

Glossary

abiotic—Pertaining to nonliving things.

accessible—Pertaining to physical access to areas and activities for people of different abilities, especially those with physical impairments.

adaptive resource management—The rigorous application of management, research, and monitoring programs to gain information and experience necessary to assess and change management activities; a process that uses feedback from research, monitoring programs, and evaluation of management actions to support or change objectives and strategies at all planning levels; a process in which policy decisions are carried out within a framework of scientifically driven experiments to test predictions and assumptions inherent in management plan. Analysis of results helps managers decide whether current management should continue as is or whether it should be modified to achieve desired conditions.

Administration Act—National Wildlife Refuge System Administration Act of 1966.

alternative—A reasonable way to solve an identified problem or satisfy the stated need (40 CFR 1500.2); one of several different means of accomplishing refuge purposes and goals and contributing to the Refuge System mission (Draft Service Manual 602 FW 1.5).

amphibian—A class of cold-blooded vertebrates including frogs, toads or salamanders.

annual—A plant that flowers and dies within 1 year of germination.

baseline—A set of essential observations, data, or information used for comparison or a control.

biological control—The use of organisms or viruses to control invasive plants or other pests.

biological diversity, also biodiversity—The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur (Service Manual 052 FW 1.12B). The National Wildlife Refuge System's focus is on indigenous species, biotic communities, and ecological processes.

biotic—Pertaining to life or living organisms; caused, produced by, or comprising living organisms.

canopy—A layer of foliage, generally the uppermost layer, in a vegetative stand; mid-level or under-

story vegetation in multilayered stands. Canopy closure (also canopy cover) is an estimate of the amount of overhead vegetative cover.

CCC—See Civilian Conservation Corps.

CCP—See comprehensive conservation plan.

CFR—See Code of Federal Regulations.

cfs—Cubic feet per second.

Civilian Conservation Corps (CCC)—Peacetime civilian “army” established by President Franklin D. Roosevelt to perform conservation activities from 1933–42. Activities included erosion control; fire-fighting; tree planting; habitat protection; stream improvement; and building of fire towers, roads, recreation facilities, and drainage systems.

Code of Federal Regulations (CFR)—The codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal Government. Each volume of the CFR is updated once each calendar year.

compatibility determination—See compatible use.

compatible use—A wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Director of the U.S. Fish and Wildlife Service, will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge (Draft Service Manual 603 FW 3.6). A compatibility determination supports the choice of compatible uses and identified stipulations or limits necessary to make sure that there is compatibility.

comprehensive conservation plan (CCP)—A document that describes the desired future conditions of the refuge and provides long-range guidance and management direction for the refuge manager to accomplish the purposes of the refuge, contribute to the mission of the Refuge System, and to meet other relevant mandates (Draft Service Manual 602 FW 1.5).

concern—See issue.

conspecific—An individual belonging to the same species as another.

cool-season grasses—Grasses that begin growth earlier in the season and often become dormant in the summer. These grasses will germinate at lower temperatures. Examples of cool-season

grasses at the refuge are western wheatgrass, needle and thread, and green needlegrass.

coteau—A hilly upland including the divide between two valleys; a divide; the side of a valley.

cover, also cover type, canopy cover—Present vegetation of an area.

cultural resources—The remains of sites, structures, or objects used by people in the past.

depredation—Destruction or consumption of eggs, broods, or individual wildlife because of a predatory animal; damage inflicted on agricultural crops or ornamental plants by wildlife.

drawdown—The act of manipulating water levels in an impoundment to allow for the natural, cyclical drying out of a wetland.

EA—See environmental assessment.

ecosystem—A dynamic and interrelating complex of plant and animal communities and their associated nonliving environment; a biological community, with its environment, functioning as a unit. For administrative purposes, the Service has designated 53 ecosystems covering the United States and its possessions. These ecosystems generally correspond with watershed boundaries and their sizes and ecological complexity vary.

EIS—Environmental impact statement.

emergent—A plant rooted in shallow water and having most of the vegetative growth above water such as cattail and hardstem bulrush.

endangered species, Federal—A plant or animal species listed under the Endangered Species Act of 1973, as amended, that is in danger of extinction throughout all or a substantial part of its range.

endangered species, State—A plant or animal species in danger of becoming extinct or extirpated in a particular state within the near future if factors contributing to its decline continue. Populations of these species are at critically low levels or their habitats have been degraded or depleted to a substantial degree.

endemic species—Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality.

environmental assessment (EA)—A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action and alternatives to such action, and provides sufficient evidence and analysis of effects to decide whether to prepare an environmental impact statement or finding of no significant impact (40 CFR 1508.9).

EPA—Environmental Protection Agency.

extinction—The complete disappearance of a species from the earth; no longer existing.

extirpation—The extinction of a population; complete eradication of a species within a specified area.

fauna—All the vertebrate and invertebrate animals of an area.

Federal trust resource—A trust is something managed by one entity for another who holds the ownership. The Service holds in trust many natural resources for the people of the United States of America as a result of Federal acts and treaties. Examples are species listed under the Endangered Species Act, migratory birds protected by international treaties, and native plant or wildlife species found on a national wildlife refuge.

Federal trust species—All species where the Federal Government has primary jurisdiction including federally endangered or threatened species, migratory birds, anadromous fish, and certain marine mammals.

flora—All the plant species of an area.

FMP—fire management plan.

forb—A broad-leaved, herbaceous plant; a seed-producing annual, biennial, or perennial plant that does not develop persistent woody tissue but dies down at the end of the growing season.

fragmentation—The alteration of a large block of habitat that creates isolated patches of the original habitat that are interspersed with a variety of other habitat types; the process of reducing the size and connectivity of habitat patches, making movement of individuals or genetic information between parcels difficult or impossible.

Friends group—Any formal organization whose mission is to support the goals and purposes of its associated refuge and the National Wildlife Refuge Association overall; Friends organizations and cooperative and interpretive associations.

General Schedule—Pay rate schedule for certain Federal positions. Sometimes “GS.”

geographic information system (GIS)—A computer system capable of storing and manipulating spatial data; a set of computer hardware and software for analyzing and displaying spatially referenced features (such as points, lines and polygons) with nongeographic attributes such as species and age.

GIS—See geographic information system.

goal—Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (Draft Service Manual 620 FW 1.5).

grassland tract—A contiguous area of grassland without fragmentation.

habitat—Suite of existing environmental conditions required by an organism for survival and reproduction; the place where an organism typically lives and grows.

habitat disturbance—Substantial alteration of habitat structure or composition; may be natural (for

- example, wildland fire) or human-caused events (for example, timber harvest and disking).
- habitat type, also vegetation type, cover type**—A land classification system based on the concept of distinct plant associations.
- herbivory**—The state or condition of feeding on plants or plant parts.
- herptile**—A reptile or an amphibian.
- HMP**—Habitat management plan.
- HUA**—Hydrologic unit area.
- hydroperiod**—The seasonal pattern of the water level of a wetland that is often used to characterize wetland types. Examples of seasonal patterns include flood frequency, duration, and depth.
- impoundment**—A body of water created by collection and confinement within a series of levees or dikes, creating separate management units although not always independent of one another.
- Improvement Act**—National Wildlife Refuge System Improvement Act of 1997.
- indigenous**—Originating or occurring naturally in a particular place.
- integrated pest management (IPM)**—Methods of managing undesirable species such as invasive plants; education, prevention, physical or mechanical methods of control, biological control, responsible chemical use, and cultural methods.
- introduced species**—A species present in an area because of intentional or unintentional escape, release, dissemination, or placement into an ecosystem as a result of human activity.
- invasive plant, also noxious weed**—A species that is nonnative to the ecosystem under consideration and whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health.
- inviolate sanctuary**—A place of refuge or protection where animals and birds may not be hunted.
- IPM**—See integrated pest management.
- issue**—Any unsettled matter that requires a management decision; for example, a Service initiative, opportunity, resource management problem, a threat to the resources of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition (Draft Service Manual 602 FW 1.5).
- Kansas Department of Wildlife, Parks and Tourism (KDWPT)**—A State agency responsible for overseeing the conservation of game and nongame species in Kansas.
- management alternative**—See alternative.
- migration**—Regular extensive, seasonal movements of birds between their breeding regions and their wintering regions; to pass usually periodically from one region or climate to another for feeding or breeding.
- migratory birds**—Birds that follow a seasonal movement from their breeding grounds to their wintering grounds. Waterfowl, shorebirds, raptors, and songbirds are all migratory birds.
- mission**—Succinct statement of purpose or reason for being.
- mitigation**—Measure designed to counteract an environmental effect or to make an effect less severe.
- mixed-grass prairie**—A transition zone between the tallgrass prairie and the shortgrass prairie dominated by grasses of medium height that are approximately 2–4 feet tall. Soils are not as rich as the tallgrass prairie and moisture levels are less.
- monitoring**—The process of collecting information to track changes of selected parameters over time.
- national wildlife refuge**—A designated area of land, water, or an interest in land or water within the National Wildlife Refuge System, but does not include coordination areas; a complete listing of all units of the Refuge System is in the current “Annual Report of Lands Under Control of the U.S. Fish and Wildlife Service.”
- National Wildlife Refuge System (Refuge System)**—Various categories of areas administered by the Secretary of the Department of the Interior for the conservation of fish and wildlife including species threatened with extinction, all lands, waters, and interests therein administered by the Secretary as wildlife refuges, areas for the protection and conservation of fish and wildlife that are threatened with extinction, wildlife ranges, game ranges, wildlife management areas, and waterfowl production areas.
- National Wildlife Refuge System Improvement Act of 1997 (Improvement Act)**—Sets the mission and the administrative policy for all refuges in the National Wildlife Refuge System; defines a unifying mission for the Refuge System; establishes the legitimacy and appropriateness of the six priority public uses (hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation); establishes a formal process for determining appropriateness and compatibility; establish the responsibilities of the Secretary of the Department of the Interior for managing and protecting the Refuge System; requires a comprehensive conservation plan for each refuge by the year 2012. This Act amended parts of the Refuge Recreation Act and National Wildlife Refuge System Administration Act of 1966.
- native species**—A species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem.

Neotropical migrant—A bird species that breeds north of the United States and Mexican border and winters primarily south of this border.

NEPA—National Environmental Policy Act of 1969.

nest success—The percentage of nests that successfully hatch one or more eggs of the total number of nests started in an area.

NOA—Notice of availability.

nongovernmental organization—Any group that is not comprised of Federal, State, tribal, county, city, town, local, or other governmental entities.

noxious weed, also invasive plant—Any living stage (including seeds and reproductive parts) of a parasitic or other plant of a kind that is of foreign origin (new to or not widely prevalent in the United States) and can directly or indirectly injure crops, other useful plants, livestock, poultry, other interests of agriculture, including irrigation, navigation, fish and wildlife resources, or public health. According to the Federal Noxious Weed Act (PL 93–639), a noxious weed (such as invasive plant) is one that causes disease or has adverse effects on humans or the human environment and, therefore, is detrimental to the agriculture and commerce of the United States and to public health.

NRCS—Natural Resources Conservation Service of the U.S. Department of Agriculture.

objective—An objective is a concise target statement of what will be achieved, how much will be achieved, when and where it will be achieved, and who is responsible for the work; derived from goals and provide the basis for determining management strategies. Objectives should be achievable and time specific and should be stated quantitatively to the extent possible. If objectives cannot be stated quantitatively, they may be stated qualitatively (Draft Service Manual 602 FW 1.5).

overwater species—Nesting species such as diving ducks and many colonial-nesting birds that build nests within dense stands of water-dependent plants, primarily cattail, or that build floating nests of vegetation that rest on the water.

OWLS—Outdoor wildlife learning site.

passerine—Pertaining to an order of birds, Passeriformes, that comprises more than half of all birds and that typically has feet adapted for perching.

patch—An area distinct from that around it; an area distinguished from its surroundings by environmental conditions.

perennial—Lasting or active through the year or through many years; a plant species that has a lifespan of more than 2 years.

plant community—An assemblage of plant species unique in its composition; occurs in particular locations under particular influences; a reflection or integration of the environmental influences on

the site such as soil, temperature, elevation, solar radiation, slope, aspect, and rainfall; denotes a general kind of climax plant community, such as ponderosa pine or bunchgrass.

prescribed fire—The skillful application of fire to natural fuels under conditions such as weather, fuel moisture, and soil moisture that allow confinement of the fire to a predetermined area and produces the intensity of heat and rate of spread to accomplish planned benefits to one or more objectives of habitat management, wildlife management, or hazard reduction.

priority public use—One of six uses authorized by the National Wildlife Refuge System Improvement Act of 1997 to have priority if found to be compatible with a refuge's purposes. This includes hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation.

proposed action—The alternative proposed to best achieve the purpose, vision, and goals of a refuge (contributes to the Refuge System mission, addresses the significant issues, and is consistent with principles of sound fish and wildlife management).

public—Individuals, organizations, and groups; officials of Federal, State, and local government agencies; American Indian tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have shown an interest in Service issues and those who do or do not realize that Service decisions may affect them.

public involvement—A process that offers affected and interested individuals and organizations an opportunity to become informed about, and to express their opinions on, Service actions and policies. In the process, these views are studied thoroughly and thoughtful consideration of public views is given in shaping decisions for refuge management.

purpose of the refuge—The purpose of a refuge is specified in or derived from the law, proclamation, Executive order, agreement, public land order, donation document, or administrative memorandum establishing authorization or expanding a refuge, refuge unit, or refuge subunit (Draft Service Manual 602 FW 1.5).

raptor—A carnivorous bird such as a hawk, a falcon, or a vulture that feeds wholly or chiefly on meat taken by hunting or on carrion (dead carcasses).

Reclamation—Bureau of Reclamation of the U.S. Department of the Interior.

refuge operations needs system (RONS)—A national database that contains the operational needs of each refuge that need money. Projects included

are those required to carry out approved plans and meet goals, objectives, and legal mandates.

refuge purpose—See purpose of the refuge.

Refuge System—See National Wildlife Refuge System.

refuge use—Any activity on a refuge, except administrative or law enforcement activity, carried out by or under the direction of an authorized Service employee.

resident species—A species inhabiting a given locality throughout the year; nonmigratory species.

rest—Free from biological, mechanical, or chemical manipulation, in reference to refuge lands.

restoration—Management emphasis designed to move ecosystems to desired conditions and processes, such as healthy upland habitats and aquatic systems.

riparian area or riparian zone—An area or habitat that is transitional from terrestrial to aquatic ecosystems including streams, lakes, wet areas, and adjacent plant communities and their associated soils that have free water at or near the surface; an area whose parts are directly or indirectly attributed to the influence of water; of or relating to a river; specifically applied to ecology, “riparian” describes the land immediately adjoining and directly influenced by streams. For example, riparian vegetation includes all plant life growing on the land adjoining a stream and directly influenced by the stream.

RONs—See refuge operations needs system.

rough fish—A fish that is neither a sport fish nor an important food fish.

SAMMS—See Service Asset Maintenance Management System.

scoping—The process of obtaining information from the public for input into the planning process.

seasonally flooded—Surface water is present for extended periods in the growing season, but is absent by the end of the season in most years.

sediment—Material deposited by water, wind, and glaciers.

Service—See U.S. Fish and Wildlife Service.

Service Asset Maintenance Management System (SAMMS)—A national database that contains maintenance projects for each refuge that need money; projects include those required to keep existing equipment and buildings, correct safety deficiencies for the implementation of approved plans, and meet goals, objectives, and legal mandates.

sheet flow—The overland flow of water, typically from precipitation to lower elevation areas.

shelterbelt—Single to multiple rows of trees and shrubs planted around cropland or buildings to block or slow down the wind.

shorebird—Any of a suborder (Charadrii) of birds such as a plover or a snipe that frequent the sea-shore or mudflat areas.

spatial—Relating to, occupying, or having the character of space.

special status species—Plants or animals that have been identified through Federal law, State law, or agency policy as requiring special protection of monitoring programs. Examples include federally listed endangered, threatened, proposed, or candidate species; State-listed endangered, threatened, candidate, or monitor species; Service’s species of management concern; species identified by the Partners in Flight program as being of extreme or moderately high conservation concern.

special use permit—A permit for special authorization from the refuge manager required for any refuge service, facility, privilege, or product of the soil provided at refuge expense and not usually available to the public through authorizations in Title 50 CFR or other public regulations (Refuge Manual 5 RM 17.6).

species of concern—Those plant and animal species, while not falling under the definition of special status species, that are of management interest by virtue of being Federal trust species such as migratory birds, important game species, or significant keystone species; species that have documented or apparent populations declines, small or restricted populations, or dependence on restricted or vulnerable habitats.

stepdown management plan—A plan that provides the details necessary to carry out management strategies identified in the comprehensive conservation plan (Draft Service Manual 602 FW 1.5).

strategy—A specific action, tool, or technique or combination of actions, tools, and techniques used to meet unit objectives (Draft Service Manual 602 FW 1.5).

submergent—A vascular or nonvascular hydrophyte, either rooted or nonrooted, that lies entirely beneath the water surface, except for flowering parts in some species.

surrogate species—A species used as an indicator of landscape habitat and system conditions. It represents multiple species and habitats within a defined landscape or geographic area.

threatened species, Federal—Species listed under the Endangered Species Act of 1973, as amended, that are likely to become endangered in the future throughout all, or a substantial part, of their range.

threatened species, State—A plant or animal species likely to become endangered in a particular state within the near future if factors contributing to

population decline or habitat degradation or loss continue.

travel corridor—A landscape feature that facilitates the biologically effective transport of animals between larger patches of habitat dedicated to conservation functions. Such corridors may facilitate several kinds of traffic including frequent foraging movement, seasonal migration, or the once in a lifetime dispersal of juvenile animals. These are transition habitats and need not contain all the habitat elements required for long-term survival or reproduction of its migrants.

trust resource—See Federal trust resource.

trust species—See Federal trust species.

USDA—U.S. Department of Agriculture.

U.S. Fish and Wildlife Service (Service, FWS)—The principal Federal agency responsible for conserving, protecting, and enhancing fish and wildlife and their habitats for the continuing benefit of the American people. The Service manages the 93-million-acre National Wildlife Refuge System comprised of more than 530 national wildlife refuges and thousands of waterfowl production areas. It also operates 65 national fish hatcheries and 78 ecological service field stations, the agency enforces Federal wildlife laws, manages migratory bird populations, restores national significant fisheries, conserves and restores wildlife habitat such as wetlands, administers the Endangered Species Act, and helps foreign governments with their conservation efforts. It also oversees the Federal aid program that distributes millions of dollars in excise taxes on fishing and hunting equipment to State wildlife agencies.

FWS—See U.S. Fish and Wildlife Service.

U.S. Geological Survey (USGS)—A Federal agency whose mission is to provide reliable scientific information to describe and understand the earth; decrease loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

USGS—See U.S. Geological Survey.

vision statement—A concise statement of the desired future condition of the planning unit, based primarily on the Refuge System mission, specific refuge purposes, and other relevant mandates (Draft Service Manual 602 FW 1.5).

visual obstruction—Pertaining to the density of a plant community; the height of vegetation that blocks the view of predators and conspecifics to a nest.

visual obstruction reading (VOR)—A method of visually quantifying vegetative structure and composition.

VOR—See visual obstruction reading.

wading birds—Birds having long legs that enable them to wade in shallow water including egrets, great blue herons, black-crowned night-herons, and bitterns.

Wage Grade Schedule—Pay rate schedule for certain Federal positions. Sometimes “WG.”

waterfowl—A category of birds that includes ducks, geese, and swans.

watershed—The region draining into a river, a river system, or a body of water.

wetland management district (WMD)—Land that the Refuge System acquires with Federal Duck Stamp money for restoration and management primarily as prairie wetland habitat critical to waterfowl and other wetland birds.

wildland fire—A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (Service Manual 621 FW 1.7).

wildlife-dependent recreational use—Use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, environmental education, or interpretation. The National Wildlife Refuge System Improvement Act of 1997 specifies that these are the six priority public uses of the Refuge System.

woodland—Habitats dominated by trees.

Appendix A

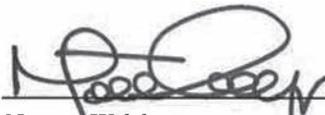
Environmental Compliance

Environmental Action Statement

U.S. Fish and Wildlife Service, Region 6
Lakewood, Colorado

Within the spirit and intent of the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act and other statutes, orders, and policies that protect fish and wildlife resources, I have established the following administrative record.

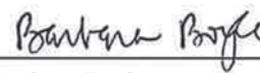
I have determined that the action of implementing the "Comprehensive Conservation Plan—Quivira National Wildlife Refuge" is found not to have significant environmental effects, as determined by the attached "finding of no significant impact" and the environmental assessment as found with the draft comprehensive conservation plan.



Noreen Walsh
Regional Director, Region 6
U.S. Fish and Wildlife Service
Lakewood, Colorado

10.23.13

Date



Barbara Boyle
Refuge Supervisor, Region 6
U.S. Fish and Wildlife Service
Lakewood, Colorado

9/27/13

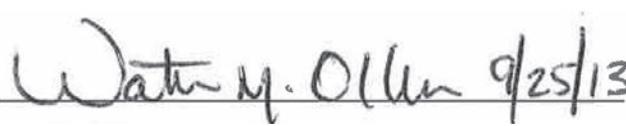
Date



Will Meeks
Assistant Regional Director, Region 6
National Wildlife Refuge System
U.S. Fish and Wildlife Service
Lakewood, Colorado

10/17/13

Date



W. Mike Oldham
Refuge Manager
Quivira National Wildlife Refuge
U.S. Fish and Wildlife Service
Stafford, Kansas

9/25/13

Date

Finding of No Significant Impact

U.S. Fish and Wildlife Service, Region 6
Lakewood, Colorado

INTRODUCTION

This finding of no significant impact provides the basis for management decisions for the final comprehensive conservation plan and environmental assessment for the Quivira National Wildlife Refuge, Kansas. The comprehensive conservation plan was prepared along with an environmental assessment in compliance with the National Environmental Policy Act and relevant planning policies. We worked closely with the Kansas Department of Wildlife, Parks, and Tourism. Other Federal, State and local agencies, tribal governments, nongovernmental organizations, and individuals contributed input to the plan.

ALTERNATIVES

Based on an analysis of comments collected from the public, input from our staff, and a review of the needs of the National Wildlife Refuge System Improvement Act of 1997 and the National Environmental Policy Act, we identified several key issues for Quivira National Wildlife Refuge. These were addressed in the alternatives for future management, which are summarized below.

Alternative A

Alternative A is the no-action alternative, which represents the current management of Quivira National Wildlife Refuge. This alternative provides the baseline against which to compare the other alternatives. It also fulfills a need of the National Environmental Policy Act. Under alternative A, our management activity would continue unchanged. We would not develop any new management, restoration, or education programs at the refuge. Current habitat and wildlife practices benefiting migratory species and other wildlife would not be expanded or changed. Habitat management would remain focused primarily on benefiting migratory birds. Our staff would keep monitoring, inventory, and research activities at current levels. Budget and staff levels would remain the same with little change in overall trends. Programs would follow the same direction, emphasis, and intensity as they do now.

Alternative B

Alternative B places emphasis on restoring native communities and promoting the potential natural range of conditions on Quivira National Wildlife Refuge that help focal resources, or focal species and their respective habitats. Public use opportunities would continue to place importance on both consumptive

and non-consumptive activities. Limited deer and turkey hunting opportunities would be offered for the first time, following the development of a more detailed hunt plan. We would increase our attention and understanding of the connectedness of habitats and the effectiveness of our management as it relates to habitat conditions and associations with wildlife. To achieve this alternative, relatively minor changes in our operations; inventory, monitoring programs, and research; staff; and infrastructure would likely be required.

Alternative C

Alternative C promotes self-sustaining natural processes with less regard to the effects on focal species relative to alternative B. Key values for restoring natural ecological processes include achieving the long-term sustainability of native communities and lowering maintenance costs. Native plant communities tend to be more resilient to climate change and other environmental stressors than nonnative and highly managed ecosystems. Native wildlife species, including our trust resources, are also characteristically able to adapt to such changes. Efforts such as prescribed fire, grazing, and invasive species control would be focused on maintaining native plant community composition and diversity.

Relative to our other alternatives, habitat conditions would be allowed to fluctuate more with climatically driven wet and dry cycles. However, we would still need to mitigate the effects of past land uses on the refuge and in the watershed that have permanently altered some ecological processes. We would carry out this alternative in stages over many years, and changes in our research and monitoring programs, staff, operations, and infrastructure on the refuge would be required. Our success would be greatly influenced by our ability to develop new and expanded partnerships with stakeholders in the Rattlesnake Creek watershed.

PUBLIC INVOLVEMENT AND OUTREACH

The scoping period began on February 24, 2010, with the publication of a notice of intent in the Federal Register (FR75 (36): 8394–95). Before this, early in the preplanning phase, we outlined a process that would be inclusive of diverse stakeholder interests and would involve a range of activities for keeping the public informed and ensuring meaningful public input. Information was distributed through news releases, planning updates, and a series of public meetings.

During the initial scoping period, we received 80 written comments, including letters from 3 nongovernmental organizations.

Comments on the Draft Plan and EA

A notice of availability for the draft comprehensive conservation plan and environmental assessment was published in the Federal Register on April 22, 2013, (FR78 (77): 23778–80) announcing its availability, our intention to hold public meetings, and a request for comments. During the public review we held three public meetings, April 29–May 1, in Stafford, Wichita, and Great Bend, Kansas. Public participation in these meetings, and in the comprehensive conservation plan review process, was strong, with the meetings attended by more than 39 participants. In addition to oral comments recorded at the meetings, 60 emails and letters were received including letters from the Osage Nation, Federal and State agencies, and nongovernmental organizations.

The majority of comments indicated support for landscape conservation and native ecological community goals and objectives, including actions related to habitat and wildlife. Comments related to visitor services and, specifically, to hunting, however, varied widely. The comment period closed May 31, 2013.

DECISION

Based on this assessment and comments received, I have selected the following preferred alternative:

- a modified alternative B for refuge management

The preferred alternative was selected because it best meets the purposes for which the Quivira National Wildlife Refuge was established and is preferable to the “no-action” alternatives in light of physical, biological, economic, and social factors. The preferred alternative will achieve a reasonable balance among significant resource management issues, the refuge purposes, the National Wildlife Refuge System mission, our management policies, and the interests and perspectives of all stakeholders.

We have considered the environmental and relevant concerns presented by agencies, organizations, and individuals on the proposed action to develop and implement a comprehensive conservation plan for Quivira National Wildlife Refuge. The substantive issues and comments raised have been addressed in the final plan.

Alternative B was revised from the proposed action after our consideration of many comments received from agencies, tribes, other stakeholder organizations, and the public during the comment period. Revisions to the key management actions of alternative B for refuge management largely relate to hunting. The most significant revisions are listed below:

- Migratory waterfowl and upland bird hunting boundaries were revised to the same actions as alternative A. Thus, hunting opportunities will be provided in the North Lake area when whooping cranes are not present.
- In development of a more detailed hunt plan, consideration will be given to (1) the expansion of white goose hunting opportunities in the spring, and (2) allowing limited frogging opportunities only for bullfrogs and only during daylight hours when the refuge is open.
- General hunting activities will be closed on the refuge when whooping cranes are present. In developing a more detailed hunt plan, consideration will be given to one or few exceptions if those controlled activities are determined to have no or insignificant adverse effects to species of concern.
- Included among the nonhunting species will be sandhill crane, rail, woodcock and snipe, and prairie chicken largely because (1) populations are low on the refuge, and (2) associations relate to the conservation of species of concern. For example, whooping cranes often occur with sandhill cranes on the refuge.
- Clarification that hunting opportunities, notably those related to turkey and mammals, will be controlled by both State and Federal (refuge) regulations. Management will have the authority to limit many aspects of deer, turkey, and furbearer hunting, such as the location, timing, methods, and allowable take. Consideration will be given to species and habitat conservation goals and objectives, public and employee safety, logistics, and balancing multiple compatible use activities. The refuge will work with Kansas Department of Wildlife, Parks, and Tourism in developing appropriate options.

Management of the refuge will comply with all Federal laws and regulations that provide direction for managing units of the National Wildlife Refuge System. Various methods that involve rest, water level control, prescribed grazing, burning, mechanical, chemical, and cultural-related activities will be used to accomplish refuge goals and objectives

FINDING AND BASIS FOR DECISION

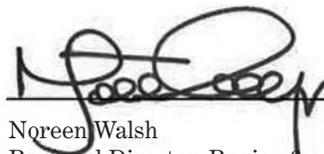
I find that the preferred alternative is not a major Federal action that would significantly affect the quality of the human environment within the meaning of Section 102(2) (C) of the National Environmental Policy Act. Accordingly, the preparation of an environmental impact statement on the proposed action is not required.

The following is a summary of anticipated environmental effects. The implementation of the preferred alternative will:

- manage for wildlife as a priority, with emphasis on providing for the needs of focal species as defined in the document;
- not adversely impact endangered or threatened species or their habitat;
- increase the sustainability and resiliency of the refuge and improve our ability to adjust to the uncertainty of climate change;
- continue to control invasive species, especially species not native to the region;
- initiate the conversion of refuge cropland areas (an estimated 850–900 acres typed as farmed) to appropriate native community types;
- reduce the amount of woody coverage (estimated to be up to 850 acres of trees) to increase the area of native sand prairie that supports many focal species, especially those that are area sensitive;
- reduce opportunities for the introduction and spread of diseases and pathogens;
- develop monitoring protocols to improve management decisionmaking, particularly related to the habitat relationships of focal species;
- improve the coordination of the refuge with the Great Plains Landscape Conservation Cooperative and other research groups to improve our understanding of the local impacts from climate change;
- not adversely impact archaeological or historical resources;
- increase interpretation of cultural resources, specifically of Native American historical use;
- preserve refuge water rights and explore opportunities to improve water use efficiency and other water-related factors within our water rights to support focal species;

- provide a balance between resource protection and providing wildlife-dependent recreational opportunities without negatively impacting natural resources;
- improve both consumptive and nonconsumptive use opportunities;
- enhance environmental education opportunities with improvements to facilities at Quivira National Wildlife Refuge and the Great Plains Nature Center;
- maintain staff at appropriate levels to accomplish goals and objectives;
- not have a disproportionately high or adverse human health or environmental effect on minority or low-income populations;
- maintain public and employee safety as a mission-critical factor;
- expand resource protection appropriately with increased public use opportunities.

The State of Kansas has been notified and given the opportunity to review the comprehensive conservation plan and associated environmental assessment.



Noreen Walsh
Regional Director, Region 6
U.S. Fish and Wildlife Service
Lakewood, Colorado

10-23-13

Date

Appendix B

Compatibility Determinations

B.1 Refuge Name

Quivira National Wildlife Refuge.

B.2 Date Established

May 3, 1955.

B.3 Establishing and Acquisition Authorities

Migratory Bird Conservation Act (16 U.S.C. § 715d)

Fish and Wildlife Act of 1956 (16 U.S.C. § 742f(a)4)

Fish and Wildlife Act of 1956 (16 U.S.C. § 742f(b)1)

B.4 Refuge Purposes

The establishing and acquisition authorities set out the purposes for the refuge, as described below:

- For use as an inviolate sanctuary, or for any other management purpose, for migratory birds.
- For the development, advancement, management, conservation, and protection of fish and wildlife resources.
- For the benefit of the United States Fish and Wildlife Service, in performing its activities and services.

B.5 National Wildlife Refuge System Mission

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

B.6 Description of Uses

The following uses are evaluated for compatibility within the Quivira National Wildlife Refuge:

- hunting
- fishing
- wildlife observation and photography, including bicycling, horseback riding, and commercial birding tours via special use permit
- environmental education and interpretation
- cooperative farming, haying, and grazing
- commercial filming, audio recording, and still photography
- research and monitoring
- dog training
- firewood cutting

Hunting

State and Federal site-specific regulations will apply. Hunters may only possess and use approved, nontoxic shot loads and vehicle travel and parking will be restricted to public roads, pullouts, and posted parking areas. The refuge Web site and public use brochures will provide guidance on site and species regulations. The general State hunting regulations are available from the KDWPT.

We will increase regulatory hunting signs, such as “closed to hunting area” and “nontoxic shot required,” and interpretive materials, like an updated, and more comprehensive, refuge hunting leaflet or tearsheet, in an effort to reduce unintentional hunting violations on the refuge.

The hunting of migratory gamebirds, including three dove species, duck, and goose, will continue in designated areas of the refuge on approximately 7,606 acres. Sandhill crane, snipe, woodcock, and rail hunting will be prohibited. The hunting of upland game, including pheasant and Northern bobwhite, will be allowed in designated areas of the refuge on approximately 9,289 acres of upland and wetland habitat. Hunting of prairie-chicken will be prohibited. Limited big-game hunting will be allowed by special use permit for white-tailed deer and turkey in designated sites within the approved 15,239-acre boundary. Small-game hunting will include rabbit and squirrel only, and will be allowed in the same designated areas as upland game hunting. Furbearer hunting and trapping by special use permit will be allowed on the same area as big-game hunting.

A universally acceptable hunting blind is located in Wetland Unit 30 and may be reserved through the refuge office.

Availability of Resources

Existing programs, such as current refuge directional signs and brochures, could be updated with available resources. Maintenance of access roads, parking, hunting and information kiosks, and public use signs, is closely tied to our Asset Maintenance Management System. The refuge’s base budget will pay for the update and printing of existing and new brochures.

More law enforcement staff time and resources will be required to manage substantial changes to the hunting program. Additions include (1) starting a deer and turkey hunting program; (2) changing hunt area boundaries, parking areas, signs, and hunt brochures; and (3) checking compliance with this new public use and managing whooping crane unit closures as necessary. Existing law enforcement staff is sufficient to manage the new programs.

Anticipated Effects of Use

The hunting program will continue to provide ample quality hunting opportunities without materially detracting from the mission of the Refuge System and the goals or establishing purposes of refuge lands. Public use brochures and the refuge Web site will be kept up to date and made readily available to hunters. Hunter success and satisfaction will be checked with random contacts with hunters in the field and at refuge headquarters.

Hunting is considered by many to be a legitimate, traditional, recreational use of renewable natural resources. The Administration Act, the Improvement Act, other laws, and our policy allow hunting on a national wildlife refuge when it is compatible with the purposes for which the refuge was established and acquired. National wildlife refuges exist primarily to safeguard wildlife populations through habitat preservation.

The word “refuge” includes the idea of providing a haven of safety for wildlife, and, as such, hunting might seem to be inconsistent with the National Wildlife Refuge System. However, habitat that normally supports healthy wildlife populations produces harvestable surpluses that are a renewable resource. As practiced on Quivira Refuge, hunting does not pose a threat to the wildlife populations and, in some instances, is actually necessary for sound wildlife management.

By its nature, hunting creates a disturbance to wildlife and directly affects the individual animals being hunted. However, it is well recognized that this activity has given many people a deeper appreciation of wildlife and a better understanding of the importance of conserving their habitat, which has ultimately contributed to the Refuge System mission.

Furthermore, despite the potential effects of hunting, a goal of the refuge is to provide opportunities for quality wildlife-dependent recreation. The hunting program will be designed and watched closely for safety and quality. The hunting program will continue to periodically close the entire refuge to hunting for the protection of whooping cranes, as determined by the refuge manager. Sandhill crane hunting could lead to the misidentification of the two bird species during a hunt, so it is not allowed on the refuge. Yet, whooping cranes are actually at higher risk of being accidental shot during hunting season off the refuge when they go out to feed where sandhill crane hunting is allowed.

Although hunting directly affects the hunted species and may indirectly disturb other species, limits on harvest and access for recreational hunting will make sure that populations do not fall to unsustainable levels. Closed areas on the refuge provide sanctuary to migratory birds during the hunting season.

In some cases, hunting can be used as a management tool to control elevated populations that are having a negative effect on wildlife habitat.

Added effects from hunting activity include conflicts with individuals participating in wildlife-dependent public uses such as wildlife observation and photography. This could decrease visitors' satisfaction during the hunting season if all users are restricted to the same parts of the refuge.

Public Review and Comment

This compatibility determination was presented for public review and comment as part of the 30-day public comment period for the draft comprehensive conservation plan and environmental assessment for the Quivira National Wildlife Refuge.

Determination

Recreational hunting is a compatible use on the Quivira Refuge in accordance with State, Federal and refuge-specific regulations.

Stipulations Necessary to Make Sure that There is Compatibility

Visitors participating in recreational hunting will follow our public use regulations, including site-specific regulations, and the State's hunting regulations.

- Hunters will continue to use approved non-toxic shot for migratory and upland game-bird hunting and turkey hunting on the lands we own.
- Vehicles will be restricted to county and public roads and parking areas on the refuge.
- Signs, brochures, and our Web site will be used to provide hunters information on where, and how, to hunt on the refuge to make sure that we have their compliance with public use regulations.

Justification

Hunting is identified as a priority public use in the Improvement Act of 1997 and will help meet Refuge System goals with only minimal conflicts. Recreational hunting can instill, in citizens of all ages, a greater appreciation for wildlife and its habitat. This appreciation may extend to the Refuge System and other conservation agencies.

In *Conserving the Future*, Recommendation 17 states: "The Service will work closely with State fish and wildlife agencies to conduct a review of its current hunting and fishing opportunities, especially opportunities offered for youth and people with disabilities. Based on this review, the Service and states will work cooperatively to prepare a strategy for increasing quality hunting and fishing opportunities on national wildlife refuges." (Refuge System 2011)

Based on the anticipated biological effects described above, we have found that recreational hunting on the refuge will not interfere with our habitat goals and objectives or purposes for which the refuge was established. Limiting access and checking the use could help limit any adverse effects.

Mandatory 15-year Reevaluation Date: 2028

Fishing

Fishing is defined as wildlife-dependent recreation under the Improvement Act. As one of the six priority recreational activities noted therein, fishing provides a traditional recreational activity on the refuge with no definable adverse effects to biological resources.

Refuges may be opened to sportfishing only after a determination is made that the activity is compatible with the purposes for which the refuge was established. In addition, the sportfishing program must be consistent with principles of sound fishery management and otherwise be in the public interest.

The CCP includes continued recreational fishing on the refuge in accordance with State, Federal, and refuge regulations. Frogging and the collection of crayfish and live bait will be prohibited.

Availability of Resources

The fishing program could be administered using current resources.

Anticipated Effects of Use

Fishing and other human activities cause disturbance to wildlife and the trampling of vegetation along the bank of rivers and streams. Littering can also become a problem.

Public Review and Comment

This compatibility determination was presented for public review and comment as part of the 30-day

public comment period for the draft comprehensive conservation plan and environmental assessment for the Quivira National Wildlife Refuge.

Determination

Fishing is a compatible use on Quivira Refuge in accordance with State, Federal, and refuge regulations.

Stipulations Necessary to Make Sure that There is Compatibility

- Visitors participating in recreational fishing will follow our public use regulations and State fishing regulations and limits.
- No bait collecting and no live bait use except for night crawlers will be allowed.
- Vehicles will be restricted to county and public roads and parking areas on the refuge.
- The use of boats will be prohibited.
- Fishing equipment and all other personal property must be removed at the end of each day.
- Fish stocking to support fishing will only occur in the Kid's Fishing Pond as necessary.
- The collection of crayfish or frogs will be prohibited.
- Fishing from on top of water control structures will be prohibited for safety reasons.

Justification

Fishing is listed as a priority public use in the Improvement Act. Based on the biological effects addressed above and in the environmental assessment, we have found that recreational fishing will not interfere with the habitat goals and objectives of the refuge or with the purposes for which the refuge was established.

Mandatory 15-year Reevaluation Date: 2028

Wildlife Observation and Photography

As two of the six priority recreational uses identified in the National Wildlife Refuge System Improvement Act of 1997, wildlife observation and photography provide recreational activities on the refuge with no definable adverse effects to biological resources.

We will continue to provide wildlife observation and photography opportunities on the refuge and support them with observation towers and blinds, an up-to-date bird species list for the refuge, and portable viewing and photography blinds issued by special use permits. Such facilities and support will help bring people closer to wildlife.

The auto tour and Wildlife Drive will provide year-round opportunities for wildlife viewing and photography via auto, foot, dog walking, bicycling, and horseback. Hazardous road conditions, such as the flooding of emergency spillways on the route may occasionally require closures for safety. The Wildlife Drive area may also occasionally close because of whooping crane use to avoid disturbance.

All roads and trails are open for foot traffic year round, from sunrise to sunset, unless short-term closures are enacted to prevent wildlife disturbance or maintenance. All refuge lands are open to foot traffic except for periodic closures during the nesting season and other closures for various reasons, such as wildlife protection, human safety, law enforcement, or maintenance. Two areas are routinely closed during nesting season on the salt flats for interior least tern nesting and in the South Big Salt Marsh unit around the bald eagle nest site. The observation tower road and photo blind on the LSM have been occasionally closed because of whooping crane use near the blind and tower. Other areas may be closed in the future depending on changes in wildlife use.

Facilities providing more opportunities for wildlife observation and photography include the LSM photo and observation blind and observation tower, the trail between the observation tower and the Kid's Fishing Pond, and the Migrants Mile hiking trail and photo and observation blind. Spotting scopes are available at the LSM observation tower and on the Wildlife Drive. A binocular loan program is also available for checkout at refuge headquarters.

More observation opportunities will be available through the proposed tower-mounted, remote camera at the BSM and bald eagle nest site. The movable tower camera will be installed near the bald eagle nest. It will allow Internet viewing of the nesting activity and provide viewing of wildlife on the BSM year round.

Commercial birding will be allowed with a special use permit obtained at the refuge headquarters.

Availability of Resources

The only money required for a new facility will go toward buying and installing an Internet-connected tower camera at the BSM. Money will be acquired from various sources, such as the Friends of Quivira, outside donations, local utilities, grants, and refuge sources. Other refuge money for visitor facilities are received as visitor facility enhancement projects through our Asset Maintenance Management System and through Visitor Facility Enhancement grants. Existing programs, such as current directional signs and brochures, can be updated with available resources.

More staff time will be required to manage the tower camera and for maintenance.

Anticipated Effects of the Use

Effects associated with the wildlife observation and photography uses of the refuge resources. These uses are ongoing, and potential disturbances are being managed with temporary closures without issue. Law enforcement is available to enforce closures, and the Internet and temporary signs at headquarters and closed areas announce closures.

Sanctuary will be provided for migrating waterfowl and other waterbirds during the waterfowl hunting season at Quivira Refuge.

Public Review and Comment

This compatibility determination was presented for public review and comment as part of the 30-day public comment period for the draft comprehensive conservation plan and environmental assessment for the Quivira National Wildlife Refuge.

Determination

Wildlife observation and photography are compatible uses on Quivira Refuge.

Stipulations Necessary to Make Sure that There is Compatibility

- Visitors participating in wildlife observation and photography will follow all public use regulations.
- Commercial photography will require a special use permit.

- Seasonal closures to protect sensitive wildlife areas and reduce disturbance to fish and wildlife will be kept.
- Non-Service vehicles will be restricted to county and public access roads on the refuge.
- All-terrain vehicle or utility terrain vehicle use on the refuge will be compatible with State and county regulations on county roads. All-terrain vehicle or utility terrain vehicle use by the public is prohibited off public roads, unless allowed under a special use permit.
- Viewing areas will be designed to decrease disturbance effects to wildlife and all refuge resources while providing a good opportunity to view wildlife in their natural environments. Visitors using the refuge's permanent blinds or their own portable observation and photography blinds will be provided with information on their suitable use and on the etiquette of these structures to decrease disturbance to wildlife and their natural environments and to other refuge visitors.
- Horseback riding and biking will be prohibited on hiking trails, off roads, or in closed areas.
- Pets must be leashed and under owners' control at all times, unless for purposes approved by the refuge manager.

Justification

Wildlife observation and photography are identified as priority public uses in the Improvement Act and will help meet Refuge System goals with only minimal conflict. Wildlife observation and photography can instill, in citizens of all ages, a greater appreciation for wildlife and its habitat. This appreciation may extend to the Refuge System and other conservation agencies.

Based on anticipated biological effects described above, we have found that wildlife observation and photography on the refuge will not interfere with our habitat goals and objectives or with the purposes for which the refuge was established. Limiting access and watching use closely could help limit any adverse effects.

Mandatory 15-year Reevaluation Date: 2028

Environmental Education and Interpretation

As two of the six priority recreational uses identified in the Improvement Act, environmental education and interpretive activities on the refuge and offsite programming and events at schools, fairs, and expo centers provide activities with no definable adverse effects to biological resources.

- Interpretive panels and auto tour brochures provide information about habitat, wildlife, management actions, and activities. Interpretation is passive in nature, from self-guided opportunities to interpretive panels, brochures, Web sites, and tearsheets. We will continue to offer binocular and Let's Go Outside! backpack loan programs at the refuge and at the GPNC. We will continue to use social media, and update it weekly, to increase contact with, and exposure to, the refuge.
- We will continue to provide interpretive programs at Quivira Refuge and the GPNC on a variety of refuge management and wildlife-oriented subjects, both by request and as scheduled activities, and we will increase programs as staff and time allow.
- We will continually evaluate our interpretive media, such as brochures, signs, and displays, for relevancy, effectiveness, and timeliness, and we will update them as needed, provided we have the money to do it.

This CCP proposes to continue environmental education and interpretation and add the following to improve these programs:

- Replace the refuge environmental education classroom with a new one near the headquarters. The location already has several facilities nearby that will be used in conjunction with the classroom, including trails, an observation tower, a pavilion, restrooms, wetlands, sand prairie uplands, meadows and other habitats.
- We will expand the opportunities for environmental education and interpretation to foster appreciation and understanding of the National Wildlife Refuge System and the resources of Quivira Refuge. More interpretive panels will be developed for the refuge,

and accessible observation sites will be developed on the refuge. The mammal, reptile and amphibian lists will be updated for the refuge, and a brochure will be developed.

- We will interpret the cultural history of the Quivira Refuge area, including tribal uses, and early settlement.
- Refuge staff will continue to take part in offsite special events and activities to bring the refuge message to many people, including at-risk youth. Participation in these events will occur as staff and time allow.
- Environmental education programs will be provided to teach curriculum-based programs for all grade levels that meet State educational standards.
- We will encourage the use of both Quivira Refuge and GPNC facilities by educational organizations as outdoor classrooms.
- We will continue to support the GPNC through its partnership with the City of Wichita Department of Park and Recreation and the KDWPT. We will use educational kits and discovery boxes, and continue to promote current and future national initiatives, such as America's Great Outdoors and Let's Go Outside!
- Participation by teachers and students in the Junior Federal Duck Stamp program will continue to increase through more outreach and marketing efforts. Artwork will be displayed throughout the year at various locations—at least 10 venues per year, including the Kansas State Fair—to further promote interest in wildlife and art.
- We will encourage virtual geocaching to enhance the appreciation of refuge resources.

Availability of Resources

Payment for environmental education and interpretation activities, directional signs, and brochures will come from annual operations and maintenance money. Other sources, such as grants, regional project proposals, challenge cost-share agreements, deferred maintenance and others will also be sought and used as they became available.

Requests to pay for new facilities will be submitted as visitor facility enhancement projects through our Asset Maintenance Management System.

Anticipated Effects of the Use

The use of the refuge for onsite activities by groups of teachers and students for environmental education or interpretation may minimally affect the immediate and surrounding areas in the short term. Effects may include the trampling of vegetation and temporary disturbance to nearby wildlife species.

Refuge brochures, interpretive panels, and other educational materials will continue to be updated as needed to meet our needs. Features such as the auto tour route and accessible observation sites will continue to provide access to the refuge.

A new, relocated environmental education classroom will have a small effect on lands near the Kid's Fishing Pond, but this will be offset by a reduction of the footprint area where the existing environmental education classroom is located. All facilities at the current location except for the public restrooms and area of the parking lot will be removed, including the bunkhouse and trailer pads, which will be relocated at the headquarters administrative site, and the area will be restored to upland habitat.

We will continue to promote a greater public understanding and appreciation of refuge resources, programs, and issues through interpretive, outreach, and environmental educational programs. Working with our Friends groups and other local groups, we will continue to provide environmental education and interpretation both on and off the lands we own. Presentations, both on and off our lands, will be provided to refuge visitors, school groups, and organizations, allowing us to reach a broader audience. Onsite presentations will be managed to decrease disturbance to wildlife, habitat, and cultural resources. Environmental education and interpretation activities taking place at the GPNC and offsite by GPNC staff will not affect wildlife or habitat in the urban setting.

Public Review and Comment

This compatibility determination was presented for public review and comment as part of the 30-day public comment period for the draft comprehensive conservation plan and environmental assessment for the Quivira National Wildlife Refuge.

Determination

Environmental education and interpretation will be a compatible use on Quivira Refuge.

Stipulations Necessary to Make Sure that There is Compatibility

- Visitors participating in environmental education and interpretation programs will follow all of our regulations. Onsite activities will be held where minimal effect to wildlife and habitats will occur.
- We will review new environmental education and interpretation activities to make sure that these activities meet program objectives and are compatible.

Justification

Environmental education and interpretation are identified as priority public uses in the Improvement Act and will help meet Refuge System goals with only minimal conflicts. Environmental education and interpretation will be used to encourage an understanding in citizens of all ages to act responsibly to protect wildlife and their habitats. These are tools used in building a land ethic, developing support of the refuge, and decreasing wildlife violations.

Environmental education is an important tool for the refuge to provide visitors with an awareness of its purposes, values, and specific issues such as wetland ecology, water quality, effects of nonnative species, and migratory bird management. This tool will also provide visitors and students a greater understanding of the mission of the Refuge System and its importance to the American people.

Based on anticipated biological effects described above, we have found that environmental education and interpretation on the refuge will not interfere with our habitat goals and objectives or with the purposes for which the refuge was established. Limiting access during certain times of the year and checking the uses will limit any adverse effects.

Mandatory 15-year Reevaluation Date: 2028

Cooperative Farming, Haying, and Grazing

We will continue to use cooperative farming and prescriptive livestock grazing and haying as manage-

ment tools on the refuge. These tools will be used to meet habitat objectives, control vegetative litter, promote native plant production and diversity, control the spread of invasive plant species, and help convert disturbed grasslands back to native plant species.

The refuge uses cooperative farming and haying as tools to manage habitats, including the control of invasive plant species, grassland reconstruction and wet meadow management. We will enter into an agreement with a local landowner to (1) help restore cropland and poor quality habitat to quality native grassland or wetland habitat for wildlife or (2) cut grasslands to promote native seed harvest the following growing season and to rejuvenate vegetation growth. A farming cooperater will be issued a cooperative farming agreement or special use permit by the refuge manager and will be allowed to till seed, harvest small grain, control invasive plants, or harvest hay on the lands we own. The choice is reserved to use genetically modified crops only for the reconstruction of native prairie plants to create more weed-free seedbeds and has been approved through an environmental assessment. The agreement will generally be issued for a 1- to 4-year management prescription.

Cooperative farming of our lands is usually done on a share basis where we and the cooperater each receive a share of the crop. We will maintain our share as standing cover for wildlife forage or in exchange for more work from the cooperater, such as seed harvesting, invasive plant control, grass seeding, or for supplies such as herbicides and fence materials for habitat protection and improvement on the management unit. Any fees or cash received by us will be deposited into the Refuge Revenue Sharing Account.

This CCP proposes to continue using cooperative farming and haying to manage habitats. Farming will gradually be phased out as those lands are planted back into native species. Furthermore, this CCP establishes goals and objectives for specific habitat types where cooperative farming and haying may be used. In addition, we have identified focal wildlife species, such as eastern meadowlark and dickcissel, and their habitat needs. This has resulted in objectives that will guide management to achieve the habitat needs of these species.

The refuge uses prescriptive livestock grazing as a tool to manage a variety of uplands and wetlands. Grazing by livestock has been a preferred management tool because of the potential effects on habitat. Livestock grazing has been used in a variety of ways including high intensity and short duration, rest rotation, and complete rest. Grazing may occur throughout the year as management needs dictate. Where

applicable, a rotation schedule using multiple grazing units is used to manage characteristics of grazing.

Fencing and controlling livestock is the responsibility of the cooperating rancher. We provide instruction and guidance in the special use permit for the placement of fences, water tanks, and livestock supplements to make sure that sensitive habitats and refuge assets are protected. A temporary electric fence is used where there is not an existing fence. Current forage conditions, habitat objectives, and available water will determine stocking rates in each grazing unit.

This CCP proposes to continue using prescriptive livestock grazing to meet habitat objectives. Furthermore, the CCP establishes goals and objectives for specific habitat types where prescriptive livestock grazing may be used. In addition, the Service has identified focal wildlife species and their habitat needs, which has resulted in objectives that will guide the prescriptive grazing program to achieve the habitat needs of these species while helping many others. The refuge will improve the monitoring and research programs to assess habitat responses to prescriptive livestock grazing. Different grazing rates and management strategies will be investigated to decide on the best methods for meeting habitat goals and objectives.

Availability of Resources

Existing resources will be sufficient to administer the farming, haying, and grazing programs at current levels. These programs will continue to be conducted through special use permits or cooperative farming agreements, which decrease the need for staff time and our assets to complete the work. A refuge biologist will be needed to plan and oversee monitoring and research programs to assess the effects and effectiveness of these management programs. One or two temporary biological technicians likely will be necessary to help with on-the-ground monitoring programs.

Rehabilitation of existing stock water wells and the drilling of more wells in strategic locations will increase the effectiveness of the grazing program by spreading out grazing use and reducing the effects caused by livestock watering in wetlands and canals and by cooperaters hauling water to grazing cells on a daily basis.

Anticipated Effects of the Use

The cooperative farming and haying program and prescriptive livestock grazing program will be used to meet habitat goals and objectives identified in the CCP. These programs are intended to support and enhance habitat conditions for the benefit of a wide

variety of migratory birds and other wildlife that use the refuge. Minimal negative effects are expected through the use of these tools. Control of invasive plant species through these programs would be a long-term benefit.

Some wildlife disturbance will occur during operation of noisy farming equipment and some animals may be temporarily displaced. Wildlife would receive the short-term benefit of standing crops or stubble for food and shelter and the long-term benefit of having cropland or other poor-quality habitat converted to native prairie plants. In addition, the restoration of cropland to grassland cover would prevent soil erosion, improve water quality, and reduce the need for chemical use.

Some trampling of areas by livestock may occur around watering areas, mineral licks or trees and wood lots. Cattle congregating under the shade of trees would increase invasive cheatgrass establishment. If fences are not kept up, it may be difficult to meet habitat objectives. It is anticipated that grazing will be in a mosaic pattern, with some areas being more intensively grazed than others in certain years. Grazing, like fire, is known to increase the nutrient cycling of nitrogen and phosphorous (Hauer and Spencer 1998, McEachern et al. 2000). Hoof action may improve conditions to allow native plant seeds to become established. However, cattle grazing would also increase the risk of invasive plants getting established. Grazing in the spring could have adverse effects on grassland bird nests because of trampling and the loss of vegetation. In addition, the presence of livestock would be disturbing to some wildlife species and some visitors. The long-term benefits of this habitat management tool should outweigh the short-term negative effects.

Public Review and Comment

This compatibility determination was presented for public review and comment as part of the 30-day public comment period for the draft CCP and EA for Quivira Refuge.

Determination

Cooperative farming, haying, and grazing as habitat management tools are compatible uses on the Quivira Refuge.

Stipulations Necessary to Make Sure that There is Compatibility

For consistency with management objectives, we will require general, and specific conditions, for each farming, haying, or grazing permit.

Only areas that have a prior crop history will be included in the farming and haying program. To decrease effects to nesting birds and other wildlife, the refuge manager will decide on, and incorporate, any needed timing constraints on the permitted activity into the cooperative farming agreement or special use permit. For example, haying will not be permitted on our lands until after August 1 to avoid destroying bird nests on the management unit unless the refuge manager deems it necessary to hay earlier to control invasive plants or restore grasslands.

The cooperative farming agreement or special use permit will specify the type of crop to be planted. Farming permittees will be required to use our approved chemicals that are less detrimental to wildlife and the environment.

Control and confinement of livestock are the responsibility of the permittee, but we will decide where fences, water tanks, and livestock supplements will be placed within the management unit. Temporary electric fence will be used to keep livestock within grazing cells as well as to protect sensitive habitat areas and refuge assets such as water control structures or public use areas. Cooperators will be required to remove fences at the end of the permit.

Grazing fees will be based on the current-year USDA Statistics Board publication for Grazing Fee Rates for Cattle by Selected States and Regions, as provided annually by the regional office, or will be established by bid. Standard deductions for labor associated with the grazing permit will be included on the special use permit.

The refuge will carry out a vegetation monitoring program to assess if habitat needs of focal species are being met. A minimum of one temporary biological technician will be necessary to check and document these activities. A biologist will be necessary to plan and oversee the monitoring program and to assess the effects of these management programs.

Justification

Some habitat management needs to occur to support and enhance habitat for migratory birds and other wildlife. When effectively managed and checked, prescriptive farming and haying are options that can be used to improve wildlife cover and to restore disturbed habitats to desirable grassland cover. Prescriptive livestock grazing can rejuvenate native grasses and help control the spread of some invasive plant species. Each of these tools can be controlled, and the results will be watched closely, as with vegetation monitoring programs, so that adjustments can be made to meet habitat goals and objectives.

Using local cooperators to accomplish the work is a cost-effective method to accomplish the habitat

objectives. The long-term benefits of habitat restoration and management far outweigh the short-term effects caused by cooperative farming, haying, and grazing.

Mandatory 10-year Reevaluation Date: 2023

Commercial Filming, Audio Recording, and Still Photography

Commercial filming is the digital, or film, recording of a visual image or of a sound—and commercial still photography is the capture of a still image on film or in a digital format—by a person, business, or other entity for a market audience such as for a documentary, television, feature film, advertisement, or similar project. It does not include news coverage or visitor use.

Quivira Refuge provides tremendous opportunities for commercial filming and still photography of migratory birds and other wildlife. Each year, the refuge staff receives requests to conduct commercial filming or photography on our lands. Our staff will continue to evaluate each request on an individual basis, and, if the use is allowed, the requesting individual or group will be issued a special use permit. The permit will designate what areas may be accessed and what activities are, and are not, allowed, to decrease the possibility of damage to cultural or natural resources or to limit interference with other visitors.

Permittees will be able to access all areas of the refuge that are open to the public and must abide by all public use regulations. In rare cases, and through the special use permit process, we may allow access to areas closed to the public.

Availability of Resources

The commercial filming, audio recording, and still photography uses could be administered with current resources. Administrative costs for review of applications, issuance of special use permits, and staff time to conduct compliance checks may be offset by a fee system designated for the agencies within the DOI.

Anticipated Effects of Use

Wildlife filmmakers and photographers tend to create the greatest disturbance of all wildlife observers (Dobb 1998, Klein 1993, Morton 1995). While observers frequently stop to view wildlife, photogra-

phers are more likely to approach the animals (Klein 1993). Even a slow approach by photographers tends to cause behavioral consequences with wildlife (Klein 1993). Photographers often remain close to wildlife for extended periods of time in an attempt to habituate the subject to their presence (Dobb 1998). Furthermore, photographers with low-power lenses tend to get much closer to their subjects (Morton 1995). This usually results in increased disturbance to wildlife, as well as habitat, including the trampling of plants. Handling of animals and disturbing cultural artifacts or vegetation, such as cutting plants and removing flowers, is prohibited on our lands.

The issuance of special use permits with strict guidelines and close checking by our refuge staff for compliance could help decrease or avoid these effects. Permittees who do not follow the stipulations of their special use permits could have their permits revoked, and further applications for filming or photographing on refuge lands will be denied.

Public Review and Comment

This compatibility determination was presented for public review and comment as part of the 30-day public comment period for the draft comprehensive conservation plan and environmental assessment for the Quivira National Wildlife Refuge.

Determination

Commercial filming, audio recording, and still photography are compatible uses on Quivira Refuge.

Stipulations Necessary to Make Sure that There is Compatibility

Commercial filming or still photography must (1) show a means to extend public appreciation and understanding of wildlife or natural habitats; (2) enhance education, appreciation, and understanding of the Refuge System; or (3) facilitate the outreach and education goals of the refuge. Failure to show any of these criteria will result in a special use permit being denied.

All commercial filming will require a special use permit that will (1) identify conditions that protect the refuge's values, purposes, resources, and public health and safety; and (2) prevent unreasonable disruption of the public's use and enjoyment of the refuge. Such conditions may be, but are not limited to, specifying road conditions when access will not be allowed, establishing time limitations, and finding routes of access. These conditions will be identified to prevent excessive disturbance to wildlife, damage to

habitat or refuge infrastructure, or conflicts with other visitor services or management activities.

The special use permit will stipulate that imagery produced on refuge lands will be made available for use in environmental education and interpretation, outreach, internal documents, or other suitable uses. In addition, any commercial products must include credits to the Quivira National Wildlife Refuge, the National Wildlife Refuge System, and the U.S. Fish and Wildlife Service.

Still photography requires a special use permit, with specific conditions as outlined above, if one or more of the following occur:

- It takes place at locations where, or when, members of the public are not allowed.
- It uses models, sets, or props that are not part of the location's natural or cultural resources or administrative facilities.
- We incur more administrative costs to check the activity.
- We need to provide management and oversight to avoid the impairment of the resources and values of the site, limit resource damage, or to decrease health and safety risks to the visiting public.
- The photographer intends to intentionally manipulate vegetation to create a shot, such as cutting vegetation to create a blind.

To decrease the effect on our lands and resources, our refuge staff will make sure that all commercial filmmakers and commercial still photographers, regardless of whether or not a special use permit is issued, comply with policies, rules, and regulations. Our staff will check and assess the activities of all filmmakers, audio recorders, and still photographers.

Justification

Commercial filming, audio recording, and still photography are economic uses that must contribute to the achievement of the refuge purposes, the mission of the Refuge System, or the mission of the FWS. Providing opportunities for these uses should result in increased public awareness of the refuge's ecological importance as well as in advancing the public's knowledge and support for the Refuge System and the Service. The stipulations outlined above and conditions imposed in the special use permits issued to commercial filmmakers, audio recorders,

and still photographers will make sure that these wildlife-dependent activities occur with minimal adverse effects to resources or visitors.

Mandatory 10-year reevaluation date: 2023

Research and Monitoring

The Quivira Refuge receives an estimated 5 to 10 requests each year to conduct scientific research or monitoring programs on our lands. Priority is given to studies that contribute to the enhancement, protection, preservation, and management of the refuge's native plant, fish, and wildlife populations and their habitats. Applicants who are not employees of ours must submit a proposal that outlines the following:

- objectives of the study
- justification for the study
- detailed method and schedule
- potential effects on wildlife and habitat including short- and long-term disturbance, injury, or mortality
- description of measures the researcher will take to reduce disturbances or effects
- staff required and their qualifications and experience
- status of necessary permits, such as scientific collection permits and endangered species permits
- costs to the Service, including staff time requested, if any
- anticipated progress reports and end products, such as reports or publications

Our refuge staff or others will review research proposals case by case and issue special use permits if approved. Criteria for evaluation will include, but will not be limited to, the following:

- Research that would contribute to specific refuge management issues will be given higher priority over other requests.

- Research that would conflict with other ongoing research, monitoring programs, or management programs will not be approved.
- Research that would cause undue disturbance or would be intrusive will likely not be approved. The degree and type of disturbance will be carefully weighed when evaluating a research request.
- Proposals will be evaluated to decide if any effort was made to decrease disturbance through study design, including adjusting the location, timing, number of permittees, study methods, and the number of study sites.
- The length of the project will be considered, and agreed on, before approval.
- Research proposals involving threatened and endangered species will require concurrence and Section 7 Endangered Species Act review before approval.

Availability of Resources

Current resources will be adequate to administer research and monitoring programs on a limited basis. A refuge biologist will be necessary to administer large and long-term projects, which generally require more in-depth evaluation of applications, management of permits, and oversight of research projects. The biologist will identify research and monitoring needs and work with our other staff, universities, and scientists to develop studies that will help the refuge and address the goals and objectives in this CCP.

Anticipated Effects of Use

Some degree of disturbance is expected with all research activities because researchers may use our roads or enter areas that are closed to the public. In addition, some research may require the collection of samples or the handling of wildlife. However, research studies will be expected to minimally affect wildlife and habitats because special use permits will include conditions on their effects.

Public Review and Comment

This compatibility determination was presented for public review and comment as part of the 30-day public comment period for the draft comprehensive

conservation plan and environmental assessment for the Quivira National Wildlife Refuge.

Determination

Research and monitoring are compatible uses on Quivira Refuge.

Stipulations Necessary to Make Sure that There is Compatibility

Extremely sensitive wildlife habitats and species will be sufficiently protected from disturbance by limiting research activities in these areas. All refuge rules and regulations will be followed unless otherwise exempted by our refuge management. Projects will be reviewed annually.

Our refuge staff will use the above criteria for evaluating and determining whether to approve a proposed study. If research methods were found to have potential effects on habitat or wildlife, it must be shown that the research is necessary for the conservation management of resources on the refuge. Measures to decrease potential effects will need to be developed and included as part of the study design; these measures will be conditions on the special use permit.

Our refuge staff will watch research activities for compliance with conditions of the special use permit. At any time, staff may accompany the researchers to look for potential effects. They may decide that research that was approved for special use permits before is terminated because of observed effects. Our refuge manager will also have the ability to cancel a special use permit if the researcher was out of compliance or for wildlife and habitat protection.

Justification

Potential effects of research activities on refuge resources will be decreased through restrictions included as part of the study design, and research activities will be checked by our refuge staff. Results of research projects will contribute to the understanding, enhancement, protection, preservation, and management of the refuge's wildlife populations and their habitats.

Mandatory 10-year reevaluation date: 2023

Dog Training

Dog training during the non-nesting season by noncommercial dog owners is an existing use at Quivira Refuge. The use of dogs for hunting is encouraged. Depending on future demand and conflicts, dog training on the refuge may require a special use permit.

Availability of Resources

Sufficient staff exists to issue the required permits, and oversee this periodic use. Facilities and staff are now available to provide access, support roads, parking lots, and secondary access roads.

Anticipated Effects of Use

There will be minimal disturbance to wildlife as a result of the activity, and effects will be temporary.

Public Review and Comment

This compatibility determination was presented for public review and comment as part of the 30-day public comment period for the draft comprehensive conservation plan and environmental assessment for the Quivira National Wildlife Refuge.

Determination

Dog training is a compatible use on the Quivira National Wildlife Refuge.

Stipulations Necessary to Make Sure that There is Compatibility

- Depending on future demand and conflicts, dog training on the refuge may require a special use permit.
- Immediately before training activity, trainers must check in with refuge staff at the headquarters for permitted opportunities to decrease disturbances to wildlife and other public uses and to maximize trainer safety.
- Training will be allowed when most bird breeding activities do not occur: September 1–March 1.
- Training will only be allowed in wetland areas along public use roads and where disturbance to wildlife can be decreased. For

instance, we will encourage the use of wetland areas that do not provide foraging or resting habitat for waterbirds at that time.

- Training will not be allowed in the Kids' Fishing Pond area.
- Training will use areas in a way that avoids or decreases unwanted, direct interactions with visitors, such as with those who are allergic or uncomfortable with dogs. Training will also use areas in a way that decreases potential conflict with visitor use activities that may be occurring in the area before training activities begin.
- Only artificial props, such as canvas or plastic dummies, may be used in training.

Justification

This activity encourages people to get outside and promotes quality and responsible hunting and the appreciation of natural resources. There is little other public land available, particularly during the non-nesting season when hunting is allowed. Use of private land with water for training dogs is difficult to find, as most is either cropland or rangeland. Most adjacent land is private farm ground that is not available to the public for this activity. The use is proposed only for individuals doing noncommercial dog training. Commercial dog training will not be allowed because of the overwhelming demand and its potential for too many dogs, trainers and vehicles on the refuge. Dog training may occur with minimal, temporary disturbance, and no permanent effect to the refuge is anticipated. The use will not materially detract from the National Wildlife Refuge System mission or purposes of the refuge.

Mandatory 10-year Reevaluation Date: 2023

Firewood Cutting

Firewood cutting will be a new use at Quivira Refuge. Firewood cutting will be an economic use of the refuge's natural resources. The use will facilitate and aid with habitat management and grassland restoration through the removal of undesirable invasive woody vegetation. The public will be permitted to cut and collect firewood on the refuge. The timber could either be removed as cut wood or as whole trees. The public will acquire a permit and a map with designated areas on the refuge to cut firewood. Unlimited

permits will be available with a \$25 annual fee. The public will be allowed to remove only trees that have been marked for removal, that had been chemically treated earlier by refuge staff, or that are dead timber. All cutting will be required to be at ground level. Access will be limited to areas along roads and trails to prevent habitat destruction and wildlife disturbance.

The use will potentially occur on all wooded upland and partially wooded upland acres of the refuge totaling approximately 15,000 acres. Specific areas will be chosen by the refuge manager to not interfere with habitat management or threatened and endangered species, and areas on the refuge will not be open to firewood cutting when threatened or endangered species are present. Affected wildlife could include deer, small mammals, raptors such as bald and golden eagles and various hawks, upland gamebirds, quail and pheasants, and other upland migratory birds. Migratory waterfowl using wetlands and marshes might also be affected.

Firewood cutting will be permitted from August 1 to April 30 to prevent effects to migrating bird nesting seven days a week from sunrise to sunset. Areas will be designated by the refuge manager and subject to closure at any time. Firewood cutting will not be permitted during periods of fire danger reaching red flag warnings as issued by the National Weather Service.

The public will be required to obtain a special use permit. Power chainsaws, handsaws, or axes will be the only means permitted to cut trees and firewood. All permittees will be required to have spark arrestors on power chainsaws and have a shovel or fire extinguisher available to aid with extinguishing fire. The public will be permitted to pull trailers or vehicles on established roads, trails, and designated areas with refuge manager approval with exact locations stated on permit and map. All firewood and equipment will be removed daily.

The use will facilitate and aid habitat management and grassland restoration by removing undesirable invasive woody vegetation. Removal of invasive tree species would prevent further seed distribution, reduce fuel load, restore native prairie, clean up fallen and cut tree piles, and provide an economic benefit to the public. Most adjacent land is private farm ground that is not available to the public.

Availability of Resources

- Resources involved in the administration and management of the use: minimal administrative costs for the issuance of permits and maps.

- Special equipment, facilities, or improvements necessary to support the use: none.
- Maintenance costs: held to a minimum. Expected costs include installing signs when necessary to inform the public on temporary closures.
- Monitoring costs: held to a minimum. Expected costs include 1–2 hours per week by the refuge manager to monitor the wood-cutting progress and potential wildlife disturbance. Monitoring will be done while conducting routine management monitoring. Refuge Law Enforcement officer could spend three to four hours per week monitoring illegal activity or noncompliance with the special use permits. This activity will be done while conducting routine refuge law enforcement.
- Offsetting revenues: an annual fee of \$25 will be assessed for a special use permit to cover administrative costs and maps.

Anticipated Effects of Use

- Short-term effects: the use will support the refuge mission by restoring grassland acres, increasing the nesting habitat of migratory grassland species, reducing invasive tree species, reducing hazardous fuel, and reducing labor hours and equipment use for mechanical tree removal resulting in cost savings for the Service. Through the management of the activity, negative direct or indirect effects would be reduced. The disturbance activity would not be any greater than what would be conducted by refuge staff conducting the same activity. Short term activity may increase as the public learns about the availability of firewood.
- Long-term effects: the use will be applied primarily in the short term, 3–10 years, until invasive tree populations have been eradicated or are at manageable levels. The duration and frequency of firewood cutting will be reduced over time and may be phased out completely. Long-term beneficial effects would include increasing the nesting habitat for migratory grassland species, controlling invasive tree species, and increasing native plant diversity.

- Cumulative effects: the use will provide beneficial effects by increasing nesting habitat of migratory grassland species, eradicating invasive tree species, and increasing native plant diversity. The combustion of the wood will be required to allow for restoration of the native plant communities on the refuge. The activity of burning the wood can either be performed by the refuge or by the public. The benefit of allowing the public to cut and use the firewood will help reduce the amount of petroleum products required to heat their homes.

Public Review and Comment

This compatibility determination was presented for public review and comment as part of the 30-day public comment period for the draft comprehensive conservation plan and environmental assessment for the Quivira National Wildlife Refuge.

Determination

Firewood cutting is a compatible use on Quivira Refuge.

Stipulations Necessary to Make Sure that There is Compatibility

Refuge staff will mark trees or spray trees in designated areas before firewood cutting. The refuge manager will monitor the use and close areas during red flag fire danger, when threatened or endangered species are present, or when it would interfere with management activities such as grazing or prescribed fire. Woodcutting equipment will be limited to power chainsaws with spark arrestors, axes, and hand saws. Heavy equipment and tractors owned by the public will not be permitted to aid with firewood cutting. Monitoring the activity will be performed by refuge staff on a regular basis. Law enforcement staff will visit sites regularly during routine patrols to monitor that activities are conducted within special use permit guidelines and refuge regulations.

Justification

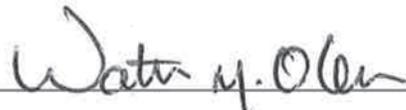
Firewood cutting will help us reach and meet the overall goal of managing habitat for migratory birds. It will aid refuge staff and provide a cost savings to the Government by reducing labor, equipment, and fuel costs to remove trees. It will help reduce hazardous fuel and fuel load to help prevent or manage wild-

fires. By managing locations, firewood cutting will not interfere with other wildlife-dependent uses. Temporary disturbance of the wooded areas may cause minimal disturbance to wildlife in the area but will be necessary to increase quality habitat for migratory birds and other refuge species. It will help promote diverse grass stands, may increase water reserves on the refuge through tree reduction, and provide enhanced nesting habitat for upland birds.

Mandatory 10-year reevaluation date: 2023

B.7 Signatures

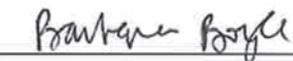
Submitted by:

 9/25/13

W. Mike Oldham, Project Leader
Quivira National Wildlife Refuge
Stafford, Kansas

Date

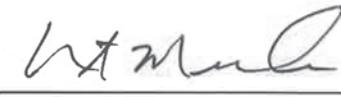
Reviewed by:

 9/27/13

Barbara Boyle, Refuge Supervisor
U.S. Fish and Wildlife Service, Region 6
National Wildlife Refuge System
Lakewood, Colorado

Date

Approved by:

 10/17/13

Will Meeks, Assistant Regional Director
U.S. Fish and Wildlife Service, Region 6
National Wildlife Refuge System
Lakewood, Colorado

Date

Appendix C

Intra-Service Section 7 Biological Evaluation

Intra-Service Section 7 Biological Evaluation Form - Region 6

Originating Person: Mike Oldham

Date Submitted: September 20, 2013

Telephone Number: 620-486-2393

- I. **Service Program and Geographic Area or Station Name:**
Quivira NWR and Great Plains Nature Center
- II. **Flexible Funding Program** (e.g. Joint Venture, etc) if applicable:
N/A
- III. **Location:** Location of the project including County, State and TSR (township, section & range):
The location of proposed actions largely occurs within the boundaries of Quivira National Wildlife Refuge. The refuge consists of 22,135 acres in Stafford, Rice, and Reno Counties in south-central Kansas. The majority of the refuge lies in Stafford County, while the eastern edge falls in Reno and the northeast section into Rice County. Its purposes are to provide migration, nesting, resting, and feeding habitat for migratory birds and to develop, advance, manage, conserve, and protect fish and wildlife resources.

Additionally, Refuge staff manages the Great Plains Nature Center (GPNC) in partnership with the Kansas Department of Wildlife, Parks, and Tourism (KDWPT), and the City of Wichita Department of Park and Recreation. The GPNC is located within the city of Wichita, entirely within Sedgwick County. The GPNC is a Service administrative site and an urban educational facility, but it is not a unit of the National Wildlife Refuge System.
- IV. **Species/Critical Habitat:** List federally endangered, threatened, proposed, and candidate species or designated or proposed critical habitat that may occur within the action area.
 - A. Federally listed species/critical habitat which may be affected by the action:
 - › **Whooping Crane (E)/Quivira National Wildlife Refuge (QNWR)**
 - › **Interior Least Tern (E)/all lands and waters on QNWR**
 - › Piping Plover (T)/No Critical Habitat in KS
 - › Eskimo Curlew/No Critical Habitat in KS
 - B. Proposed species which may be affected by the action:
 - › Lesser Prairie-Chicken (T) (Stafford County)
 - C. Candidate species which may be affected by the action:
 - › Arkansas Darter (Reno, Rice, and Stafford County)
 - › Sprague's Pipit/No Critical Habitat in KS
- V. **Project Description:** Describe proposed project or action or, if referencing other documents, prepare an executive summary (attach additional pages as needed):

Refuge and regional staff have developed a Comprehensive Conservation Plan and Environmental Assessment (CCP) that will serve as a working guide for management plans and activities throughout the refuge, and at the GPNC over the next 15 years. Because of the nature of the Plan, it is intended to be a multi-year general guidance document, but lacks some detailed actions that will be provided in step-down management plans as part of carrying out the final CCP. All of the management actions within the plan meet specific goals developed for the refuge and GPNC (see below).

A. Summary of Goals

Our goals for the refuge and GPNC are consistent with the National Wildlife Refuge System Improvement Act of 1997, the refuges purposes, and information gathered during the planning process.

Landscape Conservation Goal - Actively protect, preserve, manage, and restore the functionality of the diverse ecosystems of the Rattlesnake Creek watershed.

Native Ecological Community Conservation Goal - Actively conserve and improve environmental conditions within refuge boundaries to promote sustainable, native ecological communities and support species of concern associated with this region of the Great Plains.

Visitor Services Goal - See that visitors enjoy quality, wildlife-dependent recreational opportunities.

Public Outreach Goal - Help visitors of all abilities understand, appreciate, and support our mission, the refuge's unique habitats, and the refuge's importance to migratory birds and other wildlife and plant species.

Cultural Resources Goal - Name, value, and preserve the cultural resources and cultural history of the refuge and connect staff, visitors, and the community to the area's past.

Visitor and Employee Safety and Resource Protection Goal - Provide for the safety, security, and protection of visitors, employees, natural and cultural resources, and facilities of the refuge and the Great Plains Nature Center.

Administration Goal - Provide and support facilities, strategically fill approved positions and allocate staff, increase volunteer opportunities and partnerships, and effectively raise and use money to keep the long-term integrity of infrastructure, habitats, and wildlife resources at the refuge and at the Great Plains Nature Center.

B. Summary of the Proposed Action

Alternative B (Proposed action)

We would focus on restoration and maintenance of native communities, promoting the potential natural range of conditions on Quivira National Wildlife Refuge that support focal resources, or focal species and their respective habitats. The Management Uses - Section 4.7 of the CCP describes a range of general action types typically used to accomplish goals and objectives: rest, water management, prescribed fire, grazing, mechanical treatments (haying, mowing, tree cutting, farming activities, disking of wetlands), and chemical treatments as natural resource management techniques.

Management would continue to allow compatible public use opportunities that are a priority of the

Refuge System: hunting, fishing, wildlife observation, photography, interpretation, and education. The proposed action includes some expanded public use opportunities, such as the ability to allow state- and federally-regulated deer hunting of a high-density and increasing local population. Relatively minor changes in our operations; inventory, monitoring, and research; and infrastructure would likely be required to accomplish the proposed actions.

C. Key Elements Included in Our Management of Quivira and the GPNC

Management actions used on the refuge, such as grazing and prescribed burning, are necessary to maintain native communities given current landscape conditions, uses, and constraints.

Implementation of the proposed actions (alternative B) will involve compliance with all Federal laws and regulations that provide direction for managing units of the Refuge System.

Management would continue to actively support species recovery plans.

All wildfires will be managed in accordance with Federal Wildland Fire and Service policy. The initial action on a human-caused wildfire will be to suppress the fire at the lowest cost with the fewest negative consequences with respect to firefighter and public safety. A naturally occurring wildfire may be concurrently managed for one or more refuge objectives. Further, objectives can change as the fire spreads across the landscape. Wildfire would be viewed as playing a more natural role in the environment. Prescribed fire may be utilized in all habitat types at any time of the year based on refuge objectives, and related to hazardous fuels reduction and/or habitat management.

We will attempt to control invasive species through an integrated pest management (IPM) approach that uses approved biological, chemical, cultural, and mechanical treatment methods as part of a Pesticide Use Plan.

We will protect and manage all cultural resources.

We will support our own research efforts and those of others to help achieve management objectives.

As appropriate, we will assess conditions that indicate signs of wildlife disease, such as cholera, chronic wasting disease, avian influenza, and botulism.

We will promote strong and diverse partnerships to help meet the objectives and goals of the refuge.

We will maintain current water rights throughout the refuge.

Our approach to climate change adaptation in the next 15 years will result in specific differences in management capacity (constraints) and ecosystem resiliency (adaptability) potential as indicated throughout the CCP under various goals and topic headings. Many of our actions address key findings of climate change adaptations listed by Staudinger et al. (2012). Our management actions would:

- promote sustainability of ecosystems, biodiversity of organisms, and wildlife-dependent ecosystem services.
- reduce or alleviate environmental stressors or vulnerabilities, such as grassland fragmentation and the effects of invasive species, which may be magnified with climate change.
- implement an adaptive management process that involves the experimentation and modification of management actions and monitoring to increase success in achieving goals and objectives. For example, timing of management actions may require adjustments for success with changing climate conditions. Regardless, there remains uncertainty in the effects of climate change, such as how system variability and vulnerability will change and affect land use and environmental regulations at landscape scales that collectively influence refuge management planning. For example, we are uncertain of how water use and rights issues within the watershed and western

Kansas aquifers will be affected with climate change and what the consequences will be for refuge resources and management (e.g., Rosenberg 2010, Schlager and Heikkila 2011). Over the time of this plan, knowledge will be gained of anticipated future changes that inform management strategies and decision-making.

Our management actions would not:

- manage to stabilize natural conditions; instead, all manage system transitions and promote strategies that closer emulate or support natural processes.

Rosenberg, N.J. 2010. Climate change, agriculture, water resources: what do we tell those that need to know? *Climate Change* 100:113-117.

Schlager, E.; Heikkila, T. 2011. Left high and dry? Climate change, common-pool resource theory, and the adaptability of western water compacts. *Public Administration Review* May/June 461-470.

Staudinger, M.D.; Grimm, N.B; Staudt, A.; Carter, S.L.; Chapin III, F.S.; Kareiva, P.; Ruckelshaus, M.; Stein, B.A. 2012. Impacts of climate change on biodiversity, ecosystems, and ecosystem services: technical input to the 2013 national climate assessment. Cooperative report to the 2013 national climate assessment. [Internet]. <http://assessment.globalchange.gov> [date accessed unknown]. 296 p.

VI. **Determination of Effects:**

(A) Description of Effects: Describe the action(s) that may affect the species and critical habitats listed in item IV. Your rationale for the Section 7 determinations made below (B) should be fully described here.

1. Explanation of effects of the action on species and critical habitats in Items IV. A, B and C:

The proposed action (Alternative B) has the intent to support species of concern and associated habitats. Among the various conditions provided, management actions would restore and maintain habitat composition and structure characteristically used by the species of concern listed above (IV). As described in the objectives, management would provide open, shallowly-flooded wetlands and shoreline/beach-like areas used by shorebirds, cranes, and terns, as well as a mosaic of open and dense cover in upland prairie that has the potential for use by prairie-chickens. The boiling springs area would be managed with the intention of supporting the existing Arkansas darter population. Management would appropriately encourage continued use of sites selected by interior least terns during the breeding season, presuming current and anticipated future conditions support success.

Other refuge programs identified in the CCP that could have neutral, or minimal effects on threatened and endangered species include (visitor services) hunting, fishing, wildlife observation and photography, environmental education, interpretation, special events, and general public outreach. Management of public use programs would consider conservation of species of concern a priority. For example, temporary closures and/or other regulations would be used by management to minimize disturbance of nesting least terns and migrating whooping cranes resulting from public use activities. Certain species would not be huntable species within the boundaries largely for the protection of species of concern, such as sandhill crane that often occur with whooping crane on the refuge. Limited disturbance of species of concern may occur as a result of permitted activities, such as those related to education, outreach, monitoring, research, and/or management, that largely have the potential of increasing support of species conservation and protection at a larger level.

At the beginning of the planning process, specific issues of concern were identified by the public, and requests were made to effect suggested changes toward the management of the refuge. None of the

suggested changes were implemented in this plan that would directly adversely impact Threatened and Endangered Species. The following list identifies the issues raised by the public during the initial planning meetings, followed by a focused objective on how the refuge will proceed under the plan's proposed action.

Tree Management

Identified Issue: There are differences of opinion about tree management on Quivira National Wildlife Refuge. Prairie restoration, with a reduction in current tree coverage, is generally understood and supported. Yet, some would prefer that we keep tree coverage at a higher level for a variety of reasons.

Proposed Action: Management of tree areas would continue as it supports the purpose, goals, and objectives of the refuge, especially those pertaining to the conservation of native communities and species of concern. The plan clearly identifies the allowable coverage or removal of trees during the life of the plan, and describes various benefits to native wildlife and public use opportunities. Overall, the area of woody vegetation on the refuge would decrease, which would be potentially beneficial to species in Items IV. A, B and C. There would be no or insignificant adverse effects to species in Items IV. A, B and C.

Whooping Crane Closures

Identified Issue: When whooping cranes are present, Quivira National Wildlife Refuge has been closed to hunting to avoid disturbance and prevent accidental shooting. Whooping crane arrivals and departures are unpredictable, which makes it difficult for hunters to plan ahead. Public lands for hunting in Kansas are also limited, which exacerbates their frustration. And yet, while disappointing hunters, whooping cranes do attract birders. We at the refuge have received many requests to reconsider our refuge-wide closures. At the nearby Cheyenne Bottoms Wildlife Area, Kansas Department of Wildlife, Parks and Tourism has successfully protected whooping cranes by using partial area closures.

Proposed Action: The whooping crane closure modification, as suggested in the proposed draft Alternative B, would not be implemented. The revised proposed action would continue to maintain general hunt closures (waterfowl and upland game hunts) with the presence of whooping crane. Limited exceptions may be considered as the refuge develops a hunt plan for potential deer and turkey hunting opportunities, such as the limited use of archery in selected tree groves. There would be no or insignificant adverse effects to species in Items IV. A, B and C.

Prohibiting the Collection of Shed Antlers

Identified Issue: We are aware of limited interest in deer antler collection on the refuge. However, collecting or taking of any plant, wildlife, or parts thereof from a national wildlife refuge without a permit is specifically prohibited under Title 50 Code of Federal Regulations Part 27.61. Further, the decision to prohibit antler collecting on the refuge is consistent with other Kansas refuges. This consistency among Kansas refuges facilitates associated law enforcement and public communication activities.

Proposed Action: The refuge would not allow the collection of shed deer antlers under special use permit. There would be no adverse effects to species in Items IV. A, B and C.

Deer and Turkey Hunting

Identified Issue: Deer and turkey hunting have never before been approved as a public use activity or management strategy on Quivira National Wildlife Refuge, but there is interest in allowing these hunting activities in the future. Long-term trends show populations of these species continue to increase. Recent research suggests that effective population management may require or benefit from control that involves areas on- and off- refuge lands.

Proposed Action: The refuge would implement deer and turkey hunting under a highly controlled and limited basis through special use permit. The hunts would only be allowed after developing a step down hunt plan. Permitting would minimize indirect or unintended adverse disturbance to species of concern with control of the timing, location, and method of hunting. There would be no or insignificant adverse effect to species in Items IV. A, B and C.

Water Quantity and Quality

Identified Issue: Agriculture and oil production in the area help set water resource and land use trends that raise concerns about the current and future characteristics of water quality. Future water availability and quality may

not be assured, yet adequate water quantity and chemistry are important factors of refuge saltmarsh and wetland communities. Substantial declines in the water table would also likely affect grassland and meadow habitats.

Proposed Action: The refuge would continue to work toward solutions with other partnering agencies and organizations on improving and/or conserving water quantity and quality. Management would provide direct benefits to water quantity and quality, such as in decreasing the coverage of non-native woody phreatophytes along the creek and in wetland areas. Also, the refuge would continue monitoring related to water use and characteristics. Because this issue involves activities beyond refuge boundaries and management control, there are potential risks of localized and seasonal effects to species in Items IV. A, B and C. However, with respect to water quantity and quality, the proposed action of refuge management has the intent of minimizing adverse effects and providing benefits to species in Items IV. A, B, and C if and when possible.

Increasing Public Use and Wildlife Compatibility

Identified Issue: We are aware of potential benefits and harm to natural resource conservation brought on by an increasing interest in birding and ecotourism. Whooping cranes and rare birds quickly attract many birders and photographers when they appear on the refuge. According to the National Wildlife Refuge System Compatibility Policy, these wildlife-dependent recreational use activities are welcome as long as they are found not to interfere with, or detract from, the fulfillment of the Refuge System mission or the purposes of the refuge.

Proposed Action: The refuge would continue to manage public use activities according to the proposed Alternative B as developed in the CCP. The refuge would not allow public uses that encourage or enhance adverse effects on T & E species. There would be no or insignificant adverse effects to species in Items IV. A, B and C.

(B) Determination: Determine the anticipated effects of the proposed project on species and critical habitats listed in item IV. Check all applicable boxes and list the species (or attach a list) associated with each determination.

Determination

No Effect: This determination is appropriate when the proposed project will not directly or indirectly affect (neither negatively nor beneficially) individuals of listed/proposed/candidate species or designated/proposed critical habitat of such species. **No concurrence from ESFO required.**

May Affect but Not Likely to Adversely Affect: This determination is appropriate when the proposed project is likely to cause insignificant, discountable, or wholly beneficial effects to individuals of listed species and/or designated critical habitat. **Concurrence from ESFO required.**

_____ X _____

May Affect and Likely to Adversely Affect: This determination is appropriate when the proposed project is likely to adversely impact individuals of listed species and/or designated critical habitat. **Formal consultation with ESFO required.**

May affect but Not Likely to Jeopardize candidate or proposed species/critical habitat: This determination is appropriate when the proposed project may affect, but is not expected to jeopardize the continued existence of a species proposed for listing or a candidate species, or adversely modify an area proposed for designation as critical habitat. **Concurrence from ESFO optional.**

Likely to Jeopardize candidate or proposed species/critical habitat:

This determination is appropriate when the proposed project is reasonably expected to jeopardize the continued existence of a species proposed for listing or a candidate species, or adversely modify an area proposed for designation as critical habitat. Conferencing with ESFO required.

Signature Walter M. Oller Date 9/25/13
 [Supervisor at originating station]

Reviewing Ecological Services Office Evaluation (check all that apply):

A. Concurrence Nonconcurrency
 Explanation for nonconcurrency:

B. Formal consultation required
 List species or critical habitat unit

C. Conference required
 List species or critical habitat unit

Name of Reviewing ES Office Kansas ES Office

Signature Samuel W. Mulhern Date 10/31/13

Appendix D

Public Involvement

D.1 Public Involvement

We started public scoping for Quivira Refuge with a notice of intent published in the Federal Register on February 24, 2010. It announced our plan to prepare a CCP and EA for the refuge and to solicit suggestions and information on the range of issues to be considered in the planning process.

In February 2010 a planning update was sent to each individual, organization, and government representative on the CCP mailing list, see section D.2. This update provided information on the history of the Refuge System and on the CCP process along with an invitation to attend one of three listed open houses.

We informed local newspapers, radio, and television stations about our open houses. Flyers were also posted and announcements were made via email and at the meetings of local organizations.

Open houses were held from March 8 to March 10, 2010, in the local communities of Great Bend, Stafford, and Wichita, Kansas. A PowerPoint presentation was given at each, and informational posters, maps, and handouts were made available to provide a history of the Refuge System, an orientation of the planning area, and an overview of the CCP and NEPA processes. We presented the refuge's draft vision statement, and our staff was on hand to provide additional information. Turnout was moderate, 5–15 people attended each meeting and were encouraged to ask questions and offer comments.

We accepted written comments through March 26, 2010, and received more than 80 comments, orally and in writing, during the scoping process. Letters came from three organizations—the National Wild Turkey Federation, Defenders of Wildlife, and the Great Bend Convention and Visitors Bureau—and from 12 individuals. Comments identified biological, social, and economic concerns about our refuge management, and we used these in developing the draft CCP and EA.

Availability of the draft CCP for Quivira Refuge was announced in the Federal Register on April 22, 2013, and comments on this document were collected through May 31, 2013. Three public meetings to discuss the draft CCP and EA were announced in a planning update released in April 2013. These meet-

ings were held from April 29 to May 1, 2013, in Great Bend, Stafford, and Wichita, Kansas. Attendees were given the opportunity to submit comments. We also collected comments online, by email, and by mail.

Our planning team's response to public comments on the draft CCP and EA are included in this appendix.

D.2 Public Mailing List

Following is the mailing list for the Quivira Refuge CCP.

Federal Officials

U.S. Senator Pat Roberts, Washington, DC
U.S. Senator Jerry Moran, Washington, DC
U.S. Congresswoman Lynn Jenkins, Topeka, KS
U.S. Congresswoman Lynn Jenkins, Washington, DC
U.S. Congressman Tim Huelskamp, Hutchinson, KS
U.S. Congressman Tim Huelskamp, Washington, DC
U.S. Congressman Kevin Yoder, Overland Park, KS
U.S. Congressman Kevin Yoder, Washington, DC
U.S. Congressman Mike Pompeo, Wichita, KS
U.S. Congressman Mike Pompeo, Washington, DC

Federal Agencies

FWS—Atlanta, GA, Anchorage, AK, Sacramento, CA, Arlington, VA, Shepherdstown, WV, Portland, OR, Hadley, MA, Albuquerque, NM, Washington, DC, Fort Snelling, MN
USGS—Fort Collins, CO
National Park Service—Denver, CO, Omaha, NE
NRCS—Saint John, KS

Tribal Officials

Osage Nation Tribal Council, Pawhuska, OK

State Officials

Governor Sam Brownback, Topeka, KS
Representative Mitch Holmes, Saint John, KS
Representative Michael O'Neal, Hutchinson, KS
Representative Janice Pauls, Hutchinson, KS
Representative Joe Seiwert, Pretty Prairie, KS
Senator Terry Bruce, Hutchinson, KS
Senator Jay Emler, Lindsborg, KS
Senator Ruth Teichman, Stafford, KS

State Agencies

Kansas Department of Wildlife, Parks and Tourism—Great Bend, KS, Pratt, KS, Topeka, KS

Local Government

Big Bend Groundwater Management District 5—
Haviland, KS, Macksville, KS
City Manager, Sterling, KS
Clerk Bell Township, Rice County, Raymond, KS
Clerk Stafford County, Saint John, KS
Commissioner Reno County, District 2, Hutchinson, KS
Commissioner Rice County, District 2, Sterling, KS
Commissioner Stafford County, District 2,
Macksville, KS
Commissioner Stafford County, District 3, Saint
John, KS
Mayor, Great Bend, KS
Mayor, Hudson, KS
Mayor, Saint John, KS
Mayor, Stafford, KS
Treasurer Bell Township, Rice County, Ray-
mond, KS
Trustee, Putnam Township, Stafford County,
Ellinwood, KS

Local Businesses

Alden State Bank, Sterling, KS
ANR Pipeline Co., Alden, KS

Cole Body Shop, Great Bend, KS
Hoisington Main Street Inc., Hoisington, KS
Jayhawk Pipeline, McPherson, KS
White Eagle Resources Corporation, Louisville,
KS

Organizations

American Bird Conservancy, The Plains, VA
Audubon Society, Washington, DC
Defenders of Wildlife, Washington, DC
Ducks Unlimited, Memphis, TN
Friends of Great Plains Nature Center, Wichita,
KS
Friends of Quivira—Hudson, KS, Larned, KS,
Saint John, KS, Stafford, KS, Sterling, KS
Great Bend Convention and Visitors Bureau,
Great Bend, KS
Izaak Walton League, Gaithersburg, MD
Kansas Herpetological Society, Wakarusa, KS
Kansas Ornithological Society, Prairie Village,
KS
National Trappers Association, New Martins-
ville, WV
National Wildlife Federation, Reston, VA
National Wildlife Refuge Association, Washing-
ton, DC
Quail Unlimited, Wichita, KS
Sierra Club, San Francisco, CA
Sierra Club Southwind Group, Wichita, KS
Smokey Hills Audubon Society, Salina, KS
Stafford County Ducks Unlimited, Saint John,
KS
The Nature Conservancy, Ellinwood, KS
The U.S. Humane Society, Washington, DC
The Wilderness Society, Washington, DC
Wichita Audubon Society, Wichita, KS

Universities and Schools

Colorado State University, Fort Collins, CO

Media

Great Bend Tribune, Great Bend, KS
Hays Daily News, Hays, KS
Saint John News, Saint John, KS
Wichita Eagle, Wichita, KS

Individuals

55 private individuals

D.3 Public Comments on the Draft Plan

The Draft CCP and EA for Quivira Refuge were presented for public review from April 22 to May 20, 2013. Three public meetings were held from April 29 to May 1 in Great Bend, Stafford, and Wichita, Kansas, and were attended by 39 people, total. The comment period was extended 11 days at the request of Audubon of Kansas, Incorporated, and closed May 31. A total of 60 comment letters were received during the period.

We reviewed all comments and found the following to be substantive. As defined by NEPA compliance guidelines, comments are considered substantive if they.

- question, with reasonable basis, the accuracy of the information in the document;
- question, with reasonable basis, the adequacy of the environmental analysis;
- present reasonable alternatives other than those presented in the environmental assessment;
- cause changes or revisions in the proposal.

In compliance with the spirit of the Privacy Act of 1974, it is our policy in Region 6 to not publish the names, addresses, or other personal information of individuals. Agencies, businesses, and organizations are excluded from this policy. Rather than print every letter from individuals and redact, or black out, all personal information, we have summarized the general nature of the comments received and responded to each substantive comment. Some of the comments do not meet the definition of “substantive,” as defined previously. Those are shown as “comment noted.” In some instances, we have opted to respond to specific nonsubstantive comments where the public displayed a strong interest.

We developed responses to comments after grouping them under the following topics.

- measurable objectives
- water resources
- tree management
- grazing
- whooping cranes
- bison
- general hunting
- waterfowl hunting
- upland game hunting
- deer hunting
- turkey hunting
- sandhill crane hunting
- snow geese hunting
- furbearer hunting
- trapping
- wildlife observation
- antler collecting
- boating
- public outreach
- Friends of Quivira
- tourism
- facilities
- planning process

Measurable Objectives

Comment. *The plan should identify positive results expected from habitat management activities (i.e., burning, grazing, and mowing). Conduct baseline assessments and measure effects of the final plan. The plan should include adaptive management to be able to learn from successes and failures over the coming years.*

Response. As indicated early in the CCP and EA, the Service and Refuge System promote use of adaptive management. Guidance and policy associated with adaptive management is in place, and continues to be refined in recent years. Positive results expected from habitat management activities are captured in measurable objectives, such as those developed for native communities in chapter 6. The general effects of disturbance types used to manage communities are discussed in the CCP and EA in chapter 5. More specific details of management strategies and associated effects are outside of the scope of this plan and are typically included as part of a habitat management plan. In addition, an inventory and monitoring plan is developed after the approval of the CCP that describes protocols used to inform management and measure success in achieving objectives.

Water Resources

Comment. *I acknowledge importance of water in Kansas and urge the protection and continued use of existing water rights.*

Response. Thank you for supporting the sustainability of water resources and water rights in Kansas. Water quantity and quality are critical to current and future generations.

Comment. *With regard to water rights, I don't believe the basin is over appropriated.*

Response. We respect different perspectives and opinions and understand that some may be due to context. For clarification, we use the term “over appropriation” to mean that existing water use cannot be sustained with the continuation of long-term declines in water supplies. For more detail, several documents published by representatives outside of the Federal Government provide descriptions of local water history and declining trends in water levels that indicate uncertainty in the long-term sustainability of water resources in the basin. A few examples include published articles authored by a past manager of the Big Bend Groundwater Management District, or GMD5, (Falk 2006), a professor of law at the University of Kansas (Peck 2006), and a scientist at the University of Kansas-Kansas Geological Survey (Sophocleous 2012). The GMD5 manager explains, “In December 1998, the District (Big Bend or GMD5) recommended to the Chief Engineer that the remainder of the District be closed to further appropriation. Further evaluations had revealed each of the remaining basins to be over-appropriated, based upon a comparison of the amount of groundwater development to the recharge value. As of December 1998, the whole District was closed to large-scale development.”

Tree Management

Comment. *I support tree removal on the refuge.*

Response. We appreciate the positive feedback.

Comment. *I support some tree removal, but less than the current rate and amount.*

Response. We believe that the rate and amount referred to in this comment has lessened. Few trees have been removed this past year. Previous years' management was more aggressive partly due to the temporary availability of added resources to accomplish the work. Refuge stations

are federally funded, and the amount can change annually. Thus, opportunities to make progress in achieving goals and objectives will vary from year to year.

Comment. *I oppose tree removal on the refuge.*

Response. Thank you for sharing your opinion. Much explanation of tree removal is included in the CCP and EA.

Comment. *I support preservation of woodlots identified in Figure 17. Wooded areas provide habitat for many types of wildlife, and provide wildlife viewing opportunities for people.*

Response. We promote public appreciation of natural resources and encourage the feedback.

Comment. *Walnut trees were here when buffalo were, and should remain on the refuge.*

Response. A purpose of the CCP and EA is to provide context to guide refuge management planning, not necessarily to address specific situations case by case. With respect to tree management, several factors are considered, as described in the CCP and EA and in appendix E. Whether or not a tree is native to the region and where it naturally would have occurred in the landscape are among those factors. Furthermore, details involved in decisionmaking are not always simple and straightforward. It is likely, for example, that a planted shelterbelt (linear landscape feature) of native trees fragmenting a large block of prairie and possibly serving as ‘a predator lane’ would be viewed differently than a naturally established small grove of native trees characteristic of a natural landscape setting.

Comment. *Cottonwood is a native species of Kansas, and should remain on the refuge.*

Response. Yes, we agree that cottonwood is a native species and should remain on the refuge. This does not mean that management should, or will, protect every cottonwood seedling, sapling, or tree. Natural processes such as fire historically limited the amount of native woody vegetation on the prairie landscape. Management will allow cottonwood to occur on the refuge as described in the proposed alternative and approved final plan.

Comment. *Aerial spraying by the Service in prior years has killed the catalpa trees on the refuge and some on adjacent lands to the east.*

Response. Current staff has also noticed the change in appearance of the trees in that grove—not completely dead, but certainly affected—and cannot provide an explanation. We are not aware of aerial spraying of the catalpa grove or any other area on

the refuge by management in recent years. Several ice and hail storms, a destructive tornado, and drought are natural events that have affected many trees and wooded areas in recent years.

Grazing

Comment. *I support the current lower cattle allowances which have improved habitat conditions on the refuge.*

Response. We appreciate the observation of desired habitat conditions. The effects of drought in recent years combined with other land management activities often resulted in unintended or undesirable conditions. At the same time, more intensive treatments can have beneficial results in some cases. A recent example is the conversion of a large, monotypic stand of dense cattail to a meadow dominated by various sedges and rushes that now provides diverse structure for wildlife.

Whooping Cranes

Comment. *Cranes like Quivira Refuge because it is one of the few places they are not disturbed.*

Response. Yes, we presume that whooping cranes use Quivira Refuge and certain areas off the refuge in part because of limited disturbance. All alternatives in this document support visitor use activities that are compatible with wildlife.

Comment. *Excited to have the opportunity to reliably see this species at a location other than wintering grounds in Texas.*

Response. It is always great to hear about positive experiences with wildlife. We will continue to support the conservation of this species.

Comment. *Where do the cranes roost on the refuge?*

Response. The most common roosting areas on the refuge are in and around the Big and Little Salt Marshes.

Comment. *How far do cranes feed from the marsh?*

Response. They have been observed foraging in refuge marshes and have been reported using areas within many miles of the marshes or roosting sites. Known observations often occur within ten miles of the refuge.

Bison

Comment. *I support reintroduction of bison on the refuge.*

Response. We appreciate and share your general interest in bison and their associated effects. As indicated in the draft CCP and EA, the reintroduction of bison would require the consideration of many factors, including substantial increases to staff and budget. Our proposed action, alternative B, received much public support but does not include such increases in staff and budget. Furthermore, recent Federal budgets have not included increases that would encourage the initiation of a bison reintroduction program.

Comment. *I oppose reintroduction of bison on the refuge.*

Response. As indicated in the CCP and EA, we acknowledge the tradeoffs and complexities associated with the reintroduction of bison.

General Hunting

Comment. *Wildlife conservation should be the paramount goal, with limited hunting on the refuge as appropriate to achieve ecological health. Hunting should be used as a management tool for wildlife health based on scientific research. Recreation should not be the primary factor for allowing hunting on the refuge.*

Response. Our priority, included in the mission of the Refuge System, is to conserve wildlife and their habitats. Legitimate and appropriate wildlife-dependent uses of refuges, however, are in our guiding principles and include compatible hunting, fishing, wildlife observation, photography, interpretation, and education. Therefore, we will continue to support both compatible consumptive and nonconsumptive uses on Quivira Refuge. The challenge will be to appropriately balance multiple use activities that are compatible with wildlife and habitat conservation as things change.

Comment. *I oppose hunting in general, and all hunting at Quivira Refuge.*

Response. Thank you for sharing your opinion.

Comment. *There should be less emphasis on hunting and more emphasis on wildlife viewing and environmental education.*

Response. Thank you for sharing your opinion.

Comment. *Refuge hunting programs should be managed for the good of the public, not for adjacent landowners looking out for their investments.*

Response. Thank you for sharing your opinion. National wildlife refuges are public lands managed with wildlife and their associated habitats as a priority for the benefit of current and future generations. We desire positive working relationships with all interested parties, both local and nonlocal, especially with those who could potentially influence the conservation of natural resources and when support is needed across multiple administrative boundaries.

Comment. *I am concerned for wildlife viewing and photographer safety during hunting season since the entire refuge is open to wildlife viewing and photography.*

Response. Public safety for visitors and management staff is a critical factor in refuge operations and will remain a primary consideration when we plan visitor use activities. Signs, information resources, and more-detailed stepdown management plans will continue to promote public safety. We also encourage people to be aware of the regulations associated with refuges and of what is going on around them in all public areas.

Comment. *The State is losing hunting opportunities on private lands putting pressure on public lands to provide hunting opportunities.*

Response. It is possible that this is true in certain cases and not in others. For instance, there are different opportunities available for wetland- and upland-associated hunting opportunities on private lands. Also, certain public lands might receive, or are thought to receive, more pressure than others, depending on their mission or purposes and their relative importance to natural resources and visitor use opportunities.

Comment. *If hunting is permitted on the refuge, potential user conflicts between hunters and other refuge visitors need to be minimized.*

Response. We agree that all visitor use activities need to be considered collectively and that potential conflicts should be reasonably limited to assure safety and wildlife compatibility.

Comment. *Spotlighting and poaching is occurring on the refuge. There is a need for more law enforcement to address this issue.*

Response. We agree that law enforcement is an important need and appreciate the information. It has been unfortunate that recent changes in law enforcement staff and hiring restrictions limited surveillance frequency this past year.

Comment. *Has the Service received input from State game wardens on how to enforce the proposed programs?*

Response. We have received input and will continue to work with State partners on hunt plans that consider law enforcement and other factors. Both State and Federal regulations apply to refuge hunting, and management staff periodically consult and work with State game wardens and other law enforcement officers. It may be relevant to note that refuge law enforcement officers have the same qualifications as those who serve outside of the Service.

Waterfowl Hunting and Whooping Cranes

Comments.

- *I support alternative A which maintains current situation of closing the refuge when whooping cranes are present and maintaining North Lake within hunt area and available for hunting when the refuge is open to hunting.*
- *I support "No Hunting Window" October 10–November 20 to protect whooping cranes.*
- *Cranes are too important to allow hunting on the refuge when they are present. The risk of an accidental (or purposeful) shooting is too great.*
- *I support alternative B which allows some hunting when whooping cranes are present.*
- *Oppose closing North Lake area to waterfowl hunting.*
- *Keep North Lake in the hunt area and selectively close any unit occupied by cranes on any day. For example, if whooping cranes are in the Big Salt Marsh the Little Salt Marsh could be open and vice versa.*
- *Manage the refuge similar to Cheyenne Bottoms Wildlife Area. Close the areas being used by whooping cranes and leave the rest of the refuge open to hunting.*
- *Allow hunting on the south end of the refuge to remain open when cranes present. Suggest Units 10 and 11 could remain open to hunting.*
- *Do not close the refuge to hunting when whooping cranes are present. Hunting opportunities are limited in Kansas. Thousands of acres are available for Whooping*

Cranes. Sad to see waterfowl hunting disappear as whooping cranes stay on the refuge longer and longer.

Response. Verbal and written responses on the topic of whooping cranes and hunting boundaries and closures were numerous and varied. We appreciate the interest and the constructive feedback. It should be noted that both consumptive and non-consumptive user responses support reducing the risk to whooping cranes. Also, many hunters said they preferred the opportunity to hunt the North Lake area for a limited number of days over hunting in areas outside of the North Lake area for more days where there has traditionally been little-to-no whooping cranes use.

In discussing these topics, we applied an objective approach by evaluating public use activities within the context of Service laws, policies, and guidance. Key considerations were the Refuge System mission and the refuge's establishing legislation, or purposes. Such evaluation included, but was not limited to, (a) reducing risk to threatened and endangered species and species of concern; (b) safety; and (c) logistics, or the ability to carry out actions that facilitate compliance with laws and regulations. Among many factors, we discussed observations of whooping crane behavior and habitat use that are unique or specific to an area of the refuge. At times, a given crane individual or family has used more than one location daily on the refuge, such as the Big Salt Marsh, at the north end, and the Little Salt Marsh, at the south end. Also, based on personal staff and research experience, whooping cranes have been present but undetected by people as a result of vegetation cover or other obstructions. Issues were identified with the use of time frames, or "windows," due to changing factors, such as increasing populations, migration trends or shifts, landscape conditions, and weather or climate patterns.

Additional details are provided in our responses under other hunting-related topics in this section. We will continue to evaluate how we balance public use opportunities and natural resource conservation as conditions change and new information becomes available.

Upland Hunting

Comment. *When deer season is open will the refuge be closed to upland bird hunting?*

Response. Details related to hunting will be addressed in a hunt plan developed following the approval of the final CCP. It is likely that refuge-specific regulations will apply in order to accomplish natural resource objectives, balance public use opportunities, facilitate law enforcement, and ensure the safety of the public and refuge staff. It is possible that separate areas and times will be designated to allow for various consumptive and nonconsumptive activities.

Deer Hunting

Comment. *Support deer hunting on the refuge. In a state with limited hunting opportunities, those without financial resources for private hunts are dependent on public lands for recreational hunting.*

Response. Thank you for your comment.

Comment. *Deer hunting should be based on herd management objectives and scientific data, not solely as a recreation opportunity.*

Response. Yes, there are several reasons to allow deer hunting. The local population has continued to grow since refuge establishment, which is a long-term trend, and current densities are high relative to other areas of the state. Increases to these high deer densities may adversely affect the health of deer or other wildlife.

Comment. *Suggest limited special hunts such as governor's tag, youth hunt, wounded warriors, etc.*

Response. The Service supports special hunt opportunities, and we will consider these when developing the more-detailed hunt plan.

Comment. *Suggest limited deer hunting on refuge such as archery and shotgun only. Restrict high-powered cartridges to address safety concerns for neighboring landowners.*

Response. We appreciate the feedback and can say that safety will be a high priority in the more-detailed hunt plan.

Comment. *Suggest smaller hunt area same as the proposed area for waterfowl and upland game.*

Response. The proposed deer hunt boundary delineates the area where deer hunting might be allowed in the future, but this does not mean that the entire area would be opened at any one time. Deer movement patterns change, and there are other factors to consider, such as other consumptive and nonconsumptive use activities. Refuge-

specific regulations will limit where, when, and how deer hunting will occur within the proposed (approved) boundary.

Comment. *Proposed hunting boundary goes right to the border of the refuge creating safety issues for adjacent landowners, especially in the south end of the refuge where the boundary is narrow. Suggest hunting boundary be moved back to create a buffer area between refuge boundary and private properties for safety purposes.*

Response. Public safety concerns and potential use conflicts exist in refuge areas near administrative boundaries, especially during hunting seasons, and boundary and safety concerns exist regardless of whether or not hunting occurs on, or adjacent to, private or public lands. Refuge-specific regulations will limit where, when, and how deer hunting will occur within the proposed (approved) boundary, and safety will remain a priority in the development of a more-detailed hunt plan. Law enforcement will support public safety and the protection of natural resources.

Comment. *Oppose deer hunting on refuge. Deer herd is decreasing; fawn survival is currently low due to drought and disease.*

Response. We respect your opinion. The CCP guides management direction for the next 15 years and considers both short- and long-term trends. The current long-term trend is that the local deer population is increasing. Management needs the ability to make appropriate annual adjustments to refuge-specific hunting regulations that are consistent with management goals and objectives.

Comment. *I am concerned that deer hunting would lower the value of adjacent private property. Rates gained from leasing the hunting rights are a key consideration for landowners.*

Response. We understand the concern. We do not know if, or how, deer hunting on the refuge will influence adjacent private property values. According to current staff, property values were not affected when other hunting opportunities were offered on the refuge.

Comment. *The refuge provides wonderful deer viewing opportunities which may be negatively impacted by hunting on the refuge.*

Response. We support both consumptive and nonconsumptive opportunities that are compatible with wildlife and our conservation goals and objectives. We acknowledge that potential conflicts exist when we support multiple visitor use opportunities and will consider them when refuge-specific

hunting regulations are enacted to limit things like areas and seasons.

Comment. *Opening deer season will jeopardize ecotourism, especially if rifles, shot guns, or muzzle loaders are allowed.*

Response. We believe that, with appropriate management, ecotourism and hunting programs can coexist. Management can develop specific regulations that apply within the boundaries of Quivira Refuge that are different from other lands, such as State or private lands. We can limit how, where, and when hunting occurs. With the careful development of refuge-specific regulations, we can successfully provide compatible consumptive and nonconsumptive visitor use opportunities.

Comment. *If population control is needed, work with private landowners to take more does off their land.*

Response. We agree that this is a strategy to consider.

Comment. *What did Kansas State and Sterling College deer research indicate? Are the deer destroying habitat?*

Response. Highlights of the research findings are provided in chapter 4 of the draft CCP and EA.

Comment. *Are there population targets for deer hunting?*

Response. We do not have targets at the moment.

Turkey Hunting

Comment. *Support turkey hunting on the refuge. Start with limited-basis special hunts such as youth only, wounded warrior, etc.*

Response. Thank you for your supportive comment. Limited special hunts, such as for youth or wounded warriors, seem to be popular options. We will consider them as a starting point.

Comment. *Restrict high-powered cartridges to address safety concerns for neighboring landowners. Limit to archery and shotgun only.*

Response. We will consider this in the development of the hunt plan.

Comment. *Suggest smaller hunt area for turkey; use same area as proposed for waterfowl and upland game.*

Response. For clarification, the boundary map in the draft CCP and EA shows only where we might

allow turkey hunting in the next 15 years. After approval of the turkey hunt boundary, management will have the authority to restrict hunting to any area(s) within that boundary. Sites do not have to remain the same year after year as long as they are within the approved boundary.

Comment. *Proposed hunting boundary goes right to the border of the refuge, creating safety issues for adjacent landowners, especially in the south end of the refuge where the boundary is narrow. Suggest hunting boundary be moved back to create a buffer area between refuge boundary and private properties for safety purposes.*

Response. Public safety concerns and potential use conflicts exist in refuge areas near administrative boundaries, especially during hunting seasons, and boundary and safety concerns exist regardless of whether or not hunting occurs on, or adjacent to, private or public lands. Refuge-specific regulations will limit where, when, and how turkey hunting will occur within the proposed (approved) boundary, and safety will remain a priority in the development of a more-detailed hunt plan. Law enforcement will support public safety and the protection of natural resources.

Comment. *Oppose turkey hunting on the refuge. I am concerned whether the turkey population is large enough to support a hunt.*

Response. We presume that the local turkey population fluctuates and will consider that in the development of the more-detailed hunt plan as well as when providing opportunities for nonconsumptive use associated with turkey and factors related to wildlife conservation.

Comment. *Fall turkey hunting would be disruptive to wildlife viewing and photography opportunities on the refuge.*

Response. Seasonal restrictions and possible conflicts among visitor use opportunities will be considered in development of the more-detailed hunt plan.

Comment. *Opening turkey season will jeopardize ecotourism, especially if rifles, shot guns, or muzzle loaders are allowed.*

Response. Potential conflicts among visitor use opportunities will be considered in the development of the more-detailed hunt plan.

Comment. *Proposed turkey hunting conflicts with upland game hunting.*

Response. Federal and refuge-specific regulations often apply to hunt programs that occur on refuge lands. When developing more-detailed hunt plans, we will consider the potential conflicts among

hunt programs, among visitor use activities, and factors influencing wildlife conservation.

Sandhill Crane Hunting

Comments.

- *Support sandhill crane hunting on refuge.*
- *Oppose sandhill crane hunting on refuge.*

Response. Sandhill crane hunting will remain prohibited on the refuge in order to reduce the risk to the endangered whooping crane. One of the Service's primary responsibilities is to protect endangered species, and Quivira Refuge provides designated critical habitat for whooping cranes. Conditions among areas of critical habitat in the State and flyway are not necessarily the same. At Quivira Refuge, sandhill and whooping cranes often occur together. Local habitat use by crane species and the detectability of cranes on the refuge are relevant factors for us to consider.

Snow Geese Hunting

Comment. *I would like to see a spring hunt for snow geese.*

Response. This will be considered in the development of the more-detailed hunt plan. If allowed, it may be limited by refuge-specific regulations.

Furbearer Hunting

Comment. *Oppose furbearer hunting on the refuge.*

Response. Thank you for sharing your opinion.

Trapping

Comment. *Oppose trapping on the refuge.*

Response. We respect different opinions on public use activities. Refuge-specific regulations will restrict aspects of trapping activities, such as the number, location, and types of traps used, and will require the approval of a special use permit by the refuge manager. This approach should facilitate enforcement and alleviate safety concerns.

Wildlife Observation

Comment. *Wildlife watching increased 67 percent from 2001 to 2011. More emphasis is needed on nonconsumptive activities such as wildlife viewing and photography, interpretation, and environmental education.*

Response. Quivira Refuge has, and will continue to promote, nonconsumptive use activities. As described in chapter 4, a recent visitor use survey conducted by the USGS indicated that most use on the refuge was nonconsumptive. Over 90 percent of respondents were satisfied with the recreational activities and opportunities and the services provided by employees or volunteers.

Comment. *Support nonintrusive wildlife observation and citizen science on the refuge.*

Response. We will continue to support both consumptive and nonconsumptive visitor use activities on the refuge. Management will also consider the potential conflicts of multiple use activities in decisionmaking in order to strike an appropriate balance that is compatible with wildlife conservation and associated refuge goals and objectives.

Public Outreach

Comment. *Use Quivira Refuge Web site for more outreach.*

Response. We agree that outreach via the Internet is important. Recently, the Service redesigned websites for a more unified system-wide appearance in part to facilitate use. Quivira Refuge was one of the first refuges to activate a Web site under this new design. Management provides regular updates to the site, such as recent sightings on the refuge and scheduled events, throughout the year. Links on the site lead not only to documents and maps, but also to social sites such as Facebook and Flickr, where additional information and photographs are updated several times weekly.

Antler Collecting

Comment. *Would like to see antler collecting permitted on the refuge.*

Response. The collecting or taking of any plant, wildlife, or parts thereof from a national wildlife refuge without a permit is specifically prohibited

under Title 50 CFR Part 27.61. Prohibiting antler collecting is consistent with, and facilitates associated public communications and law enforcement activities on, other Kansas refuges.

Boating

Comment. *I would like to be able to use non-motorized small boats (canoe, float tube) on the refuge in support of fishing activities.*

Response. There are many reasons why nonmotorized boats are not permitted for use on the refuge. These include the potential for increased disturbance to wildlife, law enforcement and safety concerns, and environmental health hazards like the spread of zebra mussels, pathogens, and more. While we support many public use opportunities, wildlife and habitat conservation is the highest priority of the Refuge System mission.

Tourism

Comment. *Nature-based tourism provides important economic benefit to the State of Kansas and local communities.*

Response. Yes, we agree.

Comment. *Kansas could enjoy tourism benefits if Whooping Cranes were protected and promoted.*

Response. Refuge management supports whooping crane conservation and compatible use activities. Numerous visits to Quivira Refuge and Kansas by the public are associated with opportunities to view whooping cranes. News of the presence of whooping cranes in the area of the refuge spreads quickly via media, Internet, and phone.

Facilities

Comment. *Please provide better information and signage to let people know biking and hiking on roads closed to vehicle traffic is allowed.*

Response. Thank you for this feedback. We will continue to improve the communication of refuge use opportunities and regulations.

Comment. *A restroom facility is needed at the north end of the refuge. Suggest it be located near the North Lake and Salt Flats areas.*

Response. We will keep this in mind but will not make any commitments based on current maintenance needs, previously proposed infrastructure improvements, and budget or time constraints.

Comment. *Why is the refuge open from dawn to dusk?*

Response. The refuge is open to the public when law enforcement, safety, and conservation concerns can be met.

Comment. *I would like to camp on the refuge.*

Response. Recreational activities that are not wildlife dependent and not appropriate and compatible with the conservation of wildlife and their habitat do not support the mission and priorities of the Refuge System. Restricted camping may occur on refuges under certain circumstances, such as when access and location are not concerns, and usually requires an approved special use permit.

Comment. *Is the ADA (Americans With Disability Act) blind in an area that might be closed to hunting when whooping cranes are on the refuge?*

Response. Yes.

Comment. *No Action is a bad term; should be “Continued Management.”*

Response. Thank you for your comment.

Comment. *Parts of each alternative might work. Is it an all or nothing approach?*

Response. Based on comments we received on the draft CCP and EA, our planning team will review all of the actions proposed in all of the alternatives and pull actions from alternatives not selected to craft the management direction to be contained in the final CCP.

Comment. *The plan was developed behind the scenes with no transparency or public involvement.*

Response. We followed NEPA guidelines in reaching out to the public to encourage their involvement and to inform them on the progress of this plan. Our efforts are outlined in the beginning of this appendix and in chapter 1.

Comment. *Chapter 4 should come before chapter 3 to make it easier to understand the alternatives.*

Response. Thank you for your comment.

D.4 Comments from Tribes, Agencies and Organizations

We received formal comments from the following tribal, Federal, State, and local government agencies and organizations.

1. Osage Nation, Tribal Historic Preservation Office
2. Kansas Department of Wildlife, Parks and Tourism
3. U.S. Environmental Protection Agency
4. Audubon of Kansas, Incorporated

Letters from these agencies and organizations are shown on the following pages. Beside each reproduced letter are our responses, numbered to correspond to specific comments in the letter.

Friends of Quivira

Comment. *I would like to see increased involvement by the Friends group.*

Response. Thank you. Support for the Friends of Quivira group is much appreciated.

Planning Process and Public Notice

Comment. *Little notice of the public meetings was provided.*

Response. We followed NEPA guidelines in reaching out to the public to encourage their involvement. Our efforts are outlined in the beginning of this appendix and in chapter 1.



TRIBAL HISTORIC PRESERVATION OFFICE

Date: May 30, 2013 File: 1213-593KS-10
 RE: US Fish and Wildlife Service Quivira National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment in Stafford, Rice, and Reno counties, Kansas

Division of Refuge Planning, FWS
 Tom Griffin
 P.O. Box 25486, DFC
 Denver, CO 80225-0486

Dear Ms. Griffin,

The Osage Nation Historic Preservation Office has reviewed the **Draft Comprehensive Conservation Plan and Environmental Assessment for US Fish and Wildlife Service, Quivira National Wildlife Refuge in Stafford, Rice, and Reno counties, Kansas and has no comments at this time.** The Osage Nation is very pleased with the level of consultation between representatives of the Osage Nation and the Quivira National Wildlife Refuge and FWS Mountain-Prairie Regional staff during the development of the Comprehensive Conservation Plan and Environmental Assessment and anticipates receiving the Final drafts of those documents.

In accordance with the National Historic Preservation Act, (NHPA) [16 U.S.C. 470 §§ 470w-6] 1966, undertakings subject to the review process are referred to in S101 (d)(6)(A), which clarifies that historic properties may have religious and cultural significance to Indian tribes. Additionally, Section 106 of NHPA requires Federal agencies to consider the effects of their actions on historic properties (36 CFR Part 800) as does the National Environmental Policy Act (43 U.S.C. 4321 and 4331-35 and 40 CFR 1501.7(a) of 1969).

The Osage Nation has a vital interest in protecting its historic and ancestral cultural resources. In addition to reviewing the Final Comprehensive Conservation Plan and Environmental Assessment for US Fish and Wildlife Service, Quivira National Wildlife Refuge in Stafford, Rice, and Reno counties, Kansas, the Osage Nation anticipates working collaboratively in the identification and protection of historic and ancestral cultural resources of significance to the Osage Nation in the future.

The Osage Nation requests that this collaboration includes:

- The development of a consultation protocol agreement between the Osage Nation and Quivira National Wildlife Refuge;
- Historic property identification and management that exceeds regulatory requirements;
- A complete cultural resource survey of the Refuge;
- The development of a Refuge Cultural Resource Management Plan;
- Monitoring of significant cultural resources on the Refuge;
- Enhanced training of Refuge Law Enforcement and other staff in the identification of prehistoric artifacts and responsibilities under the Archaeological Resources Protection Act;

1-1

1-1. We agree with all of the suggestions contained in this letter and will strive to implement them as money and staff become available.

- Installing, or improving, interpretive signage throughout the Refuge regarding the prehistory of the Refuge and reflecting the relationship between Indian Tribes, specifically the Osage Nation, and the Refuge, and its surroundings; and
- The installation of interpretive and informative displays at the Refuge's Environmental Education Classroom and Visitor Center.

The Osage Nation suggests that these efforts, accompanied by compliance with Section 106 of the National Historic Preservation Act and other relevant regulations and guidance, will improve visitor experience while protecting its historic and ancestral cultural resources.

Should you have any questions or need any additional information please feel free to contact me at the number listed below. Thank you for consulting with the Osage Nation on this matter.


Dr. Andrea A. Hunter
Tribal Historic Preservation Officer


James Munkres
Archaeologist I

2-1. We appreciate the offer to provide assistance in implementing new hunting opportunities on Quivira Refuge. We are confident that our partnership will benefit the conservation of natural resources now and in the future.

2-2. We are pleased that KDWP supports our desire to “increase hunter use and satisfaction while continuing to safeguard whooping cranes.” In the early stages of CCP and EA development, representatives of the hunting community requested that the planning team explore the option of partial hunting closures during whooping crane migration, as described in the proposed alternative B. Public reviews of the draft CCP and EA indicate that many hunters and nonconsumptive users largely prefer current management (alternative A) to the proposed option (alternative B) with respect to hunting opportunities and whooping crane closures. While there were exceptions, it was the opinion of many hunters that satisfaction would be higher with fewer days of hunting the North Lake area (alternative A) due to the presence of whooping cranes compared to more days of hunting areas outside the current hunt boundary (alternative B) that have had little-to-no use by whooping cranes. Personal ties (tradition, memories), knowledge, and experience were common considerations. Many public responses from both hunters and nonconsumptive users also expressed deep concern regarding whooping crane safety. Because the protection of endangered species is one of our primary responsibilities, comments related to this topic were carefully deliberated.

When evaluating public use activities on the refuge, we applied an objective approach by placing discussions within the context of Refuge System laws, policies, and guidance. Key considerations were the Refuge System mission, priorities found in the Improvement Act, and



Phone: 620-672-6811
Fax: 620-672-6201
www.kdwp.ks.gov

Sam Brownback, Governor

Kansas
Department of Wildlife, Parks
and Tourism

Operations Office
512 SE 25th Ave.
Topeka, KS 66603-0174

Robin Ammon, Secretary

Mike Oldham, Refuge Manager
Quivira National Wildlife Refuge
1434 NE 80th St
Stafford, KS 67578

Mike,

Thank you for the opportunity to comment on the Quivira National Wildlife Refuge (QNWR) Draft Comprehensive Conservation Plan and Environmental Assessment. Due to the unique habitats of QNWR, it is an important area of conservation in Kansas, and the recreational and educational opportunities it provides makes QNWR and Kansas Department of Wildlife, Parks and Tourism (KDWP) important partners in conservation.

2-1 KDWP applauds the inclusion of expanded hunting opportunities and access as part of the recommended alternative (Alternative B) of the conservation plan. We support the recommended introduction of deer and turkey hunts on QNWR, and would be happy to provide input on the most appropriate manner to initiate those hunts. Providing opportunities for hunters is an important and popular visitor service, especially in landscapes with limited public land like central Kansas. Hunting is also an important tool for the management of wildlife populations on the refuge, and we look forward to participating in discussions regarding the most appropriate ways to manage deer, turkey, and furbearer populations. KDWP also supports the recommendation to eliminate the closure of the entire refuge to all hunting when whooping cranes are present. Allowing upland hunting or waterfowl hunting in units other than where whooping cranes are present, as is proposed in the preferred alternative, would increase hunter use and satisfaction while continuing to safeguard whooping cranes.

2-2 We recognize and support the intent to continue providing quality waterfowl hunting opportunities on the refuge while limiting hunter conflicts resulting from areas closures. However, we ask that you reconsider the recommended closure of the salt flats/north lake region of the current waterfowl hunting zone. This area is the most popular and productive area open to waterfowl hunting at QNWR. There is no evidence included that indicates the proposed waterfowl hunting area would provide the same waterfowl hunting opportunities, as it does not appear to contain the same quantity or quality of waterfowl hunting habitat. Furthermore, although proposed changes to the water management of the new hunt zone may increase waterfowl use and hunter success, they also have the potential to encourage increased whooping crane usage, resulting in situations not unlike what the refuge currently faces regarding area closures. KDWP maintains that greater waterfowl hunter satisfaction could be achieved by continuing waterfowl hunting in the salt flats/north lake area, even with periodic spot closures to that unit due to the presence of whooping cranes in the pool. The north lake area is popular during the September Teal Season and is very popular later in the duck/goose seasons (December-February), which are outside of normal whooping crane migration period.

2-3 In addition to these changes to the waterfowl hunting zone on the refuge, KDWP would like for consideration be given to expanding hunter opportunities for light goose hunting during the spring conservation order, particularly in late February and early March when light geese are most abundant on the refuge but before the spring migration of most birds, including whooping cranes. The population expansion of mid-continent light geese has been a concern for all federal and state wildlife agencies. The USFWS and Canadian Wildlife Service have been at the forefront in management decision to abate the impacts of light geese on their wintering, migration and nesting grounds. Hunting has been the primary

2-4

the purposes of Quivira Refuge. Applying these principles included, but was not limited to, (1) reducing risk to threatened, endangered, and protected species; (2) considering the safety of refuge staff and the public, which is mission critical; and (3) carrying out actions that ensure compliance with laws and regulations.

2-5

We also suggest greater consideration be given to Alternative C regarding sandhill crane hunting. QNWR is one of the larger migratory stopovers for sandhill cranes in Kansas. It is also an area of QNWR which KDPWT receives the most complaints of crane agricultural depredation. Sandhill crane hunting regulations are designed to provide recreational opportunities and relief from crop depredation while continuing whooping crane conservation. KDPWT has taken several conservative measures in the season structure to meet these objectives (delayed season dates, mandatory annual crane identification testing for all sandhill crane hunters, and limited shooting hours). Sandhill crane hunting is a biologically justified activity, and is permitted on many US NWR and state wildlife areas throughout the Central Flyway that also provide important whooping crane stopover locations.

2-6

Finally, we support the recommendation to allow furbearer harvest from the perspective of both management and recreation. However, the recommended alternative only permits furbearer hunting with firearms and archery equipment on the basis of "safety concerns". We suggest that trapping also be included as a method of furbearer harvest. Modern trapping equipment does not pose a threat to people. In Kansas, furbearers spend over 100,000 user days trapping annually, and no bystanders are injured by traps. Nationally, the user days are in the millions, and there simply are no human injuries. If the safety concern is for dogs, we would encourage allowing the use of certain trap types that do not pose a risk to dogs. Most notably, cage traps can be used effectively on several important furbearer species without fear for the safety of dogs. There is also a very popular group of foot encapsulating "dog-proof" raccoon traps that would also be suitable for trapping what is likely the most abundant furbearer on QNWR. Finally, certain types of submerged traps for beaver and other semi-aquatic furbearers that are not effectively hunted may be very beneficial to refuge management objectives, and can also be compatible with dogs when used properly. We encourage you to consider these additional opportunities for furbearer harvest, and would be happy to discuss trapping options further at your request.

2-7

Thank you for taking the time to considering this input. We recognize the difficult task the refuge faces, and look forward to further collaboration as this process moves forward.

Sincerely,



Joe Kanner
Director, Fisheries and Wildlife Division
Kansas Department of Wildlife, Parks & Tourism

CC: Tonni Griffin

2-3. As requested by KDWP and others, closure of the North Lake area to hunting was re-evaluated. With the North Lake area included as part of an approved hunt boundary, other areas proposed for hunting under proposed alternative B will be closed to hunting. According to the CFR, no more than 40 percent of the refuge may be open for waterfowl hunting. When determining hunt boundaries, we consider other wildlife and public uses, safety, law enforcement, public access and opportunity, and multiple logistical factors, especially those related to the periodic closure of hunting areas when whooping cranes are present.

2-4. As requested, we will consider "expanding hunter opportunities for light goose hunting during the spring conservation order, particularly in late February and early March when light geese are most abundant on the refuge, but before the spring migration of most birds, including whooping cranes" when we develop the more-detailed hunt plan. We agree that reducing the growing light goose population is a concern of Federal and State conservation agencies. Things to consider are (1) the potential effects on other wildlife using refuge lands at this time; (2) multiple, sometimes conflicting, public use activities; and (3) the relative level of success in reducing populations by expanding this opportunity to include refuge lands. In February and March, geese typically occur in large numbers with other waterfowl and sandhill cranes. The number and diversity of birds using the refuge at this time attract public use activities such as birding and photography. Geese commonly use the ref-

uge at this time of year and also visit surrounding lands in the region daily, offering numerous opportunities for hunting and population reduction as well as nonconsumptive public use activities. Allowing light goose hunting opportunities on parts of the refuge during the spring conservation order might be viewed by some as compensation for days closed to hunting due to the presence of whooping cranes.

2-5. We reviewed opportunities for sandhill crane hunting and considered that many public responses we received from hunters and nonhunters expressed deep concern about hunting activities' increased risk to whooping cranes. This applies to sandhill crane hunting because whooping cranes on the refuge commonly occur in, or near, flocks of sandhill cranes. With the protection of endangered species being one of our primary responsibilities, it would be difficult to justify increasing sandhill crane hunting opportunities on the refuge.

2-6. Furbearer hunting options were reconsidered in the development of the final CCP. Furbearer hunting will only be allowed under a special use permit within the same area allowed for big game hunting. Specifics will be provided in a more-detailed hunt plan. Options, including species, methods, areas, and season lengths, will be more fully developed in cooperation with KDWPT and within the context of the Refuge System mission and priorities and the refuge's purposes. We will consider the logistics of law enforcement and the safety of staff and the public among other things.

2-7. We thank KDWPT for their continued input throughout the planning process and look forward to future collaboration.

3-1. Thank you for your thoughtful review and support.

3-2. We agree that management practices should prioritize the conservation of wildlife and their associated habitat, and adverse conditions to these should be reduced. We also agree that communications with the Kansas State Historic Preservation Office and tribal historic preservation officers should remain important for increasing knowledge and improving the interpretation of cultural resources on the refuge.

3-3. We considered including a timeline as part of the Freshwater Springs strategies for the development and implementation of an associated management plan for this unique resource in the final CCP. Meetings with local experts and a review of available information would be initiated within the first 5 years to help guide management.



BISON
CONNECT

Griffin, Toni <toni_griffin@tws.gov>

EPA Review Comments: Quivira National Wildlife Refuge Draft CCP & EA

1 message

Tucker, Amber <Tucker.Amber@epa.gov>
To: "toni_griffin@tws.gov" <toni_griffin@tws.gov>

Tue, May 28, 2013 at 9:29 AM

Dear Ms. Griffin:

RE: Draft Comprehensive Conservation Plan and Environmental Assessment for the Quivira National Wildlife Refuge

This letter responds to your Notice of Availability and request for comments, concerning the Draft Comprehensive Conservation Plan and EA for Quivira National Wildlife Refuge in Stafford, Rice, and Reno counties in south-central Kansas. Thank you for involving the Environmental Protection Agency (EPA) during the consideration of environmental impacts either to or from this project.

The Draft EA adequately outlines the purpose, need, and general conservation plan. The overall benefit of implementing an adaptive management plan to the Quivira National Wildlife Refuge is sufficiently stated in this document. We also would like to thank you for addressing the potential direct, indirect, and cumulative effects. Though environmental impacts included in the EA were overall minimal, EPA offers the following comments for additional considerations of potential environmental impacts and a focus on minimization and mitigation of these impacts:

EPA continues to support avoiding and minimizing adverse impacts to air, land, and water quality, including wildlife and their habitat. We would like to suggest that any potential effects or disturbance of fish and wildlife species be minimized to the extent possible through the use of BMP's for such activity. Additionally, we commend your efforts to increase the interpretation of cultural resources on the Refuge and would recommend continued efforts to contact and involve Tribes that may be able to offer additional information on these resources. In addition to coordinating with the Kansas State Historic Preservation Office, you may also want to establish communication with any Tribal Historic Preservation Officers that may have information or investment in the region.

The only other comment we would offer is regarding the 15-year management plan mentioned for the Freshwater Springs Strategies; if you have a timeline for the development &/or implementation of this plan, it would be helpful to include that in this section.

If you have any other questions, you can contact me at 913-551-7565, or via email at tucker.amber@epa.gov.

Amber Tucker
US EPA R7
ENSV/NEPA Team
11201 Renner Blvd
Lenexa, KS 66219



BOARD OF TRUSTEES
 Chairman, Wichita
 Dick Seaton
 Vice Chair, Manhattan
 Patty Mierle
 Chair, Wichita
 Joyce Wolf
 Secretary, Lawrence

Donald Wiseman
 Treasurer, Manhattan
 Robert T. McElroy, MD
 Chairman Emeritus, Topeka
 William S. Browning, MD
 Chairman, Topeka
 Don Helges
 Exec. Committee, Lenora
 Lisa Stokelmeier, Bucyrus
 Richard W. Anderson
 Omaha, NE

Phillip L. Baker, MD
 Topeka
 Brynny
 Bernheim, MD
 Mike Bily
 Joliet, IL

Gregory Cumberland
 Topeka
 Estera Davis
 Velankusa
 Kristine B. Davis
 Hutchinson
 Michael R. Hart
 Shawnee
 David Gnirk
 Herndon, SD

Irvin "Hoagy" Hoogheem
 Topeka
 Kellie Hunt
 Lawrence
 Hon. James C. Johnson
 Abilene

Cathy Lucas
 Topeka
 Theodore Johnson
 Manhattan
 Mary Powell
 Topeka

A. Scott Ritchie
 A. Scott Ritchie
 Welling Standall
 Bassett, NE
 John Schukman
 Leavenworth
 Maryjorie E. Streeckus
 Salina

Richard G. Tucker
 Peabody
 Etale Wall
 Atimont

STATE OFFICE
 Ron Klataske, Executive Director
 210 Southwind Place, Manhattan, KS 66503
 (785) 537-4385 - aok@audubonofkansas.org
 Websites: www.audubonofkansas.org
 www.noborarasanctuary.org
 Parkland Staff
 Lana Michael, On-site Sanctuary Coordinator

May 29, 2013

To: Toni Griffin, Acting Chief, Division of Refuge Planning, U.S. Fish and Wildlife Service, Region 6,
 Mountain-Prairie Region, 134 Union Blvd., Lakewood, CO 80228
 Email address: Toni_Griffin@fws.gov

From: Ron Klataske, Executive Director, Audubon of Kansas, Inc.,
 210 Southwind Place, Manhattan Kansas 66503
 Email address: Ron.Klataske@audubonofkansas.org

**Regarding: Comments on behalf of Audubon of Kansas on the
 Draft Comprehensive Conservation Plan and Environmental Assessment**

Quivira National Wildlife Refuge

Audubon of Kansas supports the aspects of Alternative B (Proposed action) that "focus on restoring native communities and promoting the potential natural range of conditions on Quivira National Wildlife Refuge that help focal resources, or focal species and their respective habitats." "The primary purpose of the Refuge System is to conserve wildlife."

Audubon of Kansas is detailing a series of observations and concerns regarding the "Draft Comprehensive Conservation Plan and Environmental Assessment," and we are offering a series of recommendations and/or requests for revisions that will hopefully be incorporated in the final plan.

We strongly support the "Native Ecological Community Conservation Goal" and the U.S. Fish and Wildlife Service plan to:

"Actively conserve and, as appropriate, improve environmental conditions within refuge boundaries to promote sustainable native ecological communities and support species of concern associated with this region of the Great Plains."

However, we do not support the wholesale effort to increase "public use opportunities for hunting," and to a significant degree to do that at the expense of wildlife conservation and other visitor opportunities and uses. The plan almost appears to be an attempt to discard and/or diminish opportunities for nonconsumptive uses of the refuge—including wildlife viewing and photography. The Quivira National Wildlife Refuge has become one of the nation's premier wildlife viewing destinations. Nearly 71.8 million people engaged in wildlife watching, according to the 2011 national Survey of Fishing, Hunting, and Wildlife-Associated Recreation. That type of recreation has been increasing nationally at a rate far exceeding the recruitment of hunters (where numbers are unfortunately declining). Overall trip-related expenditures pursuant to wildlife watching increased 67% from 2001 to 2011. This type of nature-based tourism is the most promising prospect for future visitation to Quivira, and for economic benefits for surrounding communities.

The plan does correctly acknowledge the importance of wildlife observation and photography in one section on page 98, with the following paragraphs:

"Quivira Refuge is a premiere birdwatching site in Kansas, and one of the top sites in North America. Birders travel to the refuge from across Kansas, as well as the United States, and many return to Quivira Refuge on a regular basis. Peak birder visitation usually coincides with the peak shorebird and waterfowl migration seasons in the spring and fall.

CITIZENS COMMITTED TO CONSERVATION
 Audubon of Kansas is a nonprofit 501(c)(3) organization devoted to promoting the enjoyment, understanding, restoration and stewardship of natural ecosystems in America's heartland. We work with many conservation partners, including Audubon chapters in Kansas: Burrington A. S. of Kansas City; Jayhawk A. S. of Lawrence; Leavenworth A. S.; Northern Plains Hills A. S. of Manhattan; Smoky Hills A. S. of Selins; Sperry-Gallager A. S. of Pittsburg; Southeast Kansas A. S. of Parsons; Topeka A. S. and Wichita A. S.

4-1. Thank you agreeing with aspects of the proposed alternative B and for providing additional observations and thoughts to help us complete the plan.

4-2. Your support for the Native Ecological Community Conservation Goal is appreciated. Of utmost importance to us, as part of the overall mission of the Refuge System, is the conservation of wildlife and their habitats. Our guiding principles also include legitimate and appropriate uses of refuges, including compatible wildlife-dependent activities involving hunting, fishing, wildlife observation, photography, interpretation, and education. The appropriate balance of consumptive and nonconsumptive use activities and their potential effects on natural resources is affected by changing and interacting factors and elicits wide-ranging opinions, perceptions, and uncertainties. We presume that the perceived emphasis on hunting activities may have been due, in part, to the page length used to describe them relative to nonconsumptive use activities among the alternatives. Page length does not indicate the level of importance we place on each subject. With hunting, it may have had more to do with addressing the many public requests we received to discuss this complex subject. In fact, based on a recent visitor survey, there is general satisfaction with nonconsumptive activities and their management on Quivira Refuge. We will support these popular activities on the refuge as long as they remain compatible with wildlife. We have two and a half positions on Quivira Refuge devoted to both consumptive and nonconsumptive visitor services as their main responsibility and most of our other staff members dedicate some time to visitor use opportunities, interpretation, and education. This would not change under alternative B. We thank you for the recognition and support of these visitor use opportunities, and we will continue to consider potential conflicts among use activities.

4-3. Regardless of the alternative, we agree that whooping cranes should be protected from disturbance while they are present and be able to use the full range of habitats on the refuge. Protecting and supporting endangered species, such as whooping cranes, is one of our primary responsibilities. To clarify our intent, in the draft CCP and EA, alternative B originally would have closed areas of the refuge to hunting when whooping cranes are present. At any time, the refuge manager would still have had the authority to close the entire refuge to hunting activities for the protection of whooping cranes. The manager also would have had the option to open a part of the 22,135-acre refuge to hunting only if it was determined that it would not disturb the whooping cranes present on, or near, the refuge. Decisions would have been based on things like potential buffer distance, time in whooping crane migration, current habitat conditions, and whooping crane behavior. For all visitor use activities, we will continue to put up closed area signs and post other necessary information, such as safe approach distances.

4-4. We applaud the joint efforts of many in the conservation of whooping cranes, as you demonstrate in your discussion of the Whooping Crane Conservation Action Plan. These collaborations and the status of the whooping crane are also described in our Ecological Services 5-year review, signed 2011–2012. It is our intent that management actions on Quivira Refuge will continue to support whooping crane conservation and recovery plans, regardless of the alternative.

Besides birders, Quivira Refuge is popular with more general wildlife observers who visit to view deer, beaver, bald eagles, and the considerable amount of geese, ducks, and cranes that regularly visit during the same period.

A large percentage of visiting birders and general wildlife enthusiasts are also photographers. Many professional and experienced photographers use the refuge on a regular basis."

The Quivira National Wildlife Refuge is regarded by many people, especially wildlife enthusiasts, as the closest public land area that Kansas has to the type of wildlife attractions that Yellowstone offers the State of Wyoming. Quivira NWR has become a statewide, regional and national destination for wildlife viewing and photography.

Unfortunately, very little attention is given to maintaining the quality of and future enhancement of wildlife observation and photography opportunities. The priority given to this resource use under "actions" is summed up with two feeble sentences (page 62): "Encourage wildlife observation and photography except in seasonally closed areas. Keep the auto tour route, the observation towers, scopes and two photography blinds." The additional bullet points in the document principally focus on developing "displays, social media, and handout literature" rather than minimizing disturbances to wildlife and interactions between general "nonconsumptive" refuge visitors and potentially conflicting hunting activities.

The "Visitor Services Goal" for "Implementation of the Proposed Action" (starting on page 177) is largely dominated by "Hunting Objective 1," "Hunting Objective 2," and "Hunting Objective 3" in terms of dedicating refuge resources of land, expenditures and staff assignments.

Whooping Crane Conservation and Migratory Habitat Needs should become Paramount for Future Stewardship of the Quivira NWR.

One of the most important purposes served by the Quivira NWR is as a safe, relatively "low disturbance" migratory stopover area for the one self-sustaining and recovering population of endangered Whooping Cranes. Based on records of use in recent decades, as well as the absence of sufficient wetland complexes with a similar history of use, Quivira NWR appears to be the most important migratory stopover, resting, night roosting and "recharging" area for Whooping Cranes in the central Great Plains of the United States. Quivira stands out as a "Critical Habitat" between the Arkansas NWR on the Texas Coast and the nesting areas in and around the Wood Buffalo National Park in northern Alberta and the Northwest Territories of Canada.

To the fullest extent possible, Whooping Cranes should be protected from disturbance while they are present and should be able to use the full range of suitable habitats at the Quivira NWR. The various management strategies to accomplish this objective should include reduction or elimination of vehicle activities in the immediate vicinities of the night roosting, loafing and any feeding habitats they are using, restrictions on human access and various activities that may result in disturbance. This should include restrictions on wildlife viewing and photography that infringe on the birds and threaten to disrupt their behavior or sense of security. There has been a consensus that people should not attempt to approach closer than a quarter mile of Whooping Cranes, and that greater distance separations are advisable—depending on the nature of the human activity, landscape setting and other factors.

In 2009-2010, Whooping Crane biologists from throughout this country and Canada involved in a yearlong effort to develop a Whooping Crane Conservation Action Plan (CAP) identified a number of conservation measures that are important to the species and relevant to management choices for the Quivira NWR.

On behalf of Audubon of Kansas, I participated in the collaborative planning meetings held in Saskatchewan and Texas, and the overall project. A number of U.S. Fish and Wildlife Service officials were involved, including representation from the Quivira NWR, The Nature Conservancy, Crane Trust, and others associated with management of migratory habitat in Nebraska (especially the Platte River) and Whooping Crane habitat elsewhere were also involved in CAP leadership. Unfortunately, the KDWPFT and other entities stationed in Kansas did not participate. For purposes of highlighting the importance of migratory habitat, I am including a couple headings and a few sentences from a summary of the report < <http://www.gcbo.org/html/1000Whoopers.pdf>>. I have highlighted some statements in red for emphasis because of their relevance to the COMPREHENSIVE CONSERVATION PLAN and the guidance it will provide for management of the Quivira NWR during the next 15 years.

4-5. We appreciate the recommendations. The following considerations relate to the various discussion points mentioned.

- The period of whooping crane presence is not a given and would be expected to change due to factors such as changing landscape and climate conditions and with fluctuations in the whooping crane population.
- For clarification, hunting closures on the refuge due to the presence of whooping cranes have typically not changed daily in recent years. The refuge has been closed from nearly one week to two consecutive weeks or more.
- Yes, in this context, more resources would be required to implement alternative B due to proposed changes in hunt boundaries and opportunities, as stated in the draft CCP and EA. There are tradeoffs associated with each alternative.
- Regardless of the alternative, we will continue to refine communication strategies for increased understanding.
- We agree that numerous questions exist regarding real or perceived wildlife behaviors and potential human disturbances. Others have questioned the success of long-term conservation if public lands are closed to use activities in order to avoid risk to some or all wildlife. As a result, potential opportunities for education are lost that could influence public support for natural resource conservation. Again, there are tradeoffs associated with any balance of natural resource conservation and human activity. The

THE IMPERATIVE FOR ACTION

"The conservation of Whooping Cranes is often referred to as a success story – a job well done. What many may not realize is that the story of the long-term success and viability of the North American Whooping Crane has only just begun. Recovery efforts by the U.S. Fish and Wildlife Service, the Canadian Wildlife Service, and several other public and private stakeholders are over 75 years in the making.

While portions of the breeding and wintering habitat frequented by the wild population are generally protected from human disturbance, a growing population of birds are already venturing out into areas currently unprotected. In addition, migration corridor habitat is largely unprotected."

The culmination of the work of the Whooping Crane Conservation action planners is reflected in this Executive Summary. The group entered into the planning endeavor with a shared mission:

Permanently remove Whooping Cranes from the endangered species list through well-defined, strategic conservation actions

A 5,000-MILE COMMITMENT

"Whooping Cranes spend the winter along the Gulf Coast of Texas at Aransas National Wildlife Refuge. They arrive during October through December and depart from mid-March through April to migrate to their breeding grounds in northern Canada at Wood Buffalo National Park and remain there from May through September. Hence, the wild population is often called the "Aransas-Wood Buffalo population" or "AWBP" referring to their wintering and breeding grounds.

Fall migration occurs during October and November until the cranes arrive again at their wintering ground. Adult cranes that had a successful breeding season in Canada migrate with their chick(s).

Whooping Cranes move between the Gulf Coast and the Canadian wilderness every spring and fall – averaging 200 miles a day – under highly unpredictable conditions. It is critical for the Whooping Crane to have safe and accessible stopover wetland habitat along its travel route. Suitable habitat must provide the bird with security, seclusion, and food and water resources, allowing for rest and recovery from the long day's flight. Many factors, such as climate, weather, and human disturbance can significantly impact Whooping Cranes and their stopover habitat

MIGRATION

"The journey between Texas and the Northwest Territories of Canada spans a continent. There are many dangers in the approximately 5,000 miles this species must travel annually. The birds must stop daily for rest and feeding opportunities. The stops must have an adequate supply of freshwater and food to improve the odds of their survival during migration. Generally speaking, these daily stopovers should be located every 50-100 miles along the migratory corridor to account for varying weather patterns that can force the birds down unexpectedly. Birds having to fly too far in a day are reducing their overall health and fitness. Birds flying at night or in bad weather are increasing their likelihood of injury or death.

Unfortunately, we only know where some birds stop over and when. Developing a comprehensive analysis of their migratory flight patterns that identifies the most critical areas and suitable habitat ensures the cranes continue to be viable. We must create a shared multi-conservation partner monitoring system throughout the migration corridor to increase our understanding of flight patterns. It is critical we work collectively to promote the creation of "Whooping Crane friendly" habitats as well as avoid destroying or degrading already well documented crane stopover sites"

I. RELATIVE TO THE IMPORTANT MISSION OF WHOOPING CRANE CONSERVATION, AS IT RELATES TO THE COMPREHENSIVE CONSERVATION PLAN for the Quivira National Wildlife Refuge, Audubon of Kansas Requests the following:

- (1) Close the Quivira NWR to all hunting from October 10 to November 20.

appropriate balance of natural resource and human needs largely supports the function of Federal and State policies and regulations, such as those related to the protection of natural resources under the Migratory Bird Treaty and Endangered Species Acts. Education and enforcement activities for these regulations would be an important part of the approved management direction.

- Several of your recommendations involve specifics beyond the scope of a CCP. More-detailed stepdown plans and protocols are developed following the approval of a final CCP. These plans are consistent with the goals and intent of an approved management direction. Public review of the draft CCP and EA will be considered in the development of stepdown plans.

This is the period when Whooping Cranes are most likely to be on the refuge in the fall. A standard closing will diminish the sense of dashed expectations and the perception that Whooping Cranes create an ever-present (but somewhat unpredictable) potential "conflict" with hunters and their plans.

This regular standard closing will help to avoid the type of disappointment that has occurred when people plan to hunt on the refuge, only to be turned away at the last moment because Whooping Cranes are present. In some cases, as was acknowledged by USFWS staff at the Wichita meeting, sometimes hunters have elected to ignore the closed signs in the early morning and proceed to hunt, even shooting waterfowl relatively close to Whooping Cranes. This creates an unaccepted situation for Whooping Cranes and an unfortunate situation (and possibly a citation for violations) for hunters.

If hunting on the refuge is closed during this period of frequent use by Whooping Cranes, rather than just when Whoopers are documented as "present," refuge staff do not have to be as vigilant to the potential evening (at dusk or even after dark) arrival of Whooping Cranes on the refuge, and they will not have to expend additional resources posting signs and closing the refuge to hunting prior to the pre-dawn arrival of hunters the next morning, and law enforcement.

In spite of the claims in the report that the eleven-hour closure approach of specific sections of an area where Whooping Cranes are present has worked well at the Cheyenne Bottoms Wildlife Area, we question the validity of the state agency's claims and the wisdom of USFWS adopting it for inclusion in the Plan for Quivira. The cost to the USFWS (all taxpayers) will increase as described in the text provided below from the Draft:

"More law enforcement, signage and communications would be required."

"There would be more parking areas and roads for access and more costs related to changing hunt areas, signage, parking lots, brochures and adding law enforcement."

As indicated above we specifically question the validity of the statement--and the wisdom of the suggestion--in the plan where it states that:

"At the nearby Cheyenne Bottoms Wildlife Area, Kansas Department of Wildlife, Parks and Tourism has successfully protected Whooping cranes by using partial area closures. This may prove to be effective for us as well."

It may be true that Whooping Cranes have not been shot or shot at within the Cheyenne Bottoms Wildlife Area in recent years, but we wouldn't likely know if either had occurred. Most hunting violations are never detected or reported. The prospect of disturbance may have a greater adverse impact on the Whooping Crane population. The impact of disturbance is difficult to document. If Whooping Cranes bypass an area such as Cheyenne Bottoms in the afternoon or evening as Sandhill Cranes are being shot, other shooting is occurring and other human activities such as people moving and vehicles with lights on as hunters and others are leaving, it is not likely that it would be "documented" as disturbance. The same applies to earlier morning activities that likely start an hour to an hour and a half before sunrise. If Whooping Cranes that roosted in the wetland (alone or with Sandhill Cranes) leave the area and possibly go to Quivira or some other place, or proceed on migration, it is difficult to know if they are reacting to disturbance or naturally anxious to proceed.

If they don't linger in an area throughout the day, and roost another night, it is conceivable (but certainly not documented) that site-specific disturbance is a factor. Quivira NWR is not and has not been without various disturbance factors. However, once Whooping Cranes are known to be present, hunting activities have been largely curtailed. One measure of the impact of disturbance is a comparison of the length of stay at the two locations. The data suggests that length of stay during the fall migration is greater at Quivira NWR. The fidelity and length-of-stay for Sandhill Cranes may also suggest that disturbance (and shooting) at Cheyenne Bottoms is driving cranes from that area to night-roosting at Quivira. That may become more pronounced now that the KDWP (in 2012) eliminated the shooting hours restrictions regarded as "safeguards for Whooping Cranes" and the management protocol for Sandhill Cranes. Following the shooting of three Whooping Cranes near Quivira in 2004, Sandhill Crane shooting was delayed until a half hour after sunrise to diminish the prospect of mistaken identity under low light conditions and/or sunrise backlighting when both species of cranes appear the same when viewed as

4-6. As part of the proposed action, Quivira Refuge will be closed to all hunting activities when whooping cranes are present. However, we will consider some exceptions related to special, controlled, permitted hunts, such as the limited use of archery in hunting deer in specifically designated upland areas of refuge, when we develop a more-detailed hunt plan.

silhouettes. The same consideration is applicable at and near sunset. Afternoon closing of crane shooting at 2 p.m. (prior to 2012) allowed Sandhill Cranes to return to night-roosting wetland habitats, loaf and likely remain in the vicinity longer. However, in 2012 KDWPT changed shooting hours for Sandhill Cranes to open at sunrise and close at sunset.

The two sites differ, and in some cases it is likely that Cheyenne Bottoms provides better habitat and food resource conditions, on other occasions the reverse may be true (certainly last year with drought conditions at Cheyenne Bottoms). Thus, it is difficult to know if the differential disturbance of hunting associated activities at Cheyenne Bottoms is the primary reason of more extended Whooping Crane stays at Quivira. However, **this factor cannot and should not be discounted in development of the final Comprehensive Conservation Plan for the Quivira NWR.** Although Cheyenne Bottoms is designated as critical habitat for Whooping Cranes, the mission of the KDWPT and the operating plan for a Wildlife Area differ from the mission of the USFWS and the established conservation/management plan for the Quivira NWR.

As pointed out in the CAP, migrating Whooping Cranes must travel 2,500 miles each fall and they have a daily need for secure roosting areas, resting opportunities, fresh water and suitable feeding habitat. Family groups cannot be unintentionally "harassed" by human activities (and anthropomorphic disturbances of many kinds) for much of the length of the arduous migration and arrive on their wintering grounds in optimal condition for winter survival. On some recent occasions, depleted freshwater flows into the Gulf Coastal estuaries and other factors have dramatically diminished the supply of Blue Crabs, clams and other food staples that many Whooping Crane rely on during their winter stay. Body condition at the end of the wintering period, and sustained through migration is vital during the spring migration and for breeding in Canada. Migratory stopover habitats are important both fall and spring.

Recent records indicate that increasing numbers of Whooping Cranes are staying at the Quivira NWR during fall migration, stopping there in greater numbers and for more extended stays. A contributing factor, possibly the most important factor, in this increase may be due to the closure of hunting on the refuge during their presence.

Although shooting of Whooping Cranes mistaken for Sandhill Cranes may be a greater threat now beyond the boundaries of Quivira, disturbance caused by the proposed increase in hunting activities on the refuge (as included in Alternative B) is our greatest concern on the refuge. In essence, Alternative B transforms much of the Quivira National Wildlife Refuge from its core mission devoted to wildlife conservation of imperiled species and waterfowl to that of becoming the equivalent of a "public hunting area." If Alternative B is adopted as included in the Draft, the potential disturbance while Whooping Cranes are using the refuge will include the arrival of vehicles up to an hour and a half before sunrise (with lights and noises) associated with preparation for hunting, placement of decoys, etc. Shooting starts a half hour before sunrise. Upland game bird hunting often involves the use of dogs and whistles, as well as less restraint on talking (or hollering at dogs). With more parking areas called for in the plan and needed with this approach, the cumulative influence on the visual and audio landscape of the refuge may change substantially and change wildlife reaction and behavior. With this in mind, Audubon of Kansas requests that USFWS:

(2) Continue to close the Quivira NWR to all hunting activities when Whooping Cranes are using the refuge.

Two sentences included in the section under Alternative C that need to be recognized and incorporated in the management and hunting protocols selected in the final draft include the following:

"Whooping crane use may increase with the increase in open meadow and prairie habitat without trees, croplands, and, possibly, with reduced artificial infrastructure to break up the landscape.

Therefore, whooping cranes may use other areas, such as wide-open meadows, more often during migration."

Maintaining a "refuge" or "wildlife sanctuary" where hunting is seldom and/or very selectively allowed does not necessarily diminish hunting opportunities overall in the region. In fact, it often enhances wildlife conservation in ways that improves hunting within the surrounding area and region. Waterfowl, for example, are often more likely to remain in an area if there is a refuge for periodic retreat. This principle is probably even more essential for Sandhill Cranes. Cranes need shallow water areas for secure night roosting, and there aren't many such suitable habitats in Kansas—and even fewer that are not subject to hunting or other disturbances. Without refuge areas these

4-7. Based on our interpretation of these statements and other parts of the review, it seems that some clarification of the proposed action (alternative B) for the refuge is necessary. The review by Audubon of Kansas, Incorporated, states that we are proposing a “paradigm shift in management...devoted primarily to...wildlife conservation and non-consumptive use to one...for the purpose of public hunting access.” In short, this is inaccurate. Management philosophies associated with each alternative may not have been adequately communicated in the draft CCP and EA. In fact, the relative importance of wildlife conservation and nonconsumptive uses under alternative B will at least be the same as that under alternative A (current management). Alternative B, as a whole, has the potential to increase benefits for both wildlife conservation and nonconsumptive activities. It includes goals and objectives that support the improvement of these uses and increased efforts to inform management. Additional discussion and details may be found in our response 4-2.

4-7

4-8

birds are further stressed and often pushed out of an area, even to another state (if there is any other place to go). In times of drought, as in the past few years, it is difficult for cranes to find suitable wetland and playa sites for roosting, loafing and as a source of fresh water. In some instances the migration distances and demands of Sandhill Cranes is twice that of the 5,000-mile annual round trip of Whooping Cranes.

II. RELATIVE TO THE IMPORTANT MISSION OF WILDLIFE CONSERVATION AND WILDLIFE VIEWING OPPORTUNITIES, AS THEY RELATE TO THE COMPREHENSIVE CONSERVATION PLAN for the Quivira National Wildlife Refuge, Audubon of Kansas Requests that the USFWS:

(3) Reject the paradigm shift in management proposed for the Quivira NWR that would dramatically transform most of the refuge land for much of each year from its historical purpose devoted primarily to its unique public interest values of wildlife conservation and non-consumptive enjoyment to one (as proposed with Alternative B) primarily managed for the purpose of public hunting access.

If the public hunting recommendations included in Alternative B are adopted, public hunting of various game birds could be encouraged and allowed in one form or another nine months each year from September 1 to May 31 if the spring Wild Turkey season is included. Year-round hunting would be permitted if the full length of state squirrel and rabbit seasons are also included and the current closure of hunting from March 1 to August 31 is abandoned.

Public hunting areas provide opportunities of importance to users and the State of Kansas, and the state has invested handsomely in those opportunities. As a result, public hunting is available on approximately 300,000 acres of state lands, plus federal lands including 108,000 acres at the Cimarron National Grassland, 72,000 acres at Fort Riley, 22,072 acres at the three OTHER federal refuges, along with sixteen Army Corps of Engineers (USACE) and six Bureau of Reclamation (USBOR) reservoir areas. In addition, about 1.1 million acres of private land is open to public hunting with Walk-In-Hunting Area agreements. The federally-funded USDA Conservation Reserve Program enhances the habitat values and hunting potential of many of these acres under contract, as well as other lands within the 2.3 million acre total enrolled in the program in Kansas.

“Hunting with permission” opportunities exists on most of the rural lands within Kansas, the vast majority of the state’s \$2 million acres.

Our nation’s general funds pay for USDA, USACE and USBOR programs, and USFWS management of the national wildlife refuges. Thus, even those among us who do not annually purchase KDWPT hunting, fishing or trapping licenses are equal stakeholders in stewardship decisions involving the Quivira National Wildlife Refuge.

(4) Audubon of Kansas requests that rail hunting, and hunting of other webless migratory birds, not be permitted on the Quivira NWR. KDWPT authorizes shooting of Sora and Virginia Rails with an extraordinary bag limit of 25 per hunter per day. However, very little if any practical attempt is made to educate hunters of the risk of shooting other rail species. None of the rail species are abundant in Kansas and some species (including Virginia Rails) have “suffered considerable declines in the past....” (Thompson et al, 2011, Birds of Kansas, p. 125). Black Rails are designated as a State Species in Need of Conservation in Kansas.

Black Rail populations have been declining in the eastern United States for over a century resulting in a retraction of its breeding range, an overall reduction in the number of breeding locations within its core range, and a loss of individuals within historic strongholds. Over the past 10-20 years, some reports indicate that populations have declined 75% or greater and have become dangerously low.

The best-known and most consistent (nesting) colony (in the state of Kansas) is in a flooded field near the edge of the Quivira NWR. “Here birders have successfully heard (and occasionally seen) summering (and probably breeding) individuals since 1981. Preferred nesting sites appear to be marshy areas with stable water levels, a feature not common at most Kansas wetlands.” (Thompson et al, 2011, Birds of Kansas, p. 123).

The same authors indicate that King Rails “presumably nest at Quivira NWR.” In the last 60 years, King Rails have all but disappeared from areas where they were once locally common, including Missouri’s river marshes, the southern shores of the Great Lakes, and Delaware’s Snyrna River valley. Between 1994 and 2003, the Breeding

4-8. Thank you for the comments and information. These will be considered in the development of the final CCP and in more-detailed stepdown management plans. During initial scoping, the public identified these primary, hunting-specific factors for us to address in planning: (1) the consideration of opportunities for deer and turkey hunting; and (2) partial closures of hunting when whooping cranes are present. Therefore, the planning team addressed these specific requests and focused on broad differences among hunting alternatives in terms what may and may not be allowable, as directed by the refuge manager. Because there are many complex planning details that require further consideration, like safety, law enforcement, conflicts with other use activities, and natural resources, a stepdown hunt plan will be developed following the approval of the final CCP.

After further review, some hunting-related public comments were addressed under the proposed action or will be considered in the development of the more-detailed hunt plan. When evaluating public use activities on the refuge, we applied an objective approach that placed discussions within the context of Refuge System laws, policies, and guidance. Key considerations were the Refuge System mission, priorities found in the Improvement Act, and the purposes of Quivira Refuge. Applying these principles included, but was not limited to, (1) reducing risk to threatened, endangered, and protected species; (2) considering the safety of refuge staff and the public, which is mission critical; and (3) carrying out actions that ensure compliance with laws and regulations. With this in mind, the following bulleted responses address more-specific comments regarding hunting.

- Certain species that are not common on the refuge or are closely associated with potential impacts to species of conservation concern would not be huntable species on the refuge, such as rail, woodcock, snipe, sandhill crane, and prairie chicken. For example, not allowing rail hunting should reduce the potential for disturbing or accidentally taking black or king rails. As a result of the limited occurrence of most of these species on the refuge, hunting opportunities would not be significantly reduced. At the same time, we would promote educational opportunities on the conservation of these species and their associated communities.
- Control, such as by hunting, of furbearers and small game will involve refuge-specific regulations. Furbearer hunting or trapping will be controlled and only allowed with an approved

Bird Survey indicated acute declines, with significant losses in former strongholds like Texas, Louisiana, and Florida. Christmas Bird Count data confirm this trend.

Black Rails and King Rails are classified as "rare" on the refuge, and Virginia Rails are classified as "uncommon."

There are no compelling reasons why hunting of rails, snipe (classified as "uncommon" on the refuge) or woodcock (classified as "rare" on the refuge) should be encouraged or permitted on the Quivira NWR. There are compelling conservation and public use incompatibility reasons why shooting of these species should not be allowed on the refuge. The refuge is a migratory stopover habitat for many similar species, often using the same wet habitat. Minimizing disturbance of these species, especially considering that there are so few alternative wetlands in Kansas, should be a USFWS priority.

Audubon of Kansas opposes Sandhill Crane hunting on the Quivira NWR. Thus, we do not support the suggestion that Sandhill Crane hunting be allowed in Alternative C. That would further jeopardize Whooping Cranes.

Although there may not be any species-specific conservation concern associated with dove hunting on the refuge, most dove hunting occurs near agricultural fields, roosting sites and water sources. The agricultural fields (885.24 acres) within Quivira NWR may eventually be phased out in favor of prairie restoration. Most of the invasive trees throughout the refuge are being removed, and the twelve woodland groves identified for retention are either located near the refuge edge, or at a couple locations farther within (Migrant's Mile and Warbler) where walking trails and wildlife viewing are popular. Encouraging a lot of shooting at the boundary groves may not be helpful in terms of maintaining harmony with neighboring landowners. Those woodlands may prove to be particularly attractive to woodland and woodland edge birds, and for wildlife viewing and photography. Shooting of doves at watering sites within the refuge is inconsistent with diverse other refuge purposes and values. Fortunately for prospective dove hunters, almost all other public lands in the state (including major portions of the three other national wildlife refuges) are open for dove hunting and countless opportunities for good hunting sites exist throughout the state on private lands with hunting by permission. Minimizing disturbance of other wildlife and allowing some element of priority for other wildlife users on this one national wildlife refuge within the state seems consistent with the mission.

As a life-long hunter and professional wildlife biologist, I find the document statement suggesting that if Prairie-chicken populations can be miraculously reestablished on the refuge that hunting will be allowed "if refuge population can support it or for health purposes, as decided by the State." First, it is highly unlikely that a substantial population of Greater (or Lesser) Prairie-chickens will be reestablished on the refuge within the foreseeable future. It is less likely if the refuge implements the transformation of management to that more in line with a public hunting area. Prairie-chickens are very sensitive to excessive human activity. The late Robert J. Robel stated in conversation that all the activity of researchers and their vehicles at Konza Prairie is likely a major contributing factor to the decline of the Prairie-chicken population on that 8,600-acre research natural area near Manhattan. If Alternative B is adopted, there will be a lot more human activity as a result of the increased hunting permitted, and as the document states, "There would be more parking areas and roads for access... signage, parking lots...and...law enforcement." All of these management elements will have an impact, and the physical infrastructural changes will further fragment the grassland habitat.

Second, to the best of our knowledge, there is no reason to believe that Prairie-chickens will have to be hunted for "health purposes." Are there any known instances of record where it has been necessary to initiate a hunting season on Prairie-chickens for health purposes? Finally, the suggestion that this decision should be "decided by the State" implies that USFWS management staff at the refuge would be unable to make a determination on the need for a Prairie-chicken hunting season, and that the KDWPT is the appropriate authority for determination of refuge management for sensitive species like Greater Prairie-chickens and would give conservation priority over the perception of maximizing hunting opportunities. Currently the KDWPT annually sets a hunting season of more than 100 days on Greater Prairie-chickens and the season even includes two-dozen counties where the species has been extirpated in recent decades or only survives in remnant at-risk populations. The season for Prairie-chicken hunting (even in the area where the range of *Lessers* and *Greaters* overlap) exceeds the season length of Pheasants and Quail by three weeks.

special use permit. Among various factors considered will be certain species, such as beaver, that sometimes cause significant impacts to refuge infrastructure and compromise management plan implementation and success.

- The hunting of wild turkey would involve refuge-specific regulations that carefully consider potential conflicts with other public use activities and wildlife. For example, the refuge manager may allow limited special youth or veteran hunting opportunities at restricted times and only in specific areas within the approved boundary.

- In the final plan, northern bobwhite would remain a huntable species within the approved hunt boundary, which includes less than 40 percent of the refuge's area. Under the proposed action, the refuge manager would have the authority to develop special refuge regulations pending future conservation concerns. Bobwhite occurrence on the refuge regularly includes areas outside of the hunt boundaries, and over 60 percent of the refuge excludes the hunting of upland game birds. Thus, Quivira Refuge would continue "enhancing the breeding populations within the surrounding landscape."

To restore and retain the full range of wildlife conservation purposes of the Quivira NWR and its unique prominence as one of the nation's foremost wildlife viewing areas, Audubon of Kansas recommends that hunting should be allowed for waterfowl, Pheasants, White-tailed Deer (but not Mule Deer if they repopulate the refuge as it is restored to more open grassland), and specific furbearers that may have a substantial detrimental impact on reproductive success of species in special need of conservation on the refuge. Hunting and/or regulated trapping to manage populations of Raccoons, Coyotes, Opossums, Striped Skunks and possibly Mink may be consistent with the refuge mission, however it is unlikely that there should be a need to allow take of Beavers, River Otters or Muskrats. Beaver and Muskrats often enhance wetland areas in ways that have the potential of increasing species richness and biodiversity. In the process of removing trees, it will be beneficial to avoid piling tree trunks and limbs into large piles (as has been done recently), because they may serve as denning sites and habitats used by mammalian nest predators within the grasslands and wetlands.

Hunting of species designated as "rare" or "uncommon" on the refuge diminishes other refuge purposes and values.

The refuge has been closed to turkey hunting, and we recommend that it continue to be closed. Wild Turkeys are common throughout much of the landscape of Kansas and are by no means an at-risk species in the area. However, maintaining this closed status should be in recognition of the contribution that they provide for wildlife viewing and the enjoyment of many, many visitors to the refuge. They are a prominent, highly visible species. "Charismatic mega fauna" is a phrase that many people use for wildlife of this nature. The relatively unique Wild Turkeys and White-tailed Deer viewing opportunities contribute to the enjoyment of refuge visitors, and are among the species that are familiar to the general public of all backgrounds. Many other species of wildlife are elusive and/or are overlooked by the casual visitor. Most will never see a Least Bittern or listen for a Black Rail.

The question that should be addressed is whether the presence of a few Wild Turkeys that are accustomed to people, and not terribly wary, is a wildlife viewing and photography opportunity resource that should be maintained, and if this type of resource contributes to frequency of visitation, the length of stay and the economic value of tourism to the surrounding communities. To use a word from Benjamin Franklin's famous phrase, it is "self-evident." Although hunting also provides a similar benefit, the issue is whether the public benefit of giving a succession of visitors an opportunity to view and photograph a gobbler repeatedly over a period of months or years is more or less significant than for that bird to be shot and removed from the refuge.

Limitations on shooting of some resident species, including Northern Bobwhites, may have the added benefit of enhancing the breeding populations within the surrounding landscape. Northern Bobwhites are classified as "uncommon" on the refuge. Retaining those that occur on the refuge may offer greater opportunities for visitors to see and hear this iconic woodland edge species that was once common and now rare in many areas. Research has demonstrated that reductions in the number of Northern Bobwhites below ten in a covey reduces winter survival. As the number of birds in a covey drop further, prospects of survival diminishes further.

From the standpoint of hunting, the "law of diminishing returns" may not apply for some species within popular public hunting areas. The "law of diminishing returns" suggests that a cessation in hunting will occur when a game population in an area has diminished, allowing for survival of numbers sufficient to maintain breeding population. Within a popular public hunting area, however, the number of hunters and the arrival of a succession of hunting parties are not really limited. Excellent hunting skills and the use of good sporting dogs are effective at harvesting quail. The length of the season is also a factor. Quail hunting seasons extend for two and a half months (from the second Saturday in November to January 31) in Kansas.

As expressed by two hunters at the May 1 meeting in Wichita hosted by the USFWS on the draft plan, some neighboring landowners and the hunters who lease hunting privileges on their lands value the presence of an abundant deer population on the refuge. The deer population reportedly even adds to the market value of adjacent lands. Their primary interest is the presence of mature bucks and the prospect that they can be lured or naturally leave the refuge. By the same token, mature bucks—especially those that are relatively docile on the refuge—are an attractive resource for wildlife photographers. Visitors to the refuge are often treated with an opportunity to view deer at relatively close range. For youngsters or grandparents alike, and for many people of all ages in between, the opportunity to see and watch deer in the wild is a thrill. Deer are part of the special attraction of the Quivira NWR. As stated in the draft, with deer hunting, "The viewing opportunities of trophy deer and deer with little-to-no fear of humans would likely decline, as deer would become more wary and difficult to observe and photograph closely."

4-9. We agree that prairie dogs and associated species and habitat are important components of Great Plains ecosystems. And, we support the management of prairie dog colonies in the recovery of the black-footed ferret, which involves many refuges, states, and regions. Past management of Quivira Refuge has proactively encouraged the expansion of prairie dog colonies, including the introduction of prairie dogs to different areas of the refuge. There have been failures attributed to high groundwater levels and the periodic flooding of colonies. The refuge cannot contain all aspects of fully functioning Great Plains ecosystems within the 22,135-acre boundary. We consider the relative contribution of refuge resources to larger landscapes and ecosystems that expand beyond refuge boundaries. Prairie dog colonies and more heavily grazed areas currently exist on surrounding private uplands. We continue to evaluate the tradeoffs of actions that favor certain species and habitat conditions over others. Habitat in the same area of the existing prairie dog colonies on the refuge is used by dickcissel, prairie chicken, and other species that prefer habitat conditions that are limited in the surrounding landscape.

In February 2010 a planning update was sent to each individual, organization, and government representative on the CCP mailing list. The planning update provided information on the history of the Refuge System and on the CCP process, along with an invitation to attend listed open houses.

The best way to trim the herd, while maintaining most of the unique opportunities and values of the present and recent past, may be to allow some harvest during the early January antlerless season. On the subject of site-relevant science-based information and education, the ridiculous cartoon-like "Deer Trail to Disaster" display on the Kiosk at the intersection of NE 140th St. and NE 140th Ave. should be revised or removed. It illustrates the theme that when "large predators are gone," "hunting has been banned," "deer numbers explode," "food supplies diminish and...starvation results." Considering the past closure of Quivira for deer hunting, it portrays the USFWS's existing management as leading to a "Disaster." Although the theme has merit in some places, it is not likely that closure of deer hunting on 22,135 acres in the middle of an agricultural landscape in the middle of Kansas is going to lead to widespread deer starvation. The desirability of having a limited area closed to hunting, and also the desirability of hunting deer can be cast in a much more positive and accurate light. Deer are one species present on the refuge where hunting for population control can be justified for "health purposes." However, deer baiting (a common practice currently not regulated) for hunting purposes throughout the state may be or become a factor far more significant as a portal for deer disease transmission.

III. RELATIVE TO THE IMPORTANT MISSION OF RESTORING NATIVE ECOLOGICAL COMMUNITIES TO PROVIDE HABITAT FOR SPECIES OF CONCERN associated with the Quivira National Wildlife Refuge. Audubon of Kansas Requests that the USFWS address a major omission of national significance, and incorporate a conservation plan for the species and complex involved in the final implementation plan:

Although the plan states that the USFWS will, "*Actively conserve and, as appropriate, improve environmental conditions within refuge boundaries to promote sustainable native ecological communities and support species of concern associated with this region of the Great Plains*", there are obvious gaps in the ecological overview.

The obvious gap in planning is for the conservation and management of Black-tailed Prairie Dogs and the diverse and numerous associated species, including species somewhat or largely dependent on the presence of prairie dogs for prey, or for the habitat of burrows and short vegetation that they create. At present there is one small colony on the very northeast edge of the refuge, and because of its severely limited size it is of little significance even as a potential breeding area for Burrowing Owls. Grazing does not appear to be sufficient to allow expansion within the refuge, and illegal shooting appears to occur (based on observations of shell casings). Under current management conditions (benign neglect at best) the prairie dog colony may not be sustainable, and any potential for it to serve as a source breeding area for Burrowing Owls will be lost, along with benefits for other associated wildlife. Burrowing Owls are not mentioned as a focal species, but the species should be. Burrowing Owls prefer large prairie dog colonies over smaller colonies, and reproductive success is higher at the former.

Prairie dogs would, if reasonably abundant within an area of the refuge, provide a reliable food source for Ferruginous Hawks when they are present in winter and/or during migration. The list of birds, mammals, reptiles and amphibians that benefit from the presence of prairie dog colonies is lengthy and can be reviewed in the book Conservation of the Black-tailed Prairie Dog: Saving North America's Western Grasslands, edited by John L. Hoogland, 2006, Island Press.

As detailed in this and other publications, Black-tailed Prairie Dogs are recognized as a keystone species and a foundation species. According to Hoogland (2006), "Their disappearance drastically affects ecosystems..." Black-tailed Prairie Dogs should be a focal species, for conservation of grassland communities, and recognized as a valuable resource for wildlife viewing and photography.

The draft provides the following relevant information:

as wetland, based on GIS calculations of recent coverage.

Quivira Refuge is recognized for wetland and waterbird resources, but the refuge is also comprised of thousands of acres of upland, native sand prairie habitat that commonly support grassland obligates and species of concern, such as grasshopper sparrow and dickcissel. The decline of grassland bird populations are of serious conservation concern.

Provide a minimum of 70 percent of the estimated 4,163 acres of predominantly native-short-mid, sparse-medium grassland habitat, including at least 1 area on, or near, a prairie dog town on, or next to, refuge lands to support associated focal species, such as breeding burrowing owl, field sparrow, lark sparrow, grasshopper sparrow, upland sandpiper, and western meadowlark.”

It is obvious that there are sufficient grassland areas within the Quivira NWR to support larger colonies of Black-tailed Prairie Dogs for conservation purposes. This goal can be achieved uniquely in this “mid-grass prairie” area without presenting any significant problems to neighboring landowners by utilizing vegetative buffers, selective control and fencing similar to what Audubon of Kansas has utilized at the Hutton Naborara Ranch Wildlife Sanctuary.

(5) It is important for USFWS to recognize that the Quivira NWR presents an opportunity to establish a prairie dog colony complex of national significance that goes far beyond that envisioned in the draft plan. If half of the 4,163 acres of predominantly “native-short-mid, sparse-medium- grassland” habitat described in the report is devoted to establishment of a prairie dog complex over the next ten years, it could be ecologically significant for many of the associated wildlife species, including all of the focal bird species mentioned in the paragraph. In addition, the complex could become a suitable site for reintroduction of Black-footed Ferrets.

One of the most severe limitations for success of Black-footed Ferret reintroductions, and recovery of this endangered species, is the impact of Sylvatic Plague across most of the western grasslands. Fortunately, it has not been discovered anywhere within 150 miles or more of Quivira. Thus, within the foreseeable future, prairie dog colonies (and ferrets) should be secure from that threat.

We envision the future of the Quivira NWR as a refuge of continuing and increasing importance for Whooping Cranes, other wetland and grassland species in special need of conservation, and possibly, a site contributing to the recovery of Black-footed Ferrets.

Ron Kintasko
Executive Director
Audubon of Kansas, Inc.

Citations:

Hoogland, John L., ed. 2006. *Conservation of the Black-tailed Prairie Dog: Saving North America's Western Grasslands*. Washington D.C.: Island Press.

Thompson, Max, Charles Ely, Bob Gress, Chuck Otte, Sebastian Patti, David Seibel, and Eugene Young. 2011. *Birds of Kansas*. Lawrence, KS: University Press of Kansas

Appendix E

Key Legislation and Policy

This appendix briefly describes the guidance for the National Wildlife Refuge System and other policies and key legislation that guide the management of the Quivira National Wildlife Refuge.

E.1 National Wildlife Refuge System

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

(National Wildlife Refuge System Improvement Act of 1997)

Goals

- A. Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered.
- B. Develop and maintain a network of habitats for migratory birds, anadromous and inter-jurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges.
- C. Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or under-represented in existing protection efforts.
- D. Provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fish, wildlife observation and photography, and environmental education and interpretation).
- E. Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

Guiding Principles

There are four guiding principles for management and general public use of the Refuge System established by Executive Order 12996 (1996):

- *Public Use*—The Refuge System provides important opportunities for compatible wildlife-dependent recreational activities involving hunting, fishing, wildlife observation, photography, environmental education, and interpretation.
- *Habitat*—Fish and wildlife will not prosper without quality habitat and without fish and wildlife, traditional uses of refuges cannot be sustained. The Refuge System will continue to conserve and enhance the quality and diversity of fish and wildlife habitat within refuges.
- *Partnerships*—America’s sportsmen and women were the first partners who insisted on protecting valuable wildlife habitat within wildlife refuges. Conservation partnerships with other Federal agencies, State agencies, tribes, organizations, industry, and the general public can make significant contributions to the growth and management of the Refuge System.
- *Public Involvement*—The public should be given a full and open opportunity to participate in decisions regarding acquisition and

management of our national wildlife refuges.

E.2 Legal and Policy Guidance

Management actions on national wildlife refuges are circumscribed by many mandates including laws and Executive orders.

American Indian Religious Freedom Act (1978)—Directs agencies to consult with native traditional religious leaders to figure out proper policy changes necessary to protect and preserve Native American religious cultural rights and practices.

Americans with Disabilities Act (1992)—Prohibits discrimination in public accommodations and services.

Antiquities Act (1906)—Authorizes the scientific investigation of antiquities on Federal land and provides penalties for unauthorized removal of objects taken or collected without a permit.

Archaeological and Historic Preservation Act (1974)—Directs the preservation of historic and archaeological data in Federal construction projects.

Archaeological Resources Protection Act (1979), as amended—Protects materials of archaeological interest from unauthorized removal or destruction and requires Federal managers to develop plans and schedules to locate archaeological resources.

Architectural Barriers Act (1968)—Requires federally owned, leased, or financed buildings and facilities to be accessible to persons with disabilities.

Clean Water Act (1977)—Requires consultation with the U.S. Army Corps of Engineers (404 permits) for major wetland modifications.

Dingell–Johnson Act (1950)—Authorized the Secretary of the Department of the Interior to provide financial help for State fish restoration and management plans and projects. Financed by excise taxes paid by manufacturers of rods, reels, and other fishing tackle. Known as the Federal Aid in Sport Fish Restoration Act.

Endangered Species Act (1973)—Requires all Federal agencies to carry out programs for the conservation of endangered and threatened species.

Executive Order No. 7168 (1935)—Establishes Arrowwood Migratory Waterfowl Refuge “as a refuge and breeding ground for migratory birds and other wild life...to effectuate further the purposes of the Migratory Bird Conservation Act....”

Executive Order 11988 (1977)—Requires Federal agencies to provide leadership and take action to reduce the risk of flood loss, decrease the effect of floods on human safety, and preserve the natural and beneficial values served by the floodplains.

Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System (1996)—Defines the mission, purpose, and priority public uses of the National Wildlife Refuge System. It also presents four principles to guide management of the Refuge System.

Executive Order 13007, Indian Sacred Sites (1996)—Directs Federal land management agencies to accommodate access to and ceremonial uses of American Indian sacred sites by American Indian religious practitioners, avoid adversely affecting the physical integrity of such sacred sites, and where proper, keep the confidentiality of sacred sites.

Federal Noxious Weed Act (1990)—Requires the use of integrated management systems to control or contain undesirable plant species and an interdisciplinary approach with the cooperation of other Federal and State agencies.

Federal Records Act (1950)—Requires the preservation of evidence of the Government’s organization, functions, policies, decisions, operations, and activities, as well as basic historical and other information.

Fish and Wildlife Coordination Act (1958)—Allows the U.S. Fish and Wildlife Service to enter into agreements with private landowners for wildlife management purposes.

Migratory Bird Conservation Act (1929)—Establishes procedures for acquisition by purchase, rental, or gifts of areas approved by the Migratory Bird Conservation Commission.

Migratory Bird Hunting and Conservation Stamp Act (1934)—Authorizes the opening of part of a refuge to waterfowl hunting.

Migratory Bird Treaty Act (1918)—Designates the protection of migratory birds as a Federal responsibility; and enables the setting of seasons and other

regulations, including the closing of areas, Federal or non-Federal, to the hunting of migratory birds.

National Environmental Policy Act (1969)—Requires all agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate this Act with other planning requirements, and prepare proper documents to facilitate better environmental decisionmaking. [From the Code of Federal Regulations (CFR), 40 CFR 1500]

National Historic Preservation Act (1966), as amended—Establishes as policy that the Federal Government is to provide leadership in the preservation of the Nation's prehistoric and historic resources.

National Wildlife Refuge System Administration Act (1966)—Defines the National Wildlife Refuge System and authorizes the Secretary of the Department of the Interior to allow any use of a refuge, provided such use is compatible with the major purposes for which the refuge was established.

National Wildlife Refuge System Improvement Act of 1997—Sets the mission and administrative policy for all refuges in the National Wildlife Refuge System; mandates comprehensive conservation planning for all units of the Refuge System.

Native American Graves Protection and Repatriation Act (1990)—Requires Federal agencies and museums to inventory, find ownership of, and repatriate cultural items under their control or possession.

Refuge Recreation Act (1962)—Allows the use of refuges for recreation when such uses are compatible with the refuge's primary purposes and when sufficient money is available to manage the uses.

Rehabilitation Act (1973)—Requires programmatic accessibility and physical accessibility for all facilities and programs paid for by the Federal Government to make sure that any person can take part in any program.

Rivers and Harbors Act (1899)—Section 10 of this Act requires the authorization of U.S. Army Corps of Engineers before any work in, on, over, or under navigable waters of the United States.

Volunteer and Community Partnership Enhancement Act (1998)—Encourages the use of volunteers to help in the management of refuges within the Refuge System; facilitates partnerships between the Refuge System and non-Federal entities to promote public awareness of the resources of the Refuge System and public participation in the conservation of the resources; and encourages donations and other contributions.

Appendix F

List of Preparers and Contributors

This CCP is the result of extensive, collaborative, and enthusiastic efforts by the members of our planning team, listed below.

<i>Team member</i>	<i>Position</i>	<i>Work unit</i>
Mike Artmann	Wildlife biologist	FWS, Region 6, Lakewood, CO
Lorrie Beck	Park ranger	FWS, GPNC, Wichita, KS
Barbara Boyle	Refuge supervisor	FWS, Region 6, Lakewood, CO
Rebecca Brave	Native American Graves Protection and Repatriation Act assistant	Osage Nation, Historic Preservation Office, Pawhuska, OK
Mark Ely	GIS specialist	FWS, Region 6, Lakewood, CO
Kimberly Farr	Biological technician	FWS, Quivira Refuge
Toni Griffin	Refuge planner	FWS, Region 6, Lakewood, CO
Karl Grover	Field supervisor	KDWPT, Cheyenne Bottoms Wildlife Area, Great Bend, KS
Andrea A. Hunter	Tribal historic preservation officer	Osage Nation, Historic Preservation Office, Pawhuska, OK
Barry Jones	Park ranger	FWS, Quivira Refuge
Steve Karel	Former deputy refuge manager	FWS, Quivira Refuge
Joe Kocher	Maintenance worker	FWS, Quivira Refuge
Christine LaRue	Administrative officer	FWS, Quivira Refuge
Murray Laubhan	Zone biologist	FWS, Quivira Refuge
Rachel Laubhan	Wildlife biologist	FWS, Quivira Refuge
Dave McCauley	Range technician	FWS, Quivira Refuge
Mike Mitchener	Wildlife section chief	KDWPT, Pratt Operations Office, Pratt, KS
James Munkres	Archeologist I	Osage Nation, Historic Preservation Office, Pawhuska, OK
Mike Oldham	Project leader	FWS, Quivira Refuge
Mike Rader	Wildlife education coordinator	KDWPT, Pratt Operations Office, Pratt, KS
Andy Schaal	Range technician	FWS, Quivira Refuge
Dan Severson	Former project leader	FWS, Quivira Refuge
Brad Stumph	Natural resource specialist	Osage Nation, Department of Environmental and Natural Resources, Pawhuska, OK
Bill Waln	Fire management specialist	FWS, Quivira Refuge
Brent Waters	Maintenance worker	FWS, Quivira Refuge
Mitch Werner	Writer–editor	FWS, Region 6, Lakewood, CO

Many organizations, agencies, and individuals provided help with the preparation of this CCP. We acknowledge the efforts of the following individuals and groups. The diversity, talent, and knowledge contributed dramatically improved the vision and completeness of this document.

U.S. Geological Survey, Policy Analysis and Science Assistance Branch (socioeconomic impact studies)

Matt Hogan (Assistant Regional Director, Refuge System, FWS, Region 6)

Sheri Fetherman (chief, Division of Education and Visitor Services, FWS, Region 6)

Mickey Heitmeyer (wetlands ecologist, contractor)

Wayne King (biologist, Refuge System, FWS, Region 6)

David Lucas (chief, Division of Refuge Planning, FWS, Region 6)

Meg Van Ness (regional archaeologist, FWS, Region 6)

Appendix G

Species Lists

What follows are the common and scientific names of animals and plants found on Quivira Refuge.

G.1 List of Bird Species

These are the bird species found on Quivira Refuge.

Common name	Scientific name	Spring March– May	Summer June– August	Fall September– November	Winter December– February
Ducks, geese, and swans					
Black-bellied whistling-duck	<i>Dendrocygna autumnalis</i>		accidental		
Fulvous whistling-duck	<i>Dendrocygna bicolor</i>		accidental		
Greater white-fronted goose	<i>Anser albifrons</i>	common	rare	common	common
Snow goose	<i>Chen caerulescens</i>	common	rare	common	common
Ross's goose	<i>Chen rossii</i>	uncommon		uncommon	uncommon
Brant	<i>Branta bernicla</i>	accidental			
Cackling goose	<i>Branta hutchinsii</i>	common	rare	common	common
Canada goose*	<i>Branta canadensis</i>	common	common	common	common
Trumpeter swan	<i>Cygnus buccinator</i>	occasional		occasional	occasional
Tundra swan	<i>Cygnus columbianus</i>	occasional		occasional	occasional
Wood duck*	<i>Aix sponsa</i>	common	common	common	occasional
Gadwall*	<i>Anas strepera</i>	common	uncommon	common	occasional
Eurasian wigeon	<i>Anas penelope</i>	accidental			
American wigeon*	<i>Anas americana</i>	common	uncommon	common	occasional
American black duck	<i>Anas rubripes</i>	rare	rare	rare	rare
Mallard*	<i>Anas platyrhynchos</i>	common	common	common	common
Mottled duck	<i>Anas fulvigula</i>	rare	rare	rare	
Blue-winged teal*	<i>Anas discors</i>	common	common	common	
Cinnamon teal	<i>Anas cyanoptera</i>	uncommon	rare	occasional	rare
Northern shoveler*	<i>Anas clypeata</i>	common	uncommon	common	uncommon
Northern pintail*	<i>Anas acuta</i>	common	uncommon	common	common
Green-winged teal*	<i>Anas crecca</i>	common	occasional	common	uncommon
Canvasback*	<i>Aythya valisineria</i>	common	occasional	common	uncommon
Redhead*	<i>Aythya americana</i>	common	occasional	common	uncommon
Ring-necked duck	<i>Aythya collaris</i>	common	occasional	common	uncommon
Greater scaup	<i>Aythya marila</i>	occasional		occasional	occasional
Lesser scaup*	<i>Aythya affinis</i>	common	occasional	common	uncommon
Surf scoter	<i>Melanitta perspicillata</i>	accidental			
White-winged scoter	<i>Melanitta fusca</i>	accidental			

<i>Common name</i>	<i>Scientific name</i>	<i>Spring March– May</i>	<i>Summer June– August</i>	<i>Fall September– November</i>	<i>Winter December– February</i>
Black scoter	<i>Melanitta americana</i>	accidental			
Long-tailed duck	<i>Clangula hyemalis</i>	rare		rare	rare
Bufflehead	<i>Bucephala albeola</i>	uncommon		common	common
Common goldeneye	<i>Bucephala clangula</i>	common		common	common
Barrow's goldeneye	<i>Bucephala ialandica</i>	accidental			
Hooded merganser*	<i>Lophodytes cucullatus</i>	uncommon	rare	uncommon	uncommon
Common merganser	<i>Mergus merganser</i>	uncommon		rare	common
Red-breasted merganser	<i>Mergus serrator</i>	rare		occasional	rare
Ruddy duck*	<i>Oxyura jamaicensis</i>	common	uncommon	common	uncommon
Grouse and quail					
Ring-necked pheasant*	<i>Phasianus colchicus</i>	common	common	common	common
Greater prairie-chicken*	<i>Tympanuchus cupido</i>	rare	rare	rare	rare
Wild turkey*	<i>Melagris gallopavo</i>	common	common	common	common
Northern bobwhite*	<i>Colinus virginianus</i>	uncommon	uncommon	uncommon	uncommon
Loons and grebes					
Common loon	<i>Gavia immer</i>	occasional	rare	occasional	rare
Pied-billed grebe*	<i>Podilymbus podiceps</i>	common	common	common	occasional
Horned grebe	<i>Podiceps auritus</i>	uncommon		uncommon	occasional
Red-necked grebe	<i>Podiceps grisegena</i>	accidental			
Eared grebe*	<i>Podiceps nigricollis</i>	common	occasional	common	rare
Western grebe	<i>Aechmophorus occidentalis</i>	occasional	rare	occasional	rare
Clark's grebe	<i>Aechmophorus clarkii</i>	accidental			
Pelicans and miscellaneous					
American flamingo	<i>Phoenicopterus ruber</i>	accidental			
Neotropic cormorant	<i>Phalacrocorax brasilianus</i>	occasional	occasional	rare	
Double-crested cormorant*	<i>Phalacrocorax auritus</i>	common	common	common	occasional
American white pelican	<i>Pelecanus erythrorhynchos</i>	common	common	common	occasional
Brown pelican	<i>Pelecanus accidentalis</i>	accidental			
Hérons, egrets, and ibis					
American bittern*	<i>Botaurus lentiginosus</i>	uncommon	uncommon	uncommon	occasional
Least bittern*	<i>Ixobrychus exilis</i>	occasional	uncommon	occasional	
Great blue heron*	<i>Ardea herodias</i>	common	common	common	uncommon
Great egret*	<i>Ardea alba</i>	common	common	common	
Snowy egret*	<i>Egretta thula</i>	common	common	common	
Little blue heron*	<i>Egretta caerulea</i>	uncommon	uncommon	occasional	
Tricolored heron*	<i>Egretta tricolor</i>	rare	rare		
Reddish egret	<i>Egretta rufescens</i>	accidental			
Cattle egret*	<i>Bubulcus ibis</i>	common	common	common	
Green heron*	<i>Butorides virescens</i>	uncommon	uncommon	occasional	
Black-crowned night-heron*	<i>Nycticorax nycticorax</i>	common	common	common	rare
Yellow-crowned night-heron*	<i>Nyctanassa violacea</i>	uncommon	uncommon	occasional	
White ibis	<i>Eudocimus albus</i>	rare	rare		

<i>Common name</i>	<i>Scientific name</i>	<i>Spring March– May</i>	<i>Summer June– August</i>	<i>Fall September– November</i>	<i>Winter December– February</i>
Glossy ibis	<i>Plegadis falcinellus</i>	rare	rare	rare	
White-faced ibis*	<i>Plegadis chihi</i>	common	common	common	rare
Roseate spoonbill	<i>Platalea ajaja</i>	accidental			
Wood stork	<i>Mycteria americana</i>	accidental			
Birds of prey					
Turkey vulture*	<i>Cathartes aura</i>	uncommon	uncommon	uncommon	
Osprey	<i>Pandion haliaetus</i>	occasional	rare	occasional	
Mississippi kite*	<i>Ictinia mississippiensis</i>	uncommon	uncommon	occasional	
Bald eagle*	<i>Haliaeetus leucocephalus</i>	uncommon	uncommon	uncommon	common
Northern harrier*	<i>Circus cyaneus</i>	common	occasional	common	common
Sharp-shinned hawk	<i>Accipiter striatus</i>	uncommon		occasional	uncommon
Cooper's hawk*	<i>Accipiter cooperii</i>	uncommon	occasional	uncommon	uncommon
Northern goshawk	<i>Accipiter gentilis</i>			rare	rare
Red-shouldered hawk	<i>Buteo lineatus</i>			rare	
Broad-winged hawk	<i>Buteo platypterus</i>			rare	
Swainson's hawk*	<i>Buteo swainsoni</i>	common	common	occasional	
Red-tailed hawk*	<i>Buteo jamaicensis</i>	common	common	common	common
Ferruginous hawk	<i>Buteo regalis</i>	occasional		rare	occasional
Rough-legged hawk	<i>Buteo lagopus</i>	uncommon		rare	uncommon
Golden eagle	<i>Aquila chrysaetos</i>	occasional		occasional	occasional
American kestrel*	<i>Falco sparverius</i>	common	uncommon	common	uncommon
Merlin	<i>Falco columbarius</i>	occasional	rare	uncommon	uncommon
Peregrine falcon	<i>Falco peregrinus</i>	occasional	occasional	occasional	occasional
Prairie falcon	<i>Falco mexicanus</i>	rare	rare	occasional	occasional
Rails and cranes					
Yellow rail	<i>Coturnicops noveboracensis</i>	accidental			
Black rail*	<i>Laterallus jamaicensis</i>	uncommon	uncommon	rare	
King rail*	<i>Rallus elegans</i>	uncommon	uncommon	rare	rare
Virginia rail*	<i>Rallus limicola</i>	common	common	uncommon	occasional
Sora*	<i>Prozana carolina</i>	common	uncommon	common	
Common moorhen*	<i>Gallinula chloropus</i>	uncommon	uncommon	occasional	
American coot*	<i>Fulica americana</i>	common	common	common	uncommon
Sandhill crane	<i>Grus canadensis</i>	common		common	occasional
Common crane	<i>Grus grus</i>	accidental			
Whooping crane	<i>Grus americana</i>	occasional		occasional	rare
Shorebirds					
Black-bellied plover	<i>Pluvialis squatarola</i>	uncommon	uncommon	uncommon	rare
American golden-plover	<i>Pluvialis dominica</i>	uncommon	occasional	uncommon	
Snowy plover*	<i>Charadrius alexandrinus</i>	common	common	common	
Wilson's plover	<i>Charadrius wilsonia</i>	accidental			
Semipalmated plover	<i>Charadrius semipalmatus</i>	common	uncommon	common	
Piping plover	<i>Charadrius melodus</i>	uncommon	occasional	occasional	
Killdeer*	<i>Charadrius vociferis</i>	common	common	common	occasional

<i>Common name</i>	<i>Scientific name</i>	<i>Spring March– May</i>	<i>Summer June– August</i>	<i>Fall September– November</i>	<i>Winter December– February</i>
Mountain plover	<i>Charadrius montanus</i>	rare		rare	
Black-necked stilt*	<i>Himantopus mexicanus</i>	common	common	uncommon	
American avocet*	<i>Recurvirostra americana</i>	common	common	common	
Spotted sandpiper*	<i>Actitis macularius</i>	common	uncommon	common	
Solitary sandpiper	<i>Tringa solitaria</i>	uncommon	uncommon	occasional	
Greater yellowlegs	<i>Tringa melanoleuca</i>	common	common	common	occasional
Willet	<i>Tringa semipalmata</i>	uncommon	uncommon	uncommon	
Lesser yellowlegs	<i>Tringa flavipes</i>	common	common	common	rare
Upland sandpiper*	<i>Bartramia longicauda</i>	common	occasional	occasional	
Whimbrel	<i>Numenius phaeopus</i>	occasional	occasional	occasional	
Long-billed curlew	<i>Numenius americanus</i>	occasional	occasional	occasional	
Hudsonian godwit	<i>Limosa haemastica</i>	uncommon	rare	uncommon	
Marbled godwit	<i>Limosa fedoa</i>	uncommon	uncommon	uncommon	
Ruddy turnstone	<i>Arenaria interpres</i>	occasional	occasional	occasional	
Red knot	<i>Calidris canutus</i>	rare	rare	rare	
Sanderling	<i>Calidris alba</i>	occasional	occasional	occasional	
Semipalmated sandpiper	<i>Calidris pusilla</i>	common	common	common	
Western sandpiper	<i>Calidris mauri</i>	common	common	common	
Least sandpiper	<i>Calidris minutilla</i>	common	common	common	
White-rumped sandpiper	<i>Calidris fuscicollis</i>	common	common	uncommon	
Baird's sandpiper	<i>Calidris bairdii</i>	common	common	common	
Red-necked stint	<i>Calidris ruficollis</i>	accidental			
Pectoral sandpiper	<i>Calidris melantos</i>	uncommon	uncommon	uncommon	
Dunlin	<i>Calidris alpina</i>	uncommon	occasional	uncommon	rare
Curlew sandpiper	<i>Calidris ferruginea</i>	accidental			
Stilt sandpiper	<i>Calidris himantopus</i>	common	common	common	
Buff-breasted sandpiper	<i>Tryngites subruficollis</i>	occasional	rare	uncommon	
Ruff	<i>Philmachus pugnax</i>	rare	rare		
Short-billed dowitcher	<i>Limnodromus griseus</i>	uncommon	uncommon	occasional	
Long-billed dowitcher	<i>Limnodromus scolopaceus</i>	common	common	common	
Wilson's snipe	<i>Gallinago delicata</i>	uncommon	rare	uncommon	occasional
American woodcock	<i>Scolopax minor</i>	rare		rare	
Wilson's phalarope*	<i>Phalaropus tricolor</i>	common	common	common	
Red-necked phalarope	<i>Phalaropus lobatus</i>	occasional	rare	occasional	
Red phalarope	<i>Phalaropus fulicarius</i>	rare		rare	
Gulls and terns					
Black-legged kittiwake	<i>Rissa tridactyla</i>	accidental			
Sabine's gull	<i>Xema sabini</i>	rare	rare	rare	
Bonaparte's gull	<i>Chroicocephalus philadelphia</i>	occasional	rare	occasional	occasional
Laughing gull	<i>Leucophaeus atricilla</i>	rare	occasional	rare	
Franklin's gull	<i>Leucophaeus pipixcan</i>	common	uncommon	common	rare
Black-headed gull	<i>Chroicocephalus ridibundus</i>	accidental			
Ring-billed gull	<i>Larus delawarensis</i>	common	uncommon	common	uncommon

<i>Common name</i>	<i>Scientific name</i>	<i>Spring March– May</i>	<i>Summer June– August</i>	<i>Fall September– November</i>	<i>Winter December– February</i>
California gull	<i>Larus californicus</i>	accidental			
Herring gull	<i>Larus argentatus</i>	occasional		occasional	occasional
Lesser black-backed gull	<i>Larus fuscus</i>	accidental			
Least tern*	<i>Sternula antillarum</i>	uncommon	uncommon	occasional	
Gull-billed tern	<i>Gelochelidon nilotica</i>	accidental			
Caspian tern	<i>Hydroprogne caspia</i>	rare	rare	rare	
Black tern*	<i>Childonias niger</i>	common	common	uncommon	
Common tern	<i>Sterna hirundo</i>	occasional	occasional	occasional	
Arctic tern	<i>Sterna paradisaea</i>	accidental			
Forster's tern*	<i>Sterna forsteri</i>	common	common	occasional	
Parasitic jaeger	<i>Stercorarius parasiticus</i>		rare	rare	
Pigeons and doves					
Rock pigeon*	<i>Columba livia</i>	rare	rare	rare	rare
Eurasian collared-dove*	<i>Streptopelia decaocto</i>	occasional	occasional	occasional	occasional
White-winged dove	<i>Zenaida asiatica</i>	accidental			
Mourning dove*	<i>Zenaida macroura</i>	common	common	common	occasional
Yellow-billed cuckoo*	<i>Coccyzus americanus</i>	occasional	uncommon	rare	
Black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>	rare	rare		
Greater roadrunner	<i>Geococcyx californianus</i>	rare	rare	rare	rare
Owls					
Barn owl*	<i>Tyto alba</i>	occasional	occasional	occasional	occasional
Eastern screech-owl*	<i>Megascops asio</i>	uncommon	uncommon	uncommon	uncommon
Great horned owl*	<i>Bubo virginianus</i>	common	common	common	common
Snowy owl	<i>Bubo scandiacus</i>			rare	rare
Burrowing owl*	<i>Athene cunicularia</i>	rare	rare	rare	
Barred owl	<i>Strix varia</i>	occasional	occasional	occasional	occasional
Long-eared owl*	<i>Asio otus</i>	rare	rare	rare	rare
Short-eared owl*	<i>Asio flammeus</i>	rare		rare	occasional
Northern saw-whet owl	<i>Aegolius acadicus</i>	accidental			
Nightjars and miscellaneous					
Common nighthawk*	<i>Chordeiles minor</i>	uncommon	common	uncommon	
Common poor-will	<i>Phalaenoptilus nuttallii</i>	rare	rare		
Chuck-will's-widow*	<i>Caprimulgus carolinensis</i>	occasional	occasional		
Whip-poor-will	<i>Caprimulgus vociferus</i>	accidental			
Chimney swift*	<i>Chaetura pelagica</i>	uncommon	uncommon	uncommon	
Ruby-throated hummingbird	<i>Archilochus colubris</i>	occasional	occasional	occasional	
Belted kingfisher	<i>Megaceryle alcyon</i>	uncommon	uncommon	uncommon	occasional
Woodpeckers					
Red-headed woodpecker*	<i>Melanerpes erythrocephalus</i>	common	common	common	
Red-bellied woodpecker*	<i>Melanerpes carolines</i>	uncommon	uncommon	uncommon	uncommon
Yellow-bellied sapsucker	<i>Sphyrapicus varius</i>	rare		rare	rare
Downy woodpecker*	<i>Picoides pubescens</i>	uncommon	uncommon	uncommon	uncommon

<i>Common name</i>	<i>Scientific name</i>	<i>Spring March– May</i>	<i>Summer June– August</i>	<i>Fall September– November</i>	<i>Winter December– February</i>
Hairy woodpecker*	<i>Picoides villosus</i>	uncommon	uncommon	uncommon	uncommon
Northern flicker*	<i>Colaptes auratus</i>	common	common	common	common
Flycatchers					
Olive-sided flycatcher	<i>Contopus cooperi</i>	occasional		occasional	
Eastern wood-pewee*	<i>Contopus virens</i>	uncommon	uncommon	occasional	
Willow flycatcher	<i>Empidonax trailli</i>	occasional		occasional	
Least flycatcher	<i>Empidonax minimus</i>	uncommon		uncommon	
Eastern phoebe*	<i>Sayornis phoebe</i>	uncommon	uncommon	uncommon	occasional
Say's phoebe	<i>Sayornis saya</i>	occasional		occasional	
Great crested flycatcher*	<i>Myiarchus crinitus</i>	uncommon	uncommon	occasional	
Cassin's kingbird	<i>Tyrannus vociferans</i>	accidental			
Western kingbird*	<i>Tyrannus verticalis</i>	common	common	uncommon	
Eastern kingbird*	<i>Tyrannus tyrannus</i>	common	common	uncommon	
Scissor-tailed flycatcher*	<i>Tyrannus forficatus</i>	occasional	occasional	occasional	
Shrikes and vireos					
Loggerhead shrike*	<i>Lanius ludovicianus</i>	uncommon	uncommon	uncommon	uncommon
Northern shrike	<i>Lanius excubitor</i>	rare		occasional	occasional
Bell's vireo*	<i>Vireo bellii</i>	uncommon	uncommon	occasional	
Yellow-throated vireo	<i>Vireo flavifrons</i>	accidental			
Blue-headed vireo	<i>Vireo solitarius</i>	accidental			
Warbling vireo*	<i>Vireo gilvus</i>	uncommon	uncommon	uncommon	
Philadelphia vireo	<i>Vireo philadelphicus</i>	accidental			
Red-eyed vireo*	<i>Vireo olivaceus</i>	occasional	occasional	rare	
Corvids					
Blue jay*	<i>Cyanocitta cristata</i>	common	common	uncommon	occasional
Western scrub jay	<i>Aphelocoma californica</i>	accidental			
Black-billed magpie	<i>Pica hudsonia</i>	rare	rare	rare	rare
American crow*	<i>Corvus brachyrhynchos</i>	common	occasional	common	occasional
Larks					
Horned lark*	<i>Eremophila alpestris</i>	occasional	occasional	occasional	occasional
Swallows					
Purple martin*	<i>Progne subis</i>	occasional	occasional		
Tree swallow*	<i>Tachycineta bicolor</i>	common	common	uncommon	
Violet-green swallow	<i>Tachycineta thalassina</i>	accidental			
Northern rough-winged swallow*	<i>Stelgidopteryx serripennis</i>	uncommon	occasional	occasional	
Bank swallow*	<i>Riparia riparia</i>	common	common	uncommon	
Cliff swallow*	<i>Petrochelidon pyrrhonota</i>	common	common	common	
Barn swallow*	<i>Hirundo rustica</i>	common	common	common	
Parids, wrens, and miscellaneous					
Carolina chickadee	<i>Poecile carolinensis</i>	accidental			
Black-capped chickadee*	<i>Poecile atricapillus</i>	occasional	occasional	occasional	occasional
Tufted titmouse	<i>Baccolopus bicolor</i>	rare		occasional	occasional

<i>Common name</i>	<i>Scientific name</i>	<i>Spring March– May</i>	<i>Summer June– August</i>	<i>Fall September– November</i>	<i>Winter December– February</i>
Red-breasted nuthatch	<i>Sitta canadensis</i>	rare		rare	rare
White-breasted nuthatch*	<i>Sitta carolinensis</i>	uncommon	uncommon	uncommon	uncommon
Brown creeper	<i>Certhia americana</i>	rare		occasional	occasional
Rock wren	<i>Salpinctes obsoletus</i>	occasional		occasional	
Carolina wren*	<i>Thryothorus ludovicianus</i>	occasional	occasional	occasional	occasional
Bewick's wren*	<i>Thryomanes bewickii</i>	rare	rare		
House wren*	<i>Troglodytes aedon</i>	common	common	uncommon	
Winter wren	<i>Troglodytes hiemalis</i>	rare		occasional	occasional
Sedge wren	<i>Cistothorus platensis</i>	occasional	occasional	occasional	
Marsh wren	<i>Cistothorus palustris</i>	uncommon		uncommon	uncommon
Blue-gray gnatcatcher*	<i>Polioptila caerulea</i>	uncommon	uncommon	occasional	
Golden-crowned kinglet	<i>Regulus satrapa</i>	uncommon		uncommon	uncommon
Ruby-crowned kinglet	<i>Regulus calendula</i>	uncommon		uncommon	occasional
Thrushes, pipits, waxwings, and miscellaneous					
Eastern bluebird*	<i>Sialia sialis</i>	common	common	common	uncommon
Mountain bluebird	<i>Sialia currucoides</i>	rare		rare	rare
Townsend's solitaire	<i>Myadestes townsendi</i>	rare		rare	rare
Veery	<i>Catharus fuscescens</i>	accidental			
Gray-cheeked thrush	<i>Catharus minimus</i>	accidental			
Swainson's thrush	<i>Catharus ustulatus</i>	occasional		occasional	
Hermit thrush	<i>Catharus guttatus</i>	accidental			
Wood thrush	<i>Hylocichla mustelina</i>	rare			
American robin*	<i>Turdus migratorius</i>	common	common	common	uncommon
Gray catbird*	<i>Dumetella carolinensis</i>	common	common	occasional	
Northern mockingbird*	<i>Mimus polyglottos</i>	occasional	occasional	occasional	occasional
Brown thrasher*	<i>Toxostoma rufum</i>	common	common	occasional	rare
European starling*	<i>Sturnus vulgaris</i>	common	common	common	common
American pipit	<i>Anthus rubescens</i>	uncommon		uncommon	
Sprague's pipit	<i>Anthus spragueii</i>	rare		rare	
Bohemian waxwing	<i>Bombycilla garrulus</i>	accidental			
Cedar waxwing	<i>Bombycilla cedrorum</i>	occasional	occasional	occasional	occasional
Longspurs					
McCown's longspur	<i>Rhynchophanes mccownii</i>	accidental			
Lapland longspur	<i>Calcarius lapponicus</i>	rare		occasional	uncommon
Smith's longspur	<i>Calcarius pictus</i>	accidental			
Chestnut-collared longspur	<i>Calcarius ornatus</i>	rare			rare
Snow bunting	<i>Plectrophenax nivalis</i>	accidental			
Wood warblers					
Golden-winged warbler	<i>Vermivora chrysoptera</i>	accidental			
Tennessee warbler	<i>Oreothlypis peregrina</i>	occasional			
Orange-crowned warbler	<i>Oreothlypis celata</i>	uncommon		uncommon	
Nashville warbler	<i>Oreothlypis ruficapilla</i>	occasional		occasional	
Northern parula	<i>Parula pitiayumi</i>	accidental			

<i>Common name</i>	<i>Scientific name</i>	<i>Spring March– May</i>	<i>Summer June– August</i>	<i>Fall September– November</i>	<i>Winter December– February</i>
Yellow warbler*	<i>Dendroica petechia</i>	uncommon	uncommon	occasional	
Chestnut-sided warbler	<i>Dendroica pensylvanica</i>	accidental			
Magnolia warbler	<i>Dendroica magnolia</i>	accidental			
Black-throated blue warbler	<i>Dendroica caerulescens</i>	accidental			
Yellow-rumped warbler	<i>Dendroica coronata</i>	common		common	uncommon
Black-throated green warbler	<i>Dendroica virens</i>	rare		rare	
Blackburnian warbler	<i>Dendroica fusca</i>	accidental			
Palm warbler	<i>Dendroica palmarum</i>	occasional			
Blackpoll warbler	<i>Dendroica striata</i>	rare			
Cerulean warbler	<i>Dendroica cerulea</i>	accidental			
Black-and-white warbler	<i>Mniotilta varia</i>	rare		rare	
American redstart	<i>Setophaga ruticilla</i>	occasional		occasional	
Prothonotary warbler	<i>Protonotaria citrea</i>	accidental			
Worm-eating warbler	<i>Helmitheros vermivorum</i>	accidental			
Ovenbird	<i>Seiurus aurocapilla</i>	accidental			
Northern waterthrush	<i>Parkesia novboracensis</i>	occasional			
Mourning warbler	<i>Oporornis philadelphia</i>	accidental			
MacGillivray's warbler	<i>Oporornis tolmiei</i>	accidental			
Common yellowthroat*	<i>Geothypis trichas</i>	common	common	uncommon	occasional
Wilson's warbler	<i>Wilsonia pusilla</i>	occasional		occasional	
Canada warbler	<i>Wilsonia canadensis</i>	accidental			
Painted redstart	<i>Myioborus pictus</i>	accidental			
Yellow-breasted chat*	<i>Icteria virens</i>	occasional	rare	rare	
Sparrows and towhees					
Spotted towhee	<i>Pipilo maculatus</i>	common		common	rare
Eastern towhee	<i>Pipilo erythrophthalmus</i>	accidental			
Cassin's sparrow	<i>Peucaea cassinii</i>	rare			
American tree sparrow	<i>Spizella arborea</i>	uncommon		common	common
Chipping sparrow	<i>Spizella passerina</i>	common	rare	common	
Clay-colored sparrow	<i>Spizella pallida</i>	common		common	
Field sparrow*	<i>Spizella pusilla</i>	common	uncommon	common	uncommon
Vesper sparrow	<i>Poocetes gramineus</i>	common	rare	common	
Lark sparrow*	<i>Chondestes grammacus</i>	common	uncommon	occasional	
Lark bunting	<i>Calamospiza melanocrys</i>	occasional	rare	occasional	
Savannah sparrow	<i>Passerculus sandwichensis</i>	common		common	occasional
Grasshopper sparrow*	<i>Ammodramus savannarum</i>	uncommon	uncommon	uncommon	
Henslow's sparrow	<i>Ammodramus henslowii</i>	accidental			
Le Conte's sparrow	<i>Ammodramus leconteii</i>	occasional		occasional	rare
Nelson's sharp-tailed sparrow	<i>Ammodramus nelsoni</i>	occasional		occasional	
Fox sparrow	<i>Passerella iliaca</i>	uncommon		uncommon	uncommon
Song sparrow	<i>Melospiza melodia</i>	common		common	common

<i>Common name</i>	<i>Scientific name</i>	<i>Spring March– May</i>	<i>Summer June– August</i>	<i>Fall September– November</i>	<i>Winter December– February</i>
Lincoln's sparrow	<i>Melospiza lincolni</i>	uncommon		uncommon	rare
Swamp sparrow	<i>Melospiza georgiana</i>	uncommon		uncommon	uncommon
White-throated sparrow	<i>Zonotrichia albicollis</i>	uncommon		uncommon	occasional
Harris's sparrow	<i>Zonotrichia querula</i>	common	rare	common	common
White-crowned sparrow	<i>Zonotrichia leucophrys</i>	uncommon		uncommon	occasional
Golden-crowned sparrow	<i>Zonotrichia atricapilla</i>	accidental			
Dark-eyed junco	<i>Junco hyemalis</i>	common		common	common
Summer tanager	<i>Piranga rubra</i>		rare		
Scarlet tanager	<i>Piranga olivacea</i>	accidental			
Grosbeaks and buntings					
Northern cardinal*	<i>Cardinalis cardinalis</i>	uncommon	uncommon	uncommon	uncommon
Pyrrhuloxia	<i>Cardinalis sinuatus</i>	accidental			
Rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>	occasional			
Black-headed grosbeak*	<i>Pheucticus melanocephalis</i>	occasional	rare		
Blue grosbeak*	<i>Passerina caerulea</i>	uncommon	uncommon	rare	
Lazuli bunting	<i>Passerina ameona</i>	rare			
Indigo bunting*	<i>Passerina cyanea</i>	uncommon	occasional	rare	
Painted bunting	<i>Passerina ciris</i>	accidental			
Dickcissel*	<i>Spiza americana</i>	common	common	rare	
Blackbirds and allies					
Bobolink*	<i>Dolichonyx oryzivorus</i>	uncommon	uncommon		
Red-winged blackbird*	<i>Agelaius phoeniceus</i>	common	common	common	common
Eastern meadowlark*	<i>Sturnella magna</i>	common	common	common	common
Western meadowlark*	<i>Sturnella neglecta</i>	uncommon	occasional	uncommon	common
Yellow-headed blackbird*	<i>Xanthocephalus xanthocephalus</i>	common	common	uncommon	rare
Rusty blackbird	<i>Euphagus carolinus</i>	accidental			
Brewer's blackbird	<i>Euphagus cyanocephalus</i>	occasional	occasional	occasional	occasional
Common grackle*	<i>Quiscalus quiscula</i>	common	occasional	common	occasional
Great-tailed grackle*	<i>Quiscalus mexicanus</i>	uncommon	uncommon	uncommon	rare
Brown-headed cowbird*	<i>Molothrus oryzivorus</i>	common	common	uncommon	uncommon
Orchard oriole*	<i>Icterus spurius</i>	common	common	occasional	
Bullock's oriole	<i>Icterus bullockii</i>	accidental			
Baltimore oriole*	<i>Icterus galbula</i>	common	common	occasional	
Finches					
Purple finch	<i>Carpodacus purpureus</i>	occasional		rare	occasional
House finch*	<i>Carpodacus mexicanus</i>	occasional	occasional	occasional	occasional
Common redpoll	<i>Acanthis flammea</i>	accidental			
Pine siskin	<i>Spinus pinus</i>	occasional		occasional	occasional
American goldfinch*	<i>Spinus tristis</i>	common	common	common	common
Evening grosbeak	<i>Coccothraustes verpertines</i>	accidental			
House sparrow*	<i>Passer domesticus</i>	occasional	occasional	occasional	occasional

* Reported nesting on refuge. NOTE: Abundance is indicated as follows: common (certain to be seen in suitable habitat), uncommon (present, but not certain to be seen), occasional (seen a few times during season), rare (seen every 2–5 years).

G.2 List of Fish Species

These are the fish species found on Quivira Refuge.

<i>Common name</i>	<i>Scientific name</i>
Bass, largemouth	<i>Micropterus salmoides</i>
Bluegill	<i>Lepomis macrochirus</i>
Bullhead, black	<i>Ictalurus melas</i>
Bullhead, yellow	<i>Ictalurus natalis</i>
Carp	<i>Cyrinus carpio</i>
Carp sucker, river	<i>Carpionodes carpio</i>
Catfish, channel	<i>Ictalurus punctatus</i>
Catfish, flathead	<i>Pylodictis olivaris</i>
Crappie, black	<i>Pomoxis nigromaculatus</i>
Crappie, white	<i>Pomoxis annularis</i>
Darter, Arkansas	<i>Etheostoma cragini</i>
Goldfish	<i>Carassius auratus</i>
Killifish, plains	<i>Fundulus kansae</i>
Minnow, fathead	<i>Pimephales promelas</i>
Minnow, plains	<i>Hybognathus placitus</i>
Minnow, suckermouth	<i>Phenacobius mirabilis</i>
Mosquitofish	<i>Gambusia affinis</i>
Shiner, red	<i>Notropis lutrensis</i>
Shiner, sand	<i>Notropis stramineus</i>
Sunfish, green	<i>Lepomis cyanellus</i>
Sunfish, orangespotted	<i>Lepomis humilis</i>

G.3 List of Mammal Species

These are the mammal species found on Quivira Refuge.

<i>Common name</i>	<i>Scientific name</i>
Armadillo, nine-banded	<i>Dasypus novemcinctus</i>
Badger, American	<i>Taxidea taxus</i>
Beaver, American	<i>Castor canadensis</i>
Bobcat	<i>Lynx rufus</i>
Cottontail, eastern	<i>Sylvilagus floridanus</i>
Coyote	<i>Canis latrans</i>
Deer, mule	<i>Odocoileus hemionus</i>
Deer, white-tailed	<i>Odocoileus virginianus</i>
Fox, red	<i>Vulpes vulpes</i>
Gopher, plains pocket	<i>Geomys bursarius</i>
Ground squirrel, Franklin's	<i>Spermophilus franklinii</i>

<i>Common name</i>	<i>Scientific name</i>
Ground squirrel, thirteen-lined	<i>Spermophilus tridecemlineatus</i>
Jackrabbit, black-tailed	<i>Lepus californicus</i>
Mink	<i>Mustela vison</i>
Mole, eastern	<i>Scalopus aquaticus</i>
Muskrat	<i>Ondatra zibethicus</i>
Opossum	<i>Didelphis virginiana</i>
Porcupine	<i>Erthizon dorsatum</i>
Prairie dog, black-tailed	<i>Cynomys ludovicianus</i>
Raccoon	<i>Procyon lotor</i>
Rat, hispid cotton	<i>Sigmodon hispidus</i>
Rat, Ord's kangaroo	<i>Dipodomys ordii</i>
Skunk, eastern spotted (not known on refuge in recent decades)	<i>Spilogale putorius</i>
Skunk, striped	<i>Mephitis mephitis</i>
Squirrel, eastern fox	<i>Sciurus niger</i>
Wood rat, eastern	<i>Neotoma floridana</i>

G.4 List of Amphibian and Reptile Species

These are the amphibian and reptile species found on Quivira Refuge.

<i>Common name</i>	<i>Scientific name</i>
Bullfrog	<i>Rana catesbiana</i>
Frog, Blanchard's cricket	<i>Acris blanchardi</i>
Frog, plains leopard	<i>Rana blairi</i>
Frog, western chorus	<i>Pseudacris maculata</i>
Kingsnake, prairie	<i>Lampropeltis calligaster</i>
Lizard, prairie (fence)	<i>Sceloporus undulatus</i>
Massasauga	<i>Sistrurus catenatus</i>
Racer	<i>Coluber constrictor</i>
Racerunner, six-lined	<i>Aspidoscelis sexlineata</i>
Salamander, tiger	<i>Ambystoma tigrinum</i>
Slider, red-eared	<i>Trachemys scripta</i>
Snake, brown	<i>Storeria dekayi</i>
Snake, common garter	<i>Thamnophis sirtalis</i>
Snake, glossy	<i>Arizona elegans</i>
Snake, gopher (bull)	<i>Pituophis catenifer</i>
Snake, Graham's crayfish	<i>Regina grahamii</i>
Snake, plains garter	<i>Thamnophis radix</i>
Snake, western hognose	<i>Heterodon nasicus</i>
Snake, western ribbon	<i>Thamnophis proximus</i>
Toad, Great Plains	<i>Bufo cognatus</i>
Toad, plains spadefoot	<i>Spea bombifrons</i>

<i>Common name</i>	<i>Scientific name</i>
Toad, Woodhouse's	<i>Bufo woodhousei</i>
Turtle, ornate box	<i>Terrapene ornata</i>
Turtle, painted	<i>Chrysemys picta</i>
Turtle, snapping	<i>Chelydra serpentina</i>
Turtle, spiny softshell	<i>Apalone spinifera</i>
Turtle, yellow mud	<i>Kinosternon flavescens</i>
Water snake, diamondback	<i>Nerodia rhombifer</i>
Water snake, northern	<i>Nerodia sipedon</i>

G.5 List of Odonate Species

These are the odonate species found on Quivira Refuge.

<i>Common name</i>	<i>Family</i>	<i>Scientific name</i>
Amberwing, eastern	Libellulidae	<i>Perithemis tenera</i>
Bluet, familiar	Coenagrionidae	<i>Enallagma civile</i>
Clubtail, jade	Gomphidae	<i>Arigomphus submedianus</i>
Clubtail, plains	Gomphidae	<i>Gomphus externus</i>
Darner, blue-eyed	Aeschnidae	<i>Rhionaeschna multicolor</i>
Darner, common blue	Aeschnidae	<i>Anax junius</i>
Dasher, blue	Libellulidae	<i>Pachydiplax longipennis</i>
Forktail, black-fronted	Coenagrionidae	<i>Ischnura denticollis</i>
Forktail, citrine	Coenagrionidae	<i>Ischnura hastata</i>
Forktail, desert	Coenagrionidae	<i>Ischnura barberi</i>
Forktail, eastern	Coenagrionidae	<i>Ischnura verticalis</i>
Forktail, fragile	Coenagrionidae	<i>Ischnura posita</i>
Glider, spot-wing	Libellulidae	<i>Pantala hymenaea</i>
Glider, wandering	Libellulidae	<i>Pantala flavescens</i>
Meadowhawk, band-wing	Libellulidae	<i>Sympetrum semicinctum</i>
Meadowhawk, blue-faced	Libellulidae	<i>Sympetrum ambiguum</i>
Meadowhawk, ruby	Libellulidae	<i>Sympetrum rubicundulum</i>
Meadowhawk, variegated	Libellulidae	<i>Sympetrum corruptum</i>
Pennant, halloween	Libellulidae	<i>Celithemis eponina</i>
Pondhawk, Eastern	Libellulidae	<i>Erythemis simplicicollis</i>
Rubyspot, American	Calopterygidae	<i>Hetaerina americana</i>
Saddlebags, black	Libellulidae	<i>Tramea lacerata</i>
Saddlebags, red	Libellulidae	<i>Tramea onusta</i>
Skimmer, twelve-spotted	Libellulidae	<i>Libellula pulchella</i>
Skimmer, widow	Libellulidae	<i>Libellula luctuosa</i>
Spreadwing	Lestidae	<i>Lestes rectangularis</i>
Spreadwing, southern	Lestidae	<i>Lestes australis</i>
Whitetail, common	Libellulidae	<i>Libellula lydia</i>

G.6 List of Butterfly Species

These are the butterfly species found on Quivira Refuge.

<i>Common name</i>	<i>Scientific name</i>
Admiral, red	<i>Vanessa atalanta</i>
Azure, summer	<i>Celastrina ladon</i>
Blue, eastern tailed	<i>Everes comyntas</i>
Blue, marine	<i>Leptotes marina</i>
Blue, reakit's	<i>Hemiargus isola</i>
Blue, western pygmy	<i>Brephidium exile</i>
Buckeye	<i>Junonia coenia</i>
Checkerspot, gorgone	<i>Chlosyne gorgone</i>
Cloak, mourning	<i>Nymphalis antiopa</i>
Cloudywing, southern	<i>Thorybes bathyllus</i>
Comma, eastern	<i>Polygonia comma</i>
Copper, bronze	<i>Lycaena hyllus</i>
Copper, gray	<i>Lycaena dione</i>
Crescent, painted	<i>Phyciodes picta</i>
Crescent, pearl	<i>Phyciodes tharos</i>
Crescent, phaon	<i>Phyciodes phaon</i>
Duskywing, afranius	<i>Erynnis afranius</i>
Duskywing, funereal	<i>Erynnis funeralis</i>
Duskywing, Horace's	<i>Erynnis horatius</i>
Duskywing, juvenals	<i>Erynnis juvenalis</i>
Duskywing, wild indigo	<i>Erynnis baptisiae</i>
Emperor, hackberry	<i>Asterocampa celtis</i>
Emperor, tawny	<i>Asterocampa clyton</i>
Fritillary, great spangled	<i>Speyeria cybele</i>
Fritillary, gulf	<i>Agraulis vanillae</i>
Fritillary, regal	<i>Speyeria idalia</i>
Fritillary, variegated	<i>Euptoieta claudia</i>
Hairstreak, coral	<i>Satyrium titus</i>
Hairstreak, gray	<i>Strymon melinus</i>
Hairstreak, juniper	<i>Callophrys gryneus gryneus</i>
Lady, American	<i>Vanessa virginiensis</i>
Lady, painted	<i>Vanessa cardui</i>
Leafwing, goatweed	<i>Anaea andrea</i>
Monarch	<i>Danaus plexippus</i>
Orange, sleepy	<i>Euremia nicippe</i>
Queen	<i>Danaus gilippus</i>
Question mark	<i>Polygonia interrogationis</i>
Sachem	<i>Atalopedes campestris</i>
Scallopwing, Hayhurst's	<i>Staphylus hayhurstii</i>
Skipper, common checkered	<i>Pyrgus communis</i>
Skipper, Delaware	<i>Anatrytone logan</i>

<i>Common name</i>	<i>Scientific name</i>
Skipper, eastern dun	<i>Euphyes vestris</i>
Skipper, fiery	<i>Hylephila phyleus</i>
Skipper, nysa roadside	<i>Amblyscirtes nysa</i>
Skipper, silver-spotted	<i>Epargyreus clarus</i>
Snout, common	<i>Libytheana carinenta</i>
Sootywing, common	<i>Pholisora catullus</i>
Sulphur, clouded	<i>Colias philodice</i>
Sulphur, cloudless	<i>Phoebis sennae</i>
Sulphur, dainty	<i>Nathalis iole</i>
Sulphur, orange	<i>Colias eurhytheme</i>
Swallowtail, black	<i>Papilio polyxenes</i>
Swallowtail, eastern tiger	<i>Papilio glaucus</i>
Swallowtail, pipevine	<i>Battus philenor</i>
Viceroy	<i>Limenitis archippus</i>
White, cabbage	<i>Pieris rapae</i>
White, checkered	<i>Pontia protodice</i>
Wood nymph, common	<i>Cercyonis pegala</i>
Yellow, little	<i>Eurema lisa</i>

G.7 List of Plant Species

These are the plant species found on Quivira Refuge.

<i>Common name</i>	<i>Family</i>	<i>Scientific name</i>
Wild petunia	Acanthaceae	<i>Ruellia humilis</i>
Boxelder	Aceraceae	<i>Acer negundo</i>
Silver maple	Aceraceae	<i>Acer saccharinum</i>
Soapweed yucca	Agavaceae	<i>Yucca glauca</i>
Sea purslane	Aizoaceae	<i>Sesuvium verrucosum</i>
Northern water plantain	Alismataceae	<i>Alisma triviale</i>
Grassleaf arrowhead	Alismataceae	<i>Sagittaria graminea</i> var. <i>graminea</i>
Broadleaf arrowhead	Alismataceae	<i>Sagittaria latifolia</i>
Sandhill amaranth	Amaranthaceae	<i>Amaranthus arenicola</i>
Careless weed	Amaranthaceae	<i>Amaranthus palmeri</i>
Tall waterhemp	Amaranthaceae	<i>Amaranthus tuberculatus</i>
Snake-cotton	Amaranthaceae	<i>Froelichia floridana</i>
Slender snake-cotton	Amaranthaceae	<i>Froelichia gracilis</i>
Fragrant sumac	Anacardiaceae	<i>Rhus aromatica</i>
Smooth sumac	Anacardiaceae	<i>Rhus glabra</i>
Poison ivy	Anacardiaceae	<i>Toxicodendron rydbergii</i>
Cut-leaf water parsnip	Apiaceae	<i>Berula erecta</i>
Common water hemlock	Apiaceae	<i>Cicuta maculata</i>

<i>Common name</i>	<i>Family</i>	<i>Scientific name</i>
Floating marsh pennywort	Apiaceae	<i>Hydrocotyle ranunculoides</i>
Red River scalesseed	Apiaceae	<i>Spermolepis inermis</i>
Indian hemp	Apocynaceae	<i>Apocynum cannabinum</i>
Blunt-leaved milkweed	Asclepiadaceae	<i>Asclepias amplexicaulis</i>
Sand milkweed	Asclepiadaceae	<i>Asclepias arenaria</i>
Swamp milkweed	Asclepiadaceae	<i>Asclepias incarnata</i> ssp. <i>incarnata</i>
Showy milkweed	Asclepiadaceae	<i>Asclepias speciosa</i>
Slimleaf milkweed	Asclepiadaceae	<i>Asclepias stenophylla</i>
Butterfly milkweed	Asclepiadaceae	<i>Asclepias tuberosa</i> ssp. <i>interior</i>
Whorled milkweed	Asclepiadaceae	<i>Asclepias verticillata</i>
Green antelopehorn	Asclepiadaceae	<i>Asclepias viridis</i>
Common yarrow	Asteraceae	<i>Achillea millefolium</i>
Western ragweed	Asteraceae	<i>Ambrosia psilostachya</i>
Giant ragweed	Asteraceae	<i>Ambrosia trifida</i>
Common sagewort	Asteraceae	<i>Artemisia campestris</i>
Cudweed sagewort	Asteraceae	<i>Artemisia ludoviciana</i> ssp. <i>ludoviciana</i>
Baccharis	Asteraceae	<i>Baccharis neglecta</i>
Willow baccharis	Asteraceae	<i>Baccharis salicina</i>
Spanish needles	Asteraceae	<i>Bidens bipinnata</i>
Star boltonia	Asteraceae	<i>Boltonia asteroides</i>
Tall thistle	Asteraceae	<i>Cirsium altissimum</i>
Wavyleaf thistle	Asteraceae	<i>Cirsium undulatum</i>
Bull thistle	Asteraceae	<i>Cirsium vulgare</i>
Horseweed	Asteraceae	<i>Conyza canadensis</i>
Plains coreopsis	Asteraceae	<i>Coreopsis tinctoria</i>
Hooker's scratchdaisy	Asteraceae	<i>Croptilon hookerianum</i> var. <i>validum</i>
Eclipta	Asteraceae	<i>Eclipta prostrata</i>
Philadelphia fleabane	Asteraceae	<i>Erigeron philadelphicus</i>
Daisy fleabane	Asteraceae	<i>Erigeron strigosus</i>
Boneset	Asteraceae	<i>Eupatorium perfoliatum</i>
Alkali yellowtops	Asteraceae	<i>Flaveria campestris</i>
Indian blanket	Asteraceae	<i>Gaillardia pulchella</i>
Curly-cup gumweed	Asteraceae	<i>Grindelia ciliata</i>
Gumweed	Asteraceae	<i>Grindelia squarrosa</i>
Annual sunflower	Asteraceae	<i>Helianthus annuus</i>
Maximilian sunflower	Asteraceae	<i>Helianthus maximiliani</i>
Prairie sunflower	Asteraceae	<i>Helianthus petiolaris</i>
Jerusalem artichoke	Asteraceae	<i>Helianthus tuberosus</i>
Goldenaster	Asteraceae	<i>Heterotheca latifolia</i>
Camphorweed	Asteraceae	<i>Heterotheca subaxillaris</i> ssp. <i>latifolia</i>
Carolina woolywhite	Asteraceae	<i>Hymenopappus scabiosaeus</i>
Marshelder	Asteraceae	<i>Iva annua</i>
Prickly lettuce	Asteraceae	<i>Lactuca serriola</i>
Lanceleaf blazing star	Asteraceae	<i>Liatris lancifolia</i>
Dotted blazing star	Asteraceae	<i>Liatris punctata</i>

<i>Common name</i>	<i>Family</i>	<i>Scientific name</i>
Prairie blazing star	Asteraceae	<i>Liatris pycnostachya</i>
Scaly blazing star	Asteraceae	<i>Liatris squarrosa</i> var. <i>glabrata</i>
Marsh fleabane	Asteraceae	<i>Pluchea odorata</i>
Rabbit-tobacco	Asteraceae	<i>Pseudognaphalium obtusifolium</i>
Tuberous desert-chicory	Asteraceae	<i>Pyrrhopappus grandiflorus</i>
Prairie coneflower	Asteraceae	<i>Ratibida columnifera</i>
Viscid tansyaster	Asteraceae	<i>Rayjacksonia annua</i>
Canada goldenrod	Asteraceae	<i>Solidago altissima</i> spp. <i>altissima</i>
Canada goldenrod	Asteraceae	<i>Solidago canadensis</i>
Missouri goldenrod	Asteraceae	<i>Solidago missouriensis</i>
Downy goldenrod	Asteraceae	<i>Solidago petiolaris</i>
Sow thistle	Asteraceae	<i>Sonchus asper</i>
White heath aster	Asteraceae	<i>Symphotrichum ericoides</i> var. <i>ericoides</i>
White paniced aster	Asteraceae	<i>Symphotrichum lanceolatum</i> ssp. <i>lanceolatum</i>
Calico aster	Asteraceae	<i>Symphotrichum lateriflorum</i>
Annual saltmarsh aster	Asteraceae	<i>Symphotrichum subulatum</i> var. <i>ligulatum</i>
Red-seed dandelion	Asteraceae	<i>Taraxacum erythrospermum</i>
Common dandelion	Asteraceae	<i>Taraxacum officinale</i>
Green threads	Asteraceae	<i>Thelesperma megapotamicum</i>
Common salsify	Asteraceae	<i>Tragopogon dubius</i>
Western ironweed	Asteraceae	<i>Vernonia baldwinii</i>
Prairie ironweed	Asteraceae	<i>Vernonia fasciculata</i>
Cocklebur	Asteraceae	<i>Xanthium strumarium</i>
Trumpet creeper	Bignoniaceae	<i>Campsis radicans</i>
Southern catalpa	Bignoniaceae	<i>Catalpa bignonioides</i>
Northern catalpa	Bignoniaceae	<i>Catalpa speciosa</i>
Little catseye	Boraginaceae	<i>Cryptantha minima</i>
Bindweed heliotrope	Boraginaceae	<i>Euploca convolvulacea</i>
Salt heliotrope	Boraginaceae	<i>Heliotropium curassavicum</i> var. <i>curassavicum</i>
Seaside heliotrope	Boraginaceae	<i>Heliotropium curassavicum</i> var. <i>obovatum</i>
Stickseed	Boraginaceae	<i>Lappula occidentalis</i>
Fringed puccoon	Boraginaceae	<i>Lithospermum incisum</i>
Spring forget-me-not	Boraginaceae	<i>Myosotis verna</i>
Shepherd's purse	Brassicaceae	<i>Capsella bursa-pastoris</i>
Whitetop	Brassicaceae	<i>Lepidium draba</i>
Western tansymustard	Brassicaceae	<i>Descurainia pinnata</i> spp. <i>brachycarpa</i>
Common pepperweed	Brassicaceae	<i>Lepidium densiflorum</i>
Peppergrass	Brassicaceae	<i>Lepidium virginicum</i>
Water-cress	Brassicaceae	<i>Nasturtium officinale</i>
Winged rockcress	Brassicaceae	<i>Planodes virginica</i>
Prickly-pear	Cactaceae	<i>Opuntia humifusa</i>
Plains prickly-pear	Cactaceae	<i>Opuntia phaeacantha</i>
Waterstarwort	Callitricaceae	<i>Callitriche heterophylla</i>
Cardinal flower	Campanulaceae	<i>Lobelia cardinalis</i>
Great blue lobelia	Campanulaceae	<i>Lobelia siphilitica</i>

<i>Common name</i>	<i>Family</i>	<i>Scientific name</i>
Holzinger's Venus' looking-glass	Campanulaceae	<i>Triodanis holzingeri</i>
Narrowleaf rombopod	Capparaceae	<i>Cleomella angustifolia</i>
Rocky Mountain beeplant	Capparaceae	<i>Peritoma serrulata</i>
James' clammyweed	Capparaceae	<i>Polanisia jamesii</i>
American elder	Caprifoliaceae	<i>Sambucus nigra</i> ssp. <i>canadensis</i>
Coralberry	Caprifoliaceae	<i>Symphoricarpos orbiculatus</i>
Thymeleaf sandwort	Caryophyllaceae	<i>Arenaria serpyllifolia</i>
Mouse-ear chickweed	Caryophyllaceae	<i>Cerastium brachypodium</i>
Nailwort	Caryophyllaceae	<i>Paronychia jamesii</i>
Sleepy catchfly	Caryophyllaceae	<i>Silene antirrhina</i>
Silverscale	Chenopodiaceae	<i>Atriplex argentea</i>
Saline saltbush	Chenopodiaceae	<i>Atriplex dioica</i>
Halberd-leaved orache	Chenopodiaceae	<i>Atriplex patula</i>
Lamb's quarters	Chenopodiaceae	<i>Chenopodium album</i>
Mexican tea	Chenopodiaceae	<i>Chenopodium ambrosioides</i>
Oakleaf goosefoot	Chenopodiaceae	<i>Chenopodium glaucum</i>
Narrowleaf goosefoot	Chenopodiaceae	<i>Chenopodium leptophyllum</i>
Desert goosefoot	Chenopodiaceae	<i>Chenopodium pratericola</i>
Red goosefoot	Chenopodiaceae	<i>Chenopodium rubrum</i>
Maple-leaf goosefoot	Chenopodiaceae	<i>Chenopodium simplex</i>
Winged pigweed	Chenopodiaceae	<i>Cycloloma atriplicifolium</i>
Kochia, fireweed	Chenopodiaceae	<i>Kochia scoparia</i>
Red saltwort	Chenopodiaceae	<i>Salicornia rubra</i>
Russian thistle	Chenopodiaceae	<i>Salsola tragus</i>
Western seepweed	Chenopodiaceae	<i>Suaeda calceoliformis</i>
Poison suckleya	Chenopodiaceae	<i>Suckleya suckleyana</i>
Common Saint John's wort	Clusiaceae	<i>Hypericum perforatum</i>
Dayflower	Commelinaceae	<i>Commelina erecta</i>
Bracted spiderwort	Commelinaceae	<i>Tradescantia bracteata</i>
Prairie spiderwort	Commelinaceae	<i>Tradescantia occidentalis</i>
Field bindweed	Convolvulaceae	<i>Convolvulus arvensis</i>
Prostrate evolvulus	Convolvulaceae	<i>Evolvulus nuttallianus</i>
Bush morning-glory	Convolvulaceae	<i>Ipomoea leptophylla</i>
Pickering's dawnflower	Convolvulaceae	<i>Stylisma pickeringii</i> var. <i>pattersonii</i>
Roughleaf dogwood	Cornaceae	<i>Cornus drummondii</i>
Buffalo-gourd	Cucurbitaceae	<i>Cucurbita foetidissima</i>
Eastern redcedar	Cupressaceae	<i>Juniperus virginiana</i> var. <i>virginiana</i>
Cusp dodder	Cuscutaceae	<i>Cuscuta cuspidata</i>
Rope dodder	Cuscutaceae	<i>Cuscuta glomerata</i>
Field dodder	Cuscutaceae	<i>Cuscuta pentagona</i>
Cosmopolitan bulrush	Cyperaceae	<i>Bolboschoenus maritimus</i> ssp. <i>paludosus</i>
Sturdy bulrush	Cyperaceae	<i>Bolboschoenus robustus</i>
Southern sedge	Cyperaceae	<i>Carex austrina</i>
Shortbeak sedge	Cyperaceae	<i>Carex brevior</i>
Buxbaum sedge	Cyperaceae	<i>Carex buxbaumii</i>

<i>Common name</i>	<i>Family</i>	<i>Scientific name</i>
Emory's sedge	Cyperaceae	<i>Carex emoryi</i>
Fescue sedge	Cyperaceae	<i>Carex festucacea</i>
Smooth-cone sedge	Cyperaceae	<i>Carex laeviconica</i>
Smoothsheath sedge	Cyperaceae	<i>Carex laevivaginata</i>
Wooly-fruit sedge	Cyperaceae	<i>Carex lasiocarpa</i>
Mead's sedge	Cyperaceae	<i>Carex meadii</i>
Troublesome sedge	Cyperaceae	<i>Carex molesta</i>
Wooly sedge	Cyperaceae	<i>Carex pellita</i>
Clustered field sedge	Cyperaceae	<i>Carex praegracilis</i>
Awlfruit sedge	Cyperaceae	<i>Carex stipata</i> var. <i>stipata</i>
Tuckerman's sedge	Cyperaceae	<i>Carex tuckermanii</i>
Fox sedge	Cyperaceae	<i>Carex vulpinoidea</i>
Taperleaf flatsedge	Cyperaceae	<i>Cyperus acuminatus</i>
Poorland flatsedge	Cyperaceae	<i>Cyperus compressus</i>
Globe flatsedge	Cyperaceae	<i>Cyperus echinatus</i>
Yellow nutsedge	Cyperaceae	<i>Cyperus esculentus</i>
Great Plains flatsedge	Cyperaceae	<i>Cyperus lupulinus</i>
Sand flatsedge	Cyperaceae	<i>Cyperus schweinitzii</i>
Lean flatsedge	Cyperaceae	<i>Cyperus setigerus</i>
Awned flatsedge	Cyperaceae	<i>Cyperus squarrosus</i>
Flat-stem spikerush	Cyperaceae	<i>Eleocharis compressa</i>
Bald spikerush	Cyperaceae	<i>Eleocharis erythropoda</i>
Pale spikerush	Cyperaceae	<i>Eleocharis macrostachya</i>
Sand spikerush	Cyperaceae	<i>Eleocharis montevidensis</i>
Common spikerush	Cyperaceae	<i>Eleocharis palustris</i>
Beaked spikerush	Cyperaceae	<i>Eleocharis rostellata</i>
Hairy fimbry	Cyperaceae	<i>Fimbristylis puberula</i> var. <i>interior</i>
Hairy fimbry	Cyperaceae	<i>Fimbristylis puberula</i> var. <i>puberula</i>
Hardstem bulrush	Cyperaceae	<i>Schoenoplectus acutus</i> var. <i>acutus</i>
Common threesquare	Cyperaceae	<i>Schoenoplectus pungens</i>
Common threesquare	Cyperaceae	<i>Schoenoplectus pungens</i> var. <i>longispicatus</i>
Softstem bulrush	Cyperaceae	<i>Schoenoplectus tabernaemontani</i>
Pale bulrush	Cyperaceae	<i>Scirpus pallidus</i>
Hanging bulrush	Cyperaceae	<i>Scirpus pendulus</i>
Persimmon	Ebenaceae	<i>Diospyros virginiana</i>
Russian olive	Elaeagnaceae	<i>Elaeagnus angustifolia</i>
Smooth horsetail	Equisetaceae	<i>Equisetum laevigatum</i>
Geyer's sandmat	Euphorbiaceae	<i>Euphorbia geyeri</i>
Rip-seed sandmat	Euphorbiaceae	<i>Euphorbia glyptosperma</i>
Sand spurge	Euphorbiaceae	<i>Euphorbia missurica</i>
Sand croton	Euphorbiaceae	<i>Croton glandulosus</i> var. <i>septentrionalis</i>
Texas croton	Euphorbiaceae	<i>Croton texensis</i>
Heartleaf sandmat	Euphorbiaceae	<i>Euphorbia cordifolia</i>
David's spurge	Euphorbiaceae	<i>Euphorbia davidii</i>
Toothed spurge	Euphorbiaceae	<i>Euphorbia dentata</i>

<i>Common name</i>	<i>Family</i>	<i>Scientific name</i>
Snow-on-the-mountain	Euphorbiaceae	<i>Euphorbia marginata</i>
Eyebane	Euphorbiaceae	<i>Euphorbia nutans</i>
Roughpod spurge	Euphorbiaceae	<i>Euphorbia spathulata</i>
Leadplant	Fabaceae	<i>Amorpha canescens</i>
False indigo	Fabaceae	<i>Amorpha fruticosa</i>
Platte milkvetch	Fabaceae	<i>Astragalus plattensis</i>
Blue wild indigo	Fabaceae	<i>Baptisia australis</i> var. <i>minor</i>
Partridge pea	Fabaceae	<i>Chamaecrista fasciculata</i>
Purple prairie-clover	Fabaceae	<i>Dalea purpurea</i> var. <i>purpurea</i>
Hairy prairie-clover	Fabaceae	<i>Dalea villosa</i> var. <i>villosa</i>
Illinois bundleflower	Fabaceae	<i>Desmanthus illinoensis</i>
Prairie bundleflower	Fabaceae	<i>Desmanthus leptolobus</i>
Sessileleaf ticktrefoil	Fabaceae	<i>Desmodium sessilifolium</i>
Honeylocust	Fabaceae	<i>Gleditsia triacanthos</i>
Wild licorice	Fabaceae	<i>Glycyrrhiza lepidota</i>
Kentucky coffeetree	Fabaceae	<i>Gymnocladus dioicus</i>
Round-head lespedeza	Fabaceae	<i>Lespedeza capitata</i>
American birdsfoot trefoil	Fabaceae	<i>Acmispon americanus</i> var. <i>americanus</i>
Alfalfa	Fabaceae	<i>Medicago sativa</i>
White sweetclover	Fabaceae	<i>Melilotus albus</i>
Yellow sweetclover	Fabaceae	<i>Melilotus officinalis</i>
Sensitive briar	Fabaceae	<i>Mimosa microphylla</i>
Catclaw sensitive-briar	Fabaceae	<i>Mimosa nuttallii</i>
Palmleaf Indian breadroot	Fabaceae	<i>Pedimelum digitatum</i>
Dune scurfpea	Fabaceae	<i>Psoralidium lanceolatum</i>
Black locust	Fabaceae	<i>Robinia pseudoacacia</i>
Stick-seed fuzzybean	Fabaceae	<i>Strophostyles leiosperma</i>
Goat's-rue	Fabaceae	<i>Tephrosia virginiana</i>
Hairy vetch	Fabaceae	<i>Vicia villosa</i> ssp. <i>villosa</i>
Bur oak	Fagaceae	<i>Quercus macrocarpa</i>
Smallflower fumewort	Fumariaceae	<i>Corydalis micrantha</i>
Prairie gentian	Gentianaceae	<i>Eustoma exaltatum</i> ssp. <i>russellianum</i>
Carolina geranium	Geraniaceae	<i>Geranium carolinianum</i>
Golden currant	Grossulariaceae	<i>Ribes aureum</i> var. <i>villosum</i>
American watermilfoil	Haloragaceae	<i>Myriophyllum sibiricum</i>
Common waternymph	Hydrocharitaceae	<i>Najas guadalupensis</i>
Blue-eyed grass	Iridaceae	<i>Sisyrinchium montanum</i>
Black walnut	Juglandaceae	<i>Juglans nigra</i>
Tapertip rush	Juncaceae	<i>Juncus acuminatus</i>
Baltic rush	Juncaceae	<i>Juncus balticus</i>
Tuftedstem rush	Juncaceae	<i>Juncus brachyphyllus</i>
Leathery rush	Juncaceae	<i>Juncus coriaceus</i>
Dudley rush	Juncaceae	<i>Juncus dudleyi</i>
Inland rush	Juncaceae	<i>Juncus interior</i>
Grassleaf rush	Juncaceae	<i>Juncus marginatus</i>

<i>Common name</i>	<i>Family</i>	<i>Scientific name</i>
Lopsided rush	Juncaceae	<i>Juncus secundus</i>
Field rush	Juncaceae	<i>Juncus tenuis</i>
Torrey rush	Juncaceae	<i>Juncus torreyi</i>
False pennyroyal	Lamiaceae	<i>Hedeoma hispida</i>
Henbit	Lamiaceae	<i>Lamium amplexicaule</i>
American bugleweed	Lamiaceae	<i>Lycopus americanus</i>
Wild bergamot	Lamiaceae	<i>Monarda punctata</i> ssp. <i>occidentalis</i>
Catnip	Lamiaceae	<i>Nepeta cataria</i>
Blue sage	Lamiaceae	<i>Salvia azurea</i>
Lanceleaf blue sage	Lamiaceae	<i>Salvia reflexa</i>
Blue skullcap	Lamiaceae	<i>Scutellaria lateriflora</i>
American germander	Lamiaceae	<i>Teucrium canadense</i> var. <i>canadense</i>
Lesser duckweed	Lemnaceae	<i>Lemna aequinoctialis</i>
Common duckweed	Lemnaceae	<i>Lemna minor</i>
Minute duckweed	Lemnaceae	<i>Lemna perpusilla</i>
Turion duckweed	Lemnaceae	<i>Lemna turionifera</i>
Wild onion	Liliaceae	<i>Allium canadense</i>
Wild asparagus	Liliaceae	<i>Asparagus officinalis</i>
False lily-of-the-valley	Liliaceae	<i>Maianthemum stellatum</i>
Wild flax	Linaceae	<i>Linum rigidum</i>
Purple ammannia	Lythraceae	<i>Ammannia coccinea</i>
Grand redstem	Lythraceae	<i>Ammannia robusta</i>
California loosestrife	Lythraceae	<i>Lythrum californicum</i>
Velvetleaf mallow	Malvaceae	<i>Abutilon theophrasti</i>
Plains poppymallow	Malvaceae	<i>Callirhoe alcaeoides</i>
Purple poppymallow	Malvaceae	<i>Callirhoe involucrata</i>
Common mallow	Malvaceae	<i>Malva neglecta</i>
Hairy waterclover	Marsileaceae	<i>Marsilea vestita</i>
Moonseed	Menispermaceae	<i>Menispermum canadense</i>
Carpetweed	Molluginaceae	<i>Mollugo verticillata</i>
Osage-orange	Moraceae	<i>Maclura pomifera</i>
White mulberry	Moraceae	<i>Morus alba</i>
American lotus	Nelumbonaceae	<i>Nelumbo lutea</i>
Smooth four-o'clock	Nyctaginaceae	<i>Mirabilis glabra</i>
Four-o'clock	Nyctaginaceae	<i>Mirabilis linearis</i>
Heart-leaved four-o'clock	Nyctaginaceae	<i>Mirabilis nyctaginea</i>
Green ash	Oleaceae	<i>Fraxinus pennsylvanica</i>
Yellow sundrops	Onagraceae	<i>Oenothera serrulata</i>
Velvetweed	Onagraceae	<i>Oenothera curtiflora</i>
Bushy seedbox	Onagraceae	<i>Ludwigia alternifolia</i>
Common evening primrose	Onagraceae	<i>Oenothera biennis</i>
Hooker's evening primrose	Onagraceae	<i>Oenothera elata</i> ssp. <i>hirsutissima</i>
Largeflower evening primrose	Onagraceae	<i>Oenothera grandis</i>
Cut-leaf evening primrose	Onagraceae	<i>Oenothera laciniata</i>
Four-point evening primrose	Onagraceae	<i>Oenothera rhombipetala</i>

<i>Common name</i>	<i>Family</i>	<i>Scientific name</i>
Hairy evening primrose	Onagraceae	<i>Oenothera villosa</i> ssp. <i>villosa</i>
Great Plains ladies-tresses	Orchidaceae	<i>Spiranthes magnicamporum</i>
Slender yellow woodsorrel	Oxalidaceae	<i>Oxalis dillenii</i>
Yellow woodsorrel	Oxalidaceae	<i>Oxalis stricta</i>
Prickly-poppy	Papaveraceae	<i>Argemone polyanthemus</i>
Devil's claw	Pedaliaceae	<i>Proboscidea louisianica</i>
Pokeweed	Phytolaccaceae	<i>Phytolacca americana</i> var. <i>americana</i>
Austrian pine	Pinaceae	<i>Pinus nigra</i>
Longleaf plantain	Plantaginaceae	<i>Plantago elongata</i>
Wooly plantain	Plantaginaceae	<i>Plantago patagonica</i>
Dwarf plantain	Plantaginaceae	<i>Plantago pusilla</i>
Virginia plantain	Plantaginaceae	<i>Plantago virginica</i>
Goatgrass	Poaceae	<i>Aegilops cylindrica</i>
Redtop bent	Poaceae	<i>Agrostis gigantea</i>
Winter bentgrass	Poaceae	<i>Agrostis hyemalis</i>
Creeping bentgrass	Poaceae	<i>Agrostis stolonifera</i>
Carolina foxtail	Poaceae	<i>Alopecurus carolinianus</i>
Big bluestem	Poaceae	<i>Andropogon gerardii</i>
Sand bluestem	Poaceae	<i>Andropogon hallii</i>
Broomsedge	Poaceae	<i>Andropogon virginicus</i>
Forked three-awn	Poaceae	<i>Aristida basiramea</i>
Longspike three-awn	Poaceae	<i>Aristida longespica</i>
Prairie three-awn	Poaceae	<i>Aristida oligantha</i>
Red three-awn	Poaceae	<i>Aristida purpurea</i> var. <i>longiseta</i>
Caucasian bluestem	Poaceae	<i>Bothriochloa bladhii</i>
King Ranch bluestem	Poaceae	<i>Bothriochloa ischaemum</i> var. <i>songarica</i>
Silver bluestem	Poaceae	<i>Bothriochloa saccharoides</i>
Sideoats grama	Poaceae	<i>Bouteloua curtipendula</i>
Blue grama	Poaceae	<i>Bouteloua gracilis</i>
Rescue grass	Poaceae	<i>Bromus catharticus</i>
Smooth brome	Poaceae	<i>Bromus inermis</i>
Japanese brome	Poaceae	<i>Bromus japonicus</i>
Cheatgrass	Poaceae	<i>Bromus tectorum</i>
Buffalograss	Poaceae	<i>Buchloe dactyloides</i>
Bluejoint reedgrass	Poaceae	<i>Calamagrostis canadensis</i>
Narrowspike reedgrass	Poaceae	<i>Calamagrostis stricta</i>
Prairie sandreed	Poaceae	<i>Calamovilfa gigantea</i>
Sandbur	Poaceae	<i>Cenchrus longispinus</i>
Coastal sandbur	Poaceae	<i>Cenchrus spinifex</i>
Windmill grass	Poaceae	<i>Chloris verticillata</i>
Rigid oanic grass	Poaceae	<i>Coleataenia longifolia</i> ssp. <i>rigidula</i>
Bermudagrass	Poaceae	<i>Cynodon dactylon</i>
Orchardgrass	Poaceae	<i>Dactylis glomerata</i>
Tapered rosette grass	Poaceae	<i>Dichantheium acuminatum</i> var. <i>acuminatum</i>
Western panic grass	Poaceae	<i>Dichantheium acuminatum</i> ssp. <i>fasciculatum</i>

<i>Common name</i>	<i>Family</i>	<i>Scientific name</i>
Scribner panicum	Poaceae	<i>Dichanthelium oligosanthes</i>
Carolina crabgrass	Poaceae	<i>Digitaria cognata</i>
Slender crabgrass	Poaceae	<i>Digitaria filiformis</i>
Hairy crabgrass	Poaceae	<i>Digitaria sanguinalis</i>
Inland saltgrass	Poaceae	<i>Distichlis spicata</i> var. <i>stricta</i>
Barnyard grass, millet	Poaceae	<i>Echinochloa crus-galli</i> var. <i>crus-galli</i>
Rough barnyard grass	Poaceae	<i>Echinochloa muricata</i> var. <i>microstachya</i>
Goosegrass	Poaceae	<i>Eleusine indica</i>
Canada wild rye	Poaceae	<i>Elymus canadensis</i>
Quackgrass	Poaceae	<i>Elymus repens</i>
Virginia wild rye	Poaceae	<i>Elymus virginicus</i>
Stinkgrass	Poaceae	<i>Eragrostis cilianensis</i>
Weeping lovegrass	Poaceae	<i>Eragrostis curvula</i>
Tufted lovegrass	Poaceae	<i>Eragrostis pectinacea</i>
Red lovegrass	Poaceae	<i>Eragrostis secundiflora</i> ssp. <i>oxylepis</i>
Purple lovegrass	Poaceae	<i>Eragrostis spectabilis</i>
Sand lovegrass	Poaceae	<i>Eragrostis trichodes</i>
Prairie cupgrass	Poaceae	<i>Eriochloa contracta</i>
Tall fescue	Poaceae	<i>Schedonorus pratensis</i>
Foxtail barley	Poaceae	<i>Hordeum jubatum</i>
Little barley	Poaceae	<i>Hordeum pusillum</i>
Rice cutgrass	Poaceae	<i>Leersia oryzoides</i>
Sprangletop	Poaceae	<i>Leptochloa fusca</i>
Alkali muhly	Poaceae	<i>Muhlenbergia asperifolia</i>
Nodding muhly	Poaceae	<i>Muhlenbergia bushii</i>
Tumblegrass	Poaceae	<i>Muhlenbergia paniculata</i>
Wirestem muhly	Poaceae	<i>Muhlenbergia racemosa</i>
Witchgrass	Poaceae	<i>Panicum capillare</i>
Fall panicum	Poaceae	<i>Panicum dichotomiflorum</i>
Switchgrass	Poaceae	<i>Panicum virgatum</i>
Western wheatgrass	Poaceae	<i>Pascopyrum smithii</i>
Sand paspalum	Poaceae	<i>Paspalum setaceum</i> var. <i>stramineum</i>
Yellow bristlegrass	Poaceae	<i>Pennisetum glaucum</i>
Timothy	Poaceae	<i>Phleum pratense</i>
Common reed	Poaceae	<i>Phragmites australis</i>
Texas bluegrass	Poaceae	<i>Poa arachnifera</i>
Plains bluegrass	Poaceae	<i>Poa arida</i>
Canada bluegrass	Poaceae	<i>Poa compressa</i>
Kentucky bluegrass	Poaceae	<i>Poa pratensis</i>
Rabbit's-foot grass	Poaceae	<i>Polypogon monspeliensis</i>
Tall fescue	Poaceae	<i>Schedonorus arundinaceus</i>
Little bluestem	Poaceae	<i>Schizachyrium scoparium</i>
Cultivated rye	Poaceae	<i>Secale cereale</i>
Marsh foxtail	Poaceae	<i>Setaria parviflora</i>
Green foxtail	Poaceae	<i>Setaria viridis</i>

<i>Common name</i>	<i>Family</i>	<i>Scientific name</i>
Indiangrass	Poaceae	<i>Sorghastrum nutans</i>
Johnsongrass	Poaceae	<i>Sorghum halepense</i>
Alkali cordgrass	Poaceae	<i>Spartina gracilis</i>
Prairie cordgrass	Poaceae	<i>Spartina pectinata</i>
Prairie wedgegrass	Poaceae	<i>Sphenopholis obtusata</i>
Alkali sacaton	Poaceae	<i>Sporobolus airoides</i>
Composite dropseed	Poaceae	<i>Sporobolus compositus</i> var. <i>compositus</i>
Sand dropseed	Poaceae	<i>Sporobolus cryptandrus</i>
Puffsheath dropseed	Poaceae	<i>Sporobolus neglectus</i>
Texas dropseed	Poaceae	<i>Sporobolus texanus</i>
Intermediate wheatgrass	Poaceae	<i>Thinopyrum intermedium</i>
Purpletop	Poaceae	<i>Tridens flavus</i>
Longspike tridens	Poaceae	<i>Tridens strictus</i>
Purple sandgrass	Poaceae	<i>Triplasis purpurea</i> var. <i>purpurea</i>
Eastern gamagrass	Poaceae	<i>Tripsacum dactyloides</i>
Wheat	Poaceae	<i>Triticum aestivum</i>
Sixweeks fescue	Poaceae	<i>Vulpia octoflora</i>
Annual eriogonum	Polygonaceae	<i>Eriogonum annuum</i>
Climbing false buckwheat	Polygonaceae	<i>Fallopia scandens</i>
Water knotweed	Polygonaceae	<i>Persicaria amphibia</i>
Pink smartweed	Polygonaceae	<i>Persicaria bicornis</i>
Marshpepper knotweed	Polygonaceae	<i>Persicaria hydropiper</i>
Swamp smartweed	Polygonaceae	<i>Persicaria hydropiperoides</i>
Curlytop knotweed	Polygonaceae	<i>Persicaria lapathifolia</i>
Spotted ladysthumb	Polygonaceae	<i>Persicaria maculosa</i>
Pennsylvania smartweed	Polygonaceae	<i>Persicaria pennsylvanica</i>
Prostrate knotweed	Polygonaceae	<i>Polygonum aviculare</i>
Bushy knotweed	Polygonaceae	<i>Polygonum ramosissimum</i> ssp. <i>prolificum</i>
Yellow-flowered knotweed	Polygonaceae	<i>Polygonum ramosissimum</i> ssp. <i>ramosissimum</i>
Pleatleaf knotweed	Polygonaceae	<i>Polygonum tenue</i>
Curly dock	Polygonaceae	<i>Rumex crispus</i>
Dock	Polygonaceae	<i>Rumex fueginus</i>
Narrowleaf dock	Polygonaceae	<i>Rumex stenophyllus</i>
Blue mudplantain	Pontederiaceae	<i>Heteranthera limosa</i>
Prairie fameflower	Portulacaceae	<i>Phemeranthus rugospermus</i>
Common purslane	Portulacaceae	<i>Portulaca oleracea</i>
Kiss-me-quick	Portulacaceae	<i>Portulaca pilosa</i>
Long-leaf pondweed	Potamogetonaceae	<i>Potamogeton nodosus</i>
Pondweed	Potamogetonaceae	<i>Stuckenia pectina</i>
Western rock-jasmine	Primulaceae	<i>Androsace occidentalis</i>
Carolina anemone	Ranunculaceae	<i>Anemone caroliniana</i>
Prairie larkspur	Ranunculaceae	<i>Delphinium carolinianum</i> ssp. <i>penardii</i>
Tiny mousetail	Ranunculaceae	<i>Myosurus minimus</i>
Celeryleaf buttercup	Ranunculaceae	<i>Ranunculus sceleratus</i> var. <i>sceleratus</i>
New Jersey tea	Rhamnaceae	<i>Ceanothus herbaceus</i>

<i>Common name</i>	<i>Family</i>	<i>Scientific name</i>
Agrimony	Rosaceae	<i>Agrimonia parviflora</i>
White avens	Rosaceae	<i>Geum canadense</i>
American plum	Rosaceae	<i>Prunus americana</i>
Sand plum	Rosaceae	<i>Prunus angustifolia</i>
Peach	Rosaceae	<i>Prunus persica</i>
Chokecherry	Rosaceae	<i>Prunus virginiana</i>
Pear	Rosaceae	<i>Pyrus communis</i>
Prairie rose	Rosaceae	<i>Rosa arkansana</i>
Multiflora rose	Rosaceae	<i>Rosa multiflora</i>
Buttonbush	Rubiaceae	<i>Cephalanthus occidentalis</i>
Bedstraw	Rubiaceae	<i>Galium aparine</i>
Spiral ditchgrass	Ruppiaceae	<i>Ruppia cirrhosa</i>
Plains cottonwood	Salicaceae	<i>Populus deltoides</i> ssp. <i>monilifera</i>
Peachleaf willow	Salicaceae	<i>Salix amygdaloides</i>
Sandbar willow	Salicaceae	<i>Salix interior</i>
Black willow	Salicaceae	<i>Salix nigra</i>
Western soapberry	Sapindaceae	<i>Sapindus saponaria</i> var. <i>drummondii</i>
Slenderleaf false-foxglove	Scrophulariaceae	<i>Agalinis tenuifolia</i>
Roundleaf monkeyflower	Scrophulariaceae	<i>Mimulus glabratus</i> var. <i>jamesii</i>
Texas toadflax	Scrophulariaceae	<i>Nuttallanthus texanus</i>
Common mullein	Scrophulariaceae	<i>Verbascum thaspus</i>
Purslane speedwell	Scrophulariaceae	<i>Veronica peregrina</i>
Tree-of-heaven	Simaroubaceae	<i>Ailanthus altissima</i>
Bristly greenbrier	Smilacaceae	<i>Smilax tamnoides</i>
Jimsonweed	Solanaceae	<i>Datura stramonium</i>
Sacred datura	Solanaceae	<i>Datura wrightii</i>
Groundcherry	Solanaceae	<i>Physalis hispida</i>
Long-leaf groundcherry	Solanaceae	<i>Physalis longifolia</i> var. <i>longifolia</i>
Longleaf groundcherry	Solanaceae	<i>Physalis longifolia</i> var. <i>subglabrata</i>
Virginia groundcherry	Solanaceae	<i>Physalis virginiana</i> var. <i>virginiana</i>
Horsenettle	Solanaceae	<i>Solanum carolinense</i>
Deadly nightshade	Solanaceae	<i>Solanum interius</i>
Black nightshade	Solanaceae	<i>Solanum nigrum</i>
Buffalo-bur	Solanaceae	<i>Solanum rostratum</i>
Saltcedar	Tamaricaceae	<i>Tamarix ramosissima</i>
Narrow-leaf cattail	Typhaceae	<i>Typha angustifolia</i>
Southern cattail	Typhaceae	<i>Typha domingensis</i>
Broadleaf cattail	Typhaceae	<i>Typha latifolia</i>
Hackberry	Ulmaceae	<i>Celtis occidentalis</i>
Dwarf hackberry	Ulmaceae	<i>Celtis tenuifolia</i>
American elm	Ulmaceae	<i>Ulmus americana</i>
Chinese elm	Ulmaceae	<i>Ulmus parvifolia</i>
Siberian elm	Ulmaceae	<i>Ulmus pumila</i>
Slippery elm	Ulmaceae	<i>Ulmus rubra</i>
False nettle	Urticaceae	<i>Boehmeria cylindrica</i>

<i>Common name</i>	<i>Family</i>	<i>Scientific name</i>
Pennsylvania pellitory	Urticaceae	<i>Parietaria pensylvanica</i>
Dakota vervain	Verbenaceae	<i>Glandularia bipinnatifida</i> var. <i>bipinnatifida</i>
Fog-fruit	Verbenaceae	<i>Phyla lanceolata</i>
Prostrate vervain	Verbenaceae	<i>Verbena bracteata</i>
Blue vervain	Verbenaceae	<i>Verbena hastata</i>
Hoary vervain	Verbenaceae	<i>Verbena stricta</i>
Field pansy	Violaceae	<i>Viola bicolor</i>
Common blue violet	Violaceae	<i>Viola sororia</i>
Virginia creeper	Vitaceae	<i>Parthenocissus quinquefolia</i>
Riverbank grape	Vitaceae	<i>Vitis riparia</i>
Horned pondweed	Zannichelliaceae	<i>Zannichellia palustris</i>
Puncture-vine	Zygophyllaceae	<i>Tribulus terrestris</i>

Appendix H

Grassland Fragmentation Assessment

To determine the optimal distribution and area of grasslands on Quivira Refuge, a quantitative analysis comparing the benefits of current and future grassland areas and distribution was conducted on refuge and private lands within 2 miles of the refuge boundary using GIS. The analysis was based on the spatial needs of area-sensitive grassland birds reported in literature and on the refuge's digital NVCS map.

Species considered in the analysis are known to occur on the refuge and included upland sandpiper, grasshopper sparrow, bobolink, western meadowlark, and dickcissel (Helzer and Jelinski 1999). It is assumed that meeting the area needs of these species also would result in sufficient area to support other grassland-dependent birds. Further, similar landscape factors such as connectedness (tree cover), road density, and isolation, have been shown to affect certain wetland birds as well (Whited et al. 2000).

To assess current benefits, three separate maps were created from the 2008 NVCS data: (1) a coverage of suitable breeding habitats that included all NVCS associations dominated by upland and facultative upland grasses, including areas that now support plum that could be removed by management; (2) neutral habitats that do not provide suitable habitat but are not avoided, which included areas dominated by saltgrass and sedge meadows; and (3) hostile habitats that species avoid, which included trees, roads, croplands, buildings, wetlands greater than 437.45 yards (400 meters) wide, and tall dense plum stands that are expected to persist on the refuge.

Roads and trees were buffered by 54.68 yards (50 meters) to account for edge effects (nest parasitism and predation) that negatively affect breeding success (Johnson and Temple 1990, Winter et al. 2000, Herkert et al. 2003). The 54.68-yard (50-meter) buffer may actually be conservative as edge and patch effects vary temporally, spatially, and among species (Bakker et al. 2002; Winter et al. 2006a, 2006b) and some research suggest greater buffer distances (Bollinger and Gavin 2004).

The maps of suitable and neutral habitats were combined and intersected with the hostile habitat map to determine the area and perimeter-to-area ratio of individual grassland tracts (patches, for example). These metrics were compared to those reported for area-sensitive species to determine the suitability of individual patches.

To determine potential future benefits, the same analysis was conducted except that the planning team identified hostile habitats that could be realistically restored to increase the area of suitable grassland habitat. Treed areas and cropland were the only habitats that met this criterion. County roads and existing buildings could not be removed because of legal and budget constraints, respectively. Wetlands greater than 437.45 yards (400 meters) wide and tall dense plum stands could not be removed because they provide important habitats for other species.

A 54.68-yard (50-meter) buffer was placed around those features that could not be removed or restored, and all trees and agricultural fields that did not occur within the buffer area were removed from the map of hostile habitats. Trees within the buffer were kept because removal would not increase the area of grassland habitat.

In addition, treed areas on the perimeter of the refuge were evaluated relative to adjacent habitats on private lands. Treed areas on the refuge that extended onto private land were kept because removal would not substantially increase area of grassland tracts; all other perimeter woody vegetation was removed. A map of historical vegetation that was developed based on ecological site descriptions and historical botanical information (Heitmeyer et al. 2012) was used to assign new habitat types to treed areas and croplands that were slated for removal. These habitat types were then reclassified as either suitable or neutral before the analysis.

The results of the current habitat analysis show the refuge has 41 patches of suitable or neutral habitat that encompass 9,770 acres (44 percent) of grassland. Of these, 11 patches are of sufficient size and have suitable perimeter-to-area ratios necessary to support the area-sensitive species based on measures used in the analysis. However, the composition of most suitable patches are dominated (less than 50 percent) by neutral habitat, suggesting that suitable breeding habitat may be limited within these patches. For example, some patches considered to be of suitable size were dominated by saltgrass, which does not provide the plant height or litter depth necessary for nesting species in the analysis.

In comparison, the analysis of potential future habitats shows appropriate management could dramatically improve grassland habitats for area-sensitive species.

tive grassland species and, therefore, other grassland-dependent birds. Restoration of designated treed areas (about 850 acres) and agricultural fields (about 866 acres) to historical habitat types would result in 12 grassland patches, 9 of which would be more than 500 acres and 6 more than 1,000 acres with lower perimeter-to-area ratios (less edge) that exceed the needs for the species considered in the analysis. Furthermore, 5 of the 6 patches that are greater than 1,000 acres would have more than 50 percent of the habitat area suitable for breeding grassland birds.

H.1 Current Conditions: 54.68-Yard Analysis

Black areas in figure 19 are hostile to grassland birds, as defined by: area within 54.68 yards (50 meters) of all tress, agricultural fields, primary roads, wetlands greater than 437.45 yards (400 meters) across, and plum stands not expected to change because of various management constraints. Total acres are 9,770, or about 44 percent of the refuge.

Current suitable habitat for grassland birds includes: grasslands, including meadows and sandhills, and plum. Total acres are 5,633, or about 25 percent of the refuge.

Current nonsuitable habitat for grassland birds includes tall emergents, saltgrass, water, salt flats and bare areas, secondary roads, and prairie dog towns. Total acres are 6,739, or about 30 percent of the refuge.

H.2 Future Conditions: 54.68-Yard Analysis

Black areas in figure 20 are hostile to grassland birds, as defined by: area within 54.68 yards (50 meters) around remaining trees, primary roads, wetlands greater than 437.45 yards (400 meters) across, and plum stands not expected to change because of various management constraints. Total acres are 4,138, or about 18.6 percent of the refuge.

Future, suitable, habitat for grassland birds by removing trees and restoring agricultural fields totals 9,780 acres, or about 40 percent of the refuge.

Current nonsuitable habitat for grassland birds includes: tall emergents, saltgrass, water salt flats and bare areas, secondary roads, and prairie dog towns. Total acres are 8,222, or about 37 percent of the refuge.

H.3 Current Conditions: 54.68-Yard Analysis of Patches Greater Than 1 Acre

Current patches of nonhostile habitats were created by dissolving features labeled as suitable or nonsuitable. Forty one patches greater than one acre are shown on figure 21. Perimeter-to-area ratios were computed for each patch. White space is area hostile to grassland birds.

H.4 Future Conditions: 54.68-Yard Analysis of Patches Greater Than 1 Acre

Future patches of nonhostile habitats were created by dissolving features labeled as suitable or nonsuitable. Patches were expanded from current conditions by restoring agricultural fields and removing most, but not all, trees. The result is twelve patches greater than one acre. Perimeter-to-area ratios were computed for each patch. White space is remaining area hostile to grassland birds.

H.5 Summary

If we choose to remove 850 acres of trees and restore 886 acres of agricultural fields to native habitats at Quivira Refuge over the next 15 years, the resulting gain in suitable grassland bird habitat would be approximately 4,163 acres—3,845 acres of grassland and 318 acres of plum. We propose to leave 125 acres of trees in 13 patches ranging in size from less than 1 acre to 21 acres.

Even after restoration activities, approximately 19 percent of the refuge would remain hostile to grassland birds primarily because of the BSM, the LSM, and the presence of primary roads, which would not change.

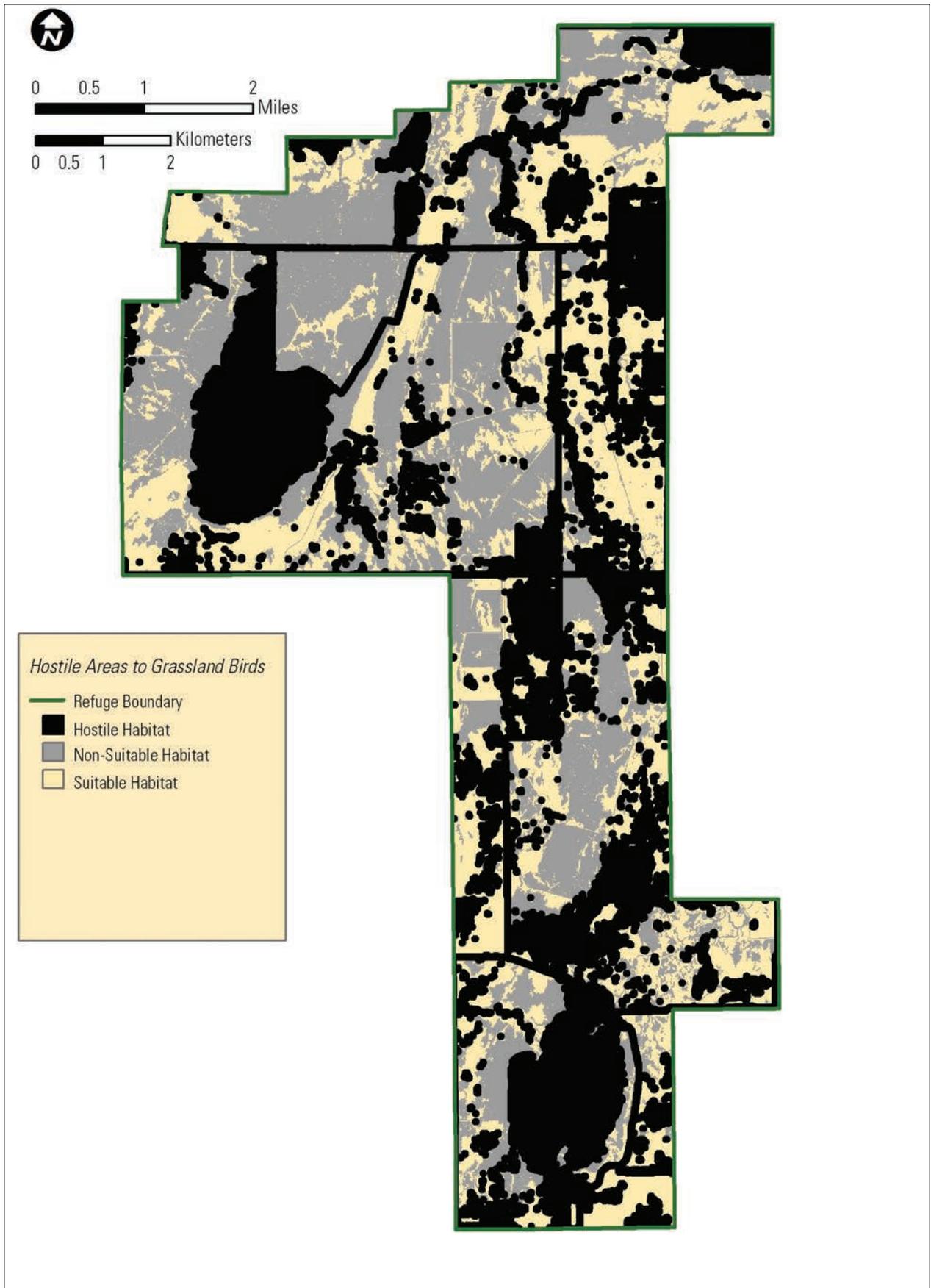


Figure 19. Current grassland conditions at Quivira National Wildlife Refuge, Kansas.

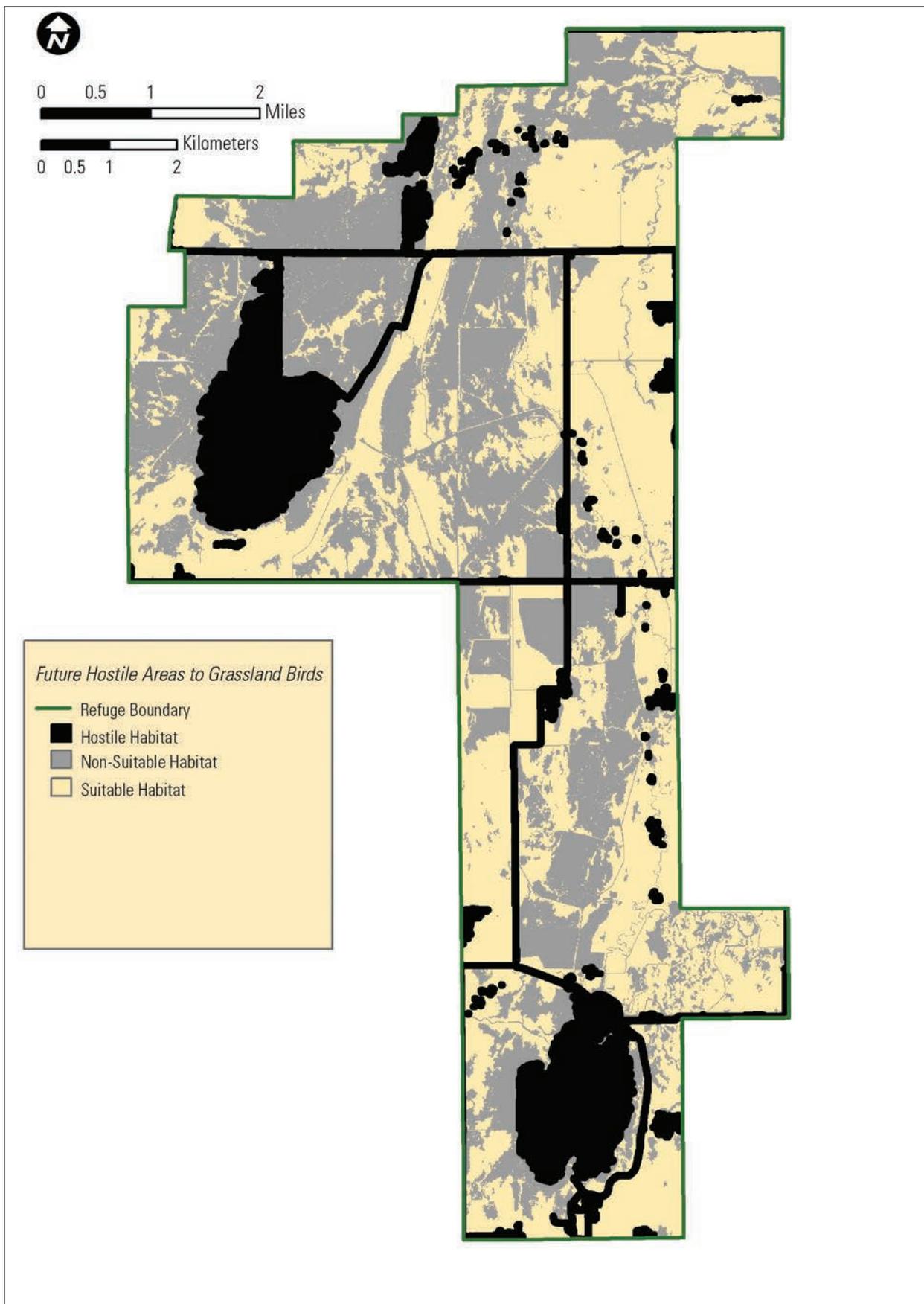


Figure 20. Future grassland conditions at Quivira National Wildlife Refuge, Kansas.

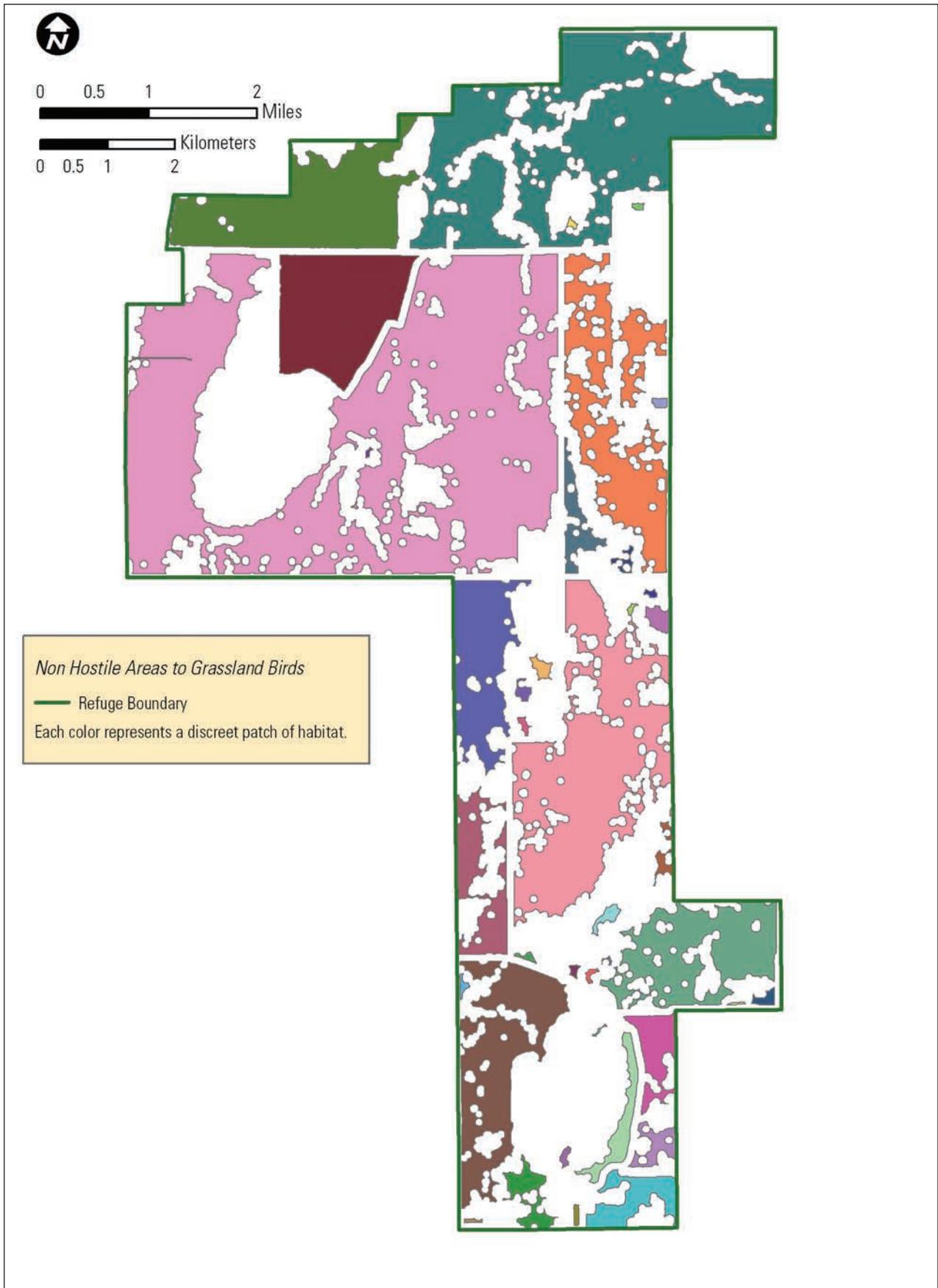


Figure 21. Current nonhostile grassland conditions at Quivira National Wildlife Refuge, Kansas.

Bibliography

- Adamcik, R.S.; Bellantoni, E.S.; Delong, D.C., Jr.; Schomaker, J.H.; Hamilton, D.B.; Laubhan, M.K.; Schroeder, R.L. 2004. Writing refuge management goals and objectives: a handbook. Washington, DC: U.S. Fish and Wildlife Service. 34 p.
- Aldous, A.E. 1935. Management of Kansas permanent pastures. Agricultural Experiment Station Bulletin 272, Kansas State College of Agriculture and Applied Science, Manhattan, KS. 43 p.
- Althoff, D.; Gibson, P.; Meggers, G.; Hilley, D.; Sellers, J. 2006. White-tailed deer spotlight survey trends on Quivira National Wildlife Refuge, 1989–2005. In: Proceedings of the North American Prairie Conference; [name of conference; date of conference; place of conference unknown]. [Place of publication: publisher unknown]. 20:297–306.
- Anderson, R.C. 2006. Evolution and origin of the central grassland of North America: climate, fire, and mammalian grazers. *Journal of the Torrey Botanical Society* 133(4):626–647.
- Arbogast, A.F. 1995. Paleoenvironments and desertification on the Great Bend Sand Prairie in Kansas [Ph.D. dissertation]. Lawrence, KS: University of Kansas. 385 p.
- Arbogast, A.E.; Johnson, W.C. 1998. Late-Quaternary landscape response to environmental change in south-central Kansas. *Annals of the Association of American Geographers* 88(1):126–145.
- Armbruster, M.J. 1990. Characterization of habitat used by whooping crane during migration. U.S. Fish and Wildlife Service Biological Report 90(4). 16 p.
- Bakker, K.K. 2003. The effect of woody vegetation on grassland nesting birds: an annotated bibliography. In: Proceedings of the South Dakota Academy of Science; [name of conference; date of conference; place of conference unknown]. [Place of publication: publisher unknown]. 82:119–141.
- Bakker, K.K.; Naugle, D.E.; Higgins, K.F. 2002. Incorporating landscape attributes into models for migratory grassland bird conservation. *Conservation Biology* 16(6):1638–1646.
- Bangsund, D.A.; Leistriz, F.L.; de Silva, L.L.; Steadman, E.N.; Harju, J.A. 2005. Terrestrial carbon sequestration potential in southwest North Dakota. [Internet]. [Revised date unknown]. <<http://www.undeerc.org/PCOR/newsandpubs/pdf/TerrestrialCarbonSequestration.pdf>> [accessed date unknown].
- Basin Management Team. 2010. Rattlesnake Creek 2009 field analysis summary. Topeka, KS: Kansas Department of Agriculture, Division of Water Resources. 32 p.
- . 2011. Rattlesnake Creek 2010 field summary. Kansas. [Place of publication unknown]: Department of Agriculture, Division of Water Resources. 32 p.
- . 2012. Rattlesnake Creek Partnership, draft third four-year review of management program 2009–2012. Topeka, KS: Kansas Department of Agriculture, Division of Water Resources. 50 p.
- Blackmar, F.W. 2002. Quivira. Transcribed from: Vol. II, Kansas: a cyclopedia of state history, embracing events, institutions, industries, counties, cities, towns, and prominent persons; 1912. Chicago, IL: Standard Publishing Company. [Pages unknown].
- Blecha, K.; Conard, J.; Wisely, S. 2011. Deer density, movement patterns, and group dynamics on Quivira National Wildlife Refuge: assessing potential for chronic wasting disease transmission. In: Final U.S. Fish and Wildlife Report. Manhattan, KS: Kansas State University; and Sterling, KS: Sterling College. 197 p.
- Bolenbaugh, J.R.; Kremetz, D.G.; Lehnen, S.E. 2011. Secretive marsh bird species co-occurrences and habitat associations across the Midwest, USA. *Journal of Fish and Wildlife Management* 2(1):49–60.
- Bollinger, E.K.; Gavin, T.A. 2004. Responses of nesting bobolinks (*Dolichonyx oryzivorus*) to habitat edges. *Auk* 121(3):767–776.
- Briggs, J.R.; Knapp, A. K.; Blair, J.M.; Heisler, J.L.; Hoch, G.A.; Lett, M.S.; McCarron, J.K. 2005. An ecosystem in transition: causes and consequences of the conversion of mesic grassland to shrubland. *BioScience* 55(3):243–254.
- Brown, M.; Dinsmore, J.J. 1986. Implications of marsh size and isolation for marsh bird management. *Journal of Wildlife Management* 50:392–397.
- Brown, S.; Hickey, C.; Harrington, B.; Gill, R. (editors). 2001. The U.S. shorebird conservation plan, 2nd edition. Manomet, MA: Manomet Center for Conservation Sciences. [Pages unknown].

- Buller, G. 1976. Indian chapter. In: Broken hoops and plains people – a catalogue of ethnic resources in the humanities: Nebraska and surrounding area. [Place of publication unknown]: Nebraska Curriculum Development Center. [Pages unknown].
- Bureau of Economic Analysis. 2012. Local area personal income. Table CA25N NAICS (2001-2010), total employment by industry. [Internet]. [Revised date unknown]. <<http://www.bea.gov/regional/reis/>> accessed October 22, 2012.
- Burns and McDonnell. 1999. Quivira National Wildlife Refuge water resources study additional investigations. Prepared for U.S. Fish and Wildlife Service. [Place of publication: publisher unknown]. [Pages unknown].
- Carver, E.; Caudill, J. 2007. Banking on nature 2006: the economic benefits to local communities of National Wildlife Refuge visitation. Washington, DC: U.S. Fish and Wildlife Service, Division of Economics. [Pages unknown].
- Castelli, R.M.; Chambers, J.C.; Tausch, R.J. 2000. Soil-plant relations along a soil-water gradient in Great Basin riparian meadows. *Wetlands* 20(2):251–266.
- Chapman, R.N.; Engle, D.M.; Masters, R.E.; Leslie, D.M., Jr. 2004. Tree invasion constrains the influence of herbaceous structure in grassland bird habitats. *Ecoscience* 11(1):55–63.
- Christensen, V.G. 2001. Characterization of surface water quality based on real-time monitoring and regression analysis, Quivira National Wildlife Refuge, south-central Kansas, December 1998 through June 2001. In: Water-Resources Investigations Report 01–4248. Lawrence, KS: U.S. Geological Survey. 28 p.
- Christensen, J.H.; Hewitson, B.; Busuioc, A.; Chen, A.; Gao, X.; Held, I.; Jones, R.; Kolli, R.K.; Kwon, W. T.; Laprise, R.; Magaña Rueda, V.; Mearns, L.; Menéndez, C.G.; Räisänen, J.; Rinke, A.; Sarr, A.; Whetton, P. 2007: Regional climate projections. In: Solomon, S.; Qin, D.; Manning, M.; Chen, Z; Marquis, M.; Averyt, K.B.; Tignor, M.; Miller, H.L.; editors. *Climate change 2007: the physical science basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, UK; New York: Cambridge University Press. [Internet]. [Revised date unknown]. <http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg1_report_the_physical_science_basis.htm> [accessed date unknown].
- Cody, R.L., editor. 1985a. *Habitat selection in birds*. New York: Academic Press. [Pages unknown].
- . 1985b. *Habitat selection in grassland and open-country birds*. *Physiological Ecology Service* p. 191–226.
- Collins, J.T.; Collins, S.L.; Taggart, T.W. 2010. *Amphibians, reptiles, and turtles of Kansas*. [City of publication unknown], UT: Eagle Mountain Publishing. XVI + 312 p.
- Cooper, B.S. 2009. Sand plum relationships with avian abundance in Oklahoma [master's thesis]. Stillwater, OK: Oklahoma State University. 65 p.
- Coppedge, B.R.; Engle, D.M.; Masters, R.E.; Gregory, M.S. 2001. Avian response to landscape change in fragmented southern Great Plains grasslands. *Ecological Applications* 11(1):47–59.
- . 2004. Predicting juniper encroachment and CRP effects on avian community dynamics in southern mixed-grass prairie, USA. *Biological Conservation* 115:431–441.
- Coppedge, B.R.; Fuhlendorf, S.D.; Harrell, W.C.; Engle, D.M. 2008. Avian community response to vegetation and structural features in grasslands managed with fire and grazing. *Biological Conservation* 141:1196–1203.
- Cross, D.; Vohs, P., editors. 1988. *Waterfowl management handbook*. Fort Collins, CO: U.S. Fish and Wildlife Service. [Pages unknown].
- Cutler, W.G. 1883. *History of the State of Kansas*. Chicago, IL: A.T. Andreas. [Pages unknown].
- Davis, C. 2001. Abundance and habitat associations of birds wintering in the Platte River Valley, Nebraska. *Great Plains Research* 11:233–248.
- Dobb, E. 1998. Reality check: the debate behind the lens. *Audubon* January–February. [Pages unknown].
- Dodge, D.A.; Hoffman, B.R.; Horsch, M.L. 1978. *Soils survey of Stafford County, Kansas*. Washington, DC: U.S. Department of Agriculture, Soil Conservation Service. [Pages unknown].
- (DOI) U. S. Department of the Interior. 2012. Safetynet. [Internet]. Revised September 25, 2012. <www.doi.gov/safetynet/#scorecard> [accessed date unknown].
- Dolin, E.J. 2010. *Fur, fortune, and empire: the epic history of the fur trade in America*. New York: W. W. Norton & Company Inc. 464 p.
- Dunkin, S.W.; Guthery, F.S. 2010. Bird nesting in Chickasaw plum related to age of plum in Oklahoma. *American Midland Naturalist* 164(1):151–156.
- Eberle, M.E.; Welker, T.L.; Welker, T.L. 1996. Survey of fishes from Rattlesnake Creek in central Kansas. *Transactions of the Kansas Academy of Science*. 99(1/2):29–38.
- Economic Research Service. 2012. *State fact sheets: Kansas*. [Internet]. <<http://www.ers.usda.gov/data-products/state-fact-sheets/state-data.aspx?StateFIPS=20&StateName=Kansas>> accessed December 20, 2012.
- Edvarchuk, K.A.; Ransom, C. 2012. Inventory of invasive non-native plant on Quivira National

- Wildlife Refuge [unpublished draft: weed science research project report no. CR1101A 2011]. [On file at location unknown]. [City of publication unknown], UT: Utah State University, Plants, Soils, and Climate Department for U.S. Fish and Wildlife Service. 34 p.
- (EPA) Environmental Protection Agency. 2011a. National Ambient Air Quality Standards (40 CFR part 50). [Internet]. [Revised date unknown]. <<http://www.epa.gov/air/criteria.html>> accessed December 23, 2011.
- . 2011b. Science and technology. [Internet]. [Revised date unknown]. <<http://www.epa.gov/gateway/science/air.html>> accessed December 23, 2011.
- . 2011c. [Title unknown]. [Internet]. Revised September 13, 2011. <<http://www.epa.gov/amad/EcoExposure/index.html>> accessed December 23, 2011.
- Erwin, K.L. 2009. Wetlands and global climate change: the role of wetland restoration in a changing world. *Wetlands Ecology and Management* 17:71–84.
- Estep, M.A. 2000. Quivira National Wildlife Refuge water conservation plan. Lakewood, CO: U.S. Fish and Wildlife Service. [Pages unknown].
- Euliss, N.H., Jr.; LaBaugh, J.W.; Fredrickson, L.H.; Mushet, D.M.; Laubhan, M.K.; Swanson, G.A.; Winter, T.C.; Rosenberry, D.O.; Nelson, R.D. 2004. The wetland continuum: a conceptual framework for interpreting biological studies. *Wetlands* 24:448–458.
- Faber-Langedoen, D., editor. 2001. Plant communities of the Midwest: classification in an ecological context. Arlington, VA: Association for Biodiversity Information. [Internet]. [Revised date unknown]. <www.natureserve.org/library/kansassubset.pdf> [accessed date unknown].
- Fader, S.W.; Stullken, L.E. 1978. Geohydrology of the Great Bend prairie, south-central Kansas. Irrigation Series No. 4. Lawrence, KS: Kansas Geological Survey. [Pages unknown].
- Falk, S. 2006. Does institutional groundwater management work? Lessons learned from Groundwater Management District #5. *Kansas Journal of Law and Public Policy* 15(3):557–566.
- Farr, K.; Laubhan, R. 2011. Quivira National Wildlife Refuge vegetation mapping project [unpublished report]. On file at U.S. Fish and Wildlife Service, [location unknown]. [Pages unknown].
- Federal Geographic Data Committee. 2008. National vegetation classification standard. [Internet]. [Revised date unknown]. <<http://biology.usgs.gov/npsveg/vncls.html>> [accessed date unknown].
- Fent, O.S. 1950. Pleistocene drainage history of central Kansas. *Transactions of the Kansas Academy of Science* 53(1):81–90.
- Fredrickson, L.H.; Taylor, T.S. 1982. Management of seasonally flooded impoundments for wildlife. Resource Publication 148. Washington, DC: U.S. Fish and Wildlife Service. 36 p.
- Fuhlendorf, S.D. 1999. Ecological considerations for woody plant management. *Rangelands* 21(1):12–15.
- (FWS) U.S. Fish and Wildlife Service. 1953. Memorandum no. 46 procedure, Great Salt Marsh National Wildlife Refuge, Kansas. [Place of publication: publisher unknown]. [Pages unknown].
- . 1962. Master plan for physical and biological development of Quivira National Wildlife Refuge. Stafford, KS: U.S. Department of the Interior, Bureau of Sport Fisheries and Wildlife. [Pages unknown].
- . 1994. An assessment of alternatives for management of upland habitats at the Quivira National Wildlife Refuge. Environmental assessment. [Place of publication: publisher unknown]. [Pages unknown].
- . 1999. *Fulfilling the Promise*. Arlington, VA: U.S. Department of the Interior, U.S. Fish and Wildlife Service. 94p.
- . 2008a. Birds of conservation concern 2008. Arlington, VA: U. S. Department of Interior, U.S. Fish and Wildlife Service, Division of Migratory Bird Management. 85 p.
- . 2008b. Staffing model for field stations—final report [unpublished report]. On file at Quivira National Wildlife Refuge, Stafford, Kansas. 22 p.
- . 2011. Conserving the future: wildlife refuges & the next generation. [Place of publication: publisher unknown]. 93 p.
- . 2012a. 2011 National survey of fishing, hunting, and wildlife-associated recreation. [Internet]. [Revised date unknown]. <<http://digitalmedia.fws.gov/cdm/ref/collection/document/id/858>> [accessed date unknown].
- . 2012b. Quivira National Wildlife Refuge. [Internet]. [Revised date unknown]. <<http://www.fws.gov/refuge/quivira/>> accessed December 15, 2012.
- . 2012c. Species by county report, Stafford, KS. [Internet]. [Revised date unknown]. <http://ecos.fws.gov/tess_public/countySearch!speciesByCountyReport.action?fips=20185> accessed January 5, 2012.
- . 2012d. Species profile for Arkansas Darter. [Internet]. Revised July 23, 2012. <<http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E06H>> [accessed date unknown].
- Gates, F.C. 1937. Grasses in Kansas. In: Report of the Kansas State Board of Agriculture for the Quarter Ending December, 1936. Topeka, KS: Kansas State Printing Plant. [Pages unknown].

- Gazda, R.J.; Meidinger, R.R.; Ball, I.J.; Connelly, J.W. 2002. Relationships between Russian olive and duck nest success in southeastern Idaho. *Wildlife Society Bulletin* 30(2):337–344.
- GEI Consultants, Inc.; Burns and McDonnell. 1998. Quivira National Wildlife Refuge water resource study. Document No. 97–806–4. [Place of publication: publisher unknown]. [Pages unknown].
- Geist, V.; Mahoney, S.P.; Organ, J.F. 2001. Why hunting has defined the North American model of wildlife conservation. In: *Transactions of the North American Wildlife and Natural Resources conference*; March 20, 2001; Washington, DC. Washington, DC: Wildlife Management Institute 66:175–85.
- Geist, V.; Organ, J.F. 2004. The public trust foundation of the North American model of wildlife conservation. *Northeast Wildlife* 58:49–56.
- Ghedotti, M.J. 1998. An annotated list of the crayfishes of Kansas with first records of *Orconectes macrus* and *Procambarus acutus* in Kansas. *Transactions of the Kansas Academy of Science* 101 (1–2):54–57.
- Grajeda, R. 1976. Chicano chapter. In: *Broken hoops and plains people—a catalogue of ethnic resources in the humanities: Nebraska and surrounding area*. [Place of publication unknown]: Nebraska Curriculum Development Center. [Pages unknown].
- Grant, T.A.; Madden, E.; Berkey, G.B. 2004. Tree and shrub invasion in northern mixed-grass prairie: implications for breeding grassland birds. *Wildlife Society Bulletin* 32:807–818.
- Grover, P.B.; Knopf, F.L. 1982. Habitat requirements and breeding success of Charadriiform birds nesting at Salt Plains National Wildlife Refuge, Oklahoma. *Journal of Field Ornithology* 53(2):139–148.
- Hammersmark, C.T.; Rains, M.C.; Wickland, A.C.; Mount, J.F. 2009. Vegetation and water-table relationships in a hydrologically restored riparian meadow. *Wetlands* 29(3):785–797.
- Hands, H.M. 2008. Shorebird (Charadriiformes) migration at selected sites throughout Kansas during 2002–2006. *Transactions of the Kansas Academy of Science* 111(1/2):61–78.
- Harris, M.R. 1999. Diatom survey of Quivira National Wildlife Refuge [master's thesis]. Fort Hays, KS: Fort Hays State University. 42 p.
- Hathaway, L.R.; Galle, O.K.; Waugh, T.C.; Dickey, H.P. 1978. Chemical quality of irrigation waters in Ford County and the Great Bend prairie of Kansas. *Chemical Quality Series 7*. Lawrence, KS: Kansas Geological Survey, University of Kansas. 48 p.
- Hauer, F.R.; Spencer, C.N. 1998. Phosphorus and nitrogen dynamics in streams associated with wildfire—a study of immediate and long-term effects. *International Journal of Wildland Fire* 8:183–98.
- Hay, R. 1890. A geological reconnaissance in southwestern Kansas [type of map unknown]. U.S. Geological Survey Bulletin 57. 1–49.
- Heisler, J.L.; Briggs, J.M.; Knapp, A.K. 2003. Long-term patterns of shrub expansion in a C4-dominated grassland: fire frequency and the dynamics of shrub cover and abundance. *American Journal of Botany* 90(3):423–428.
- Heitmeyer, M.E.; Laubhan, R.A.; Artmann, M.J. 2012. Hydrogeomorphic evaluation of ecosystem restoration and management options for Quivira National Wildlife Refuge. Greenbrier Wetland Services Report 12–04. Bloomfield, MO: Blue Heron Conservation Design and Printing, LLC. Prepared for U.S. Fish and Wildlife Service, Region 6, Denver, CO.
- Helzer, C.J. 2010. The ecology and management of prairies in the central United States. Iowa City, IA University of Iowa Press. 225 p.
- Helzer, C.J.; Jelinski, D.E. 1999. The relative importance of patch area and perimeter-area ratio to grassland breeding birds. *Ecological Applications* 9(4):1448–1458.
- Henszey, R.J.; Pfeiffer, K.; Keough, J.R. 2004. Linking surface- and ground-water levels to riparian grassland species along the Platte River in central Nebraska, USA. *Wetlands* 24(3):665–687.
- Herkert, J.R.; Reinking, D.L.; Wiedenfeld, D.A.; Winter, M.; Zimmerman, J.L.; Jensen, W. E.; Finck, E.J.; Koford, R.R.; Wolfe, D.H.; Sherrod, S.K.; Jenkins, M.A.; Faaborg, J.; Robinson, S.K. 2003. Effects of prairie fragmentation on the nest success of breeding birds in the midcontinental United States. *Conservation Biology* 17(2):587–594.
- Holling, C. S.; editor. 1978. Adaptive environmental assessment and management. [Place of publication: publisher unknown]. 377 p.
- Homer, C.H., Fry, J.A., Barnes, C.A. 2012. The national land cover database, U.S. Geological Survey fact sheet 2012–3020. 4 p.
- Huner, J.V. 2000. Macroscopic: crawfish and water birds. *American Scientist* 88(4):301–303.
- Igl, L.D.; Ballard, B.M. 1999. Habitat associations of migrating and overwintering grassland birds in southern Texas. *Condor* 101:771–782.
- Jian, X. 1998. Simulation of canal and control-pond operation at the Quivira National Wildlife Refuge, south-central Kansas. U.S. Geological Survey Water Resources Investigations Report 97–4289.
- Johnsgard, P.A. 1978. The ornithogeography of the Great Plains states. *Prairie Naturalist* 10(4):97–112.

- . 2009. Birds of the Great Plains (revised edition). [Internet]. [Revised date unknown]. <<http://digitalcommons.unl.edu/bioscibirdsgreatplains/>> accessed July 17, 2012.
- Johnson, R.G.; Temple, S.A. 1990. Nest predation and brood parasitism of tallgrass prairie birds. *Journal of Wildlife Management* 54(1):106–111.
- Kane, S.A. 2011. Breeding habitat structure and use by Kansas-occurring black rail [master's thesis]. Fort Hays, KS: Fort Hays State University. 56 p.
- Kansas Corporation Commission. 2008. 30 meter average windspeed map. [Internet]. [Revised date unknown]. <http://www.kcc.state.ks.us/energy/wind_maps.htm> [accessed date unknown].
- Kansas Department of Agriculture. 2000. Rattlesnake Creek partnership management proposal. [Internet]. [Revised date unknown]. <http://www.ksda.gov/includes/document_center/subbasin/Rattlesnake/RSC_Management.pdf> [accessed date unknown].
- Kansas Department of Agriculture. 2006. Report on the Rattlesnake Creek subbasin. [Internet]. [Revised date unknown]. <<http://www.ksda.gov/subbasin/content/201>> [accessed date unknown].
- Kansas Department of Health and Environment. 2010. Kansas water quality and assessment strategy, 2011–2015. [Internet]. [Revised date unknown]. <<http://www.kdheks.gov/bar/index.html>> accessed December 23, 2011. 47 p.
- (KDWPT) Kansas Department of Wildlife, Parks and Tourism. 2011. Species of concern. [Internet]. Revised November 14, 2011. <<http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/County-Lists/Stafford-County>> accessed January 5, 2012.
- Kansas Geological Survey and Kansas State University 1997 Final report for the computer model in the Rattlesnake Creek basin. [Internet]. [Revised date unknown]. <<http://www.ksda.gov/dwr/content/367>> [accessed date unknown].
- Kansas Natural Heritage Program, Kansas Biological Survey. 2008. [Title or description of text unknown]. [Internet]. [Revised date unknown]. <<http://www.ksnhi.ku.edu/data/html/avail.gtm>> accessed January 11, 2012.
- Kansas Scenic Byways Program, Wetlands and Wildlife National Scenic Byway. [Internet]. [Revised date unknown]. <<http://www.kansaswetlandsandwildlifescenicbyway.com/index.php>> accessed December 15, 2012.
- Kendall, W.L. 2001. Using models to facilitate complex decisions. In: Shenk, Tanya M.; Franklin, Alan B.; editors. Modeling in natural resource management. Washington, DC: Island Press. 147–170.
- Klein, M.L. 1993. Waterbird behavioral responses to human disturbances. *Wildlife Society Bulletin* 21:31–9.
- Klug, P.; Jackrel, S.L.; With, K.A. 2010. Linking snake habitat use to nest predation risk in grassland birds: the dangers of shrub cover. *Oecologia* 162:803–813.
- Klug, P.; Wolfenbarger, L.; McCarty, J.P. 2009. The nest predator community of grassland birds responds to agroecosystem habitat at multiple scales. *Ecography* 32:973–982.
- Knapp, A.K.; McCarron, J.K.; Silletti, A.M.; Hoch, G.A.; Heisler, J.L.; Lett, M.S.; Blair, J.M.; Briggs, J.M.; Smith, M.D. 2008. Ecological Consequences of the replacement of native grassland by *Juniperus virginiana* and other woody plants. In: Van Auken, O.W.; editor. Western North American Juniper communities: a dynamic vegetation type. [Place of publication unknown]: Springer. 156–169.
- Knopf, F.L. 1986. Changing landscapes and the cosmopolitanism of eastern Colorado avifauna. *Wildlife Society Bulletin* 14:132–142.
- Küchler, A.W. 1974. A new vegetation map of Kansas. *Ecology* 55(3):586–604.
- Lancia, R.A.; Braun, C.E.; Collopy, M.W.; [and others]. 1996. ARM! for the future: adaptive resource management in the wildlife profession. *Wildlife Society Bulletin* 24(3):436–42.
- Latta, B.F. 1950. Geology and ground-water resources of Barton and Stafford Counties, Kansas. Kansas Geological Survey Bulletin No. 88. [Pages unknown].
- Laubhan, M.K.; Fredrickson, L.H. 1997. Wetlands of the Great Plains: habitat characteristics and vertebrate aggregations. *Ecological Studies* 125:20–48.
- Laubhan, M.K.; Roelle, J.E. 2001. Managing wetlands for waterbirds. In: Rader, R.B.; Batzer, D.P.; Wissinger, S.; editors. Biomonitoring and management of North American freshwater wetlands. New York: John Wiley and Sons, New York. 387–411.
- Laubhan, M.K.; King, S.L.; Fredrickson, L.H. 2012. Managing inland wetlands for wildlife. In: Silvy, N.J.; editor. The wildlife techniques manual, volume 2. 7th edition. Baltimore, MD: The Johns Hopkins University Press. 95–132.
- Laughland, A.; Caudill, J. 1997. Banking on nature: the economic benefits to local communities of national wildlife refuge visitation. Washington, DC: U.S. Fish and Wildlife Service. 118 p.
- Lyons, J.; Trimble, S.W.; Paine, L.K. 2000. Grass versus trees: managing riparian areas to benefit streams of central North America. *Journal of the American Water Resources Association* 36(4):919–930.

- Ma, Z.; Cai, Y.; Li, B.; Chen, J. 2010. Managing wetland habitats for waterbirds: an international perspective. *Wetlands* 30:15–27.
- Matthews, J.H. 2008. Anthropogenic climate change in the Playa Lakes Joint Venture region; understanding impacts, discerning trends, and developing responses. Corvallis, OR: World Wildlife Fund. 40 p. Prepared for the Playa Lakes Joint Venture.
- Matthews, W.J.; Endress, A.G. 2008. Performance criteria, compliance success, and vegetation development in compensatory mitigation wetlands. *Environmental Management* 41:130–141.
- Macfarlane, P.A.; Combes, J.; Turbek, S., Kirshen, D. 1993. Shallow subsurface bedrock geology and hydrostratigraphy of southwestern Kansas. Kansas Geological Survey Open-File Report 93–1a. [Internet]. [Revised date unknown]. <http://www.kgs.ku.edu/Hydro/Publications/1993/OFR93_1a/> [accessed date unknown].
- McEachern P.; Prepas, E.E.; Gibson, J.J.; Dinsmore, P. 2000. The forest fire induced impacts on phosphorus, nitrogen and chlorophyll a concentrations in boreal sub-arctic lakes of northern Alberta. *Canadian Journal of Fisheries and Aquatic Sciences* 57(Supplement 2):73–81.
- Mitsch, W.J.; Gosselink, J.G. 2003. *Wetlands*. 2nd edition. New York: Van Nostrand Reinhold. 722 p.
- Moreno-Mateos, D.; Power, M.E.; Comín, F.A.; Yockteng, R. 2012. Structural and functional loss in restored wetland ecosystems. *Public Library of Science Biology* 10(1):1–8.
- Morton, J. M. 1995. Management of human disturbance and its effects on waterfowl. In: Whitman, W.R.; Strange, T.; Widjeskog, L.; Whittemore, R.; Kehoe, P.; Roberts, L.; editors. *Waterfowl habitat restoration, enhancement and management in the Atlantic flyway*. 3rd edition. Dover, DE: Environmental Management Committee, Atlantic Flyway Council Technical Section; Delaware Division of Fish and Wildlife. F59–F86.
- Murkin, H.R.; Murkin, E.J.; Ball, J.P. 1997. Avian habitat selection and prairie wetland dynamics: a 10-year experiment. *Ecological Applications* 7(4):1144–1159.
- Naugle, D.E.; Higgins, K.F.; Nusser, S.M. 1999. Effects of woody vegetation on wetland birds. *Canadian Field-Naturalist* 113(3):487–492.
- (NOAA) National Oceanic and Atmospheric Administration. 2006. National climatic data center. [Internet]. [Revised date unknown]. <<http://www.ncdc.noaa.gov/oa/ncdc.html>> accessed October 25, 2006.
- (NRCS) Natural Resource Conservation Service. 2010. Ecological site information system, ecological site description. Quivira National Wildlife Refuge. [Internet]. [Revised date unknown]. <<http://esis.sc.egov.usda.gov/about.aspx>> [accessed date unknown].
- Ogle, G.A., and Company. 1904. Standard atlas of Stafford County, Kansas including a plat book of the villages, cities, and townships of the county. Chicago, IL: Geo. A. Ogle and Company Publishers and Engravers. [Pages unknown].
- Olson, D.; Lindall, S. 1999. IMPLAN professional software, analysis and data guide. [Place of publication unknown]: Minnesota IMPLAN Group, Inc. [Pages unknown].
- Peck, J.C. 2006. Groundwater management in Kansas: a brief history and assessment. *Kansas Journal of Law and Public Policy* 15(3):441–465.
- Peterson, G.; Allen, C. R.; Holling, C. S. 1998. Ecological resilience, biodiversity, and scale. *Ecosystems* 1(1):6–18.
- Peterson, D. L.; Egbert, S. L.; Price, K.P.; Martinko, E.A. 2004. Identifying historical and recent land-cover changes in Kansas using post-classification change detection techniques. *Transactions of the Kansas Academy of Science* 107:105–118.
- Poole, A., editor. 2005. *The birds of North America online*. Cornell laboratory of Ornithology, Ithaca, NY. [Internet]. [Revised date unknown]. <<http://bna.birds.cornell.edu/BNA/>> [accessed date unknown].
- Ratajezak, Z.; Nippert, J.B.; Harman, J.C.; Ocheltree, T.W. 2011. Positive feedbacks amplify rates of woody encroachment in mesic tallgrass prairie. *Ecosphere* 2(11):121. 1–14.
- Rattlesnake Creek/Quivira Partnership. 2000. Rattlesnake Creek management program proposal. Kansas Department of Agriculture, Division of Water Resources. [Internet]. [Revised date unknown]. <<http://www.ksda.gov/subbasin/cid/749>> [accessed date unknown].
- Reinke, D.C. 1981. Enteromorpha, a marine alga in Kansas. *Transactions of the Kansas Academy of Science* 84(4):228–230.
- Reiss, S.A. 1995. Sport in industrial America, 1850–1920. The American history series. Wheeling, IL: Harlan Davidson, Inc. 178 p.
- Reynolds, J.D. 2011. A review of ecological interactions between crayfish and fish, indigenous and introduced. *Knowledge and Management of Aquatic Ecosystems* 401(10). 21 p.
- Ribic, C.A.; Guzy, M.J.; Sample, D.W. 2009. Grassland bird use of remnant prairie and Conservation Reserve Program fields in an agricultural landscape in Wisconsin. *American Midland Naturalist* 161(1):110–122.
- Rosenberg, N.J. 2010. Climate change, agriculture, water resources: what do we tell those that need to know? *Climate Change* 100:113–117.
- Rubin, H.; Young, D.P.; Buddemeier, R.W. 2001. Sources, transport, and management of salt con-

- tamination in the ground water of south-central Kansas. Kansas Geological Survey, Open-File Report 2000–60. Version 2.0.
- Samson, F.; Knopf, F.L. 1994. Prairie conservation in North America. *BioScience* 44(6):418–421.
- Sauer, J.R.; Hines, J.E.; Fallon, J. 2008. The North American Breeding Bird Survey, results, and analysis 1966–2007. Version 5.15.2008. Laurel, MD: USGS Patuxant Wildlife Research Center. [Pages unknown].
- Sauer, J.R.; Link, W.A. 2011. Analysis of the North American Breeding Bird Survey using hierarchical models. *Auk* 128(1):87–98.
- Schlager, E.; Heikkila, T. 2011. Left high and dry? Climate change, common-pool resource theory, and the adaptability of western water compacts. *Public Administration Review* May/June 461–470.
- Schoewe, W.H. 1949. The geography of Kansas: part II. Physical geography. *Transactions of the Kansas Academy of Science* 52(3):261–333.
- Sexson, K.; Hlavachick, B.; van Zwoll, W. 1985. Kansas deer—resource on the rebound. *Kansas Wildlife* 42:9–24.
- Sexson, K.; Monte, D.; Hlavachick, B. 1985. Landowner deer survey winter 1984–1985. *Statewide Wildlife Surveys Federal Aid Project FW–9–P–3*. 50 p.
- Sexton, N.R.; Dietsch, A.M.; Don Carlos, A.W.; Koontz, L.; Solomon, A.N.; Miller, H.M. 2012. National Wildlife Refuge System visitor survey 2010/2011: individual refuge results for Quivira National Wildlife Refuge. Fort Collins, CO: U.S. Geological Survey. 25 p. plus appendixes.
- Sheridan, R. 1956. Economic development in south central Kansas. Lawrence, KS: University of Kansas, School of Business. In: Ungar, I.A. 1961. An ecological study of the vegetation of the Big Salt Marsh, Stafford County, Kansas [Ph.D. dissertation]. Lawrence, KS: University of Kansas. 212 p.
- Short, H.L. 1989. A wildlife habitat model for predicting effects of human activities on nesting birds. In: Sharitz, R.R.; Gibbons, J.W.; editors. *Freshwater wetlands and wildlife*. CONF–8603101, Symposium Series No. 61 (NTIS No. DE90–005–384). Oak Ridge, TN: U.S. Department of Energy. 957–973.
- Skagen, S.K.; Knopf, F.L. 1993. Towards conservation of midcontinental shorebird migrations. *Conservation Biology* 7(3):533–541.
- . 1994. Migrating shorebirds and habitat dynamics at a prairie wetland complex. *Wilson Bulletin* 106(1):91–105.
- Skinner, R.M. 1975. Grassland use patterns and prairie bird populations in Missouri. In: Wali, M.K.; editor. *Prairie: a multiple view*. Grand Forks, ND: University of North Dakota Press. 171–180.
- Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. 2010. Soil survey geographic (SSURGO) database for Stafford, Reno, and Rice Counties, Kansas. [Internet]. Revised April 12, 2011. <<http://soildatamart.nrcs.usda.gov>> accessed March 1, 2010.
- Sophocleous, M. 2012. The evolution of groundwater management paradigms in Kansas and possible new steps towards water sustainability. *Journal of Hydrology* 414–415:550–559.
- Sophocleous, M.A. 1997. Water budget and stream routing study for the Quivira National Wildlife Refuge. Report to U.S. Fish and Wildlife Service. [Place of publication unknown]: Kansas Geological Survey. [Pages unknown].
- . 2000. Quantification and regionalization of groundwater recharge in south-central Kansas: integrating field characterization, statistical analysis, and GIS. *The Compass*, University of Kansas, Special Issue 75(2–3):101–115.
- . 2003. Groundwater recharge and water budgets of the Kansas high plains and related aquifers. Geological Survey, Kansas Water Resources Institute Report No. KWRI02–02. Lawrence, KS: University of Kansas. Kansas 166 p.
- Sophocleous, M.; McAllister, J.A. 1987. Basinwide water-balance modeling with emphasis on spatial distribution of ground water recharge. *Water Resources Bulletin* 23(6):997–1010.
- Sophocleous, M.A.; Ma, T.S. 1998. A decision support model to assess saltwater vulnerability in the Great Bend prairie aquifer of Kansas. *Ground Water* 36(3):476–483.
- Sophocleous, M.A.; Perkins, S.P. 1992. Stream-aquifer and mineral intrusion modeling of the lower Rattlesnake Creek with emphasis on the Quivira National Wildlife Refuge, Kansas. Final report. Kansas Geological Survey, Open-File Report 92–6, 204 p.
- Sophocleous, M.A.; Koelliker, J.K.; Govindaraju, R.S.; Birdie, T.; Ramireddygar, S.R.; Perkins, S.P. 1997. A computer model for water management in the Rattlesnake Creek Basin, Kansas. Final report to Division of Water Resources, Kansas Department of Agriculture. +225 p.
- Staudinger, M.D.; Grimm, N.B.; Amanda Staudt, A.; Carter, S.L.; Chapin, F.S., III; Kareiva, P.; Ruckelshaus, M.; Stein, B.A. 2012. Impacts of climate change on biodiversity, ecosystems, and ecosystem services: technical input to the 2013 national climate assessment. Cooperative report to the 2013 national climate assessment. [Internet]. <<http://assessment.globalchange.gov>> [accessed date unknown]. 296 p.

- Steele, F.A. 1953. History of Stafford County. [Place of publication: publisher unknown]. [Pages unknown].
- Stynes, D. 1998. Guidelines for measuring visitor spending. [Place of publication unknown]: Michigan State University, Department of Parks, Recreation and Tourism Resources. [Pages unknown].
- Striffler, P.S. 2011. Quivira National Wildlife Refuge water resource inventory and assessment [unpublished draft report]. On file at U.S. Fish and Wildlife Service, Division of Water Resources, Lakewood, CO. [Pages unknown].
- Thompson, R.A. 1871. Original survey data located at the state auditor's office, Topeka, KS. In: Ungar, I.A. 1961. An ecological study of the vegetation of the Big Salt Marsh, Stafford County, Kansas [Ph.D. dissertation]. Lawrence, KS: University of Kansas. 212 p.
- Towne, E.G.; Hartnett, D.C.; Cochran, R.C. 2005. Vegetation trends in tallgrass prairie from bison and cattle grazing. *Ecological Applications* 15(5):1550–1559.
- Townsend, M.A.; Young, D.P. 1995. Factors affecting nitrate concentrations in ground water in Stafford County, Kansas. Kansas Geological Survey, Current Research in Earth Sciences, Bulletin 238, part 1. [Internet]. [Revised date unknown]. <<http://www.kgs.ku.edu/Current/1995/Townsend/index.html>> [accessed date unknown].
- Ungar, I.A. 1961. An ecological study of the vegetation of the Big Salt Marsh, Stafford County, Kansas [Ph.D. dissertation]. Lawrence, KS: University of Kansas. 212 p.
- . 1964. A phytosociological analysis of the Big Salt Marsh, Stafford County, Kansas. *Transactions of the Kansas Academy of Science* 67(1):50–64.
- . 1965. An ecological study of the vegetation of the Big Salt Marsh, Stafford County, Kansas. *University of Kansas Science Bulletin* 46: 1–98.
- U. S. Census Bureau. 2010a. American fact finder: selected economic characteristics. [Internet]. [Revised date unknown]. <<http://factfinder2.census.gov/faces/nav/jsf/pages/searchresults.xhtml?ref=top&refresh=t>> [accessed date unknown].
- . 2012b. State & County QuickFacts. [Internet]. [Revised date unknown]. <<http://quickfacts.census.gov/qfd/index.html>> accessed December 1, 2012.
- U.S. Department of Agriculture. 2007. State and county profiles: Kansas. Washington, D.C.: National Agriculture Statistics Service. [Internet]. [Revised date unknown]. <http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/Kansas/index.asp> accessed December 21, 2012.
- U.S. Fish and Wildlife Service; Canadian Wildlife Service. 1986. North American waterfowl management plan—a strategy for cooperation. Washington, DC: U.S. Department of the Interior; Gatineau, QC Canada: Environment Canada. 26 p.
- (USGS) U.S. Geological Survey. 2006. Strategic habitat conservation. [Internet]. [Revised date unknown]. <http://training.fws.gov/CSP/Resources/SHC/shc_finalrpt.pdf> [accessed date unknown].
- . 2012a. National Wildlife Refuge visitor survey results: 2010/2011: U.S. Geological Data Series 685. [Internet]. [Revised date unknown]. <<http://pubs.usgs.gov/ds/685/>> [accessed date unknown].
- . 2012b. Rattlesnake Creek subbasin, hydrologic unit code 11030009. [Internet]. Revised February 1, 2012. <<http://water.usgs.gov/lookup/getwatershed?11030009>> [accessed date unknown].
- . 2012c. Regional economic impacts of current and proposed management alternatives for Quivira National Wildlife Refuge. [Place of publication unknown]: United States Geological Survey. 17 p.
- . 2012d. Zenith gage station water data. [Internet]. [Revised date unknown]. <http://waterdata.usgs.gov/nwis/nwisman/?site_no=07142575&agency_cd=USGS> accessed December 20, 2012.
- The University of Kansas Institute for Policy and Social Research. 2012. Population projections for Kansas, by county 2010–2040, selected years. [Internet]. <<http://www.ipsr.ku.edu/ksdata/ksah/population/2pop17.pdf>> accessed December 21, 2012.
- VerCauteren, T.; Gillihan, S.W. 2004. Integrating bird conservation into range management. [City of publication unknown], CO: Rocky Mountain Bird Observatory. [Pages unknown].
- Walters, C.J.; Holling, C.S. 1990. Large-scale management experiments and learning by doing. *Ecology* 71(6):2060–68.
- Wasson, T., Yasui, L.; Brunson, K.; Amend, S.; Ebert, V. 2005. A future for Kansas wildlife, Kansas' comprehensive wildlife conservation strategy. [Place of publication unknown]: Dynamic Solutions, Inc., in cooperation with Kansas Department of Wildlife, Parks and Tourism. 170 p.
- Wedel, W.R. 1942. Prehistory and environment in the central Great Plains. *Transactions of the Kansas Academy of Science* 50(1):1–18.
- Weller, M.W.; Spatcher, C.S. 1965. Role of habitat in the distribution and abundance of marsh birds. Agriculture and Home Economics Experiment Station Special Report 43. Ames, IA: Iowa State

- University of Science and Technology. [Pages unknown].
- West, R.R.; Miller, K.B.; Watney, W.L. 2010. The Permian system in Kansas. Kansas Geological Survey Bulletin 257. [Internet]. [Revised date unknown]. <<http://www.kgs.ku.edu/Publications/Bulletins/257/index.html>> [accessed date unknown].
- Whited, D.; Galatowitsch; Tester, J.R.; Schik, K.; Lehtinen, R.; Husveth, J. 2000. The importance of local and regional factors in predicting effective conservation planning strategies for wetland bird communities in agricultural and urban landscapes. *Landscape and Urban Planning* 49:49–65.
- Wichita State University. 2011. Kansas county population forecast; summary and methodology. [Internet]. [Revised date unknown]. <<http://www.cedbr.org/content/2012/kspopulationforecast.pdf>> accessed December 21, 2012.
- Wiens, J.A. 1973. Patterns and process in grassland bird communities. *Ecological Monographs* 43:237–270.
- Wiens, J.A.; Bachelet, D. 2010. Matching the multiple scales of conservation with the multiple scales of climate change. *Conservation Biology* 24(1):51–62.
- Wilcox, I.B. 1870. Original survey data location at the state auditor's office, Topeka, KS. . In: Ungar, I.A. 1961. An ecological study of the vegetation of the Big Salt Marsh, Stafford County, Kansas [Ph.D. dissertation]. Lawrence, KS: University of Kansas. 212 p.
- Winter, M.; Johnson, D.H.; Faaborg, J. 2000. Evidence for edge effects on multiple levels in tall-grass prairie. *Condor* 102(2):256–266.
- Winter, M.; Johnson, D.H.; Shaffer, J.A. 2006a. Does body size affect a bird's sensitivity to patch size and landscape structure? *Condor* 108:808–816.
- Winter, M.; Johnson, D.H.; Shaffer, J.A.; Donovan, T.M.; Svedarsky, W.D. 2006b. Patch size and landscape effects on density and nesting success of grassland birds. *Journal of Wildlife Management* 70(1):158–172.
- With, K.A.; King, A.W.; Jensen, W.E. 2008. Remaining large grasslands may not be sufficient to prevent grassland bird declines. *Biological Conservation* 141:3152–3167.
- Zedler, J.B.; Kercher, S. 2005. Wetland resources: status, trends, ecosystem services, and restorability. *Annual Review of Environmental Resources* 30:39–74.
- Zeller, D.E., editor. 1968. The stratigraphic succession in Kansas. Kansas Geological Survey Bulletin 189. [Revised date unknown]. <<http://www.kgs.ku.edu/Publications/Bulletins/189/index.html>> accessed June 20, 2012.

