SOME OBSERVATIONS ON CONTAINER PLANTING IN CANADA

FRANK A. TER BUSH, *Reforestation Specialist*
State and Private Forestry,
USDA Forest Service

The Canadians have been working with container planting for almost a decade. To date, U.S. foresters have not largely imitated them. They have, however, followed Canadian efforts with considerable interest. In the summer of 1970, members of the Intermountain Reforestation Council had an opportunity to take a close look at Canadian efforts. The following is a partial account of what they saw.

It is often said there is nothing new under the sun. So it is with container planting. A Canadian scientist pointed out that container techniques have been used for nearly 300 years. First mention is made of "ball seedlings" of oak wild-

Figure 1.—Tree carrier and planting tool

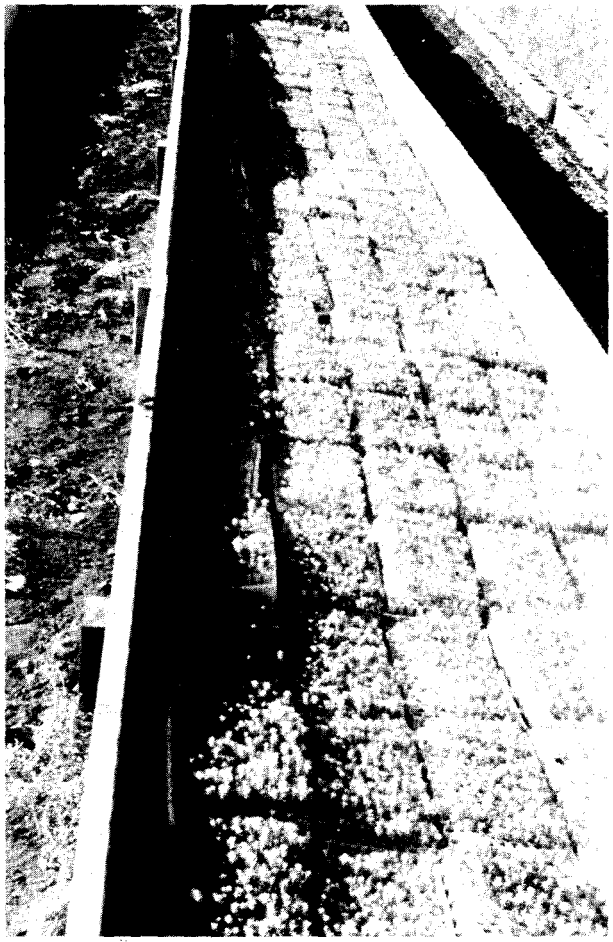

Figure 2.—Hardening off bed outside of greenhouse

ings in 1725. The literature contains reference to "ball seedlings," container seedlings, and "assisted" seedlings. Basically, all describe seedlings grown or planted in a suitable rooting medium.

Most of us are familiar with ornamentals sold in burlap containers. What makes the Canadian version unique is the small size of the container and planting stock used in their reforestation program. The Canadians have produced and used millions of seedlings in the "Ontario tube," an open-ended plastic tube '/2 to 3/4 inch in diameter and 3 to 4 inches long.

Scientists pointed out that they have tried over 22 different sizes and shapes of containers and are still looking for the best one. Veneer, plastic, and styrofoam are among materials tried. Here, too, the search for the most effective material continues.

Some advantages of container planting to the Canadians are:

1. Little nursery space is needed.

Figure 3.—Root/shoot development in spruce 4 years after planting.

2. Seedlings are easier to handle and well adapted to mechanization.
3. There is no transplant shock. (Better initial survival and growth.)
4. Planting season is extended-the Canadians plant throughout the summer except on the hottest and dryest of days.
5. Costs and production time are reduced.

Some disadvantages are:

1. Planting stock is small in size.
2. Stock is root-bound.
3. There is frost heaving.
4. There is higher field mortality under some conditions.

Reforestation efforts of the Northwestern Power and Pulp Company, Ltd. at Hinton, Alberta were studied with particular care. Their foresters raise about 1.5 million seedlings each year for the company's lodgepole and spruce reforestation program.

Seed is placed uncovered in the top of tubes filled with a mixture of peat and teralite (2/3 peat and 1/3 teralite). No soil is used due to the possible presence of bacteria which might harm the seedling. A non-ionic soil wetting agent is added to insure thorough wetting of the potting medium. The planted tubes are put in the greenhouse under an 18-hour photoperiod. Germination takes place in 14 days and germinants are then covered with gravel grit.

Greenhouse temperature is held at 80 degrees during the day and 60 degrees at night. Two applications of a fungicide are made 13 and 20 days following seeding. Seventeen days after seeding, liquid fertilizer is applied for the first time and then weekly thereafter. The seedlings are held 3 to 4 weeks in the greenhouse and then the racks of containers are put in beds outdoors to harden off.

The container-planted seedlings are outplanted 9 weeks following germination. Planting continues throughout the growing season stopping only on days when high winds, low humidity, and 90-degree-plus temperatures make survival unlikely. The company reported their planting crews lost only 4 days to these conditions last summer.

Seedling production cost breakdown is as follows:

Materials-40 percent
Labor-42 percent
Heat-5 percent
Maintenance-2 percent
Depreciation-11 percent

Planting costs are $23.60 per thousand seedlings or $10.16 per acre using 432 seedlings per acre. The planting cost breakdown is:

Wages-76 percent
Overhead-18 percent
Transportation-6 percent

Planting crews are on an incentive system and are paid an average of 1.8 cents per planted tree, with actual wages negotiated on the basis of the condition of the terrain. Three and fiveman planting crews are used, with total earnings evenly divided among the carrier and planters. Minimum union wages of $2.54 an hour or $20.32 per day are paid, with individual wages ranging from $26 to $50 per day. About 3500 acres are planted each year.

Company logging operations cover 10,000 to 12,000 acres yearly. The Canadians clear-cut in strips and rely heavily on natural regeneration. Planting is done 3 to 5 years following logging only where checks show that regeneration has not come in. naturally. They report 75 percent success with the container planting technique.

As with any new system, this one has its problems. When paper tubes were used in an attempt to get a biodegradable container, molds developed that absorbed soil nutrients intended for the seedlings. Frost heaving of the containers remains a problem as do pot-bound roots. Alberta Forest Service scientists are directing their efforts to these problems. One method being developed is to extrude low density (.094-.180) potting medium into 15 feet of 1-inch diameter polyethylene sausage casing. This is then cut into three-inch strips and seeded. A device has been developed to remove the casing in the planting operation and is in use.

Another promising development is the Kinghorn plug. Seedlings are raised in styrofoam

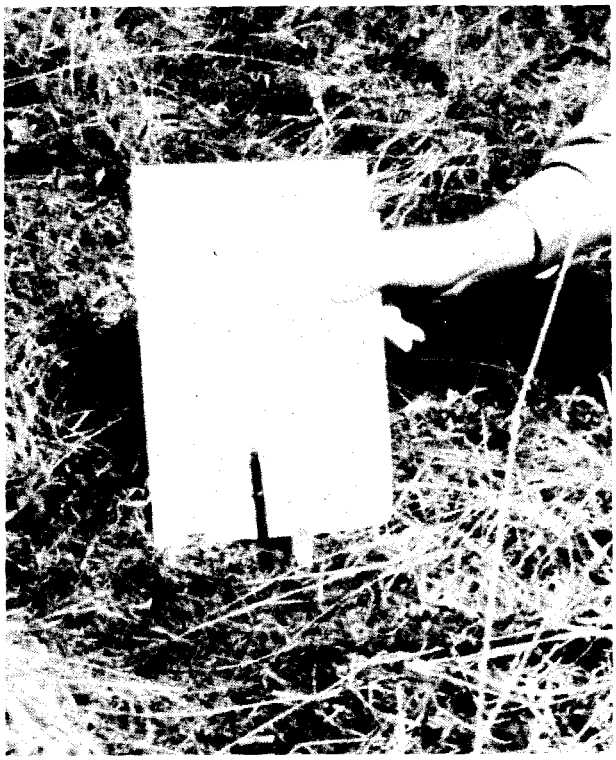

Figure 4.—Frost-heaved container after one winter in the ground.

Figure 5.—Kinghorn plug

containers with tapered teflon-lined holes (3A inches by 4 inches), The plug seedlings are lifted manually and planted with a dibble in early trials of this method. Canadian scientists expect that frost heaving will be minimized and lateral root development will be entirely uninhibited by this method. Initial observations of tests of this plug look very good (table 1).

Alberta Forest Service scientists have been making careful evaluations of early container plantations on crown lands. An example of their results are given in table 2.

TABLE 1.—*Container planting of Douglas Fir on East Coast of Vancouver Island*

Container type	*Planting season*			
	Early spring—1968		*Late spring—1968*	
	Percent survival[1]			
	1968	1969	1968	1969
2½" Bullet—Large stock	85.3	81.7	91.5	82.6
4½" Bullet—Large stock	87.3	77.4	78.8	72.9
2½" Bullet—Small stock	63.5	46.3	76.0	60.0
4½" Bullet—Small stock	70.5	41.1	76.0	69.7
4½" Plug—Large stock	94.5	91.4	96.5	90.9
½" Tube	72.0	70.9	89.0	80.9
Bare Root 2-0	76.3	76.3	82.8	83.7
	Average height (cm)			
2½" Bullet—Large stock	7.9	10.6	7.8	10.9
4½" Bullet—Large stock	9.9	13.2	12.8	15.1
2½" Bullet—Small stock	5.3	6.3	5.2	7.2
4½" Bullet—Small stock	5.9	6.7	6.8	9.0
4½" Plug—Large stock	10.5	13.9	12.2	16.0
½" Tube	8.7	12.1	11.2	13.2
Bare root 2-0	28.8	32.8	29.1	32.2

[1]Based on 8 plots with 800 trees per plot.

TABLE 2.—*Container planting on cutover area (scarified) at Hansinger Mill site, Clearwater-Rocky Forest*[1]

Species	Container type	Planting treatment	No. of samples	Mortality			Average total height	
				1967	1968	1969	1968	1969
Lodgepole pine	Tube	Litter and duff partially removed	120	29%	38%	40%	2.9"	4.1"
Lodgepole pine	Tube	Mineral soil exposed	120	9%	15%	18%	2.8"	3.5"
Lodgepole pine	Tube	Undisturbed	120	23%	42%	44%	2.9"	3.9"
White spruce	Tube	Litter and duff partially removed	120	43%	76%	78%	0.8"	1.0"
White spruce	Tube	Mineral soil exposed	120	29%	55%	58%	1.0"	1.5"
White spruce	Tube	Undisturbed	120	40%	73%	75%	1.1"	1.5"

[1]Data are from Area 5, C and D Blocks, planted July 12, 1967; last date examined: August 4, 1969.

Table 2 indicates that container planting is no panacea. As new techniques develop, however, container-grown seedlings may prove a useful reforestation tool where climate and other conditions make its use practical.

References

1. Adams, R. S.
   1969. California conifers in containers. Proc. 1969 meeting of the Western Forestry and Conservation Association, Portland, Ore.
2. _____
   1968. Provisional instructions for growing and plantseedlings in tubes. Ontario Dept. of Lands and Forests, Toronto, Canada, p. 73.
3. Beck, G. E. and Adams, J. W.
   1966. Propagation and growth of ornamental plants in acrylonite stabilized wood pulp. Proc. XVII Int. Hort. Congr., Vol. 1, Summary No. 493, University of Maryland, College Park, Md.
4. Crossley, D. I.
   1969. Container planting in Alberta. Proc. of 1969 meeting Western Forestry, & Conservation Association, Portland, Ore.
5. Dick, J.
   1969. Container planting in Oregon and Washington. Proc. 1969 meeting of Western Forestry and Conservation Association, Portland, Ore.
6. Herman, Richard K.
   Growth of seedlings in peat pellets. Tree Planters Notes. Vol. 20, No. 1, p. 8-9.
7. Ingestad, T.
   1967. Methods for uniform optimum fertilization of forest tree plant. Proc. I.U.F.R.O. Congress, Munich.
8. Kinghorn, J. M.
   1969. Container systems in British Columbia. Proceedings 1969 meeting of the Western Forestry and Conservation Association, Portland, Ore.
9. Schneider, G.: White, D. P.: Heiligmann, R.
   1970. Growing coniferous seedlings in soilless containers for field planting. Tree Planters' Notes Vol. 21, No. 3, p. 3-7.
10. Siren, G.
    1967. Mechanizing forest regeneration in Sweden. In world symposium on man-made forests and their industrial importance. Foreign Agricultural Organization (U.N.) FO/MMF 67-6/5.
11. Swan, H. S. D.
    1970. Relationships between nutrient supply, growth and nutrient concentrations in the foliage of black spruce and jack pine. Pulp and Papers Res. Inst. Conf., Woodland Paper No. 19, 46 p.
12. Walters, J.
    1961. The planting gun and bullet: a new tree-planting technique. For. Chron. 37:(2) 94-95, 107.
13. _____
    1963. An improved planting gun and bullet: a new tree-planting technique. Tree Planter's Notes 57: 1-3. U.S. Dept. Agric., Washington, D.C.
14. _____
    1967. Container planting in forestry. Proc. International Plant Propagator's Soc. Ann. Mtng. Sept., p. 141-146.
15. _____
    1968. Planting gun and bullet. Agric. Engin. 49:(6) p. 336-339.
16. _____
    1968. An annotated bibliography of reports, theses, and publications pertaining to the Campus and Research Forests of the University of British Columbia. Faculty of Forestry, University of B.C., Vancouver 8, B. C.
17. _____
    1969. Container planting of Douglas-fir. Forest Products Journal Volume 19, no. 10, p. 11-14.
18. _____
    1969. Synthetic ball planting on the University of British Columbia Research Forest, Haney, B.C., Tree Planters' Notes, Vol. 20, No. 1, p. 10-13.
19. White, D. P.; Schneider, G.; Lemmien, W.
    1970. Hardwood plantation establishment using container grown stock, p. 5.
20. White, D. P.
    1969. Container systems for forest trees. Proc. 1969 meeting of Western Forestry and Conservation Association, Portland, Ore.