

# Wildland Project Gathering

Tuesday 13<sup>th</sup> November 2012

## Executive Summary

The gathering held in November 2012 for some of those involved in and contributing to the re-wilding project was an opportunity to share ideas, re-acquaint with the reasoning behind the project and address important questions regarding the science behind it. Frans Vera and Keith Alexander presented persuasive new arguments in support of the wood-pasture theory using recent pollen research and knowledge about the modern ecology of beetles. In the afternoon, a walk around the wildland project area provided the group with an opportunity to observe the vegetation development after 10 years of re-wilding and encouraged contemplation on a wide range of subjects including the progress of the project and comparisons with other wildlife sites, experiences at the Oostvaardersplassen in the Netherlands, the future for conservation management in the future and even resulted in the discovery of brown hairstreak eggs on some blackthorn.

The main issues to arise concerning the re-wilding project were the low stocking density, lack of red deer and vegetation development. The current stocking density is resulting in a higher abundance than would be expected in a wood-pasture system, and unless this changes a natural wood-pasture landscape may not develop. Related to this is the general consensus that red deer as an important component of a grazing ecosystem is certainly lacking at Knepp and at this stage in the project is becoming evident.

Also of interest was the spatial development of differing vegetation types between fields in the project area and why the grazing animals seem to favour some areas over others. Further monitoring work and continuation of the project is deemed necessary to ascertain exactly how grazed landscapes develop following arable reversion and why.

The importance of these meetings lies in the development of ideas and the opportunity for those involved in conservation work to stimulate progress in their ideas and the ideas of others. If Knepp is to herald change in the way we manage land in Britain and conserve our wildlife then the next step is to communicate to as wide an audience as possible and continue questioning and learning from the land.

Notes on proceedings taken by H.M Welsh

## Frans Vera

**Frans Vera** is convinced that the Bialowieza in Poland has developed from former wood pasture, like so many other landscapes in Europe. This idea is contradictory to the theory of succession proposed by Clemence which led to the belief that spontaneous growth is synonymous with a natural system. Vera proposes that this simply cannot be true as many of the original components of the system are simply not there, principally the grazing animals. In the Bialowieza all indigenous animals are culled to a low density which does not harm the forest. With the cessation of agriculture and in a system lacking grazing animals in sufficient density or variety a landscape such as can be seen in the Bialowieza will develop. A landscape that is often and wrongly termed 'primeval forest'.

Palynologists oppose Vera's hypothesis and base their claims on long-term pollen data. Diagrams of pollen taken from 12000 years ago at the end of the ice age to the present day were developed by counting pollen grains preserved in sediment. The results showed a very high abundance of tree pollen and it was noted that 5000 years ago when man began to exert an influence on the land, the pollen counts changed dramatically. The pollen diagrams for 6000 years ago show 95% tree pollen and almost zero percentage of grasses. The palynologists use this as their proof of complete and continuous tree cover, when in fact it shows us nothing of what the landscape looked like then. It merely tells us that there was a lot of tree pollen around, and this, along with the lacking abundance of grass pollen can be explained in a number of ways.

One theory based on assumption (that of closed canopy forest) has led to a baseline for nature in Europe which has informed nature conservation, management and education alike and influenced other theories. This is not science based on observation.

The closed canopy theory of high forest or as **Keith Alexander** calls it 'pollen forest' led to the idea that prehistoric animals such as tarpan and auroch were 'forest animals'. In fact observation clearly shows us that these animals damage trees and prevent regeneration therefore prevent the development of high forest.

Closed canopy theory has become the paradigm of thought, nobody questions it and many follow a blind belief in something that is not supported by simple observation and simple science.

### **'Observation is the basis of science'**

**Cattle are indigenous animals**, people forget this, but they **should** be in our landscape, they are the analogous link to our history, a direct descendant of the auroch. It is important in this respect to use primitive breeds as they exhibit similar behaviour to their ancestors.

European bison are on the IUCN red list with only 4,000 left worldwide. The WWF and the IUCN suggest a stocking density of 3-5 per 1000 ha but they are learning that this is inaccurate. These animals have a major effect on shrubs and trees. They are found in the Bialowieza forest but are fed hay to stop them de-barking the trees. Why? Preventing natural animal behaviour in their natural habitat is surely preventing the landscape from developing naturally, that is, without the influence of man.

Wood-pasture landscape is a park like landscape with a mosaic of groves and trees. When people try to create their idea of a 'natural landscape', this high forest, they think it is right to have beech and lime which are shade tolerant species. Classifications of oak and beech woods or oak and lime woods have been made but these are inaccurate. What happens then in these systems once the beech trees grow up, the oaks cannot. Neither can much else and inevitably beech woodland develops. How can the pollen records show such abundance of pine, oak and hazel when these are all light demanding species which cannot survive or produce an abundance of pollen in a closed canopy system?! An oak-beech wood is ecologically impossible!

Also consider wild fruit trees, seeds of fruit trees dating back to the Mesolithic period have been found so there is evidence for their existence, but there are **no records** of these trees in the pollen diagrams. Why? These trees are insect pollinated and do not spread pollen in to the air. The pollen is not preserved in sediment in the same way as oak or hazel thus highlighting how unreliable pollen records are in showing the whole picture.

Beech has roughly  $\frac{1}{4}$  the biodiversity importance then oak. With the development of high canopy forest, over 40 years 50 per cent of vascular plants were lost. In graphs showing the growth patterns and diameter distribution of trees at the National Park of Dalby Soderskog oaks exhibit bell curve showing that they are dying out while beech show an inverse J curve.

'In some cases, a forester can understand ecology much better than palynologists, they understand that if you plant beech trees around an oak to produce a straight clean trunk, you must return to prune the beech at regular intervals or they will quickly out-compete the oak.'

'In Germany they are trying to change the history books which describe a landscape full of oak, hazel and pine. They look around now, see woods full of beech and convince themselves that this is the natural way.'

Heavy browsing by cattle results in blackthorn producing vegetatively leading to thickets which are ideal habitat for butterflies and songbirds. These thickets develop in to groves surrounded by mantle and fringe vegetation. How big can these groves become? This is not known, but in the New Forest they reach 900ha and it is thought this could be much bigger. In a complete wood-pasture system it is feasible that these 'mini high-forests' would exist within these groves. At 1400ha is the project area at Knepp too small to really hold a complete wood-pasture cycle? We can only wait and see. It may be that the whole cycle cannot play out in this size of an area, and if it cannot, one option would be to interfere by cutting trees to mimic the natural system.

**Maarten Boers** asks about stocking density. This is a key question that can only really be explored through observing development at places like the Oostvaardersplassen and Knepp. This theme is discussed further on the walk around the southern block; essentially **Frans Vera** explains that stocking density informs inbreeding and adaptability

The commoners in the New Forest were not allowed to supplement feed to their animals and could keep only those that survived the winter. Stocking density was determined by the food available, as is the way in a natural system.

In the Oostvaardersplassen the options were to provide supplementary feeding or remove animals that were not going to make it. It was decided that the latter was the best option and this should be

done at the end of the winter, essentially just shortening the starvation period of weak and dying animals. Yearlings are the ones that usually lose out and weaken at this time as the stronger adults outcompete for food.

In any case as **Tony Whitbread** points out, stocking density in a natural system would always be fluctuating.

Predators don't change numbers but they do change behaviour, with possible exceptions such as the wolves in Yellowstone.

## **The Pollen Story**

Observations:

Hazel will not flower under canopy, and really only flowers prolifically in direct bright sunshine. French pollen records showed 30% hazel, this would simply not be possible in a closed canopy situation.

Grass pollen percentages are very low in the diagrams. Why?

1. Grasses which are heavily grazed do not flower or flower much less prolifically
2. Prolific seed producing trees can overwhelm grasses in the pollen count
3. Grass pollen in an open landscape is blown about by wind and is not laid down as sediment, the low movement under tree canopies allow arboreal pollen to drop straight down in to the sediment layer.
4. Fruit trees are insect pollinated

Studies carried out at the Oostvaardersplassen have discovered that grass pollen is positively correlated to water bodies and negatively to grassland and that fungal spore abundance has a significant relationship with large herbivores local density.

The results highlight that pollen is an unreliable indicator for openness but confirms that fungal spores could be used to show past herbivore densities.

### **Absence of evidence is not evidence of absence!**

The pollen sampling method does not paint a picture of relative abundance. Pollen grains are counted to 200 or 500, in a system completely lacking trees the pollen diagrams would show a grazed grassland, but if say, there was one prolifically producing oak tree within that system inevitably the percentage of tree pollen grains counted would be significantly higher than the grasses and the conclusion that the landscape is closed canopy trees is presumed.

**Frans Vera** believes that the higher grass pollen counts shown later on in the diagrams could be explained by the development of hay meadows.

It is important to test things in modern situations in order to reconstruct the history of the forest. The present is the key to the past.

High densities of large herbivores do not completely stop regeneration of trees. Foresters would not believe that with 3 red deer per ha in winter at Oostvaardersplassen trees could regenerate. It is important to consider the carrying capacity of the soil, and **be patient for results**.

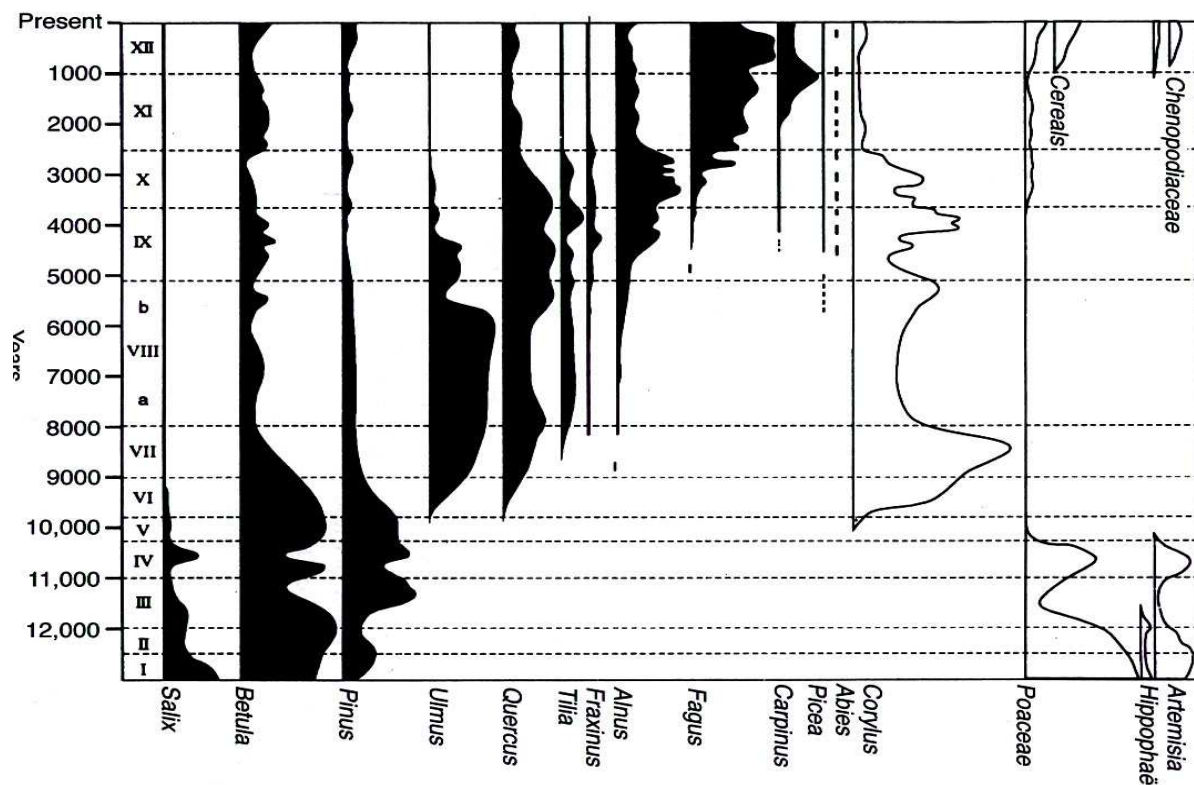


Figure 1 – *Pollen diagram*

**Mick Crawley** - 'Waiting is key and also persuading the foresters the way of the wood-pasture. The point about not just expecting one outcome is really valid.'

## The mammoth tundra

**Julian Smith** brought up the Russian Taiga and Tundra, an anachronism after the mammoth population disappeared. The Tundra is mossy and wet whereas the Taiga is dry and grassy and the Tundra was called the mammoth steppe. Grasses were found in the stomachs of the mammoths, it has been shown that tundra grasses froze as temperatures dropped rapidly overnight preserving nutrients thus allowing the mammoths to survive the harsh conditions.

Was it first Tundra and then the mammoths became extinct turning it to Taiga or was it the other way round?

**Frans Vera** - They carried out an experiment on an area that was very wet then put in grazing animals, over just 15 years it changed from very wet and boggy to a very dry grassy place with trees disappearing. The organiser of the experiment wanted to go in with a tank to remove the remaining trees, saying 'the only problem is that with a tank there is no dung!' This experiment showed that you don't need a whole set of grazing animals just the key ones.

## Keith Alexander

2000 species are dependent on deadwood they are the saproxylic insects, 700 of these are beetles are preserved remarkably well in peat. Palynologists have collectively classified these as 'deadwood species' of woodland. This is wrong; they need a tree not woodland.

There is a widespread perception that beetles depend on woodland based on an unproven and counter-intuitive assumption that the **greater the number of beetle species, the greater the tree density** - it is assumed that a rich assemblage indicates closed canopy woodland. Palaeo-ecology shows a picture of post-glacial vegetation cover which is in conflict with the modern ecology of exactly the same species (Alexander 2012)

If you have an understanding of basic ecology the closed canopy theory, after looking at beetles simply does not make sense. This led to **Keith Alexander** writing his 'angry paper'.

There is a huge spectrum of distribution, mobility, habitat and feeding type within beetles, ranging from generalists to specialists and everything in between. Different habitats are created by the controlled and uncontrolled death of wood and are associated with completely different suites of species. With controlled death the living tree adjusts tissue contents before it dies, this is commonly associated with lateral branching and heartwood, both features of open grown trees and the latter of very old open grown trees.

If the landscape has changed so much since the theoretical 'wildwood' system one would expect a significant reduction in saproxylic species composition, favouring some and pushing others out. In sub-fossil studies suggest we have lost only 18 species, a remarkably low 2.6% of the total, suggesting that habitat has not changed a great deal.

The commonest species found as sub-fossils were *Prostoma mandibularis* and *Ernoporicus caucasicus*. The former is extinct across much of Europe but survives in wood pasture landscapes in the south of England. It lives between the annual growth rings of heartwood which has been partially decayed and softened by a white rot decay fungi such as honey fungus (*Armillaria mellea*) or a Ganoderma.

A list of indicator species of the old high forest was developed. Significantly the majority of these are associated with large, old open grown trees with many developing in the heartwood decay of such trees.

The theory of high forest became the starting point for the interpretation of sub-fossil insect assemblages; as a result pollen analysts assumed the existence of trees automatically meant forests.

The short mobility of many beetle species explains why those remaining in Windsor Great Park are confined to this locality. Most of these beetles are sun loving and live in coppice with standards and open areas, just like butterflies. Flight is almost exclusively done in calm, bright sunny conditions, not those of dense forest. These so called 'woodland' insects are actually creatures of open areas and associated with open grown trees.

## Walkabout



**Figure 2 – Maarten Boars, William Hobhouse, Tony Whitbread, Ted Green, Frans Vera, Jill Butler, Neil Hume, Mick Crawley and Julien Smith – in Broomers corner one of the blocks of sallow that is heavily browsed by cattle**

Broomers corner field was taken out of arable in 2005, the cattle come here daily, often travelling long distances with straight route marches (observed and recorded by GPS collars) to spend time there and this also happens with the ponies and pigs. There is obviously something they like, but what that is remains to be seen as soil tests revealed very little.

Apparently this also happens at Oostvaardersplassen. Vera explained that in the spring the sallow is favoured by cattle but less by the ponies. The issue of a lacking grazer in the red deer was discussed - their impact through de-barking and **Charlie Burrell's** concerns over the danger of rutting stags. At the Oostvaardersplassen the red deer have killed ponies and various examples across the UK were discussed where the red deer exhibit very different behaviour.

Discussion on the propensity of oak seedlings to survive with or without thorny protection, **Tony Whitbread** cites Ebernoe common as an example of where seedlings have grown but usually do not survive and where they do succeed, are repeatedly browsed back.

Wood mice have been recorded caching acorns 45-50m out from the woodland edge while jays hoard distances up to 6km. Acorns are not usually cached in groups, and it is single saplings rather than groups that are seen at Knepp. Generally wood mice prefer to hoard with some protection from predators, while jays will hoard in the open but often use a landmark to select their cache though long grass can suffice. Mice have been shown to 'relay' acorns up to 75m. There is a scientific



paper on these two methods of caching. It was thought that the openness of the grassy fields in the northern block suggested caching of acorns by jays and rooks.

Increased nitrogen in plants results in darker leaves; animals appear to be aware of this and herbivory increases. As **Mick Crawley** points out, this only happens with a nitrogen increase, so ironically a nitrogen increase results in a biomass decrease due to increased herbivory. But if nitrogen and phosphorous or potassium is increased the cellular structure is altered in a different way and the colouring is not affected.

Stocking density on the estate was queried – in 2012 the southern block holds 130 longhorns in 1100 acres (approx. 0.27 GLU per ha.) 6 Tamworth sows, 130 fallow deer, approximately 60 roe deer and 15 Exmoor ponies. At the end of last winter **Maarten Boers** says their condition was very good whereas the first two winters the cattle were in poor condition. Likely due to a hard winter and the cows calving all year round with some being heavily pregnant in poor weather conditions. The removal of bulls results in all calving taking place in late spring. **Frans Vera** questioned this action and also pointed out that in a natural system cattle would not come out of winter in very good condition and there would likely be some much weaker individuals that may die - a population sustained by the amount of food available.

The issue of inbreeding cattle at the Oostvaardersplassen was raised. **Frans Vera** explained that there used to be 1:1 cow: bull, now it is 1 bull to 4 cows and birthing has synchronised. **Frans Vera** suggested that synchronisation is aided by the cows following a natural system which involves the cows becoming meagre by the end of winter. It was suggested that stocking density should/could be higher at Knepp and **Charlie Burrell** explained that the herds in the North and South blocks are slowly growing (the middle is to stay the same for a while)

A narrow genetic pool which is very well adapted to conditions—Chillingham is a good example of how inbreeding is not always a bad thing. Foot and mouth and other population fluxes reduced the population to near extinction but the breed recovered from just a few individuals and genetic diversity was not adversely affected.

At the Oostvaardersplassen the proportion of bulls to cows has shrunk to 20%, **Mick Crawley** pointed out that this is quite natural for wild ungulates for all sorts of reasons. Cattle numbers rose to around 500/600 (rising exponentially) plateaued and are now dropping. The Dutch parliament decided that condition scoring would determine weak and dying animals to be shot. In 2011 there was a 40% 'crash' but Vera was eager to point out this terminology is misleading and in fact a 'crash' is often just natural fluctuation.

Stock management – should this be done against determined and calculated numbers or by condition scoring and essentially just shortening the starvation period of weak/dying animals. Traditionally culling is carried out in autumn, instead at the Oostvaardersplassen nature takes its course and as a result the yearlings which are naturally lower in the pecking order and are outcompeted for food become weaker and die.

Interesting point raised about what constitutes a wild animal in the Netherlands, the Stadsbosbeer released animals in the Oostvaardersplassen with no intention of ever getting them back and therefore they were classed as 'lost property'. What is lost property -it is belonging to nobody, which



means it is a wild animal. This has implications for how carcasses are dealt with. Only red deer carcasses can be left on site the heads are removed. Carcasses are eaten by white-tailed eagles, foxes, crows, rare beetles and even a visiting black vulture which was around for 4 months before being killed by a train next to the site.

The issue of non-intervention in vegetation management was raised. **Tony Whitbread** pointed out that 10 years ago the talk was of non-intervention in vegetation management; now the talk is of non-intervention of the drivers of vegetation change and wondered whether in 10 years' time the discussion will be of non-intervention of the management of predators?

**Frans Vera** discussed the potential for a population of 200 wolves at the Oostvaardersplassen, this figure being based on a piece published in the Nature journal which outlined a ratio of 90kg of predator supported by 10,000kg of prey, approximately 1000: 1. He spoke of how it can be completely out of peoples mind what exactly it is that determines population sizes and how varied they can be, citing the Ngorogoro crater as an example. Here there is 1 lion per 300ha, 1 spotted hyena per 80ha and approx. 26,000 ungulates.

**Ted Green** proposed that browse die-back could be a result of fungal spores or other particles spread by cattle through saliva, Julian wondered if it could also be affected by the time of year, Mick Crawley points out there actually already is a large body of work on saliva and its effect on vegetation<sup>1</sup>.

**Neil Hulme** discovered Brown Hairstreak (*Thecla betulae*) eggs on blackthorn scrub while standing in a field that came out of arable in 2003. He explained how much easier it is to survey them with egg counts in winter than in spring or summer as the adults like to spend most of their time up in the tops of trees. The brown hairstreak is a UKBap species and active between August and September.



**Figure 2 – Neil Hulme showing Frans Vera brown hairstreak eggs on blackthorn in the Southern Block**



Gillian Thompson

<sup>1</sup>Detling J.K, M.I. Dyer M.I, Procter-Gregg C, and Winn D.T. 1980 *Plant-Herbivore Interaction: Examinations of Potential Effects of Bison Saliva on Regrowth of Bouteloua gracilis* (H.B.K.Lag)

Xing Teng, Lei Ba, Deli Wang, Ling Wang, Jushun Liu 2010. *Growth Response of Leymus chinensis (Trin.) Tzvelev to sheep saliva after defoliation.*

**Neil Hulme** has seen purple emperors on the estate and thinks Knepp will be a haven for this species within 10 years.

Tits predate on caterpillars and this is bad for butterfly populations. Butterfly egg surveys are taken any time after leaf fall. **Neil Hulme** is proposing continuing with the previous survey and in addition carrying out a spring survey, (imperative to monitor certain species such as dingy and grizzled skipper) and timed routes in May and July. Even in one of the worst years for butterflies he has already recorded 25 different species at Knepp and expects this to rise to around 30 next year.

**Charlie Burrell** discussed Olivia Hicks' research on Nightingales which found 34 territories (three times the amount recorded pre-wilding) and 79% of these were paired birds that were potentially breeding. Only 9 territories were found on neighbouring farms of which 2 were paired). 86% of these territories were found in scrub and hedgerow rather than woodland, and absolutely all of them in scrub or hedgerow over 8m wide.

One field with scrubby growth dominated by hawthorn was in contrast to the majority of fields which are predominantly blackthorn and rose. This begs the question, 'why after coming out of arable in the same year do different fields under the same grazing management and with the same history develop different vegetation?'

Main issues/observations to arise:

- Stock density to increase
- Need red deer to complete team of browsers
- Differing vegetation in fields

On the value of red deer as a valuable grazer **Frans Vera** told of a situation where red deer debarked a large area of ash trees but did not touch the oak trees at all. He reckoned they would damage willow and ash but leave oak. **Jill Butler** thought it of most importance to learn PR lessons from the Oostvaardersplassen. There is a time lag happening at Knepp, certain tree species have taken advantage of the relatively light grazing and are flourishing, this needs to be caught up with correct grazing pressure in terms of both density and type.

On inspecting a very old oak in the parkland area **Keith Alexander** talked through some thoughts on beetles and trees. Everyone neglects dead, lower branches when in fact they are extremely important habitats. The rare *Phloiophilus edwardsii* larvae feed exclusively on the rare fungus *Peniophora quercina* which develops on lower dead branches of a tree. This is a controlled death, and these organisms can be called aerial pruners or aerial recyclers. If the branch drops these beetles will no longer be interested in the branch and will attempt to move upward to their preferred habitat. There exists a very different suite of fungi on lower lateral branches than is found anywhere else.

Germans are testing fungal brackets for the potential usability for mankind in particular for their use as antibiotics, they are reservoirs of biodiversity and we just have no idea what the potential is.

**Ted Green** – "I think of Oaks as the rainforests of Europe" 'Minimum intervention is actually maximum intervention.' **Frans Vera** - 'Semi natural is also semi-un natural!'