Malformation

During the recent D-fir Co-op meeting at Darfield in Canterbury, stem malformation was possibly the main topic of discussion – especially in the field.

With the increasing interest in harvesting smaller logs (down to 150 mm SED), stem straightness is vital. Not only can stem deviations preclude trees from early harvesting, but they can also limit sawn timber recovery when trees are harvested at larger dimensions. D-fir may grow fast in New Zealand, but unfortunately, the stem form in many stands is poor. Such observations are common by overseas visitors to our forests.

There is much debate about the causes – is it genetics, silviculture, site factors or climate, or as is most likely, a combination of all four? Other factors, such as mycorrhizae, could also play important roles.

Stem malformation can be very obvious in vigorous young stands, such as the Ashley origin shown here. The interaction of genetics and site on stem form is a major focus of Co-op research.

It is not surprising, therefore, that malformation is a major focus of future research proposals. Co-op members are keenly awaiting the outcome of a proposed study of the effects of site, silviculture and genetics on the incidence and severity of key malformation types, and the impact of these on log conversion and timber grade.

What seedlot should I plant?

In 1996, seven seed source (provenance) trials and three progeny trials were established within the major Douglas-fir growing regions of New Zealand. Almost 25,000 seedlings from 224 families and 33 seedlots or provenances were involved. The majority of trials have established well, with many putting on over 1 m in height over the last year. The first full assessments are about to be undertaken, and when combined with existing information, should give most useful leads as to the best genetic material for use by growers. The tallest seedlot in a pilot assessment of one trial at age 3, was of New Zealand origin, but it was not significantly different from a number of others.

With the possible exception of the 1959 provenance trials, these 1996 trials would be the most comprehensive set of Douglas-fir genetic trials ever established in New Zealand. The 1959 trials were planted at six sites in forests from Kaingaroa to Rankleburn; 346 plots within these trials supply data for growth models. An analysis has shown that we can predict yield as a function of latitude and altitude in the Pacific North West. The results from this preliminary analysis are presented in Table 1.

Table 1. *Predicted volume (MAI) in New Zealand for a North American provenance of given altitude and latitude.*

	Latitude				
Altitude (m)	**37°**	**40°**	**43°**	**46°**	**49°**
0	27.5	24.1	20.8	17.5	14.1
200	20.8	18.8	16.8	14.8	12.9
400	16.8	15.7	14.5	13.3	12.1
600	14.5	13.8	13.1	12.4	11.7
800	13.1	12.7	12.2	11.8	11.4

It can be seen from Table 1 that seed source, or provenance has a big effect on yield. For instance, the difference in volume after a 40-year rotation, between a San Francisco provenance (sea level, 37° latitude) and one from near Portland (800 m asl, 43° latitude) is over 600 m^3/ha.

When this information is combined with data coming to hand on malformation and wood quality, then our ability to match the most appropriate seedlot with site will increase significantly.

Douglas -fir

RESEARCH CO-OPERATIVE

Newsletter

forest research
creative wood-based solutions

This Newsletter

This is the first Co-op Newsletter. Its purpose is to keep members informed of Douglas-fir research happenings and progress. This has become particularly important as meetings are now annual, whereas previously two were organised every year. The Newsletter is intended to be informal and easily read. All the technical detail will be left for meeting presentations and formal reports — 26 of which have been produced so far.

Many of you will be aware of another D-fir newsletter, which is just into its second issue. This is the ***Southern NZ D-FIR News***, produced by Mark Belton, of Mark Belton and Associates (MBA) Ltd. In no way has this Co-op Newsletter been launched to compete — indeed Mark and this Editor (Nick Ledgard) are long-time colleagues, who see the two newsletters as complementary, both serving to promote the wise use of D-fir in New Zealand. Two different approaches are used — the *D-FIR News* is more commercial in its intent, whereas this Newsletter aims at disseminating research updates and results.

The Co-operative

The NZ Douglas-fir Research Co-operative was first formed in mid-1993. Its purpose is to promote research into the profitable and environmentally sustainable management of Douglas-fir in New Zealand.

Ten members attended its first meeting at Nelson in February, 1994. Membership interest from overseas was expressed at that meeting, and a good liaison has been maintained with overseas D-fir growers ever since, particularly in the Pacific North-West of America. That was in the heyday of high forestry prices, which have since fallen significantly. The Co-operative's membership level also fell with the downturn in prices. At the last meeting at Darfield, in February 2000, four members were present, with one apology.

However, the purpose of the Co-op remains the same, and its importance has, if anything, increased (see below). There are good signs of increasing interest in its work, plus emerging new members.

The Co-op as a sounding board

The Government is increasingly stressing the importance of end-user input to its Public Good Science Fund (PGSF) research. At the Darfield D-fir Co-op meeting, it was pointed out that although the research funded directly by the Co-op was important, a pos-sibly more significant function was the Co-op's ability to act as a sounding board for presenting results and determining future research options. Indications are that if industry does not show support for research (through the likes of this Co-op), then Government assistance could well decline. At Darfield, PGSF research proposals were presented, and right now member's comments are being received – these will have a major impact on future research direction.

The Douglas-fir Research Co-operative meets once annually. Its objective is to fund a limited amount of its own research, provide advice for public-funded research, and to be a major outlet for research results. Apart from its New Zealand members, it has close contacts with researchers in the Pacific North West of the USA. The Co-op's major contact people are:

Chairman – Phil De La Mare, Ernslaw One, Tapanui
(Ph: 03204 8061; Fax: 03 204 8067
email: p.delamare@ernslawtap.co.nz)
Manager – Leith Knowles, ***Forest Research***, Rotorua
(Ph: 07 343 5899; Fax: 07 343 5332
email: leith.knowles@forestresearch.co.nz)
Secretary - Nick Ledgard, ***Forest Research***, Christchurch
(Ph: 03 364 2949; Fax: 03 364 2812
email: nick.ledgard@forestresearch.co.nz)

Darfield Co-op meeting, Feb 22-23, 2000

Seventeen people attended this meeting. Particular welcome was given to Angus McPherson, of Groome Forestry Consulting, who was representing a group of clients who wish to become members of the Co-operative. A warm welcome was also accorded to Drs Greg Filip and Gerry Beattie of Oregon State University, who gave a rather alarming address on the recent heavy outbreak of Swiss Needle Cast fungus in western North America (see later).

The technical session updated members on the on-going research into breeding/genetics, the effect of thinnings at different regime stages, fertiliser requirements and foliage sampling, growth modelling and the national planting and investment scene. Later in the day there was considerable discussion about future research, centred around a 4-page summary of past results and future options. A number of the above issues are covered in more detail elsewhere in this Newsletter.

In the evening, our hosts, the Selwyn Plantation Board, catered for us with a BBQ on the spacious lawn around their office building. The following day we toured the Boards' D-fir plantations on the plains (where history has shown D-fir to be at considerable risk from drought and late frosts), and in the much better D-fir environment in the foothills of the Southern Alps at Dalethorpe and Lowmount.

Co-operative members inspecting a seed source trial with Ernslaw One at Gowan Hills in Southland. Secretary Nick Ledgard is standing beside a 3-year-old control-pollinated tree from Washington, USA.

George Fenn comments

George Fenn, of Fenn Farms in Oregon, is our most distant Co-op member. George is a retired NASA scientist, who is passionate about trees (particularly D-fir), and has undertaken some interesting research of his own. He has had some positive results from his work to promote early seeding in D-fir, and the Co-op plans to look more closely at this. Not so long ago, George visited New Zealand and wrote the following short note on returning home.

"My major contact with the silviculture of D-fir occurred in the region between Dunedin and Tapanui. I was able to see some mature forests and some new plantings on former sheep pasture.

"The mature forests currently being harvested are excellent specimens of the species. The growing sites appeared to be well suited to D-fir, by virtue of the good soil drainage and an adequate supply of moisture. I was particularly impressed by the survival of the older foliage on the trees.

"We, in the US, are currently facing a question about the optimum length of rotation. Economic considerations and a prospective declining market for large logs relative to smaller logs are driving some of us in the direction of shorter rotations, in the order of 25-30 years. Given these conditions, the initial stand development years are critical to reaching rapid stand development. All of our experience with D-fir says that the first 5 years establish the trajectory of future stand development.

"The new plantings that I observed seemed robust. I would hope, on a future visit, to see their progress over their first 5 years. I have no doubt that the New Zealand tree farmers are capable of equalling the best of the US performance in D-fir."

D-fir dominates new planting

Mark Belton regularly updates the Co-op on the New Zealand planting and investment scene. News from the 1999 season makes most interesting reading. New D-fir plantings are up 10-fold on pre-1993 levels, and in 1999 accounted for 37% of all new planting. As new D-fir planting increases, that for radiata pine continues to decline. Most of the new plantings (85+%) are in southern New Zealand (Canterbury, Otago and Southland), where the new D-fir area has exceeded that of radiata for the last 3 years.

Recent planting is mostly by a small number of larger investors (*cf*., radiata pine). There are a number of reasons for the increasing interest in Douglas-fir, two of the more important being the premium prices obtained on world lumber markets, and the availability of high-productivity land with relatively low purchase and growing costs. Often, the suitability of land for growing D-fir does not correlate with its value for farming. Much of the best land is at higher altitudes and has not been developed for improved pastoral use. Such land is commonly priced at NZ$500 – $900/ha. However, although land prices are lower, higher initial stockings and more costly seedlings mean more expensive establishment than for radiata pine.

Swiss Needle Cast – waiting to strike?

The Swiss Needle Cast (SNC) fungus (*Phaeocryptopus gaumannii*) reduces D-fir diameter and height growth by causing chlorosis (yellowing) and premature loss of needles. It has been in New Zealand for many decades.

Although it has caused losses in productivity in the North Island and the warmer northern and western parts of the South Island (*see comment under "Growth Modelling"*), its impact has never been as severe as is currently being experienced in western Oregon and northern California. In these parts of the Pacific North West, the incidence and severity of SNC has increased dramatically in recent years. Though it rarely kills trees, it has depressed volume growth by an estimated 22% over large areas. If the disease continues, these effects are likely to be compounded, and recovery, if it occurs, is likely to be slow.

Several hypotheses have been suggested to explain why this normally benign pathogen is causing such severe damage to D-fir in its native range. One popular explanation is that a highly virulent strain has become established. More likely is a combination of a warmer, moister climate, and changed management practices, where dense D-fir stands have been planted 'off-site' in zones formerly dominated by sitka spruce and western hemlock. Upsetting the balance between the tree, the pathogen and the environment may have allowed natural mechanisms of tolerance to be overwhelmed.

With large estates of dense D-fir being established in New Zealand, a watch needs to be kept on SNC infection levels. Co-op members have been shown what to observe in the field, and a close link is being established with the Oregon-based SNC Co-operative.

Hopefully, any outbreak can be detected early, and control strategies implemented quickly.

Growth modelling

At the Co-op meeting, Leith Knowles unveiled a new national silvicultural growth model for Douglas-fir. This model utilises more than twice as much increment data as the old version, allows predictions up to 50 years (was 30), and can be calibrated for local use (including provenance) through adjustment of site basal area potential (SBAP). Currently. prospects look good for including response to infection levels of SNC. All updates are regularly added to this model, which will be available to Co-operative members through STANDPAK.

Frost damage

Young Douglas-fir plantings can be hard hit by unseasonal frosts. It is easy to imagine that seedlots originating from higher (colder), northern hemisphere latitudes would be more frost-tolerant than those from further south. Assessments of frost damage to Co-op seedlots in the nursery and in the field indicate that the picture is not that simple.

On November 25, 1998, a hard frost killed much newly-flushed foliage in a provenance trial near Lake Waipori, just south and inland from Dunedin. Forest Research's Charlie Low scored the relative frost damage from 32 provenances (25 from the USA) in this trial. He concluded from this (and the earlier nursery assessment) that there were important and significant differences between provenances, and between progenies from the same regional US seed orchard. However, there was NO correlation between latitude of origin and frost damage score. Along the same lines, time of flushing was only weakly correlated to degree of frost damage. Interestingly, a number of fast-growing Californian and New Zealand seedlots showed very low frost scores.

Devastating windthrow

Europe's 690,000-ha D-fir resource has been devastated by last winter's storms. France was worst hit, with almost total windthrow of all conifer species over extensive areas. France has about 60% of Europe's D-fir resource, mostly in young stands aged from 10 to 40 years. Key D-fir regions were hard hit. The effects of the storm will be felt on EU and world wood markets for some time.

But there was some good news — owners of wind-thrown D-fir forest have an advantage over owners of other types of conifer forests, in that fallen trees will not deteriorate quickly, and the markets for D-fir are strong. (From *Southern NZ D-fir News*)