U.S. Fish & Wildlife Service

Wetland and Riparian Habitats of the Playa Lakes Region: Status Report, 2006-2007

Vegetated Playa in Cimarron County, Oklahoma

Project Status Report from The U.S. Fish and Wildlife Service's National Wetlands Inventory Program

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By

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Introduction

Playa lakes reside on the level high plains of the Caprock within the southern Great Plains of Texas, Oklahoma, New Mexico, Kansas, and Colorado. Playa lakes are unique, closed freshwater systems with vertisol clay floors. These playas play an important role in providing migratory birds with feeding and wintering habitat as well as providing valuable habitat to resident wildlife. Playas also aid in ground water recharge to the Ogallala Aquifer. Originally short and mid-grass prairie, this area is now one of the most agriculturally impacted areas in the western Hemisphere. Playas are under constant threat from agricultural expansion and related sedimentation and contamination from surrounding cropland.

Lacking up-to-date digital map data for the southern Great Plains in Region 2, The U.S. Fish & Wildlife Service (Service) National Wetlands Inventory proposed a large-scale digital mapping project to address this data gap. With interest and support from Service Field Offices, National Wildlife Refuges, Migratory Bird Program, Playa Lakes Joint Ventures, Bureau of Land Management, State of New Mexico Environment Department, Oklahoma Conservation Commission, and cooperative technical assistance from Texas Tech University, the Inventory undertook the task of compiling new wetland and riparian data for this important ecological area. The data for this project are designed as a decision-support tool for biologists, resource managers, Federal, State and local officials, and the general public with a variety of wetland and resource issues, including but not limited to; potential wetland restoration sites, habitat assessments and future status and trends studies.

Since the mid-1970's the U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) has been providing the nation with wetland maps and information, as well as conducting assessments of wetland status and trends. Various products from this program include wetland /riparian digital data, hardcopy maps, mapping reports, and wetland /riparian vegetation species documentation. This information is available online at: http://www.wetlands.fws.gov, or by contacting a Regional Wetlands Coordinator.

Study Area

The project area covered thirty three counties in Texas and Oklahoma panhandles plus eastern New Mexico (Note; Beaver, Oklahoma was not completely mapped), See Figure 1. The project area is located in the southern part of the Great Plains. It is characterized by nearly level and treeless high plains bisected by several canyons and rough land areas. Elevations range from 3,400-3,900 feet. above sea level. Precipitation ranges from 14 inches on the western side to 25 inches on the eastern side. Temperatures can vary greatly, from -20 degrees F in the winter to well over 100 degrees in the summer. Average annual potential evaporation can exceed 100 inches. Drought is a natural and common occurrence. Playa lakes/depressions range in condition from natural (little impact) to heavily ditched/drained to farmed, showing no wetland characteristics.

Riverine and riparian corridors can be found in the canyons and broken rough lands that have cut through the Caprock. Major drainages include the Cimarron and Beaver Rivers in the Oklahoma panhandle, the Canadian River in the northern Texas panhandle and the upper tributaries of the Brazos and Red River systems in the eastern and southeastern parts of the project area. The high plains are dominated by agriculture with rangeland and some natural short grass prairie. Broken rough lands and canyons have exposed rock/soil with semi-arid vegetation. Overall, soils are typically clay loam.
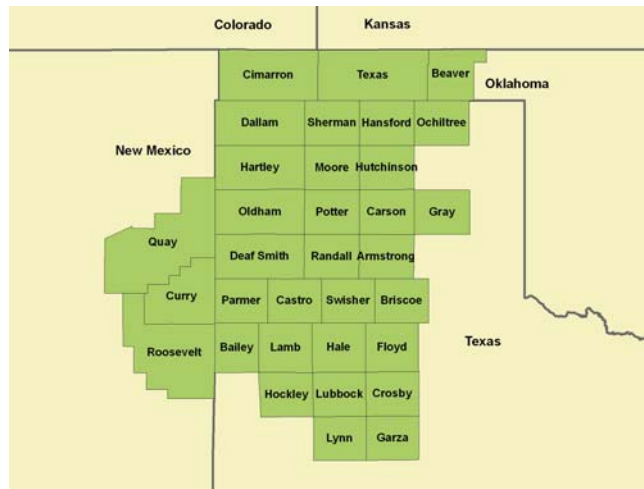

Figure 1. Study area.

Methods

Data Collection and Image Analysis

Mapping was performed in a heads-up environment, using ArcGIS (9.1 & 9.2). Digital delineations were done on-screen at an average relative scale of 1:12,000 using the digital NAIP county mosaic imagery. Traditional NWI photo interpretation techniques (looking for unique photo signature differences) were employed to identify and delineate different wetland and riparian cover types. Digital Photo interpretation was performed by NWI-trained students from Texas Tech University. The study area was completed a county at a time, since the imagery was county-based. This gave NWI Regional personnel a systematic method to verify data quality for each county in the study area. After all county datasets were collected, the data was edge-matched and merged into one dataset for final data verification and delivery. Other, collateral data sources used were U.S Geological Survey (USGS) National Hydrology Data (NHD) high resolution linear data, USGS Digital Raster Graphs (DRG), USGS National Elevation Data (NHD). Older-era NWI aerial photography of various scales and emulsions and Region 2 Habitat and Population Evaluation Team (HAPET) digital vegetation data for Optima and Buffalo Lake National Wildlife Refuges in Oklahoma and Texas was also employed.

SSURGO digital soils data were used extensively. Playa soils were extracted and imported into the polygon Feature Class. These were used as base delineations for playa features. These polygons were fit to the imagery and classified using the Cowardin system. This technique simplified digital data creation of numerous polygon features. Playas not indicated by hydric soils, non-playa wetlands, and riparian features were added using photo interpretation techniques to complete the mapping of each county.

Polygon counts, acreages and percentages were derived from the polygon feature class data tables, through basic Geographic Information System (GIS) analysis techniques.

Polygon counts, especially for playas, reflect playa features divided by roads and other development, (i.e.; one playa feature with a major road through it would be two polygons). This is a standard mapping convention of the National Wetlands Inventory (see Appendix B. Distribution of Wetland and Riparian Data).

Types and Dates of Imagery

To acquire nearly uniform imagery coverage for this very large project area, USDA National Agricultural Imagery Program (NAIP) imagery was used. This dataset is comprised of mosaicked 1 meter resolution DOQQ images assembled on a county scale. Every county in the project area has its own image. The mean dates of the imagery used are listed below;
>
> TX-2004 Color Infrared (CIR)
> OK-2003 Natural Color
> NM-2005 Natural Color

Wetland Definition and Classification

NWI uses the Cowardin *et al.* (1979) for defining and describing wetlands. This is the Service's official standard for classifying and mapping wetlands. It has also been adopted as the national standard for wetland mapping, monitoring and data reporting as determined by the Federal Geographic Data Committee. It is a two-part definition as indicated below:

> *Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water.*

> *For purposes of this classification wetlands must have one or more of the following three attributes: 1) at least periodically, the land supports predominantly hydrophytes; 2) the substrate is predominantly undrained hydric soil; and 3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.*

Riparian Definition and Classification

The term *"riparian"* may be viewed from different perspectives, and has many definitions. In 1997, the western Regions of the Service developed a classification system to identify riparian habitats that fell outside of the Cowardin *et al.* (1979) system. Since that time, "A System for Mapping Riparian Areas In The Western United States" (USFWS 1997) has also been adopted by the Service and has been proposed as a national standard for riparian mapping, monitoring and data reporting as determined by the Federal Geographic Data Committee. This definition is:

> *Riparian areas are plant communities contiguous to and affected by surface and subsurface hydrologic features of perennial or intermittent lotic and lentic water*

bodies (rivers, streams, lakes, or drainage ways). Riparian areas have one or both of the following characteristics: 1) distinctly different vegetative species than adjacent areas, and 2) species similar to adjacent areas but exhibiting more vigorous or robust growth forms. Riparian areas are usually transitional between wetland and upland.

This definition and the accompanying classification system were used to identify and map riparian habitats in the study area.

Special Classifications Used for This Project

Wetlands
1. To distinguish salt lakes and alkali flats from playa lakes, the Water Chemistry modifier for pH ("i") was used to identify these features. Example; L2UBFi. This modifier indicates fresh water alkaline conditions, characteristic of these salt lakes.

2. To identify sparsely vegetated riverine sand bars, a "7" (for streambed "SB") or a "5" (for unconsolidated shore "US") subclass was used. Example; R4SB7A, or R2US5A. The vegetation was distinguishable on the imagery, but did not meet wetland/riparian percent coverage requirement to be mapped in the vegetated class.

3. Playa features 20 acres or greater will be attributed L2EM plus the appropriate water regime. The emergent subclass "1" indicating persistent emergents cannot be used in the lacustrine system.

Riparian
1. The "Dead" ("5") subclass was used in limited situations, to identify dead salt cedar recorded through field observation or photo interpretation.

Field Verification

Two field surveys were conducted in the spring and summer of 2006 to verify photo signatures and document vegetation, soils and hydrology characteristics. Global Positioning System (GPS) points and digital photographs were also collected at each site. Of the thirty-three counties in the project area, twenty-one were inspected to verify photo signatures. Within these twenty-one counties approximately 80 sites were visited to record current vegetation and hydrologic conditions. See Appendix A.

Quality Control

Regional Service personnel reviewed 100% of the digital data received from the Texas Tech photo interpretation team, following internal interpretation quality procedures. An on-line forum, set up by Texas Tech that allowed student photo interpreters to ask questions and send screen captures to NWI personnel for immediate response. This technique decreased the learning curve for the student interpreters, leading to more accurate delineations and increased workflow. Field surveys were used to verify

vegetation photo signatures and critique completed delineations. Collateral data sets, such as SSURGO and NHD were used to aid in identifying missed wetland features (Note: this is subject to the quality of the collateral data set being used). All digital data were screened by the Service's Verification Tool and was inspected by the National Standards and Support Team prior to acceptance to the National Wetlands Geodatabase.

Study Limitations

The digital data was created in a "mono" heads-up environment. Shrub and forested differentiations were determined by photo signature, shadows, relative to known structures (houses, barns, silos, etc.), and by consulting older-era aerial photography and conducting field surveys. Identification of wetland and riparian vegetation may be limited by the time of year, relative climatic conditions and emulsion and resolution of the source imagery. Every attempt was made to accurately classify wetland and riparian features. The Texas imagery was collected after one of the wettest winter/spring (2004) seasons in recorded history for that area. Field observations were made after one of the longest dry spells in decades (summer 2006). Even with this discrepancy most playas still reflected a similar hydrologic condition, through vegetation or visible hydrology (with slight water regime variations) that was observed on the imagery. The only exception was in Floyd County, which exhibited an abundance of open water playas (possibly due to precipitation prior to the overflight) on the imagery and very few to none during field observations. Some playas dominated by hydrophytic vegetation may be classified as unconsolidated shore or open water. A small area of Armstrong County had minor cloud coverage. Collateral imagery from online sources was used to aid in delineating areas obscured by cloud cover.

Results and Discussion

Total Feature and Acreage Data

Within the thirty-three county project area, a total of 52,290 polygons, totaling 634,958 acres, were digitally mapped and classified as wetland and/or riparian.

Wetland playas and farmed playas accounted for 29,209 polygons totaling 363,248 acres.

There were 11,872 excavated or impounded wetland and deepwater polygons, totaling 23,432 acres.

Total wetland riverine polygon acreage was 47,778 acres, and the total acreage for non-playa wetlands and deepwater polygons was 118,093 acres. Riparian polygon acreages totaled 82,408.

NOTE: Data is not broken out by state, in this report, because the project area does not cover all known playa areas within the three states. All data is subject to future change.

Mapped Playas on Hydric Soils

To aid in the identification and differentiation of playa lakes from other wetlands, digital soils data (SSURGO) was used. Hydric soils data is not mapped consistently from county-to-county. An attempt was made to standardize a hydric soils data layer for the entire project area, using the most common soils that comprise the basin of the playa. For this project 16, 217 polygons were extracted from the hydric soil SSURGO data. The major "playa" soil components Randall, Ness, and Church (mostly in NM) made up 87% of these polygons. Other minor components comprised the rest.
The Service mapped and identified 21,849 playa polygons, totaling 300,916 acres, within the project area. Seventy one percent of these polygons fell within a mapped hydric soil, identified above.

Mapped Playas on Non-Hydric Soils

The remaining percentage of playas identified by the Service fell on non-hydric soil complexes with minor hydric components, or on McLean or Sparenburg soils. These two soils series, though officially not listed as hydric, were formerly in the Randall series. Since many of the playas that occur on these soils exhibit distinctive wetland characteristics, they were mapped as wetlands. McLean and Sparenburg soils are predominant in the Texas counties of, Floyd, Randall, Lynn, Hockley and Carson.

Farmed Playas

National Wetland Inventory mapping conventions and the Cowardin classification system allow the identification of wetlands that are being farmed. For this project farmed playas (identified as "Pf" in the data) occurred on hydric soils exhibiting little or no hydrophytic vegetation or hydrology and had evidence of plowing or cultivation. These areas can potentially be targeted for future playa restoration efforts, if hydrology can be restored.

Within the project area, 7,360 polygons, totaling 62,333 acres, were identified. Ninety four percent of these polygons fell on hydric soils. The remaining percentage of farmed playas identified fell on soil non-hydric complexes with minor hydric components, or on McLean or Sparenburg soils that had some evidence of being wetter than the surrounding upland areas (through photo interpretation), and evidenced by stressed crops (variations in tone and texture) or darker soil colorations. It was thought these few "wetter" non-hydric farmed playas may be important for future playa restoration efforts as well.

Human Impacts on Playas Identified Through Mapping

Using GIS techniques with the digital data, playas that had some kind of human impact were identified for this report. It was found that 4,722 playa polygons, 22% of all playa polygons identified, had some kind of human impact that was identifiable through photo interpretation or comparisons with other digital data sets. Playa polygons with excavated ponds inside (or within 10m of the polygon edge), playa polygons that were interpreted

with a "d" (partially drained/ditched) Special Modifier, or ones that intersected linear artificial drainages identified in the National Hydrologic Dataset (NHD), fell into this category. Again, these polygons could be potentially targeted for future playa enhancement or restoration efforts.

Playa Polygon Cover Types and Polygon Sizes

Breaking out some of the classification of the playa polygons, 82% of these were comprised of emergent or scrub-shrub wetland vegetation. Twelve percent were non-vegetated shore and 6% were open water. Of the 21,849 playa polygons identified 4,411 or 20% were greater than 20 acres in size. See Appendix C. for general plant community information.

Distribution of Playa Features

The table below indicates the spatial distribution of playa features across the study area. This table includes wetland and farmed playa features. Playa features cut by a county boundary are counted in both counties, hence the total polygon count will be higher than the overall count discussed above. See Appendix B. for a graphic display of spatial distribution.

Table 1. Distribution of playa features by County.

County	Playa Feature Count	County	Playa Feature Count
Hale, TX	2172	Roosevelt, NM	564
Floyd, TX	2144	Carson, TX	521
Lamb, TX	1894	Randall, TX	514
Beaver, OK *	1741	Curry, OK	506
Lubbock, TX	1727	Deaf Smith,TX	503
Briscoe, TX	1621	Hansford, TX	493
Swisher, TX	1549	Garza, TX	459
Crosby, TX	1422	Cimarron, OK	364
Castro, TX	1195	Dallam, TX	319
Hockley, TX	1165	Hartley, TX	308
Gray, TX	1090	Sherman, TX	295
Lynn, TX	1054	Moore, TX	291
Texas, OK	1030	Hutchinson,TX	271
Ochiltree, TX	973	Quay, NM	249
Armstrong, TX	927	Oldham, TX	210
Bailey, TX	883	Potter, TX	154
Parmer, TX	789		

*County not completely mapped.

Conclusion

This dataset covers over 38,000 square miles (almost 25 million acres) of the Southern Great Plains in parts of Texas, New Mexico and Oklahoma. Identifying over 52,000 polygon features, mapping more than 600,000 acres of wetland/riparian habitats, this data contains a wealth of spatial wetland and riparian information that can be utilized to aid in future analyses such as, wildlife habitat characterization and values, functional wetland assessments, and wetland/riparian restoration efforts.

Acknowledgments

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Contact Information

These and other wetland/riparian data and information can be obtained from the Regional Wetlands Coordinator, U.S. Fish & Wildlife Service, Southwest Region 2, Albuquerque, NM; 505-248-6660 or jim_dick@fws.gov

Web-Based NWI Data and information can be found at; http://wetlandsfws.er.usgs.gov/ or http://www.fws.gov/southwest/es/nwi/

Appendix A. General Project Location Map/Field Survey Counties
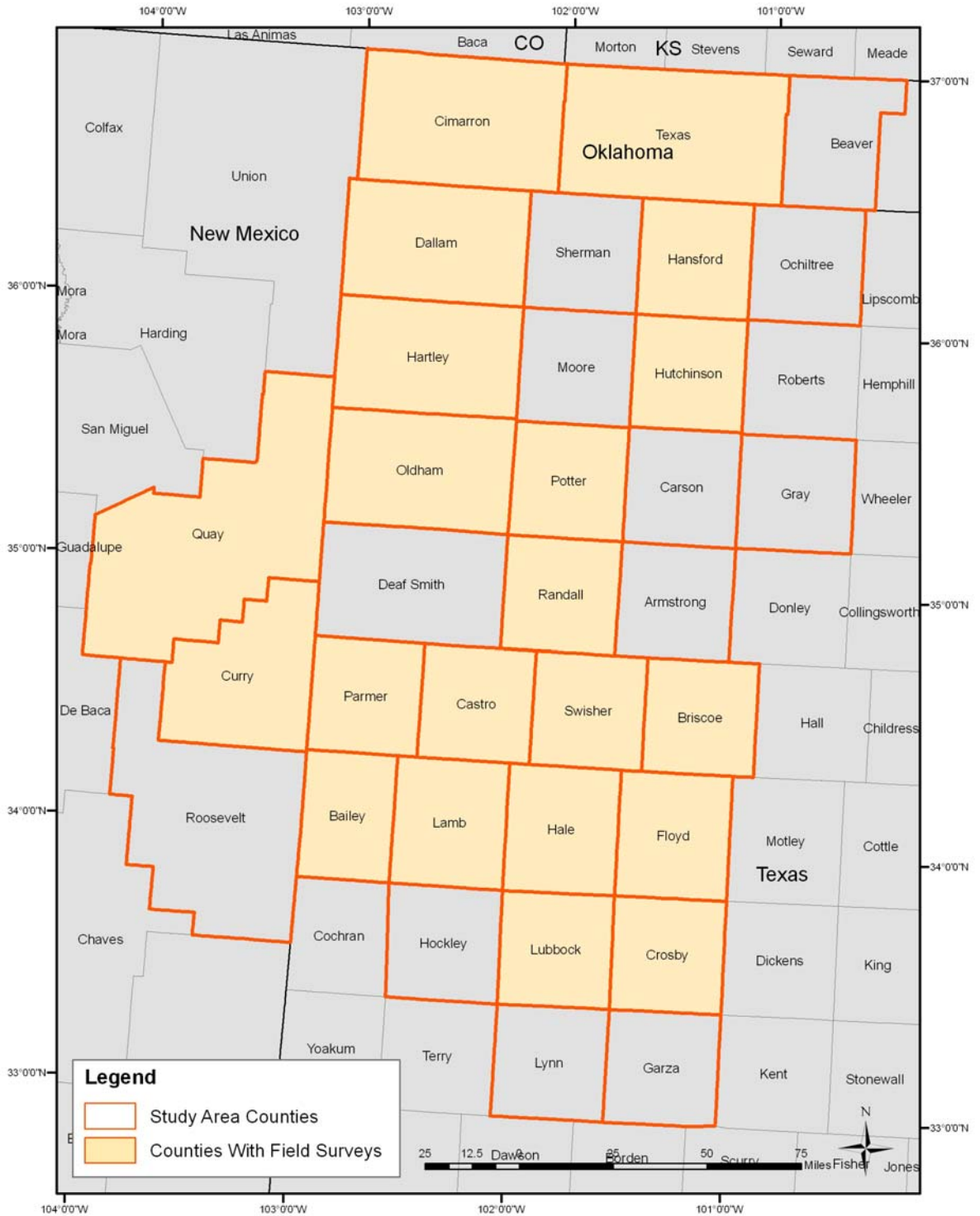
Appendix B. Spatial Distribution of Wetland and Riparian Data
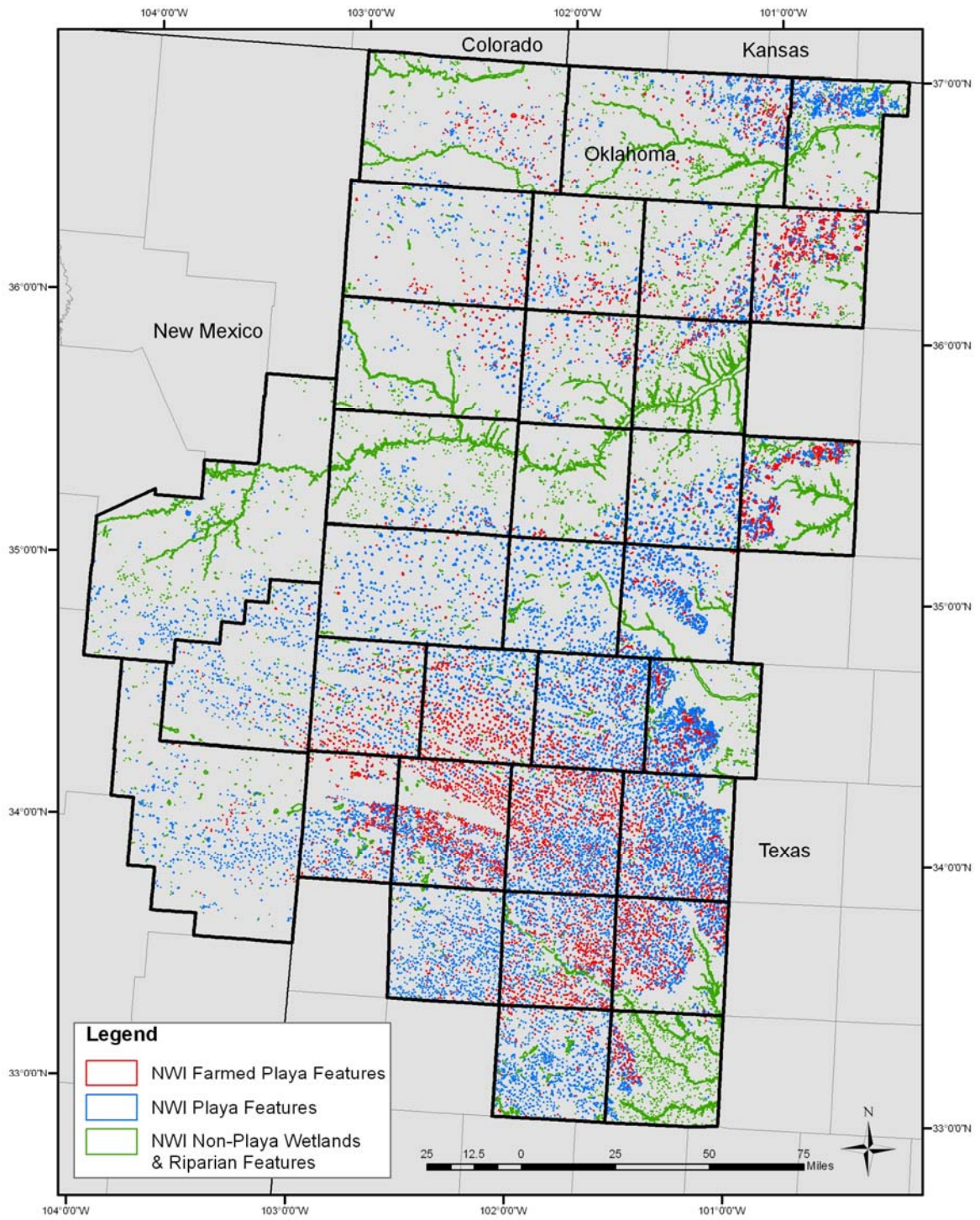
Appendix C. General Description of Wetland/Riparian Habitats

Table 2. Wetland classification codes and corresponding plant community type(s)

NWI Code - Water Regime/Modifier	Cowardin Description	Common Description	Common Vegetation
P(f)	Palustrine wetland, farmed	Hydric soil with no Wetland hydrology or vegetation	None/Agriculture
PEM1/L2EM (A, J)	Palustrine/Lacustrine emergent wetland	Playa, marsh, grassy drainage, impoundment, or floodplain wetland exhibiting drier conditions	Bur Ragweed (*Ambrosia grayi*) FACW Alkali Sacaton (*Sporobolis airoides*) FACSaltgrass (*Distichlis sp.*) FACW+ Plains Coreopsis (*Coreopsis tinctoria*) FAC
PEM1/L2EM (C, F)	Palustrine/Lacustrine emergent wetland	Playa, marsh, grassy drainage, impoundment, or floodplain wetland exhibiting wetter conditions	Smartweed (*Polygonum amphibium*) OBL Saltmarsh Aster (*Aster subulatus*) OBL Spikerush (*Eleocharis sp.*) FACW Threesquare (*Scirpus americanus*) OBL Curly Dock (*Rumex crispus*) FACW *Phragmites sp.* FACW *Scirpus sp,* OBL *Typha latafolia* OBL
PFO1 (A, C, J)	Palustrine broad-leaved forested wetland	Forested floodplain bottomland	Black Willow (*Salix nigra*) FACW+ Cottonwood (*Populus deltoides*) FAC Hackberry (*Celtis occidentalis*) FAC Soapberry (*Sapindus saponaria*) FACU- Siberian Elm (*Ulmus pumila*) NI
PSS1 (A, C, J)	Palustrine broad-leaved scrub-shrub wetland	Depression or shrub floodplain bottomland	Black Willow (*Salix nigra*) FACW+ Sandbar Willow (*Salix exigua*) FACW+ Willow Baccharis (*Baccharis salicina*) FAC
PSS2 (A, J)	Palustrine needle-leaved scrub-shrub wetland	Depression or shrub floodplain bottomland	Salt Cedar (*Tamarix chinensis*) FACW

PUB/L1UB (F, H)	Palustrine/Lacustrine unconsolidated bottom wetland	Open water pond, impoundment, excavation, or reservoir	None
PUS/L2US (A, C, J)	Palustrine/Lacustrine unconsolidated shore wetland	Non-vegetated or sparsely vegetated playa, flat, shoreline or floodplain wetland	Silver-leaf Nightshade (*Solanum elaeagnifolium*) NI Narrowleafed Goosefoot (*Chenopodium leptophyllum*) FACU Summer Cypress (*Kochia scoparia*) FACU Plains Ironweed (*Veronia marginata*) FAC
R2UB (F, H)	Riverine lower perennial, unconsolidated bottom	Perennial Stream/River	None
R2US (A, C)	Riverine lower perennial, unconsolidated shore	Sand bar	None
R2US5 (A, C)	Riverine lower perennial, vegetated, unconsolidated shore	Sand bar with sparse, or pioneering vegetation	Silver-leaf Nightshade (*Solanum elaeagnifolium*) NI Narrowleafed Goosefoot (*Chenopodium leptophyllum*) FACU Summer Cypress (*Kochia scoparia*) FACU Plains Ironweed (*Veronia marginata*) FAC
R4SB (A, C)	Riverine intermittent, streambed	Intermittent stream	None
R4US (A, C)	Riverine intermittent, unconsolidated shore	Sand bar	None
R4US7 (A, C)	Riverine intermittent, vegetated, unconsolidated shore	Sand bar with sparse, or pioneering vegetation	Silver-leaf Nightshade (*Solanum elaeagnifolium*) NI Narrowleafed Goosefoot (*Chenopodium leptophyllum*) FACU Summer Cypress (*Kochia scoparia*) FACU Plains Ironweed (*Veronia marginata*) FAC

Riparian classification codes and corresponding plant community type(s):

Forested (Rp1FO6);
Cottonwood (*Populus deltoides*)
Siberian Elm (*Ulmus pumila*)
Hackberry (*Celtis occidentalis*)
Soapberry (*Sapindus saponaria*)

Scrub/Shrub Deciduous (Rp1SS6);
Salt Cedar (*Tamarix chinensis*)
Mesquite *(Prosopis sp.)*
Cottonwood (*Populus deltoides*)
Baccharis sp.
Sandbar Willow (usually mixed in with other)

Scrub/Shrub Evergreen or Mixed (Rp1SS7/8)
Sagebrush *(Artimisia filifolia)*
Rabbitbush *(Chrysothamnus sp.)*

Emergent (Rp1EM);
Alkali Sacaton (*Sporobolis airoides*)
Sand Dropseed (*Sporobolis cryptandrus*) FACU-
Western Wheatgrass (*Agropyron smithii*) FAC-
Buffalo Grass (*Buchloe dactyloides*) FACU
Switchgrass (*Panicum virgatum*) FAC
Saltgrass (*Distichlis sp.*)
Ragweed (*Ambrosia grayi*)

Mixed Herbaceous Communities (Rp1EM/SS6);
Undifferentiated mix of any of the above.