

## Work Task F1: Habitat Monitoring at Conservation Areas

FY16 Estimate	FY16 Actual Obligations	Cumulative Expenditures Through FY16	FY17 Approved Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate
\$450,000	\$471,224.34	\$4,820,512.99	\$950,000	\$850,000	\$850,000	\$850,000

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**Start Date:** FY05

**Expected Duration:** FY55

**Long-Term Goal:** Pre- and post-development monitoring

**Conservation Measures:** BEVI1, BLRA1, CLRA1, CRCR2, ELOW1, GIFL1, GIWO1, LEBI1, MNSW1, MRM2, SUTA1, VEFL1, WIFL1, WRBA2, WYBA3, YBCU1, YHCR2, and YWAR1

**Location:** All LCR MSCP conservation areas

**Purpose:** The purpose of this work task is to provide post-development monitoring to assess the effectiveness of each conservation area. Monitoring will include biotic and abiotic components and will inform management decisions throughout the life of the LCR MSCP.

**Connections with Other Work Tasks (Past and Future):** Post-development habitat monitoring will be conducted at habitat creation sites detailed in the Conservation Area Development and Management (Section E) work tasks. Soil moisture data collected under Work Task E34 was used for analyses performed under this work task. All salinity and soil moisture monitoring performed under Work Task E34 will be performed under this work task starting in FY17. Data collected under this work task are also used under Work Task C60.

**Project Description:** Species habitat characteristics will be evaluated. Monitoring data will be used to document progress toward achieving program goals and to provide habitat data for covered species to inform management decisions.

**Previous Activities:** Four conservation areas were monitored in FY10 using a variety of monitoring protocols designed to provide information about vegetation composition and health from ground cover to the upper canopy. In FY11, new

protocols were developed and tested in a pilot-year study in addition to those used in FY10. The protocols included measuring variables such as density, species richness, vegetation structure, ground cover, canopy closure, distance to nearest standing water, and distance to nearest open space. Temperature and relative humidity data were also collected.

An external program review of the vegetation monitoring protocol was conducted in FY12 under Work Task G4 to evaluate if data being collected could be used to assess conservation measure accomplishment. It was found that the known variability on the sites was not detectable at various spatial scales. Recommendations were provided for adjusting the current vegetation monitoring sample design and protocols, including the method chosen for randomization of monitoring plots, the collection of various data that were not tied to management questions, and measurements that were too subjective for inclusion into decisionmaking.

In FY14, the adaptive management recommendations for vegetation monitoring were implemented. Vegetation monitoring was conducted in a spatially randomized approach, targeting areas where the vegetation structure and soils were more consistent with southwestern willow flycatcher (*Empidonax traillii extimus*) and yellow-billed cuckoo (*Coccyzus americanus occidentalis*) habitat characteristics. The Beal Lake Conservation Area, the Cibola National Wildlife Refuge Unit #1 Conservation Area, the Cibola Valley Conservation Area, the Palo Verde Ecological Reserve, and Yuma East Wetlands were monitored, collecting data on density, vegetation structure, canopy closure, and canopy height.

In FY14, long-term vegetation monitoring started being transitioned to using remote sensing techniques. This decision was based on the improvements in light detection and ranging (LiDAR) technology. LiDAR has been proven to provide more accurate representations of vegetation in forests; it can be collected quickly during the breeding season without disturbing the covered species, and it is expected to provide higher-quality data at a reduced cost.

**FY16 Accomplishments:** LiDAR data for all conservation areas were collected in FY16. These data were processed and analyzed using techniques developed under Work Task C60 that provide metrics describing the vegetation structure related to species' habitat requirements. In addition to the LiDAR data being collected for vegetation monitoring, bathymetric data were collected using LiDAR technology for certain conservation areas that have a significant backwater or marsh component. These data will be used for monitoring habitat changes over time related to these land cover types (e.g., sediment deposition).

Initial steps to use the LiDAR data to classify vegetation at LCR MSCP conservation areas with the Anderson and Ohmart classification system were

completed. Test versions of an automated tool were developed that will allow vegetation at multiple scales and from multiple years to be classified to monitor the growth and seral succession of existing habitat.

Soil moisture data (Work Tasks E34 and C60) will be used with LiDAR vegetation monitoring data to evaluate the habitat conditions at sites with and without observed southwestern willow flycatcher breeding. The three sites include the Rockhouse Riparian Demonstration Project (near Roosevelt Lake, Arizona), three study areas on the Middle Rio Grande in New Mexico, and the Palo Verde Ecological Reserve.

**FY17 Activities:** Long-term habitat monitoring is continuing in FY17. LiDAR data will be acquired to assess vegetation characteristics and will be analyzed using the tools developed under Work Task C60. Soil moisture monitoring began to be managed under this work task in FY17, and data will be used to (1) further identify the range of habitat characteristics (vegetation and soil moisture) present at areas occupied by breeding southwestern willow flycatchers, (2) assess whether adequate soil moisture is being maintained during the nesting season at conservation areas being managed for southwestern willow flycatchers, and (3) assess whether soil moisture and salinity conditions are adequate for sustained vegetation health. A scope of work is being drafted to expand the monitoring network using the protocols developed under Work Task E34.

Vegetation monitoring techniques being analyzed under Work Task C60 may be used under this work task. This involves the use of unmanned aerial systems (UASs) to collect marsh vegetation data at Hart Mine Marsh using multispectral and photographic sensors. Depending on the results of the work being performed under Work Task C60, UAS-based monitoring may be incorporated into the long-term marsh vegetation monitoring performed under this work task.

**Proposed FY18 Activities:** Long-term habitat monitoring will continue in FY18 using the previously developed techniques. Using the LiDAR data collected from FY14 to FY17, a data collection schedule will be developed based on the needs for each conservation area. It is likely that LiDAR data will be collected at a higher frequency for new conservation areas, while more mature conservation areas will require less frequent data collection. Based on the results of the marsh vegetation monitoring using UAS techniques (C60), UAS-based data collection will be evaluated as a tool for habitat monitoring under this work task. If it is concluded that UAS techniques provide valuable marsh vegetation monitoring data, marsh vegetation monitoring will transition to UAS-based techniques. Due to the rapid deployment time possible using UASs, it is likely that this technique could also be used when data are required soon after a disturbance occurs (e.g., fire or flash flood).

The soil moisture and salinity monitoring network will be expanded to all conservation areas where these parameters are of concern for evaluating species'

habitat requirements and maintaining vegetation health. Data collection will continue at the three locations already being monitored. These data will continue to be used to evaluate the hydrologic requirements for southwestern willow flycatchers.

Additional remote sensing techniques and products will be evaluated based on vegetation mapping needs at LCR MSCP conservation areas. The techniques and products evaluated may also be used for system-wide monitoring purposes.

**Pertinent Reports:** During the development of remote sensing vegetation monitoring techniques, annual reports for FY15–17 will not be prepared. Once remote sensing monitoring techniques are finalized, the reports will then be prepared annually and posted on the LCR MSCP Web site upon completion.