

Work Task G1: Data Management

FY16 Estimate	FY16 Actual Obligations	Cumulative Expenditures Through FY16	FY17 Approved Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate
\$1,000,000	\$919,025.71	\$5,401,408.48	\$1,000,000	\$1,000,000	\$1,000,000	\$750,000

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Start Date: FY07

Expected Duration: FY55

Long-Term Goal: Data management will be an ongoing task for species research, system monitoring, habitat creation, post-development monitoring, and habitat maintenance programs.

Conservation Measures: All

Location: Program-wide

Purpose: To develop and maintain an accessible, multi-disciplinary, spatially referenced, relational database and associated tools to consolidate, organize, document, store, and distribute scientific information related to the LCR MSCP

Connections with Other Work Tasks (Past and Future): Data management is integral for the successful completion of the work tasks undertaken: Fish Augmentation (Section B), Species Research (Section C), System Monitoring (Section D), Conservation Area Development and Management (Section E), Post-Development Monitoring (Section F), Adaptive Management Program (Section G), and Funding Accounts (Section H).

Project Description: Under this work task, the data management team manages all aspects of the LCR MSCP that are related to the database, data collection, applications development, and software management. To fully implement the program, a database management system is being developed to handle the data collected through the species research, system monitoring, habitat creation, post-development monitoring, adaptive management, and habitat maintenance programs. Database design, initial implementation, and maintenance are funded under this work task.

Previous Activities: Hardware was purchased to increase data storage for the implementation of the centralized database. The intranet/document/calendar management system was upgraded and modified to accommodate the future needs

of the LCR MSCP. Implementation of remote data collection from field data loggers began at Beal Lake for the fish program. The Native Fish Augmentation Database was maintained.

Database design and implementation of the LCR MSCP database management system was completed. Data modules for the database were acquired and phased in according to priority for implementation of the Habitat Conservation Plan. The modules consist of an application for data entry that is standardized for input into the database. On an annual phased approach, all standardized projects will be incorporated into the database.

Mobile data loggers and software for collection of data in the field were acquired. These units standardize data collection across LCR MSCP projects. Mobile electronic field forms (MEFFs)/data dictionaries for data collection were developed and are now used for most field data collection.

FY16 Accomplishments: The Native Fish Augmentation Database continued to be maintained in its current format. Initial steps to incorporate this into the LCR MSCP database began, including development of schema and initial steps for standardization of attributes. Native fish stocking data in legacy formats were evaluated, and a draft schema was developed. Test imports were performed on these data to simulate transfer into the LCR MSCP database.

Maintenance and updates to the LCR MSCP Web site continued. Field data collection devices and supporting software were maintained to support data collection activities. Acquisition of light detection and ranging (LiDAR) data and aerial imagery for selected conservation areas and system-wide areas was supported under Work Tasks C60 and F1 for FY16, while the management of these data was handled under this work task.

Data collection processes were reviewed, updated, and maintained. MEFFs were created (or updated) and tested for the following projects: the southwestern willow flycatcher (*Empidonax traillii extimus*) (D2 and F2), yellow-billed cuckoo (*Coccyzus americanus occidentalis*) (D7 and F2), amphibians (C62 and D12), small mammals (D10 and F3), bat surveys and research (D9 and F4), elf owl (*Micrathene whitneyi*) (C24), and MacNeill's sootywing skipper (*Pholisora graciellae* = *Hesperopsis graciellae* [MacNeill]) (F6). Documentation for all MEFFs was created so that end-users had the necessary reference materials for proper MEFF use. Additionally, the LCR MSCP trained end-users in how to use the MEFFs for field data collection.

The LCR MSCP databases continued to be maintained and upgraded for location, species, project-related reference tables, and utility procedures to centralize processing of project data, with emphasis on the support of MEFF needs (e.g., MEFF locations, codes, etc.). Support continued to be offered for users

of desktop computer-based data entry forms, including form and code updates, data merging, internal quality queries, and assistance in the design and creation of contractor-required queries for avian system-wide surveys (D6).

Quality assurance measures for field data collection processes were maintained, with full audit trails from raw field data to final production data. MEFF data viewers were also developed or updated during FY16 in support of projects for the southwestern willow flycatcher (D2 and F2), yellow-billed cuckoo (D7 and F2), amphibians (C62 and D12), small mammals (D10 and F3), bat surveys and research (D9 and F4), elf owl (C24), and MacNeill's sootywing skipper (F6). The data viewers allowed field surveyors to view collected data in tables and perform queries shortly after field collection as part of the quality assurance process.

The use of remote and continuous data collection from data loggers continued to be developed and supported. The external data upload site was maintained in order to improve data flow and tracking.

Efforts to restructure and more effectively maintain all LCR MSCP tabular and spatial data continued in FY16. The focus of these efforts involved selecting the appropriate tools for the required tasks.

In FY16, the Bureau of Reclamation decided to transfer server administration for the collaboration software that the LCR MSCP utilizes to Denver, Colorado. This centralization effort also involved a major version upgrade. In preparation for this upgrade and centralization (to occur in FY17), the LCR MSCP took efforts to reorganize the content that is being maintained in this system with the goal of making all project information easier to find and more accessible.

FY17 Activities: Maintenance of the Native Fish Augmentation Database continues in its current format. Work continues on incorporating these data into the LCR MSCP database. Native fish stocking data in legacy formats continues to be evaluated, and the draft schema continues to be modified. Test imports continue to be performed on these data to simulate transfer into the LCR MSCP database.

The LCR MSCP Web site continues to be maintained and updated. Acquisition of LiDAR data and aerial imagery for selected conservation areas and system-wide areas is supported under Work Tasks C60 and F1 for FY17, while the management of these data is handled under this work task. Due to the storage requirements of LiDAR data, aerial imagery, and other storage-intensive data, additional storage capacity (hardware and server software) is being evaluated to ensure the integrity and availability of these data. Once an acceptable alternative is identified, steps will be taken to transfer these data to the long-term storage solution.

The data collection processes continue to be updated and/or maintained, and MEFFs are being evaluated, developed, updated (and/or maintained), and tested

for the following projects: the southwestern willow flycatcher (D2 and F2), yellow-billed cuckoo (D7 and F2), amphibians (C62 and D12), small mammals (D10 and F3), bat surveys and research (D9 and F4), elf owl (C24), and MacNeill's sootywing skipper (F6).

Field data collection alternatives are being evaluated in order to take advantage of more efficient and versatile hardware and software technologies. Once these alternatives are identified, limited field testing will begin on projects that are currently using MEFFs for field data collection. These technologies might also be tested on projects that currently use other field data collection techniques (multiple fisheries projects, breeding bird surveys [D6 and F2], and marsh bird surveys [D1 and F7]). Support for the purchase of MEFF development tools, new hardware and software technologies, Global Positioning System devices, and other supporting software continues.

An independent evaluation of all data management processes is being conducted during FY17. This evaluation has three components: (1) identify overarching framing questions to guide adaptive management and data management processes and practices, (2) identify pertinent datasets that will be used for adaptive management purposes, and (3) technical review of current data collection and management practices. The overall goal of this exercise is to provide the necessary information to develop a digital information management system that will allow the LCR MSCP to make informed management decisions throughout the life of the program.

The LCR MSCP continues to reorganize the content contained in the collaboration platform that will be upgraded and transitioned to servers in Denver. Workflows will also be developed using this platform to make internal work processes more efficient, transparent, and trackable.

Proposed FY18 Activities: Maintenance of the Native Fish Augmentation Database will continue in its current format. It is anticipated that incorporation of these data into the LCR MSCP database will take place in FY18. It is also anticipated that native fish stocking data in legacy formats will be incorporated into the LCR MSCP database in FY18. Field collection of native fish stocking data will be updated to use MEFFs or some other standardized electronic method during FY18.

Existing MEFFS will continue to be updated or converted to one of the alternative field data collection techniques identified in FY17. Projects not using a standardized electronic field data collection method will be upgraded to use one of these methods.

LiDAR data acquisition will continue to be supported under Work Task F1, but the raw data will be managed and maintained under this work task.

Database schemas and data import/conversion codes will continue to be designed or updated in support of the MEFFs for projects as appropriate. All related database documentation (e.g., schema design, MEFF to Structured Query Language data mapping, processing workflows, standard naming conventions, etc.) will be maintained or created as required. Efforts to provision software that will enable project coordinators to access LCR MSCP database tables will continue. Importation of all data into the database will continue.

Information gathered from the data management evaluation taking place during FY17 will be used to advance several tasks, including (1) developing a digital information management system that meets the LCR MSCP's science and adaptive management needs using the existing databases as a foundation, (2) developing systems for incorporating pertinent legacy data into the information management system, and (3) implementing recommendations and modifications to current data management practices (field and office based). The information management system will include tools for extraction of information from collected data that will be used to make informed management decisions.

The LCR MSCP will continue to refine the quality assurance procedures already in place. This effort includes the use of the external data upload site to upload all raw data for tracking and quality assurance.

Pertinent Reports: N/A