CONDITIONING, OVERWINTERING AND FROST EFFECT IN MULTI-CROP CONTAINER PRODUCTION

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Multi-crop container seedlings of lodgepole pine *(Pinus contorta* Dougl. var. *latifolia* Engelm.) and white spruce *(Picea glauca* [Moench] Voss) that are grown for a relatively short time in the greenhouse, followed by outside rearing, are difficult to winter in prime condition without frost damage and substantial loss. The alternative method would be to rear up to three crops of seedlings in greenhouses for 10 to 14 weeks using fertilizer and irrigation schedules published by Carlson (1979), and then condition them in greenhouses until 20 weeks old by providing automatic blackout screens for 8-hr day length and 10°C constant temperature and by concurrently reducing fertilizer and irrigation requirements. Ample field storage sheds with R40 fiberglass batt insulation should be provided for winter storage to maintain stable inside temperature of 0° to -2°C when outdoor temperatures are 15° to -30°C or lower. The storage space should be cooled by overnight venting during the last week of October or first week of November, then sealed when the hygrothermograph stabilizes at -1°C. Removal from the greenhouse and storage of the conditioned trees should begin about 7 November, and all seedlings should be in place by 7 December. Seedlings of pine and spruce require no light or water for the duration of field storage to maintain the container stock in prime condition till spring planting. Survival in the first season of outplanting should be 95%, with site conditions accounting for not more than 5% subsequent loss.

Soundness (health) of the roots and shoots of planting stock outweigh size as a factor in survival and growth in the Prairie Region. In the short seasons of the northern latitudes the seedlings must respond quickly to establish a normal growth rhythm essential for tree survival. Stock which is frost damaged during outside storage can be expected to suffer relatively high mortality after planting. The survivors are often too weak to withstand cold soils, frost heave, lack of moisture or high temperatures. Survivors also have delayed and irregular patterns of phenology in bud flushing, cambial repair, foliation, and root and shoot development (Fig. 1 and 2). As a result of irregular recovery patterns, damaged stock requires several years to recover and resume a normal phenological rhythm.

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Carlson, L.W.
1979. Guidelines for rearing containerized conifer seedlings in the Prairie Provinces. Dep. Environ., Can. For. Serv., Edmonton, Alta. Inf. Rep. NOR-X-214. 62 p.

Figure 1. Outplanted frost-damaged lodgepole pine showing, left to right, unsatisfactory and satisfactory rehabilitation.

Figure 2. Frost-damaged white spruce seedlings showing similar effects on vigor but with greater variation from left to right.