Work Task E34: Salinity and Soil Moisture Monitoring Network

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$150,000	$51,701.73	$133,159.02	$500,000	$0	$0	$0

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Start Date: FY13

Expected Duration: FY16

Long-Term Goal: Restoration research to guide management actions

Conservation Measures: MRM1, MRM2, CLRA1, WIFL1, WRBA2, WYBA3, CRCR2, YHCR2, LEBI1, BLRA1, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, and MNSW2

Location: Conservation areas and non LCR-MSCP southwestern willow flycatcher-occupied sites (for comparable data)

Purpose: To monitor salinity (soil and groundwater) and soil moisture to facilitate management actions that will allow for the long-term health and survival of established land cover types on LCR MSCP conservation areas

Connections with Other Work Tasks (Past and Future): This work task was initiated with funds from Work Tasks E4, E24, F1, and G3. Data collected under this work task are also used under Work Tasks C60 and F1.

Project Description: Monitoring soil and groundwater conditions provides information about why some restoration sites establish and develop more successfully than others. In addition to guiding decisions for vegetation establishment and health, research results suggest that adequate soil moisture levels are an important habitat requirement for certain covered species. The soil and groundwater monitoring network will be expanded, and monitoring efforts will be standardized across all applicable LCR MSCP conservation areas. The process of determining which phases will be monitored and to what level will occur over a period of years. The information gathered through this effort will facilitate decisions about managing soil moisture levels and saline conditions of soils and groundwater and will also ensure the long-term viability of LCR MSCP conservation areas.

The monitoring network established under this work task will be operated and maintained throughout the life of the LCR MSCP to ensure that data are available to make management decisions for the long term. In addition to providing data for the Restoration Group for the successful management of vegetation, efforts under this work task will result in information being provided for Work Tasks C60 and F1, allowing for a reduction of duplicated data collection efforts and providing necessary data to fulfill the objectives of these other work tasks.

Previous Activities: Research results from previous studies funded by Work Task G3 indicate that riparian obligate trees will use groundwater instead of applied surface water when they have reached sufficient maturity.

An extensive review of the available literature on salinity and sodicity was conducted to summarize what was already known about managing saline soil and groundwater conditions.

Efforts to measure soil moisture for recently planted riparian vegetation were initiated in 2007 by installing soil moisture devices on the Cibola National Wildlife Refuge Unit #1 Conservation Area (Nature Trail and Crane Roost), the Palo Verde Ecological Reserve (PVER) (Phases 1–5), the Cibola Valley Conservation Area (Phases 1–3), and the Beal Lake Conservation Area. These sites were operated and maintained until the vegetation was adequately established. Data collected at these sites will be used to evaluate past irrigation management of constructed restoration sites and may be used during the expansion of the monitoring network.

A soil and groundwater monitoring network was established at portions of three LCR MSCP conservation areas: the Beal Lake Conservation Area, the PVER, and the Cibola National Wildlife Refuge Unit #1 Conservation Area. Using the data collected from the three conservation areas over 2 years, a mass balance model to evaluate salt accretion/loss in soils and groundwater was developed.

A soil moisture monitoring pilot study was completed in Phase 2 of the PVER during 2010–13 under Work Task F1. The results and lessons learned from this study will be used to guide future efforts in monitoring soil moisture at existing and future conservation areas.

FY15 Accomplishments: A preliminary soil moisture monitoring effort was initiated in FY15 as the first step in establishing the larger salinity and soil moisture network. The purpose of this preliminary effort was twofold. The first purpose was to collect data to determine the current level (temporal and spatial distribution) of surface soil moisture present at a non-LCR MSCP southwestern willow flycatcher-occupied site (Rockhouse Riparian Demonstration Project near Roosevelt Lake, Arizona) and at the PVER. The other purpose was to provide the necessary background information needed to draft the scope of work for expanding the network across all LCR MSCP conservation areas. The specific objectives of this secondary purpose included: (1) establish the necessary standards and protocols, (2) identify the equipment and instrument needs for

expanding the network, (3) identify the level of effort needed for expanding the network, and (4) identify potential issues that may arise while expanding the network. The results will be used to make decisions regarding habitat management. Based on the results of this preliminary effort, it was concluded that additional data would assist in further identifying the range of soil moisture and site conditions at other southwestern willow flycatcher-occupied sites. Therefore, future plans for FY16 include adding two new southwestern willow flycatcher-occupied (non-LCR MSCP) sites for monitoring as well as continuing the monitoring of the two sites monitored during FY15.

Expenditures were less than what had been approved, as a preliminary effort was conducted before expanding the salinity and soil moisture network. This was done to better prepare for implementation and expansion of the LCR MSCP-wide network.

FY16 Activities: During FY16, two additional, non-LCR MSCP sites on the Middle Rio Grande in New Mexico will be instrumented as part of the preliminary effort that was initiated in FY15. The purpose of adding these two sites is to include southwestern willow flycatcher-occupied sites that have different vegetation or hydrologic characteristics and to increase the amount of available data. With a wider range of site characteristics and a larger dataset (both spatial and temporal), it is expected that the analyses will provide more information to make informed decisions. The two sites monitored during FY15 will be maintained, and data will be collected for a second season.

The protocols for the salinity and soil moisture monitoring network are expected to be finalized during FY16. The protocols will synthesize input from all the studies mentioned in previous activities, and from the lessons learned during the FY15 preliminary effort, and will lay out a schedule for expanding the salinity and soil moisture network. The schedule will be based on priority, targeting the higher priority (high soil salinity, higher southwestern willow flycatcher potential) areas first. The schedule will also lay out what parameters will be collected at which conservation areas since this will be dictated by site conditions (i.e., salinity will not be monitored if there is low risk for soil salinization).

Proposed FY17 Activities: This work task will be closed in FY16. Future salinity and soil moisture monitoring will be covered under Work Task F1.

Pertinent Reports: The reports titled *Review of Salinity and Sodicity, Monitoring, and Remediation for Riparian Restoration Areas; Groundwater and Soil Salinity Monitoring Network in Support of Long-term Irrigation and Salt Management of MSCP Restoration Areas;* and *Soil Moisture Monitoring Pilot Study at Palo Verde Ecological Reserve Phase 2* have been posted on the LCR MSCP Web site. Once a final review has been completed, the report titled *Soil and Groundwater Salinity Conditions for Lower Colorado River Multi-Species Conservation Program Habitat Creation Sites* will also be posted.