

The culture of aquatic plants naturally requires the construction of special growing beds and special attention to their cultural requirements. Large-scale commercial growers have found it does not fit in easily with their overall program and it remains a specialty market. In order to address that market properly, it is important to provide a wide variety of aquatics for the consumer and to facilitate the availability and proper use of other pond products, such as liners, pumps, filters, etc. Extra attention is required to provide sufficient customer support.

However, you do not have to be a commercial grower of aquatic plants to appreciate them. I became interested in aquatics because they were fun. If you enjoy plants, you will enjoy aquatics. If you have been in terrestrial horticulture for some years, the differences are just great enough to pique your interest.

Terra Plug® Production

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Terra Plugs® (U.S. Patent 5331908) are field-grown perennial plugs produced by a patented process developed several years ago by Carl Loeb and Bruce Gibson, the owner and general manager of Summersun Greenhouse Company. The nursery had been a large producer of bedding plants, baskets, and poinsettias and was interested in expanding into the perennial market. The search for an efficient and labor-saving way to produce field-grown perennials led to the concept of planting perennials directly into the field in 3-in. bottomless pots. The initial production crop was 500,000 plants and this year there are 2.7 million plants in the field. Currently we are growing 176 taxa, 40% of which are vegetatively propagated.

Propagation begins in the greenhouses at Mount Vernon, Washington in early April. Cutting material is taken from both container and field stock beds at the perennial farm. The first crops are those items requiring superior drainage or on which losses are fairly high, such as *Phlox subulata* or *Dianthus*. These are stuck in 200 cells in 100% perlite. By early May we are cutting and sticking an average of 40,000 cuttings daily, most directly to the 3-in. bottomless pot. Cuttings are placed on heated floors and mist or fungicides are applied by robots. We use the same 18-in. × 18-in. flat used throughout the nursery. Our spacer insert holds 30 plants and allows ample room for growth without overcrowding. We set the same spacer into a cardboard insert for storage and shipping.

Seeds are sown into 288-cell plug trays on one of three seed-sowing machines. They are moved into a sweat chamber for 2 to 5 days and then either to the greenhouse or to the freezer for stratification. Once established, the plugs are transplanted into the 3-in. pots and grown in the greenhouse for 4 to 6 weeks. When roots are visible at the bottom of the pot the plants are sufficiently established to withstand field conditions. At this point they are graded, racked, and trucked to the perennial farm.

Three to four weeks prior to planting, the fields are treated with Vapam for weed and disease control. Planting begins mid June and continues until early August, with an average of 100,000 pots planted daily. Terra Plugs® are planted in raised beds that are made with a Struik rotovator and hiller that has been customized to

inject Chapin™ drip tape into the hills as they are being formed. A specially designed dibbler follows behind the hiller.

Racks of plants are brought to the field and loaded onto the planter. Plants are fed to each of 4 planters below by a co-worker riding above on the trailer. Pots are set into the hills just flush with the soil surface. An irrigation crew follows behind and connects the drip tube to the lay-flat irrigation hose that feeds it. This subirrigation system is extremely efficient. The entire 110 acres can be watered in a single day, if necessary. A 750-gal-per-min pump draws water from a slough at the back of the property and filters out particles.

Fertilizer is applied regularly at 200 ppm through the drip tubes beginning 2 or 3 weeks after planting. Initially, we use Peter's Excel 21N-5P-20K, which is an ammonium nitrate-based all-purpose feed. In early autumn we switch to a calcium nitrate-based fertilizer 15.5N-0P-0K to prepare plants for dormancy.

Within days of being planted, Terra Plugs® are well-rooted into the hills. Throughout the growing season they are continually inspected for trueness to type and uniformity and culled as necessary. We mow and hand shear many varieties to encourage basal branching. Frequent shearing is especially important with *Phlox subulata* and *Dianthus* to produce a compact crown.

Beginning in mid December, plants are harvested from the field. This is accomplished by a piecework crew of 12 men and two pick-up crews of three men each. Roots are cut off flush with the pot and the plants are then placed in flats, racked, and transported to the barn for processing.

The majority of the plants are processed using two custom-made carousel trimmers. Plants are placed into rotating cups on the carousel and passed through sets of flail blades that can be adjusted to trim to different heights and widths. As they come off the machine, plants are placed into the spacer trays and cardboard shipping insert. They are re-inspected visually, labeled, and stacked on pallets to be transported to the freezer. All plants that go dormant are frozen at 28F prior to shipment. Evergreen plants, such as *Iberis* and taxa that do not store well, are harvested fresh and pre-cooled prior to shipment. We ship from January through May throughout the United States and Canada.

The end result of this process is a large, field-grown crown with the handling characteristics of a plug. Transplant losses are low and uniformity is excellent. Summersun produces 350,000 1-gal perennials annually from Terra Plugs® at our facility in Aurora, Oregon. We plant beginning in late February directly outdoors and begin selling the first pots in mid April. With the possible exception of a few of the later-breaking types, such as *Ceratostigma* or *Platycodon*, finished product can be produced in 6 to 8 weeks from transplanting. The larger crowns produce many more flowering stems and much more reliable blooms than containers started from smaller greenhouse-grown plugs. The Terra Plug® concept has made it possible for us to produce superior containers in a short period of time and it gives our customers an opportunity to add or expand a perennial program into an already busy production schedule without sacrificing valuable greenhouse space.

“Perennials” Question-Answer Period

Anonymous: Can you recommend some peony cultivars that will grow in warmer areas?

Rick Rogers: Get early-blooming singles and semi-doubles in the Japanese types. Tree peonies work well in California. Stay away from the late-blooming doubles. They will not be luxuriant in the Bay Area, but they will grow.

Kristin Yanker-Hansen: Does shallow planting help in providing the cold temperature treatment peonies need to bloom?

Rick Rogers: The shallow planting will help. Peonies need 400-900 h of sub-40F temperatures.

Joan Trindle: What kind of water quality issues do you face in your propagation and are any of the plants you work with candidates for some of the wetland/pond treatment facilities?

Jim Purcell: Absolutely. I am pondering putting in a septic system with a lagoon that actually replaces a septic system. Water hyacinths are routinely used in tropical countries and some of the warmer climates of this country, at least experimentally, for reducing the BODs in water and then using the plants as a mulch or livestock fodder.

Terry Finnerty: What regulations are in place, if any, to protect from the possible danger of spread of your plant materials?

Jim Purcell: The grower and shipper have the responsibility to know what restrictions may apply anywhere they ship.

Hannah Mathers: How are the insectivorous plants propagated?

Jim Purcell: They are propagated by division, but we are not propagating any of those at this time.

Carole Barnett: What medium do you use in the plugs?

Gina Falcetti: It's Ball #3 mix.

Anonymous: What fungicides are you using?

Gina Falcetti: Banrot is used as a preventative. In the case of *Dianthus* and *Phlox*, we use Chipco or Daconil to prevent *Alternaria*.