

Wetland Program Development Grant (WPDG) FFY 2017

Characterizing Biological Structure and Ecological Function of Playas and Upgrading the existing Kansas Wetland Program Plan (WPP)

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Grant Recipient: Kansas Water Office

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Submitted by: Kirk Tjelmeland, Kansas Water Office

Project Description:

Program Priorities: The Kansas Water Office (KWO) has developed (CD# 97731701) a Wetland Program Plan (WPP), approved by EPA Region 7 in March 2013. The proposed projects address eight of the planned activities to implement the WPP during the next three to five years. All four Core Elements are addressed in the WPP and this proposal addresses three of them: *Voluntary Restoration and Protection, Monitoring and Assessment, and Water Quality Standards for Wetlands*. The relevant WPP goals, associated planned activities contained in the WPP that these proposals address and relationship to the EPA Core Elements are discussed below. Page numbers refer to the WPP.

WPP GOAL 1. Increase the knowledge base about Kansas' wetland systems through surveying, monitoring, research and assessment to establish wetland condition, identify trends, and the causes and sources affecting wetland change. (*EPA M&A Core Element*) Action 1:

Utilize potential wetland area locations in WRAPS watersheds to achieve TMDL and other WRAPS goals; direct resources to priority areas (p.6). Action 2: Establish baseline condition of public and private wetlands (p.7). **WPP GOAL 2.** Promote public awareness about the value and importance of wetlands through coordinated programs of education and information (*EPA Voluntary Restoration Core Element*). Action 1: Provide technical and financial assistance to private landowners for protection, enhancing or restoring wetlands (p.3). Action 2: Support development of Best Management Practices to protect and restore wetlands (p.4). Action 3: Attain no net loss of remaining wetland resources considering acreage, function and value (p.3.) Action 4: Optimize sustainable and multipurpose uses of wetland areas (p.5). Action 5. Increase efforts to Protect Playa Wetlands through Partnership with Play Lakes Joint Venture and others (p. 5). **WPP GOAL 3.** Provide effective and responsible levels of protection and restoration of Kansas' wetlands through continued implementation of the existing regulatory program (*EPA Water Quality Standards Core Element*). Action 1: Continue to compile data from public and private wetlands to be available as reference data should the state decide to develop wetland specific water quality standards (p. 9).

The proposed projects will begin implementation of these planned actions:

Project 1 - We will apply our Topographic Wetland Identification Process (TWIP), which we have already adapted for playa wetlands, to delineate playas and their watersheds in the western Kansas study area. Physical and biological data from two primary playa clusters in west-central and northwest Kansas will be collected, compared, and geospatially analyzed. This project will result in better identification, determination and characterization of existing playas and enhance efforts to protect them.

Project 2 – We will contract with a wetland proficient entity that will facilitate the updating of a modified WPP covering the next 5 years (2018-2022).

Description of Need. Project 1. Playas may originate wherever water can periodically collect in a surficial depression and then expand by hydrologic and geomorphic processes. Thus playas often occur where the topography is flat, climate is semi-arid, and evaporation rates are high, all of which contribute to the playa hydro period. Much of western Kansas meets this description and is home to thousands of playas, an appreciable fraction of which have not been mapped based on findings from our previous project, CD 97743401. Western Kansas is also intensively cultivated, and consequently playas within this region are embedded in a highly altered landscape, resulting in ecological and hydrological impairment of many playas. Healthy playas are biological “hot spots” within the Plains region that support a high diversity of plants, birds, mammals and invertebrates upon which many vertebrate species feed. Additionally, ongoing research examines the role of playas as focal points for recharge of the High Plains Aquifer, a function that potentially is compromised due to cultivation and sedimentation that impacts plays structure and function.

Outcomes from CD 97743401 established a methodology using TWIP tools and carefully prepared LiDAR data to significantly expand the state’s potential playa inventory beyond features contained in the PLJV-PP dataset (www.pljv.org/). The PLJV-PP dataset for Kansas consists of approximately 22,000 features. The study area from the previous project contained about 8,900 of these features. The LiDAR-based evaluation from that project identified more than 3,100 additional potential wetland features that occurred in the broadly mapped playa-supporting region, which was defined using the loess soils class from the Kansas Surface geology map produced by the Kansas Geological Survey. Subsequent visual inspection

of the 3,100 features resulted in the elimination of about 1,100 non-playa features (e.g. terrace retentions, feedlot ponds, etc.), leaving approximately 2,000 new potential playas identified through LiDAR analysis in the original study area. With this substantial increase to the state's playa inventory, the utility of the modified TWIP process to identify potential playas not included in the PLJV-PP dataset was firmly established, as was the need to apply the process to the rest of the playa-supporting regions of western Kansas to complete the dataset. LiDAR data are now available covering the entire region.

This proposal builds from and expands on the results from our previous project to develop LiDAR-based techniques to remotely identify and delineate potential playas along with their drainage catchments and landscape characteristics. This work included field-based efforts to assess identification accuracy and potential misclassification problems. Additionally, biological sampling was done on a subset of potential playas to identify the presence or absence of known playa community elements including wetland plants, invertebrates and birds. As described in the project final report, the LiDAR-based approach was effective for identification of relatively large numbers of potential playas beyond those already included with the PLJV probable playa dataset that was developed primarily using aerial imagery. Further, the fieldwork revealed some notable difference in the plant communities (and lesser so with invertebrates) associated with playas occurring entirely within cultivated crop fields as opposed to those occurring in pastureland, which has implications for ecosystem services and functions associated with these sub-populations.

We propose to expand upon our initial research within the large west-central Kansas playa complex by applying information and methodologies acquired in our initial project to a different large playa complex located in northwestern Kansas where there are some distinct

physiographic differences. Within this new study area, we will apply our developed methodologies to locate and map potential playas and their catchments using recently acquired LiDAR elevation data not available at the time of our initial study. As these tasks are being accomplished, we will perform fieldwork to collect biological and ecological data from a subset of playas from both regional groups. We will then analyze these data in a geospatial framework in an effort to identify potential physical and physiological similarities and differences between the two populations, as well as to assess various spatial indicators (localized and catchment-scale) for their ability to predict biological structure, ecological function, and condition. In addition to expanding and enhancing the state's digital playa inventory, we expect the outputs from this project to be used in support of playa identification and prioritization efforts directed toward restoration or preservation, or for basic estimation of essential playa characteristics.

With LiDAR data now available covering all of western Kansas, with this project we will apply the developed methodology to the rest of the area. In addition, during the previous project we discovered PLJV-PP features that corresponded with knob-like projections (which had the appearance of playas in imagery) rather than playa-like depressions. Using LiDAR, we will examine the entire Kansas PLJV-PP dataset to identify and flag these non-playa anomalies for potential removal from the dataset.

The morphologic and ecologic functions of playas are directly influenced by land use within the playa drainage area (catchment). Wetlands located in cropland-dominated areas receive more surface runoff and sedimentation than wetlands within grassland areas. It has been found that playa catchments dominated by cropland in the Southern High Plains have lost their hydric soil-defined volume due to increased sedimentation, and that sedimentation reduced the original playa volume, increased surface water area and evapotranspiration rates, and as a result

caused a shortened hydro period. Alterations to hydro period affect the ecological aspects of wetlands including nutrient cycling and the composition of flora and fauna species.

Project 2. Current WPP (2013-2017) has been used effectively to increase the knowledge and awareness of wetlands in Kansas with benefits to its citizens. However the plan needs to be modified to reflect the changes that have taken place with the completed projects and increased knowledge. The new WPP after updating and submitted for approval will be used to further our knowledge of the impacts of wetlands on the Kansas ecosystem.

Outputs, Outcomes, Results. Outputs from Project 1 will be a completion of the LiDAR-based potential playa inventory for western Kansas, in addition to estimated catchment delineations for playa-like features found in both the PLJV-PP dataset and in the LiDAR-based PPA dataset. A refined PLJV-PP dataset will be produced with anomalous, non-playa protrusion features eliminated. Biological data collected will help to inform the potential development of wetland water quality standards and will help to establish baseline conditions for Kansas playas.

Outputs from Project 2 will be an updated Kansas WPP that will be used for the next 5 years to solicit wetland projects that coincide with the goals and objectives of the newly crafted plan.

Outcomes of Project 1 will be better identification, determination and characterization of Kansas playas and their watersheds and will allow the state to integrate this information into the WPP for the protection and enhancement of the State's wetland resources. Playas are less well understood than eastern wetlands and increased knowledge of their ecological function, with respect to their location and *in situ* environment, will help us to better educate the landowners responsible for their maintenance. Outcomes from Project 2 will be the ability to increase our understanding of Kansas wetlands with increased potential to pass this

information on to our partners. The current WPP has increased coordination and collaboration between state agencies other entities with wetland interests.

PARTNERSHIP INFORMATION. The Playa Lakes Joint Venture (PLJV) supports this project because it will increase their ability to model dynamics in playa watersheds increasing the effectiveness of their conservation decision support tools. Kansas Department of Health and Environment (KDHE) recognizes the importance wetlands and in particular Plays Lakes are important sources of groundwater recharge for aquifers. Kansas Department of Wildlife, Parks and Tourism (KDWPT) feels this project will greatly improve methods and accuracy with which playa watersheds are able to be remotely identified, targeting restoration of privately owned playas in western Kansas. The Kansas Department of Agriculture, Division of Conservation (DOC) feels this project will provide important information and improve awareness levels of wetland ecosystems in Western Kansas. Kansas Alliance for Wetlands and Streams (KAWS) believes this project will ultimately assist their organization and partners in prioritization of restoration and preservations efforts. The University of Kansas (KU) sees this project as essential for future playa-wetland research. Ducks Unlimited (DU) believes this work will enable a better utilization of our conservation dollars on the ground. All support Project 2 because without an updated WPP little progress would have been made on the wetland ecosystems of Kansas.

PROJECT #1. GOALS AND OBJECTIVES:

Accomplishments for this reporting period are in red in the following text.

Goal 1. Application of TWIP for potential playa identification, PLJV-PP refinement, and Year 1 field assessments.

Action 1. LiDAR & GIS data preparation. Jan-Mar 2018.

Progress:

We started pulling together the 2-m LiDAR mosaics for the study area, and we took an inventory of our GIS needs.

Action 2. Map potential playa areas (PPAs) using LiDAR for northwest Kansas playa cluster. Jan-Sep 2018.

Progress:

Nothing to report

Action 3. Playa field assessment, Year 1. May-Aug 2018.

Progress:

Nothing to report

Action 4. Map PPAs using LiDAR for rest of the study area. Oct 2018-Jun 2019.

Progress:

Nothing to report

Action 5. Identify protrusion anomalies in PLJV-PP dataset. Jan-Dec 2018.

Progress:

Nothing to report

Goal 2. Playa catchment mapping, Year 2 field assessments, and geospatial analysis

Action 1. Map catchments for PPAs and PLJV probable playas. Jan-Sep 2019.

Progress:

Nothing to report

Action 2. Playa field assessment, Year 2. May 2019-Aug 2019.

Progress:

Nothing to report

Action 3. Geospatial analysis of field assessment data from northwest and west-central playa clusters. Jul 2019-Mar 2020.

Progress:

Nothing to report

Goal 3. Prepare Final Report

Action 1. Develop final report and datasets for dissemination. Jan-Jun 2020.

Progress:

Project management

Action 1. Develop and secure EPA approval for QAPP before sampling begins Jan.-June 2018.

Progress:

We have reviewed the approved QAPP from the previous playa project and began QAPP development for this project.

Action 2. Prepare quarterly reports. Jan 2018, April 2018, Jul 2018, Oct 2018, Jan 2019, Apr 2019, Oct 2019, Jan 2020, Apr 2020.

Progress:

1st Quarterly report submitted

Action 3. Keep partners informed of progress. Jan 2018-2020.

Progress:

KBS hosted a meeting with KAWS on 12/19/17, during which we discussed project objectives and possibilities for fieldwork collaboration.

Action 4. Meet at least annually with EPA to review results.

Progress:

Nothing to report

Action 5. Write final report. Mar-Jun 2020.

Progress:

Nothing to report

Action 6. Submit final report. Jun 2020.

Progress:

Nothing to report

Action 7. Attend National Conference either 2019 or 2020.

Progress:

Nothing to report

PROJECT #2. Goals and Objectives:

Accomplishments for this reporting period are in red in the following text.

Goal 1. Solicit Bids for modification of WPP.

Action 1. Write scope of work and release for bid. Oct 2017-Mar 2018.

Progress:

Nothing to report

Action 2. Review bids, write contract and execute contract. Mar 2018-May 2018.

Progress:

Nothing to report

Goal 2. Update existing WPP

Action 1. Work with successful contractor on WPP. May 2018-Aug 2018.

Progress:

Nothing to report

Action 2. Submission of preliminary WPP draft to EPA. Sep 2018.

Progress:

Nothing to report

Goal 3. Prepare Final WPP

Action 1. Submit to EPA for approval. Dec 2018.

Progress:

Nothing to report

Project Management

Action 1. Prepare quarterly reports. Jan 2018, Apr. 2018, Jul 2018, Oct. 2018, Jan. 2019.

Progress:

1st Quarterly report submitted

Action 2. Keep partners informed of progress. Oct 2017–Jan 2018.

Progress:

Nothing to report

Obstacles/Remedies:

Changes in Personnel:

Equipment Purchased in Current Quarter:

Upcoming Activities:

Project #1: During the next quarter we plan to finish drafting the QAPP and submit it for approval. We will complete the LiDAR & Data assembly, create a mapping plan (sub-area delineation and order for processing), and begin mapping. We will begin planning for the Year 1 field assessment, which is scheduled to begin in the subsequent quarter.

Project #2: In the next quarter the scope of work will be developed for the WPP and released for bids.

Accomplishments measured against work plan commitments:

Existing and potential problem areas:

Lack of complete funding of the grant will impact year 2 of project.

Cumulative effectiveness of the work performed:

Suggestions for improvement including, where feasible, schedules for making improvements: