

Propagating a Botanic Garden: The Mount Goliath Project[®]

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The gardens at Mt. Goliath and the Dos Chappel Nature Center were first conceptualized by the Garden Club of Denver (GCD), Denver Botanic Gardens (DBG), Volunteers for Outdoor Colorado (VOC), and the United States Forest Service (USFS). The goal was to create and interpret a unique habitat and give access to it for people who might not get to experience it otherwise. Mt. Goliath is along the fee-area road that leads to the peak of Mt. Evans. Approximately 140,000 vehicles travel that road every year. Propagating and growing plants for display and reclamation in a specialized climate presents some challenges and some unique opportunities.

The first garden planted at the Mt. Goliath area was designed by Zdenek Zvolanek and funded by the GCD through DBG. The garden and rock work construction was done by USFS, DBG, GCD, and volunteers and completed in July, 1987. After that first slot garden was built, the VOC came in and redefined the trail system around the gardens and established a trailhead for the Pesman trail. With the VOC now involved as partners Dos Chappel (Director of VOC) wanted to build a nature center to better interpret this area and began raising funds. In 2002, DBG developed the plans for the gardens around the Nature Center. The following year the Dos Chappel Nature Center was built. Then in 2004, DBG staff and volunteers installed the garden, flagstone, and rock work. More than 100 tons of rock were brought in and placed. In 2005, planting began for the garden. The grand opening was held in the summer of 2008, marking the official completion of the project.

The main planting was done in 2006 with plants produced from three different suppliers: Rocky Mountain Native Plants Co., Laporte Ave. Nursery, and DBG. Any and all plant material planted there is site-specific and has been collected at the Mt. Goliath site by DBG staff and volunteers. For the subsequent plantings all plants were produced at DBG by staff and volunteers. To facilitate this unique production goal, a store of seed had to be collected in preceding years. Multiple trips are taken to collect seed and cuttings every year. Typically, seed collection starts in late August and continues through September. In addition, specific trips have been made to collect scion wood from *Pinus aristata* for grafting projects in December, January, and February.

All seeds collected are brought back to DBG and hand-cleaned by staff. Several techniques have been used in germinating seed and processes have been refined by species-specific germination requirements. A database, which includes photos of the seed, is currently being developed; it contains the most effective pretreatments for each plant. Initially at DBG, all seeds were sown in 3½-inch pots covered with vermiculite, and given a 30-day cold wet stratification. Trays of pots were then taken to a greenhouse to germinate. Greenhouse temperatures were set at 60 °F nights and 80 °F days. As seed began to germinate, young plants were plucked out of the pots and transplanted to 38-cell 10 × 20 plug-trays and moved to a finishing greenhouse. Once plants rooted and filled in, the plug trays were then moved outside to harden off in a shaded nursery block. Species that did not germinate during

the initial treatment were investigated and given alternate treatments. As the best germination practices were discovered for each species they were then sown into plug trays. To rapidly increase production numbers on grasses, as soon as they filled their plugs they were divided. This process was repeated until it was time to plant in mid- to late-June. In general, most members of the Asteraceae, Poaceae, and Caryophyllaceae will germinate without cold treatment. When space allows, seeds are germinated in a greenhouse that has more fluctuating temperatures; 70 °F days and 38 °F nights have proven optimal. Outdoor and refrigerated cold storage has also been used on plants that exhibit physiological dormancy. For the majority of plants needing cold stratification, 30 days of cold treatment in a refrigerator has proven suitable.

Some woody species have been produced vegetatively for use in the Mt. Goliath project. The *Salix* sp. have been rooted from cuttings at multiple times during the year. Cuttings that are actively growing are cut and placed in plastic bags with some water to keep plants from wilting. Dormant cuttings are simply bundled with string. All cuttings are brought to DBG for processing and rooting. Willow cuttings are cut to a length of 6–8 inches and dipped in a 1000 ppm IBA solution. Dipped cuttings are then stuck into the same 38-cell plug trays that are used to finish the herbaceous species. It is preferable to grow *P. aristata* from seed; however, it is uncommon to find and very slow to finish. Due to seed scarcity, grafting is attempted as a supplement to seed production. Unfortunately for this method, collection of scion material and quality understock is difficult to obtain. Grafting has also proved to have very low success rates and few plants that accept the graft survive when planted.

Plant material establishment and survival rates are influenced by the lack of ability to provide regular water to newly transplanted plants. The harsh environment and short growing season also limits the efficacy of planting projects. On the area adjacent to the parking where a new slope was graded and installed, plants have been planted as well as seeded directly on the slope. The plants and soil are held in place using a jute mat. This slows the erosion and helps keep plants and seeds in place.

All propagation and reclamation efforts are still ongoing. This area is treated as a satellite location of DBG and is maintained by staff and volunteers. There are also regular tours and educational programs that have been implemented to help share the importance of the alpine habitat to the public that visit DBG and Mt. Evans.