A study of practical pollarding techniques in northern Europe

Report of a three month study tour
August to November 2003

Helen J. Read

'Most of the human-induced and human dependent vegetation types are under great pressure from extensive encroachment and disuse, vanishing due to inexperience to maintain and preserve them'

Ingvild Austad

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Introduction

This report has been produced as a result of a three month study tour, the main aim of which was to find out more about pollarding techniques in different European countries. 11 countries and some 75 sites were visited but inevitably it just provides a snap shot view. Others, notably Carl-Adam Hæggström and Håkan Slotte have also looked at pollarding across Europe but their reports have tended to look at a smaller range of places in more detail. In addition, much of their work is not published in English. I hope that this report provides an overview of the status of pollards in Northern Europe and helps to put the work in the UK in perspective. It does of course have many short comings, some of which are listed below:

- I concentrated my visits to places where pollarding had taken place on species of tree that are native to the UK. This limited my travel to northern Europe but the area was not defined by any method other than tree species.
- I was particularly interested in *Fagus sylvatica* so this also influenced the sites visited, especially in those countries where *Fagus* has been pollarded.
- Generally I searched for pollards of deciduous species native to Britain.
- Willow & poplar pollards were not generally included except in a couple of places which were particularly interesting (Hungary) or discovered incidentally (Romania).
- I visited places that I had either been told had pollards or had previously read about. Rarely did I actually search for trees.
- Pollarding is not an easy concept to explain to people when the local term is not known (or where there is not one). In many instances I was reliant on a local contact or contacts to help locate suitable sites for me to visit and in general this worked remarkably well. However, in Romania this was a problem and led to serious short comings in terms of the knowledge gained about pollarding here.
- The choice of places to visit was biased by the knowledge of the people I made contact with and their understanding of what I wanted to see as well as my prior knowledge. I hope that they were representative of sites with pollarding in the various countries but this might not always have been the case.
- A few places were visited for reasons other than the pollards, for example because they had notable old trees or interesting examples of interpretation, but generally this was unusual and by far the majority of the sites did have pollards.
- The knowledge gleaned did depend on the language skills of the people I met and my ability to understand them. Inevitably this was variable!
- I am aware that there are some countries I did not visit that are omitted from this review, notably Bulgaria and Italy. In three months it was not possible to do everything so I concentrated on places where I had contacts and/or could travel easily.
- Some countries visited (notably France and Spain) certainly have more regions where pollards occur that may be different to those that I was able to visit in the time.
- The original intention was to carry out more quantitative work, measuring various aspects of the trees. It quickly became evident that this was not realistic as the trees occurred in an almost infinite number of situations and of course the tree species was also variable. Also, lack of time would have made it unrealistic to both do this and talk to the owner/managers of the sites. However, the people I met hold a wealth of

information and I hope that this report will tap a little of their knowledge and also assist people to find relevant publications.

- I have tried to check as much of the information as possible but all mistakes in understanding are my own!
- Inevitably there will be places that readers will know of that I did not visit.

Comments made under the descriptions of the sites are usually the views of the people I met but sometimes I have expressed opinions and hopefully clear which are my views.

This report has been substantially longer in gestation than I anticipated and inevitably more knowledge has been gained and some situations have moved on. In general I have not updated the report with extra sites and detailed information unless it would have been misleading not to have done. I also hoped that the report would have been properly edited and formally laid out, but eventually it seemed more important to make it available even though it might not look very professional. I hope that the result is interesting and readable.

Notes on the bibliography

The list of references is not intended to be a complete bibliography of published material on pollarding. Those listed are given because they provide more information about the case studies described by my site visits or about pollarding in the country concerned. I have also included a few review documents and some UK papers to help the reader to access published material in this country.

Norway

Traditional cutting trees for animal fodder in Norway (from the work of Austad and colleagues).

In Norwegian traditional agriculture every bit of the landscape was used and this intensive agricultural use may have been at its peak around 1900. During the long winters food was needed for the housed animals and they were fed on dried leaves and hay. Leaf fodder requires less sophisticated tools than hay cutting and was less dependent on periods of long warm weather for drying. Leaf cutting was very widespread but the methods and the names varied across the country. The ways of doing it were passed down by word of mouth and largely not written down.

Types of tree cut, and their uses
Ulmus, Fraxinus, Sorbus aucuparia and *Salix capraea* were fed to milking cows and calves. *Betula* and *Alnus* were said to have a lower nutritional value and *Betula* had an acrid effect on milk and so was fed to sheep and horses. *Populus tremula* was fed to horses. Usually one feeding of leaves/twigs was made per day. *Corylus avellana, Tilia cordata, Prunus, Quercus petraea* and *Q. robur* were used, especially for sheep, but only to a small extent, partly because they were less suitable and partly they were used for other purposes such as timber, tanning and rope making (*Tilia cordata*). The bark of *Ulmus* was also used as human food in bread

Methods of leaf gathering
Lopping or **Lauving** was the actual process of fodder collection, either from a pollard or other type of tree. The branches were cut with their leaves still o and were gathered into bundles and then dried by putting them IN the pollards or on structures such as tripods or racks to protect them from grazing animals.

Shredding (**rising**) took place in early spring before the trees were in leaf. Thin twigs with large buds were good fodder. Harvesting was similar to lopping, large branches were cut and the twigs cut off, they were collected into bunches and used fresh.

Plucking of leaves was done on trees in the years when they were not lopped or shredded. The fresh foliage was plucked (**risping**) and collected in sacks as fodder

Trees were also cut in winter for **twigs** and **bark** as it was important to have as high a production as possible. *Ulmus* were often very tall and had many layers of branches (photographs of trees show them pollarded and then tall branches with shredding up them). It was difficult winter work but there was more time in the winter to do this than the summer. If spring was late and the farmer had insufficient fodder the trees such as *Salix* and *Betula* were used but *Ulmus* and *Fraxinus* were considered best.

Skav was peeling of bark using a special tool, bark was then cut into small pieces, mixed with warm or cold water and fed to cattle in the winter and spring. The rest of the wood was used as fuel.

More details of how the lopping (pollarding) was done

Trees were first cut at 2-3m when they were 10-15 years old or had a stem diameter of more than 15cm. They were cut by men from a short ladder in July and August and were cut again 5-7 years later. The trees were cut hard to stimulate buds near the top of the stubs and the trees developed a candelabra shape.

Pollarding methods varied from one tree species to another taking account of their different growth forms and ensuring that regrowth and production for each species was as good as possible. There was two main types of cutting, both of which resulted in trees with conspicuous forms regardless of how they were shredded/lopped.

1. Thinning the crown – With *Betula* spp. cutting back all branches had to be avoided. The young parts produced new branches only if the top and a few branches were cut off. Thus the tree crown was thinned giving a wide crown. If the tree was cut back harder then 1-3 branches had to be left. *Betula* was cut in summer to early autumn for the leafy twigs or used directly in winter and early spring. The trees were harvested every 5-7 years.

2. Cutting back the crown –With *Ulmus* and *Fraxinus* the trees could be pollarded at 2-3m above ground level and all the branches removed with just the trunk left. A ring of new branches grew from the resting buds and tree regenerates well.

The number of bunches harvested depended on the number of animals and size of the hay harvest. Sometimes new trees were planted for harvesting. In 1863 the 9 farms for which there are records used varying amounts of branches, they cut between 0 – 10 000 bunches of twigs (only 1 farm cut no branches).

Ulmus, *Fraxinus* and *Alnus* dried very brittle so they were transported almost fresh to the barns so they could dry nearby. *Betula* could be transported a long distance after drying and these bundles were often stored and stacked in the outfields in semi permanent stacks in pollards.

Types of land management

The cutting of the trees coupled with different management of the land around them resulted in three main types of 'Human induced vegetation types', although these categories do to some extent blended together. Pollards were found in all three.

1. Pollard woodland (not grazed)
2. Wooded pastures (grazed)
3. Wooded meadows (mowed)

Pollard woodland

This was deciduous woodland, exploited for its fodder e.g. Lopped in summer or autumn or shredded in winter/spring every 5-7 years.

Examples were *Ulmus* groves where each tree was lopped at several heights to maximise the amount of leafy twigs. These occurred on stony scree where trees were shredded in spring and the sappy branches and buds fed to the animals.

Wooded pastures.
These were grazed areas, for example *Betula* groves on outfields (rough grazing on the outskirts of the farms), land with low productivity such as shallow soils or gravel terraces. The trees had a well developed root system to help bind the soil and stop erosion. The appearance was often park-like, with scattered trees and grazing underneath. *Betula* groves were stable and generally regnerated from suckers. *Ulmus* groves also occurred as wooded pastures. These tend to be on warm slopes with good water supplies. There were often large old trees but many wooded pastures are now neglected and grown over with younger trees.

Wooded meadows
Here the trees were usually cut back to exploit the ground and trees to the full. The tree layer could include one or several species of tree. The ground flora tended to be patchy due to a mix of sun and shade. Although the trees were formerly lopped and hay cut from the land beneath many are now just grazed. The most common trees were generally *Betula pendula* and *Fraxinus.*

Norwegian terms
Stuving/styving/naving – To cut branches off a tree
Stuve - pollard
Lauving/Løving – Lopping/cutting of leaves for fodder (not necessarily pollarding), sometimes whole trees were cut.
Lauvkjerk – Bunch of twigs (4-6kg in weight)
Lauvrak – Stack of bundles of twigs with tops stacked to the centre and the bases outwards. 1 stack consisted of about 200 bunches.
Rising – Cutting of branches without leaves for fodder (i.e. using bark and buds)
Ris – Shredded tree
Rispelauv – Plucking of leaves (usually *Ulmus* or *Fraxinus*)
Rakelauv – Raking of leaves in the autumn e.g. *Populus* and *Fraxinus* as use for animal bedding
Skav – Peeling of bark with special tools, then it was cut into small pieces, mixed with water and fed in winter and spring
Styvingsskog/navskog – Pollard woodland
Skuddskog/snelskog – Coppice wood
Kandelaberform – Pollard with an open crown e.g. *Betula* pollards

Ulmus glabra pollard between Skei and Lunde

Examples of pollarding and traditional agriculture in Norway

Havråtunet – A traditional working farm now run as a worhing museum

Havråtunet is on the Island of Osterøy, north east of Bergen, at an altitude of 60m and on the edge of the fjord.

Norwegian farms were traditionally small groups of families living in small settlements or 'cluster farms'. Havråtunet is a cluster farm that is a living museum, and gives a good idea of what the farming in Norway was like traditionally. Today it is funded 50% by the Government. The information presented here is from a guided tour of the farm and from Moe & Botnen (1997).

The cluster farm of Havråunet had 60 people living in it in 1900. It was managed in a traditional way until 1960 but at this time the areas near to the farm buildings were still managed while the outer fields were neglected. Today there are four farms here and the people who live at Havråtunet do so because they like the ideology of living in the traditional way.

How the cluster farm works

The typical Scandinavian farm had an 'infield' where crops were grown and was close to the buildings and an 'outfield' which was usually rough summer grazing.

Mending the barn roof (with Juniper)

At Havråtunet each farm had a one acre plot of land where they could grow corn and potatoes. Mostly the people worked on their own plots but for the physically hard work they helped each other. Other land was communal.

The people from Havråtunet used to help the people living on the otherside of the fjord at certain times of the year such as hay making. Havråtunet was worked first (as it was south facing) and the other farm second (as it was north facing).

The hay was cut with scythes and sickles, when they cut the steep slopes they did not wear shoes as bare feet make it easier to grip on the steep hillsides. One hay crop was cut each year, after being cut it was dried on specially constructed drying racks. *Fraxinus* wood was used to make hay drying racks and tools, *Salix capraea* was also used for the hay drying racks. When there were 60 people living here 400-500 hay drying racks were needed.

Corn plots and hay racks

Hay drying on a rack

There were pollards around Havråtunet, mostly *Fraxinus* and a few *Ulmus*. They were found from sea level to 220m and were mostly round the edge of the fields. The epipytes on the *Fraxinus* pollards at Havrå were studied by Moe & Botnen (1997) who looked at the impact of a reduction in traditional management. The pollards at that time had a girth of 1.0-3.8m and a bolling height of 1.5-3.0 some were believed to be 300-400 years old.

***Fraxinus* pollards near a small water mill**

Basket for leaves (left)

Tool for carrying branches & hay (right)

Getting the leaves and wood from the outfield to the farm buildings was difficult on such steep slopes. A special tool made of wood and rope was used to help hold a bundle (e.g. of leaves) together to carry it, baskets were used to carry dried leaves There were also 25 'sky lines' or wires from the steep hillsides down to the barns to help bring in the wood and hay. The cattle used today are a traditional Norwegian breed, Vestlandskyr (west coast small cow). In the summer they lived outside on the highest part of the farm and the people milking them had to walk up night and morning. In the winter both cattle and sheep lived inside, in small stone byres accessed down steps. Larger barns were used to store hay and dried leaves. The walls were made of juniper to let the wind through and keep the rain out.

Grinde – a farm worked in traditional ways until very recently and part restored as a research project

(including discussion with the farmer Lars Grinde and researcher Ingvild Austad)

The farm of Grinde is in Leikanger Kommune in Sognefjord. The farm slopes steeply and is roughly 200m from top to bottom with the lowest point at an altitude of 230-250m. With a bed rock of Migmatic gneiss the pollards are on the east facing slope. The farm is 0.15km^2 in size and is owned and managed by the farmer Lars Grinde (who also lets some of the land). Although the farm was used for a research project in recent years it has not protection or designation. Within wooded meadows there are pollarded *Fraxinus exselsior, Ulnus glabra* and a few *Betula* spp.

The farm at Grinde with pollards

Management of ground flora

The whole area was managed traditionally until 1962 and for a while after that the meadows closer to the house were still managed. Now, hay is cut in some areas, some are also grazed by sheep, others are not managed. Some of the hay is cut with a scythe and some with a machine (Allen Sythe). Traditionally the meadows were fertilised with sheep dung and salt peter every third year.

Description of tree pollard management

Pollarding history

Trees have been pollarded regularly on this farm since 1750. During the 2nd World War the children cut leaves for the horses of the Germans in this area but after the War there was a decline in cutting. However, after a lapse in cutting for about 30 years most of the trees were restored as part of a research project (see below), but pollarding has not been carried out since the research project finished, except for odd trees. The farmer is now too old to pollard himself and has no children to take over. Some of the farmland is now rented to another farmer but he does not cut any trees. Today many of the outfield trees have been left a long time since last being cut and the trees are lapsed pollards.

Grinde probably has about 400 pollards. Some were in wooded meadows, some were round the edges of fields. Most are in the 5ha of infield but there are pollards in the outfield too and this is where most of the *Betula* and *Alnus* pollards are. The ages of the pollards are distributed fairly randomly across the farm. Some are over 300 years old, others younger.



Pollards in the area restored as part of the research project *Ulmnus glabra* (left & centre) & *Fraxinus* (right)

Another area of the farm with pollards, now very overgrown

Traditional pollard management on the farm:

The trees were cut every 4-5 years. The whole family was involved, the men climbed the trees and the women and children made bundles of leaves. Approximately 50-60 bundles of branches were made per day, roughly 15-20 per tree, which equates to 200kg of *Fraxinus* and 400kg *Ulmus*.

Pollarding started at the end of July or beginning of August, it was done between the early and late hay cut although the trees were cut as long as there were leaves on them. *Fraxinus* was cut first, then *Ulmus*. *Alnus* was cut later as it stays green longer.

The practicalities of pollarding

Branches were cut from the trees with a snidel (bill hook type tool) or saw and then reduced in size afterwards with a knife. They were cut as close as possible to the tree and made to look aesthetically pleasing too. (During the restoration work 1-2cm stubs were left when the branches cut off). At times in the past the trees were cut as 'piece work' this encouraged smaller branches to be cut and the work to be done quickly which was said by Lars not as good for the trees. Cuts were always made on a slant and above previous cutting points.

Pollarding tools – a snidel and some *Betula* branches

Cutting a *Fraxinus* pollard. This tree should have been pollarded again sooner but has been left a few years too long. Lars would traditionally have done the pollarding with a sneigel but as the branches were too thick Mark used a small saw.

Lars Grinde directed Mark Frater how to cut the branches (watched by Ingvild Austad).

Making bundles of leaves

The main branches were cut off the stem and cut into suitable lengths. The branches cut from the tree here were roughly 1-1.5cm in diameter and were a bit thicker than would have been traditional.

4-6 kg of branches, varying in length was gathered together under an arm. The varying length means that leaves emerge from the bundle all along the length.

A then *Betula* branch about 1m long (just as cut off the tree) was used to tie the bundle together.

The bundle was squashed tightly together using the knee.

The *Betula* twig passed round the bundle once, then it was twisted twice round itself and the end stuck into the bunch.

The bundles are robust and hold together well.

All these bundles resulted from cutting a single stem of the *Fraxinus*.

The branches were hung to dry on a fence post, tree or pole (in this demonstration they were hung on a fence that was really too shaded by other trees). The branches were dried for about 14 days and then brought inside.

Betula and *Alnus glutinosus* leaves were stored with the hay out in the fields, but other species were too brittle when dry so they were moved nearer to the house soon after cutting. Horses were used to bring the hay and leaves to the farm.

The leaves were used as fodder, first they were fed to the cattle, then the sheep, then goats and finally the wood was used as firewood for bread as it burns hot. Animals were traditionally fed hay in the morning, leaves at midday and hay again in the evening. Hay and leaves were not mixed. (During the research project, 4/5 bunches of leaves from 25 trees plus hay were fed to the animals, thus 10-20% of the fodder was leaves, the rest was hay.)

In recent years Lars just had sheep and he fed the bunches of leaves directly to them. The sheep came indoors in October and were fed branches from November/December right through the winter. Lars used to feed 200-300 bunches per year.

Branches were also cut without leaves in the early spring for the cattle to eat the bark. The branches were cut into short pieces and fed fresh. Fallen leaves were raked and gathered for bedding.

Four or five years after pollarding the branches on the trees were roughly 50% leaves and 50% wood. If the trees are left longer between cuts the percentage of wood gets higher and, since it is the leaves that are the main product, it is better to cut before the wood portion gets higher. All trees were cut on the same rotation. The trees were grouped into harvesting blocks of equal size so the same amount of fodder was produced each year.

Pollards along the edges of a field

Most of the pollarded trees at Grinde were *Fraxinus* and *Ulmus*. They may possibly originate from earlier boundaries and some may have been planted. In the 1930's *Ulmus* were planted along roads and fences for feed. As well as pollarding, the leaves were plucked from *Ulmus* in the spring and they were also shredded in the spring.

Not many new pollards had been created at Grinde in Lars' time as there were plenty of old pollards to cut. Lars thought that the trees should be smaller than a thigh in diameter when first cut and that not all branches might have been removed.

Restoration work for research project

***Ulnus* pollards restored as part of the research project and Ingvild Austad**

The restoration pollarding was done in March 1993 when there was 20-30cm of snow on the ground so the large branches would not damage the ground flora. *Ulmus, Fraxinus* and a few *Salix capraea* pollards were pruned 10-12cm above the last cut using a chain saw. Large branches were winched off and all the branches were removed. The *Ulmus* were cut a bit further above the last cut. With *Betula* it was not

considered possible to remove all the branches (but not many/any *Betula* were restoration pollarded.) Because the pollards were on the east facing slope those to the south were shaded if not all were cut, however *Ulmus* can withstand more shade than *Fraxinus*. Young trees were also pollarded at a height of 2.5-3.5m.

Research on the production of the wooded meadows at Grinde

Work by Austad and her colleagues compared an area in active use (pollarded until 1972, hay cut until 1980 now restored and managed traditionally by pollarding and hay cutting) with an area pollarded until 1960, hay cut until 1975 and not restored.

***Betula* pollard**

Production from the trees (in terms of foliage and twigs) was 39-50% of the total harvested biomass. The maximum growth after pollarding was 1.25m (*Ulmus*) or 0.9m (*Fraxinus*) per year but most branches were shorter than this. The annual ring growth was fairly even each year. Over a 5 year cycle approximately 9kg of foliage was produced per tree per year. The restored site had 10 trees/0.1ha so this totalled 950kg foliage per ha per year.

Light was the most important factor in determining the ground vegetation and in the second year after restoration this was very luxuriant, probably due to increased nutrients as a result of the restoration work.

It was expected that production would be higher in the unrestored site than the restored one where the hay was removed but it was actually 32% lower and also lower in the open meadow than wooded areas. There was however a mosaic with lowest production near the trunks of the pollards (due to increased shade, a relatively dry environment and much bare ground) and production increased outwards from the trees. Further from the trees, production was higher than the unrestored area. This could be due to extra nutrients dripping from canopy, or from the die back of tree rootlets after canopy reduction which reduces competition between the roots of the trees and those of the herbs and grasses.

When pollarding stopped the trees become wide with dense canopies which changed the micro climate in terms of radiation, temperature and humidity. Lack of hay cutting resulted in a build up of organic matter and increased nutrients in the soil. Higher humidity resulted in a luxuriant field layer and big proportion of nitrophilous species, ferns and tree saplings.

Spring grazing stopped aggressive grasses from dominating and hay cutting favoured those species that seed before the cut and those with perennial underground storage organs.

In conclusion the total production of both foliage and hay was found to be significantly lower in the overgrown wooded meadow to the managed one despite the annual removal of hay from the latter. Hay production in the managed wooded meadow was 2684kg/ha dry weight which is relatively high since it was only lightly

fertilised in the past and not at all since 1991 (and spring and autumn grazed). When including the grazing, the production was 5824 kg/ha. The foliage production was 950kg/ha. Loss of hay under the trees is balanced by having the tree foliage every 5th year, and the trees can always be used for wood too. Fodder is also more reliable than hay in a northern European climate. Pollarded trees can live for 200-300 years and it was therefore demonstrated that it is economically viable to retain pollarded trees in the meadows. This helps explain the importance of wooded meadows in Nordic countries where they were harvested intensively for hundreds of years without manuring. In contrast, production in an open hay meadow decreased without fertiliser.

The future

This farm is a wonderful example of traditional management including a large number of pollarded trees. Despite the research project, which restored many trees to a cutting cycle, that was just a 'one off' and it is not clear how this farm will be managed in the future.

Restored wooded meadow at Grinde

Kussalid – Modern farm with regularly cut pollards and a modern approach to leaf harvesting (and discussion with farmer Kåre Solhaug)

Kussalid farm is near to Førde, Førdefjord, the nearest village is Sunde and the farm is to north of the E39 west of a small museum. At an altitude of 110m and on a south facing slope it is owned and managed by the farmer Kåre Solhaug. None of the land is protected but there are some wonderful pollarded *Ulmus glabra* trees being sympathetically managed in a former wooded meadow that is now pasture. Hay was cut in the past but now it is grazed by cattle in the spring and autumn. The farm has probably about 100 pollards and is one of three sites locally all currently cutting the trees again for the leaves.

Location of Kussalid farm showing pollards in wood pasture and a hay field

Description of tree pollard management

The trees were cut regularly until about 30 years ago when cutting stopped. Kåre has recently restored many of the trees to a cutting cycle and has now cut some for the second time since restoration. Currently the trees are usually cut in July or August every 5-6 years and the leaves are used as fodder for sheep.

The trees cut in 2003 included some lapsed pollards and some suckers. Several young trees had been left to be pollarded in the future. The cuts on the trees looked as if they had been progressively higher at each cut, *Ulmus* clearly knuckles up well. The majority of the trees looked in good health. There were two dead pollards, which were both in shady conditions. There were approximately 100 pollards on the farm many of which were quite large although their ages are unknown.

Modern use of dried leaves as fodder

Kåre has developed a way of using the leaves as fodder but has adapted the traditional methods to suit modern farming. Cutting and making leaf bundles is time consuming and the bulky dried leaves need lots of space to store. Now Kåre cuts *Ulmus* branches from the trees and shreds them, (i.e. put them through a shredding machine) all the branches and leaves together. Then the material is spread out on the concrete apron of the barn and dried (if it is a hot day the drying can take just one day, so he tries to cut the trees early on a hot day). Roughly 10 trees are now cut each year. Kåre has 100 sheep and he feeds them the dried shredded leaf and wood chip mixture in the morning and silage in the evenings. The sheep live inside for 5 months over the winter and picking through the dried leaves also helps to keep them busy during the long winter indoors. The wood chips that the animals do not eat are used as bedding at lambing time. Kåre also tried making silage from the leaf wood and chips rather than drying but this didn't work as there was too much wood.

***Ulmus glabra* pollard cut quite recently (below)**

Several of these pollards are ready to be cut again

Close up of the bolling showing new shoots

Most of the trees were in good health but this one showed signs of die back. It was very close to a farm track

Hay is cut from the flatter areas around the pollards (one area is grazed and no hay cut)

***Ulmus glabra* pollards that have just been cut. Some younger suckers have been pollarded as well as the old tree**

Close up of the pollarding work

Research on the use of dried leaves as sheep fodder

Austad and her colleagues have looked in detail at the value of dried leaves produced using Kåre's modern method (see Austad, Braanaas and Haltvik, 2003 for more details).

The leaves were analysed chemically, which showed that there were some differences between tree species in terms of protein, fat and various essential elements. *Ulmus* leaves were found to have an energy level equivalent to good quality hay and *Sorbus aucuparia* leaves were equivalent to medium quality silage.

Three farms were involved in the study and they each had two groups of sheep, one fed on 10-20% dried leaves and the other group fed no leaves. In some farms the leaves were dried using a barn drier rather than just sunlight. The sheep were weighed regularly and blood samples taken. Those fed on the leaves were a little lighter in weight but had higher levels of blood B-12 (which is an indicator of good health). Some interesting observations were also made. The sheep were easily able to select the leaves and leave the wood chips and it helped to keep them occupied during the long days inside. When turned out in the spring these sheep had a tendency to browse more than those not fed leaves in winter.

Harvesting of the leaves using this modern method was quicker than the traditional way. Over the three farms the equivalent of 537 bundles of leaves were harvested in a day. This is roughly 5 times quicker than the traditional method where 120-180 bundles is the norm. There were also savings in transport, drying and storage which was estimated to be 10 times more efficient. A cost benefit analysis showed the costs and benefits to be roughly equal.

The future

Because of the affection of the farmer for the trees, his innovative way of dealing with the leaves and his willingness to feed the sheep on healthy rather than simply weight gaining food the future for the pollarded trees on this farm looked much more positive than most places in Norway.

Pollard with sheep in grazing underneath

Other examples of fodder pollards in Norway

Tenndalen, Sognefjord

Tenndalen is a valley on the north side of Sognefjord, which enters the sea north of Kvamsøy (south of Høyanger). On the east side of the valley just after the road bridge were *Betula* and *Tilia* pollards in *Juniperus communis* and *Corylus avellana* scrub. The *Betula* were cut in an open candelabra pollard shape with subsequent cutting heights well above previous ones. One of the larger trees had a girth of 1.2m. It is possible that one branch had been left when it was last cut, but this was by no means certain.

***Betula* pollard (left)**

'Phoenix' *Tilia* pollard (right)

Between Skei and Lunde, along road 5 beside Kjøsnesfjord.

This south west facing slope consisted of rocky scree and was very rough grazing for goats. There were small groups of about 10 *Ulmus glabra* pollards close to each of the goat sheds with standard *Ulmus*, *Betula* and *Pinus* in between. Between the first and second tunnels and just after the third tunnel there were about 60-100 pollards in total but they were difficult to count as they were mixed in with younger trees. The trees seemed to be of similar size to those at Kussalid.

One place was looked at in more detail. The trees looked as if the cutting had lapsed and then they had been cut again after about 20-30 years. Some trees looked as if large branches had been retained when cutting and others did not. Some appeared uncut for around 10 years and are in need of cutting again. Many showed two tiers of growth, one close to the bolling and one higher up. The branches on the trees were growing about 20cm in length per year.

View of the valley (left), the area with the pollards was on the right hand side

The goat shed with the pollards round it (right)

***Ulmus glabra* pollards some fairly recently cut (left) others longer ago (right) some with two tiers of growth**

The goats grazing under the pollards

Galdane

The settlement of Galdane is just north of the old E16 beyond Lærdal. It can only be reached on foot, but in 2003 was impossible to reach due to the river bridge being removed during to road works. From the other side of the valley it was clear that there were *Ulmus glabra* pollards and some large trees, but probably not large numbers of pollards.

The sign board explaining about Galdane (left)

View of the farm from across the river the *Ulmus* are all pollards (right)

The farm of Galdane is situated close to one of the oldest trails in Norway and has been described in many travel accounts and drawn by artists. The farm was 26.8 ha in size, most of which was forest, bare rock or scree and only about 1 ha was cultivated. It ranged from 210 – 300m above sea level and was very steep with an average gradient of 55%. Rock type was largely granitic and gneisses with outcrops of more fertile phyllite. It is in a rain shadow and receives 400mm per year, a third of which falls in May to August.

The oldest settlement dates to 17th century but it was probably inhabited earlier and was a cotters farm with no land of its own. The name comes from the word 'Gald' which is a structure built from wood and stones on a steep trail to support the track across rocky ledges. In 1865 seven people lived in the farm and they had 5 cows, 14 sheep and 10 goats and it was possible to sow 150kg barley and 300kg potatoes. The tilled fields were in the infield and the outfield was cleared of stones for hay making. Extensive collections of leaves and twigs were made for winter feeding. *Ulmus*, *Betula pendula*, *B. pubescens*, *Salix capraea* and *Alnus incana* were all used. *Ulmus* was used more for pollarding and pealing of bark than for leaf collecting. Heavy grazing suppressed the deciduous forest such that in 1870s the crofter had to sell the goats because of over grazing. The farm was abandoned in 1947.

Restoration work started in 1989 and the aim of the management plan was to restore and maintain the landscape as it appeared around the turn of the century. All of the restoration process was recorded. The main aim was to make the landscape visually attractive so 'aesthetic' features such as decorative pollarded trees were considered important'.

Close up of pollarded *Ulmus* trees

The pollards were very top heavy having not been harvested for several years but previous experience on restoring large *Ulmus* pollards had been encouraging so the tree here were cut in a similar way. They were cut back hard in early May 1986. Two years later they had long shoots, the crowns were starting to thin naturally and it was predicted that the most vigorous shoots would develop further. The plan was to cut every 4-5 years in the future. Some young trees were cut too and they were also growing well two years on. *Ulmus* 0.5 – 2m tall are vulnerable to red deer browsing, which break the top shoots and gnaw the bark, however it was considered that there was sufficient regeneration to provide new pollards. The farm buildings were restored too and are protected.

See Austad & Hauge (1989) and Hauge (1986) for more information.

Mundesheim – Riverside pollards

On the east side of the R48 between Skogseid and Mudesheim, near Norheimsund, in Hardangerfjord was a line of pollards, all between the road and the stream (with one other tree on other side of road). The valley was approximately 1.3 miles long with pollards intermittent along it. In one section of 230m there were 15 pollards, three of which were dead. The owner/manager was unknown but most probably a local farmer.

Line of *Fraxinus* pollards along riverside

The tree species pollarded were mostly *Fraxinus excelsior* (13 including 2 dead) along the stream with some *Salix capraea* (2 pollards including one dead) in the middle of the fields. There were also some *Alnus* trees, possible lapsed pollards. Around the trees was rough grassland probably cut for hay/silage and perhaps grazed at times as some lower branches showed evidence of browsing.

Pollard management

The trees looked as if they had been pollarded several times and then lapsed. Judging by the size of the branches the lapse was probably about 35-40 years. There were coppiced trees in the rough ground too.

Several of the *Fraxinus* pollards had been cut again fairly recently, especially those along the river. The cuts were all made at the bolling and no stubs were left. However, the trees had at least one large branch retained and one had two branches retained. Probably all the recent work had been done at the same time. The resultant growth was two years old judging from the branches but the cuts were already grown over with mosses and looked as if they might have been cut longer ago.

Those with retained branches as sap risers were mostly still alive but the long term viability was uncertain.

***Fraxinus* pollard with some recent flush cuts and a retained branch, back left**

Old *Fraxinus* pollard with some fallen branches and two cut. Some growth has resulted which has then died back. The tree has lots of fungal fruiting bodies

***Salix caprea* pollard in the middle of a field**

The largest tree in the area with a girth of 4.5m, a *Fraxinus* pollard that has not been cut recently standing in a small cluster of trees.

Pollarding for wood products

While most pollards in Norway were cut for leaves and the wood was a by-product, there were some trees pollarded primarily for wood.

Stekka Nature Reserve

Stekka Nature Reserve or Berg Farm is on the east side of road 49 near to the village of Tørvik, near Norheimsund, in Hardangerfjord County. The east facing slope was wooded, with pasture on the top and on the west facing slope. It is a Nature Reserve and has been protected since 1984.

There were many pollarded *Quercus robur* and in the woodland area there were also *Pinus sylvestris* trees. The woodland ground flora was dominated by acid loving species such as *Vaccinium myrtilis*, *Calluna vulgaris* and *Juniperus communis*. Part of the area was rough pasture grazed by cattle, perhaps improved a long time ago, with boggy patches.
Unfortunately it was not possible to talk to anyone about the management of Stekka.

Description of tree pollard management

The trees looked as if they had been pollarded several times in the past. The branches were said to have been cut for ship building and there is an old water powered saw mill nearby presumably for cutting the timber. Most of the *Quercus* timber in the Hardangerfjord area was exported to Scotland between 1500-1600.

The water powered saw mill

Most of the trees in the woodland looked to have been cut again recently after a lapse. Each tree had also been cleared around to let more light in. The clearance work looked quite sensitive but the cutting had been rather harsh. All the branches had been removed from most of the trees. Some of the trees were growing new shoots but there was substantial die back of some of the branches. Some had flushed initially and then died back, many of the trees looked in poor health. The trees in the pasture looked better and had been restoration cut probably longer ago than the trees in the woodland. Some of the trees had mildew on them. Almost all the trees seen had some form of work carried out, either clearing cutting or both. The site may extend further and may include trees as yet uncut recently.

Trees in woodland area - cleared round and cut back

Trees in woodland area

Left – tree cut back very hard and with extensive mildew

Right – Very large pollard with a girth of 6.92m (above the bulge), several branches han been retained on this tree

The biggest tree was in the pasture had not been worked on recently, it was 10.4m in girth and had three rowan trees growing in it. This tree had been cable braced in the past. It looked reasonably healthy but the growth was a bit patchy and the leaves were rather clustered at the ends of the branches.

No new pollards had been started and in the pasture there were no younger *Quercus* trees so there will be a continuity problem in future years.

Responses of trees and future prospects

The responses of the trees at this site were very similar to those at places in England where old *Quercus* trees have been cut. *Quercus* seems to be robust when young but older trees require more care. The clearance of competing trees in the woodland here

seemed sensitive but the long term prognosis on the trees cut back may not be good. Although the cutting had mostly left long stubs and the trees were not cut back to the original bolling most trees had all their large branches cut. Not all the branches had regrown and there was also substantial die back of many of them. The trees would have benefited from taking a more cautious approach to the cutting. This area is a nature reserve but it has not been possible to contact the managers.
In the woodland area we looked at about 15 trees, in the pasture there was a similar number. There were more trees in the woodland but we did not walk further into the area. The total number was perhaps 40-50.

***Quercus robur* pollards in open pasture**

That on the right had a girth of 8.1m

Old pollard between a rock, a telegraph pole and a birch tree

The largest tree with a girth of 10.4m girth. This tree had not been cut recently, had been cable braced in the past and there were three rowan trees growing in it. The growth did not look as healthy as some of the other trees with leaves clustered at the ends of the branches.

Survey of cultural landscapes in Sognefjord (Austad, Hauge & Helle, 1993)

This project took place in the Sognefjord area with the aim of finding typical cultural landscapes for nature conservation and cultural heritage. The reasons for doing this were as a basis for trials for management regimes and to explore ways to promote rural tourism. The term 'character unit' was used to refer to both buildings and vegetation type. 'Type' areas were identified in each municipality, as authentic as possible, in active use and run on traditional lines. The places were registered without detailed description of boundaries etc. Management plans are planned in the next stage of the project. The following information is from the report of the survey which also includes some general comments about traditional land management in Norway.

Pollards

Large numbers of pollards were found on screes and steep slopes where agriculture could take place in the tree layer with a small amount of grazing. Often areas were divided into sectors, each of which was harvested every 7-8 years and these were properly defined. *Fraxinus* pollards could be very close together but were seldom tall or old.

The consequences of having trees on pasture/meadows

Trees provide shelter in rain and wind and keep a more even temperature over the 24 hour period. There is less radiation and evaporation under the tree canopy so the soil is moister. A well developed tree root system binds sand and gravel and prevents erosion while nutrients a brought up from deeper soil to the surface by the roots. Traditionally in Norway the meadows were grazed for a short period from May to early June as this prevents aggressive grass species dominating. Then the sward is left for 7 weeks or so to grow until it is mown in late July. Sheep dung might be raked up after the spring grazing so it did not get in the hay. Grazing takes place again in the autumn which helps to create gaps in the sward for seedling establishment and helps promote a high flora diversity.

The benefits of feeding leaf fodder

Those farmers that still continue to harvest leaves do so as they consider it good for the health of the sheep by controlling parasites. Pollarding is now done now in August after the raspberry harvest.

Protein levels and sugars of all the leaves of all trees (except *Sorbus aucuparia*) exceed that of hay and *Trifolium pratense*.

Summary of pollards and pollarding in Norway

Pollarding was an integral part of the farming life in Norway and pollards were widespread and common. Most pollards were found in wooded meadows but trees were probably pollarded in other situations too (e.g. willows along water courses) and some trees were pollarded in wood-pastures if the land was too poor or stony to cut hay from. Pollarding was largely done to generate leaves for animal fodder though in a few places *Quercus* was pollarded primarily for the wood.

A wide range of species were pollarded, mostly determined by what would grow. Not all the species were equally palatable to the livestock but in the absence of better

fodder the animals would eat what was given. *Fraxinus excelsior* and *Ulnus glabra* were most frequently found but *Alnus glutinosa*, *Betula* spp., *Salix* spp. and *Quercus robur* and *Tilia* were also seen.

Pollarded trees are still widespread but the activity of pollarding has severely declined in recent times. In 1981 there were just 15 farmers left collecting leaves in the Middle Sogn area and these were doing so because they considered it good for the health of their livestock, this number is probably even fewer now. Research work by Invild Austad and her students are demonstrating clearly the role that pollarding and leaf fodder can continue to play in modern farming and this is helped by young farmers such as Kåre. However, there is a less optimistic future for some of the farms where the farmers are getting old and there are no new replacements who are willing to continue with using tree leaves as fodder.

Some of the important sites with pollards are protected but many of the farms are probably not and may need some type of designation and/or subsidy in order to encourage continuation. The survey project in Sognefjord may help identify places worthy of protecting from a cultural perspective and there is clearly interest in this. Most places with many pollards are not under immediate threat of destruction but are becoming neglected the main threat to the trees is lack of management.

The work of Ingvild Austad in determining the nutritional value of feeding leaves and the benefits of traditional wooded meadow management without the need for fertiliser is one of the few examples of scientific work backing up traditional practices to help justify the continuation of them. This, together with initiatives from farmers such as Kåre give cause for cautious optimism in Norway, however it is unlikely that the extensive range of intensive tree exploitation by cutting will be able to persist and much of the culture associated with the trees will be lost.

Old *Quercus robur* tree near Stekka with the road built round it.

Sweden

General notes on farming systems in Sweden

The Swedish system was very similar to that in Norway and Swedish farms also traditionally consisted of an infield and outfield. The infield was the area close to the house and was fenced. It was where the hay and cereals were grown although parts may have been grazed after the crops harvested, e.g. after the hay cut. The outfield was the area of pasture and also the woodland. The pasture was not completely open and contained trees and bushes. Today, many of the outfield areas have become coniferous woodland while the abandoned infields tend to become deciduous woodland.

Historical management of oak trees

Oak trees were protected for many centuries in Sweden and they belonged to the Crown; it was therefore illegal to fell any oak, (until 1830 when the protection of *Quercus* trees was lifted). The reason for this protection was so that there would be enough timber for ship building. However, the trees were a nuisance in the meadows and pastures because they shaded out the ground vegetation and the fallen leaves and branches acidified the soil. In places with a high density of trees this must have been quite a problem. The farmers often tried to surreptitiously 'remove trees' e.g. by lighting fires very close by, hoping to damage and kill them, this was not against the law as it was viewed as being an accident. The effects of fire on one side of some trees can still be seen today. The trees however could be managed (although not pollarded) and often the lower branches were cut (underkvistning) which gave the trees the look of a shredded tree. The reason for doing this was that the extent of the branches was reduced and the area of unproductive land under each tree was minimised. Was shredding (or cutting the lower limbs) also done to improve the timber quality? The signs indicating that a tree was shredded in the past were very obvious on trees at several sites visited on previous trips to Sweden. A booklet about Sörmland shows photographs of pollarded *Quercus*, so clearly there were a few pollards however. There are reports of cattle having a high appetite for *Quercus* leaves but generally they were not used because of the high tannin content (Bergendoff & Emanuelsson 1996).

Swedish wooded meadows

In Sweden both wood-pasture (grazed land with trees on) and wooded meadows exist. The wooded meadows were left to grow early in the year and a hay cut taken. They were often aftermath grazed after the hay was cut. Trees in these both these types of land management included *Betula*, *Juniperus* (columnar forms were preferred and may have lower branches removed to encourage straight growth for fencing), *Quercus* spp., *Fraxinus excelsior*, *Ulmus glabra*, *Sorbus intermedia* and *Corylus avellana*. *Corylus* was abundant in some of the places visited that were traditionally managed in this way. There seems to be no conflict between the presence of *Corylus* and grazing animals. Although there was a clear browse line in places the *Corylus* obviously regenerates well. In these areas the grazing pressure may be quite low and when *Corylus* is cut selected branches were removed leaving other; this allowed regrowth from within the stool. *Corylus* was obviously not as widely used in Sweden as in Britain because *Juniperus* was traditionally used for fencing and the houses were built from soft wood timber.

Management of trees for leaf fodder - Information from Slotte (2000, 2001)
Traditionally (for example between 1850-1950) leaf harvesting was normal agricultural practice in most of Sweden. In the southern areas the leaves were mostly harvested from pollards in the dry semi natural meadows of the infield. Cutting was started on young trees and they were then cut every 3-8 years. Leaf fodder was used in various forms: Stripped leaves, picked leaves, raked leaves and leafy twigs.
The leafy twigs were cut after the hay and before the grain harvest (in the county of Norrland it was before the hay). The gathering was on such large scale that they were taken from all the most common tree species in the area (although the scale of harvesting from *Quercus* and *Fagus* forests is unclear). The twigs with leaves were often bound into sheaves or bundles and then dried by hanging from trees, fences or special racks. They were then usually stored in well ventilated barns and fed to the animals during the winter. This was the form of leaf harvesting that was carried out on the biggest scale. Dried leaves were often the major or only source of winter fodder for goats and sheep and estimates show that 190 million bundles of leaves were consumed annually by these animals. Most sheep consumed 1-2 bundles a day (the range was 0.5 to 5 bundles per day). A bundle weighed about 6kg when green, 3kg when dry and the animals ate about half of it. Leaves in this form were also fed to cattle, horses and swine but this was probably less than half the total amount fed to sheep and goats (the written documentation is such that it is impossible to calculate the total amounts used for these animals). Cows also ate stripped leaves that were heated in water and fed when cool. After the animals had eaten the leaves the twigs remaining were used as firewood and kindling.

Leaves were cut on such a large scale because the winters are very long and the animals had to be kept indoors for a long period. In addition, there was insufficient hay to support them through the winter, thus in years of a small hay harvest more leaves were cut.

There were various ways of getting this leaf fodder, including felling the tree at ground level or coppicing as well as pollarding. Pollarding was more common in the infields of Gotaland and Svealand.

Because of the need to leave the trees to recover for a few years before the next cut large areas were needed to cut tree fodder. Pollards often occurred in densely populated farming areas where trees in the meadows were especially important.

Abandonment of pollarding
Pollarding became abandoned as the agricultural revolution progressed, there was a move towards more arable farming so that more grass hay and straw was produced. There was also a decline in sheep numbers. The decline in pollarding was especially fast between 1870 and 1910, however, in the archipelagos it continued until the 1950's.

Examples of pollards in Sweden
Many different places were visited in Southern Sweden and interesting information gained from those that we met. Below are a small selection illustrating different issues.

Swedish terms
The cutting was done with billhooks, a small one (løvhacka) and larger one (kvisthacka). A small bow saw was also used and sometimes an axe (hamling ax).

Topphamling – Pollarding
Side Hamling – General term for cutting the side branches off like shredding
Sidohamling utan topp – Combined pollarding and shredding
Sidohamling med topp – Shredding
Hamlad - Pollard
Hamling – Pollarding

Other Nordic words for pollarding
Stoevning – Danish
Styving – Norwegian
Shredding in Denmark was believed to have been done on a short rotation as shredded trees could still flower and produce pollen from the tops of the trees.

Outfield at Krokshult (left)

Infield and outfield at Krokshult (right)

Racks and poles for drying hay Krokshult (left)

Young pollards in wooded meadow Målaskogberg (right)

Krokshult – Småland County – traditionally managed farm

On road between Kristdala and Mölunde, west of Kristdala is the farm of Krokshult at an altitude of 100m. It is designated/protected as a kultur-och Naturreserve, owned and managed by Ivar Andersson. A small leaflet is available describing the reserve.

Krokshult is still a working farm. It contains pollarded *Tilia* and *Fraxinus excelsior* in the wooded meadow and there are also *Quercus robur* trees.

Management of the pollards - Conversation with Ivar Andersson

The trees are cut every 5-6 years in August/September. On the farm there are 4 whitebeam (or maple?) pollards and the rest are *Tilia* and *Fraxinus*. The leaves were used as winter fodder for horses but not cows; *Fraxinus* was best for the horses and *Tilia* for sheep (*Populus tremula* was also used for horses but it was cut at ground level not pollarded).

Ivar Andersson and his pollarding tools, kvisthacka and løvhacka

The trees were about 12-15 years old when they were first started as pollards. To pollard a trees takes about 5 minutes for a young tree and up to two hours for an older one - 20-30 mins would be average for a medium sized tree. The cutting was done with billhooks, a small one (løvhacka) and larger one (kvisthacka). A small bow saw was also used and sometimes an axe (hamling ax). Sometimes a ladder was used if the tree was big, otherwise the men just climbed into the trees. Usually 4-5 branches were left on *Fraxinus* trees when pollarding, 10-12 on *Tilia* and the stubs left were short. *Fraxinus* grows faster as a young tree than an older one but *Tilia* grows equally well regardless of size. Some of the trees were shredded pollards, a combination of both methods, which maximises leaf growth (we would call this cutting to the form of the tree). The grass around the trees is cut with an Allen Scythe.

The future

The trees are currently still pollarded traditionally but the longer term is more uncertain - what will happen when the farmer, Ivar Andersson can no longer do the practical work?

Pollards round field edges (left) *Fraxinus* pollarded and shredded (above right), close up of pollard (below right)

Råshult (Linneaus' house) – farm managed as in 18th century as a visitor attraction and meeting with Jan Karlsson, Eva Johansson & Michael Michaelson

Råshult is situated at Stenbrohult, north of Älmhult, west of the road running between Älmhult and Diö. It is owned and managed by Länsstyrelsen and designated as a nature reserve. A leaflet is available in English.

Råshult was a traditional farmstead where Carl Linneaus was born. Today it is being restored as a traditional cultural landscape from the 18th century for people to visit. It has many pollarded trees, mostly *Tilia* but also *Fraxinus excelsior* and *Ulmus glabra*. *Tilia*. Unusally for Sweden there is also a pollarded *Quercus*. The pollards are in wooded meadows.

The hay around the trees is cut with 3 different tools – Scythe, Allen scythe and tractor – depending on the land type. After cutting the land is grazed using old traditional breeds including Värmland Forest sheep and Swedish red poll cattle.

Pollard and wooded meadow management
The *Tilia* pollards were cut until 1900-1910 and then they lapsed until the 1950's. The leaflet says that in the past the leaf fodder was gathered in August after the hay harvest, the trees were pollarded and the leaves bound into sheaves and dried. The trees were pollarded every third or fourth year. The farm animals liked the *Tilia* leaves in particular. The leaflet also implies that the leaves were fed only to the sheep with one ewe requiring 10 sheaves of leaves per week during the winter months and 3000 sheaves being required each year to feed the 12 sheep on the farm. It mentions that hay was fed to the horses and cattle but there is no suggestion that they were fed leaf fodder. The *Tilia* trees were cut just before midsummer and the bark was used for making rope. After cutting it was put in the lake until the autumn when it was soft and easy to work with. In 1751 the farm had 14 cows, 2 horses and 12 sheep. The sheep were usually indoors for 22-28 weeks of the year.

In the 1950s the pollards were cut again for landscape reasons. Pictures in 1954 show trees looking like 'skeletons' but they now looking much better.

Currently the trees are cut aiming for a 4 year interval but this has been longer recently because of discussions on how/when to pollard and how the landscape looked. Some of the public raised emotive issues over pollarding but it is hoped that pollarding can now continue.

Currently there are over 100 pollards at Råshult (including many on the northern part of the farm) and 50 on a nearby nature reserve. It is hoped that the trees will now be cut regularly.

Recent methods of pollarding
The trees have been pollarded by cutting very close to branch collar and leaving only a 5-10 cm stub. Growth is regularly from just below the cut. Many of the trees have suckers which have grown well and a lot of these have been left, (more than desired in order to create new pollards but it is expected that many will suffer damage from roe

deer). By using the suckers to start new pollards the trees themselves will be perpetuated. When cutting pollards from suckers it is important to those from the same tree at the same time, otherwise one becomes vigorous at the expense of the other. Some new pollards here are 'shaped' a little in the years prior to the creation of the pollard.

Old *Tilia* pollards and a traditional barn

Views of the wooded meadow showing pollards of various ages and species

This leaning pollard had a trunk diameter of 0.5m in the 1950's. Today its diameter is 1.0m

Close up of *Tilia* pollard showing growth from just below cut (left)

Old *Tilia* pollard with a *Sorbus aucuparia* tree growing in it (right)

These two newly created *Tilia* pollards (left) are from the same tree rootstock. One has been cut recently and the other was not cut. The tree has put all its resources into the uncut stem and the cut one has died

***Quercus robur* pollard (right) unusual for Sweden. This tree was quite small in the 1950's and has been cut only one or two times.**

Sites in Småland County- with Jan Karlsson & Eva Johansson

Målaskogberg – restoration of wooded meadow, managed as nature reserve (with Thomas Norlin too)

Målaskogberg is north of the road running between Ljungby and Vislanda, East of Ljungby. It is at an altitude of 160m and is 32 hectares in size. It is owned and managed by Lansstyrelsen as a nature reserve. One person is employed as the manager and unemployed people are used to help the farmers locally especially with hay cutting. There is a small leaflet available about the site.

A former *Fraxinus* meadow with pollards, the site became overgrown and uncut for 100 years and became in effect forest. In the 1970's it was restored and the trees have been cut several times since then.

Management of ground flora:

Hay is cut once per year, usually after 15th July. One meadow is high in nitrogen levels so it is cut earlier to try to reduce this. The hay is cut mechanically as far as possible (i.e. with an Allen Scythe) but the rocky areas are cut by hand with a scythe. If the weather is bad the hay is thrown away, if possible it is used. Sometimes it is given to fallow deer kept by someone in the village. After hay cutting the wooded meadows are grazed using cattle from a local farmer until about October, depending on the weather.

Description of tree pollard management

The tree species pollarded are *Fraxinus excelsior* and *Ulnus glabra*. As well as the restoration work of the old pollards new pollards were also started in 1970 at a size of 10-20 cm diameter. The ideal size was said to be 5-10 cm. They are cut on a slant with the slant facing south.

The trees are now pollarded after the hay has been cut. The cattle in eat the grass and fresh cut leaves and then the branches are then thrown away. The leaves from the trees are no longer dried for use as winter fodder. Elk come in and eat the pollards as they are tall enough to do so.

As a nature reserve this site is likely to be managed in a similar way in the future, i.e. the pollards are cut but the products not used in the traditional way.

Young *Ulmus glabra* (above) perhaps cut only once or possibly damaged. The side branches have also been pruned

Close up of *Ulmus* pollard (left) created in 1970's and cut 4-5 times since. When cut all branches are removed, even tiny ones

***Fraxinus* pollard (right) with a similar history**

This *Fraxinus* pollard was cut repeatedly for hundreds of years until 1920's when cutting lapsed. In 1972 it was cut back hard (left)

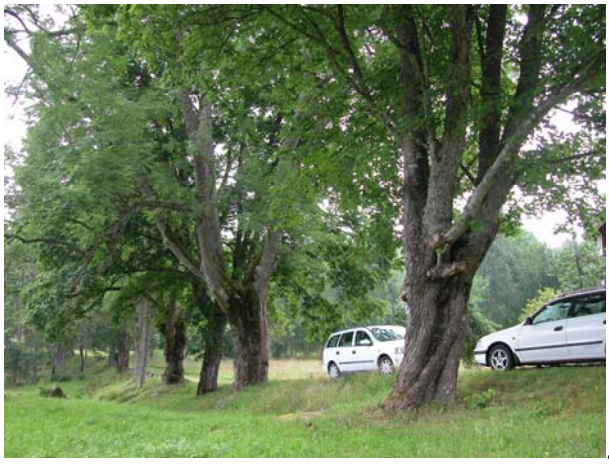
Same tree in 2003. It has been cut approximately every 6 years since 1972 (right)

Pollarding courses are run for farmers locally and there is a big demand. EU money for is obtained for pollarding

***Fraxinus* being pollarded (left). Note the ladder strapped to the tree.**

The tools being used for pollarding – modern saws (right)

Close up of the tree being pollarded after several cuts (below right). There is some decay in the top of the bolling, perhaps the first time of pollarding was done when the tree was older than ideal?



Avenue of *Fraxinus* and *Acer platanoides*. These trees were last cut at the beginning of the 20th Century. They will probably not be cut again as the risk of snow damage is not considered to be so high

Sjösåsäng (with Toni Johansson)

Sjösås is NE of Vaxjo, N. of Braas, it is a nature reserve managed by Länsstyrelsen with pollarded *Tilia* and also standard *Quercus robur*.

2000 years ago the area was probably cultivated, as the cairns date from this period. In 1696 it was definitely all meadow and it was still meadow in the 1960's. In the 1990's the meadow was made bigger. The grassland was considered to be of high value and the trees are also of nature conservation interest so there was a conflict in management. The more *Quercus* the more acid the land became, so to prevent this the *Quercus* leaves on the ground are removed in spring. Traditionally the leaves were removed and burnt as they were of no nutritious value. Now the site is cattle grazed to encourage open grown *Quercus*.

In the distant past the *Tilia* were pollarded regularly, this lapsed but in the 1980's the trees were restoration pollarded and new pollards also created. New pollards were also created in the 1990's when the area of meadow was expanded. Now there are over 20 old pollards and about 100 new ones. The restoration pollarding of the trees was done in the winter. The new pollards are cut every 4th year, the old ones every 4-6 years.

The *Quercus* are probably 4-500 years old and were about 2m in diameter when the nature reserve was declared in the 1960's. The *Quercus* were protected here longer than in most places as it was church land, which is probably why so many survived.

We were told that *Tilia* shades out the *Quercus* over time and most of the management has focussed on the *Tilia* trees. However the *Quercus* were quite exceptional and perhaps the management would have been better targeted at them, not the small number of old *Tilia* trees.

Old *Quercus robur* trees (left)

Older *Tilia* pollard with lots of bushy lower growth (right)

Skäraskog – Restoration of high pollards

Various small areas around the village of Skäraskog, North of Lenhovda, North east of Växjö were visited.

1838 maps show that very little has changed in this area except that it was the site of an old village that was moved. When the village was moved the productivity of the land was calculated for each family so that the people had the same equivalent in the new village and their new houses were built in the centre of their land. Wooded meadows with pollards were left behind in the old area.

We visited an area with high *Fraxinus* pollards. The trees were pollarded for fodder until about 1930 when the cutting lapsed. The pollards are now very high; the first cut may have been at the same level as other pollards but each subsequent cut was higher. There may also have been a gap of approximately 20 years between some cuts and when the trees were cut after this lapse it was done higher up. This may have happened several times.

In the 1970's some of the trees were cut in January to restore them, using a chainsaw from a ladder. Those with smaller branches were cut but others trees were not so it was very dark for the meadow.

At the end of the 1990's pollarding was considered again. A drawing of 1947 showed that all the *Fraxinus* were pollarded so it was decided to cut the rest of them although it was uncertain if it would work. The original idea was to do the work with a forestry harvester but there were two very wet years so it was not possible to do it this way and arborists were used instead. Thus the remaining trees that were not restored in the 1970's were cut in 2001. It took 1.5 days to cut 15 trees and they were cut in the autumn with leaves on, (it was a late autumn leaf fall that year so it was probably October.) The cut branches were cleared up in the winter. Branches cut from the trees showed that it was 60-70 years since they were last cut (=1930's).

The trees restored in the 1970's are now cut every 8/10 years using hand saws and ladders. They are cut in either March or July/August which is the best time for work. When the 2001 trees are cut again they will be cut to the 2001 point or higher, but not lower.

***Fraxinus* pollards showing very high restoration cutting**

The success rate was almost 100% both times (1970's and 2001) but 1-2 trees died each time. The new growth comes from just below or at the cut and there is lots of new

growth on the trees. This new growth may succumb to snow damage but that is a risk that will be taken. Cold winter damage killed some shoots last winter.

Younger *Fraxinus* pollards (left)

Close up of a younger pollard (right) showing long stub left and subsequent die back as well as new growth

This *Acer platanoides* pollard (left) was cut in the spring, which was the wrong time to cut it, however it has grown well!

***Sorbus intermedia* tree (right) that has been broken (a 'self pollard')**

We also visited a nearby area of *Tilia* pollards that were created in the 1970's and have been cut regularly since.

A group of *Tilia* pollards (left)

Close up of one pollard (right)

Sites in Blekinge County

Ire

Ire is to east of the road between Karlshamn and Tingsryd, North of Karlshamn. It is 100 hectares in size and owned and managed as a nature reserve by Länsstyrelsen.

Ire was a working farm until the 1970's (according to the leaflet – but we were told the trees were restored in the 1970's). There was a wide range of trees pollarded within the wooded meadows, including, *Fraxinus escelsior, Tilia, Acer platanoides,*

Sorbus intermedia, Ulmus glabra, Carpinus betula, Fagus sylvatica (1), more species than seen anywhere else.

Hay is cut from the meadow, partly by hand, and the area then grazed by Ringamålako (Swedish red cow).

Pollard management

The trees were supposedly cut since the 1970's so it would be expected that there would be 4+ cuts in that time but they do not look like it. Work by Slotte (2000) aged the trees here by counting rings. Seven of the 10 trees studied were over 150 years old, the other three were over 200 years. Old pollards are being cut each year and now trees started too.

Ire was described to us as being somewhere to see a more traditional way of pollarding but the cutting did not appear very sensitive. The area is close to a 'Kulturskolen' although we were told the trees were not cut as part of the training in the school it looked like they had been done by inexperienced students! Some of the old trees seemed to be growing better than the younger ones.

A young *Fagus sylvatica* pollard, 0.7m in girth. Probably cut once, retaining some branches, which resulted in some die back. The retained branches have grown upwards and were cut again probably 2 years ago. Last year's growth was 20cm and the year before 40cm.

Young *Carpinus betulus* pollard with extensive die back on one side (left)

Fraxinus pollard cut two or more times and showing die back of cut stem (right)

Three stemmed *Tilia*, two stems of which have been cut and one left in tact. Of the cut stems one has no growth and the other just a little. Probably the tree is putting all its effort into the uncut stem (left)

Old *Tilia* pollard with two good knuckles. The growth looks good (right)

A double stemmed *Carpinus* pollard. This tree was probably cut several years ago but appears to have only produced growth this year (left)

Fraxinus pollards cut perhaps four times at different heights (left)

Fraxinus meadow (left), older _Fraxinus_ pollard, cut several times (above right), close up of older _Fraxinus_ pollard (right) showing new shoots

Steneryd

Steneryd is on the road between Jämjö and Torhamn, south of Jämjö (south east of Karlskrona). It is a Nature Reserve owned and managed by Länsstyrelsen.

Description of tree pollard management

Presumably the old trees of *Fraxinus excelsior* and *Ulmus glabra* were cut regularly as part of the farm work, up until 1970's. They are mostly found around the edges of the fields. Work by Slotte (2000) aged the trees here by counting rings. Eleven *Fraxinus* were over 150 years and three over 200 years. The oldest *Ulmus* were 350 years but many were rotten in the middle and difficult to age. From looking at the rings it is likely that the trees here were pollarded when they were very young and cut every 3-8 years. Hæggström (1992a) comments that some of the trees here show a combination of pollarding and shredding – the trunks were cut at 6-10m and the resulting branches had leaves cut from them.

Some young pollards were created between 1990 and 2000 but there was a generation gap with no trees started in the 1960's. Many of the trees have been shredded and pollarded, cut to their form to create lots of leaves. The trees have a clumped distribution, many (especially *Fraxinus*, *Tilia* and *Ulmus*) are clustered on top of cairns. Probably these are mostly suckers of a single (or small numbers) of trees.

This site was described as being less traditional than Ire but the cutting looked more careful. With old lapsed trees where there is only a short lapse it is easy to see where to make the next cut. With younger trees it is not so easy and so there is perhaps a tendency to cut too hard.

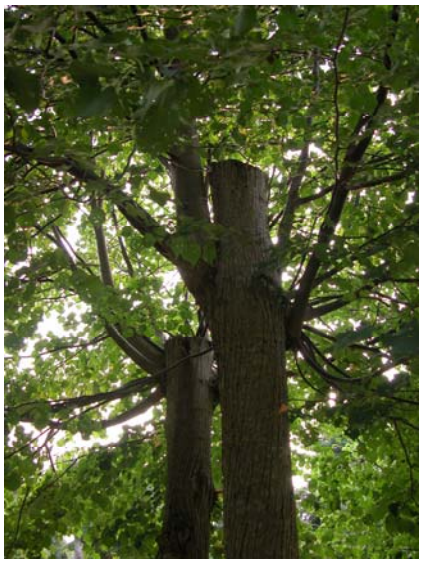
View of the pollards at the edges of the cereal fields

Fraxinus **pollard cut at progressively higher levels (right)**

Very high cut *Tilia* pollards. There are signs of cattle browsing on growth at the base.

Young *Fraxinus* pollard 2-3 years since cutting. Three cuts had been made of stems roughly 5cm in diameter.

A clump of *Ulmus* pollards (below) and close up of tops of bollings (right)



Two large *Fraxinus* pollards 30cm in diameter. Resulting growth is rather one sided and the long term viability of these trees may not be good (left)

Large *Fraxinus* pollard cut and then flushed but now dying back (right)

Cow browsing on *Fraxinus* leaves

Bråbo – Village with many pollards; management only recently abandoned

Bråbo village is South of Kristdala, north west of Oskarshamn. There are pollards found all around the village, both east and west of the road between Bråbo and Ostantorp. There is a photocopied leaflet about a nature trail available.

The village traditionally had many pollards that were cut regularly and pollarding was abandoned here only in the 1980's. The pollards are largely *Fraxinus excelsior*, *Ulmus glabra* & *Tilia* within wooded meadows. The ground flora has hay cut and is then grazed. The trees look to be regularly pollarded again.

***Tilia* pollard two years since cutting, cut back hard with almost flush stubs 20cm in diameter. Growing about 1m per year but lots of decay (left)**

As above, in close up (right)

Close up of *Fraxinus* pollard, three years since cutting. Good growth of over 1m per year but lots of dead stems (left)

***Tilia* pollards on a large heap of stones (right)**

Views of ash meadow (left)

Close up of *Tilia* pollard cut hard (right)

Misterfalls äng (and discussion with Pär Johansson) – Small wooded meadow with very regular pollarding

Misterfall is on the west side of the road from Kisa to Tidersrum, west of Kisa in Östergötland. It is at an altitude of 250m and only 2ha in size. It is a biotope protection area (i.e. a nature reserve not owned by Länsstyrelsen). Pär Johansson is in charge of the management.

There are 140 *Fraxinus excelsior* pollards on the site, some estimated to be 300-400 years old. Hay is cut and then the area is grazed with cattle to benefit the ground flora. A variable number of animals used, usually 10-15.

Description of tree pollard management

The trees were pollarded regularly until 1955. They were cut again in the 1970's after a 20 year lapse. As part of the restoration work some trees were felled, but no pollards.

Currently some trees are cut each year with 5-10 years between cutting on each tree. The branches cut are 6-8cm in diameter, if they are left bigger there are fewer leaves on them (relative to the amount of wood). Also, the branches were originally cut with hand tools so the bigger branches would not have been easy. Now there are better tools and it is easier to cut the larger branches. The work is done now with a Japanese saw and the stubs are cut as low as possible as there is no benefit in leaving long stubs (however the trees cut this year did not appear to have short stubs). With the older trees it is more difficult to tell if the cutting is going to work and bigger branches are more difficult. New pollards are started on suitable trees, the biggest of these are generally about 30 years old and 10cm in diameter. When the older pollards don't have so many roots they shoot from the base, then new pollards can be formed from the old tree. Not many of the trees have been lost, only some of the older ones.

This year the trees were cut on 9th August. Five people were working on the trees and it took them 2 hours to cut 25 trees. A ladder was used to climb up and a tractor was to be used to remove the branches. The leaves are burnt (unfortunately) as there is no use for them. EU money is received for hay cutting and pollarding.

The managers of the site appeared very confident that the work they were doing was right and would work. They had an approach much that was less focussed on individual trees that would be likely in the UK. They were making use of suckers to perpetuate individual trees rather than concentrating entirely on the existing trunk and canopy.

The future management of this site is reasonably secure but it is sad that the leaves and branches cannot be used.

A four year old branch removed in the recent cutting work (above)

The main stem of this pollard has died but the suckers from the lower part of the trunk will replace it (left)

Pollard cut last year, it has died back on one side and has very large leaves (right)

Pollard getting very 'leggy' and in need of cutting again soon (left)

One of the largest trees with a girth of 2.62m (right)

Close up of a very vigorous pollard bolling (left)

A small newly created pollard of 6cm diameter this has grown about 1m/year for three years and needs cutting again! (right)

Krusenberg Uppsala (with Håkan Slotte)

Krusenberg is situated along road 255 from Sävja to Alsike near Uppsala, Uppland. Some of the old trees are protected but the wooded meadow is not. It is part of a large estate, recently bought by the university and was an old wooded meadow grown up with dense woodland at the time of purchase. Normally such an overgrown area would not have been considered worthwhile to restore, however it was done partly as an exercise for the students. Gotland sheep were grazing as part of the restoration phase, cattle will be used too.

There are no old pollards here but new ones have been created from *Fraxinus excelsior* and some *Ulmus glabra*. The trees to be retained were selected before the area was cleared so they were smaller than in many other areas of restored wooded meadow. The ideal age was said to be about 2 years old and the cut was made above existing branches, ideally above a whorl. The trees were cut by hand, using gob cuts from a ladder. The tops were then pulled off using a rope from the ground. The tops were flat or with a slight slope to the north so they don't dry out. As the work was done by hand tools, the pollards were not cut a second time to 'perfect them' so the first cut was generally the final one. Long stubs were left but were not generally considered necessary, cutting to the branch collar was reported to be more usual when pollarding. When a few branches were left on the trees they tended to produce very vigorous growth; the second cut then results in even more growth. The restoration and pollard management will continue here but the *Ulmus* will probably die of Dutch Elm Disease which is in this part of Sweden and spreading.

This site was a very different example of creating new pollards and wooded meadow restoration than all other sites visited in Sweden. It was much more tree focussed and the restoration work planned over a longer period of time.

Gotland sheep and Håkan in front of a *Fraxinus* pollard tree (the red ribbon was to indicate that it should be saved during clearance and cut as a pollard) (above right)

Long stubs were left on this young *Fraxinus* pollard but usually they would be much shorter (left)

Young *Fraxinus* two years of age and an ideal diameter to cut. This tree was cut just above existing branches (right)

Sites with large old oaks, not pollards in Botkyrka parish (with Håkan Slotte)

Sturehof Castle near to Botkyrka

Close to sea level on the edge of the fjord is an area that was formerly a wooded meadow but now it is part cereal fields, part moist woodland with large *Quercus robur* trees, probably over 200 years old. The cultivation of the cereal fields was very close to the trees but most looked very healthy. Håkan thought that the ploughing was not a problem for the trees as long as it did not go any deeper than previous ploughs.

The *Quercus* were generally owned by the admiralty in Sweden and thus protected for use in ship building but here, on nobility land, the *Quercus* were owned by the owners of the land.

General views of *Quercus robur* in amongst cereal fields with the outskirts of Stockholm in the background

Tree on the other side of the motorway protected as a Natureminne with details of the mark

Ekholmen [oak small island]

Ekholmen is close to Tumba and can be accessed via a path leading from the riding stables across wet woodland. It is designated as a Natura 2000 site.

The *Quercus* trees are on an 'island' joined to the mainland by a region of wet, winter flooded woodland. It was possibly a wooded meadow a very long time ago. There are no pollards but some very large old *Quercus robur*. In recent years these have become surrounded by many younger trees some of which have been felled to let light into the older *Quercus* trees. The work was quite sensitively done and not too dramatic, the old trees were looking healthy.

Notes on oak tree management and wooded meadows in Sweden from Håkan Slotte

Quercus trees where branches have been cut up the sides is an indication that an area was formerly a meadow as the branches were cut to stop them shading the hay. Spreading branches on the oaks indicate a former pasture as the branches were not cut, the animals just browsed them. Old apple (*Malus sylvestris)* and *Crategus* trees are also good indicators that the area was meadow. *Acer platanus* trees appear about 30 years after wooded meadows are abandoned. On land owned by the nobility pollards were not common as they had more hay and so needed the foliage from the trees less.

General comments on pollarding in Sweden

Notes from Jan Karlsson, Micheal Michaelson & Håkan Slotte (with additions from publications)

Frequency of cutting

Traditionally *Fraxinus* trees were cut every 3-6 years and *Betula, Alnus* and *Populus tremula* every 4-6 years. They could be cut every second year if they HAD to because of shortage of hay, however, they could not be cut every year as this killed them.

Now the trees are mostly cut every five years, with the older, bigger trees cut every 7 years as they grow slower. Larger/bigger branches are more likely to get snow/wind damage and smaller trees are easier to cut. Generally all the branches are cut off the trees but when restoring trees it may be better to leave a few sucker type branches.

Time of year to cut

When on nature reserves and as part of restoration projects the trees have been cut in winter when thinning was carried out, but now they are cut in August and September (the traditional time). Sometimes the trees were cut after the winter, but before the sap starts rising in March, but this is not good for *Betula* and *Acer*. Cutting in July/August was reported as best for all trees.

Trees cut in winter could perhaps be cut every year but not those cut in summer.
If they are cut in the growing season there is usually some dieback but only 2cm or so. If cut in winter the tree takes longer to form the barrier (to compartmentalise) and therefore there is more die back and drying out. Cutting in August/Sept into October is ok but not cutting between sap rising and mid summer.

In theory the ideal time to cut the trees is when it is 'alive' so it can plug the xylem flow and not dry out in the winter.

Starting new pollards

Jan said that the ideal size for starting young pollards should be 5-10 cm. They should be cut on a slant with the slant facing south. But Michael said that 10cm is too early to cut, a new leader starts but a proper pollard does not form. The ideal is thickness of man's arm. Michael was also shaping trees intended as new pollards before pollarding by cutting side branches to encourage strong top branches then these were cut leaving stubs rather than just a simple single stem to get good pollard shape. He also had some interesting observations on some young pollards he had created.

First that some young trees cut with a chainsaw were growing well from the base and not from the top. Secondly he had cut a young pollard on the same root stock as a sucker that was not pollarded. The result was that the tree put all its resources into the one stem that was intact so the cut one died.

An old Swedish book says to cut 3-5 decemetres (i.e. 30-50cm) above the previous cut but after three cuts the tree would become very tall so the principle used now is to cut a little above the branch collar.

Slotte 1997 suggests the following guidelines for creating new pollards:

- They should be started in the traditional way where possible
- Top cut small trees above a fork in the branches.
- Aim for a trunk diameter of 4-8cm in diameter and no more than 12cm.
- To ensure continuous management pollards should be cut at moderate heights
- Larger trees may also be cut if they would otherwise be felled.

Booklets produced in the Swedish series also give guidelines on cutting new pollards:

- Cut 3m up and at 3-8 year intervals.
- Traditionally cut in August/September between the hay and the corn harvest.
- Figures show taking the top off and leaving the upper branches intact, then coming back 5 years later when the tree has grown to take off the side branches but leaving long stubs. [NB This would create candelabra shaped trees but the illustration is of an *Fraxinus* which doesn't usually appear to be shaped like this]
- Cut at 5-9cm diameter, the thickness of a forearm
- Recommends removing the top by tying the top of the tree to another then part cutting and then pulling the top off with a rope. Illustrates leaving few if any branches on the tree.

Reasons for cutting trees other than for fodder

Some trees were cut for fuel in Southern Sweden, including *Fagus*, e.g. Skane where there is less woodland. Trees were not pollarded for fuel in Småland. *Populus tremula* was cut and bundled for fodder but not pollarded. In Småland the *Tilia* was cut for rope, the best quality gained from 2yr old stems. Harvesting of *Betula* was often combined with bark tanning and use of wood for fuel wood.

Many of the pollards in Sweden are growing on heaps of stones. Was the heap of stones created first or were the stones piled round the trees? It is thought by Jan & Michael that the stones were piled round the trees, possibly during the Middle Ages before the black death when there was a high population and an explosion of agriculture. After this the trees regenerated in the stone heaps.

Restoration of wooded meadows
Restoration work is usually done in March, just before sap rising and when it is a quiet time for the foresters and their equipment. Often the restoration phase uses forestry harvesting equipment as well as by hand. Usually in Sweden the clearance work for ground flora is done first and as a result the very young trees get strimmed while this is being done. Then the pollarders come in and the only trees they have to work with are too big. Håkan is trying to encourage them to think about trees needed as future pollards while restoring the grassland but it doesn't usually happen (a similar situation was seen in the Åland Islands).

Restoration of lapsed pollards (information from Slotte 1997)
- Cut above the last pollarding cut and preserve old stubs and these are most likely to produce new shoots.
- The cutting of thick branches and trunks should be avoided as these are unlikely to produce new branches and the risk of fungus attack is higher. The cutting surface is seldom grown over if the branches cut are greater than 10-15cm in diameter.
- Small branches or parts of branches should be retained if possible
- Shading of a cut tree inhibits growth but strong light on formerly totally shaded trunks can also be harmful.
- The ability to form new shoots depends on the tree species so there are species specific differences. *Alnus glutinosus, Betula* spp. *Populus tremmulus, Fagus* and *Quercus* suffer after the hard cutting of large branches. *Tilia, Fraxinus* and *Ulmus* are more durable and will sprout easily.
- Re-pollarding should be done between mid summer and early August.
- Do not cut in spring and early summer

Guidelines for cutting lapsed pollards from the two booklets (also included are several diagrams):
- Shows clearing away all surrounding trees in one hit and then cutting off all the branches leaving 20-40cm stubs.
- Cut in August and September.
- *Fraxinus* and *Tilia* are suitable to do in this way.
- Illustration of an old *Salix* type pollard is shown leaving two small branches on.
- Make sure that any suckers are not retained intact but are cut as new pollards.
- Observe various health and safety requirements, for example tie the ladder to the tree with a strap and tying off the branch to a nearby tree to hold it while cutting.
- Proposes cutting the branches once to remove the major part of the branch and then making another cut to tidy it up and leave a shorter stub.
- The use of forestry harvesting equipment to remove large branches from pollards may be appropriate.

The restoration of a Kandelaberträd (candelabra shaped pollard) is illustrated but the cutting proposed to restore a tree like this doesn't look very sensitive. The suggestion is to leave long stubs but just one branch completely in tact. Then to return in three years to remove the branch that was left.

An illustration shows a dead *Tilia* after a dry summer but it also looks like this tree was cut very hard and possibly below the previous cutting points.

Cutting of Fagus in Sweden (from Bergendoff & Emanuelsson 1996)
In Scania (southern Sweden) *Fagus* occurs and has traditionally been both coppiced and pollarded. Generally the coppices were in the infield and the outfields had both coppice and pollards. With *Fagus* being the most widespread outfield woodland type and an important as a fuel source.

Fagus were often cut by 'topphuggning' a form of pollarding in which some small branches were left on the bolling and these were then cut, thus forming 'secondary pollards'. *Fagus* cutting is also described as being a 'diffuse' type of pollarding, possibly meaning that selected branches were removed high in the canopy, however they state that, 'It is obvious that the coppicing capability of *Fagus* is higher in central Europe than in Southern Sweden'. This may be because of more favourable climatic factors.

Many outfield *Fagus* woods in Skåne were Ollonskogar or mast woodlands for pigs. *Fagus* was considered the best of all the Swedish trees for firewood and this was partly produced by outfield pollarding. In central Europe *Fagus* was rarely used as leaf hay but was eaten fresh by cows. In Skåne there is some information on foddering with *Fagus* but it was probably not of great importance. For the leaves to be used as fodder they must be harvested in the first few weeks after leafing. *Fagus* was sometimes used as leaf hay, the leaves were stripped off the branches and the twigs were not used as they were not tasty. *Fagus* leaves are most palatable when cut early in the year, for example in June. Normally *Fagus* were kept out of the meadows as they cast too much shade.

Fagus are also described as being sown by caching animals so that several separate trees grow together forming a multiple stem that looks like a tree cut once.

In Scania pollarding ceased in many places in the 19th century but resumed temporarily in dry years where there was not enough hay and also continued near houses and roads for decorative reasons.

Spectacular *Fagus* pollards can been seen in three places in Skåne today:
Norra Svartskylle and Getryggarna in Baldringe parish and Borstbäcken in Öved parish. Formerly pollarded *Fagus* outfields have high conservation values and may contain the only genetically Scanian *Fagus*. (I did not discover this information until after leaving Sweden so was unable to visit these sites.)

Studies of tree rings from pollarded trees (Slotte 2000)
The mean annual ring width of pollarded trees is narrower than unpollarded ones.
Tree ring studies were made in Ire and Steneryd.
Ire - The average ring width of pollarded *Fraxinus* was 0.47-1.23mm. Unpollarded trees nearby had rings of 2.29-4.83.
Steneryd – The ring widths of *Ulmus glabra* were significantly narrower than un pollarded *Ulmus* nearby but the oldest trees were rotten in the middle so counting was not possible.
Tree rings are thinner for 1-2 years after pollarding. When the trees are cut regularly (every 2-6 years) it is not possible to distinguish variation in the ring width due to other factors such as weather and thus the rings are narrow every year.
Pollards have a relatively high age and slow growth rate.

Reasons to pollard today (from Slotte 2000):

- Small trees often removed today could be pollarded.
- Focusing on this sort of management results in a varying structure of trees and shrubs in wooded meadows.
- Pollards are important for species that depend on old trees in light or semi shade.
- There is a cultural importance for establishing new pollards.
- In second half of 1990's several thousand trees in the Swedish landscape and reserves were pollarded and repollarded.

Incentives for encouraging farmers to pollard trees

There are 60 farmers in Småland that get money from the EU for pollarding. However the subsidy paid (150 SEK per pollard) is dependent on the tree being close to an arable field (so for example 90% of the trees at Råshult do not qualify).
Jan and a few other people run day courses on pollarding for farmers. This year they have 20 people wanting to do the courses. They concentrate mostly on pollarding younger trees or those in cycle, not restoring lapsed pollards. When devising pollarding techniques/teaching people the Health & Safety authority were consulted prior to a booklet being produced and the courses being run. They agreed to allow cutting trees from ladders if the ladders have a foot and are tied to the tree. Hand tools only are used and the shorter the better. In Sweden it is not permitted to use chain saws from ropes, only from access platforms. Long stubs are sometimes left but then shortened afterwards.

Numbers of pollards in Sweden

There are currently estimated to be over 70 000 pollards in Sweden (Slotte 2000) and several hundred thousand abandoned fodder trees (Slotte 2001). This is thought to be only a fraction of the number in the 19th century (Slotte 2001). Pollards were found across southern Sweden but were especially abundant on the east coast and very large numbers were found on the island of Gotland as well as the Åland Islands (see later). A meadow in Gotland that was studied in detail had 153 pollards to the hectare and Gotland may have 50% of the Swedish pollard population, in total 4000,000 trees. However, they were generally small and 100-200 years of age.

Summary of pollarding in Sweden

Pollarding was very widespread, at least in southern Sweden. Almost all the pollards were found in wooded meadows and the trees were cut to produce leaves for winter fodder. *Fraxinus excelsior* and *Ulmus glabra* were the most common species cut but a variety of others were probably used as well, depending on what was available locally.

Today there are only in a few places where pollarding is still practiced as a farming method and the leaves fed to the animals. It is much more widespread on nature reserves and cultural reserves for reasons of conservation. Thus many of the sites with pollards are protected and are therefore not generally at risk of being lost. However the pollards may be at threat due to lack of management if enough resources are not available to maintain a cutting regime. It is also important that the health of the trees should be checked regularly and management adapted if necessary. Most people seemed to be fairly confident that the trees would survive well when cut and this may not be true in all situations. In addition more care may be needed when

restoring wooded meadows with pollards not to focus entirely on the meadow in the early stages.

Take home messages

In Sweden many pollards are protected within cultural reserves as well as nature reserves. There is no equivalent in Britain but it could be a good way of protecting traditional farms and landscapes. The Swedes can also protection individual trees for nature conservation reasons, these are clearly marked and under stronger protection.

The need for many people to be pollarding trees on farms and in wooded meadows in Sweden has led to the development of courses in pollarding. This has been subjected to various comments regarding health and safety issues but a small booklet with guidelines in has been produced along with the equivalent of the Health and Safety Executive and shows safe ways of working from ladders.

Åland Islands –with Carl-Adam Hæggström

Introduction to the islands
The Åland Islands are situated between Sweden and Finland. They belong to Finland but much of the language and culture is Swedish in origin. The are now a Principality.

The soils are mostly acid granite bedrock but there are calcium rich limestones too. Land in the Åland islands is rising from the sea at the rate of 5mm per year. The climate is variable, the winters sometimes have no snow, while others can have 50cm of snow and –32C. The temperature regime is more like an Atlantic climate but the precipitation is more like a continental climate. Generally there is a long cold spring and a warm autumn

There are various words to describe islands, Ö – Big island, Holmen – Small island, Sker – smaller island.

Pollards, a hay stack and a typical house

General comments about pollarding in the Aland Islands
As in much of Scandinavia the trees were pollarded for animal fodder, the principle species being *Fraxinus excelsior, Ulnus glabra*, *Betula pendula* and *B. pubescens* (birch was pollarded for fodder but was difficult to cut and provided only poor fodder), *Alnus glutinosa* (the sheep eat dried leaves but not fresh, the cattle don't eat it at all), *Populus tremula* was cut high, also for fodder for the horses, it was supposed to be good for their teeth. *Acer platanoides*, was occasionally pollarded but it is a pioneer species and is found 20-30 years after the land is abandoned.

There have been estimated to be up to 1000 pollarded trees in Åland today because the pollarding ceased here so late here (see Slotte 2000). 1867-68 was a famine in Finland and many date from this period.

The pollards were in Scandinavian wooded meadows so the ground beneath them was cut for hay. Traditionally they would have been grazed in the early spring very lightly (but this is not thought to be good for the hay so is not done now) and they were grazed after the hay cut was taken. Traditionally hay was cut in June/July and the aftermath grazing started in August. Now the animals graze mostly from mid summer to mid September. On the smaller islands sheep grazing is harder to achieve and often there is no hay is cut either.

The grazing animals in wooded meadows were traditionally cows and horses, not sheep or calves. Goats were rare and pigs a few.

In some places pollards and coppice were mixed and this is referred to as a coppice type wooded meadow

There is a ?Finnish Saying:
Animals get fat on elm
Get fed on ash
Survive on alder
Starve on willow
….However, this is really more to do with the quality of land that the trees grow on than the trees themselves. I.e. if you have a farm where you can only grow willow you are in trouble!

Another saying: 'The meadow is the mother of the field'. This means that if you have a good meadow it can support more animals which produce more dung to fertilise the fields.

Historical information on pollarding in the Åland Islands

Pollarding took place from around 1700 to the beginning of the 20th century. It has been estimated that 1.5 to 2 million leaf bundles were harvested from an area of 7 500 hectares (Slotte 1992b). 1000 leaf bundles per hectare were taken every 5th year (Slotte 2001). In the Åland islands pollards were the most commonly used way of getting leaf fodder (i.e. coppicing and felling were not often used).

The leaf harvest had a great impact on the formation of the semi natural grassland in the islands and there has been impoverishment of the field layer since leaf harvesting ceased, 'Probably man and domestic animals kept the old natural plant communities going after extinction of the large herbivores'. The fodder from wooded meadows is estimated to be 1.5 times that of meadows alone (Slotte 1993). The tools used for cutting the trees were narrow billhooks.

In early 20th Century Åland the old agricultural landscape was still predominant with few agricultural machines and horses and oxen being used. The woods were mostly destroyed in the 18th & 19th centuries due to the export of wood to Stockholm. There was a big change in the early 20th century as there was a growth of subsidised cash crop farming and a then a total depopulation. Much of the pasture was lost to woodland and later forestry while the mires were ditched.

Ramsholmen was the first nature reserve created on the islands in 1925; now there are 39 reserves with 1,616ha of land and 8,605ha water protected (but this is still only 1.09% of the total area.

History and development of leaf cutting for fodder
It is believed that the use of leaf fodder husbandry is very early (Troels-Smith 1984). In the earliest forms of agriculture sheep and cattle were kept in pens and fed leaves and twigs from pollards while small plots were cultivated with wheat and barley.

Evidence for this includes a reduction in *Ulmus* pollen (leaf cutting inhibits pollen in *Ulmus* as it will not flower until 7-9 years after pollarding, in contrast *Betula* can flower the following year).

It is believed that Switzerland shows the earliest agriculture of the European mainland 6000 years ago leaf fodder was used for cattle, the leaves were stored in barns and there were heaps of manure. Extensive grazing on common land was a later development and started 3800-3400BC.

Management of wooded meadows (Haeggstrom 1983, 1988, 1992a)
loväng – Swedish word
Lehtoniitty – Finnish
Lesolug - Russian

Wooded meadows are an ancient land management form found in coastal areas of Scandinavia and the mountains of central and southern Europe. They contain small copses or groups of trees (runna) and meadow glades (glänta). Together these form a mosaic with the trees and shrubs providing shade for the sward which is considered beneficial. A typical feature of wooded meadows is the lopped trees. Leaf harvesting may predate hay making historically as trees could be cut with flint tools but grass needs bronze or iron tools to cut. On flat land the pollards tended to be solitary or in small stands. On steep slopes they tended to be along the banks of narrow terraces or as a row delimiting strips of meadows.

Pollarded species included: *Acer platanoides, Alnus glutinosus, Betula pendula, B. pubescens, Carpinus betulus, Fraxinus excelsior, Populus tremula, Quercus robur, Salix alba, Sorbus aucuparia, Tilia cordata, T. platyphyllos* and *Ulmus glabra*.

The tree branches provided a range of wood products from the different species Thick branches were used for firewood and the smaller ones or 'sheep sticks' were used as kindling. Charcoal could be made from species such as *Alnus, Carpinus* and *Betula.* Many trees had edible fruits too.

Most produce from wooded meadows were used locally but some was used more widely e.g. hay might be exported to other villages. Apart from hay and leaves and wood from the trees, other less obvious products included hazel nuts, meat, butter and cheese all of which could be traded.

There are broadly three kinds of wooded meadows, coppiced, pollarded and orchards, however the types are not sharply defined.

Wooded meadows were gradually abandoned and by the beginning of 20th century most disappeared, either becoming cultivated fields, thickets or wood pastures.

The traditional management of wooded meadows is described by Haeggstrom (1983) for Nåtö

There are five phases:
1. Raking to clear the debris that hampers mowing. This also hinders moss growth. Heaps of leaves were left to decay by trees or burnt on mounds of stones

2. Hay making – Hay was raked into broad piles and turned occasionally. In other places it was put on fences or stakes to dry. When dry it was put into sheds. On uninhabited islands the hay was brought to the farms by boat
3. Grazing – often this was twice in the year. Once very light in the spring (not on all sites) and then 2-3 weeks after the hay making until the grass growth stopped in late September early October. Usually only horses and cows grazed the wooded meadow. Calves, steers, heifers, sheep and goats grazed the wood pasture areas. Grazing intensity on the wooded meadows was low, about 1 animal per hectare.
4. Lopping of trees (lövkvistning or hamling). This was done after the hay cut. Lopping was usually performed at new moon. Leaves harvested early were said to be bitter, those frost damaged were of no value.
   Trees were lopped for the first time when the trunks were 12-15 cm thick and were cut 2-3m above ground. Usually a few branches were left on the stump. After 3-5 years the same tree was lopped again.
   Cutting was done from a short ladder and by a saw or axe. Women lopped the leafy twigs from the branches with leaf knives (lövskära) or leaf chisels (lövjärn). The loppings were bound in sheaves and were the main fodder of sheep. Cows were said to yield more milk if fed leaves.
5. Thinning of thickets and removing trees and stumps and tussocks. This was done when needed but not every year. (Added in Hæggström 2003).

Wooded meadows probably stayed in equilibrium for long periods, for perhaps hundreds of years they were used in the same way.

Restoration of wooded meadows

A few of the traditional wooded meadows are left as nature reserves but many pollards have not been cut since about 1930-50. Many meadows are now grazed rather than cut for hay. Modern agricultural systems generally import fodder but the dung is not exported so as a consequence there is now a build up of nitrogen whereas the old systems were more neutral.

In Åland restoration work has taken place since the 1960's but to retain their biodiversity value they need to be both restored and managed. Of those still managed many are now nature reserves, they typically have a mix of woodland and open ground plants. The number of species increases if woodland ecosystems are subject to moderate disturbance and this is the situation in wooded meadows. It should be emphasised that management ought to be carried out every year if wooded meadows are to be maintained properly. Today many of the nature reserves have been described as being 'managed more as outdoor museums than as genuine pollard meadows' (Hæggström 1998).

Recent work on the pollards – age and form of cutting (Slotte 1993)

A study of the tree rings from mostly *Fraxinus* pollards from the islands shows a sudden narrowing of growth rings at 5-10cm diameter, indicating the first pollarding cut, although some started on even thinner trunks. Some trees have very narrow rings for decades (or more than 100 years in some cases) illustrating a continual, very intense harvesting by pollarding with perhaps intervals of just 3-4 years. These pollards have thicker and rougher bark than younger trees although the stem may actually not be very thick. The top of the bole can be 1.1- 1.5 times thicker than the

trunk and the trees often have a wide base. Usually there are no traces of unhealed cut surfaces as the intense and continuous pollarding has very short intervals between cuts. Lapsed pollards, despite earlier cutting of the branches, can be tall and with smooth barked branches that can be 0.7 times the diameter of the bole.

Number of pollards

It is estimated that more than 40 000 pollards remain in Åland today although some are very small in diameter.

General comments on pollarding from Carl-Adam and a practical demonstration of creating a new pollard

Cutting in November is ok but September is too early and Carl-Adam said that it is better to cut in the winter [but traditionally pollarding was done in the summer!]. The tree should be 10-12 cm in diameter, or as thick as an arm, at the first cut. It needs to be strong enough that the cows can't push it over to eat the leaves. Trees can be started at thumb sized but this is not possible with grazing animals present as trees cut too young are browsed. On *Fraxinus* the side branches can be trimmed up when they are 3 years old, this is firm enough for sheep but perhaps not for cattle. The pollarding cut is made just above the year 2 growth. The water shoots should be cut away every year.

In a wooded meadow, the open meadow patches should be at least 2 times the height of the trees (to get enough light). At Espholm the pollards were cut 15-20cm above the buds which Carl-Adam thinks is too high. *Alnus* cannot withstand large branches being removed.

The tools used for pollarding were:

Traditionally:
Leaf fodder hook – straight
Broken scythe blade used to cut the leaves off the main stems to make leaf bundles. (The A type mark was the mark of the farm. Each had their own mark so the tools were recognisable to those that could not read.)

Modern versions:
Norwegian blade = Vb road
Modern bill hook (blue handle)
Fiskars – Foresters 1 handed tool, modern and very good – the hook is used to crush the bark round a stump to kill it and stop it growing again
Fiskars saw is very efficient
Clippers are also useful.

Carl-Adam taking the top off a young *Fraxinus* sucker to create a pollard

The finished pollards

Closer view of the tops of the pollards showing a few sprigs left on

The leaves were fed fresh to some sheep who were very enthusiastic!

The botanist Palmgren tried to encourage traditional management in some areas of the Åland Islands by paying the farmers in barley or butter. In his work he mentions the work of the farmers but gives no details. He did not allow any grazing as he thought cattle grazing created good conditions for spruce regeneration.

On Nåtö (island) cutting of trees around the houses took place more or less continually and old pictures showed the farmers what the landscape used to look like. In the 1960's Carl-Adam looked at the islands and did not find any freshly cut pollards except for those owned by B. Häggbloms (see later). The term Ask gård is used in Swedish, it means an 'Ash farm' and refers to areas where there are dense ash pollards.

Peasants cut in blocks so that the cut trees were not shaded out. Traditionally the leaves etc. would have been raked up in the early spring to tidy up (before the wood anemone flowered). This was the job of the women and children. Wood (bark) shaving was a big industry in Norway but was not recorded in Sweden or Finland.

Carl-Adam asked his 'Grandparents' about pollarding but they said there was 'nothing to tell' it was just ordinary work.

Two *Fraxinus* pollards at the biological station at Nåtö
That on the right was cut in 2003 as a demonstration for a film crew. The leaves are drying on the rack to the right of the tree. It was cut regularly between 1930's and 1970's, then lapsed until 5 years ago. Growth is typically 1m/year

Nature reserves restored under LIFE programmes

Nåtö (Island) – Restored wooded meadow

A nature trail route can be followed using a leaflet available from the biological station, on the north of the island.

The site is a crag with moraine tail and boulders, the bed rock is granite. It is 30ha in size and a Nature reserve.

The area was abandoned as farmland in the 1940's. In 1959 100ha of land and 500ha of water were bought by The 'Landscape agency'. They tried to rent it out to a young farmer to manage but none were interested in farming using traditional methods. The Society Flora Fennica was asked to become involved and they sent some officials to have a look and then agreed to run it jointly with the Åland Landscape Agency. Helsinki University send students to work on the Island but they have no control over the practical management.

In 1964 the spruce trees were felled but the area was unmanaged except for sheep grazing. There was some burning and then it was left. The result was *Betula* and *Salix* regrowth. In 1970's there was uncontrolled clearing of trees and the pollarded trees were last used for fodder, although the last 'proper cut' was in 1943. Traditionally the leaves were used as fodder and the branches for building etc.

All the tree species were pollarded except *Populus tremula* and *Corylus avellana* which was coppiced and the stems used for barrel hoops. Nåtö was reknowned for this. Carl-Adam said 'Animals don't eat hazel (well, perhaps deer and sheep might)' The *Acer* regenerated in the 1970's but were not generally present before this.

The ground flora is a wooded meadow with many notable species. It is managed by a single hay cut each year (with scythes and an Allen scythe) and aftermath grazing by 10-12 animals. This is third year of mowing but for some areas this is the first time it has been cut.

Pollard management

The trees here were regularly cut for fodder although some around the houses may have been cut for aesthetic reasons.

They were last cut for fodder in the 1970s. Restoration of the pollards was carried out under a LIFE project which ran from 1998-2000. All the trees were cut in the same year towards the end of the project. They were cut with chainsaws during the winter, between November and February. However, the restoration work was 'schematical' and was not like the peasants would have done it. No management of the trees has been done since the restoration.

One small area has been left unrestored as a demonstration. It was a wooded meadow in 1905 and then became grown over with spruce. The trees are mostly from about 1900 with the oldest spruce dating from 1870s. The spruce naturally regenerated, were not planted and have now killed the *Betula* pollards in the area.

There are no definite plans to pollard the trees again although the hay cutting and grazing will continue. This is a common problem with LIFE funded projects as they

provide funds for three years but not long term management. The pollards after cutting are putting on good new growth but in some there is considerable dieback where large branches have been cut.

***Betula* pollards round the edges of the fields (above) and a newly created *Betula* pollard of ideal size (right)**

Older *Betula pubescens* pollard, recently cut again (left)

Unrestored *Betula* pollard (right)

High density of small *Fraxinus* pollards (below)

***Alnus* pollards (left)**

Pollards killed by *Picea abies* encroachment and shading (right)

***Fraxinus* with large branches cut. This tree has a younger sucker to the side that has also been cut (below)**

Older *Fraxinus* pollards with long stubs left but not growing well (right)

View of wooded meadow (below)

Jäsö Island

This reserve is a former wooded meadow, now grazed. There is a lake within it and some areas give an impression of what an 'Archipelago wilderness' looks like, here it is grazed but it is very similar to the entirely natural land type. There are large numbers of ticks and a 30% incidence of tick borne encephalitis in this area!

Pollard management

The pollards are largely *Fraxinus*, in the distant past they were cut regularly, but they were all cut 2 years ago during a LIFE project, again they were all cut in the same year. However, the clearance work removed all the small trees, leaving an 'arboretum' of trees that are too big to pollard and the only smaller specimens are the rare species, this has then reduced the opportunities for making pollards from younger trees. The work was contracted out and was probably done by unemployed and/or forest workers from Finland. (There are only 2% unemployed in the Åland Islands but Finland has the second highest rate in the EU.). In the future grazing will continue but it is uncertain if the trees will be managed by pollarding.

***Fraxinus* pollards on Jäsö Island (left). The area is grazed with Finnish Country Sheep which all came running when they heard a branch being snapped off a *Fraxinus* (above)**

Young *Betula* pollards cut without retaining any branches (below)

The trees are growing on very poor soils typical of the archipelago (above)

When the hay has been cut everyone celebrates with a party held on this large open area (right)

Espholm

Espholm has been a nature reserve since 1940's. It is now grazed with 3-4 cows (and would benefit from more grazing animals).

Pollard management
Espholm had not been managed since 1930's so the lapse on the pollarded *Fraxinus excelsior* and *Ulnus glabra* was about 70 years. Many of the trees have a wide 'kink' at pollard level – were they perhaps only cut once? It was part of a LIFE project between 1998-2000 and the trees were probably cut in 2000. Restoration work was done in the winter and all the trees have responded well. The work however is rather stereotype, *Fraxinus* is pollarded, the other species of the trees are not.
There are probably about 200 cut pollards and some new ones have been started on larger trees, perhaps 70 years old.

Again the future of tree cutting on this site is uncertain.

Views of the site showing young *Fraxinus* pollards (left) and pollards of various ages (right)

Old *Betula* pollard recently cut and not growing well (left) the *Corylus avellana* bush next to it is probably casting too much shade

Lapsed pollarded and shredded *Fraxinus* (right)

***Fraxinus* pollard cut low in the past, recently cut higher up with big cuts (left)**

***Taxus baccata* protected from grazing and with new pollards nearby (right)**

Ramsholmen

Ramsholmen (the name comes from Ransomes) is north of the capital Mariehamn, on the flight path for the airport. It was the first nature reserve in Åland and is situated on a Drumlin ridge

Hay is cut and cattle grazed on part of the area, it is wood pasture with no hay cut on the other part. The hay is stacked and the stacks are burnt in winter as there is no use for it. The grazing season is from the end of April to the end of October

Pollard management
In the past the trees were pollarded regularly. Some *Fraxinus* were cut high, perhaps to keep them above the *Corylus* found in amongst them. Some trees are described by Hæggström (1992a) to have a combination of pollarding and shredding – the trunks were cut at about 6-10m and the lateral branches cut near trunk too.

The trees were cut in 2001 for the first time since the war. The very high cut *Fraxinus* pollards were restored with a high lift platform during the LIFE project. The dead trunk was felled as 'not so good looking'. The *Quercus* were planted in 1930's as an arboretum and then thinned

General views of the *Fraxinus* pollards

***Fraxinus* pollard with a trunk cavity (left)**

Large stump of a *Fraxinus* near to the pollards. This tree was only about 140 years old when it was felled (right)

High cut *Fraxinus* pollards showing recent restoration work (left) and unrestored above *Corylus avellana* bushes (right)

Brännbolstad

Brännbolstad is near Sund on the south side of road. It is not a nature reserve and has no protection. The name Brännbolstad means a burnt living place. There were pollards here in the 1960's. Today there were *Ulmus* pollards along the base of the rock face and some *Alnus* coppice and 'coppards' along the river. There was also one very old, large *Fraxinus* pollard. Most of the *Ulmus* looked like 'traditional' style pollards but one was cut at several different points progressively higher up the tree. *Ulmus* is protected by law in the Åland Islands as it is rare. The land around the pollards was pasture, grazed by cattle. *One lmus* had fallen a few years ago. The branches were about 60yrs old indicating that this was probably when it was last pollarded.

Very large *Fraxinus* pollard with a girth of 4.7m standing apart from the *Ulmus*. There was a sucker up one side and the tree is showing very strong growth.

General view of the *Ulmus* pollards at the base of the rock face

Views of *Ulmus* pollards showing their position under the rock face

Gottby/Brändö Junction

An area of birch pollards & juniper bushes, a private area and not nature reserve

Lapsed *Betula* pollards (below)

Ekerö

Near Öra/Skag in the northern part of Ekerö there were several areas with pollards all belonging to various members of the Häggblom family:

Marja Häggblom's sheep pasture

This area with ash pollards was cut very recently (2002-03). Marja had been on a course that Carl-Adam ran about old landscapes which included wooded meadows. She is Swedish but married to a local man so she has been able to learn the practical side from him and his family.

Very recently cut Fraxinus pollard

B. Häggblom's land

The trees here were last cut in 1969/70 (see picture in Carl-Adam's thesis) and the area was very similar to Kruksholt in Sweden, a mix of cereal fields and wooded meadows. However, the *Fraxinus* pollards have not been managed recently

Old *Fraxinus* pollard showing recent stress cracks (left)
***Fraxinus* pollards (right)**

There as also an area of new pollards, recently created from young trees. Some clearance work had taken place here to restore the meadow/pasture.

***Betula* and *Alnus* pollards (above left)**
***Betula* pollard growing well (above right)**

***Alnus* pollards (left) in the centre of which a large *Picea abies* tree had been removed.**

Skarpnåtö – The northernmost part of Hammarland

And conversation with Mr Häggblom (owner/manager of above site)

The pollards here were cut regularly in the past but then lapsed for several decades. They were cut again starting about 7 years ago (all at the same time) and most have been cut at least twice since. Now they are all cut at different times. Most of the trees are *Fraxinus*, there are a few *Betula*. The area is sheep grazed now and no hay is cut.

The trees are cut now in September/October when the leaves have fallen. The farmer does not use the leaves but does use the branches as chips. He aims to cut each tree every 3rd year and uses a chain saw to do the work. Traditionally they might have been left for longer, 3-5 years, between cutting. The rules laid down by the Government (Landsyrelsen) are followed so that he gets the grant for doing the work.

General views showing sheep (left) and *Fraxinus* pollards cut in various different years (right). In the initial years after cutting they have dark green leaves, from about 4 years on they go paler.

The farmer has Åland sheep and gets EU money for them as well (until recently they were not recognised as a breed in their own right by the EU). He also has some Texel and some Finnish Country sheep too. Åland sheep are small and variable in colour.

Leaf sheaves are counted by the 20 and every 20 is one rating. 100-120 ratings are obtained from the trees. If 20 sheep are overwintered (about average for Nåtö) and 1 bunch is fed per sheep for 100 days (they are also fed hay) this requires 2000 sheaves or 100 ratings.

Before joining the EU it was possible to get grants of 35-85% for fencing and clearing. The *Betula* were more difficult to cut; a *Betula* that had every branch removed had died so now they are cut more cautiously.

Old *Betula* pollard showing a good example of restoration cutting.

***Betula* 'pollarded' to fit around telegraph wires.**

Strömma – Hammarlan

The *Fraxinus* trees here were last cut about 10 years ago after a long lapse since the 1940's or 1950's or earlier.

***Fraxinus* pollards last cut 10 years ago (above)**
***Sorbus intermedia* pollard (right)**

Selskar Island – An example of a wooded meadow on a small island

Selskar Island, north west of Nåtö is a small island 3ha in size half of which is meadow. The island has a moist side and a dry side and is a popular picnic spot for people from Mariehamn as it is one of the few that is not privately owned.

Historically at least part of the island was wooded meadow with pollarded trees. When the island it was included in the nature reserve it was cleared (in 1962/63) and then nothing was done so it became very dense with tree cover. On the south side there was a lot of *Primula veris* which was lost at this time. In the 1990's everything was started again, the meadow was cleared and mown and pollards created and

restored. The wooded meadow area is now mown every year and then grazed with a small number (6) of sheep carried to the island by boat.

Pollard management

Fraxinus excelsior, Ulnus glabra were reguarly pollarded in the past. About 290 of the trees show traces of leaf cutting. During the restoration process all the trees were cut in the same year, the work was very prescriptive but some pollards have been created in subsequent years. The *Alnus* trees were cut too hard. The work is done each year by unemployed people and it seems that, at the moment, the work will continue into the future.

Tomas who is now in charge of the station did the work for his thesis on the island in 1999 but it is not yet written up. Perhaps it is too quick to say if this work is successful or not. Almost all the dead wood is cleared up and none is left standing.

View of the island showing the pollards (left). Sheep graze after the hay is cut, a young pollard is in the foreground (right)

Lapsed *Fraxinus* pollard showing what the old trees were like before restoration (left)

View showing pollards of different ages, some created last year (right)

Old *Betula* pollard showing careful restoration pollarding (right)

Summary of pollarding in the Åland Islands

Pollarding was widespead in the past and a very important part of the economy in the Åland Islands. The trees were pollarded in the summer for the leaves and the land underneath was wooded-meadow, it was hay cut and then grazed. Almost every tree species found on the islands was pollarded! Some like *Betula* were not easy but were still cut. The pollards are still fairly widespread but the act of pollarding is not. A very small number of farmers are still cutting the trees but some only because they are subsidised to do so and they do not use the leaves. A few farms/houses have a few pollards in their 'gardens' as they look in keeping with the landscape but pollarding is now more widespread in nature reserves. Many sites with pollards are protected within nature reserves but some, notably the area with large numbers of birch pollards is not and would benefit from being.

The sites are not generally under threat however the long term management of many of the pollards is not necessarily secure. Many of the trees have been cut recently under LIFE programmes and, while the management of the ground flora seems to be under control this is not necessarily true of the trees. It is not clear if the trees will be pollarded again, and when.

It is not ideal to cut all the trees at one site at the same time, and this is what all the sites with large numbers of trees have been subjected to as part of the restoration work. It would be far better to cut some trees each year. In some places the pollards have been cut, after a lapse, quite high up and it is also not clear what the future of these trees will be because it will be less easy to cut them in subsequent years. Another problem with cutting all the trees in the same year is that the management is presumed to be successful. In fact the long term viability of some of the trees may not be as good as anticipated, especially for those for which there has been a long lapse since regular cutting. This is particularly true for difficult species such as *Betula* where learning from previous restoration work may have enabled subsequent work to be more successful. Continued cutting is also going to be needed otherwise the branches will become heavy and, after the lapse the anchor points will be more vulnerable.

There seems to be a general problem that the work has been carried out by people without the supervision of those who understand the work that needs to be done. This

has led to a very prescriptive approach that has not taken into account opportunities and problems on each particular site.

The site with the old *Ulnus* pollards under the cliff would benefit from some sensitive management, clearing round the old trees a little, creating new pollards and ensuring there is no damage to the trees from the grazing cattle.

The sites would all benefit from more dead wood both laying and standing being left. Much of the hay is not used but stacked and burnt.

Take home messages from the Åland islands

The Åland Islands have an incredible resource of pollards and wooded meadows, some of which continue to be managed despite physically difficult situations such as hay cutting and grazing on small uninhabited island. Much of the restoration work has been possible due to EU LIFE funding which has been very valuable in enabling practical work to be carried out. However no trials on the success of restoration work were done as it was considered that pollarding was known to work and that meadow restoration was practiced elsewhere. Perhaps however trials and information exchange would have been beneficial, talking to other people about success/failure of different aspects, particularly related to the trees, may have enabled the work to be even better. The next challenge will be to keep the pollards managed regularly in the future.

Norwegian orses standing under a *Tilia* pollard in a field

Romania

Beech pollards were reported in Romania by Håkan Slotte from Sweden. We first visited the area where he had seen them and then spent some time in other suitable places including the Carpathian mountains. Unfortunately we were not able to meet people who could both speak English and also knew about the pollards. Pollards in Romania are largely in wood pastures (not wooded meadows) although at least some of the tree cutting seems to be carried out for the leaves as fodder, not just for the wood.

Maramureş area

Botiza

Botiza village is not far from the town of Sigetu Marmarţiei at an altitude of 4-600m. At the southern end of the village after the road becomes unmetalled was a (probably common) pasture area although there were not any animals evident while we where there. At the top end of the pasture was *Fagus* dominated dense woodland consisting of young trees, presumably managed for their firewood value.

Botiza village from pasture area with *Fagus* pollards (left)

The road running along the bottom of the pasture area. (below)

The junction between the woodland and pasture looked in most places to be a hedge but on closer inspection this was a grazed 'wall' of *Fagus* trees that had become hedge-like and was impenetrable in places. The whole area was east sloping. There was no sign that hay had been cut from any part of this area. Just below this 'hedge' were pollards that extended down towards the track at the bottom of the slope in clusters, mainly on the edges of gullies. It was not very clear how far the area with the pollards extended. We saw probably 20-30 pollards but there may have been more on the other side of the valley/road.

***Fagus* 'hedge' between the pasture and woodland. (left)**

The ground flora was grazed but it was not obvious what with, when or how. Perhaps by flocks of sheep and herds of cattle guided by a herdsman? It was not fenced apart from the *Fagus* 'hedge', which was not completely animal proof.

Pollard management

The pollards were mostly *Fagus sylvatica*, with some *Carpinus betulus* and looked like they had been cut at different times with branches cut in an *ad hoc* way. There seemed to be very little system to the cutting and the branches that had been removed were of varying sizes. Some trees had become substantially higher than the original bolling and some had been cut initially at quite a low height. It was also evident that more branches had been removed recently from the parts of the tree easiest to reach, i.e. the uphill side.

Several of the trees had been cut relatively recently. Cutting seemed to have been done partly with a machete type tool and partly with a saw – the small boys we met there agreed a 'motor' saw was used. One tree showed more recent type cuts on one side while the other side had been left. It seemed to be growing well. (Note that this is contrary to what might be expected following the Swedish experience of suckers – if one is cut and the other not that which is cut tends to die. Also the Hungarian experience that *Populus alba* does not pollard well as it produces too many suckers instead).

The *Carpinus betulus* pollard was cut with a machete type tool and not a saw. It had been cut more on the upper side than the lower side (presumably as it was easier to reach that side). The resulting arisings were of varying ages, for example one was 7 years growth and one 2 years growth. There were the remains of cut branches on the ground around the trees so it is not clear why they were cut.

***Carpinus* pollard (left)**

7 year old branch (above right) and two year old branch (below right)

Unfortunately we had to shorten our visit here as we were joined by several small boys who amused us with their antics but we became worried by their safety!

It is not known how frequently the trees were pollarded or cut in the past but it seems likely that they are cut less often now than they were. It is also likely that with the increase of urbanisation and tourism the trees will be cut less frequently in the future.

***Fagus sylvatica* pollards (and children!)**

Pollard that has been cut recently (left) and close up (right)

Comments from Slotte 2002

Botiza was studied in more detail by Håkan Slotte during his visit in 2000. He describes the *Fagus* pollards as being found on fenced common land close to the village. We believe that the trees we found were the same as those he saw. In 2000 the trees looked as if they might still be actively pollarded and they were said to be cut every 10-12 years. The trees were said to look old but probably to be about 100 years of age. Photographs show the cutting to be fairly rough and a range of branches were retained. The *Fagus* was said to be cut for firewood and the other trees for fodder. Leaves from all trees were cut in the summer for stabled animals. Håkan also reported that fires were sometimes lit in the *Fagus* pollards as it was thought that this would help get rid of fungi and insects and stop the rotting process.

Valley beyond Poienile Izei
On the south side of the village of Poienile Izei, south east of Sigetu Marmației and at an altitude of 4-500m various types of tree management were seen on both sides of the valley, but no pollards.

Fagus coppice – An area of *Fagus* woodland superficially resembling other woodland was seen but the trees had clearly been felled and left to regrow. It seemed that the small brash had been piled over the stumps

Fagus, *Fraxinus*, *Alnus* (probably *incana*) and *Populus* shreds – These trees had clearly been cut with an axe or other cutting tool. No leaves were seen here drying. There was also a high *Fraxinus* pollard. The shredded trees were in groups. The shredding did not appear to be for letting light to the ground flora as the area was not obviously grazed or hay cut and was very scrubby underneath with blackthorn bushes etc.

Other farming methods seen here included stooks of oat sheaves, a narrow strip of lucerne or some equivalent clover type plant. Hay stacks here clearly consisted of 3-4 poles formed into a pyramid shape.

Shredded *Fagus* trees (left) with close up of cut (right)

Coppiced *Fagus* (below)

Along the road side between Ruscova and Repedea on a south or southeast facing steep slope were some pollards on a very steep sloping meadow going from the roadside (almost at river level) to the top of the hill. These trees were growing in hay meadows (cut probably twice per year) but the grassland was interspersed with patches of woodland. Within the woodland were also pollards, implying that at some stage the trees had stood in more open conditions.

Tree species pollarded were *Fagus*, *Acer campestre*, *Carpinus betulus*, *Quercus* sp. And there were also *Malus domestica* trees.

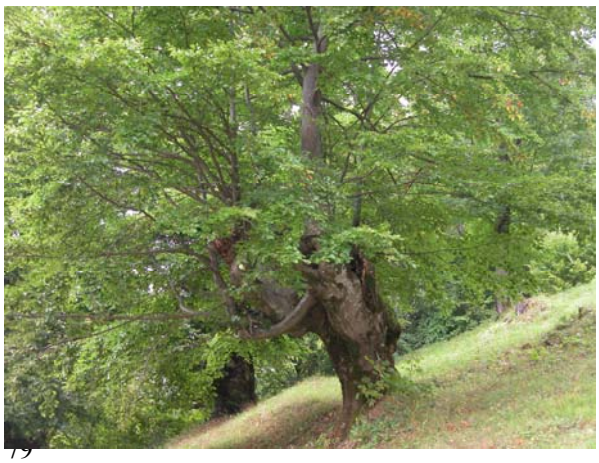
A view down from the meadow with pollards, illustrating the steepness of the slope. Note the shredded trees on the hillside behind

Pollard management

The trees were of varying shape and in a range of situations. Several looked as if they had branches cut in the last few years, others (mostly in the woodland) looked to have lapsed, with branches perhaps 100 years old. The branches cut ranged from quite small to over 30cm in diameter and some were cut well above the previous cut height. Cutting seems to have been done by both an edged tool and a saw. Some of the younger *Fagus* trees in the woodland looked to have been coppiced.

Judging from the lack of management of pollards well into the woodland it seems likely that occasional branches might still be taken off the more accessible trees but the long term future in terms of regular management is probably not good, especially for those on very steep slopes.

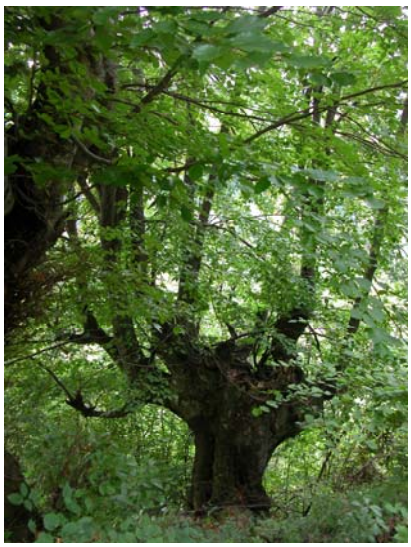
***Acer campestre* pollard showing branches removed with saw**



***Fagus* pollard. This tree looks to have lapsed and was last cut over 30 years ago. There is much die back and the tree looks very vulnerable, it also has wood ants in it**

***Fagus* pollard with 2 big (30cm+) branches removed in last 2 years. 2 more removed about 10 years ago. Other branches look to have been removed over the years, some smaller. Several have been cut higher than the previous cuts by up to 50cm. Because of the *ad hoc* method of cutting it is difficult to see what has grown afterwards. Some new growth seems to be close to, but below, the cuts. On one side of the tree several small branches 10-20cm in diameter have been cut with regrowth from below cuts. Growth is approximately 30cm last year and 0.75cm this year. The saw cuts are raggedy. The tree is completely hollow.**

***Fagus* pollard (Uppermost of pair) had had perhaps three branches cut away, 1 of which was forked. The cut branches were 10-20cm in diameter. There were arisings from below and at the cut. 1 older branch has been cut and has decayed (or perhaps it was cut at same time and did not grow). The stubs left were 0.5-1.m (that of 1m has a branch left on). The bolling height is about 2m. There are large amounts of fungal decay on the uphill side. There is adventitious growth on the downhill side and a low spur.**



***Fagus* pollard. This tree was on the edge of a very steep slope with all its weight going down the hill. All the branches were round the edge of the bolling with none in the middle. The tree was probably last cut about 30 years ago and some of the largest branches are perhaps 100 years old. It may not have been cut as recently as the previous trees as it was on the edge of the meadow and on a very steep slope.**

***Fagus* pollard not growing well. Some branches have been cut from it recently, probably all except two younger ones. It looks to have grown a little and then died back. There was better growth on the uphill side but even this is sparse at the top and yellowing.**

***Carpinus* pollard in dense woodland (right)**

***Fagus* pollard/coppice. (below left) One big branch has been cut from this tree recently.**
There is no new grown from near the cuts but the retained branches lower down are growing well. 2+ smaller branches have also been cut and there was regrowth from just below or well below these stubs. Overall the tree has been cut at various different levels. There is a *Corylus avellana* bush mixed in with the tree on the downhill side

Fagus pollard in dense woodland (right) with no signs of recent cutting

In the Viseu river valley

Shredded *Alnus* were seen and also *Salix* pollards. Two lines of older *Salix* looked as one branch had been left on each.

A line of *Salix* pollards here were being cut by a man. We stopped to watch but he spoke no French and soon got shy and stopped. He was cutting the trees with an axe. The work did not look very careful and he was just cutting where he could and not worrying if it took several cuts to remove a branch. He was standing in the trees, which were quite low pollards, and was cutting the whole line on the same day.

Salix pollards cut while we watched

Prahova County, Wallachia (north of Bucharești)

Brebu (on the maps as Brebu Mânăstirei)

Conversation with Adrian Ungureanu from Agrotour (and local forester) about pollarding in Romania.

He told us that there is no special name for a pollard in Romanian. Trees cut along the streets and *Salix* pollards would be termed fasonare. Branches from the *Salix* pollards could be used to make baskets and the trees cut repeatedly. The leaves might be given to animals especially goats.

Adrian denied that pollards were cut from other trees than *Salix* and trees along the streets. He told us that *Fagus* wood was generally used as firewood. We asked about shreds and he said that trees were only cut as shreds to remove the lower dead branches or to let light in.

Despite this conversation we clearly did see pollards and shredded trees that were cut for wood and leaf products.

Prahova County, Road to Talea

The village of Talea on the road to Breaza runs at an altitude of about 700m from east to west so slopes are north and south facing. There were *Fagus* pollards on the south facing slope. The land is probably communal village land.

Fagus and *Salix* were both pollarded and there was also *Corylus avellana*. The trees were growing in a mosaic of pasture with hay cut from small areas in between the pasture. The hay cut areas were species rich with yellow rattle (*Rhinanthus minor*), betony (*Stachys officinalis*), *Arnica* etc. There was also Chicory along roadsides (*Cichorium intybus*). The houses had their own small fenced gardens where vegetables were grown and also fruit trees. Some gardens had pollarded trees in, especially round the edges.

General views of the Talea valley (left) Sheep flock grazing (right)

Description of tree pollard management

***Salix* pollards**

There were three different species of *Salix* seen as pollards. One pollarded tree was within the pasture, the others round the edges. The *Salix* looked as if they had had all their branches removed 2 or 3 times. The larger branches had been removed with a saw, the smaller with axe/billhook.

***Salix* pollards on the edge of the pasture**

***Fagus* pollards**

In one small area a few *Fagus* 'pollards' stood amongst pasture. Some looked as if they had had branches cut from them recently. The cuts were not very tidy, some seemed cut with a saw and some with an axe or similar. One of the trees seemed to have had branches removed from higher up in the crown.

The trees stood in pasture grazed by cattle watched over by a cow herd. He spoke some French so we established that the *Fagus* was cut for fuel (and conifers for

construction). I tried to ask when the *Fagus* pollards were cut i.e. winter or summer and he implied that they could be cut all year round, or any time.

Left: *Fagus* that was probably pollarded once and has then grown out, then two big branches had been removed about 20 years ago, one calloused over and the other did not. Four or more smaller branches were also cut. The cuts were made with a chainsaw. Regrowth had only occurred from two of the smaller cuts.

Right: *Fagus* similar to the above but with no signs of recent cutting.

***Fagus* with 3 branches cut this year, 2 sawn and one hacked. Whole tree (far left) and close up of cuts.**

Some similar cutting had taken place previously and there was some regrowth from round the cuts.

In this area we could also see beech shreds but they were difficult to see as they were in the back gardens of houses! Closer to Talea village there were also many shredded *Fraxinus* trees, presumably for the leaves. There were lots of trees in the landscape, all with clear browse lines, many looked from a distance like pollards, but were not.

Shredded *Carpinus* tree (left) and *Fraxinus* (above & right) nearer to Talea village

Description of the pasture/hay meadows

The pastures contained a few bushes and trees including hazel. It looked as if there were a few permanent fences, including some corals for the animals at night. The animals could wander across the whole area but the herdsman presumably kept them from grazing the hay crops.

The haystacks were mostly still in place, a couple had been removed (some stacks are left out through the winter). Hazel leaves were placed in a layer under the haystacks and a few branches put on top. The haystacks here were a single pole (probably with cross pieces) made of beech. There were chips of wood from shaping the beech pole or other poles just left on the ground. Odd branches of hazel were also just left on the ground.

Hay making (left)
A hay stack (below left)
***Corylus* leaves placed under a hay stack that has since been removed (below right)**

The land is all used but not as intensively as in the Mediterranean area and does not look as overgrazed. There were some prickly plants such as *Eryngium* and *Carlina* and some distasteful like *Euphorbia* but they were not an overwhelming part of the population. Does hay cutting stop the dominance of such plants? Do the places where the hay is cut vary from year to year of stay the same?

Typical ground flora in the pasture areas (left)

The varied working landscape with large areas of pasture was very diverse in structure and contained occasional trees and groups of trees, worked for their products.

Transylvania – Working trees in the landscape

Road from Alba Iulia to Albac via Abrud - Metes
Some recently (summer 2003) cut *Fraxinus* shreds were seen. Long stubs of some lower branches had been left on the previous time of cutting and these were left on again this time. The trees were cut with an axe or other edged tool.

Freshly cut *Fraxinus* shreds (left) and close up (right)

Another group of shredded *Fraxinus* (left) and close up (right)

A group of *Salix* had just been cut (with an axe) and the branches were propped up to dry. There were several different sizes of branches stacked in different heaps. Even small twiggy bits were stashed in the top of a cut pollard.

Freshly cut *Salix* pollards (above left)
***Salix* pollard with small twigs on the bolling to dry (above right)**

The leaves were left on the branches and stacked to dry leaning against some of the trees (below left)
A close up showing the pole laid between the trees and used to lean the branches on (below right)

Izoru Ampoiului

There was a group of *Quercus* shreds including some that had just been cut, other trees cut last year and some the year before (How many years between cut?). The leaves had been clearly stacked and protected from grazing.

Shredded *Quercus* trees showing different ages of cutting (left)

The leaves piled up and fenced (below)

More shredded *Quercus* trees (below)

Towards the top of Izoru Ampoiului were some *Fagus* pollards. The trees looked similar to other *Fagus* pollards in Romania, i.e. they had been cut by removing different sized branches at different time. Most of the trees did not look very healthy. The last tree (further along road) looked as if it had slipped into the river but was still growing.

View of the area from the slope with the *Fagus* pollards (left)

***Fagus* pollard in woodland (left)**

Dead *Fagus* pollard (right)

***Fagus* that had slipped into the river (below)**

Fagus pollard in more open grazed area (right)

Summary and additional comments

Pollarding clearly was part of Romanian land management although denied by some of the people we met. Pollarded trees were regularly seen in gardens and towns as well as in wood-pasture/wooded meadows. Szabó (2001) mentions the presence of pollards in parts of Romania that were formerly Hungarian. For example he mentions Seclar, an area of Transylvania near Farkaslaka (Lupeni) as having wood pasture with dozens of ancient beech. He also mentions that there are hundreds of place names across the Carpathian basin that preserve the memory of pollards (of course there may not be pollards there today). Based on living trees, pollarding in the Carpathian basin can be traced back to the Middle ages and pollards were clearly part of the medieval and post medieval landscape.

Pollarding seems to have been a widespread management technique for *Salix* trees along water courses and in wetter areas, in *Fraxinus* in gardens and in *Fagus* in wood-pastures in the higher areas at the edges of the villages. *Fagus* pollards were probably widespread, perhaps small numbers found in many different places. However, many trees with a pollard-lie appearance from a distance were not on closer look, so it is very difficult to know total numbers.

Pollarding is still widespread but is much more obvious in *Salix* and street trees than in the wood-pasture situations. It seems likely that many of the wood-pasture pollards have lapsed or are almost lapsed.

Salix were still pollarded regularly. Some clumps of *Salix* appeared to be coppiced but many trees showed a browse line and/or tightly packed leaves on the lower stems and branches. Perhaps animals are tethered there overnight?

Pollarding has been adapted in Romania as a street tree management form. In towns and more urban areas pollarded *Tilia* and *Ulmus*, as well as other trees, were seen, seemingly regularly cut but probably not mainly for the products of cutting. In the Prahova valley there were large numbers of street pollards. Many were *Aesculus hippocastunum*, *Tilia*, *Populus* and *Fraxinus*. Some of the trees looked reasonably well maintained, others look hacked! Some had been cut unevenly so that they avoided power lines or similar obstacles. Being cut on one side is clearly a common feature of Romanian trees! While most were clearly mainly cut to keep the trees short or to prevent excessive shade along the edge of gardens, it is possible that the leaves of some of those cut in gardens were used along with the hay although no drying leaves were seen except for those from the shredded trees.

Pollarded *Aesculus hippocastunum* in Campina

Probably none of the wood-pasture, wooded meadows with pollards are protected but consideration should be given to doing so when Romania joins the EU. Probably none of the sites are directly under threat and there may be many of them so the loss of a few

many not be a problem. However, Romania must be one of the few places in Europe where shredding is still commonly carried out and it would be a shame to loose the knowledge of how this is done. The protection and value of cultural landscapes is likely to be overlooks and it is likely that many of the areas where there are old trees as a result of pollarding, especially the *Fagus* trees, may go into decline due to lack of tree cutting. In these places there is likely to be a loss of continuity of old trees.

Comments from other people about Romanian pollarding

Dénes Dobrosi (Hungary – Kiskunság National Park)
The *Fagus* pollards usually occur about 1-2km from the villages on land belonging to the villages and they are cut for firewood. They tend to occur in the poorer areas. Dénes also thought that shredding would probably be done for fire wood and could not think why the leaves would be kept. The bigger forests are state owned whereas the smaller ones belong to the villages. The King forest, west of Cluj and north of the Albac road is a good area.

Péter Szabó (Hungary)
Péter took one look at the front of the Burnham Beeches guide book and said that there were lots of trees like that in Romania. He had seen plenty in Transylvania but had not been to Maramureş himself. He said that shredding is clearly done for leaf fodder, although he had no suggestions for why oak might have been shredded (he, and Håkan Slotte were the only people I spoke to who were in no doubt that shredding is done in Romania for fodder! – see also below).

In Transylvania he had seen charcoal makers working in a plateau woodland where there were *Fagus* trees but there was no evidence of the trees being cut as pollards for charcoal. Some of the charcoal makers have come to Hungary in recent years as they can get a better living making it for barbecues.

Why shred trees

Despite most people we asked denying that shredding was done for the fodder this clearly must be the reason. Shredding is not an easy task so there must be a good reason to do it. We were told that shredding was done to let light to the ground but the result in the long term for most species seems to be more shading as *Fraxinus*, *Alnus* and *Populus* all to produce profuse leaf growth. In Spain I was told that shredding is preferred to pollarding when cutting the trees for fodder as more leaves are produced. This is probably the reason for this type of cutting in Romania too. I was also told that *Quercus* leaves are suitable for fodder if mixed with other tree leaves so this explains the shredded *Quercus* seen. The method of stacking cut leaves in the trees to dry while keeping them out of reach of the grazing animals (as seen in the *Salix* in Romania) was also spoken of in Spain.

We were repeatedly told that *Fagus* is only cut for firewood. However several shredded trees were seen in different places; shredding would not produce good firewood. In Scandinavia I was told that *Fagus* twigs are good early spring fodder, as they are coming into leaf and before the grass is growing, which may be an explanation for shredded trees in Romania. None were seen with abundant leaves on the stems like other shreds but this may just be because all those we saw had been

quite freshly cut. *Picea abies* was also seen shredded, probably for the timber but it is possible the branches were used for animal bedding as in Austria?

Shredded *Picea abies*

It was noticeable that all the shredding looked relatively neatly done, in contrast to the *Fagus* pollards that looked generally 'hacked'. Although on close inspection the one group of *Fagus* shreds we could get to were not so neat so perhaps it was just that we couldn't get so close to most shreds!

There were plenty of examples of trees shredded this year or last year, however, no pollards looked this recent except *Salix* and some street trees.

Shredded *Alnus* in the Viseu valley (right)

Romanian words

Fag	Beech
Salcie	Willow
Otava	Second hay cut
Fasonare	Trees cut for 'fashion!'
Nuc	Walnut

Frunzo Capacului – Small boy's writing of name of tree

Take home messages from Romania

Romanian pollarding of *Fagus* seems to be more about taking odd branches when needed than any more systematic pollarding, although in the past this might have been different. The trees seem able to cope with this (though they are not always especially beautiful). Presumably it was discovered that removing all the branches kills the trees so this is the Romanian compromise.

Regrowth following pollarding does seem to take place when single branches are removed, contrary to what might be expected in light of experiences on other trees elsewhere. Regrowth following pollarding did, in several cases, look rather different to the Burnham Beeches situation where little or no growth occurs close to the cut. Is this because the trees are genetically different, climatic factors or something else? Some trees did look more 'hairy' with adventitious growth.

We would have struggled to find the *Fagus* pollards if it was not for Håkan's maps. Clearly *Fagus* pollards are well known to interested people (Håkan, Péter etc.) Both Håkan and Péter implied that they were much more abundant than we found them to be. Was this because we could not easily spot them as the leaves were on the trees? We tried in several places using binoculars to try and spot them and rarely succeeded. Our impression was that they were not common in the areas currently open but were largely subsumed within the woodland that is often at the edges of the villages, higher up on the slopes. If this is so then very few of the trees are likely to be under any active management. We certainly did not see large numbers of trees that had been pollarded in the generally accepted sense, in recent years. Our feeling then is that pollarding of *Fagus* might have been a widespread activity at some point in the past as trees showing signs of pollarding were found in Transylvania, Maramureș and Prahova county. However, despite the persistence of a largely rural life style, and the importance of the land for the people, for some reason these trees are no longer needed to provide the resources that they once did. If this is true the future for the old *Fagus* trees in Romania is not ensured.

Questions we couldn't answer!

Has the pollarding 'changed' with the advent of the chain saw? I.e. are larger branches removed now than in the past?
Various people told us that *Fagus* was cut for firewood and not for fodder. We were also told it was not used for building. If this is the case then why cut the pollards at all when there appears to be plenty of beech woodland. Why not just fell the trees?
Why were the branches left on the ground near to the trees? (Additional summer feed as seen in Picos de Europa?)
Was *Fagus* cut for fodder in years of need? - Although no one has hinted at this at all.
Håkan said that the trees were cut in winter but is this actually the situation? – All other trees we saw cut were being done in the early autumn.
When do you leave the top branches on a shred and when remove them?
What is the real Romanian name for a pollard! (and a shred)

***Fagus* pollard at Botiza**

General comments on the agricultural system

In all areas we visited a varying proportion of the transportation was by animals. Carts were pulled by (in order of most common) horses, oxen, buffalo and donkeys. Probably the highest proportion of animal transportation was in Maramureş where perhaps 1/8 to ¼ was not motor powered.

Ox cart in Maramureş

Horses and cart

The horses

Horse colours were many and varied but it was noticeable that there were lots of roans and also fleabitten greys, two colours not particularly common in Britain currently. There were few (if any) coloured horses. Most of the animals were light in stature with only a few heavier ones in the more hilly parts of Maramureş. In Maramureş many of the horses had very simple harnesses consisting of a cloth breast

collar and a strap across the withers, which were jointly attached to the traces. In more hilly areas and closer to the bigger towns the harnesses were fuller and had breeching. Some carts had breaks, usually a break on each wheel but many clearly did not. We saw two heavily laden carts going down a long hill dragging tyres full of stones behind them presumably to act as breaks.

Most carts in the Maramureş had a central pole and were pulled by two horses. If there was only one horse then one side was used. Close to Bucharest we saw more carts with two shafts and one horse. Foals and young horses were tied to the back of the cart (sometimes as many as 4!). Sometimes they were left free to follow on. If a pole shaft was being used with only one horse the foal was often tied into the position of the second horse but only by its head collar so it was not pulling.

Horses following a cart

Work in the fields

The main work while we were travelling in Romania was hay cutting, potato picking and firewood collection. Both young and old, male and female people were seen working in the fields.

Hay was cut almost invariably with a scythe and these were seen carried around by various people over their shoulders. The hay when cut and dried was stacked and then some stacks were brought to the houses and stacked up outside or stored inside in barns. Other stacks clearly stay outside in the fields during the winter until they are needed. Most stacks had a few leaves on top but most did not appear to have any form of water proofing. A few had small sheets of polythene but mostly these looked quite ineffectual. Two cuts of hay are taken from each hay meadow so there is no aftermath grazing.

Hay making

Firewood is obviously important to see people through the winter. Many carts full of wood were seen travelling about. Most of the wood was fairly small in diameter and people were visibly chopping up wood and stacking it. Some people had clearly bought loads of off cuts from the sawmills to cut up and use as firewood with the result that great heaps were seen

outside some gateways! The wood is clearly also used for building work, fencing and peasticks amongst other things!

Towards the end of the time we were there people were out collecting the pumpkins (apparently for animals feed not human consumption) and also cutting maize cutting and stacking the stems to dry.

The animals are herded in communal herds, with a shepherd or cattleherd looking after animals owned by many different people. The cattle come back to their own homes each night. We met a farmer in Brebu who was probably quite typical. He has 1 cow and 6 sheep and cuts 2 tons of hay per year (1ha cut twice). Horses and cattle were regularly seen tethered.

Herds of sheep, goats and cattle

Pigs were seen but many probably live in sheds most of the time and are not so visible. A variety of shapes and colours were seen. Some white, some saddlebacked colours and some clearly imported commercial type breeds.

Saddleback type pig in orchard

The chickens were also variable with some marran looking types seeming popular. The farmer we met had a German breed with marran colouring and feathered topknots.

Mostly the villages were fairly discrete and consisted of small fenced gardens or orchards associated with the houses. The grass under the fruit trees was usually cut or grazed. Outside the villages were extensive areas of hay meadow, pasture, fruit trees, small fields and woodland all closely intertwined and with few if any fences. Along the road from Rasnov heading north west the land was rather flatter and the cultivated areas were cleared fenced from the surrounding meadow/pasture and the animals were grazing in between the fenced areas.

Cultivated land fenced from the pasture north of Rasnov

General views of the Maramures area – carrying hay making tools (right) and stacks of maize (below)

Hungary

Kiskunság National Park – with Dénes Dobrosi – Head of Forestry Division and Land agency for the National Park

General information about Kiskunság National Park

Kiskunság is situated between the two major Hungarian rivers, the Tisza and the Danube and is fragmented into various different sections. The landscape is very varied and ranges between wet forest and moving sand dunes, including oxbow lakes and open plains. It was the second National Park established in Hungary and consists of 48,198 hectares in nine separate units. A further 28,402 hectares are associated with the park and are protected landscape areas and nature conservation areas. Two thirds of the National Park is a biosphere reserve and two areas are RAMSAR sites.

Woodland and Forestry in the National Park

The natural woodland for this area should be *Q. robur*, *Populus alba* and *P. nigra* with *Alnus* in the wet areas. There are two different sub species of *P. nigra* occurring in the park, one found in the wet areas and the other on dry sandy soils.

Commercial forestry is carried out in the National Park where approximately 50% of the forestry consists of introduced species, largely pine and *Robinia*. The current aim is to return to native species where possible.

Grazing

The National Park graze areas with Hungarian Grey cattle, buffalo and sheep, some of which are the steppe breed, Racka, with spiral horns. Forest law in Hungary forbids the grazing of forests and the cutting of leaves for grazing animals. There are a few special 'plantations' for grazing and a few pastures where scattered trees provide shade but this is supposed to be all. However, wood-pasture areas clearly do exist and WWF Hungary has produced a list in an internal report.

Salix and *Populus* pollards along the River Tisza

Near to the village of Nagykörű in Szolnok there are pollards along the east bank of the River Tisza. The soils are rich alluvial inundation forest and it is within the Kiskunság National Park.

History of the site and pollarding

The river Tizsa was regulated 150 years ago which involved building high banks on either side as flood protection. The forest alongside the river was all cleared at that time, however it was soon discovered that there was high flooding and lots of erosion, thus trees were planted to stop the erosion. The species planted were *Populus alba*, *P. nigra*, *Salix alba* and *S. fragilis*. The original aim was to pollard all the trees to keep them below the level of the banks and to use the branches on the banks to trap silt. However, many *Populus* died as they could not withstand their trunks being flooded, while the *Salix* survived.

After initial regular cutting every 2-3 years, the pollarding ceased about 25 years ago. There was a lack of man-power to do it and it was discovered that it was cheaper to use plastic to trap the silt. This was not so good for the *Salix* however as they started

to fall apart. About 10 years ago Dénes arrived in the park and he became concerned about the *Salix* and started the pollarding again.

The Tisza runs the whole length of Hungary (500km) and on both sides there is a corridor of old *Salix* trees, which is perhaps 3-6 trees wide.

The flood protection bank and the pollarded *Salix* trees(left)

Old *Populus* trees (below)

Salix alba and *Salix fragilis* are now pollarded but not the *Populus alba* and *Populus nigra*. There is inundation woodland on one side of the pollards and wet grassland on a flood defence bank on the other. The ground vegetation is not currently managed.

Several bird species like the structure of low trees adjacent to the taller trees and in spring and early summer when the forest is inundated they fly over the pollards to roost in the trees behind. Black storks nest in the area and also fish eagles. The tree holes are good for otters when the forest is inundated and the normal otter holes at ground level are flooded.

Current pollarding regime

The *Salix* are cut about every 5 years in the winter by local people who use the wood for firewood. They are cut in a 'mosaic' with 100m strips cut here and there so that a whole stretch is not cut in one go. The area we visited was cut 5 years ago.
The pollards are mostly cut with chainsaws but in some areas the gypsies have been persuaded to cut the trees using axes. It is considered that there is better regrowth if they are cut with an axe. The villagers have to apply to Dénes to do the pollarding and he tells them which areas are to be cut in a particular year. Usually about 20 people cut each section. The other foresters said that no one would be interested in doing the work but as they get any wood they cut for free in fact there is competition for it! As the work is done in the winter there are no leaves and any small branches have to be removed, not left on site, so they are usually burned.

The *Populus* trees are not cut any more as the trees grew too big. Pollarding the *Populus* was less successful as the trees do not like the canopy or the cut surfaces

getting wet. In contrast, *Salix* can withstand being completely underwater (branches and trunk) for one month without harm.

(Salix are also cut for basket making but these are generally coppiced. Unfortunately we were unable to see an example as it was too muddy to reach the area!)

Pollarded *Salix* (left)

Dead pollard (below)

Problems
The main hindrance to the pollards growing is being overgrown by surrounding trees. The problem species are *Fraxinus pensylvannicus* an introduced ash from USA (control measures are planned) and the various creepers which shade out the trunks and stop new shoots.

Variation in response between species and individual trees
P. nigra is easier to pollard than *P. alba*. *P. alba* produces a lot of suckers when it is cut and all the energy goes into the suckers. *P. nigra* does not produce the suckers so it puts more energy into pollard growth. Cutting off all the branches is usually successful with *P. nigra*.

Ice plates (floating pieces of ice) that occur in the spring cause damage to the trees, those that respond to this damage by producing small shoots tend to be those that pollard better (ice pollards!). If you cut above these shoots caused by the ice plates you can pollard the tree successfully.

Take home messages
Despite not being either a wood pasture or wooded meadow this corridor of old pollarded *Salix* trees proved interesting. It demonstrated the impact that just one person can have in getting active management carried out and his observations provided interesting information about tree responses. Ice pollards and different

responses of *Populus* species are interesting observations that can be transferred to other situations.

Ópusztazser – mulberry pollards

Hódmezővásárhely, near Ópusztazser and at an altitude of about 79m is a flat grazed area within the National Park but managed by a local farmer who describes the area as a 'Royal' donkey, mule and Tarpan farm!

The pollards were *Morus alba* (White mulberry) within pasture lacking any shrubs and grazed by equines and sheep. It is a good area for tree hole nesting birds such as Hoopoe and also bats.

Mulberries were originally planted for silk worms, probably after the Second War but possibly as early as 1930's, and there were several places in Hungary where silk was produced. However, a North American moth was introduced (Gypsy moth??) which was spreading to the fruit trees so almost all the trees were cut down. Mulberry pollards remain in just two places, possibly more.

From talking to older people in the village it has been established that the trees were cut every two years and throughout the growing season (to provide continuous leaves). Lots of trees were needed to sustain the silk worms through the whole season.

The trees look as though the cutting lapsed for some years but then some larger branches have been cut recently approx. 10cm in diameter. The trees look to have then been left again. Growth was, in most cases, good following cutting after the lapse and some cuts have started callousing over but the weight of the branches is pulling the trees apart.

Morus pollard falling apart (above)

Close up of the top of a pollard bolling (right)

***Morus* pollards with my guides Zoltán Korsós (left) and Dénes Dobrosi (right)**

Racksa sheep (below)

View of the pollards (below)

Currently there is no management, except that a few stems may be cut by the farmer to try to keep the trees alive. There was evidence of caterpillar damage when we were there which may not help the general health of the trees. The grazing animals do not appear to have touched the bark of the trees. Dénes thought it might be bitter and unpalatable.

Brief notes on trees seen in the grounds of castles in Fejer County

Iszkaszentgyorgy

The large castle in this village originally had extensive grounds that are said to have been laid out in the early 20th century in the style of an English Garden. The land was terraced. Running parallel to one side of the house was a line of ash (*Fraxinus excelsior*) trees that have been pollarded. They have been cut in the candelabra style with repeated cuttings higher up the tree and a very open structure from the bolling. In shape they strongly resemble some Spanish oaks and the Nordic *Betula* pollards. The trees look to have been cut relatively recently, following the same pattern of cutting. The shape of the trees and the terracing makes me wonder if the garden style was Mediterranean not English!

***Fraxinus* pollards at Iszkaszentgyorgy (above) and close up (below left)**

Plane avenue at Alcsutdoboz

Alcsutdoboz

The main castle here now only exists as a façade but the cattle shed is still intact and was clearly very grand as it is now a hotel! Leading up to it is a long avenue, incorporating a bend, of large plane trees. Although not pollarded some were very large in size. Clearly new young trees were being planted to replace old ones that were being lost.

The Balcony mountains – *Fagus* pollards in wood pasture (with Péter Szabó)

This part of Hungary (the range of hills to the north of Lake Balaton) was probably inhabited from the 13th century, but by 1600 all the villages were deserted as a consequence of the repeated attacks by the Ottoman Turks. The villages were resettled in the 19th century, however the people resettling did not necessarily have any links with those that had lived in the area previously and did not necessarily use the same farming techniques as those that had lived there prior to the Turkish invasions.

The Balcony mountains run approximately north-east to south-west and are divided into two parts with a shallow valley between them (which contains the road running from Veszprém to Körmend). Péter had noted that the north eastern part of the hills is/was wood-pasture with *Fagus* pollards. The southern western part is characterised by wood-pasture with open grown *Quercus*.

Olazsfalu, north side of village
On the north side of Olazsfalu village south of Zirc and north of Veszprém at an altitude of 400m is a south facing rocky slope with pollards. Until recently it was a military area that was fenced off and probably had limited access. Prior to this it must have been wood-pasture as there is a large neglected water trough in the middle of the site.

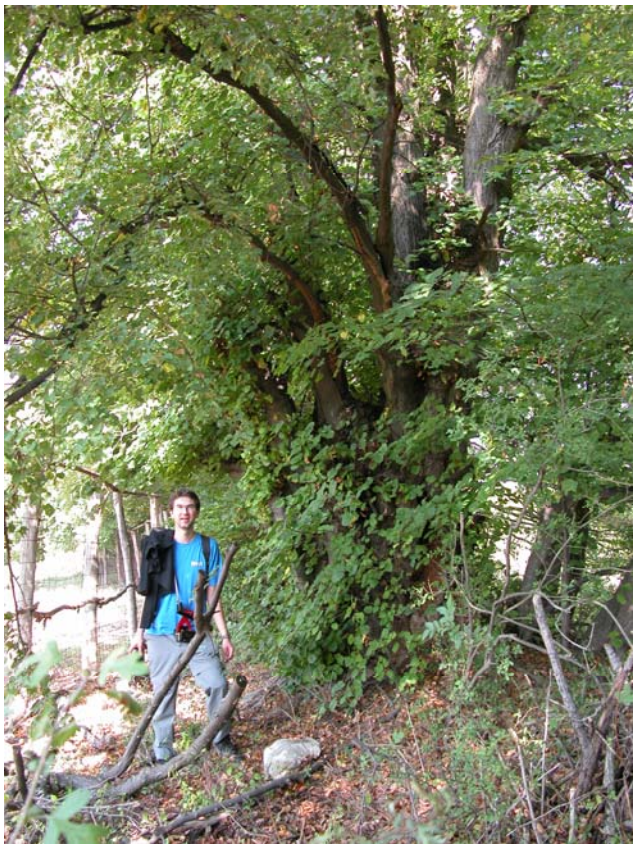
Pollards were of *Tilia platyphyllos* and apparently *Fagus* in places but although we found some large *Fagus* they were not obviously pollarded. There was also *Pyrus* (a species commonly associated with wood-pasture in Hungary), *Acer campestre*, *Fraxinus* sp., *Rosa* sp., *Prunus spinosus*, and *Quercus* sp. in a good range of size classes, most were in fairly dense growth but some were in sheltered open areas.

General view of site, the red leaved trees are *Pyrus*

The land around the trees is rough pasture clearly grazed by deer, wild boar and probably some cattle

On the lower edge of the area was a very large boundary bank (the largest Péter has seen in Hungary) with a huge *Tilia cordata* growing on it (girth of 5.7m) and some stems close by of *Acer campestre* that look like *Tilia* suckers! Also a large *Carpinus* coppice stool.

The future management of this area is unknown.



Old *Tilia platyphyllos* pollard (above)

Large *Tilia cordata* tree on the boundary bank and Peter (right)

Olazsfalu S. side of village

On the south side of Olaszfalu is the north facing slope which is a Landscape Protection Area 2002 with pollarded *Fagus sylvatica*, *Tilia platyphyllos* and possibly also *Quercus*. There are also large *Pyrus* (one with a girth of 2m and a possible pollard?). The trees are in recently cleared and now grazed pasture (probably just with one year of grazing). There was a new looking coral for animals (cattle) though none were present during our visit. The lower branches of the *Fagus* trees showed signs of new recent browsing. The clearance of the scrub has also included removal of all young trees too! The old *Fagus* trees are now in open conditions.

Some of the trees looked in good condition, others had lost most of their leaves although the shape of the twigs looked good and most did not show the claw shaped indicator of stress. Presumably the leaf loss was a response to the dry weather this summer perhaps exacerbated by the recent clearance of surrounding scrub. One or two trees had large dead branches and one had a large bracket fungus (*Ganoderma ?resinaceum*).

The trees showed evidence of pollarding similar in style to that seen in Romania. The branch removal looked to have been *ad hoc* and the trees were varied in shape and form. Some had been cut at higher levels on subsequent cuts, some showed branches removed from higher in the canopy. A few trees showed signs of having branches removed very recently. This recent cutting had been carried out with a saw and mostly was not tidy cutting. The branches removed from one tree were quite big (e.g.

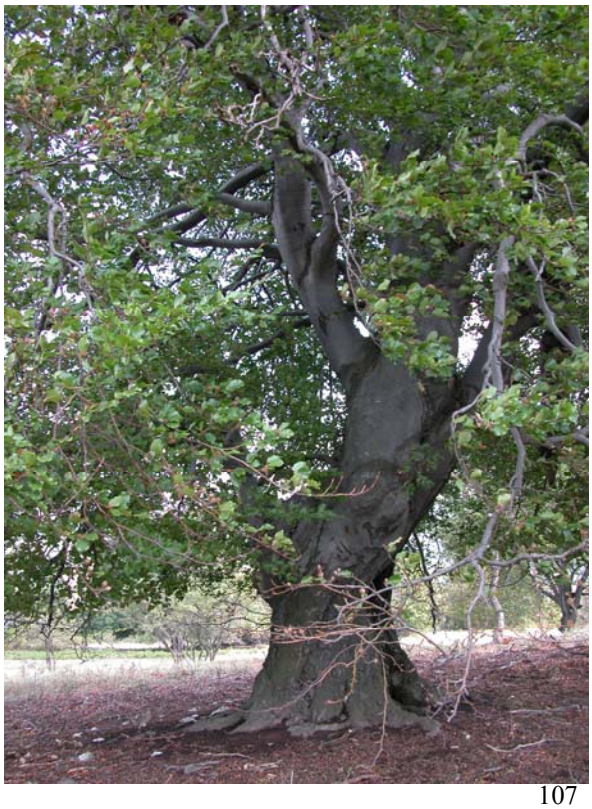
about 40 years old) and were cut about 5 years ago. This tree did have twigs showing signs of stress. Others had smaller branches cut recently. One smaller/younger tree seemed to have been cut in a similar way to the older ones. One *Quercus* did not look like a classic pollard but seemed to have had some branches removed from bolling height and also from higher in the crown.

If removing a couple of branches from a tree can be considered as a method of pollarding here then these trees are as good recent pollards as those in Romania.

Current plans for the management of this area are unknown but there is concern over the implementation of the grazing, the lack of a new generation of trees, and the health of the trees.

View of the area from the other side of the valley, the pollards are on the hillside in the distance

***Fagus* pollard (below)**



***Fagus* pollard with shape due to uneven cutting (left)**

Close up of old wounds from branch cutting (right)

***Fagus* pollard with Peter for scale, more of a classic pollard shape with heavy branches, cut higher up in recent years and with a thinning crown (perhaps drought induced) 4.8m girth**

Close up of recent cuts on the above tree (below)

***Quercus* that looks like it was cut in the same way as the *Fagus* trees, i.e. a couple of branches lopped off (left)**

Brief notes from trees on the road from Zirc to Penzesgyőr

A group of lime trees were seen close to road in an area of disturbed and probably seasonally wet ground with lots of *Urtica*. They were possible pollards with the biggest we saw having a 4.5m girth. Most of the trees had lots of mistletoe in the crown.

***Tilia* pollard (above)**

Pénzesgyőr
Pénzesgyőr near to Veszprém has a track running south from the village towards Hárskút. Pollards were seen on all sides of the ridge at an altitude of about 400m. This extensive area is owned by over 200 people and it has no protection or designation. A local NGO based in the village started numbering the old beech trees and recording some aspects of them. At least 250 trees on one side of the hill over about 3.5m girth were recorded by summer 2002.

The area is scrubbed up wood pasture with pollarded *Fagus.* There appears to be very little management of the ground flora, perhaps light grazing in places. There has been some disturbance due to motorbikes and 4wd vehicles close to the tracks.

In 1082 the area was described as being a monastery with a surrounding belt of woodland and then the villages outside the woodland. From the 13th Century onwards forest guards kept ordinary people out of the forest. The wooded belt was settled in only in the 19th Century so the current villages in the area date from this period and are very recent. Thus the trees predate the villages.

Pollard management
Trees were variable in shape and showed indications of being cut in the *ad hoc* way with occasional branches removed. All showed evidence of cutting but few/none were classic pollard shaped with a clear bolling. The trees here did not appear to have had any branches removed recently. In the short distance we walked into the site two trees were seen that had been felled. One during this (2003) summer, presumably because it was leaning over a track (which did not look heavily used). Another tree had been felled a few years ago. One standing dead tree had many lower branches removed but it was not clear if these were cut before of after it had died.

Many of the trees are now hidden in the undergrowth. There is lots of new growth to provide a new generation of pollards but few apparent 'middle aged' *Fagus*. The older trees mostly do not seem to be suffering too much from lack of light from encroaching trees but it may not be long before they are. A consequence of the dense undergrowth is that it will draw the trees up into shapes that are then difficult to restore.

This extensive area is in need of protection and some sympathetic work to rescue the trees. It has the potential to be very important biologically.

***Fagus* pollard recently felled. The recent rings on main stem were wide, each of 0.5-1cm but it was decayed on one side. The main stem was cut quite high up and is actually 2 stems fused together. The largest branch was 70 years old. The tree was felled recently as the branches stacked nearby had dried leaves on. Presumably the tree was overhanging the track (which was not the main track and probably carried little traffic)**

***Fagus* pollard with recently cut branches (left)**

Close up of the cuts on the above tree (below)

***Fagus* pollard with bracket fungus and path waymark (below left). Standing dead *Fagus* pollard. This tree has had some large branches cut but it is not clear if this was after it died or just before (below right)**

Dead *Fagus* pollard cut some years ago and all the wood removed

An example of a typical *Fagus* pollard. All the trees were in dense undergrowth so it was difficult to photograph them (left)

View of the landscape. The pollards photographed are in the foreground. They probably stretch all the way to the top of the hill and perhaps over the other side too (below)

Hárskút

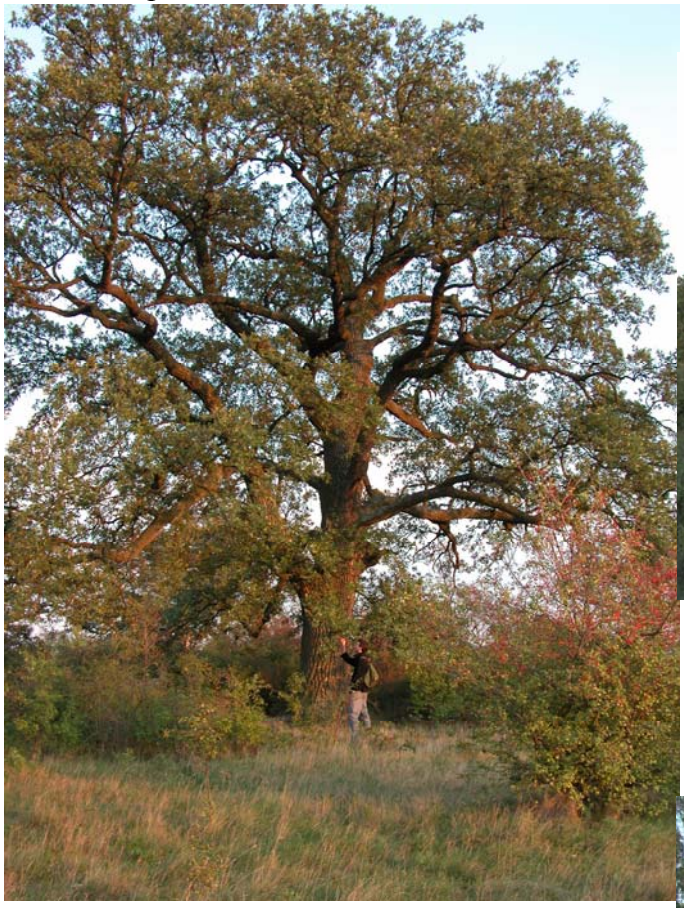
This village is the southern end of the site described above. We walked across a field from the bus stop/parking area to reach it. In denser woodland were some *Carpinus betula* pollards. There were also *Fagus* trees looking in similar conditions to those described above. There was one exceptionally large tree (4m girth) which was a *Carpinus betula* pollard. This tree had one stem of *Acer campestre* growing in amongst it that looked like part of the pollard.

Large *Carpinus* pollard (on left) with a large *Acer campestre* tree growing out on the right

Nyirád

To the east of the road between Pusztamiske and Nyirád, south of Devecser is a flat area of wood pasture. Despite lacking any pollards it has large open grown oaks of *Quercus cerris* and *Q. robur*. Other tree and scrub species present included *Betula pendula*, *Rosa sp., Juniperus communis*, *Crategus sp.,* and *Prunus spinosus*. There was also lots of mistletoe.

Most trees looked relatively healthy. There was some die back but it was not clear if this is natural or not. There was a reasonable mix of age classes but perhaps a need for more younger trees. This area was visited as a demonstration of the wood pasture without pollards found on the south west side of the Balcony mountains.



Large *Quercus cerris* with 4m girth left)
***Quercus robur* dying back. The picture also shows the structure of the area with scrub and open areas (above)**

Large *Betula* standard (above)

Standing dead tree. The branches on this tree seem to have fallen naturally rather than been cut (above)

The Balcony area seems to have been almost unknown as an area of wood pasture and pollards. The extensive stretch of land between Pénzesgyőr and Hárskút is exceptional and should be protected, the pollards are suffering from very similar problems to those in Britain such as over shading, drought, overheavy branches, lack of an intermediate generation etc..

Pollarding of *Fagus* in Hungary, like Romania, was probably not a 'tidy' well regulated affair. However it still resulted in trees with abundant niches and decay pockets that are valuable for wildlife.

***Quercus* dying back from the main stem**

Summary

In the recent past, pollarding of trees in wood-pastures was probably not particularly widespread in Hungary (in terms of the current boundaries of the country). However pollarding of *Salix* was probably more abundant. Wood pasture of a more traditional form clearly did exist in Hungary and a recent list of wood-pasture sites in Hungary (WWF 1997) lists 171 although only 2 of those visited during my brief travels are listed. The majority of those listed are in counties Somogny and Danube/Drava and they range in size from 3ha to 391. Of course wood-pasture does not necessarily imply that pollards are present but Péter has seen at least some of these sites and reports that there are pollards in other places than the Balcony Mountains. Since some of the sites are small even if pollards are present there may not be very many.

Pollarding certainly was practiced in Hungary in the past. Pollarding of *Fagus* trees appears not to have been particularly systematic so that branches were removed as and when they were needed rather than being a regular cycle but that is surmising from observations of the trees now and might not be indicative of pollarding in the past. It seems that there are few written records to help in the interpretation of pollarding (see Szabo 2001, 2003).

Aside from *Salix* pollards, pollarding seems to be associated with wood pastures rather than wooded meadows. However, in the past the situation may have been more similar to present day Romania and thus the distinction between wooded meadows and wood pasture may have been blurred.

Species seen pollarded were *Fagus sylvatica*, *Tilia* spp. and *Carpinus betulus*. Also *Salix* spp. and *Morus alba* for silk worm farms. Amenity pollarding included *Fraxinus excelsior* and other street trees were regularly pollarded, in particular *Sophora japonica.* Many of these had clear swellings at the top of the bolling showing they had been cut many times. Note that *Aesculus hippocastanum* were used

extensively as street trees in Hungary but many are suffering from a disease that limits their life expectancy.

Pollarding now does not seem to be widespread and is almost unknown except for *Salix spp*.. It is only carried out on a very small scale for occasional branches or for nature conservation/amenity reasons. However it has been adapted for nature conservation reasons (for example the *Salix* pollards along the Tisza river) and for street trees.

Pollarded and recently cut *Sophora japonica* in Budapest. There were many complaints about the recent cutting of these trees.

Some sites with pollards protected but not many. Of the 171 listed in the WWF (1997) list 25 have National Protection and 13 local protection. Pénzesgyőr, the site with 250 known old *Fagus* pollards and probably many more, is not mentioned. Only two sites I visited were believed to have any type of designation. One had a sign saying 'landscape protection area' but this is not in the published list of sites protected for that particular county so it is not clear what this means. WWF started listing the sites because they are considered good for birds. The list is by no means complete but is at least a starting point. WWF might be worth contacting to see if they propose to do more with their list.

Judging from the work done recently on the area with the 'landscape protection area' sign there may not be enough thought given to long term continuity of the trees even when some form of designation has be established.

Hungary is now in the EU and all prospective Natura 2000 sites currently have some degree of protection in current Hungarian law. It is however unlikely that many/any more wood-pasture sites will be included. There is of course no category for wood-pasture.

The pollards in the wood pasture areas are under threat from neglect. Without work soon the trees will start losing limbs and there is also the problem of the lack of next generation. The trees are also under threat from felling, either for the wood or for other reasons because their value is not recognised.

General comments about pollards in Hungary

As Hungary once included much of Romania it is not surprising if some aspects of farming are similar (i.e. *Fagus* pollarding). Within the current day boundary of Hungary is not clear is why pollarding seems so restricted in distribution, or alternatively why it was done at all. Perhaps pollards were more widespread but they have been lost in most places due to the intensification of the land use.

Péter considered that perhaps the settlers had plenty of land so they could afford to have some rough pasture areas but this does not then explain why they would bother to pollard at all. Péter thought that the concept of the tree belonging to one owner and the branches being used by another was probably too sophisticated and unlikely in Hungary/Romania.

Farming generally
While undoubtedly the farming methods are becoming more and more mechanised and this is particularly easy on the large flat areas it is still possible to see more traditional farming methods. These included cattle and sheep flocks being shepherded, horses and carts used for transporting goods and some hay being made by hand. In general there seemed less hay being cut here than Romania. The last true peasants in Hungary 'died out' about 50 years ago. It seems that it was not communism that caused the decline but it happened about the same time as communism took hold.

Awareness of pollards
Most ecologists are not aware of the presence of old pollards in their country. An email request was sent round the ecologists discussion group to ask if anyone knew of interesting places to see pollards and there were no responses. It was a medieval historian who knew of them and was able to guide me to see them.

Hungarian words for pollards
The currently used word for a pollard in Hungarian is botolás from bot meaning a stick (referring to the arisings). However, botolás is a recent word and only dates from the last 200 years. Another word sometimes used is fejesfa (fej meaning head and fa meaning tree).

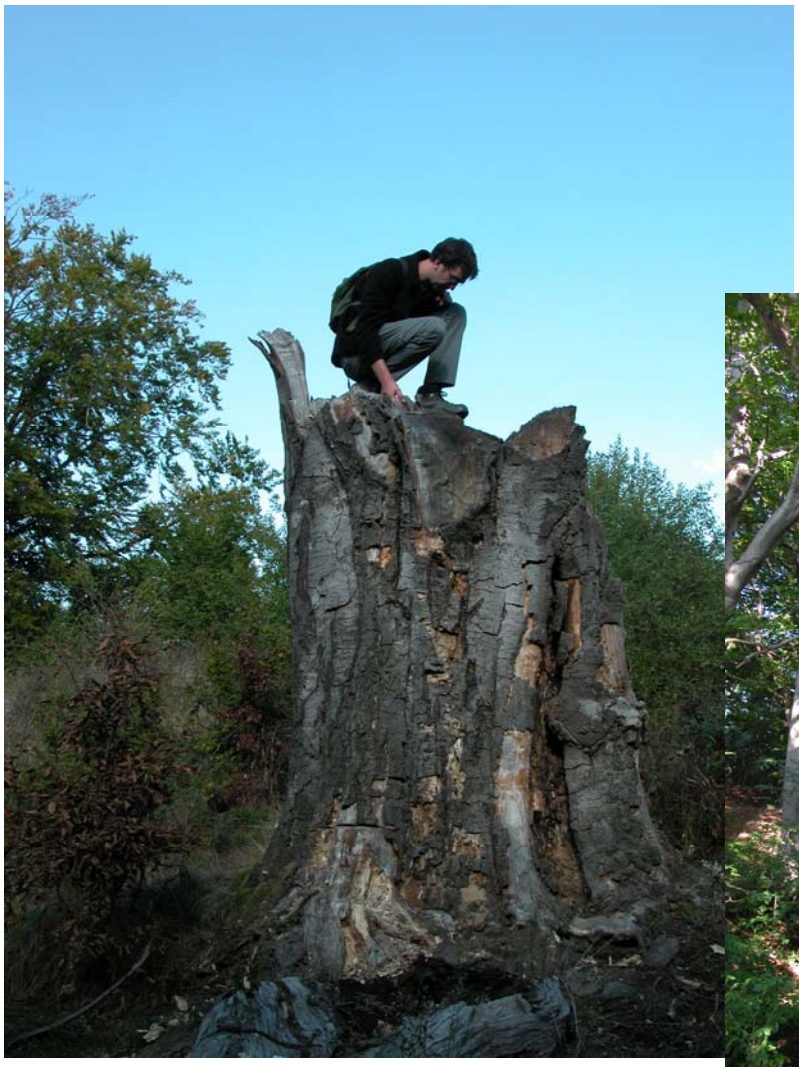
Csonkolas (pro. Tchonkolas) is the old Hungarian word for pollarding and is found in medieval writings etc. a 'csonkolt fa' is a pollarded tree. However the word csonkolas has rather negative connotations nowadays as it also means to amputate and is used to refer to the country of Hungary now (having been 'truncated' by loosing territory to surrounding countries).

In medieval perambulations of Hungarian villages (written in Latin) the word Csonkafa is thought to refer to a pollard with csonkás the adjective. Troncus is also used and this is probably also a pollarded tree although 14th century dictionaries translate this as tőke or törzsök. Törzsök is not used in modern Hungarian but means a nobleman from an ancient family. Tőke has 3 meanings

- Vine stock
- Capital (in a monetary sense)
- Remains of a tree above ground when cut and when taken out for firewood.

A 1533 dictionary also gives the meaning as the length/trunk of a tree from the roots to the branches. It seems likely that in the charters a Tőke was a standing tree consisting of a big trunk and small branches. Csonkafa then refers to the management form while Tőke is the plant itself, or the bolling.

The word Csonka is the modern Hungarian ‘correct’ word for a pollard. The term also appears in the form Csonkafa meaning Csonka + type of tree.



***Fagus* pollards at Pénzesgyőr**

Austria

Zillertal Valley

Dieter Stöhr, Otto Mayr & Gudrun Wallentin

Two parishes were visited in the Zillertal Valley near Zell am Ziller, Finkensberg and Brandberg. The geology of the area is a mixture of siliceous and calcareous rocks, these are very crumbly and unstable.

View of the Zillertal valley

Finkensberg – an example of *Picea abies* shredding

Shredding in Austria was done on coniferous trees, in order to provide bedding for winter housed animals. It appears to have been quite widespread in the mountain areas.

We visited an area that was farmland with houses until the 1950's. Now the houses are gone but the area is still managed. The land is owned communally. Probably 50-100ha of the forest was shredded in this village in the past and 5,000–10,000 hectares in total in the Zillertal valley. The branches were cut from the trees using a tool with a hook on the end and the trees were climbed using climbing spikes strapped to the climber's feet.

Climbing spikes for climbing *Picea abies* trees

The men climbed the trees and then moved from one to another without coming back to the ground (by swinging the trees and catching hold of the next one!) A maximum of 1/3 of the crown of the spruce was left at the top of the tree (if too much was removed they died). The branches were cut

into short pieces, originally by hand but in later years using a shredding machine. The pieces were heaped together in the forest and covered with bark to protect them from rain. In this way they decomposed/composted during the summer months. In the winter they were taken to the houses on sledges and used for bedding for the cattle. When soiled, the resulting manure was spread on the fields.

The manure was spread on the fields in the Zillertal in the autumn but where Otto comes from in the eastern Alps it was spread in the spring. He said that spreading in the autumn was 'as useless as burying a dead man' as the snow melt removed much of the nutrients. The muck spreading was done by hand and was very heavy work. The technique of spreading the muck is still carried out in some places (and involves swinging your head between your legs!). The muck had to be broken into small pieces otherwise it would roll off down the hills!

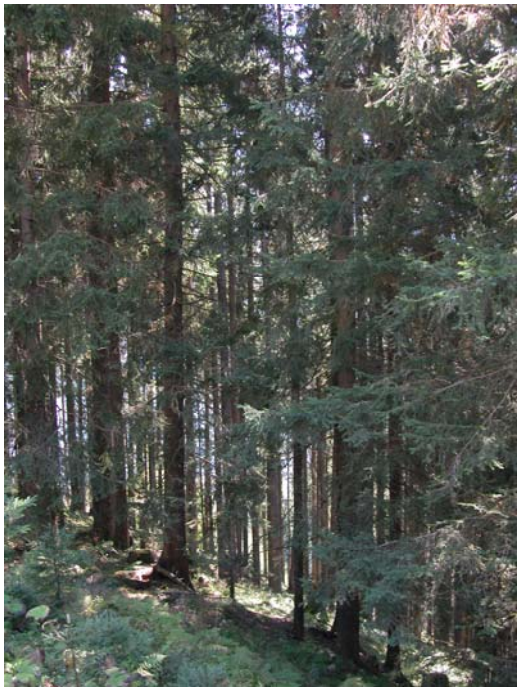
Generally the cattle were more important than the people; the cow shed was built before the house!

The meadows in these areas are called 'asten' meadows. They were not close to the houses or close to the tops of the mountains but somewhere in between. The hay was hay cut from them in August and then the cattle were brought down from the high pastures to graze them. They were kept at this level, and fed on hay when the weather turned until about the end of December or beginning of January and the farmers would go up twice per day from their farms in the valleys to feed the cattle. There was a series of cattle sheds with hay barns above them and the cows would slowly move down the hillside from one shed to the next as the winter progressed. When all the hay was used up the cattle were moved the final stretch down to the farms, often in lots of snow. The reason for this was that the hay was heavy to carry down the hills and the manure even heavier to carry up so it was easier to move the cows.

As well as shredding the trees the area under them was grazed by the cattle, and the ground vegetation, mostly *Vaccinium mytilis*, was cut using a scythe with a short strong handle and then raked which removed the cut *Vaccinuim* and leaves that had fallen to the ground.

Area of *Picea abies* that has been shredded and the leaves raked in the past

The timber quality of the *Picea abies* was reduced by the action of shredding and they also often became infected by a fungus that stained the wood brown. Thus the community had a small area of spruce forest that was not shredded and from where occasional trees were removed when needed for timber. The trees today here were much larger even though every aspect of the woodland was the same except for the historical management.



Area of *Picea abies* kept by the village unshredded for timber

In this way it is estimated that 20-30kg of nitrogen per year per hectare was transferred from the forest to the fields.

The area of *Picea abies* we saw had been shredded probably since the 12th century. The ground flora consisted of acid loving plants and the trees were small and low despite being 200-250 years old. Tree regeneration in these areas is very poor.

Picea abies shredding was probably widespread in Austria and occurred in some parts of Italy, perhaps in Switzerland. It might have been essentially an Austrian speciality!

Because of the long term shredding and removal of leaf litter the soils in general are very impoverished which is not good for present day timber quality. In order to rectify this areas to be replanted are deep ploughed to bring nutrients deep down in the soil to the surface. This is done with a machine with 2 wheels and two arms which 'walks' across the steep slopes. Shredding has also now been discouraged for this reason. The growth of trees now planted in these areas is quite good and much better than adjacent spruce on the unploughed soils.

Recent forestry work has included the planting of mixed broadleaves to help stabilise the slopes above the village. A mixture of coniferous and broadleaved trees are thought to be better for stability.

Aerial deposition of nitrogen has also increased recently by 10-15kg per ha per year (rather less than Germany of about 20+) but still significant in terms of its effect on the trees.

Native species to the area

Picea abies, Alnus incana, Acer pseudoplatanus, Fraxinus excelsior, Sorbus aucuparia, Fagus sylvaticus and *Tilia* are all native here but some are only found on the warmer south facing slopes. Beech reaches much greater heights in the Zillertal valley than is normal in this region because the valley gets more rain swept up it because of its north facing entrance and north south orientation. *Alnus glutinosus* is only found in the valley bottoms and *Alnus viridis* is found on plateau areas.

Corylus avellana grows well in the Zillertal as there are lots of avalanches and rock and snow damage creating open areas, which it likes. The wood is used for barrel hoops and it is also useful to hang on to when walking in the forests!
Spruce produce seed only every 10 years or so like beech – this year is one.

Pollards and pollarding in Austria

Information from Otto Mayr about the East Alp region (he was brought up W. of Lienz) and Hermann Thanner for Zillertal.

Fraxinus excelsior was the main (only) species pollarded in Austria. The trees were cut in September/October (Otto said after the first cold night) when the leaves come easily off the branches. The men climbed the trees and cut the branches with billhooks and the children on the ground stripped the leaves off.

The trees were cut every year but only branches of 3-4 years in age were cut and the smaller ones left on. The leaves were dried and fed to the cattle, sheep and goats throughout the winter. Otto said leaves were fed in the morning and hay later in the day, he said the leaves made the butter more yellow in colour, Hermann said they give the animals more energy. The woody parts were used as fuel.

The *Fraxinus* pollards were situated along the edges of the fields and were planted to help stabilise the ground and also to stabilise paths in steep places.

Hermann said that pollarding is part of the normal farm work to the older people but the younger farmers don't have time to do it so it is dying out. He also said that traditionally the leaves of the *Corylus* were cut to feed to the animals too.

Brandberg parish

Brandberg is a village at the southern end of the Zillertal valley. Most of the valley has become very developed for tourism with elderly hikers in the summer and huge numbers of young skiers in the winter. Brandberg is aiming to keep a lower profile within the valley and retain it's rural charm and culture. The Mayor, Hermann Thanner has been very active in this and has the support of the village. The Mayor is also fairly elderly and has farmed all his life.

My guides in Brandberg, left to right: Otto Mayr, Dieter Stöhr, The Mayor of Brandberg – Hermann Thanner - holding his pollarding knife, and Gudrun Wallentin

The village had EU money for a project to map the features of cultural value and to produce a booklet. Trees are marked on the maps. (At the end of the project there was an international meeting and a key politician from South Tirol said that some old techniques should not be continued and pollarding of *Fraxinus* was one of them, as it made the trees ugly and unsightly!)

20% of the village has slopes of 80% or more and with the crumbly rock type stability is a real problem. Thus trees are now planted and pollarding mostly to stabilise the soil rather than to produce the leaves. All the tree pollarded were *Fraxinus excelsior*

We saw regularly cut pollards in three different places within the village

1. The trees near the Mayors house. 30 years ago this area was cleared for growing wheat but there was a lot of erosion so trees were planted to stabilise the soil. *Fraxinus* are still being planted in very dry areas, such as along the terrace walls, and also wet areas e.g. below some of the buildings. The trees close to the house were cut for the first time only a few years ago and then cut every year since. They are really pollarded because they shade the pasture. There are more trees that need cutting but it is difficult to persuade people to do it for free as there are other sources of energy now and people do not need wood as much as they did.

Ash pollards near the Mayor's house (left) and a close up of one of the trees (right)

2. A few trees at the steepest part of the village, some pollarded this year.

Ash pollards on a very steep slope, some of the trees have been pollarded this year (left)

Leaves of one of the pollards have been broken from a branch and are lying on the ground. This would be done after the branches were cut to dry and store them (right)

3. A farmer with a large group of pollards just cut. This farmer cuts the trees and feeds the leaves to his cattle and sheep. He says that milk production is lower when he feeds leaves but that the protein content is higher (the price the farmers get for milk depends partly on the protein content). He has 4ha and has 6-8 cows. He gets a subsidy to pollard the trees.

[Actually Gudrun said that he gets money from three sources, the Federal Government, the Local Brandberg Community and the Tourist Board. The money is paid for three main reasons; having traditional roofs, traditional fencing and hay cutting by hand. However, the farmers are encouraged to maintain all aspects of traditional agriculture and culture and pollarding is mentioned as part of this. Thus he may believe he is paid for pollarding but technically speaking he is not!]

Pollarded ash trees in and around a farm. Various pollards recently cut. (left & right)

Some trees part cut

A close up of a pollard

The examples of recent pollarding all followed the pattern as described above. Most of the trees did not look very old. They are likely to continue to be pollarded in the immediate future but the very long term future of pollarding is more doubtful.

Dried leaves stored in a barn with hay

Other pollards seen:

Finkenberg

This area was a meadow but is now owned by an electricity company and has not been managed as a meadow for many years and there is no management planned. All the pollards were lapsed and becoming very overgrown with younger trees. We could easily see one *Tilia* and four *Fraxinus*. The *Fraxinus* all looked to have been cut at progressively higher points whereas the *Tilia* was more of a classic pollard shape. These trees were much older than those at Brandberg.

***Tilia* lapsed for perhaps 20-30 years (left)**

A *Fraxinus* tree looked to have been cut as a coppice or pollard (right)

A possible *Acer pseudoplatanus* pollard growing on top of a heap of stones (right)

Karwendel Alpen Park

The area around Eng is an extraordinary valley, steep sided to the south and then opening out to a 220ha flat area with extremely steep sides. The flat land was probably the bottom of a lake or sea at some stage and the soil is very gravelly but also very loamy and rich in places, usually under the gravel.

View of Karwendel with visitors (left)
One of the *A. pseudoplatanus* (right)

80% of the park belongs to Austria and 20% to Germany. There is no vehicular access to the rest of Austria without going through Germany (and it is perhaps 50 km over the mountains to the nearest Austrian village, shop and school). Unusually for Austria, the land is owned by the farmers but the trees are owned by the Federal State. People live in the valley in the summer but no one stays over winter as it is too unsafe. The higher pastures seem to be the older ones and have names indicating their Austrian descent. It is probable that the farmers used to bring their animals over the mountain tops and into the top of the valley. The lower areas were not accessible and only used as pasture more recently, they tend to have names suggesting a German origin.

In the flat valley bottom are approximately 2000 *Acer pseudoplatanus* trees, some probably around 500-600 years old. Cattle graze during the summer months and it is also a popular place for people to visit so the feel was like a 19th century English landscaped park!

It is thought that on the valley bottom the *Picea abies* trees were cleared at some stage to create pasture and the *Acer pseudoplatanus* were left, along with occasional *Fagus sylvatica*. Most of the clearance was done several centuries ago but there was more in the 1960's. There are also areas of *Picea abies* dominated woodland with occasional *Acer pseudoplatanus* trees showing what the area was probably like before clearance.

None of the trees were pollarded but many of the trees had been damaged by snow and landslides. The valley sides are loose and avalanches are common during the winter. It seems that the *Acer pseudoplatanus* trees can withstand avalanches much better than the spruce trees. The latter are usually killed whereas the *Acer pseudoplatanus* often survive. The *A. pseudoplatanus* also survive and hold back

deep snow, Dieter has seen situations where a tree has been scoured by snow up to 5m in height, removing all mosses from the trunk, and the tree has survived. Many of the trees near Eng are also buried in gravels to a depth of perhaps 2m. These trees are still growing and just appear to have rather low crowns and short trunks. The depth of gravel is known from excavations done around some trees. Dieter has also seen an extreme version of this elsewhere where the crown of the tree really started at ground level. Because of the soil structure and being buried in gravel these trees can have root systems that form several separate horizons.

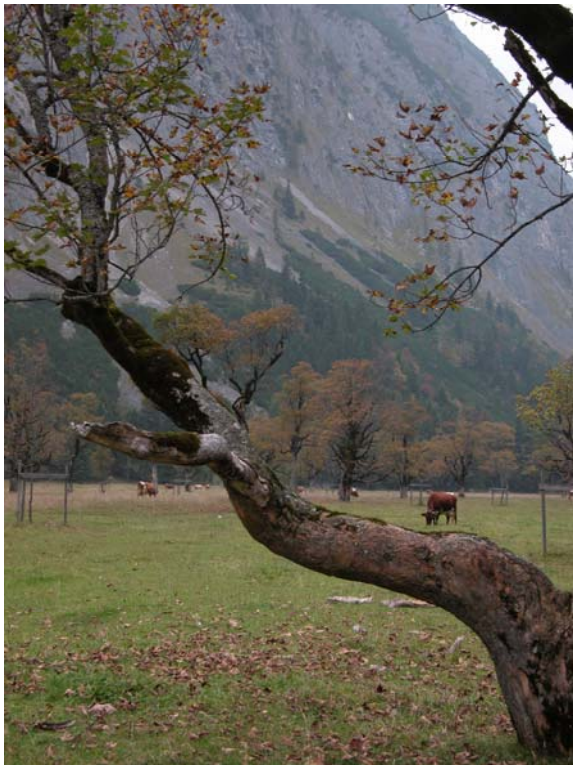
***Acer pseudoplataus* buried in the gravel (left)**

Trees buried in the gravel and cattle grazing (above right)

Some of the trees are estimated to be around 500 years old, this was calculated on the basis of trees that have died and been solid enough to count rings and then extrapolating to the biggest trees. Many of the bigger trees are hollow so ring counting of these would be difficult. A fairly typical large tree was 4.6m in girth.

Some of the older trees (left & right)

The trees are not evenly distributed thoughout the valley and occur in clumps. There are also areas with few or no trees. The areas with no trees often correspond to those where avalanches regularly occur. Some planting was done in these areas in the past but it will not be continued as the long term viability of the trees is lower here. Other areas where trees do not occur are where there are frost hollows or wet places, which tend to be rather colder.



Old tree (left) newly planted and protected trees (right) and also showing the steep valley sides

A few *Fagus sylvatica* trees were growing amongst the *A. pseudoplatanus* but there were many more on the hillsides. Probably the valley floor is too cold for them

The older trees are probably older at least partly because of the effects of avalanches and snow. Most showed some signs of damage to the branches that resulted in regrowth. Many of the older trees also were hollowing and had cavities in them.

The area around the trees is managed as summer pasture, grazed by dairy cattle. Traditional breeds used to climb up the hillsides to graze but now the animals used are much heavier and cannot climb up the steep slopes. As a consequence the *Fagus* is starting to grow on the former pasture of the lower slopes. However, the number of cows grazed is rising each year. Milk produced here is outside the normal quota system so the farmers want to produce as much as they can. The combination of more cows and less agile ones has increased the grazing pressure on the valley floor. This year there was over 400 livestock units grazing in the valley. The trees did not seem to be adversely affected by this except one young one that was bark chewed (but this was a maple and not sycamore).

Cattle damaged *Acer platanoides* (left)
Cow rubbing against a tree (right)

Other notable species:
Some entomological survey work has been carried out by a previous park manager.

Recent management/survey work:
Concern about the losses of the older trees has resulted in some planting of trees grown from local seed. The trees are planted out as large whips and protected from the cattle by wooden cages. It has been found that the trees stand the best chance of survival when they are planted into very large holes that have been filled with loamy soils. If this is not done they grow well for several years with their roots in the gravel and then decline due to lack of nutrients and/or lack of water due to the well drained nature of the gravel. The older trees have their roots in the loam under the gravel.

The trees have been counted and their survival rate plotted by using aerial photographs from the 1950's and 1990's. From this the intention is to try to replant as many trees as needed to keep the population stable but there are concerns about the viability of the older trees. The trees do produce seed and there are plans to try a grazing exclusion area to encourage natural regeneration.

The visitors probably do not cause significant problems for the trees. The majority walk on a well made up path and only the occasional tree is the subject of intense trampling. The visitor numbers however can be very high in the autumn when the trees are (normally) lovely colours and this can cause traffic jams and significant problems lower down in the valley. Various solutions have been discussed to try to deal with this but as the surrounding land belongs to Germany there are greater problems than if it were within the same country.

The management seemed to be genuinely concerned about the trees and taking them into consideration. The work done to ensure continuity of trees by planting and

considering natural regeneration is testament to this. There is probably nothing that could really be done on the older trees themselves to ensure that they live longer as their age is partly due to regular damage by snow and rocks. Some will just grow old naturally without damage as open grown trees. If a generation gap does become a problem then consideration might be given to causing artificial damage to the trees to retain the continuity of habitat for invertebrates etc. but there seemed to be a reasonable age distribution so I would not have though this was necessary. It would be better and perhaps less work to obtain natural regeneration rather than having to plant trees so the result of the first experiment to encourage this should be interesting.

There did not appear to be very much dead wood on the ground or as standing dead trees (although there was some of each). It has only been the policy to retain it for the last couple of years so hopefully this will increase as time progresses.
Concern was expressed over the grazing pressure. This could become a problem and needs to be watched, especially if an increase in animals does result in increasing manuring and therefore increasing nutrients that might affect both the ground vegetation and potentially the tree mychorrizae. Increasing grazing pressure might increase the incidences of damage to the bark of the trees by chewing and also damage to the roots by trampling under 'favoured' trees. Both these need to be watched out for. The ground flora was very pasture dominated and was completely lacking in shrubs. One consequence of leaving more dead wood, especially fallen dead trees in their entirety might be that more shrubby growth might develop around the branches where the cattle cannot get in to graze. This in turn might also encourage some natural regeneration of the trees. This process would also be speeded up by a reduction in grazing pressure. Of course the consequence of this would be that the aspect of the whole area would change from being open 'formal parkland' with trees to be more of a 'natural' wood pasture. This would probably benefit some of the invertebrates and birds. It would also change in many people's eyes from being tidy to being untidy! It would be interesting to look at the list of invertebrates recorded and see if there are any particular requirements that they have that are not well met.

Summary of Austria

Pollarding was probably quite widespread in the past, at least at certain altitudes where the winter feed needed to be supplemented with leaves and where it was not too high for ash to grow. Pollarding seems to have been done almost entirely for the dried leaves as fodder but, unlike Scandinavia the leaves were removed from the branches at the time of cutting and the cutting was done very close to leaf fall. It is also different because the trees were cut every year but not all the branches removed. Subsidiary reasons for pollarding were to prevent excess shading to the meadow/pasture and to help stabilise steep slopes.

The key species pollarded was *Fraxinus excelsior*, however it seems likely that other tree species were also cut occasionally, such as *Tilia* and *Ulnus* (and one lapsed *Tilia* pollard was seen).

Pollarding is no longer widespread and very few farmers are still doing it in any form. Even fewer are probably using the leaves. It is now largely being considered as a

traditional management technique that is being perpetuated for its cultural interest. An additional reason for doing it is that the *Fraxinus* trees are helpful in stabilising the soil and are planted for this reason, however they then cast a lot of shade so pollarding can be used as a method of reducing this. (Probably this is not disimilar to the traditional reasons for pollarding!)

The sites with pollards are not protected and are largely on land owned by farmers. As many of the trees are quite young they may not have such a high biodiversity value as pollards in other countries.

There are two potential types of threat to the pollards:

1. The practice of pollarding is very restricted and is very little known. There obviously are methods of getting subsidies but most farmers are probably not inclined to do it even if they knew more about it.
2. Lapsed pollards probably do exist in more places than the Zillertal valley but the localities are not known or recognised. The one small site with lapsed pollards that was visited would have benefited from a small amount of clearance of competing vegetation and then the *Fraxinus* trees could probably have been cut again. The current lapse on these trees was not many years but the longer such trees are left the more difficult any restoration work would be. Of course trees like this need to be located first!

Pollarding terms used in Austria

Laub – leaf
Lauben – leafing – pollarding
Schneiteln – shredding of spruce branches
Schneitleschen (also schnoatleschen in tirol dialect) – Literally ‘shredding of ash trees’ – term used to describe the ‘pollarding’ of the ash trees

I feel that my visit has helped raise awareness of pollards in Austria, a country with pollards that no one in England seemed aware of.

Cow wearing ceremonial bell (left)
Cow head dresses (below)

The cattle having the head dresses put on (left) and parading through the streets (right) – traditionally this was when they were brought down from the high pastures in autumn

Additional notes

Dieter also told me about: Tirol larch wooded meadows where the trees were well spaced and fallen branches were collected in the spring. The trees were cut occasionally when they reached about 200 years old and used for building cow sheds or fencing. These wooded meadows were fertilised occasionally and were typical to the Tirol.

In the E. Alps are *Carpinus* coppice that must, by law be cut with an axe not a saw (as thought better for regrowth).

Recently pollarded *Fraxinus* tree

France

In northern France the bocage landscape of Orne & Sarthe (small patchwork field landscape with hedges) had abundant pollards in hedgerows. Heading south there were small numbers of pollards found in certain areas but another major locations was in the French Basque country. Pollards were largely cut for wood, but there were pollards for fodder too, especially in the more mountainous areas.

Bocage landscape with pollards in hedges and in fields
Orne and Sarthe Departments
Along the road between Sées and Mortagne in the Orne department several large *Tilia* pollards were seen, one in a field and another outside a farm building. Also lines of *Quercus* pollards recently cut with the wood stacked underneath them. All the *Quercus* pollards in one line had with sap risers left on.

A group of pollards in a pasture (above)
Old *Fraxinus excelsior* pollard (above right)
***Quercus* pollards recently cut, some with sap risers left and with wood stacked between them (below)**

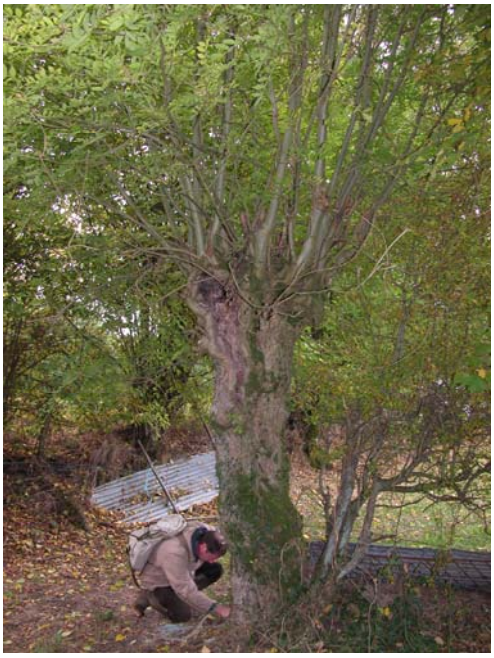
Driving south from Cherbourg towards Le Mans there were pollards in many places, but they had quite a clumped distribution. Some *Quercus* were fairly recently cut, some with no branches retained. There were also several dead bollings, all appearing to have died longer ago than this year.

Area around Gacé (Orne) (with Vincent Vignon)

Croisilles village
This is a bocage area where pollarded trees were cut about every 9 years; the reason being that the tenant farmers had contracts that ran for 3, 6, 9 years etc.. A wide range of trees species were pollarded for fuel and also sometimes cattle fodder. In Sarthe there were more *Quercus*, in Orne more *Fraxinus*. When there were *Ulmus* trees alive (before Dutch Elm Disease) there were many more trees with hollows and the density of trees with hollows is thought to have been about the same as a 'natural' situation.

Traditionally the *Quercus* trees were cut leaving a sap riser or tire sève (literally pull sap) which was left just for a few years after cutting. This would also act to shade the tree as well as draw sap. Leaving one sap riser worked well in trees cut every 9-10 years but may not be enough if they have lapsed for longer, thus more branches need to be left.

The *Quercus* trees were also often shaped by cutting, so that they formed an inverted cone, in this shape they were more stable and had less sail area at the top and were more wind resistant.



Bocage system, small fields with hedges round them containing pollards, some of which were *Fagus* (above left)

***Acer campestre* pollard (above right)**

***Fraxinus excelsior* cut quite recently and also used as a gate post (left)**

Hedge with *Acer campestre* and *Fraxinus excelsior* pollards and a large *Carpinus*. It has been cut recently with a hedge trimmer and a few big branches have perhaps been taken (below left)

***Fagus* pollard recently hedge trimmed (below right)**

Younger *Fagus* pollard (left) this is perhaps less than 20 years since the last cut.

Coulmer Village and the *Osmoderma* story (See also Mansion 2000b)

Osmoderma ermitas lives in the tree humus of a range of deciduous trees. It needs a volume of about 1m^3 to develop and therefore requires large old trees and is rare in France. Over the last 100 years many populations have disappeared along with the old trees. *Osmoderma* is protected under the Bern convention & the Habitats Directive.

The new Autoroute A28 between Alençon and Tours was in the process of being built in 1996 when an amateur entomologist found *Osmoderma*, which that had not been mentioned in the impact assessments. Various protection associations alerted the French state and the EU and in 1997 work stopped between Le Mans and Tours. An entomological study confirmed the presence of *Cerambyx cerdo* and *Lucanus cervus* as well as *Osmoderma* and confirmed that the autoroute would have a negative effect of on these directly or indirectly. Local press and people started applying pressure demanding the autoroute be built 'at all costs'. Farmers in armies of tractors drove down the streets of Le Mans and an effigy of the entomologist in charge of the study was burnt. After a long blockage the problem was resolved and work started again

with entomologists carrying out inspections and giving advice under a scientific committee.

Two trees with *Osmoderma* were found during initial survey work, right on the route of the new road. The motorway was moved 50m to avoid them (but a farmer then felled one). Of course it is difficult to survey all trees properly to be sure they do not have the beetle so every tree felled as part of the motorway work has to be inspected and if it is found to have lots of *Osmoderma* it is moved and re-erected. If a few larvae are found they are moved to a re-erected tree. The farmer who felled the *Osmoderma* trees would have been prosecuted by the 'nature policemen' if it had been in Sarthe but they are not as active in Orne so nothing happened.

The re-erected stumps photographed below are (from left to right): *Quercus, Fraxinus excelsior, Pyrus, Quercus, Quercus* and *Quercus*. The *Pyrus* also contain larvae from an apple that fell apart too much to save the tree and contains *Gnorimus* larvae too. To finish off, the area will have fruit trees etc. planted between the stumps and the motorway. The bright plastic strap will be replaced too. The motorway construction can be seen in the background. In Sarthe there are three other sites like this, all were inspired by Ted Green's work at Windsor

Motorway works on the same road but further south - more re-erected trees (left)

Survey work for *Osmoderma* has now included Sarthe, Mayenne and part of Orne. Hollow trees were plotted first from a plane and then on the ground. Other good areas are in Brittany and the Loir area.

The villages in this area have large numbers of old trees in the hedgerows. *Osmoderma* in the départements of Sarthe & Orne lives in seven different tree species, *Quercus, Fraxinus, Pyrus, Castanea, Populus tremula, Malus sylvestris*. There are also many grazed orchards in the area. *Osmoderma* is also found in some of the orchard trees. Such apple orchards have no protection even though *Osmoderma* is a protected species.

Huge *Alnus glutinosus* pollard (left)

***Fraxinus excelsior* pollards probably cut last less than 20 years ago (right)**

***Fraxinus* pollard where some branches have been lost and the live branches have formed a ring round the outer hollow trunk (below)**

Large *Quercus* with extensive die back in the middle of a field (right)

Discussion with a farmer (the brother of the man farming the land where the motorway is passing through and the trees felled.)

The pollards are now cut every 12-15 years now using a chain saw. Traditionally they were cut every 9 years with a bill hook type implement (and the branches would have been smaller). Sap risers were left on *Quercus* trees but not other species. The trees were cut in winter. Very occasionally they were cut in summer, in dry years to feed the animals, but there is a risk of killing the pollard so it was not done often. (The trees here were not cut in summer this year - although it was dry it was not considered to be critical in this area.) Sometimes the *Quercus* grow for two years after cutting and then die. This is usually when they have lapsed for a long time so the branches are too large and when not enough of a sap riser is left. [The sap riser would also act as a sun shade to stop the tree drying out]. *Fraxinus* can be cut at any time, any how! The farmer didn't have *Fagus* on his land so had no experience of cutting them. In the past there were a lot of *Ulmus* trees/pollards but in the dry summer of 1976 almost all died and they were suffering from Dutch Elm Disease anyway). Perhaps 1/3 of the pollards were *Ulmus* at that time?

Farmer demonstrating the use of his pollarding billhook

Trees felled as part of the motorway works are closely inspected for signs of *Osmoderma*

Cisal St. Aubin
We found one dead *Betula* pollard in this village and another still just about alive. Vincent also knows about one other in Sarthe too but they are very rare.

Dead *Betula* pollard

There was also some *Fagus*, all very twisty and large and all the pollards were last cut longer ago than in the previous village, perhaps 50 years since the last cut?

A tree line had been cut recently and was a mixture of *Fagus* and *Carpinus betulus*. Some were cut leaving leaders and some were not. The lapse before this cutting had been longer – why were they cut? (below)

In general, the pollards in these Départements are all in hedgerows, those that appear to be in the middle of fields are actually remnant hedges.

Pollards in a remnant hedge, including *Carpinus* and *Quercus*

The species of pollard seen were:
Quercus robur, Fraxinus excelsior, Pyrus, Populus tremula, Alnus glutinosa, Fagus sylvatica, Carpinus betula, Betula pendula and also domestic *Malus* and *Pyrus*.

Day with Dominique Mansion at Boursay (Loir et Cher) and the European Centre for pollarding

Dominique is an artist and botanical illustrator. He comes from a farming background and has a long standing interest in pollards for artistic reasons and as representative of traditional cultures

The area around Boursay was traditionally bocage, mostly with cattle grazing the fields, now there are larger fields and wheat is grown.

The tennant farmers had to hedge lay every 8 years and as a result of hedge laying some live (small) trees were cut for use as posts in situ. If these grew and were cut repeatedly they become like high coppice (or even pollards).

The pollards were cut every eight years, this was two crop rotations and the trees were cut in the fallow years.

A few *Quercus* and *Fraxinus* trees were cut in summer 2003 in order to feed the fresh leaves to cattle. This was traditional in times of drought. *Quercus* has lots of tannins so it is not that good as fodder.

Shredded trees – the trunk was used for house building and the branches for fuel as faggots. Sometimes the latter was sold for bread oven fuel. They were ALWAYS cut in the winter. Cutting was generally about every 7 years but this depended on the region.

La ragosse – a shred
La trogne - word for a pollard in the Perche region
La guette – hedge laying

Trees were cut for fodder in the Massive central and the Pyrénées and especially the Haut Alpes. These were mostly *Fraxinus*. Some *Quercus* was cut but as it is not palatable it is mixed with other species.

The Maison Botanique
The Maison is a small museum devoted to various aspects of botany. It has a small permanent exhibition but mostly it houses exhibitions that change every six months. All are created ‘in house’ by the people working there, two full time and one part time. While I was there the exhibition was about plants traditionally used for making cloth, such as linen, hemp and nettles. The previous exhibition was about fungi and the next will be about pollards, all were of a very high standard.

The European Centre of pollards is based in the museum and the initiative has come from Dominique. Elisabeth Dumant, who is a part time member of staff at the museum is collating all of Dominique’s information about the location of pollards in France and French speaking countries and his literature which is largely in French. They would like to host a conference on pollarding in the future.

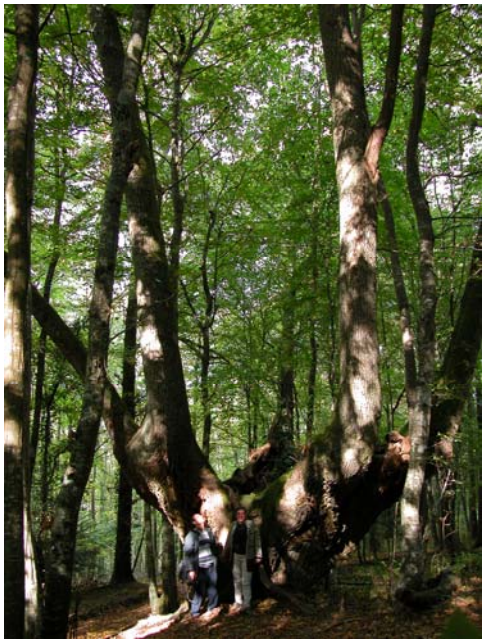
Chemin des trognes.
This path has 27 pollard bollings that have been moved from their original locations. Most are *Quercus* but one is *Fraxinus* and two are *Carpinus betulus*. The trees were first erected as an exhibition at a garden festival where Dominique as an artist was asked to design a garden. He arranged a ring of these dead stumps with a pile of dead wood in the middle. Round the edge were 'tomb stones' with panels about each tree species and a new tree planted. The idea of the exhibition was to highlight the loss of traditional tree management and the loss of the pollards. When the exhibition was finished Dominique held various public meetings and raised money via sponsors to move the pollards to Boursay to form the path that is now accessible from the museum.

The Chemin des trognes with Dominique Mansion and Jenny Clark-Contreras

A single pollard on the chemin (right). Each one is numbered and illustrated. In the Maison Botanique there is information about each one, where it came from and which species it is etc.

Dominique also took me to see a few notable trees in his local area:
A *Quercus* pollard near the Maison Botanique – was cut recently leaving four branches on. The next year most of these were removed leaving one complete sap raiser and one long stub. The tree is now three years since the first cut. A sap riser, (tire sève, or colloquially a teteu meaning a milk giver) is a traditional method with *Quercus* trees. Now many people have forgotten about leaving this branch and so they cut all the branches from the trees as seen in Sarthe and this often kills the trees. Traditionally if the farmers killed a pollard they had to start a new one.

***Quercus* pollard with sap riser (right) near the Maison Botanique**



An old *Fraxinus excelsior* in the grounds of a Château which is possible a boundary marker. Dominique and Elizabeth are standing underneath it (left)

A *Fraxinus* that previously had two stems. One has now fallen and the live part of the remainder is growing round the decaying area

An old *Quercus* trees (this had the dead wood removed from the crown this spring)

New pollards in Boursay

Dominique creates a new pollard by cutting it one year and then again after 2 years. After this it is to be cut in a regular cycle. He does this as the first branches are very fragile and break off easily. Cutting twice initially is better as the tree to heals up more. I asked if this was a traditional method. He said he doesn't know but the peasants would have realised this too and surely cut like this. Traditionally the trees were cut with an axe. Dominique's young pollards in the hedges were mostly cut 2-3 years ago. Most are very healthy.

Recently laid hedge with some new pollards (left)

Close up of young *Carpinus betulus* pollard (right)

French Pays Basques - Cyril van Meer

Historical information about the forest in the Pays Basques (from Balié 1933a, b, c)

Development of the forests

The forests in this area originally covered an area of 5,546ha and were the forests of Biriatou, Urrugne, Sare, Saint Pée sur Nivelle and Ainhoa. The climate in this area was wet and the soil cold and humid so it was not good conditions for cereal crops. However, in the sun and the rain the vegetation grows very vigorously. In mountainous area the communes had land with a big altitudinal range. That between 500-600m was used in the winter. Above this level the land was rocky and the forest of *Fagus* and *Salix* was maintained for heating and building. Then above the forest were the summer pastures. However, in the Province of Labourd the land does not extend above 900m so the zones of summer and winter pasture do not occur and woodland dominates. The problem the farmers were faced with in this area was how best to cultivate the soil and find ways to nourish animals.

This was achieved by a land management form that combined 3 production types on the same land. These were pasture, wood and soutrage (soutrage is the regular cutting of plant growth such as bracken). In the autumn and winter peasants cut herbs and leaves and transported them to stables. There were areas dominated by bracken and this was also cut. This method of land management involved the culture of têtards (pollards), also called the culture of Haut Taillis. The land was communal and in most communes the land available was large enough for the needs of the inhabitants.

Pollards

Trees for pollarding were planted at a big distance of 8m apart and grown to 2.5-3m when they were pruned. The branches had space and light but did not get so big that they stopped the growth of herbs and vegetation to be cut underneath. *Quercus robur* and *Q. petraea* were planted as they grew well locally and these forests were called the Forêts de Chêne Têtard or oak pollard forests. Cherry and *Castanea sativa* were also planted and more *Quercus robur* than *Q. petraea*.

It is difficult to be precise about when the pollards developed but they must have been several centuries old due to the size and age of some of the trees. Various old documents exist that were written about these Forests, for example the ‘1704 Regulations of the Forest’ and the pastoral system was rigorous in the protection of wood, pasture and bracken areas and the defence of the common land. Loose dogs, wolves etc. were all mentioned.

Grazing animals in the Forests

Balié 1933b described that the forest of Biriatou was renowned for its semi wild cattle and bulls that were very aggressive and charged without hesitation but today they are no longer found there. However the forest ponies were still found and are today. They are known as potock, poutchokas or poutchocks and are small nomadic horses found largely in the valley of Bastan in Spanish Navarra where they are called bastanès. They are strong and agile ponies also used as pack animals and of use in the mines because of their strength and small size. Balié mentions that they are a problem in the plantations but are easier to catch in the winter when they get hungry.

Cutting of the trees

Each year some of the trees were cut, chosen for the best branch formation and dimensions. About the same number were cut each year and the age of the branches when cut varied but 10-15 years were considered best. In 1848 the age was fixed at 15 years. The Forests were under a regime regulated by the foresters.

The parcels were marked with a clear boundary and the exact number of pollard trees in the parcel was counted. Each year one or more parcels or a fraction of a parcel in numeric or alphabetic order was exploited – the same number of pollards each time. The price obtained was not the same each year however, as parcels where the access was difficult commanded a lower price than those where it was easy. The trees were marked by the forester and the work was done by a team of tree fellers. It was difficult and dangerous work and the men climbed into the trees using a rustic ladder. They slid about in the branches and worked with an axe.

However the Foresters considered the pollard forest archaic, primitive and barbaric and thought that they should be converted to plantations to produce better timber, as better prices were obtained for standard trees over 30 years of age. In 1849 Napoleon wrote in detail about the conversion of each of the pollard forests to plantation, retaining part of the area as pollards only (for Sare it was planned to have 2,570 pollards remaining after conversion which would be on only ¼ of the area). The methods for doing this involved regeneration that was to be protected. However, by 1885 there was very poor regeneration. It seems that there was a general refusal to follow the directions and by 1860 the conversion was abandoned. It was agreed that conversion was not possible without a fence that was secure but that this was not possible due to the nature of the forest and the fact that it was right on the border with Spain. There was a return to effective pollarding during the years 1885-1890 and populations of pollards that had been uncut for 30 years were cut leaving some branches as sap risers. However the result was that more than 404 hectares of pollards were had been converted in the forests of Ainhoa, Sare and St Pee. No successful conversion took place in Urrugne which was still all pollards. In 1933 there was reported to still be 5,516ha of *Quercus* pollards in the Pays Basques area and additional small areas in Bayonne too.

In the early 20th century the trees suffered an illness and thousands and ‘dozens of thousands’ of pollards were lost. 100’s of hectares were depopulated and at the end of 1909 the dead trees were replaced.

2 types of tree cutting were proposed to resist the attacks of the disease:

1. Bipartite – The trees were cut first when they were 10 years old and half the branches were removed. Three years later the same tree was cut again, those branches being removed that were at the time of the first cut. (i.e. cut the tree half at a time)
2. Furetage – At 10 years all the branches were cut that were over 25cm in diameter at the base. The smaller branches were left on as sap risers. 10 years later the same tree was returned to and again the big branches were removed and the smaller ones left.

A bipartite tree could be in the form of a:

Couronne (crown) – a single head or a

Candélabre (candelabrum) – with many heads

The two methods were both used at the same time and were both said to have their advantages.

Fôret de Sare

The Forest of Sare in the Pyrénées Atlantiques is at an altitude of 900m and receives 1700mm of rain each year. It has no official designation or protection it is about 1300ha in size and there are about 300ha of pollards. Some of the land is open and not wooded. With Cyril we visited the area south of the D306 close to the Spanish border.

Tree species pollarded that were seen were *Quercus robur, Fagus sylvatica* and a few *Alnus glutinosus*. The land around the pollards is rough pasture, grazed with sheep, horses and a few goats. There are about 300 'wild' poutchocks, the Basque pony. There was also the right to turn out pigs in the past but this practice ceased about 30 years ago.

***Alnus glutinosus* pollard (above)**
Basque ponies underneath pollards (right)

Pollard management

In 1600? the oaks (*Q. robur*) were planted 8m apart and any native trees in existence were removed in order to obtain this regular spacing. They were first pollarded at 30 years of age. Almost all the branches were removed when the trees were beheaded, if the tree died as a result it was felled and replanted (thus the spacings are fairly even now). They were then pollarded every 15 years (except in times of war etc.). It seems the area was managed fairly 'industrially' and regularly.

In 1672 it was reported that there was no suitable wood that could be obtained from the forest for boat building as the trees were all pollards. Old documents from 1884 list the number of pollards and the amount of wood obtained from them. At this time there were 44,361 *Quercus robur* pollards. There were also *Q. pyrenaica* pollards but the number of these was not separated from the number of standard trees. The north

facing slope was mostly *Fagus*, the south facing was mostly *Quercus*. No one is sure if the *Fagus* were planted, they may have been, or perhaps they were in existence beforehand, especially on steep slopes.

The young people of the village climbed the trees and cut the branches and others dealt with the wood when it was on the ground. The trees were cut to make charcoal and the charcoal was made in the forests. (When charcoal was no longer needed the trees were still cut for a while and the wood was given to the villagers). The forest was originally a mixture of pollards and standards, there were many more pollards but the standards were left to fruit.

Within the forest were tree nurseries, inside stone walls forming a square of 50m by 50m, where the trees were grown until they were 10-12 years of age. They were grown for replacing dead trees (which were felled and replanted). It was still operational until the 19th century. The charcoal makers were also responsible for the nursery and planting out replacement trees. They were given milk and cheese by the sheep farmers in exchange for doing this (the whole system was economically sustainable).

Old tree nursery. The wall is in the foreground (with bracken on it) and the trees inside have not been pollarded.

1940 was the last time the trees were pollarded as part of this regular system although a few were cut later. In 1930 the trees were cut leaving at least one sap riser but later this practice stopped. Cyril felt that this was not a good thing and since the regular cycle has lapsed the cutting of all the branches would kill the trees.

A small number of *Fagus* pollards were cut about five years ago by the hunters, in order that the birds can fly over at a low level. Cyril said that *Fagus* do not like to 'stand alone' (otherwise they get too much sun) but prefer to be in a group. Cutting in February is best, in very early spring. These trees will now be cut every 6-7 years.

***Fagus* pollard cut by hunters**

***Fagus* pollards recently cut by the hunters**

Current estimate of pollard numbers

Supposing that the trees are still at 8m spacings then there could be 1250 trees per hectare. Cyril told me there was 300 hectares of pollards which could be a potential of 375, 000 pollards in the forest. This must now be an over estimate as at least some have been lost and much of the area we walked through did not have such dense spacing.

Some young trees have been planted to help with regeneration, they are now about 15 years of age and will be pollarded in 15 years time (if Cyril is around to do it!).

Other land management

In the recent past *Quercus rubra* was planted, now *Q. petraea* is used as it grows better than *Q. robur*, which is the main pollarded species. *Q. rubra* is no longer planted. Exclosures have been made recently to allow regeneration. *Castanea sativa* has suffered from a *Phytophthora* species so Japanese chestnut has been planted instead, the horses prefer it but the nuts are no so good for humans. *Alnus glutinosa* pollards were cut for the wood, perhaps for making clogs.

The storm in December 1990 resulted in some areas of wind blown trees. The locals were allowed to collect fallen wood from some areas (mostly the more accessible ones) but in other places, usually where it was very steep, the wood was allowed to remain.

Pteridium aquilinum is cut from the hillsides by the farmers. They prefer it to straw for sheep bedding as it is free. It is cut in October when it is just turning red as cutting earlier (June/July) results in a lower growth the following year. In the past it was cut by hand using a scythe but now they use tractors and this is of concern as it causes compaction.

The *Ilex aquifolium* trees are not really eaten by the animals but are respected by the farmers as they provide shade in the summer and shelter from the elements.

A *Pterdium aquilinum* bale standing on an old charcoal hearth. The tree behind is *Ilex aquifolium*

Typical view of the forest. The pollards are variable in how they have been cut. The mixture of pollards and standards would also have been typical (left)

A large *Fagus* pollard with a girth of just under 8m. This tree used to have 3 branches as chandelier type but one fell recently. It is thought to be about 380 years old (based on work done by counting the rings of felled trees and extrapolating using a graph). Cyrille is standing under the tree on the far left (right).

Some of the *Quercus* pollards are cut in the chandelier (guiado) shape

Dead *Fagus* pollard bolling with bracket fungi

Many of the *Fagus* pollards were very similar to those in Burnham Beeches. The tree on the left has very long branches from the bolling with all the leaves very high up. As with all forests with old pollards this one had a tremendous atmosphere

Fôret de St. Pée

The Fôret de St. Pée is near Ainhoa, that remaining part of the forest is south of the D4, close to the Spanish border. It has no protection.

The trees are *Quercus robur* pollards in previous pasture, now not managed.

Pollard management
Like the forest of Sare this forest is a mixture of pollards and standards. The trees looked to have been cut in a variety of ways. Some were classic pollards and some were more like shredded pollards with their tops cut off very high up and very knobbly trunks.

The whole area is also under threat of a new dam. First discussed over 20 years ago the dam is getting nearer to becoming a reality, especially as the Mayor of St Jean is very keen to see it built and is also a Minister. If it goes ahead it will be a flood relief scheme, and will prevent flooding of properties that have been built recently on the flood plain. The effect will be seen as far away as St Jean de Luc. For the Forest it will mean that in times of flooding the water level might rise 5m (so would surely kill the trees).

The area has lots of rare species including the beetles *Osmoderma* and *Cerambyx cerdo* but does not have any protection under law. Cyril proposed that it should be a Natura 2000 site but this was not accepted.

There are currently problems here because of the number of visitors and tree safety. There are tracks through the trees where people walk and drive cars (and camp over night). The trees are under considerable threat from safety work and felling. There is opportunity for doing some minor work to deter people and cars from damaging the trees or being in vulnerable positions but it is unlikely that much will be done while

the future of the dam is uncertain. It is obvious though that this is a popular place for people to visit – much more so than Sare.

The photographs do not do St. Pée justice as it was getting dark and also raining.

***Quercus* pollard cut at various different heights in the past**

Summary of France

Pollarding must have been widespread in the north of France, the Pyrénées and the Pays Basques. There are other areas where pollarding is reported to occur and but due to lack of time I was not able to substantiate this. Balié (1933b) stated that most rural houses in diverse regions of France have a parcel of land next to the house where you can find oak pollards cut for firewood.

Pollarding was carried out both for fodder (such as *Fraxinus* in the Pyrénées) and for small scale fuel wood (such as the bocage areas of Orne, Sarthe and Loir et Cher). This was also seen in various places on a much smaller scale, for example in the Dordogne. In addition, the Basque area has remnants of larger scale pollarding for fuel within wood pasture situations. Mansion (2000a) mentions that in Léon trees were pollarded for charcoal and that pollards also occur in Alsace as well as the Pays Basques. The list of local names he gives (Mansion loc. cit.) also suggests that pollarding was widespread and he attributes some pollards to fence pickets that have subsequently grown.

***Tilia* pollard outside a house in the Dordogne**

A wide range of species were found pollarded, an especially large range in the bocage areas. *Fraxinus* was probably the most frequently cut for fodder, *Quercus* and some *Fagus* were the predominant species in the Basques area. (See also notes on pollarding in the Spanish Basque Country).

Pollarding is not now widespread and routine. It seems that there has been a considerable decline in active pollarding in recent years. Some cutting is still being done in Orne, Satre and the Loir area but this seems to be declining. Pollarding in the wood pastures of the Pays Basques area has just about

ceased.

Pollarding does not appear to be done for Nature Conservation reasons in France although there are undoubtedly places that would benefit from this. Dominique and the Maison Botanique are trying to initiate pollarding for an educational/heritage perspective.

There is an active culture of pollarding street trees trees in France, especially *Platanus* and *Tilia* in towns and villages, both along the streets and in the squares. It is also a popular method of generating shade trees for campsites! The trees provide shade and greenery which is especially valuable in southern areas.

Pollarded *Platanus x hispanica* cut to cast shade at a camp site

Generally the sites with pollards are not protected, despite having protected species found in them. The issue of farmland systems and cultural landscapes has been discussed elsewhere in this report (but clearly applies to northern France and the issue of the motorway and *Osmoderma*). It is staggering that neither Sare nor St Pée are protected and that the latter is under threat of destruction by a flood relief scheme. In addition to some key sites being physically under threat many pollards are also threatened because of lack of management.

Pollarding terms

Têtard is the ancient French for a person with a disproportionally large head. It is also the word for a tadpole and the most commonly used word for a pollard. There are numerous more local names however:
Trogne in the Perche region
Échabeille of Ardèche region
Queules of Morvan are oak cut very low to form fences
Many of the names for pollards refer to figures such as têtard, têteau, tronch, trogne, alo, Stève.
The ragosses of Morbihan are shredded trees.
Dominique refers to ‘the civilisation of the trogne’

Terms used in the Pays Basques

Fulare – Standard tree, left to produce acorns
Bas tailles – coppice
Haut taillis – pollard. These could be low or high. A higher pollard was sometimes cut so that the trunk could be felled in the future for large pieces of wood, for construction etc.
Arbes chandelliers – Pollard with a very open structure

Spain

Pollards cut for both fodder and wood were seen in Spain. The fodder pollards were intended very much for local use but some of the extensive areas of wood pollards were cut on an industrial scale.

Aragon region. Gistain Valley – Fodder pollards (with Federico Fillat)

Area around San Juan de Plan

The Gistain valley is the only (or almost the only) place in the Pyrennees where it is possible to see pollarding still taking place. In fact it has declined here considerably recently so very little is now done and it has just about stopped in the last 2-3 years. In the past pollarding of trees for fodder was widespread in the Pyrenean region and a typical part of the farming culture.

The trees, mostly ash, were cut after the hay and before the 20th August. They were still green when cut and were stacked (without any drying) in the trees (or mostly between the tree stems but off the ground). They were made into bundles bound together with hazel twigs (or more recently baler twine!) and then the bundles were stacked neatly onto platforms made of *Fraxinus* poles between the trees. The bundles were always of a weight that can be lifted up with one hand (i.e. less than 11kg, usually around 6-7kg). They were stacked so that the leaf end of the bundles are orientated exactly south wards. Although from the outside these leaves look brown and unappetising, those in the middle of the stacks remain quite green. Unusually black leaves might mean that it was raining when they were cut or that they had been kept for longer than one year. The tops of the stacks were covered with *Corylus* leaves (and recently polythene). Some bundles were also stored inside the barns (we saw some stored upright in a hay barn for goats) for use from February onwards.



***Fraxinus* leaves stacked between live trees (left), a different shape of stack (middle) and a close up showing the cut branches in the stack (right)**

The sheep go up to the high pastures in spring. They come part way down in September and then to the valley bottoms in October. Finally around Christmas time they are brought indoors and remain there until April. The branch bundles seem to have been fed to the sheep either in the fields, where bundles were taken off the stacks and spread in the fields or they were used during the time when the sheep were indoors.

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Dried leaves stored in a barn (left) One of the leaf bundles from the barn held by the Mayor of San Juan de Plan (right)

The leaves were generally fed to the sheep at midday, with hay in the morning and evening. One bundle was given to 3-4 sheep per day. After being fed to the sheep the branches were fed to rabbits and then the dry woody parts were used in fires to singe the hair off pork.

Recent work (20 years ago) by Federico looked at developing this system into a more modern version by using leaves to feed to captive rabbits (the meat of which is used in a local dish like Paella with rabbit meat and rice). They found that the leaves were richer in calcium and magnesium than 'traditional rabbit concentrate' and the rabbits matured around five days earlier, however this new use was not successfull.

A knife with a thin curved blade was used to cut the branches from the trees. Something more like an axe was also used. (We also saw some branches that had been cut using a saw). The trees were cut every 3-4 years, however this was not exact. If necessary, in times when the grazing or hay crop was poor, the trees could be cut every 2 years. Also, if necessary they would climb into the trees and break off the leaves for use fresh.

Although most of the trees cut were *Fraxinus excelsior* we also saw some *Quercus* (various species), *Populus tremula*, other *Populus* species (probably *P. alba*), one *Tilia* and one *Juglans regia*.

The pollards were very much a part of the landscape in the valley but almost all were quite small in size and probably quite young. Many of the trees were felled during the Spanish Civil War when there was high pressure on the land, which explains why there are few older trees. In the Franco era too dams and *Pinus* plantations were the preferred 'land uses'.

View of the Gistain Valley with worked pollards and shreds (left) Worked trees round the edges of the fields (right)

The lower slopes consisted of an enclosed field system in private ownership but the upper areas were communal. These upper pastures (around 1600m) were previously part cultivated for rye, with manure and urine added for fertiliser. Now they are only used for grazing.

The majority of pollards we saw were in the Gistain valley around San Juan de Plan. There were some larger pollards, probably not cut as recently, in the lower part of the valley. There were also pollards in the side valley to the village of Sin.

The pollards in the Gistain valley were largely along the edges of the fields, a few stood in clumps where there was poor grass underneath. They were also found in and around the houses/farms. There must have been several hundred pollards in this valley, ranging from 10-50cm in diameter but there were far fewer in the larger size classes. Hæggström (1998) recorded that the *Fraxinus* trees here grow branches of 250-330cm length in the first year after cutting. The majority of pollards we saw in the valley had been cut in the last 10 years (or less) however few had been cut this summer.

Fraxinus **pollard of a classic shape (left)**

Fraxinus **with multiple 'heads' (right)**

The villagers of San Juan de Plan seemed keen to find sources of employment and a future for the village that is not as commercial as some of the neighbouring villages and that is not based on skiing. They would like to be able to retain the traditional aspects of their culture. However a ski lift and piste is a potential option and a tarmac road link to the Benasque valley (popular with skiers) is being considered. Many young people move away from the valley and there are very few young families in the village of San Juan; there are just 4 children and a considerable proportion of the male population are bachelors with little prospect of marrying. As we saw very few pollards elsewhere in the Pyrennees that had been cut recently (except for street/avenue trees) it is very likely that cutting will also cease in the Gistain valley unless other reasons/incentives are found to retain it. Subsidies are paid to Spanish farmers here for three reasons: to farm in the mountains, for farming in a national park and to keep the Pyrenean breeds of cattle/sheep.

Hæggström (1998) also describes the landscape and cultivation in the Gistain valley in more detail. He also mentions pollards cut for fodder in the neighbouring areas of Benasque and south of Ordessa National Park.

Worked trees beside a small meadow, with a log pile nearby (left). Farmer cutting *Corylus* (right)

***Fraxinus* left too many years since last cut (left), *Quercus* pollard with a classic shape (middle), *Quercus* shredded pollard (right)**

Newly started pollards, very small in size (left) Stack of wood in the middle of the village, note the *Fraxinus* pollard behind (middle) *Populus* pollard (right)

Day with Álvaro Aragón Ruano discussing the historical aspects of pollarding in Gipuzkoa county.

Álvaro Aragón Ruano had just finished his Doctoral thesis on the historical management of the forests in Gipuzkoa. He took me to see various trees to illustrate the findings of his work.

We first visited a small group of pollarded oaks on the edge of San Sebastian, next to and in the grounds of the Chillida Leku Museum. Part of the area is military land, is fenced but is not managed in any way. The future of this area is under discussion because of the possibility of building an expanded car park for the museum. (Another alternative is to provide interpretive material about the trees for visitors to the museum).

We also travelled by road to Sare (France), via Olhette and then back into Spain to Vera de Bidasoa. Along the roadside we stopped to look at several trees.

History of pollarding in the Spanish Basque area
Prior to the 15th century, three different types of forests were needed in the region, one to grow wood for charcoal, one to grow wood for ships and one to graze the animals in.

Charcoal wood was probably mostly obtained from coppicing while timber came from clear-cut woodland and did not need to be any particular shape or size. Wood for ship building had very different requirements. Large planks were needed, Y shaped planks and also special curved pieces.

During the 16th and 17th centuries the forest use became very intensive and there were many conflicts which resulted in an increased use of pollards as recently coppiced woodlands could not be grazed.

A high demand for charcoal in Gipuzkoa developed due to the iron foundries. The foundries were usually in mountainous areas close to forests (for charcoal) and streams for water. At one stage there were 40-50 foundaries in the province. As the wood used for charcoal making and that needed for ship building was very different the normal pollards were unable to satisfy the two types of need. To solve this problem the Spanish crown decided to regulate the forests (most were managed by the town councils) and promote a new method of pollarding. The new method involved growing branches horizontally from the point of cutting that then bent upwards to obtain the curved ribs. 1601 is the first mention of the necessity to ‘guiar los desmochos’ by the Superintendent of the Naval factory however the term trasmocho was not generally used until the 17th century.

The increased use of pollard management and the new system of cutting the pollards enabled all three types of land use to be carried out in the same place. Alongside these changes in land management was a population expansion and thus more intensive land use in general was necessary. The Basques became the leaders in ship building at this time and ships were exported to many different countries. They also had iron and were able to trade with America, at home the agriculture also intensified.

Alvaro previously thought that the writings referred to these new shaped pollards as trasmochos, as opposed to the pollarding solely for charcoal or fuel wood referred to as desmochos. Since my visit he has found more historical papers which suggest that desmochos and trasmochos are two names for the same type of cut trees, but the shaped pollards can be referred to as guiados.

Wood needed for ship building

Various curved pieces of wood were needed, called corbatones. The Y shape is especially important; this is used in the narrowest part of the bottom of the boat. Two joined pieces of wood can be used for this but a single piece is much stronger.

Pollarded *Quercus* with a good example of a Y shaped branch good for ship building high in the canopy (San Sebastian) (left)
Y shaped planks for ship building (and curved planks on the floor) (right)

The curved parts are obtained from the curved branches or from the place where the branches join to the trunk of the tree (so the wood includes both part of the branch and part of the trunk). Shaped pieces of wood from trees such as these were first obtained in the 15th century. The practice spread until by the 17th century it was widespread. In this period war ships were needed and then merchant ships to sail to India. Ship building also required long logs as masts, but these generally came from large coniferous trees grown in the Pyrenees.

There are no mentions of pollards in written documents prior to the 15th century. In 1498 the techniques were described; in 1548 the Government of the Province of Gipuzkoa ordered pollards to be made.

The methods of pollarding

The trees were pollarded from 3m upwards as the animals grazing underneath were cattle and horses. Pigs could be turned out to feed on the acorns from the 28th September. Typically the areas with pollards contained a mixture of different shaped trees and grazing land underneath. There were two types of pollard:

Guiados – These were the carefully shaped trees intended for ship building. At the top of the bolling two or more branches were encouraged to grow horizontally by

hanging weights from them. Cutting needed to be careful, it was necessary to avoid creating the right shape for a pool of water to collect at the top of the bolling as this would generate decay and the wood would not be strong and reliable for the ships. The cuts were therefore carefully angled. When the trees were needed for the wood they were felled completely, usually at 70 to 100 years. The waste wood (i.e. that not needed for ship building) was used for charcoal. These were valuable trees, but each tree was a 'one off' long term investment. Thus all the trees we see today with these shapes are those that were never used.

The branches were said to be 'guided' to make 'ipinabar' (literally 'put branches') and they consisted of 'horca y pendón'. The horizontal branch was the horca and the vertical the pendón. The horca and pendón were cut when they were 5 'codos' above the ground (1 codo is equivalent to 55.7cm so 5 codos were 278.5cm). This 3m high start to the branching prevented the animals from eating the branches. After 40 years or so the trees produced the special curved branches for ship building, the 'corbatones'. Cutting/shaping of the guiados were done every 10-12 years for *Quercus* and 5-6 years for *Fagus* to obtain wood for fuel or charcoal while still promoting the shape of the tree. Guiados trees were cut between 20 February and 25 March and in exceptional circumstances they were cut in November or December too.

Trasmocho or desmocho – These were the trees cut just for charcoal on a regular basis every 10 to 12 years. It was not so necessary to be careful with the cutting of these and they were more like 'normal' pollards with a single head to the bolling. Probably all the branches were removed at a single cut, it is not known if a sap riser was left. They were cut between the day of San Miguel (19 September) and 25 February with charcoal cutting largely done in February and March. Trasmocho/desmocho trees were important because they 'lasted for ever' as opposed to the guiados. Thus they provided produce that was lower in value but more continuous. They also provided fodder for the animals continuously.

By the 18th century the word desmocho become obsolete and today the only word in regular use is trasmocho, which is applied to other species of tree as well as *Quercus*.)

A trasmocho or desmocho (the tree on the left next to the litter bin) and a guiado (the tree on the far right - Sare) (left)
A very old guiado *Quercus* tree (Sare) with Alvaro Aragon left and Juan Alberdi centre (right)

Guiado cutting of *Quercus* trees (Sare)

In the 15th Century is the first mention in documents of a saw being used (it was probably in use before this but not written down). However, saws were probably only used for planking wood. Axes, machetes and knives were used for cutting the trees. An adze was also used for hollowing out wooded pieces.

Cutting of *Quercus* was always done as the moon decreases. The reason for this is that the sap is in the roots at this time. The wood is generally drier, and lasts for longer. For ship building the wood was dried by immersion in salt water and this process was quicker if the trees were cut in a waning moon. (Planting is done on an increasing moon as the sap is rising and the tree is strong.)

As well as curved pieces, straight planks of *Quercus* wood were needed. These were gained from 'robles bravos'. The side branches of these trees were repeatedly trimmed (every 10 or more years) so the trunk grew straight. The leaves were used as fodder for animals and also as fertiliser. The trees were felled between 60-100 years of age.

Start of the use of *Fagus* wood

Until the 18th century *Quercus* was definitely the most important wood for charcoal as it burns at a high temperature. *Fagus* wood was not as good and it was also not as good for ship building. However, when the *Quercus* started to get rare *Fagus* was used instead. *Quercus* grows to an altitude of about 6-700m in the Basque lands and this lower lying land is productive for farming and also in demand for development. Oaks were also important trees because, as they grew close to farms and factories, the wood products did not have to be transported so far (which was costly when using horses and carts). *Quercus* is still considered a 'sacred' tree to the Basque people but out of necessity *Fagus* started to be used instead for both ship building and charcoal. *Fagus* grows at higher altitudes, thus on land that is less useful for other purposes but this is also further from the point of need, requiring higher transportation costs.

In the 16th to 18th centuries the majority of planted trees in Gipuzkoa were *Quercus* or *Castanea sativa*. By the mid 18th century *Fagus* was being planted as the only available land was the higher parts where *Quercus* would not grow.

Boat building - visit to ship yard in Pasai Donibane

Quercus is good wood for boats as it only absorbs a certain amount of water. *Alnus* is not good as it soaks up too much and becomes very heavy. *Fagus* is suitable if it is completely submerged but it does not withstand repeated wetting and drying.

The frames of the boats made in the ship yard are *Quercus* and the planks for the sides *Pinus*. The rollocks are now *Robinia pseudo-accacia* (probably they were *Quercus* originally). The boat being planned is a galleon, a copy of one that sank off New Foundland, and that boat had a keel of *Fagus* wood. The large pulleys were made of *Fagus* and also barrels. There were a few *Quercus suber* trees in the area close to San Sebastian. The cork from these trees was used to make fishing floats and also soles for shoes.

Oars for the boats were made from *Fagus* wood or sometimes *Fraxinus*. A long straight pole was required as the oar is made from a single piece. Much of the *Fagus* wood for oars came from Leitza and was cut from pollarded trees.

The frame of a copy of a traditional Basque boat (above) The Y shaped pieces of wood are used at the base of the boat at the front

At the back of the boat a curved piece of wood was needed (right)

Examples of boat oars (above)

The decline of the pollarding system

Cutting for ship building ceased about 1850 (ship building with wood did continue but smaller boats were made and the wood mostly imported) and for charcoal about 1880. Most pollarding and coppicing ceased in the 19th century and many of the communal forests were sold to private owners and there was substantial loss of forest. Maize growing increased and this required high levels of fertiliser. This was especially marked in Guipuzkoa and Biscay but rather less so in Navarra where common land is more abundant.

During the 20th century firewood was replaced by other sources of fuel. Wood is still used in farms and rural areas but there are usually plenty of trees that have fallen so there is no need to pollard now.

Charcoal makers persisted into the 20th century but these probably did not need to pollard trees much either.

Bosque del Irati – Beech pollards cut for wood/charcoal

Between Orbaitzeta and Embalse de Irabiako

We did not meet anyone here except a ranger who was manning an information hut. He gave us a leaflet about the area, which did not mention the pollards at all, despite the fact that the car park is right in the middle of many large pollards and it is clearly where the visitors stop. It was one of the few places visited that had a ranger on site and literature to pick up.

The pollards were all *Fagus sylvaticus* and are very similar to those in Burnham Beeches. The area with the pollards is probably fairly small as we drove out of them quite quickly along the road. I had visited this place a few years ago with the Ancient Tree Forum. We were able to stay longer at that time and walked well off the road where there were more pollards.

None of the trees show any signs of being cut recently except for the clearing away of trees that have fallen recently.

Pollarded *Fagus* (left)
The area is grazed with ponies (above right)

Some of the trees are obviously tiny remnants of past larger pollards (below left)

A tree recently fallen and almost entirely cleared away Right)

Navarra, wodland belonging to Leitza Commune

Day with Jose Miguel Elosegui, Arturo Elosegi and Migel Mari Elosegi

Leitza is in the province of Navarra, at an altitude of about 700m and with both calcareous and siliceous soils. This area receives 2500mm of rain each year and is the wettest place in Spain. The area we visited was communal land belonging to the village and has no protection.

41 native species of tree were found in the area of the village, most of the woodland was *Quercus robur* and *Fagus sylvatica*. We saw *Fraxinus excelsior* pollarded for fodder and *Fagus sylvatica* pollarded for wood to make charcoal. Much of the land is wood pasture and the villagers have the rights to graze with semi wild cattle, there are a few horses but not as many as in other areas. (There are also pigs turned out now but it is not clear if this is actually allowed). The *Fraxinus* pollards were in pasture and hay meadow grazed by sheep.

Pigs in the woodland

Pollard management

Fraxinus pollards

The *Fraxinus* trees are still cut in the traditional way, every two years removing all the branches. The smaller branches are tied into bundles, dried and stored in barns to feed to the sheep in the winter. In the past there were many small barns for the leaves dotted up the hillsides as the leaves were very bulky to store. The larger poles were used as bean poles. The trees are cut in September, prior to leaf abscission. Cutting was done with a small axe, cuts seen were a few centimetres above previous cuts.

Fraxinus pollards were seen round the edges of fields and close to the buildings. Small groups of buildings on the hill sides usually consisted of a barn for the sheep with a hay loft above from which the hay can be dropped down to fill the hay racks round the edge. The shepherd stayed in a smaller stone hut. The roofs were traditionally stone and not tile. Tiles signified private ownership but these buildings were on common land and were therefore not actually owned by the shepherd. A small piece of tile was often placed along the boundaries of private land to signify ownership and not common land. Above the door of the barns were placed small crosses of *Crategus monogyna* twigs with a leaf of *Laurus nobilis* threaded through the cross piece to protect from lightening strikes.

Fraxinus pollards were seen widely in the area around Leitza and are clearly still being cut regularly.

Recently cut *Fraxinus* pollards close to farm buildings

Pollards round field edges (left) Dried *Fraxinus* leaves in a barn (right)

Bracken was cut from the hillsides for animal bedding. Huge areas were cut by hand using sickles. Now cutting is done with machines but only the more accessible areas so there are many places where it is not now cut. Cutting of bracken is done from August onwards. Bracken was previously stacked up like hay in stooks. Now much is baled in large round bales.

***Pteridium aquilinum* cut and stacked**

Woodland management

Judging by old place names and the location of old shepherd's huts deep in the woods it is likely that the land was not tree'd 400 years ago and was pasture. At some point it was planted, with *Quercus* being favoured over *Fagus*.

Wood from both *Fagus* and *Quercus* was used to make charcoal. *Quercus* was coppiced and both *Fagus* and *Quercus* wood was also gained from various other woodland practices. There was a lot of iron found locally and also a great deal of water so there were 5 iron foundries in the area in the 17th century, charcoal from the trees was used as fuel in the foundaries but also as fuel wood for local people. *Quercus* was favoured, but the *Fagus* grew well so *Quercus* had to be continually planted to keep it in abundance. However, in recent years the *Fagus* is gaining in abundance to the detriment of the *Quercus*. As well as doing better on the north facing slopes it survives under the *Quercus* trees and gradually takes over. The *Quercus* does better on the south, dry and stony areas.

Traditionally there were tree nurseries to provide the replacement trees and these nurseries were enclosed by stone walls. As by law it was necessary to plant 10 trees for every one felled the nurseries were very important. Those felling the trees had to buy young ones from the nurseries and they often fell greatly into debt as they had to buy so many trees. These debts were retained across generations and for hundreds of years until in the 1860's and 1870's when much common land was sold in order to pay the families of those that had been nursery men. As a result there was a tremendous loss of common land at that time.

Today the Government Forest Service marks the trees that can be felled or removed. Often they are trees that have already fallen. The villagers can then come and collect the wood. Trees marked for felling are done so using a slash at the base of the tree that is imprinted with a special mark from the heel of the axe. This ensures that only true foresters mark the trees. When felled the mark must be removed with the trunk, which ensures that the stumps are low. Permission must be granted to fell trees in gardens and they must be marked in the same way.

Felling axe with Forest Service mark (left)
Mark on the base of a tree (this tree was not felled and the mark is healing over (right)

Comments from Batista (previously a charcoal maker)

Species with round leaves, such as *Fagus*, *Alnus* and *Betula* should be cut with the rising moon at any time of the year but preferably in the winter (when without leaves). Lobed and pointed leaves, such as *Quercus*, *Fraxinus* and *Castanea*, should be cut with the waning moon.

Batista started making charcoal and cutting the trees when he was 12 years old. The charcoal was needed all year round so they had to cut the trees all year round. The size of the branches cut was not too important and sometimes whole trees were felled. He had cut branches from *Fagus* pollards in a variety of different sizes. The trees needed to be pollarded because of the cattle grazing underneath. A log was put against the tree for the woodman to stand on to do the cutting. When creating a *Fagus* pollard it should always cut above some branches, either a whorl or two. Ideally a new pollard should be started when it is not too big otherwise it does not heal up well. At subsequent cuts some branches were always left on the beech trees. A tree was probably returned to every 20 years (other local charcoal makes say every 50 years).

Creating a *Fagus* pollard with an axe

Cutting was always done with an axe. Even as late as 1900 wood cutting was done here using axes and not saws as saws were too expensive. Grass cutting was done with a sickle and not a scythe for the same reason.

(It was pointed out that at least towards the end of the time that Batista was cutting the trees for charcoal the pressure on the forests was not very great, therefore it was probably not necessary for them to be too fussy about how they cut the trees. In the past when there were many more people living in the forest everything had to co-exist and there might have been more organised ways of doing some of the work. They might also have gained more wood from the pollards whereas Batista used maiden trees too.)

The large *Fagus* pollards were of a similar size to those in Burnham Beeches but were thought probably to be younger in age. If the forest only existed for the last 400 years perhaps the beech pollards predate the forest (as they are at the tops of the forest on the interface with the pasture?). The trees must grow well in the moist warm climate and most also looked quite vigorous.

Large *Fagus* pollards

Charcoal hearths could contain wood from a mixture of tree species. One was made 6-7 years ago as a demonstration; it was 14m in diameter and burned for 1 month.

Axes are clearly a part of the Basque culture. Axe cutting competitions are common in the towns and villages and although the forest service use chainsaws they clearly also use axes. It is thought that the chainsaws have a greater chance of transmitting diseases between trees than an axe and there are problems of disease in *Castanea sativa*.

Felling a *Tilia* limb with an axe

The *Fagus* trees are not pollarded currently and have not been cut for many years. It seems unlikely that they will be managed in the future*.

'Arboretum'
We also visited a small fenced area of 2.5hectares. This had been a tree nursery and planted in it was a stand of *Abies alba*. These trees were now very large and old and were due to be felled recently. Jose Miguel persuaded the Mayor to retain the trees and to turn it into a small 'arboretum' with all the trees native to Leitza in it. Small clearings have been made and groups of each species planted. Attempts have been made to use local stock and also appropriate stock (i.e. small growing forms). Thinning is planned in the future. All the planted trees are labelled.

Stand of old *Abies alba* (left)
Newly planted *Tilia* trees with their label (right)

Finally we saw the remnants of a giant oak that fell in 1888. A family group photographs was taken round the tree in 1897 and repeated 100 years later. An young oak was planted on the same spot but felled at some point so a new one was planted on the 100 year anniversary.

Young *Quercus* planted to replace the giant one that fell in 1888

Axes are clearly part of the local culture and young foresters are happy/keen to use them. Some of the beech pollards seen seem to have been cut many times in the past, although appearing of a similar size to those in Burnham Beeches they are (judging by ring counts) rather younger. A 20-50 year cycle appears longer than most cutting cycles mentioned for beech in the U.K.

Aiako Harria Natural Park and Natura 2000 area in Gipuzkoa close to Oiartzun – *Fagus* pollards cut for charcoal
Day with Inaki Aizpuru

In Aiako Harria Natural Park, I visited two places on the GI 3633, (road south of Oiartzun), Oianleku just north of Alto Bianditz and Artikutza just beyond the closed off road at the end of GI 3633, south of Alto de Bianditz.

The Natural Park is 7,000 hectares, has a granite bedrock and being a Natural Park is protected and managed by the Local Government. 80% is communal land owned by the commune of Oiartzun. It is a Natura 2000 site. There are nine Guardians of the Natural Park and they cover both Aiako Harria and Artikutza (10,000ha). They work for the forest service of Gipuzkoa.

In the 10,000 hectares managed by the Gipuzkoa forestry service there are roughly 6,000 sheep (most owned by 4-5 commercial farmers and the rest by many hobby farmers) and 3-4,000 cattle and horses. (In fact as the 2,700 hectares of Artiktza is technically fenced off the density of animals is higher).

Oianleku
The area was mostly south facing but there were *Fagus* pollards on some north facing slopes too. The land has been communal grazing land for many centuries. The *Fagus sylvatica* trees were pollarded for charcoal.

The majority of area is grazed by sheep and ponies and looks tightly grazed. A 20 hectare exclosure was fenced off from the animals two years ago (i.e. 2001) to get some tree regeneration. *Fagus* fruits here approximately every two years (but not in 2003 as it has been so dry) so there is not yet much regeneration to be seen. The old trees do produce fruit. The lack of any young trees here was quite remarkable.

View of the Oianleku from the south (above) *Fagus* pollards extend from the foreground to the top of the hill in the middle distance. *Fagus* pollards with pasture underneath (right)

Pollard management
The trees were pollarded regularly for charcoal production to feed the iron smelters. They were planted in the more accessible areas and some did look to be in rough lines

and the spacing was very even. In the more difficult areas the trees were almost certainly natural woodland.

The trees were last pollarded about 50 years ago. They have not been pollarded recently and there has been no management of the older trees. There were generally more concerns about the lack of young trees than the state of health of the old ones. A few young trees have been planted, but in the majority of the area regeneration is unlikely while the grazing pressure is high. Dead/fallen wood was said to be left '*in situ*' but there was a remarkable lack of it! – Probably most is taken away for fire wood.

How many pollards? There were said to be thousands! - At least too many to count. About 800 hectares of land has *Fagus* pollards on it just like the area we visited (and that was just on one side of the mountain). The pollards did vary a little in size but there were no young ones. Some of these trees could be pollarded again quite easily, others would be more difficult. However, if not done soon all will be much more difficult in the future.

The trees were thought to be quite young as the growing conditions here are very good (wet and mild). The largest of the pollards was thought by Iñaki to be about 120 years. It looked similar to our 400 year old trees and judging by the size of the 80 year old beech trees in the Artikutza area this may be an under-estimate although they do appear to be younger than similar sized trees in Britain.

Some of the recently planted trees are currently 10-12 years old and would be an ideal size for pollarding from a British perspective. Iñaki said they must be too small as they would not yield enough wood if cut at this size – fair point!

Fagus pollards in enclosure to keep grazing animals out to encourage regeneration (above left)

New _Fagus_ plantings (above right)

Older _Fagus_ pollard (below left)

Artikutza

Adjacent to Oianleku is Artikutza, a large basin with *Fagus* on the south facing slopes and *Quercus* on the north facing. Although technically part of Navarra this area is owned by San Sebastian city and managed along with Aiako Harria National Park by the forestry service of Gipuzkoa. It is 3,700 hectares in size.

In about 1200 the land was owned by the church and areas of roundels or squares were clearly marked out where people were able to cut the trees to make charcoal on payment of a fee. In around 1840 there was an increased need for charcoal for the iron foundries (there were three just in the area of the basin) and the cutting of the trees and the charcoal making became much more commercial and intensive.

In 1950 the basin was protected as a water catchment area for San Sebastian and the coastal towns (this was an unusually strong protection for the Basque region). 80 years ago it was enclosed by a fence (32km long) and grazing was prohibited. In fact the fence is 'porous' but the grazing pressure is clearly lower than the surrounding area.

Old charcoal hearth, there are large numbers of these throughout the woodland

The main tree species pollarded were *Fagus sylvaticus* and *Quercus robur*. The *Quercus* was also pollarded for charcoal but the *Fagus* was considered better for this. In some places the *Quercus* was pollarded for ship building (?here) but the *Fagus* was not cut for this reason. Other tree species were *Castanea sativa*, *Ulmus glabra*, *Corylus avellana* and *Prunus avium*. Also *Quercus rubra*, *Larix japonica* and *Pinus radiata* in plantations. The future of *Castanea sativa* is bleak here as they suffer from a *Phytophthora* disease.

There are various notable species found including the plant *Soldanella villosa* (Primula family), the Pyrenean Desmid, European mink and the beetles *Lucanus cervus*, *Osmoderma ermita* (in *Fagus* trees).

Currently the vegetation types are *Fagus* woodland 30% (1,135ha), *Quercus robur* woodland 20% (500ha) and open land (mostly the tops of the mountains) 14%. The remaining area is plantation woodland and *Alnus glutinosa* dominated wet woodland. Potentially when the exotic species are removed there will be 50% *Fagus* and 28% *Quercus*. In fact the amount of *Fagus* dominated woodland at the moment is probably larger then 30%. (Almost) all of the *Fagus* and *Quercus* woodland has pollards in it although the density is variable. In the past (almost) all the area consisted of only pollarded trees.

Apart from very light grazing (mostly with cattle and ponies) the ground vegetation is not managed. Dead/fallen wood largely remains '*in situ*'. In the past some was

removed to San Sebastian for use by institutions but now none is removed. There was much more dead wood standing and lying here than in Aiako Harria.

Cattle grazing in the woodland (above)
Standing dead pollard left in place (right)

Pollard management

Historically the trees were pollarded intensively for charcoal production and they were probably cut every 15 years. There are large numbers of charcoal hearths in the woodland so the need for wood must have been very high. There has been no pollarding for the last 80 years.

The old pollards here will eventually die from being top heavy and being shaded out by the younger beech trees and this process is clearly visible. The exclusion of grazing and encouragement of regeneration of *Fagus* (and other native species) is to make the area into a natural forest, with natural processes.

In some areas the *Fagus* pollards were still in large numbers (left)

Old *Fagus* pollards in dense woodland are dying through lack of light

Visitors

The area has marked trails and open access, however there is no vehicular access and cars must park

just past the Alto de Biandiz. There are frequent visitors in the summer and autumn for mushroom picking and it can be popular on Sundays but the numbers are usually in the tens rather than hundreds each day.

Interpretation is provided in the form of panels showing rare species and various details about the area. The panels were notable in not mentioning pollarding at all! The notable species also lacked any invertebrate or fungal examples.

On the lower slopes were *Quercus* pollards too (left)

Information panel. The picture of the dead pollard describes it as a 'living sculpture' but no mention is made of why these trees are the shape they are (right)

Take home messages from both Oianleku and Artikutza

The similarity of this area to Burnham Beeches was striking. Oianleku was like visiting Burnham Beeches about 80-100 years ago. The density of trees was very high, the ground grazed tightly giving it a park like atmosphere and there was very little dead wood. Artikutza was more like Burnham Beeches today. The high density of younger *Fagus* trees was clearly shading out the older pollards, already vulnerable under the increased weight of their branches. The reasoning behind the exclosure of the stock and non management of the trees here can be easily understood by looking at Oianleku which is presumably what Artikutza was like 80 years ago. In the context of the surrounding countyside this area is an important 'natural' reserve for many species. Many of the old *Fagus* pollards here were in a poorer state of condition than those in the Beeches and most would probably not respond to any work anyway. Doing some minor clearance work round a few trees if possible might be of benefit. Another consideration is the amount of open land (in the form of clearings) within the woodland. There were a few but only a few and mostly the result of clear felling exotic species or close to human habitation. (However, in a British context we would probably be more old tree focused and more interventionist).

There obviously is some grazing in Artikutza (we saw two ponies and four cows during our visit) this sort of level is probably quite good and better than total exclosure.

If the long-term plan for areas such as Oianleku is either total exclusion of stock or continuation of grazing with no plans to do any work on the trees I think this would

be a shame. Pollarded trees are an important part of the cultural landscape, they are indicators of past management and form a very characteristic scenery. This type of scenery must have been what much of Gipuzkoa and northern Navarra looked like only a relatively short time ago. Also, they live longer than maiden trees and this is an important fact that has not been grasped in many different countries. Despite the good growing conditions I believe some of these trees must be older than 120 years. Replacing these pollards with standard beech trees will in the long run result in a different appearance to the woodland and also a drop in age class. There will inevitably be short term increase in the amount of decaying wood followed by a decline and the woodland will also be denser and darker. While it is true that when the trees were cut for charcoal huge quantities of wood was removed but there must also have been much decaying wood in the trees that were still growing. Many specialist invertebrates need this.

There is considerable concern over the lack of regeneration of beech here and rightly so in terms of the continuity of the woodland. But by looking at Artikutzu the results of 'too much' regeneration can bee seen. This new growth is killing off the old pollards quicker than in Oianleku. Some sort of happy medium is clearly needed, some suggestions might be:

- Having exclosures for a time but then letting the stock back in after a few years to thin the trees – thus developing open grown *Fagus* trees that in the long term will replace the pollards.
- Ensuring that the small twigs of any fallen/felled trees are retained on the ground. This may provide a protected place for seedings to regenerate out of reach of grazing animals. Likewise any prickly/unpalatable species could be encouraged in some areas for the same reason. This might reduce some of the grazing area but would probably be compensated for by variety of browse.
- Creating new pollarded trees (and having a commitment to pollarding in the future), either from natural regeneration or planted trees.
- Considering pollarding some of the older trees again while it is still possible.

Ideally a mixture of all these options could be carried out (not necessarily in the same area!)

I appreciate that the pollarding aspect might seem like 'gardening' and that with the area/number of trees it is not possible to repeat anything like the scale that was carried out in previous centuries but, without any pollarding the aspect of these sites will change dramatically in future years. In 200 years time they will be like the majority of the British sites where we have just remnants of a previous landscape. Areas that had dense pollard growth will just have a tiny number of such trees. This means a loss in culture but it also potentially means a loss of biodiversity.

In this area there is tremendous potential for a wonderful mosaic landscape of grazed wood-pasture. Incorporating all the important elements of the past management with small changes to benefit the conservation value.

The number of pollarded beech (and to a lesser extent oak) trees in this region of Spain is just incredible. One of the problems is that they are so common that they are not viewed as anything special. As with many such situations something is not really valued until it is lost. Certainly in England 100 years ago pollards in high densities

were generally not considered important or valuable and many were felled or lost in the face of development, lack of management or just non realisation of their importance. Even as recently as 20 years ago old pollards were being felled on nature reserves. In Spain there is the potential to avoid making the same mistakes we have made in England. At the moment there is still plenty of potential to continue managing some pollards with only a short lapse since their last cut for charcoal or domestic use. This opportunity should be taken, future generations will be thankful!

Also to be taken into consideration is the importance of protecting some areas with active management as something similar to the Swedish 'cultural reserves'. A major future source of income to this region is tourism and interpreting cultural landscapes for visitors could be a major part of this.

* This situation has changed. As a result of my visit pollarding of old beech pollards has started again with a few trees cut each year and the wood used by local people.

Sierra Urbassa Natural Park, Navarra.

I was shown round by:
Karmele Areta (in charge of authorising the forestry in the Park – but a short term post)
A ranger
D. Champion – A biologist that is under contract to the Natural Park working for a company that is to some extend controlled by the Navarra? Government.
Iñaki Recalde – An amateur coleopterist who was largely acting as translator.
Kiko Alvares – The Park Director

The calcareous plateau of Sierra Urbassa is situated west of Pamplona and is 21,000 hectares in size, including (7,000 hectares of grassland). It is a Natural Park and proposed Natura 2000 site (for three different beech woodland types). It is common land and any inhabitant of Navarra has the right to graze their animals here and to collect wood. The southern part is owned by the inhabitants of the villages nearby, they have the rights in this area and receive any money obtained from the sale of firewood from this area. No hunting is allowed in the Park and that was a very controversial decision! There are four full time staff (rangers) who look after Sierra Andia as well as Sierra Urbassa. In addition there are 16 additional summer staff to man the information points and look after visitors.

View from the plateau

For many centuries Urbassa was owned by the monarchy, first the King of Navarra and then the King of Spain. There are pollarded *Fagus sylvaticus*, and a few *Acer campestre*, (there are some large trees but they are not said to have been pollarded as the wood is not good for splitting- although their shape suggests they have been pollarded). In addition there are *Crategus monogyna* and *C. laevigata*, some *Quercus* spp. trees, and in the past there were a wider range of species (e.g. *Fraxinus*). The *Fagus* were selected for.

The pasture is grazed with 45,000 sheep, 35,000 cattle, 28,000 horses and 90 pigs (and 3 donkeys!). The horses are bred for eating, most go to Italy and a smaller number to France. There are three different types of grazing regimes:

- A small number of animals are present all year (this number is increasing due to the milder winters)
- A large number of animals are summer grazed and spend the winters in the villages
- The final group are animals that pass through in the spring and autumn on their way to and from the north and south. Some people in the Pyrenees have the right to graze here at these times.

There are 320 different 'farmers' and the number of animals cannot be limited or controlled because it is traditional to graze. There is currently a conflict as the authorities want to authorise more all year round grazing but the staff do not want this as they think the grass needs some time each year to recover. Overall the number of animals is not increasing but the grazing season is extending. The chemicals for controlling parasites on the stock are provided by the Natural Park and have to be administered is special areas. (I think this might just apply to sheep dips (or 'showers') not internal parasites).

Plateau area grazed with sheep and ponies, pollarded *Fagus* are in the background.

Management of standard trees

The final cut of beech standards is done at 150 years of age. The trees are in blocks and several thinnings are made prior to this. At the final cut 10 trees good quality trees per hectare are left just for a few years to seed and start the natural regeneration. When there is a good crop of young trees coming on these are felled. 10,000m^3 of wood was authorised to be cut last year but in fact only 3,000 was actually felled. In the southern part 6,000m^3 was authorised as this is a more productive area. Here in recent years the villagers have become more concerned about the woodland and so have put more consideration into where and what is felled each year, rather than the *ad hoc* system that had been taking place. Until 1982 some trees were felled for railway sleepers

The aim is for 20m^3 per hectare of dead wood to be retained. At the moment there are various studies going on to try to see what is optimum for this type of forest (I am not clear if this is for the standard *Fagus* forest or the whole area.) In reality the need for firewood is dropping so the target of 20m^3 should become easier to reach.

Pollard management

In the past *Fagus* trees close to the farms were pollarded. There are just six farms on the plateau (and these will probably not continue to be farmed into the future as there are no young people to take them over). The pollards were cut just to supply firewood and building material for the farms. *Fagus* was traditionally cut for charcoal here but from coppiced trees.

It has been a long time since the trees were last pollarded because, although the farms still use firewood, for a long time now they have obtained it as green wood from the clear fell areas. It is not known how many old pollards there are, or how old they are or seemingly anything about the

historical management of them. No cutting of pollards has taken place for many years. Dead and fallen branches can be removed.

Old and probably pollarded *Corylus avellana* (right)
Old and possibly pollarded *Acer campestre* (below)

Pollards are only felled for safety reasons or if they interfere with electric cables etc. If they are cut for safety reasons usually just the branches are cut and the trunk is retained. Dead/dry pollards can also be taken as firewood, however, the National Park Rangers can mark recently fallen wood, or standing pollards that are dead or near dying and then they cannot be taken. However, dead trees/wood near to the roads are often taken at times when the rangers are not about even if they have been marked!

Fallen branches marked to prevent them from being removed for firewood

Tree regeneration and the next generation of pollards

There is clearly concern over the lack of tree regeneration and this was being addressed by fencing areas from grazing and then planting young trees (of local provenance). The holes for the new trees were dug with a tractor and there did not seem to have been much consideration about where the holes were placed except for being evenly spaced. Some were right under the canopy of the old trees. Some *Fraxinus* were planted in amongst *Fagus*. Would it not be better to wait for a short time to see if there was any natural regeneration? Perhaps a few smaller clumps plantings of similar species and or deterring grazing by less stark methods than putting up fences might be better?

Freshly dug holes for new trees within an exclosure. Some of the holes were very close to the remnant of the old *Fagus* tree.

We had long discussions about tree safety, doing work within the canopy of the old trees and creating new pollards and cutting old ones again. There is clearly a desire by the biologists for a slight shift in emphasis of management. The foresters did seem reasonably open for discussions but over the years that members of the Ancient Tree Forum have visited Sierra Urbassa there appears to have been no shift towards more sympathetic tree management.

Safety of visitors is of concern as the old trees are shedding limbs

There is a small amount of literature for visitors and some display boards at various places (and an information centre but I did not visit). Nothing seems to mention the pollards.

Ermita de Aitxiber (with Iñaki Recalde) – *Quercus robur* pollards

The area surrounding the Ermita (north of Alsasua) is a owned by the local commune, and is a popular place for walking. It is a valley bottom with *Q. robur* pollards and is quite unusual as most similar areas have either been built on or cultivated. It has no protection.

The ground flora was presumably previously pasture. Now the area is clearly used a great deal by local people for recreation. The access road through it was being widened while I was there although it is not clear why. New trees were being planted in most of the available open spaces, some very close to existing trees and some were *Q. rubra*.

***Quercus* pollards at Ermita de Aitxiber**

***Quercus* pollards at Ermita de Aitxiber**

Goñi (with Iñaki Recalde) – Very rough mountain pasture

The village of Goni is in Sierra de Andia on the north side of the road running out of the village was an area of stony ground owned by the commune. It has no designation or protection despite Iñaki submitting a species list of rare coleoptera and requesting it to be considered as a Natura 2000 site.

Quercus pubescens pollard (almost in the dark!)

The land is communal pasture for the village grazed with cattle and with pollarded *Quercus pubescens* as well as various other trees including prickly shrubs.

The *Quercus* were probably pollarded in the past but showed no sign of recent management.

Orgi

Orgi is on the edge of Lizaso village, north of Pamplona in Narrava Province. It is 80 hectares in size and a small part of a much larger Natura 2000 site. It is owned by Lizaso village and managed by a small company as a 'country park' on their behalf.

For many years it was used as common land by the people of Lizaso. In 1980s there were two proposals, one to fell it and the other to protect it. Finally in 1996 it was protected. The labour Government of Navarra at that time proposed to set up a network of places equivalent to the English county parks and Orgi was the first.

Unfortunately an incoming Conservative Government abolished the scheme so no others followed, however there is a commitment to fund Orgi for 30 years; it is now very popular and it is hoped that the funding will continue.

There are two parts to the site separated by a busy road. Currently only half has been made accessible to the public. The other part is currently unmanaged although it does contain some ancient *Quercus* pollards and future management aims to consider these and perhaps start some new pollards. The description below relates to the accessible part.

Old *Quercus* tree in the less accessible part of Orgi

There are some *Quercus* pollards and a variety of other trees and shrubs (also *Quercus rubra*). It was previously grazed, now small areas are cut. Major scrub clearance was carried out in 1985. It has a good list of invertebrates and a population of agile frogs.

It is managed by a small company who have to bid for the contract. They organise or do all the practical work and carry out ranger duties. Thus they try really hard to do new things and have lots of new ideas every year in their proposal. There are 4 staff, 2 full time and 2 part time (the latter work longer hours in the summer). The initial start up money for the infra structure was from the Navarra Government. Now the village of Lizaso pay the company but most of that money they get themselves from the Navarra Governement. This is not enough to fully pay for all the work done but it is topped up by various means (e.g. log and post card sales).

In 2002 there were 50 000 visitors, in 2003 the numbers were a little lower as it was so hot. People are counted as they enter, they don't have to pay so the numbers are always higher than counted as there is not a person on duty 24 hours every day! 80% of visitors come from Pamplona. About 5-6000 children come every year as school groups and the staff lead them in activities, however, they usually only come for 2 hours.

Visitors on the trail path

The area was worked until the mid 1980's so the majority of the trees are 80-100 years old with the oldest at 250 (across the road the

trees must be more however). The villages get the wood from the *Quercus rubra* when they are felled so they still do get something from the area. Local farmers were asked if they could graze the area but none were keen because of the public being present. There are various areas of *Quercus rubra* and the long term plan is the remove them year by year. Last year contractors were employed to do the work. This year some forestry students will do the work as training thereby saving money. One of the special species locally is the agile frog. New ponds have been created for this and a translocation project is taking place which has been very successful.

The site was unusual for wooded land in the Province as it is flat. Thus there are more opportunities for disability access as well as children. There was a zoning approach to public access with the recreation area in a robust place with car parks, entrance hut, toilets and picnic places. Barbecues were allowed in specific places in this area (except in hot dry summers!) and the wood for making them was sold by Orgi.

The entrance hut was manned on weekends and during the summer. It had information boards on the outside so they are accessible at all times. One set of boards was for current projects or things people can see at the current time of the year. One some tables there were a few other things including a large folder with pictures of the flowers and plants found. These (and a board with leaf colours on) were colour photocopies of the real flowers and plants and were even better than photographs!

There was a well surfaced path enabling visitors to do a trail (with a short cut if they want). The trail has numbered features that relate to a leaflet and also has independent display boards. The path varied in texture with a fine grained surface and mown edges in the open grassy areas and a coarser texture with un mown edges in the wet woodland where people are encouraged to stay on the path. In the wettest areas the path was slightly raised by using railway sleeper type wood along the edges.

At various points there was a board showing the route of the trail and points of interest. These are done as one off's in house and were original art work. This is a conscious decision so they could be updated when replaced if necessary. They were all behind perspex. The panels about features were made very pertinent to the specific point where people are standing, which works very well.

The entrance hut (above)

They had an interesting 'planned' conversation approach. All the staff have researched and prepared information on specific subjects that are relevant to the site/time of year/specific issues etc. Then they either approached someone 'cold' starting with a 'nice weather isn't it' type of conversation starter or approach people they need to talk to in order to ask them e.g. not to pick the plants. After the initial introduction they talk about one of their prepared subjects. The

people they are talking to feel that they have had individual attention but are unaware that it is actually a planned 'meeting'. The down side of this is the length of time it takes to do the preparing.

The folder with photocopies of flowers in (right)

Braille Traile: The idea for this came from USA. It was done because the area was very wet and it was necessary to do some substantial work quite quickly but the funding was lacking. They approached the 'blind society' in Spain who had lots of money and they thought the idea was an excellent one so they funded it. The trail doubles as a blindfold trail for children and also encouraged children to explore it normally. It was called the labyrinth, it twists and turns and there were low seats and places for children to get into. The boards had Braille with writing over the top so sighted people could read the same panels. The pictures were in relief. The panels did not last very well and a continual supply was need to replace them so a new system was being looked at. They have done guided walks along the Braille trail for blind people and have found it works really well and they enjoyed it more than doing the trail on their own.

Agile Frog viewing platform: This was a wheelchair friendly 'hide'. In fact there was nothing to see of the frogs except the pond and some netting around it but in the shelter was information panels about the frogs, explaining what the netting was and also with two posters about the frogs that were copies of those presented at scientific meetings. This worked well to put the site into context. They did have some volunteers but these were biology students or people studying specific species (e.g. invertebrate surveyors, frog person). The next project was to build a bird hide with a feeding station (where this years *Quercus rubra* are to be cleared).

Sign at the entrance of the braille trail (above left). Part of the trail and a seat (above right)

Ramp to agile frog viewing platform (below)

Take home messages

The best example I have seen of an interpreted site. Staff with lots of ideas and enthusiasm and it all looked well cared for and well thought out. (It all is relatively new however).

Picos de Europa

I spent one day spent driving through the Picos but I was unable to talk to anyone about the management either past or current.

From Panes south to La Hermida, high up on the east facing valley side were *Fagus* pollards. They were fairly widely spaced and growing on a very rocky slope with scree. They looked like they had been cut recently.

From La Hermida towards Rionansa (I turned round at about Sobre la peña but also drove the side road to Cicera) there were lots of shredded trees. Most had not been cut in the past couple of years. Some were almost pollards or were shredded pollards. Species included *Fraxinus excelsior*, *Quercus*, *Juglans regia*, *Castanea sativa* and *Populus nigra*. There was a small stand of old pollarded *Castanea*.

Area around Potes there were lots of shredded *Quercus* and *Populus* trees, but close to Potes itself there were not so many trees that looked as if they had been cut recently. Further towards Puerto de San Glorio the trees were more recently worked, especially after La Vega.

***Fagus* pollards high on the valley side (left)**

Shredded *Quercus* tree (above)

Pollarded *Castanea sativa* (left)

Near to Potes there was a *Fraxinus* pollard recently cut with a bladed tool. The branches were strewn about on the ground in the field. Were they cut for summer fodder?

Recently shredded *Fraxinus* with branches on the ground around it (above left) *Fraxinus* pollards around the edges of the fields (above right)

***Populus* shreds (left)**

Between the Embalse de Riaño to Puerto del Pontón *Fagus* was present in abundance along the valley side (east facing). Much of the time it had been worked but some was coppiced and some pollarded. Higher up it was not clear if some had just been snow/wind damaged. It was also difficult to tell how many pollards there were altogether. *Fagus* continued on the north side of Puerto del Pontón, including pollards.

Between Puerto del Pontón and the first tunnel the *Fagus* declined with the drop in altitude and *Quercus* became more abundant within a well grazed, open wood pasture. Cattle were grazing and also ponies. There was a small similar area just north of the tunnel (perhaps linked to the first area). Many of the *Quercus* trees here were outgrown shredded trees.

Grazed wood-pasture with some worked trees (above)
***Fagus* pollard (left)**

At Camporriondi (along the Desfiladero de los Beyos road) there were lots of shredded trees including recently cut ones. Most seemed to be *Fraxinus*, *Quercus* and *Populus*.

Landscape with worked trees

The *Quercus* species in this area may not have all been *robur* or *petraea* as there are various other species found, although all those described above were deciduous. The south facing slopes of the Picos, especially to the south had a different vegetation type with more Mediterranean aspects including *Q. ilex*.

Hæggström (1998) records seeing pollarded *Tilia platyphyllos*, *Fraxinus excelsior*, *Acer pseudoplatanus* and *Juglans regia* in the Picos area around Cordiñanes. Slotte noted that most of the pollarded *Fagus* trees were abandoned in the Picos about 30 years ago (Slotte pers. com).

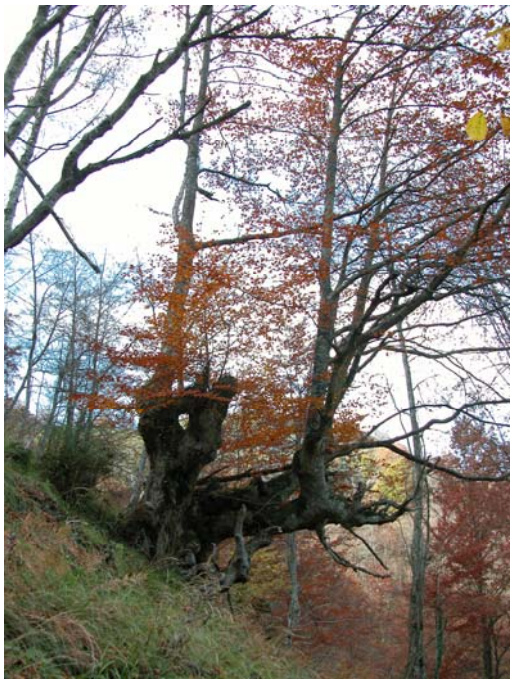
Parque Natural de Somiedo – Asturias – *Fagus* pollards and *Fagus* woodland.

Valley south of Pigüeces – *Fagus* pollards

Walking up the valley to the south there were abundant *Fagus* trees on the east facing slope. The valley bottom had *Corylus* bushes (and other trees) along the river, then the land above this was pasture or overgrown pasture. Some of the 'fields' nearer to the village had hedges round them; some near to the higher summer village had the remnants of hedges. There were cattle and ponies grazing and also evidence of sheep. Perhaps some of the grassy areas were cut for hay but it was not obvious at this time of the year. Closer to the village and also to the summer village there were *Fraxinus* pollards, mostly well grown out and clearly not cut recently.

At the upper edges of the grazed areas the *Fagus* woodland started on the east facing slope. (On the west facing slope there was *Quercus* woodland lower down and this progressed into *Ulex* and *Erica arborea*). At the edges of the open areas the trees looked clearly 'worked' and were much more pollard like. Even so, most were not exactly like the Burnham Beeches trees but more like the Romanian examples. They were clearly worked by cutting branches as and when required and did not have a clear pollard bolling. Some were more coppiced or copparded and the incidence of this (compared to more obvious pollarding) increased higher up the slopes. None of the trees had been cut recently and the last time of cutting was perhaps 20 years ago. Some of the branches were considerably older than this however. There were a few clear paths leading up into the trees, similar to the green lanes lower in the valley but these were clearly not maintained anymore whereas those lower down were still mostly used. Stephane who I was staying with told me that Spain had changed a great deal when it joined the EU and he wondered if the drop in pollarding may date from around this time.

East facing slope from the west, the *Fagus* pollards are clearly visible (left) A green lane (right)



The *Fagus* pollards on the steep slope and the edge of the stream

Day with Alfonso in Parque Natural Somiedo and comments from Pepe a villager (*Fagus* woodland and cutting of trees for fodder)
We walked from Aguinu village, up through the village land and round Peñas Albas to the east, to Vildeu wood and then back to El Reconcu and the village.

Fraxinus excelsior was cut for leaf fodder in the past, it is not cut so much now although it is perhaps more frequently seen in the eastern part of the mountains. Hay is cut for winter feed and the *Fraxinus* trees were cut after the hay in August and September. The leaves were fed to the cattle directly without any drying which explains the cut branches in the field that I saw. Feeding leaves was supposed to be good for the milk. Some people stripped the leaves off the stems but most cut the whole branch. A few people cut the trees in May for the leaves.

Shredding of trees was very popular – I asked Pepe why they were shredded and not pollard, since pollarding must be easier, he said that shredding produces more leaves.

Ilex aquifolia was also cut and fed straight to the cows without cutting or other preparation. It is not now used. Pepe thinks the leaves are smaller now and the trees are not growing well. *Ulex* was fed to the horses, it was cut up into very fine pieces for them. *Quercus ilex* occurs in Somiedo and was coppiced for use as firewood. In times of deep snow Pepe cuts trees that are covered in *Hedera helix* and brings them down for the animals to feed on. There were plenty of trees with *Hedera* on, especially lower in the valley. *Acer pseudoplatanus*, *Betula* and *Fagus* wood were used for making clogs. (Pepe was wearing a fine pair, the clog being raised above the ground by high ridges on the front and back, presumably to help grip on the steep and slippery ground).

The village had pasture and cultivated lands above the valley bottom, these were mostly terraced and used in the past for the cultivation of corn, maize and vegetables as well as hay. In 2003 there was very little such cultivation and many of the terraces were growing over with coarse grasses such as *Brachypodium* and the woodland was starting to encroach. A few very low trees (*Fagus*) with wide spread branches were seen at the edges of some of the former fields and they marked some sort of boundary (between uses I think).

Over grown terracing with *Brachypodium*

Above the cultivated areas was woodland. There was a mixture of tree species in the valleys and in between the fields but the upper areas were dominated by *Fagus*. The lower trees, nearer the terraces had been pollarded. Higher up the slopes fewer trees were pollarded and more were younger standards. Two types of wood were needed by the villagers, fuel wood and timber for building houses, barns etc. The pollards supplied the former and the standards the latter.

There appears to be no name for the pollards here and Alfonso did not seem familiar with the name trasmocho. Alfonso said that the *Fagus* were pollarded by taking off just a few branches (3-4) when they reached 10-15cm diameter and the smaller branches were left on. Pepe said that they were cut by removing every branch and only leaving the very smallest. They were cut in early spring and each tree was not returned to for 30 years. The trees were cut with axes until about 1900 but then saws became more popular. Today Pepe cuts wood for fuel with a hand saw. In the 1960's-70's there was a period of very high intensity land use here. The population increased and the land, including the woods, was very heavily used. Now the *Fagus* trees have not been cut for at least 20 years (Alfonso had been in the area 20 years and never seen them cut). However, he did think that there might be one or two trees cut somewhere in the area.

There was a fire here in the mid 1980's that killed a lot of young trees, but the older pollards were not affected. The lower part of the slope had *Quercus faginea* – rare in this area as it is a Mediterranean species. This was particularly badly affected by the fire. *Betula* occurs here above the beech trees.

***Fagus* pollard**

Winters are variable but there is always snow, usually 10-20 cm deep, and occasionally 1m or so. Damage is done to the trees by snow but it is only really a problem when there is very early or very late snow fall so the leaves are still on the trees or they have already come into leaf in the spring. In the middle of the winter there is not usually much damage.

Part way down the hill we saw a shredded *Fagus* tree, growing very well. Perhaps it was cut to provide fence posts for the fence down the hill? Nearby were a shredded *Populus nigra* and a pollarded *Salix* sp. In the *Fagus* dominated woodland there was a lot of dead wood on the ground.

Shredded *Fagus*

The woodland of Vildeu

This patch of woodland was a long way from the village and therefore was less heavily used by people in the past. However, some of the *Fagus* trees showed pollarded shapes and the *Ilex* was probably cut in the past. Generally though it is considered not to have been managed much recently. It is often in the cloud and is very moist. The trees probably grow quite slowly here.

The trees species in the wood were *Fagus sylvatica*, *Ilex aquifolia*, *Betula* in the upper area and *Sorbus aucuparia*. The ground flora included *Erica* (?*arborea*) and *Vaccinium myrtilis*. There were a very large number of epiphytic lichens and mosses including *Pulmonaria*

The *Ilex* 'stands' were often where an older tree had collapsed but had produced many suckers that formed a 'copse'. These *Ilex* thickets were very important as winter shelter for the animals. The *Ilex* all had a pronounced browse line and many stems were barked by the deer both antler rubbing and eating the bark. There was much dead wood on the ground but perhaps less than the previously more heavily managed lower beech woodland.

Vildeu from the distance (above left)
The edge of the woodland (above right)

Browsed *Ilex* at the edge of the wood (above left) *Ilex* stand within the wood (above right)

Old *Betula* tree (left)
Trunk of *Fagus* tree with *Lobaria pulmonaria* on it (right)

Abundant lichens growing mostly on *Fagus* trees

There are about 100 bears in the mountains of Cantabrica and Asturias. They are not usually a problem in the villages except that they sometimes steal honey from the hives. Barbara (a local bee keeper) said that they only really do it when they are a bit short of other food. Bears are like people and have different personalities, so one bear will take the whole hive and put it in the river to kill the bees, another will totally destroy the hive and another will carefully open the hive, take out a frame and put it under his arm, close the hive again and go off with the honey. The Government compensates for loss of honey but the loss of sales is worst. Generally the bears are very little seen, they walk round muddy places

like people so the prints are harder to find than the wolves and they are not radio tagged any more. They usually hibernate between January and April but often the larger bears do not hibernate.

There is also a good population of wolves. They do take sheep and also young cows and horses. The villagers are compensated but do not like the wolves. There are many wild boar too and they are not liked as they dig up the pastures. Snares are set for them (illegally) which can be a problem for bears too.

***Fagus* tree that looks to have been pollarded in the past (above left)**
General views of the woodland (below)

Local breeds of farm livestock

Asturian Roxa (or red) cow is a beef breed. Asturias produces large quantities of milk but mostly from Fresian type cows in the lowland areas. There are apparently more different types of cheese produced in the Someido area than any other part of Spain.

Other local breeds
These include the Xalda sheep, the Asturcon pony (usually dark brown or black and legend has it that they eat their manes and tails in hard winters), the Bermeya red goat, the Pinta chicken (white with black edging to feathers), the Mastin dog (which guards the cattle and traditionally wore collars with spikes on to protect them from wolf attack) and the most threatened of all, the El Gochu'l pais (country pig).

Asturian Roxa cow (left) and Pinta Chicken (right)

Summary

Pollarding was widespread in northern Spain for two different reasons, to provide fodder to supplement the hay in the mountains and to supply wood. (It was also probably done to increase the fruit crop of *Castanea* trees). The wood was used for a variety of purposes but mainly for fuel wood in houses, for charcoal making (largely for iron smelting) and for ship building.

Pollards were seen in the Pyrenees, the Basque area, the Picos de Europa and the mountains of Asturias. They have also been reported from Sierra de Gredos (M. Smith pers. com) and the cutting of *Fraxinus angustifolius* for fodder from 'ash dehesas' is mentioned in the Pastoral Project note 4.

The leaf fodder producing trees tend to either have multiple pollarding heads or be shredded as well as pollarded. The wood producing trees tend either to have a single pollarding head or be of the open structure with shaped branches intended for ship building.

Fraxinus seems to be the most popular fodder tree but *Populus* and *Quercus* were sometimes seen cut this way too. *Quercus* sp. and *Fagus* were the principle wood producing species. *Castanea sativa* is pollarded in some places so that there are multiple stems to produce the chestnuts; presumably these trees are just cut once to achieve this. A variety of other species were seen pollarded occasionally, for example *Juglans regia.*

Pollarded *Juglans* in the Pyrenees

Pollards are still widespread but pollarding is not. The only worked trees still being cut were the pollards and shreds cut for fodder. Recent cutting was seen in the Pyrenees, in the Picos de Europa and in the Spanish Basque area. Pollarding for wood may still take place occasionally in single trees but is no longer carried out on a large scale. However in some area the lapse since the last pollarding is not long and the trees could easily be restored and cut again (this has already happened in Leitza and Oianleku).

Pollarding seems to be dying out and has only been adapted for modern uses as street trees to provide shade in towns.

Pollarded *Platanus* outside Pamplona cathedral

Some of the sites with pollards are protected but sites with *Quercus* pollards in particular are generally not. Most areas are protected for reasons other than the pollards. At the moment the major threat to the pollards seems to be neglect. No wood producing pollards were seen that had been cut more recently than about 20 years ago. Many of the trees would be manageable again but there does not seem to be much interest in cutting them again. For many of the places with a high nature conservation status the concern is focussed on the lack of tree regeneration. The end result of this will be that the old pollards will gradually become shaded out by the younger trees and die.

Terms for pollarding

Trasmocho – word for cutting the head off a tree. Originating in the Basque area it is actually a Castillian word. It has now become the most frequently used word meaning a pollard in Spain.

Desmocho – Originally meaning a pollard cut for fuel wood or charcoal by beheading and not shaping the branches. Now not in general use.

Guiado – Trees with guided branches that were shaped for specific use, such as for ship building. The process of cutting/shaping produced wood used for fuel or charcoal making.
Basque – Pago motza [Literally beech short]
Ramas – Branches
Podar – to cut leaves from trees as fodder.
Mugarratu – Another Basque word for pollarding

Beech pollards in Spain

Cutting of *Fagus* was clearly an important part of the culture in certain areas in the past but it was the species of 'last resort'. It occurred higher up the mountains and further away from the villages and water courses than *Quercus* and *Fraxinus* and the wood was not as good for charcoal or building materials. It seems that the leaves were not used as fodder. *Fagus* began to be cut and the wood started to be important either when the need for wood increased due to expansion of industry (iron smelting) or when the population/agricultural pressure increased such that other preferable species such as *Quercus* were felled or in short supply. The period of *Fagus* exploitation may have been quite short in time but resulted in trees in certain areas being cut on an industrial type basis (e.g. Navarra and Gipuzkoa) or in a more agricultural way for local use (probably the Picos and Somiedo). A few times I was told that *Fagus* wood was considered better than *Quercus*. It seems that this is likely to be a relative comment, *Fagus* was perhaps better in the areas **in which the wood production had to be grown** as other land was not available.

When other fuels started to become available and the need for wood and charcoal for domestic use and for the iron smelting declined the cutting probably ceased first in *Fagus*. The trees being further away and uphill it was harder work than those nearer the houses. As the land became less intensively used there was also a greater amount of dead wood on the ground to be collected (less effort than pollarding). Also the number of animals may have declined making the need to cut pollards less important and small trees could be felled when needed rather than having to climb into the larger trees. The results we can see today are that the grazing areas are declining. The forest is encroaching on the open area between the pollards from the tops of the slopes downwards. Young *Fagus* trees are growing up between the older ones. The band of pollarded *Fagus* at the tops of the pastures is increasingly less evident as the woodland becomes denser. At the same time the areas of grassland are also disappearing from the bottom of the slopes upwards as valley bottom shrub species such as *Corylus* increase.

Exactly the same situation was apparent in Romania at the tops of the slopes. Most of the *Fagus* trees had not been cut in recent years and were increasingly difficult to see as they disappeared into a forest of young *Fagus*. This makes estimating the numbers of pollards/old trees very difficult in both Romania and Spain.

It is perhaps not surprising that it is difficult to find people that are still cutting *Fagus* as pollards because they now have plenty of other options either to pollard better species or to cut wood as clear fell/coppice or collect fallen wood.

It has been noticeable that pollarding for fodder has continued for longer than pollarding for fuel wood. Thus *Fraxinus* is still being cut today in small quantities and is still part of some cultures. Shredding of *Quercus* is still being done and this must mean that the value as fodder is higher than we would give it credit for in England.

Shredding may produce more leaves but at much greater effort Perhaps the value of the trunk as timber after a few years of shredding is still of consideration?). Pollarding for fodder seems not to produce older trees that are retained in the landscape. Presumably they are felled once they start to become less productive in terms of leaves (as in Scandinavia). Is this why old shreds are rare – they are used for fodder until the amount of leaves produced reduces and are then felled for timber?

If *Fagus* is such a poorly regarded species for fuel wood one question is why do we not have Burnham Oaks instead of Burnham Beeches? *Quercus* would appear to be a far more valuable wood and both *Q. robur* and *Q. petraea* do grow quite well in parts of the Beeches. We do not have a clear altitude effect or even a pronounced aspect one. *Quercus* trees are well distributed across the Beeches and were pollarded. Perhaps in the north west of the site where the soils are so poor *Fagus* would have grown better (but there is *Q. petraea* coppice here). It seems unlikely that the *Fagus* trees lived longer than the *Quercus*. We still do not know exactly when or why the pollarding started in the Beeches. Probably it must have been at a time of increased population pressure or an increased need for wood. Another possibility is that the *Fagus* was really preferred for use in, for example, the furniture industry (although there is no evidence of this). Was the wood from the Beeches made into charcoal? There are no obvious charcoal hearths but perhaps the charcoal was made off site.

There are only perhaps three other places in England where *Fagus* was pollarded regularly. In Epping Forest the industrial type nature of the forest has been shown. Here the increased need for wood in London resulted in a greater intensity of cutting and presumably the need was met through the existing tree species available. At Fellbrigg Hall and Savernake beech was pollarded.

It can be assumed that most pollards of *Fagus* and *Quercus* in both Spain and England are over mature trees. This is a realistic proposal as we know that almost all (apart from recently started pollards in places like Burnham Beeches) those in Britain have not been cut regularly for getting on for 100 years. The lapse in Spain is not as long, perhaps 50 years, however the trees do have a lapsed appearance. Many are hollow and contorted with decay and the hollowing processes taking place.

In Navarra and Gipuzkoa there are large areas of *Fagus* pollards. Several sites rival Epping Forest in terms of numbers of pollards and most of these appear older than many of the small Epping forest pollards that have perhaps been cut only relatively few times.

In addition, in the Picos and Somiedo areas there are other substantial areas with *Fagus* pollards. These must at least rival the numbers of those pollards in Britain if not surpass them.

In conclusion northern Spain (together with southern France) definitely has a substantially higher population of old *Fagus* pollards than southern England. In addition, the population of the larger size categories of the trees in Spain is greater than that in Britain.

Spain also has populations of *Quercus* pollards. These are less abundant than *Fagus* due to the higher pressure for the land on which they grow. The *Quercus* sites in Spain are more poorly known and, in addition, there are several more species of deciduous *Quercus* so a guestimate cannot be so easily made. My general feeling is that there are not as many truly ancient old oaks (*Q. robur* or *Q. petraea*) in Spain as in Britain and that Britain also generally has larger size categories. Having said that, there are some important sites for old *Quercus* and these should not be overlooked.

The future for old pollards in Spain

One of the consequences of the large numbers of *Fagus* pollards in northern Spain is that they are not considered out of the ordinary or special in any way. The emphasis on management in most of the reserves that I visited with such trees was on creating 'natural' woodland. This was most obvious in Artikutza but was also seen in Bertiz, Irrati, Aiako Harria and Urbassa. There is more concern over getting good regeneration of young *Fagus* trees and creating a wilderness than looking after the existing old trees. Whilst to some extent this is understandable, and probably a very valuable policy for Artikutza this does not mean that it should be applied in every situation. There seems to be little realisation that while the pollards have been created by man, that they are more valuable for nature conservation in the short term than acres of young *Fagus* trees. In addition they will not live forever unless managed.

Quercus pollards also do not seem to be viewed as special and despite some specialists proposing sites as Natura 2000 reserves this has not been taken up. This is at least partly as *Fagus* woodland has some sort of 'special place' as far as the biologists are concerned and *Quercus* is not as 'special'. In addition, most of the *Quercus* areas are very highly and obviously affected by people and do not seem to have a natural aspect. Cattle grazed wood pasture close to villages (as I saw with Iñaki) looks disturbed and a bit of a mess – whereas in fact it is probably very good quality wood pasture.

The distribution of *Fagus* in Spain is from the western end of the Pyrenees westwards. The major concentrations are in Navarra and Gipuzkoa, the Picos do Europa and Asturias. There is another small outlier in Galicia. This is the potential distribution of *Fagus* pollards in Spain and searching for them in other parts of Asturias and Galicia would be worthwhile.

Notes on pollarding in countries not visited as part of the study tour

Italy

A variety of different tree species are reported to have been pollarded in Italy. Hæggström (1989) described leaf meadows near Lake Como and pollarded *Morus alba*. A very detailed description of leaf harvesting was made by Bargioni and Sullii (1998) who studied a farm in the Agno valley and which is summarised as follows.

The farm as 5 hectares in size and consisted of pastures and trees for fodder. 4-5 cows were kept on the farm and lived in the barn between November and May, being fed on hay, leaf fodder (frascari) and grass collected on the day of feeding. Between May and October the cattle grazed in the wood pasture and the meadow after it was mown.

Fodder leaves were produced in various forms. Broco were leaves from thin branches and were used directly as fodder. *Fraxinus excelsior*, *Alnus*, *Populus* and *Corylus avellana* were all fed fresh. *Fagus* was best fed in the spring when here were new shoots but the grass was lacking.

Frascari were faggots of leaves and branches that were collected, preserved and fed in winter. *Fraxinus* trees were cut when they were 8-10cm in diameter and 7-8 years old in the second half of August. The top of the crown was cut with a billhook (cortelon) so that it bifurcated and then all the branches along the stem were cut 15-20cm from the main stem, leaving a stub or gropo. This acts as a small stump producing frascari, prevents rotting and acts as a support for tree climbing. The trees were 4.5-5.0m tall with stubs from 2m up the tree. The branches cut from the trees were left on the ground for a day and then bundled into faggots 25-30cm in diameter using *Laburnum anagyroides*. They were left standing in the fields for 2-3 days and then brought into the barns and stacked in criss cross layers. Before being fed to the animals the faggots were brought from the barn to the stable and left there for the morning to absorb moisture. The branches were then shredded and the cows fed with the leaves. One faggot was fed to each cow and the twigs were used as fuel.

The fodder trees were mostly in groups in the pasture (usually where the land was poor, steep or otherwise unproductive) or in rows round the edges. The rows tended to be the most productive whilst producing the least shade. The branches of each tree were cut every 3 years when the branches were about 1.5m long. In the years when the branches were not cut the leaves were picked. The farm also had woods for providing fuel and these trees could also be used for fodder in poor years.

It was estimated that each tree took 3-4 hours to cut and yielded 8-10 faggots or $0.5m^3$ of fresh leaves. There were 250-300 fodder trees on the farm and annual production from 85-100 trees was 700-1,000 faggots. Between 1920 and 1992 it is estimated that one third of the fodder used on the farm was obtained from the trees.

When the trees stopped producing regularly (when they had a diameter of 25-30cm) they were cut down. If the tree was in pasture the stump was dug out and a new seedling planted; the shepherds protected new trees and natural regeneration by surrounding them with thorny branches. If it was in a row a shoot from the stump was used as a replacement. This description of cutting trees for fodder is interesting

because it appears to describe shredding and indicates that the trees did not remain productive for many years, being cut down when relatively small. The animals were also clearly fed a mixture of fresh and dried leaves.

Fagus pollards have also been reported from Italy, for example in Abruzzo National Park (P. Read pers. Com)

Bulgaria

Hæggström (1998) described pollarding of trees at Ribaritsa, 80km east of Sofia. A range of species were pollarded between mid July and the end of September. These included *Acer campestre*, *Acer platanoides*, *Carpinus betulus*, *Carpinus orientalis*, *Fraxinus excelsior*, *Morus nigra*, *Salix alba*, *Ulmus* spp., *Tilia platyphyllos* and *Quercus* spp. including *Q. cerris*. *Fagus* was probably cut for feeding directly. The trees were cut every 3-4 years using a 'long-handled short-bladed axe'. Bundles of branches were tied together with *Clematis vitialba* and stacked in a platform between 2-3 trees and about 2-3m above the ground. About $4m^3$ of leaves could be gathered by 2 people in a day. The leaf fodder was normally fed to sheep and goats in the winter; cows, horses and mules were fed hay.

Pollards were also seen by Hæggström (1998) in the Milanova area. Here *Crategus* pollards in the valley bottoms were cut for goats and *Quercus dalecampii* were shredded and pollarded every three years to provide sheep and goat fodder.

Fagus pollards were seen in the mountains on the north side of the Plovdiv valley by Slotte (pers. Com.). He reported that there were many pollards but all were abandoned and there were now few people living in this area. Some of his photographs show shredded *Fagus* with the lower branches cut for fuel in the winter and the tops kept in tact. *Fraxinus angustifolia* was also seen shredded here with 10cm stubs left so that they were easy to climb again. Other shredded trees seem to have been pollarded and then each individual resulting branch shredded.

Estonia

Estonia has large areas of wooded meadows. Many are now overgrown but it has been estimated that there was 850,000 hectares at the end of the 19^{th} century. There are also areas of wood pasture. Open grown trees are important elements in these systems but pollards do not appear to be (see Key Habitats book – Ref?). Leaf fodder was used (mostly from *Fraxinus* but also from *Populus tremula*, *Alnus incana* and *Betula*) and this still takes place on a small scale on Kihnu island. Pollards are known from Saaremaa island and, in the past, from Vormsi island (Heikki Luhamaa pers. Com.)

Germany

Pollarding was carried out at least in north-west Germany on *Carpinus betulus* and *Fagus sylvatica*. Most trees are neglected but some new pollards are being created on *Carpinus* and this has been most successful when cut in February (Ludwig Steginк-Hindriks pers. com).

Compilation of notes on pollarding.

Pollards in regular cycles

Cutting cycle

Fodder trees

- In Norway fodder trees were cut every 4-6 years. At Grinde it was aimed to optimise the amount of leaves to wood at 50%. If left longer the amount of woody material increases relative to the amount of leaves.
- In Sweden fodder trees were cut every 3-8 years. Generally *Fraxinus* was cut every 3-6 years and *Betula/Alnus* every 4-6. Trees could be cut every second year of necessary due to poor weather but cutting every year in the summer kills them (cutting every year in the winter might be possible).
- In Åland analysis of tree rings indicates traditional harvesting of just 3-4 year intervals A farmer said he cuts every third year.
- In Austria *Fraxinus* cut for fodder were cut every year but only branches of 3-4 years in age are removed and the smaller ones left on.
- In Hungary *Salix* were cut every 5 years and *Morus* every 2 years.
- In the Spanish Pyrenees *Fraxinus* were cut every 3-4 years but this was not exact. If necessary, in times when the grazing or hay crop was poor, the trees could be cut every 2 years.
- *Fraxinus* in the Spanish Basque area were cut every two years and all the branches were removed.

Quercus and *Fagus* trees

- In Romania *Fagus* pollards were said by Slotte (2000) to be cut every 10-12 years.
- In northern France the tenant farmers had to cut the pollards in hedges every eight years (two rotations and the trees cut in fallow years). Shredded *Quercus* were cut generally about every 7 years but this depended on the region. A modern day farmer cut his pollards every 12-15 years and said that traditionally they were cut every 9 years.
- In southern France large numbers of *Quercus* were cut each year, certain of the trees were exploited, chosen for the best branch formation and dimensions. About the same number were cut each year and the age of the branches varied between 10-15 years. In 1848 the length of time between cuts was fixed for a long time at 15 years.
- *Fagus* in Artikutza, Spanish Basque Country, were pollarded intensively for charcoal production and they were probably cut every 15 years.
- Guiado pollards in Spain were cut every 10-12 years for *Quercus* and 5-6 years for *Fagus*, the aim of the cutting was to obtain wood for charcoal while still promoting the right shape of the tree for pieces of shaped timber.
- Desmocho/trasmocho pollards in Spain were cut just for charcoal every 10 to 12 years.
- *Fagus* in Somiedo were cut but each tree was not returned to for 30 years.

Fodder trees were cut on short rotations in order to optimise the ration of leaves to wood. In very poor areas the trees might be cut more frequently to obtain leaves when the hay crop was poor.

Trees cut for the wood or for charcoal making were cut on a longer rotation as the wood was more important than the leaves. There seems to be a distinct tendency for the rotations to become longer as better tools became available to deal with larger branches (first hand saws and then chainsaws).

Time of year to cut

Norway

Fodder trees were mostly cut in July or August. *Ulmus* trees were sometimes cut in the winter. If spring was late the farmer would cut twigs from trees such as *Salix* and *Betula* and feed direct to the animals. *Betula* was cut in summer to early autumn for the leafy twigs or used directly in winter and early spring. A Norwegian family demonstrated to Carl-Adam Hæggström cutting half the crown in July and the other half in August.

Sweden

Fodder trees were mostly cut in July or August. The time to avoid is between sap rising and mid summer. It was said to be better to cut when the tree is 'alive' (i.e. not dormant in the winter) so it can plug the xylem flow.

Åland Islands

Traditionally the trees were cut for fodder in July/August but Carl-Adam Hæggström believes later in the autumn (November) to be good and one farmer was cutting in September/October after leaf fall as that was more convenient with his other work.

Romania

Most fodder trees seen had been cut recently (August/September) and this included *Fraxinus*, *Quercus* and *Salix*. Slotte (2002) reports that *Fagus* here were cut in winter. Some branches cut for fodder seem to have been left on the ground for the animals to eat immediately; others were dried and stored for winter.

Hungary

Morus were cut throughout the growing season. *Salix* were cut in the autumn/winter.

Austria

Fraxinus were cut in September/October (after the first cold night but before the leaves had fallen).

Northern France

Shredded trees were always cut in the winter. Pollards for firewood were also cut in the winter. A few *Quercus* and *Fraxinus* trees were cut in dry summers to feed the fresh leaves to cattle but this risks killing the pollard.

Southern France

Fagus were cut in February which is considered best (very early spring).

Spain

Fraxinus in the Pyrenees were cut for fodder after the hay was cut and before 20th August. Trasmocho/desmocho *Quercus* were cut between 20 February and 25 March, in exceptional circumstances they were cut in November or December too. Guiado

Quercus were cut between 19 September and 25 February. Cutting for charcoal was largely done in February and March.

Fraxinus in the Basque area were cut after the hay, in August and September. The leaves were fed to the cattle directly without any drying. A few people cut the trees in May for the leaves. In Somiedo *Fagus* were cut in early spring.

In Spain cutting was also determined by the phase of the moon – species with round leaves, such as *Fagus, Alnus* and *Betula* should be cut with the rising moon at any time of the year but it is better in winter (when without leaves). The reason for this was that the sap was in the roots at this time. The wood is generally drier and lasts longer. Lobed and pointed leaves, such as *Quercus, Fraxinus* and *Castanea*, should be cut with the waning moon.

Generally fodder trees were cut in the summer and the leaves fed fresh or dried. However, some cutting seems to have taken place all year round, especially if there was a hard winter, late spring or drought in the summer.

Trees cut for wood or charcoal were cut in the winter.

Tools used for pollarding

Norway
Traditionally a knife or saw

Sweden
Traditionally bladed tools, a bill hook or an axe, narrow billhooks were common. Now modern tools such as Japanese saws are used. Hand tools only are allowed by the Health and Safety authority. It is not permitted to use chainsaws from ropes, only from access platforms.

Åland
Traditionally cut with hooks and blades, including old scythe blades which were used to cut leaves from the branches. Now modern tools are used, such as a Fiskers one handed tool, a saw or clippers. A farmer was using a chainsaw.

Romania
Shreds – These trees had clearly been cut with an axe or other cutting tool
Fagus pollards – cut with a saw and axe/machete type tools historically, some branches now cut with handsaws and some bigger ones with chainsaws.
Salix - Chain saws regularly used but hand cutting by axe preferred as better regrowth.

Austria
Fraxinus – cut with billhooks

France
Farmer in Normandy – Traditionally with a billhook type tool was used. Now a chainsaw is used as branches are left for longer and are therefore larger.
Quercus in Sare – An axe was used

Spain
Fraxinus in Gistain – A knife was used to do the cutting, with a thin curved blade. An axe was also used. (We also saw some branches that had been cut using a saw).
Fraxinus in the Basque area – Cut using a small axe. Even as late as 1900 wood cutting was done here using axes and not saws. It is thought that chainsaws have a greater chance of transmitting diseases between trees than an axe.
Trasmochos – Prior to 15th century cutting was with axes, machetes and knives. Later saws were used just for planking the wood.
Fagus in Somiedo – the trees were cut with axes until about 1900 but then saws became more popular. Today hand saws are still used.

It is clear that edged tools such as axes, machetes and billhooks were the commonly used tools of pollarding. Handsaws started to be used in some areas but in the poor economies where pollards were cultivated, these often seem to have been a relatively late arrival. The advent of the saw and especially the chainsaw enabled larger branches to be cut and this may have altered the pollarding cycle in some places which has had consequences for the trees. Chainsaws are only used today in a small number of places.

Adverse reactions from chainsaws have been noted: greater ability to transfer disease in Basque areas, reduced growth compared to axe cutting in willows and stimulating basal growth not pollard growth in young trees in Sweden.

Tools for climbing
The use of ladders to get into the trees was mentioned in Sweden (Misterfall and Råshult) and France (Sare).
A log propped against the tree was used in Spain (Leitza) [also large branch with notches in Munain].
Men were said just to climb into the trees in Austria.

Health & Safety
The Health and Safety Authority were consulted prior to a booklet being produced in Sweden about pollarding courses being run. They agreed to allow cutting trees from ladders only if the ladders have a foot and are tied to the tree. Only the use of hand tools is allowed.

Pollarding methods
Pollarding methods varied from one tree species to another, taking account of their different growth forms and ensuring that regrowth and production for each species was as good as possible. Methods also varied according to the product required.

Fodder pollards
- Cutting back the crown – With *Ulmus* and *Fraxinus* the trees can be pollarded at 2-3m above ground level and all the branches were removed with just the trunk left. A ring of new branches grow from the resting buds and the tree generally regenerates well.
- Thinning the crown – With *Betula* spp. cutting all the branches had to be avoided. The young parts produce new branches only if the top and a few branches are cut off. Thus it is crown thinned, giving a wide crown. If the tree is cut back harder then 1-3 branches must be left.

- Trees to produce lots of leaves can be pollarded and then shredded. This combination approach produces the most leaves and the trees can have multiple layers.
- Hard cutting of most trees stimulates the growth of resting buds near stumps and maximises fodder production.
- 4-5 branches were left on *Fraxinus* when pollarding and 10-12 in *Tilia* (Swedish farmer) other branches were removed leaving short stubs.
- Generally all branches were removed on fodder pollards.
- Don't remove all branches on *Betula* (rules determined by Landsyrelsen in Åland)
- *Alnus* cannot withstand large branches being removed
- *Populus alba* produces a lot of suckers when it is cut and all the energy goes into the suckers.
- *Populus nigra* does not produce the suckers so it puts more energy into pollard growth. Cutting off all the branches is usually successful with *P. nigra*.

Clearly *Betula* and *Alnus* did not survive removal of all branches. Other species used for fodder mostly had all branches removed but some farmers were more cautious. Austrian pollarding is different in that the *Fraxinus* were cut every year and the small branches retained while the larger ones removed.

Quercus *and* Fagus

- *Fagus* in Scandinavia were often cut by 'topphuggning' pollarding in which some small branches were left on the bolling and these were cut, forming 'secondary' pollards'. This is also described as 'diffuse' type pollarding, possibly meaning that selected branches were removed high in the canopy.
- In Spain some branches were always left on the *Fagus* trees, but usually small ones.
- In the forest of Sare *Fagus* were said not to like to 'stand alone' (otherwise they get too much sun) but prefer to be in a group.
- Spanish guiados – branches grown horizontally (using weights to keep them straight) from the point of cutting, then bent upwards to obtain curved ribs.
- Spanish trasmochos/desmochos – It was not so necessary to be careful with the cutting of these trees and they were more like 'standard' pollards with a single head to the bolling. Probably all the branches were removed on *Quercus* at a single cut, it is not known if a sap riser was left.
- Romania/Hungary – *Fagus* trees worked by cutting branches as and when required, sometimes there was not a clear pollard bolling.
- Somiedo – *Fagus* were probably cut leaving only the smallest branches still on.
- Romania *Fagus* – the trees looked like they had been cut at different times with branches removed in an *ad hoc* way. There seemed to be very little system to the cutting and the branches that had been removed were of varying sizes. Some trees had become substantially higher than the original bolling. Branches had been cut recently from the parts of the trees easiest to reach, i.e. the uphill side. When the importance of wood was higher, probably more branches were removed and any one time (photographs from Håkan). Regrowth following pollarding does seem to take place when single branches are removed, contrary to what might be expected in light of experiences on

other trees elsewhere. Stubs of 0.5-1.0m were left and trees were cut at various different levels.

- Hungarian *Fagus* – The trees looked similar pollards to those in Romania. Branch removal looked *ad hoc* and the trees were varied in shape and form. Some had been cut at higher levels on subsequent cuts, some showed branches removed from higher in the canopy. Recent cutting included large branches (e.g. about 40 years old), others had smaller branches cut recently. Other tree species may also have been cut in this way.
- Removal of just one branch in *Fagus* from Romania and Hungary seemed to result in new growth from around the point of cutting. This is not so readily seen in Britain.

The need to leave branches on Fagus *seems to be well understood but in order to do this pollarding may not have been a 'tidy' well regulated affair but was more* ad hoc *with branches taken off when needed. At least in some places it appears that all the large branches were removed and regrowth was successful.* Fagus *pollarding in the Basque area must have been of industrial proportions and it would be interesting to know more about how this was done to optimise the amount of wood without killing the trees. The cutting of* Quercus *in Spain was sometimes very precise and produced very specialised pieces of wood.*

Use of sap risers

In France

- Leaving sap risers is a traditional method with *Quercus* trees. Now many people have forgotten about this branch so they cut all the branches from the trees and this often kills the trees.
- A *Quercus* pollard (Maison Botanique) was cut leaving four branches on. The next year most were removed leaving one complete sap riser and one long stub.
- *Quercus* trees were cut leaving a sap riser just for a few years after cutting. This also shades the tree as well as drawing sap. One branch is enough in trees cut every 9-10 years but is probably not enough if the trees have lapsed.
- A farmer described sap risers being left on *Quercus* trees but not other species. Sometimes the *Quercus* grow for two years after cutting and then die, this is usually when they have lapsed for a time, the branches are too large and not enough of a sap riser is left.
- Two types of tree cutting for *Quercus* were proposed in Sare to resist the attacks of a disease:
    - Bipartite – the trees were first cut when they were 10 years old and half the branches were removed. Three years later the same tree was cut again, those branches being removed that were at the time of the first cut (i.e. cut the tree half at a time) – re word this!
        - A bipartite tree could be in the form of:
            - Couronne (crown) – A single head or
            - Candelabre (candelabrum) – with many heads
    - Furetage – At 10 years all the branches were cut that were over 25cm in diameter at the base. The smaller branches were left on as sap risers. 10 years later the same tree was returned to and again the big branches were removed and the smaller ones left.

In Sare in 1930/40's the trees were cut leaving a sap riser but after 1945 this practice stopped. Now it is considered that removing all branches would kill the trees.

The *Quercus* trees were also often shaped by cutting into an inverted cone so that they were more stable and had less sail area at the top and were more wind resistant.

Sap risers were clearly known to be important for Quercus *pollards throughout France but were not deemed necessary on other tree species (*Fagus *unknown).*

Length/shape of stub to leave

- Norway (e.g. Grinde and Kusselid) – Cuts were always made above the height of the previous cuts (sometimes well above, making the pollards progressively taller).
- An old Swedish book says to cut 3-5 decemetres (i.e. 30-50cm) above.
- 'Conservation cutting' in Sweden now aims to cut a little above the branch collar, but some (e.g. at Misterfall) seemed longer.
- *Fraxinus* shreds in Romania had long stubs left as points of regrowth and for climbing.
- *Salix* pollards in Romania were being cut by a man standing in them and cutting, leaving relatively long stubs but new shoots were probably from the bolling.
- *Fagus* pollards in Romania and Hungary seemed to have very variable stubs, from nothing (i.e. not even the branch collar) to quite long.
- Cuts at Grinde in Norway were said to be made on a slant. Most cuts made from edged tools were also slanted.

Other comments

- Trees were divided into blocks of roughly equal size for cutting in Åland and Norway so they did not shade each other.
- Older trees are more difficult and may not always work.
- In the past there were probably more trees so if some died when they got bigger then this was not a problem.
- *Fraxinus* can be cut at any time, any how.
- Pollarding results in trees with conspicuous forms regardless of how they are shredded/lopped.
- There may be generic differences within species that result in differing results to similar pollarding treatments in different countries. For example *Fagus* trees in Central Europe may respond to a single branch being cut by producing new growth. Something that is rare in northern Europe.

Lapsed pollards

Where to make the cuts

- Cut above the last pollarding cut. Preserve old stubs as these are most likely to produce new shoots.
- The cutting of thick branches and trunks should be avoided as these are unlikely to produce new branches and the risk of fungal attack is higher. The cutting surface is seldom grown over if the branches cut are greater than 10-15cm in diameter.

- Small branches or parts of branches should be retained if possible.
- In Grinde (Norway) various species were cut again for fodder (*Fraxinus*, *Ulmus* and *Salix*) and 1-2 stubs were left.
- *Fraxinus* etc. were cut very close to the branch collar leaving only 5-10cm stubs. Growth is regularly from just below the cut.
- *Ulmus* was cut a bit higher than the previous cut.
- *Fraxinus* trees that have had several lapses in management (of around 20 years) showed that each subsequent cut has been made higher than the previous pollarding point. Now they are very tall.
- At Loi (Norway) *Ulmus* after a lapse of 40 years were cut with a chainsaw in early spring, cutting 20-25cm above the last trace of pollarding. Cutting was quite harsh but seemed successful.
- A proposal was made to cut the branches once to remove the major part of the branch and then a second time to tidy it up and leave a shorter stub.
- With old lapsed trees where there is only a short lapse it is easy to see where to make the next cut. With younger trees it is not so easy and so there is a tendency to cut too hard.

The clear consensus is to always cut above previous pollarding points but to try to ensure that the branches cut should not be too large. One problem may be that subsequent cuts above the previous pollarding point might make the trees too tall.

Balance of light and shade

- The shading of a cut tree inhibits growth, but strong light on formerly totally shaded trunks can also be harmful.
- Cut all new the trees in a block so that those still uncut don't shade those that have been newly cut.
- *Ulmus* can withstand more shading than *Fraxinus*.

Shading can be a problem but over exposure may also be harmful.

Species differences in cutting and leaving sap risers on old lapsed trees

The ability to form new shoots depends on the tree species so there are species-specific differences.

- *Alnus glutinosus*, *Betula* species, *Populus tremula*, *Fagus* and *Quercus* suffer after the hard cutting of large branches. *Tilia*, *Fraxinus* and *Ulmus* are more durable and will sprout more easily.
- Clearing away all surrounding trees in one hit and then cutting off all the branches leaving 20-40cm stubs is ok for some species e.g. *Fraxinus* and *Tilia*.
- Even some old *Salix* type pollards may benefit from leaving one or two small branches on.
- *Fraxinus* pollards in Norway were left with one/two large branches as sap risers following a lapse of 35-40 years.
- *Quercus* pollards at Stekka Norway were cleared round and then subject to very harsh cutting. All the branches were removed from most trees. Many did not look in good health and showed much die back and lots of mildew. The trees in pasture (in open conditions for longer) looked better. This confirms suggestions from the UK that *Quercus* is more sensitive when older and lapsed.

- *Betula* will not stand removal of all branches
- The restoration of a Kandelabertrad (candelabra shaped pollard) is described ina Swedish booklet. The suggestion is to leave long stubs but just one branch completely in tact. Then to return in three years to remove the branch that was left. (This looks very harsh).
- Must make sure that any suckers are not retained intact but are cut as pollards.

Clear species differences have been reported. Some trees respond well to complete removal of the branches but others require much more sensitive treatment. As trees get older they seem to become less robust than when young.

Time of year

- Re-pollarding should be done between mid summer and early August.
- In Åland doing restoration work in winter is thought to be better
- In Sweden *Fraxinus* restored in 1970's was done in January with a chainsaw, from a ladder. More trees were restored in 2001 by cutting in the autumn (October) with leaves still on the trees (after a lapse of 60-70 years).
- Restoration work was done in Norway in March when snow is on the ground which is better for the ground flora.
- A cold winter killed some new shoots of *Fraxinus* in Sweden.
- Do not cut in spring and early summer
- But at Galdane *Ulmus* trees were restored in May and two years later they were growing well.

There are discrepancies about the best time of the year for restoration. In wooded meadows the restoration of the ground vegetation is also a high priority and this has resulted in work being done in the winter to cause least damage to the ground. The two best times seem to be the end of the summer and the winter. The spring when the sap has started to rise would appear not recommended although this has been successful in some situations.

Other methods/comments

- Large branches can be winched off
- Restoration of high *Fraxinus* at Ramsholmen was done using a high lift platform.
- The use of forestry harvesting equipment to remove large branches from pollards may be appropriate and has been carried out in Sweden.
- Observe various health and safety requirements, which have become essential in some countries.
- Usually restoration of wooded meadows involves clearance and restoration of meadows first. Then the pollarders come in but by this stage all the small suitable trees to make into pollards have been strimmed! So think earlier about all the planning stages.
- No trials were done in the Åland islands to test how restoration might work as it was considered that pollarding was known to work and trials were not necessary.

The consideration of innovative methods can be beneficial. Trials rarely seem to have been undertaken at sites but there has been a general assumption that restoration will

be successful. This is not always the case and there is an argument for the cutting of a small number of trees and waiting for a few years before the majority in many situations (grant conditions may not always make this possible).

Young pollards

Size at first cut

Trees for fodder production

- Grinde (Norway) various species, cut for fodder – cut when smaller than a man's thigh
- General information from Ingvild Austad (Norway) – Cut at 2-3m when 10-15 years old and with a stem diameter of 15cm.
- Galdane (Norway) *Ulmus* – 0.5-2m whips are vulnerable to red deer grazing as they break the tops and gnaw the bark
- Målaskogberg (Sweden) – Ideal size to start is 5-10cm
- Swedish booklet – Cut at 5-9cm, the thickness of a forearm
- Jan Karlsson (Sweden) – 5-10cm at first cut
- Michael Michaelson (Sweden) – 10cm is too small as a new leader results not a proper pollard
- Misterfalls (Sweden) – The biggest of the new pollards cut were 30 year old trees with 10cm diameters
- Håkan Slotte (Sweden) – Aim for a trunk diameter of 4-8cm in diameter and no more than 12cm, ideal age is 2 years old. Older trees can be cut if they would otherwise be felled.
- Krokshult (Sweden) – 12-15 years old when first pollarded
- Åland – 5-10cm at first cut
- Carl-Adam Hæggström in Åland – 10-12cm at first cut, strong enough that cos can't push it over. Trees can be thumb sized if there are no grazers

There are some differences of opinion over the ideal age to start pollards. Some people advocate a very young tree, only perhaps two years old and 5cm in diameter. Potential disadvantages of this are that the tree may be browsed or it will produce a new leader rather than become a pollard. The maximum size proposed seems to be 12cm in diameter. If the tree is too large it may not heal up properly.

Pollards for wood (*Quercus* and *Fagus*)

- Batista (Spain) – Ideally a new pollard should be started when it is not too big otherwise it does not heal up well
- Iñaki (Spain) – 10-12 years of age is too young to pollard as the trees would not have produced enough wood at the first cut
- Forest of Sare (France) – Trees were first pollarded at 30 years of age

Substantially less information is available but there is a suggestion that, while trees should be young they were perhaps older at the first cut than those intended as fodder producing trees.

Where and how to cut

- Cut above existing branches, ideally above a whorl

- Top cut above a fork in the branches
- When creating a *Fagus* pollard it should always be cut above some branches, either a whorl or two
- Figures from Sweden show taking the top off and leaving the upper branches intact, then coming back 5 years later when the tree has grown to take off the side branches but leaving long stubs (this would create candelabra shaped trees).
- *Fraxinus* – trim up side branches when three years old. Cut above the year 2 growth and cut water shoots away every year.
- Trees intended as new pollards can be shaped before pollarding by cutting the side branches to encourage strong top branches for a growing season. These can then be cut leaving stubs rather than just a simple single stem and this gets a good pollard shape.
- If a few branches are left on the trees at the first cut they produce very vigorous growth and the second cut results in even more growth.
- Longer stubs can be left but this is probably not necessary and cutting to the branch collar is more usual.
- Leaving 15-20cm above the cuts was considered leaving too long a stub.
- Cut hard to stimulate buds near the top of the stubs.
- Dominique (France) creates a new pollard by cutting it one year and then again after two years (then it is in a regular, longer cycle). He believes that the first branches produced are very fragile and break off easily. Cutting twice initially is better as the tree heals up better.
- The trees may have been cut more frequently in the first few years to get better callousing over.
- Cut again 5-7 years later

There is a distinct impression that even with trees that pollard readily some thought went into the first cut and the tops were not just lopped off. Leaving a whorl of branches is essential for trees like Fagus but even for Fraxinus cuts seem to have been made above existing whorls or forks. Whilst the majority of those spoken to said they would return to the trees in the normal cycle for their site there are several indications that cutting more frequently initially might be beneficial.

Tools

- Cut with bill hooks
- Cut with an axe
- Use hand tools, no second cuts were made to perfect/neaten the first
- Cut small trees with clippers
- Some young trees cut with a chainsaw were growing well from the base but not from the top
- Make gob cuts and then pull off the tops by using a rope from the ground
- Removing the top by tying the top of the tree to another one and then part cutting, followed by pulling off the top with a rope. The illustration shows leaving few, if any, branches on the tree
- Cut by hand saw from a ladder

While the traditional implements were considered best, most people were now using saws rather than bill hooks and axes. Clippers are an interesting idea for trees that are small enough. Very few people were using chainsaws. Most people were working from the ground or from a ladder.

Height of first cut

- 2.5-3m high after pruning
- Cut 3m up
- To ensure continuous management pollards should be cut at moderate heights
- Loi (Norway) *Tilia* – Cut at 2.5-3.5m above ground

Height clearly depends on the land management/grazing under the trees but there is an interesting point that if the trees are too tall and therefore difficult to manage they are more likely to be abandoned in the future.

Type of cut

- Cut on a slant with it facing south
- Cut tops are flat, or with a slight slope to the north so they don't dry out

The benefits of a north/south slanted cut may depend on the situation! Notably the humidity of the climate may be important.

Time of cuts

- Traditionally cut in August/September
- In July/August

Little information was gained on this (and most relates to fodder pollards). See general pollarding for more comments.

Other comments

- Cut water shoots away every year
- Cut all stems from the same root stock as young pollards at the same time.
- Older trees with poor roots often shoot from the base and these suckers can be pollarded
- Cutting of suckers from older pollarded trees perpetuates the genetic stock
- In Sare the trees destined for pollarding were planted out at 10-12 years of age and at a distance of 8m apart.
- In wooded meadows the open meadow patches should be 2 times the height of the trees to get enough light.
- Damage to trees by ice plates during the spring melt results in some trees (*Populus*) responding by producing new shoots. If cut above these the trees pollard well.

Various suggestions were made about how to encourage growth where it is desired on the pollard, which may be worthy of consideration.

Arboricultural notes on some of the practices seen

From notes compiled during a discussion with Neville Fay. See also Mattheck & Breloer (2003) and Lonsdale (1999).

Longevity of pollards and shreds

Pollards regularly appear to live to a great age whereas old shreds were not seen during the study tour and do not appear to live on in the landscape as relicts of former management in the way that pollards do.

It is readily accepted that pollards have the capability to live longer than standard trees of the same species. This may be due to various reasons, for example:

- Reducing the size of the crown at intervals delays the onset of the ancient stage of the tree's life when the demand for water and nutrients exceeds its ability to increase the root area to absorb them (Read 2000).
- Because the crown is reduced regularly the tree is much lower than a standard tree. This means that the 'sail area' is smaller so the tree is less vulnerable to winds, the centre of gravity is lower so the tree is more stable and the branches are shorter so the 'lever arm' is reduced and the branches are less likely to fail.
- Multiple branches from the bolling also produce a larger number of vascular connections into the trunk than on a normal tree. These act as separate compartments and it is less easy for pathogenic agents to spread through the entire tree.

Repeatedly shredded trees seem not to live as long, which may be for the following reasons:

- The develop decay that is confined within a relatively narrow trunk. As the areas of decay coalesce the tree becomes more vulnerable to collapse. This is the reason also that trees shredded several times are not suitable as timber trees.
- If the shredded tree is very tall the transportation distances within the tree become very high and the root system is unable to support it.
- All trees have a 'hot spot' which is a vulnerable area for breakage between 1m from the ground and the lowest branches (Lonsdale 1999). Because the lower branches are removed on a shred this makes the 'hot spot' much larger than on a normal tree.
- In normal tree growth the tree develops an axiom of uniform strength by tapering at each branch going upwards. If the branches are removed there is no build up of wood at the branch junctions and the tree becomes cylindrical rather than cone shaped. The cylindrical shape is less stable than a cone.
- Shreds where the top of the tree is left intact are a very tall 'lollipop' shape. This acts a a pendulum and there is a high risk of failure associated with it. A normal shaped crown acts as a dampener, absorbing energy, and is therefore more stable.

As in any tree the longevity of a pollard or shred depends on:

- The ratio of sound wood to the total radius of the tree
- The size of any cavities and the amount of incomplete trunk

- The load (i.e. the amount of weight in the tree)
- The shape or design of the tree
- The condition of the wood

'Pollarding works with the tree's biological system – shredding works against it' (N. Fay pers com.)

Rejuvenation and different lengths of pollarding cycle
It is often said that a tree is rejuvenated by the act of pollarding. When many (or all) branches are removed the tree has lost a major part of the leaf area that produces food. It responds by putting energy into two main activities, callusing to heal the cut surfaces and producing leaves. The leaves are juvenile foliage resulting from the activation of embryonic tissue and are produced instead of flowers, seeds and wood (just like a young tree). The tree rings after cutting are smaller because growing a thick coating of wood over the trunk is a lower priority than healing the wound and growing leaves. As the pollarding cycle (i.e. the gap between cuts) progresses the tree stops producing so much foliage and starts putting energy into wood production and seeds. Rejuvenation is the activation of embryonic tissue and in this way a pollarded tree can be considered rejuvenated. It also responds by growth rather than reproduction and this is also true of a juvenile state.

This growth response after pollarding also explains the cutting cycles for the different tree products. If foliage is required the optimum time to cut the tree is just at the point when it stops putting so much energy into leaf production and starts diverting it to wood. If the wood is the required product then the cycle needs to be long enough that wood is laid down on the new branches.

Trees pollarded at repeatedly short intervals also suffer from reduced nutrients, as the leaves from the tree are unable to go into the ground underneath to be broken down for use. Such trees continually produce small rings but are able to survive in the long term, as verified for example by the work of H. Slotte.

Impacts of restoration pollarding – large wounds
Creating a wound by removing branches (as when pollarding) causes a zone of desiccation that the tree tries to heal up by covering with a callous. The size of wound that the tree can callous over successfully depends on the vitality of the tree. Even *Fagus* can callous over large branch wounds but the larger the wound the more energy is required to heal it. Even if the tree is stressed in other ways it will still put energy into callusing wounds. Thus the impact of wounding a tree is lessened if the wounds are small and the tree has a high vitality.

Restoration pollarding is particularly traumatic to a tree as the wounds tend to be large and the tree may not have such a high vitality due to other factors. Large areas of dysfunctional tissue often result and it becomes more difficult for the tree to support the crown.

Fagus does not have true heart wood but is a ripe wood tree. The live sap wood has a life span of approximately 30 years, after this it is unable to respond to cuts by producing callous wood. Thus branches over 30 years of age are unable to heal completely and a potentially large desiccation zone develops.

Time of year of cuts

The product required of the pollards determined if they were traditionally cut in the summer (for the leaves) of the winter (for the wood). It is probably possible to find some traditional method for cutting in just about any season (especially in Norway). Cutting was also clearly carried out in drought years and long winters. Traditionally in Britain most tree work is considered a winter job but what are the consequences of cutting in different seasons?

A tree cut in winter is wounded during the dormant season. It is unable to respond until the start of the growing season, but is less likely to suffer from drying out, thus the wood near the wound will not become desiccated so quickly. In contrast, a tree wounded in the growing season can potentially respond immediately and can grow quickly to heal the wound. However, during the summer the wood near the wound is in a period of moisture deficit and cannot respond.

It has been suggested that April (i.e. early spring) is when the tree can most quickly respond to a wound but this is not recommended for trees in the family Rosacea as they suffer from silver leaf after spring cutting.

Whilst cutting in spring/summer seems to be very successful if is probably a higher risk strategy than winter cutting. Droughts in a previous growing season or immediately after cutting may result in moisture deficits and may be a problem to trees that cannot always be predicted. Looking at individual trees to ascertain their responses to dry periods may be beneficial but is not always easy to do. Some may suffer in a drought year whereas others may be more resilient and able to cope with cutting. For trees in a regular cycle it may not be too important when they are cut but the problem of drying out after summer cutting is particularly acute after restoration pollarding as the wounds tend to be larger in area.

Perhaps it is no accident that cutting trees for their wood has traditionally been a winter activity as this produces larger wounds than cutting for fodder. Fodder trees tend to be cut in high latitudes and altitudes where perhaps the risk of drought is lessened.

Changes in climatic factors may be as problematic to trees as exceptional years. For example several dry years followed by a wet one could lead to problems of anaerobic root conditions. The reverse situation is also likely to cause problems. The best solution to this is to do any work gradually if possible.

The use of phases of the moon to determine suitable times to cut trees is not confined to the Spanish. It was mentioned by Pliny that this method was used in Roman Italy and is also a technique used by Steiner in his biodynamic agriculture. Cutting when the moon is

waning was generally done so that there was less water in the wood and not particularly for any reasons associated with the health of the tree.

How to cut a pollard that lives for ever!
Pollards clearly do have the ability to live for a very long time. It seems that the most beneficial cutting regime is one that balances the frequency of cuts such that the tree is able to recover from each pollarding occasion but not so long that the branches removed create large wounds. Cutting should ideally take place in continual wet summers or in the winter and the most important point is to keep pollarding and not let the practice lapse.

Tools used to make the cuts and the type of cut
Bladed tools do seem to have been the favoured method of cutting in the past. Use of a chain saw encourages the cutting of larger branches, thus creating larger wounds, thus it is perhaps difficult on the strength of anecdotal evidence to separate the real effects of different tools. The surface area of cambium resulting from the cut is crucial to the amount of regrowth. A larger cut has a smaller area of cambium exposed relative to the area of the cut. On larger cuts, desiccation will be greater too. Work by Phillips (1971) on *Castanea* coppice showed that although growth after a chain saw cut was initially less than using a hand saw, over the growing season there was no difference. More work might reveal differences between cutting tools.

Producing a slanting cut may also be easier with an edged tool. This produces more cambium per surface area and is thought to heal quicker than a flat surface. Discussion concerning the best direction of the slant probably depends largely on the situation of the tree, balancing amount of light stimulating growth with that likely to cause drying out.

Creating new pollards
While most new pollards have been created by a single cut it was suggested that the trees benefit by being cut twice in rapid succession before being left for the normal cycle.

For trees that callous easily this may indeed be worth trying. After a cut the tree tries to heal the wound with callous tissue, which then becomes wound wood as it starts to lignify. Repeated cutting produces a complex of callous tissue because the tree heals successive wounds. Callous has a very strong woody structure and is also very vigorous in growth so this complex is stronger than normal wood.

Fagus generally callouses less easily and the growth resulting from pollarding is generally from existing dormant buds rather than being regenerative and resulting from the wound. Cutting at short time intervals initially might still be worth trying on these trees but the growth may be different in type than from a species such as *Fraxinus*.

Species specific differences, sap risers and suckers
High vigour species (such as *Salix*) have lots of energy and this is probably the reason why a sap riser results in less even growth. *Quercus* is a more complex species and less vigorous so a sap riser is a successful strategy when cutting. By the same reasoning a

sucker has a higher vitality than the pollard it arises from so the sucker will succeed and not the pollard. Leaving a sap riser may also have a beneficial effect in shading a tree like *Quercus* that might have become accustomed to a more shaded environment for the trunk before pollarding.

Different responses of *Fagus* to cutting

The few *Fagus* pollards in Romania and Hungary that had branches removed recently showed better regeneration (as new shoots from around the cut surface) than trees cut in Burnham Beeches. Bergendoff & Emanuelsson (1996) also discussed the fact that *Fagus* in central Europe appeared to respond better to cutting than in Sweden and thought that the trees might be genetically different. N. Fay (pers comm.) has noted that *Fagus* responds better in the Mendip area and south Wales on the wetter west side of Britain than trees in the drier south east. While genetic difference might be one reason for such differences, climatic factors might be an important factor too. In view of the possible impacts of climate change on this species it would be interesting to explore these issues further.

Final discussion and conclusions

Pollarding as a technique has clearly been widespread across Europe in the past wherever a crop from trees has been required as well as a crop from the ground flora. However, in all areas visited, remnants of systems that in some cases much have been very intense management regime, are all that are left. Even in Romania where the most traditional landuse system was observed the trees had clearly been more intensively managed in the past. From talking to others that have carried out similar reviews across Europe (e.g. Hæggström *pers com*) it is clear that this decline has resulted in almost extinction during the last 20 years. Areas where, in the 1980's pollarding was still an everyday part of the agriculture, it has now almost died out.

Pollarding has been carried out for various different reasons but in the region studied traditional cutting (excluding *Salix*) can be divided into two basic types with an almost infinite number of variations.

- Pollarding for fodder was generally carried out during the summer months, on a relatively short rotation length. In a few systems this was every year or every other year but 4-6 year intervals were more usual. Tree species where the leaves (or buds) were considered palatable and nutritious to the animals were cut although these varied from one place to another. Often the leaves were dried after cutting and stored for winter use, however sometimes the animals ate them from the branches left on the ground under the trees immediately after cutting. The twigs remaining after the animals had eaten the leaves were normally used and often burnt but this was not the principle reason for cutting the trees. Cutting for fodder was occasionally done during the winter when there were no leaves and the animals ate the buds or twigs. The cutting aimed to produce the maximum amount of leaves so sometimes subsequent cuts effectively shredded the branches to obtain more leaves. Variation in tree shape was generally as a consequence species specific responses to the removal of foliage. Cutting was traditionally done with a tool resembling a billhook.

- Pollarding for the wood was generally carried out in the winter months on a relatively longer rotation (generally up to 15 years but occasionally even longer) than fodder cutting. The wood was used directly as firewood, made into charcoal or used for building use (including ship building). Sometimes the trees were encouraged to grow into special shapes so the wood could be used for specific purposes. *Quercus* and *Fagus* were the most usual species but in the UK a wide range of others such as *Carpinus* and *Fraxinus* were used too. Cutting was traditionally still carried out with a bladed tool rather than a saw, most likely an axe.

Pollards are interesting for a variety of reasons. One of the most notable is that, as a consequence of human management trees with a high nature conservation value are produced at a potentially higher density that would probably develop in natural woodland. One off storm type events can be considered an exception but it is unlikely that these would occur repeatedly on the same stand of trees. In the over developed and

intensive agricultural landscape of most of Europe these trees have an immense value, providing habitats that are equivalent to old growth woodland regarding their continuity of dead wood habitat for saproxylic species and this is why aggregations of these trees are more valuable than individual trees. In addition they have a high cultural value demonstrating traditional agricultural practices and reminding us what it was like for our ancestors when trees were necessary for their survival. For these reasons alone pollards are worthy of preserving but pollards should not be seen as just features in a museum of traditional rural life. The long term survival of wooded meadows, wood pastures and associated pollards will depend on their continued management. Management principally for nature conservation is happening in, for example, Scandinavia and the UK. Management to maintain a traditional landscape is also carried out in, for example Austria and parts of France. The ideal situation is ultimately to find ways in which to incorporate traditional techniques into modern farming and land management systems. In this way the products have a use and the reasons for managing are increased. This is being attempted on a small scale in various places but the farmers in Norway are perhaps the furthest ahead, with scientific evidence backing up their activities to demonstrate its worth to the policy makers.

The value of pollards in traditional farming systems has been recognised by others. Austad (1993) pointed out that 'the traditional agrarian landscape contained an ecological diversity which is lacking in the modern cultural landscape' and is dissimilar to modern landscapes. She points out that the traditional landscape is characterised by 'small scale pattern of variation resulting in a great diversity of plant communities and ecological processes'. Lopping, hay making and grazing are considered by her to be the most important elements in such a landscape.

The value of pollards and pollard systems are clearly recognised in some countries, notably the more northern European ones. However awareness raising is urgently required in others, such as Spain, southern France, Romania and Hungary. Two factors seem to have hindered the realisation of the high value of these trees and associated landscapes. The first is familiarity – in areas such as northern Spain or Romania where pollards are abundant and common-place it is difficult for local people to see them in a European context and be aware that what they have is exceptional and of European importance. The second is realisation that a man made and relatively intensely managed system has a conservation value that is as high as, if not higher, than non intervention woodland. The view that a wilderness is not necessarily the ultimate nature conservation aim is a challenging one! This does not imply that pollarding all trees, or whole nature reserves, is always the solution, it is of course necessary to apply appropriate techniques in different situations. However, it is necessary to overcome the prejudice that nature conservation is always best when nature is left to her own devices. This option might be possible if we had not interfered with anything, but since humans have destroyed such huge areas we are no longer dealing with a natural situation. Pollarding is a rare example of human intervention improving on the natural system and we ought to make the best of it! I am not proposing that active intervention is the way to manage all nature reserves, non intervention has a definite place for many however, it is certainly necessary to manage some very actively. Of course the disadvantage of such a decision is that active

management is actually much more difficult and expensive than non intervention and must be continued once started. For this reason alone it is unlikely to be adopted universally.

The concept that active management is 'bad for tree'd ecosystems' is reinforced by the Natura 2000 network. An issue of the Natura 2000 newsletter in May 2003 about natural and semi-natural forests stresses that they are among the richest ecosystems in Europe and states guidance for selecting sites for the network where focus should be on:

- Forests of native species
- Forests with a high degree of naturalness
- Forests of tall trees
- Presence of old and dead trees
- Forests with a substantial area
- Forests having benefited from continuous sustainable management over a significant period.

It summarises these with the statement that ' These principles indicate that preference should be given to autochthonous forest with little human interference and/or those already subject to sustainable management practices favouring biodiversity.'

I argue that this has reinforced the bias of those designating areas away from sites that have large numbers of old pollarded trees because they have been heavily managed by man despite the fact that they have often been managed quite positively for nature conservation (although that might not have been the primary reason for management). Too much emphasis has been placed on naturalness to the extent that young regenerating trees may be preferred to old pollarded trees in designated sites despite the fact that the latter have a higher biodiversity value. The EU and the Natura 2000 network must start taking these arguments on board otherwise significant loss of biodiversity will occur in the future, and along with it part of Europe's heritage. Scandinavia has already achieved this by insisting that wooded meadows be a habitat type, Britain has attempted this by squeezing sites into other woodland categories but this does not help or encourage the rest of Europe that is struggling to realise the value of such places.

There is an additional problem where pollarded trees occur as part of a wider landscape, for example as hedgerow trees, rather than being in discrete areas. The recognition and preservation of landscapes is a more difficult task than the preservation of specific individual sites.

In the UK the realisation of the value of pollards, old trees and associated systems is slowly being taken for granted and becoming main-stream. As a result policies and procedures are generally in place, or being put in place to conserve and protect them (although clearly there is still opportunity for improvement!). In some other European countries this acceptance is not necessarily universal and substantial work needs to be done. It is hoped that experiences in the UK can help some of these countries recognise what they have and start to act to both manage and protect them. The following check list is intended to stimulate discussion and activity to promote awareness, management and protection of agricultural systems with pollarded trees across Europe.

Ideas for helping other countries

- Better interpretation of pollards and cultural landscapes
- Raising awareness of the value of traditional agricultural systems in the 'cultural consciousness'.
- Learning lessons from other countries and situations
- Designation of suitable areas with pollards as nature reserves
- Getting wood pastures sites recognised by the EU habitats directive.
- Helping accession countries and those recently joining the EU with designation of appropriate areas
- How will Romanian agricultural systems cope with EU'isation?
- There are a small number of people with considerable knowledge of pollard systems in their countries and others – How is this knowledge passed to those doing the practical work?
- How is this knowledge shared with other experts and interested people
- Locating important sites in each country – the formation of site directories
- A small number of active people can have a huge effect within a country or region - how do we find and assist such 'champions'

Ideas for work in Britain

Lessons learnt from other European countries can still provide ideas and opportunities for improvement of the British situation, some of these are:

- Protection of individual trees as nature reserves such as the Natur Minne system in Sweden
- Designation of cultural reserves as well as nature reserves and National monuments. These can help promote traditional farming systems and could help preserve interesting buildings along with the land management that surrounds them as one unit rather than as separate entities.
- Consider identifying traditional farming systems and setting up an inventory of particularly good examples
- Recognition of the importance of sap risers even in regularly pollarded *Quercus* trees
- In the past pollarded trees did die and this was not considered a complete disaster as long as other trees were able to take its place, either new younger trees or suckers or some other remnant of the same tree. Are we sometimes too precious about the importance of individual trees? Is continuous, consistent management of the site as important in the long term?
- For further information on pollarding, try talking to ethnographers.
- We have become so mechanised that we have forgotten that it is possible to do things by hand and at a slower pace. Are there more opportunities to take the pace a little slower and try using some traditional methods, such as pollarding with blades rather than a chain saw or cutting hay by hand? If it is an excuse to have a party afterwards like the traditional hay making parties in Scandinavia all the better!

- Increased awareness of the work of Ingvild Austad in Norway demonstrating that trees increase the productivity of meadows and that the nutritional value of tree leaves of some species are equivalent to hay or silage.
- Could we encourage more of a pollard culture again in Britain? The creation of new pollards is regularly discouraged because of the need for ongoing regular management that is labour intensive and expensive. Perhaps there is a use for pollards both as shade bearing trees where interesting tree shapes could be a feature and in other situations such tree plantings along motorways where non sensitive cutting using a tractor mounted hedge trimming flail would be an acceptable method of ensuring the trees do not grow too tall. There are definite opportunities for the creative use of pollards.

Potential projects to explore

- Cutting of new pollards with a slanting top
  - Is it better than a flat top?
  - Should the slant face north or south? Or does this depend on whether the tree is more likely to suffer from drying out or benefit from increased light levels?
- The benefit of using sap risers i.e. retaining one or two stems on trees that are in a regular cycle for a year or two after removing the rest of the branches. Do all tree species respond to sap risers in the same way – i.e. is the response in an 'easy' species such as *Salix* less beneficial than in *Quercus*?
- Is there a different response to cutting *Fagus* trees in Eastern Europe to those in northern Europe and if so does this have a genetic basis?
- Further exploration of the time of year of cutting. Is it actually better for the tree to be cut in the growing season when it can respond quicker? Does this depend on the weather conditions? Does it depend on the age of the tree and/or the regularity of cutting?
- Are pollards 'more forgiving' of hard cutting when they are in a regular cutting cycle rather than being cut at infrequent intervals?
- Is there any merit in taking lunar cycles into account when cutting trees?
- Do pollards respond differently to cuts made from a sharp blade, a hand saw and a chain saw?
- How important is the length of the cycle to tree survival. Is there an optimum length for the tree? Has the development of a longer cycle encouraged through the use of saws and chainsaws been detrimental to tree health and survival?

As a result of the tour various questions have been raised about historical pollarding in Britain and in particular about the *Fagus* pollards at Burnham Beeches. Answers to the following questions would help with our understanding of past management of pollards in the U.K:

- How big were the branches cut from *Fagus* and *Quercus* for fuel wood? Perhaps they were smaller than we might think.
- Did the trees grow slower in the U.K. than in some other countries? I.e. was a branch of 10 years here equivalent to one of 5 years in southern Sweden.

- What was the death rate of pollarded trees in regular management? Did death become progressively more frequent on older trees even in an active cycle? Presumably death of a few trees was not a problem, since there were so many, as long as new pollards were being created.
- Were sap-risers common-place on *Quercus*, like in northern France?
- What did the animals in Burnham Beeches eat in the winter months? Was it really hay and if so, where was it grown? (Why are there so few hay meadows locally marked on older maps?). If animals grazed in the Beeches all year round what did they eat in the winter? (heather?)
- Were trees cut for fodder at any time? What happened in drought years or hard winters?
- Was pollarding of *Fagus* (and other trees) in Britain like the Romanian examples (roughly 'hacked' branches) or Norwegian ones (cut tidily and with pride)?

How many old trees are there in the U.K.?

The question of how many old trees are in the UK relative to the rest of Europe is a much discussed issue currently. This tour has not answered this question but it has provided additional information. Pollards of course are not necessarily particularly old although many old trees are pollards. In three months I was limited by those places where people could tell me or show me trees and many interesting sites were discovered. However, I also realised how easy it would be to miss crucial places due to the intensely clumped nature of such places on a European scale. With the probable exception of Romania, where pollards are perhaps more widespread but at lower densities it would have been possible to overlook aggregations of trees very easily with no prior knowledge. Any system for estimating numbers must take this into consideration and the most accurate information would surely be gained by talking to the relevant experts in each country or region. The difficult part of this of course is finding the right person to ask!

It is clear that Britain is not the only European country to have old pollarded trees. A remarkable number of countries can boast at least some. The Spanish/French Basque country must have substantially more beech pollards than the U.K. and Romania may also have more too. Very old oaks were discovered in small numbers in a variety of countries; again the Basque country has many but these are probably, in general smaller than those in Britain.

Glossary

Bolling – the trunk of a pollard (that part which remains uncut)
Candelabra – Word used in several different languages to describe the shape of a pollard where the branches have not been cut back to the bolling each time but where long stubs were left. The tree subsequently becomes very open in shape.
Coppice – Tree cut repeatedly at ground level in order to obtain a harvest, for example of wood/leaves.
Cut to the form of the tree – Method by which the tree is cut using the previous shape of the tree to guide where to cut rather than to a predetermined shape. The trees are often irregular in shape. (Courtesy of Ted Green).
Desmocho – Old Spanish name for a pollard cut with a single head, a term now largely not in use.
Guido – Old Spanish term for a tree shaped to provide specific pieces of wood for ship building. The trimmed wood was used for charcoal making
Lapsed pollard – Pollard that has been left uncut for longer than it's normal cycle
Lopping – Term used to refer to cutting of trees, often used in a wide sense including all types of coppicing and pollarding. Sometimes referring to as the cutting of large branches.
Pollard – According to the European Arboricultural Council a pollard is 'A frequently misunderstood term, and used in two contexts. Traditionally and still commonly used this term describes the removal of all branches from the trunk…. a less frequently used definition can mean the regular (annual or biennial) pruning back of small branches to the same point resulting in the formation of a pollard head'. I believe this definition is misleading, generally describes the treatment of street trees and adds to the misconception that a tree has not been pollarded unless all the branches are removed. A better definition is given by Lonsdale (1999): 'Pollarding is the complete or partial removal of the crown of a young tree so as to encourage the development of numerous branches; also, further cutting to maintain this growth pattern.' It could be added that traditionally pollarding was done to gain a product from the tree (e.g. wood or leaves) and that it was intended that the trees would be cut regularly.
Pollard woodland – (Norway) ungrazed area with pollarded trees and predominantly woodland ground flora.
Restoration pollarding - The cutting of lapsed pollards in an attempt to keep them alive and, if possible to restore the pollarding cycle.
Sap riser – Branch or branches left on a pollard after cutting. The branch may be removed at a future time before the complete pollarding is done again.
Secondary pollards – Term used to refer to trees that have been pollarded with branches retained and these themselves have then been pollarded well above the original bolling height (i.e. pollards on top of pollards).
Shred – Tree where the side branches are cut repeatedly in order to obtain leaves or wood through adventitious branches, or to reduce the shading effect of the branches on the ground, or to produce a straight piece of timber for felling. The top branches of the tree are left intact. Also called branch lopping.

Shredded pollard – Generally used to describe a shredded tree where the top of the tree has been removed as well as the branches. Also used for trees that have been pollarded but where the subsequent branches arising have been shredded.
Trasmocho – Now the most commonly used term to describe any pollard in Spanish, originally those cut to a single bolling head (a 'classic' pollard shape).
Wood pasture – An area of woodland which is grazed for much of the year. In a pollard wood pasture the trees are largely pollarded
Wooded meadow – A meadow that is cut for hay but which has scattered trees. The trees may be pollarded, coppiced or orchard trees. The ground flora may be grazed in the early spring and after the hay has been cut.
Working tree – Any species of tree that has been managed in any way (though predominantly by cutting) for its produce. (Courtesy of Ted Green).

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