

# Research News...

## Fraser Fir Plugs: Tomorrow's Seedling?

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With increased concern about Phytophthora root rot, the traditional approach to planting field-grown Fraser fir seedlings is coming under question. A seedling with good bud-set and a good strong stem is no longer a sufficient measure of quality. Rather, a healthy, Phytophthora-free root system may be the most important measure of seedling quality. It not only determines the health of that tree but the long-term profitability of the field in which it is planted. Recognizing this, many growers are now becoming interested in containerized Fraser fir 'plugs' as a possible way to eliminate the risk of introducing Phytophthora to their fields on contaminated seedlings. Several of the advantages and disadvantages to using these plugs will be discussed.

The technology to produce containerized Fraser fir in the greenhouse has been available since the mid-1970's. By artificially extending daylength to eighteen hours and by optimizing water, nutrients, and temperature, the equivalent of a 3-0 seedling can be produced in about a year under an accelerated greenhouse production system. With longer

der accelerated growth conditions. Several commercial operations in North Carolina and across the United States are currently producing greenhouse-grown Fraser fir plugs.

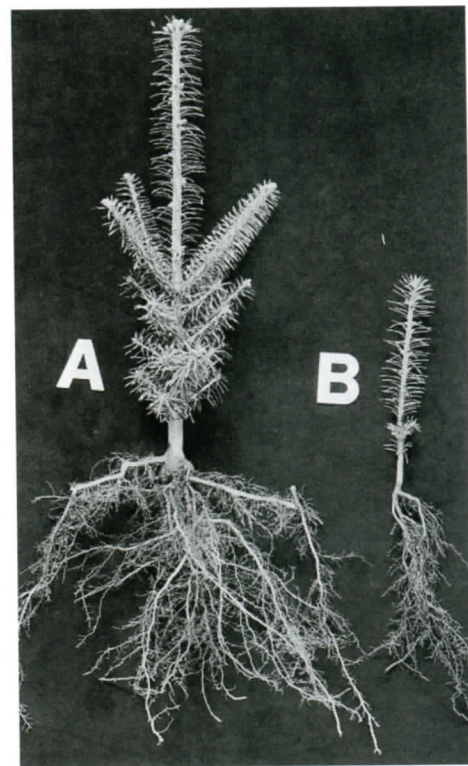
Finding a guaranteed Phytophthora-free source of seedlings is the primary motivation for the current interest in Fraser fir plugs. All common sources of fungal contamination can be controlled in the greenhouse environment with proper management. The plugs are grown in a soil-less media, usually a sterile bark-peat mixture. Well water should be used for irrigation because ponds and streams are frequently contaminated with Phytophthora from nearby fields. Plug containers and the surface on which they rest (either a gravel floor or a mesh table) are usually designed to eliminate any standing water or extended saturation of seedling roots. If these conditions are followed with good sanitation practices, the soil-borne phytophthora fungus can be eliminated from the seedling growing environment.

There are several additional advantages to using containerized seedlings. Plugs have the potential to be larger than

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days, the seedlings can produce three flushes of growth in one season before they need to go dormant in the fall. The challenges of growing greenhouse plugs (containerized seedlings) arise in producing plants of uniform size that will break dormancy the following spring. The NC Forest Service was the first to produce Fraser fir in a greenhouse un-

der accelerated growth conditions. Several commercial operations in North Carolina and across the United States are currently producing greenhouse-grown Fraser fir plugs. Finding a guaranteed Phytophthora-free source of seedlings is the primary motivation for the current interest in Fraser fir plugs. All common sources of fungal contamination can be controlled in the greenhouse environment with proper management. The plugs are grown in a soil-less media, usually a sterile bark-peat mixture. Well water should be used for irrigation because ponds and streams are frequently contaminated with Phytophthora from nearby fields. Plug containers and the surface on which they rest (either a gravel floor or a mesh table) are usually designed to eliminate any standing water or extended saturation of seedling roots. If these conditions are followed with good sanitation practices, the soil-borne phytophthora fungus can be eliminated from the seedling growing environment. There are several additional advantages to using containerized seedlings. Plugs have the potential to be larger than



**A = Plug + 2 year transplant**  
**B = 2-0 Seedbed**

trays can be carried directly on a transplanting machine so the seedling root systems are only briefly exposed to the air during planting. The container also provides short-term storage, where the plugs can be watered and maintained until a bed or new container is ready for them.

Fraser fir plugs have yet another potential advantage. Actively growing seedlings have been safely transplanted by several growers. While greater care must be used to handle tender plants, several benefits can occur. The natural growing season can be extended by setting out actively growing plants. While this will not produce an extra flush of growth, it should increase to the size of the stem and root system achieved in that season.

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## Fraser Fir Plugs...

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spring and be handled about the same as dormant seedlings. Actively growing plugs can be planted much later in the spring as long as they are continually maintained. Frost is a limiting factor early in the season on actively growing plugs.

Fraser fir plugs do have several disadvantages. Any container plant including plugs will become pot-bound if they stay in place too long. In most round containers, the roots will coil around the inside of the container. Other plug trays or tubes guide roots to the bottom where they are air-pruned. In either case, the pot-bound root system tends to maintain the shape of the container with greatly reduced root function and even survival. It is vital to move the plugs out of their container before this happens. When examining plugs, the roots on the outer face should only be an inch or two long - not twining around or down the length of the container.

Containerized plants also have a greater requirement for water that ei-

## Living With Woollies... *continued from page 6*

sary. A good scout or your county Extension agent can help assess if waiting would be too risky.

2. Where will the trees be sold? Trees affected by BWA often shed their needles after being cut. Trees marketed where they will have a lot of stress put on them at the tree lot will

have more needle shedding problems. Trees infested with BWA that are sold on lots in cooler climates, displayed in water, and otherwise well treated can be successfully sold and marketed.

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ther seedlings in the ground or bare-rooted seedlings in cold storage. The plugs are actively transpiring and have a very limited reservoir from which to draw water. Even if they are only being held in their containers until being planted, they will need frequent and possibly daily watering. They can be the highest quality plant, but will be worthless if they dry out. If you buy plugs, irrigation needs to be in your plan.

Cost can be another negative to using plugs. Expect to pay more to either produce or buy Fraser fir plugs. Be sure that your reasons for buying a plug will justify the extra cost. If you are willing to incur the added cost of phytophthora-

free plugs, be sure the transplant beds and the planned field locations are not already infected with the fungus.

Thus far, the discussion has focused on seedling-sized plugs, but growers are ultimately interested in a Phytophthora-free transplant. While a field-grown transplant may be clean, it is impossible to guarantee it. Soil contaminated with Phytophthora can easily be tracked, washed, or carried into a nursery field at any point during the one to two years that the transplants are there. Any field-grown transplant (or Fraser fir plug) must stand on its own merits and a thorough root inspection for the symptoms of disease.

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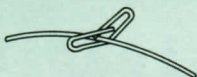
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### **Fraser Fir Plugs...**

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In conclusion, Fraser fir plugs can provide a healthy alternative for seedlings in the industry as long as the greenhouse producers maintain clean operations. Ultimately, greenhouses can be beset by the same kind of sanitation problems that have occurred in field nurseries. Even with the technology involved in greenhouse production, there are no guarantees in relation to phytophthora root rot. So, always grade your seedlings and transplants and practice good sanitation.

### **Quotable Quote:**

**"You must learn from the mistakes of others.  
You can't possibly live long enough to make  
them all yourself."**

**Sam Levenson**

### **CPSC and Husqvarna**

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guards that show signs of heat damage. For additional information, consumers should call Husqvarna at (800) 438-7297.

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