

## Work Task C60: Habitat Manipulation

FY16 Estimate	FY16 Actual Obligations	Cumulative Expenditures Through FY16	FY17 Approved Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate
\$225,000	\$11.05	\$197,396.83	\$175,000	\$175,000	\$175,000	\$175,000

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**Start Date:** FY13

**Expected Duration:** FY20

**Long-Term Goal:** Develop cost-effective management techniques and determine the timing and extent of management actions necessary for maintaining structural diversity in riparian habitats

**Conservation Measures:** BLRA1, CLRA1, LEBI1, MRM2, WIFL, and YBCU

**Location:** All current and future riparian LCR MSCP conservation areas

**Purpose:** The purposes of this work task are to identify riparian habitat areas in need of structural diversity enhancement and develop protocols to manage LCR MSCP habitat creation sites. The intent is to use the results of this research to appropriately manage the successional stages of riparian habitat that are required by several covered riparian avian species and thereby meet established management guidelines.

**Connections with Other Work Tasks (Past and Future):** Research and monitoring data obtained from Work Tasks D1, D2, D3 (closed), E34, F1, F2, F7, G3, and G4 are used.

**Project Description:** The LCR MSCP riparian habitat creation sites are planted densely in order to reduce invasive species competition with native species and provide habitat for covered avian species. In natural systems where periodic flooding is a component of the system, habitat can be periodically disturbed and “reset” to earlier successional stages and increased structural diversity. Several covered avian species require as habitat early to mid-successional stages of native riparian trees. Over time, some of the LCR MSCP riparian habitat creation sites may grow beyond suitable habitat for some covered species unless management actions are taken.

Without the disturbance events that were once more common in the historic river hydrograph, direct manipulation of portions of these conservation areas may be required. Information will be provided to not only perform assessments but to provide protocols, which will guide the deliberate manipulation of these habitats to enhance structural diversity and produce the appropriate seral stages for covered species.

The objectives of the riparian study are to:

1. Provide a protocol for assessing areas for structural diversity and target areas that may require enhancement to meet management objectives. This will typically result in identifying areas that have at least 8 years of growth and that comprise more monotypic stands of riparian trees; however, the protocols that are developed may indicate longer or shorter durations based on measures of structural diversity.
2. Provide a protocol to guide cost-effective and appropriate manipulations of identified riparian habitats in order to reset portions of these areas to the earlier successional stages. Protocols that may be established could include, but are not limited to, locations within stands for thinning, numbers or percent of trees per stand to be removed, height at which trees should be cut to encourage stump sprouting, and potential for in-planting in thinned areas to encourage species diversity as well as longer-term structural diversity.
3. Evaluate the timing and extent of manipulation necessary for maintaining multi-successional riparian habitat at the appropriate scale. Based on the collected data from this research, potential areas and the extent of manipulation for future areas may be predicted so that proper timing and budgeting for management can be more controlled and proactive. The funds for actual management action of conservation areas will be provided through each specific conservation area's work plan.

Changes in the hydrologic regime along the lower Colorado River have reduced the likelihood of marsh habitat being refreshed through active periods of flooding and removal of the vegetation structure. The covered marsh bird species thrive in marshes that function with ephemeral flooding and resetting of the habitat. Without flooding, active restoration and management of these marsh habitats is expected throughout the life of the LCR MSCP. The current literature suggests that burning of the marshes' decadent dry material allows for new habitat to emerge.

The objectives of the marsh study are to:

1. Provide a protocol for assessing areas at various spatial scales that are no longer providing habitat for the covered marsh birds

2. Provide a protocol to guide cost-effective and appropriate manipulations of marsh in order to reset portions of these areas to the earlier successional stages
3. Evaluate the timing and extent of the manipulation necessary for maintaining a mosaic of a functioning marsh

**Previous Activities:** A literature review was completed on riparian stand thinning/manipulations to determine the best approaches for achieving the desired habitat structure and to determine the measured parameters needed to indicate success. The best approaches for assessing habitat diversity in different structure types were tested to identify study sites with low structural diversity and/or those with later successional stages of growth. A supplemental literature review was conducted on the habitat requirements and limitations of the southwestern willow flycatcher (*Empidonax traillii extimus*) and yellow-billed cuckoo (*Coccyzus americanus occidentalis*). The addition of species habitat parameters was needed to assist in defining what vegetation parameters could be manipulated.

Following the literature review, two strategies using light detection and ranging (LiDAR) were investigated to assess structural diversity: (1) field-based methods (terrestrial laser scanning [TLS]) and (2) airborne-based methods (aerial laser scanning [ALS]). Both methods were used to identify vegetation strata and their relative heights at a site within a plot. Additionally, statistical tools were developed to assess the diversity of this vegetation data at multiple spatial scales (e.g., plot, patch, restoration area, etc.).

**FY16 Accomplishments:** ALS and TLS data collected during FY15 were processed and analyzed. The processing and analysis methods were developed to provide a repeatable procedure resulting in scalable metrics that described the vegetation structure of both created and existing habitat. Two sites were used for this analysis: the Palo Verde Ecological Reserve and the Rockhouse Riparian Demonstration Project. The goal of this initial analysis was to compare these two sites to evaluate the habitat suitability for southwestern willow flycatchers since the Rockhouse Riparian Demonstration Project has had evidence of them breeding since 2010, while only two southwestern willow flycatchers have been detected at the Palo Verde Ecological Reserve to date (one in 2015 and one in 2016). The analysis showed some differences in vegetation structure between the two sites, but since it included only one southwestern willow flycatcher-occupied site, additional southwestern willow flycatcher-occupied sites will be analyzed before any recommendations or conclusions regarding habitat manipulation are made.

The analysis did conclude that ALS data were sufficient for evaluating riparian forest vegetation to meet LCR MSCP needs; the added detail provided by TLS was not needed and did not warrant the additional level of effort associated with this technique.

The literature review to gather information to better manage marsh habitats was finalized. The literature review identified management techniques that could be implemented at LCR MSCP conservation areas that contained marsh land cover types. Preliminary planning to implement some of these techniques was undertaken.

Obligations were less than approved because work was completed using prior year's obligations and portions of the work were completed under Work Tasks F1 (LiDAR data acquisition) and G1 (data management activities).

**FY17 Activities:** The methods developed in FY16 to process and analyze ALS data to describe vegetation structure are being automated to facilitate future processing. Once the automated procedure is complete, ALS data collected at LCR MSCP conservation areas (with cottonwood-willow [*Populus fremontii*-*Salix gooddingii*] land cover type) and southwestern willow flycatcher-occupied sites throughout the Southwestern United States will be processed and analyzed. The data from the southwestern willow flycatcher-occupied sites will be used to develop ranges for each of the vegetation metrics. LCR MSCP conservation areas will then be evaluated against these ranges to make recommendations on whether some level of habitat manipulation is warranted or not.

One of the marsh habitat manipulation techniques identified in the literature review will be tested at Hart Mine Marsh in cooperation with the U.S. Fish and Wildlife Service. Mechanical disturbance will be performed at Hart Mine Marsh during FY17, and vegetation response data will be collected using unmanned aerial systems equipped with multispectral and photographic sensors. The sensors will be used to create three-dimensional models of the vegetation that describe structure and species composition. The results of this test will help determine whether or not this management technique should be included in the long-term marsh habitat manipulation toolbox.

**Proposed FY18 Activities:** ALS data will continue to be acquired in FY18 under Work Task F1 and will be processed and analyzed using the techniques developed in FY17. The long-term monitoring under this research work task will help inform the LCR MSCP about the level of active habitat manipulation that is necessary. If habitat manipulation is deemed necessary, the Habitat Conservation Plan and the literature review conducted under this work task will be consulted to identify appropriate riparian forest habitat manipulation techniques. Initial planning and design will be conducted to implement habitat manipulation tests at select LCR MSCP conservation areas. The goal of these tests will be to evaluate techniques for inclusion in the long-term riparian forest habitat manipulation toolbox.

Vegetation response monitoring will continue at Hart Mine Marsh using data acquired with unmanned aerial systems. This monitoring will continue to inform the LCR MSCP on whether mechanical disturbance should continue to be

included in the long-term marsh habitat manipulation toolbox. Additional marsh habitat manipulation techniques will be evaluated, and if appropriate, field tests will be planned and designed to evaluate their inclusion in the long-term marsh habitat manipulation toolbox.

**Pertinent Reports:** The report titled *Integrating Terrestrial Laser Scanning (TLS) and Aerial Laser Scanning (ALS) to Describe Physiognomic Vegetation Structure in Riparian Forests and Options for Managing Emergent Wetlands as Marsh Bird Habitat along the Lower Colorado River* will be posted on the LCR MSCP Web site upon completion.