space as misting area. In the other house, we have installed rolling benches and bottom heat. When laying out the misting area, the beds or benches should be perpendicular to the boom's travel. As the boom moves down the greenhouse, different beds or benches can be watered or not watered as needed. By installing the proper switching, it is possible to water one bed every 4 minutes while watering another bed every 6 minutes.

New applications for the traveling irrigator system continue to be developed. A small injector is now available. This injector rides along with the boom and is capable of applying fertilizer or pesticide. Toxic chemicals can be applied to the crop without personnel being present. High pressure fog traveling along with the boom promises to outperform even the best designed stationary system available today.

When planning changes to your present mist system or when making expansion plans, consider the advantages of a traveling boom mist system.

PROPAGATION OF ALPINES AND THEIR PRACTICAL USES

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Oliver Nurseries is a small retail nursery in Connecticut specializing in dwarf and rare plants, including dwarf conifers, azaleas and rhododendrons, alpines, and rock garden plants. Most of the alpines are propagated and grown on at the nursery. This paper will deal with what constitutes an alpine plant, their propagation, and where they can be used in the home landscape.

In the strictest sense, alpines are considered to be plants that grow above the timberline. They may be evergreen or deciduous shrubs, or they may be herbaceous perennials, but they are never annuals as the growing season is too short to manage a full life cycle in one season.

Alpines are characterized most often by foliage pressed very close to the ground, which is a result of the severe climate in the high mountains. In addition, their flowers are quite large in proportion to their foliage. In part this is because their foliage grows so slowly and is so tightly compressed that their flowers seem overly large against it. Occasionally, when an alpine plant is taken out of that severe climate and grown in a more temperate climate, the foliage expands and loosens up, and the flowers appear to be more in proportion

with it. This is something that alpine growers try to avoid, by growing them under conditions that most closely imitate those in nature: cool temperatures, strong but not hot light, gritty soil, excellent drainage, and good air circulation. These are conditions that very few of us can achieve, especially in maritime climates such as ours in Connecticut, where the summers are hot and muggy, and snow cover in the winter is a rare occurrence. Therein lies the challenge of growing alpines.

In the looser sense of the word, and the more commonly accepted use, "alpines" encompasses a much wider group of plants than those that grow above timberline. Usually it refers to any plant that is suitable for a rock garden and can include any dwarf shrub, perennial, or biennial that looks appropriate. But in this paper, the propagation of alpines will mostly be concerned with the more difficult plants and the challenges of growing high-mountain plants.

There are several mountain ranges in the United States which are high enough to have alpine plants. In the east we are essentially limited to the White Mountains, where there are some very fine alpine plants but not a great deal of diversity. In the west, the greatest mountain range is the Rockies, which stretches from northern New Mexico all the way to northern Canada and includes many types of excellent alpine plants, some of which are relatively easy to grow but many of which are very difficult. Examples include *Dryas octopetala* (not particularly difficult to grow, but a little tricky to get started), *Eritrichium nanum,* and one of the cushion phloxes. *Diapensiã lapponica,* an endemic of the Presidential range of the White Mountains in New Hampshire, is an example of one of the more difficult Eastern alpines.

Here in the East, we are fortunate to have an abundant supply of stone, a prerequisite to growing alpines. But not all of us have natural rock outcroppings on our properties, nor do we all have sloping areas, ideal for rock gardens because of the improved drainage inherent in a slope, so we must create natural looking situations for the plants. A flat area does not preclude the possibility of a rock garden, as flat areas occur frequently in the mountains and are called either an alpine lawn, where plants all grow together, or a rocky pasture, where alpine plants grow in combination with the stones which litter the ground. If there is a slope, it can either be planted as a rock garden, or a retaining wall or "raised bed" preferably built of stone, can be constructed. The resulting "raised bed" can be planted as well as all the crevices in the spaces between the stones if, instead of mortar being used, soil is used as the cement. If there is no slope at all, a free-standing raised bed can be constructed, and the resulting four sides of the walls (or however many you choose to make) can be planted with alpines. This creates an ideal situation for the plants, giving them good air circulation, perfect drainage at the crown, and a cool root run in the crevices

between the stones. Limestone can be used for the "lime lovers", if available, and since the walls of the raised bed face in all directions, the plants can be situated so that they receive their best light conditions: south or west facing for the "sun lovers", north or east facing for those that do best with bright but indirect light. The top of the raised bed can also be planted with "sun lovers". An advantage of planting a wall is that a wall of inferior stone can be camouflaged with vigorously growing plants, or a finely built wall of superior stone can be enhanced using the tighter, cushion-forming alpines.

An alternative to this idea of the raised bed is that of the trough or sink garden, which originated with the British when their stone watering troughs and sinks no longer served a purpose and they began planting them with dwarf plants. Ideal for this purpose are the tiny alpines, as roughly 20 to 25 of the smaller plants can be fit in a space 20 × 30 in. Realizing that stone watering troughs are a rare commodity in this country, we at Oliver Nurseries have devised a method of constructing them out of a combination of peat, sand, and cement which looks surprisingly like stone when dry. When filled with a gritty soil mixture and planted with a "landscape" of dwarf plants, the trough becomes a somewhat portable rock garden in miniature. Placed on a patio or by the front door, alone or in combination with others, troughs can be used to grow quite a number of difficult plants whose needs for special light conditions or soil can be met fairly easily with a little forethought. Some of the more difficult plants that we grow in troughs include *Dianthus alpinus, Gentiana acaulis, G. verna* [syn. *G. angulosa*], *Campanula aucheri, Primula auricula* var. *alpina* (syn. *P. alpina*), and *Penstemon.*

Most of our propagation is by seed or by cuttings. We collect seed from our own stock plants, and we belong to five alpine garden societies throughout the world which offer seed exchange programs. Seed is sown in the winter, and placed directly outside on benches protected by screening material. This protects against strong driving rains, burning sun, and curious animals. Seeds are sown in square plastic pots, usually 3½ in. square but occasionally as large as 4½ in. in Jiffy Mix plus coarse sand (1:1, v/v) with a light feeding of Osmocote 14-14-14 mixed into the medium. The seeds are sown lightly on the mix, then topdressed with a thin layer of granite grit (purchased at poultry suppliers) to protect the seeds from washing away during watering or in heavy rains. The pots are then soaked until thoroughly moistened, then placed outside on benches to freeze.

Seed germination begins in March and continues through June and sporadically thereafter. Seed pots that show no signs of germination are held for two years and then discarded. Depending on their size, seedlings are transplanted when they have either one or two sets of true leaves. The pots are allowed to dry for a few days before transplanting; this facilitates separating the seedlings, which

occasionally are quite crowded. They are lined out into 14 × 16 × 2½ in. flats, 30 to a flat, in rows of 6 × 5. Occasionally, with either very tiny plants or much larger plants, seedlings are lined out closer or farther apart, respectively. We feel that lining out in flats is better than potting up each seedling individually because it facilitates keeping an even moisture level in the flat; they take up less space than they would in pots, and it is a more natural situation for the seedlings to be growing in the company of others. The soil mix used is a very well drained one, and the pH ranges between 5.8 and 6.3. The flats are top-dressed with Osmocote 14-14-14, and then with a layer of stone mulch which mostly protects the small plants from the drip of the lath. Flats are placed on the ground in a lath house, where they will stay until the following spring, when they will be potted up for sale.

When most of our seedlings have been lined out, we begin taking cuttings, usually around the end of June. Stock plants are either planted out in the gardens in the nursery, in "stock troughs", or occasionally they are kept in pots in a stock area. We use Wood's Rooting Compound at the rate of 20:1 (v/v) in most cases, 10:1 with particularly hard-to-root species. Cuttings are stuck in flats, quite close but without touching. The mix consists of super coarse perlite, coarse sand, and screened peat (8:2:1, v/v/v). Flats are placed under a mist system which is on a 6 min timer, so the mist goes off for 6 sec every 6 min. This is a fairly heavy mist, which is why the mix has to be so well drained. Propagation is done in a hoop house where it gets quite hot in the summer so the mist helps to cool the plants.

When the cuttings have rooted, usually within 3 to 4 weeks, they are moved into flats in the same manner as the seedlings, and placed in a lath house. Most will winter outdoors under the cover of a layer of microfoam and plastic, but those that are moved on late in the season, i.e. September, are wintered over in a minimum heat hoop house.

Some of the problems that we have encountered are due to the inherent nature of the alpines. Many of them, being from a high mountain, open environment, do not do well under the close, humid atmosphere of a mist system. So, the difficulty lies in getting them to root before they decay under the mist. After rooting, they are moved on immediately before they deteriorate any further. Another limitation in rooting alpines is the size of the cutting we can take. In many cases, the growth on the plants is so compressed, that the longest stem we can get may only be ¼ in. long, so contact with the cutting mix is very limited. Cuttings are easily dislodged, and many cuttings can be lost that way. But usually the percentage of those rooting is quite good when they are watched carefully.

Alpines are a beautiful and fascinating group of plants, and a continuing challenge to even the best growers. Although not the most economically lucrative plants to grow, they attract a large

number of customers who then buy some of the "bread and butter" items in the nursery. Therefore I think they pay their way by drawing in customers looking for the rare and unusual.

EDITOR'S NOTE: The following four papers by Wayne Mezitt, William Flemer III, Richard Jaynes, and James Cross are all part of a panel discussion: *Maintaining Credibility in Plant Introductions.* Wayne Mezitt was moderator.

MAINTAINING CREDIBILITY IN PLANT INTRODUCTIONS I

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Over the last several years the nursery industry has experienced an upsurge in the number of new cultivars becoming available. As progressive as this trend appears on the surface, the implications become far deeper as we explore the commitments that follow. This situation offers large potential rewards along with some special challenges. I believe our industry currently has a real need for self examination; we as propagators are probably in the appropriate position to begin the process.

WHY DO NEW PLANTS INTEREST US?

Many aspects of new introductions are exciting to propagators, growers and horticultural salespeople. Primary to many of us is an improvement in quality of one or more of these characteristics: cold hardiness, heat tolerance, adaptability to stressful climates, better color in flower or foliage, improved growth habit, flowering season, fragrance, seasonal appeal, and numerous other advantages. Improvements that make it easier for the ultimate customer to be successful and happy with his/her purchase of the new cultivar are also of interest.

A second area of interest includes resistance to such problems as insects and diseases; tolerance of soil compaction; wet or dry growing conditions; adaptability to sun or shade, wind, short seasons, etc.

A third area appeals especially to the grower. Qualities, such as ease of propagation; ability to produce a saleable plant that looks good to the customer; and the ability of a new cultivar to "make up", dig and ship successfully are all vitally important in creating a large market for it.