

## Work Task E7: Mass Transplanting Demonstration

FY05 Estimate	FY05 Actual	Cumulative Accomplishment Through FY05	FY06 Approved Estimate	FY07 Proposed Estimate	FY08 Proposed Estimate	FY09 Proposed Estimate
\$350,000	\$307,000	\$307,000	\$10,000	\$15,000	\$15,000	\$15,000

**Contact:** Gail Iglitz, (702) 293-8138

**Start Date:** FY05 **Expected Duration:** FY09 decision point

**Long-Term Goal:** Restoration Research

**Conservation Measures:** WIFL1, WRBA2, WYBA3, CRCR2, YHCR2, LEBI1, BLRA1, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, and SUTA1

**Location:** Reach 4, Cibola National Wildlife Refuge, ½ mile east of River Mile 97, AZ

**Purpose:** This research project evaluates mass transplanting techniques for cottonwood and willow using commercially available mechanized transplanting equipment. Based on a cursory review of the species profiles being prepared for LCR MSCP covered species, combined with the requirement to create 5,940 acres of cottonwood-willow land cover type habitat, a significant amount of native trees will need to be established each year. Mass transplanting is an approach used successfully by commercial growers. If mass transplanting of native species proves effective, it is expected to provide a useful cost effective tool in the creation of future habitat.

**Connections with Other Work Tasks (past and future):** This Work Task was previously included in the Draft FY05 Work Tasks as a portion of Farm Unit #1 (Genetics, Mass Planting, Seed), Cibola National Wildlife Refuge (E6). This applies to all Work Tasks in Section E that require terrestrial habitat creation.

**Project Description:** Reclamation has entered into a 5-year land use agreement with the FWS to conduct restoration research in Farm Unit #1 at Cibola NWR. The agreement expires in FY09, at which point a decision will be made to continue research activities, manage land cover types as habitat created during the research for the 50-year term of the LCR MSCP program, or discontinue funding. This Work Task demonstrates automated mass transplanting techniques using native riparian species. The intent is to investigate the feasibility and effectiveness of using this technique in restoration of agricultural fields. The cost benefit of this method will be evaluated along with its effectiveness and appropriateness in the creation of native habitat to meet LCR MSCP goals. The technique involves mechanized, rapid, dense planting of up to 4,500 seedlings per acre to inhibit growth of non-native plant species and to achieve dense growth of native tree species. Up to 36 acres of cottonwood-willow habitat may be created as a result of the demonstration.

**Previous Activities:** In anticipation of the implementation of the LCR MSCP, Reclamation evaluated the planting methods utilized on restoration demonstration projects conducted prior to

2001. With the exception of the Cibola Nature Trail at Cibola NWR, all those demonstration projects were less than seven acres in size. Dormant poles and individual potted plants were used as the plant materials on these sites. These methods are labor-intensive and do not translate well to large-scale habitat creation. At the scope required to meet LCR MSCP obligations, past methods have proven too costly and labor intensive. The costs and effectiveness of other methods are being tested and will be evaluated as results become available.

Over the last several years Reclamation has conducted demonstrations to investigate the feasibility and effectiveness of various methods to achieve dense, rapid growth plantings of native species; inhibit the establishment and growth of non-native plant species on restoration sites; and evaluate any potential cost benefit of the methods. The demonstration of mass transplanting may be used as an alternative to planting either dormant poles or 1-gallon rooted stock and to evaluate density spacing of 1 – 3 feet.

**FY05 Accomplishment:** A contract for the demonstration of mass transplanting of cottonwood and willow utilizing commercially available equipment was awarded to two contractors. Each contractor detailed similar mass transplanting approaches with significantly different timing for collection of plant material and planting of trees and varied greenhouse facilities. The intent was to demonstrate and compare each of these techniques. Each technique was evaluated for the effectiveness of creating quality habitat and cost benefit. Currently, these methods are being utilized in the agricultural industry to produce high quality fruits and vegetables cost effectively.

The demonstration project took place on two existing alfalfa fields, each approximately 20-acres in size, and provided for the mass transplanting of cottonwood and willow. Each field was prepared in the same fashion with disking and ring rolling. Both fields were flood irrigated prior to planting, immediately after planting, and every three days for the first two months.

Plant material was collected by each contractor from areas along the LCR. One contractor collected in January 2005 when the trees were dormant; and the other collected in March 2005, when the trees were no longer dormant. The contractor who collected in January utilized a state-of-the-art greenhouse with a computer-controlled environment (heat, light, and moisture), rolling benches, shade systems, and high intensity discharge lighting to propagate the cuttings. The contractor who collected in March utilized only a basic greenhouse with shade covers to control lighting.

The trees collected in January were planted April 24 and 25, 2005. The ambient temperature was 75 degrees F with no wind. A total of 8.5 acres were planted with 46,000 trees, with either 1-foot or 3-foot in-line spacing in rows 38” apart. Irrigation was provided within 24 hours of planting. The fields previously had a crop of alfalfa growing in each, which had been disked prior to planting. Some alfalfa grew back and, although sparse, it provided some protection from competing vegetation. Water grass seed came in by way of the irrigation and grew robustly, causing some decrease in growth of the trees. However, by October 2005, the survival rate was approximately 95 percent.

Plant material collected in March and grown in an outdoor greenhouse was planted May 31, 2005. The ambient temperature at the time of planting was in excess of 110 degrees F with a

moderate wind. A total of 17 acres were planted with 76,000 trees, also with either 1- foot or 3-foot in-line spacing, in rows 38” apart. Irrigation was provided within 24 hours of planting. Within one week, there was no survival.

After one growing season, it was determined that the feasibility of mass transplanting of cottonwood and willow was shown to be a viable option for achieving dense rapid planting. The fields were planted at densities of 3,800 trees per acre and 5,200 trees per acre. Planting time was greatly reduced from previous restoration projects (Cibola Nature Trail) from a 2-week planting time to less than two days. Costs were significantly reduced from \$7,700 per acre to \$5,900 per acre.

The survival rates of the differing approaches employed by the two contractors were dramatically apparent. Survival rates may have been influenced by one or combinations of the conditions during collection, propagation, and planting. At the end of the first growing season, the surviving field of trees grew an average of 4 feet. Some of the trees were “trapped” under an invasion of water grass. Towards the end of the growing season, the water grass went dormant, giving the trees opportunity to grow. A few trees were girdled (rubbed or chewed), most likely by deer. However, those trees had already sprouted back by November. Almost all the trees appeared to be generally healthily.

**FY06 Activities:** Due to the unusual amount of rain and early warming in spring 2005, the collection time (dormancy) was narrowed for the first contractor. This limited the amount of plant material from cottonwood and willow collected in 2005; as a result only 8.5 acres were planted, which left a remaining 11.5 acres to plant in 2006. Plant material was collected in December of 2005 for propagation. In April 2006, the field was prepared by disking and pre-irrigation for mass planting. This field was planted with predominately willow along with cottonwood in a 4-hour period. The trees were spaced at 5-foot in-line spacing with rows 38” apart.

The mass transplanting methods have demonstrated a feasible option for planting trees at a high density, over large acreage in a short period of time. Based upon observations and comparison, mass planting appears to be an effective, efficient method of planting habitat.

**Proposed FY07 Activities:** Trees established in FY05 and FY06 will be irrigated and monitored for survivability and general condition.

**Pertinent Reports:** A final report is being drafted and will be posted on the LCR MSCP website in FY07



**Figure E7a:** Root growth, April 2005



**Figure E7b:** Mass transplanting of trees, April 2005



**Figure E7c:** Cottonwood over 8 feet tall, October 2005



**Figure E7d:** May 2006