as guards of species and habitats. Furthermore, they have networks involving local inhabitants, other associations, and contacts on other scales. The diversity of management practices (resulting from the many different actors involved) is another strength of local stewards and their associations. However, being local and small-scale, building on voluntary efforts, also poses some constraints. Lacking power, they can not always do anything about the negative changes they perceive in the landscape. There are also some limits to the time and the effort that they can put into projects since the work is non-profit and performed during leisure time.

Strengths (differ between groups)	**Weaknesses (differ between groups)**
• Local ecological knowledge • Long-term, detailed monitoring, fast response to changes, new initiatives • Networks • Always on nature's side, strengthening interest of nature • Diversity in practices	• Lack of power – can not act on their own • Voluntary work – time and effort limits • Narrow-mindedness

Figure 4. Strengths and weaknesses in contribution abilities among local steward associations in Kristianstad.

Thus, although local steward associations play important roles in managing the landscape, it should not be concluded that the work of these association can substitute the efforts of formal management. Rather, their self-organizing ability complements it. It seems that to be truly effective, the associations need a larger context. Many of them take part in national and international networks for information sharing and common action. In Kristianstad, the Ecomuseum play a unique role in coordinating efforts around different projects and connecting them to larger scales. A coordinating team, like the EKV, can bridge scales and epistemologies by providing an overview and mitigating between one-sided opinions, providing links to decision-makers and scientists, and providing a professional framework where volunteer work can contribute without being

burdened with too much responsibility. Folke et al. refers (2003) refer to this at framed creativity.

The EKV are able to see the larger picture; to mediate between special interests and combine conservation and development. Furthermore, they have the ability to apply for funding from organizations on higher scales, and they have an advisory role in society planning processes. With this overview, they are able to launch projects at the right time, in the windows of opportunity (Olsson et al 2004). Local stewards and steward associations often take initiatives, but then they need the Ecomuseum to take lead for the project to gain momentum. Eventually, they provide support in different ways, and whereas the EKV are the coordinators, local stewards are operative.

The EKV acknowledge and build on local ecological knowledge of local stewards, but they are also able to put new research and directives from higher scales into a local context.

To enhance and facilitate the contribution of local steward associations, a coordinating team should also identify and amplify initiatives, as well as identify and amplify incentives for ecosystem management. For example, the sandy grasslands project was initiated by the flora conservation group, but implemented by the EKV. The EKV are also aware of the different motives of different groups, and try to create win-win situations tailored to different needs (Hahn et al manus). For example, the argument for turning farmers' land into reserves is that then it will always be protected, and therefore the farmers do not risk losing subsidies in the future. They are also careful in acknowledging good initiatives and the work of local stewards.

The management system in Kristianstad can be characterized as adaptive co-management (Berkes et al 2003, Olsson et al 2004). It could be argued that the institutional conditions in the area are favorable for local steward associations, and it is seems like the EKV and the institutional framework on higher scales foster conditions for collaboration and self-organization.

However, the existence of local steward associations is not unique to Sweden. For instance, a study by Freeman and Ray (2001) in Mid-Western USA found that five small, non-profit, local groups for river conservation knew their neighborhoods, sub-watersheds, local landowners and political figures better than any regional group could. However, the groups that can be expected to be found, and the incentives for ecosystem management should differ between cultural settings.

Conclusions

Local steward associations and individual landowners can provide active management, long-term monitoring, local ecological knowledge and extensive networks. Building ecosystem management around these associations and their management practices can reduce conflicts around conservation and development, and improve management. Such a framed bottom-up approach is very different from a top-down implementation of conservation projects based on natural sciences information alone.

The case illustrates that there is great potential in making use of the self-organizing capacity of local stewards and framing their creativity through guidelines and visions of organizations at other scales. A coordinating team like the EKV can also

provide cross-scale links and combine different knowledge systems. Taken together, all the efforts in the study area manage the capacity of ecosystems to provide a range of services.

When preparing a nature reserve, or planning ecosystem management, ecological inventories are not enough. Social-ecological inventories supplement the picture.

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