The Norwegian Forest Habitat Inventory

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The MiS project

Forests cover about 38% of the land area in Norway. Except for a small proportion in reserves and national parks, the forest areas are managed for multiple purposes, including timber production. Consequently, the habitats that managed forests can offer will be of great importance for the overall conservation of forest biodiversity. On this background a large project was launched in 1997 by the Norwegian Ministry of Agriculture and Food: *Miljøregistrering i Skog* (MiS). The project was carried out by the Norwegian Forest and Landscape Institute in cooperation with several other institutions and stakeholders. The main goals of the project were to increase knowledge of biodiversity in Norwegian forests, and to develop a method for mapping important habitats for biodiversity that could be integrated in forestry planning. Following three initial years of research a basic model for such a habitat inventory was presented in 2000. The inventory was tested in the field, and in 2001 an instruction manual was printed. Since then the habitat inventory has been carried out in most of the productive forest area in Norway.

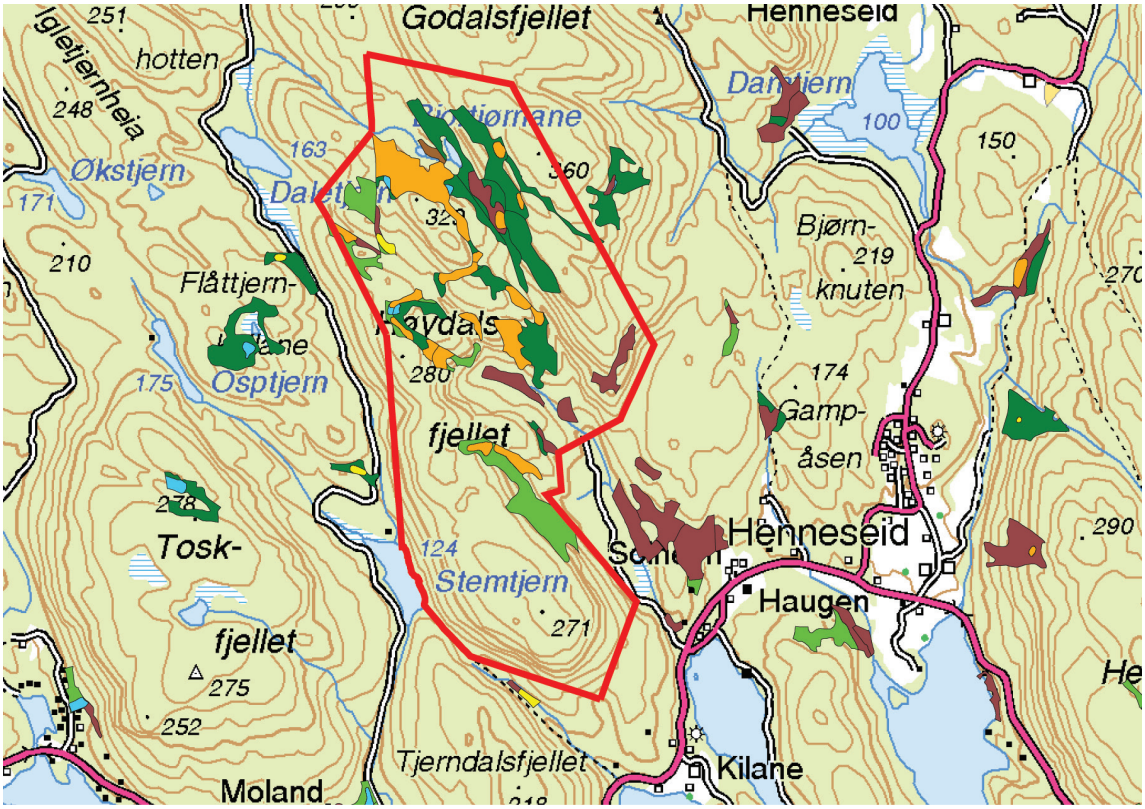
The inventory

The purpose of the inventory is to localise and map habitats in managed forests that are of particular importance for biodiversity. In the initial part of the project we therefore identified forest habitat types that tend to be inhabited by relatively large numbers of rare and threatened species. We found that such species were to a large degree associated with habitats that are either less common in managed forests than in unmanaged forests (e.g. coarse woody debris, old trees, burned forest), highly nutritious forest habitats (e.g. calcareous soils, trees with nutrient-rich bark), or highly humid forest habitats (e.g. clay ravines, stream gorges, north-facing rock walls). Twelve main habitats types were selected for the inventory, and they were delimited in the field according to specified criteria, either by using densities of habitat elements or by using vegetation or topographic criteria.

In essence, the habitat inventory sorts the investigated forest landscape in three area categories: (1) areas exceeding 0.2 hectare containing high quality occurrences of one or more habitat types, (2) forest stand units with more scattered distribution of important habitats, and (3) areas with no or very few occurrences of the investigated habitats. During the inventory tree species, vegetation types, and topography are also recorded. This information is used for identifying the main environmental context of the recorded habitats, based on the two major environmental gradients determining species composition in northern forests at the forest stand scale: humidity and nutritional status.

The application of inventory data

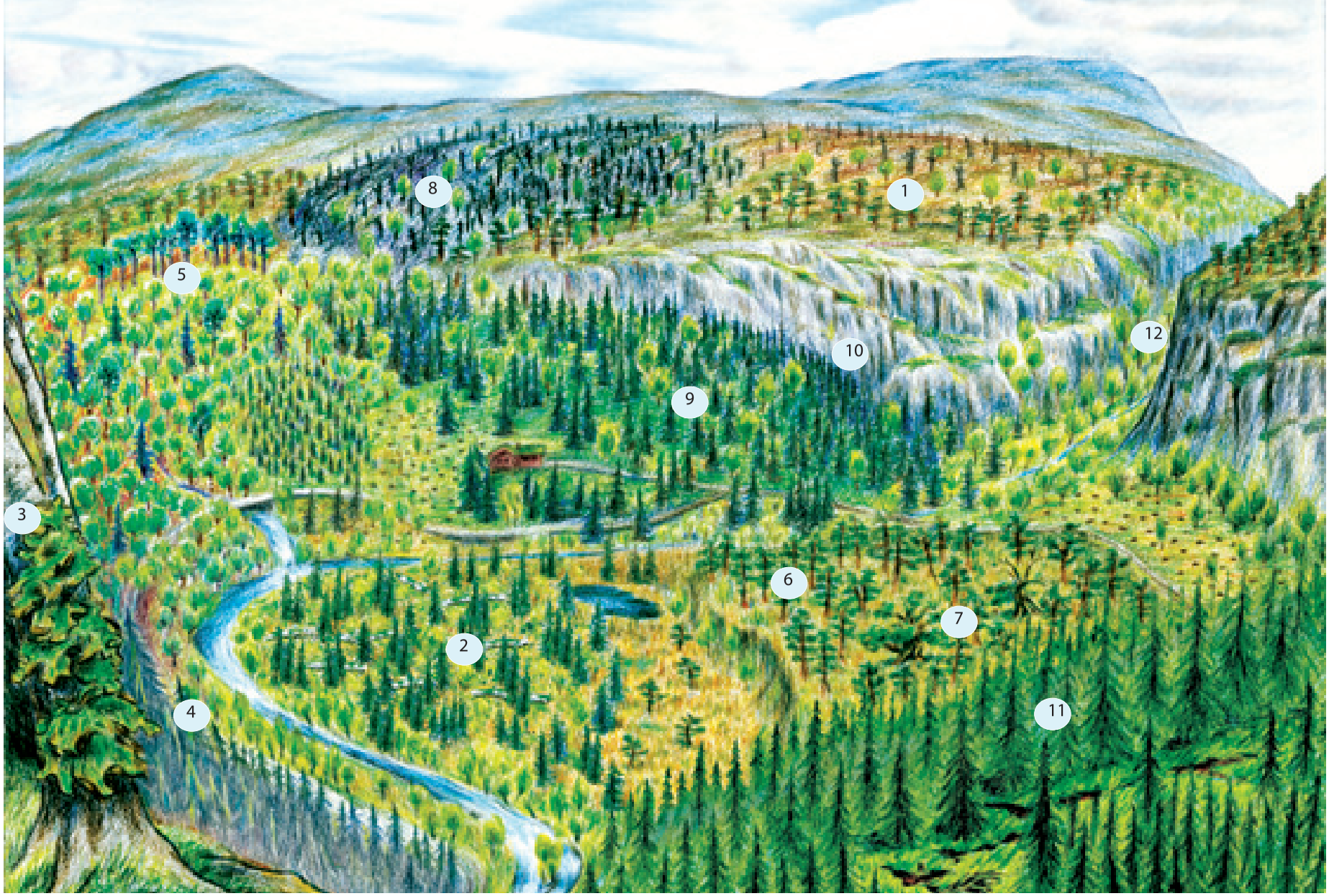
The habitat inventory generates comparable data on important habitats for biodiversity in forests. This information is used when making forestry plans. The purpose is to improve the environmental considerations in the activities of each landowner, including the plans for new forest roads, which forest stands that are scheduled for cutting, and when and how they are cut. The inventory is an important basis for a sustainable management and for timber certification in the forestry sector in Norway. However, the inventory data is also used in other contexts than forestry plans, such as land planning within the municipalities. The local authorities can consult the habitat maps when evaluating alternative areas for new roads, power lines, buildings etc. Furthermore, although the inventory data has a high spatial resolution, this does not mean that the management actions have to be correspondingly fine-scaled. Accordingly, clusters of important habitats identified by the Norwegian Forest Habitat Inventory are now used as a basis for forest reserve selection.



Forest reserve (borders shown by red line) based on a cluster of important habitats for biodiversity identified by the habitat inventory.

The CHI model

The CHI model (Complementary Hotspot Inventory) was developed in the MiS project and constitutes the basis for the habitat inventory, and for the application of inventory data. As sufficient species data for prioritisation is not obtainable at the forest stand scale, the model was based on habitats, and on documented relationships between species distributions and habitat types. The CHI combines two main strategies of cost-efficient biodiversity conservation: the identification of «hotspots» and «complementary» areas. Biodiversity hotspots are areas with high density of rare and threatened species, whereas complementary areas are sites that differ markedly in species composition. Although prioritisation of hotspots in theory is a cost-effective way of conservation, our research clearly revealed many species to be found outside hotspots. By only selecting hotspots for conservation many species will not be included. Therefore, the hotspot approach should be balanced by an approach based on complementarity. The habitat inventory incorporate both approaches by mapping areas that tend to have high density of rare and threatened species (hotspots) within a set of habitat types that differ markedly from each other in species composition (complementarity). For a more thorough presentation of the CHI model, see Gjerde et al. 2007, Biological Conservation 137: 549-557.



Twelve important habitats for biodiversity in managed forests

1 Snags (insects, fungi, birds, bats)
2 Logs (fungi, insects, bryophytes)
3 Trees with nutrient-rich bark (lichens, bryophytes)
4 Trees with pendant lichens (insects, spiders, mites, lichens)
5 Late successions of deciduous trees (insects, fungi, birds)
6 Old trees (insects, spiders, mites, lichens)
7 Hollow deciduous trees (insects, bats, birds)
8 Recently burned forest (fungi, insects, plants)
9 Luxuriant ground vegetation (plants, insects, fungi, snails)
10 Rock walls (bryophytes, lichens)
11 Clay ravines (lichen, bryophytes)
12 Stream gorges (bryophytes, lichens)