Tall-Pot Transplants Established With Hydrogel
A Technique for Revegetating in the Arid Southwest without Intensive Irrigation

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A successful transplanting system that has minimal follow-up maintenance, particularly irrigation is needed for wind strip and wildland restoration plantings in the arid southwest. Planting container grown shrubs along with some irrigation are essential for successful revegetation of most dry sites. The selection of tall-pot containers (Fig.1) coupled with the application of a superabsorbent hydrogel (sodium carboxymethyl cellulose) for irrigation is being tested at three locations in northern New Mexico that receive an average annual precipitation of 10 to 14 inches. Another superabsorbent having substantially lower cost per application is also being evaluated.

The superior performance of containerized transplants grown in tall-pots (containers longer than 24 inches) has been well-documented. After eight years of field experience testing different container size transplants, Bainbridge (1994) concluded that seedlings grown in deep containers (e.g. PVC pipe) have improved survival and growth compared to smaller transplants grown in Super Cells (8" deep) or plant bands (6 – 12"deep). He has found that excellent seedling survival and growth can be expected even in areas with less than 3 inches of rain per year if plants are properly planted and provided with minimal water (2-3 supplemental waterings totaling about 2 quarts). The Center for Arid Lands Restoration at Joshua Tree National Monument in California has developed a tall-pot made with 32 inch tall, 6 inch diameter PVC pipe with a wire mesh base held by cross wires. Survival rates were more than 40 percent greater (Holden, 1992) for these tall-pot transplants planted on a south facing slope in the low desert compared with 16 inch transplants. In Australia, tall-pots have been used with consistent success (Newman 1990).

Figure 1: 28-inch rootball of a shrub grown in a PVC tall-pot

Plant trials on reclaimed tailings have shown it is essential to supply irrigation water during the first two growing seasons where annual precipitation is 11 to 12 inches (Ludeke, 1977). As an alternative to traditional irrigation, a superabsorbent hydrogel might be applied to serve as a slow release water reservoir.

A superabsorbent hydrogel is a crosslinked polymer or acrylonitrile with cellulose that absorbs and retains water hundreds of times its own weight. Some superabsorbents have been traditionally used in horticulture and agriculture successfully as soil additives as

reported by Erazo (1987) to: 1) improve water holding capacity, 2) improve aeration and drainage of soil mix, 3) reduce irrigation frequency, and 4) increase shelf life of plants in cold storage. Also, some superabsorbents have been used as root dips for shipping bare root seedlings. A new usage for superabsorbents as an irrigation source for transplants in arid environments is being developed. When the powdered product is hydrated, each granule acts as a tiny reservoir that makes water available to plants as microbial degradation of the cellulose product releases free water into the soil which is available to plants through root absorption. A hydrated superabsorbent placed in buried irrigation tubes can supply water.

Native shrub species of ecotypes generally with origins within a 200 mile radius of the planting sites were grown in 30-inch tall, 4 inch diameter PVC DWV (drain, waste and vent) pipe at the Plant Materials Center in Los Lunas, New Mexico.

Depending upon species, it generally takes about three years to produce a mature root ball from seed in this container (some take four years or longer, for example, mountain mahogany, winterfat and Mormon tea). These containers have two split seams that run most of the pipe length to encourage spiraling roots to grow downward and ease root ball removal. The bottoms of the containers are sealed with a porous fabric to allow drainage. The fabric was manufactured with a “Spin-Out” coating (copper hydroxide) to control root penetration.

During the Fall of 2000, more than 1,500 transplants of 16 common native shrub species were planted in northern New Mexico at three locations: Milan, Santa Fe, and Eldorado Village. Planting holes were dug with 9-inch diameter, 40-inch long auger powered by a 50-horsepower farm tractor. Holes, 3-foot in depth, were hand cleaned using standard post-hole diggers. Plants were then removed from containers, placed in holes, and back-filled. Prior to back filling, an irrigation tube was placed in each hole (see Figure 2).

Figure 2: Watering plants through irrigation tubes to remove air pockets and hydrate the soil in the root zone (November 2000)

This tube allows the plant to be supplied with water with either a hydrated hydrogel (e.g., hydrated sodium carboxymethyl cellulose) or water near the bottom of the root-ball to encourage growth of a deeper root system**.** The irrigation tubes are constructed from a PVC DWV pipe 3-inches in diameter and 40-inches in length, (see Figure 3). The orifice is capped to prevent animal entry and exposure of the root systems to sunlight. The 10-inch top section of the tube can be removed from the 30-inch perforated main tube body.

After the end of the irrigation period (two years), the top 10-inch section of pipe will be removed and the remainder will be back-filled with soil. Because the lower portion of the tube should contain substantial root development, it will remain in place.

The three plantings will be evaluated for survival in fall of 2001 through 2003 with results published in a later issue. The other treatments tested at each location consisted of: 1) plants grown in tallpots with irrigation tubes and only supplied an equal amount of water for irrigation, 2) plants grown in tallpots planted without irrigation tubes and only surfaced watered, 3) Lastly, plants grown in tall-pots and irrigated with a more inepensive type of hydrogel.

Figure 3: Irrigation tubes used in the 3 plantings

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