

## Overwintering Container Plants without Refrigeration

By Thomas D. Landis

The type of overwinter storage system that you select will depend on the species that you are growing and the severity of winter conditions in your area of the country. Traditionally, container seedlings for reforestation have been stored under refrigeration but the demand for larger stock types has growers looking for other alternatives.

**Open storage.** In areas with freezing temperatures, open storage is the least expensive but most risky overwintering option. Select an area of the nursery that has some protection from the wind and where cold air will drain away. Utilize gravel and/or drainage tile to promote free drainage of rain or snow melt in the spring. Pack all containers together tightly and insulate the perimeter with straw bales or a berm of sawdust. With this perimeter insulation, the roots of the stored plants will be protected by the heat stored in the ground (Figure 1A).

Open storage is most successful in forested northern climates where adjacent trees create both shade and a windbreak, and continuous snow cover can be expected. If tree shelter isn't available, seedlings can be stored in

narrow East-West oriented bays between vertical snowfence (Figure 1B). This orientation is critical with conifer stock to shade foliage and prevent desiccation. Snow is an ideal natural insulation for over-wintering container plants but complete and continuous snow cover is not always reliable. Some northern nurseries have had success with generating snow cover with snow making equipment (Figure 1C).

### Structureless storage systems .

These are the simplest and least expensive ways to overwintering container stock. The term "structureless" means that plants are enclosed in a protective covering but without any mechanical support. Many different coverings have been used but the basic principle is the same: to provide a protective, insulating layer of the stored plants. Clear plastic should never be used because it transmit sunlight so that temperatures

**Thermal Mass**  
In open storage, the thermal mass of soil and growing media protects sensitive roots from freezing. Therefore, the smaller the container size, the higher the risk of freezing injury.

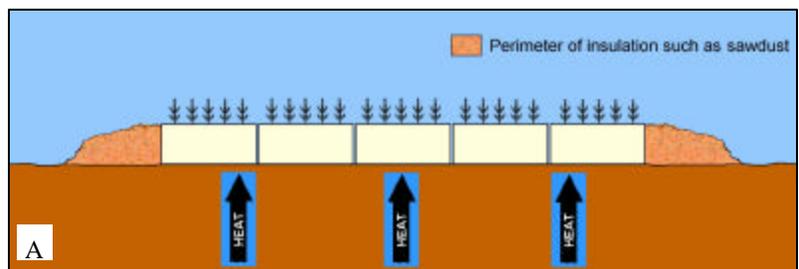


Figure 1 - Open storage can be effective when plants are blocked on the ground and surrounded by insulation (A). Plants should be protected from direct sun and wind by natural or artificial snowfences (B). Snow is an excellent insulator, and northern nurseries have augmented natural snowfall with snow-making equipment (C).

within the storage area can reach damaging levels. Because they reflect a majority of the sunlight, white or reflective coverings are preferred. All these coverings are eventually decomposed by direct sunlight so should be stored in a dry, dark location when not in use (Green and Fuchigami 1985).

*White plastic sheeting* - Single layer films are the most common covering in structureless systems, such as a 4-mil white copolymer plastic sheeting (Figure 2A). White is preferred because it reflects sunlight and keeps temperatures from building-up under the covering. As mentioned in the last section, grouping the containers together on the ground takes advantage of the heat stored in the soil (Figure 1A).



Figure 2 - Container plants can be bunched together on the ground and covered with white plastic or Microfoam® sheeting (A). Supporting the cover with a hoop of PVC plastic pipe or heavy metal wire provides better protection (B-C).

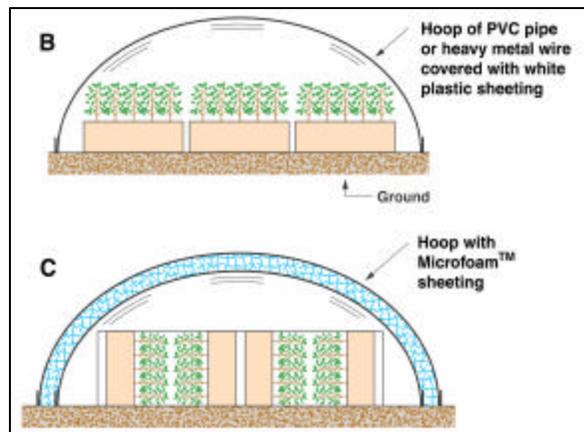
*White foam sheets and sheeting* - Microfoam® is a breathable Styrofoam®-like material that is lightweight, reusable, and easily removed and stored. It is available in a variety of widths and thicknesses. Microfoam® prevents wide fluctuations in temperature, minimizes heat build up and keeps root zone to above 10 °F ( -12 °C) if snow is present.

This system generally works well with hardy native species. The sheeting can be placed directly over the plants but works best if supported by wooden poles or hoops of PVC pipe or heavy metal wire (Figure 2B-C). Because Microfoam® is so lightweight, it needs to be secured well so that it does not rip or blow off the plants during windstorms. Typically, foam sheeting is secured around the edges with concrete blocks, wooden planks, or even a berm of sand. One layer of Microfoam® is reported to be insufficient in harsh climates without reliable snow cover such as northern Minnesota and

North Dakota. SM/Perimate® is rigid sheet insulation panels that have been proven to protect conifer seedlings as well as refrigerated storage but with a significant cost savings.

*Plastic bubble-wrap sheeting* - This material has

**Timing is Critical**  
Any structureless storage system is only effective if it is applied after plants have developed sufficient hardiness and, most importantly, removed before plants lose dormancy in the spring.



better insulation than regular plastic sheeting and is reported to be cheaper and more durable than Microfoam® sheets. Because it is relatively transparent however, sunlight can penetrate and cause premature warming.

*Frost Fabrics* - Woven and nonwoven landscape fabrics have been used for covering structureless storage systems. Because they are white in color they retard solar heating but allow infiltration of rain or snow melt and also allow stored plants to “breathe.” Horticultural suppliers offer frost fabrics in a range of weights and thicknesses giving from 4 to 8 °F (2.2 to 4.4 °C) of thermal insulation. Arbor Pro is a felt-like material that has been used successfully for conifer storage in Canada.

*Plastic film with layer of insulating material* - In harsh, northern climates without reliable snow cover, some nurseries cover their container stock with a “sandwich” of straw or other insulating material between two layers of clear plastic sheeting. The clear plastic and straw create additional heat on clear, frigid days and provide more constant temperatures during the over-wintering

period compared to other systems. The thermoblanket system consists of white plastic sheeting over a layer of Microfoam® proved effective for overwintering a variety of forbs. In general, the sandwich covers provide better insulation but cannot be removed or vented during periods of sunny warm winter weather.

*Cold frames* - A variety of different cold frames have been used for overwinter storage. In northern Alberta and Alaska, cold frames constructed of sideboards lined and topped with rigid Styrofoam® sheets have proven effective (Figure 3A). During warm periods in the winter or as soon as weather conditions permit in the spring, the top layer of insulation is removed so that plants can be irrigated (Figure 3B). Cold frames of wooden pallets, which are supported by cement blocks and covered by white plastic sheeting, are considered the most effective overwintering system for conifer seedlings at a nursery in eastern Canada.

### Conclusions and Recommendations

The growing popularity of larger container stock types has made traditional refrigerated storage uneconomical, and growers are looking for alternatives. Open storage is an option where freezing temperatures are not frequent or in northern climates with predictable snow coverage. Many growers are looking to the various types of structureless storage as a low-cost but effective way to overwinter their stock. While these overwintering systems are effective at preventing desiccation, growers need to be especially vigilant during late winter when high temperature around plants can cause premature dehardening and even bud break. In many nurseries, more than one overwintering system is used to accommodate the requirements for different native plant species.

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Figure 3 - Cold frames of wood and rigid Styrofoam™ sheet insulation are used to overwintered container plants in northern climates (A). When weather conditions permit, the top layer of insulation is removed so that plants can be irrigated (B).