Work Task E6: Cottonwood Genetics Study

FY06 Estimates	FY06 Actual	Cumulative Accomplishment Through FY06	FY07 Approved Estimate	FY08 Proposed Estimate	FY09 Proposed Estimate	FY10 Proposed Estimate
$25,000	$23,438	$243,369	$15,000	$15,000	$0	$0

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Start Date: FY04

Expected Duration: FY09

Long-term Goal: Restoration Research

Conservation Measures: WIFL1, WRBA2, WYBA3, CRCR2, YHCR2, 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 is designed to determine the relative levels of genetic diversity in the remaining stands of Fremont cottonwood across the Southwest, and investigate the influence of this genetic diversity and local genetic adaptations on community diversity in the context of habitat restoration. The expression of these genetic adaptations may manifest in trees possessing superior traits with respect to growth, reproduction, survival, and the habitat quality they influence. Previous research indicates that diversity in cottonwoods can have a direct effect on associated trophic communities and can lead to increases in wildlife diversity. A benefit of genetically diverse stands of trees in dominant riparian communities is increased plasticity to varying environmental perturbation including disease, insect outbreaks, and climate change. Reclamation will use the information gained from this study to increase knowledge and success in creating functional wildlife habitat, and to insure that adequate genetic diversity of dominant riparian plants are included in habitat creation projects.

Connections with Other Work Tasks (past and future): All work tasks in Section E that target cottonwood-willow habitat. Starting in FY09, operation and maintenance costs for E6 will be included in Cibola NWR Unit 1 (E24).

Project Description: Reclamation has entered into a 5-year land use agreement with the USFWS to conduct restoration research in Unit 1 at Cibola NWR. Information is lacking regarding the relative levels of genetic diversity within the remaining cottonwoods along the LCR and the impact of this genetic diversity as it pertains to community structures and ultimately, wildlife diversity within restoration sites. In an effort to increase knowledge and success in creating functional wildlife habitat, Reclamation solicited the scientific community for proposals to investigate these relationships. The NAU was awarded a cooperative agreement and contributed matching funds from a National Science Foundation grant to undertake these

investigations. The project includes genetically screening remaining stocks of Fremont cottonwood trees in stands throughout the Southwest and selecting genetically distinct trees, representative of these locations, to be planted in an experimental garden with a replicated design. The experimental garden will be monitored to observe how these genetic differences may be expressed in terms of growth, reproduction, and survival in a typical restoration site, and genetic traits that influence superior habitat quality (including those that may support LCR MSCP covered species). These genetic traits will likely be important for long-term survival and for maintaining habitat quality and health throughout the life of the program. Sampling will be conducted to indicate species diversity and richness at multiple trophic levels with respect to soil microbes, invertebrates, and vertebrate communities associated with specific cottonwood genotypes. The experimental garden will be located at Cibola NWR on agricultural land with water and irrigation infrastructure.

Previous Activities: None

FY06 Accomplishments: Baseline arthropod data were collected through September 2006, and additional genetic data are being gathered for the remaining primer combinations for all 56 cottonwood genotypes. A number of publications have been generated based partially on these preliminary data (see pertinent reports).

Initial spring 2006, survival surveys indicated that mortality was approximately 30% in the experimental garden; however, follow-up fall 2006 surveys indicated that mortality had increased to approximately 90%. Researchers suspect that fall planting may have influenced this high mortality. Trees were planted dormant in fall of 2005 (FY06), but warm temperatures induced early bud break using up important food reserves for the trees' growth in the following spring. Without these reserves, the trees may not have been able to adequately compete with an already tall and vigorously growing cover-crop and other weedy species. This experience has been recognized as an important lesson that will influence all future LCR MSCP plantings with respect to planting season.

FY07 Activities: The cottonwood genetics experimental garden will be replanted in spring of FY07. The design and composition of the garden will be identical to the original garden as detailed in the study plan. Reclamation is assisting with field preparation and personnel for planting; however, the majority of the replanting and labor costs (recollection, propagation, transportation, and planting) are being assumed by NAU. This replanting will necessarily mean a delay in information from the experimental research, but it is not expected to impact budget projections for this work task. Additional measures are being used (spring planting season, rigorous field preparation, and weed management) to ensure successful establishment of the experimental garden.

Proposed FY08 Activities: Data collection including recording trophic responses and measuring physical parameters will continue through FY08. These data will include samples of soil microbes, invertebrate communities, and monitoring growth and development of trees. This information is necessary to determine if genotype differences important for restoration are being expressed. The majority of this portion of the study will be funded through NAU cost share. Support from Reclamation will be limited and may include staff time for agreement coordination and administration, equipment purchase or rental, and minor field support.

Pertinent Reports: *Nature Reviews*, July 2006; *Science Daily***,** July 2006; U.S. Dept of State *Washington File*, August 2006; and Ecological Society of America *Frontiers in Ecology and the Environment*, October 2006, are posted on the LCR MSCP Web site.