



U.S. Shorebird Conservation Plan

Central Plains / Playa Lakes

Regional Shorebird Conservation Plan

Version 1.0

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EXECUTIVE SUMMARY

The Central Plains/Playa Lakes Region (CP/PLR) includes Texas (excluding the coast), eastern New Mexico and Colorado, western Oklahoma, Kansas and Nebraska, and the southeastern corner of Wyoming. There are five North American Bird Conservation Initiative (NABCI) Bird Conservation Regions (BCR's) within the CP/PLR. Shorebird habitat types within the CP/PLR include ephemeral wetlands such as playa lakes, semi-permanent wetlands, seasonally flooded wetlands, mud and alkali flats, wet meadows, shortgrass prairie, agricultural fields, reservoirs, rivers and other shallow water sources such as ditches and farm ponds.

Thirty-eight species of migrating shorebirds forage and rest within the CP/PLR. These species use the CP/PLR to replenish body reserves required both to complete their migration and to enhance their reproductive success once they arrive on the breeding grounds. Thirteen of these species also breed within the area, including the federally threatened Piping Plovers and the candidate for federal listing Mountain Plovers.

Within the CP/PLR, sixteen shorebird species have been identified as species of primary concern. Piping, Mountain, and Snowy plovers (western populations), Long-billed Curlews, and Upland and Buff-breasted sandpipers are considered examples of priority species due to low population numbers and/or dependence upon regional uplands, grasslands, and other habitats. Other priority species depend heavily upon interior wetlands due to specialized migratory routes or other life history requirements. These species include the White-rumped, Baird's, and Pectoral sandpipers.

There are three Western Hemisphere Shorebird Reserve Network Sites in the CP/PLR. These areas are Cheyenne Bottoms Wildlife Management Area and Quivira National Wildlife Refuge in south central Kansas and Salt Plains National Wildlife Refuge in north central Oklahoma. In addition to these and other key migratory stop-over sites in the area, shorebirds also rely on numerous small wetland complexes and interior rivers. Collectively, these sites support a large percentage of the hemisphere's long-distance migrants such as Stilt and White-rumped sandpipers. These mosaics of ephemeral wetlands are critical to shorebird survival but are extremely dynamic and unpredictable, making management, monitoring and planning efforts challenging. The hydrology of most of the wetlands in the CP/PLR have been negatively altered by the draining of aquifers and lowering of the water table due to pumping for irrigation of agricultural crops, drainage for agricultural conversion, water development projects, and urbanization. Many of the rivers have been altered by damming, dredging, and channelization.

Major shorebird issues in the CP/PLR are the lack of data on shorebird use of the area and limited monitoring of priority species. The lack of information on shorebird habitat use and needs within the CP/PLR impedes efforts to conserve shorebirds by reducing the ability to effectively manage for and provide quality shorebird habitat. A major component of the land base in the CP/PLR is privately-owned land. Shorebird conservation cannot be fully achieved solely on the relatively small public land base set aside for wildlife purposes. In addition, the federal and state programs assisting private land owners with habitat protection and maintenance are underfunded and understaffed.

However, most of the major shorebird habitat management challenges revolve around complicated water issues. Management efforts include securing and maintaining water rights, managing water levels to benefit invertebrates and to create dynamic hydro-periods, controlling encroachment of vegetation into wetlands, and maintaining appropriate vegetation structure on upland habitats while meeting other wildlife habitat needs. Other habitat management challenges include unpredictable precipitation, increased salinization of wetlands, and lack of funding to support shorebird habitat management activities.

The CP/PLR can contribute to hemispheric populations of shorebirds by identifying, restoring, and protecting key shorebird staging and breeding areas; improving the quality of habitat presently managed for shorebirds; maintaining an appropriate configuration of wetland and grassland habitats; working with private landowners to protect and provide suitable habitat; protecting water quality and availability; increasing and improving monitoring of shorebird populations and habitat; and increasing the awareness and understanding of grasslands, wetlands, and rivers within the CP/PLR and their importance to shorebird populations. None of these goals can be achieved without cooperation from private landowners, the state and federal agencies and private organizations managing wetland and grassland habitats, the natural resource, agriculture, and regulatory agencies which impact shorebird habitat, and the Joint Ventures within the CP/PLR.

OVERVIEW OF THE CENTRAL PLAINS/PLAYA LAKES REGION (CP/PLR)

The Central Plains/Playa Lakes Region (CP/PLR) encompasses Texas (excluding the coast), eastern New Mexico and Colorado, western Oklahoma, Kansas and Nebraska and the southeastern corner of Wyoming (Figure 1). The region consists of five Bird Conservation Regions (BCR's), the Short Grass Prairie (#18), Central Mixed Grass Prairie (#19), Oaks and Prairies (#21), Edwards Plateau (#20), and Tamaulipan Brushlands (#36) (Figure 2).

In general, the CP/PLR is characterized by flat to rolling topography, relatively low precipitation, from a high of 60 cm (24 in) in central Kansas to a low of less than 38 cm (15 in) in the western portions of the region, high spring winds, and in some situations, saline soils. Cattle ranching and agriculture are common economic uses of the area.

With the exception of Cheyenne Bottoms Wildlife Management Area in south central Kansas, the interior of the United States is generally not recognized as important shorebird habitat due to the lack of coastlines, major water bodies, and shorebird data. However, the grasslands, wetlands and interior rivers of the southern plains lie within a major migratory corridor for approximately 38 shorebird species (Helmers 1992; E. Young pers. comm.). The CP/PLR is essential to the western hemisphere's shorebird populations. Several species use the interior exclusively during migration (Skagen 1997). Shorebirds rely upon invertebrate populations at CP/PLR staging areas to replenish body reserves used during migration. The interior is especially critical to long-distance migrants such as Stilt Sandpipers (scientific names for shorebird species are found in Table 1) which migrate from the southern end of South America to the Arctic to breed (Skagen et al. 1999). Spring migration is a critical time for shorebirds, especially for those breeding in the Arctic, where there is a short window of time for successful reproduction. It is important for shorebirds to arrive on the breeding grounds in adequate body condition so nesting may be quickly initiated.

Thirteen species breed in the CP/PLR, including Piping and Mountain plovers and Long-billed Curlews.

Three wetland areas in the CP/PLR have been recognized as sites which traditionally support large numbers of migrating and breeding shorebirds and have been established as Western Hemisphere Shorebird Reserve Network (WHSRN) Sites (Myers et al. 1987). These sites are Cheyenne Bottoms Wildlife Management Area (Hemispheric Site $\geq 500,000$ shorebirds) and Quivira National Wildlife Refuge (Regional Site $\geq 20,000$) in south central Kansas and Salt Plains National Wildlife Area (also a Regional Site) in north central Oklahoma. Collectively, the WHSRN sites and other staging areas in the CP/PLR support a large percentage of the populations of the hemisphere's long-distance migrants such as Stilt and White-rumped sandpipers as well as large numbers of Baird's and Pectoral sandpipers.

SHOREBIRD COMMUNITY

SPECIES COMPOSITION AND USE OF CP/PLR

There are at least 38 species of migrating and breeding shorebirds which occur within the CP/PLR (Table 1). Thirteen of these breed within the CP/PLR. The Eskimo Curlew, presumed to be extinct was also once part of the CP/PLR spring migratory bird fauna. Historical accounts numbered them in the hundreds of thousands. Since there have not been any confirmed or reliable sightings since 1987 (Gill et al. 1998), it will not be considered further in the CP/PLR Shorebird Plan.

Breeding Species.

Federally threatened Piping Plovers nest on vegetation-free to sparsely vegetated mudflats, river sandbars and islands, sandy shorelines, reservoirs, and sandpits within the northern edge of the CP/PLR. In the latest International Piping Plover Survey in 1996 (Plissner and Haig 1997), 155 breeding pairs were documented in Nebraska (excluding the Missouri River population which is not included in the CP/PLR), three breeding pairs in Colorado, and one breeding pair in Kansas. Breeding pairs were not found in New Mexico, Oklahoma, or areas of Texas included in the CP/PLR (N. McPhillips, pers. comm.). This represents approximately 2% of the breeding population. Mountain Plovers, which are candidates for federal listing as a threatened species, breed in shortgrass prairie, grazed and burned pastures, and fallow agricultural fields in eastern Colorado, northeast New Mexico, Oklahoma panhandle, southwest Kansas, southwest Nebraska and southeast Wyoming (Knopf 1996). Snowy Plover, a Species of Management Concern (USFWS 1995), also nests on barren areas, usually on salt flats in Texas, Oklahoma, Kansas, and New Mexico (Page et. al 1995). Grasslands within the CP/PLR are also important breeding sites for Upland Sandpipers and Long-billed Curlews. The CP/PLR also supports breeding populations of Killdeer, Black-necked Stilts, American Avocets, Willets, Spotted Sandpipers, Common Snipe, American Woodcocks, and Wilson's Phalaropes. These species breed throughout the western United States and are not solely dependent upon CP/PLR habitats. Successful breeding in the CP/PLR, however, helps to ensure the long-term survival of hemispheric populations.

Migration.

Spring migration is a critical time for shorebirds when they must quickly replenish body reserves (Hlemers 1992). In the spring, shorebirds use CP/PLR staging areas from mid-March (Baird's Sandpipers) to late May (White-rumped Sandpipers). Shorebirds migrating south begin arriving in the CP/PLR as early as July (Lesser Yellowlegs, Solitary Sandpipers, and Willets) and continue through late October (Skagen et. al 1999). Fall migration for many shorebirds, especially Arctic-breeding species, occurs as two peaks. The first is dominated by adults during July and early August and the second peak is dominated by juveniles from late August through September and October (Helmers 1992). In many species, during both the spring and fall migrations, there may also be a difference of several weeks between the migration times of males and females (A. Farmer, pers. comm.).

During the spring season in years which have average precipitation events, shorebird use of the CP/PLR is often spread out throughout the landscape due to relative availability of water. Southward migration is longer and occurs during the typically drier conditions of summer and early fall. At this time shorebirds are often more heavily concentrated on a few available sites than during the spring. They are often more dependent upon rivers and reservoirs when water availability is low and vegetation is high in wetlands and surrounding uplands.

Adding to the complexity of management for migrating shorebirds within the CP/PLR is the differing resource needs of adults vs. juveniles and males vs. females, as well as the prolonged migration periods, and water and vegetation control issues.

Priority Shorebirds.

The National Shorebird Research and Monitoring (Brown et al. 2000) and the CP/PLR working groups have developed a list of shorebird species of high conservation priority within the region.

A list of the 16 priority species, their use of the CP/PLR and justification for being designated as a priority species as well as the areas where they have been documented to occur in high numbers, is found in Table 2. Species were considered a priority in the CP/PLR if they were (1) federally or state endangered or threatened and were found in fairly significant numbers within the area (e.g. Piping Plovers); (2) species dependent upon unique habitats within the CP/PLR for breeding and/or migrating purposes (e.g. Mountain Plovers and Buff-breasted Sandpipers); (3) species with a specialized migratory route which causes them to be dependent upon the southern interior regions during some aspect of their migration (e.g. White-rumped Sandpipers); (4) long-distance migrants which are particularly dependent upon CP/PLR staging areas to replenish fat reserves (e.g. Baird's Sandpipers); or (5) species with a large percentage of the population relying upon the CP/PLR (e.g. Stilt Sandpipers).

SHOREBIRD HABITATS IN THE CP/PLR

GENERAL HABITAT TYPES

While the shorebirds using the CP/PLR vary morphologically, many are fairly opportunistic in their use of habitats and subsequently depend upon a large variety of wetland and habitat types. Small shorebirds such as White-rumped, Baird's and Least sandpipers use water depths of 7 cm (3 in) or less. Greater Yellowlegs, Stilt Sandpipers, American Avocets and other longer-legged shorebirds use wetlands with water up to 15 cm (6 in). Most shorebirds use fairly unvegetated, shallow water wetlands such as playa lakes, ephemeral wetlands, semi-permanent impoundments, shallowly flooded mudflats and salt flats, rivers, receding reservoirs, ditches, sewage lagoons, and stock and farm ponds. In many areas, rivers are important breeding and migratory areas to shorebirds (e.g. Piping Plovers) especially in the fall when water may be scarce. Species which are more tolerant of vegetation (e.g. Wilson's Phalaropes and Pectoral Sandpipers) also use flooded salt grass, wet meadows, and agricultural fields. The CP/PLR also hosts shorebirds which primarily rely upon upland habitats, during at least one portion of their life cycle, including shortgrass prairies, abandoned agricultural fields, plowed crop fields, and

grazed pastures.

In addition to the WHSRN sites and other key migratory stopover sites in the CP/PLR, shorebirds also heavily rely upon chains of small wetlands and small to large rivers which dot the landscape.

These small wetlands support a myriad of shorebird species especially early in the spring migration when the water in smaller wetlands warms earlier than larger wetlands. These small wetlands provide the first bloom of aquatic invertebrates (J. Minnerath, pers. comm.). The conservation, management, and monitoring challenge of these interior wetland sites is that they are dynamic and unpredictable (Skagen and Knopf 1993). Wetland complexes with fewer numbers of birds (below the threshold for designation as a WHSRN site) may be critically important for some species during some years (Skagen and Knopf 1994). Additionally, small wetland complexes may provide critical connections to regional breeding areas for Piping Plovers (Plissner and Haig 1997) and complexes of small, closely spaced wetlands can be important migration stopovers for mid-continent Pectoral Sandpipers (Farmer and Parent 1997). In the aggregate, these sites support large numbers of shorebirds.

PRIORITY HABITAT TYPES

All shorebird habitats within the CP/PLR are important to their conservation, especially scattered and ephemeral wetlands. The most critical habitats in the CP/PLR for those species experiencing population declines, are the grasslands and other upland areas with low vegetation structure, rivers, and salt flats. The salt flats and river sandbars within the CP/PLR are used by migrating and nesting Piping Plovers and nesting Snowy Plovers. Short-stature grasslands, mowed areas, alfalfa fields, plowed agricultural fields, and sod farms in Oklahoma, Kansas, and Nebraska are important to migrating Buff-breasted Sandpipers. Shortgrass prairies, grazed grasslands, and fallow agricultural fields in western Kansas and Nebraska and in the eastern portions of New Mexico, Colorado, and Wyoming are breeding sites for Mountain Plovers. Upland habitats, recently burned rangelands, and salt flats within the CP/PLR are used as staging areas for American Golden-Plovers. A particular challenge is that a high proportion of potentially important playa lakes, salt plains, and grasslands are either wholly or partly under private ownership (approximately 75%). Appendix A discusses individual high priority habitats in the CP/PLR, their use by shorebirds, and their identified threats.

MAJOR SHOREBIRD ISSUES

There are a myriad of habitat management, research, monitoring, and outreach issues which impact shorebird conservation in the CP/PLR. However, the following have been identified as the most critical issues in the conservation of shorebirds in the CP/PLR.

Issue 1. There is limited baseline data available on shorebird numbers, population trends, and habitat use for most of the CP/PLR. Currently, the International Piping Plover Survey monitors populations and trends of Piping Plovers across North America. There is a need for (1) baseline population numbers of other priority shorebirds, including Mountain and Snowy plovers and

Long-billed Curlews, (2) a long-term monitoring program which can track population trends of all shorebird species, and (3) an inventory of habitat use by shorebirds across the CP/PLR. Currently there are limited monitoring efforts for Mountain Plovers and Long-billed Curlews on National Grasslands. This effort should be expanded to include other public and private lands across the CP/PLR. The International Shorebird Survey has been used to inventory shorebird numbers and their temporal patterns on a relatively limited scale within the CP/PLR (B. Harrington pers. comm.). There is a need to develop and conduct surveys specifically designed to track population trends (Howe et. al. 2000).

Issue 2. Most of the land in the CP/PLR is under private ownership. Only a relatively small percentage of the land base in the CP/PLR is publically owned by either a state or federal natural resource agency. As was recognized by the North American Waterfowl Management Plan (NAWMP), and which holds equally true for managing and conserving shorebird habitats in the CP/PLR, “the efforts required to maintain and enhance [waterfowl] habitat in North America are beyond the capability of public land resource agencies alone.”

Several federal and most state natural resource agencies have programs designed to assist private landowners to manage wildlife and wildlife habitat on their property. However, not all staff members involved in private lands programs have the training or are familiar with tools available to promote shorebird habitat preservation. In most cases private land programs are understaffed and underfunded. Providing training opportunities and increasing funding and staffing levels for private lands programs would increase their ability to work with landowners for shorebird conservation.

Issue 3. Many critical habitats have limited or no habitat management capabilities. Currently, many sites throughout the CP/PLR are limited in their ability to manage shorebird habitat for several reasons. Many wetlands are ephemeral and dependent upon the natural, but altered, water regime. Some management areas lack the water rights, water management capabilities, funding, or administrative support to manipulate or maintain habitat. Under these conditions, even in areas set aside for wildlife, the appropriate habitat cannot be provided.

The CP/PLR is characterized by productive shallow water wetlands which are very dynamic and unpredictable in space and time. Management of dispersed and dynamic wetland habitats for the conservation of migrating shorebirds is a challenge which will require an integrated approach throughout the CP/PLR and other geographic regions (Skagen et al. 1999). Some of the most numerous and important ephemeral wetlands in the CP/PLR are playa lakes. Although many playas are not connected to groundwater, unpredictable rainfall and ground water levels can determine their presence. It is not usually feasible to pump or move water into these depressions which are scattered over large, semi-arid areas and the ability to manage these wetlands will probably never be fully realized. Even if we are unable to manage playas, it is possible to protect some of these wetlands from further degradation and loss.

Issue 4. Wetland loss and drastically impacted hydrology of the CP/PLR results in net loss of

habitat and habitat management obstacles. Many of the CP/PLR's ephemeral and other wetlands have been lost or degraded resulting in a net loss of shorebird habitat, a decrease in the quality of remaining wetlands and the creation of management challenges and difficulties. There are many challenges and obstacles in offsetting these habitat losses primarily due to the drastically impacted hydrology of the CP/PLR.

The draining of aquifers and ground water depletion from over-pumping, water development projects, sedimentation, and other factors have created or exacerbated many habitat management issues. These challenges include issues of water quality, increased salinization of wetlands, managing water levels to benefit invertebrates, mimicking dynamic hydroperiods, controlling encroachment of undesired plant species, and meeting other waterbird habitat needs within the same management area.

Issue 5. Poor coordination and communication within agencies and organizations that impact shorebird habitat. There is a need for better coordination and communication among the various government agencies at the federal, state, and local levels and non-governmental organizations with shorebird management responsibilities. Some regulatory agencies, such as the Army Corps of Engineers, are not charged with managing shorebirds, but in carrying out their duties shorebird habitats are impacted. For example, in Oklahoma, breeding habitat for Snowy Plovers is being altered due to channel alteration from bank stabilization projects. Many agencies could do more to conserve shorebirds with additional information on shorebird life history requirements, habitat needs, population status, and maps of known shorebird use sites and concentration areas as well as an increase in technical assistance, coordination and communication.

Potential solutions could be the formation of an organization similar to the Kansas Wetlands and Riparian Areas Alliance organized in 1996 as a "response to the need to provide quality informational and educational materials to a variety of audiences on the functions and values of wetlands and riparian areas; to demonstrate how they could be enhanced, restored and protected; and to encourage closer cooperation between agencies, organizations, and groups that deal with these valuable areas." Cooperation between the Kansas Livestock Association, Farm Bureau with Partners for Fish and Wildlife Program (USFWS) has been productive in dealing with some of the issues pertaining to the social, economic and biological concerns in the tallgrass prairie region of Kansas (J. Minnerath, pers. comm.). Tangible results could come about through similar coalition activities in other states, if the correct approach is taken.

Issue 6. The general public does not recognize the CP/PLR as important habitat for shorebirds. Perhaps most importantly, the people living in the CP/PLR as well as throughout the U.S., do not appear to recognize the CP/PLR as containing important wetlands. Consequently many lack interest in preserving and managing these unique and critical areas. Examples of ways to mitigate this include dispensing shorebird habitat management information to public and private landowners through programs such as NRCS and USFWS Private Lands. Involvement in parks and tourism departments at the local and state level could also advertise the presence and increase public awareness of the vital habitat and roles it plays in providing migratory shorebird

habitat.

HABITAT MANAGEMENT AND CONSERVATION ISSUES

OVERVIEW OF CURRENT HABITAT MANAGEMENT ACTIVITIES

Providing habitat for shorebirds initially is currently most effectively done by public land managers overseeing the management of impounded wetland habitats. There are many local wetland habitat management issues and practices throughout the CP/PLR which pertain to water, including quality, availability, and timing of management actions. In many areas, shallow water habitat no longer exists because of the degradation of aquifers and other factors. It is a significant management challenge to mimic the natural and dynamic hydroperiods which produced the productive shallow water wetlands shorebirds evolved with and continue to depend upon.

In some areas, wetland managers are implementing “moist soil management,” a technique used to produce annual plants for seed production to provide a food base for waterfowl. These areas can also provide appropriate shorebird habitat and wetland managers can flood and drain impoundments in an attempt to provide shallow water and mudflat habitats that are conducive to invertebrate populations.

Throughout much of the CP/PLR, the ability to directly manage water levels for shorebird habitat (wetland and grasslands) is not available. Some of the most numerous and important wetlands in the CP/PLR are ephemeral and are maintained by unpredictable rainfall and ground water levels.

Even on some publicly-owned wildlife areas, many land managers do not have water rights or water management capabilities, which limits or excludes the manipulation of water to create shorebird habitat. In these cases, often the only management which can be conducted is protection from excessive grazing, wetland filling, and dumping of pesticides or oil and other waste products and controlling the encroachment of woody vegetation.

Wetland managers are also challenged with providing wetlands with little or no vegetation. As fires and natural forces which set back plant succession were reduced or eliminated during European settlement, many wetlands became overgrown and no longer provide habitat suitable for shorebirds. Wetlands naturally become more vegetated due to siltation as they age, but this process has been accelerated through human activities. Managers can attempt to maintain or set back emergent vegetation, such as cattail (*Typha* spp.), reed canarygrass (*Phalaris arundinacea*), and bulrush (*Scirpus* spp.) using tools such as discing, mowing, grazing, burning, and flooding. Woody species are also controlled in the playa lakes along rivers of Texas, New Mexico, and Oklahoma throughout the CP/PLR by burning, mowing, and chemical applications.

Recent research on migrant shorebird use of playa lakes has resulted in management recommendations which can be promoted to land managers (Davis and Smith 1998). Management should focus on enhancing invertebrate populations and on maintaining sparse

vegetative cover and adequate mudflat (at least 10-15%) and shallow water (at least 10-20%) habitats throughout the period of use by shorebirds. Habitat can be managed through gradual drawdowns of playas with deep water and flooding of dry playas where water movement capabilities exist. Mowing and shallow discing can be used to create preferred habitat conditions and provide a detrital food base to enhance invertebrate populations. Variations of current moist-soil management practices used by waterfowl managers (Haukos and Smith 1993) may also benefit shorebirds, especially in the spring.

Recommended habitat management activities for shorebirds on shortgrass prairies within the CP/PLR are primarily vegetation manipulation techniques to provide the proper vegetation structure for nesting Mountain Plovers and, in some cases, Long-billed Curlews. Grazing and winter use of prescribed fire are two tools currently being employed to maintain shortgrass prairies specifically to create breeding habitat for Mountain Plovers.

INFORMATION NEEDS OF HABITAT MANAGERS

In the CP/PLR some habitat managers are not aware of shorebird issues such as timing of shorebird use, appropriate habitats, and managing for invertebrates as a prey base. To increase the number of wildlife areas that include shorebird habitat needs into management plans, land managers must know migration chronology, species composition, and habitat needs to be able to best incorporate their needs with habitat management goals of other wildlife species.

Information about shorebird habitat needs, migration timing, and effective management techniques should continue to be provided. Shorebird habitat management should be presented at agency meetings and managers should be encouraged to attend shorebird training workshops.

Many wetland areas, especially those owned by States, were purchased or are maintained with hunting revenues, and therefore traditional wetland management has also been primarily geared toward waterfowl management. Increased interest in nongame wildlife, such as secretive marshbirds, colonial waterbirds, and shorebirds is often seen to be contrary to the primary purposes and goals of many wildlife areas. However, multi-species management is both practical and possible. Understanding of different management techniques and tools, timing of management practices, availability of information on habitat needs of different species groups, and flexibility on the part of both managers and coordinators is necessary to provide quality habitat for both traditional and non-traditional species.

MANAGEMENT COORDINATION NEEDS

The Playa Lakes Joint Venture (PLJV) and the Rainwater Basin Joint Venture (RWJV), created under the NAWMP, should be aware of shorebird issues and conservation and management recommendations. The Joint Ventures are already protecting, improving, and maintaining wetlands in areas critical to shorebirds. It is imperative for new, nongame money to be brought into the Joint Ventures so shorebird habitat restoration projects can be incorporated into their current habitat work. In the PLJV, which includes eastern New Mexico and Colorado, western Kansas, and the panhandles of Texas and Oklahoma, restoration and protection should focus on playa lakes, freshwater wetlands, salt plains and basins, riverine habitats including rainwater

basins, and grasslands with associated wetlands. Specific shorebird population objectives could be added to the PLJV's population objectives in its Implementation Plan. The need for shorebird monitoring at PLJV and RWJV project sites could be added to the their Evaluation Plan.

RESEARCH AND MONITORING ISSUES

Understanding the large-scale, hemispheric needs of individual species during different times of their life cycle, as well as their needs during migration stopovers, will assist in setting population and habitat management goals at the regional level. There are numerous research and monitoring needs which have been recognized which are relative to shorebirds and shorebird habitat in the CP/PLR. There is a need to increase monitoring of all shorebirds and their use in the region. Due to their status as priority species breeding in the CP/PLR, there is particularly a need to increase monitoring of Piping, Mountain, and Snowy plovers and Long-billed Curlews, within the region. It is also a need to increase the monitoring of shorebird habitats.

There are also numerous research questions regarding shorebirds in the CP/PLR including the impact of various habitat management practices on grasslands and wetlands, the importance of various staging areas within the CP/PLR to hemispheric populations of shorebirds, and wetland connectivity and its impact on managing and purchasing shorebird habitat.

REGIONAL GOALS

The CP/PLR working group supports the hemispheric and national goals of the U.S. Shorebird Conservation Plan, to "restore and maintain populations of all species of shorebirds in the Western Hemisphere" and to "stabilize populations of all shorebird species known or suspected of being in decline due to limiting factors occurring within the U.S., while ensuring that common species remain common" (Brown, et al. 2000). Land managers and biologists within the CP/PLR, however, cannot control some of the factors which affect population sizes, such as conditions on the wintering and, in most species, on the breeding grounds. Therefore, the CP/PLR can best contribute to the above goals by concentrating on protecting, improving and expanding the habitat available for migrating shorebirds within the region and protecting, improving and expanding the habitat available for the species which breed in the region.

1) Protect, restore, and enhance habitat conditions to support migrating shorebirds. Ensure an appropriate amount and quality of staging habitat (primarily wetland habitat) is available to long-distance migrants.

- a. Continue to identify and ultimately restore and/or protect wetland and upland habitats critical to shorebirds in the CP/PLR
- b. Ensure priority habitats are protected from drainage, pesticide dumping, increased salinization, and other threats.
- c. Improve and increase habitat management efforts on federal and state-owned wildlife areas which provide shorebird habitat, including National Wildlife Refuges and National

Grasslands.

- d. Support and/or improve the private lands programs which encourage and assist private landowners in restoring and/or maintaining wetlands.
- e. Ensure management activities are carried out in conjunction with the timing of shorebird use, so habitat is available at all critical times for shorebird use.
- f. Establish a communication format which can be used by wetland managers to help ensure, on a collective basis, there is adequate habitat within the CP/PLR.
- g. Investigate tools to better manage, predict, and cope with dynamic and ephemeral habitats which are critical to shorebird conservation.

2) Provide optimal breeding habitat to maintain and/or restore populations of species which are high priority in the CP/PLR, namely Piping, Snowy, and Mountain plovers, Long-billed Curlews, and Upland Sandpipers.

3) Improve habitat quality of wetlands and grasslands currently owned and managed by state, federal, non-government organizations, and private landowners.

- a. Improve the dissemination of information about habitat management and shorebird issues to all land managers and landowners.
- b. Conduct necessary research, training workshops, and monitoring programs to provide land managers with the information they need to better manage for shorebirds.
- c. Manipulate water levels to maximize invertebrate populations when shorebirds need them.
- d. Utilize burning, mowing, disking, and grazing, at appropriate levels and times, to maintain certain wetlands in early successional stages which will increase availability of invertebrates and increase habitat availability for shorebirds.
- e. Maintain an appropriate configuration of wetland and grassland habitats.

4) Gather baseline shorebird use data on key areas.

- a. Increase and improve monitoring of shorebird use of the key sites identified in the CP/PLR (Appendix A).
- b. Increase coverage of monitoring efforts to look for other sites which may have high shorebird use.

5) Protect water quantity and quality and ensure proper use of water near key shorebird habitats (as well as other wetlands) to ensure their existence and maintain their value as wildlife habitat.

6) Increase the general public's awareness and knowledge of wetland and shorebird issues.

- a. Provide articles about the value of wetlands, shorebird facts, and shorebird habitat management strategies in farming and ranching journals and newspapers.
- b. Produce area specific pamphlets, videos, or "mini-plans" which would be distributed to private landowners, Joint Ventures, and non-government organizations.
- c. Seek out partnerships with private landowners to assist them in protecting and improving shorebird habitat.

d. Use pre-established infrastructures, such as the Joint Ventures, to facilitate cooperation, collect data, and disseminate information regarding shorebirds and their habitat needs

FUNDING

In general, more funding is needed to support the personnel charged with managing and monitoring public-owned wetland and grassland areas in the CP/PLR. Funding would potentially allow for additional personnel to monitor shorebirds and shorebird habitat.

There is a need to increase funding to support operations and maintenance of wetland areas. In some wetland management areas, especially state-owned sites, increased funding from a nongame source could help shift management orientation from a primarily waterfowl habitat focus to a multi-species approach. Additional funding would support shorebird habitat management training for wetland managers.

Additional funding would allow for programs specifically designed for shorebird habitat conservation and management on private lands by increasing personnel and funding for private lands programs.

One of the most effective methods of conserving shorebirds and shorebird habitat in the CP/PLR is to cooperate and assist the established Joint Ventures in their efforts to conserve wetland habitat.

CONCLUSION

Identifying, restoring and protecting key shorebird staging and breeding areas; improving the quality of habitat currently managed for shorebirds; working with private landowners to protect and provide suitable habitat; protecting water quality and availability; increasing and improving monitoring of shorebird populations and habitat; and increasing the awareness and understanding of shorebird habitats within the region and their importance to shorebirds, will allow the CP/PLR to contribute to hemispheric populations of shorebirds. All of these goals need the cooperation of private landowners, the agencies and organizations responsible for managing shorebird habitats, the agencies which impact shorebird habitat and the Joint Ventures within the CP/PLR.

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Table 1. Shorebird species occurrence and use of the Central Plains and Playa Lakes Region (CP/PLR).

Species	Scientific Name	Season of Use
Black-bellied Plover	<i>Pluvialis squatarola</i>	M
American Golden-Plover	<i>Pluvialis dominica</i>	M
Snowy Plover	<i>Charadrius alexandrinus</i>	M B
Semipalmated Plover	<i>Charadrius semipalmatus</i>	M
Piping Plover	<i>Charadrius melodus</i>	M B
Killdeer	<i>Charadrius vociferus</i>	M W B
Mountain Plover	<i>Charadrius montanus</i>	M w B
Black-necked Stilt	<i>Himantopus mexicanus</i>	M b
American Avocet	<i>Recurvirostra americana</i>	M B
Greater Yellowlegs	<i>Tringa melanoleuca</i>	M
Lesser Yellowlegs	<i>Tringa flavipes</i>	M
Solitary Sandpiper	<i>Tringa solitaria</i>	M
Willet	<i>Catoptrophorus semipalmatus</i>	M b
Spotted Sandpiper	<i>Actitis macularia</i>	M w B
Upland Sandpiper	<i>Bartramia longicauda</i>	M B
Whimbrel	<i>Numenius phaeopus</i>	m
Long-billed Curlew	<i>Numenius americanus</i>	M B
Hudsonian Godwit	<i>Limosa haemastica</i>	M
Marbled Godwit	<i>Limosa fedoa</i>	m
Ruddy Turnstone	<i>Arenaria interpres</i>	m
Red Knot	<i>Calidris canutus</i>	m
Sanderling	<i>Calidris alba</i>	m
Semipalmated Sandpiper	<i>Calidris pusilla</i>	M

Western Sandpiper	<i>Calidris mauri</i>	M
Least Sandpiper	<i>Calidris minutilla</i>	M W
White-rumped Sandpiper	<i>Calidris fuscicollis</i>	M
Baird's Sandpiper	<i>Calidris bairdii</i>	M
Pectoral Sandpiper	<i>Calidris melanotos</i>	M
Dunlin	<i>Calidris alpina</i>	m
Stilt Sandpiper	<i>Calidris himantopus</i>	M
Buff-breasted Sandpiper	<i>Tryngites subruficollis</i>	M
Short-billed Dowitcher	<i>Limnodromus griseus</i>	m
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>	M W
Common Snipe	<i>Gallinago gallinago</i>	M W b
American Woodcock	<i>Scolopax minor</i>	w b
Wilson's Phalarope	<i>Phalaropus tricolor</i>	M b
Red-necked Phalarope	<i>Phalaropus lobatus</i>	m
Red Phalarope	<i>Phalaropus fulcaria</i>	m
<p>B = Breeding, M = Migration, W = Wintering. B, M, W = high concentrations, region extremely important to the species relative to other regions. B, M, W = common or locally abundant, region important to species. b, m, w = uncommon to fairly common, region within species range but species occurs in low abundance relative to other regions. Bold species name = priority species within CP/PLR (see text for definition).</p>		

Table 2. Priority Species in the Central Plains and Playa Lake Region (CP/PLR) and justification as a priority species.	
Species	Justification
American Golden-Plover	Elliptical migration pattern which goes through the CP/PLR
Snowy Plover	USFWS Avian Species of Management Concern (1995), local breeder
Piping Plover	Federally threatened species, local breeder, migrates through CP/PLR, winters in southern portion of CP/PLR
Mountain Plover	Federal candidate threatened species, approximately 2/3 of the population breeds within western one-third of CP/PLR
American Avocet	Breeds in western half of region, migrates throughout CP/PLR
Upland Sandpiper	USFWS Avian Species of Management Concern (1995), breeds in CP/PLR grasslands
Long-billed Curlew	USFS Region 2 Sensitive Species, USFWS Avian Species of Management Concern (1995), breeds in western portion of region, migrates throughout region, breeds in CP/PLR grasslands
Hudsonian Godwit	Migrates through central and eastern portion of CP/PLR
Semipalmated Sandpiper	Large percentage of population migrates through CP/PLR (Skagen et al 1999)
Least Sandpiper	Large percentage of population migrates through CP/PLR (Skagen et al 1999)
White-rumped Sandpiper	Elliptical migration pattern, large percentage of population migrates through CP/PLR in spring
Baird's Sandpiper	Large percentage of population migrates through CP/PLR (Skagen et al 1999)
Pectoral Sandpiper	A large percentage of the population migrates through Cheyenne Bottoms WMA (ISS

	data; Farmer and Parent 1997)
Stilt Sandpiper	A large percentage of the population migrates through Cheyenne Bottoms WMA, narrow migration period
Buff-breasted Sandpiper	Primarily documented in Central Plains, Oklahoma, Rainwater Basin, Nebraska, sod farms and other shortgrass areas in central Kansas; dependent upon CP/PLR grasslands
Long-billed Dowitcher	A large percentage of the population migrates through Cheyenne Bottoms WMA (ISS data; Farmer and Parent 1997)

APPENDIX A. HIGH PRIORITY HABITATS IN THE CP/PLR

The following are descriptions of the priority habitats in the CP/PLR, their use by shorebirds, and identified threats.

SHORTGRASS PRAIRIE

Found in eastern Colorado and New Mexico, western Oklahoma, Texas, Kansas, southeast Wyoming and Nebraska. There are several National Grasslands within the CP/PLR which are managed by the U.S. Forest Service (USFS). These grasslands are breeding habitat for Mountain Plovers, Long-billed Curlews, Upland Sandpipers and Killdeer and are used by migrating shorebirds throughout the CP/PLR.

Pawnee National Grassland (NG), Colorado, USFS.

The Pawnee NG has large contiguous amounts of habitat where federal lands are interspersed with private and state lands, totaling 193,000 acres about 80% of which (154,400 acres) is potentially suitable habitat for Mountain Plovers. This area has less than 30 acres of permanent water, no perennial streams and practically no ephemeral wetlands. In wet springs, spring migrating Long-billed Curlews are present. Curlews formerly nested in the Pawnee NG but they have not been documented nesting there since 1985. American Avocets and Wilson's Phalaropes nest on the Pawnee NG if water becomes available. Active habitat management includes maintaining vegetation at a height of 7 cm (3 in) or less for nesting Mountain Plovers. This grassland has extensive potential habitat for this species because the dominant vegetation is blue grama and buffalograss which can be grazed to a short stature while maintaining system integrity (M. Ball pers. comm.).

Comanche, Cimarron, Rita Blanca, and Kiowa National Grasslands, USFS.

These grasslands occupy about 800,000 acres in southeast Colorado, southwest Kansas, the panhandle of Oklahoma, northwest Texas, and northeast New Mexico and are used by breeding Mountain Plovers and Long-billed Curlews. Habitat types include shortgrass prairie, mixed prairie, sand sage prairie and playa lakes. Mountain Plovers primarily nest on or near the Cimarron and Comanche Grasslands. Their use is low to nonexistent on the Rita Blanca and Kiowa National Grasslands because the vegetation height is higher than their preferred nesting habitat (D. Svingen pers. commun.). These grasslands also contain a small number of playa lakes (about 1% of the area) which have migrating American Avocets, Killdeer, Long-billed Dowitchers, Black-necked Stilts, Pectoral, Baird's and White-rumped sandpipers. The number of birds using the playas are relatively small (usually less than 50). These playas, however, may receive greater use after the completion of projected restoration work.

Ogalala National Grassland, Nebraska, USFS.

Contains shortgrass to mixed prairie, rolling plains, badlands, and rock outcrops. Scattered stock ponds provide the only consistent source of water. Nesting Long-billed Curlews and Upland Sandpipers use this grassland.

MIXED AND TALLGRASS PRAIRIE

These habitats are found in the Flint Hills Grasslands, at the eastern edge of the CP/PLR. They include Konza Prairie in north central Kansas and the Tallgrass Prairie Reserve in north central Oklahoma. These grasslands are used by nesting and migrating Upland Sandpipers. Buff-breasted Sandpipers and American Golden-Plovers migrate through mixed- and tallgrass prairies of the CP/PLR. Buff-breasted Sandpipers are commonly reported around “sod” farms in eastern Nebraska, and particularly in York and Seward counties in Nebraska and in Sedgwick, Douglas and Johnson counties in Kansas.

SEMIPERMANENT IMPOUNDMENTS AND MUDFLATS

These wetlands are usually managed and maintained by various state, federal, and non-government agencies with the intent of providing habitat for migrating waterbirds, primarily waterfowl and shorebirds. The availability of water within these wetlands is fairly stable and reliable. As these wetlands dry during the summer or as high spring winds move water from one side of the moist soil impoundment to the other, mudflats emerge providing foraging and resting habitat to migrating and nesting shorebirds.

Cheyenne Bottoms Wildlife Management Area and Preserve, Kansas Department of Wildlife and Parks (KDWP) and The Nature Conservancy.

This is one of the key large, (16,595 ha or 41,000 acres), and relatively stable sites providing shorebird habitat in the CP/PLR. It is an important stopover area for White-rumped, Baird's, Stilt, and Pectoral sandpipers, Long-billed Dowitchers, Wilson's Phalaropes, Hudsonian and Marbled godwits, and, in the surrounding dry fields, Buff-breasted Sandpipers. It provides breeding habitat for American Golden-Plovers, Snowy Plovers, Killdeer, Black-necked Stilts, American Avocets, Spotted, Upland, Least and Semipalmated sandpipers and Wilson's Phalaropes. This area is critical due to its large size, extensive mudflats, relative isolation, and tremendous invertebrate populations. Threats to Cheyenne Bottoms include cattail encroachment, unreliable water rights, and development of hog processing/production industry in the county and within the watershed of the Arkansas River and Walnut Creek. Potential management conflicts include water management which minimizes the spread of cattail, avian botulism outbreaks, and providing a balance of relatively shallow water for migrating shorebirds and deeper water for recreational use in the fall.

Quivira National Wildlife Refuge (NWR), Kansas, USFWS.

Also a WHSRN site, Quivira is another key stable areas of shorebird habitat (~12,000 acres). It is an important staging area for many species of migrating shorebirds including priority species such as White-rumped and Stilt sandpipers. It is also an important breeding site within the CP/PLR for American Avocets, Black-necked Stilts, Snowy Plovers, and Killdeer. This NWR is crucial to shorebirds due to its size and availability of mudflats, shallow water wetlands, salt flats, grasslands and habitat management capabilities. Potential threats to the habitat quality and ability to manage habitat include water rights, effects of groundwater pumping for irrigation, droughts and floods which affect water availability, increase in water salinity, and control of

emergent vegetation. If a proposed hog processing plant is constructed near Great Bend, there could be threats to water quality from production facilities as well. Active oil wells, operated by private organizations and individuals who own the mineral rights, are also located within the refuge boundary. Although they are closely monitored, they do pose an inherent threat of small localized oil spills.

Hackberry Flat Wildlife Management Area, Oklahoma.

Located in southwest Oklahoma it is a State-owned and managed wetland area. A critical area for shorebirds due to the extensive and stable amount of mudflats. There are 2880 total ha (7,120 ac); 1600 ha (4,000 ac) can be flooded and the remaining acres are upland habitat. Restoration work has been completed, including the installation of a 27 km (17 mi) water delivery pipeline which will provide water management capabilities on a year round basis. This area is an important stop-over site for over 24 species of migrating shorebirds notably White-rumped, Baird's, Stilt and Pectoral sandpipers, Long-billed Dowitchers, and Mountain and Snowy plovers. The area also offers breeding habitat for Killdeer, Black-necked Stilts, and American Avocets. There are numerous wetlands that support from a hundred to a few thousand migrating shorebirds in eastern New Mexico and Colorado and north central Oklahoma. These wetlands may not be critical on an individual basis but as whole they are quite important. The habitat that these sites provide to migrating shorebirds is potentially threatened by a variety of activities such as invasion of woody species, proximity to a superfund site, urban sprawl and neighboring hog processing plants.

SALT FLATS

These large expanses of unvegetated, saline flats can be temporarily flooded by precipitation or rising water levels in nearby lakes or impoundments. Snowy Plovers generally nest on the drier portions of salt flats. They forage on springs or other sources of ephemeral water sources found within or near the flats. American Avocets also nest among clumps of vegetation within salt flats. These flats are very important staging areas for migrating shorebirds, especially Semipalmated Plovers, Semipalmated, White-rumped and Stilt sandpipers and Dunlins. Often there are pockets of salt flats within wetland management areas. These areas may be viewed as "unused" and not important wildlife habitat due to their stark appearance; however, collectively they are vital to shorebirds, especially to nesting and migrating Piping Plovers and nesting Snowy Plovers. Quivira NWR (above) is also an example of salt flat habitat managed for shorebird habitat.

Salt Plains NWR, Oklahoma, USFWS.

This is the third WHSRN site located in the CP/PLR. This important stopover area has extensive mudflats and shallow water which supports thousands of migrating shorebirds and 600 pairs of nesting Snowy Plovers. It is an important area for large numbers of American Golden-Plovers, Baird's, Semipalmated and White-rumped sandpipers and other species. Salt Plains NWR is critical because it is one of the most reliable sources of mudflat and shallow water habitat in the CP/PLR. One threat to the shorebird habitat on this refuge is tamarisk, or salt cedar, encroachment.

Slate Creek Wetlands, Kansas, KDWP and private.

This 5,000 acre (2024 ha) area is a mosaic of freshwater and saline water wetlands. This area is an important stop-over site for over 30 species of migrating shorebirds and it falls within the WHSRN guidelines as a regional site with at least 20,000 shorebirds passing through annually (E. Young and M. Thompson pers. comm.). Priority species such as Hudsonian Godwit, Semipalmated, Least, White-rumped, Baird's, Stilt, and Pectoral sandpipers, and Long-billed Dowitcher use the area during migration. Additionally, Upland Sandpiper breed in the surrounding uplands. Killdeer are common breeders and American Avocets and Snowy Plovers are possible breeders being recorded throughout the nesting season but breeding has not been confirmed. Potential threats include urbanized development (primarily mobile home parks); siltation from increased sediment loads both upstream along Slate Creek and in the immediate area from development and farming; and management conflicts that provide shallow water areas for migrating shorebirds versus deeper water habitats for recreational use in the fall.

SALINE LAKES

These wetlands are primarily found in Texas and New Mexico and most are in private ownership. These lakes provide shallow water and mudflat habitats and support valuable invertebrate populations. Saline lakes are breeding habitat for Snowy Plovers, American Avocets and Black-necked Stilts, and an important stopover site for many migrating shorebird species. Saline lakes are important to maintain because of the water permanence and reliability relative to other wetlands (playas) in the southern portion of the CP/PLR. These wetlands also may be a critical stepping stone for migrating shorebirds between Cheyenne Bottoms and the Texas Coast. Threats to this habitat include declining water table (results in less permanence and higher salinities), pesticide dumping, and petroleum development. Examples include Mound Lake, Cedar Lake, Tahoka Lake, and Muleshoe NWR and Nebraska's Eastern Saline Wetlands.

PLAYA LAKES

Playa lakes are the "potholes of the southern Central Plains". They are shallow depressions within the landscape that fill with water from precipitation and/or ground water. Most are ephemeral but some may hold water year round depending on conditions. These drying and wetting cycles keep the wetlands very productive relative to invertebrate production. However, the natural water regime has been disrupted by agriculture, grazing, and other human demands on water in these arid lands. Playa lakes constitute a large proportion of the wetlands within the CP/PLR and can be found throughout the area with most found in the panhandle of Texas and Oklahoma, southwest Kansas, eastern New Mexico and Colorado, and southwest Nebraska. Some of these lakes are in state and federal ownership but most are in private ownership. These ephemeral lakes are used by thousands of migrating shorebirds (Davis and Smith 1998) including Long-billed Curlews and nesting Snowy Plovers (in New Mexico and Oklahoma), American Avocets, Black-necked Stilts, and Wilson's Phalaropes. In the southern portion of the CP/PLR, threats to these wetlands include altered hydrology (primarily supplemental pumping), and irrigation water re-use pits that drain numerous playas. These pits are deep, sometimes up to 10 feet and eliminate shallow water with the resulting impacts to plants and invertebrates,

sedimentation, tillage, and drainage. Management of water levels and other attributes are not always possible due to the water regime. Other threats to playas are runoff from confined animal feeding operations (e.g. hog farms) and farming of surrounding grassland buffers.

Rainwater Basin, Nebraska, USFWS, NGPC, private.

Located in south central Nebraska, the Rainwater Basin covers 17 counties including Kearney, Phelps, Adams, Clay, Hamilton, York, and Fillmore and measure approximately 4,200 square miles. The Rainwater Basin is a series of temporary or seasonal playa lakes. Most temporary or seasonal wetlands are farmed and most semipermanent wetlands are used for pasture land. However, shorebird habitat can be exceptional if rainfall coincides with shorebird migration. This area is important to large numbers of migratory Hudsonian Godwits, Long-billed Dowitchers, Buff-breasted, White-rumped, Stilt, Least, and Pectoral sandpipers, American Avocets, Lesser Yellowlegs, Semipalmated Plovers, Common Snipe, Wilson's Phalaropes, and Killdeer. However, shorebird numbers and stopover habitat may not be fully understood. With the cooperation of landowners, state and federal natural resource agencies are conducting wetland habitat restoration and improvement work on private lands as part of the Rainwater Basin Joint Venture. However, most of this work primarily benefits waterfowl due to the timing of agricultural practices and natural rainfall patterns. Nevertheless, if agreements were made with private landowners to graze vegetated playa lakes the amount of relatively vegetation-free wetland habitat for shorebirds would be increased. There are management activities that could be conducted on these small basins, including vegetation management, timed water delivery, and conversion to grazing land.

ROLLING PLAINS, PERCHED WATER-TABLE LAKES

These areas occur in the eastern third of the Texas panhandle and further east into Haskell County, Oklahoma. Ownership is both private and public, and the areas are important to migrating shorebirds and nesting American Avocets and Black-necked Stilts. Threats include brush encroachment along shorelines, impacts of altered hydrology (supplemental pumping) to plants and invertebrates, sedimentation, tillage, and drainage. Examples include Winchester and Taylor lakes.

RIVERINE AND ASSOCIATED FLOOD PLAINS AND OXBOWS

The rivers within the CP/PLR, such as the Red and Canadian, are critical habitat for nesting Snowy Plovers and migrating habitat for many species. The Platte, Niobrara, and Loup River systems in Nebraska are also critical habitat for nesting Piping Plovers. Spotted Sandpipers often nest along river banks and Killdeer nest along river edges or on sandbars within the channels. Rivers within the CP/PLR benefit migrating shorebirds especially in the fall when water levels in other wetlands may be low, and they will use shallow water, sandbars, and mudflats within the channel.

Red River.

This system is found in the Texas Panhandle and Oklahoma, and is in private and state ownership. Snowy Plovers nest on sand and gravel bars within the river. Migrating shorebirds

use shallow water and sandbars within the river channel as well as adjacent wet meadows. Threats to shorebird habitat within this river system include bank stabilization, establishment of vegetation, sand mining, and reservoir construction.

Canadian River.

This river system cuts through Oklahoma, Texas, and New Mexico. Migrating shorebirds use shallow water, sandbars and wet meadows. Snowy Plovers nest on sandbars within the river. Threats include bank stabilization projects and sand mining operations.

SANDHILLS OF NEBRASKA

They are located in northwest and north central Nebraska. While most of the area is in private ownership, it does contain the Crescent Lake and Valentine NWRs, USFWS. The region contains over 405,000 ha (1 million acres) of marshes, lakes and wet meadows. Crescent Lake and Valentine NWRs provide important habitat for breeding and migrant shorebirds. Within the CP/PLR, this is where most of the Long-billed Curlews, Wilson's Phalaropes and Willets breed. This area is especially important to shorebirds because of the abundance of migratory stopover habitat. Management capabilities, however, are limited because wetlands depend on a natural variable water regime.

RESERVOIRS

Large reservoirs are associated with river systems, including the Platte, Arkansas, and Solomon rivers. Many reservoirs were developed for flood control, recreation, and irrigation purposes. Their value as wildlife habitat is often of secondary concern. However, these reservoirs provide extensive mudflats for foraging shorebirds, especially during late summer/early fall when water levels are receding due to water being removed for crop irrigation and evaporation. During dry years, nesting habitat is also available during the spring and early summer. Issues and threats to these areas include water rights (regarding sale of water to municipalities); woody vegetation encroachment along shorelines; and shoreline recreation (ORVs, water skiers, personal watercraft, and camping).