

tip not overhang the understock. The graft is held together securely with a grafting elastic that is stretched slightly and not twisted when wrapping it around the graft.

Newly grafted plants are put back into the plastic trays and placed back on the peat moss in the bench. Humidity is maintained high in the greenhouse by keeping the paths damp and syringing the grafts several times a day. *Fagus* grafts are kept in the greenhouse with the night temperature set at 60°F. The leaves are allowed to expand fully on the scion and callus tissue will be visible in several weeks. Cut back the understock about one half the first time with the final cutting back and removal of the elastic not done until just before moving the grafts to the cold frames for the hardening off process. *Fagus* grafts remain in the cold frames for several weeks prior to planting out. We apply shading over the grafts, in both the cold frame and the field to protect the leaves from burning.

DON SHADOW: What size are the deep pots that you use?

KATHY FREELAND: About 3 × 3½ inches.

DON SHADOW: Once you cut the understock off, do you wax the cut with anything?

KATHY FREELAND: No, just cut them back and put them in the cold frame.

JOERG LEISS: Do you have any problems with sunburn?

KATHY FREELAND: Sometimes, but we shade the scions in the coldframe and when planted out.

JOERG LEISS: Have you had any incompatibility problems?

KATHY FREELAND: No.

JOERG LEISS: The purple weeping form does have such problems.

PROPAGATION OF ORNAMENTAL GRASSES

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My experience is that most horticulturists do not know much about ornamental grasses. It is a group of plants that only recently has begun to gain popularity.

Bluemount Nurseries is a wholesale nursery specializing in perennials, unusual ground covers, wildflowers, ferns, ornamental grasses, and bamboo. We supply plants to garden centers and landscape contractors in seven states. Our nursery

was started by my father in 1926 who had his early training as a grower of perennials for the original Moon's Nurseries in Morrisville, Pa. In 1960 we brought to our nursery from Germany a young nursery worker who later became a friend of a German-born landscape architect in Baltimore. They both saw the potential of ornamental grasses in this country after having had experience with them in Europe. We began to import grasses in the early 1960's and have continued to expand our collection since then.

An ornamental grass can be a very dwarf plant like blue fescue, *Festuca ovina* var. *glauca*, or a 16 foot giant like the giant miscanthus, *Miscanthus floridulus*, sometimes mistaken for *M. sinensis*, or *M. sacchariflorus*. Ornamental grasses have much to offer in the landscape. They have a distinct texture. Many have very lovely and spectacular plumes. Many have very strong winter interest. Most are very hardy, dependable, long-lived plants and they are dependably pest-free. They can be used for screening purposes, for mass plantings, or as accent plants. For me, it is important that an ornamental grass be a clump grower as opposed to a "runner" that can create problems in the garden. Some of the ornamental grasses do have rhizomes, such as *Spartina pectinata aureomarginata* (Syn: *S. michauxiana*) (prairie cord grass), or *Phalaris arundinacea* var. *picta* (ribbon grass or reed canary grass), and you need to know how to use them.

I wish to clarify at this point a problem that we all have when we use common names. There is confusion among grass names, especially with the name pampas grass. The true pampas grass is *Cortaderia selloana* and it is a native of Argentina. It has, in my opinion, the showiest of all plumes. You see it planted in Florida and north to Norfolk, Virginia, and in California. My experience is that it is not hardy in the Washington-Baltimore area, so we don't grow it, and I discourage people from planting it. Incidentally, if anyone knows of a plant which would survive in our area, I would like to know about it. We find that many people in our area confuse pampas grass with *Miscanthus*, or silver grass. We get a lot of inquiries about pampas grass and I always ask for a description so I know how to advise them.

We propagate most of our grass cultivars by division, although we do propagate a few by seed. For division, we have to have adequate stock plants in order to generate the quantities we need because one needs more stocks for growing plants by division than stock plants for collecting seed. We plant the grasses grown by division in nursery beds 4 ft. wide by 50 ft. long. The spacing in the beds depends on the ultimate size of the cultivar planted. We make the beds with a 48 in. wide

rototiller, add lime if necessary, and fertilizer. We plant divisions, or potted plants, and then mulch the planted bed with a hardwood bark mulch, 3 in. deep. The plants are watered, then given occasional irrigations and two or three supplemental fertilizings during the summer months.

We divide our grasses in March and early April, when the plants are still dormant. It is possible to divide them after growth starts, but more attention needs to be given to the plants if the culms (stems) and leaves are already forming. We pot divisions in various sized containers, depending on whether they are for immediate sale or future stock. Generally, we do not plant bareroot divisions out for stock, not because you cannot but because we are so rushed in late March and April that we concentrate on the dividing and potting. Once the nursery selling season is over, then we plant the new stock plants out in the beds. Another source of stock plants for us is the individual clumps of grasses that are scattered around the nursery for display purposes.

Since the grasses we grow by division have various types of root systems, I will group the various types by whether we use a knife, a hatchet, or a saw, to separate the plants. We use a hard pruning saw for dividing *Arundo donax* (giant reed) and the giant miscanthus (*Miscanthus floridulus*). We use a hatchet for the other *Miscanthus* varieties, including *M. sinensis*, *M. sinensis gracillimus*; *M. sinensis variegata*; and *M. sinensis* 'Zebra.' We also use a hatchet on *Panicum virgatum* (switch grass), *Calamagrostis epigios* var. *hortorum* (feather reed grass), *Erianthus ravennae* (plume or ravenna grass), *Spartina pectinata* (prairie cord grass), *Chasmanthium latifolium* (Syn.: *Uniola latifolia*) (northern sea oats) and *Pennisetum alopecuroides* (fountain grass or Chinese pennisetum). A sharp knife can be used for *Halictotrichon sempervirens* (Syn.: *Avena sempervirens*) (ornamental oats), *Festuca ovina* var. *glauca* (blue fescue), *Deschampsia caespitosa* (tufted hair grass), *Carex* spp. (sedges) and *Phalaris arundinacea picta* (ribbon grass).

Techniques used to divide grasses are:

1. Dig grasses with heavy spade — roots are very tenacious.
2. Shake off as much soil as possible in the bed.
3. Shake more soil off as you work with it.
4. Divide plant in half.
5. Continue to redivide until you get the size plants you want, either for sale or for stock.
6. Save all bits and pieces for stock.
7. Some plants like *Pennisetum*, *Deschampsia*, and *Festuca* can be divided down to a single shoot with roots.

8. In some cases, if a shoot doesn't have a root connected we still stick the shoot in sand under mist; it roots readily. We only do this if we really need every available piece in order to build up stocks quickly, or if we do not have many stock plants to start with. We did this with *Calamagrostis* in the beginning.

We do grow two species of grasses by seed: *Pennisetum alopecuroides* and *Chasmanthium latifolium* (Syn.: *Uniola latifolia*). We sow *Pennisetum* in the winter in seed trays in the greenhouse and the seeds germinate quite readily, but one must be careful with mice eating the sown seed. We sow *Chasmanthium* outside in December in a seed frame and it germinates in the spring. One of the reasons we don't grow more species by seed is that we have not been able to successfully do so. Some do not seem to set seed in our area. These include *Arundo donax* (giant reed), *Miscanthus floridulus* (giant miscanthus), and *Erianthus ravennae* (ravenna or plume grass). *Miscanthus sinensis* must set seed in our area as it naturalizes here, but we have not successfully grown it from seed. I suspect the *Miscanthus* varieties will not come true from seed.

The grasses I have referred to are ones that we have in production and for sale. We have other species we are building stocks for, and some are still in the hardiness testing stages. There are many potential kinds of ornamental grasses that have merit besides the ones we grow, and we are actively trying to locate these for trial.

The ornamental grasses are an amazing group of plants but not many will grow like the giant miscanthus (*Miscanthus floridulus*) — 16 feet in one season.

No other plant, except bamboo, creates a rustling sound at the slightest breeze. Their plumes make wonderful dried arrangements and against a clear blue sky are an unforgettable sight.

JOHN PAIR: Which of the *Pennisetum* species do you consider perennial?

RICHARD SIMON: We grow *P. alopecuroides* as a perennial.

JOHN PAIR: What about *P. setaceum* (Syn.: *P. ruppellii*)?

RICHARD SIMON: It is perennial but it is not hardy. It is one that grows about 4 ft high with beautiful red foliage. It is a wonderful bedding plant and the city of Baltimore uses it as a bedding plant.

RUTH KVAALLEN: Are there any of these clump grasses that have to be divided because they get too big.?

RICHARD SIMON: Yes, that is particularly true of the *Miscanthus* species. I have seen some that are maybe 15 ft in

diameter that are hollow in the center. They need rejuvenation when they get to be about 5 ft in diameter.

PROPAGATION OF TOP-GRAFTED STANDARD TREES

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Nurserymen have been engaged in the production of top-grafted standards for many years. For example, the camper-down elm, *Catalpa bungei*, and more recently weeping forms of cherry, laburnum, and caragana. These are only a few of many kinds of deciduous trees grown in quantity by wholesale producers. This paper will deal mostly with top grafting of plants that are not produced commercially at this time, so far as I know, and are evergreen in nature.

The circumstances that led to our production of top-grafted standards was the availability of greenhouse space during the first week in March when plants forced for various flower shows are removed for the spring exhibits. Our winter greenhouse grafting is completed by this time, and we have personnel and space available for several weeks before our spring season begins. We have been doing this for about 20 years, and we are finding a good market for some of these plants.

The cultivars we choose for top grafting are mostly dwarf, slow-growing, or weeping. When grafted on standards, they grow rapidly undoubtedly because of the large and strong root system they have acquired. Their ultimate size, however, is still small, and the resulting plant becomes ideal as a feature in a small garden or patio.

We containerize, or ball and burlap in plastic burlap the understock to be grafted during the summer or fall and store them in our packing shed and lean-to unheated greenhouse. While in storage branches are pruned out leaving only the limbs on which grafts will be made. After the plants are moved into the greenhouse in March, we start grafting immediately. During the last few years we have also been grafting earlier in the lean-to greenhouse after increasing the heat.

Grafting is mostly a side-cleft graft with the scion placed on the top side of the limb 2 to 6 inches from the trunk. We tie with rubber grafting strips and then seal the graft with grafting wax. Some difficulties occurs when removing the strips later on during the summer because of the wax, but we feel that waxing is necessary to insure the take. Pines generally bleed enough to seal the wound and do not require waxing as a rule.