PLANTING

By A. H. BAMFORD¹

"The Tree is one of the Magi of man's universe. Its gifts are many, its favours manifold. It has always been so and if man, its trustee, is faithful to his obligations, it will continue to be so." So wrote G. Herbert Lash in his booklet "The Incredible Tree" (10). Speaking as a forester I would prefer to think of the tree as a Jinni which by definition is "one of a class of supernatural beings, subject to magic controls". The forester is the master who exercises control and his magic is knowledge and understanding based on observation and research.

The forest manager with the grim spectre of overcutting at his shoulder must turn more and more to the planted tree as a silvicultural tool to restock his forest. Surely it is here that the forester has the greatest scope for exercising control over his "tree Jinni". The forest geneticist is fast approaching the day when he can fill the manager's specifications for improved individuals. It remains for the planter to weld these individuals into a healthy, vigorous, uniform forest designed for efficient and economic utilization while at the same time adding his own increment through an ever-improving technique.

The first step in accomplishing this is to improve the quality and continuity of his seed supply. This is done by cataloguing prime seed bearing stands, annual cone crop surveys, exchange of collecting areas, development in young stands of rogued, thinned and fertilized seed production areas. Seed yield on a per acre basis in Coastal Douglas fir has been increased five fold and germination increased 15 per cent in a bumper seed year (4). Again in an otherwise cropless year, seed yield has been increased ten fold (5). Administrative problems of cone collecting are simplified and costs reduced. Production areas are being developed in all Forest Districts in British Columbia. Careful attention to seed maturity as determined by examination of the embryo (8) also increases germination, germinative energy and storability of seed. Rigid control of extraction processes, careful checking for seed coat damage in cleaning, high cutting tests (95 per cent) and purity tests (95 per cent) all contribute to securing average germination in the 90 per cent class rather than the 70 per cents of the past. Douglas fir seed stored under ideal conditions of moisture and temperature for the species (generally 8 per cent moisture and zero degrees Fahrenheit) will maintain high viability for many years.

Seed of this quality germinates strongly in the nursery giving well stocked seed beds of vigorous seedlings. The old idea that seedlings should be grown on low fertility soil because they will be outplanted on low fertility sites is

¹Forester, Reforestation Division, B.C. Forest Service, Victoria, B.C.

a fallacy. Tests here have shown (6) (9) that the larger classes of seedlings have significantly higher initial growth (Fig. 1). While there are indications that this initial advantage may eventually disappear after 10 years or more, there are numerous advantages in favour of the initially fast grower when we consider the early hazards of animal browsing and trampling, snow-press, ground frosts and brush competition. In short, premium stock pays dividends. Recent research (1) (7) (13) has taught us much about the required nursery fertility levels for producing premium planting stock.

FIGURE 1. Comparison of Small, Average and Large classes of 2-0 Coastal Douglas fir planting stock. Left hand bars represent survival, right hand bars represent growth. (Survival of Large stock is significantly better than Average. Differences in growth are significant.)

Diversification of stock classes and matching these various classes to various site conditions permits economy in use of the more expensive classes. Autumn sown 1-0 Douglas fir can be economically planted on clean burns with good results. Jumbo 2-0 seedlings graded out of nursery run stock and 2-1 transplants with quick initial height growth are best reserved for high sites where brush may become a problem or for brush sites which have been scarified. The production of transplant stock, as you all know, is expensive. The use of youths from Correctional Institutions, Boys' Industrial Schools and men from Forestry Pre-release camps of the Attorney-General's Department has made possible the economical production of transplant stock in transplant nurseries attached to the various institutions and camps.

Where planting stock is used by numerous organizations there is always the problem of varying ideas on what constitutes a cull. Here in British Columbia under the Reforestation Sub-Committee we have set up a mutually acceptable minimum standard for 2-0 stock (2) and are in the process of testing the validity of this standard by co-operative outplanting trials (11). Results should simplify and standardize nursery culling, increase survival and save usable trees from needless culling in the field.

The increasing amount of planting being done at higher elevations has necessitated the introduction of seedling cold storage. The ability to store seedlings from 4 to 6 months (3) (12) has added considerably to the flexibility of planting operations. The season can be considerably extended and smaller crews used. Stock reaches the field fully dormant and in the best condition. Lifting in the nurseries can be concentrated in better weather, thus reducing root damage. The use of modern packaging methods such as multi-wall paper bags with polyethylene moisture barriers keeps trees in good condition during storage and transit and obviates the necessity of heeling in. Trees can be kept for several weeks in the bags as long as they are shaded and protected from rain. There is also a saving both in material and in freight and handling charges. Bags which are to travel extreme distances may be encased in burlap bags or corrugated cartons.

In the task of planting itself much is being accomplished by the use of small, more or less permanent forestry crews as pioneered by British Columbia Forest Products Limited. These men spend the greater part of the year planting and so become very proficient, able to maintain high production and secure good survival. Because they know they have a permanent job and have been around long enough to see the results of their work they begin to take a personal interest in it. They cease being labourers and become professional planters, men with an avocation rather than a job. Their use on allied work such as cone collecting, site preparation, and thinning increases their knowledge and tends to increase their interest not only in planting but in the whole field of silviculture. These trained and experienced men form the nuclei of expanded crews during parts of the season and act as pace-setters and lead planters thereby easing and spreading the task of supervision. A supply of labour for planting is always a problem. Whenever one of those rare individuals who either enjoys planting or is willing to do a conscientious job is encountered, every effort should be made to find permanent employment for him. He is worth four casual labourers.

Quality planting stock carefully planted will always pay dividends. It is the duty of the supervisor to determine the balance point between care in planting and production rates but he should also bear in mind that growth can also be affected by quality of planting (Fig. 2) (6). Here again bigger stock is better able to overcome the effects of poor planting (6).

The actual physical actions required to plant a tree are extremely simple. As E. Madsen, one of the Forest Service planting supervisors, asks "If a man can't plant a tree, what else can he do?" However, it is extremely difficult to get casual labourers to do a conscientious job of this simple task. Tree planting is looked upon by most as an extremely monotonous, boring and undesirable job and their work generally shows it. Here is the weakest link in

AVERAGE STOCK AFTER 7 SEASONS

FIGURE 2. Effect of poor planting technique on Survival and growth of average Coastal Douglas fir. Left hand bars represent survival, right hand bars represent growth. Only shallow planting significantly poorer in survival. Both shallow and deep are significantly poorer in growth. "Too shallow" means that the root collar of the planted seedling was 1-1½ inches above the soil surface. "Too deep" means that the root collar was about 2½ inches below the soil surface.

the whole process. Courses to teach planters not just how to plant but to acquaint them with the whole field of reforestation from seed collecting to survival examinations, etc. should do much to arouse their interest. The job needs to be glamorized. Some incentive system, if a foolproof one could be evolved, would be very worthwhile. Courses and workshops for supervisors where they can meet, discuss and compare notes, methods and problems can increase their enthusiasm, some of which rubs off on their planters.

The false economy of avoiding highly productive sites because of brush is now being recognized and methods for rehabilitating these are being pioneered. Scarification of Salmonberry areas with large bulldozers and immediate planting can be done for less than \$25.00 per acre. Trial underplantings under established alder followed by aerial spraying to kill the alder indicate that this also is practical. It is becoming increasingly evident that the most economic way to restock our highly productive sites is to burn and plant immediately. For eons Nature has used fire as a means of establishing our most desirable stands. Man, by ignoring this lesson, makes the job much more difficult and expensive. The concentration of nutrients near the soil surface by burning provides a definite boost to seedlings planted soon enough to take advantage of this. Such seedlings are vigorous and dark green in appearance. However, not all old cutovers lend themselves either to economical scarification or to burning and their productive capacity is lost. It is the responsibility of

the forest manager to consider the full cycle and leave his cutovers in such a condition that they can be restocked quickly and economically rather than becoming "Silvicultural Slums". Too often planting is considered only as a last resort when all else has failed and a good part of the rotation wasted. Only when all the steps from utilization through re-establishment of the forest are given full consideration and planned as phases in one continuous integrated cyclic operation does the planter have an adequate opportunity to establish a thrifty and desirable growing stock.

What can he do in the future to improve planter performance and seedling survival and growth? I repeat, some form of incentive for the conscientious high producer would work wonders. As the work becomes more widespread, some form of contracting may prove advantageous. The constantly increasing costs of labour and the associated problems make one's thoughts turn more and more to machines. Future research should be directed along these lines. I believe it is only a matter of time before some genius will develop a mechanical planter, possibly integrated with scarifying equipment, the use of which will permit several skilled men to top the production of large hand-planting crews with better quality planting. The planting gun and bullet being developed by J. Walters of the University of British Columbia Research Forest (14) is an interesting development in this direction.

In summary I would like to quote a little saying of Jack Long, our Supervisor of Nurseries, "A poor tree well planted is better than a good tree poorly planted, but a good tree well planted is best."

BIBLIOGRAPHY

1. ARMSON, K. and R. D. CARMAN. 1961. Manual for Forest Tree Nursery Soil Management. Ontario Department of Lands and Forests. 74 pp.
2. CROSSIN, E. and J. REVEL, 1961. Interim Minimum Standard for Culling 2-0 Douglas fir Stock for planting on the British Columbia Coast. Tree Farm Forestry Committee, Reforestation Sub-Committee. Mimeo. 1 pp.
3. DEVITT, W. J. B. 1959. Preliminary Studies of late planting of 2-0 Douglas fir planting stock, Reforestation Division, British Columbia Forest Service, mimeographed report. 9 pp.
4. ——— 1960. Douglas fir Seed Production Areas, Reforestation Division, British Columbia Forest Service, mimeographed report. 3 pp.
5. ——— 1962. Supplement to mimeographed report on Douglas fir Seed Production Areas, refertilization 1960. 3 pp.
6. ——— 1962. X-12 Planting Trials. Summary of Treatments and 1962 Survival. Reforestation Division, British Columbia Forest Service. 2 pp.
7. VAN DEN DRIESSCHE, R. 1962. British Columbia Nursery Fertilizer Guide. Research Division, British Columbia Forest Service. 9 pp.
8. FINNIS, J. M. 1950. Seed Maturity in Douglas fir. British Columbia Forest Service Research Note. No. 18. 8 pp.
9. KNIGHT, H. 1957. Growth and Survival of Experimental Plantations of Douglas fir. British Columbia Forest Service Research Note. No. 33. 22 pp.
10. LASH, G. H. (no date) The Incredible Tree. Canadian Pulp and Paper Association, Montreal. 19 pp.
11. REVEL, J. 1961. Co-operative Planting Study of 2-0 Douglas fir Culls. E.P. 581. Working Plan. Research Division, British Columbia Forest Service. 16 pp.
12. ——— 1961. Cold Storage of 2-0 Douglas fir Planting Stock in multiwall bags. E.P. 582. Working Plan, Research Division, British Columbia Forest Service (verbal communication regarding results after first growing season).
13. SCHAEDELE, M. 1959. A study of the Growth of Douglas fir (*Pseudotsuga menziesii*) Seedlings. Research Division, British Columbia Forest Service, mimeographed report. 141 pp.
14. WALTERS, J. 1961. The Planting Gun and Bullet: A new Tree-Planting Technique. Forestry Chronicle 37: 94-95.