

# LARGE GRAZING ANIMALS IN FLANDERS

Daniël Josten, Ministry of Flemish Community

The Nature Division of the Ministry of the Flemish Community prepares, implements and monitors nature policy in Flanders. The Flemish authorities manage only a modest area of land set aside as nature reserves (when compared with the Netherlands). At the present time the Nature Division manages 13,000 hectares of natural area: of which 4,500 hectares are owned, 3,100 are leased or held under another form of agreement, and more than 5,500 hectares are classified as areas of high ecological value in military areas (maintained under agreement with the Ministry of Defence).

Due to the growing size of the land area under management, (very) extensive grazing is more and more opted for as a means of management, whenever possible or desirable.

This ties in with international developments and findings in the area of nature management, i.e. achieving a better natural return with the help of large grazing animals. With large grazing animals it is therefore possible to aim for a higher degree of naturalness in a given area. Large grazing animals are also used to complete an ecosystem. In the latter case, the mere presence of the large grazing animal as an animal species is valued.

## Grazing management in Flanders

At the present time the Nature Division manages about 2,250 ha of natural areas by means of extensive grazing. It uses its own large grazing animals on a good 1,360 ha. This involves a total of more than sixty grazing projects. The reserves vary greatly in size in Flanders, from tens of ares to several hundred hectares.

Still, most of the areas are relatively small. Grazing is mainly used to preserve the existing nature (preserving the variety of species, valuable vegetation, etc.).

Areas in which grazing is used to shape the landscape are extremely scarce in Flanders. There are high expectations of new nature development projects, in which space is created for natural processes, such as natural grazing.

There is no simple answer to the question as to which herbivores should play a key role in nature areas. The most important thing is to achieve the greatest possible natural return. If we opt to develop less natural, yet semi-natural ecosystems, the most obvious thing would be to use native species and/or breeds that fit in with the area (ecologically). When developing large, sustainable ecosystems the natural ecosystem would favour large, wild, endemic grazing animals. The closer the herbivores come to the original species the more the effects of grazing tend to increase. With the exception of the Voerstreek (Limburg) where wild boar can still be found, roe deer are the only large grazing animals living in the wild in Flanders. Roe deer are mostly found in the provinces of Antwerp, Limburg and Flemish Brabant.

The Nature Division uses several species. Besides the smaller ungulates, the main grazing animals are horse and cattle breeds, which are well suited to running wild. Examples include Koniks and other 'sturdy' breeds of horses and ponies (fjord horses, Shetland ponies) and hardy cattle breeds such as Scottish Highlanders, Aberdeen Angus, Galloways and Heck cattle.

When choosing large grazing animals we should bear four elements in mind.

- Diet and feeding strategy have a massive influence on the effects of grazing.
- The history of domestication and winter hardiness are important factors in

the animals' behaviour and survival in natural situations.

- Manageability (for example moving the animals) is equally an important factor for the managers.
- Visual attractiveness is an important factor for visitors to the natural area.

The use of large grazing animals is best in socially complete herds. Horses and cattle are herd animals. Their natural behaviour is fully adapted to life in a group, with herd leaders, mares with foals and stallions, or cows with calves and bulls.

In a herd such as this there is a clear hierarchy and distribution of tasks. The presence of a complete herd gives more variation to a nature area, which has a positive outcome for the variety of species. Where this is not possible due to the confines of space, the size of the herd should at least correspond (preferably) with the smallest social unit.

Privately owned animals are often put to graze on land with a short grazing season (seasonal or winter grazing). These are often the cattle of local farmers.

These farmers are involved in the management of the nature reserve on the basis of a user agreement (this is a positive element in increasing the groundswell of support for natural conservation and development). In some cases this is a transitional measure, before we reach a final decision.

In theory, there is no cost involved for the animals' owners, but there are a few preconditions to be observed. The owners remain entirely responsible for their animals. They are required, for example, to intervene during the winter period, when the animals are sick, and so on. The costs of the state are confined to layout and supervision. In most cases this form of co-operation works well, but experience shows that supervision is best handled by the land manager. Sometimes the failure to respect the opening and closing dates for temporary grazing can have negative effects, such as excessive grazing density, use of artificial fertilisers, etc.

The process also involves putting local breeds out to graze. In a few Flemish reserves the grazing animals therefore

include a number of rare, local breeds of sheep and goat, and Red (or West-Flemish) cattle. This ancient local breed is being superseded, however, by more productive cattle breeds. Only about 200 thoroughbreds remain. Pursuant to the Countryside Ordinance (protection of genetic diversity) the Flemish authorities (in this case the Agriculture and Horticulture Administration of the Ministry of the Flemish Community) subsidise the farmers' upkeep of certain breeds of cattle, horse, sheep and goat threatened with extinction.

There is no need for a strict appraisal of the costs and benefits of grass management.

Nor is there any clear indication of whether we should work with our own animals or those belonging to private individuals. Much depends on how we tend to view these large grazing animals in our nature areas - as cheap mowing machines or as an added value for the natural terrain? In other words, is grazing purely a management tool, or are large grazing animals an essential element of the landscape?

### Veterinary aspects

Large grazing animals do not always live in isolated areas. As nature managers we often encounter all kinds of practical problems in the field. Flanders has no legislation specific to large grazing animals in nature areas.

The animals found in nature areas are considered as utility animals.

This means that they are seen as 'kept', and, as a consequence, fall under the Belgian and European legislations on the prevention of infectious diseases, such as brucellosis, leucosis and tuberculosis.

Nature managers therefore bear the same responsibilities as ordinary cattle farmers.

It is obligatory to have a recognised veterinary surgeon perform blood tests to check the animals for disease once a year. We use this occasion to carry out extra tests to extend our own body of information (DNA studies, weight, condition scoring, etc.). In these manipulations hooves may also be tended to, for

example, or animals treated against mange and parasitic infections such as stomach, intestinal and lungworms. In natural areas the animal population is not particularly high. As a result, the disease infection rate will be fairly low. When managing the herd we devote most attention to preventing infection and the spread of diseases.

However the Ministry of Agriculture takes the position that a herd of freely living cattle cannot be considered as utility animals. But how do we define freely living cattle?

In the Netherlands special provisions exist for the identification, registration and veterinary examination of large grazing animals in certain nature areas. Contrary to the Netherlands, our federal (Belgian) legislature is unclear on the definition of 'animal living in the wild'. Nor can an answer be found in our own Flemish legislation.

Cloven-hoofed farm animals are registered via the Belgian SANITEL system. Pursuant to two European directives cattle require individual identification (now two plastic earmarks, formerly one copper and one plastic earmark). Newborn calves must be earmarked within seven days. Furthermore, each animal must have its own 'personalised' accompanying document.

Since 1996 it has been compulsory to identify and register sheep, goats and deer. Sheep and goats must be earmarked within 6 months, or on departure from the farm of birth. There is no requirement to identify or register horses.

SANITEL keeps a list of the various cattle stocks and the arrival and departure of animals in or from each stock. This registration requirement is supervised by the Provinciale Verbond voor Veeziektenbestrijding [Provincial Livestock Disease Prevention Association], which is affiliated to the Ministry of Agriculture. It is not possible, therefore, to transport or trade non-earmarked animals or animals without an accompanying document.

Since grazing animals in nature areas are considered as 'kept', Flanders has

no guidelines on dealing with animals living independently in nature areas. The only framework of reference is the Animal Welfare Act of 1986, which describes the duty of care and the principle of prevention (no unnecessary animal suffering).

### Regulation of numbers

With no clear management objectives it is impossible to check the favourable or detrimental effects of grass management.

The effects of trampling and grazing by large grazing animals have been insufficiently monitored to allow us to choose the best management system for vulnerable and rare ecological communities. Continuing ecological and management-oriented research will help.

The grazing duration and intensity, and type of grazing animal, are still too dependent on practical considerations, and less on a well-conceived management objective.

Where there is a surfeit of animals their fate depends on the animal species. They may be moved to another nature area or another (domestic or foreign) manager, by means of selling, exchanging or moving under a so-called breeding-loan agreement. Another possibility is that of sale to private individuals. In exceptional cases - in the event of disasters or diseases - animals are taken to the slaughterhouse. Provided the SANITEL provisions are met (national identification and registration, compulsory livestock disease prevention) there can be no objection to the slaughter of animals from nature areas for human consumption. Sales of the meat occur only sporadically.

Large grazing animals that die on nature areas must be taken away to a suitable company to be destroyed.

### Herd management

In view of the relatively small size of the majority of Flemish nature areas there is usually only one small herd of grazing animals with a 'permanent' bull or stallion in the area. However, herd manage-

ment is on the rise in Flanders. We are still in the process of developing our herds.

The basis for good herd management is a careful administration of all animals: veterinary details, lineage, visual characteristics, social behaviour, and special occurrences (disease, death, births, etc.).

For a small number of large grazing species (Galloways, Heck cattle and Koniks) there is a system of national and international herd consultation.

### Interaction between grazing animals and humans

In some Nature Division areas visitors are free to wander in the grazing enclosure. These areas are grazed by non-aggressive and hornless species. Not everyone appreciates the thrill of suddenly finding themselves eye-to-eye with a large grazing animal during their visit to a nature area. Fear and ignorance play a significant role.

Others think they are visiting a children's farm and throw caution to the wind.

Interactions between grazing animals and people are never free of risk. There is a need to provide visitors with appropriate information on large grazing animals in nature areas. The Nature Division gives out information brochures on large grazing animals and grazing.

To avoid misunderstandings, we stress the exceptional winter hardiness of the grazing animals on information boards. The Act of 1986 on the protection and welfare of animals imposes no requirement on the nature manager to provide shelter for animals kept outside. Nor does the relevant EC legislation impose a provision of this type.

Keeping and dealing with large herbivores requires specific knowledge and skills. It also requires the use of 'specialist' personnel and equipment.

Accurate information on grazing as a process and staff training courses on dealing with large grazing animals are important. Hence our Nature Division offers a special course for workers and

nature conservators who have to deal with large grazing animals.

### Practical experience and monitoring

Grazing management in Flanders is slowly but surely growing out of its infancy. However, large grazing animals are all too often used as an alternative for active land management - as a sort of 'cheap mowing machine'. The grazing duration and intensity, and type of grazing animal, are still too dependent on practical considerations, and less on a well-conceived management objective. Not everyone has awoken to the idea that large grazing animals can actually be part of an ecosystem. The likely reason for this is the small area of nature reserves in Flanders. To gain the best results the overall area of Flemish nature reserves should be enlarged and fragmentation removed, thereby enabling us to manage large, annexed areas.

In the meantime Flanders has built up a knowledge and experience of large grazing animals and everything involved with them. In recent decades countless grazing experiments have been started. However, they are often accompanied by little or no documentation and/or research. There is also a need to pass on existing results and findings. Sharing experiences is at least every bit as important as setting up grazing experiments. There is a need, therefore, for a broad Flemish platform from which land managers can report the findings of current projects and exchange information and experiences.

Large grazing animals fall under the legislation for ordinary livestock and therefore under the jurisdiction of the (federal) Ministry of Small Enterprises, Traders and Agriculture. Our agriculture has been going through a process of regionalisation since 1 January 2002. New federal (Belgian) and regional (Flemish) structures are gradually taking over the powers of the current Ministry of Small Enterprises, Traders and Agriculture. Environment and nature policy is an area of full Flemish decision-making power.

The further the developments in grazing progress (consider, for example, the (re)introduction of wild herbivores), the more important the co-operative links between the stakeholders. On the other hand, changes in European, and therefore national, veterinary regulations are having an effect on large grazing animals in nature areas.

We would argue for the establishment of a Veterinary Nature Supervision Commission, in line with the Dutch example. This commission would be able to discuss relations between agricultural policy and natural policy, veterinary developments, and legislation and regulation at the (inter)national and regional level. It would comprise representatives from the relevant administrations, alongside, perhaps, nature associations, and organisations for the protection of animals, livestock breeding, and the preservation of rare cultural breeds. One way of achieving this would be to transfer a number of specific powers to the Flemish level.

*Daniël Josten works for the Nature Division of the Ministry of Flemish Community (Environment; Nature, Land and Water Management Administration).*

# LIVESTOCK FARMING CHANGED THE LANDSCAPE

Joep (G.H.P.) Dirkx

At the end of the last ice age, about 10,000 years ago, the climate improved so much that many deciduous tree species returned to north-western Europe. We know this from the analysis of pollen found in the soil. This data is not contested. There is considerably less agreement among scientists about the appearance of the landscape in those times, as illustrated in Vera's contribution to this issue. Was the land covered by dark woods, or was it more open and park-like?

Pollen diagrams, which depict the results of pollen analyses, clearly indicate that the landscape was not very open. In the Atlanticum (roughly 7000 to 3000 BC), tree cover was more dense than in the preceding period. Light-dependent herbs and grasses all but disappeared from the vegetation and their place was taken by trees such as hazel, oak, elm, lime and ash. These trees were the predominant vegetation until the Neolithicum (about 4500 to 2000 BC), when the early inhabitants of our country gradually abandoned the hunter-gatherer way of life in favour of farming. This led to a sharp reduction in the number of trees in the vegetation, which of course benefited herbs and grasses. The more open landscape was due directly to the activities of neolithic farmers, who felled trees to make clearings where they planted their crops for a few years, until the soil was so worn out that a new clearing had to be made. Livestock, which was put out to graze in the woods, kept the abandoned clearings open.

## How changes in the landscape influenced fauna

We can deduce from skeletal remains what animals looked like in prehistoric times. Although remains have only been found in low-lying areas of the Netherlands, and only of prey animals, we have enough to draw a fairly accurate picture of the fauna of that time. Birds and mammals were most common, for example the fish-otter, beaver, wild boar and deer. Hunters did not often catch large herbivores like moose,

aurochs and wild horse, perhaps because these animals were not very common.

The changes in the vegetation probably increased the availability of food for herbivores. The grasses and shrubs which grew on abandoned plots provided more food than the Atlanticum forest. The plots attracted grazing animals, which in turn benefited dung beetles. These insects had been quite common before the Atlanticum but disappeared when the forest became denser. They returned in the Neolithicum when the forest had become more open and apparently become home to larger numbers manure-producing animals. Hazendonk in Alblasserwaard, for example, offered an abundance of food for deer. From the time that man started clearing the forest, deer populations grew rapidly in places where they had

not occurred before. The forest had probably been much too dense to provide much suitable plant matter for deer. It also explains why there are no wild horses and aurochs in Hazendonk.

However, most of the additional food was eaten by the livestock of neolithic farmers. Aurochs, for example, did not benefit from the clearing of the forest. Although it is difficult to establish whether skeletal remains are of an auroch or a domesticated cow, archaeologists assume that the former died out in our country in the late neolithic period (about 3000 to 2000 BC). Domesticated cattle, which featured prominently on early farms next to pigs and probably goats, took their place.

## How livestock influenced the landscape

The fell-and-burn type of shifting cultivation and grazing livestock irreversibly changed the vegetation. The soils of abandoned plots degraded quickly, so that lime trees which have higher soil fertility requirements, lost out to oak and disappeared from the forest. Grazing livestock prevented reforestation of the plots by eating tree seedlings and saplings. Yet other plant species benefited from grazing, such as holly whose thorny leaves kept livestock at bay.



*Seasonal grazing causes irreversible changes to vegetation.*



*Remains of aurochs provide evidence that the species only occurred in the Netherlands before the Late Neolithicum era (2000-3000 BC); Soest, Germany.*

three years of respite gave coppices enough time to grow big enough to withstand grazing animals.

Another common rule was that forests were often closed to livestock in summer. The forest of Niensen mark, for example, was closed to cattle from the end of June to the end of September ('allerhandt ander besten van koeibest en sullen sommers van sant Peter biss sant Michehl in den busch nit gaen'), a rule which applied to most common forests on sandy soils in the east of the Netherlands. Sheep were banned in the forest from May onward. It is interesting to note that this summer ban for cattle coincides with the season in which grasses in the forest have little nutritive value. Perhaps the cattle fed

20

The practice of putting livestock out to graze in the woods and fields surrounding a settlement continued until the 19th century. On poor sandy soils, this ultimately resulted in extensive, almost treeless heaths. In places, vegetation had deteriorated to the extent that sand dunes developed. On richer soils, semi-open landscapes developed. Examples of this landscape still exist today at Borkener Paradies (Germany) and the New Forest (England). In all but a few locations, forests retreated bit by bit. Only forests which were completely closed off have survived the onslaught of ages.

Time has revealed the inadequacy of restrictions that users imposed on their own exploitation of the forest. These restrictions primarily concerned logging and grazing. There are historical records of the rules by which these activities were governed, which give an indication of the problems that were caused by grazing in the forest. In coppices, newly felled plots were usually closed to grazing for a certain period of time. Otherwise, seedlings and new offshoot would be eaten immediately by hungry livestock. The forests of the marks of Loenen and Sylven, for example, were forbidden territory for cattle, sheep and pigs up to three years after felling ('te verhoeden all onheyl ende schade die duslange int jonge lot is gedaen'). This three-year term was also used elsewhere in Europe. Apparently

### The Large Herbivore Initiative'

The 'Large Herbivore Initiative' (LHI) was founded in 1998 by WWF International under the European Programme (Europe and North and Central Asia). The idea was inspired by the success of the Large Carnivore Initiative (for Europe) (LCIE) that was founded in 1995, to put the large carnivores of Europe back on the map again. Large mammals can serve as good advocates for nature conservation as had been experienced by WWF. The large herbivores (LH) are special in a way, since they are considered to be a group of key-species in ecosystems that through their grazing, browsing and gancral interaction with vegetation have a major impact on vegetation structure and composition. These interactions are in part responsible for the creation of whole landscapes, they are essential for the dynamics of plant species and vegetations and with it facilitate for numerous other plant and animal species.

So the LHI would not just aim at LH species, but would be aiming at several targets using the LH species as a 'flag-ship' species. Ecological restoration, the recreation of wilderness including the large mammal species and the development of ecological networks, would not just be beneficial for a sustainable European biodiversity, but would also provide for a sustainable regional economic bases. It is essential to include socio-economics and policy in nature conservation efforts. This so-called 'human dimensions' approach of nature conservation is an integral element in all LHI projects.

The idea was further, not just to have a new WWF Programme, but to create a network of international experts and interested parties, that would be able to operate more or less independent from WWF. The role for WWF would be to act as a catalyst; bring people together, provide basic logistics and coordination capacity and provide basic funding, also as seed-money to start key projects and organise cooperation.

The LHI as a network-organisation works closely together with for example PAN Parks with respect to ecotourism, and has developed cooperation with various international conventions for legislation matters.

For more information, please contact the LHI coordination office:  
Fred Baerselman and Nadja van Leeuwen, P.O. Box 7, 3700 AA Zeist,  
The Netherlands. fbaerselman@wwf.nl or nleeuwen@wwf.nl

too much on trees and shrubs, and caused damage. Most rules concerned the period that grazing was allowed in the forest and not the number of cattle that were allowed to graze there. When grazing took place was probably considered more to have more influence than grazing intensity. This makes it difficult for modern historians to estimate grazing intensities in neolithic forests. It was clearly too high, as evidenced by the receding of the forests. Damage occurred in the longer term, just as overgrazing had caused such severe damage to some heaths that they changed into sand dunes.

### Conclusion

In summary, fossilised remains of plants indicate that trees were the most prevalent vegetation in the Atlanticum period, a period also in which large herbivores were sparse. This was followed by an extended period during which forests slowly disappeared from all but a few sites due to felling and grazing of livestock. The fact that forests did survive on a few locations can probably be ascribed to a complete ban on livestock grazing.

*G.H.P. Dirx (Joep) works for the Landscape and Spatial development section of Alterra.*

## HOOFED ANIMALS IN NATURE AREAS: THEORY AND PRACTICE VERSUS RESEARCH

Loek (A.T.) Kuiters, Alterra

Until now, there is little substantiated scientific knowledge about the effects of grazing on flora, vegetation and fauna. It is therefore difficult to supply general management guidelines to those working in the field. The development of theories which explain the influence of grazing on various processes, is urgently required. Currently, grazing research is being carried out in the Dutch dunes and the flood plains along the major rivers which promises to fill in at least part of this lacuna.

Since the launch of the first grazing experiment in 1972, in which ponies were put out to graze on abandoned farmland in Baronie Cranendonck in Brabant province, a lot of practical experience has been built up of grazing in nature areas. There are now hundreds of grazing projects, particularly in salt marshes, dune grasslands and woods on higher sandy soils, on heaths, nutrient-poor grassland in the hills of Limburg and on floodplains along the major rivers. Sometimes site managers introduce grazing animals to boost biodiversity. This goal is most common for semi-natural sites that resulted centuries ago from traditional forms of intervention. In other cases, the goal of grazing is to recreate a natural 'wilderness', usually on a large scale, which regulates itself and which is influenced by landscape-forming processes such as grazing by large herbivores.

### Lack of sound research

The introduction of grazing animals is rarely based on sound scientific research. Site managers typically record only changes in the occurrence of plant and animal species. The interpretation of this data is made difficult because other management measures are often implemented at the same time, so that changes cannot be attributed exclusively to grazing. Often, there has been no inventory of the site before grazing is introduced. In addition, changes to

grazing management are frequently made, making it difficult or even impossible to compare different series of measurements made over time. Other difficulties are posed by the absence of good controls and the short time span of many research projects. Conclusions regarding the effects of grazing therefore tend to be assumptions rather than the sum of substantiated factual evidence.

Similarly, little research has been done into the underlying processes which are affected by grazing. Grazing has a significant impact on the microclimate of the soil and sod (light, temperature, moisture level). These changes in turn affect seed germination and the establishment of species of grass, herbs and woody plants and the occurrence of smaller animals such as reptiles, grasshoppers, spiders and beetles. We need to know more about the causes and effects. Often, the results of different studies appear to contradict each other. Perhaps we could understand these results better if we had more knowledge about the underlying mechanisms.

### Effects on flora and fauna

The effects of grazing on flora and fauna depend to a large degree on the type of vegetation on a site and abiotic circumstances, in particular soil fertility and hydrology. We know that the number of plant species increases in about



*Research into the effects of large herbivores on plant and animal life is urgently needed.*

half of all grazing projects. Generally, the number of plant species increases on fertile soils and decreases on poor soils, especially on poor dry soils. Some researchers, however, claim that grazing on fertile grassland leads to a decline in plant species diversity and increased diversity on poor sites. They attribute this to a shift away from competition for light to competition for nutrients.

The effects of grazing on fauna are more complex. Many types of animals benefit from a varied vegetation structure, which can be realised with extensive to extremely extensive grazing. In fifty to sixty per cent of studies, however, a decline in the number of animal species was recorded. This might be due to overly intensive grazing. A definitive conclusion cannot be made, however, as most studies had an inadequate design.

Rabbits usually benefit from grazing by cattle, while numbers of hares and mice decline. A few specific coprophilous and necrophilous populations also benefit from grazing, or rather from the

dung and cadavers of hoofed animals. General principles about the effects of grazing on flora and fauna cannot be drawn up until we have more reliable data collected in studies with a solid methodological design. In particular, better understanding of processes influenced by grazing will help us to generalise research results. Currently, various studies are being carried out in the dunes and on the floodplains of the major rivers. These studies also include fauna, which gives us hope of new knowledge in the future.

### **Grazing in forest landscapes**

Frans Vera's doctorate dissertation gave a new impulse to the theoretical debate on the role of large herbivores at landscape level. His views are set out elsewhere in this issue. Vera states that a landscape, when left to itself, becomes a mosaic of grassland, shrub and woody vegetation. He bases this assertion on extensive evidence acquired by various scientific disciplines. In a process of cyclic succession, the landscape passes

through all stages of vegetation. In this, the role of hoofed grazing animals is crucial. He transposes this to the past and concludes that the ancient European forest was not a closed forest but a semi-open park-like landscape, which was maintained by hoofed animals. Many shrubs and woody species, such as oak and hazel, would have regenerated in open vegetation, not under a closed canopy. Thorny shrubs would have played a key role in protecting young seedlings from hungry grazers. Grazing would have facilitated the establishment and vegetative expansion of thorny shrubs.

How does the theory of cyclic succession and grazing hold out in the light of a major study into forest grazing carried out in the Veluwe in the 1990s? This study describes the long-term effects of grazing by an analysis of enclosures (fixed numbers of a certain species in a fenced-off area), so-called exclosures (no hoofed animals) and simulation models. Researchers examined the impact of red deer, roe deer, wild boar, Scottish highland cow and Konik horse

on forest development and regeneration in both coniferous forest and deciduous forest and on heathland.

The results of this research showed that forest regeneration under a closed canopy was severely hindered by the presence of hoofed animals, especially cattle, and in this situation various forest types would die out within 100 years (as predicted by the model). At the same time, the cessation of turf-cutting and controlled fire management on heathland resulted in a rapid upshoot of trees, especially Scots pine, regardless of whether grazing animals were absent or present. In areas without hoofed animals, a rich variety of shrub and tree species grew up under gaps in the canopy of birch-oak forest and sessile oak-beech forest. When hoofed animals were present, however, the influx of light resulted in treeless clearings, with only vegetation suitable for grazing. In larger open spaces, such as felled areas, the presence of wild hoofed animals resulted in regeneration with, primarily, Scots pine. Regeneration in the relatively light Scots pine woods consisted primarily of Scots pine and beech. When wild hoofed animals were present (ten to fifteen animals per square kilometre), English oak rarely regenerated successfully, either in woodland or heathland.

The researchers concluded that hoofed animals such as red deer, roe deer, wild boar and cattle cannot keep heathland open. At the same time, in most types of forest they impede the regeneration of tree species which are sensitive to predation such as downy birch, silver birch, English oak and sessile oak. The exception is beech. Beech regenerated successfully in most forest types, except beech forest where regeneration was prevented by the presence of hoofed animals. In the long term, therefore, hoofed animals probably transform the landscape: open landscapes become overrun by trees and closed forest becomes more open.

### Theory and practice

Vera developed his ideas about the park-like landscape particularly for more fertile areas. There, sloe and



*Juniper bushes acting as a shield for oaks. Lüneburger Heide.*

hawthorn protect vulnerable young seedlings against predation. It is uncertain whether these shrubs can also offer this degree of protection on poorer soils, or areas with sand dunes or sand deposits. In the old days, juniper bushes acted as a shield here. But in the last few decades this species has regenerated very poorly or not at all in north-western Europe, for reasons yet unknown. We do know that juniper regeneration often coincided with the end of intensive grazing by sheep on heathland, poor grassland or abandoned arable plots.

As juniper bushes slowly disappear, forest landscapes on poor sandy soils lose an important defence against predation of young broadleaved trees such as oak. Blackberry bushes may also fulfil this function, and we already see it happening in areas where cattle and horse graze. But blackberry is eaten by 'trimming' animals, such as roe deer or sheep. The only chance for English oak to regenerate is in the impenetrable tangle of branches and twigs and shoots of fallen trees, especially where

it does not have to compete with the more virile beech seedlings. In nature areas with red deer and roe deer, oak may regenerate provided the ratio of animals to area is sufficiently low for a period of five to ten years. Suggested densities are less than three animals per km<sup>2</sup> for red deer and less than seven for roe deer. Another option would be to raise fences temporarily, although the same result could be achieved by expanding the animals' range. The latter is more suited to a style of management that gives more room for natural processes to run their course.

We recommend that more research is carried out to test Vera's theory that grazing animals, especially cattle and horse, maintain semi-open park-like landscapes. Both experimental and model designs would be recommended. For now, we can conclude that the results of the forest grazing study described above do not contradict his theory.

*A.T. Kuiters (Loek), Alterra, department of Ecology and Environment.*