



Natural Resources Conservation Service

CEAP Conservation Insight
Conservation Effects Assessment Project

May 2014

Relationship of Lesser Prairie-Chicken Lek Presence and Density to Grassland Conservation Programs

Summary Findings

- The Playa Lakes Joint Venture conducted an assessment of the effects of landscape attributes related to land cover and USDA conservation programs on the presence and density of lesser prairie-chicken leks.
- Lesser prairie-chicken lek presence was significantly associated with amount of surrounding grassland at multiple spatial scales. The strongest relationship was at 7,500-m radius buffers surrounding leks, but the relationship was present at 10,000-m radius buffers.
- Lek presence was also significantly associated with amount of surrounding Conservation Reserve Program (CRP) land at multiple spatial scales. The relationship was the strongest at 510-m radius buffers, but the relationship was present at 10,000-m radius buffers.
- Amount of grassland and CRP combined was significantly associated with lek density at multiple spatial scales. This association, however, was not in the predicted direction. Low-density lek points had more surrounding grassland and CRP than did high-density lek points or no lek points. Thus, amount of grassland and CRP alone may not be enough to conserve lesser prairie-chickens; condition of grasslands may be more important.
- Preliminary analyses of landscape structure indicate that a combination of composition (grassland) and structure (patch size and continuity) are important for lesser prairie-chicken conservation.
- Properly targeting USDA Farm Bill conservation programs through the Lesser Prairie-Chicken Initiative can provide large blocks of habitat needed for conservation of this species.

Background

The lesser prairie-chicken, a resident grouse species endemic to the Southern Great Plains, is a species of high conservation concern. Lesser prairie-chickens were once found abundantly throughout the short- and central mixed-grass prairie regions in Colorado, Kansas, New Mexico, Oklahoma, and Texas. Since European-American settlement, their estimated occupied range has been reduced to 10% of its original extent (fig. 1; currently about 16 million acres) and population numbers have also declined by more than 90%. The decline is due to habitat loss, degradation, and fragmentation due to agriculture and energy development. In March 2014, the species was listing as Threatened under the Federal Endangered Species Act.

Currently, lesser prairie-chickens are patchily distributed in southern portions of Bird Conservation Regions 18 and 19 in Colorado, Kansas, Oklahoma, New Mexico, and Texas (fig. 1). They are most abundant in the northwestern portion of Kansas (McDonald et al. 2012). Habitat use varies across their range but generally consists of dwarf shrub/mixed-grass vegetation types associated with sandy soils, which may be interspersed with shortgrass or mixed-grass prairie (Hagan 2005). Habitat is composed of sandsage brush prairie in Kansas and Colorado, mixed-grass prairie and Conservation Reserve Program (CRP) lands largely intermixed with shortgrass prairie in Kansas, and sand shinnery oak prairie in Oklahoma, Texas and New Mexico. The species also uses CRP in some areas outside of Kansas. Croplands can provide seasonal food sources, depending on proximity to rangeland or CRP across the range.

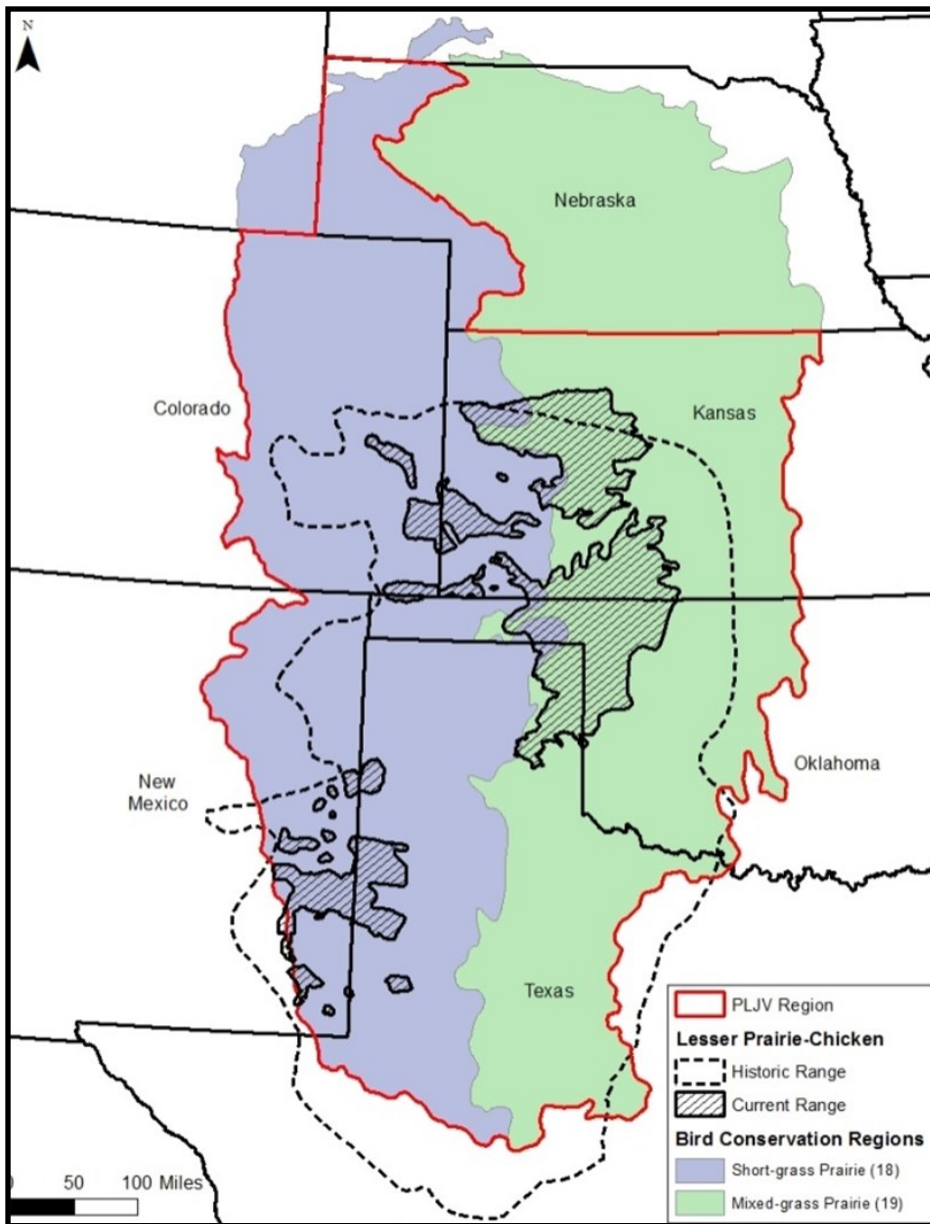
The primary mechanisms for conserving or creating habitat for lesser prairie-chickens are conservation programs through the Farm Bill (Riley 2004). In 2010, the Natural Resources Conservation Service (NRCS) established the Lesser Prairie-Chicken Initiative (LPCI) to emphasize use of various Farm Bill programs to conserve habitat for the species. The focus of the initiative is on land improvement programs such as the Environmental Quality Incentives Program (EQIP, including the former Wildlife Habitat Incentives Program, or WHIP), and easement programs including the former Grasslands Reserve Program and Farm and Ranch Lands Protection Program, both made part of the Agricultural Conservation Easement Program by the Agricultural Act of 2014. The Farm Service Agency-administered CRP is also recognized as an important tool in lesser prairie-chicken conservation.

While few formal studies of lesser prairie-chicken breeding success or habitat use in CRP have been conducted to date, numerous observational studies and anecdotal evidence suggest that CRP is an important tool for conserving lesser prairie-chickens. Field studies conducted in the Colorado and Kansas portions of the species' range have documented



PHOTO: GARY KRAMER

Figure 1. The historical and current estimated occupied range of the lesser prairie-chicken



lesser prairie-chickens lekking, nesting, and roosting in grassland provided by the CRP (Fields et al. 2006, Davis et al. 2008). In Kansas, lesser prairie-chicken nests were found predominately in CRP with stands of mid to tall native warm season grasses (Fields et al. 2006). In Colorado, leks were found in CRP fields with stunted ‘sod-like’ grass cover, providing the sparse and low-stature vegetation associated with leks (Davis et al. 2008). Biologists believe CRP lands planted to native grasses located within 3.2 km of other native grassland have the most potential to serve as suitable nesting habitat (Davis et al. 2008). Conversely, in Texas, New Mexico, and Oklahoma, it appears that CRP may not

be providing suitable habitat, although lesser prairie-chickens have been observed in CRP fields in the southwest Texas Panhandle. In these states, CRP fields are predominately characterized by weeping lovegrass and non-native bluestem species.

Numerous studies have documented impacts of CRP on wildlife, particularly grassland birds. However, a literature search showed that there has been no evaluation of land improvement programs such as EQIP on grassland wildlife, the primary focus of the LPCI. This may be for two reasons. First, EQIP is still a relatively new programs in the Farm Bill. Second, and most likely,

unlike CRP which converts agricultural fields to long-term grass cover, thus demonstrating a quantifiable shift from one landcover to another, EQIP is a habitat improvement program that changes grassland structure. Thus, existing grasslands or expiring CRP fields are typically enrolled to improve or implement grazing practices, making quantification of shifts difficult to document.

Assessment Partnership

Through a Conservation Effects Assessment Project (CEAP) contribution agreement with NRCS, the Playa Lakes Joint Venture (PLJV) conducted an assessment of the effects of landscape attributes related to land cover and USDA conservation programs on the presence and density of lesser prairie-chicken leks. The specific purpose of the assessment was to evaluate the potential for Farm Bill conservation programs included in the LPCI to provide benefits to lesser prairie-chickens. This conservation insight summarizes the approach and findings of the assessment. Additional details are available from the full assessment report posted on the CEAP website at http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1167521.pdf

To inform the assessment, PLJV asked the following questions:

1. Is there a difference in landcover composition (CRP, Grassland and EQIP contracts) between Lek and Random (No Lek) points and High lek density versus Low lek density points?
2. Is there a difference in the number of EQIP contracts between Lek and Random points and High lek density versus Low lek density points?
3. At what spatial scale are differences among landcover types at Lek and Random points and High versus Low lek density points observed?

Assessment Approach

Lek data were obtained from a pilot helicopter survey conducted throughout the lesser prairie-chicken range. The pilot survey used a random sampling approach to select blocks and transects

to survey, thus providing publicly available, randomly sampled lek data using a consistent protocol. PLJV also collected landcover data at 30 random points not associated with leks. Thus, points were identified as being “Lek” or “Random” points and “High” (>1 lek per 7238-ha area), “Low” (1 lek per 7238-ha area), or “None,” reflecting lesser prairie-chicken lek density in the surrounding landscape.

The PLJV maintains a seamless six-state landcover database with a 30-m spatial resolution (McLachlan 2012). This database was updated to include 2011 CRP data. The landcover contains 22 habitat types, which were aggregated into six categories (Cropland, CRP, Developed, Grassland, Wetland, and Woodland) for this assessment. However, only CRP and Grassland were used in statistical analyses to focus on grassland effects.

A seventh category, designated as “EQIP,” represented an aggregation of lands enrolled in EQIP (including the former WHIP) and USDA conservation easement programs from 2008 to 2012. Only fields that were enrolled in LPCI-approved practices (described in the 2011 conference report between the NRCS and the U.S. Fish and Wildlife Service) were included, and LPCI practices that are linear features (e.g., fence marking) or those not gauged in acres were excluded. Table 1 lists the practices included in the analysis.

Unlike the CRP dataset in which polygons represent the fields that are enrolled in CRP, EQIP practice data uses points as a spatial representation. Each point is attributed with the number of acres enrolled, but points were not always associated with a specific field. Therefore, several assumptions were made regarding these point data:

1. Practice points are located in fields in which the practice is employed, even though some points may actually correspond to the program participant’s physical address (e.g., on the house) or represent multiple fields.
2. The point is at the center of a circle whose area is equivalent to the number of acres attributed to the point. This was done to address the

Table 1. EQIP practices included in the analysis

Practice code	Description
314	Brush Management
338	Prescribed Burning
528	Prescribed Grazing
550	Range Planting
643	Restoration of Rare and Declining Habitat
645	Upland Wildlife Habitat Management

limitations of the first assumption and for ease of processing.

3. Because no pre- or post-practice condition data were available, practices were assumed to have been completed to a condition that would benefit lesser prairie-chickens.

Since EQIP practices occur on already established grasslands, there is the potential to have grass acres represented in both the Grassland category and the EQIP category. Therefore, EQIP data were not incorporated into the geospatial landcover but analyzed separately.

If the amount of Grassland differed between Lek and Random points or among High, Low, or None lek density points, PLJV asked follow-up questions:

1. Is there a difference in the amount of EQIP acreage?
2. Is there a difference between the proportion of points with EQIP contracts at lesser prairie-chicken Lek vs. Random points and among High, Low, and None lek density points?

To determine if there was a spatial scale at which landscape composition no longer differed between Lek and Random points or among High, Low and None lek density points, buffers of various sizes around points were examined. This information is useful for understanding the appropriate spatial scale at which conservation efforts are most important. PLJV calculated the number of acres of CRP, Grassland, and EQIP within 150-, 240-, 420-, 510-,

Presence of lesser prairie-chicken leks was significantly associated with the amount of surrounding grassland and CRP at multiple spatial scales.

810-, 1020-, 1,620-, 2,010-, 3,000-, 4,020-, 5,010-, 7,500-, and 10,000-m radius circular buffers around Lek and Random points. A study by Fuhlendorf et al. (2002) suggested that landscape change at 4.8 km best explained the difference between leks classified as declining versus stable. However, this assessment revealed strong relationships at this scale, so the larger buffers (up to 10 km) were included.

To determine how landscape structure, including presence of grassland and CRP, influences lek presence, several landscape structure variables were examined within buffers: Largest Patch Index, Area-weighted mean of patch size, Area-weighted mean of Shape Index, and Area-weighted mean of Contiguity Index. McGarigal et al. (2012) provides complete descriptions of these metrics.

Findings

Lek/Random. Amount of Grassland and CRP was significantly greater at Lek points than at Random points at all spatial scales except 150 m (figs. 2, 3). Amount of EQIP was not significantly different at Lek points compared to Random points.

Lek Density. Amount of Grassland was significantly greater at Low lek density points than at High density or None points at multiple spatial scales: 420 m, 510 m, 4,020 m, 5,010 m, 7,500 m, and 10,000 m (fig. 4). Amount of CRP was greater at Low lek density points than High density or None points at smaller spatial scales: 240 m, 420 m, 510 m, 810 m, and 1,020 m (fig. 5). High lek density points had a greater amount of CRP at larger spatial scales: 3,000 m, 4,020 m, 5,010 m, and 7,500 m (fig. 5). Amount of CRP was lower at None points at the 1,620 m and 2,010 m scales (fig. 5). Amount of EQIP was significantly greater at High lek density points than

Low density or None points at the 4,020 m and 5,010 m buffer.

Landscape Structure. For Grass only and Grass+CRP calculations, Largest Patch Index (LPI) and Contiguity Index were significantly greater ($P < 0.10$) at Lek points than Random points (table 2). Area-weighted mean and Shape Index were not significantly different at Lek and Random points for either Grass only or Grass+CRP calculations.

Putting Findings into Practice

The CRP has long been recognized as an important conservation program for grassland birds and other grassland-obligate wildlife. CRP was not originally thought of as providing suitable habitat for lesser prairie-chickens, but these birds have been found in CRP enrollments and in landscapes that contain large amounts of CRP grasslands. One study in Kansas found

that most nests and broods were found in CRP fields of various types (Fields et al. 2006). Another benefit may be to expand grassland patches to create larger, more continuous blocks of grassland, creating, for example, a buffer of hospitable matrix grassland around a highly suitable block of native grassland. Regardless, CRP can be used to target expanding and connecting large blocks of native grassland.

Amount of Grassland was not significant in the predicted direction; Low density lek points had greater amounts of Grassland than did High density lek points. This assessment measured amount of Grassland using a landcover dataset, with the implicit assumption that Grassland condition is suitable for lesser prairie-chickens. However, even though High lek density points have less Grassland, that Grassland may be of

Grassland structure and condition and landscape composition are important determinants of lesser prairie-chicken lek presence.

higher quality than that in the vicinity of Low lek density points.

Importance of vegetation structure condition has been investigated at nest (Riley et al. 1992, Giesen 1994, Pitman et al. 2005, Bell et al. 2010) and brood (Riley and Davis 1993, Hagen et al. 2005, Bell et al. 2010) sites and has been used to infer structure needs at the home range scale (~2 km; Hagen et al. 2004). Vegetation structure and condition is harder to assess at broader landscape scales. Intensive field sampling at large

Figure 2. Amount of Grassland at Lek and Random (No Lek) points at multiple spatial scales

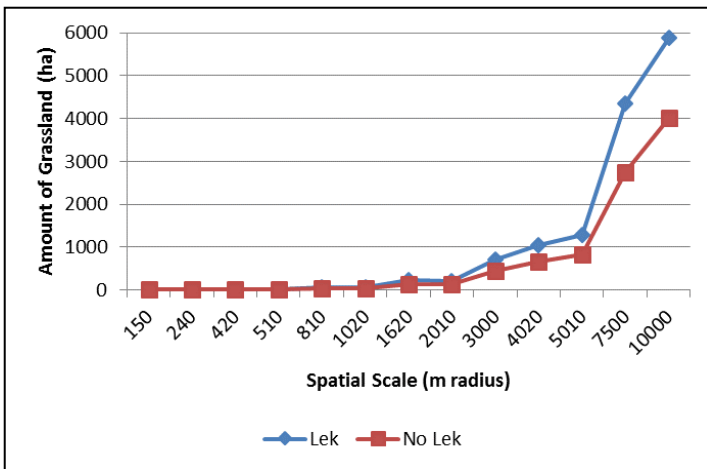


Figure 3. Amount of CRP at Lek and Random (No Lek) points at multiple spatial scales

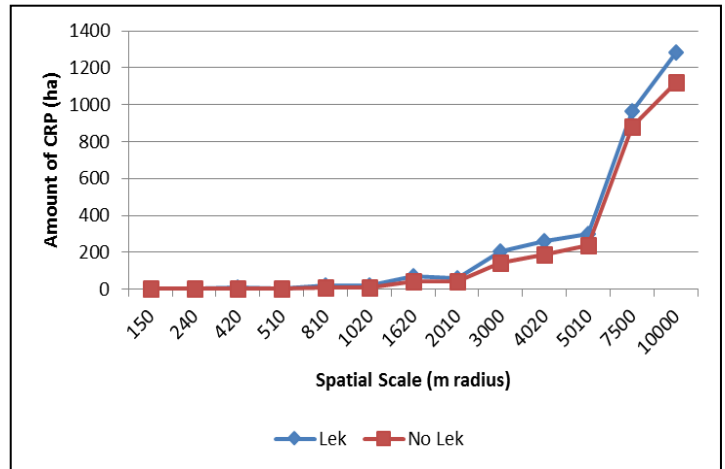


Figure 4. Amount of Grassland at High density, Low density and None lek points at multiple spatial scales

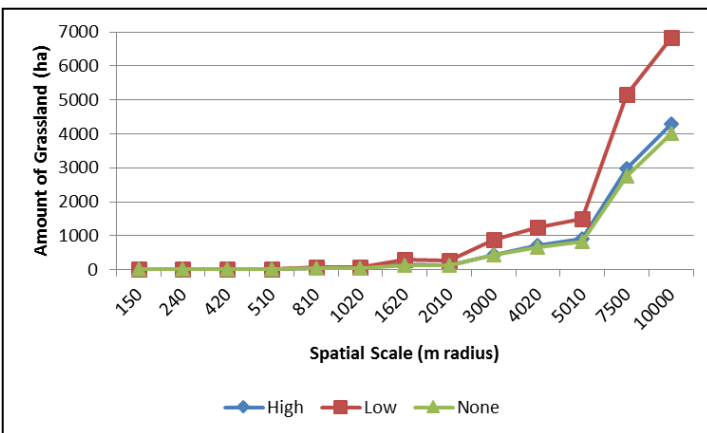


Figure 5. Amount of CRP at High density, Low density, and None lek points

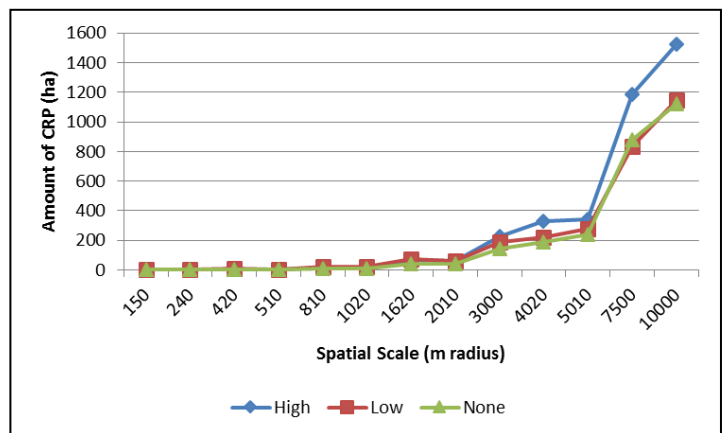


Table 2. Landscape structure calculations for Grassland only and Grass+CRP patches at lesser prairie-chicken Lek and Random points in a 10,000-m buffer surrounding points

	Lek (n=67)		Random (n=30)		P value
	Mean	s.d.	Mean	s.d.	
Grassland Only					
Largest Patch Index	17.2	22.01	10.73	15.82	0.09*
Area-weighted mean of patch size	3930	6672	2156	4115	0.11
Area-weighted Shape Index	5.21	5.26	4.25	3.49	0.18
Contiguity Index	0.94	0.03	0.91	0.07	0.09*
Grass+CRP					
Largest Patch Index	19.03	22.09	14.29	18.19	0.08*
Area-weighted mean of patch size	4164	6722	3042	5044	0.13
Area-weighted Shape Index	5.29	5.36	4.79	3.98	0.21
Contiguity Index	0.95	0.02	0.93	0.03	0.01*

* indicates the variable was significant at the $p = 0.10$ level.

spatial scales coupled with remotely sensed data may foster a better understanding of relationships between landscape composition, condition, and structure and lesser prairie-chicken biology.

The pattern of greater amounts of Grassland at Low lek density points revealed by this analysis may be the result of how leks were surveyed and classified. Lek locations were from the 2012 Western Association of Fish and Wildlife Agencies pilot helicopter survey, which relied on detecting active leks from the air (McDonald et al. 2012). However, grassland structure varies across the lesser prairie-chicken range, and detectability of leks may vary with density of grass cover. Therefore, lek detectability in high Grassland areas may have been lower than areas with low vegetation density.

Unlike CRP, which converts largely unsuitable (cropland) to suitable (native and non-native grassland plantings) landcovers, EQIP works to improve existing grassland structure and function. Results of this assessment suggest that EQIP practices included in the analyses may be providing some benefit to lesser prairie-chickens at large spatial scales.

Amount of EQIP was greater at High lek density points than Low or None points at the 4,020-m and 5,010-m scales. However, not much more inference can be drawn from this analysis. In addition, only two of 12 spatial scales had significant results, which may not differ from random, but these results warrant more investigation. The benefit of grassland to lesser prairie-chickens relative to cropland is easily measured, but the benefits of modifying grassland structure may be revealed only through direct measurements of grassland structure attributes in an experimental framework. Documenting changes in local-scale habitat conditions associated with LPCI management is a focus of other ongoing CEAP assessments.

Analysis of lek density at the 10,000-m spatial scale indicated that landscape structure, as measured by patch size and contiguity, were important predictors of lesser prairie-chicken presence (table 2). Woodward and Fuhlendorf (2001) and Fuhlendorf et al. (2002) showed that landscape change was an important predictor of lesser prairie-chicken population status. Results from this assessment support current conservation efforts, including targeted delivery of

Assessment results support current targeted delivery of the Lesser Prairie-Chicken Initiative to conserve large blocks of grassland needed for lesser prairie-chicken conservation.

the LPCI to maintain and expand blocks of grassland and provide connectivity among grassland patches.

The results of this study also indicate that lesser prairie-chicken populations require much larger landscapes with suitable habitat than previously considered. Conservation of this species will thus require protection of large intact native grasslands and expansion of smaller grassland fragments. In addition, CRP contributes significantly to lesser prairie-chicken habitat at landscape scales; therefore, CRP can be used to expand blocks of grassland. Finally, enrollment of expiring CRP grasslands in working lands programs such as EQIP can be used to maintain extent and contiguity of grassland in areas of priority for lesser prairie-chicken conservation.

The Conservation Effects Assessment Project: Translating Science into Practice

The Conservation Effects Assessment Project (CEAP) is a multi-agency effort to build the science base for conservation. Project findings will help to guide USDA conservation policy and program development and help farmers and ranchers make informed conservation choices.

One of CEAP's objectives is to quantify the environmental benefits of conservation practices for reporting at the national and regional levels. Because wetlands are affected by conservation actions taken on a variety of landscapes, the wetlands national assessment complements the national assessments for cropland, wildlife, and grazing lands. The wetlands national assessment works through numerous partnerships to support relevant assessments and focuses on regional scientific priorities.

This assessment was conducted through a CEAP partnership between NRCS and the Playa Lakes Joint Venture. Primary investigators on this project were Anne Bartuszevige and Alex Daniels. The PLJV is a non-profit partnership of Federal and State wildlife agencies, conservation groups, private industry, and landowners dedicated to conserving bird habitat in the southern Great Plains. It provides science-based guidance and decision-support tools for all-bird conservation throughout the region, as well as outreach, coordination, and financial support to its partners and local groups to conduct on-the-ground habitat conservation and restoration.

For more information: <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/nra/ceap>, or contact Charlie Rewa at charles.rewa@wdc.usda.gov.

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