

Equipment, Products, and Services

The Long Tube Stocktype and Expandable Stinger

Nurseries are growing larger and larger stock for restoration projects. The size and shape of containers have evolved from the short, round 1-gallon containers to containers that are much deeper and narrower. While longer containers offer greater survival and growth potential, the biggest drawback is the difficulty and high costs of outplanting. These limitations can be overcome with the use of the long tube stocktype and the expandable stinger.

The Long Tube Stocktype

Long tubes consist of a 3 inch (7.6 cm) PVC pipe that is lined with Vexar® tubing (Figure 1). The pipe can be cut to any length, depending on the species growth habits, soils and climate of the outplanting site and project objectives. Typically, long tube containers are cut at 6 inch (15cm) increments, 12, 18, and 24 (30, 46, 61 cm). A 24 inch (61 cm) long tube is comparable in volume to a one-gallon container. Vexar tubing is cut to lengths longer than the PVC pipe to allow at least 3 inches (7.6cm) or more netting to extend above the pipe. The extended netting can either be folded down over the pipe or kept upright for protections from browsing. Vexar tubing is specially ordered from the manufacturer to be made of biodegradable plastic so that it will breakdown in the soil after outplanting.



Figure 1

Advantages of the Long Tube

1. Greater root depth - From late spring to early fall, rainfall is low for much of the Western United States and most soils dry out by mid summer. After outplanting, long tube seedlings have the advantage of beginning root growth at much deeper soil depths during the first growing season. This allows roots greater access to either the water table or soil levels with higher moisture contents.

2. High root surface area - Long tubes have a high root surface area, which can be an advantage to early seedling establishment. Comparing the 24-inch (61 cm) long tube to other one-gallon (3,785 cm³) containers, the long tube has twice the root surface area as the round one-gallon (3,785 cm³) container and a third more than the "Tall One" Treepot™ container. This greater surface area creates more root-soil contact, resulting in potentially greater root egress into the native soil during initial establishment.

3. Easy to extract - The original reason for placing Vexar netting within the PVC pipe was to protect roots and stem from animal damage. A more important reason for using this material is because it holds the growing media together to allow easy and complete extraction without damage to the seedling. Seedlings would be hard to extract from the long tubes because of their weight and the high surface area. Without the Vexar, seedlings would have to be pulled from their container by the stem, which can result in physical injury. With long tube containers, this stress is eliminated because seedlings are extracted by pulling the Vexar netting.

This makes it possible to extract long tube seedlings at any time. Most container seedlings can only be extracted late in the growing season after a firm root plug has developed. Unfortunately, this firm root plug often becomes root-bound and prevents good root egress after outplanting. The netting in the long tube gives the client a greater outplanting window and more flexibility in planning.

4. Eliminates root spiraling - The Vexar lining in the long tube also has another benefit. In round containers with smooth walls, roots grow in a spiral pattern. However, in long tubes, new roots follow the diamond-shaped pattern of the Vexar to the bottom of the container where they are air-pruned. This effectively prevents root spiraling and results in a better root system after outplanting.



Figure 2

The Expandable Stinger

Although long tube seedlings less than 24 inches (61 cm) can be planted by shovel or power auger on soils that are low in rock fragments, these soil types are rarely found in the mountainous terrain of the Western States. Recently, a planting device called the expandable stinger (US Patent 6,158,362 with additional patents pending) was invented to plant long tube seedlings or non-rooted cuttings of *Salix* and *Populus* in soils with high rock content. Attached to the arm of an excavator (Figure 2), the expandable stinger is hydraulically operated and can plant seedlings or cuttings on any soil type or slope gradient. The expandable stinger is composed of two parallel steel shafts, which are narrowed to a point at the end to form a “beak”. The shafts are hinged in the middle so that they open and close in a scissor-like manner. Each half of the beak is formed to create a long hollow chamber in the middle when they are closed. On the outplanting site, a long tube seedling or non-rooted cutting is inserted into the beak. The expandable stinger is then maneuvered to the planting spot, where the beak is inserted into the soil (Figure 3A). The beak is opened allowing the seedling to drop to the bottom of the created hole (Figure 3B). While the beak is open, the stinger is lifted from the soil leaving the seedling in place (Figure 3C). On sandy or coarse textured soils, the sides of the hole will collapse on the plug, forming a good soil contact. Other soil types and soil conditions might require manually tamping the soil around the plug. Ideally, long tube containers are planted several inches below ground line (Figure 3C).

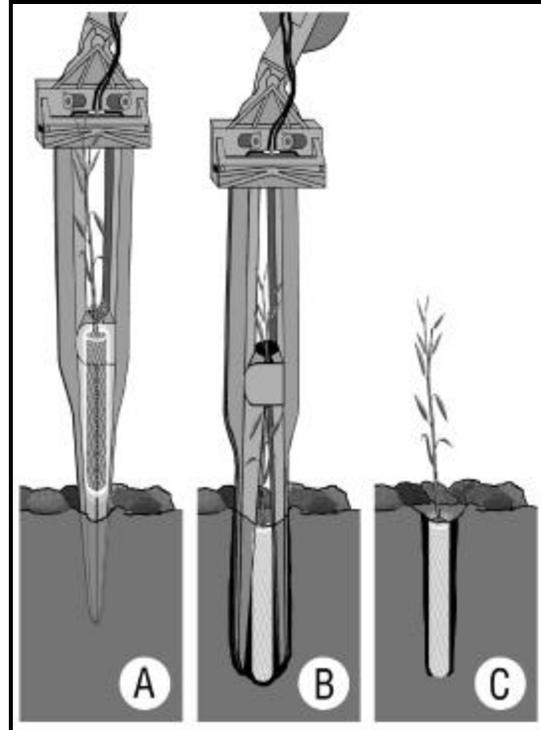


Figure 3

The expandable stinger can plant seedlings and non-rooted cuttings at a rate of one to five per minute depending on planting density, soil type, site accessibility and degree of planning. Generally, planting rates decrease on rocky soils and steeper slopes and increase where planting densities are high and travel time from one planting area to another is minimal. Having a supply of seedlings or cuttings at the site and ready for planting increases efficiency. However, this can be a challenge due to the large size and weight of these containers. Due to the inaccessibility of many sites to trucks, other methods of seedling transportation have been developed such as using a trailer attached to an all terrain vehicle.

Applications and Limitations

The long tube stocktype and the expandable stinger increase the possibilities for restoring severely disturbed sites such as gravel bars along streams, steep road cut and fill slopes, decommissioned roads, and mining spoils. The expandable stinger is restricted to those sites accessible to an excavator. The main limitation is the steepness of slope, which for safe operation, is less than 40 percent slope gradient. The size of the excavator also determines the planting radius. Smaller excavators can reach 25 feet (7.6m) while the larger machines extend planting to a 50-foot (15.2m) radius. A potential limitation to the long tube is the decomposition rate of the Vexar tubing. Although the tubing is composed of biodegradable plastic, it is unclear how fast this material breaks down in different soil types and moisture regimes.

For more information about the expandable stinger, please contact Dan Culley at 509-382-4824 or contact him at daytrac@hscis.net.

