

Chavasse Travel Award Report

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For three weeks in September and October last year I was fortunate to be able to visit Germany and the United Kingdom to learn more about wind effects on trees. This trip was made possible through the generous support of the NZIF who awarded me the Chavasse Travel Award. In this report I will present a brief overview of some of the highlights of my trip.

I started out in Karlsruhe, Germany which is about an hour south of Frankfurt by train. The reason for visiting Karlsruhe was to attend the IUFRO (International Union of Forest Research Organisations) conference on "Wind Effects on Trees". This conference is only held once every five years and is one of the few opportunities for researchers studying the effects of wind on trees to meet and discuss their work. This time around it was being hosted by the University of Karlsruhe. On the previous two occasions this conference had been held, the locations have also been in Europe.

According to the organisers, 89 people attended the conference. Over 20 countries were represented, and all but one of the participants (i.e. me) were from the Northern Hemisphere. The disciplines represented at the conference included aerodynamics, meteorology, physics, engineering, forestry, ecology and tree physiology. Due to the relatively large number of papers, the conference had both joint and parallel sessions. The themes of the various sessions were:

- Aerodynamic interaction of wind and trees.
- Ecological dynamics following windthrow.
- Storm impacts and risk modelling.
- Physical and numerical modelling of airflow around trees.
- Biomechanics.

Each of these themes was represented in at least one of the joint sessions. I presented a paper entitled "Wind damage in alternative silvicultural systems" in the storm impacts and risk modelling session. In addition, I also chaired one of the sessions on biomechanics.

As part of the conference, two field trips were held. The first was a half-day trip to the Black Forest (Schwarzwald) to look at wind damage resulting from Storm Lothar in 1999. Wind speeds during this storm exceeded 200 km/hr and resulted in damage to some 200 million m³ of timber throughout Europe. We visited two sites within the forest that were close to Bad Herrenalb and Gernsbach in the Alb River valley. Given the time that has elapsed since the damage, all

that was visible were the openings created by the storm. Local forest managers from the Baden-Württemberg State Forestry Department (complete with collared shirts and ties!!) gave an overview of how they coped with salvaging the large volumes of wood that were blown down. They also discussed the regeneration strategies being employed for the areas and the importance of selecting species that are adapted to the particular site conditions.

Fig. 1: (a) Employee from the State Forestry Department explains the impacts of Storm Lothar on the area of Black Forest near Bad Herrenalb. (b) Three years following the storm, scattered regeneration has occurred.



At the second stop on the field trip we were shown an example of management which aims to create more structurally complex forests. Here the main species was Norway spruce (*Picea abies*) and trees were either removed as individuals or in small groups to create an uneven-age stand structure. Because Norway spruce is relatively shade tolerant, abundant regeneration was occurring in the harvested gaps. The result was aesthetically appealing as well as providing good habitat for many of the wildlife species in the area.

Fig. 2: Increased structural complexity in a Norway spruce has been created by removing individual trees and small groups of trees.



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That evening the conference dinner was held at a local restaurant in Bad Herrenalb complete with live musical accompaniment provided by a jazz quartet. It was a good opportunity to meet people and I also received a bottle of wine for being the participant who travelled the furthest to attend the conference. I was certainly aware of the distance that I had flown as I fought off the effects of jet-lag while giving my talk!

The second field trip was a post conference tour to Palatinate Forest in the states of Rheinland-Pfalz and Saarland. The purpose of the trip was to look at how high-quality timber could be produced at low wind risk using a close-to-nature strategy (i.e. low impact). The first stop was at Gersheim to look at a 41-year old mixed broadleaved stand (beech, oak, field and sycamore maple, wild cherry, ash, and wild service tree). Management focused on 46 target trees per hectare in free growth with a final live crown ratio of 75%. The aim is to produce high quality (and hence high value) trees which can be used for veneer.

Four growth phases are recognised in this approach: (1) establishment where competition between neighbouring trees is regulated; (2) qualification (self-pruning phase) where trees are

Fig. 3: Example of a broadleaved stand at Palatinate Forest. In the foreground is a *Sorbus torminalis* objective tree at approximately age 46 years.



allowed to reach a certain clear bole height; (3) dimensioning (fattening up) where the objective trees are selected and crown thinning is carried out if necessary to reduce competition; and (4) maturing (height growth has slowed and lateral crown expansion is not possible) where selected trees that have made the target DBH are harvested. Diameters of 60 cm can be obtained in 90 years, but trees can frequently be larger than this. Wild service tree (*Sorbus torminalis*) is desirable as an objective tree as it can fetch up to E15,000 (\$NZ 29,400) per m³ as veneer!! It was interesting to compare the management philosophy here, with its intensive focus on controlling competition around the objective trees, with the more extensive approach taken in conifer plantations. Despite the high values quoted for the timber of certain species, there was little discussion of the overall economics of the approach.

After lunch at the German version of a roadside diner (where we had pig grease on bread as an appetiser) we stopped at Jägersburg. At this stop we looked at 13-year-old regeneration following a major wind disturbance in a 160-year-old beech (*Fagus sylvatica*) stand. Again the focus is on low impact management. Trees are girdled rather than thinned by cutting them down. Thinning (girdling) is only carried out when there is competition from above on objective trees. Objective species were mainly birch, beech and oak.

Fig. 4: Example of tree girdling at Jägersburg showing (a) the tree girdling blade and (b) a recently girdled tree.



Prior to returning to New Zealand I spent a week at the Forestry Commission Northern Research Station (NRS). The purpose of this visit was reaffirm the collaborative relationship between NRS and Forest Research that began in the early 1990s. NRS is considered the main centre of excellence for research into wind damage in the world and so it is important to maintain contact with them. During my visit I spent a day sitting in on the stability group meeting where they

discussed the progress to date and future directions of stability research in Britain. This was interesting as it provided ideas for future work in New Zealand and also indicated common areas where collaborative projects could be undertaken.

While at NRS I also visited Kielder Forest in Northumberland with Dr Chris Quine to look at the role wind plays in the stand dynamics of a mature Sitka spruce (*Picea sitchensis*) plantation. Prior to entering the forest we stopped at the headquarters to meet Graham Gill, Forest District Manager, Kielder, and Neville Geddes, planning forester to discuss their plans for incorporating more species and structural diversity into the forest. After this meeting we drove to Birkley Wood, one of the oldest Sitka spruce stands in upland Britain. The Wood is approximately 1.9 ha in size and was planted in 1923, as a Sitka spruce/Scots pine mixture at a density of 6719 trees/ha. It received a thinning in 1960, but no information on the residual density was provided. I had visited this area earlier in 1996/7 and was quite amazed to see the change. Data from Chris Quine indicated that when he started monitoring the area in 1987 there were 53 windthrown trees in the Wood; by 2000 this number had increased to 233. The average loss was 7 trees per hectare per year.

The location of every tree in the Wood was mapped in 1988, and since this time Chris has studied Birkley Wood extensively and has mapped the formation of new gaps as well as the expansion of existing gaps. His data show that there has been an eight-fold increase in gap area and a 3-fold increase in gap number between 1984 and 2000. New gaps only contribute 13.7% of the total increase in gap area, the remainder being expansion of pre-existing gaps. In the majority of these gaps there was abundant natural regeneration, almost exclusively Sitka spruce. The stands surrounding the Wood are scheduled for harvesting soon, so it will be interesting to see how long this stand can survive when it is fully exposed to the wind. In case you are wondering why this stand was never felled, it was used for machine gun training during the Second World War and no sawmiller has ever been brave enough to touch trees from it.

Overall, I found the visit extremely rewarding both professionally and personally and I hope that many of the contacts that I made and ideas that I was exposed to can be incorporated into my work here in New Zealand. It was interesting to learn about large multidisciplinary projects such as VENFOR which are focusing on many different aspects of wind damage to forests from wind flow over stands to tree biomechanics. One theme that

Fig. 5: Birkley Wood in Kielder Forest with (a) a root plate of an uprooted tree, and (b) natural regeneration that is occurring in the windfall gaps.



arose from the conference that is of relevance to New Zealand is the effect of wind on wood quality. Many regions of New Zealand experience reasonably high chronic wind speeds and the impact of these winds on wood quality may be considerable. Another interesting observation was the difference in management philosophy between Germany and New Zealand. In New Zealand, we tend to have either unmanaged reserves or intensively managed plantations, whereas in Germany management intensity spans the full range of intensities between these two extremes. This probably has a lot to do with contrasting patterns of forest land ownership between the two countries.

Finally, I would again like to thank the New Zealand Institute of Forestry for awarding me the Chavasse Travel Award which made this trip possible. I would also like to thank Dr Chris Quine and other researchers from NRS for hosting me while I was in Edinburgh.