IN THE UNITED STATES DISTRICT COURT
DISTRICT OF KANSAS

AUDUBON OF KANSAS, INC. Plaintiff, vs. UNITED STATES DEPARTMENT OF THE INTERIOR; DAVID BERNHARDT, Secretary of United States Department of the Interior; UNITED STATES FISH AND WILDLIFE SERVICE; AURELIA SKIPWITH, Director of United States Fish and Wildlife Service; MICHAEL BEAM, Secretary of the Kansas Department of Agriculture, and EARL B. LEWIS, Chief Engineer of the Kansas Department of Agriculture, Division of Water Resources. Defendants.	)	Case No.: **COMPLAINT FOR DECLARATORY AND INJUNCTIVE RELIEF AND REQUEST FOR MANDAMUS**

INTRODUCTION

Audubon of Kansas brings this action on behalf of its membership against the U.S. Department of Interior, David Bernhardt in his official capacity as the Secretary of Interior, and other government entities and their agents—both federal and state—for violations of their statutory duties to protect the senior water right held by the U.S. Fish and Wildlife Service ("Service") and relied upon by the Quivira National Wildlife Refuge ("Refuge").

The Refuge lies in the transition zone where the arid eastern and western prairies meet. As a wetland of international importance, the Refuge provides sanctuary to a wide variety of waterfowl, shorebirds, and other wetland species, several of which are listed as threatened or

endangered pursuant to the federal Endangered Species Act. Since its establishment in 1955, the Refuge has grown to encompass 22,135 acres of land and wetlands—all dedicated to the purposes of conservation and protection of the numerous species of fish, plants, and wildlife inhabiting the area, especially the migratory waterfowl that rely on the Refuge's location upon the Central Flyway. The Service has clear duties under federal law to protect the Refuge. To that end, the Service obtained a Kansas water right for the Refuge ("Refuge Water Right"), which holds a 1957 priority.

However, decades of excessive groundwater pumping by neighboring irrigators holding junior water rights have damaged and desiccated the Refuge, seriously harming its hydrological integrity and threatening its survival as a functioning groundwater-dependent ecosystem. Since the 1980s, the Service has known about these harms and threats. It first participated in halting efforts to address them through voluntary negotiations and agreements with local irrigation interests, but has consistently neglected its clear statutory duty to protect the Refuge and the Refuge Water Right. After three decades of such negotiated inaction, the Service at last acted to protect the Refuge Water Right when, in April of 2013, it filed an impairment complaint with the Kansas Department of Agriculture—Division of Water Resources ("KDA-DWR").

Acting pursuant to his non-discretionary duties, the chief engineer for KDA-DWR, David W. Barfield, P.E., and his staff timely conducted a thorough impairment investigation. On July 15, 2016, chief engineer Barfield published the FINAL REPORT OF THE CHIEF ENGINEER CONCERNING A CLAIM OF WATER RIGHT IMPAIRMENT IN THE MATTER OF WATER RIGHT FILE NO. 7,571 OWNED AND OPERATED BY U.S. FISH AND WILDLIFE SERVICE ("Impairment Report"), attached as Exhibit 1 to this Complaint. The Impairment Report made five principal findings: (1) the Refuge Water Right was indeed chronically and substantially impaired; (2) upstream and up-

gradient groundwater pumping by junior water right holders was the principal cause of that impairment; (3) as a consequence of such impairment, the Refuge had suffered from reduced water supplies for the last 34 years; (4) the Refuge and the Refuge Water Right would continue to suffer from shortages without the administration of junior water rights; and (5) because Kansas water law follows the prior appropriation doctrine, the Service was entitled to obtain the administration of all junior water rights which KDA-DWR had determined were impairing the Refuge Water Right.

How did the Service respond to this undisputed and unchallenged finding that the Refuge Water Right, and therefore the Refuge itself, was suffering from profound harm and neglect, in violation of federal law? In two dramatically different ways. At first, its professional field staff in Kansas filed requests to secure water to satisfy the Refuge Water Right—action consistent with Service custom and with the Service's 2013 decision to request an impairment investigation. Yet under the leadership of Secretary Bernhardt and Director Skipwith, the Service then began to openly defy its clear statutory duty to protect the Refuge and the Refuge Water Right.

At the highest echelon of KDA-DWR, the Service found a willing accomplice to defy federal law. Between 2016 and 2018, Dr. Jackie McClaskey, Ph.D., secretary of KDA, issued repeated written statements that KDA-DWR would not protect the Refuge Water Right. She would not allow the administration, or curtailment, of the junior water rights that were impairing the Refuge Water Right. Dr. McClaskey issued these defiant statements despite Service requests to protect the Refuge Water Right, despite the Impairment Report's clear finding that the Refuge Water Right was seriously impaired, and despite the fact that she lacked any statutory authority over the administration of Kansas water rights. Mr. Barfield, who as chief engineer held the

office that does hold exclusive jurisdiction over the administration of all Kansas water rights, submitted to Dr. McClaskey's decision not to protect the Refuge Water Right. He submitted to Dr. McClaskey's *ultra vires* directives and her forceful appeasement of politically powerful irrigation interests. Unfortunately, he thereby violated the laws he was entrusted with enforcing.

By late 2019 however, after the departure of Dr. McClaskey, KDA-DWR was at last prepared to protect the Refuge. The agency designed and distributed a comprehensive plan to administer all of the junior rights whose pumping was impairing the Refuge Water Right, according to the findings of the Impairment Report. Recognizing that KDA-DWR was finally going to fulfill its non-discretionary duties, junior irrigators and Big Bend Groundwater Management District No. 5 ("GMD5") contacted various politicians, most prominently members of Kansas's congressional delegation, Senator Jerry Moran and Congressman (now Senator) Roger Marshall. Together, they negotiated with secretary of agriculture Mike Beam (Dr. McClaskey's successor), the Service, and GMD5. These negotiations yielded a void and illegal bargain between the Service and GMD5, in which the Service agreed to withdraw its request to secure water. The Refuge Water Right would thus remain unprotected—in open and knowing violation of federal law.

As a consequence of this deliberate dereliction of duty by federal and state officials, the Refuge has been starved of groundwater and surface water supplies—even when Kansas was suffering from an official drought emergency in 2018. The defendants have blatantly violated numerous procedural, substantive, and—most importantly—*non-discretionary* statutory duties that command the protection of the Refuge and the Refuge Water Right. In willfully failing to secure and to protect the Refuge Water Right, the defendants have demonstrated deliberate intent to ignore the statutes that protect the Refuge. Because they cannot be expected to protect the

Refuge and the threatened and endangered species that depend upon it, it now falls upon this Court to ensure that the Refuge has sufficient water supplies. This Court must therefore make these legal protections clear by declaration, enjoin the defendants from further violating federal law according to these declarations, and order the defendants to protect the Refuge and the Refuge Water Right according to the law's clear mandates.

JURISDICTION AND VENUE

1. This Court has jurisdiction over this action pursuant to 28 U.S.C. § 1331 (federal question), 28 U.S.C.A. § 2201 (declaratory judgment), 28 U.S.C.A. § 2202 (injunctive relief), and 28 U.S.C.A. § 1361 (mandamus relief). The challenged agency inaction is subject to this Court's review under the Administrative Procedure Act ("APA"), 5 U.S.C.A. § 706.

2. Venue in this Court is proper under 28 U.S.C.A. § 1391(e), because a substantial part of the events or omissions giving rise to the claims occurred in this judicial district and a substantial part of the land at issue is within this judicial district. Plaintiff resides in and maintains its primary place of business in this judicial district.

PARTIES AND STANDING

Plaintiff

3. Plaintiff AUDUBON OF KANSAS ("AOK") is an independent grassroots nonprofit organization with approximately 5,000 members. AOK was founded in 1999 to promote the enjoyment, understanding, protection, and restoration of the state's natural ecosystems with a focus on birds, other wildlife, and their habitats. The members of AOK are being and will be adversely affected by Defendants' actions or failures to act complained of herein. AOK is a not for profit corporation authorized and existing under the laws of the state of Kansas. It was actually founded in 1976 with a name change in 1999.

4. AOK engages in conservation work to protect and advocate for birds and other wildlife throughout Kansas, Nebraska, and the central Great Plains, and both its members and Board of Trustees come from numerous states across the region. AOK owns and maintains nature sanctuaries to protect birds, habitats, and ecosystems, and organizes birding and natural history activities. Restoring and protecting the health of the Refuge is of paramount importance to migratory waterfowl along the Central Flyway. AOK staff provides education and information to its members and the public through action alerts, press releases, fact sheets, reposting of letters to lawmakers, and information distributed by Service staff relating to the Refuge.

5. AOK's primary concern in this case is the protection of the Refuge. AOK has members that regularly visit, use, or enjoy the Refuge for bird watching and other recreational, aesthetic, scientific, educational and spiritual purposes, and AOK's members will continue to do so on a regular basis indefinitely. The impairment of the Refuge Water Right poses an ongoing threat to the Refuge and the birds that depend on it, and therefore, to the interests of AOK members. Defendants' failure to comply with legal obligations under federal law ensuring the Refuge has an adequate supply of water to carry out the conservation mission of the Refuge and the National Wildlife Refuge System injures AOK's members' use and enjoyment of the Refuge.

6. Plaintiff AOK has standing to bring this action on behalf of its members. Members of Plaintiff AOK live near and enjoy the use of the Refuge affected by Defendants' actions or failure to act complained of herein, and they will continue to visit and enjoy the resources of the Refuge at regular times indefinitely. The above-described property, educational, scientific, aesthetic, conservation, and recreational interests of the Plaintiff and

its members have been and will continue to be adversely affected and irreparably injured by Defendants' failure to acquire, protect, and maintain adequate water supplies for the Refuge and to fulfill the conservation mission of the National Wildlife Refuge System.

7. The defendants have recognized the participation of AOK in the controversy surrounding the Refuge Water Right and have participated with AOK in public and private meetings and in correspondence regarding the Refuge.

Defendants

8. Defendant DAVID BERNHARDT is the Secretary of the United States Department of the Interior ("Secretary"). The Secretary is the official ultimately responsible under federal law for the management and protection of the Refuge. The Secretary is sued in his official capacity.

9. Defendant UNITED STATES DEPARTMENT OF THE INTERIOR is an agency of the United States within the meaning of the Administrative Procedure Act, 5 U.S.C.A. § 1331 *et seq*.

10. Defendant AURELIA SKIPWITH is the Director ("Director") of the Service, an agency housed within the Department of the Interior. She is legally responsible for overseeing the Service's activities, including the protection of the Refuge. The Director is sued in her official capacity.

11. Defendant UNITED STATES FISH AND WILDLIFE SERVICE is the federal agency responsible for the management, operation, and protection of the Refuge in accordance with federal law. The Service's mission is to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. Defendant United States

Fish and Wildlife Service is an agency of the United States within the meaning of the Administrative Procedure Act, 5 U.S.C.A. § 500 *et. seq*.

12. Defendant MICHAEL BEAM is the Secretary of the Kansas Department of Agriculture ("KDA"). He is legally responsible for overseeing the KDA, an agency that includes the Kansas Division of Water Resources ("KDA-DWR"). He is therefore responsible for KDA-DWR's role in failing to protect the Refuge Water Right. Secretary Beam is sued in his official capacity.

13. Defendant EARL B. LEWIS, P.E., is the chief engineer of KDA-DWR. He succeeded Mr. Barfield as chief engineer in November, 2020. Under the Kansas Water Appropriation Act ("KWAA"), K.S.A. § 82a-701 *et seq.,* the chief engineer has jurisdiction over all of the waters of Kansas and the administration of Kansas water rights, according to the doctrine of prior appropriation. Chief engineer Lewis is sued in his official capacity.

14. Defendant KANSAS DEPARTMENT OF AGRICULTURE, DIVISION OF WATER RESOURCES is an agency of the State of Kansas charged with administration of State statutes and regulations governing the waters of Kansas and the beneficial use of water made according to water rights. It is the only water rights agency in the United States that is subordinate to a department of agriculture.

STATUTORY AND LEGAL BACKGROUND

The National Wildlife Refuge System and Improvement Act of 1997

15. The Federal National Wildlife Refuge System Improvement Act of 1997 ("NWRSIA") is the organic statute and legal foundation of the nation's federal wildlife refuges. 16 U.S.C.A. § 668dd.

16. The mission of NWRSIA 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 Unites States for the benefit of present and future generations of Americans." 16 U.S.C.A. § 668dd(a)(2).

17. NWRSIA further states that "it is the policy of the United States that . . . each refuge shall be managed to fulfill the mission of the System, as well as the specific purposes for which that refuge was established." 16 U.S.C.A. § 668dd(a)(3)(A).

18. To ensure the fulfillment its mission and policies, Congress included a list of substantive management criteria within NWRSIA that establish non-discretionary duties on the part of the Secretary and officials of the Service to whom the Secretary delegates authority. 16 U.S.C.A. § 668dd(a)(4).

19. NWSRIA mandates that, "[i]n administering the System, the Secretary shall—

> (A) provide for the conservation of fish, wildlife, and plants, and their habitats within the system;
>
> (B) ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans;
>
> . . .
>
> (D) ensure that the mission of the System . . . and the purposes of each refuge are carried out, except that if a conflict exists between the purposes of a refuge and the mission of the System, the conflict shall be resolved in a manner that first protects the interests of the refuge, and, to the extent practicable, that also achieves the mission of the System;
>
> (E) ensure effective coordination, interaction, and cooperation with owners of land adjoining refuges and the fish and wildlife agency of the States in which the units of the System are located;
>
> (F) assist in the maintenance of adequate water quantity and quality to fulfill the mission of the System and the purposes of each refuge;

(G) acquire, under State law, water rights that are needed for refuge purposes;

. . .

(M) ensure timely and effective cooperation and collaboration with Federal agencies and State fish and wildlife agencies during the course of acquiring and managing refuges; and

(N) monitor the status and trends of fish, wildlife, and plants in each refuge. *Id.*

20. The Service considers "biological diversity" as "the biotic composition, structure, and functioning at the genetic, organism, and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms, and communities." 66 Fed. Reg. 3,818 (Jan. 16, 2001); U.S. FWS Division of Natural Resources, *U.S. Fish and Wildlife Manual*, 601 FW 3, § 3.6(A) (2001) (as amended July 31, 2006) ("Service Manual").

21. The Service defines "biological integrity" as "[b]iotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural processes that shape the environment." 66 Fed. Reg. 3,818 (Jan. 16, 2001); Service Manual at § 3.6(B).

22. The Service defines "environmental health" as "[c]omposition, structure, and functioning of soil, water, air, and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the environment." 66 Fed. Reg. 3,818 (Jan. 16, 2001); Service Manual at § 3.6(C).

23. The Service defines the "historic conditions" benchmark within these above definitions to mean "[c]omposition, structure, and functioning of ecosystems resulting from natural processes that [the Service] believe[s], based on sound professional judgment, were

present prior to substantial human related changes to the landscape." 66 Fed. Reg. 3,818 (Jan. 16, 2001); Service Manual at § 3.6(D).

24. In addition to the above listed statutory duties, the Secretary is required by the NWRSIA to issue a "comprehensive conservation plan ("CCP") for each refuge" every 15 years, and "shall manage each refuge . . . in a manner consistent with the plan." 16 U.S.C.A. § 668dd(e)(1).

25. A CCP for the Refuge was finalized and published in October 2013. It articulates the Service's goals for the management of the Refuge, including:

a. To "[a]ctively protect, preserve, manage, and restore the functionality of the diverse ecosystems of the Rattlesnake Creek watershed.";

b. To "[a]ctively 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."; and

c. To "effectively raise and use money to support the long-term integrity of the infrastructure, habitats, and wildlife resources at the [R]efuge . . . ."

U.S. Fish and Wildlife Service, *Comprehensive Conservation Plan: Quivira National Wildlife Refuge*, 16–17 (Oct. 2013) ("Quivira CCP", attached as Exhibit 2 to this Complaint).

26. The Quivira CCP expressly notes that "water rights have been overappropriated within the [ground]water management district," [GMD5], and that the current water resource and land use trends in the area are a cause for concern in assuring both future water availability and quality. Quivira CCP at 18.

27. It is further stated within the Quivira CCP that "adequate water quantity and chemistry are critical factors of refuge saltmarsh and wetland communities," and that "[s]ubstantial declines in the water table would also likely affect grassland and meadow habitats." *Id.* at 18–19.

28. The Quivira CCP notes the seniority of the Refuge Water Right and provides that—as part of its strategies in ensuring the refuge's water need are met in the future— the Service will "[c]ollaborate with agencies responsible for regulating water use in the Rattlesnake Creek watershed to help identify and improve water use efficiencies." *Id.*

29. Additionally, federal regulation dictates that "[n]o person shall take any animal or plant on any national wildlife refuge," which includes "[d]isturbing, injuring, spearing, poisoning, destroying, collecting or attempting to disturb, injure, spear, poison, destroy or collect any plant or animal on any national wildlife refuge." 50 C.F.R. §§ 27.21, 27.51.

The Endangered Species Act

30. Congress declared within the Endangered Species Act of 1973 ("ESA") that many species of fish, wildlife, and plants, which "are of esthetic, ecological educational, historical, recreational, and scientific value to the Nation and its people" have "been so depleted in numbers that they are in danger of or threatened with extinction," and therefore, the declared purpose of the ESA is to "provide a means whereby the ecosystems upon which endangered species and threatened species depend may be preserved." 16 U.S.C.A. § 1531.

31. The term "endangered species" is defined by the ESA to mean any species which is in danger of extinction. 16 U.S.C.A. § 1532(6).

32. The term "threatened species" is defined by the ESA to mean "any species which is likely to become an endangered species within the foreseeable future." 16 U.S.C.A. § 1532(20).

33. With respect to any endangered species, the ESA declares it unlawful to "take any such species within the United States or the territorial sea of the United States." 16 U.S.C.A. § 1538(a)(1)(B).

34. The term "take" under the ESA is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." 16 U.S.C.A. § 1532(19).

35. The term "harass" is further defined by the regulations to mean "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." 50 C.F.R. § 17.3(c).

36. The term "harm" is defined by the regulations to mean "an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering." *Id.*

37. The meaning of the statutory and regulatory definitions of "harass" and "harm" include any intentional or negligent act or omission which modifies wildlife habitat in such a way as to create the likelihood of injury to wildlife. *Babbitt v. Sweet Home Chapter of Communities for a Great Oregon,* 515 U.S. 687, 704 (1995).

38. The ESA mandates that all Federal agencies must make sure "that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species . . . ." 16 U.S.C.A. § 1536(a)(2).

39. The ESA expressly allows for citizen suits, stating that "any person may commence a civil suit on his own behalf—"

> (A) to enjoin any person, including the United States and any other governmental instrumentality or agency (to the extent permitted by the eleventh amendment to the Constitution), who is alleged to be in violation of any provision of this chapter or regulation issued under the authority thereof; or

> (B) to compel the Secretary to apply . . . the prohibitions set forth in or authorized pursuant to section 1533(d) or 1538(a)(1)(B) of [the ESA] with respect to the taking of any resident endangered species or threatened species within any State; or
>
> (C) against the Secretary where there is alleged a failure of the Secretary to perform any act or duty under section 1533 of [the ESA] which is not discretionary with the Secretary.

16 U.S.C.A. § 1540(g).

40. The ESA citizen suit provision states that "[t]he district courts shall have jurisdiction, without regard to the amount in controversy or the citizenship of the parties, to enforce any such provision or regulation, or to order the Secretary to perform such act or duty, as the case may be. In any suit commenced under subparagraph (B) the district court shall compel the Secretary to apply the prohibition sought if the court finds that the allegation that an emergency exists is supported by substantial evidence." *Id.*

National Environmental Policy Act

41. Under the National Environmental Policy Act (NEPA), Congress declared it to be "the continuing policy of the Federal Government, in cooperation with State and local governments, and other concerned public and private organizations, to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans." 42 U.S.C.A. § 4331(a).

42. To carry out this policy, Congress established that "it is the continuing responsibility of the Federal Government to use all practical means, consistent with other

essential considerations of national policy, to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may—"

1. fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
2. assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;
3. attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;
4. preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice; [and]
5. achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities.

Id. at § 4331(b).

43. Pursuant to NEPA, whenever taking a major Federal action significantly affecting the quality of the human environment, all Federal agencies must create a detailed statement that states:

(i) the environmental impact of the proposed action;

(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented;

(iii) alternatives to the proposed action;

(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and

(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

42 U.S.C.A. § 4332(C).

44. Additionally, such agencies must "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources" under NEPA. *Id.* at § 4332(E).

45. These procedural requirements are in place to ensure that each agency decision maker considers all possible approaches to a particular project that could alter the environmental impact and cost-benefit balance, and this is to ensure that the most intelligent, optimally beneficial decisions will be made. *See Concerned about Trident v. Schlesinger*, 400 F.Supp. 454, 489 (D.D.C. 1975).

46. Furthermore, compelling a formal detailed statement and a description of alternatives provides evidence that the mandated decision-making process has in fact taken place and, most importantly, allows those removed from the initial process to evaluate and balance the factors on their own. *See Schlesinger*, 400 F.Supp. at 489.

47. Even where an agency has decided that a NEPA statement is not yet necessary, it should state the reasons for its decision. *See Scientists' Institute for Public Information v. Atomic Energy Commission*, 481 F.2d 1079, 1094 (D.C. Cir. 1973).

48. Essentially, NEPA requires all agencies to give environmental issues a "hard look" before making decisions. *See Schlesinger*, 400 F.Supp. at 489.

Administrative Procedure Act

49. Under the APA, "[a] person suffering legal wrong because of agency action, or adversely affected or aggrieved by agency action within the meaning of a relevant statute, is entitled to judicial review thereof." 5 U.S.C.A. § 702.

50. Judicial review is available under the APA where such review is either expressly granted by statute or where an agency action constitutes a "final agency action for which there is no other adequate remedy." 5 U.S.C.A. § 704.

51. "Agency action" under the APA includes an agency's failure to act. 5 U.S.C.A. § 551.

52. Under the APA, the reviewing court may "compel agency action unlawfully withheld or unreasonably delayed," as well as hold unlawful and set aside agency action it finds to be:

> (A) arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law;
>
> (B) contrary to constitutional right, power, privilege, or immunity;
>
> (C) in excess of statutory jurisdiction, authority, or limitations, or short of statutory right;
>
> (D) without observance of procedure required by law; [or]
>
> (E) unsupported by substantial evidence in a case subject to sections 556 and 557 of [the APA] or otherwise reviewed on the record of an agency hearing provided by statute.

5 U.S.C.A. § 706.

Federal Reserved Water Rights Doctrine

53. The Supreme Court of the United States has recognized the federal reserved water rights doctrine since 1908, in *Winters v. United States,* 207 U.S. 564 (1908). The doctrine acknowledges the implied federal rights of the United States when it dedicates public land for a federal purpose: in such a case, "the Government, by implication, reserves appurtenant water then unappropriated to the extent needed to accomplish the purpose of the reservation. In so doing the United States acquires a reserved right in unappropriated water which vests on the date

of the reservation and is superior to the rights of future appropriators." *Cappaert v. United States*, 426 U.S. 128, 142–43 (1976).

54. In making the determination over whether there exists a federal reserved water right appurtenant to federal land, courts will infer the intent to reserve water rights if they are necessary to accomplish the purposes for which the reservation was created. *Id.*

The Kansas Water Appropriation Act

55. By enacting the 1945 Kansas Water Appropriation Act (KWAA), K.S.A. § 82a-701 *et seq.*, Kansas conferred exclusive jurisdiction over all of the water resources of the state, both surface and groundwater resources, upon the chief engineer of KDA-DWR. K.S.A. §§ 82a-702, 82a-706, 82a-707(a).

56. The KWAA codified the prior appropriation doctrine for all of the waters of Kansas. The KWAA charges the chief engineer and no one else with the nondiscretionary duty to "enforce and administer the laws of [Kansas] pertaining to beneficial use of water and shall control, conserve, regulate, allot and aid in the distribution of the water resources of the state for the benefits and beneficial uses of all [Kansas] inhabitants in accordance with the rights of priority of appropriation." K.S.A. § 82a-706.

57. A "water right" under the KWAA is defined as "any vested right or appropriation right under which a person may lawfully divert water," and furthermore, that "[i]t is a real property right appurtenant to and severable from the land on or in connection with which the water is used." K.S.A. § 82a-701(g).

58. Under Kansas's codified prior appropriation doctrine, "the date of priority of every water right of every kind, and not the purpose of use, determines the right to divert and use water at any time when the supply is not sufficient to satisfy all water rights." K.S.A. § 82a-

707(b). Between holders with appropriation rights, "the first in time is the first in right." K.S.A. § 82a-707(c).

59. The KWAA charges the chief engineer or his authorized agents, and no one else, with the specific and non-discretionary duty to administer water rights according to priority:

> "(a) It shall be unlawful for any person to prevent . . . any waters of this state from moving to a person having a prior right to use the same . . . . Upon making a determination of an unlawful diversion, the chief engineer or the chief engineer's authorized agents, shall, as may be necessary to secure water to the person having the prior right to its use . . . :
>
> (1) Direct that the headgates, valves, or other controlling works of any ditch, canal, conduit, pipe, well or structure be opened, closed, adjusted or regulated . . . ."

K.S.A. § 82a-706b(a). The statutory language of this section is clear. It is unlawful to interfere with the beneficial use of water made pursuant to prior rights by preventing such water from reaching the prior right's point of diversion. Upon determining that such interference has occurred—in this case by determining that the Refuge Water Right, a prior right, has been impaired—the chief engineer "shall" shut down junior rights to remedy that impairment. *Id.* As set forth in detail in the Impairment Report, the pumping of junior groundwater rights in the hydrological vicinity of the Refuge Water Right has, for over three decades, prevented surface and groundwater—the waters of this state—from moving to the senior Refuge Water Right's point of diversion in quantities necessary to satisfy its authorized annual quantities.

60. Where KDA-DWR has found senior water rights to be impaired by the pumping of junior water rights, both temporary and permanent injunctive relief, in the form of shutting down all wells impairing the senior right, is appropriate. K.S.A. §§ 82a-716, -717a; *Garetson Brothers. v. American Warrior, Inc.*, 51 Kan.App.2d 370, 347 P.3d 687 (2015); *Garetson Brothers v. American Warrior, Inc.*, 56 Kan.App.2d 623, 435 P.3d 1153 (2019). To "impair" means to diminish, weaken, or injure the prior right. *Garetson,* 51 Kan.App.2d at 389. The

impairment of a senior water right, year after year, constitutes irreparable harm under Kansas law. *Id*. at 379.

61. Rattlesnake Creek, the source of supply for the Refuge Water Right, is entitled to minimum desirable streamflows, subject to subsequent assessment of the "lagged effects of extensive groundwater appropriations in [the] regional aquifer." K.S.A. § 82a-703c(b).

62. The KWAA requires the chief engineer to adopt and to enforce regulations necessary for the purposes of the KWAA. K.S.A. § 82a-706a.

63. Section 706b of the KWAA was amended in 2015 to allow the chief engineer to, "within the rattlesnake creek subbasin located in hydrologic unit code 11030009, allow augmentation for the replacement in time, location and quantity of the unlawful diversion, if such replacement is available and offered voluntarily." K.S.A. § 82a-706b(a)(2).

64. The chief engineer has never adopted regulations defining or explaining what "augmentation" in particular and K.S.A. § 82a-706b(a)(2) in general mean.

65. Whenever any court has declared or adjudicated water rights, the chief engineer shall enforce the court's decree. K.S.A. § 82a-719.

66. Any person who violates the KWAA may incur a civil penalty. K.S.A. § 82a-737(b)(3).

67. While the secretary of agriculture may review certain orders of the chief engineer pursuant to the Kansas Administrative Procedure Act, the chief engineer's decisions in administering junior water rights to remedy the impairment of senior water rights are not subject to review by the secretary. K.S.A. § 82a-1901(c). They never have been.

Kansas Groundwater Management District Act

68. Under the Kansas Groundwater Management District Act ("GMDA"), local groundwater management districts ("GMDs") enjoy substantial powers, including the power to recommend rules and regulations to the chief engineer; but such rules and regulations have no effect unless the chief engineer adopts them pursuant to the KWAA. K.S.A. § 82a-1028(o).

69. Under the GMDA, GMD's may take the initiative to reduce groundwater pumping by recommending to the chief engineer the start of proceedings for the designation of an intensive groundwater use control area ("IGUCA") within the district, K.S.A. § 82a-1028(u), but GMD5 has made no such recommendation.

70. Under the GMDA, the chief engineer may, on his own initiative, begin proceedings for the designation of an IGUCA, K.S.A. § 82a-1036, but the chief engineer has not done so for the area surrounding the Refuge.

71. Under the GMDA, GMDs may also take the initiative to reduce groundwater pumping by recommending to the chief engineer the start of proceedings for the designation of a local enhanced management area ("LEMA") within the GMD, K.S.A. § 82a-1041(a), but the chief engineer has yet to accept a LEMA management plan for the Refuge.

72. Regardless of what GMD5 has done or not done, nothing in the GMDA limits or affects "any duty or power" of the chief engineer granted pursuant to the KWAA. K.S.A. § 82a-1039.

THE QUIVIRA NATIONAL WILDLIFE REFUGE

Historical Background

73. The Migratory Bird Conservation Commission approved the establishment of the "Great Salt Marsh National Wildlife Refuge" in May, 1955. In 1958, the name of the refuge was changed to the Quivira National Wildlife Refuge.

74. The Refuge was established pursuant to the following authorities and for the following purposes: (a) the Migratory Bird Conservation Act, 16 U.S.C. § 715d, for use "as an inviolate sanctuary" for migratory birds; and (b) the Fish and Wildlife Act of 1956, 16 U.S.C. § 742f, for "the development, advancement, management, conservation, and protection of fish and wildlife resources". Quivira CCP at 14.

75. The Refuge, located west of the 98th Meridian, contains approximately 22,135 acres in Stafford, Reno and Rice Counties, approximately 7,000 acres of which are groundwater-dependent wetland ecosystems. Quivira CCP at 14.

76. By 1969, the Service had acquired 21,820 acres for the Refuge by purchase from willing sellers. Subsequent acquisitions and purchases enlarged the Refuge to its present size of 22,135 acres. The Service paid $2,059,238 for these lands. Quivira CCP at 14.

The Wildlife and Ecology of the Refuge

77. The Refuge attracts and protects hundreds of thousands of ducks and geese of thirty different species, shorebirds, wading birds (including tens of thousands of Sandhill Cranes and one of the only surviving flocks of Whooping Cranes) and water birds annually.

78. The Refuge's location in the middle of the Central Flyway of the United States places it in the primary pathway for many species of migrating birds; over 340 species of birds have been recorded at the Refuge.

79. The habitat of the Refuge is a unique combination of rare inland salt marsh and sand prairie. It is an extremely rare, isolated, and valuable groundwater-dependent ecosystem.

80. The Refuge is one of only thirty Wetlands of International Importance as defined by the Ramsar Convention for the Conservation and Sustainable Use of Wetlands, an international treaty signed in 1971, to which the United States is a signatory party.

81. In 1994, the Refuge was also designated as part of the Western Hemisphere Shorebird Reserve Network. The designation is based upon the Refuge's supporting more than 500,000 shorebirds annually during their vast, nearly pole-to-pole migrations.

82. In 2001, the American Bird Conservancy designated the Refuge as a Globally Important Bird Area.

83. The Whooping Crane (*Grus americana*) is listed as an endangered species under the ESA. 16 U.S.C.A. § 1533; 32 Fed. Reg. 4001. The tallest North American bird and one of the rarest, Whooping Cranes once numbered as few as sixteen. Whooping Cranes depend upon the Refuge during their annual migrations along the Central Flyway. They stay regularly at the Refuge during their Spring (March-April) and Fall (October-November) migrations.

84. Whooping Cranes depend upon the saline-freshwater mix of the Refuge's wetlands, the shallow depths of the wetlands, and the Refuge's littoral, marsh, and riparian areas for feeding and roosting.

85. The Refuge provides habitat for the Interior Least Tern (*Sternula antillarum*), which is listed as an endangered species under the ESA. 50 Fed. Reg. 21784.

86. The Refuge hosts a nesting population of Interior Least Terns in both the Big and Little Salt Marsh areas of the Refuge. Interior Least Terns rely upon the Refuge's habitat during the spring, summer, and early fall (March-September).

87. The Refuge provides habitat for the Snowy Plover (*Charadrius nivosus*), which is listed as a threatened species under the ESA. 56 Fed. Reg. 58804.

88. A population of Snowy Plovers regularly nests on sand flats within the Refuge, primarily in the Big Salt Marsh area. Snowy Plovers rely upon the Refuge's habitat from spring through early fall (March-September).

89. The Piping Plover (*Charadrius melodus*), a small shorebird similar to the Snowy Plover, occurs at the Refuge during migration. It is recognized as a "species of concern." Species of concern are those species of plants and animals that, while not falling under the definition of special status species, are of management interest by virtue of being Federal trust species such as migratory birds, important game species, significant keystone species, species that have documented or apparent populations declines, small or restricted populations, or dependence on restricted or vulnerable habitats. *See* Quivira CCP at 117.

90. Many other recognized "species of concern" depend upon the Refuge. Species with that status that reside at the Refuge include but are not limited to: Black Rail (*Laterallus jamaicensis),* Black Tern (*Chlidonius niger*), Eastern Hognose Snake, Western Hognose Snake, Ferruginous Hawk (*Buteo regalis),* Golden Eagle (*Aquila chrysaetos),* Long-billed Curlew (*Numenius americanus),* Short-eared Owl (*Asio flammeus*), and Southern Bog Lemming.

91. Hundreds of thousands of migratory shorebirds of at least thirty different species rely upon the Refuge and its water-dependent habitat to feed on shorelines, mud flats, and in shallow water. These shorebirds include but are not limited to: plovers, sandpipers, phalaropes, yellowlegs, and snipe.

92. The Refuge attracts migrating shorebirds during the spring and fall migrations. Beginning as early as February of each year, Greater and Lesser Yellowlegs, along with other

species of sandpipers, begin to appear at the Refuge during their northward migration. The number of varied species and birds increase until reaching a peak in May, when shorebirds can be found wherever surface water is available at the Refuge. The Fall, southward migration begins in early July, typically peaking in late August and September.

93. Shorebirds do not reside at the Refuge merely as migratory species. Several species use the Refuge as nesting habitat. These extant breeding populations survive often hundreds of miles distant from the next nearest breeding population of the same species. Nesting species include but are not limited to: Wilson's Phalarope (*Phalaropus tricolor*), Snowy Plover (*Charadrius nivosus*), American Avocet (*Recurvirostra Americana*), and Black-necked Stilt (*Himantopus mexicanus*).

94. A critical hydrological feature of the Refuge is its inland salt marsh. Inland salt marshes are rare in the United States. The Refuge's wetlands are unique in the Central Flyway due to the high concentrations of naturally-occurring salt deposits at the Refuge. These deposits are near enough to the land surface of the Refuge to affect groundwater that percolates and migrates to the Refuge's surface water supplies.

95. As a consequence of the Refuge's salt deposits, the Refuge enjoys a sufficiently high salinity to support plant species such as inland salt grass (*Distichis spicata*), alkali sacaton (*Sporobolus airoides*), and seepweed (*Suaeda caceoliformis*). These plant species form an important component of the Refuge's native ecology.

The Refuge Water Right

96. The Service holds the Refuge Water Right, File No. 7,571, pursuant to the KWAA. The Refuge Water Right is a permanent, real property right with the following attributes:

a. A priority of August 15, 1957;

b. An authorized quantity of 14,632 acre-feet of annual diversion and use;

c. A maximum diversion rate of 300 cubic feet per second ("cfs");

d. Three points of diversion from Rattlesnake Creek, a surface water tributary of the Little Arkansas River, which is a tributary of the Arkansas River;

e. Places of use consisting of wetlands, the Little Salt Marsh, and Refuge management areas, all of which are located within the confines of the Refuge; and

f. The beneficial use of recreational use. *See* Certification of Appropriation for Beneficial Use of Water, Water Right File No. 7,571 (April 9, 1996), included as Exhibit 4 to the Impairment Report, at pp. 73-74.

97. Based on Kansas law and KDA-DWR's own statements, the Service may hold an additional state law water right or water rights appurtenant to the Refuge with the following attributes:

a. A priority date or priority dates prior to August 15, 1957, including vested rights appurtenant to the Refuge that date prior to 1945; and

b. Quantities of authorized diversion and beneficial use in addition to those described in the Refuge Water Right Certificate of Appropriation. *See* Impairment Report, at 17.

98. Based on Kansas law and KDA-DWR's own statements, the Refuge Water Right is entitled to divert an annual authorized quantity of 22,200 acre-feet from Rattlesnake Creek, based on its claims to necessary water usage in 1957. *See* Impairment Report, at 17-18.

The Impairment of the Refuge Water Right, 1970s-2016

99. The Refuge is located at the lowermost extent of the Rattlesnake Creek sub-basin, just upstream of its confluence with the Arkansas River in Rice County.

100. Rattlesnake Creek can be considered primarily as the drain, or overflow spillway, from the hydrologically connected aquifer beneath it. Because of this groundwater supply, Rattlesnake Creek has, until fifty or so years ago, been a perennial stream from a point several miles upstream from St. John, Kansas, to where it turns north near the Little Salt Marsh on the Refuge. The flow of Rattlesnake Creek is very dependent upon hydrologically-connected groundwater supplies.

101. Defined as conditions before the onset of "significant, human-caused change," 16 Fed. Reg. 3,811 (Jan. 16, 2001), the "historic conditions" of the Refuge and its surrounding area were those of the native Great Bend Prairie, including abundant surface and groundwater supplies undepleted by the activities of man, sand prairie, salt marshes, and surface- and groundwater-dependent ecosystems. Quivira CCP at 13–16.

102. According to KDA-DWR's and GMD5's own estimates, flows in Rattlesnake Creek at the Macksville gage ranged between 20 and 84 cfs during the historical period between 1940 and 1980.

103. According to KDA-DWR's and GMD5's own estimates, flows in Rattlesnake Creek at the Zenith gage ranged between 24 and 172 cfs during the historical period between 1940 and 1980.

104. According to KDA-DWR's and GM5's own estimates, flows in Rattlesnake Creek diminished precipitously after 1980, and have not regained their pre-1970 average flows.

105. As early as 1986, the Service observed the harmful effects of junior, upstream and up-gradient groundwater pumping upon Rattlesnake Creek streamflow, and notified KDA-DWR of its concerns about how that pumping was interfering with the Refuge Water Right. Impairment Report at 18.

106. GMD5 created a groundwater model that estimated that by 1987, junior groundwater pumping had depleted Rattlesnake Creek streamflow by about 38,000 acre-feet, or over 12 billion gallons. *Id.* at 19. (One acre-foot is 325,851 gallons.)

107. In a letter dated May 27, 1994, then-chief engineer David Pope, P.E., acknowledged that junior groundwater pumping likely reduced the amount of water the Refuge Water Right may otherwise have been able to divert, but he nevertheless limited certification of the Refuge Water Right to no more than it had actually diverted and used. *Id.*

108. Despite the fact that the Service had originally filed for the right to divert 22,200 acre-feet of water in 1957, in 1996—through a mechanical application of the KWAA and related regulations—KDA-DWR certified a permit for the Refuge for only 14,632 acre-feet, a neat two-thirds of its original authorized quantity.

109. Even with this dramatically reduced certified quantity, the Refuge continued to be regularly prevented from exercising the Refuge Water Right in full due to the lack of administration of junior water rights within the the Rattlesnake Creek basin. *Id.* at 25–29.

110. During the period in which KDA-DWR evaluated the diversion of water from Rattlesnake Creek and the beneficial use of water on the Refuge for the purpose of perfecting the Refuge Water Right according to the KWAA, the Service and KDA-DWR were fully aware of depletions in flows of Rattlesnake Creek that were caused by the development of junior groundwater irrigation surrounding the Refuge.

111. On April 8, 2013, after attempts at seeking voluntary reductions to improve the flow of water to the Refuge, the Service filed a formal request with KDA-DWR for an impairment investigation pursuant to K.S.A. § 82a-706b and K.A.R. § 5-4-1.

112. An impairment investigation was conducted under the supervision of chief engineer Barfield, who published the Impairment Report on July 15, 2016.

113. In the Impairment Report, the chief engineer found the Refuge Water Right to be impaired. He made a specific finding that "junior groundwater pumping within the Basin is and has been significantly reducing water availability at the Refuge in the order of 30,000-60,000 acre-feet per year over the recent record (1995-2007)". Impairment Report at 2.

114. The chief engineer further found that junior groundwater pumping has been impairing the Refuge Water Right for more than three decades. "Over the last 34 years reviewed, shortages—when junior groundwater pumping prevented the Refuge from exercising its water right—were greater than 3,000 acre-feet in 18 years, particularly during periods of limited water supply." *Id.* at 3.

115. Based upon the historical simulations used in making his determination of impairment, the chief engineer further stated "while it will take years, reductions in groundwater pumping will restore streamflow at the Refuge," and furthermore, "[l]ong term reductions in upstream, junior groundwater pumping and/or the use of augmentation appear to be the only practical physical remedies of the Refuge's water right." *Id.*

Failure to Protect the Refuge Water Right and the Harm that has Ensued

116. In a letter to the Service dated the same day as the publication of the Impairment Report, July 15, 2016, chief engineer Barfield stated that he would take no action to remedy the impairment of the Refuge Water Right without the written request of the Service to secure water pursuant to K.A.R. § 5-4-1.

117. Since at least 2016, GMD5 has been preparing various iterations of a LEMA management plan pursuant to K.S.A. § 82a-1041, a voluntary water-management option that

other groundwater management districts in Kansas have employed to conserve groundwater. On September 8, 2016, GMD5 submitted a draft "Request for Rattlesnake LEMA" to KDA-DWR. This draft plan contains no date certain for water use reductions within GMD5, no fixed water use reductions, and no other firm commitments. This was the first of numerous LEMA proposals that KDA-DWR would find to be unacceptable.

118. In a letter to GMD5 dated December 8, 2016, Kansas secretary of agriculture, Dr. McClaskey, stated that KDA-DWR would not administer junior water rights in the Rattlesnake Creek sub-basin during 2017—including all rights that chief engineer Barfield had found were impairing the Refuge Water Right. *See* Exhibit 3.

119. On January 17, 2017, the Service filed a request to secure water pursuant to K.A.R. § 5-4-1 to protect the Refuge Water Right from the impairment and injury caused by junior groundwater pumping which KDA-DWR had described fully in the Impairment Report. *See* Exhibit 4.

120. Despite the Service's January 17, 2017 request to secure water for the 2017 irrigation season, the chief engineer did not administer junior water rights in the Rattlesnake Creek sub-basin to protect the Refuge Water Right in 2017.

121. Instead, KDA-DWR deferred to GMD5, providing it time to recommend how to regulate the junior water rights that are impairing the Refuge Water Right—even though GMD5 has no regulatory authority over the administration of water rights.

122. On September 6, 2017, AOK wrote the chief engineer a detailed letter setting forth the applicable law concerning the impairment of the Refuge Water Right, requesting a full, substantive response to the legal issues set forth in the letter, and a plan by KDA-DWR to protect the Refuge in accordance with federal and state law. *See* Exhibit 5.

123. KDA-DWR's response on September 29, 2017 disputed none of the facts contained in AOK's September 6, 2017 letter, but addressed none of the legal issues set forth in the same. *See* Exhibit 6.

124. Chief engineer Barfield instead indicated that the matter of the impairment of the Refuge Water Right would be deferred to GMD5.

125. The Service received but did not reply to AOK's September 6, 2017 letter.

126. Between 2017 and 2019, KDA-DWR and GMD5 met multiple times and exchanged many documents and technical analyses, but GMD5 has yet to propose a LEMA to KDA-DWR pursuant to K.S.A. § 82a-1041 that the chief engineer has found to be acceptable.

127. On December 13, 2017, KDA-DWR renewed secretary McClaskey's promise of December 8, 2016 not to administer junior water rights or otherwise protect the Refuge, this time for 2018. *See* Exhibit 7.

128. On January 1, 2018, the Service filed a Request to Secure Water for the Refuge Water Right for 2018.

129. The chief engineer did not secure water for the Refuge Water Right at any time in 2018 by administering junior rights or by taking any other regulatory action, despite the findings of the Impairment Report and despite the Service's Request to Secure Water.

130. On February 15, 2018, GMD5 submitted a draft "Request for Rattlesnake LEMA" to DWR. Like its earlier proposal of September 8, 2016, it contained no date certain, no fixed reductions, and no other firm commitments.

131. On February 16, 2018, chief engineer Barfield responded to the February 15, 2018 GMD5 "Request for Rattlesnake LEMA" with a powerpoint presentation which he gave in St. John, Kansas.

132. In this presentation, chief engineer Barfield stated that DWR would not expect a LEMA from GMD5 to address the impairment of the Refuge Water Right until 2020 at the earliest.

133. In the same presentation, chief engineer Barfield also stated that DWR would be satisfied with a LEMA plan that merely reduced the rate of groundwater depletions. By doing so, chief engineer Barfield took the position that the Refuge Water Right did not deserve to be protected by restoring the hydrological conditions to those existing at the time the Refuge was established, much less the historic conditions of the Refuge area as they existed prior to the activities of man, as required by NWRSIA.

134. Mr. Barfield is a licensed professional engineer who has been admitted as an expert by the Supreme Court of the United States in original actions. Throughout his long career at KDA-DWR, Mr. Barfield distinguished himself through his successful efforts to protect surface water supplies allocated to Kansas by interstate compacts.

135. In his capacity as an expert, as the Kansas chief engineer, and as the Kansas commissioner for the Arkansas River and Republican River Compact Administrations, he repeatedly provided expert reports and testimony before the Court regarding the impacts of excessive groundwater pumping upon streamflows.

136. In these capacities, Mr. Barfield testified before the Court that for stream systems to recover from excessive groundwater pumping, merely reducing the rate of groundwater depletions is insufficient; rather, the depletions themselves must be reversed and eliminated.

137. In these capacities, Mr. Barfield has also testified before the Court in support of permanent retirements of hundreds of thousands of acres of irrigated land to reduce the excessive groundwater pumping that causes long-term stream depletions.

138. In these capacities, Mr. Barfield has also testified before the Court in support of injunctive relief forbidding groundwater pumping that violates federal law.

139. In these capacities, Mr. Barfield has repeatedly opposed so-called "augmentation" projects in Nebraska and Colorado that pump groundwater and pipe it into surface water bodies to temporarily compensate for the depleting effects of excessive groundwater pumping on stream flows. He consistently opposed such projects on the grounds that augmentation does not address the root cause of stream depletion: groundwater over-pumping.

140. On March 13, 2018, Governor Jeff Colyer, M.D., issued Executive Order 18-11, a Drought Declaration for all of Kansas. Stafford County, where most of the Refuge is located, was under a Drought Emergency according to that declaration.

141. The Service took no action to protect the Refuge Water Right in response to Governor Collyer's 2018 Drought Declaration, even though the spring migration of migratory birds which depend upon the Refuge was well underway.

142. KDA-DWR took no regulatory action regarding the Refuge in response to Governor Collyer's 2018 Drought Declaration, despite the official Drought Emergency at the Refuge.

143. On August 17, 2018, AOK again wrote the Service and KDA-DWR, complaining of the following: the lack of administration of junior groundwater rights that KDA-DWR had found to be impairing the Refuge Water Right; complaining of secretary McClaskey's and chief engineer Barfield's explicit refusal to so administer; and requesting that the Service make clear its request to secure water pursuant to K.A.R. § 5-4-1(d). In the same letter AOK attempted to file a request to secure water on the Refuge's behalf. *See* Exhibit 8.

144. On August 27, 2018, KDA-DWR responded to AOK's August 17, 2018 letter by acknowledging the Service's request to secure water for 2018, but placed responsibility for addressing the impairment of the Refuge upon GMD5, through the establishment of a LEMA. *See* Exhibit 9.

145. On December 13, 2018, the Service filed a request to secure water to protect the Refuge Water Right "from injury due to junior groundwater wells" for the 2019 irrigation season. *See* Exhibit 10.

146. Despite the Service's request, KDA-DWR did not, in 2019, administer junior groundwater rights that it had previously found were impairing the Refuge Water Right according to the Impairment Report.

147. On June 30, 2019, chief engineer Barfield rejected a LEMA proposal from GMD5, on the grounds that it was inadequate to address and remedy the impairment of the Refuge Water Right.

148. On August 16, 2019, AOK sent a third letter to KDA-DWR, complaining of continued inaction at the Refuge. *See* Exhibit 11.

149. During the late summer and fall of 2019, KDA-DWR prepared a plan to administer water rights junior to the Refuge Water Right in the Refuge Area for the years 2020 through 2022. The chief engineer sent all affected water users notice of this plan. KDA-DWR held a public meeting in St. John, Kansas on October 21, 2019, in which KDA-DWR staff planned to explain the plan.

150. During the summer and fall of 2019, Senator Roger Marshall, then serving as United States Representative for Kansas's First Congressional District, sought and obtained repeated in-person and/or telephonic meetings with secretary Beam, in which Representative

Marshall emphasized his desire that the junior water rights that were impairing the Refuge Water Right not be administered, despite the chief engineer's clear and non-discretionary duty to do so.

151. During the Fall of 2019, United States Senator Jerry Moran sought and obtained in-person and/or telephonic meetings with Director Skipwith and secretary Beam, in which Senator Moran likewise emphasized his desire that the junior water rights that were impairing the Refuge Water Right not be administered, despite the chief engineer's clear and non-discretionary duty to do so.

152. In October, 2019, Senator Moran and Director Skipwith, neither of whom has jurisdiction over the administration of water rights in Kansas, announced a bargain: The Service would withdraw its request to secure water for the Refuge Water Right, in exchange for GMD5 and KDA-DWR working together to find an adequate solution to the Refuge's water-shortage problem by 2020. *See* Exhibit 12.

153. Following discussions with then-Representative (now Senator) Marshall, Senator Moran, and Director Skipwith, secretary Beam agreed to the bargain set forth in the preceding paragraph.

154. Just prior to the meeting in St. John, Kansas on October 21, 2019, in which chief engineer Barfield and his professional staff were to explain KDA-DWR's planned administration of junior water rights, the Service informed KDA-DWR that it was apparently withdrawing its request to secure water.

155. On October 25, 2019, the Service provided written notice to KDA-DWR that it would not make a written request for water to protect the Refuge Water Right during the 2020 irrigation season, and would instead:

> "work to find local, voluntary, collaborative and non-regulatory solutions, including augmentation, to address the water needs of the

> community and the wildlife purposes of the refuge before determining if more formal measures are necessary to ensure the refuge's water rights are secured. We look forward to working with the Kansas Department of Agriculture, the Kansas congressional delegation, and all water users to develop concrete milestones and lasting solutions." *See* Exhibit 13.

156. Chief engineer Barfield did not object to or oppose the bargain set forth in the preceding paragraphs. In response to that bargain, he withdrew the KDA-DWR plan to administer junior water rights whose operation were and are continuing to impair the Refuge Water Right.

157. Between October 2019 and summer, 2020, negotiations and discussions among the Service, KDA-DWR, and GMD5 took place.

158. On July 25, 2020, the Service and GMD5 executed a Memorandum of Agreement ("2020 MOA"), attached as Exhibit 14. Its relevant provisions reflect a second bargain: in exchange for GMD5's promises to conduct certain preliminary activities related to building an augmentation wellfield and preliminary activities related to purchasing water rights to supply water for the Refuge, the Service agreed not to protect the Refuge Water Right "to address its impairment in 2020 and 2021." 2020 MOA at 4.

159. The 2020 MOA contains no dates certain by which GMD5 will complete the augmentation wellfield or obtain additional water rights for the Refuge.

160. During 2020, water-supply conditions in the Refuge area qualified as "DO (Abnormally Dry)" according the United States Geological Survey, https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?High_Plains

161. KDA-DWR did not administer any junior water rights in 2020 that, according to his own Impairment Report, are impairing the Refuge Water Right.

162. In December, 2020, Director Skipwith announced that the Service would not file a Request to Secure Water to Protect the Refuge Water Right. Instead, Director Skipwith stated that the Service would "try to find a commonsense solution that is equitable to us all . . . ." *See* Exhibit 15.

163. Absent a LEMA or an IGUCA, the prior appropriation doctrine codified in Kansas water law forecloses "equitable" solutions. In times of shortage, first in time is first in right. K.S.A. § 82a-707(c). Under the doctrine of prior appropriation, priority *is* equity.

CLAIMS FOR RELIEF

COUNT ONE

VIOLATION OF THE NATIONAL WILDLIFE REFUGE SYSTEM IMPROVEMENT ACT AND THE ADMINISTRATIVE PROCEDURE ACT

164. Plaintiff realleges and incorporates the allegations in the above paragraphs by reference.

165. By repeatedly subordinating the needs of the Refuge to the interests of GMD5 and its constituent junior groundwater rights holders, and by surrendering to the requests of Kansas politicians, the government defendants have willfully ignored and defied their statutory duties under NWRSIA.

166. The decision made by the government defendants to not protect the Refuge Water Right has harmed and will continue to harm the biological integrity, diversity, and environmental health of the Refuge and the National Wildlife Refuge System as a whole.

167. In his official capacity as Secretary of the Interior, Secretary Bernhardt has violated and continues to violate his statutory duties under NWRSIA by failing to protect the Refuge Water Right, and by failing to secure adequate water of sufficient quantity and quality for the Refuge. *See* H.R. Rep. No. 105-106, at 10 (1997) (stating: "[t]he [NWSRIA] directs the

Secretary to assist in the maintenance of adequate quantities and quality of water to fulfill the mission of the System and the needs of each refuge. In doing so, the [NWSRIA] imposes a new, more specific, obligation on the Secretary. . . . [T]he Secretary must rely on existing authority, such as the authority to: acquire water rights with appropriated funds; improve the operations of Federal agencies with respect to the identification and protection of relevant water rights; purchase water; and participate in State water rights adjudications to perfect and defend relevant water rights.")

168. In her official capacity as Director of the Service, Director Skipwith has violated and continues to violate her statutory duties under NWRSIA by failing to protect the Refuge Water Right, and by failing to secure adequate water resources of sufficient quantity and quality for the Refuge.

169. The October, 2019 bargain reached among the Service, KDA-DWR, and GMD5 as described above in paragraph 152 is *ultra vires* and void because it commits the Service to violate NWRSIA by committing it to leave the Refuge Water Right unprotected.

170. Likewise, the 2020 MOU as described above in paragraph 158 is *ultra vires* and void because it commits the Service to violate NWRSIA by committing it to leave the Refuge Water Right unprotected.

171. In his official capacity as Kansas Secretary of Agriculture, secretary Beam has violated and continues to violate NWRSIA by interfering with KDA-DWR's statutory duty to protect the Refuge Water Right according to the KWAA and the prior appropriation doctrine.

172. Plaintiff has been harmed and will continue to experience harm to its interests as a result of the government defendants' failure to protect the Refuge Water Right.

COUNT TWO

VIOLATION OF THE ENDANGERED SPECIES ACT

173. Plaintiff realleges and incorporates the allegations in the above paragraphs by reference.

174. By willfully failing to secure water to which the Refuge Water Right was entitled after KDA-DWR found that it was chronically impaired, each of the government defendants have knowingly taken, harmed, and harassed wildlife as those terms are defined under the ESA in violation of its provisions.

175. The decision not to protect the Refuge Water Right has jeopardized and continues to jeopardize the survival of various endangered and threatened species, and threatens the further adverse modification of their habitat.

176. Furthermore, the government defendants did not simply fail to "use the best scientific and commercial data available" prior to making a decision that could adversely affect endangered and threatened species, but rather chose to willfully ignore such data altogether by failing to consider the Impairment Report and its recommendations.

177. The government defendants' decision to not protect the Refuge Water Right was not based upon the best scientific data available, but was instead based upon the fear of making a decision that would be unpopular with irrigation and agribusiness interests.

178. The ESA does not permit the government defendants to consider what is politically convenient in making decisions having adverse effects upon endangered and threatened species.

179. The bargain reached among the Service, KDA-DWR, and GMD5 as described above in paragraph 152 is *ultra vires* and void because it commits the Service to violate the ESA

by committing it to leave the Refuge Water Right and the habitat which depends upon it unprotected.

180. Likewise, the 2020 MOU as described above in paragraph 158 is *ultra vires* and void because it commits the Service to violate the ESA by committing it to leave the Refuge Water Right and the habitat which depends upon it unprotected.

181. Plaintiff has been harmed and will continue to experience harm to its interests as a result of the government defendants' failure to protect the Refuge Water Right, and is additionally entitled to seek review of the government defendants' actions under the citizen suit provision of the ESA. And as set forth above in paragraphs 30–40, the Plaintiff is entitled to injunctive relief under the ESA. The willful neglect of the Refuge Water Right has created a hydrological emergency.

COUNT THREE

VIOLATION OF THE NATIONAL ENVIRONMENTAL POLICY ACT

182. Plaintiff realleges and incorporates the allegations in the above paragraphs by reference.

183. Because each refuge within the System is part of a larger interconnected whole, and harm suffered by one refuge can have a negative domino effect across the entire national Refuge System (especially in relation to migratory wildlife), the decision of the government defendants to seek voluntary augmentation in lieu of administering junior water rights that are impairing the Refuge Water Right constitutes a major Federal action significantly affecting the quality of the environment according to NEPA.

184. Before the government defendants may take any such action in the furtherance of any augmentation, they must first satisfy NEPA's requirements, including providing formal

detailed statements describing the environmental impact of the proposed actions, any adverse environmental effects that cannot be avoided should the proposal be implemented, and a description of appropriate alternatives that would show the government defendants properly weighed all relevant factors in their decision-making process, and made their decision based upon the best data available.

185. The government defendants failed to follow the procedural requirements of NEPA, as no detailed statements regarding the environmental impact of and alternatives to the suggested action have been issued.

186. The bargain reached among the Service, KDA-DWR, and GMD5 as described above in paragraph 152 is *ultra vires* and void because it commits the Service to violate NEPA by committing it to leave the Refuge Water Right unprotected absent NEPA review—a commitment that clearly constitutes major federal action affecting the environment.

187. Likewise, the 2020 MOU as described above in paragraph 158 is *ultra vires* and void because it commits the Service to violate NEPA by committing it to leave the Refuge Water Right unprotected absent NEPA review—a commitment that clearly constitutes major federal action affecting the environment.

188. Plaintiff is entitled to appropriate declaratory relief for the government defendants' procedural violations of NEPA.

COUNT FOUR

VIOLATION OF THE ADMINISTRATIVE PROCEDURE ACT

189. Plaintiff realleges and incorporates the allegations in the above paragraphs by reference.

190. The actions of the federal defendants in failing to secure the Refuge Water Right violate the APA. The APA forbids agency action that is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C.A. § 706(2)(A). It also forbids action taken "in excess of statutory jurisdiction, authority, or limitations, or short of statutory right," as well as those taken "without observance of procedure required by law." 5 U.S.C.A. § 706(2)(C), (D).

191. The federal defendants' failures to take action in defending the Refuge's senior water right constituted unlawful agency action because it violated NWRSIA, the ESA, and NEPA. The federal defendants therefore violated the APA.

192. The decision of the federal defendants to ignore their statutory duties under NWRSIA, the ESA, and NEPA and to revert instead to the impotent policy of requesting voluntary reductions in water use by junior irrigators constitutes an arbitrary and capricious action under the APA, as well as an abuse of agency discretion.

193. Furthermore, because the actions constitute a de facto revision of the 2013 CCP for the Refuge, they are also unlawful for a failure to observe the procedure required by law to revise a CCP.

194. Plaintiff has no adequate or available administrative remedy.

COUNT FIVE

CLAIM FOR ADDITIONAL WATER RIGHTS AND WATER SUPPLY

195. Plaintiff realleges and incorporates the allegations in the above paragraphs by reference.

196. NWRSIA establishes a clear duty for the Service to acquire water rights sufficient to maintain the Refuge at historic conditions. As set forth above in paragraphs 96–98, the Service

applied for and received a water right with an initial authorized annual quantity of 22,200 acre-feet in 1957.

197. Yet as set forth above in paragraph 108, KDA-DWR certified the Refuge Water Right with an authorized annual quantity substantially smaller than 22,200 acre-feet—14,632 acre-feet, which is a neat two-thirds of the Service's original determination that the Refuge would require 22,200 acre-feet annually.

198. Moreover, as set forth above in paragraphs 102-110, KDA-DWR conducted the perfection and certification of the Refuge Water Right during a period in which then-chief engineer Pope knew that junior groundwater pumping in the hydrological vicinity of the Refuge Water Right was preventing the Service from diverting 22,200 acre-feet annually—for which it had obtained KDA-DWR approval to divert as of the date of the approval of its application.

199. Had the hydrological conditions of 1955—the date of the establishment of the Refuge—remained during the period in which the Refuge Water Right was perfected and certified, the Refuge Water Right would likely have been certified in an annual authorized quantity approximating that of its original approval, 22,200 acre-feet. The Refuge Water Right is thus significantly smaller in authorized annual quantity than the Service sought to obtain in 1957.

200. The Impairment Report found that the Refuge Water Right, even in its dramatically diminished, certified annual authorized quantity, has been chronically impaired by junior groundwater pumping; as a consequence, the Refuge has not received, for over three decades, the water supplies necessary to fulfill the mandates of NWRSIA and the ESA.

201. As set forth above in paragraphs 18–23, NWRSIA's biological integrity and biological diversity mandates require that the Refuge hold sufficient water rights to maintain and preserve original historic conditions—in this case, the hydrological condition of the Refuge area

prior to substantial human-related changes to the landscape, which began to occur in the Refuge area shortly after the establishment of the Kansas Territory in 1854. At minimum, these historical hydrological conditions are those that existed around the Refuge in May, 1955, at the time of the establishment of the Refuge.

202. NWRSIA also requires the Service to assist in the maintenance of adequate water quantity and water quality to fulfill the mission of the Refuge System. As set forth above in paragraphs 94–95, the unique salt-and-freshwater mix of the Refuge is a critical component of the Refuge's water resources. That mix depends upon the protection of the Refuge's hydrological system as a functioning open basin, rather than a basin that, as a result of excessive groundwater pumping, has deviated from historical conditions and lost much of its streamflow and groundwater baseflow. Because any augmentation plan that uses existing groundwater rights junior to the Refuge Water Right to pump native groundwater directly into Rattlesnake Creek only serves to increase that deviation from historical conditions, any such augmentation plan is legally defective under NWRSIA.

203. As detailed in the Impairment Report, the Refuge Water Right has long been insufficient to meet the mandates of NWRSIA and other federal statutes; the Refuge has long suffered from insufficient water supply.

204. Because junior groundwater pumping prevented the perfection and certification of the Refuge Water Right at its originally approved quantity of 22,200 acre-feet; because its certified quantity is inadequate to meet the needs of the Refuge; because NWRSIA requires the Refuge to hold water rights sufficient to satisfy NWRSIA's "historic conditions" requirement; because the ESA similarly requires that the Refuge hold water rights and protect habitat upon which listed species depend; and because the *Winters/Cappaert* federal reserved water rights

doctrine requires that the Refuge hold water rights sufficient to satisfy the Refuge's purposes, the Refuge is therefore entitled to substantial additional water rights of sufficient quantity and priority to meet these legal requirements.

205. The Service must accordingly obtain additional water supplies for the Refuge. It can do so in three ways. First, it can secure additional rights through the long-recognized doctrine of federal reserved water rights, as described above in paragraphs 53–54. Under the doctrine, the Refuge is entitled to a federal, reserved water right, with a May, 1955 priority (the date of the establishment of the Refuge), that supplies water of sufficient quantity and quality to ensure that the preservation mandates of NWRSIA—the primary purpose of the Refuge—are met. *Winters v. United States*, 207 U.S. 564 (1908); *Arizona v. California*, 373 U.S. 546, 375 U.S. 892 (1963); *Cappaert v. United States*, 462 U.S. 128 (1976); *United States v. New Mexico*, 438 U.S. 696 (1978).

206. Second, the Service can obtain existing state law water rights recognized and obtained pursuant to the KWAA, either through voluntary acquisition or through the exercise of eminent domain. 16 U.S.C. § 668dd(a)(4)(G). However acquired, these state-law water rights must be of sufficient quantity and sufficiently senior priority to fulfill the legal requirements set forth under NWRSIA, the ESA, and the federal reserved water rights doctrine. Once obtained, state-law water rights can then be changed pursuant to K.S.A. § 82a-708b to supply the Refuge.

207. In combination with the previous two methods, which require the acquisition of additional water rights, the Service can protect the Refuge Water Right and at least partially restore its historic hydrological conditions by obtaining orders from this Court and from KDA-DWR requiring the long-term curtailment of all junior groundwater rights that have been impairing the Refuge Water Right. Permanent injunctive relief to protect senior water rights from

junior water rights whose pumping has been found to impair senior rights is the standard court-ordered remedy in Kansas. *Garetson Brothers. v. American Warrior, Inc.*, 51 Kan.App.2d 370, 347 P.3d 687 (2015); *Garetson Brothers v. American Warrior, Inc.*, 56 Kan.App.2d 623, 435 P.3d 1153 (2019). The same hydrological result can be obtained by the permanent administration of such impairing junior rights. K.S.A. § 82a-706b. In prior appropriation jurisdictions, either action to curtail junior water rights to protect senior water rights such as the Refuge Water Right raises no takings issues under the United States Constitution or state constitutions, because all junior water rights holders hold their rights subject to senior rights. *See, e.g., Kobobel v. Department of Natural Resources*, 249 P.3d 1127 (Colo. 2011).

COUNT SIX

VIOLATION OF THE PROHIBITION OF DISPOSING OF FEDERAL PROPERTY

208. Plaintiff re-alleges and incorporates the allegations in the above paragraphs by reference.

209. The Refuge Water Right is a real property right held by the Service. K.S.A. § 82a-701(g). Federal law clearly prohibits the disposition of federal property, which includes the diminution of the Refuge Water Right. Neither Interior, the Service, nor KDA-DWR can dispose of or diminish the Refuge Water Right by negotiation with GMD5, Senators Moran and Marshall, or other politicians. Only Congress, and not an executive branch agency such as Interior or the Service, can authorize the disposition of federal property. This rule dates back at least to *Gibson v. Chouteau,* 80 U.S. 92, 99 (1871).

210. For every year in which the Refuge Water Right was impaired, and the governmental defendants knew about that impairment but failed to secure water to which the Refuge Water Right was entitled, they knowingly disposed of a substantial portion of that federal

property for that season. In so doing, the governmental defendants violated the prohibition against disposing of federal property without congressional consent.

211. For the same reasons, neither can the governmental defendants place a burden (such as an easement for augmentation purposes) on Refuge land that diminishes the value of the Refuge property.

PRAYER FOR RELIEF

For the foregoing reasons, Plaintiff respectfully requests that this Court make the following **Declarations:**

1. The government defendants violated NWRSIA and the APA by willfully failing to protect the Refuge Water Right, a failure which began during the 1980s and continued after KDA-DWR issued the Impairment Report on July 15, 2016.

2. The government defendants committed a taking of wildlife in violation of the ESA and its related regulations.

3. NWRSIA imposes upon the government defendants the affirmative duty to protect the historic hydrological conditions of the Refuge that were in place in the Refuge area as of the time prior to human settlement.

4. The duty set forth in Declaration 3 requires the government defendants to fully protect every attribute of the Refuge Water Right from any interference by junior water rights.

5. Pursuant to NWRSIA and the ESA, the Refuge has a valid claim to federal reserved water rights and/or additional Kansas water rights necessary to restore, protect, and maintain the hydrological conditions of the Refuge as they existed prior to human settlement.

6. The October, 2019 bargain among the Service, KDA-DWR, and GMD5, and the 2020 MOU between the Service and GMD5 are void, ultra vires and ab initio, because they

violate NWRSIA, the ESA, the APA, and NEPA, and were entered into by officials without authority to make such agreements binding.

7. The Service's decision not to protect the Refuge Water Right constitutes major federal action affecting the environment that was done without fulfilling the requirements of NEPA, thus violating NEPA and the APA.

8. Any proposal for an augmentation project to supply water to the Refuge is major federal action affecting the environment and requires NEPA review.

9. NWRSIA requires that any augmentation plan approved by the chief engineer must be dedicated to the purpose of restoring, as soon as is practicable, the hydrological conditions in place at the Refuge prior to human settlement.

10. Any augmentation plan that proposes to change existing groundwater rights from within the Rattlesnake Creek sub-basin to a use that merely transfers the water diverted under such rights into Rattlesnake Creek does not physically add water to the Rattlesnake Creek sub-basin, and disrupts the hydrological conditions in place at the Refuge prior to human settlement; thus, any such plan cannot be approved by the chief engineer because it violates NWRSIA and the ESA.

11. The Service's deliberate decision not to protect the Refuge Water Right from known impairment constitutes a disposal of federal property in violation of federal law.

12. NWRSIA requires the chief engineer to issue orders to administer junior water rights sufficient to restore and to maintain the hydrological integrity of the source of supply of the Refuge Water Right, the Rattlesnake Creek sub-basin, at the level of the basin's historic conditions prior to human settlement.

13. Any order issued by the chief engineer to administer junior water rights that condones any depletions of groundwater supplies within the Rattlesnake Creek sub-basin beneath historic conditions prior to human settlement violates NWRSIA.

14. NWRSIA requires that any order issued by the chief engineer pursuant to K.S.A. § 82a-1036 to establish an IGUCA for the Rattlesnake Creek sub-basin must restore and protect the historic hydrological conditions of the basin prior to human settlement.

15. NWRSIA requires that any order issued by the chief engineer pursuant to K.S.A. § 82a-1041 to establish a LEMA for the Rattlesnake Creek sub-basin must restore and protect the historic hydrological conditions of the basin prior to human settlement.

Plaintiff further requests this Court to issue an **injunction** effecting the following:

16. The governmental defendants shall be permanently enjoined from taking any action that impairs the restoration, protection, and maintenance of the hydrologic conditions of the Rattlesnake Creek sub-basin according to the "historic conditions" standard of NWRSIA.

17. The governmental defendants shall be permanently enjoined from taking any action that impairs the restoration, protection, and maintenance of the hydrologic conditions necessary to protect the Refuge and the Refuge Water Right according to the ESA.

18. Interior and the Service shall take all affirmative actions necessary to restore, protect, and maintain the Refuge to its historic hydrological conditions prior to human settlement, in accordance with the above-made Declarations.

19. Specifically, the Service shall take immediate action to obtain sufficient federal reserved and/or Kansas water rights, consistent with its duty set forth in Declaration 3, to obtain additional water rights of sufficient priority and authorized quantity that, when combined with

the Refuge Water Right, are sufficient to restore, protect, and maintain the hydrological balance of the Rattlesnake Creek sub-basin to its historic conditions prior to human settlement.

20. All water rights which the chief engineer has found to be impairing the Refuge Water Right according to the Impairment Report are immediately prohibited from diverting any water, and this prohibition shall remain in effect until this Court approves an order by the chief engineer for the administration of the Rattlesnake Creek sub-basin that is consistent with the requirements of NWRSIA, the ESA, and NEPA.

Plaintiff further requests this Court issue an **Order of Mandamus** ordering the following:

21. Interior and the Service shall immediately fulfill their non-discretionary duty to protect the Refuge Water Right by requesting the full administration of all water rights in the Rattlesnake Creek sub-basin that have impaired and are impairing the Refuge Water Right according to the Impairment Report.

22. Chief engineer Lewis shall fulfill his non-discretionary duty to comply with this request and shall immediately and fully administer all junior water rights in the Rattlesnake Creek sub-basin that, according to the Impairment Report, have impaired and are impairing the Refuge Water Right.

Finally, Plaintiff requests that this Court:

23. Find that the position of the government defendants was not substantially justified, and that as a result, the Plaintiff is to be awarded its costs of litigation, reasonable attorney fees, and other disbursements for this action, and there exists no special circumstances that would make such an award unjust.

Dated: January 15, 2021

Respectfully Submitted,

DEPEW GILLEN RATHBUN & MCINTEER, LC

/s/ Randall K. Rathbun
Randall K. Rathbun #09765
Dylan P. Wheeler #28661
8301 E. 21st Street N., Suite 450
Wichita, KS 67206-2936
Telephone: (316)-262-4000
Facsimile: (316)-265-3819
randy@depewgillen.com
dylan@depewgillen.com

Richard Seaton #05994
SEATON, SEATON & DIERKS, L.L.P
410 Humboldt Street, Suite 6031
Manhattan, KS 66502
Telephone: (785)-776-4788
rhseaton@yahoo.com

Burke W. Griggs #22805
GRIGGS LAND & WATER, LLC
1717 W. 7th Street
Lawrence, KS 66044
burke.griggs@gmail.com

Attorneys for Plaintiff

DESIGNATION OF PLACE OF TRIAL

COMES NOW the plaintiff and designates Kansas City, Kansas, as the place of trial.

Respectfully Submitted,

DEPEW GILLEN RATHBUN & MCINTEER, LC

/s/ Randall K. Rathbun
Randall K. Rathbun #09765
Dylan P. Wheeler #28661
8301 E. 21st Street N., Suite 450
Wichita, KS 67206-2936
Telephone: (316)-262-4000
Facsimile: (316)-265-3819
randy@depewgillen.com
dylan@depewgillen.com

Richard Seaton #05994
SEATON, SEATON & DIERKS, L.L.P
410 Humboldt Street, Suite 6031
Manhattan, KS 66502
Telephone: (785)-776-4788
rhseaton@yahoo.com

Burke W. Griggs #22805
GRIGGS LAND & WATER, LLC
1717 W. 7th Street
Lawrence, KS 66044
burke.griggs@gmail.com

Attorneys for Plaintiff

INDEX OF EXHIBITS

1. Inpairment Report (July 27, 2016)
2. Quivira CCP
3. Letter from Secretary McClaskey to GMD 5 (December 8, 2016)
4. FWS Request to Secure Water (January 1, 2017)
5. AOK Letter to KDA-DWR (September 6, 2017)
6. KDA-DWR Response to AOK (September 29, 2017)
7. KDA-DWR Letter to GMD5 (December 13, 2017)
8. AOK Letter to KDA-DWR (August 17, 2018)
9. KDA-DWR Response to AOK (August 27, 2018)
10. FWS Request to Secure Water (December 13, 2018)
11. AOK 3rd Letter to KDA-DWR & Service (August 16, 2019)
12. Moran Press Release (October 21, 2019)
13. FWS Statement to KDA-DWR (October 25, 2019)
14. Memo of Agreement (July 25, 2020)
15. Skipwith Announcement (December 23, 2020)

1320 Research Park Drive
Manhattan, Kansas 66502
(785) 564-6700

Kansas
Department of Agriculture
agriculture.ks.gov

900 SW Jackson, Room 456
Topeka, Kansas 66612
(785) 296-3556

Jackie McClaskey, Secretary

Governor Sam Brownback

July 15, 2016

Kathleen R. Dennis
Assistant Regional Director
U.S. Dept. of the Interior/Fish & Wildlife Service
PO Box 25486
Denver Federal Center
Denver, CO 80225-0486

Dear Ms. Dennis,

Attached is our final report for the impairment investigation requested by the U.S. Fish and Wildlife Service related to its Water Right File No. 7,571 for the Quivira National Wildlife Refuge.

No action will be taken based on our findings without the written request of the Service to secure water.

I understand the next meeting of the Service, Big Bend Groundwater Management District No. 5, the basin stakeholders and the Department will be July 27, 2016 in Wichita. We look forward to continuing to work with all in exploring options for resolving the underlying concerns.

Sincerely,

David W. Barfield

David W. Barfield, P.E.
Chief Engineer
Division of Water Resources

pc: Big Bend GMD No. 5
WaterPack

EXHIBIT 1

Final Report of the Chief Engineer

Prepared pursuant to K.A.R. 5-4-1

Concerning a Claim of Water Right Impairment

In the Matter of

Water Right File No. 7,571

Owned and operated by

U.S. Fish and Wildlife Service

July 15, 2016

David W. Barfield, P.E.
Chief Engineer
Division of Water Resources
Kansas Department of Agriculture

This final report provides the results of DWR's impairment investigation requested by the U.S. Fish and Wildlife Service related to their water right for the Quivira Refuge, Water Right File No. 7,571.

The United States Fish & Wildlife Service (Service) holds Water Right File No. 7,571; a surface water right near the bottom of the Rattlesnake Creek for its Quivira National Wildlife Refuge. The Refuge's water right entitles it to take water from Rattlesnake Creek at three points of diversion at a combined maximum diversion rate not in excess of 300 cubic feet per second and a quantity not to exceed 14,632 acre-feet of water per calendar year for recreational use. The Refuge is located along the Central Flyway and consists of 7,000 acres of wetlands. The Refuge uses water primarily to provide habitat for several hundred species of birds and other animals, including several federally protected endangered species.

Over the last three decades, the Service has alleged that junior groundwater pumping above the Refuge has resulted in periods of significant water shortages at the Refuge. For more than 15 years, the Service worked with the Rattlesnake Partnership, seeking to bring about voluntary reductions in use to improve its supply. On April 8, 2013, the Service requested this impairment investigation.

DWR reviewed existing records and gathered additional information on the Refuge's infrastructure, historical use and shortages, and the pattern of water needs at the Refuge as part of this investigation. DWR used the GMD 5 groundwater model to determine the magnitude and timing of streamflow depletions due to upstream, junior groundwater pumping on water availability at the Refuge. Finally, DWR compared the streamflows that would have been available but for the effects of junior groundwater pumping with the seasonal needs of the Refuge to estimate the magnitude and frequency of impairment in the record reviewed.

A technical report on the investigation and data analyses is attached hereto.

Based on our impairment investigation, I make the following findings and conclusions.

Findings

Upstream, junior groundwater pumping within the Basin is and has been significantly reducing water availability at the Refuge on the order of 30,000-60,000 acre-feet per year over the recent record (1995-2007). This does not mean that the Refuge is being impaired by 30,000-60,000 acre-feet per year, but rather that junior

groundwater pumpers are taking that much out of the stream; water that would have otherwise flowed through or past the Refuge.

In comparing the seasonal needs of the Refuge, within the scope of its water right, with water that would have been available at the Refuge but for the effect of junior pumping, I find that the Refuge's water supply has been regularly and substantially impacted by junior groundwater pumping (see Figures 5-8 and Figure 9 of the report). Over the 34 years reviewed, shortages — when junior groundwater pumping prevented the Refuge from exercising its water right — were greater than 3,000 acre-feet in 18 years, particularly during periods of limited water supply.

As evidenced by various scenarios reviewed in the modeling report, while it will take years, reductions in groundwater pumping will restore streamflow at the Refuge.

DWR's analysis of water right data, water use data, and groundwater modeling analysis indicates that, due to the relatively small amount of pumping adjacent to the stream and the multi-year lag between pumping reductions and streamflow enhancement, real-time administration of junior groundwater pumping (i.e. curtailment only during periods of shortage) is unlikely to restore streamflow quickly enough to prevent impairment at the Refuge. Long-term reductions in upstream, junior groundwater pumping and/or the use of augmentation appear to be the only practical physical remedies to the impairment of the Refuge's water right.

My finding of impairment is based on historical simulations using the GMD 5 groundwater model and a retrospective analysis of the Service's needs. While I find this sufficient to conclude that impairment has occurred in the past and will occur in the future, the actual magnitude and timing of future impairment will depend on the specific circumstances. For instance, the Service has acknowledged that significant drought periods, and the resulting water shortages, are part of the natural hydrologic cycle, and DWR's impairment analysis does not directly factor in the Service's use of storage in Little Salt Marsh, which, in practice, may help to reduce some shortages to a limited degree.

Based on the historical analysis, and assuming that the basin's hydrology will not significantly change, for better or worse, in the next several decades, it appears that, to relieve the impairment of the Service's water right, groundwater reductions and/or augmentation will be needed to increase available streamflow at the Refuge by 3,000-5,000 acre-feet on a regular basis.

Conclusion

Based on the results of this investigation, I conclude that upstream, junior groundwater pumping regularly and significantly impairs the Service's ability to use its Water Right File No. 7,571.

Further, I find this impairment is not substantially due to regional overall lowering of the water table, but is principally due to ongoing impacts of junior groundwater pumping and the associated reduction in outflows from the groundwater system to the stream system.

Pursuant to K.A.R. 5-4-1, this report is posted on the agency's website as of July 15, 2016: agriculture.ks.gov/quivira.

Technical Report

Prepared pursuant to K.A.R. 5-4-1

on a Claim of Water Right Impairment
In the Case of

Water Right File No. 7,571
owned and operated by

United States Department of the Interior
Fish & Wildlife Service
Quivira National Wildlife Refuge

July, 2016

Division of Water Resources
Kansas Department of Agriculture

i. Executive Summary

Quivira National Wildlife Refuge ("Refuge") is located in south-central Kansas and primarily gets its water supply from Rattlesnake Creek which runs into and through the Refuge. The Refuge is located midway along the Central Flyway and consists of about 7,000 acres of wetlands. The Refuge uses water primarily to grow feed crops and maintain wetlands at certain depths to provide habitat for several hundred species of birds and other animals, including several federally protected endangered species. The Refuge is owned and operated by the United States Fish & Wildlife Service (Service), a part of the United States Department of the Interior.

After nearly three decades of expressing concerns that junior groundwater appropriators upstream of the Refuge are depleting the streamflow in Rattlesnake Creek, and working with local water users and the groundwater management district to try to find solutions to their concerns, the Service lodged an impairment complaint with the Kansas Department of Agriculture Division of Water Resources (KDA-DWR) in an April 8, 2013, letter.

The Service owns Water Right File No. 7,571; which is senior in priority to about 95% of the water rights in the basin, and which entitles the Refuge to divert up to 14,632 acre-feet of surface water each year from Rattlesnake Creek, when water is available.

Results from KDA-DWR's simulations using a groundwater model commissioned by Big Bend Groundwater Management District #5 ("GMD5") and built by groundwater modeling consultants, show that junior groundwater pumping upstream of the refuge has significantly reduced streamflow available to the Refuge over the years.

Using the modeling results and the Service's operational guide, which lays out the Refuge's seasonal water needs, KDA-DWR finds that junior groundwater pumping in Rattlesnake Creek impaired the Refuge's water right, to varying degrees, in 26 of the 34 years 1974-2007. The results showed that the impairment was greater than 3,000 acre-feet in 18 of the 34 years. However, the results also showed that, because groundwater moves very slowly, shutting off junior groundwater pumping would take two or more years to significantly benefit streamflow.

Since there have been no substantial long-term changes to pumping levels or precipitation trends in the region of the basin closest to the Refuge, it is reasonable to conclude that the impacts to streamflow caused by pumping will continue into the foreseeable future.

ii. Procedure, Content and Nature of this Report

This report was developed pursuant to the duties and responsibilities of the chief engineer and KDA-DWR set forth in the Kansas Water Appropriation Act, including but not limited to K.S.A. 82a-702, 82a-706, 82a-706b, 82a-707, and 82a-711a, and the procedures set forth in K.A.R. 5-4-1.

This technical report was developed to support the initial report of the chief engineer as described in 5-4-1(c)(2).

This report is intended to present the facts analyses performed to inform the chief engineer's finding on water right impairment. This report is not intended to evaluate or prescribe any particular remedy or resolution of any impairment observed.

iii. Table of Contents

Final Report of the Chief Engineer 1
Findings 2
Conclusion 4
Technical Report 5
i. Executive Summary 6
ii. Procedure, Content and Nature of this Report 8
iii. Table of Contents 9
iv. List of Figures 10
v. List of Tables 10
1. Introduction and Background 11
2. Hydrogeologic Setting 13
3. Water Use Summary 15
4. The Refuge's Water Right 17
5. The GMD5 Groundwater Model 21
6. Determination of Junior Groundwater Pumping Impacts at the Refuge 24
7. Observations From Comparing Model Simulations and the Refuge's Operational Water Needs 25
8. List of References 38
9. List of Attachments 38
Modeling Appendix 40
Introduction 40
GMD5 groundwater model 40
Baseline and scenario pumping conditions 41
Description of pumping scenarios 42
Basin-wide pumping curtailments 42
Targeted pumping curtailments 42
Other scenarios investigated 43
Model results 43
Scenario 1: Impact of pumping by rights junior to Water Right File No. 7,571 on streamflow 43
Summary of results presented by Barfield and others (2014) 45
Scenario 11: Comparison of impacts for single- and multilayer model versions 46

Temporal response of water budgets to pumping curtailment for selected scenarios 46
Conclusions 47
Response to Technical Comment 47
References 49
Tables 50
Figures 53
Attachment 1 March 2014 USFW letter to KDA-DWR (USFW) 63
Attachment 2 April 2013 impairment complaint (USFW) 66
Attachment 3 Refuge water right certification memo (KDA-DWR) 68
Attachment 4 Refuge water right certificate (KDA) 73
Attachment 5 Refuge operations information (USFW) 75
Attachment 6 Scenario 1 modeling results (KDA-DWR) 80
Attachment 7 Public Comments on Draft Reports and KDA-DWR Responses 83

iv. List of Figures

Figure 1 - Effect of Groundwater Pumping on Surface Water 14
Figure 2 - Rattlesnake Creek Basin map of water rights 16
Figure 3 - Refuge features 22
Figure 4 - Method for determining historical simulated impairment to the Refuge's water right based on the USGS gage at Zenith 28
Figure 5 - Interpolated Change in Water Levels in Rattlesnake Creek Basin 31
Figure 6 - Simulated evaluation of impairment to the Refuge's water right 1974 - 2007 32
Figure 7 - Simulated evaluation of impairment to the Refuge's water right 1978 - 1987 33
Figure 8 - Simulated evaluation of impairment to the Refuge's water right 1988 - 1997 34
Figure 9 - Simulated evaluation of impairment to the Refuge's water right 1998 - 2007 35
Figure 10 - Simulated amount of impairment to the Refuge's water right by year 36
Figure 11 - Modeled depletions to Rattlesnake Creek 1974 - 2007 37

v. List of Tables

Table 1 - Summary of Rattlesnake Creek Basin Water Rights 15
Table 2 - Gaged flow, Refuge needs and calculated shortfall 29

1. Introduction and Background

After several decades of expressing concerns that junior groundwater pumpers were interfering with and harming the management operations of the Quivira National Wildlife Refuge (Refuge) by depleting the streamflow in Rattlesnake Creek which supplies the Refuge, in an April 8, 2013, letter, the United States Fish & Wildlife Service (Service) lodged an impairment complaint with the Kansas Department of Agriculture Division of Water Resources (KDA-DWR). This report summarizes KDA-DWR's resulting investigation. See Attachments 1 and 2.

In the late 1980s, the Service began to express concerns to KDA-DWR and Big Bend Groundwater Management District #5 (GMD5), that junior appropriators were reducing the flows in Rattlesnake Creek such that the Refuge was prevented from exercising its water right and its operations were being negatively impacted. In 1994, the Service entered into the Rattlesnake Creek Partnership (Partnership) with GMD5, KDA-DWR, and a group of local water users called the Water Protection Association of Central Kansas (WaterPACK) to find a way to address the Service's concerns. In 2000, the Partnership finalized a 12-year plan (Management Plan) to address USF&W's concerns and submitted the plan to the KDA-DWR's chief engineer who approved it. The Management Plan called for KDA-DWR to prepare and submit a report every four years on the progress made towards the plan's goals. Three four-year reviews of the Rattlesnake Creek Partnership Management Plan were prepared and are available at dwr.kda.ks.gov/impairment/RSC.Quivira/TechReport.Attachments/

Near the end of 2008, GMD5 began work on developing a hydrologic model of the district (GMD5 Model), including the Rattlesnake Creek Basin and the Refuge. KDA-DWR participated in the peer review of the model development. The GMD5 Model was completed in 2010.

In 2012, the last four-year review of the Management Plan was conducted by KDA-DWR and submitted to the Partnership for approval. KDA-DWR found that over the course of the Management Plan water savings from incentive-based programs and enhanced compliance and enforcement, yielded 2,804 acre-feet, just over 10% of the goal of 27,346 acre-feet of savings laid out by the Partnership. There was no significant reduction in irrigated acres and the amount of irrigation water applied per acre has remained generally constant when factoring in the effects of precipitation. GMD5 and WaterPACK did not accept KDA-DWR's 2012 review report.

After receiving the Service's 2013 impairment complaint, KDA-DWR began using the GMD5 Model to evaluate the historical impacts that junior appropriators have had on Rattlesnake Creek streamflow. Simulations using the GMD5 Model show that stream depletions (depletions to baseflow) caused by junior appropriators are on the order of approximately 30,000 acre-feet to 60,000 acre-feet per year for the period 1995-2007. This does not mean that the Refuge is being impaired by 30,000-60,000 acre-feet per year, but rather that junior groundwater pumpers are taking that much out of the stream; water that would have otherwise flowed through or past the Refuge.

A retrospective analysis added the streamflow depletions to the observed streamflow record gaged at Zenith to simulate how much streamflow would have been measured at the Zenith gage if there had been no pumping junior to the Service's right. Comparing the simulated "no junior pumping" record to the observed record and then evaluating how the seasonal needs of the Refuge within its water right would have been fulfilled in the simulated and observed cases shows that the Refuge's water right was impaired by upstream junior groundwater pumping in 26 of the 34 years of the simulation period 1974-2007. Further, the simulations also show that because of the relatively slow movement of groundwater, the time between when a pumping well is reduced or shut off and when the water that would have been streamflow but for the pumping is restored to the stream is on the order of two or more years, or even decades, depending on the well's distance from the stream.

2. Hydrogeologic Setting

The descriptions below are taken in large part from "A Computer Model for Water Management in the Rattlesnake Creek Basin, Kansas" (Kansas Geological Survey, The University of Kansas and Department of Civil Engineering, Kansas State University, 1997). Internal citations are omitted.

The Rattlesnake Creek basin is approximately 1,317 square miles in area and is located within the Great Bend Prairie of south-central Kansas. It is approximately 95 miles long and 18 miles wide with the long axis oriented in a southwest-to-northeast direction. Parts of Rice, Barton, Reno, Stafford, Pawnee, Edwards, Kiowa, Pratt, Ford, and Clark counties are included in the basin, with Stafford, Kiowa, and Edwards counties covering more than 82% of the watershed area.

The watershed is located in two physiographic regions. The upper 85% of the watershed is located in the Arkansas River lowlands (Great Bend Prairie region); it is a relatively flat alluvial plain characterized by sand-dune topography with moderate slopes and small hills separated by small basins. The upper 15% of the watershed belongs to the High Plains region, which is also a comparatively flat alluvial plain dissected by intermittent streams and exhibiting shallow depressions and gentle swells. Much of the sand-dune area of the watershed is covered by vegetation, and a large part of it is farmed; the watershed is primarily agricultural.

The watershed is drained by the Rattlesnake Creek, which is a meandering stream flowing from the High Plains region northeasterly into the Great Bend lowlands area where it empties into the Arkansas River. A number of smaller streams merge into the Rattlesnake Creek throughout its course from the highlands to the Arkansas River.

The primary source of recharge to the system is infiltration from precipitation, which varies spatially within the basin. Recharge varies with the soil type. The Rattlesnake Creek and its tributaries are a source of water to the ground-water system in the western parts of the watershed, where surface runoff into the stream eventually percolates into the subsurface. In the north-eastern parts of the watershed, the Rattlesnake Creek is essentially a gaining stream as recharge is discharged into the stream system from approximately Macksville downstream. The Quivira marsh in the lower reaches of the basin acts as a drainage outlet for the ground-water system.

Figure 1 illustrates the effect of groundwater pumping on streamflow.

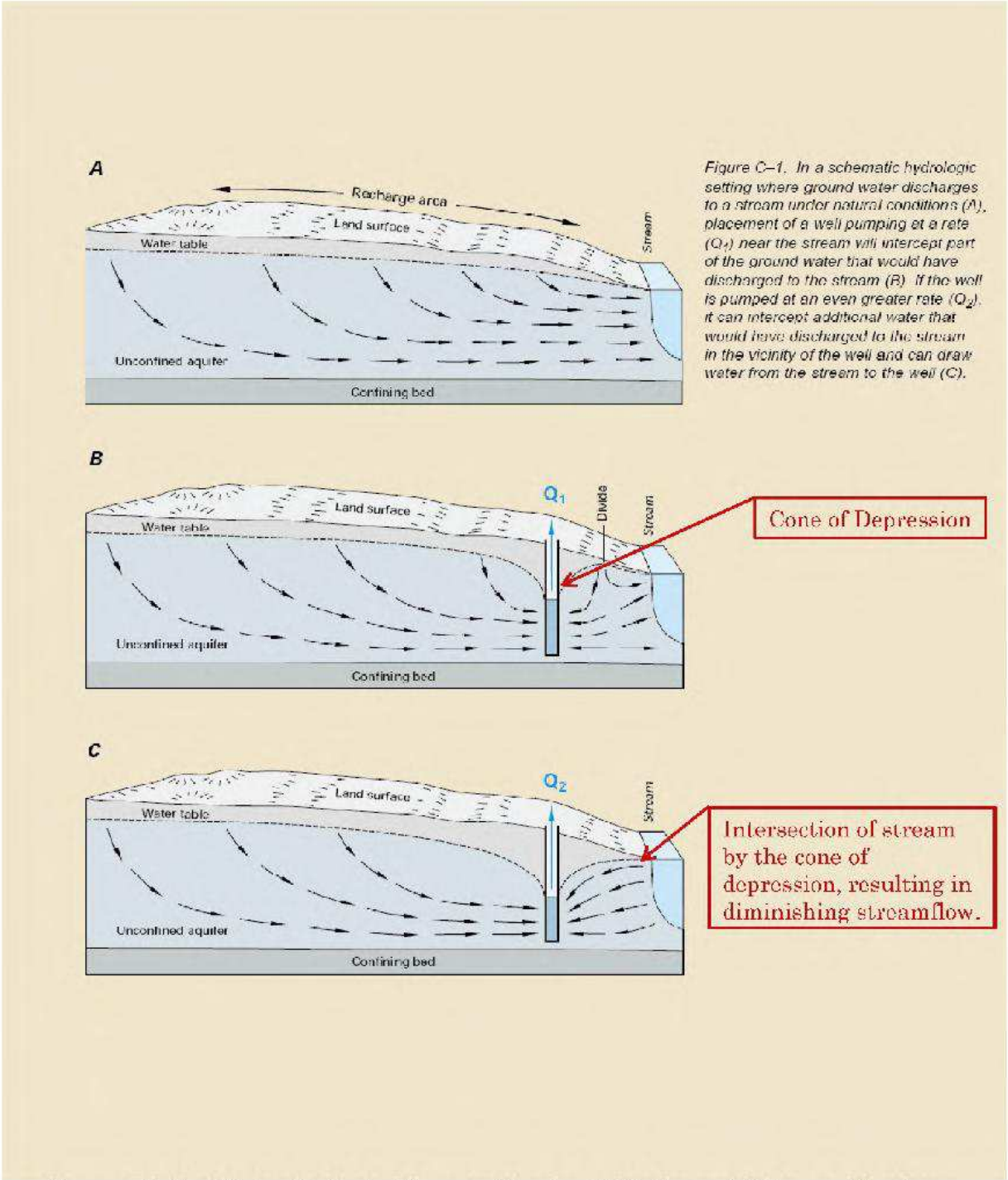


Figure C–1. In a schematic hydrologic setting where ground water discharges to a stream under natural conditions (A), placement of a well pumping at a rate (Q_1) near the stream will intercept part of the ground water that would have discharged to the stream (B). If the well is pumped at an even greater rate (Q_2), it can intercept additional water that would have discharged to the stream in the vicinity of the well and can draw water from the stream to the well (C).

Source: United States Geological Survey, Circular 1139, *Ground Water and Surface Water: A Single Resource* (1998), Figure C-1, p. 15 (Figure title and boxed annotations in red added).

Figure 1 - Effect of Groundwater Pumping on Surface Water

3. Water Use Summary

Year of record	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
# of Water Rights *												
Groundwater	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680
Surface Water	10	10	10	10	10	10	10	10	10	10	10	10
Quivira (included in Surface	1	1	1	1	1	1	1	1	1	1	1	1
Junior to Quivira	1,599	1,599	1,599	1,599	1,599	1,599	1,599	1,599	1,599	1,599	1,599	1,599
Senior to Quivira	90	90	90	90	90	90	90	90	90	90	90	90
# of Water Rights Reporting Use												
Groundwater	1,374	1,371	1,367	1,368	1,379	1,378	1,376	1,375	1,376	1,377	1,381	1,381
Surface Water	5	5	5	5	5	5	5	5	5	5	5	5
Quivira (included in Surface	1	1	1	1	1	1	1	1	1	1	1	1
Junior to Quivira	1,304	1,301	1297	1298	1,309	1,308	1,306	1,305	1,306	1,307	1,311	1,311
Senior to Quivira	74	74	74	74	74	74	74	74	74	74	74	74
Water Use (AF)												
Groundwater	208,499	167,241	169,229	200,386	152,764	175,749	169,163	190,372	251,259	212,251	172,422	174,368
Surface Water	1,747	9,701	4,591	4,907	31	3,329	1,766	8,539	3,351	2,275	2,728	2,199
Quivira (included in Surface	1,727	9,679	4,559	4,875	0	3,323	1,760	8,526	3,320	2,249	2,712	2,178
Total water use (AF)	210,246	176,941	173,820	205,293	152,795	179,078	170,929	198,911	254,610	214,525	175,150	176,567
Authorize Quantity (AF)*												
Groundwater	252,258	252,258	252,258	252,258	252,258	252,258	252,258	252,258	252,258	252,258	252,258	252,258
Surface	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902
Quivira (included in Surface	14,632	14,632	14,632	14,632	14,632	14,632	14,632	14,632	14,632	14,632	14,632	14,632
Total	267,160	267,160	267,160	267,160	267,160	267,160	267,160	267,160	267,160	267,160	267,160	267,160
% of Authorized Quantity Used*												
Groundwater	83%	66%	67%	79%	61%	70%	67%	75%	100%	84%	68%	69%
Surface	12%	65%	31%	33%	0%	22%	12%	57%	22%	15%	18%	15%
Quivira (included in Surface	12%	66%	31%	33%	0%	23%	12%	58%	23%	15%	19%	15%
Total	79%	66%	65%	77%	57%	67%	64%	74%	95%	80%	66%	66%
# of Irrigated Acres												
Groundwater	160,692	161,606	157,722	160,660	158,168	160,400	160,129	160,867	161,316	160,274	158,510	158,765
Surface	21	0	0	0	0	0	0	0	0	0	0	0

Table 1 - Summary of Rattlesnake Creek Basin Water Rights

Table 1 summarizes the basin's water rights and water use information over 2003-2014. Over 98% of the water use in the basin is from groundwater. The Refuge's surface water right accounts for 98% of all the surface water appropriated in the basin and is senior in priority to about 95% of all the water rights in the RSC Basin — groundwater and surface water.

The Water Right Information System database from which Table 1 was compiled does not contain records of the years in which water rights were dismissed. Water rights dismissed during 2003-2014, if any, are not represented in Table 1. The same is true for authorized quantity associated with dismissed rights.

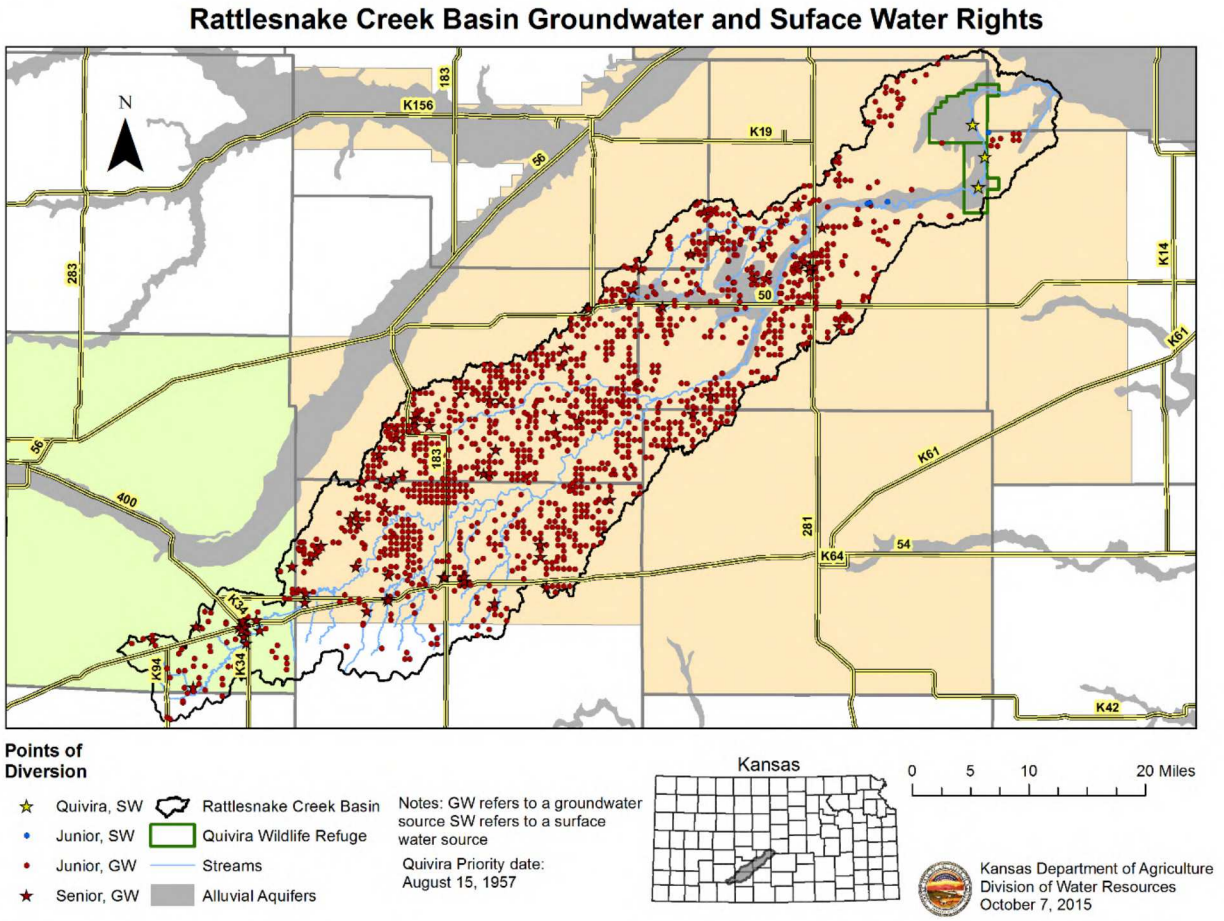


Figure 2 - Rattlesnake Creek Basin map of water rights

4. The Refuge's Water Right

The Refuge's Water Right File No. 7,571 was filed Aug. 15, 1957. The application requested 22,200 acre-feet at a diversion rate of 300 cubic feet per second. The Refuge's water right application was approved May 9, 1963, and specified a perfection date of Dec. 31, 1968. Citing ongoing construction and funding delays, on Nov. 29, 1968, the Service requested that the perfection period be extended to Dec. 31, 1973. This and the remaining documents referenced in this section are included in the electronic water right file available online at agriculture.ks.gov/quivira.

In a May 2, 1973, memorandum to the State Board of Agriculture, DWR Stafford Water Commissioner J. Maurice Street reported on a meeting held in St. John where an attorney representing the Service asserted that the Service held vested rights to some Rattlesnake Creek streamflow based in its acquisition of property from a gun club that had used water for recreational purposes prior to 1945.

In its July 17, 1973, letter, the Service described progress made in developing the Refuge and noted that the Refuge construction was 80% complete. The letter requested that the perfection period be extended to Dec. 31, 1978. In a March 20, 1974, letter the chief engineer noted that the Refuge was complete.

DWR notified the Service by March 20, 1974 letter that it considered the Refuge construction complete, that it had determined that the Refuge's 1971 water use report, along with the other documentation already compiled in the water right file was sufficient to fulfill the Notice and Proof requirements of K.S.A. 82a-714, and that the perfection period was extended to Dec. 31, 1978. The 1971 water use report showed that 10,063 acre-feet were used on the refuge.

Citing funding delays, the Refuge in its Dec. 22, 1978, letter requested the perfection period of its water right be extended to Dec. 31, 1983. DWR's receipt and approval of that request was not located in the paper file, nor was any subsequent request or approval for extending the perfection period to include the year of record 1987.

However, in order to catch up on a backlog of files pending certification, in August 1989, DWR implemented Administrative Policy 89-9 which, among other things, allowed for extensions of the perfection period for good cause shown for applications with a priority date on or before May 1, 1978. The perfection period of

the Refuge's water right was extended to 1978 under the guidelines of this policy whose principles later became regulation K.A.R. 5-8-7 and are still in force today.

DWR's certification memorandum of Feb. 8, 1993, which is excerpted below, explains why 1987 was chosen as the year of record and notes that an extension would need to be granted by DWR. K.A.R. 5-8-7 allows the Chief Engineer to extend the perfection period of a water right if other records or information are available for a period after the original perfection period that would reasonably represent the application of water to beneficial use in accordance with the terms, conditions, and limitations of the permit. A USGS gage was installed at Zenith in 1973. The Refuge's diversion works were not fully functional until 1978. The 10-year perfection period after 1978 was extended until 1987. The USGS gage at Zenith established a good, verifiable water flow record which was used in part to help quantify the Refuge's water right.

On Oct. 31, 1986, the Service sent a letter to DWR claiming that Rattlesnake Creek streamflow was declining due to junior diverters, especially groundwater development. The Service was especially concerned about the increasing lack of streamflow in late summer and early fall when there is the greatest need for water on the refuge. In its letter, the Service also references K.S.A. 42-306 which says, "No person shall be permitted to take or appropriate the waters of any subterranean supply which naturally discharge into any superficial stream, to the prejudice of any prior appropriator of the water of such superficial channel."

DWR issued the draft certificate and its Feb. 8, 1993, Certification Memorandum, File 7571 laid out the chronology of events that led to finalizing the Refuge's water right and summarized the process:

> *File 7571 was approved in 1963. During the time period 1963 to 1972 many of the water use reports were estimated and during that time the diversion works were reported to be only 80% complete. An actual water measurement program may not have been in place prior to 1973. In 1973, a year of torrential rainfall, the diversion works and control structures at Quivira were destroyed. It was not until 1978 that the damage was finally repaired. The year 1978 was, therefore, the first year that the diversion works were complete and ready to divert and store water according to management plans. Assuming that the water requirements of the refuge are best represented by years after 1978, the year 1987 has been selected as the year of record. Using 1987 will require that an extension of time to perfect be granted to that year.*

> *During 1987 the U.S. Fish and Wildlife Service reported that 10129.7 acre feet of water was diverted from the Rattlesnake Creek and that the refuge was "full all year." … the measurements do not reflect the amount stored and the subsequent evaporation in the Little Salt Marsh. Using an area of 950 acres in the Little Salt Marsh, and a capacity of 2260 acre feet, one would assume 2850 acre feet of evaporation during a calendar year (36 inches of net evaporation). The proposed certified quantity for file 7571 would then be the sum of the acre feet reported in 1987, the amount stored in the Little Salt Marsh: 10129.7 acre feet + 2260 acre feet + 2850 acre feet = 15240 acre feet. It is also proposed that all of the 15240 acre feet be shown as direct use and that the "quantity to be accumulated in reservoirs" as stated in the approval be dropped from the certificate.* (internal references omitted)

The Service's Nov. 12, 1993, letter raised several issues with DWR's draft certificate. The Service noted that the original application was for 22,000 acre feet of water and that hydrologic modeling performed by the Kansas Geological Survey (KGS Open File Report 93-7) estimated that by 1987, junior groundwater pumping — modeled at 70% of authorized — had depleted the streamflow in Rattlesnake Creek by at least 8,456 acre feet, some or all of which could have been used by the Refuge. As noted below, DWR has used the groundwater model developed by GMD5 to evaluate pumping impacts on Rattlesnake Creek streamflow. Figure 11 shows that the GMD5 model estimates that by 1987, junior groundwater pumping had depleted Rattlesnake Creek streamflow by about 38,000 acre-feet.

In a May 27, 1994, letter, Chief Engineer David Pope acknowledged the streamflow at the Refuge may have been reduced by groundwater pumping and that the Refuge may have been able to divert and beneficially use more water but for those reductions. However, DWR's position was that it was constrained by K.S.A. 82a-714 and K.A.R. 5-3-8 which, among other things, limits certification of a water right to no more than the amount actually diverted and used by the water user.

The Service and DWR exchanged several more letters over the next two years expressing their views on how the Refuge's water right should be certified. On April 10, 1996, DWR issued the final Certificate of Appropriation for File No. 7,571.

In a subsequent memorandum, KDA-DWR noted and recommended correcting a 45 acre-foot transposition error in the original certification memorandum. The corrected quantity was ultimately certified. See Attachment 3.

The Refuge's water right entitles it to take water from Rattlesnake Creek at three points of diversion at a combined maximum diversion rate not in excess of 300

cubic feet per second and a quantity not to exceed 14,632 acre-feet of water per calendar year for recreational use. This is the volume of water used in 1987 to operate the wetlands areas including filling Little Salt Marsh (1,865 acre-feet), evaporation from Little Salt Marsh (2,592 acre-feet), and filling the Refuge's management areas to meet wildlife feed crop demands (10,175 acre-feet). See Figure 3 below and Attachment 4.

Like all Kansas water rights, the Refuge's water right does not guarantee the availability of any certain amount of water, rather it entitles the Refuge to its authorized rate and quantity subject to prior and vested rights, and the natural availability of water. And, just like the water rights held by its irrigator neighbors, the Refuge's water right entitles it to divert the water at the times when it is most beneficial. Even though a quantity in excess of the Refuge's annual water right might pass by the Refuge's point of diversion in any given year, the test for whether the Refuge's water right has been diminished in value or utility — impaired — is whether the Refuge could have more fully exercised its water right if junior diverters had not taken the streamflow out of priority.

The owner of a water right can adjust the operation of his or her right once the right is perfected and certified, as long as the operation of the right stays within the terms, conditions, and limitations set forth in the certificate (use made of water, point of diversion, place of use, authorized quantity, etc.). The Refuge's water right was applied for, perfected, and has subsequently been exclusively used for recreational use, one of the authorized uses of water in Kansas. In the decades since it was established, the Refuge has adjusted the way it manages its habitat. Modifications to the operations of all water rights are to be expected as technology and best management practices change. For example, if someone perfected an irrigation water right on 160 acres of corn using a flood irrigation system in 1975, then modified their operation by installing a pivot, now watering 130 acres and growing wheat, that owner would not be required to reduce their property right as long as they stayed within the terms, conditions and limitations of the irrigation right. That water right owner would also have the right to go back to flood irrigating corn or another crop if they so choose to do. Likewise, a water right holder could perfect a stock watering right on 1500 head of cattle in a confined feeding operation. They could modify their operation by switching to 2000 head of hogs. No reduction would be required. They also could go back to 1500 head of cattle.

The Refuge water right was developed to manage approximately 7000 acres of wetlands within a refuge area of 22,135 acres (from 2014 CCP). In a letter dated November 12, 1993, the USFW stated that net evaporation based on DWR policy

84-1 using 36" of evaporation and a 6469.6 acres of marshes equates to 19,409 AF which does not include any water to fill the impoundments, which it estimated to be 13,246 AF. The Service recommended the certificate be issued for 20,021 AF year at 300 CFS. Based on managing approximately 7000 acres of wetlands, at 31 inches/year of net evaporation (average year, K.A.R 5-6-3), it would appear that the full authorized quantity could be used in most years, and substantially more than this in critical dry periods.

During both the perfection period and currently, the Refuge seeks to manage approximately 7000 acres in wetlands. As the use for the water and acres has remained the same, we see no evidence of expanded use.

5. The GMD5 Groundwater Model

In 2008, GMD5 commissioned Balleau Groundwater, Inc. to develop a numerical groundwater model of the district. The model was peer reviewed throughout its development by KDA-DWR and KDA-DWR's consulting expert, Steven P. Larson of S.S. Papadopoulos and Associates. The model was completed in 2010. The Model report and peer review report are available at dwr.kda.ks.gov/impairment/RSC.Quivira/TechReport.Attachments/.

The GMD5 model was built with seven layers, each layer representing a geologic formation at a range of depths below the surface of the ground. One of the principal reasons for using multiple layers in this model was so that the movement of water contamination plumes could be simulated and management strategies to contain those plumes could be evaluated. The complexity of the seven-layer model requires significant computer resources and time to run simulations.

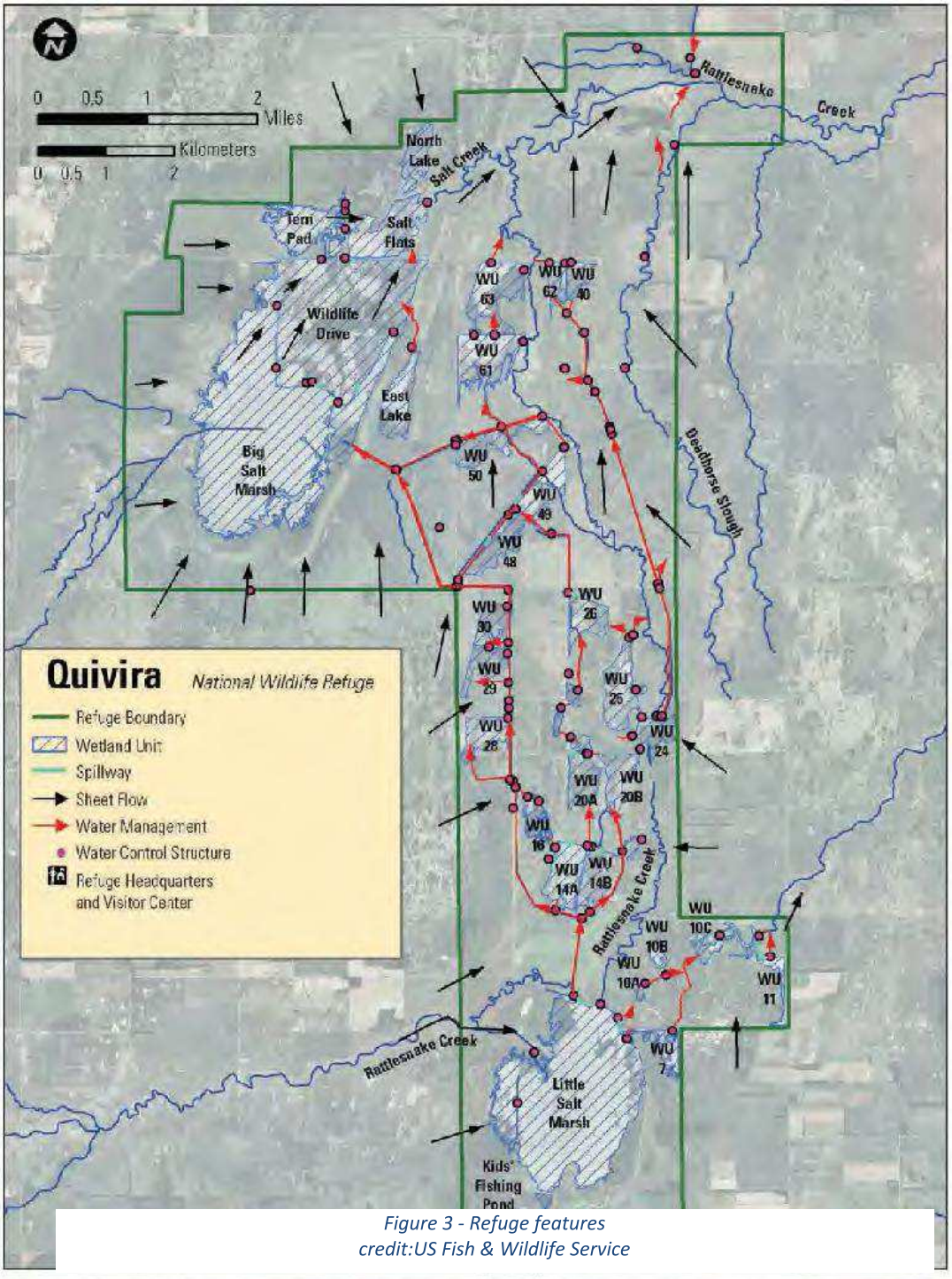


Figure 3 - Refuge features
credit:US Fish & Wildlife Service

To evaluate the effects of pumping on groundwater levels and the discharge of groundwater into the stream system, a one-layer model, if properly designed and calibrated, is sufficient. S.S. Papadopoulos and Associates simplified the GMD5 model by "collapsing" the original seven-layer model into a one-layer model so that it could be used to run scenarios in minutes instead of hours. The conversion from seven-layer model to one-layer model did lose the vertical resolution needed to

simulate how contaminant plumes move up towards the surface of the earth and down away from it, but by effectively averaging the aquifer properties across the seven layers, the way that the horizontal movement of water beneath the ground is simulated was not significantly altered.

Beginning in 2014, KDA-DWR used the original seven-layer GMD5 model, and the simplified, one-layer modification of the model to simulate how the Rattlesnake Creek streamflow would respond to several alternative historical pumping scenarios. For instance, one scenario simulated the effect of no pumping anywhere in the basin junior to the Refuge's water right. Another scenario simulated no junior pumping in a corridor along the stream. The work was intended to increase familiarity with and understanding of the model, to show that the original seven-layer model and the simplified one-layer version of the model were functionally equivalent for these kinds of scenarios, and to show the Basin community how and when groundwater pumping affects RSC streamflow.

KDA-DWR presented results for nine alternative historical scenarios at a public meeting in St. John on November 4, 2014. The Appendix documents KDA-DWR's modeling work presented at the meeting. The following observations from this work were made at the meeting:

1. The seven-layer GMD 5 model and the one-layer simplified version of it are functionally equivalent for the purpose of evaluating groundwater pumping impacts to streamflow in Rattlesnake Creek.

2. The GMD5 model shows that junior groundwater pumpers have caused significant reductions to the amount of groundwater that discharges to Rattlesnake Creek. Basin-wide, the depletions are on the order of 30,000-60,000 acre-feet over the period 1995-2007.

3. Pumping reductions near the stream provide the most immediate benefit to Rattlesnake Creek stream flow. However, only about 8% of the junior pumping takes place within two miles of the stream, and only about 3% is within one mile of the stream. This nearby pumping accounts for about 16% (2 miles) and 6% (1 mile) of the impacts to streamflow, respectively [averaged over years 1998-2007 as fractions of impact of scenario 2, from Appendix, Table A3].

4. Depending on the distance from the stream, it takes two or more years for pumping reductions to manifest as increased streamflow in significant amounts and longer to fully recover.

In comments on the First Draft of the Initial Impairment Investigation Report, Balleau Groundwater, Inc. noted what they agreed was a minor issue with the way that DWR's model simulations started — from a "transient" instead of a more correct "steady state" condition. DWR has developed revised model runs accordingly and found discrepancy between the transient and steady-state runs diminished over the period from 1940 to 2008, and were negligible for the purposes of this impairment analysis. Therefore, DWR has not redone the rest of this analysis. Documentation of the resulting work is included as an addendum to the Modeling Appendix of this Second Draft of the report.

Further descriptions and results of these simulations are available at dwr.kda.ks.gov/impairment/RSC.Quivira/TechReport.Attachments/.

6. Determination of Junior Groundwater Pumping Impacts at the Refuge

One of the fundamental elements of an impairment investigation is the determination of the impacts that junior diversions have had, are having, and will likely have on senior water rights. The GMD5 Model was used to evaluate the historical effects of junior groundwater pumping on Rattlesnake Creek streamflow at the Refuge. The results of the modeling analysis were presented at a public meeting in St. John, Kan., on Nov. 4, 2014, and are documented in the Appendix. Below is a summary of the results that are most relevant to this investigation.

To evaluate the effects that junior pumpers upstream of the Refuge have had on the flows of Rattlesnake Creek at the Refuge, two simulations of the model were compared. In one simulation, pumping in the basin junior to the Refuge's water right was "turned off," or omitted from the simulation, and the amount and timing of groundwater that discharged from the aquifer to the stream was observed. This simulation was called "no junior pumping." The other simulation, called the "baseline," simulates the effects on streamflow caused by the actual recorded historical pumping. The "baseline" results were subtracted from the "no junior pumping" results and the effects of junior pumping on Rattlesnake Creek simulated streamflow over time were observed. These simulations show that there would have been significantly more water in Rattlesnake Creek, often at times when the Refuge could have made use of the additional water, if there had been no pumping junior to the Refuge's water right. See Figures 5-9 and Figures A8 and A9 in the Appendix.

KDA-DWR performed other simulations with the GMD5 Model to evaluate how Rattlesnake Creek would respond to targeted pumping reductions close to the stream. The simulations showed that, because of the characteristics of the hydraulic connections between the stream system and the groundwater system, and because of the relatively low volume of pumping in the stream corridor, even targeted reductions close to the stream would take on the order of two to three years to produce significant increases in streamflow. Though such reductions would eventually restore streamflow, they would be ineffective in providing timely, same-year, much less same-season, relief from shortages caused by junior pumping. For example, if the Refuge needed water in August of 2016, restricting upstream pumping by junior water rights in the spring of 2016 would provide limited benefit to the Refuge until the summer of 2018. See Figures A6 and A7 in the appendix on page 43.

7. Observations From Comparing Model Simulations and the Refuge's Operational Water Needs

The Service has documented its management strategies and quantified its goals for providing seasonal habitat in its Comprehensive Conservation Plan. At KDA-DWR's request, Service staff prepared a document explaining the water needs and management at the Refuge and specifying time periods and amounts of water needed within those time periods to accomplish the Refuge's mission within the scope of its water right. An excerpt of the Service's Comprehensive Conservation Plan describing the management goals for Refuge's wetlands and the subsequent documentation of the Refuge's water seasonal needs is in Attachment 5, Table 4. The historical averages from Table 1 of the Refuge's document were not used in this analysis as they represent the Service's use from the significantly depleted supply which has been the focus of the Service's complaints for decades and which led to this impairment investigation. As noted in the section of the report on the Service's water right, it is reasonable to expect that most of the Service's water right will be needed in each year, particularly during critical, dry periods. The Service's complete Comprehensive Conservation Plan is available here: www.fws.gov/mountain-prairie/planning/ccp/ks/qvr/qvr.html.

KDA-DWR compared the modeled impacts of junior pumping with the seasonal water needs defined by the Service to determine if there have been times when the Refuge was prevented from exercising its water right because streamflow was taken by junior pumpers. Comments to the initial report were concerned about use of a schedule based on 14,632 acre-feet per year without making allowances for

evaporation and storage in Little Salt Marsh (LSM). The analysis compares the Service's schedule with flows at Zenith which is above LSM and thus could measure the water available to supply the storage and evaporation needs at LSM plus the diversion needs below it.

The analysis shows that junior groundwater pumping has prevented the Refuge from exercising its water right regularly in the past. Figures 6-7 show simulated seasonal streamflow that would have been in Rattlesnake Creek but for junior groundwater pumping and actual streamflow over time contrasted against the Refuge's seasonal water needs as defined by the Service in Attachment 5. The dark blue modeled pumping depletions are stacked on the light blue gaged streamflow to show how much streamflow would have been in Rattlesnake Creek but for junior pumping depletions. The green trace represents the Refuge's water needs, which is a repeating pattern over the time period illustrated. The red "impairment" trace shows where the dark blue modeled pumping depletions have intersected the green Refuge needs trace. The orange trace on the graphic shows the Refuge's reported historical diversions. The reported diversions are understated to varying degrees because they are measured after water from Rattlesnake Creek has been impounded and released from Little Salt Marsh, and therefore do not include evaporation from the Marsh, which would be counted as use. The surface area of the Little Salt Marsh is approximately 864 acres; 1,865 acre-feet of evaporation from the Marsh was assumed in the year of record for the certificate.

Note that the evaluation shows that the Refuge was impaired in 1987, the year of record for its water right certificate. The amount of simulated impairment is very small (220 acre feet); close to zero when compared to the amount of impairment simulated in other years, but it should be zero by definition. The small impairment simulated in 1987 is an artifact of imposing the Refuge's present operational plan on the historical record.

It is reasonable to assume that effects of the same magnitude seen in the year of record and caused by applying the Service's current operational plan to the historical record are present in all years in the simulation. No analysis was performed to compare differing management plans. Applying the Service's present operational plan on the historical record comes to within 1.5% of the seasonal and total water use in the year of record and indicates that the evolution of the Refuge's operations has not increased its water demand.

The historical impairment evaluation also does not explicitly take into account any mitigating effects that storage in Little Salt Marsh might have on the

Refuge's water needs. Figure 8, for instance, shows that in the two management periods May-June and July-September 1995, there is an abundance of water flowing at the Zenith gage. The expectation is that the Refuge would maximize their storage capabilities to the extent possible within the constraints of their primary mission to create and maintain habitat.

The historical impairment evaluation during dry periods such as 1990-1992 and 2001-2006 indicate that the pumping depletions to streamflow caused by junior groundwater pumping exceeded the actual measured streamflow, providing little to no opportunity to fill storage or fulfill the Refuge's water right. It is in these periods of pumping-induced shortages that the Refuge's water right was most severely impaired: 5730-8580 acre-feet in 1990-1992 and 4220-7930 acre-feet in 2001-2006. See Figure 10.

Unless groundwater pumping operations change significantly in the Rattlesnake Creek Basin, it is reasonable to assume that junior groundwater pumping will prevent the Refuge from exercising its water right regularly in the future.

Figure 4 below shows the method for determining the retrospective impairment illustrated in Figure 6-8.

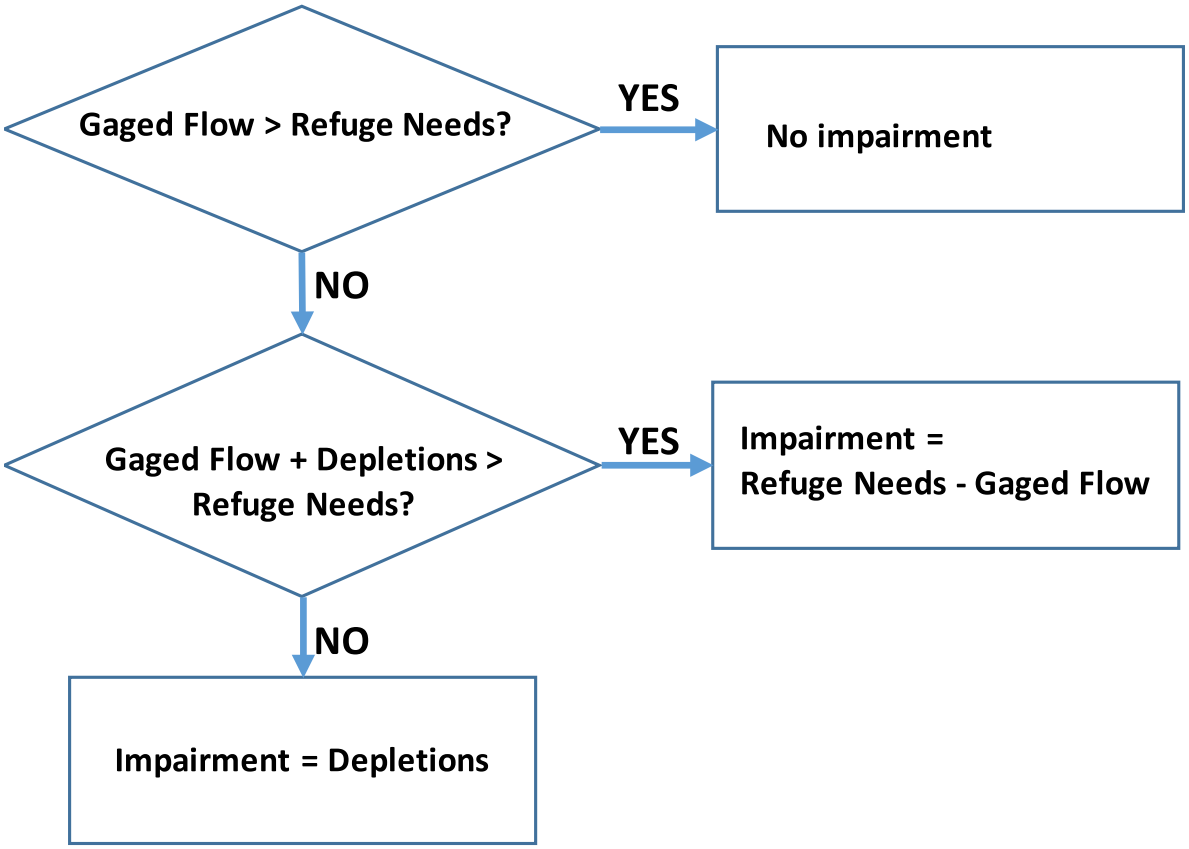


Figure 4 - Method for determining historical simulated impairment to the Refuge's water right based on the USGS gage at Zenith

USFW Management Period	Year	Zenith Gaged Flow	Modeled Impacts to RSC	Refuge Reported Diversions	Refuge Needs	Amount short of needs
Jan/Feb	2003	1860	7340	1180	1500	0
Mar/Apr	2003	4720	9640	320	3500	0
May/Jun	2003	2770	5690	0	2000	0
Jul/Aug/Sep	2003	650	4040	120	3500	2850
Oct/Nov	2003	840	4290	40	3600	2760
Dec	2003	540	2800	80	500	0
Jan/Feb	2004	1050	5140	970	1500	450
Mar/Apr	2004	2300	6270	2840	3500	1200
May/Jun	2004	1500	5430	370	2000	500
Jul/Aug/Sep	2004	2960	13070	4370	3500	540
Oct/Nov	2004	1690	7640	550	3600	1910
Dec	2004	1080	3220	580	500	0
Jan/Feb	2005	2490	7820	2130	1500	0
Mar/Apr	2005	2390	5630	130	3500	1110
May/Jun	2005	3000	7280	0	2000	0
Jul/Aug/Sep	2005	3620	8230	1660	3500	0
Oct/Nov	2005	900	5510	0	3600	2700
Dec	2005	740	2540	640	500	0
Jan/Feb	2006	1760	3710	1870	1500	0
Mar/Apr	2006	1940	4020	1240	3500	1560
May/Jun	2006	1060	4910	790	2000	940
Jul/Aug/Sep	2006	940	7970	750	3500	2560
Oct/Nov	2006	730	5150	220	3600	2870
Dec	2006	640	3650	0	500	0
Jan/Feb	2007	1670	7400	1690	1500	0
Mar/Apr	2007	10540	9530	1420	3500	0
May/Jun	2007	32510	14730	130	2000	0
Jul/Aug/Sep	2007	16420	14710	1720	3500	0
Oct/Nov	2007	2510	7580	1670	3600	1090
Dec	2007	3280	5240	830	500	0

Table 2 - Gaged flow, Refuge needs, and calculated shortfall

Table 2 above shows the recorded flow at the USGS gage at Zenith, the modeled groundwater pumping impacts to Rattlesnake Creek, the seasonal needs of the Refuge, and amounts, if any, that the pumping depletions impaired the Refuge's ability to execute its management plan. The table showing the entire simulation period from 1974-2007 is in Attachment 6.

The record shows that Rattlesnake Creek Basin experiences periodic dry cycles, when groundwater levels and streamflow decline, and wet periods when groundwater levels largely recover and streamflow is more plentiful. Figure 5 shows interpolated changes in water levels over the three review periods of the Rattlesnake Creek Management Plan. 2001-2004 was a dry period, but 2005-2008 saw widespread recovery to water levels. 2001-2012 shows declines in water levels on the order of 10 feet or more in the southwestern part of the basin, but in the northeastern part of the basin where the water table is shallower and more connected to the surface water system, declines are generally in the 0 ft. to -3 ft. range.

As demonstrated in the groundwater modeling work and the analysis above, water shortages to the Refuge are related to the impacts of junior groundwater pumping intercepting recharge which otherwise would show up as streamflow. These impacts are most pronounced during the dry periods.

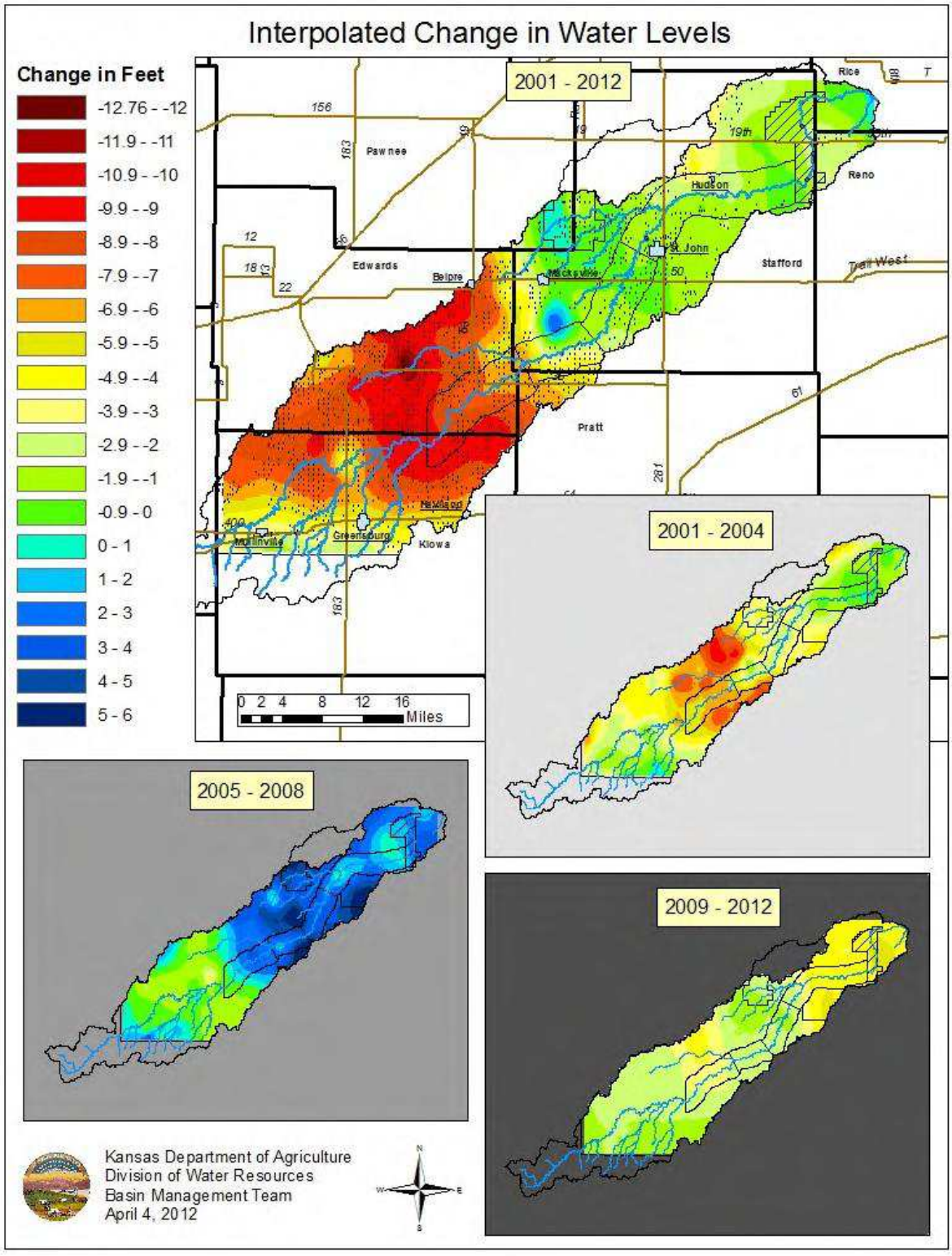


Figure 5 - Interpolated Change in Water Levels in Rattlesnake Creek Basin

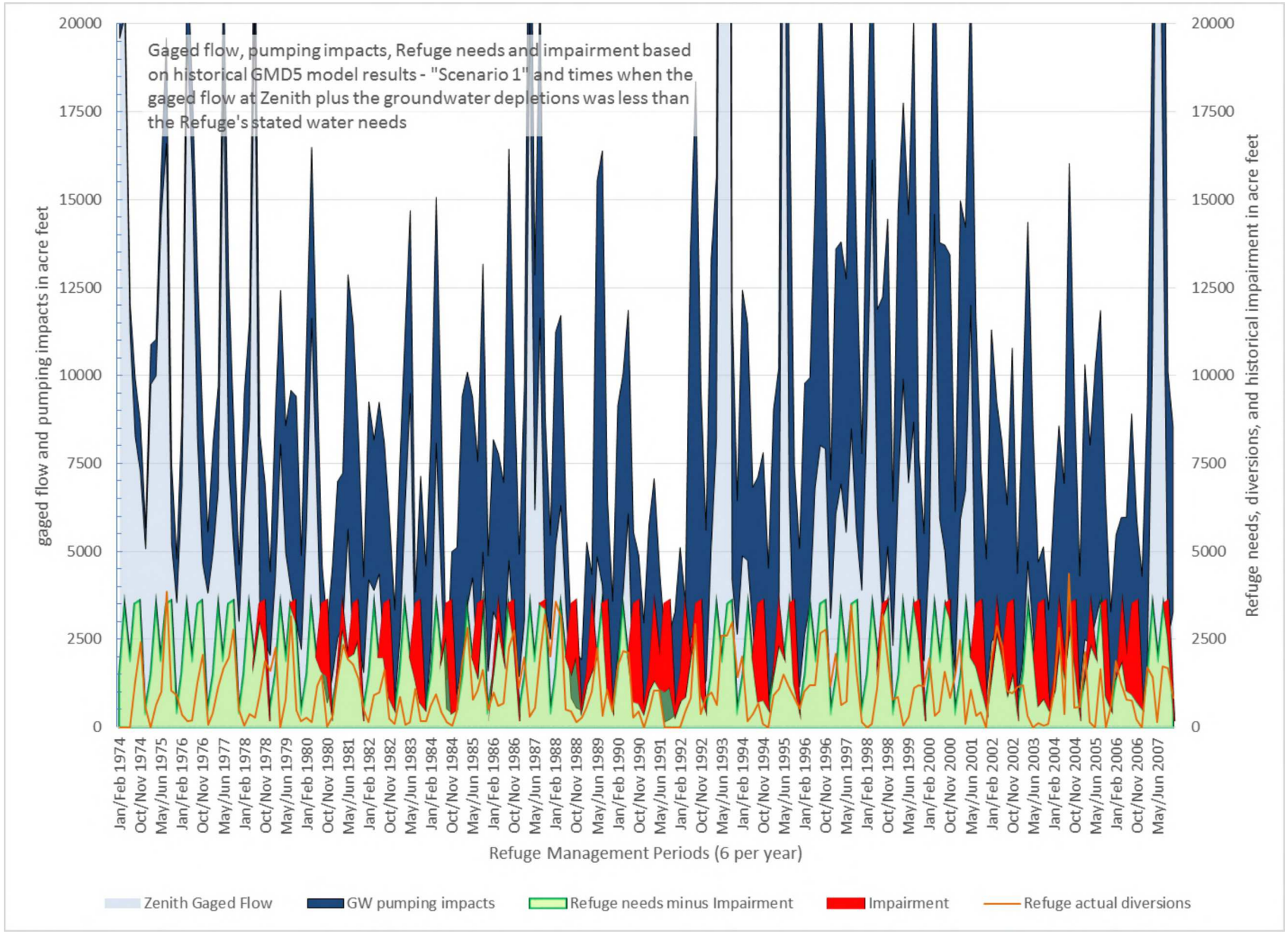


Figure 6 - Simulated evaluation of impairment to the Refuge's water right 1974 - 2007

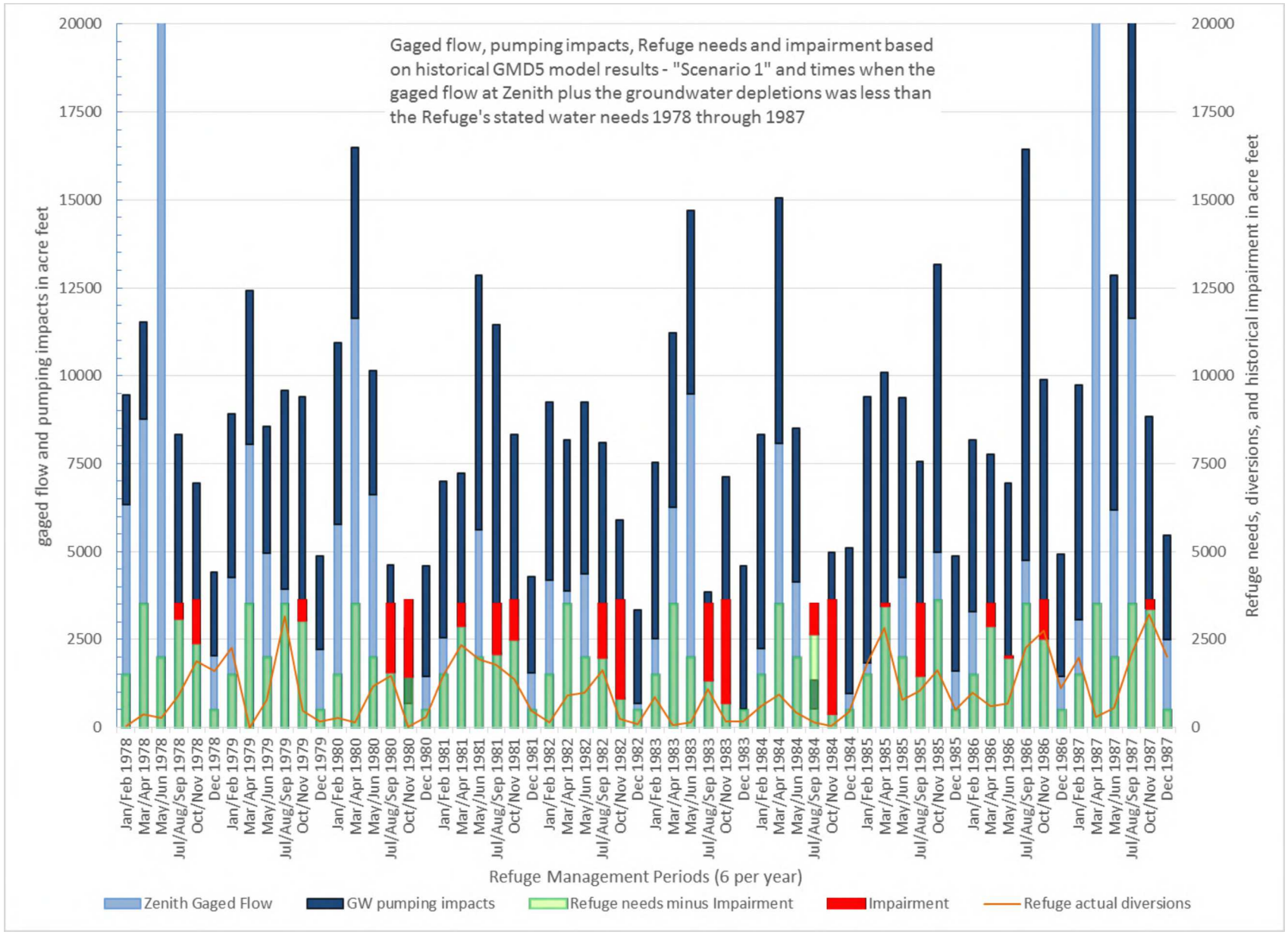


Figure 7 - Simulated evaluation of impairment to the Refuge's water right 1978 - 1987

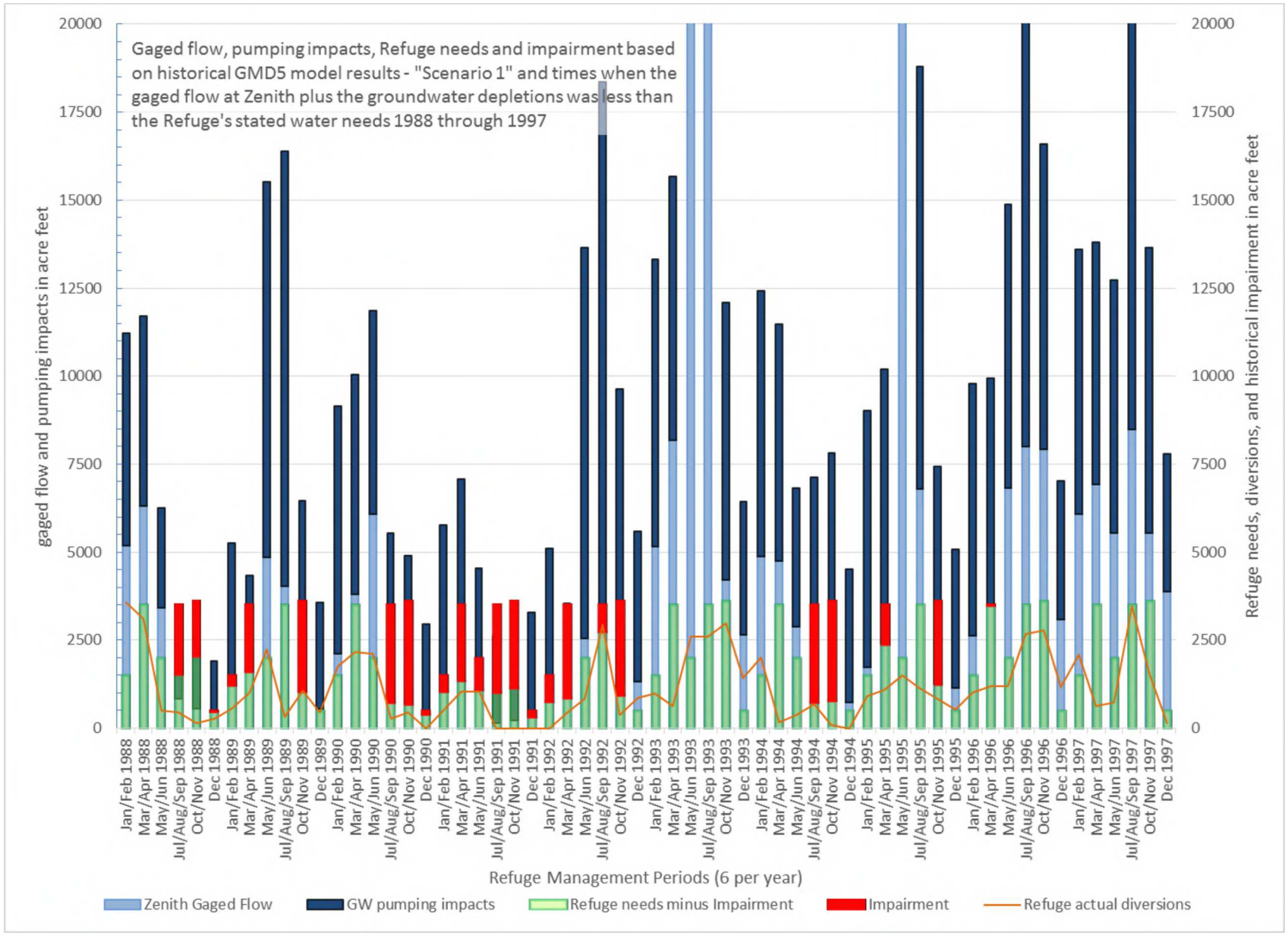


Figure 8 - Simulated evaluation of impairment to the Refuge's water right 1988 - 1997

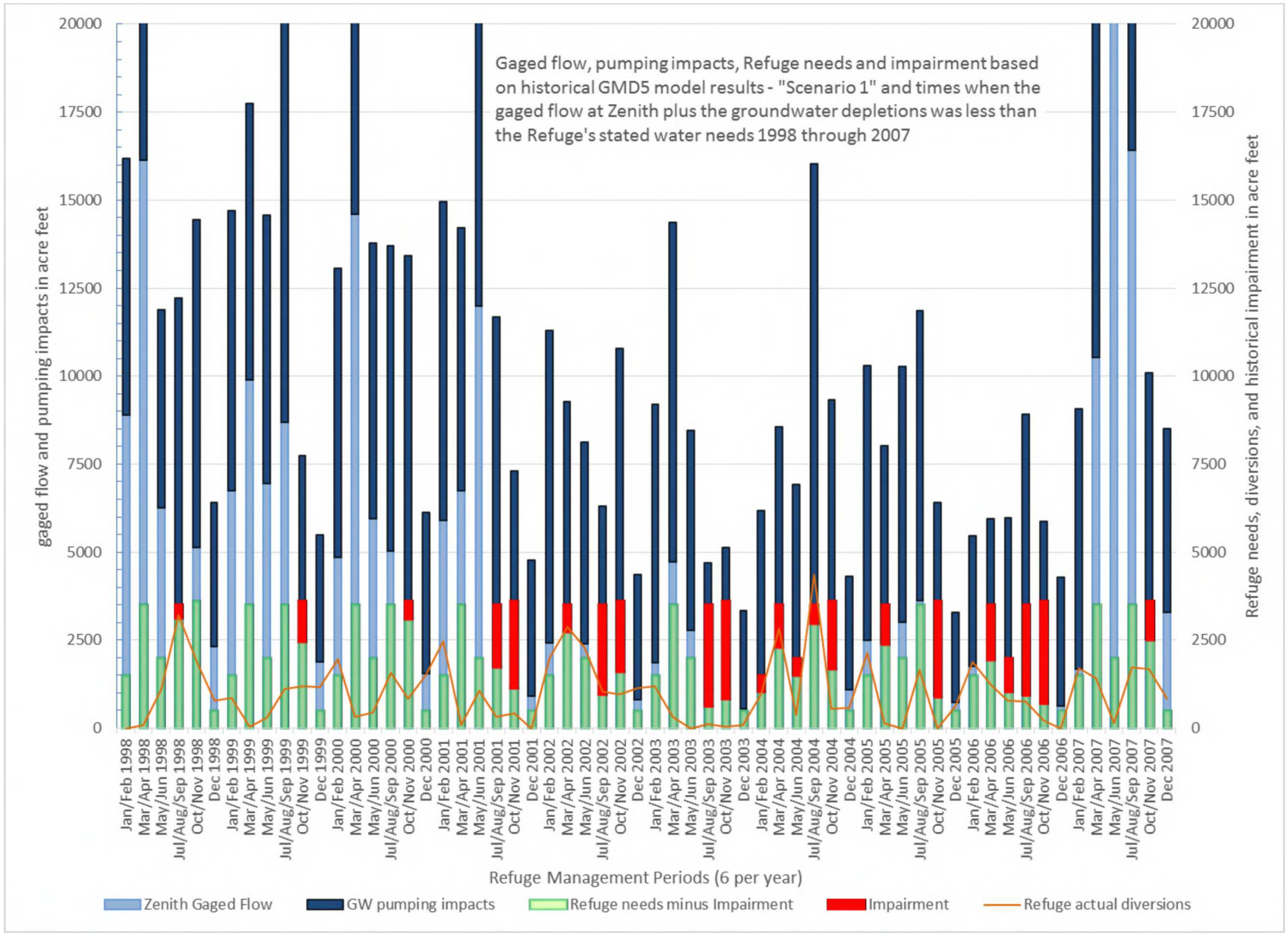


Figure 9 - Simulated evaluation of impairment to the Refuge's water right 1998 - 2007

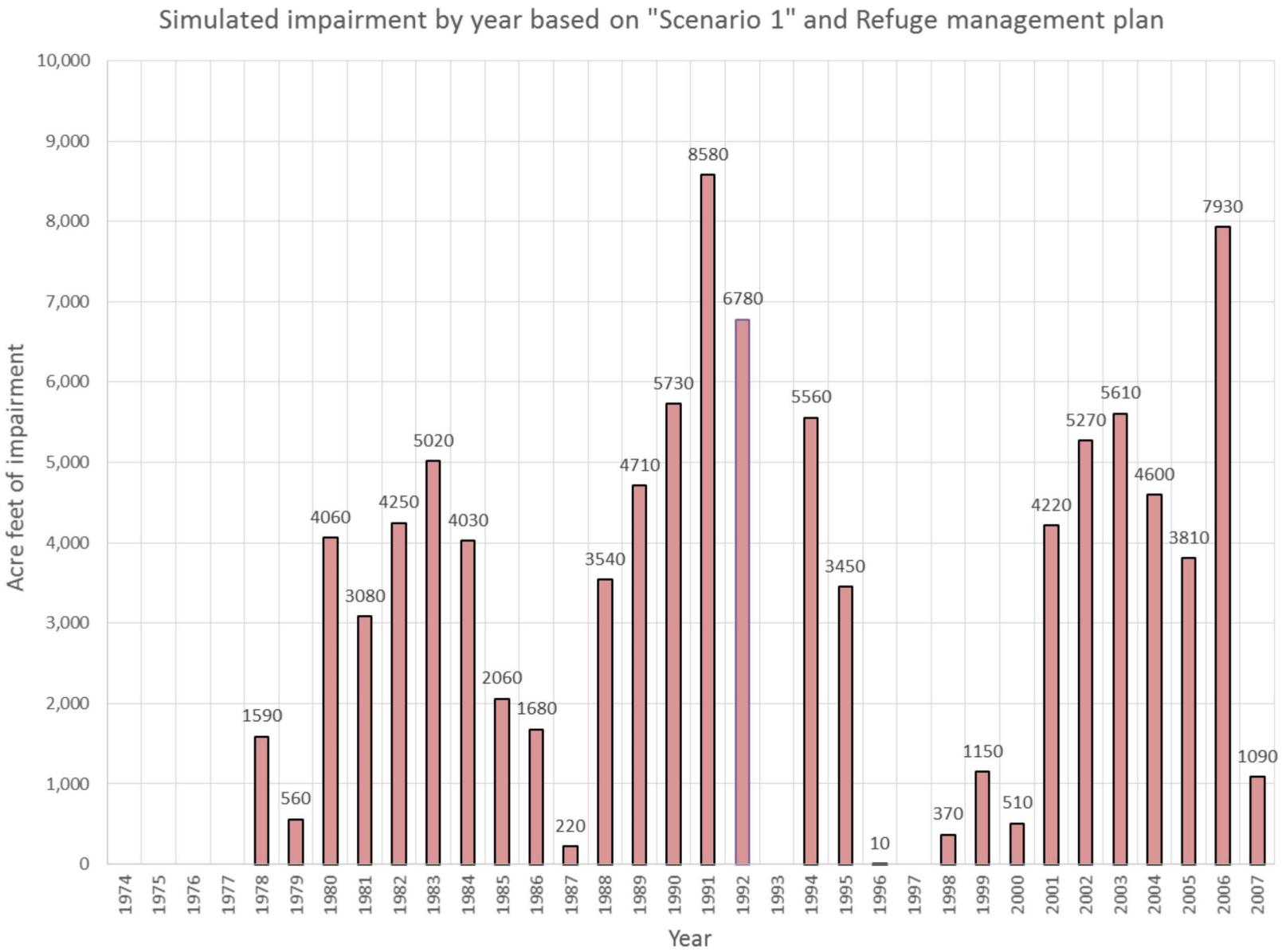


Figure 10 - Simulated amount of impairment to the Refuge's water right by year

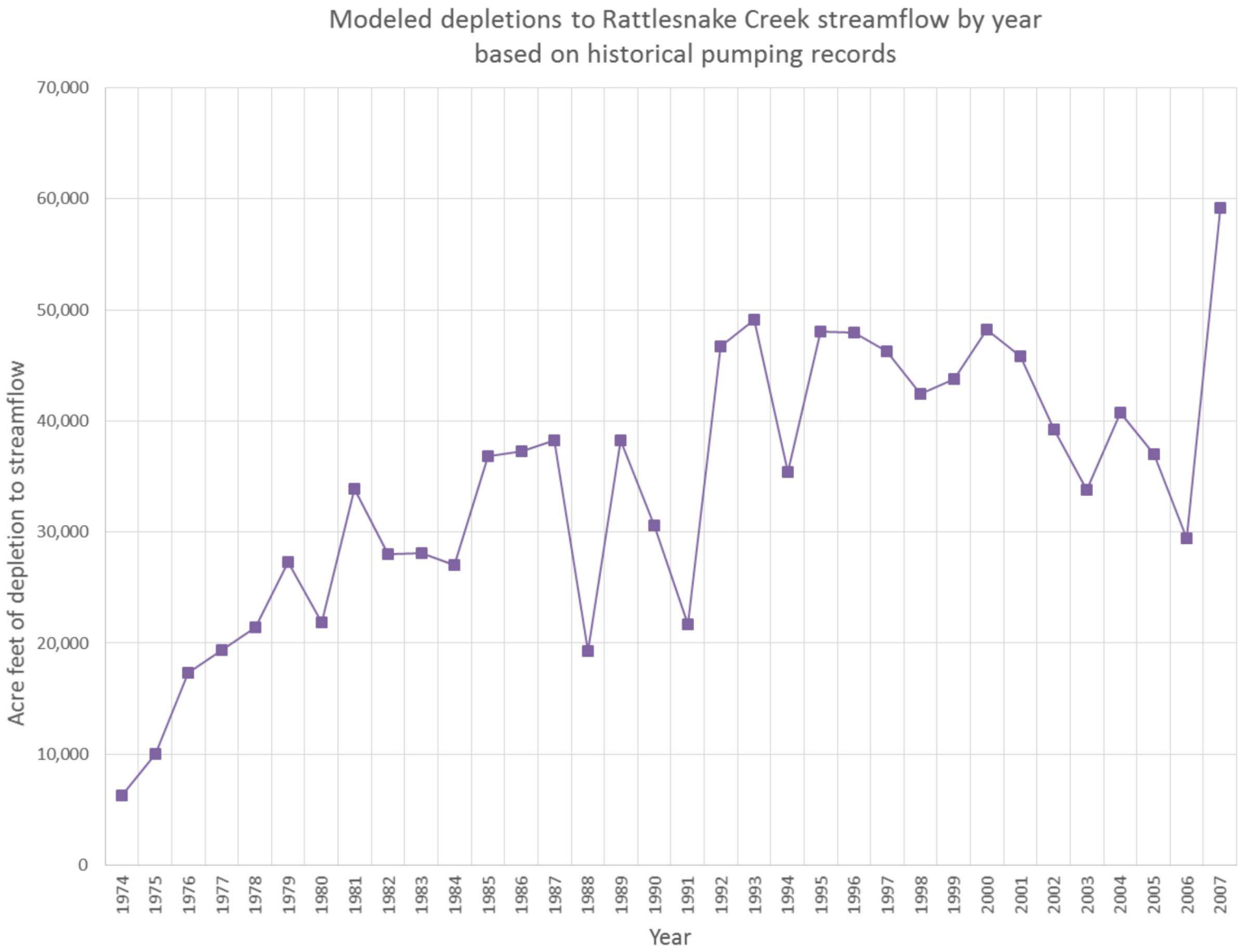


Figure 11 - Modeled depletions to Rattlesnake Creek 1974 - 2007

8. List of References

Kansas Statutes Annotated, Chapter 82a, Article 7
www.ksrevisor.org

Kansas Administrative Regulations, Chapter 5, Article 4
www.kssos.org

Kansas Department of Agriculture – Division of Water Resources, Rattlesnake Creek Third Four-Year Review of the Management Program 2009-2012, 2012

Kansas Department of Agriculture – Division of Water Resources, Rattlesnake Creek Second Four-Year Review of the Management Program 2005-2008, 2008

Kansas Department of Agriculture – Division of Water Resources, Addendum Rattlesnake Creek Four-Year Review of Management Plan, 2008

Balleau, Peter W.; Romero, David M.; Silver, Steven E.; *Hydrologic Model of Big Bend Groundwater Management District No. 5 and Appendices*, 2010

Larson, S. P.; *Big Bend GMD5 Model Peer Review*, 2011

9. List of Attachments

Appendix: November 2015 GMD5 groundwater model scenarios developed by KDA-DWR

Attachment 1: March 5, 2013, letter from United States Fish & Wildlife Service to Kansas Department of Agriculture Division of Water Resources

Attachment 2: April 8, 2013, letter from United States Fish & Wildlife Service to Kansas Department of Agriculture Division of Water Resources

Attachment 3: Feb. 8, 1993, Certification Memorandum, File 7571; Kansas State Board of Agriculture

Attachment 4: April 9, 1996, Certificate of Appropriation for Beneficial Use of Water; Water Right File No. 7,571; Priority Date August 15, 1957; Kansas Department of Agriculture – Division of Water Resources

Attachment 5: Oct. 23, 2013, Excerpt from Comprehensive Conservation Plan, Quivira Nation Wildlife Refuge; Unites States Fish & Wildlife Service

Attachment 6: December 2015 GMD5 Model; KDA-DWR Scenario 1 analysis results table; KDA-DWR

Modeling Appendix

GMD5 groundwater model scenarios developed by KDA-DWR
Sam Perkins and Ginger Pugh, KDA-DWR
November 12, 2015

Introduction

KDA-DWR staff developed and evaluated historical pumping scenarios with the Big Bend Groundwater Management District No. 5 (BBGMD5) groundwater model as part of this impairment investigation. The pumping scenarios are variations on pumping conditions specified for input to the historical simulation for the period 1940-2007. The purpose for developing the pumping scenarios was to quantify impacts of groundwater pumping within Rattlesnake Creek basin on Rattlesnake Creek streamflow, with a focus on inflow to the Quivira National Wildlife Refuge (Refuge) near the gage at Zenith, Kan.

Pumping impacts are defined as the difference between water budget terms for a given pumping scenario and baseline conditions specified for the calibrated model for the simulation period 1940-2007. Water budget terms with significant impacts in response to alternative groundwater pumping scenarios include groundwater storage, streamflow and evapotranspiration.

This Appendix parallels, in part, a presentation on Nov. 4, 2014, by the Chief Engineer and KDA-DWR staff to basin stakeholders in St. John, Kan., (Barfield and others, 2014). The Appendix also documents in greater detail than was presented in St. John, modeling results for Scenario 1, which were used in the impairment analysis. This scenario was run to calculate pumping impacts on streamflow by all groundwater rights upstream from the Rattlesnake Creek gage at Zenith, Kan., and junior to USFW Water-Right File No. 7,571 with priority date Aug. 15, 1957, a surface water right to diversions from Rattlesnake Creek to the Refuge (Refuge's right).

GMD5 groundwater model

Balleau Groundwater, Inc. (BGI), of Albuquerque, N.M. developed the regional groundwater flow model, referred to here as the BBGMD5 model (Balleau and others, 2010). The model extent includes all of GMD5 and a considerable region to the west of GMD5, including upstream basins drained by the Arkansas River and its tributaries, the Pawnee River and Rattlesnake Creek (Fig. A1). The model was calibrated to simulate transient groundwater flow for the historical period 1940-2007, with stress periods corresponding roughly to months and each stress period simulated with three equal time steps. The model extends 167.5 miles west to east, from near Garden City on the west to six miles east of the eastern GMD5 boundary, and 90 miles south to north on a regular grid of cells ½ mile on a side (335 x 180 cells). The BBGMD5 model is composed of seven layers representing hydrogeologic units from the land surface to bedrock, including river alluvium, Pliocene and Quaternary sediments, Cretaceous shales, Dakota, Cedar Hills sandstone and underlying Permian bedrock. The Cedar Hills sandstone is considered to be a source of significant saline water, and interest in tracing movement of saline water through the aquifers helped motivate development of the multilayer model. Runtime for the historical simulation

with the multilayer model ranged from five to twelve hours on KDA-DWR computers, depending on factors such as server response time.

A single-layer version of the multilayer model was developed by Steve Larson and staff at S.S. Papadopulos and Associates (SSPA). Mr. Larson served as peer reviewer for KDA-DWR and member of the Technical Advisory Committee (TAC) during development of the BBGMD5 model for KDA-DWR. His report documents the single-layer model version (Larson, 2011).

Conversion of the multilayer BBGMD5 model into a single-layer model involved primarily equating the aquifer property of transmissivity of the single-layer model to the sum of transmissivity over the seven layers of the BBGMD5 model. Evapotranspiration and recharge inputs for the single-layer model are the same as those for the BBGMD5 model. The single-layer model version was found to be a satisfactory substitute for the BBGMD5 model, based on comparisons of global water budgets, computed water levels and streamflow. It has the advantage of shorter run times of 30 to 60 minutes for the historical simulation on KDA-DWR computers. The single-layer model version was used to evaluate the pumping scenarios described here, one of which (Scenario 11, below) was run with both model versions to compare computed pumping impacts.

Mr. Larson (2011) also developed an alternative calibration of the single-layer model in which recharge was reduced by 20 percent and evapotranspiration was reduced by 40 percent, and for whose calibration performance was similar or improved on the BBGMD5 model. This alternative version of the single-layer model was not used by KDA-DWR in the analysis of pumping impacts under scenarios presented here.

Baseline and scenario pumping conditions

Baseline pumping and return flow conditions are specified for the historical simulation by an input file that is read by the MODFLOW Well package (Harbaugh and others, 2000). The data were prepared as described in the BBGMD5 model report (“Well and Water Management Operations,” p. 62-65) and summarized in the BGI report, Table 3, lines 20-34. Irrigation pumping is specified as an extraction from groundwater at grid cell containing the pd, and the corresponding return flow is specified as an injection into groundwater at the grid cell containing the place of use (pu). Pumping for non-irrigation use is similarly represented, but return flow is neglected; domestic pumping is excluded from the model.

The WELL package input file (pumping file) does not identify the type of water use or the water right associated with each pd or pu. Pumping scenarios developed as variations on the baseline pumping file. Consequently, the pumping scenarios were restricted to spatial and temporal variations of the baseline pumping file, and were applied without distinguishing type of water use. Input files for pumping scenarios were produced by preprocessors that read the baseline pumping file and wrote a pumping scenario file that included wells meeting the spatial and temporal criteria of the scenarios. The preprocessors are variations on one developed by Steve Larson that converted the historical pumping file for the multilayer model (file bbgmdmod_v6.wel) into one for the single-layer model (file bbgmdmod_v6_1Layer.wel).

Description of pumping scenarios

Pumping conditions and impacts for nine scenarios presented at the St. John meeting are described below, while additional scenarios that were examined are also identified. The nine scenarios include four basin-wide curtailments and five spatially focused curtailments, which are explained as follows.

The map in Fig. A2 identifies points of diversion for all groundwater rights in Rattlesnake Creek basin (dots) and distinguishes between those that are senior (solid) and junior (hollow) to USFW Water-Right File No. 7,571. Fig. A2 also identifies the Macksville and Zenith gaging stations along Rattlesnake Creek, which is typically gaining below the Macksville gage. The Zenith gage captures most flow generated in the basin and lies about two miles upstream from the first of three Refuge intakes (USFW File 7,571) from Rattlesnake Creek below the Zenith gage. Fig. A3 identifies these intakes and centers of the model's regular grid of cells that are ½ mile on a side.

Basin-wide pumping curtailments

The basin-wide scenarios curtail pumping to all wells in Rattlesnake Creek basin (Scenarios 1, 2, 2.5 and 2.75). Scenario 1 excludes all pumping at points of diversion within Rattlesnake Creek basin that lie upstream from the Quivira intakes and are junior to the date of the Refuge's water right, Aug 15, 1957. Pumping and return flow for these wells are shut down from the beginning of 1958 through the remainder of the simulation. All other scenarios are variations or subsets of this scenario.

For the purpose of the impairment analysis, the effect of pumping by rights junior to File 7,571 is represented by Scenario 1.

Scenario 2 applies to the same wells as Scenario 1, but excludes pumping and return flow beginning in 1990 instead of 1958, so that pumping under Scenario 2 is the same as baseline conditions until 1990.

Scenarios 2.5 and 2.75 apply to the same wells as Scenario 2, but instead of shutting the wells down beginning in 1990, pumping and return flow for those wells are multiplied by factors of 0.5 for Scenario 2.5 (a 50 percent reduction), 0.75 for Scenario 2.75 (a 25 percent reduction).

Targeted pumping curtailments

The targeted scenarios curtail pumping only within areas that are expected to produce faster streamflow response, based either on response zones reported by Balleau et al. (2011) or on distance to Rattlesnake Creek Scenarios.

Scenarios 7-9 are based on stream depletion response zones computed by Balleau et al. (2011), shown in Fig. A4 and in the Balleau report as Fig. 51. These scenarios shut off all junior pumping within computed areas of stream response exceeding 70 percent (Scenario 7), 40 percent (Scenario 8) and 20 percent (Scenario 9). Fig. A4 shows that, within the Rattlesnake Creek basin, all areas of depletion response exceeding 20 percent lie downstream of the Macksville gage.

Scenarios 10 and 11 shut off all junior pumping within one mile (Scenario 10) or two miles (Scenario 11) of Rattlesnake Creek. Fig. A5 maps these zones, and shows that they begin at the Macksville gage and proceed downstream. The Balleau response map suggests little would be gained by continuing these corridors upstream.

Scenario 11-ML identifies a version of Scenario 11 that was run with the multilayer BBGMD5 model version. Scenario 11 impacts under single- and multilayer model versions are compared below.

Other scenarios investigated

Other scenarios evaluated as part of the investigation of streamflow response to pumping curtailments, but not presented at the meeting in St. John include:

Scenario 3: 1-mi curtailment corridor for the entire length of Rattlesnake C.

Scenario 4: shut off junior pumping within Rattlesnake Creek alluvial extent as delineated by a GIS coverage from USGS within the state of Kansas. This alluvial extent is shown in Fig. A3 with a light blue shading, and in Fig. A4 for a smaller area in the vicinity of the Zenith gage and Quivira NWR. Fig. A3 shows that relatively few points of diversion lie within the alluvial extent, limiting the potential impact of curtailments.

Scenarios 5-6: These curtail pumping within preliminary versions of the Balleau response zones, and were superseded by Scenarios 7-9.

Scenarios delaying pumping curtailment until 2000.

Scenarios that were run using the single-layer model with the alternative calibration (recharge reduced by 20 percent and evapotranspiration reduced by 40 percent; Larson, 2011).

Model results

Scenario 1: Impact of pumping by rights junior to Water Right File No. 7,571 on streamflow

Impacts of pumping on Rattlesnake Creek streamflow as described in the Quivira Impairment Report and shown in Figs. 2 and 3 of the report are based on differences in the basin water budgets for Scenario 1 and a baseline model run for the historical period. The basin water budget refers to the water budget restricted to the Rattlesnake Creek basin as opposed to the global budget for the entire model domain. Some impacts of pumping from within Rattlesnake Creek basin by rights junior the Refuge Right eventually propagate outside the basin boundaries, so that baseflow impacts that pass through the Zenith gage are somewhat less than this total.

The Quivira Refuge management periods described in the Impairment Report are 1-3 months in duration. The baseflow impact for a given management period is the sum over impacts for corresponding time steps (about ten days each) according to the basin water budget. Budgets restricted to Rattlesnake Creek basin were extracted from model results for each year, but not for each simulated time step. Basin-only water budgets for each time step could be extracted from model output by

modifying a postprocessor and re-processing model results, but baseflow impacts within the basin for each time step can also be reasonably approximated by reducing global baseflow impacts for each time step by the ratio for the corresponding year of basin-only and global baseflow impacts. This approximation was used to represent baseflow impacts restricted to Rattlesnake Creek basin for each time step.

Table A1 compares annual pumping impacts on a water budget for Rattlesnake Creek basin with a global water budget, i.e. for the entire model domain, averaged over years 1998-2007. The Greek letter delta (Δ) symbolizes the change in a quantity for a given scenario with respect to the baseline, or calibrated historical model run. The comparison shows that for the averaged period 1998-2007, the baseflow impact restricted to the Rattlesnake Creek basin is only 74.4 percent of the impact over the entire model domain. The rightmost column is the ratio of baseflow impact to pumping reduction. The column labeled “Balance” is the sum over the four columns to its left (changes in storage, pumping, ET and baseflow). The water imbalance over the model domain of –116 acre-feet per year (afy) is attributed to impacts at constant heads (26 afy) and numerical error (90 afy). The balance, or sum over budget impacts restricted to Rattlesnake Creek basin is –8584 afy, and much larger than for the model domain.

Fig. A6 plots annual impacts on global water budget terms 1958-2007 for Scenario 1. Fig. A7 plots corresponding impacts restricted to Rattlesnake Creek basin. Comparison of the two figures shows that ET and baseflow impacts are reduced in Fig. A7 for the basin-only impacts, but show similar behavior in the two budgets; only storage impacts show significant differences. Fig. A8 shows baseflow impact from the global water budget for each stress period. Fig. A8 superimposes the annual ratio of basin-only and global baseflow impacts (right axis). As mentioned above, the basin-only impact on baseflow for each time step was approximated by the product of the global-budget baseflow impact and the ratio of basin-only and global baseflow impacts for the corresponding year (Fig. A8).

Fig. A9 plots Refuge flow deficiency (flow deficit) and baseflow depletion by the basin’s junior water rights. The flow deficit is given by the Quivira refuge requirement (needs) minus Zenith gaged flow, when that difference is positive, and is otherwise zero. When a flow deficit exists, the deficit is exceeded by baseflow depletion in all management periods except six that occurred prior to 1992.

Table A2 lists selected management periods from a worksheet that calculates impairment based on baseflow depletions within the Rattlesnake Creek basin. Spreadsheet calculations behind Table A2 are expressed in the table headings. Table A2 lists results for two sets of management periods. (a) In the first six periods, Refuge flow deficit exceeds baseflow depletion, in which case the deficit is attributed to predevelopment flow conditions and not to depletion by pumping. This situation occurred in only six management periods, all predating 1992. (b) The last six periods are for 2007, and illustrate more typical conditions, when flow deficits are either zero or are less than baseflow depletions. In this case, any flow deficits are attributed to baseflow depletion. The summary of spreadsheet calculations at the bottom of Table A2 show that, for 1974-1991, 87.67 percent of Refuge flow deficits are attributed to pumping depletion in the basin, while 12.33 percent of deficits are due to low-flow conditions that would have existed with no depletion by pumping, i.e. predevelopment low-flow conditions. In the years since 1991,

however, all flow deficits are attributed to depletion by pumping, and none to predevelopment low-flow conditions.

Summary of results presented by Barfield and others (2014)

Pumping impacts on water budgets are first summarized as average change in water budget terms over years 1998-2007 in Table A3 for the basin-wide and targeted scenarios of interest, and in Table A4 for comparison of impacts under the single- and multilayer model versions for Scenario 11. An explanation of these tables is followed by graphs showing temporal response for some of the pumping scenarios. See Figs. A6 – A14. Streamflow response statistics of interest in these results include average baseflow increase for 1998-2007, the ratio of baseflow increase to pumping reduction (or bang for the buck), and response time, or lag between pumping reduction and significant baseflow increase, which is presented qualitatively in the graphs.

Tables A3 and A4 are shown below as they were presented in 2014. The table columns are first explained as follows.

Columns 1 and 2 summarize scenario descriptions given above. In the remaining column headings, the Greek letter, delta (Δ) is used to symbolize the change in a quantity for a given scenario with respect to the baseline, or historical conditions for the calibrated model. Column 3, Δpumping is the change in pumping (acre-feet/year) for each scenario, denoted as reduction by parentheses and red type. The remaining columns summarize the water budget response for each scenario. Columns 4, 7 and 8 are responses of the significant water budget terms corresponding to change in baseflow, evapotranspiration and groundwater storage (acre-feet/year). Column 5 expresses the baseflow response in cubic feet/sec, a unit conversion of Column 4. Column 6 is the ratio of the baseflow response (col. 4) to pumping reduction (col. 3), and quantifies the relative efficacy, or bang for the buck, of each scenario; for now, the term “relative baseflow yield,” or “relative yield” as shorthand will be used for column 6.

Tables A3 and A4 differ in the type of water budgets that they reference. Table A3 summarizes impacts on water budgets restricted to the Rattlesnake Creek basin. Water budget balances within basins are not enforced, and water budgets indeed do not balance within the Rattlesnake Creek basin. Water budget impacts within the basin were summarized with the intent of better characterizing the baseflow impact at the Zenith gage.

Table A4 summarizes global water budget impacts, which are based on balanced water budgets over the entire active model domain, and which are balanced as a result of convergence of the solution for computed heads for each time step. The distinction between global and basin-only budget impacts was discussed previously for Scenario 1 results. Table A4 compares global water budget impacts for Scenario 11 based on the single- and multilayer model versions instead of impacts limited to Rattlesnake Creek basin because the multilayer model output does not provide the necessary data for that comparison without modifying the model’s output control instructions.

Of the basin-wide pumping scenarios, Scenarios 1 and 2 show the same pumping reduction average over years 1998-2007; the scenarios differ only in the date when shutoffs are applied (1958 for Scenario 1 and 1990 for Scenario 2, both of which predate the impact averaging period). Scenario 1 quantifies baseflow depletion by rights in the basin junior to the Refuge's water right, and is used in the impairment analysis described in the report. Scenario 2 characterizes what might have happened had such management action been taken in 1990.

The basinwide pumping scenarios curtail far greater pumping than the targeted pumping scenarios but yield relatively little baseflow. Scenario 2.75 with 25 percent basinwide pumping reduction has the lowest relative yield, i.e. producing only about 15 acre-feet of baseflow for each 100 acre-feet of curtailment (delta baseflow / delta pumping, col. 6). Scenario 2.5 with 50 percent basinwide pumping reduction is a close second yielding only about 19 acre-feet per 100 acre-feet of curtailment.

The targeted pumping scenarios in Table A4 show relative baseflow yields ranging from 43 to 63 percent, which correspond to response zone curtailment scenarios 9 and 7, respectively. Relative baseflow yields for stream corridor curtailment scenarios 10 and 11 fall in the middle of the targeted pumping scenarios at 54 and 50 percent, respectively.

Scenario 11: Comparison of impacts for single- and multilayer model versions

Scenario 11 was selected to run with the multilayer model version for comparison because it shows a significant baseflow impact of 5,560 afy or 7.7 cfs and a high relative baseflow yield, 50 percent. Line 3 of Table A4 shows small differences in budget impacts between the model versions averaged over years 1998-2007. Based on the similarity of computed impacts for the single- and multilayer model versions for Scenario 11, we expect that multilayer model versions of the other scenarios would also compare closely with the single-layer model versions that we have depended on for comparing scenarios.

Temporal response of water budgets to pumping curtailment for selected scenarios

Annual response of Rattlesnake Creek water budget terms to pumping curtailments are shown for basinwide curtailment under Scenario 2 and for targeted curtailment under Scenarios 9 and 11.

The temporal response to basinwide shutoff of pumping in 1990 (Scenario 2) is plotted on an annual basis in Fig. A10 for global water budget terms, and in Fig. A11 for Rattlesnake Creek water budget terms. Comparison of the two graphs shows similar behavior between the two budgets except for storage; the dissimilarity for storage is attributed to an imbalance in the Rattlesnake Creek basin budget, whereas the global budget is balanced as part of the model solution. Both Figs. A10 and A11 show that despite a large, immediate change in pumping and corresponding change in storage in 1990, baseflow response is negligible in the first two years of the shutoff, and is significant only beginning in 1992.

Fig. A12 shows the annual response of global water budget terms under Scenario 9, which shuts off pumping within zones of 20 percent or greater response. Baseflow response in the first two years of shutdown is greater than for Scenario 2, but is significant only beginning in 1992.

Figs. A13 and A14 show annual response of global water budget terms under Scenario 11 for single- and multilayer model versions. Again, baseflow response in the first two years of shutdown is greater than for Scenario 2, but is significant only beginning in 1992. Comparison of Figs. A13 and A14 shows that the single- and multilayer model versions of Scenario 11 exhibit very similar responses on an annual basis.

Conclusions

The single and multi-layer models are functionally equivalent for determining pumping impacts on streamflow.

GMD5 model results for the pumping shutoff scenarios show that baseflow reductions due to junior pumping are significant.

Scenario 1, which shuts off all pumping junior to Water Right File No. 7,571 in Rattlesnake Creek basin beginning in 1958, quantifies baseflow reductions in the basin, which would appear at the Zenith gage were it not for the pumping by juniors.

Pumping reductions near the stream produce faster baseflow response. However, none of the pumping shutoff scenarios produce an effective baseflow response for two to three years.

Response to Technical Comment

This section describes modeling work and results in response to the only technical comment from Balleau Groundwater, Inc. on modeling work that could have a bearing on the report. To summarize, a correction was applied as suggested by Balleau Groundwater modelers such that the initial model solutions are treated correctly. Here we describe the correction and the model runs to test its effects, and show that the correction has negligible effects on stream depletion calculations that are referenced in the original report.

Technical comment number 5 [from the file 2016-05-13 GMD5 Comments Final.pdf] reads,

“**The starting head condition used in the model scenarios is not steady. Beginning the simulations with an initial condition that is not in steady state should be corrected.**”

Chris Beightel and Sam Perkins discussed this comment on Friday, May 20, with Dave Romero and Steve Silver of Balleau Groundwater, Inc. to clarify its meaning. Chris first verified in that discussion that the above comment was the only one related to model runs that underlie the report.

With respect to the above comment, Dave and Steve explained that the unsteady initial conditions would affect the model budget terms (i.e., storage, streamflow, ET, and flows at specified-head boundary cells), and that their comment applies to the single-layer model version, but not to the

multi-layer version, for which they said that initial conditions were represented correctly. The implication was that the model should be re-run with this correction to calculate stream depletion impacts of pumping by junior right holders in the Rattlesnake Creek basin under Scenario 1. Dave and Steve suggested that a simple way to correct this would be to extend the length specified for the first stress period from 30 days (more accurately, 365.25/12 days) to, say, ten billion days, or a little over 27 million years. By extending the first stress period length in this way, the change in storage for the first stress period should be drastically reduced in magnitude, so that even though the first stress period is transient, it should be a good approximation for steady state conditions, under which change in storage is zero. (More accurately, the equation that Modflow solves under steady state conditions does not include a storage term; i.e., there is no change in storage under steady state conditions.)

Two additional simulations were run in order to respond to technical comment number 5. These include re-running the base case and Scenario 1 with the initial stress period redefined to approximate steady state conditions as described in the preceding paragraph. We used the additional model runs to determine the discrepancy introduced by the original unsteady initial conditions on (a) the global water budget for the base case, and (b) the stream depletions due to pumping by junior water right holders in the Rattlesnake Creek basin under Scenario 1.

Results: Impact of initial transient conditions for historical base case (1-layer model):

Global budgets for the original and corrected versions of the base case were compared, and show that by extending the stress period length from 30 to ten billion days, the change in storage by the end of the first stress period is reduced from a flow rate of 399 ac-ft/day to 4.52e-7 ac-ft/day, which is approximately zero using single-precision calculations. That is, setting the length of the first stress period to ten billion days is a convenient way to closely approximate steady state conditions. (At the same time, this approach avoids possible convergence problems that arise sometimes when the first stress period is specified as steady-state.)

Figures A15 and A16 plot the budget impacts due to changing the initial stress period to give a steady-state solution. Figure A15 plots the budget impacts for each 10-day time step of the simulation 1940-2007; Figure A16 plots an annual summary of the same budget impacts. Both figures show large budget impacts of the unsteady conditions of initial heads for the single layer model, although the impacts slowly decay over time. The time period of interest for the pumping and augmentation scenarios, particularly for Scenario 1 with full basin shutoff of junior rights, is 1958-2007.

Global impact of pumping on streamflow under Scenario 1 based on model runs beginning with steady state conditions, and comparison with original calculations

Pumping impacts, in particular streamflow depletion, were then calculated for Scenario 1 based on the model runs beginning with the quasi-steady state stress period (length set to ten billion days in both base case and impact case), and were compared with depletions calculated for the original model runs.

Fig. A17 shows streamflow depletion based on model runs that begin with a quasi-steady state stress period (blue line), and the discrepancy in the original calculation of streamflow depletion (thin red line, right axis), i.e. the original streamflow depletion minus the recalculated value. The discrepancy lies within a range from -0.3 and +0.9 cfs for 1958-2007 (mean -0.16 cfs, std deviation 0.25 cfs), so the discrepancy is negligible.

This comparison shows that pumping impacts on streamflow for the original and corrected versions of Scenario 1 are nearly identical, as we interpret the differences shown in Fig. A17 to be negligible. Based on this interpretation, we conclude that the original depletions calculated for the impairment report under Scenario 1 are acceptable.

References

Balleau, W. Peter, Dave M. Romero and Steven E. Silver, 2010. Hydrologic model of Big Bend Groundwater Management District No. 5. Balleau Groundwater, Inc., Albuquerque, N.M.

Barfield, David, Sam Perkins and Ginger Pugh, 2014. Power Point presentation on Nov. 4, 2014, to Basin Stakeholders at the St. John, Kan., library (file GMD5.ModelingScenarios.KDA-DWR.pdf, referenced in the Quivira impairment report).

Harbaugh, A.W., Banta, E.R., Hill, M.C., and McDonald, M.G., 2000, MODFLOW-2000, the U.S. Geological Survey modular ground-water model -- User guide to modularization concepts and the Ground-Water Flow Process: U.S. Geological Survey Open-File Report 00-92, 121
p. Link: http://water.usgs.gov/nrp/gwsoftware/modflow2000/modflow2000.html

Larson, Steve, 2011. Big Bend GMD5 Model Peer Review. S.S. Papadopulos and Associates, Bethesda, Md.

Backup Excel spreadsheet file:
RS_pumping_impact_scenario_1_cbc_RSMask_cwb_20150923_sp_revised _2015_1112.xlsm

Tables

Table A1. Comparison of Scenario 1 pumping impacts on global and basin-only water budget (1998-2007 average).

budget extent	Δstorage	ΔPumping	ΔET	ΔBaseflow	Balance	ΔB/ΔP
RS Basin	70,505	(143,529)	22,387	42,053	(8,584)	29.3%
model (global)	61,464	(143,529)	25,426	56,523	(116)	39.4%
RS Bsn / model			88.0%	74.4%		

Table A2. Selected refuge management periods from the period of impairment analysis, 1974-2007.

refuge mgmt period	year	u: annual basin depl / global depl	v: Refuge Needs	w: Zenith Gaged Flow	x=max(0, v-w): inflow deficit (refuge needs > Zenith gaged flow), af	y: baseflow depletion (approx. basin budget)	z=max(0, v-(w+y)): predev flow deficit	aa=x-z: impaired by depletion af
Oct/Nov	1980	0.9084939	3600	690	2910	2150	760	2150
Jul/Aug/Sep	1984	0.8769227	3500	520	2980	830	2150	830
Jul/Aug/Sep	1988	0.8061852	3500	830	2670	1960	710	1960
Oct/Nov	1988	0.8061852	3600	550	3050	1560	1490	1560
Jul/Aug/Sep	1991	0.8473867	3500	150	3350	2470	880	2470
Oct/Nov	1991	0.8473867	3600	220	3380	2460	920	2460
Jan/Feb	2007	0.7499378	1500	1670	0	7400	0	0
Mar/Apr	2007	0.7499378	3500	10540	0	9530	0	0
May/Jun	2007	0.7499378	2000	32510	0	14730	0	0
Jul/Aug/Sep	2007	0.7499378	3500	16420	0	14710	0	0
Oct/Nov	2007	0.7499378	3600	2510	1090	7580	0	1090
Dec	2007	0.7499378	500	3280	0	5240	0	0
					sum(x)	sum(y)	sum(z)	sum(aa)
sum 1974-1991					56020	462860	6910	49110
sum 1992-2007					50360	693230	0	50360
volumetric fraction:							sum(z)/ sum(x)	sum(aa)/ sum(x)
1974-1991							0.1233	0.8767
1992-2007							0	1

From cols a:b and u:aa in sheet cwb_QNWRGrp, file RS_pumping_impact_scenario_1_cbc_RSMask_cwb_20150923_sp_revised_cwb_lookup_2015_1112.xlsm.

Table A3. Pumping impacts on water budget within Rattlesnake Creek basin (1998-2007 average) for basin-wide (Scenarios 1–2.75) and targeted (Scenarios 7–11) pumping curtailments.

scenario	Scenario definition	Δpumping	Δbaseflow	ΔB cfs	ΔB/ΔP	Δstorage	Δ et
1	basinwide shutoff from 1958 on	(143,529)	42,053	58.0	29.3%	70,505	22,387
2	basinwide shutoff from 1990 on	(143,529)	34,420	47.5	24.0%	76,837	18,007
2.5	basinwide 50% pumping	(71,765)	13,366	18.4	18.6%	34,019	8,662
2.75	basinwide 75% pumping	(35,882)	5,475	7.6	15.3%	18,200	4,265
7	response zone >70%	(1,059)	661	0.9	62.4%	77	253
8	response zone >40%	(9,701)	4,646	6.4	47.9%	1,442	2,597
9	response zone >20%	(19,604)	8,326	11.5	42.5%	3,350	4,975
10	RSC 1-mi corridor to Macksville	(3,932)	2,115	2.9	53.8%	410	1,094
11	RSC 2-mi corridor to Macksville	(11,230)	5,560	7.7	49.5%	1,396	3,086
Notes:	[1] Restrict selections to Rattlesnake C basin wells junior to Aug 15 1957 (USF&W File 7571).						
	[2] Scenario 1 selection begins Jan 1958 (str per 218); others begin Jan 1990 (str per 602).						
	[3] Scenarios are specified as input to preprocessor by scenario id and pump scaling factor.						

Table A4. Comparison of single- and multilayer model versions of Scenario 11: pumping impacts on global water water budget (1998-2007 average).

scenario id	Scenario definition [1,2,3]	Δpumping ac-ft/y	Δbaseflow ac-ft/y	Δbaseflow cfs	ΔB/ΔP pct	Δstorage ac-ft/y	Δ ET ac-ft/yr
11	RSC 2-mi corridor to Macksville	(11,230)	5,729	7.9	51.0%	2,253	3,275
11 ML [4]	RSC 2-mi corridor to Macksville	(11,230)	5,464	8	48.7%	2,404	3,379
difference	[multi - single] layer versions	0	(265)	(0)	-2.4%	150	104

Figures

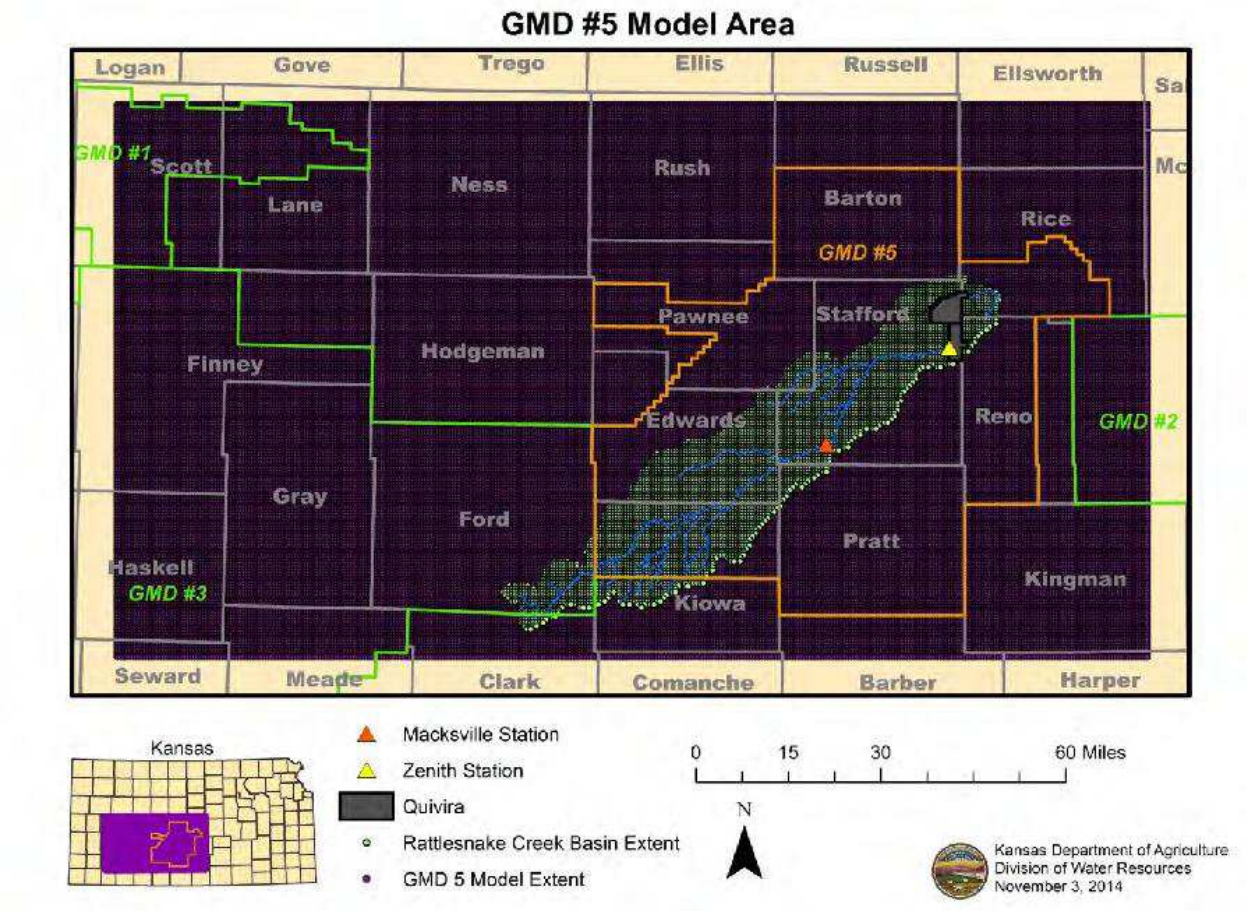


Fig. A1. GMD5 model extent. (Slide 6, Barfield et al., 2014)

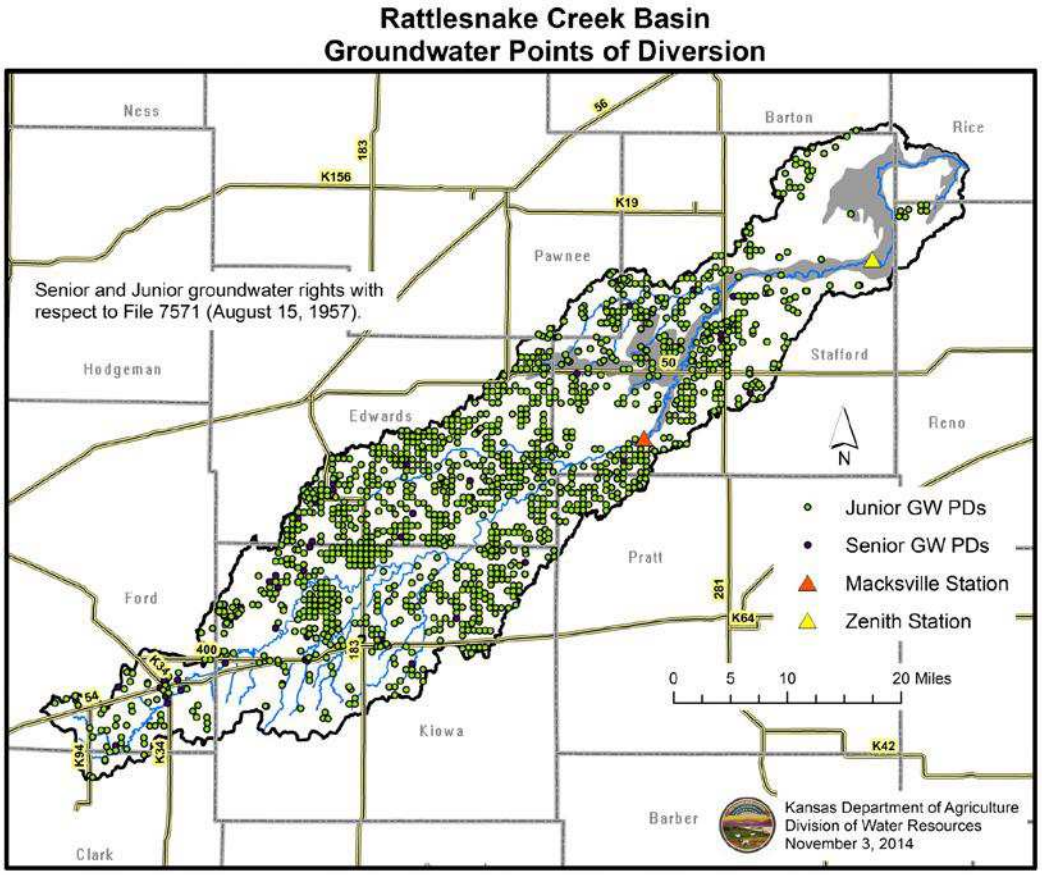


Fig. A2. Groundwater points of diversion in Rattlesnake Creek Basin. (Slide 7, Barfield et al., 2014)

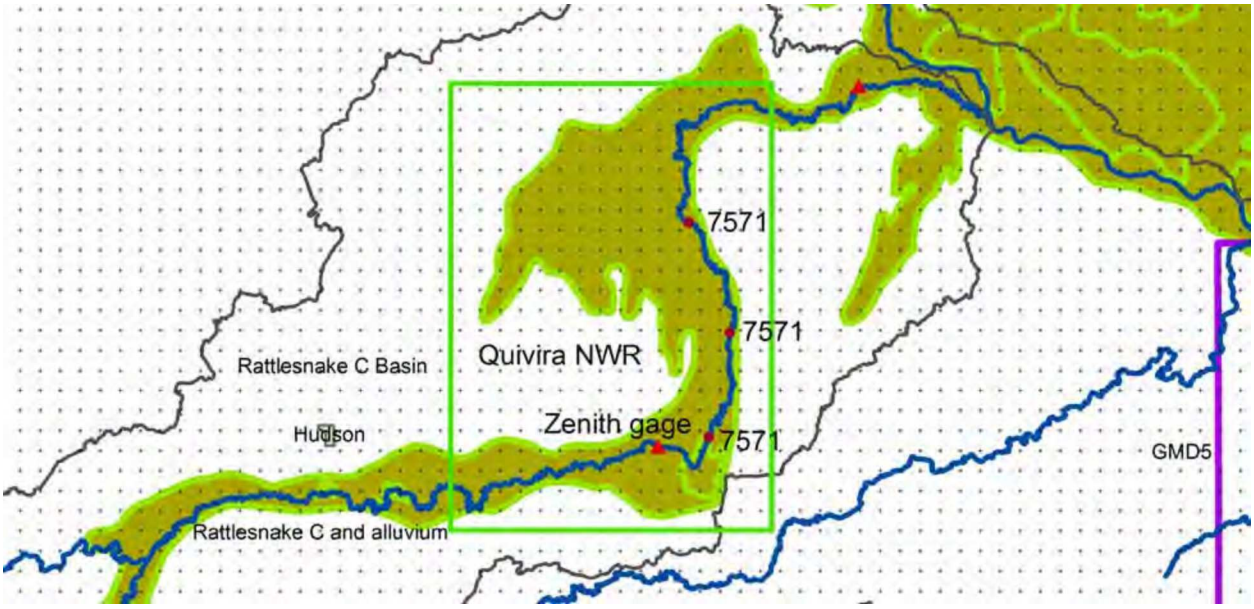


Fig. A3. Vicinity of Quivira National Wildlife Refuge and intakes from Rattlesnake Creek (USFW Water Right File No. 7,571) downstream from Zenith gage.

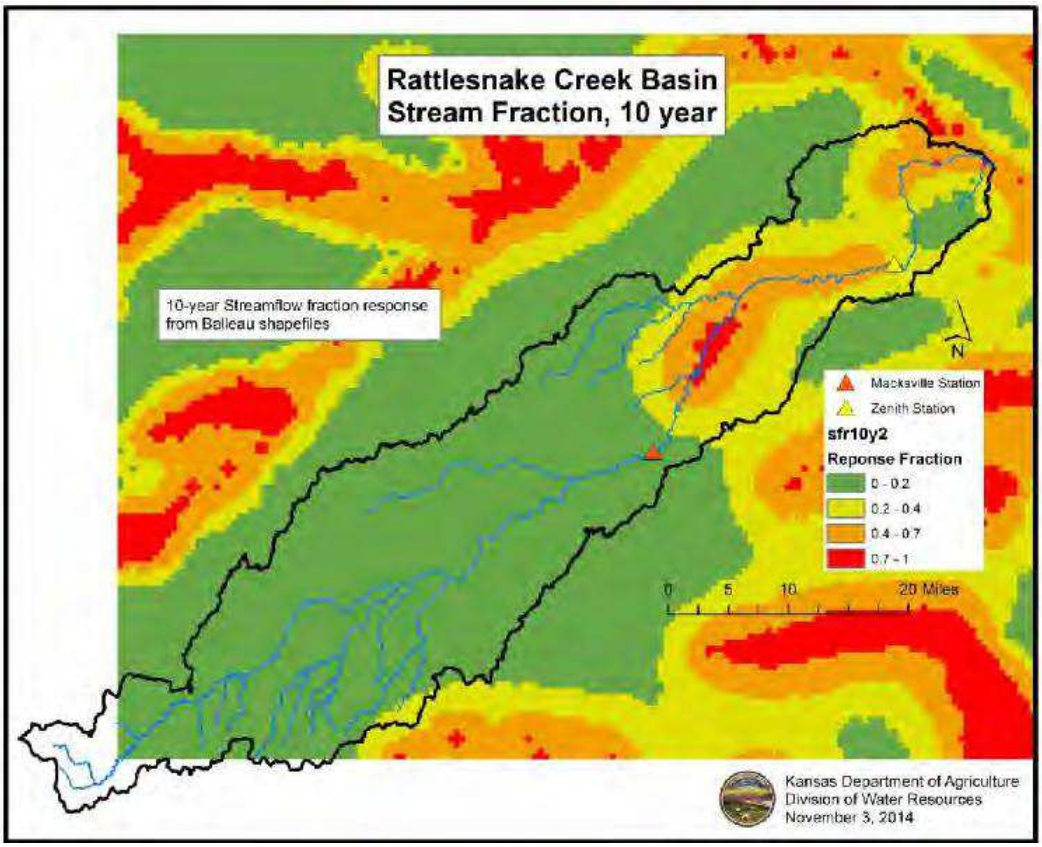


Fig. A4. Map of 10-year streamflow response, the fraction of Rattlesnake streamflow at the Zenith gage depleted by ten years of pumping, evaluated at each model grid cell within the mapped area. (See also Fig. 51, Balleau et al., 2010)

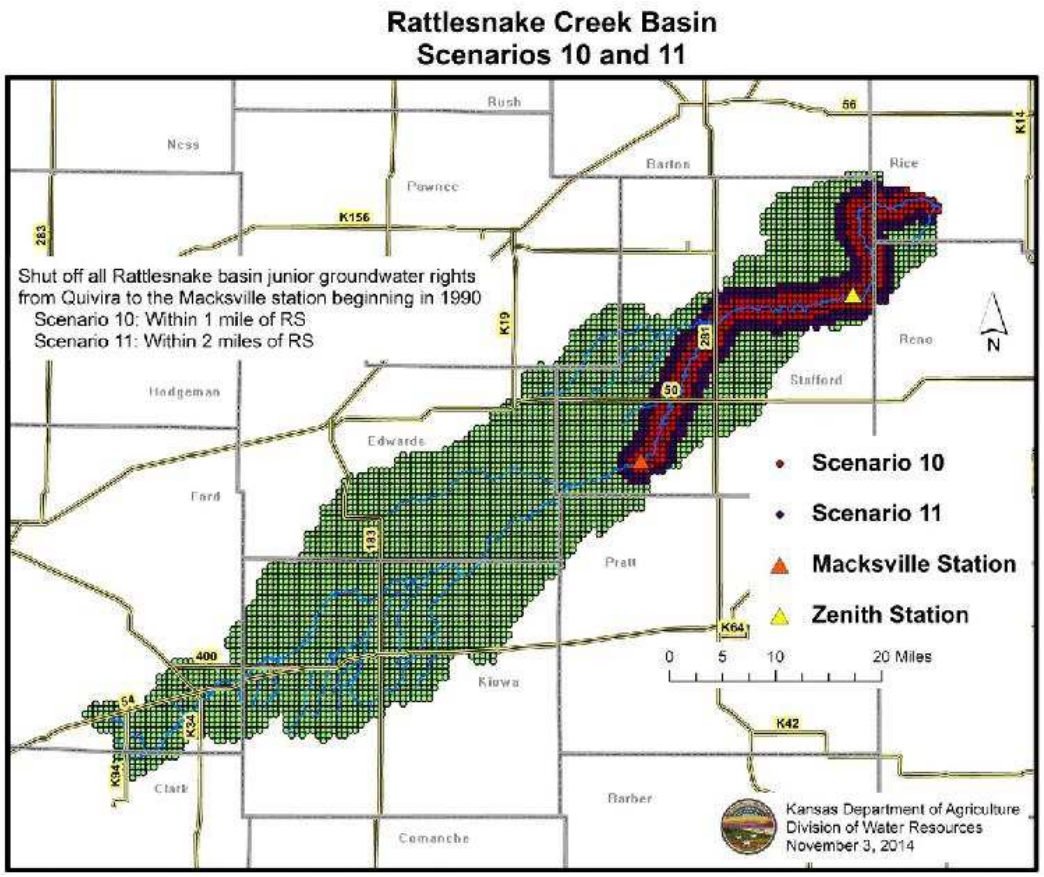


Fig. A5. Map showing one-mile and two-mile corridors along Rattlesnake Creek within which all junior pumping is shut off for Scenarios 10 and 11, respectively.

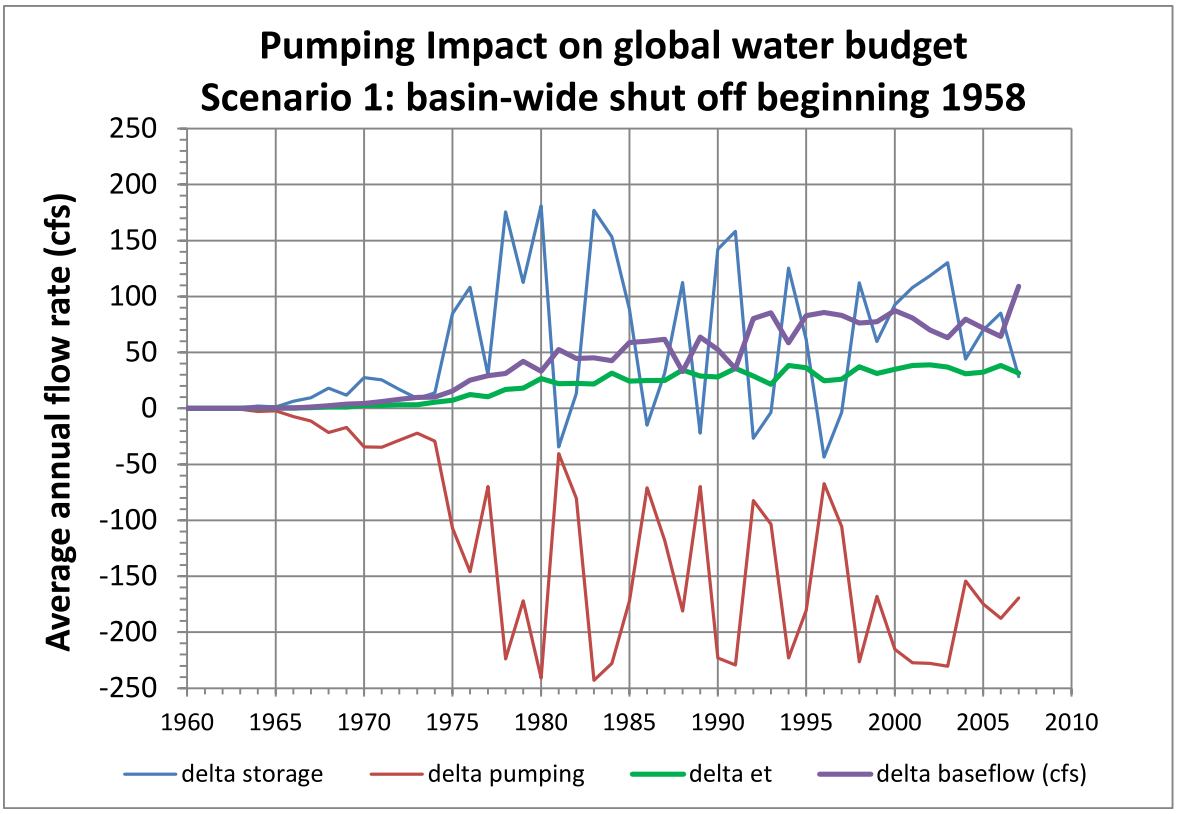


Fig. A6. Global water budget impacts 1958-2007 for Scenario 1 as flow rates, cu. ft/sec.

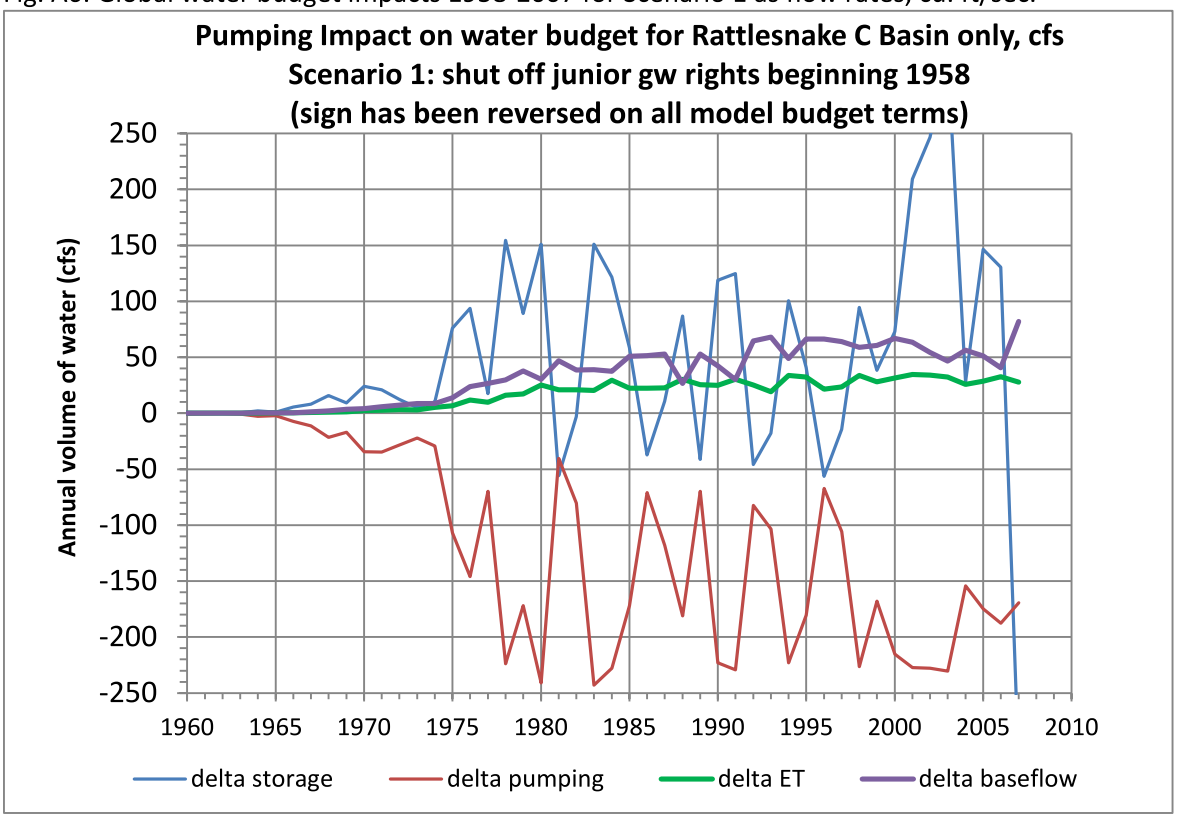


Fig. A7. Rattlesnake Creek Basin water budget impacts 1958-2007 for Scenario 1 as flow rates, cu. ft/sec.

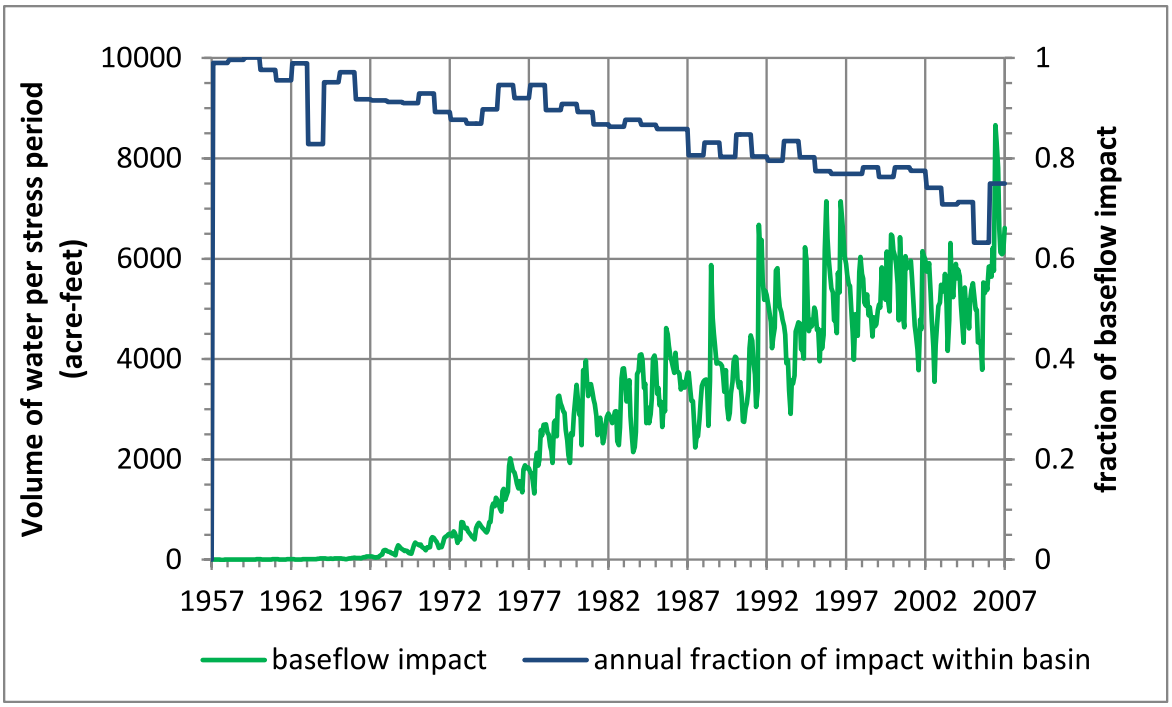


Fig. A8. Scenario 1 global pumping impact on baseflow per stress period, acre-feet (left axis) and annual fraction of global impact on baseflow within basin (right axis). Stress periods approximate months (365.25/12 = 30.4375 days). [Chart at AD822, Impacts_RS_wells_scenario_1_bgw, backup file]

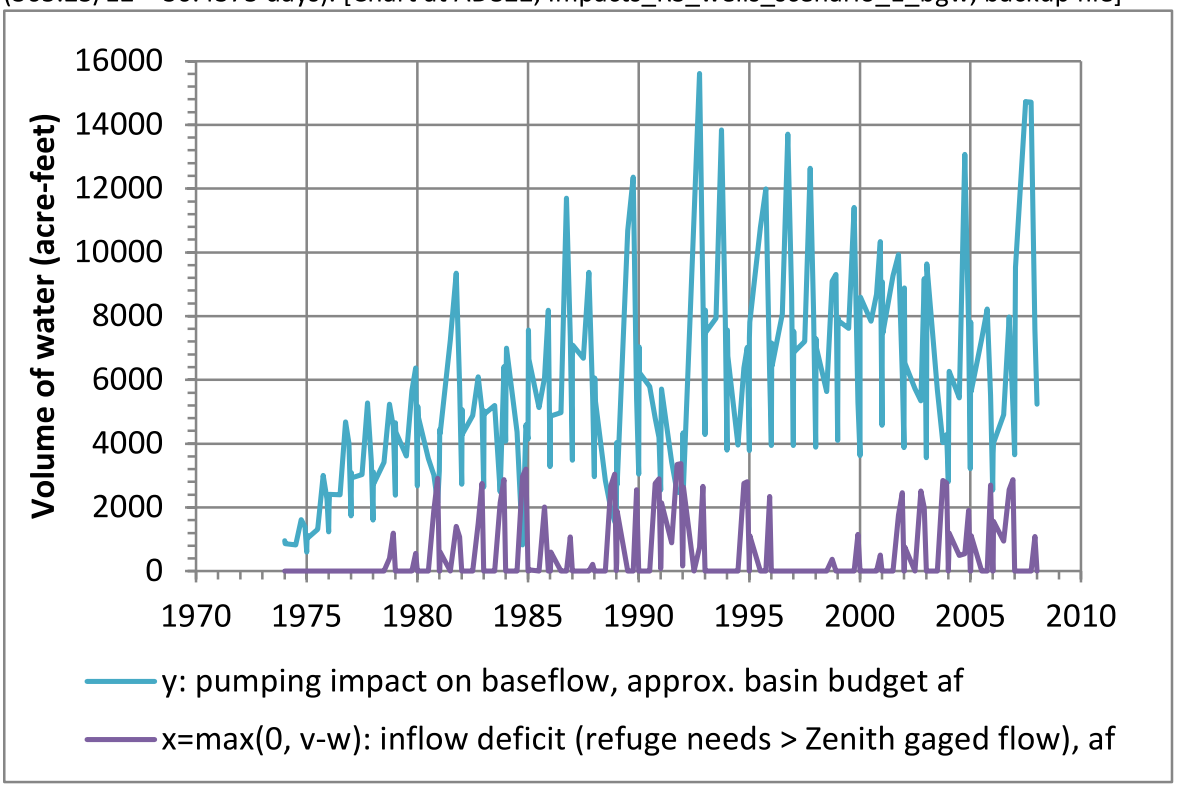


Fig. A9. Deficit in Refuge requirement (purple) and baseflow depletion by pumping (blue), for each Refuge management period. [Chart at w220 in sheet cwb_QNWRGrp of backup file]

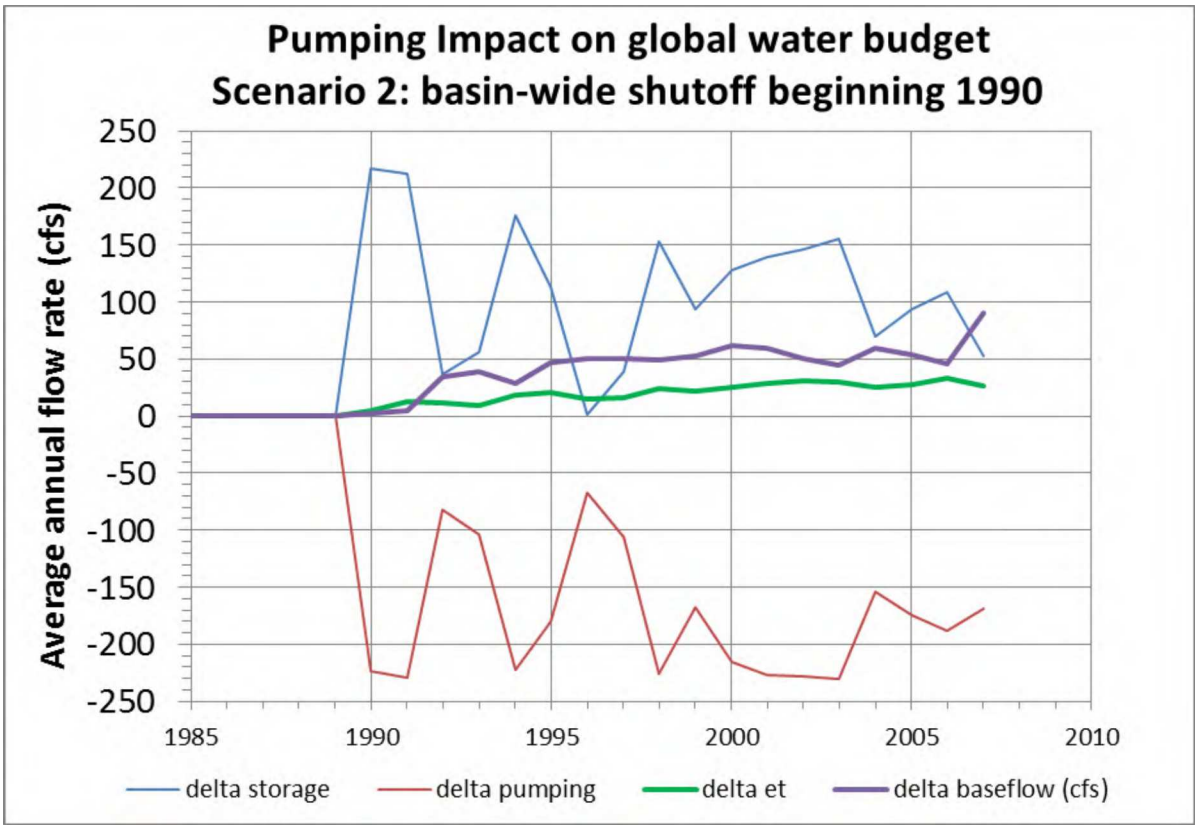


Fig. A10. Pumping impacts on global water budget for Scenario 2: basinwide shutoff beginning 1990.

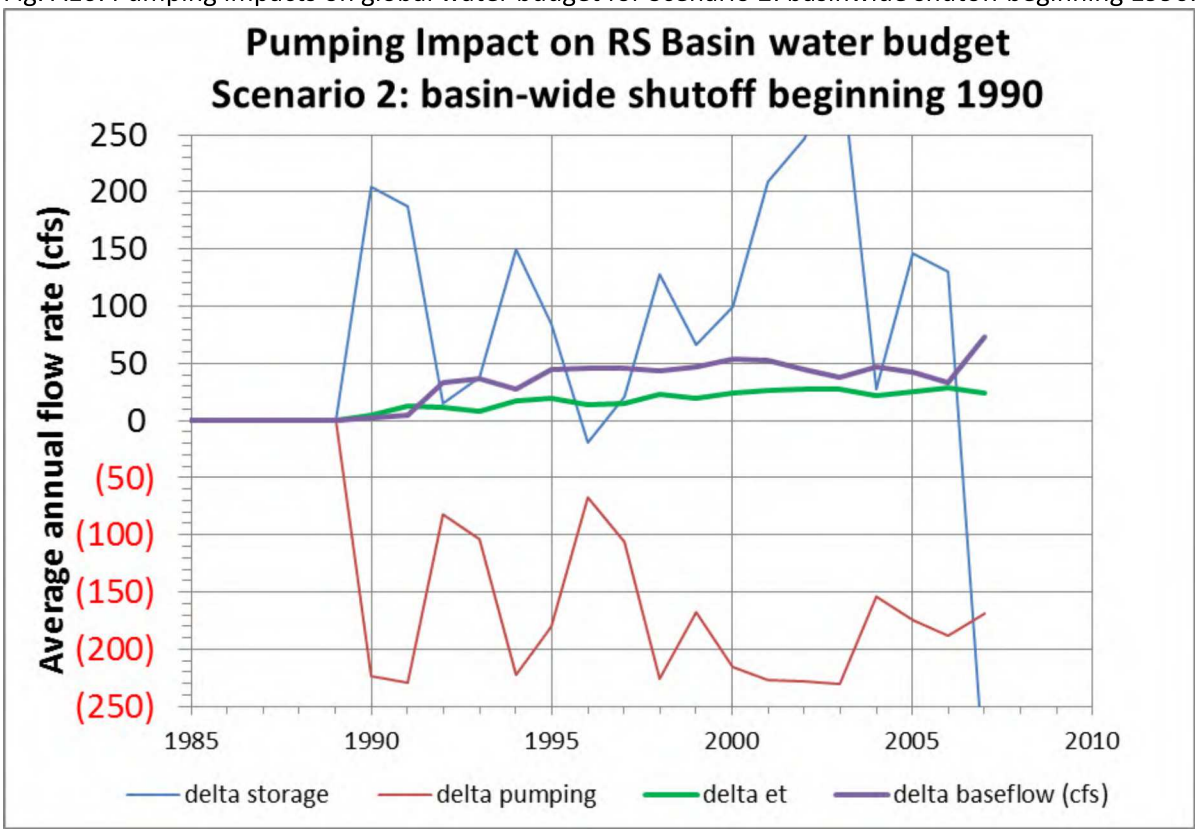


Fig. A11. Pumping impacts on RS Basin water budget for Scenario 2: basinwide shutoff beginning 1990.

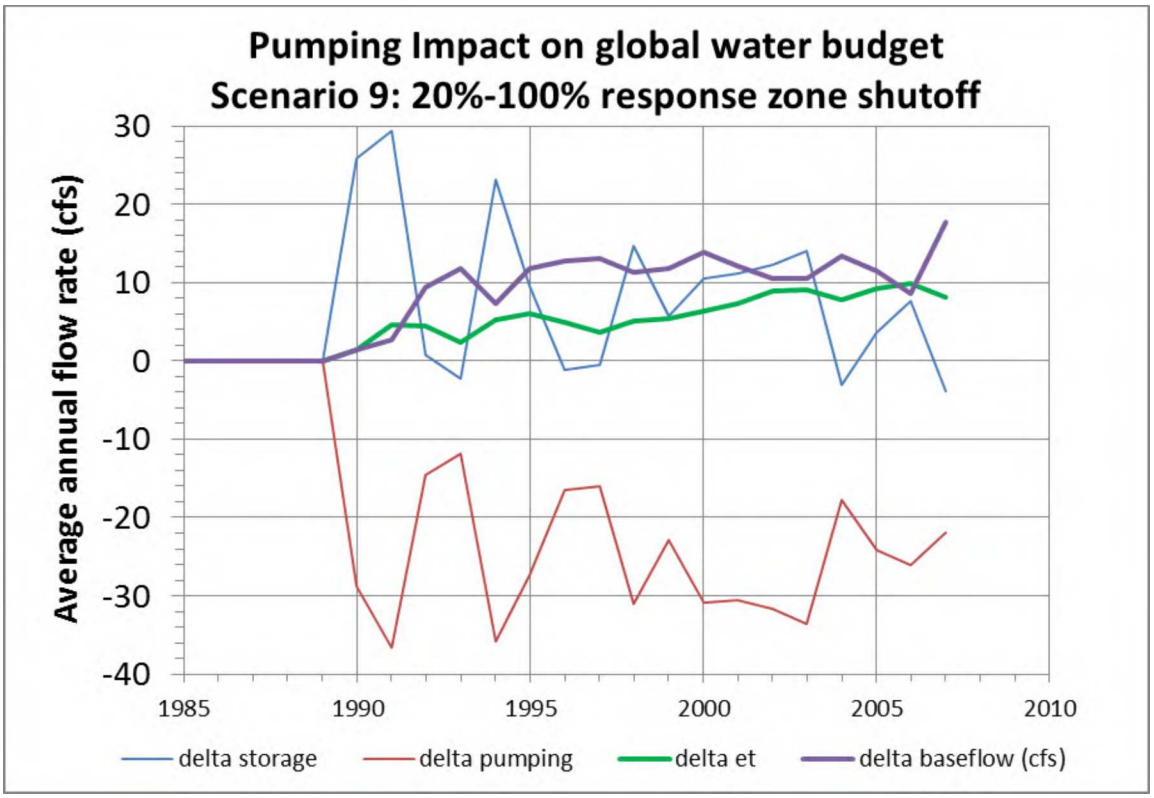


Fig. A12. Pumping impacts on global water budget for Scenario 9: targeted shutoff of wells within 20 percent or greater response zones beginning 1990. (response zones by Balleau and others, 2010)

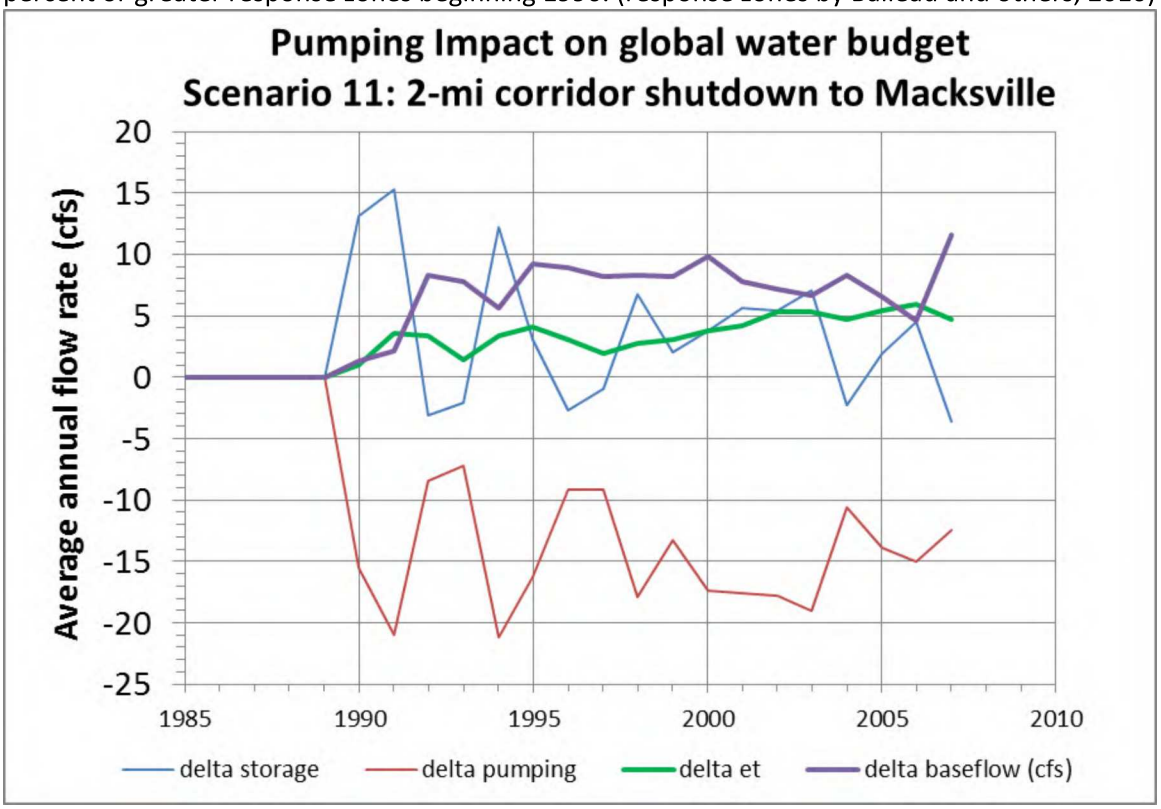


Fig. A13. Pumping impacts on global water budget for Scenario 11 (single-layer model version): targeted shutoff of wells within two miles of Rattlesnake Creek beginning 1990.

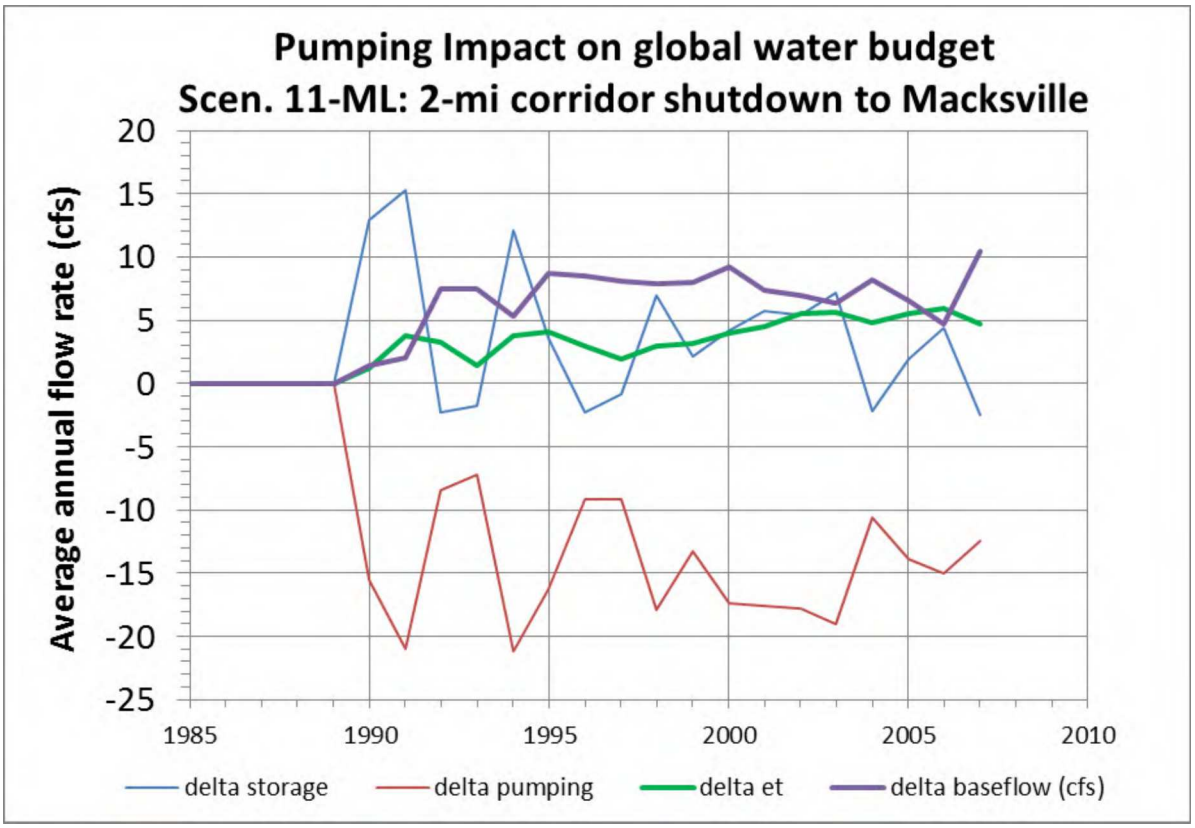


Fig. A14. Pumping impacts on global water budget for Scenario 11-ML (multilayer model version): targeted shutoff of wells within two miles of Rattlesnake Creek beginning 1990.

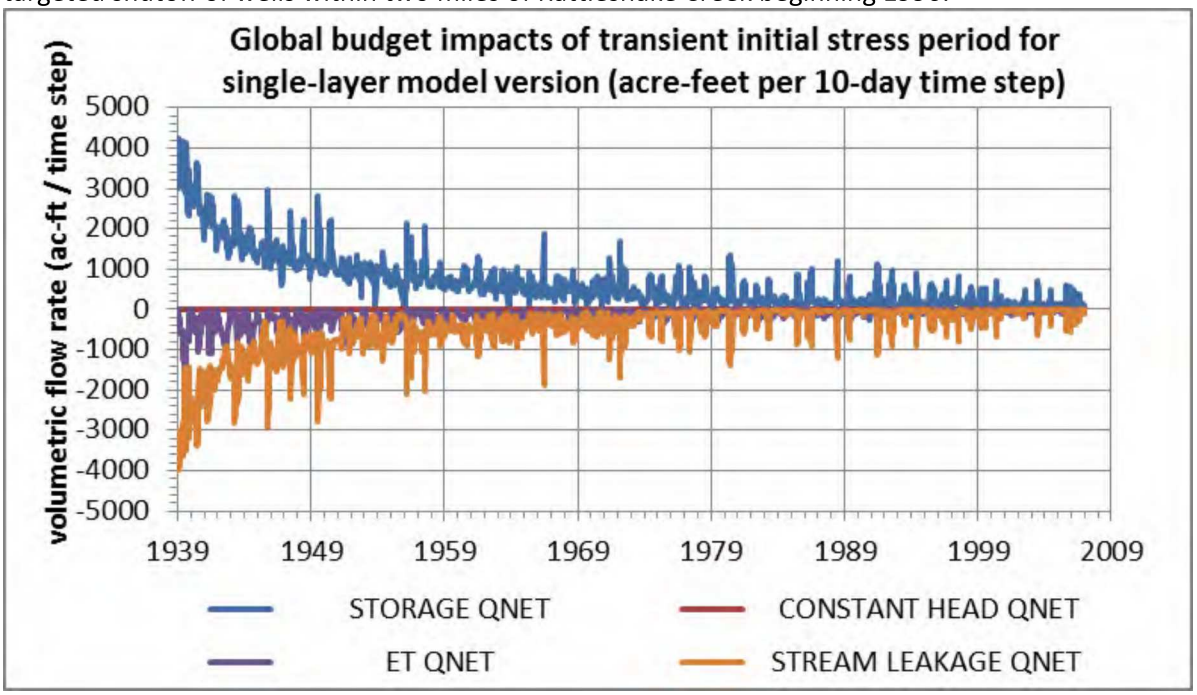


Fig. A15. Global budget impacts (acre-feet per ten-day time step) introduced by transient conditions in first stress period for the historical base case simulation 1940-2007 (single-layer model version).

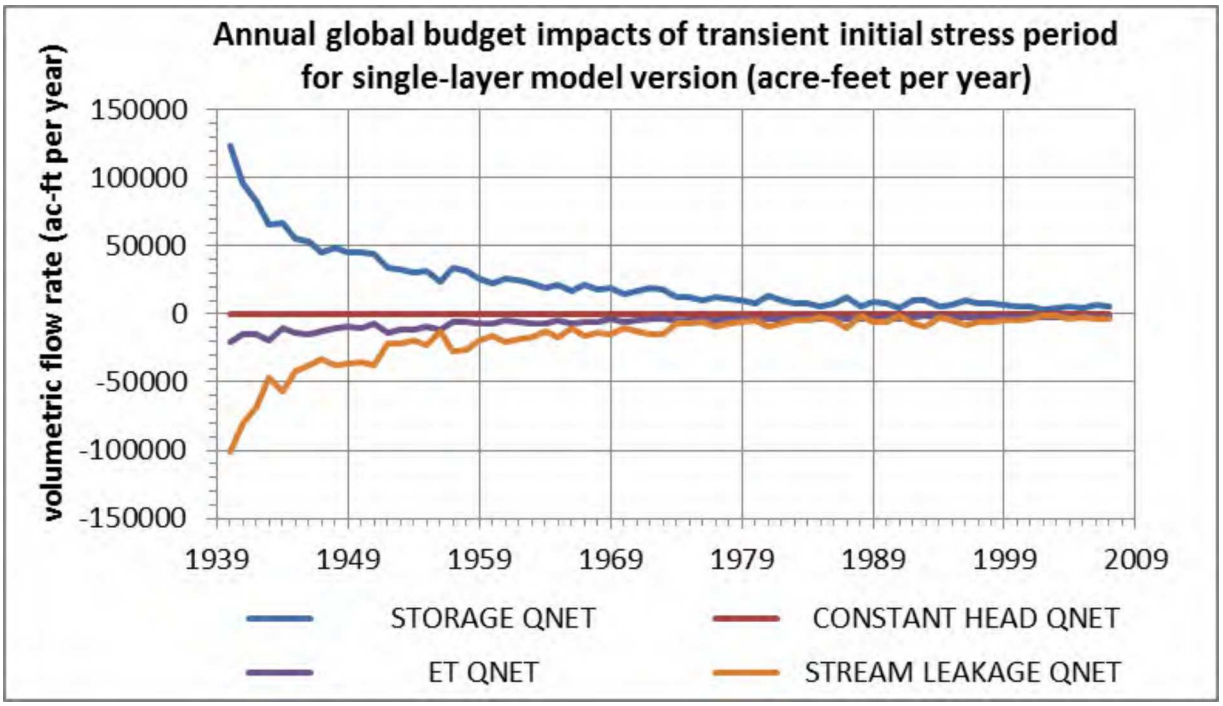


Fig. A16. Annual budget impacts (acre-feet per year) introduced by transient conditions in first stress period for the historical base case simulation 1940-2007 (single-layer model version).

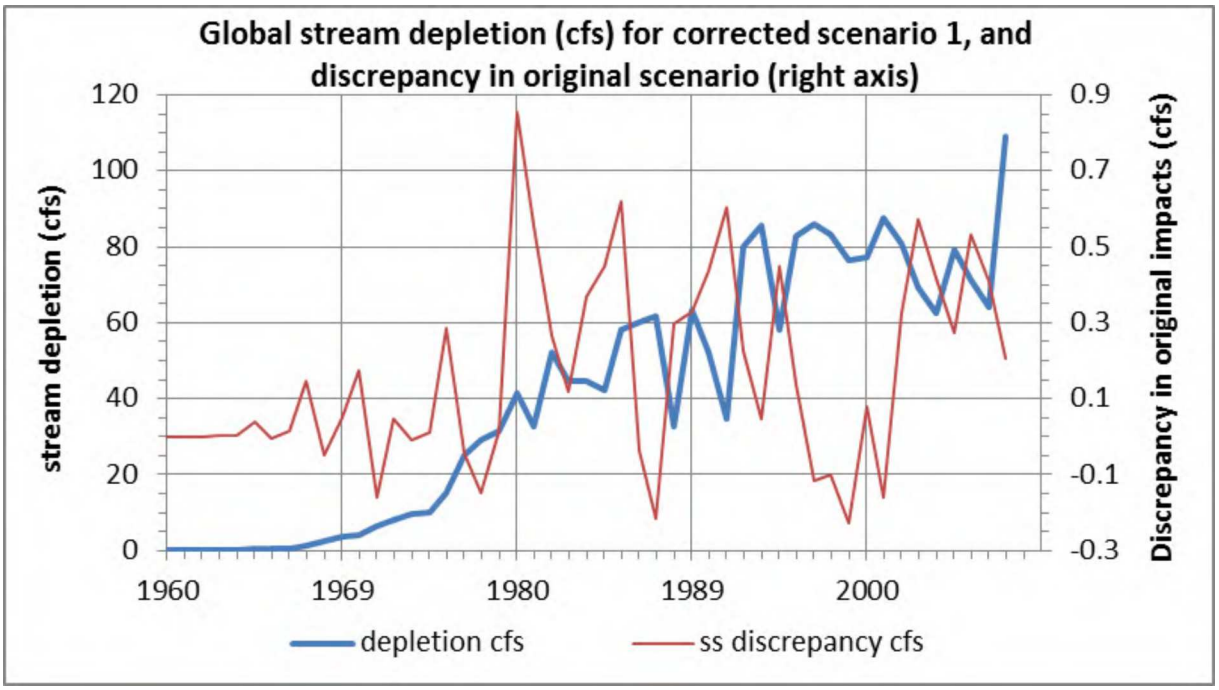


Fig. A17. Global stream depletion by Rattlesnake C Basin rights junior to File 7571 according to single-layer model runs beginning from steady state conditions as recommended by Balleau Groundwater, Inc., and discrepancy in original impact calculations (right axis).

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Mountain-Prairie Region

IN REPLY REFER TO:
BA WTR
WR KS
Mail Stop 60189

MAILING ADDRESS:
Post Office Box 25486
Denver Federal Center
Denver, Colorado 80225-0486

STREET LOCATION:
134 Union Blvd.
Lakewood, Colorado 80228-1807

MAR 04 2014

David Barfield, Chief Engineer
Kansas State Board of Agriculture
Division of Water Resources
109 SW 9th Street, 2nd Floor
Topeka, Kansas 66612-1280

Dear Mr. Barfield:

Staff from Quivira National Wildlife Refuge (Refuge) and the U.S. Fish & Wildlife Service Region 6 Division of Water Resources (Service) recently attended the monthly board meeting for Big Bend Groundwater Management District No. 5 (GMD#5). At the request of the Service, they met with Jeff Lanterman and yourself afterwards to discuss the ongoing impairment investigation and impacts to the Refuge's senior surface Water Right, File No. 7571.

It appears that the investigation and report generation may take a considerable amount of time to complete. Kansas statutes do not address a specific time period that the Chief Engineer has to complete the investigation and report. The Service recognizes that your agency may be dealing with other water right or resource issues, however, the Service raised concerns as early as 1971 about potential impairment to our senior water right, and they have not been addressed to date. At the meeting, you requested that the Service answer questions contained in your October 21, 2013, letter regarding impairment. The Service indicated that much of the information you were seeking was contained in the 1998 Burns and McDonnell study, Quivira National Wildlife Refuge Water Resource Study. You indicated that you have not reviewed the report and the Service came away with the impression that your office has committed little focus to the impairment investigation. You suggested that we could provide you with the location of the information in the report that we believe provides information regarding your questions. The Service feels very strongly that answers to these questions have been provided numerous times over the past 25 years, both in letters and in reports paid for using Service resources. If the Service agrees to spend time and resources to review and mark up the Burns and McDonnell report, we expect you to make a commitment to a definite time period to complete the impairment investigation and report.

Both the Service and the water users continue try to plan for the future with great uncertainty concerning the availability of water. It is in the interest of all water users within the Rattlesnake

Creek Subbasin, the thousands of visitors to the Refuge, and the State of Kansas that progress be made toward reaching a long-term solution to protecting and sustaining water resources. During the February meeting of GMD#5, the Service first learned that GMD#5 submitted a proposal for a 5-year water management plan to your office. It was equally interesting to learn that WaterPACK is active again after years of being relatively inactive. The Service was proceeding under the impression that there is still a functioning Partnership. Under the terms of the Partnership, communication should be transparent and all partners should be kept informed concerning the activities of the other Partners.

The Service has been an active and patient partner as attempts were made to implement the programs identified in the 12-year Rattlesnake Creek Subbasin Management Plan. The 12-year review conducted by your office concluded that water reduction targets were not met, groundwater use has increased, groundwater levels continue to decline, the target flow for January for the Rattlesnake Creek at the USGS Zenith gage is not being met, and junior irrigators continue to pump. The Chief Engineer's office was a signatory to the Plan, as well as GMD#5 and WaterPACK. The Plan was not developed solely to address the impairment of the Refuge's water right, and the water use reductions identified were meant to address other issues such as the high decline areas. Section VIII. Alternative Action Management Strategies states: "If, after the 12-year time line, the goals have not been achieved, then sufficient reductions in water rights would be imposed to achieve the goals. Reductions in appropriations will be calculated by dividing the remaining amount of water use needed to reach the goal by 72%." This section goes on to describe the goals and present alternatives to put into effect if these reductions do not result in meeting these goals, including the possible establishment of an Intensive Groundwater Use Control Area. It has now been over 13 years since the Partners, including your office, signed this agreement. We respectfully request that the groundwater use reductions agreed to by all of the Partners be achieved now. The impairment investigation being conducted by your office can continue concurrently.

Enclosed are copies of Kansas Geological Survey Open-File Reports 92-6 and 92-37 that may assist you in the impairment investigation. These are examples of studies that were funded by the Service. We also strongly encourage you to schedule a visit to the Refuge to help you better understand how the Refuge operates and manages its water resources to support wildlife and its associated habitat for current and hopefully future generations.

If you have any questions, please contact me at meg_estep@fws.gov or call (303) 236-4491.

Sincerely,

Megan A. Estep, Chief
Division of Water Resources

Enclosures

Enclosures

cc: Project Leader, Quivira NWR
Refuge Supervisor, CO/KS/NE
Rocky Mountain Region Solicitor's Office
Water Commissioner, Stafford Field Office
Manager, Big Bend Groundwater Management District #5
WaterPACK

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Mountain-Prairie Region

IN REPLY REFER TO:
BA WTR
WR KS
Mail Stop 60189

MAILING ADDRESS:
Post Office Box 25486
Denver Federal Center
Denver, Colorado 80225-0486

STREET LOCATION:
134 Union Blvd.
Lakewood, Colorado 80228-1807

APR 0 8 2013

David Barfield, Chief Engineer
Kansas State Board of Agriculture
Division of Water Resources
109 SW 9th Street, 2nd Floor
Topeka, Kansas 66612-1280

Dear Mr. Barfield:

The U.S. Fish and Wildlife Service (Service) owns and manages the Quivira National Wildlife Refuge (Refuge). The Refuge holds Water Right No. 7571, priority date August 15, 1957, at a combined diversion rate not to exceed 300 cubic feet per second and a quantity not to exceed 14,632 acre-feet per calendar year for recreational use. Based on available studies and the results of the Rattlesnake Creek Subbasin Management Plan, the Service believes that our water right is impaired by junior well use. We hereby request that your office commence an impairment investigation.

The Refuge is important to natural resource conservation not only regionally and nationally, but globally as well. The Refuge is designated as a Western Hemisphere Shorebird Network site, a Wetland of International Importance (RAMSAR site), an Important Bird Area (American Bird Conservancy), and is critical habitat for federally endangered whooping cranes. The federally endangered piping plover and interior least tern also use the refuge and the State has designated refuge lands (waters) as critical habitat for the western snowy plover and Arkansas darter, both of which are state listed as threatened species.

Surface water originating from Rattlesnake Creek and groundwater discharge from the shallow, saline Precambrian bedrock are critical to sustaining Refuge wetlands that attract and support the vast variety of associated migratory and resident bird species. Without both of these components, groundwater upwelling or sufficient streamflow, the ecology of the entire system will change. The Refuge and its values will not be sustained unless the aquifer system is brought into balance.

Like a farmer, the Refuge needs water during critical time periods. The values of wetlands on refuge lands for migratory birds can only be sustained by providing flooded conditions at proper times during the year, particularly during spring and fall migration. Simply because 14,632 ac-ft

WATER RESOURCES
RECEIVED
APR 10 2013
KS DEPT OF AGRICULTURE

is available on an annual basis in most years does not meet Refuge habitat management needs. Water is typically unavailable in the late summer and early fall when the Refuge is trying to flood migration habitat for birds. Irrigation pumping is usually greatest during this time as well. Water shortages typically occur during the months of July, August and September, when as little as a few hundred acre-feet may be available.

The Service has been patient as the 12-year Rattlesnake Creek Subbasin Management Plan was allowed to run its course. The Service was a supportive and sincere partner in the effort to utilize an incentive-based plan to reduce groundwater use. At the end of the 12 years, groundwater use has increased, groundwater levels have not improved, and streamflow goals have not been met. Streamflow continues to decline, and junior irrigators are allowed to continue to pump. We respectfully request that you conduct your investigation and take whatever administrative actions are necessary to protect the Service's senior water right and, we believe, the ability of the Rattlesnake Creek watershed to support all current land uses over the long term.

Please contact me at meg_estep@fws.gov or a call if you have any questions at (303) 236-4491.

Sincerely,

Megan A. Estep, Chief
Division of Water Resources

cc: Refuge Manager, Quivira NWR
Refuge Supervisor, CO/KS/NE
Rocky Mountain Region Solicitor's Office
Water Commissioner, Stafford Field Office
Manager, Groundwater Management District #5
Water Pack

WATER RESOURCES
RECEIVED
APR 10 2013
KS DEPT OF AGRICULTURE

FEB 0 8 1993
STATE BOARD OF AGRICULTURE

CERTIFICATION MEMORANDUM, FILE 7571

The certification of application to appropriate water, File 7571 actually began in July of 1991. A tour of the refuge was made in the company of Patrick D. Gonzales, assistant manager of Quivira National Wildlife Refuge. Mr. Gonzales reviewed the basic operations at the refuge and detailed how water was used among the various management units within the refuge proper. Copies of missing water use reports (exhibit A) were obtained from the U.S. Fish and Wildlife Service in Denver. These reports filled in all the missing gaps in the water use history of the refuge. In February of 1992, contact was made with representatives from U.S. Fish and Wildlife Service (USFWS) headquarters. It was learned that a detailed survey of the refuge was to be conducted in the near future. The survey would include cross sections of each management pool in the refuge and more accurately define the total water holding capacity of the entire project. As of February 1, 1993, the survey has been completed, but the information has not been tabulated or made available for review. Since the new survey has not been completed in a timely manner, older information that was originally computed from aerial photos is being used to prepare the certificate. Much of this information was already in the files and additional information was obtained from USFWS itself (exhibit B).

The Water Resources Data of Kansas published yearly by the U.S. Geological Survey was consulted for the years 1963 through 1990. These publications give the streamflow values for permanent gaging stations on the Rattlesnake Creek at Macksville, Kansas and Raymond, Kansas. The Macksville station gives interesting results, but it is over 30 miles upstream from the diversion points authorized by this file. On a stream such as the Rattlesnake that is often gaining base flow in some areas and losing base flow to the aquifer in other areas, depending on the immediate section of the stream being analyzed, a gaging station over 30 miles away is not of much value as it relates to this project. The Raymond, Kansas gage was also analyzed. This gage should have been useful since it is situated at the outflow from Quivira Refuge. What complicates the readings from this gage is that artesian saltwater flows on the north edge of the refuge enter the stream (referred to as Salt Creek at this location) and are recorded at the gaging station. The result is that at times flow is recorded at the gage even when operations at Quivira are using the entire upstream flow of the Rattlesnake Creek. Flood flows, artesian groundwater, and occasionally normal streamflows reach the Raymond gage, unfortunately, it is impossible to distinguish where the recorded flows may have come from.

In May of 1973 a gaging station was put into service at Zenith, Kansas. This gage is approximately 1 1/2 miles upstream from the first diversion structure at Quivira Wildlife Refuge. This gage

RECEIVED
APR 28 1993

has the potential to provide the most pertinent data in regards to the certification of File 7571. Since the Zenith gage was not installed until 1973 there is no actual data for that location during prior years. For that reason Jim Bagley, of the Division of Water Resources, prepared streamflow regression analysis charts (exhibit C). While these charts are definitely an asset in obtaining the total picture of past streamflow and appear to correlate exceptionally well with actual flow records at the other gaging stations, Mr. Bagley warns against depending on the regression analysis too much. On a related note, Marios Sophocleaus states in his KGS open file report 92-10 that 19625 acre feet is the average annual streamflow at the Zenith gage during the years 1981 through 1990.

Hydrographs were prepared (exhibit D) to visually display the monthly and annual flows recorded, in acre feet, at all of the above gaging stations from 1963 to 1990. The 1963 to 1973 flows estimated from regression analysis at the Zenith gage were also plotted. In addition, the annual reported quantity of water used at Quivira was plotted against the streamflow quantities. If nothing else, the hydrographs reveal that the water use reports submitted for Quivira do not exceed the quantity shown to have been provided by the Rattlesnake Creek.

Next, information from the area and capacity information (exhibit B) and the Annual Water Management Plan (exhibit E) were combined into one table. This table is titled "Typical Annual Water Use at Quivira Wildlife Refuge" (exhibit F). The purpose of the tabulation is to demonstrate the maximum amount of water the refuge might use if it had sufficient water available and it was able to fulfill all of the management options listed in its Annual Water Management Plan. The tabulation is actually less than the maximum water needs as it does <u>not</u> include unmanaged areas that are often flooded to a depth of two to three inches; it also does <u>not</u> include evapotranspiration by moist soil plants, seepage, lake evaporation through fall and winter months, or transit losses in canals or within the streambed itself. One other item that is not calculated is the fact that at certain times it may be beneficial to drain one management unit, utilizing the drained water into a second unit in need of water, although in most instances the units are allowed to evaporate naturally. Additionally, large salt flats at the north end of the refuge, and the northern end of the Big Salt Marsh itself, appear to receive a portion of their water supply from the artesian seeps and springs that flow into the refuge from the west.

Certification Memo, File 7571

Exhibit F demonstrates that when considering the permanent management pools only, operated under the guidelines of existing management plans, that the quantity of water reported since 1963 appears not only to have been reasonable, but also possible.

On December 21, 1992 and January 28, 1993, Mr Dave Hilley, Manager of Quivira Wildlife Refuge, was contacted for additional information concerning operations at the refuge. The methods used by the refuge to measure water flows were observed, tested, and recorded in a memorandum labeled exhibit G. This document outlines specifically what instrument is used to measure flows, how it works, how quantities are calculated for annual water use reports, and states the one discrepancy found in the water reporting method. That discrepancy was the fact that the quantity of water stored and evaporated from the Little Salt Marsh was not reflected in the refuge's reporting methods. The information obtained on both visits, combined with previously gathered data, were compiled to form exhibit H, which is a detailed map of each management unit, the canals connecting each unit, control structures used to move water within the refuge, and the diversion points on the Rattlesnake Creek.

SUMMARY

Based on the above information and attached exhibits a certificated of appropriation for file 7571 is proposed as follows:

File 7571 was approved in 1963. During the time period 1963 to 1972 many of the water use reports were estimated and during that time the diversion works were reported to be only 80% complete. An actual water measurement program may not have been in place prior to 1973. In 1973, a year of torrential rainfall, the diversion works and control structures at Quivira were destroyed. It was not until 1978 that the damage was finally repaired. The year 1978 was, therefore, the first year that the diversion works were complete and ready to divert and store water according to management plans. Assuming that the water requirements of the refuge are best represented by years after 1978, the year 1987 has been selected as the year of record. Using 1987 will require that an extension of time to perfect be granted to that year.
During 1987 the U.S. Fish and Wildlife Service reported that 10129.7 acre feet of water was diverted from the Rattlesnake Creek and that the refuge was "full all year." As pointed out above and in exhibit G, the [illegible] reported do not reflect the amount stored and the subsequent evaporation in the Little

RECEIVED
APR 26 1996

Salt Marsh. Using an area of 950 acres in the Little Salt Marsh, and a capacity of 2260 acre feet, one would assume 2850 acre feet of evaporation during a calendar year (36 inches of net evaporation). The proposed certified quantity for file 7571 would then be the sum of the acre feet reported in 1987, the amount stored in the Little Salt Marsh, and the amount evaporated from the Little Salt Marsh: 10129.7 acre feet + 2260 acre feet + 2850 acre feet = 15240 acre feet. It is also proposed that all of the 15240 acre feet be shown as direct use and that the "quantity to be accumulated in reservoirs" as stated in the approval be dropped from the certificate.

It is proposed that the rate of diversion be certified as natural flows not needed for prior downstream diversions. The diversion should be limited to a maximum of 300 c.f.s. Flows of 300 cfs can be verified from streamflow records at the Zenith station (see exhibit I).

Finally, the description of the point of diversion noted as "diversion A" is being proposed differently than originally approved. The stream is not located in that ten acre tract. Therefore it is proposed to correct that description when the certificate is issued.

It is the recommendation of the Stafford Field Office that U.S. Fish and Wildlife Service be required upon issuance of this certificate to install a permanent metering system on the Rattlesnake Creek immediately downstream from their last diversion point and that a water conservation plan be prepared for the refuge, both to be completed by December 31, 1995.



FIELD INSPECTION, FILE 7571

LAND TO BE INCLUDED ON CERTIFICATE

The South 80 acres of the SE1/4 of Section 15; the S1/2 of Section 14; the NE1/4, SW1/4, and SE1/4 of Section 29; and all of Sections 13, 21 through 28, and 32 through 36 in Township 21 South, Range 11 West;

and all of Sections 1 through 5, 11 through 14, 23 through 26, and sections 35 and 36 in Township 22 South, Range 11 West;

and all of Sections 1 and 2 in Township 23 South, Range 11 West;

all in Stafford County, Kansas;

Section 18 in Township 21 South, Range 10 West, in Rice County, Kansas;

and Section 30 in Township 22 South, Range 10 West, in Reno County, Kansas.

PLACE OF USE DURING YEAR OF RECORD

Water was applied to and circulated among the various management units within the place of use described above. Those management units are depicted on the map accompanying this field inspection report.

RECEIVED
APR 26 1996

THE STATE OF KANSAS

DUPLICATE COPY

KANSAS DEPARTMENT OF AGRICULTURE
Alice A. Devine, Secretary of Agriculture

DIVISION OF WATER RESOURCES
David L. Pope, Chief Engineer

CERTIFICATE OF APPROPRIATION FOR BENEFICIAL USE OF WATER

Water Right, File No. 7,571
Priority Date August 15, 1957

WHEREAS, It has been determined by the undersigned that construction of the appropriation diversion works has been completed, that water has been used for beneficial purposes and that the appropriation right has been perfected, all in conformity with the conditions of approval of the application pursuant to the water right referred to above and in conformity with the laws of the laws of the State of Kansas.

NOW, THEREFORE, Be It Known that DAVID L. POPE, the duly appointed qualified and acting Chief Engineer of the Division of Water Resources of the Kansas Department of Agriculture, by authority of the laws of the State of Kansas, and particularly K.S.A. 82a-714, does hereby certify that, subject to vested rights and prior appropriation rights, the appropriator is entitled to make use of natural flows of Rattlesnake Creek to be diverted at three (3) points:

One (1) point located in the Southwest Quarter of the Southeast Quarter of the Northeast Quarter (SW¼ SE¼ NE¼) of Section 35, more particularly described as being near a point 3,100 feet North and 1,150 feet West of the Southeast corner of said section,

in Township 21 South, Range 11 West, Stafford County, Kansas, and

one (1) point located in the Southwest Quarter of the Northeast Quarter of the Northeast Quarter (SW¼ NE¼ NE¼) of Section 13, more particularly described as being near a point 4,450 feet North and 1,000 feet West of the Southeast corner of said section,

in Township 22 South, Range 11 West, Stafford County, Kansas, and

one (1) point located near the center of the Southwest Quarter (SW¼) of Section 25, more particularly described as being near a point 1,250 feet North and 3,850 feet West of the Southeast corner of said section,

in Township 22 South, Range 11 West, Stafford County, Kansas,

at a combined maximum diversion rate not in excess of 300 cubic feet per second and a quantity not to exceed 14,632 acre-feet of water per calendar year for recreational use. Such quantity can subsequently be stored and accumulated in marsh areas within the Quivira National Wildlife Refuge, to the extent perfected by December 31, 1987, located on the following described property:

The South 80 acres of the Southeast Quarter (SE¼) of Section 15; the South Half (S½) of Section 14; the Northeast Quarter (NE¼), Southwest Quarter (SW¼) and Southeast Quarter (SE¼) of Section 21 and 29; and all of Sections 13, 22 through 28, and 32 through 36 in Township 21 South, Range 11 West;

and all of Section 1 through 5, 11 through 14, 23 through 26, and Section 35 and 36 in Township 22 South, Range 11 West;

RECEIVED
APR 26 1996
DIVISION OF WATER RESOURCES
MICROFILMED

and all of Sections 1 and 2 in Township 23 South, Range 11 West,

all in Stafford County, Kansas, and

DUPLICATE COPY

Section 18 in Township 21 South, Range 10 West, in Rice County, Kansas;

and Section 30 in Township 22 South, Range 10 West, in Reno County, Kansas.

The appropriator shall maintain in an operating condition, satisfactory to the Chief Engineer, all check valves installed for preventing chemical or other foreign substance likely to cause pollution of the water supply.

The appropriator shall maintain records from which the quantity of water actually diverted during each calendar year may be readily determined. Such records shall be furnished to the Chief Engineer by March 1 following the end of the previous calendar year.

The appropriation right shall be deemed abandoned and shall terminate when without due and sufficient cause no lawful beneficial use is made of water under this appropriation for three (3) successive years.

The right of the appropriator shall relate to a specific quantity of water and such right must allow for a reasonable raising or lowering of the static water level and for the reasonable increase or decrease of the stream flow at the appropriator's point of diversion.

IN WITNESS WHEREOF, I have hereunto set my hand at my office at Topeka, Kansas, this 9th day of April ,1996.

DIVISION OF WATER RESOURCES
DAVID L. POPE
CHIEF ENGINEER
KANSAS DEPARTMENT OF AGRICULTURE

David L. Pope, P.E.
Chief Engineer
Division of Water Resources
Kansas Department of Agriculture

State of Kansas, Shawnee COUNTY, SS

The foregoing instrument was acknowledged before me this 9th day of April , 1996, by David L. Pope, P.E., Chief Engineer, Division of Water Resources, Kansas Department of Agriculture.

DENISE J. ROLES
NOTARY PUBLIC
My Appt. Exp. 3-1-98
STATE OF KANSAS

Notary Public

My appointment expires:

(Record in the Office of Register of Deeds in the county or counties wherein the point of diversion is located)

CERTIFICATE OF APPROPRIATION
FOR BENEFICIAL USE OF WATER

STATE OF KANSAS

Water Right, File No. 7,571

STATE OF KANSAS, COUNTY, ss.

Filed for record this day of , 19 , at o'clock m. and recorded in Book Page

Fee $

Register of Deeds.

Table 17. Estimated greatest potential distribution of wetland habitat conditions (acres by unit and objective) for the proposed alternative for Quivira National Wildlife Refuge, Kansas.

		Mid-February through May spring migration			*May through July summer breeding*		*August–November fall migration*			*November–February winter*
		A1	A2	A3	B1	B2	C1	C2	C3	D
Wetland	*Acres*	Acres bare flats <25% vegetation, flood <6 inches	Acres >75% annual or meadow, flood <15 inches	Acres <25% emerging >20% submerged aquatic vegetation, flood 6–30 inches	Acres of bare flats <25% cover	Acres of 30–60% tall emerging, flood <10 inches	Acres of bare flats <25% vegetation, flood <6 inches,	Acres >75% annual or meadow, flood <15 inches	Acres <25% emerging >20% submerged aquatic vegetation, flood 6–30 inches,	Acres <25% emerging, flood 6–30 inches
Little Salt Marsh	931	181.2	0	662.9	3.8	87.3	181.1	0	662.9	931
Unit 7 (created)	62	15.8	40.5	5.6	15.8	0	15.8	40.5	5.6	62
Unit 10a (created)	19	12.9	12.9	6.3	0	6.3	0	12.9	0	19
Unit 10b (created)	14	0	0	10.3	0	0	3.9	0	10.3	14
Unit 10c (created)	7	6	6.1	0.8	6.1	0	0	6.1	0.8	7
Unit 11 (created)	30	11.9	12	16.3	0	0	0	12	6.3	30
Unit 12b (created)	12	8.8	8.8	2.9	0	11.5	0	8.8	2.9	12
Unit 14a (created)	100	15.5	73.9	0	27.3	0	15.6	73.9	0	100
Unit 14b (created)	45	43.1	43.1	1.7	0	1.7	0	43.1	1.7	45
Unit 16 (created)	14	0	5.8	8.5	0	14.2	0	5.8	8.5	14
Unit 20a (created)	69	60.3	60.4	8.5	0	8.5	0	60.4	8.5	69
Unit 20b (created)	66	0	62.2	3.7	0	3.7	0	62.2	3.7	0
Unit 21 (created)	11	3.9	0	5.9	3.8	1.5	3.8	0	5.9	11
Unit 22 (created)	12	0	0	12.1	0	12.1	0	0	12.1	12
Unit 23 (created)	14	0	0	14.1	0	14.1	0	0	14.1	14
Unit 24 (created)	54	0	0	54.1	0	54.1	0	0	54.1	54
Unit 25 (created)	54	0.6	53.4	0	0	0	0	53.4	0	54
Unit 26 (created)	69	69.1	69.1	0	0	0	0	69.1	0	69
Unit 28 (created)	61	60.8	60.9	0	0	0	0	60.9	0	61

Table 17. Estimated greatest potential distribution of wetland habitat conditions (acres by unit and objective) for the proposed alternative for Quivira National Wildlife Refuge, Kansas.

		Mid-February through May spring migration			*May through July summer breeding*		*August–November fall migration*			*November–February winter*
		A1	A2	A3	B1	B2	C1	C2	C3	D
Wetland	*Acres*	Acres bare flats <25% vegetation, flood <6 inches	Acres >75% annual or meadow, flood <15 inches	Acres <25% emerging >20% submerged aquatic vegetation, flood 6–30 inches	Acres of bare flats <25% cover	Acres of 30–60% tall emerging, flood <10 inches	Acres of bare flats <25% vegetation, flood <6 inches,	Acres >75% annual or meadow, flood <15 inches	Acres <25% emerging >20% submerged aquatic vegetation, flood 6–30 inches,	Acres <25% emerging, flood 6–30 inches
Unit 29 (created)	27	23.7	23.7	3.6	0	0	0	23.7	3.6	27
Unit 30 (created)	42	41.6	41.6	0	0	0	0	41.6	0	42
Unit 37 (created)	50	0	0	49.8	0	49.8	0	0	49.8	50
Unit 40 (created)	36	36.7	36.4	0	0	0	0	36.4	0	36
Unit 48 (created)	55	54.4	54.4	0.8	0	0	0	54.4	0.8	55
Unit 49 (created)	85	83.9	83.9	1.3	83.9	0	83.9	83.9	1.3	85
Unit 50 (created)	91	90.5	90.6	0	0	0	0	90.6	0	91
Unit 57 (created)	89	0	43.4	34.0	11.5	43.4	11.5	0	34	89
Unit 58 (created)	116	67.5	0	48.9	0	48.9	0	0	0	116
Unit 61 (created)	121	121.2	104.2	0	121.2	0	17.2	104.2	0	121
Unit 62 (created)	38	35.7	35.8	1.7	0	0	1.7	35.8	1.7	38
Unit 63 (created)	103	93	93	0	10	0	10.0	93	0	103
Unit 80 N. Lake	393	393.2	0	72.1	393.2	0	0	0	0	393
Marsh Road Meadow	494	267.6	226.2	226.2	267.6	0	0	0	0	0
Wildlife Drive (BSM)	801	723.2	0	107.3	697.1	0	25.1	0	0	801
Big Salt Marsh	1209	408.8	0	800.6	98.3	0	206.4	0	0	1209
Salt Springs	252	0	238.3	0	0	14.7	0	0	14.6	252
Total	5646	2930.9	1580.6	2160	1739.6	371.8	576	1072.7	903.2	5086

NOTE: Table does not include wetlands managed as part of the grassland habitat type.

Seasonal Rattlesnake Creek Water Need Estimates for Quivira National Wildlife Refuge, Prepared May 2015

Background

At the request of Kansas Department of Agriculture, Division of Water Resources (DWR), the U.S. Fish and Wildlife Service (Service) has provided information to increase understanding of *seasonal* water needs to accomplish management objectives of the Quivira National Wildlife Refuge (Refuge). The Refuge's current annual Water Right 7571 on Rattlesnake Creek is 14,632 ac-ft. There is no single estimate that accurately predicts seasonal surface water needs of the Refuge because various factors influence water needs within and among years, such as short- and long-term weather patterns, the timing of wildlife events (e.g., migration), and changing habitat conditions.

Approach

Scenario 1 – There was interest by DWR to evaluate the potential of using past water use records to quantify estimates of seasonal water needs to accomplish refuge management objectives. To accomplish this task, Refuge staff compiled 48 years of monthly water-use records and grouped months into seasons based on the life cycle events of waterbirds (timing of migration, relative abundances) and the lag time required to transfer water to wetlands through the ditch infrastructure (Table 1). For example, flooding a wetland to the appropriate depth can require days to weeks depending on location from the diversion, volume of water available, and existing soil moisture conditions (e.g., dry, saturated).

Table 1. Significant annual events largely considered in determining seasonal water needs to accomplish management objectives of Quivira National Wildlife Refuge.

Jan-Feb	Mar-Apr	May-Jun	Jul-Sep	Oct-Nov	Dec
MANAGEMENT TO SUPPORT WILDLIFE FOOD & COVER REQUIREMENTS					
Use water where needed to provide/maintain semipermanent wetland habitat.					
	Shallowly flood select units to saturate dry soils that will be used to produce wildlife foods.				
		Dewater select wetlands for suitable germination and growth of desired plants used for wildlife food and cover. Drawdown dates are based on scientific information.			
		Irrigate select wetland units to support survival, growth, and seed production of germinated wildlife food plants.	After seeds mature, gradually increase water levels in wetlands to coincide with the food and cover needs of target species.		
CHRONOLOGY OF SPECIES ANNUAL EVENTS OR WHEN LIFE REQUIREMENTS NEED TO BE AVAILABLE FOR SPECIES USE					
Waterfowl and bald eagle wintering habitat is provided when open water is available (generally where flooded deep and/or where flow prevents ice formation).	Peak spring waterfowl migration (habitat flooded <15 inches).	Main spring shorebird migration (habitat flooded <6 inches and mudflat).	Main fall shorebird migration (habitat flooded <6 inches and mudflat).	Peak fall waterfowl migration (habitat flooded <15 inches).	
	Endangered whooping crane spring migration (shoreline & habitat flooded <1 ft).	Breeding-related activities occur for several waterbirds that require flooded habitat for food and/or cover resources, such as for the state-threatened snowy plover, the endangered interior least tern, and for state species in need of conservation (e.g., black rail, black tern).		Endangered whooping crane fall migration (shoreline and habitat flooded <1 ft).	

After reviewing the water use records, Refuge staff made the determination to exclude years (n=28) when total annual water use did not exceed 7,000 ac-ft to prevent extreme bias in estimating seasonal water use due to

limited water availability and/or inappropriate timing of available water. For example, during low water years Refuge staff often receive and use water at less than optimal times (e.g., winter) to help increase the odds that at least some wetland habitat is flooded at critical times (e.g., spring waterbird migration). In this case, the average amount of water used during the winter season would be biased high. Conversely, it is common during low water years to not have sufficient water to maintain wetland vegetation, which results in low food production and sparse cover required by wildlife. In this case, the use of water during summer would be biased extremely low. The use of 7,000 ac-ft as a cutoff point was based on approximating 50% of the Refuge water right and, as such, is somewhat arbitrary.

For the 20 years of when total annual water use exceeded 7,000 ac-ft, water use for each year was partitioned into the appropriate seasons and the median, minimum, and maximum seasonal values across all years were calculated (Table 2).

Table 2. Seasonal median, minimum, and maximum water use (ac-ft) values, calculated using 20 years of data where annual use exceeded 7,000 ac-ft. Totals of the median and maximum seasonal water use values are respectively lower and higher than the current annual water right (14,632 ac-ft).

	Jan -Feb	Mar-Apr	May-Jun	Jul-Sep	Oct-Nov	Dec	Total
Median	986	1,115	1,062	2,117	1,781	684	7,746
Minimum	0	89	126	463	151	101	
Maximum	3,557	3,111	2,601	4,374	6,205	2,003	21,851

This Scenario 1 estimate is biased due to the following:

- Historic *use* does not accurately reflect water *needs* during any given year or season.
- Historic water use in a given season may not accurately reflect the volume of water that would have been used if water had been available during that season or, perhaps, previous to that season.
- The use of records that exceeded 7,000 ac-ft was arbitrary and only represents nearly half of the Refuge water right. As such, these estimates likely are biased low.

Scenario 2 **–**

Scenario 2 is based on achieving minimum requirements of CCP objectives following a drought year and water use was not constrained by the current water right (Table 3, Scenario 2). Unlike Scenario 1, seasons in Scenario 2 were defined by CCP habitat-based objectives, as approved in 2013. Data used to develop this scenario included area estimates and area-capacity curves developed by the Service for individual wetlands, published long-term precipitation and pan evaporation data (including the use of a coefficient to account for shallow wetlands), soil infiltration rates calculated based on information in NRCS soil survey data (SSURGO), LiDAR data to estimate volume of ditches, and aerial imagery to estimate surface area of water in the Big and Little Salt Marshes at the beginning of the scenario.

Table 3. Comparison of Rattlesnake Creek surface water use Scenarios 1 and 2 for Quivira NWR.

Scenario	Seasonal Water Use Estimates (Acre-Feet)												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1	986		1,115		1,062		2,117			1,781		684	7,746
2	3,144		7,427		2,895		4,053			5,881			23,400

This Scenario 2 estimate is biased due to the following:

- Water loss due to plant transpiration was not included in water use estimates (which would increase water needs to meet objectives).
- Water loss due to soil infiltration in some wetlands was underestimated because values for the available water capacity of 2,300 acres of wetland soils were not available (which would increase water needs to meet objectives).

- Water loss due to horizontal seepage in ditches during initial flooding was not estimated (which would increase water needs to meet objectives).
- Estimate based on a "normal precipitation" year following a drought year (all units dry); thus, a large volume of water (3,144 acre-feet) is needed to initially flood the Little Salt Marsh before water can be diverted elsewhere on the Refuge. This volume would be lower in years not preceded by drought.
- Estimate based on initially flooding only units and infrastructure on the south end of the Refuge. If north portion of Refuge were flooded early in the year, water use estimates would increase.
- Seasons are based on habitat objectives and do not always reflect the water management activities/schedules (e.g., time required for water to travel from diversion to wetland of interest).

Results

The seasonal estimates in Table 4 were developed after considering Scenarios 1 and 2 described in the approach above.

Table 4. Seasonal Rattlesnake Creek surface water need estimates for Quivira NWR, given the current water right.

Seasonal Water Use (Acre-Feet)						
Jan-Feb	Mar-Apr	May-Jun	Jul-Sep	Oct-Nov	Dec	Total
1,500	3,500	2,000	3,500	3,632	500	14,632

Although Scenarios 1 and 2 were developed based on quantitative information; these estimates were constrained by limitations that precluded either scenario from being used to directly estimate seasonal water needs. In general, the estimate based on past water use is known to be flawed because the Refuge either did not receive its full annual right of 14,632 ac-ft and/or the seasonal availability of water was not available or lacking, which resulted in the use of water during suboptimal times that often limited or impeded the accomplishment of management objectives. In contrast, the Scenario 2 estimate, based on water needs following drought, exceeded the Refuge water right even though important factors (e.g., water infiltration in ditches, plant transpiration) that would have increased water needs were not included in the estimate. Therefore, the Service used information from both Scenario 1 and Scenario 2 to adjust water use so total annual use matches the current water right of 14,632 ac-ft (Table 4).

Attachment 6: GMD5 Model; KDA-DWR Scenario 1 analysis results table

USFW Management Period	Year	Zenith Gaged Flow	Modeled Impacts to RSC	Refuge Reported Diversions	Refuge Needs	Amount short of needs
Jan/Feb	1974	19590	960	0	1500	0
Mar/Apr	1974	20230	860	0	3500	0
May/Jun	1974	11220	820	0	2000	0
Jul/Aug/Sep	1974	8260	1620	1320	3500	0
Oct/Nov	1974	7240	1390	2430	3600	0
Dec	1974	5070	600	600	500	0
Jan/Feb	1975	9750	1130	0	1500	0
Mar/Apr	1975	9990	1040	630	3500	0
May/Jun	1975	14550	1310	1020	2000	0
Jul/Aug/Sep	1975	16600	3000	3840	3500	0
Oct/Nov	1975	5230	2270	1040	3600	0
Dec	1975	3540	1240	920	500	0
Jan/Feb	1976	6850	2060	340	1500	0
Mar/Apr	1976	19610	2410	180	3500	0
May/Jun	1976	15800	2390	190	2000	0
Jul/Aug/Sep	1976	8240	4680	1270	3500	0
Oct/Nov	1976	4650	4010	2060	3600	0
Dec	1976	3810	1740	70	500	0
Jan/Feb	1977	4990	3080	400	1500	0
Mar/Apr	1977	6780	2920	1140	3500	0
May/Jun	1977	18550	3030	1670	2000	0
Jul/Aug/Sep	1977	7450	5280	1980	3500	0
Oct/Nov	1977	5060	3440	2780	3600	0
Dec	1977	3010	1600	490	500	0
Jan/Feb	1978	6340	3110	50	1500	0
Mar/Apr	1978	8770	2750	360	3500	0
May/Jun	1978	20670	3410	260	2000	0
Jul/Aug/Sep	1978	3100	5240	910	3500	400
Oct/Nov	1978	2410	4540	1870	3600	1190
Dec	1978	2040	2380	1610	500	0
Jan/Feb	1979	4270	4660	2270	1500	0
Mar/Apr	1979	8050	4370	0	3500	0
May/Jun	1979	4960	3610	790	2000	0
Jul/Aug/Sep	1979	3920	5660	3150	3500	0
Oct/Nov	1979	3040	6370	470	3600	560
Dec	1979	2210	2670	180	500	0
Jan/Feb	1980	5780	5170	270	1500	0
Mar/Apr	1980	11630	4860	150	3500	0
May/Jun	1980	6620	3530	1160	2000	0
Jul/Aug/Sep	1980	1590	3020	1480	3500	1910
Oct/Nov	1980	690	2150	20	3600	2150
Dec	1980	1440	3150	300	500	0

Attachment 6: GMD5 Model; KDA-DWR Scenario 1 analysis results table

USFW Management Period	Year	Zenith Gaged Flow	Modeled Impacts to RSC	Refuge Reported Diversions	Refuge Needs	Amount short of needs
Jan/Feb	1981	2540	4450	1480	1500	0
Mar/Apr	1981	2900	4330	2330	3500	600
May/Jun	1981	5630	7240	1940	2000	0
Jul/Aug/Sep	1981	2100	9350	1780	3500	1400
Oct/Nov	1981	2520	5820	1370	3600	1080
Dec	1981	1550	2730	470	500	0
Jan/Feb	1982	4190	5060	140	1500	0
Mar/Apr	1982	3890	4280	900	3500	0
May/Jun	1982	4360	4880	980	2000	0
Jul/Aug/Sep	1982	2000	6090	1620	3500	1500
Oct/Nov	1982	850	5050	240	3600	2750
Dec	1982	690	2640	80	500	0
Jan/Feb	1983	2520	5020	870	1500	0
Mar/Apr	1983	6270	4940	70	3500	0
May/Jun	1983	9490	5200	150	2000	0
Jul/Aug/Sep	1983	1350	2490	1080	3500	2150
Oct/Nov	1983	730	6410	180	3600	2870
Dec	1983	520	4070	180	500	0
Jan/Feb	1984	2230	6090	610	1500	0
Mar/Apr	1984	8080	6990	940	3500	0
May/Jun	1984	4140	4370	430	2000	0
Jul/Aug/Sep	1984	520	830	150	3500	830
Oct/Nov	1984	400	4590	30	3600	3200
Dec	1984	970	4140	460	500	0
Jan/Feb	1985	1840	7560	1840	1500	0
Mar/Apr	1985	3450	6650	2830	3500	50
May/Jun	1985	4250	5130	790	2000	0
Jul/Aug/Sep	1985	1490	6060	1040	3500	2010
Oct/Nov	1985	4980	8190	1630	3600	0
Dec	1985	1590	3280	510	500	0
Jan/Feb	1986	3280	4900	990	1500	0
Mar/Apr	1986	2900	4870	600	3500	600
May/Jun	1986	1990	4970	670	2000	10
Jul/Aug/Sep	1986	4740	11700	2260	3500	0
Oct/Nov	1986	2530	7370	2760	3600	1070
Dec	1986	1440	3480	1120	500	0
Jan/Feb	1987	3050	6700	1990	1500	0
Mar/Apr	1987	20610	7090	300	3500	0
May/Jun	1987	6180	6680	550	2000	0
Jul/Aug/Sep	1987	11640	9380	2120	3500	0
Oct/Nov	1987	3380	5450	3210	3600	220
Dec	1987	2500	2960	2000	500	0

Attachment 6: GMD5 Model; KDA-DWR Scenario 1 analysis results table

USFW Management Period	Year	Zenith Gaged Flow	Modeled Impacts to RSC	Refuge Reported Diversions	Refuge Needs	Amount short of needs
Jan/Feb	1988	5170	6060	3560	1500	0
Mar/Apr	1988	6310	5400	3110	3500	0
May/Jun	1988	3420	2840	490	2000	0
Jul/Aug/Sep	1988	830	1960	460	3500	1960
Oct/Nov	1988	550	1560	150	3600	1560
Dec	1988	480	1440	260	500	20
Jan/Feb	1989	1220	4040	550	1500	280
Mar/Apr	1989	1620	2720	1000	3500	1880
May/Jun	1989	4850	10680	2240	2000	0
Jul/Aug/Sep	1989	4030	12360	310	3500	0
Oct/Nov	1989	1050	5410	1060	3600	2550
Dec	1989	540	3040	440	500	0
Jan/Feb	1990	2110	7040	1750	1500	0
Mar/Apr	1990	3810	6240	2160	3500	0
May/Jun	1990	6070	5790	2110	2000	0
Jul/Aug/Sep	1990	750	4800	280	3500	2750
Oct/Nov	1990	700	4200	460	3600	2900
Dec	1990	420	2540	0	500	80
Jan/Feb	1991	1040	4720	510	1500	460
Mar/Apr	1991	1360	5710	1040	3500	2140
May/Jun	1991	1110	3430	1040	2000	890
Jul/Aug/Sep	1991	150	2470	0	3500	2470
Oct/Nov	1991	220	2460	0	3600	2460
Dec	1991	340	2940	0	500	160
Jan/Feb	1992	770	4340	0	1500	730
Mar/Apr	1992	860	2690	450	3500	2640
May/Jun	1992	2540	11120	830	2000	0
Jul/Aug/Sep	1992	2750	15610	2930	3500	750
Oct/Nov	1992	940	8690	360	3600	2660
Dec	1992	1320	4280	850	500	0
Jan/Feb	1993	5150	8180	990	1500	0
Mar/Apr	1993	8180	7500	640	3500	0
May/Jun	1993	46390	7930	2600	2000	0
Jul/Aug/Sep	1993	72440	13840	2590	3500	0
Oct/Nov	1993	4200	7900	2970	3600	0
Dec	1993	2640	3800	1420	500	0
Jan/Feb	1994	4870	7560	2000	1500	0
Mar/Apr	1994	4740	6740	160	3500	0
May/Jun	1994	2870	3950	370	2000	0
Jul/Aug/Sep	1994	750	6370	690	3500	2750
Oct/Nov	1994	790	7020	80	3600	2810
Dec	1994	740	3780	0	500	0

Attachment 6: GMD5 Model; KDA-DWR Scenario 1 analysis results table

USFW Management Period	Year	Zenith Gaged Flow	Modeled Impacts to RSC	Refuge Reported Diversions	Refuge Needs	Amount short of needs
Jan/Feb	2002	2410	8890	1990	1500	0
Mar/Apr	2002	2740	6530	2890	3500	760
May/Jun	2002	2390	5730	2280	2000	0
Jul/Aug/Sep	2002	980	5340	1050	3500	2520
Oct/Nov	2002	1610	9170	970	3600	1990
Dec	2002	810	3560	1150	500	0
Jan/Feb	2003	1860	7340	1180	1500	0
Mar/Apr	2003	4720	9640	320	3500	0
May/Jun	2003	2770	5690	0	2000	0
Jul/Aug/Sep	2003	650	4040	120	3500	2850
Oct/Nov	2003	840	4290	40	3600	2760
Dec	2003	540	2800	80	500	0
Jan/Feb	2004	1050	5140	970	1500	450
Mar/Apr	2004	2300	6270	2840	3500	1200
May/Jun	2004	1500	5430	370	2000	500
Jul/Aug/Sep	2004	2960	13070	4370	3500	540
Oct/Nov	2004	1690	7640	550	3600	1910
Dec	2004	1080	3220	580	500	0
Jan/Feb	2005	2490	7820	2130	1500	0
Mar/Apr	2005	2390	5630	130	3500	1110
May/Jun	2005	3000	7280	0	2000	0
Jul/Aug/Sep	2005	3620	8230	1660	3500	0
Oct/Nov	2005	900	5510	0	3600	2700
Dec	2005	740	2540	640	500	0
Jan/Feb	2006	1760	3710	1870	1500	0
Mar/Apr	2006	1940	4020	1240	3500	1560
May/Jun	2006	1060	4910	790	2000	940
Jul/Aug/Sep	2006	940	7970	750	3500	2560
Oct/Nov	2006	730	5150	220	3600	2870
Dec	2006	640	3650	0	500	0
Jan/Feb	2007	1670	7400	1690	1500	0
Mar/Apr	2007	10540	9530	1420	3500	0
May/Jun	2007	32510	14730	130	2000	0
Jul/Aug/Sep	2007	16420	14710	1720	3500	0
Oct/Nov	2007	2510	7580	1670	3600	1090
Dec	2007	3280	5240	830	500	0

Index of Comments Received Regarding Draft Versions of the Quivira Impairment Investigation Report

Name	Type of comment	Attachment 7 Page #	Comment on
A) WaterPack	Letter	2	1st draft report
B) Stafford County Farm Bureau	Letter	4	1st draft report
C) Kansas Corn Growers Association	Letter	10	1st draft report
D) Christiansen	Letter	12	1st draft report
E) Innovative Livestock Services Inc.	Letter	17	1st draft report
F) Kansas Chapter of Wildlife Society	Letter	20	1st draft report
G) GMD5	Letter	21	1st draft report
H) Benjamin Gray	Email	28	1st draft report
I) Janet Thew	Email	29	1st draft report
J) Beth Harshfield	Email	30	1st draft report
K) Catherine Catt	Email	33	1st draft report
L) Gloria Holcroft	Email	34	1st draft report
M) Cathy Lucas	Email	35	1st draft report
N) Luke Harshfiled/Audobon letter attached	Email	36/37	1st draft report
O) Stu Luttich	Email	41	1st draft report
P) Ralph Hoover	Email	42	1st draft report
Q) Karen Hall	Email	43	1st draft report
R) Madeline McCullough	Letter	44	1st draft report
S) Sierra Club, Kansas Chapter	Email	46	1st draft report
T) Joyce Wolfe	Email	48	1st draft report
U) Kristen Schweltzer	Email	49	1st draft report
V) Kansas Wildlife Federation (Sorenson)	Letter	50	1st draft report
W) Mary Powell	Email	52	1st draft report
X) Audobon of Kansas (Klatake)	Letter	53	1st draft report
Y) Connie Achterberg	Email	57	1st draft report
Z) Mike Higley	Email	58	1st draft report
AA) U.S. Fish & Wildlife Service	Letter	59	2nd draft report
AB) KDA-DWR Responses to Comments	Email	61	

4/5/2016

To: David Barfield, P.E., and Chief Engineer

Kanas Division of Water Resources

From: Water PACK Board, and Members

Re: Quivira Impairment Comments

Mr. Barfield

As you are aware the board of Water PACK represents the majority of agricultural water users in Barton, Pratt, Pawnee, Stafford, Kiowa, and Edwards Counties. The outcome of this impairment process could have a catastrophic effect on the people and economies of these counties if not handled properly. We appreciate the opportunity to submit our comments on the initial draft of the impairment findings. We also look forward to continuing to work with your office, USFW, and GMD 5 to reach the best solution possible for all affected parties.

The official comments of the Water PACK organization are as follows:

1. Irrigators in the Rattlesnake Basin must continue to use water as conservatively as possible to protect the resource. They should also continue to look for new techniques in application, scheduling, and crop rotation to make the most efficient use of water possible.
2. Quivira should review their current methods of storing, moving, metering, and managing their water to see if there are any efficiencies that can be gained within their system.
3. Water Pack feels that augmentation holds the greatest promise to resolve the impairment. All other solutions will only result in incremental gains that will take years to positively impact streamflow. Augmentation needs to be modeled to determine the most effective plan possible.
4. At this time Water PACK feels that the refuge does not have adequate metering in place to account for water entering, exiting, and being diverted on the refuge. This needs to be resolved to obtain the best data possible for modeling before solutions can be explored. Accurate data is critical to this process. As a water right holder in GMD 5 the refuge should be held to the same metering and reporting standards as the rest of the water users in the district.
5. Water PACK does not agree that the upper Rattlesnake basin is a decline area. Over all the area from Macksville to the refuge is very stable in regards to groundwater levels. Many of the wells in the area are still at predevelopment levels.
6. Reduction in allocations from current levels would have a devastating economic effect on the people, and the communities in the Rattlesnake corridor. Reductions in allocation should not be a consideration.
7. The DWR model runs should be reviewed by Balleau to verify their accuracy. This will insure that we are working with the best data possible to reach a solution.
8. Water PACK supports the clearing of trees and brush from the creek. Clearing the stream bed from the refuge to the western border of Stafford County would reduce the riparian impact on stream flow benefiting the refuge.

WATER RESOURCES
RECEIVED
APR 11 2016
KS DEPT OF AGRICULTURE

9. In total there are four parties involved in this issue. US Fish and Wildlife, Kansas Division of Water Resources, the communities in and around the Rattlesnake corridor, and the agricultural water users. It is the responsibility of DWR, USFW, and the Ag water users to develop a long term sustainable solution without negatively impacting the economies, and quality of life in the fragile communities along the Rattlesnake corridor.

Thank you for taking the time to review this. Again Water PACK is very appreciative that you are giving such weight to our input.

Respectfully,



Pat Janssen

Water PACK Board Secretary

Water PACK Board of Directors

WATER RESOURCES
RECEIVED

APR 11 2016

KS DEPT OF AGRICULTURE

Stafford County Farm Bureau Association
306 N. Main, Box 308, St. John, Kansas 67576 / (620) 549-3292

May 3, 2016

David W. Barfield, P.E.
Chief Engineer
Division of Water Resources
Kansas Department of Agriculture
1320 Research Park Drive
Manhattan, Ks. 66502

WATER RESOURCES
RECEIVED
MAY 0 9 2016
KS DEPT OF AGRICULTURE

Dear Mr. Barfield,

The Stafford County Farm Bureau is submitting written comments on the chief engineer's impairment findings on Quivira Wildlife Refuge. We understand the complexity of this issue, but we as a board disagree with your findings. We do not believe that the refuge has been impacted to the severity that you stated in your findings. We do not see severe cutbacks in groundwater usage as a solution; augmentation has to be seriously considered as a significant part of the solution.

Looking across Stafford County since the 1950's, noticeable changes have occurred. The moldboard plow and treeless plains used to be the norm. Today, we have abundant trees, strip tillage, no till, irrigation and thousands of acres of CRP ground. Conservation efforts have led to less soil erosion and less runoff from precipitation events. Streamflow has been affected by all these factors and the only way to return to the old days is to eliminate all the progress that has occurred since the 1950's. This is not a plausible solution; so therefore, we must be innovative and look to the future with great vision.

Stafford County has always been at the forefront when it comes to being willing to step forward and innovate and lead into the future. We are proud of the job past members and current members of our GMD#5 board have done. They were the first to cut back water appropriations during development, and then close the district to further appropriations in 1993. This was a great vision that began long before anyone else in the state of Kansas acted. Waterpack was formed in the 90's to lead efforts on the state and national level as a proactive organization and to lead for incentive based solutions rather than regulatory solutions. Stafford County KSU extension service is very active in promoting technologies to help agricultural producers conserve and be efficient users of our natural resources. Stafford County Farm Bureau board members continually promote agriculture in our county, the state of Kansas and on the national level. We promote agriculture in the classroom at our schools and have

supported Stafford County school children to visit Quivira Wildlife Refuge. We lobby legislators at both the state and national level. In the past, we have lobbied on behalf of Quivira Wildlife Refuge.

The first comment we would like to make is on the perfection year 1987. This is the year that set the record for Max daily discharge at the Zenith gauge. It was the eighth wettest year out of 100 years of data. Although we understand the concept of the perfection period and it being based on the year of maximum diversions, we wonder if this is a reflection on stream base flow perfecting water right #7571 or runoff from storms perfecting this water right.

Our next concern is the Services Operational Guide. It is our understanding that this operational guide was just developed by the service at the request of the chief engineer.

1. How does this compare to the original management plan that on page 872 of the Quivira document states, "To fully utilize the water available in Rattlesnake creek it is estimated that active storage capacity for 6000 acre feet or more must be provided"?
2. How does it compare to the plan developed by the refuge in 1993? It was to be done with the conservation officer in the Topeka office of DWR. Page 617 of the Quivira document.
3. Does the operational service plan reflect the wording in the transmittal letter to Cheryl Williss prepared 1/17/93 where it is stated "Please be aware the diversion rate and quantity of water defined in the Certificate of Appropriation are for maximum conditions. The available water in most years will not facilitate utilization of water to that extent. Management plans for the refuge area should be based on probable flows in Rattlesnake creek". Page 408 of the Quivira document.
4. Does the operational service plan resemble the conservation plan in 1995 in the certification memo on page 61 of the chief engineer's impairment finding?
5. April 10, 2000 wording in the Quivira Management plan states. "The water management currently done at the refuge consists of storing as much water as is available starting in February to create habitat for migrating waterfowl and shorebirds. Water is diverted into management units and the units are held as full as possible to offset the possibility that water will not be available to refill the units later in the summer and fall". Page 285 of the Quivira document.
6. Does the operational plan still maintain that "The Big Salt Marsh is also highly attractive to shorebirds, and in a normal year almost all water that is found in the Big Salt Marsh is a result of groundwater upwelling and local runoff."? Page 285 of the Quivira document.
7. Also stated in this same Quivira Management Plan. "From May until September, most units are managed so that they dry out gradually. It is impractical to attempt to maintain all the units during the hot summer months, except when precipitation is unusually high". Page 285 of the Quivira document.
8. Has the Wetland Restoration project, specifically the re-contouring process, increased the demands for water at different times of the year?

WATER RESOURCES
RECEIVED
MAY 0 9 2016
KS DEPT OF AGRICULTURE

We are concerned that the Service operational plan is a change in management on the Quivira National Refuge. It appears that now we have seasonal Rattlesnake Creek surface water need estimates that have never existed until the last couple of years. We have gone from planning, managing and storing for the benefit of the refuge to, "We want our water when we want it." This raises these questions: has the water that is now being diverted been kept on the refuge and put to beneficial use and has consumptive use on the refuge increased under this new operational service plan? We would like to see the water that leaves the refuge monitored by meters at the point it exits the refuge. Without meters, there is no way to measure the following:

1.) "provided you do so within the constraints of the permit to proceed, it is also my duty to ensure that the consumptive use of water at the Refuge does not increase." Quoted text found on page 3 of David Pope's letter to Ralph Morgenweck dated May 27, 1994.
2.) "once this water has been diverted, provided it is retained on the authorized place of use (the Refuge) and not used in a wasteful manner, the water may be used in the manner required for the proper management of the Refuge." Quoted text found on page 2 of David Pope's letter to Ralph Morgenweck dated May 27, 1994.

At a minimum, we believe that the monitoring gauge at Raymond should be put back in service as a monitoring device of water leaving the refuge.

The next area we would like to comment on are the diversions that have been reported since 1967.

A. In the following years, these diversions were reported. Nov-Dec of 1994 and with Jan-Feb of 1995 total diversions of 901.5, Nov-Dec of 2003 and with Jan-Feb of 2004 total diversions of 1086.7, Nov-Dec of 2006 and with Jan-Feb of 2007 total diversions of 1714.1, Nov-Dec of 2012 and with Jan-Feb of 2013 total diversions of 0.00 occurred respectively. These four years all take the refuge from ¼ full Nov. 1st to full on March 1st. Does this imply that the 75% of the refuge water needs can be met with less than 1714.1 acre feet of diversions, the highest amount of the four years needed to fill the refuge?
B. In the year of 1999 diversions from March 1st to Nov 1st totaled 2181.10 acre feet. The year of 2002 diversions from March 1st to Nov 1st totaled 6474.90 acre feet. The refuge started both these periods at 75% full and ended at 75% full. What dynamics are at play here to need almost 300% more diversions in 2002 than was necessary in 1999?

In reviewing the certificate issued to Quivira Wildlife refuge we would like to comment on this section.

"The right of the appropriator shall relate to a specific quantity of water and such right must allow for a reasonable raising or lowering of the static water level and for reasonable increase and decrease of the stream flow at the appropriator's point of diversion."

It is our belief that Stafford County, as evidenced by the water level measurements of GMD#5 over time and the Great Bend Prairie Regional Planning Area Usable Lifetime of the High Plains Aquifer

WATER RESOURCES
RECEIVED
MAY 09 2016
KS DEPT OF AGRICULTURE

map, is very close to equilibrium with regards to irrigation withdrawals and recharge rates in the county. Referring to this map, approximately 85% of Stafford county has over 250 years before saturated thickness reaches minimum thresholds. Analysis of annual water level measurements leads us to believe that a reasonable raising or lowering of the static water level is occurring in our county. There are irrigation wells that were established in the 60's that in 2010 were equal or exceeded the static water level of the day they were drilled.

How do we define what is a reasonable increase and decrease of the stream flow at the appropriators point of diversion? The components of this are many fold. We realize the effect the cone of depression from irrigation well has on the stream, but we also know that the year of perfection for this water right, the majority of irrigation wells affecting the stream were already present. Was this water right not perfected with irrigation already established? The other components are numerous. Changes in farming practices contribute to less runoff making it to the streambed. Millions of dollars have been invested by farmers in our county on technological advances to maximize efficiencies to conserve a precious natural resource. CRP acres are here by thousands of acres, therefore, runoff no longer occurs from these lands. Trees line streambeds that use to be barren. A mature cottonwood exceeds a thousand gallons of water use per day. We have hundreds of cottonwoods, cedars and other trees per mile now in our county. Amy Bickel at the Hutchinson News reported in Purging the Prairie, "Some people have seen it within a week – water flowing again in streams," referencing the killing of the red cedars in the massive wildfire in southern Kansas this spring and the effect on stream flow. Conservation efforts have been promoted, encouraged and paid for with programs directed by the Natural Conservation Resource Service that all are aimed at reducing runoff and keeping every inch of water that falls on the land where it falls. Looking in the near future, how will the new WOTUS program affect land next to the stream? It's a guess, but we feel it will decrease stream flow further.

Our next area of concern is the table that starts on page 69 of the chief engineer's impairment findings. We understand the table and how the amount short of needs is calculated. We provide these thoughts.

1A. Does the Seasonal Rattlesnake Creek surface water need estimates from Quivira NWR that is used to figure the amount short of needs column accurately reflect past management practices?

2A. Since it appears that no allowance has been made for evaporation and storage in the 14,587 acre feet that is permitted, should the beginning number for the diversions not be 10,129.7 acre feet? If not, then we suggest that an additional column for evaporation and storage needs to be added into the table. This number then needs to be added into the refuge reported diversions column so that an accurate number representing the amount short of needs can be calculated. We raise this question based on the fact that 10,129.7 acre feet were actually diverted; the balance to 14,587 acre feet in Quivira Refuge certificate was credit for evaporation and storage. To ask simply, if diversions of 14,587 acre feet are allowed at the Refuge diversion points, then if evaporation and storage are calculated, would not this be an over appropriation of the Refuge certified water right?

WATER RESOURCES
RECEIVED
MAY 09 2016
KS DEPT OF AGRICULTURE

3A. In 1995, 2004 and 2005 there appear to be times when the refuge was full, however the amount short of needs column showed a shortage occurred.

4A. Why is the full appropriated water right being used to calculate the amount of need when the Refuge has been notified numerous times not to expect their full allotment every year as it is a maximum quantity perfected, not a guaranteed quantity every year?

Before we summarize our concerns we want to make it known we support the language that David Pope wrote on page four of the letter dated May 27, 1994 to Mr. Ralph Morgenweck.

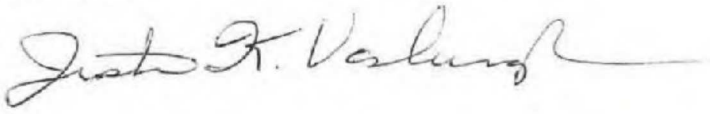
"Even under pristine conditions, most of the streams in Central and Western Kansas are not continuously dependable sources of supply. Particularly in the case of very large water rights, such as the Quivira Refuge right, the water holder should not expect to be able to fully exercise the right each and every year. I should also point out that a certificate states the maximum quantity of water that may be diverted in any year. Because certificates are based on the maximum year of record, no water right holder should expect to need or have available the maximum authorized quantity every year."

The Stafford County Farm Bureau board appreciates the hard work put in on this impairment issue by you and your staff. We have raised several important issues in our minds that need addressed and look forward to your response. We do not believe the refuge is impaired to the extent that you have suggested in your preliminary findings. We have tried to detail why in this letter we feel that way. Severe cutbacks only destroy our local economy, county valuations, schools, businesses and forces individuals to look elsewhere for jobs as they become unemployed. Furthermore, severe cutbacks will not guarantee the Refuge water when they want it. The only realistic solution to this problem is augmentation, if impairment exists. We are more than willing to step forward and help in any way we can when it comes to design, planning and implementation of an augmentation plan. We support augmentation for the Quivira Wildlife Refuge, but in no way can we support severe cutbacks in ground water pumping when it destroys our county while not satisfying the Refuge water right. We also believe further reductions in ground water pumping can be achieved through incentive based programs that reward conservation of water. Several of these programs have just been finalized, and now are being promoted. We also would like to suggest that the possibility that the waste water treatment facility for St. John, Kansas that currently sets on the banks of the Rattlesnake Creek could be converted to return water to the stream.

Our vision for Stafford County as a Farm Bureau board is to sustain and conserve our natural resources for the benefit of the many generations to come after us. We are proponents of agriculture, communities, and conservation. We believe in our people of Stafford County and together we are willing to move forward with a sensible innovative solution to this issue. It is in all of our best interests to resolve this among Stafford County residents and the Quivira Refuge for the good of the county and the many generations to come in the future. We would again like to express our thanks for allowing us to respond to the impairment investigation findings.

WATER RESOURCES
RECEIVED
MAY 09 2016
KS DEPT OF AGRICULTURE

Respectfully,



Justin K. Vosburgh	Stafford County Farm Bureau President
Shon Meschberger	Stafford County Farm Bureau Vice-President
Marlyn Spare	Stafford County Farm Bureau Secretary-Treasurer
Tyler Alpers	Stafford County Farm Bureau board member
Brian Dunn	Stafford County Farm Bureau board member
Cammie Vaupel	Stafford County Farm Bureau board member
Keith McNickle	Stafford County Farm Bureau board member

cc: Jackie McClasky — Secretary of Kansas Department of Agriculture
Richard Felts — Kansas Farm Bureau President
Keith Miller — Kansas Farm Bureau
Kent Askern — Kansas Farm Bureau
Matt McCabe — Kansas Farm Bureau
Senator Pat Roberts
Senator Jerry Moran
Representative Mike Pompeo
Kansas Senator Mitch Holmes
Kansas Representative Greg Lewis
GMD#5
Waterpack
Stafford County Extension

WATER RESOURCES
RECEIVED
MAY 09 2016
KS DEPT OF AGRICULTURE

To: David Barfield, Chief Engineer, Division of Water Resources

From: Greg Krissek, CEO, Kansas Corn Growers Association

Date: May 13, 2016

Re: **Quivira National Wildlife Refuge Impairment Complaint**

Thank you for the opportunity to provide written comments regarding the Quivira National Wildlife Refuge (the Refuge) impairment complaint. My name is Greg Krissek. I am providing these comments in my role as CEO of the Kansas Corn Growers Association (KCGA.) KCGA represents Kansas corn producers on a variety of issues that concern our members.

Kansas corn producers have a vested interest in the conversation about water quantity and quality in our state. Water quantity is a key issue for our growers as is protecting our water quality through improved farming practices, using best management practices for pesticides and fertilizers, employing conservation measures like reduced and no-till farming, and installing riparian buffers. By controlling sedimentation and pesticide runoff, we are also controlling our future access to crop protection tools and ultimately the use of our land to produce needed crops.

Farmers are always looking to the future, especially when we talk about water quantity. Irrigation has been key to growers in specific areas of the state, including the Rattlesnake Creek basin. This resource plays a key role in the economic well-being of Kansas. Examples of productive agriculture such as corn farming, cattle feeding, hog facilities, dairies, beef processing, grain handling, ethanol production, equipment and implement dealers, ag retailers, and transportation companies to move corn, cattle, pigs, meat, milk, ethanol, distiller's grains and a host of other products, have all contributed to build a thriving agribusiness complex in Kansas.

Most irrigators are already taking measures to conserve water as a practical business decision driven by economics. Corn farmers have made great strides in water conservation through improved farming practices, improved irrigation mechanics and technology, and continuing advances in the corn seed itself through breeding and biotechnology. As we continue down this path, we must remember that technological advances in corn and corn farming will continue to occur and improve the efficient use of water for this needed crop.

Impairment Report Issues

The Initial Report of the Chief Engineer Concerning a Claim of Water Right Impairment In the Matter of Water Right File No. 7,571 (Initial Report) contains many errors. The errors are so numerous as to make the findings of the report appear to be in error.

First, the entire impairment claim is based on a water schedule that the Refuge claims they need. The Refuge provides no proof showing that the water is needed at the specific times they have listed in their schedule. Furthermore, the water use that they have reported does not mirror the schedule at any point in the past 30 years. In fact, during most of the periods that show impairment in the analysis in Attachment 6 of the Initial Report, it appears the Refuge did not even utilize all of the water that was available. Using the Refuge's schedule, there was impairment in the year that the water right was certified. It would seem logically impossible to have impairment on the certification year. Furthermore, the use of the water during the certification year was not in line with the claimed needs of the refuge. Therefore, the Refuge's claim of impairment would not be valid since they were not utilizing the water that is available to them. Additionally, basing an impairment analysis on the "claimed" needs and timing of the complaining party without requiring any verification of those needs and timing is not the proper way to make a decision on impairment.

There also appear to be numerous potential problems with the perfection and certification of Water Right 7,571. In reviewing the water right file, it appears that the perfection and certification of the right should have occurred by December 26, 1982. The file for the Water Right 7,571 indicates that DWR had received a "Notice and Proof of Completion of Works for Diversion Works" on December 26, 1978. K.A.R. 5-8-6(a) makes it clear that a water right should be perfected within four years of the completion of the diversion works. Therefore, the water right should have been perfected and certified between 1979 and 1982. If the water right file is missing an extension of that time period, then many other issues may arise regarding what portions of the water right file are missing.

Finally, the permit for Water Right 7,571 states that the water right "must allow for the reasonable raising or lowering of the static water level and for the reasonable increase or decrease of stream flow at the appropriator's point of diversion." The Initial Report does not attempt to analyze whether the alleged impairment is caused by either a reasonable lowering of the static water level or a reasonable decrease of stream flow. Specifically, there is no analysis in the Initial Report regarding the Refuge's proposed water schedule and the reasonableness of that schedule with their historic use and the historic stream flow of the Rattlesnake Creek.

For the aforementioned reasons, the initial report is wholly lacking in finding impairment. The analysis of the impairment complaint should include a look at the reasonableness of the alleged water shortages as compared to the alleged needs of the Refuge. Additionally, a legal analysis should be completed to determine if 1987 was truly the proper year to certify and perfect the water right.

Augmentation

While there is still a valid question regarding whether an actual impairment exists in this situation, it is important to note that should impairment be found, augmentation should be utilized as the best method to satisfy the needs of the water right. Kansas Corn Growers Association and numerous other groups worked to ensure that augmentation can be a potential solution to impairment claims in the Rattlesnake Creek Basin. Therefore, we strongly encourage DWR to look at augmentation should an impairment be found in the future.

Kansas Dept. of Agriculture

Division of Water Resources

5/13/2016

TO

DAVID BARFIELD
1320 RESEARCH PARK DRIVE
MANHATTAN KS 66502

FROM

STANLEY CHRISTIANSEN
640 NE 190th
HUDSON KS 67545

TOPIC

QUIVIRA NWR / RATTLESNAKE CREEK IMPAIRMENT

5/13/2016

Mr David Barfield:

I live at 640 NE 190th Hudson Kansas 67545. The location is seven miles as a crow flies from the main lake. I have averaged crossing the mud flats once a day for the last 40 years. I have ground in Rice and Reno counties that borders the Refuge

Dad was born in 1906 and hunted Ducks and geese starting in 1919 or 1920. He passed away at 93. The first year there was a limit on ducks the limit was 40 ducks a day.

The reason I bring this up is the first year he saw the main lake dry was 1980. That year there was no reason for it to be dry. The Refuge had the water flowing out of Rattlesnake when they could or should have put the water in the big marsh.

(2)

The Refuge had built Least Tern nests on the north mud flats. Cattle were about to destroy the nests when I called the Refuge. I also helped with the cattle and after talked with the Refuge manager. I asked why they were running water out the Rattlesnake creek instead of into the main lake to keep it from going dry. The next day the flow in the creek stopped.

It was too late to keep the lake from drying up. The Refuge had the water, but just left it flow out.

I am 13 years old. I have seen wasteful water practices every year. They get the water every year.

There is I believe never a reason not to hold as much water as they can, except in a flood.

They can move the water through the impoundments and hold and hold the water for further use instead of letting it flow out of the system.

They have spent all the money to build impoundments let's use them for efficient water management.

In the 1980's when it started raining and they didn't have the boards in the dikes to hold the water, I put the boards in the dikes to hold the water. I also called them and told them I was doing it. They told me that if they caught me, they would arrest me.

That's when I told them to get out and put them in themselves. They didn't seem interested as I kept putting them in.

Kansas Dept. of Agriculture Division of Water Resources

(4)

Mr. Barfield, there are many more instances of waste water management, I have not mentioned. I would be glad to visit with you if you want.

Sincerely

Stan E Christiansen

STAN E CHRISTIANSEN
6210 NE 190th
HUDSON, KS 67545

620-793-6878 Lodge
314-651-7911 Cell
STANC942@GMAIL.COM

Kansas Dept. of Agriculture

DEVINE & DONLEY, LLC
Attorneys at Law

Division of Water Resources

534 S. Kansas Ave., Suite 830
Topeka, KS 66603
Office - (785) 246-8444 Fax - (866) 588-9472
www.devineanddonley.com

To: David Barfield, Chief Engineer, Division of Water Resources

From: John Donley, Legal Counsel, Innovative Livestock Services, Inc.

Date: May 13, 2016

Re: **Comments on the Initial Report of the Chief Engineer Concerming a Claim of Water Right Impairment in the Matter of Waater Right File No. 7,571 Owned and operated by U.S. Fish and Wildlif Service**

Thank you for the opportunity to provide written comments regarding the U.S. Fish & Wildlife Service (the "Service") impairment complaint. My name is John Donley. I am providing these comments in my role as Legal Counsel for Innovative Livestock Services, Inc. ("ILS"). ILS owns and operated numerous water rights in the Rattlesnake Creek Basin that is subject to this impairment investigation. ILS incorporates the comments of the Board of Directors for Big Bend Groundwater Management District #5 into these comments.

In reviewing the Initial Report of the Chief Engineer Concerning a Claim of Water Right Impairment in the Matter of Water Right File No. 7,571 (the "Initial Report"), many problems were found with the water right itself as well as the analysis used to determine impairment. Many of these issues will be addressed in these comments. The short time frame for comments made it difficult to conduct a complete analysis of the file and to study the model runs used in the initial report. The Division of Water Resources ("DWR") took 20 months to complete the impairment investigation and publish the Initial Report. For all interested parties to be expected to analyze the same issue and prepare comments in less than six months is grossly inadequate. Furthermore, Water Right File No. 7,571 was only available to review for less than four months. For these reasons, ILS affirmatively asserts that other issues may be raised in the future should litigation or further comments need to occur in order to reach a legal conclusion to this matter.

Issues discovered in reviewing Water Right File No. 7,571 and the Intitial Report

Upon review of the file, there are numerous problems regarding the perfection and certification of Water Right 7,571. It appears that the perfection and certification of the right should have occurred by December 26, 1982. The file indicates that DWR received a "Notice and Proof of Completion of Works for Diversion Works" on December 26, 1978. K.A.R. 5-8-6(a) states that a water right should be perfected within four years of the completion of the diversion works. Under this rule, the water right perfection period ended December 26, 1982. If the water right file is missing an extension of that time period, it raises the question as to what other documents are missing from the file.

The permit for Water Right 7,571 states that the water right "must allow for the reasonable raising or lowering of the static water level and for the reasonable increase or decrease of stream flow at the appropriator's point of diversion." The Initial Report does not attempt to analyze whether the alleged impairment is caused by either a reasonable lowering of the static water level or a reasonable decrease of stream flow. Specifically, there is no analysis in the Initial Report regarding the Service's proposed water schedule and the reasonableness of that schedule with their historic use and the historic stream flow of the Rattlesnake Creek.

The Service received notification from DWR multiple times regarding the fact that the full amount of the water right may not be reasonably available at all times. Specifically, DWR sent a letter to the service on August 19, 1993 stating that "it is quite probable that the natural flows of water to the full extent of the water right will not be available in ***most*** years." (emphasis added) In correspondence dated May 27, 1994, DWR again notified the Service that "no water right holder should expect to need or have available the maximum authorized quantity every year." Why didn't DWR utilize a reasonableness standard when drafting the initial report?

There is also a question regarding the inclusion of the evaporated amount as the amount diverted in 1987. The file never gives legal justification for including this amount. The water that was evaporated in 1987 was actually diverted in previous years. Therefore, the authorized quantity for File No. 7,571 should have been the actual amount diverted in 1987 (assuming DWR had extended the perfection period to include 1987), which was 10,129.7 acre feet. If the evaporated amount is to be included, why hasn't the service reported the evaporated amounts in their annual water use reports?

Another problem that exists in the Initial Report, is the fact that the entire impairment claim is based on a water schedule that was recently submitted by the Service. None of the Annual Water Management Plans contained in the file for the water right reference the water schedule submitted to DWR in the past. Those plans never reference anything close to the alleged needs submitted by the service in May 2015 (see Attachment 5 of the Initial Report). Why did DWR simply accept Scenario 3 found in Attachment 5 of the Initial Report? It seems that the application of Scenario 1 from the Attachment 5 or a similar historic use of the water would be more accurate than a subjective assessment that maximizes the Service's claim of impairment.

Furthermore, the water use that the Service has reported does not coincide with the schedule used in the Initial Report at any point in the past 30 years. In fact, during most of the periods that show impairment in the analysis in Attachment 6 of the Initial Report, it appears the Refuge did not even utilize all of the water that was available. Using the Refuge's schedule, there was impairment in 1987; the year that the water right was certified. It would seem logically impossible to have impairment on the certification year. Furthermore, the use of the water during the certification year was not in line with the claimed needs of the refuge.

There are multiple months where there is water available to meet the alleged needs of the service, and they do not even divert their alleged needs. Therefore, the Refuge's claim of impairment would not be valid since they were not utilizing the water that was available to them. Additionally, basing an impairment analysis on the "claimed" needs and timing of the complaining party without requiring any verification of those needs and timing is not the proper

way to make a decision on impairment. This portion of the analysis alone should require that DWR reevaluate this impairment claim.

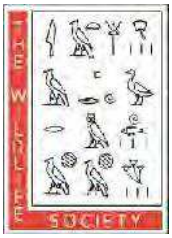
For these and many other reasons, the initial report does not provide the legal or factual foundation to find impairment. A more thorough and accurate analysis of the impairment complaint should include a look at the reasonableness of the alleged water shortages as compared to the alleged needs of the Service. Furthermore, the alleged needs of the Service should be scrutinized. Finally, a legal analysis should be completed to determine if 1987 was truly the proper year to certify and perfect the water right.

Potential for Augmentation

While there is still a valid question regarding whether an actual impairment exists in this situation, it is important to note that should impairment be found, augmentation should be utilized as the best method to satisfy the needs of the water right. All potential options for augmentation should be analyzed to satisfy a call for water should impairment be found.

Conclusion

As stated earlier, the initial report does not provide the legal or factual foundation to find impairment. A more thorough and accurate analysis of the impairment complaint should include a look at the reasonableness of the alleged water shortages as compared to the alleged needs of the Service. The alleged needs of the Service should be scrutinized. A legal analysis should be completed to determine if 1987 was truly the proper year to certify and perfect the water right. Additionally, all questions raised in these and other comments should be answered before moving forward with a final report. Furthermore, should impairment be found, would any call for water be a futile call. Shutting down groundwater wells would not provide the relief necessary if the Service's right is being impaired as they allege. Therefore, it appears that augmentation would be the best alternative should impairment be found.



The Wildlife Society
The Kansas Chapter

Promoting Excellence in Wildlife Stewardship through Science and Education

13 May 2016

David W. Barfield. PE.
Chief Engineer
Division of Water Resources
Kansas Department of Agriculture
1320 Research Par Drive
Manhattan, KS 66502

Dear Mr. Barfield:

This letter constitutes comment by The Kansas Chapter of The Wildlife Society (KSTWS)—a professional society of wildlife biologists, land managers, researchers, and educators in the state of Kansas—on the "Claim of Water Right Impairment, In the Matter of Water Right File No. 7,571, Owned and operated by U.S. Fish and Wildlife Service." Our chapter strongly encourages the Kansas Department of Agriculture's Division of Water Resources (DWR) to adhere to all relevant regulations and water rights in fully restoring water flow in Rattlesnake Creek to provide sufficient flows to Quivira National Wildlife Refuge (QNWR), a site managed by the U.S. Fish and Wildlife Service (FWS). The FWS has senior water right priority to approximately 95% of the water rights in the Rattlesnake Creek Basin. Our chapter is troubled by your report concerning the claim that water supply for QNWR "has been regularly and substantially impacted by junior groundwater pumping."

Our concern is regarding the ability of the FWS to manage wetlands at QNWR that are vital to wetland-dependent wildlife in Kansas and continentally. Quivira National Wildlife Refuge has been recognized as a Wetland of International Importance by the 1988 Ramsar Convention on Wetlands. It is a major stopover site for migratory waterbirds (waterfowl, shorebirds, herons and egrets, rails, etc.). It has been estimated that most – if not all – of the individuals of some species of shorebirds stop over at the QNWR-Cheyenne Bottoms Wildlife Area wetland complex on their continental migrations. The site represents an expansive wetland, the type of which has become exceedingly rare in the modern world. Impairment of water flows to QNWR could contribute to a hemispherical degradation of migratory water birds, species which constitute major components of natural heritage for the people of Kansas and the United States of America.

Again, KSTWS strongly encourages the DWR to respect the senior water rights of FWS in the Rattlesnake Creek Basin by fully restoring water flow in Rattlesnake Creek through appropriate regulatory means.

Respectfully submitted,

William E. Jensen, Ph.D.
President
The Kansas Chapter of The Wildlife Society
Topeka, Kansas
jensenwi81@yahoo.com

Darrell Wood - Edwards (Pres.)
Fred Grunder - Pratt (V Pres.)
John Janssen - Kiowa (Treas.)
Curtis Tobias - Rice (Sec.)
Justin Gatz - Reno
Kent Lamb - Stafford
Phil Martin - Barton
Bob Standish - Pawnee
Tom Taylor - At-Large



Orrin Feril, Manager
125 South Main Street
Stafford, Kansas 67578
ph: (620) 234-5352
fx: (620) 234-5718
gmd5@gmd5.org
www.gmd5.org

May 12, 2016

David Barfield, Chief Engineer
Division of Water Resources
Kansas Department of Agriculture
1320 Research Park Drive
Manhattan, Kansas 66502

Re: Initial Report of the Chief Engineer
Water Right Impairment

Dear Mr. Barfield:

Thank you for the opportunity to provide comments on the Initial Report (the "Report") of the Chief Engineer for the impairment investigation filed by your office on December 2, 2015. The Board of Directors for Big Bend Groundwater Management District #5 (the "District") appreciates the complexity of this investigation and has invested great time and consideration in preparing the following responses to the Report.

The District has, for the past 40 years, worked to fulfill the mission statement outlined in its first management program approved June 6, 1976:

> Big Bend Groundwater Management District No. 5 was organized through the efforts of concerned citizens to conserve, promote, and manage groundwater resources so that quality and quantity of that resource will be maintained for present and future needs. The Groundwater Management laws (K.S.A. 82a-1020-1035) establish the right of local landowners and water users to determine their own destiny with respect to the use of groundwater within the basic law of the State of Kansas.

Throughout the District's 40-year history, it has implemented numerous strategies to protect and conserve the Great Bend Prairie aquifer. These strategies have included strict monitoring of water use with water flow meters; well spacing requirements; waste of water enforcement; well movement limitations; and a restrictive safe yield policy. In October 1991, the District implemented a flow meter requirement for "diversion works of all vested rights, appropriation rights and approved applications for permit . . ." on or before January 1, 1993. In 1998, the District was formally closed to new appropriations through a revision to K.A.R. 5-25-4.

As a result of these management objectives, the Great Bend Prairie aquifer has not seen the dramatic water table declines that have occurred in other parts of the state. The District has noted declines in the water table during years in which precipitation was limited, but these declines have proven temporary. Due to the soil types that overlay the District and the relatively shallow depth to water, the aquifer recharges and recovers quickly.

On January 15, 2016, the Kansas Department of Agriculture – Division of Water Resources ("KDA–DWR") staff provided a copy of the entire file (the "Record") for Water Right File No. 7571 to give members of the general public an opportunity to review the process the United States Fish and Wildlife

Service (the "Service") and KDA–DWR followed to register and perfect this water right. The District's review of this process has brought to light several areas of concern that are the subject of the remainder of this letter.

Irregularities in the Certification of Water Right File No. 7571

According to the Record, the Service submitted an application for permit on August 15, 1957. On May 20, 1963, the Service received the permit to appropriate water for beneficial use (the "Permit") from KDA–DWR Chief Engineer R.V. Smrha. In this Permit, the KDA–DWR outlined the Service's deadline to complete construction of diversion works. The time frame in which an applicant must construct diversion works following the approval of an application to appropriate water is set out in K.A.R. 5-8-4.

The Permit further stated a deadline of December 31, 1968, for perfection of the appropriation, or within any authorized extension of time. The Service requested and received extensions of the completion deadline on two separate occasions, pursuant to K.A.R. 5-8-5(b)-(d). According to the Record, the Service received its final extension on March 20, 1974. Pursuant to this extension, the Service had until December 31, 1978, to complete the construction of the diversion works.

The Record includes a letter from KDA–DWR staff, dated December 26, 1978, acknowledging receipt of "Notice and Proof of Completion of Works for Diversion Works" for Water Right File No. 7571. K.A.R. 5-8-6 outlines the process an applicant must follow to perfect a water right. Subsection (a) states that the time period for perfection begins following the deadline for construction of the diversion works. There is no document in the Record indicating that the Service requested or received an extension of the deadline for the completion of diversion works beyond December 31, 1978. Therefore, the perfection period for Water Right File No. 7571 should have begun no later than that date.

Curiously, the Service submitted a letter to KDA–DWR on July 15, 1982, enclosing the Notice and Proof of Completion of Works for Diversion Works for Water Right File No. 7571. KDA–DWR then sent a letter in response noting that this document was unnecessary, as KDA–DWR had acknowledged receipt of this document already in March 1974, effective May 1972. This gap in the record leaves the District to question whether the Service received an extension of its deadline to complete construction of diversion works, and if so, whether any documentation of that extension has survived.

K.A.R. 5-8-6(a) states that a reasonable time to perfect a water right shall be no fewer than four full calendar years following the deadline for construction of the diversion works. Pursuant to K.A.R. 5-8-6(b), if the permit holder's time to construct the diversion works is extended, the perfection period shall also be extended to no fewer than four full calendar years beyond the final deadline to construct the diversion works. As noted earlier, KDA–DWR acknowledged receipt of the Notice and Proof of Completion of Works for Diversion Works document on December 26, 1978. There is no indication within the Record in regard to an extension beyond the minimum of four full calendar years. Therefore, the deadline to perfect Water Right File No. 7571 should be no later than December 31, 1982. Once again, if the Service received an extension on the deadline to perfect its water right through 1987, the record does not contain any documentation of that extension.

Based on the aforementioned irregularities, the District is concerned about the procedure followed to perfect the Service's water right.

The Service's Report of Annual Water Use is Incomplete

The Report repeatedly notes that the appropriated quantity of water for Water Right File No. 7571 is 14,632 acre-feet ("AF") per calendar year.

The Certification Memo (the "Memo") for Water Right File No. 7571 states its reliance on a table titled "Typical Annual Water Use at Quivira Wildlife Refuge." According to the Memo, this table was intended to demonstrate the maximum amount of water the Service might use if sufficient water was available to

fulfill all of the management options in its Annual Water Management Plan. Importantly, the Memo notes that the tabulation does not account for other items, such as several unmanaged areas often flooded to a depth of 2-3 inches; evaporation during winter months; or the drainage of management units. To account for this discrepancy, the Memo explains that the active diversions from the three points for the year of record, 1987, was added to the storage and evaporation from the Little Salt Marsh as shown below:

10,175 AF of active diversions + 1,862 AF storage + 2,595 AF evaporation

Each year, the Service includes water diversions in its water use report, but not the amount that evaporated from the Little Salt Marsh. Because the Service's water right was calculated using a method that factored in this evaporation, the District believes the water right certificate should be amended to note the two methods of accounting for water annually. If no amendment is made, the Service should be found in violation for failing to report the evaporation from the Little Salt Marsh annually.

The Holder of a Water Right Should Not Expect to Fully Exercise It Every Year

As stated previously, the Refuge water right was perfected in 1987. Not coincidentally, that year set the record for maximum daily discharge at the Zenith gage. In fact, it was the eighth wettest year out of 100 years of data. While the District understands the concept of the perfection period and its reliance on the year of maximum diversions, the District wonders whether these diversions are a reflection of stream base flow or simply runoff from storms. In any event, the Record contains multiple letters from the Service to KDA–DWR indicating concerns about water the Service claims would have been available if not for the groundwater pumping conducted by the holders of junior rights within the subbasin.

As a preliminary note, activities outside of the boundaries of Quivira National Wildlife Refuge (the "Refuge") are not within the jurisdiction of the Service. The Chief Engineer for KDA–DWR retains jurisdiction for the use of water throughout the State of Kansas and, in that capacity, granted the Service a permit to construct diversion works and perfected its water right. Then Guy Ellis, a hydrologist with KDA–DWR discussed the nature of that water right in an August 19, 1993, letter to the Service. He stated that "it is quite probable that the natural flows of water to the full extent of the water right will not be available in most years. Management plans for the Refuge area should be based on probable flows of Rattlesnake Creek." In May 1994, the Chief Engineer cautioned the Service again. He explained that:

> Even under pristine conditions, most of the streams in Central and Western Kansas are not continuously dependable sources of supply. Particularly in the case of very large water rights, such as the Quivira Refuge right, the water holder should not expect to be able to fully exercise the right each and every year. I should also point out that a certificate states the maximum quantity of water that may be diverted in any year. Because certificates are based on the maximum year of record, no water right holder should expect to need or have available the maximum authorized quantity every year.

This statement suggests that it is appropriate to account for a shortage in supply to the Refuge water right. Nevertheless, the Chief Engineer's Report has allowed the Service to determine its monthly water needs based on the assumption that it will fully exercise its water right every single year. This allowance is in direct conflict with the KDA-DWR's prior statement that no water right holder should expect to need or have available the maximum quantity authorized by the certificate for appropriation on a yearly basis.

Even the Service's own Quivira Management Plan acknowledges that "[f]rom May until September, most units are managed so that they dry out gradually. It is impractical to attempt to maintain all the units during the hot summer months, except when precipitation is unusually high". (Page 285 of the Quivira document.)

Clarification Needed Regarding "Normal" Conditions of the Subbasin

In an April 10, 1996, letter to the Service, the Chief Engineer stated that 41,056 AF of water passed the

USGS streamflow gage near Zenith (Zenith gage) in 1987 at a rate below 300 cfs, but notes that the Service did not divert this water. In light of this statement, the District requests clarification as to Water Right File No. 7571. Does KDA–DWR consider the 41,056 AF of water that passed the Zenith gage in calendar year 1987 below 300 cfs to be normal conditions of the subbasin? More specifically, what component of that amount can be attributed to baseflow versus excess runoff? As the KDA-DWR is aware, land practices throughout the region have changed dramatically over the past 30 years. These changes have minimized—perhaps even eliminated—the vast majority of the runoff coming from fields. In many cases, these land practices were motivated by state or federal incentive programs.

Errors in the Calculation of the Service's Water Use History

In September 1996, the Chief Engineer issued to the Service a document titled "Findings and Order". It required the installation of water flow measurement structures and devices, as well as a monitoring system sufficient to provide continuous, daily data relative to the diversion of natural flows of the Rattlesnake Creek.

The difficulty in designing and implementing an accurate metering system at the Refuge's diversions is acknowledged several times in the Record. As a result, the Service twice requested (on June 8, 2001, and again on January 22, 2003) that the Zenith gage be used as a "means of measuring the volume of water entering the Refuge." The Service requested this method of measuring volume in order to ensure the collection of accurate data that is logged in real time on the USGS website. As noted by the Service, this measurement location would also account for the filling and maintenance of water level in the Little Salt Marsh, in addition to the water diverted by the Service to fill the other water units at the Refuge. In March 2002, KDA–DWR responded with a letter that did not answer the Service's request to use the Zenith gage for measuring total volume entering the Refuge.

The Service was given a deadline of December 31, 1997, to meet these requirements. This order came five years after the District required water flow meter on the "diversion works of all vested rights, appropriation rights and approved applications for permit . . ." Subsequent to this order, the Service filed numerous requests for extensions and waivers from this requirement until it finally installed the necessary equipment in early 2012.

According to the Record, the Service used the Clausen Rule for estimating water use from 1978 through 2012. The District would like to know whether the KDA–DWR has completed a review of the water flow diversion history for Water Right File No. 7571 to validate the water use history—specifically, the accuracy of the water use history in comparison to water availability through the Zenith gage. Furthermore, if the KDA-DWR has completed such a review, the District is interested to learn the nature and extent of that study, as well as its conclusions.

On a related point, Exhibit G within the Record, dated December 21, 1992, details the correct application of the Clausen Rule for measuring flow. This same document notes that there may have been errors in the water use records due to personnel errors. However, after calling into question the accuracy of the Service's record-keeping, the KDA–DWR did not issue any penalties against the Service for failure to maintain an accurate water measuring device. This is another point of concern for the District, whose constituents are also held to strict measuring requirements.

The Effect of the Service's Shifting Management Strategy for the Refuge

In the same September 1996 "Findings and Order", the Chief Engineer also ordered the development of a water conservation plan to avoid waste of water, to minimize unnecessary losses, and to optimize efficient use of water for the Service's authorized purpose. This plan was to encompass the development of an operational plan for the improved conservation and management of water at the Refuge, including a drought contingency plan. Following the grant of several extensions, the Refuge submitted a water conservation plan that the KDA–DWR approved in 2000.

Attachment 5 to the Report describes the seasonal water need estimates for the Refuge as of 2015. This need is estimated based on the Refuge's water use records for the previous 20 years and the Comprehensive Conservation Plan adopted by the Service in 2015. The Service's 2015 water conservation plan differed in several important aspects from the 2000 plan. For instance, the 2000 plan acknowledged that streamflow in the Rattlesnake Creek is variable throughout the year. The Refuge's strategy was to store up as much water as was available in February and then allow drawdown in management units for habitat in late spring (March – May). The majority of the remaining management units would then be allowed to dry out gradually throughout the summer months (May – September).

This strategy outlined in the water conservation plan adopted in 2000 is in conflict with the 2015 water need estimate for the Refuge, which contemplates approximately 60% of the annual appropriation being diverted from the creek into the management units between March and September. In other words, the management demands of the Refuge seem to have shifted away from a cyclical management strategy that works in concert with water availability annually.

The concerning result of the Service's shift in management strategies for the Refuge is apparent when comparing diversions before and after the Service's new operational plan was adopted in 2000. For example, in 1999, Refuge diversions between March 1 and November 1 totaled 2181.10 AF. In 2002, Refuge diversions between March 1 and November 1 totaled 6474.90 AF. The Refuge began both of these periods at 75% full and ended at 75% full. The District is bewildered as to why the Service required almost 300% more diversions in 2002 than was necessary only a few years before.

Casting a wider net and examining Refuge diversions between 1994 and 2013 paints a cloudier picture still. During this time period, the following diversions were reported:

- Nov. – Dec. 1994 and Jan. – Feb. 1995 – total diversions of 901.5
- Nov. – Dec. 2003 and Jan. – Feb 2004 – total diversions of 1086.7
- Nov. – Dec. 2006 and Jan. – Feb. 2007 – total diversions of 1714.1
- Nov. – Dec. 2012 and Jan. – Feb. 2013 – total diversions of 0.00

Each of these four periods took the Refuge from 1/4 full on November 1 to full on March 1. The District's impression based on these numbers is that 75% of the Refuge's water needs can be met with less than 1714.1 AF of diversions—the highest amount of diversions needed to fill the Refuge in any one of the above years.

Technical Review and Comments by Balleau Groundwater, Inc.

When the Chief Engineer issued the Report on December 2, 2015, the District asked BGI to conduct a thorough technical review of the data collection and analysis presented in the Report. This technical review resulted in the following conclusions.

1. The Chief Engineer's approach to estimating flow in Rattlesnake Creek had junior pumping not occurred is technically sound. We see no apparent issues in the calculations comparing flow in Rattlesnake Creek with the water demand schedule provided by the Service.

2. Although the Chief Engineer's impairment analysis considers the water needed to fully supply the Service's demand schedule for the Refuge, it also recognizes that natural shortage is an occurrence during drought periods and that there are times when the Refuge will experience a water shortage. There are technical methods for assessing how that shortage could occur in administration of the Service's water right. Augmentation amounts would vary accordingly.

   The recognition of the natural shortages associated with the diversion of water from the Rattlesnake creek is documented in the August 19, 1993, letter to the Service from the Chief Engineer. According to the September 25, 1996, Findings and Order, the Chief Engineer explained that a water conservation plan was required for the Refuge because "the Rattlesnake

Creek may be insufficient, during times of drought, to provide a supply of water sufficient to meet the needs of all water users dependent upon the creek."

3. The Chief Engineer should indicate whether hydrologic effects from out-of-basin pumping have an implication on his finding of impairment.

   The Report as written is unclear on this point. Take, for example, the following statement on Page 37: "Some impacts of pumping from within Rattlesnake Creek basin by rights junior the Refuge Right eventually propagate outside the basin boundaries, so that baseflow impacts that pass through the Zenith gage are somewhat less than this total." The reverse impact of wells located outside the basin is expected to deplete flow from Rattlesnake Creek.

4. The Appendix of the Report details the modelling efforts conducted by KDA-DWR staff during this investigation. Several model scenarios were conducted using various versions of the hydrologic model. Scenario 11 compared the results from both the single-layer and the multi-layer model and indicates a difference in the change to Rattlesnake Creek flow of 2.4 percent. In comparing these two versions of the model for Scenario 1, as described in the Appendix, there is a difference of about 5 percent on the global stream budget. The difference in the magnitude of streamflow is generally 1-6 cfs. This indicates there are some differences between multi- and single-layer models that are sensitive to the magnitude of change in groundwater pumping. Perhaps the single-layer model could be used for scoping-level assessments and then the multi-layer model could be used for final calculations and conclusions.

5. The starting head condition used in the model scenarios is not steady. Beginning the simulations with an initial condition that is not in steady state should be corrected.

6. A comparison of flow at Zenith gage to the seasonal demand schedule developed by the Service for the Refuge indicates a number of times when river flow exceeds Refuge demand. Coordination with the Refuge on managing stored water in Little Salt Marsh may be an approach to facilitate the effectiveness of augmentation pumping. The degree of storage in the Refuge's operations is a question that may affect augmentation.

   As noted in the certificate of appropriation for Water Right File No. 7571, dated April 9, 1996, the Refuge is entitled to "a quantity not to exceed 14,632 acre-feet of water per calendar year for recreational use. Such quantity can be subsequently stored and accumulated in marsh areas . . ." The Record shows several references to the need for storage of water in recognition of the fluctuation in natural flows of the Rattlesnake Creek within a calendar year.

7. When comparing the water use history for the Refuge to the historical flow at the Zenith gage, the storage and evaporation from Little Salt Marsh should be added to the reported diversions, as this is the methodology used in certifying Water Right File No. 7571. When conducting this analysis, over the period 1974 through 2013, flow at Zenith gage exceeds the Service's water right in 28 out of 40 years, or 70 percent of the time; however, the reported water diversions (with evaporation added) are generally less than the amount certified. This indicates a possible failure to exercise the full water right. The effectiveness of full exercise of the Refuge water right is a question that may affect augmentation.

Strategies for Augmentation

In 2006, the Kansas Water Office ("KWO") produced a report titled "Stream Flow Augmentation of Rattlesnake Creek." In that report, the KWO calculated average augmentation needs over a three-month demand schedule of 1,146 AF of water (6.3 cfs) from a site near U.S. Highway 281. The augmentation plan described would pump this water into the Rattlesnake Creek channel for delivery to Water Right File No. 7571.

Water Right File No. 7571 is located at the downstream end of an intermittent stream which traverses approximately 35 miles across the District. The majority of the subbasin area has been classified as dry subhumid and is comprised of low bluffs of dune sand. Reliance on this stream as a sole source of water can be difficult, especially in years of limited precipitation such as 2011 and 2012.

Recently, the District conducted preliminary model scenarios to evaluate the impact of augmentation of streamflow from groundwater pumping from locations closer to the Refuge. This model work is still ongoing and is subject to adjustment depending on the water management at the Refuge within a calendar year.

Additionally, utilization of a trigger mechanism similar to those noted in both the Water Conservation Plan for the Refuge and the Program will help to limit the need to augment water in years of significant drought. Utilization of the Palmer Drought Severity Index from the Climate Prediction Center of the National Weather Service is one method to help establish such a trigger mechanism. Finally, augmentation water should never go unused on the current day, thus an adjustment to the target need based on actual performance of Refuge water use is reasonable.

...

Moving forward, the District requests that the Chief Engineer clarify the issues and answer the questions raised in these comments to the Report. This information is critical to analyzing the Service's impairment claim and to formulate a workable solution.

As previously recognized by KDA–DWR, no surface water right holder is guaranteed full exercise of its calendar year allocation every year. The model indicates the Service will receive its annual allocation in the vast majority of calendar years; therefore, there is no impairment.

The District will continue to be an active advocate for the proper management of the local aquifer to ensure that the future generations of Kansans will have a viable water source to provide for their families.

Sincerely,

Darrell Wood, President

Fred Grunder, Vice-President

John Janssen, Treasurer

Curtis Tobias, Secretary

Kent Lamb

Kent Lamb

Phil Martin

Tom Taylor

Justin Gatz

Bob Standish

Barfield, David

From: Benjamin Gray <benjamincgray@gmail.com>
Sent: Friday, May 13, 2016 2:46 PM
To: Barfield, David
Subject: Claim of Water Impairment re: Right File 7571

I'm writing to urge you to restore adequate water flow to Quivera National Wildlife Refuge.

Simply put, the refuge's water rights supercede the claims of other users.

The Division of Water Authority must act to preserve the National Wildlife .

Sincerely,

Benjamin Gray

Barfield, David

From: Janet T <gavelgoddess@gmail.com>
Sent: Friday, May 13, 2016 2:46 PM
To: Barfield, David
Subject: Quivira National Wildlife Refuge desperately needs protection.

I visit Kansas every year in the fall specifically to see the wildlife of Quivira, and I am appalled that you have allowed junior water rights holders to take water that legally should be going to the refuge. Tens of thousands of birds rely on the refuge, and Kansas is enhanced by its existence. How can you choose to side with illegal water theft over the protection of this critically important wetland? I am extremely disappointed in your management.

Janet Thew

Barfield, David

From: Beth Harshfield <Beth@exhibitarts.net>
Sent: Friday, May 13, 2016 3:14 PM
To: Barfield, David
Cc: Vernon Harshfield
Subject: Mange the water resources for Rattlesnake Creek !

Dear David -

Please see the attached article regarding our state's policy of not providing adequate water to Quivira's National Wildlife Refuge. This area is critical to migratory birds and our state's wildlife heritage. The information below was published by the Kansas Audubon Society. We do not want this National Wildlife Refuge compromised by politics!

Quivira's Water, Wetlands, and Wildlife in Jeopardy

Our inquiries regarding the situation have disclosed the following information which serves as an informed overview of this serious violation of water right protection that has resulted in severe damage to a nationally and internationally significant wildlife habitat resource critical to conservation of major migratory bird populations and to imperiled and endangered species. Needless to say, the Quivira National Wildlife Refuge is also critically important to what can be described as the state's wildlife heritage, and to the diverse recreational opportunities provided.

BACKGROUND/STATUS:

- In the mid-1980's, the Refuge Manager at Quivira National Wildlife Refuge (Quivira or Refuge) began submitting correspondence to the Regional Office of the U.S. Fish and Wildlife Service regarding what he believed was an issue with streamflow depletion. He felt that the vast number of irrigation wells that had been permitted and put into operation over the last decade was having an impact on the volume of water reaching Quivira. The Refuge has a senior surface water right with a priority date of 1957, perfected in 1996.

- From 1989 through 1991, a severe drought occurred. Refuge pools were virtually dry, greatly impacting the ability of the Refuge to supply habitat for migrating birds. During the same time period, several environmental groups raised concerns with the Kansas Division of Wildlife and Parks (KDWP) over their failure to assert and protect a water right on Walnut Creek that supplied the Cheyenne Bottoms State Wildlife Area located to the northeast of Quivira. The assertion made by these groups was that the junior irrigation wells were interfering with the volume of surface water reaching the Bottoms, impacting habitat for migratory birds.

- The Kansas State Engineer (Chief Engineer) heads the Kansas Division of Water Resources, and is responsible for administration of water rights throughout the state. The State is broken up into quasi-governmental Groundwater Management Districts that also have a certain degree of control over groundwater use in their district.

- In 1990, the Manager of Big Bend Ground Water District No. 5 (GMD#5) requested the Chief Engineer to initiate proceedings for the designation of an Intensive Groundwater Control Area (IGUCA) in the Walnut Creek Basin. These hearings consisted of testimony of a range of hydrologic and biologic experts, as well as individual water users that would be affected. The Chief Engineer concluded that the junior wells were interfering with the senior surface water right held by KDWP, and, in 1992, created an Intensive Groundwater Use Control Area. The IGUCA gave the Chief Engineer the authority to reduce the amount of junior water rights that he determined were impacting Walnut Creek.

- As a result of this case, a group of private irrigators formed a group called the Water Protection Association of Central Kansas (WaterPACK). WaterPACK and the Groundwater Management District #5 contacted the Service and several of the environmental groups who had been involved in the Walnut Creek process and formed a group called the Rattlesnake Creek Partnership in 1993. This group led to the development of an effort to lobby Congress for funding to study the water issue, and the formation of a group to try to develop a groundwater management plan. Concurrently, the Service began funding a series of contracts with the Kansas Geological Survey to determine the projected impact of existing groundwater pumping on the Refuge.

- The DWR recognized that there was significant over-appropriation of groundwater throughout the central and western portions of the State. The DWR began forming Subbasin Management Teams to work on addressing the issue from a State level. The Rattlesnake Creek Subbasin Management Team was eventually tasked with working with the other partners to develop a groundwater management plan for the Rattlesnake Creek Subbasin. The State identified two areas of high ground water decline, and these areas, as well as a portion of the stream corridor were targeted for the greatest reductions in groundwater use.

- The Service and the other partners met over a series of years to hammer out an incentive-based management plan. The goal of the plan was to reduce groundwater use to the extent that the Refuge water right was protected while ensuring that the agricultural economy was allowed to continue to function. The State committed funds to the development of an interactive surface water/groundwater model, which could be used to determine the amount of water use reduction that would be needed. At the end of 1999, WaterPACK and the GMD rejected the State's model, and the water use reduction targets that were agreed on were largely based on less robust methodology. A group of groundwater use programs were developed, and a plan was written and signed in 2000. The plan required the DWR to do a progress review at the end of each four-year period. There was never any intent by the Service to enter into any new agreement at the end of the 12-year period. The Program was supposed to address the problem of over-pumping, and ensure that the Service's senior water right was protected.

- To date, the only parts of the overall program that have been initiated are Water Banking and the End-Gun Removal Programs. There has been a lack of funding from the State. The water rights buy-back program has been largely unsuccessful because of a lack of funding, the tendencies of prospective sellers to ask very high prices, and the initial unwillingness of the Chief Engineer to permanently retire those rights.

- The State greatly reduced staffing for the Subbasin management teams, and the amount of turnover has been significant. The Subbasin Management Team for the Rattlesnake Creek Subbasin had its responsibility expanded to cover a much larger area. Although they have produced a report every four years on the "progress" of the Management Plan as required, they have spent a considerable amount of time and money developing a new groundwater model that covers the entire GMD#5. The report on this model greatly downplays the streamflow interference issue. However, the 4-year reports on the Management Plan consistently show that targets are not being met, both water use reduction targets, as well as aquifer and streamflow stabilization targets. Groundwater levels as well as streamflow have continued to decline despite many years of above-average precipitation.

- In 2015, there was a severe drought, the stream dried up. The State passed a bill allowing irrigators to pump more water than they hold water rights for, provided that they pump less in the future. The Refuge did not get any water, but junior pumpers got more water than they had a water right to take.

REPORTED POSITION OF GMD#5:

- The GMD#5 would like some certainty regarding water availability for the future, and believes some action needs to be taken. However, they would like the Service to accept the development of augmentation wells to provide water to the Refuge as the solution.

DEPARTMENT OF THE INTERIOR/FISH & WILDLIFE SERVICE PERSPECTIVE:

- There is currently no physical way to augment streamflow with pumping, and it would realistically take a decade to develop, as well as a huge investment of funds.

- The Service entered into the above-described agreement in good faith, has not asked for an administrative remedy during the agreed-upon 12-year term of the agreement, and expected the other Partners to meet their obligations under the agreement. This is not what has been happening, and the Service is being asked to continue to accept injury to the Refuge's senior water right while some new plan is developed.

- The Service is not asking to be treated any differently than any other water user in the State. The Service applied for, developed and perfected the Refuge water right in accordance with State law, and is asking that it receive the same consideration and protection as any other water user's right.

- The Service has asked that the current groundwater use reductions that were agreed to more than a decade ago be met.

ExhibitArts

Beth Harshfield, President

ExhibitArts | WOSB | NWBOC | NMSDC
326 N. Athenian | Wichita, KS 67203
P: 316-264-2915 TF: 877-222-8494 C: 316-708-0943
www.ExhibitArts.net

Note: Privileged/Confidential information may be contained in this message and may be subject to legal privilege. **Access to this e-mail by anyone other than the intended is unauthorized. If you are not the intended recipient (or responsible for delivery of the message to such person), you may not use, copy, distribute or deliver to anyone this message (or any part of its contents) or take any action in reliance on its contents.** In such case, you should destroy this message, and notify us immediately. If you have received this email in error, please notify us immediately by email (beth@exhibitarts.net) or telephone (316.264.2915) and delete the e-mail from any computer, storage device, or server.

Barfield, David

From: cathy catt <cmbcatt@hotmail.com>
Sent: Friday, May 13, 2016 3:13 PM
To: Barfield, David
Subject: water rights for Quivera

Dear Mr. Barfield,

Please do whatever is necessary to protect the future viability of the Quivera wetlands, an essential stopover for North American bird migrations.

Thank you for your efforts.

Sincerely,

Catherine Catt

Barfield, David

From: Gloria Holcroft <glorybks@gmail.com>
Sent: Friday, May 13, 2016 3:20 PM
To: Barfield, David
Subject: Quivira National Wildlife Refuge

Mr. Barfield -

I am very concerned about the Quivira National Wildlife Refuge wetlands, where thousands of migratory birds depend on that habitat. Junior water rights and their irrigation wells have severely depleted this precious area by pumping more water than they have rights to do, thus interfering with the senior surface water.

I would implore you to meet the requested U.S.Fish and Wildlife Service current groundwater use reductions, agreed to more than a decade ago, to help save this critical area in the central U.S. flyway.

Sincerely,

Mrs. Gloria Holcroft
11309 Grant St.
Overland Park, KS 66210

Barfield, David

From: rwlucas@pld.com
Sent: Friday, May 13, 2016 3:28 PM
To: Barfield, David
Subject: Quivira National Wildlife Refuge - File No. 7,571

Dear Mr. Barfield,

The U.S. Fish and Wildlife Service has senior water rights at Quivira and I and my family urge the Division of Water Resources to protect it from junior rights. The Quivira was opened 61 years ago and it is an internationally known bird area. It draws tourists and promotes Kansas' image of environmental goodwill. I first visited Quivira on a trip with my grandmother in 1974. I remember seeing on our drive many birds and mammals. Visiting Quivira has continued to be a highlight for me through the years. Please protect one of the Eight Wonders of Kansas.

Thank you for all you do,
Cathy Lucas
Sublette, Kansas

Barfield, David

From: Luke Harshfield <lukeharshfield@gmail.com>
Sent: Friday, May 13, 2016 4:04 PM
To: Barfield, David
Subject: Claim of water right impairment
Attachments: Restoring Quivira's water.pdf

Hello David,

I am contacting in you regards to restoring water flows into rattlesnake creek by tightening and enforcing regulations of irresponsible pump practices.

I have attached a letter from Ron Klataske. I fully support all that is being said with in the letter.

We need to make steps to cut the irresponsible pumping practices that need regulation. Restoring water to Quivira National wildlife refuge will not only benefit our current generation but it will protect a habitat for future generations to learn and grow from.

I am a 25 years old, and a native born Kansan. This is my home. If we do not begin to measures to protect our natural resources from debilitating human influences. I fear no one will until our impact is to vast. I write this for my children.

Please view this issue with an open heart and I hope this email reaches you in kindness.

Best,

Luke

David W. Barfield. PE.
Chief Engineer
Division of Water Resources
Kansas Department of Agriculture
1320 Research Par Drive
Manhattan, KS 66502

May 13, 2016

Dear Mr. Barfield:

The purpose of this letter is to comment on the "Claim of Water Right Impairment, In the Matter of Water Right File No. 7,571, Owned and operated by U.S. Fish and Wildlife Service."

Audubon of Kansas, Inc. urges the Kansas Department of Agriculture (KDA) Division of Water Resources (DWR) to implement all necessary measures, regulations and water rights to fully restore water flows in Rattlesnake Creek to provide the U.S. Fish and Wildlife Service (Service) with flows sufficient to provide for the senior water right for the Quivira National Wildlife Refuge (Refuge). As acknowledged in the Initial Report of the Chief Engineer, Prepared pursuant to K.A.R. 5-4-1 Concerning a Claim of Water Right Impairment, In the Matter of Water Right File No. 7,571, Owned and operated by U.S. Fish and Wildlife Service published December 2, 2015, the Service's water right is senior in priority to approximately 95 percent of the water rights in the Rattlesnake Creek Basin.

The report finds the Refuge's water supply "has been regularly and substantially impacted by junior groundwater pumping." According to the report, over the 34 years reviewed, shortages of greater than 3,000 acre-feet occurred in 18 years. Impairment of the Refuge's water right has become increasingly frequent and severe as hundreds of irrigation wells with junior water rights have been approved by the DWR, resulting in the cumulative lowering of groundwater levels and instream flows in the Rattlesnake Creek Basin.

Audubon of Kansas urges that the water right for the Quivira National Wildlife Refuge be fully protected and provided for prior to depleting consumption by junior water rights users.

Audubon of Kansas does not support the suggestion that the severe impairment of the Refuge water right (due to over-pumping of groundwater in the Rattlesnake Creek Basin) can be satisfactorily solved by pumping groundwater into the Refuge. In addition to the astronomical cost of installation and ongoing operations/maintenance, this approach would ignore the fact that depleting the groundwater and stream flows will further diminish ground water levels and adversely impact and/or destroy the stream, wetlands, wet meadows and other ecological values associated with the Refuge and other areas within the Rattlesnake Creek Basin.

The Quivira National Wildlife Refuge was established in 1955 to protect migratory waterfowl. Its 7,000 acres of wetlands attract hundreds of thousands of ducks and geese of thirty different species, shorebirds, wading birds (including tens of thousands of Sandhill Cranes, and Whooping Cranes) and water birds annually. Its location in the middle of the Central Flyway places it in the primary pathway for many species of migrating birds. Over 340 species of birds have been recorded at Quivira. It's 22,135 acres feature a unique combination of rare inland salt marsh and sand prairie.

In terms of protection of, and management for, species of concern, several official levels of Threatened and Endangered status are recognized within the United States and within the State of Kansas. An Endangered species is one that is in danger of becoming extinct; a Threatened species is one whose population levels are low enough where the species could become Endangered. A Federal Candidate species is one that is under review for listing as a Threatened or Endangered species. In several cases, Quivira has been designated as Critical Habitat for certain species, either at the national or state level (or both).

Whooping Cranes are an endangered species that consistently utilize Quivira as an important migratory habitat. The tallest North American bird, and one of the rarest, they once numbered as few as 16. Whooping Cranes occur regularly at Quivira each fall and spring. Fall migration use typically occurs from late October through late November, while spring migration occurs from late March through early April. Whooping Cranes utilize Quivira's shallow wetlands and lake borders for feeding and overnight roosting.

Inland populations of Least Terns are typically found along large river systems. Interior Least Terns have been declining and are classified as Endangered nationally and in the state of Kansas. Quivira hosts a nesting population of these birds, in both the Big and Little Salt Marsh areas. Least Terns occur at the Refuge during the spring, summer and early fall.

The Western Snowy Plover is classified as Threatened in Kansas. This small, whitish shorebird occurs at Quivira from spring through early fall, and nests regularly on sand flats, primarily in the Big Salt Marsh area. Their populations have suffered declines similar to those of the Interior Least Tern, with whom they share habitat.

Many other "Species of Greatest Conservation Concern" depend on habitat at Quivira. The Piping Plover, a small shorebird similar to the Snowy Plover, occurs at Quivira occasionally during migration. The State of Kansas recognizes Species in Need of Conservation (SINC) throughout the state. Species with that status that occur at Quivira include: Black Rail, Black Tern, Eastern Hognose Snake, Western Hognose Snake, Ferruginous Hawk, Golden Eagle, Long-billed Curlew, Short-eared Owl, and Southern Bog Lemming.

Tens of thousands of shorebirds—shorebirds of thirty different species --rely on the wetlands and water-associated habitats of the Quivira National Wildlife Refuge. Shorebirds are a large and diverse group of birds that typically feed on shorelines, mudflats, and in shallow water. The group includes, but is not limited to, plovers, sandpipers, phalaropes, yellowlegs, and snipe. Although located in the center of the Great Plains, Quivira is uniquely situated in the center of the Central Flyway, one of the busiest of North America's four migration pathways. An oasis in the prairie, Quivira attracts migrating shorebirds by the tens of thousands in aggregate both spring and fall.

Beginning as early as February, Greater and Lesser Yellowlegs, along with a few other sandpipers, begin appearing on their northward journey. Numbers of species and birds increase until a peak in mid-May, when shorebirds can be found just about anywhere there is water at Quivira. There is a short lull of just a few weeks during June, after which the "fall" southward migration begins for many species by early July. This period of shorebird occurrence typically peaks in late August and September.

Shorebirds do not just occur as migrants at Quivira. Several species use Quivira's wetlands to nest. These are extant breeding populations, where the next nearest breeding populations may be hundreds of miles from Quivira. Nesting species include Wilson's Phalarope, Snowy Plover, American Avocet, and Black-necked Stilt.

Inland Salt Marshes are rare in the United States. The presence of Inland Salt Marshes contributes to the uniqueness of Quivira. Quivira's wetlands are unique due to the high concentration of salt in many areas. Subterranean salt deposits are near enough to the surface in the Quivira area to affect the groundwater that percolates to the surface. Salinity (or salt) levels in the water varies depending on rainfall, runoff from rainfall, and the depth of the water.

Many areas have a high enough salinity to support salt-tolerant plant species such as inland salt grass (*Distichlis spicata*), alkali sacaton (*Sporobolus airoides*), and seepweed (*Suaeda caceoliformis*).

Once dotted with active sand dunes, Quivira is also home to a unique prairie community called Sand Prairie. In the pre-settlement era of Kansas, prairie covered most of the state. During this time, much of the area south of the "great bend" of the Arkansas River consisted of plains with scattered active sand dunes. Once inactive, these dunes were covered with prairie grasses and forbs. This Sand Prairie is a unique and uncommon ecosystem in North America.

The Quivira National Wildlife Refuge is among thirty **"Wetlands of International Importance,"** as designated under an international treaty signed in 1971. The Ramsar convention on wetlands, signed by 160 countries, provides the framework

for national action and international cooperation for the conservation and wise use of wetlands and their resources.

Quivira was also designated in 1994 as part of the **Western Hemisphere Shorebird Reserve Network.** The designation is based on the fact that Quivira supports more than 500,000 shorebirds annually. Shorebirds are among nature's most ambitious, long-distance migrants. But their numbers are dropping quickly with some species projected to go extinct within our lifetime. Protecting these birds is an important international conservation priority that requires proactive and coordinated efforts within each of the countries these birds fly through during their vast, nearly pole-to-pole migrations.

Quivira was also designated as a **Globally Important Bird Area** by the American Bird Conservancy in 2001.

It is critical that the State of Kansas recognizes that the Quivira National Wildlife Refuge is critically important for migratory birds from a state, national, international and global perspective. Restoring the Service's water rights and making flows available to the Refuge is a legal and ecologically essential responsibility of the Kansas Department of Agriculture, Division of Water Resources.

Sincerely,

Ron Klataske
Executive Director
Audubon of Kansas

Barfield, David

From: Stu Luttich <rangifer@windstream.net>
Sent: Friday, May 13, 2016 4:12 PM
To: Barfield, David
Subject: Quivira National Wildlife Refuge Impairment Complaint

Mr. Barfield:

While not a resident or landholder in the State of Kansas, I am a stakeholder with interests in the Quivira National Wildlife Refuge, and, am quite familiar with water management issues and agreements (and disagreements). I am an agriculture landowner with an irrigation well. The static water-levels within the Natural Resource District where the well is located are declining, with the static water-level in the well declining proportionately more than in the over-all District. The simple unhonored fact is that we are removing water from the system faster than it is being replaced. While we have been quite proficient in extracting water, we have been particularly deficient as well as derelict in replacing or replenishing what has been extracted – and this policy cannot, and, will not, continue in any sustainable manner. We are gradually killing the proverbial goose that lays the golden egg; and, it will probably be death by a thousand cuts. Unfortunately, repair, as per usual, will prove more costly than the gains made in the taking. Unfortunately, a large proportion of the landowners and people believe they have a special right to use the water until the last drop is taken. For them water is not a resource to be shared, but, it is their resource. Unfortunately, water has a habit of not respecting boundaries. When it flows in uncommon abundance, we act to hasten its departure into the oceans. Then when it fails to flow in a desired abundance we pump unsustainable amounts from subsurface reservoirs.

I fully support Audubon of Kansas's position on this issue, as outlined in a letter from Mr. Ron Klataske. We either act to honour our agreements in a civilized and honourable manner, or, we fight like the uncivilized reprehensible barbarians that we loath. Life needs water to exist; but, while more water is not being created to support life, more life is being created to need water, and, life is also compounding more needs for the water that does exist. I find it particularly disconcerting that the oil fracking industry is being allowed to remove water from the system, pollute that water, and, then discharge that tainted water into virtually unrecoverable geological depths below the Earth's surface. This is ignorance being personified at level that mystifies rational comprehension.

In any case, would appreciate interests in protecting and honouring the senior water-rights for the Quivira NWR.

Thanking your for time and consideration, I remain…

Stu Luttich
824 "K" Street
Geneva NE-USA 68361

Tele: 402-759-3597

Barfield, David

From: Ralph Hoover <r.hooov@gmail.com>
Sent: Friday, May 13, 2016 4:52 PM
To: Barfield, David
Subject: Quivira

I am watching to see if the water rights of Quivira National Wildlife Refuge are being protected as they should be. The wetlands are a treasure. Thank you.

Barfield, David

From: Karen Hall <showyouhome@gmail.com>
Sent: Friday, May 13, 2016 5:27 PM
To: Barfield, David
Subject: Quivera Water Rights

Dear Mr Barfield,

It is very important to improve the flow of water into Quivera. This is an incredible resource for Kansas.

Rattlesnake Creek should not be raided illegally. Water Rights should be enforced.

In the past Kansas sued Colorado when the flow of water was impeded.

Birds cannot sue. I am speaking out for them. And for future tourism dollars.

Thank you for your consideration.

David W. Barfield. PE. Chief Engineer
Division of Water Resources
Kansas Department of Agriculture
1320 Research Par Drive
Manhattan, KS 66502

May 13, 2016

RE: Claim of Water Right Impairment, In the Matter of Water Right File No. 7,571, Owned and operated by U.S. Fish and Wildlife Service.

Dear Mr. Barfield:

I urge you as the chief engineer for the Division of Water Resources for the Kansas Department of Agriculture to implement all necessary measures, regulations and water rights to fully restore water flows in Rattlesnake Creek to provide the U.S. Fish and Wildlife Service with flows sufficient to provide for the senior water right for the Quivira National Wildlife Refuge, which has been regularly and substantially impacted by junior groundwater pumping — which will not solve the problem.

In addition to the exorbitant cost of installation and ongoing operations and maintenance, pumping ignores the fact that depleting the groundwater and streamflows will further diminish groundwater levels and will adversely impact and/or destroy the stream, wetlands, wet meadows and other ecological values associated with the refuge and other areas within the Rattlesnake Creek Basin.

The Quivira National Wildlife Refuge was established to protect migratory waterfowl. Its 7,000 acres of wetlands attract hundreds of thousands of ducks and geese of thirty different species, shorebirds, wading birds (including tens of thousands of Sandhill Cranes, and Whooping Cranes) and water birds annually. Its location in the middle of the Central Flyway places it in the primary pathway for many species of migrating birds. Over 340 species of birds have been recorded at Quivira. It's 22,135 acres feature a unique combination of rare inland salt marsh and sand prairie.

Species of concern include several official levels of threatened and endangered status. Quivira has been designated as Critical Habitat for certain species, either at the national or state level or both for Whooping Cranes, Least Terns, Western Snowy Plover, Piping

Plover, Black Rail, Black Tern, Eastern Hognose Snake, Western Hognose Snake, Ferruginous Hawk, Golden Eagle, Long-billed Curlew, Short-eared Owl, and Southern Bog Lemming and many other "Species of Greatest Conservation Concern."

The Quivira National Wildlife Refuge is among 30 Wetlands of International Importance. Quivira was also designated in 1994 as part of the Western Hemisphere Shorebird Reserve Network. Quivira was also designated as a Globally Important Bird Area by the American Bird Conservancy in 2001.

It is of paramount importance that the State of Kansas recognizes that the Quivira National Wildlife Refuge is critically important for migratory birds from a state, national, international and global perspective.

Restoring the Service's water rights and making flows available to the refuge is a legal and ecological responsibility of the Kansas Department of Agriculture, Division of Water Resources.

Sincerely,

Madeline McCullough
810 Shadyway
Wichita, KS 67203

Barfield, David

From: Giessel/Voss <ecos@everestkc.net>
Sent: Friday, May 13, 2016 9:02 PM
To: Barfield, David
Cc: Yvonne Cather
Subject: Sierra Club Comments: In the Matter of Water Right File No. 7571, U.S. Fish and Wildlife Service

RE: Water Right Impairment In the Matter of Water Right File No. 7571, Owned and operated by U.S. Fish and Wildlife Service

Mr. Barfield:

Please accept the following comments from the Kansas Chapter of the Sierra Club regarding the above-referenced matter:

The Division of Water Resources of the Kansas Department of Agriculture (DWR) recognizes that there is significant over-appropriation of groundwater throughout the central and western portions of the State. DWR published an initial impairment investigation report on December 2, 2015, indicating that junior groundwater pumping has impaired the U.S. Fish and Wildlife Service (Service) from exercising its senior water right for the Quivira National Wildlife Refuge.

The Quivira NWR provides critical and unique wetland habitat in the Central Flyway. The refuge has been recognized globally for its importance for migratory birds, some species of which are listed under state and/or federal endangered species protection laws. Groundwater levels and streamflow have continued to decline in the area, impacting the quality of the wetlands.

The Service, in its formal complaint, stated that regular long-term augmentation of water without groundwater pumping reductions in GMD5 would increase concerns of water resource sustainability. The Service also expressed concern that water flow augmentation will lead to reduced water quality being delivered to the refuge during certain times of the year. The Service recommended increased focus on improving water use efficiencies and/or reduction of water use by junior appropriators that would benefit long-term sustainability of surface and ground water resources.

The Service applied for, developed and perfected the Refuge water right in accordance with State law. It should receive the same consideration and protection as any other water user's right. The Service has asked that the current groundwater use reductions that were agreed to more than a decade ago be met. K.S.A. 82a-706b of the Kansas Water Appropriation Act charges the chief engineer with the duty to regulate use to prevent such “impairment” of senior water rights by junior water rights.

The Kansas Chapter of the Sierra Club strongly supports protection of the Quivira NWR. The DWR must address the problem of over-pumping by junior water rights holders to ensure that the Service's senior water right is protected. The future of the Quivira NWR is at stake.

Please put me on your mailing list of interested parties for this matter. Thank you,

Elaine Giessel
Conservation Chair,
Kansas Chapter, Sierra Club

11705 W. 101st Terr.
Overland Park, KS 66214

--
C. Elaine Giessel
913-206-1180

Barfield, David

From: Joyce Wolf <rjjawolf@sunflower.com>
Sent: Friday, May 13, 2016 10:48 PM
To: Barfield, David
Subject: Quivira National Wildlife Refuge Water Rights

To: David Barfield, Chief Engineer
Division of Water Resources
KS Department of Agriculture

Dear Mr. Barfield:

Having participated in the Cheyenne Bottoms litigation process may years ago, and being aware that a very similar situation now exists at Quivira National Wildlife Refuge (NWR), in my opinion the established of an Intensive Groundwater Use Control Area (IGUCA) is warranted and needed in order to uphold and recognize the senior water right of the US Fish and Wildlife Service. Just like Cheyenne Bottoms Wildlife Area, Quivira NWR provides important habitat for many migratory species of birds.

Without question, the Refuge has a senior surface water right dating to 1957 and perfected in 1996. And it appears that the area has been permitted to become over-appropriated regarding the numbers and volume of water rights approved by DWR. Furthermore, I believe the Chief Engineer has the authority to make a finding of an impairment of a senior water right and also the authority to intercede and establish an IGUCA. I'm certain that you are fully aware of the following: An entity which applies to the Division of Water Resources of the Kansas Department of Agriculture for a water right (for a beneficial use) and is approved, those rights have precedence over subsequent or "junior" water rights' holders.

Furthermore, this principle is applied regardless of the type of use. K.S.A. 82a-707 provides; "….the date of priority of an appropriation right, *and not the purpose of use,* (emphasis added) determines the right to divert and use water at any time when the supply is not sufficient to satisfy all water rights that attach to it."

But one of the most significant results of the Cheyenne Bottoms IGUCA was that agricultural junior water rights owners, were not fully cut off from their supply, but a formula was applied that decreased the number of acre/feet that could be pumped. Recent analyses by agricultural economists have pointed out that after an initial reduction in income, most producers were able to recover and equal what they had been earning prior to the adoption and implementation of the IGUCA in the Wet Walnut Basin.

The US Fish & Wildlife Service is not seeking more than what is established by state water law in appealing to DWR to recognize its senior water right and take the necessary steps to ensure that the water right is upheld.

Therefore I see no reason to not move forward with the establishment of an IGUCA.

Thank you for your careful consideration of these comments.

Sincerely,

Joyce A. Wolf
1605 East 318 Road
Lecompton, KS 66050-4034

Barfield, David

From: Rolan & Kristen <schwavis@yahoo.com>
Sent: Friday, May 13, 2016 8:44 PM
To: Barfield, David
Subject: Claim of water right #7,571

Dear David Barfield,

Quivira National Wildlife Refuge is an important part of our state's natural beauty and heritage. Please preserve the water rights to protect it, for the sake of wildlife and future generations.

Sincerely,
Kristen Schweitzer
B.S. Biology, M.S. Curriculum Development Captured Moments Photography www.KSchweitzerphoto.com
Become a fan on Facebook to receive specials!
http://www.facebook.com/kschweitzerphoto

KANSAS WILDLIFE FEDERATION

The voice of outdoor Kansas

13 May 2016

David W. Barfield. PE.
Chief Engineer
Division of Water Resources
Kansas Department of Agriculture
1320 Research Par Drive
Manhattan, KS 66502

Dear Mr. Barfield:

This letter constitutes comment by the Kansas Wildlife Federation (KWF) — a 66-year old grassroots organization of hunters, anglers and concerned wildlife conservationists dedicated to the sustainable use, conservation, appreciation, and the restoration of our state's wildlife and natural environment — on the "Claim of Water Right Impairment, In the Matter of Water Right File No. 7,571, Owned and operated by U.S. Fish and Wildlife Service." The U. S. Fish and Wildlife Service (USFWS) owns the water right from the Rattlesnake Creek which flows through Quivira National Wildlife Refuge (QNWR), managed by the USFWS. Their water right, No. 7,571, is a senior water right priority, dated in 1957, to approximately 95% of the water rights in the Rattlesnake Creek basin. The KWF strongly urges the Kansas Department of Agriculture's Division of Water Resources (DWR) to adhere to all relevant regulations to fully restore the water flow in Rattlesnake Creek to meet QNWR's water rights.

KWF has been involved in the Quivira water rights issue for the last decade, yet we were not notified of the pending water right impairment issue. The recent report states that the water supply to QNWR "has been regularly and substantially impacted by junior groundwater pumping."

Quivira provides critical habitat for numerous species of wildlife, some of which are listed as Threatened or Endangered. QNWR has been recognized as a Wetland of International Importance by the 1988 Ramsar Convention on Wetlands. Quivira was also designated in 1994 as part of the Western Hemisphere Shorebird Reserve Network. Quivira was designated as a Globally Important Bird Area by the American Bird Conservancy in 2001. Endangered species utilizing QNWR are Whooping Cranes and inland populations of Least Terns, which nest at QNWR. Threatened species using QNWR include the Western Snowy Plover. Water, and its timely reception of that water for wetland manipulation, is critical to meet the habitat needs of

these and other species that utilize QNWR. QNWR is a major stopover site for migratory waterbirds such as waterfowl, shorebirds, herons and egrets and rails. It is estimated that 90% of 5 different species of migratory shorebirds pass through and utilize the QNWR-Cheyenne Bottoms Wildlife Area wetland complex while on migration. The impairment of QNWR's water rights has had a significant impact on the Threatened, Endangered and other species which utilize QNWR.

KWF was involved in the water rights issue and subsequent lawsuit regarding the Cheyenne Bottoms water rights. At that time many newspapers boiled the issue down to "ducks vs. crops." This was unfortunate as it was merely a senior water right holder versus junior water right holders.

The same premise holds regarding QNWR: it is a senior water right holder asking DWR to adhere to all relevant regulations to restore water flow in the Rattlesnake Creek basin to meet QNWR's water rights, which may (and should) require reducing water use by junior water right holders. The Kansas Wildlife Federation strongly urges DWR to utilize any and all regulatory means to ensue that Quivira National Wildlife Refuge receives its legal senior water right.

We request to be kept apprised in writing of the process and outcome of the issue regarding Quivira's water right. Thank you.

Sincerely,



Angela Anderson
President
Kansas Wildlife Federation

Barfield, David

From: The Yorke Powells <yorke.powell@gmail.com>
Sent: Monday, May 16, 2016 8:04 AM
To: Barfield, David
Subject: Quivira Refuge

Dear Mr. Barfield,

Please make sure KDA protects the water rights of Quivira National Wildlife Refuge, an amazing and essential place for wildlife, regionally and globally. Take time to go visit this refuge and honor the protected water rights and restore the flow.

Sincerely,

Mary Powell, Topeka

Kansas Dept. of Agriculture
Division of Water Resources

Audubon of Kansas

STATE OFFICE
Ron Klataske, Executive Director
210 Southwind Place, Manhattan, KS 66503
TEL: (785) 537-4385 FAX: (785) 537-4395
aok@audubonofkansas.org
Websites: www.audubonofkansas.org
www.niobrarasanctuary.org
Lana Micheel, On-site Sanctuary Coordinator

BOARD OF TRUSTEES

Lisa Stickler
Chair, Bucyrus

Randy Rathbun
Past Chair, Wichita

Dick Seaton
Vice Chair, Manhattan

Joyce Wolf
Secretary, Lawrence

Don Wissman
Treasurer, Manhattan

Robert T. McElroy, MD
Chair Emeritus, Topeka

Cathy Lucas
Exec. Committee, Sublette

Matt Gearheart
Exec. Committee, Lenexa

Harold W. Andersen
Omaha, NE

Dan Baffa
Salina

Phillip L. Baker, MD
Topeka

Bernita Berntsen, MD
Berryton

William Browning, MD
Madison

Mike Bily
Joliet, IL

Nancy Clark
Kansas City

Evelyn Davis
Wakarusa

Kristine B. Davis
Hutchinson

Michael Donnelly
Manhattan

Tom Ewert
Wichita

David Gnirk
Herrick, SD

Don Heikes
Lenora

Irwin "Hoogy" Hoogheem
Ogden/Manhattan

Kelley Hurst
Lawrence

Grant Newbold
Minden, NE

Mary Powell
Topeka

Wesley Sandall
Bassett, NE

John Schukman
Leavenworth

Richard G. Tucker
Parsons

David W. Barfield. PE.
Chief Engineer
Division of Water Resources
Kansas Department of Agriculture
1320 Research Par Drive
Manhattan, KS 66502

May 13, 2016

WATER RESOURCES
RECEIVED
MAY 16 2016
KS DEPT OF AGRICULTURE

Dear Mr. Barfield:

The purpose of this letter is to comment on the "Claim of Water Right Impairment, In the Matter of Water Right File No. 7,571, Owned and operated by U.S. Fish and Wildlife Service."

Audubon of Kansas, Inc. urges the Kansas Department of Agriculture (KDA) Division of Water Resources (DWR) to implement all necessary measures, regulations and water rights to fully restore water flows in Rattlesnake Creek to provide the U.S. Fish and Wildlife Service (Service) with flows sufficient to provide for the senior water right for the Quivira National Wildlife Refuge (Refuge). As acknowledged in the Initial Report of the Chief Engineer, Prepared pursuant to K.A.R. 5-4-1 Concerning a Claim of Water Right Impairment, In the Matter of Water Right File No. 7,571, Owned and operated by U.S. Fish and Wildlife Service published December 2, 2015, the Service's water right is senior in priority to approximately 95 percent of the water rights in the Rattlesnake Creek Basin.

The report finds the Refuge's water supply "has been regularly and substantially impacted by junior groundwater pumping." According to the report, over the 34 years reviewed, shortages of greater than 3,000 acre-feet occurred in 18 years. Impairment of the Refuge's water right has become increasingly frequent and severe as hundreds of irrigation wells with junior water rights have been approved by the DWR, resulting in the cumulative lowering of groundwater levels and instream flows in the Rattlesnake Creek Basin.

Audubon of Kansas urges that the water right for the Quivira National Wildlife Refuge be fully protected and provided for prior to depleting consumption by junior water rights users.

Audubon of Kansas does not support the suggestion that the severe impairment of the Refuge water right (due to over-pumping of groundwater in the

Rattlesnake Creek Basin) can be satisfactorily solved by pumping groundwater into the Refuge. In addition to the astronomical cost of installation and ongoing operations/maintenance, this approach would ignore the fact that depleting the groundwater and stream flows will further diminish ground water levels and adversely impact and/or destroy the stream, wetlands, wet meadows and other ecological values associated with the Refuge and other areas within the Rattlesnake Creek Basin.

The Quivira National Wildlife Refuge was established in 1955 to protect migratory waterfowl. Its 7,000 acres of wetlands attract hundreds of thousands of ducks and geese of thirty different species, shorebirds, wading birds (including tens of thousands of Sandhill Cranes, and Whooping Cranes) and water birds annually. Its location in the middle of the Central Flyway places it in the primary pathway for many species of migrating birds. Over 340 species of birds have been recorded at Quivira. It's 22,135 acres feature a unique combination of rare inland salt marsh and sand prairie.

In terms of protection of, and management for, species of concern, several official levels of Threatened and Endangered status are recognized within the United States and within the State of Kansas. An Endangered species is one that is in danger of becoming extinct; a Threatened species is one whose population levels are low enough where the species could become Endangered. A Federal Candidate species is one that is under review for listing as a Threatened or Endangered species. In several cases, Quivira has been designated as Critical Habitat for certain species, either at the national or state level (or both).

Whooping Cranes are an endangered species that consistently utilize Quivira as an important migratory habitat. The tallest North American bird, and one of the rarest, they once numbered as few as 16. Whooping Cranes occur regularly at Quivira each fall and spring. Fall migration use typically occurs from late October through late November, while spring migration occurs from late March through early April. Whooping Cranes utilize Quivira's shallow wetlands and lake borders for feeding and overnight roosting.

Inland populations of Least Terns are typically found along large river systems. Interior Least Terns have been declining and are classified as Endangered nationally and in the state of Kansas. Quivira hosts a nesting population of these birds, in both the Big and Little Salt Marsh areas. Least Terns occur at the Refuge during the spring, summer and early fall.

The Western Snowy Plover is classified as Threatened in Kansas. This small, whitish shorebird occurs at Quivira from spring through early fall, and nests regularly on sand flats, primarily in the Big Salt Marsh area. Their populations have suffered declines similar to those of the Interior Least Tern, with whom they share habitat.

WATER RESOURCES
RECEIVED
MAY 16 2016
KS DEPT OF AGRICULTURE

Many other "Species of Greatest Conservation Concern" depend on habitat at Quivira. The Piping Plover, a small shorebird similar to the Snowy Plover, occurs at Quivira occasionally during migration. The State of Kansas recognizes Species in Need of Conservation (SINC) throughout the state. Species with that status that occur at Quivira include: Black Rail, Black Tern, Eastern Hognose Snake, Western Hognose Snake, Ferruginous Hawk, Golden Eagle, Long-billed Curlew, Short-eared Owl, and Southern Bog Lemming.

Tens of thousands of shorebirds—shorebirds of thirty different species --rely on the wetlands and water-associated habitats of the Quivira National Wildlife Refuge. Shorebirds are a large and diverse group of birds that typically feed on shorelines, mudflats, and in shallow water. The group includes, but is not limited to, plovers, sandpipers, phalaropes, yellowlegs, and snipe. Although located in the center of the Great Plains, Quivira is uniquely situated in the center of the Central Flyway, one of the busiest of North America's four migration pathways. An oasis in the prairie, Quivira attracts migrating shorebirds by the tens of thousands in aggregate both spring and fall.

Beginning as early as February, Greater and Lesser Yellowlegs, along with a few other sandpipers, begin appearing on their northward journey. Numbers of species and birds increase until a peak in mid-May, when shorebirds can be found just about anywhere there is water at Quivira. There is a short lull of just a few weeks during June, after which the "fall" southward migration begins for many species by early July. This period of shorebird occurrence typically peaks in late August and September.

Shorebirds do not just occur as migrants at Quivira. Several species use Quivira's wetlands to nest. These are extant breeding populations, where the next nearest breeding populations may be hundreds of miles from Quivira. Nesting species include Wilson's Phalarope, Snowy Plover, American Avocet, and Black-necked Stilt.

Inland Salt Marshes are rare in the United States. The presence of Inland Salt Marshes contributes to the uniqueness of Quivira. Quivira's wetlands are unique due to the high concentration of salt in many areas. Subterranean salt deposits are near enough to the surface in the Quivira area to affect the groundwater that percolates to the surface. Salinity (or salt) levels in the water varies depending on rainfall, runoff from rainfall, and the depth of the water.

Many areas have a high enough salinity to support salt-tolerant plant species such as inland salt grass (*Distichlis spicata*), alkali sacaton (*Sporobolus airoides*), and seepweed (*Suaeda caceoliformis*).

Once dotted with active sand dunes, Quivira is also home to a unique prairie community called Sand Prairie. In the pre-settlement era of Kansas, prairie covered most of the state. During this time, much of the area south of the "great bend" of the

WATER RESOURCES
RECEIVED
MAY 16 2016
KS DEPT OF AGRICULTURE

Arkansas River consisted of plains with scattered active sand dunes. Once inactive, these dunes were covered with prairie grasses and forbs. This Sand Prairie is a unique and uncommon ecosystem in North America.

The Quivira National Wildlife Refuge is among thirty **"Wetlands of International Importance,"** as designated under an international treaty signed in 1971. The Ramsar convention on wetlands, signed by 160 countries, provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

Quivira was also designated in 1994 as part of the **Western Hemisphere Shorebird Reserve Network.** The designation is based on the fact that Quivira supports more than 500,000 shorebirds annually. Shorebirds are among nature's most ambitious, long-distance migrants. But their numbers are dropping quickly with some species projected to go extinct within our lifetime. Protecting these birds is an important international conservation priority that requires proactive and coordinated efforts within each of the countries these birds fly through during their vast, nearly pole-to-pole migrations.

Quivira was also designated as a **Globally Important Bird Area** by the American Bird Conservancy in 2001.

It is critical that the State of Kansas recognizes that the Quivira National Wildlife Refuge is critically important for migratory birds from a state, national, international and global perspective. Restoring the Service's water rights and making flows available to the Refuge is a legal and ecologically essential responsibility of the Kansas Department of Agriculture, Division of Water Resources.

Sincerely,

Ron Klataske

Ron Klataske
Executive Director
Audubon of Kansas

WATER RESOURCES
RECEIVED
MAY 16 2016
KS DEPT OF AGRICULTURE

---------- Forwarded message ----------
From: **connie achterberg** <connieachterberg@yahoo.com>
Date: Fri, May 13, 2016 at 10:02 PM
Subject: Quivira
To: Ron Klataske <ron_klataske@audubonofkansas.org>

Attention: David W Barfield, Chief Engineer, Division of Water Resources:

I have no special position; but feel compelled to join the US Fish and Wildlife Service and Audubon of Kansas In their emergency appeal to restore sufficient water flows to provide for the senior water
Rights of Quivira. I do not have the scientific knowledge necessary to speak; but I do know that
the main creek (Bullfoot Creek) on my farm in Lincoln County, which I recently deeded to Audubon of Kansas (to create a "Wildlife Friendly Demonstration Farm" wildlife sanctuary, flowed continuously at a good rate when I was growing up. Now parts of it are dry in the summer so that the bullheads and sunfish can no longer survive. It appears that groups have met time after time over extended periods of time regarding the senior water Rights of Quivira to no avail. The Kansas Water Resources office must have the fortitude to enforce the
Senior water rights of Quivira immediately. Otherwise we will lose this world famous wetland and
Flyway. We'll only have one chance. the current groundwater use reductions agreed to long ago must be enforced.

Thank you for considering the conservation concerns.

Connie Achterberg
132 0verhill Road
Salina, Kansas 67401

Sent from my iPad

++++++++++++++++++++++++++++

From: Ron Klataske [mailto:ron_klataske@audubonofkansas.org]
Sent: Monday, May 16, 2016 4:42 PM
To: Metzger, Susan
Subject: Fwd: Quivira

Susan, I received this email from Connie Achterberg on Friday night. As you will note, she wrote in a follow up email that she tried to send it to David Barfield so it would be received prior to midnight, but she couldn't get the emails to go through. --Ron

--
Ron Klataske
Executive Director
Audubon of Kansas

Barfield, David

From: Mike Higley <mike.higley@gmail.com>
Sent: Tuesday, May 17, 2016 9:41 AM
To: Barfield, David
Subject: Quivera National Wildlife Refuge Water Rights

Dear Mr. Barfield,

Regarding the claim of water right impairment by the U.S. Fish and Wildlife Service (File No. 7,571), I urge you to uphold the senior water rights of the Quivera National Wildlife Refuge over the junior water rights of irrigation wells in the Rattlesnake Creek Subbasin. Please do not allow for-profit users to continue to rob the refuge of its rightful share of water.

--
Mike Higley
1524 Vermont Street
Lawrence, KS

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Mountain-Prairie Region

IN REPLY REFER TO:
BA WTR
KS WR
Mail Stop 60189

MAILING ADDRESS:
P.O. Box 25486, DFC
Denver, Colorado 80225-0486

STREET LOCATION:
134 Union Boulevard
Lakewood, Colorado 80228-1807

JUN 27 2016

David Barfield, P.E., Chief Engineer
Kansas Department of Agriculture
Division of Water Resources
1320 Research Park Drive
Manhattan, Kansas 66502

Dear Mr. Barfield:

The U.S. Fish and Wildlife Service (Service) appreciates all the work performed by the Kansas Division of Water Resources (DWR) regarding the impairment investigation. The Service entered into the Rattlesnake Creek Partnership Agreement (Partnership) in 2000 in good faith that impacts to the water rights at the Quivira National Wildlife Refuge (Refuge) would be addressed and a remedy would be legally enforced. After 12 years of the Partnership and more than 15 years of collaboration, very minor reductions in groundwater withdrawals were achieved, and the Service was informed that the stipulations from the Partnership would not be enforced. The Service consulted with the DWR and found we had no other choice but to file an impairment investigation to seek relief.

In reviewing the report, we recommend a correction on page 26. The following sentence cites information from a Certification Memo that was superseded.
"The surface area of the Little Salt Marsh is approximately 950 acres; 2,850 acre-feet of evaporation from the Marsh was assumed in the year of record for the certificate."

The full memo on pages 18 and 19 of the impairment report indicates that the Little Salt Marsh has a capacity of 950 acres and 2,850 acre-feet. However, the Service submitted area-capacity information in a November 12, 1993 letter that listed the Little Salt Marsh having a surface area of 864 acres and a capacity of 1,865 ac-ft. The correct capacity and resulting evaporation were listed in the impairment report on page 20. It should be made clear that the capacity and evaporation information that was used in the perfection of Water Right Certificate No. 7,571 are the amounts listed on page 20, and not the assumed amounts listed in the Certification Memo that were later superseded.

Going forward, we understand that the impairment report is the technical analysis determining if impairment occurred and that the next step is the remedy phase if impairment is found. However, many of the comments to the impairment report supported augmentation as the

only feasible solution. The Service believes there may be legal and technical challenges in using augmentation. The Kansas Legislature in 2015 passed Senate Bill 52 that allowed for augmentation of senior water rights in Rattlesnake Creek Basin if the water was given voluntarily and if it is available. We believe that water cannot be considered "available" in an over appropriated basin that is closed to new appropriations. Surface water and groundwater may be in excess of legal demands during portions of the year, but a water shortage will likely be in place when augmentation is needed.

Additionally, augmentation poses several technical challenges. The DWR conducted a series of model runs using the Big Bend Groundwater Manager District No. 5 funded Balleau Groundwater Inc. groundwater model looking at different augmentation scenarios. The results were presented in a webinar on November 4, 2014 and the presentation is posted on the DWR website. These hypothetical wells and augmentation of streamflow occurred about 13 miles upstream of the Refuge. The modeled results found that only about 50% of the water augmented to the stream actually reached the Zenith gauge due to infiltration back into the aquifer.

One of the options mentioned at the collaborative meetings was to locate augmentation wells closer to the Refuge to reduce the percentage of flow that infiltrates from the stream into the aquifer. The Service is concerned that the aquifer near the Refuge is not able to support large demands from pumping wells. The enclosed publications by Rubin and Buddemeier (2003) and Ma et al. (1997) indicate that there is abundant saline water located at the base of the Great Bend Prairie Alluvial Aquifer near the Refuge, and that high pumping demands lead to upconing of this saline water. Ma et al. (1997) recommended a maximum pumping rate of 525 gpm under normal climatic conditions to reduce saltwater upconing. Augmentation water would likely be needed most in times of drought, further reducing the safe pumping rate. Higher pumping rates during drier conditions could lead to salinization of the aquifer. This could permanently degrade water quality such that the aquifer is unsuitable not only for augmentation needs, but also for irrigation of crops in the vicinity of the augmentation wells.

Finally, the scale and capacity of augmentation is a general concern due to long term development, large up-front expenses, and perpetual operation and maintenance costs. The lack of availability of sufficient groundwater near the refuge, water quality concerns, the legal availability of water, and the potential adverse impacts to natural resources within the watershed should all be considered before choosing augmentation as a remedy. The Service does not desire on augmentation plan that ultimately leads to a temporary partial solution and further degradation of the watershed. The depletion of surface water flows in Rattlesnake Creek was caused by over-appropriation of groundwater. The Service has maintained that solving an issue of over-pumping with further pumping is not a sustainable solution.

Please contact Jaron Andrews of my staff at jaron_andrews@fws.gov or call at 303-236-4490 if you have any questions.

Sincerely,

Kathleen R. Dennis
Assistant Regional Director
Budget and Administration

Enclosures/References:

Ma, T. S., Sophocleous, M., Buddemeier, R.W. 1997. Modeling saltwater upconing in a freshwater aquifer in south-central Kansas. *Journal of Hydrology* 201, 120 – 137

Rubin, H., Buddemeier, R.W. 2003. Analysis of aquifer mineralization by paleodrainage channels. *Journal of Hydrology* 277, 280 - 304

Supplemental response to comments on initial report for the Quivira Impairment Investigation

June 10, 2016

Many comments on the first draft of the initial impairment report have been addressed in the second draft of the report. Comments that were not addressed in the second draft are addressed, either generally or specifically, below.

How much of the certified amount in 1987 was from runoff vs. baseflow?

We don't know how much runoff there was in 1987 or what portion of the Refuge's water supply came from runoff. However, the GMD5 groundwater model shows that in 1987, junior groundwater pumping reduced streamflow by 38,000 AF. While runoff may have been the source of a portion of the supply in 1987, it would have been available as baseflow without junior pumping effects.

Perfection year of 1987 set a record for max daily discharge at Zenith; 8th wettest on record.

See Report, Section 4

There is no legal justification for including evaporation in the certified amount as the water was diverted in previous years. The certificate should have been limited to 10,129.7 AF.

See Report, Section 4

There is no justification for granting extensions of time to perfect to 1987.

See Report, Section 4

As evaporation and storage in Little Salt Marsh (LSM) is part of certificate amount, shouldn't the beginning number for the diversions in the impairment analysis be 10,130 AF? Should the water available to the Refuge be limited to 10,130 AF?

See Report, Section 7

During many periods of alleged impairment, the Service did not use all of the water available. There appear to be times when Refuge was full but a shortage is shown (e.g.1995, 2004, 2005).

The impairment analysis considered all water available during the Service-defined management periods to meet the scheduled needs, even if not diverted. See Report, Section 7, which notes storage was not considered in our analysis and there may have been times, such as 1995 and others, when impairment may have been less to the degree that the Refuge's limited storage would mitigate such shortages.

DWR past statements evidence that every surface water right holder should expect shortages and thus not expect to have available their full authorized quantity every year. Why did DWR's analysis not consider this, applying a reasonableness standard of some sort, allowing for shortages?

See Report, Section 4. While it is true that a water right does not provide any guarantee that water will be available in every year, and in fact water may not be available in periods when there is a high

need for the water, the KWAA does ensure that a water right is entitled to protection from junior appropriators. DWR's statements were in observance of the shortages that result from natural hydrologic cycles and not meant to limit the expectation that senior water right holders are entitled to protection from junior appropriators.

Groundwater levels are not in decline in the upper basin; water levels are stable from Macksville downstream.

See Report, Figure 5, which shows the variation in groundwater level changes in the basin and over time. The groundwater model estimates stream-aquifer interactions, including the effects of well pumping on streamflow. The model demonstrates that groundwater pumping is significantly reducing streamflow at the Refuge (see Figure 11 of the report). In this system it does not take significant water level declines to intercept recharge destined for the stream. Water levels have declined from pre-development conditions, producing stream depletions that have and are occurring, and as demonstrated by the Model, will continue to increase over time.

Has the accuracy of the Service's records relied upon for the certificate been verified?

During a supplemental field inspection, of which the report is included in the online electronic water right file, field office staff compared the results of the use of the Clausen Rule with a DWR Pygmy flow measurement. The results showed an acceptable level of accuracy for measuring use at the Refuge with the Clausen Rule.

In reviewing reported diversion records, it is difficult to align them with the Service's reports on the percent of storage filled at various times.

Annually DWR has sent its standard water use report for surface water users which includes a section for reporting reservoir percent full. The report format presents some ambiguities to Refuge staff because it is not clear whether the storage referenced is all of the storage on Refuge or just LSM. It appears that Refuge managers over the years have reported reservoir storage values inconsistently. DWR will develop more specific and clear reporting requirements for the Refuge.

Most water rights do not need their full authorized quantity every year? Has the Service demonstrated that it needs its full authorized quantity in every year, as DWR's analysis seeks to accomplish?

See Report, Section 4. Water rights are certified on the maximum year of record, that is, the maximum amount of water put to beneficial use in a calendar year. For most water rights, average use is lower than the maximum authorized. For various reasons, some water rights are not fully perfected, meaning that during the perfection period, the maximum potential water use was not achieved, resulting in a "short" water right that can be expected to be fully used in most years. There is a clear record of the Service's objections to the draft certificate. The Service argued that junior pumping had diminished its water supply during the perfection period, preventing it from using enough water to meet its full needs. From this perspective, the Refuge's water right can be considered "short," and it is reasonable to expect that it could use its full water right in most years.

The entire impairment claim is based on a schedule recently submitted by the Service. Why did DWR accept Scenario 3 in Attachment 5 rather than Scenario 1?

See Report, Section 7. The Service has been claiming impairment for several decades. Groundwater modeling shows that the Refuge's supply has been substantially reduced over those decades. In light of this, the use of the historical record, as in Scenario 1, is unjustified and inappropriate.

How does the KWAA's language requiring an appropriator to allow for a reasonable increase or decrease in static water level and for a reasonable increase and decrease of streamflow at the appropriator's point of diversion relate to this investigation esp. in light of the relative equilibrium of regional groundwater levels? How is such reasonable increase or decrease in streamflow defined?

The language cited in the question is from the section of law governing approval of applications to appropriate water. However, even if we were to apply this standard in the context of the present impairment claim of the Service, the investigation has shown that a substantial amount of water that should have been available for diversion by the Service has been diverted by junior appropriators, beyond what could be considered reasonable. As the Service has the right pursuant to its senior water right to divert these flows, and are being prevented from doing so, we do not believe this statutory provision impacts our analysis

If wells are shut down, would it not be a futile call?

See Report, Section 6. KDA-DWR's modeling work demonstrates a direct link between groundwater pumping and water availability to the Refuge and that administration of junior appropriators would result in significant increases to available flows, increasing from a gain of 2 cubic feet per second after one year to over 10 cubic feet per second after three years. See Report, Modeling Appendix, Figure A12.

There was inadequate time to comment on the draft report.

The time frame for developing the report included time to obtain records from the Service, to perform groundwater modeling and report those modeling findings to basin stakeholders (provided December 2014), developing the impairment analysis and drafting the initial report. The time provided for review of the initial report was well beyond that required by regulation, and additional time for review is provided for the second draft. We believe the time frames for review are sufficient for this stage of the impairment investigation.

The impairment claim is based on a water schedule that the Refuge claims they need, without proof that they need it at the specific times listed on the schedule. There is no analysis of the reasonableness of the Service's schedule vs. their historic use and available streamflow.

See Report Section 4 and Section 7. The U.S. Fish & Wildlife Service is staffed with professionals who have training and experience in managing wildlife habitat and they are, therefore, best qualified to know the timing of the Refuge's needs. The Refuge's recent comprehensive review evidences thoughtful consideration of their water needs, including timing, which we have determined to be reliable.

The water right was perfected with groundwater depletion already in place.

This is true and the Service objected to the draft certificate based on that fact. The record is clear that the Service's water right was restricted to what was actually used from the available water supply, despite the Service's objections that more could have been perfected had those junior groundwater depletions not been in place.

Why does your impairment analysis show impairment in the year certified?

See Report, Section 7.

Model runs should be confirmed by Balleau.

See GMD 5 letter of comment that confirms this has been done. The only technical concern expressed by Balleau related to the modeling was addressed. See Report, Section 5 and Appendix.

Starting head conditions are not steady.

See Report, Section 5 and Appendix.

The single-layer model impacts are 2.4 to 5% different that the 7-layer model impacts. They recommend the 7-layer model be used for final calculations and conclusions.

We believe the accuracy of the one-layer model was sufficient for this impairment investigation.

Metering of water entering, exiting and diverted on the Refuge is inadequate. The Service's water use report does not include filling and evaporation from LSM. The certificate should be amended to split this use off or the Service should be found in violation of permit for failure to report this use.

We believe additional reporting should be required in the future for water administration purposes including estimates for evaporation and storage change at LSM. While we continue to work with the Refuge on improving data, esp. in light of potential future needs related to water administration, DWR believes the available records are sufficient for this investigation and it is not necessary to await refined data to craft solutions.

Do the seasonal needs used in the impairment analysis represent past management?

No; but they represent the Service's current management and thus are appropriate for this analysis.

Given that there are times of excess flows, the use of Refuge storage may facilitate the effective use of augmentation.

See Report, Section 7.

Has the consumptive use of water increased on the Refuge as a result of its changing management contrary to the chief engineer's requirements? The gage at Raymond should be restored to determine water leaving the Refuge.

See Report, Section 4. Consumptive use is typically a downstream concern; we don't see anyone affected downstream. It is unclear whether downstream measurement will be needed. This will be examined as specific actions to address the impairment are finalized.

Has the wetland restoration project including re-contouring increased the demand for water?

Our understanding is that re-contouring is done to allow for more efficient use of water.

How does the Service's operations compare with requirements of conservation plan of the mid-1990s?

Conservation planning of the period required certain water right holders to develop a conservation plan and a plan for implementation. The Service complied with these requirements.

Is the Service's water need estimate of 2015 in conflict with their year 2000 water operations plan? Does the current management strategy shift away from a plan that works in concert with water availability? Is the Service operating as efficiently as possible, holding water in units as long as possible? Do they allow units to dry in the summer when water is insufficient?

KDA-DWR is obligated to make sure that the Refuge is not wasting water and putting water to its intended use within the conditions of its water right. The Service has recently conducted a comprehensive review of its operations and updated its plan for operation. KDA-DWR has no evidence that the Refuge is wasting water or deviating from the terms and limitations of its water right.

Pursuant to the Service's year 2000 operations plan, is the use of Big Salt Marsh still an important part of its operation?

Big Salt Marsh is a natural depression that receives water from local runoff and groundwater upwelling and on occasions from diversions from the Rattlesnake via the Service's diversion works. Use from local runoff and groundwater upwelling is not considered use under Water Right File No. 7571. Use via the Refuge's distribution works is considered use under File No. 7571.

Clearing of trees and brush along the creek will reduce riparian impact, benefiting the Refuge.

These actions could lead to improved water supply conditions and could therefore help to reduce the frequency and magnitude of future impairment.

Streamflow has declined for many other reasons besides groundwater pumping: farming practices, trees, federal programs, etc.

While conservation practices do reduce streamflows by making more water available for crop use and recharge, the impairment determined by our analysis is caused by junior groundwater pumping as determined by the groundwater model.

All parties need to work toward solutions that will not negatively impact economies and quality of life. Basin stakeholders wish to develop a plan that avoids severe cutback to pumping that will devastate the local economy. We would like to explore augmentation, use of incentive-based programs, etc.

Local solutions are strongly encouraged and KDA-DWR stands ready to assist stakeholders in developing such solutions, but the law must be upheld. Tools available to local water users include augmentation, development of one or more local enhanced management areas (LEMAs), development of one or more water conservation areas (WCAs), and water right retirement, among others. To the extent local solutions are not available, tools available to the chief engineer include strict priority administration or the initiation of intensive groundwater use control area (IGUCA) proceedings.

Augmentation should be the preferred option to resolve the impairment. Augmentation needs to be modeled. Augmentation strategies should be evaluated including the consideration of trigger using the Palmer Drought Index.

Augmentation can be considered if the Basin stakeholders develop a plan. KDA-DWR is available to assist with the development and evaluation of an augmentation plan, but the law is clear that augmentation can only be voluntarily implemented and cannot be ordered by the state.

Reductions in allocations should not be a consideration due to the devastating effect on the economy of the area.

The basin has a variety of water management tools available and an opportunity to offer solutions to remedy the impairment.

Will out-of-basin groundwater pumping that affects the Refuge be administrated the same as in-basin?

This will be determined in the remedies phase of this investigation.

We encourage KDA-DWR to fully restore water flow in Rattlesnake Creek to provide sufficient flows to Quivira National Wildlife Refuge.

The impairment analysis quantifies the degree of impairment caused by upstream junior groundwater pumping. As mentioned above, the Refuge's water right does not guarantee water availability, but the Refuge is entitled to protection from junior appropriators.

The Refuge is a wetland of international significance, critical to migratory birds and Kansas wildlife heritage. KDA-DWR has been remiss in allowing junior users to impair its use for these decades.

KDA-DWR, along with the U.S. FWS, GMD5 and WaterPACK worked for many years to seek a solution to the Service's concerns. Now that the Service has claimed water right impairment, we have performed this impairment investigation and will work through the process to its conclusion.

The Service has complained for decades that its water right has been impaired and has patiently worked with the Rattlesnake Creek Partnership in its attempt to reduce groundwater pumping. Those efforts were unsuccessful. The Service should not be asked to continue to be injured due to junior groundwater pumping impacts.

While the Service has worked for many years with the Basin seeking a solution to its concerns, we must work through our process that was initiated with the Service's claim of water right impairment. We are working to ensure we are taking necessary and appropriate action to address these concerns.

We do not support the use of groundwater pumping (augmentation) to remedy this impairment as it will further deplete the groundwater and streamflows of the area and adversely affect streams, wetlands and other ecological values associated with the Refuge and other areas of the Basin. Augmentation could also lead to a reduction in water quality into the Refuge.

During the 2015 legislative session, state statutes were amended to allow the chief engineer to consider augmentation, if voluntarily offered, as a remedy for impairment. That said, any augmentation plan that is developed must consider the additional stream depletions created from the augmentation pumping. If an augmentation plan is offered, KDA-DWR will evaluate the augmentation pumping effects on streamflow with the GMD5 groundwater model.

While portions of the basin are significantly developed and experiencing water level declines, other parts of the basin and level are much less developed and are not seeing such declines. The Basin has been closed to new appropriation since 1998. To allow for augmentation supplies, either existing water rights will have to be changed to augmentation use or the GMD and chief engineer would have to agree to open the district to new water appropriations for this purpose. This would only be done if it is in an area that can sustain this use. For augmentation to be approved as a remedy for impairment, the quality of the water would have to meet the Refuge's needs as well as any applicable laws, rules, and regulations governing water quality in Kansas.

Like Cheyenne Bottoms, an Intensive Groundwater Use Control Area (IGUCA) should be established to make the appropriate cuts in pumping while allowing the level of irrigation use allowable without impairment to the Refuge's right.

The specific remedy for any impairment found in the final impairment report will be determined in the next phase of this process. First, basin stakeholders will be provided with an opportunity to develop a plan to remedy the impairment. If no plan is offered or the plan is inadequate, the IGUCA process is one alternative to address any remaining impairment.

Comprehensive Conservation Plan

Quivira National Wildlife Refuge

Kansas

October 2013

Approved by

10-29-13

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

Prepared by

Quivira National Wildlife Refuge
1434 NE. 80th Street
Stafford, Kansas 67578
620 / 486 2393

U.S. Fish and Wildlife Service
Region 6, Mountain-Prairie Region
Division of Refuge Planning
134 Union Boulevard, Suite 300
Lakewood, Colorado 80228
303 / 236 8145

CITATION

U.S. Fish and Wildlife Service. 2013. Comprehensive conservation plan—Quivira National Wildlife Refuge, Kansas. Lakewood, CO: U.S. Department of the Interior, Fish and Wildlife Service. 221 p.

EXHIBIT 2

Comprehensive Conservation Plan

Quivira National Wildlife Refuge

Kansas

Submitted by

Walter M. Oldham 9/25/13

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

Concurred with by

10/17/13

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

Barbara Boyle 9/27/13

Barbara Boyle — Date
Refuge Supervisor (Colorado, Kansas, Nebraska)
U.S. Fish and Wildlife Service, Region 6
National Wildlife Refuge System
Lakewood, Colorado

Contents

Summary XI
Abbreviations XVII

CHAPTER 1—Introduction 1
1.1 Purpose and Need for the Plan 2
1.2 The U.S. Fish and Wildlife Service and the National Wildlife Refuge System 3
U.S. Fish and Wildlife Service 3
National Wildlife Refuge System 3
People and the Refuge System 4
1.3 National and Regional Mandates 4
1.4 Refuge Contributions to National and Regional Plans 5
Conserving the Future 5
Partners in Flight 5
North American Waterbird Conservation Plan 5
North American Waterfowl Management Plan 5
U.S. Shorebird Conservation Plan 6
Recovery Plans for Federally Listed Threatened or Endangered Species 6
Kansas State Wildlife Action Plan 6
Responding to Accelerating Climate Change 7
1.5 Landscape-Scale Conservation 7
Strategic Habitat Conservation 7
Landscape Conservation Cooperatives 8
1.6 The Planning Process 8
Coordination with the Public 9
State Coordination 11
Tribal Coordination 11
Results of Scoping 12
The Draft Plan 12
The Final Plan 12

CHAPTER 2—The Refuge 13
2.1 Establishment, Acquisition, and Management History 13
Establishment 13
Acquisition History 14
Management History 14
2.2 Purposes 14
2.3 Vision 16
2.4 Goals 16
Landscape Conservation Goal 16
Native Ecological Community Conservation Goal 16
Visitor Services Goal 16
Public Outreach Goal 16
Cultural Resources Goal 17
Visitor and Employee Safety and Resource Protection Goal 17

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 6 of 144

Administration Goal 17

2.5 Special Values 17
Rare, Diverse, and Quality Habitat 17
Wildlife Species 17
Species of Concern 17
Water Resources 17
Communities and People 17
Education and Visitor Services 17
Cultural Resources 18
Facilities and Infrastructure 18
Special Designations 18

2.6 Planning Issues 18
Water Quantity and Quality 18
Tree Management 19
Whooping Crane Closures 19
Prohibiting the Collection of Shed Antlers 19
Deer and Turkey Hunting 19
Increasing Public Use and Wildlife Compatibility 19

CHAPTER 3—Refuge Resources and Description 21

3.1 Physical Environment 21
Climate 21
Land Features 25
Soils 25
Water Resources 26
Air Quality 29

3.2 Biological Resources 29
Plant Communities 31
Wildlife Communities 40
Federally and State-Listed Species 45

3.3 Management Tools 46
Rest 46
Water Management 47
Prescribed Fire 47
Grazing 47
Mechanical Treatments 48
Chemical Treatments 48

3.4 Human History and Cultural Resources 48
Prehistoric Resources 48
Prehistoric Occupation 48
Protohistoric and Historic Native Americans 49
Historic Euro-Americans 49
History 50

3.5 Special Management Areas 52

3.6 Visitor Services 52
Hunting 52
Fishing 53
Wildlife Observation and Photography 53
Environmental Education 53
Interpretation 54
Other Uses 55
Special Events 55
Public Outreach 55

3.7 Partnerships 56
3.8 Socioeconomic Environment 56
Population, Ethnicity, and Education 57
Regional Economic Setting 58
Public Use of the Refuge 60
Visitor Levels 60
Economic Contributions of the Refuge 61
3.9 Operations 61
Funding and Staff 62
Facilities 62

CHAPTER 4—Management Direction 65
4.1 Management Focus 65
4.2 Overview of Goals and Objectives 66
4.3 Landscape Conservation Goal 66
Landscape Conservation Objective 1: Land Ownership and Collaboration 68
Landscape Conservation Objective 2: Habitat Fragmentation 70
Landscape Conservation Objective 3: Environmental Health and Climate Change 71
4.4 Native Ecological Community Conservation Goal 72
Native Ecological Community Conservation Objective 1: Wetlands 81
Native Ecological Community Conservation Objective 2: Grasslands 89
Native Ecological Community Conservation Objective 3: Woodlands 93
4.5 Visitor Services Goal 95
Hunting Objective 1 97
Hunting Objective 2 97
Fishing Objective 1 98
Fishing Objective 2 100
Wildlife Observation and Photography Objective 1 100
Wildlife Observation and Photography Objective 2 101
Environmental Education and Interpretation Objective 1 101
Environmental Education and Interpretation Objective 2 102
Environmental Education and Interpretation Objective 3 102
Environmental Education and Interpretation Objective 4 102
Environmental Education and Interpretation Objective 5 103
Environmental Education and Interpretation Objective 6 103
Other Uses Objective 103
4.6 Public Outreach Goal 104
Public Outreach Objective 1 104
Public Outreach Objective 2 105
Public Outreach Objective 3 105
4.7 Cultural Resources Goal 106
Cultural Resources Objective 106
4.8 Visitor and Employee Safety and Resource Protection Goal 106
Visitor and Employee Safety Objective 106
Resource Protection Objective 107
4.9 Administration Goal 108
Funding and Staff Objective 1 108
Funding and Staff Objective 2 108
Facilities Objective 1 109
Facilities Objective 2 110
Facilities Objective 3 110
Facilities Objective 4 110

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 8 of 144

4.10 Stepdown Management Plans 111
4.11 Monitoring and Evaluation 111
4.12 Plan Amendment and Revision 112

GLOSSARY 113

BIBLIOGRAPHY 213

APPENDIXES

Appendix A
Environmental Compliance 119
Appendix B
Compatibility Determinations 123
Appendix C
Intra-Service Section 7 Biological Evaluation 139
Appendix D
Public Involvement 147
Appendix E
Key Legislation and Policy 175
Appendix F
List of Preparers and Contributors 179
Appendix G
Species Lists 181
Appendix H
Grassland Fragmentation Assessment 207

FIGURES

Figure 1. Quivira National Wildlife Refuge and Great Plains Nature Center, Kansas 2
Figure 2. Basic strategic habitat conservation process 7
Figure 3. Great Plains Landscape Conservation Cooperative with Quivira National Wildlife Refuge, Kansas 8
Figure 4. Process steps for comprehensive conservation planning and associated environmental analysis 9
Figure 5. Water control structures, Quivira National Wildlife Refuge, Kansas 15
Figure 6. Playa Lakes Joint Venture region, Quivira National Wildlife Refuge, Kansas 23
Figure 7. Refuge soil map, Quivira National Wildlife Refuge, Kansas 27
Figure 8. Potential presettlement conditions, Quivira National Wildlife Refuge, Kansas 33
Figure 9. Vegetation cover types in 1954, Quivira National Wildlife Refuge, Kansas 36
Figure 10. Vegetation cover types in 2008 (NVCS), Quivira National Wildlife Refuge, Kansas 37
Figure 11. Public use facilities at Quivira National Wildlife Refuge, Kansas 63
Figure 12. Elevation at Quivira National Wildlife Refuge, Kansas 67
Figure 13. Land use and habitat outside the boundaries of Quivira National Wildlife Refuge, Kansas 69
Figure 14. Native ecological community conservation objectives for Quivira National Wildlife Refuge, Kansas, illustrated in a community profile schematic 80
Figure 15. Cropland and tree coverage planning at Quivira National Wildlife Refuge, Kansas 94
Figure 16. Location of woodland groves at Quivira National Wildlife Refuge, Kansas, in 2012 96
Figure 17. Proposed deer and turkey hunt area, Quivira National Wildlife Refuge, Kansas 99

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 9 of 144

FIGURES (CONTINUED)

Figure 18. The adaptive resource management process 112
Figure 19. Current grassland conditions at Quivira National Wildlife Refuge, Kansas 211
Figure 20. Future grassland conditions at Quivira National Wildlife Refuge, Kansas 212
Figure 21. Current nonhostile grassland conditions at Quivira National Wildlife Refuge, Kansas 213

TABLES

Table 1. Summary of the Comprehensive Conservation Plan process for Quivira National Wildlife Refuge, Kansas 10
Table 2. Land acquisition history of the Quivira National Wildlife Refuge, Kansas 14
Table 3. Vegetation descriptions for Quivira National Wildlife Refuge, Kansas 31
Table 4. Hydrogeomorphic relationship of historical distribution of vegetation communities or habitat types to geomorphic surface, soils, and hydrological regime in the area of Quivira National Wildlife Refuge, Kansas 32
Table 5. Comparison of vegetation cover types between 1954 and 2011 on Quivira National Wildlife Refuge, Kansas. 38
Table 6. National Vegetation Classification System (NVCS) associations, Quivira National Wildlife Refuge, Kansas 39
Table 7. Observed woodland bird use at Quivira National Wildlife Refuge, Kansas 42
Table 8. Threatened and endangered species and species of concern, Quivira National Wildlife Refuge, Kansas. 46
Table 9. State and county population estimates in the area around Quivira National Wildlife Refuge, Kansas. 57
Table 10. Community population estimates in the area around Quivira National Wildlife Refuge, Kansas. 57
Table 11. State income, unemployment, and poverty statistics and county statistics in the area around Quivira National Wildlife Refuge, Kansas 58
Table 12. Community income, unemployment and poverty statistics in the area around Quivira National Wildlife Refuge, Kansas. 58
Table 13. Employment by sector in the area around Quivira National Wildlife Refuge, Kansas. 59
Table 14. Total visitor expenditures, expressed in dollars per person per day, for Quivira National Wildlife Refuge, Kansas. . . 62
Table 15. Base staff budgeted in fiscal year 2012 and other staff stationed at Quivira National Wildlife Refuge, Kansas. 62
Table 16. Focal species by life event and habitat at Quivira National Wildlife Refuge, Kansas. 75
Table 17. Estimated greatest potential distribution of wetland habitat conditions (acres by unit and objective) for the proposed alternative for Quivira National Wildlife Refuge, Kansas 83
Table 18. Dominant nonwetland habitat types at Quivira National Wildlife Refuge, Kansas. 92
Table 19. Stepdown management plans for Quivira National Wildlife Refuge, Kansas. 111

Summary



© Mitch Werner

Kansas Sunflower

We, the U.S. Fish and Wildlife Service, manage the Quivira National Wildlife Refuge, which consists of 22,135 acres in Stafford, Rice, and Reno Counties in south-central Kansas. Our staff at the Quivira National Wildlife Refuge also manages the Great Plains Nature Center in Wichita, Kansas, in partnership with the Kansas Department of Wildlife, Parks and Tourism and the City of Wichita Department of Park and Recreation.

Quivira National Wildlife Refuge is located in the Great Plains. 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.

The refuge also provides opportunities for the public to enjoy compatible wildlife-dependent public use activities including hunting, fishing, wildlife observation, photography, environmental education, and interpretation.

This document contains the comprehensive conservation plan for Quivira National Wildlife Refuge.

The Refuge

We developed a vision for Quivira National Wildlife Refuge that describes the focus of refuge management, including what will be supported and improved in the future. This is the essence of what we want to accomplish at the refuge by the end of the life of this CCP in 15 years.

We also developed a set of goals for Quivira National Wildlife Refuge to direct our work in achieving the vision and purposes of the refuge and to outline approaches for managing the refuge's resources.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 12 of 144



Barry Jones/FWS

This dickcissel nest was found in the Hornbaker Unit of Quivira Refuge.

Vision Statement

The vision for Quivira National Wildlife Refuge is as follows:

Near the confluence of the Rattlesnake Creek and Arkansas River in central Kansas, water remains the great driver of a diverse complex of saltmarsh and unique native sand prairie community that is Quivira National Wildlife Refuge. The combination of these productive habitats as well as the refuge's midcontinent location continue to attract millions of birds needing to replenish essential reserves and to find protection in the mosaic of largely open grasses, sedges, rushes, and water. Through environmental education and outreach, we promote understanding and appreciation of the refuge's dynamic landscapes. For visitors, each moment is unique—the smell of moist earth and salty air, the primitive call of a crane, the whispering bluestem, the cacophony of geese, the early steps of a snowy plover chick, or the discovery of a subtle pattern or design in nature. In a land of recurring extremes, ongoing collaboration between refuge professionals, partners, and the public sustains a healthy system. Through land stewards transcending refuge boundaries, the integrity of these ecosystems are conserved with awe, respect, and appreciation of the gifts it offers for all to receive.

Goals

Our goals for Quivira National Wildlife Refuge are based on the National Wildlife Refuge System Improvement Act of 1997, the refuge's purposes, and the information we gathered during planning.

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

Identify, value, and preserve the cultural resources and cultural history of the refuge and connect staff, visitors, and the community to the area's past.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 13 of 144

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 maintain the long-term integrity of infrastructure, habitats, and wildlife resources at the refuge and at the Great Plains Nature Center.

Management Direction

The comprehensive conservation plan directs the management of the Quivira National Wildlife Refuge to meet the purposes of the refuge and to address issues.

The plan is intended to be a broad umbrella of general concepts and specific objectives for the refuge over the next 15 years. As the plan is implemented, we will develop stepdown plans with details for carrying out actions needed to achieve objectives.

Concepts and Objectives for the Refuge

We will 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 and on increasing public use opportunities for hunting. We will increase our attention and understanding of the connectedness of habitats and the effectiveness of our management. To achieve this, we will make relatively minor changes to our current operations; inventory, monitoring programs, and research; staff; and infrastructure.



Rachel Laubhan/FWS

White Pelicans

Abbreviations

Administration Act	National Wildlife Refuge System Administration Act of 1966
AFY	acre-feet per year
BSM	Big Salt Marsh
CCP	comprehensive conservation plan
CFR	Code of Federal Regulations
cfs	cubic feet per second
DOI	U.S. Department of the Interior
EA	environmental assessment
EPA	Environmental Protection Agency
°F	degrees Fahrenheit
FWS	U.S. Fish and Wildlife Service
GIS	geographic information system
GPLCC	Great Plains Landscape Conservation Cooperative
GPNC	Great Plains Nature Center
Improvement Act	National Wildlife Refuge System Improvement Act of 1997
KDWPT	Kansas Department of Wildlife, Parks and Tourism
LSM	Little Salt Marsh
NEPA	National Environmental Policy Act of 1969
NWR	national wildlife refuge
NVCS	National Vegetation Classification System
NRCS	Natural Resources Conservation Service of the U.S. Department of Agriculture
Partners	Partners for Fish and Wildlife
PLJV	Playa Lakes Joint Venture
the refuge	Quivira National Wildlife Refuge
Refuge System	National Wildlife Refuge System

Region 6	Mountain-Prairie Region 6 of the U.S. Fish and Wildlife Service
Service	U.S. Fish and Wildlife Service
U.S.	United States
U.S.C.	United States Code
USGS	U.S. Geological Survey

A glossary of these and other terms follows chapter 4.

Chapter 1—Introduction



© Bob Gress

Black-necked Still

We, the U.S. Fish and Wildlife Service (Service or FWS) manage the Quivira National Wildlife Refuge (Quivira Refuge or refuge), which consists of 22,135 acres in Stafford, Rice and Reno Counties in south-central Kansas. Our staff at the Quivira Refuge 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. To address the long-term management of the refuge and the GPNC, we have developed this comprehensive conservation plan (CCP).

This chapter introduces our process for development of the Quivira Refuge CCP. It describes our involvement as well as that of the public, our partners, the State of Kansas, and other interested parties and also describes conservation issues and plans that affect the refuge.

The chapters that follow contain information we used and the results of our analysis. These form the foundation of the plan:

Chapter 2 describes the refuge and planning issues.

Chapter 3 describes the physical, biological, and social environment of the refuge.

Chapter 4 describes objectives and strategies for all aspects of managing the refuge.

The refuge is part of the National Wildlife Refuge System (Refuge System), and is located in south-central Kansas (figure 1). The GPNC is a Service administrative site and an educational facility, but it is not a unit of the Refuge System.

We have developed this CCP to provide a foundation for the management and use of Quivira Refuge. The CCP specifies the necessary actions to achieve the vision and purposes of the refuge. Wildlife is the first priority in refuge management, and public use, including wildlife-dependent recreation, is allowed and encouraged as long as it is compatible with the purposes of the refuge. The CCP will serve as a working guide for management programs and activi-

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 18 of 144

ties throughout the refuge over the next 15 years. Although this document contains management direction for the refuge, greater detail will be provided in stepdown management plans as part of carrying out the final CCP.

1.1 Purpose and Need for the Plan

The purpose of this CCP is to define the role that Quivira Refuge will play in support of the mission of the National Wildlife Refuge System and to provide long-term guidance for managing programs and activities. The CCP will help us:

- communicate with the public and our partners in carrying out the mission of the Refuge System;
- establish a clear statement of direction for managing the refuge;
- provide refuge neighbors, refuge visitors, and government officials an understanding of our management actions on, and around, the refuge;

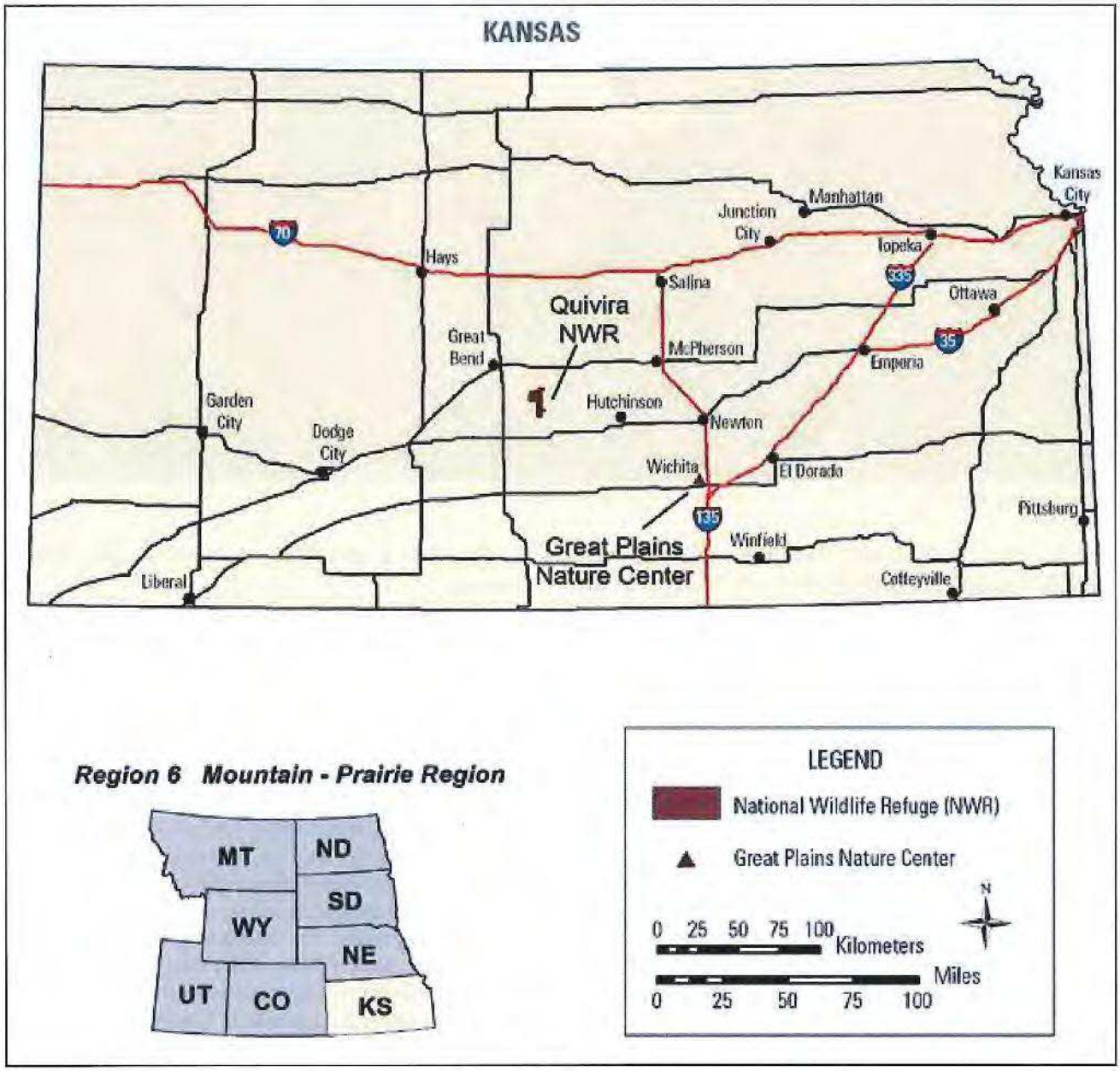


Figure 1. Quivira National Wildlife Refuge and Great Plains Nature Center, Kansas.

- make sure that our management actions are consistent with the mandates of the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) (Public Law 105–57);
- make sure that our management of the refuge is consistent with Federal, State, and county plans;
- establish a basis for developing budget requests for refuge operation, maintenance, and capital improvement needs.

1.2 The U.S. Fish and Wildlife Service and the Refuge System

We are the principal Federal agency responsible for fish, wildlife, and plant conservation. The Refuge System is one of our major programs.

U.S. Fish and Wildlife Service

The mission of the U.S. Fish and Wildlife Service, working with others, is to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people.

In the late 19th and early 20th centuries, America's fish and wildlife resources declined at an alarming rate, largely because of unrestricted market hunting. Concerned citizens, scientists, and hunting and angling groups joined together and generated political will for the first significant conservation measures taken by the Federal Government. These actions included the establishment of the Bureau of Fisheries in the 1870s and, in 1904, passage of the first Federal wildlife law, the Lacey Act, which prohibited interstate transportation of wildlife taken in violation of State laws. Beginning in 1903, President Theodore Roosevelt created more than 50 national wildlife refuges across the Nation.

Over the next three decades, the United States ratified the Migratory Bird Treaty with Great Britain, and Congress passed laws to protect migratory birds, establish new refuges, and to create a source of money for refuge land acquisition. In 1940, we, the FWS, were created within the U.S. Department of the Interior (DOI), and several existing Federal wildlife functions, including law enforcement, fish management, animal damage control, and wildlife refuge management, were placed in our charge, under one organization, for the first time.

Today, we enforce Federal wildlife laws, manage migratory bird populations, restore nationally significant fisheries, conserve and restore vital wildlife habitat, protect and recover endangered species, and help other governments with conservation efforts. In addition, we administer a Federal aid program that distributes hundreds of millions of dollars to the States for fish and wildlife restoration, boating access, hunter education, and related programs across the United States.

National Wildlife Refuge System

The mission of the National Wildlife 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.

In 1903, President Theodore Roosevelt designated the 5.5-acre Pelican Island in Florida as the Nation's first wildlife refuge for the protection of native nesting birds. This was the first time the Federal Government set aside land for wildlife. This small, but significant, designation was the beginning of the National Wildlife Refuge System.

One hundred years later, the Refuge System has become the largest collection of lands in the world specifically managed for wildlife, encompassing more than 150 million acres within more than 550 refuges and more than 3,000 small areas for waterfowl breeding and nesting. Today, there is at least one refuge in

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 20 of 144

every State including Puerto Rico and the U.S. Virgin Islands.

The Improvement Act established a clear mission for the Refuge System. It states that we must manage each national wildlife refuge to:

- fulfill the mission of the Refuge System;
- fulfill the individual purposes of each refuge;
- consider the needs of fish and wildlife first;
- include the development of a CCP for each unit of the Refuge System and to fully involve the public in the preparation of these plans;
- support the biological integrity, diversity, and environmental health of the Refuge System;
- recognize that wildlife-dependent recreation activities, including hunting, fishing, wildlife observation, photography, environmental education, and interpretation, are legitimate and priority public uses;
- allow our refuge managers to identify compatible public uses;

Besides the mission for the Refuge System, the wildlife and habitat vision for each unit of the Refuge System supports the following principles:

- Wildlife comes first.
- Ecosystems, biodiversity, and wilderness are vital concepts in refuge and district management.
- Habitats must be healthy.
- Growth of refuges and districts must be strategic.
- The Refuge System serves as a model for habitat management with broad participation from others.

Following passage of the Improvement Act, we began to carry out the direction of this new legislation including preparing CCPs for all national wildlife refuges. The Improvement Act says we will create CCPs with involvement from the public, and each refuge must have a completed CCP by 2012.

People and the Refuge System

The Nation's fish and wildlife heritage adds to the quality of American lives and is an integral part of the country's greatness. Wildlife and wild places have always given Americans special opportunities to have fun, relax, and appreciate the natural world.

Through birdwatching, fishing, hunting, photography, and more, wildlife recreation contributes millions of dollars to local economies. In particular, money generated from the taxing of sporting arms and ammunition and of fishing equipment, as authorized by the Pittman–Robertson and Dingell–Johnson Acts, respectively, has generated tens of millions of dollars. We distribute this money to the States to increase wildlife and fish populations, expand habitat, and to train hunters across the Nation. Our efforts to support national wildlife refuges also generate substantial economic help for communities that surround these refuges and wetland management districts.

Economists report that visitors to national wildlife refuges contribute more than $1.7 billion annually to local economies. They also enjoy the nature trails, auto tours, interpretive programs, and hunting and fishing opportunities found on refuges.

1.3 National and Regional Mandates

We manage national wildlife refuges to achieve the mission and goals of the Refuge System along with the designated purpose of each individual refuge as described in establishing legislation, Executive orders, or other establishing documents. The key concepts and guidance for the Refuge System are in the National Wildlife Refuge System Administration Act of 1966 (Administration Act), Title 50 of the Code of Federal Regulations (CFR), The "Fish and Wildlife Service Manual," and the Improvement Act.

The Improvement Act amends the Administration Act by providing (1) a unifying mission for the Refuge System; (2) a new process for determining compatible public uses on refuges; and (3) a need for each refuge to be managed under a CCP. The Improvement Act states that wildlife conservation is the priority of Refuge System lands and that the Secretary of the Department of the Interior will make sure that the biological integrity, diversity, and environmental health of refuge lands are kept. Each refuge must be managed to fulfill the Refuge System's mission and the specific purposes for which the refuge was established. The Improvement Act requires us to check

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 21 of 144

the status and trends of fish, wildlife, and plants in each national wildlife refuge.

Detailed descriptions of these and other laws and Executive orders that may affect a CCP or our carrying out of a CCP are in Appendix E—Key Legislation and Policy. Our policies for planning and the day-to-day management of refuges are in the Refuge System Manual and the "Fish and Wildlife Service Manual."

1.4 Refuge Contributions to National and Regional Plans

Quivira National Wildlife Refuge contributes to the conservation efforts outlined in the various State and national plans described here.

Conserving the Future

A 2011 report, "Conserving the Future, Wildlife Refuges & the Next Generation" (FWS 2011), is the culmination of a yearlong process by teams of our employees to evaluate the Refuge System nationwide. The report contains 42 recommendations packaged with three vision statements for wildlife and habitat, people, and leadership. This CCP incorporates all three vision statements. Our planning team examined the recommendations in this document for guidance during CCP planning.

Partners in Flight

The Partners in Flight Program began in 1990 to address the declining population levels of many migratory bird species. Its challenge is to support functional natural ecosystems in the face of human population growth. Partners in Flight worked to identify priorities for landbird species and habitat types. Their activity has resulted in 52 bird conservation plans covering the continental United States.

North American Waterbird Conservation Plan

The North American Waterbird Conservation Plan provides a contiguous framework for conserving and managing colonial-nesting waterbirds, including 209 species of seabirds, coastal waterbirds (gulls, terns, and pelicans), wading birds (herons and ibises), and marshbirds (certain grebes and bitterns). Geographically, the plan covers 28 countries, from Canada to Panama, as well as islands and near-shore areas of the Atlantic and Pacific oceans, the Gulf of Mexico, and the Caribbean Sea. As with Partners in Flight and other migratory bird plans, the North American Waterbird Conservation Plan has a goal to establish conservation action and to exchange information and expertise with other bird conservation initiatives. The plan also calls for establishment of "practical units for planning" for terrestrial habitats. Quivira Refuge is located within the Central Mixed-grass Prairie Bird Conservation Region in the Central Prairies Waterbird Conservation Planning Region.

North American Waterfowl Management Plan

Written in 1986, the North American Waterfowl Management Plan envisioned a 15-year effort to achieve landscape conditions that could sustain waterfowl populations. Specific plan objectives are to increase and restore duck populations to the average levels of the 1970s—62 million breeding ducks and a fall flight of 100 million birds (FWS and Canadian Wildlife Service 1986). Recognizing the importance of waterfowl and wetlands to North Americans and the need for international cooperation to help in the recovery of this shared resource, the United States and Canadian Governments developed a strategy to restore waterfowl populations through habitat protection, restoration, and enhancement. The innovative plan is international in scope and regional in its implementation. Its success depends on the strength of partnerships, called joint ventures, which involve Federal, State, Provincial, tribal, and local governments; businesses; conservation organizations; and individual citizens.

Joint ventures are regional, self-directed partnerships that carry out science-based conservation through a wide array of community participation. Joint ventures develop implementation plans that focus on areas of concern identified in the plan. Quivira Refuge lies within the Playa Lakes Joint Venture. We have considered The North American Waterfowl Management plan and the supporting efforts of the Playa Lakes Joint Venture throughout the planning process, and these will be supported and promoted within the CCP.

U.S. Shorebird Conservation Plan

In 2000, the U.S. Shorebird Conservation Plan began through a partnership between Federal, State, and nongovernmental conservation agencies and researchers mainly to sustain the quantity and quality shorebird habitat at local-to-hemispheric scales (Brown et al. 2001). The plan is meant to complement other conservation plans already developed for waterfowl, colonial waterbirds, and landbirds. The plan involves eleven regional groups, and Quivira Refuge is part of the Central Plains–Playa Lakes Region. Nearly all the 37 shorebird species listed for the region use Quivira Refuge during migration. At least six of those species have been reported nesting on the refuge, mostly common in occurrence.

Recovery Plans for Federally Listed Threatened or Endangered Species

We are responsible for administering the Endangered Species Act that requires development and implementation of federally endangered species recovery plans. Quivira Refuge contributes to the whooping crane and interior least tern recovery plans. Management actions identified in the plans are intended to recover and conserve species and their ecosystems to levels where protection under the Endangered Species Act is no longer necessary.

Kansas State Wildlife Action Plan

The Kansas Comprehensive Wildlife Conservation Plan (Wasson et al. 2005) is a strategic, habitat-based plan that considers 315 species of greatest conservation need living within the State. Regions are identified and key habitats are ranked within the plan according to the degree of threat to their well-being . The plan lists species of concern for each key habitat along with issues of concern and strategies to address them. Issues of concern include existing data gaps, extensive changes in habitat structure over the past century, ongoing fragmentation and conversion of habitat, the spread of invasive species, and effects of natural resource management on habitat conditions. In addition, information is lacking for many species in need. Criteria used to rank the relative importance of species conservation strategies were derived from species status and considered whether or not species were regionally endemic or were subject to commercial harvest but were not eligible for



Barry Jones/FWS

Windmill located in the Reno Unit of Quivira Refuge.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 23 of 144

money from programs such as Federal aid. Quivira Refuge is part of the Central Mixed-grass Prairie Conservation Region where mixed and sand prairie are listed first and second in importance, respectively. We support the habitats and many associated species listed in The Kansas Comprehensive Wildlife Conservation Plan.

Responding to Accelerating Climate Change

The Service expects accelerating climate change to affect the Nation's fish, wildlife, and plant resources in profound ways (Staudinger et al. 2012). While many species will continue to thrive, some may decline and some may go extinct. Others will survive in the wild only through direct and continuous human intervention. In 2010, we completed a strategic plan to address climate change for the next 50 years. This strategic plan uses three key strategies: adaptation, mitigation, and engagement. In addition, the plan acknowledges that no single organization or agency can address climate change. Partnerships are necessary across the Nation and around the world. This plan is an integral part of the DOI's strategy for addressing climate change as expressed in Secretarial Order 3289 (September 14, 2009).

The Service will use the following guiding principles from the strategic plan to respond to climate change:

- priority setting—continually evaluate priorities and approaches, make difficult choices, take calculated risks, and adapt to climate change
- partnership—commit to a new spirit of coordination, collaboration, and interdependence with others
- best science—reflect scientific excellence, professionalism, and integrity in all of our work
- landscape conservation—emphasize the conservation of habitats within sustainable landscapes, applying our strategic habitat conservation framework
- technical capacity—assemble and use state-of-the-art systems to meet the climate change challenge
- global approach—lead national and international efforts to meet the climate change challenge

1.5 Landscape-Scale Conservation

In the face of escalating challenges such as land use conversion, invasive species, water scarcity, and refuge issues that have been amplified by accelerating climate change, we have broadened our vision from applying an ecosystem approach to conservation to looking at the interrelation of ecosystems across landscapes.

Strategic Habitat Conservation

The National Ecological Assessment Team, a cooperative effort between us and the U.S. Geological Survey (USGS), wrote a report outlining a unifying adaptive resource management approach for conservation (USGS 2006). It can be applied on a landscape scale and across the entire range of a focal species or across a suite, or guild, of species. This is strategic habitat conservation, a new way of thinking and doing business that uses biological goals for focal species populations, makes strategic decisions about needed work, and constantly reassesses (figure 2).



Figure 2. Basic strategic habitat conservation process.

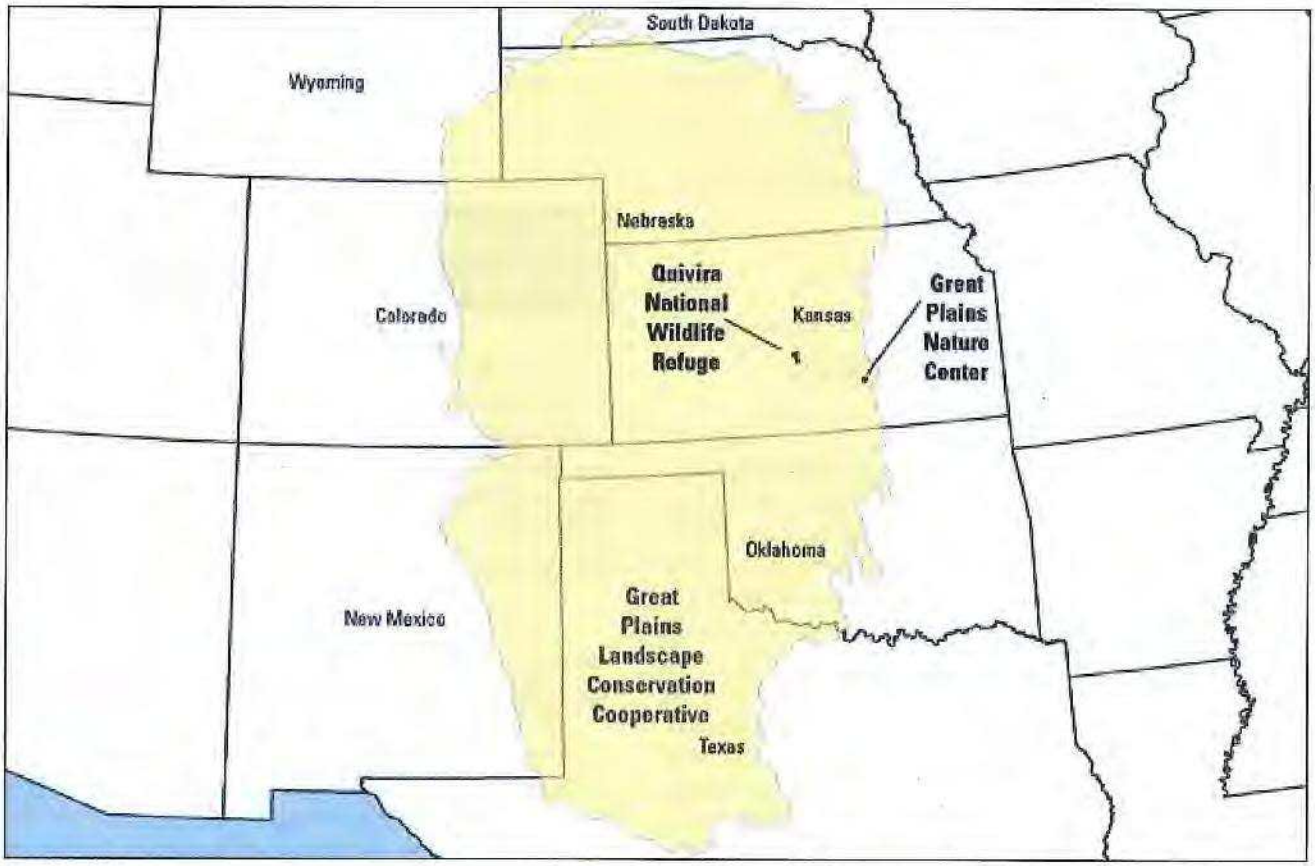


Figure 3. Great Plains Landscape Conservation Cooperative with Quivira National Wildlife Refuge, Kansas.

Landscape Conservation Cooperatives

Strategic habitat conservation helps us to apply adaptive management across large landscapes. We used the framework of strategic habitat conservation to identify the first generation of landscape conservation cooperatives. These cooperatives are partnerships between us and Federal agencies, States, tribes, nongovernmental organizations, and universities. Designed to help planning and science, the cooperatives will help us conduct biological planning, conservation design and delivery, and monitoring programs and research.

Quivira Refuge lies within the Great Plains Landscape Conservation Cooperative (GPLCC) (figure 3). The GPLCC has grasslands, playas, saline lakes, prairie rivers, streams and riparian corridors, savannas, shrublands and sand dune habitats in parts of Kansas, Nebraska, western Oklahoma and Texas, eastern Colorado and New Mexico, and southeast Wyoming.

The GPLCC has identified priority species, which include the burrowing owl, black-tailed prairie dog, American bison, American burying beetle, mountain plover, long-billed curlew, lesser prairie-chicken, grasshopper sparrow, Cassin's sparrow, lark bunting, Harris' sparrow, prairie falcon, northern pintail, sandhill crane, least sandpiper, western sandpiper, long-billed dowitcher, whooping crane, snowy plover, Wilson's phalarope, interior least tern, piping plover, Bell's vireo, Arkansas River shiner, Arkansas darter, Topeka shiner, Pallid and shovelnose sturgeon, paddlefish, blowout penstemon, and sand dune lizard. Many of these species have been reported on the refuge, such as burrowing owl, grasshopper sparrow, Cassin's sparrow, lark bunting, Harris's sparrow, prairie falcon, Bell's vireo, Arkansas darter, and all the listed waterfowl, shorebirds, and cranes.

The GPLCC will serve as a convening body to bring all interested parties together to address existing and future issues related to climate change and landscape-scale conservation.

1.6 Planning Process

The Improvement Act requires that we develop a CCP for Quivira Refuge. This is the final plan, and it

will guide our refuge management for the next 15 years.

We prepared this plan in compliance with the Improvement Act and part 602 (National Wildlife Refuge System Planning) of the "Fish and Wildlife Service Manual." The actions described herein meet the needs of the Council on Environmental Quality regulations that implement the National Environmental Policy Act of 1969 (NEPA). Other requirements and guidance are contained in the Refuge System's planning policy, issued in 2000. This policy established needs and guidance for refuge and district plans, including CCPs and stepdown management plans, to make sure that planning efforts follow the Improvement Act. The planning policy identifies several steps for CCP and environmental analysis development (figure 4).

We began in September 2009 by creating a planning team comprised primarily of our staff from the Quivira Refuge and our Mountain-Prairie Region 6 of the U.S. Fish and Wildlife Service (Region 6) Division of Refuge Planning. Added teammembers included staff from some of our other divisions; staff from the KDWPT; and members of the Osage Nation. See Appendix F—List of Preparers, Consultation, and Coordination for a complete teammember list. During preplanning, we, the team, developed a mailing list and identified internal issues and qualities unique to the refuge. We then identified and reviewed the purposes of the refuge and current programs, compiled and analyzed relevant data.

Scoping for the public and our partners started with a notice of intent to prepare a draft CCP and environmental assessment (EA) that was published in the Federal Register on Wednesday, February 24, 2010. We informed about the plan's progress through news releases, the first planning update, and three public scoping meetings held between March 8 and 10, 2010, in Stafford, Great Bend, and Wichita, Kansas, between 4 and 7 p.m. Throughout the planning process we encouraged comment on, and added input to, the draft CCP and EA to comply with the public involvement needs of NEPA. Table 1 lists the specific planning steps taken to date for the preparation of this final CCP.

Coordination with the Public

The mailing list we use contains more than 270 names and has private citizens; local, regional, and State government representatives and legislators; other Federal agencies; and interested organizations.



Figure 4. Process steps for comprehensive conservation planning and associated environmental analysis.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 26 of 144

Table 1. Summary of the Comprehensive Conservation Plan process for Quivira National Wildlife Refuge, Kansas.

Date	*Event*	*Outcome or purpose*
September 22–23, 2009	Preplanning meeting	Toured the refuge, formed into an initial planning team, started the mailing list, and discussed the planning schedule and data needs.
October 5, 2009	Work plan	Completed the work plan.
October 30, 2009	Planning team invitation letters mailed	Service Regional Director invited tribal nations and the KDWPT to be on the planning team.
February 2010	Planning update	Mailed the first planning update to those on our mailing list. The update described the planning process and announced upcoming public scoping meetings.
February 24, 2010	Notice of intent	Published the notice of intent to prepare a CCP in the Federal Register (volume 75, number 36, pages 8394–8395).
March 8–10, 2010	Public scoping meetings	Held public meetings in Stafford, Great Bend, and Wichita, Kansas. The public had an opportunity to learn about the CCP process and provide comments.
March 9–10, 2010	CCP kickoff and vision and goals meeting	Reviewed the refuge purposes, identified refuge qualities and issues, and developed a draft vision statement and goals for the refuge.
March 22–23, 2011	Hydrogeomorphic method analysis project update	Reviewed the progress and findings of the hydrogeomorphic analysis project.
November 2–3, 2011	Alternatives development planning meeting	Discussed management alternatives.
March 13–14, 2012	Environmental consequences and choosing proposed action workshop	Reviewed the environmental consequences for the alternatives, and to select a proposed action alternative.
May 1–2, 2012	Objectives and strategies work session	Developed objectives and strategies for the proposed action alternative.
May–June 2012	Draft plan preparation	Prepared the draft CCP and EA.
November 2012	Draft plan internal review	Team and other Service staff reviewed the draft CCP and EA and provided comments to help clarify the analyses and provide consistency.
January–March 2013	Draft plan preparation	Completed the draft plan for public review.
April 2013	Draft plan public review	The planning team completed the draft plan for distribution to the public for review.
April 2013	Planning update	Mailed the second planning update to those on our mailing list. The update announced upcoming public scoping meetings.
April–May 2013	Public scoping meetings	Public meetings were held in Great Bend, Stafford, and Wichita, Kansas.
June–September 2013	Public comments review	The planning team reviewed the public comments and determined needed changed for the final CCP.
October 2013	Decision on preferred alternative	The Regional Director selected the preferred alternatives and signed the finding of no significant impact.
November 2013–April 2014	Final Plan preparation	The planning team finished revising and editing the final CCP for printing and distribution.

See Appendix D—Public Involvement for more detail.

We mailed the first planning update using our mailing list, and we made updates available at the public scoping meetings. The update included information on the history of the refuge and on the CCP process. It included an invitation to attend the public scoping meetings and contained information on how to be placed on the CCP mailing list as well as on how to submit comments to us. Our planning team leader accepted emails at address: toni_griffin@fws.gov.

We held three public scoping meetings from March 8 to March 10, 2010. We used an open house format and set up stations tended by our staff to provide information and answer questions. Attendees were encouraged to ask questions and offer comments. We recorded verbal comments, and each person was given a comment form that could be used to submit added thoughts or questions in writing.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 27 of 144

Written comments were due March 31, 2010. We received more than 80 comments orally and in writing during the scoping process. We received letters from 3 organizations (National Wild Turkey Federation, Defenders of Wildlife, Great Bend Convention and Visitors Bureau) and from 12 individuals. Each member of our team reviewed the comments, and we considered them throughout the planning process.

State Coordination

Our Regional Director for Region 6 of the Service sent a letter to KDWPT, inviting them to take part in our planning process. As a result, three of their representatives joined our planning team.

We mailed the first planning update to the offices of U.S. Representatives Lynn Jenkins, Jerry Moran, and Todd Tiahrt and U.S. Senators Sam Brownback and Pat Roberts for Kansas telling them of the planning process, inviting them to attend our public scoping meetings, and asking them to provide comments on issues to be addressed during the planning process. We also mailed planning updates to Kansas Governor M. Parkinson, to Kansas State senator Ruth Teichman, and to State representatives Mitch Holmes and Dennis Moore. We also invited these elected officials to attend our scoping meetings by phone.

Tribal Coordination

Our Regional Director for Region 6 sent a letter to tribes that have been identified as possibly having a cultural and historic connection to the Quivira Refuge area. The Citizen Potawatomi Nation, Kickapoo Tribe in Kansas, Kickapoo Tribe of Oklahoma, Kiowa, Osage Nation of Oklahoma, Prairie Band of Potawatomi of Kansas, Seneca–Cayuga Tribe of Oklahoma, Shawnee, and Wyandotte Nation of Oklahoma tribal councils all received this letter.

The Osage Nation tribal council responded to our letter, and they appointed Dr. Andrea Hunter, tribal historic preservation officer; James Munkres, archaeologist I; Rebecca Brave, Native American Graves Protection and Repatriation Act assistant; and Bradley P. Stumph, natural resource specialist, to represent them on our planning team. These tribal representatives attended two planning meetings, our vision and goals workshop and our hydrogeomorphic method analysis project update session. The Osage



Rachel Laubhan/FWS

Silky Prairie Clover

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 28 of 144

Nation reviewed the draft CCP and EA during internal review, and they provided comments.

Other tribal councils did not respond to the letter from our Regional Director, but we continued to invite their comments.

Results of Scoping

We used the comments, collected from scoping meetings and correspondence, in the development of a final list of issues that were addressed in the draft CCP and EA. We decided which alternatives could best address these issues. The planning process ensures that we resolve or give priority to issues with the greatest effect on the refuge resources and programs over the life of the final CCP. Chapter 2 contains the issues we identified, along with a discussion of effects on resources. In addition, we considered suggested changes to current refuge management presented by the public and other groups.

The Draft Plan

Availability of the draft CCP and EA 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 this plan were announced in a planning update released in April 2013. These meetings were held from April 29 to May 1, 2013 in the local communities of Great Bend, Stafford, and Wichita, Kansas. Meeting attendees were given the opportunity to submit comments. Comments were also collected online, by email, and by mail.

The public commented on the draft CCP and EA during a review period. We recorded all comments, oral and written. The planning team then reviewed them. Some modifications were made to this final CCP based on the public review. Appendix D has more detail about our involvement with the public, including responses to substantive public comments on the draft CCP and EA.



Rachel Laubhan/FWS

Long-billed Dowitcher

The Final Plan

Approved by the Regional Director, this final CCP directs the management of the Quivira National Wildlife Refuge to meet the purposes of the refuge and to address issues.

The plan is intended to be a broad umbrella of general concepts and specific objectives for the refuge over the next 15 years. As the plan is implemented, we will develop stepdown plans with details for carrying out actions needed to achieve objectives.

Chapter 2—The Refuge



Dan Severson/FWS

Whooping Crane

This chapter explains the establishment, management history, purpose and special values of Quivira National Wildlife Refuge. Planning issues and a discussion of their effects on resources are also summarized here. Our planning process sought to resolve issues that have the greatest effect on refuge resources and programs, and it ranked these issues for further consideration over the life of the plan.

2.1 Establishment, Acquisition, and Management History

The following section describes the establishment, acquisition, and management history of Quivira Refuge.

Establishment

In May 1955, the Migratory Bird Conservation Commission approved the establishment of, and the processing of purchase agreements for, the "Great Salt Marsh National Wildlife Refuge" to recognize two unique, historic saltmarsh and salt flat areas, the Big Salt Marsh (BSM) and the Little Salt Marsh (LSM).

In 1958, the name of the refuge was changed to Quivira National Wildlife Refuge after the Spanish term for the area. Quivira Refuge has a mixed-grass sand prairie ecosystem that contains a diversity of grassland and wetland vegetation associations (Faber-Langedoen 2001) with a range of salinities, stream corridors, salt flats, sand dunes and hills, and agricultural lands.



Barry Jones/FWS

Boiling Springs

Acquisition History

After establishment, acquisitions were made to bring the refuge area to 21,820 acres by 1969. In August 1991, two Hornbaker tracts totaling 116 acres southwest of the refuge were acquired from the Farmers Home Administration. Approximately 200 more acres were bought from Richardson in 1998 in the BSM area. These acquisitions enlarged the refuge to 22,135 acres (table 2)

Management History

Water management has played a major role at the refuge. In 1957 we filed for a "senior" right to divert 22,200 acre-feet of water from Rattlesnake Creek to refuge wetlands (Estep 2000, Striffler 2011). In 1982, we filed a Notice of Proof of completion of work for water right permit #7571. In 1996, the Kansas Division of Water Resources certified a permit for only 14,632 acre-feet of water diversion from Rattlesnake Creek because we could not show that we had diverted 22,200 acre-feet during the period of proof.

The current Kansas Water Right for the refuge is 14,632 acre-feet per year not to exceed 300 cubic feet per second from Rattlesnake Creek. The actual quantity of water normally diverted from Rattlesnake Creek for refuge management is less than this water right, often because sufficient quantities are not available at the time water is desired to achieve refuge habitat goals and objectives. In years with below-average precipitation and heavy demands for agricultural irrigation, the refuge receives insufficient quantities to exercise all habitat management options. Water is not metered when it leaves the refuge mostly because water rights are absent downstream where it enters the Arkansas River.

Water control structures may be found in figure 5.

2.2 Purposes

Every unit of the Refuge System has one or more purposes for which it was established. They are the foundation on which to build all management programs, from biology and public use, to maintenance and facilities. No action that anyone takes may conflict with them. The purposes are found in the legislative acts or administrative orders under which lands are either transferred or acquired, or conservation easements are established, for a refuge unit. An individual unit may contain lands that have been acquired under a variety of transfer and acquisition authorities, which then gives the unit more than one purpose.

On May 3, 1955, Quivira Refuge was established under these authorities and for these purposes:

- Migratory Bird Conservation Act (16 United States Code [U.S.C.] § 715d)
  - for use as an inviolate sanctuary, or for any other management purpose, for migratory birds
- Fish and Wildlife Act of 1956 (16 U.S.C. § 742f(a)4)
  - or the development, advancement, management, conservation, and protection of fish and wildlife resources
- Fish and Wildlife Act of 1956 (16 U.S.C. § 742f(b)1)
  - for the benefit of the United States Fish and Wildlife Service, in performing its activities and services

The goals, objectives, and strategies identified in this CCP support these purposes

Table 2. Land acquisition history of the Quivira National Wildlife Refuge, Kansas.

Acres reserved from public domain	*Acres acquired by other Federal agency*	*Acres donated*	*Acres bought*	*Acres in agreement easement or lease*	*Total acres in refuge*	*Total cost of land acquisition*
0	116	199.2	21,820.1	0	22,135.3	$2,059,238

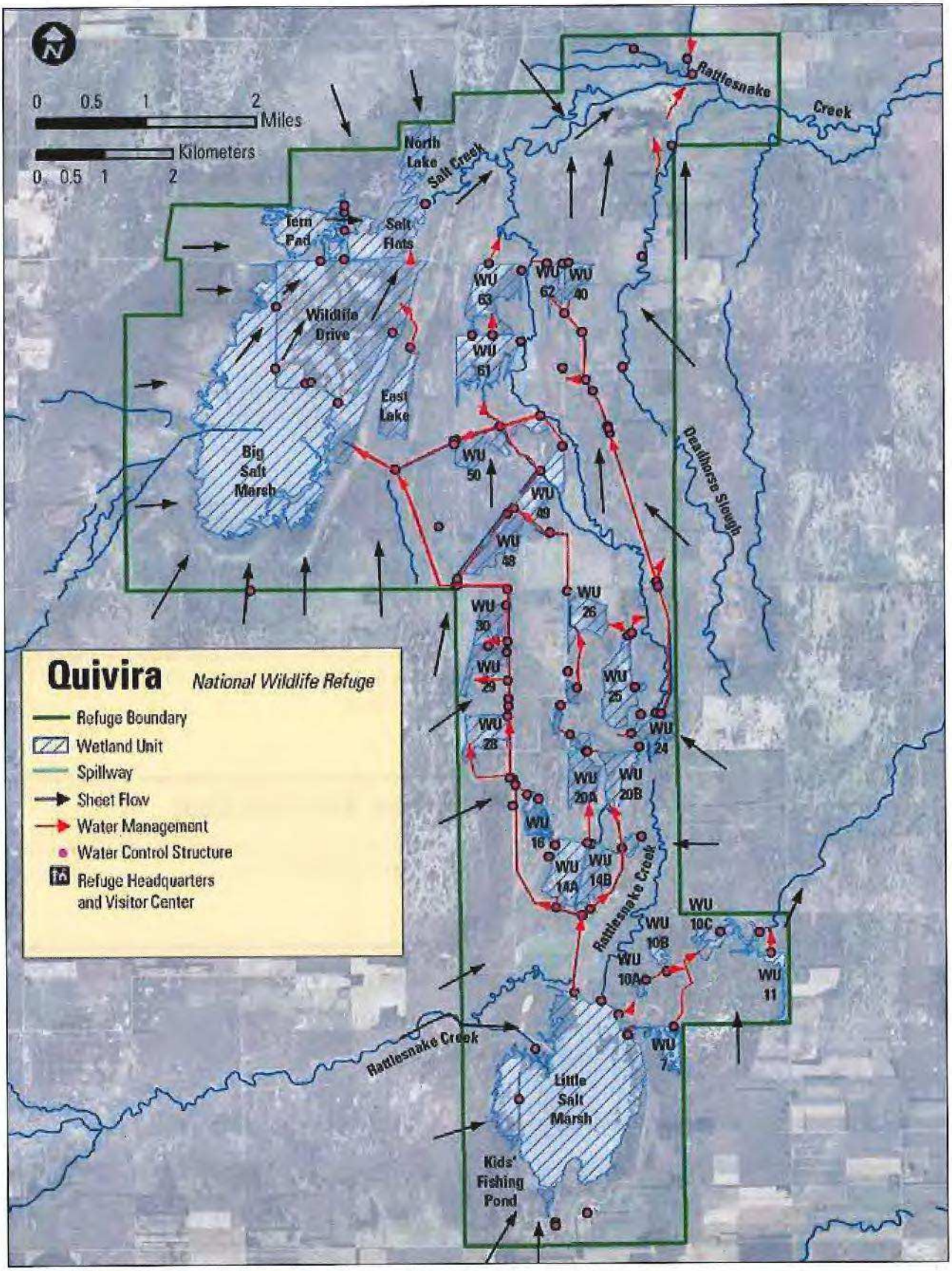


Figure 5. Water control structures, Quivira National Wildlife Refuge, Kansas.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 32 of 144

2.3 Vision

We developed a vision for Quivira Refuge that describes the focus of refuge management, including what will be different in the future. This is the essence of what we want to accomplish at the refuge by the end of the life of this CCP in 15 years. The vision for Quivira Refuge is as follows:

Near the confluence of the Rattlesnake Creek and Arkansas River in central Kansas, water remains the great driver of a diverse complex of saltmarsh and unique native sand prairie community that is Quivira National Wildlife Refuge. The combination of these productive habitats as well as the refuge's midcontinent location continue to attract millions of birds needing to replenish essential reserves and to find protection in the mosaic of largely open grasses, sedges, rushes, and water. Through environmental education and outreach, we promote understanding and appreciation of the refuge's dynamic landscapes. For visitors, each moment is unique—the smell of moist earth and salty air, the primitive call of a crane, the whispering bluestem, the cacophony of geese, the early steps of a snowy plover chick, or the discovery of a subtle pattern or design in nature. In a land of recurring extremes, ongoing collaboration between refuge professionals, partners, and the public sustains a healthy system. Through land stewards transcending refuge boundaries, the integrity of these ecosystems are conserved with awe, respect, and appreciation of the gifts it offers for all to receive.

2.4 Goals

We also developed a set of goals for Quivira Refuge based on the Improvement Act, the refuge's purposes, and the information we gathered, with help from the public, during planning. These goals will direct our work in achieving the vision and purposes of the refuge, and they outline approaches for managing the refuge's resources.

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.



© Mitch Werner

Prickly Pear

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 33 of 144

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 GPNC.

Administration Goal

Provide and maintain facilities, strategically acquire and allocate staff, increase volunteer opportunities and partnerships, and effectively raise and use money to support the long-term integrity of infrastructure, habitats, and wildlife resources at the refuge and at the GPNC.

2.5 Special Values

The public helped us to name the special values of Quivira Refuge, which are the characteristics and features that make it special, valuable for wildlife, and worthy of national wildlife refuge status. Special values can range from unique biological features to something as simple as "a quiet place to see a variety of birds and enjoy nature."

Naming the special values for Quivira Refuge, listed below, helps us to recognize its worth and to make sure that these values are preserved, protected, and enhanced through planning.

Rare, Diverse, and Quality Habitat

Quivira Refuge contains unique systems, including inland saltmarsh and native sand prairie. The saltmarsh and alkali flats support a diverse range of wildlife species that use the refuge for migration and nesting. The refuge contains quality grassland habitat that is complimented by a grassland buffer that surrounds the refuge and creates large blocks of contiguous habitat for grassland-dependent species, including prairie-chicken. The refuge has large areas of wetland habitat that supports many wildlife species and has the potential for moist soil management.

Wildlife Species

Quivira Refuge is located in a transition zone providing habitat for both eastern and western migratory bird species. Large numbers and concentrations of these birds occur on the refuge, and a variety of rail species are also present. The refuge also supports a diverse population of reptiles and amphibians, as well as a prairie dog town.

Species of Concern

The refuge provides critical habitat for the federally listed whooping crane and State-listed western snowy plover. Bald eagles winter and nest on the refuge, and federally listed interior least terns also nest here.

Water Resources

Quivira Refuge has senior water rights, approximately 14,000 acre-feet per year, and water management capability on the refuge is good because of a strong network of infrastructure that has water control structures and dikes.

Communities and People

Local, regional, and international communities support Quivira Refuge. It has a Friends group and boosts the economies of surrounding, rural communities. Less than 3 percent of Kansas' lands are owned by the public, and the refuge makes up a large part of that. In addition, the refuge feels little urban encroachment.

Education and Visitor Services

Quivira Refuge offers many opportunities for wildlife-dependent recreation, including hunting, fishing, wildlife observation, photography, environmental education, and interpretation. Forty percent

of the refuge, or approximately 9,000 acres, is open to hunting. All of the refuge is open to fishing and to foot traffic for wildlife observation and photography year round, except when temporary closures are necessary for events like eagle or tern nesting. Quivira Refuge also comanages the GPNC in Wichita, which complements and supports its purposes.

Cultural Resources

The area is rich in Native American history, as generations of people came here for both food and water. As such, the potential exists for cultural resources to be found on Quivira Refuge.

Facilities and Infrastructure

There is good access to, and within, Quivira Refuge. Directions to the refuge are well signed, and many sites within the refuge are accessible to persons with disabilities.

Special Designations

Quivira Refuge has many special designations including: Ramsar Site, as identified by Wetlands of International Importance; Western Hemisphere Shorebird Reserve Network contributor; one of the Eight Wonders of Kansas; and Important Bird Area, as identified by the National Audubon Society. We have also designated the Santana Research Natural Area on the refuge.

2.6 Planning Issues

Based on an analysis of comments collected from the public, input from our staff, and a review of the needs of the Improvement Act and NEPA, we identified several key issues for Quivira Refuge. These were used to create alternatives for future management and are summarized below.

Water Quantity and Quality

Agriculture dominates the area, oil production is common, and water rights have been overappropriated within the water management district. These water resource and land use trends relate to additional concerns of current and future characteristics of water quality. Future water availability and quality may not be assured, yet adequate water quantity and chemistry are critical factors of refuge saltmarsh and wetland communities. Substantial declines in the



FWS

White-tailed Deer

water table would also likely affect grassland and meadow habitats.

Tree Management

There are differences of opinion about tree management on Quivira 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.

Whooping Crane Closures

When whooping cranes, which are federally listed as endangered, are present, Quivira Refuge closes to hunting to avoid disturbing them and to prevent accidentally shooting them. 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, KDWPT has successfully protected whooping cranes by using partial area closures. This may prove to be effective for us as well.

Prohibiting the Collection of Shed Antlers

Deer population density on Quivira Refuge is relatively high, and those who have an interest in shed antler collection do not support our decision to prohibit this activity on all refuges in Kansas. 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 CFR Part 27.61.

Deer and Turkey Hunting

Deer and turkey hunting have never been approved as a public use activity or management strategy on Quivira National Wildlife Refuge, but there is interest in allowing these hunting activities



Rachel Laubhan/FWS

Eastern Racer

in the future. Populations of these species continue to increase, and research suggests that effective population management may require a control of some sort both on and off refuge lands.

Increasing Public Use and Wildlife Compatibility

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.

Chapter 3—Refuge Resources and Description



© Bob Gress

Pectoral Sandpiper

This chapter describes the environment found at Quivira Refuge that will be affected by the actions we choose to enact as a result of the planning process contained in this CCP. The environment has physical and biological parts and elements that have been created by humans, such as cultural resources, special management areas, visitor services, operations and socioeconomics.

3.1 Physical Environment

The following sections describe aspects of the physical environment of the refuge. Physical characteristics include climate, climate change, air quality, geography and physiography, water resources, and soils. Many regional descriptions of the physical environment have been completed and may be reviewed for more detail, such as a report on the Rattlesnake Creek Subbasin available through the Kansas Department of Agriculture (2006).

Climate

The refuge climate is dry sub humid, lying along the transition boundary between the rain shadow of the Rocky Mountains and the warm, moist air currents of the Gulf of Mexico. Regional weather patterns depend on the interaction of these two air masses (Sophocleous and Perkins 1992).

Refuge habitat conditions are influenced greatly by climate and management strategies, and prescriptions are adjusted based on seasonal and annual fluctuations in precipitation, temperature, and evaporation. Weather data have been recorded from a station in Hudson, Kansas, about 8 miles west of

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 38 of 144

the refuge, since at least 1941. Based on this historical data, the coldest month is January, with average low and high temperatures of 20 and 41 °F, respectively, and the warmest month is July, with average low and high temperatures of 68 and 95 °F, respectively. Annual precipitation varies between 13 and 41 inches, with a long-term average of 24–25 inches. It rains an average of 74 days per year in Stafford County and 71 percent of the precipitation falls during the growing season, which averages 185 days between April and September. Mean snowfall is 20 inches per year, yet substantial accumulations seldom occur. The average annual free-surface evaporation is about 64 inches (Sophocleous et al. 1997), with rates being highest during the summer months (Latta, 1950).

Because of its location at a climatic boundary prone to multiple air masses, Kansas is also vulnerable to strong thunderstorms, especially in the spring months. Many of these storms become super cell thunderstorms. According to statistics from the National Climatic Data Center, Kansas has reported more tornadoes (for the period January 1, 1950 through October 31, 2006) than any state except Texas, and it averages more than 50 tornadoes annually (NOAA, 2006). Prevailing winds are from the southeast during the summer months, May through September. Northeast winds are common throughout the winter months, October through April. Average wind velocities are moderately strong in all seasons and reach their greatest velocities during the spring. The mean, 0.02-mile (30-meter) wind speeds for Quivira Refuge range from 13.4 to 14.5 miles per hour (Kansas Corporation Commission 2008).

Climate Change

Climate change is the preeminent issue for conservation in the future. Over the next two decades, a warming of about 0.36 °F per decade is projected for the planet as a whole. Warming is expected to continue for centuries, even if greenhouse gas emissions are stabilized, because of the substantial time lags of climatic processes (Christensen et al. 2007).

Along with this projected warming, atmospheric moisture transport and convergence is projected to increase, resulting in a widespread increase in annual precipitation over most of the continent, except the south and southwestern part of the United States (Christensen et al. 2007). This increased precipitation is more likely to occur in winter and spring months, rather than in the summer (Christensen et al. 2007). It is also considered likely that extreme weather, such as heat waves and flooding, will become more frequent. Increases in annual precipitation may be partially offset by increases in evaporation. Moisture availability, rather than just precipitation, is an essential resource for plants and animals.

Such changes will influence many environmental factors that will affect our management of Quivira Refuge, such as the balance of water inflows and outflows, water runoff patterns, the rate and extent of erosion, aquifer recharge rates, water quality parameters, and species abundance and distributions. However, climate change predictions are generally applied at large spatial scales, and much uncertainty remains about the use of this information at local scales (Weins and Bachelet 2010). Thus, it is difficult to plan for specific management changes on the refuge based on our current understanding.

While finding specific management actions to address climate change are not possible at this time, a report on the potential effects of human-caused climate change was prepared for the Playa Lakes Joint Venture (PLJV) region with a focus on habitats (Matthews 2008) (figure 8). This report synthesized much of the relevant information available at the time, including works of the Intergovernmental Panel on Climate Change and many peer-reviewed publications. The author notes that while global and regional shifts in climate are natural, adapting to recent changes is different because of landscape modifications like habitat fragmentation, invasive species, and water quality degradation. Species most vulnerable to climate change have restricted ranges, specialized habitat needs, and are largely migrants. Predicted potential climate change effects on habitat within the PLJV region cited in this report are summarized in the list below. It is important to note differences in climate change predictions at various scales of the PLJV region, such as overall, southwest, and northeast, though all scales are important considerations in the management of natural resources that occur on the refuge. The author also qualifies predictions with the understanding that local variations in weather patterns, like the amount and intensity of precipitation, are a continuing characteristic of the region.

Predicted Potential Effects of Climate Change at the Scale of the Playa Lakes Joint Venture Region

- decreasing annual precipitation in contrast to the larger Great Plains region
- increasing winter temperatures causing less snow, or frozen, precipitation and less ice cover and more rain, with precipitation falling later and melting earlier
- decreasing water volume in wetlands in fall and winter leading to more shallow habitat

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 39 of 144

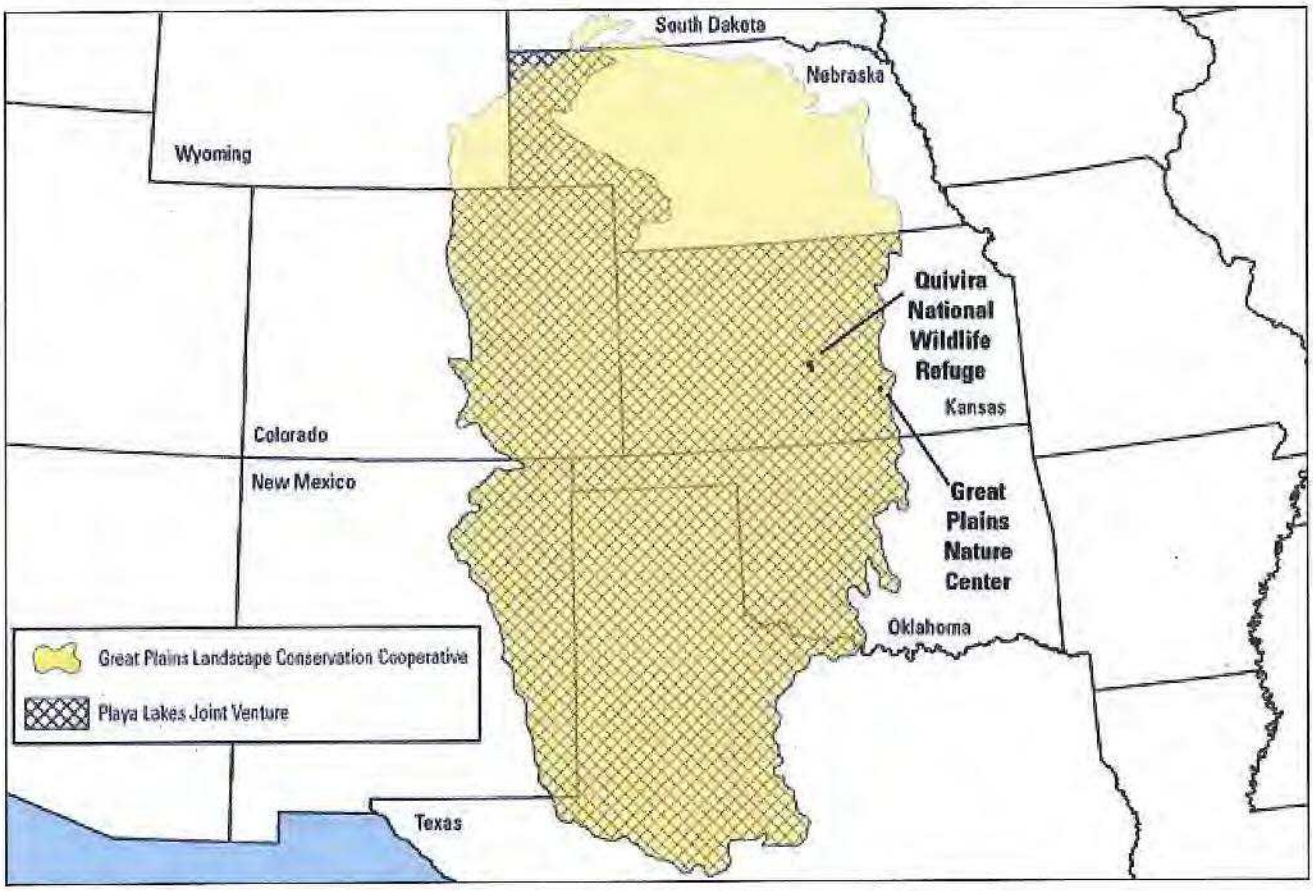


Figure 6. Playa Lakes Joint Venture region, Quivira National Wildlife Refuge, Kansas.

- decreasing presence of flooded, or functioning, wetlands, especially more ephemeral and shallow types—which compose most of the wetlands in the PLJV region—or those that respond quickly to changes in precipitation and evaporation, like playas, warm-water sloughs, floodplain marshes, and wet meadows, resulting in decreased cooler, deeper water during warm periods, particularly in the summer and early fall
- increasing rate of increase in summer temperatures
- changing plant species productivity, abundance, and ranges across all habitat types and partly related to the differences in their tolerance levels or adaptation strategies to events like drought, flooding and fire
- changing distribution of wetlands across the landscape
- decreasing connectivity among wetlands by ground water or by periods of high precipitation and flooding
- increasing likelihood of disease transmission because of higher concentrations of waterfowl in limited habitat areas, higher winter temperatures, and more
- changing species composition, or abundance, of fish
- changing water column turnover cycles for larger, deeper wetlands that leads to the reduced overall productivity of open-water habitat
- decreasing sensitivity and increasing resiliency of sandhill wetlands, or those influenced by ground water—not playas, or wetlands dependent on precipitation and with no, or limited, connectivity to ground water—to temperature and precipitation extremes during the next one to two decades or longer with changes in erosion rates possibly causing sandhills to move
- sustaining local populations of specialized arthropod species in saline wetlands may be affected by persistent dry conditions and

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 40 of 144

sustaining bird species with great dependence on saline wetlands could be negatively affected by more extreme flooding and drying events

- increasing drought frequency
- increasing abundance of fully flooded playas, or temporary, seasonal wetlands, in the spring
- increasing abundance of fast runoff events
- increasing sedimentation rates
- decreasing food availability for birds with shifts in the quality and state of wetlands, such as moving from a water condition that is dominated by plants large enough to be seen by the human eye, which results in oxygen-rich water, to one that support a dense growth of algae that depletes oxygen
- likely increasing generalist invasive exotic species
- decreasing overall water quality
- eastern shifting of the central United States and Canada migratory flyway
- decreasing sensitivity to climate changes by larger catchments and watersheds with more permanent flowing water relative to smaller catchments and watersheds with less permanent flowing water
- altering flow regimes for rivers and streams in the PLJV region, with lower flows occurring in later summer and early fall and higher flows occurring in the winter and spring and with low-order streams being more directly affected by winter and spring flooding events than the middle, and lower, reaches of rivers
- emerging economic and political trends and resultant changes in land use patterns, such as agricultural strategies and practices, urbanization, and fire suppression, will decide natural resource effects
- shifting distribution—moving north and east into the PLJV region—of nematodes, insects and other arthropod species that are native to North America but exotic to region
- increasing grassland productivity with the increased rates of spring precipitation, while increasing levels of atmospheric carbon dioxide and other complex feedback mechanisms may affect the duration of this trend
- accentuating thermal effects on grassland habitats by insects, notably plant pollinators and herbivores will affect associated predator–prey relationships and influence species abundance and phenologies, like the timing of breeding, migration, and other life events
- increasing fire on the landscape to help most grassland habitats, while creating uncertainty about what grassland types and conditions will follow burns over the long term
- affecting prairie dog communities, but how is not known, with one study suggesting that prairie dog herbivory might support their resilience to climate change

Predicted Potential Effects of Climate Change on Areas within the PLJV Region:

- An increasingly extreme annual precipitation gradient between the southwestern and northeastern parts of the PLJV region will develop—uncertainty makes drawing clear boundaries extremely difficult. It is likely that, by midcentury, areas farther north, perhaps to Nebraska, will be similar to the current thermal regime of the southern high plains.
- For northern and eastern parts of the PLJV region, including the refuge area, there may be an increase in annual precipitation of less than 10 percent by 2100 and uncertainty about specific changes in hydrologic patterns, like timing. This precipitation trend is in contrast to that at a PLJV scale and more consistent with trends at a Great Plains scale.
- For northern and eastern parts of the PLJV region, current trends suggest that ephemeral wetlands could shift to more permanent types. However, some models suggest that summers could become warmer in these areas and increase evaporation rates.
- For the southwest area of the PLJV region, increasing drought frequency and severity could turn semiarid regions into deserts.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 41 of 144

Collectively, the potential effects of climate change described above inform us on how environmental conditions may change in the future, as well as how the roles, and relative importance, of natural resources that occur on the refuge might change within the context of the PLJV region. Many strategies used in traditional refuge management may also be used to address challenges related to climate change, like the control of invasive species, the support of native communities, the control or reduction of habitat fragmentation, the manipulation of water levels, and the periodic assessment of conservation goals and objectives, but new strategies may also have to be developed.

Land Features

Quivira Refuge is located in the Great Bend Lowland, or Prairie, which is part of the Arkansas River Lowlands section of the larger Central Lowland physiographic province (Schoewe 1949). Following the large, northward bend of the Arkansas River in central Kansas, the Great Bend Lowland is an alluvial plain, with sediment originally deposited by flowing water that has local, gently rolling hills. Refuge lands range in elevation from about 1,700 to 1,800 feet above sea level (Schoewe 1949) and are only slightly higher in elevation than the Arkansas River (Hathaway et al. 1978). Arbogast and Johnson (1998) refer to the Great Bend (Sand) Prairie as a "mosaic of sand sheets and dune fields," with dune orientations that are mostly northwesterly and southwesterly. Surface materials are mostly easily erodible sands and gravels of Quaternary Dunes (Schoewe 1949, Zeller 1968) that are generally of Rocky Mountain origin deposited from laterally shifting channels of the ancestral Arkansas River (Fent 1950). The Rattlesnake Creek is a mostly perennial tributary that meanders northeasterly through the Great Bend Lowland and flows through Quivira Refuge about 15 miles from its confluence with the Arkansas River.

Thin, unconsolidated, or undifferentiated, alluvium that is less than 20 feet thick and more-recent Eolian sand deposits are common in the area of the refuge (Arbogast 1995, Arbogast and Johnson 1998, Sophocleous 2003). The alluvial materials are poorly sorted sand, silt, and clay broadly described as silty sand, sandy loam, or loess, whereas, sands are well sorted. Poorly sorted materials are less porous, have poor drainage when compared to well-sorted materials, and are commonly associated with local depressions like wetlands. In contrast, well-sorted deposits are characteristic of higher sand dune sites and often occur in areas of ground water recharge or springs. Particle size of deposits also influence soil and water properties, which partly determine plant and wildlife communities. Dune sands generally are very fine-to-fine-sized particles, and those of the beach ridge occurring along the east and southeast side of the BSM, which were derived from a Wisconsin-age lake, are fine-to-medium sized (Arbogast and Johnson 1998, Heitmeyer et al. 2012). More detailed soil descriptions and their relationships with different communities on the refuge are provided in the soils section of this chapter.

A broad description of the geologic stratigraphy of the Quaternary alluvium in the area of the Quivira Refuge, in order from surface to bedrock, is as follows: (1) sand dunes; (2) relatively continuous near-surface silt–clay bed from a loess deposit; (3) alternating sequences of sandy silt–clay, sand, and gravel lenses; (4) basal sand and gravel beds of fluvial origin; and (5) bedrock (Latta 1950, Macfarlane et al. 1993, Fader and Stullken, 1978, Kansas Department of Agriculture 2006). The type, relative age, and position of parent material greatly influence soil formation, hydrology, and resulting plant communities. The Permian bedrock, many feet below the relatively more permeable surface materials, is up to 350 feet thick in the area of the refuge (Macfarlane et al. 1993, West et al. 2010). Fader and Stullken (1978) state that the Permian bedrock underlying the refuge is primarily associated with the Salt Plain Formation, although an area along the east boundary of the refuge is associated with the Harper Sandstone Formation. In other reports, these two Permian bedrock formations are collectively called the Harper Salt Plain Formation or "red beds." Materials in these formations consist of reddish-brown sandstone, siltstone, shale, salt, gypsum, anhydrite, and limestone, which are a source of saline water that is characteristic of the refuge (Rubin et al. 2001, Kansas Geological Survey and Kansas State University 1997). At various depths between the surface and bedrock zones are clay lenses or layers that create separation between saltwater of the bedrock aquifer and fresh water of the higher alluvium aquifer of Cretaceous bedrock (Latta 1950, Sophocleous and Ma 1998, Sophocleous 2000, Rubin et al. 2001). More detailed descriptions of geology and hydrology of the area may be found in the Water Resources Inventory and Analysis Report (Striffler 2011) and hydrogeomorphic method analysis report (Heitmeyer et al. 2012) prepared for the refuge.

Soils

Soils are diverse (figure 7) and they differ with respect to texture, moisture and nutrient retention capacities and salinities. Such differences influence

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 42 of 144

plant and wildlife community distribution and composition. Refuge lands are comprised of the following soil subgroups: 37 percent Subirrigated; 22 percent Saline Subirrigated; 17 percent Sands, choppy and subirrigated; 14 percent Aquolls; 10 percent Sandy; and less than 1 percent each of Loamy Clay and Clay Upland (Soil Survey Staff 2010). Ecological site characteristics and State transition models are described by the National Vegetation Classification System (NRCS) for each soil subgroup (Soil Survey Staff 2010), Heitmeyer et al. 2012).

Water Resources

Hydrology is one of the most important factors influencing ecosystem structure and function. Consequently, hydrology also is of primary importance in planning our refuge management activities. However, hydrology involves complex relationships that exist at multiple spatial scales that are difficult to characterize in a CCP and EA. Therefore, a review of the Water Resources Inventory and Analysis Report (Striffler 2011) and the hydrogeomorphic method analysis report prepared for the refuge, as well as models and reports that provide detailed descriptions of water resources in the Rattlesnake Creek basin, is recommended. For purposes of this CCP and EA, a more general description of water resources is provided below.

Regional Context

Refuge lands occur within the Rattlesnake Creek watershed, which is approximately 95 miles long and 18 miles wide and encompasses parts of 10 counties (Basin Management Team 2010). Within the watershed, Quivira Refuge is located at lower elevations in the eastern part of the watershed and Big Bend Ground-Water Management District No. 5 (USGS 2012b, Sophocleous and McAllister 1987, Rattlesnake Creek/Quivira Partnership 2000). Refuge resources and management are dependent on surface water from the Rattlesnake Creek, but surface and ground water interactions are common, most noticeably in the form of seeps, springs, and underflow.

Surface Water

The drainage area of the watershed is 1,047 square miles, but the upstream area that actually contributes runoff to the area of the refuge is only 519 square miles, as identified by the contributing drainage area for USGS Zenith gaging station #07142575 (USGS 2012d). Rattlesnake Creek flows are checked continuously at the Zenith station, a distance of about 2 aerial miles before entering the southwest boundary of the refuge.

Traditionally, total annual flows in the creek are positively correlated with annual precipitation amounts. However, data from the Zenith gauge show a declining trend in average annual streamflow during recent years that is related to an increased use of ground water for irrigation coupled with reduced precipitation (Striffler 2011). But of equal or greater, importance are the observed changes in the timing of within-year flows. In part because of land use activities upstream from the refuge, water often has been unavailable when needed during the growing season to manage plant communities or to provide habitat for wildlife.

Ground Water

The Rattlesnake Creek watershed overlies the Great Bend Aquifer, which is part of the High Plains Aquifer. In general, ground water flow at a regional scale is eastward (Hathaway et al. 1978), but local variation occurs (figure 5). Near the refuge, the depth to ground water is generally 1–4 feet (Sophocleous 2003, Hathaway et al. 1978). Ground water pumping is a primary water source for irrigated crops, including small grains such as wheat and some corn. In general, most farmland presently lies west of the rangeland and woodland tracts that are next to the refuge boundary.

Water Quality

Major factors affecting water quality in the Rattlesnake Creek Subbasin include complex interactions between aquifers and soil stratigraphy (Sophocleous and Ma 1998, Rubin et al. 2001), irrigation practices (Hathaway et al. 1978, Rubin et al. 2001), and oil and gas activities (Rubin et al. 2001). While mineral composition varies within the watershed, northeastern Stafford County—of which the refuge area is a part—is referred to as a mineral intrusion area. Here, water in the aquifer has contact with salt-bearing Lower Permian bedrock, causing chemical reactions of dissolved solids and the natural occurrence of sodium chloride-type salts (Hathaway et al. 1978). As a result, saline and sodic soils and waters are produced, depending on soil drainage capacities and evaporation patterns (Hathaway et al. 1978, Rattlesnake Creek/Quivira Partnership 2000). High rates of ground water pumping in the Rattlesnake Creek corridor may disrupt the natural discharges of saltwater because of decreased surface flows and increased saltwater entry into the freshwater aquifer (Rubin et al. 2001). Differences in the conductance of water occurs throughout the water-

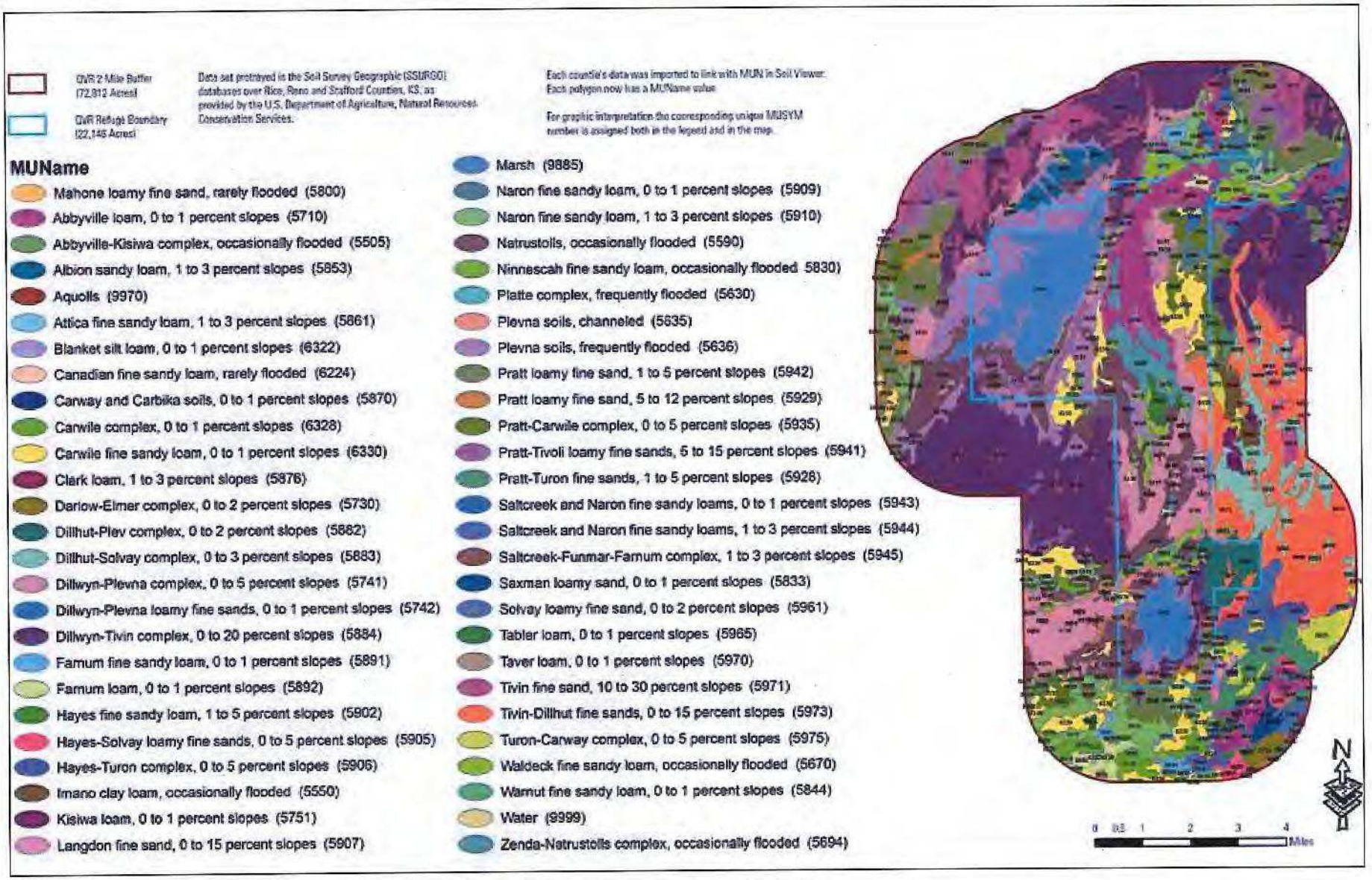


Figure 7. Refuge soil map, Quivira National Wildlife Refuge, Kansas. *Source: Soil Survey Staff 2010.*

shed, with wide ranges possible in the area of the refuge (less than 750, 750–2,250, and up to greater than 2,250 micromhos) (Hathaway et al. 1978). More well test results of chemical quality data sampled at certain points in time in the Great Bend Prairie may be found in a report by Hathaway et al. (1978).

Abnormally high nutrient levels in different states, such as nitrates found in oxygenated conditions, may have adverse ecosystem effects (Christensen 2001). Nitrate concentrations in the Great Bend Prairie aquifer are commonly affected by irrigation well density, subsurface clay lenses, and land use practices. Land managers who use grazing or who manage herbivores in areas of high nitrate concentrations, especially when using more intensive grazing in drought conditions, are often concerned about differential effects to forage plants. For example, cornstalks may hold more nitrates than some bluestem grasses, and the lower 6 inches of a plant may have the highest nitrate concentrations. Land managers adjust strategies to decrease, or prevent, potential adverse effects, such as toxicity and poisoning that can lead to cattle asphyxiation. Nitrate levels reported before in the Great Bend Prairie aquifer are relatively high, often greater than 0.000083454 pound per gallon (10 milligrams per liter), compared to many other samples of uncontaminated ground water collected throughout the United States, which average less than or equal to 0.000025036 pound per gallon (3 milligrams per liter) (Townsend and Young 1995). Based on 42 samples of ground water collected in Stafford County, Townsend and Young (1995) reported that nitrate nonpoint-source contamination was more evident in shallow wells typically used for domestic and stock, with a mean (range) depth of well equal to 60.04 (28.87–93.83) feet (18.3 [8.8–28.6] meters), compared to deep wells typically used for irrigation, with a mean (range) depth of well equal to 83.99 (41.99–135.17) feet (25.6 [12.8–41.2] meters). Nitrate–N values had a mean (range) of 0.00005508 (0.000010849–0.000095972) pound per gallon (6.6 [1.3–11.5] milligrams per liter) for shallow wells and 0.000032547 (0.000011684–0.000079281) pound per gallon (3.9 [1.4–9.5] milligrams per liter) for deep wells. There were no substantial differences in nitrate–N concentrations between sandy and loamy soils or flood versus center-pivot irrigation methods. A thicker clay layer above well screens was positively associated with lower nitrate concentrations in the study. Results of this research may be used in evaluating the potential effects of existing wells in a given area, or considered, when planning the addition or removal of wells on refuge lands.



Rachel Laubhan/FWS

Rattlesnake Creek flows into Little Salt Marsh on Quivira Refuge.

Recent Trends in Water Quantity

Recent regional trends in water quantity that are important in refuge planning include: (1) the encroachment of woody vegetation into open prairie, which likely has resulted in higher water use when compared to the natural plant communities that occurred before human settlement (Striffler 2011, Heitmeyer et al. 2012); and (2) declines in the ground water table and streamflows that are inadequate to meet refuge management needs (Sophocleous 1997, Rattlesnake Creek/Quivira Partnership 2000).

Water Rights and Management

Refuge hydrology is complex, largely because of dynamic precipitation and flow patterns, surface–ground water interaction, and a highly altered landscape that uses extensive ground water pumping within the watershed. Overall, the main sources of surface water entering the refuge are precipitation, ground water discharge, and Rattlesnake Creek surface inflows. Primary surface outflows are evaporation, plant transpiration, ground water recharge, and surface drainage outflows. As discussed above, short- and long-term shifts in the water balance occur in response to precipitation patterns and land use activities within the watershed.

The refuge senior water right [Permit #7571] allows quantities of 14,632 acre-feet per year (AFY) and flows of 300 cubic feet per second (cfs). This water right seems adequate for current refuge management except that often the refuge does not receive water sufficient to meet our water right and water is not always available at a time when it is most critical for refuge management. The refuge waterflow system, or infrastructure, allows various levels of control in flooding, dewatering, and moving water among more than 30 water units (figure 5, Striffler 2011).

In high flow years, excess water may be transferred downstream or used to support desirable water depths in water units, such as impoundments or wetland areas. Sediment and water chemistry may be altered through the periodic flushing and draining of water through the refuge water conveyance system. Occasional dewatering of wetlands is desired to promote the nutrient cycling required for supporting the long-term productivity of wetland systems and for the management of plants with different germination and growth needs (Mitsch and Gosselink 2003). Water depths are often regulated to increase the availability of food resources or structural conditions for waterbirds that have different nutritional needs and adaptations used in acquiring resources.

Air Quality

The Clean Air Act requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (EPA 2011a). In accordance with this need, the EPA has set standards for the following six pollutants to protect the health of humans and the environment: carbon monoxide, lead, nitrogen dioxide, ozone, particle pollution, and sulfur dioxide. Other primary functions of EPA are to provide regulatory authority and technical help to State and local control agencies, as well as to conduct programs that research many different aspects of air science and technology (EPA 2011b). Of particular interest to natural resource managers is current EPA research linking air quality to ecosystem exposure (EPA 2011c), which may provide new insights about the relative importance of sustaining natural resources to improving air quality and interactions between air quality and ecosystem health.

The Kansas Department of Health and Environment's Bureau of Air is the agency that checks, regulates, and reports air quality in Kansas and sends data to the EPA's Air Quality System. Cold winters, warm dry summers, and high winds cause ozone and particulate matter to be criteria pollutants of particular concern in Kansas, especially during events of blowing soil and surface inversions (Kansas Department of Health and Environment 2010). Because of the remoteness of Quivira Refuge, it is presumed that farming and burning activities that affect air quality are of most concern for the refuge. However, the refuge is mostly in Stafford County, where the population density is in the 6,000–9,000 category, and is not included in any Kansas Department of Health and Environment monitoring area or in any designated statistical area. Hutchinson, Great Bend, and Salina are cities close to the refuge that are listed as Micropolitan Statistical Areas, but the Kansas Department of Health and Environment only operates monitors in the Salina Micropolitan Statistical Area, which covers Ottawa and Saline Counties. Salina is downwind of Wichita and is a proposed ozone monitoring site for the next 5 years.

Thus, based on available information, air quality is not a current issue near the refuge, but it may be a consideration in the near future, depending on activities at a larger landscape scale.

3.2 Biological Resources

Evaluating refuge lands in the appropriate ecological context is needed for developing management

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 46 of 144

goals and objectives that will best meet the purposes of the refuge and optimize contributions to the conservation of biological resources at larger spatial scales. Among the factors that contribute to the diversity and abundance of refuge flora and fauna is the refuge's central location within the mixed-grass transition zone where characteristically short western and tall eastern grasses meet, northern cool-season grasses and southern warm-season grasses converge, and many species range distributions overlap. Thus, depending on shifting short- and long-term environmental conditions, biological resources of the refuge are dynamic within, and among, years. In addition, wetland habitats that tend to be fewer and less reliable in this geographic region attract some species that rely on both wetland and grassland resources for life events. For example, dry shoreline and salt flat habitat provides nesting sites for waterbird species, such as interior least tern, western snowy plover, black-necked stilt, and American avocet. Also, the complex of upland and wetland habitats produces a high abundance and diversity of plants, invertebrates, and vertebrates and, therefore, is an attractive source of food for species associated with both communities. Collectively, these factors contribute to a diverse flora and fauna, because the distributions of many western and eastern wildlife and plant species overlap, such as with the presence of both the eastern and western meadowlark and kingbird.

Quivira Refuge supports a diversity of wetland types that each provide resources like invertebrates, plant foods, and cover in unique combinations that are important for meeting the life requisites of focal species. In addition, each wetland provides multiple plant communities simultaneously, such as tall emergent and wet meadow, and plant communities tend to change temporally in response to abiotic factors like bare mudflats in spring that can be colonized by annual emergent vegetation later in the same year.

Within created wetlands, the partial drawdown or flooding of a unit and brief periods of inundation during the spring has resulted in sparse vegetation interspersed with expanses of mudflats that provide suitable foraging habitat for spring and fall migrating shorebirds. If partial drawdown or flooding is prolonged through the summer, bare mudflats next to shallowly flooded habitats have provided shorebird nesting habitat. Conversely, if water is maintained on units for longer periods, perennial emergent vegetation tends to colonize sites. Local interspersion of emergent herbaceous wetland cover and open water is reported to benefit a high diversity of marshbirds, provided long-term wetland cycling is sustained (Weller and Spatcher 1965, Bolenbaugh et al. 2011), and wetland size is a reported influential factor of habitat use for some waterbirds (Brown and Dinsmore 1986). Depending on the type of perennial vegetation, suitable nesting and foraging habitat has been provided for grebes and bitterns (cattail or bulrush) or rails and phalaropes (sedge or rush). In addition, semipermanent units that support emergent vegetation interspersed with open water have offered suitable breeding habitat for amphibians and thermal cover for waterfowl during early winter.

In grasslands, differences in species niche selection allow cohabitation within the same community. Bird habitat selection differs largely based on behavioral interactions and needs of various life activities, such as for foraging, mating, nesting, brooding, or protection from weather or predators (Wiens 1973, Cody 1985a, Cody 1985b). In general, sand prairie grassland for this region has been described as being dominated by grasses with lesser amounts of forbs and woody vegetation (Küchler 1974, Natural Resource Conservation Service 2010). Ecological site descriptions report potential woody coverage of less than 5–15 percent on some soil associations and up to about 30–40 percent on others, with amounts changing largely dependent on management history. Some shrub cover exists as a natural part of the grassland community to provide valuable wildlife food and different types of cover for nesting, resting, escape, and thermal protection. During winter, a combination of grassland and shrub habitat contributes to bird use diversity and abundance, including focal species (Davis 2001). However, some woody vegetation has been managed to conserve native grassland communities because, for example, extensive tall, dense shrub cover is avoided by some breeding grassland birds (Cooper 2009) and has been associated with higher rates of predation (Klug et al. 2009, 2010).

All biological resources of the refuge are dynamic within, and among, years, depending on short- and long-term environmental conditions. Therefore, evaluating the potential contribution of refuge lands to wildlife is complex and requires consideration of short- and long-term community dynamics relative to the status and importance of species and communities at various spatial scales.

Populations of many species native to the area have declined because of habitat loss and degradation caused by factors such as land use changes, the spread of invasive species, habitat fragmentation, urbanization, and management actions that affect the quantity and quality of water resources. The importance of each of these factors depends on the scale considered. In this planning process, we examined several plans and documents at scales ranging from local to national that were relevant to the purposes and goals of Quivira Refuge. These included our lists of species of management and conservation concern (FWS 2008a) that consider various national and international bird conservation plans and other locally important status reports, or designations.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 47 of 144

The descriptions of plant and wildlife communities that follow are not comprehensive.

Plant Communities

This sections includes details on the various plant communities found on Quivira Refuge

Landscape Context: Status and Trends of Plant Communities

Saltmarsh and sand prairie are two distinct ecological communities of Quivira Refuge and the western Great Plains that are of importance at both the global and State scale (Kansas Natural Heritage Program, Kansas Biological Survey 2008). Based on the Natural Plant Communities of Kansas status list dated October 9, 2003, saltmarsh is globally ranked as an imperiled community because of its rarity or its vulnerability to extinction, but is now not able to be ranked at a State level because of the lack of, or conflicting, information. Sand prairie, on the other hand, is a secure community at a global level, but is State listed as imperiled because of its rarity and vulnerability to extirpation in Kansas.

More than 97 percent of lands in Kansas are in private ownership, and most are highly altered from conditions that occurred before European settlement. For example, an evaluation of land cover maps and remotely sensed data shows that current plant community alliances differed substantially from before settlement times—or before about 150 years ago, and more recent times of about 5 years ago (Peterson et al. 2004). Changes in land use from the historical period include 48 percent of lands cultivated in Kansas, and a dramatic reduction in the area of native short, and tall, grass communities. Recent changes in land use affected less than 20 percent of Kansas lands and included conversion of grassland to cropland—greater than 2,471,053 acres (1,000,000 hectares)—and woodland, as well as the conversion of cropland to grassland. The latter can be attributed to enrollments in the Conservation Reserve Program, rather than to the reconstruction, or restoration, of native grassland conditions that occurred historically (Heisler et al. 2003, Briggs et al. 2005).



Rachel Lanbian/FWS

Insects thrive in Quivira Refuge plant communities.

Presettlement Conditions

Küchler (1974) characterized potential natural vegetation for Kansas at a landscape scale. Based on that report, Quivira Refuge's potential natural vegetation includes: saltmarsh (saltgrass–seepweed), floodplain vegetation (cottonwood–willow) and prairie cordgrass, and sand prairie (bluestem–sandreed). While historical surveys vary with respect to the presence of little, or no, woody vegetation, there seems to be agreement that woody vegetation was not a dominant feature, and trees were generally cottonwood and willow (Wilcox 1870, Gates 1937, Thompson 1871, unpublished refuge reports on file at Quivira Refuge headquarters, Stafford County, Kansas).

Küchler's vegetation descriptions, relevant to refuge lands, are provided in table 3. More detail on ecological site potentials are provided by the soil survey staff (2010), which were used to describe potential presettlement conditions of refuge lands in figure 8 and table 4 (Heitmeyer et al. 2012).

Table 3. Vegetation descriptions for Quivira National Wildlife Refuge, Kansas.

Küchler's classification	*General description*	*Major plants*	*Other characteristic parts*	*Location (Kansas and landscape)*
Saltmarsh	Dense to open stands of short-to-medium-tall grasses, few forbs	*Dominants*: saltgrass, seepweed *Local Codominants*: spikerush, threesquare, prairie bulrush, prairie cordgrass, alkali sacaton	Wood bluegrass, western ragweed, prairie dogbane, white heath aster, woolly-fruit sedge, Canada wildrye, foxtail barley, inland rush, plains bluegrass, tall or yellow knotweed, drooping bulrush, sea purslane	Alkaline, periodically flooded depressions in central and north-central Kansas

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 48 of 144

Table 3. Vegetation descriptions for Quivira National Wildlife Refuge, Kansas.

Küchler's classification	*General description*	*Major plants*	*Other characteristic parts*	*Location (Kansas and landscape)*
Floodplain vegetation (western and central Kansas)	*Savanna*: tall, medium-tall, and low broadleaf deciduous scattered trees and shrubs with "impoverished" bluestem prairie understory *Freshwater marsh*: dense stands of tallgrasses with forbs common but not prominent	*Dominants*: cottonwood, peachleaf willow, and, in eastern Kansas, black willow and American elm *Codominant in western Kansas*: sandbar willow *Dominants*: prairie cordgrass	Nearly 30 species and combined species found in eastern and western Kansas *** Wood bluegrass, big bluestem, rice cutgrass, whitegrass, Michigan lily, Virginia bunchflower, switchgrass, cup plant or squarestem rosinweed, hardstem and softstem bulrush, Indiangrass, eastern gamagrass, broadleaf or common cattail	Floodplains and streambanks with permanent and intermittent flooding (note differences in eastern and western Kansas) *** Shallow depressions of floodplains, periodically flooded or with high water table; common in eastern Kansas and in bluestem prairie
Sand prairie	Medium dense stands of grasses that are medium-tall to tall, forbs common	*Dominants*: big bluestem, little bluestem, sandreed, switchgrass	Sand bluestem, field sagewort, sand milkweed, sideoats grama, sandbur, sand lovegrass, umbrella plant, field snakecotton, flaxflowered gilia, prairie sunflower, golden aster, roundhead lespedeza, fourpoint evening primrose, sand paspalum, chickasaw plum, hardstem and softstem bulrush in wet spots, sand dropseed, and broadleaf or common cattail in wet spots	Sandy sites in south-central Kansas

Source: Küchler 1974.

Table 4. Hydrogeomorphic relationship of historical distribution of vegetation communities or habitat types to geomorphic surface, soils, and hydrological regime in the area of Quivira National Wildlife Refuge, Kansas.

Habitat type	*Geomorphic surface*	*Major soil types*	*Flood frequency**
Sandhills	Dune sands	Tivin	OP
Sandy grassland			
(Beach ridge)	Beach ridge	Pratt–Tivoli	OP
Saltmarsh	Alluvial or lacustrine depressions	Soil survey geographic database marsh	SGD, ROB
Saltgrass	Depression fringes	Plevna	SGD, ROB
Seasonal herbaceous	Alluvium depressions	Aquoll, Waldeck	Seasonal surface
Riparian creek corridors	Rattlesnake Creek corridor	Varied, sand	Continual creek flow
Subirrigated saline grassland	Alluvium	Abbyville, Natrisols	SGD, OP
Subirrigated nonsaline grassland	Alluvium	Dillhut–Plevna, Hayes–Solweg, Dillwyn, Zenda	GD, OP
Upland sandy grassland	Dune sands	Canadian, Carwille, Naron, Pratt, Tivin–Dillhut	OP
Upland clay or loam Grassland	Dune loess, loam	Farnum, Tabler	OP

* OP—mostly onsite precipitation; SGD—saline ground water discharge; GD—ground water discharge with low salinity; ROB—Rattlesnake Creek overbank and backwater surface flows; Seasonal surface—mostly seasonal surface water runoff and minor creek overbank flooding, relatively fresh or slightly brackish water; Continual creek flow—sustained flows in Rattlesnake Creek.

Sources: relationships were found on land cover maps prepared for the Government Land Office survey notes taken in the late 1800s, historical maps and photographs, current and historical U.S. Department of Agriculture soil maps (Dodge et al. 1978, NRCS 2010), geomorphology maps, region-specific hydrology data (Fader and Stullken 1978, Sophocleous 1997, Jian 1998, Estep 2000, Striffler 2011), and various botanical accounts and literature (NRCS 2010, Ungar 1961).

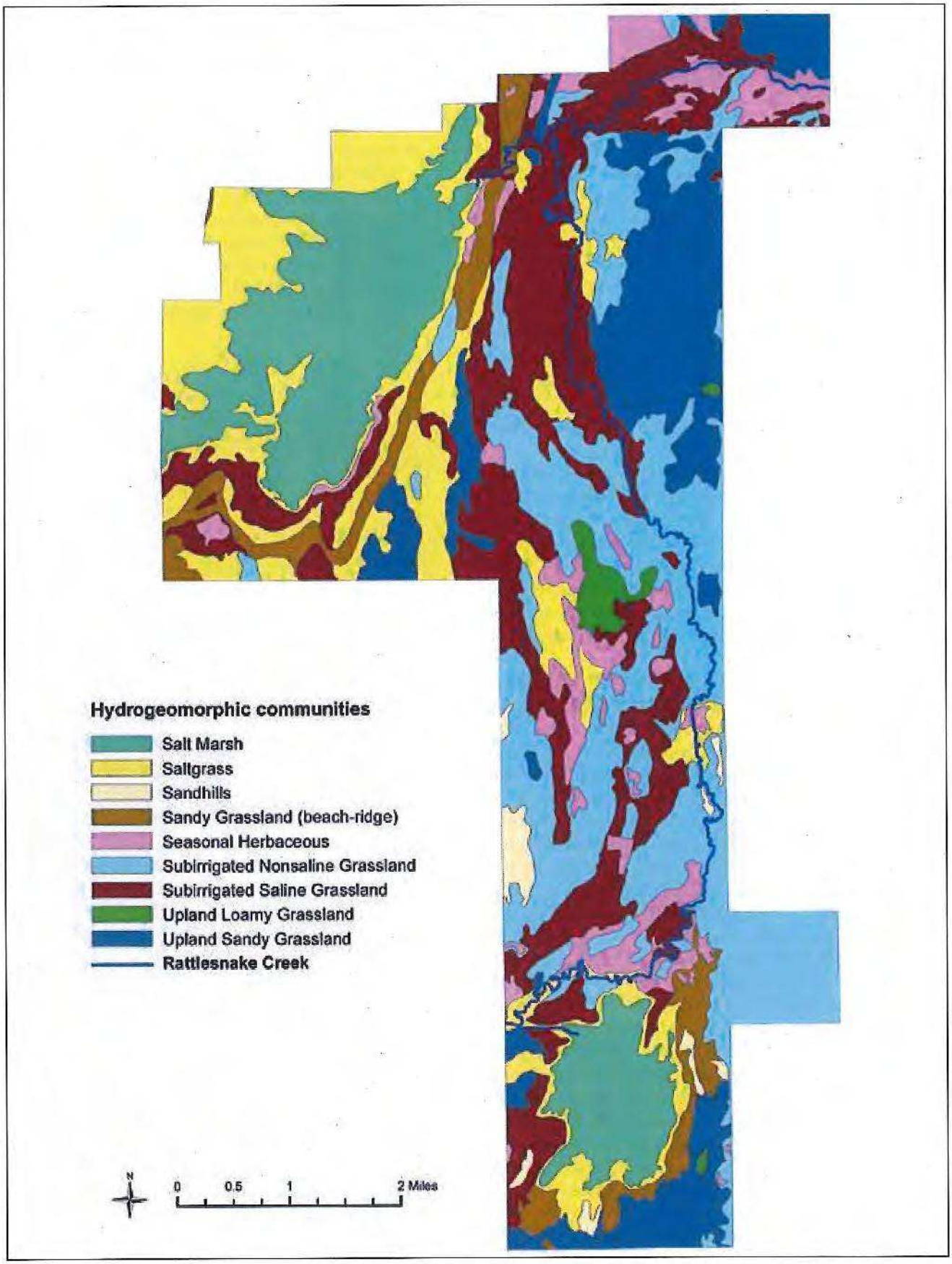


Figure 8. Potential presettlement conditions, Quivira National Wildlife Refuge, Kansas. *Source: Heitmeyer et al. 2012.*

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 50 of 144

Historical biological information on the saltmarshes of Quivira Refuge is extremely limited. There are a few aerial photos, drawn maps, and miscellaneous notes in published and gray literature. However, hydrologic inputs to the LSM historically occurred only from periodic overbank flooding of Rattlesnake Creek and from precipitation. It was not until the late 1920s–early 1930s that a ditch was constructed to divert Rattlesnake Creek flows directly into the LSM. Likely, this essential hydrologic change generated various short- and long-term transformations of the marsh ecosystem, such as water quantity and quality changes and the introduction or increased presence of carp. For example, at the time of refuge establishment, notes in Quivira Refuge's master plan suggest that the estimated size of the LSM was about 640 acres and its greatest depth was 4 feet. However, a comparison of aerial photographs ranging from the 1920s to today shows that the historical size of the marsh was much smaller (Heitmeyer et al. 2012).

During the 1958–1960 growing seasons, an intensive ecological study of vegetation in, and around, the BSM was conducted by Ungar with emphasis on salt tolerance and its resulting effects on plant distribution (1961, 1964, and 1965). At the time, the marsh covered parts of 12 sections, and water depths rarely reached 2–3 feet, partly because of constructed ditches that had been dug to control drainage before the refuge's establishment.

Seasonal fluctuations in water depth and quality in the BSM were because of characteristic sporadic rains and drying in July and August. The main source of salts in the BSM was found to be sodium chloride. Water and soil samples collected in 1959 and 1960 found similar monthly changes in chloride ion concentration and total salinity, and variability occurred among sampling sites. The lowest salinities occurred in the adjacent prairie and the highest salinities occurred in the barren salt flats, with a general increase in salinity values as the marsh dried in July. In the water, the chloride ion concentration range was equal to 0.008–1.65 percent, and the total salinity range was equal to 0.02–2.96 percent. In the soil surface from 0–3.94 inches (0–10 centimeters), the chloride ion concentration range was equal to 0.001–2.34 percent, and the total salinity range was equal to 0.003–2.96 percent. Salts were greater at the surface, from 0–3.94 inches (0–10 centimeters), than in the soil subsurface, from 23.62–27.56 inches (60–70 centimeters). Soil salinity had more of an effect on the distribution of rooted plants than water salinity, and extremes in salinities—where survival was equal to, or greater than, 1-percent salinity—were most limiting to plant distribution, when compared to averages. Ungar's research and other biological studies conducted since (Reinke 1981, Harris 1999) have identified many unique features of Quivira Refuge's inland saltmarsh systems.

Fine-scale descriptions of lands where created wetlands now occur are limited, however, the following observations were noted from Quivira Refuge's original master plan (FWS 1962):

- In general, refuge infrastructure development was intended to increase the availability of water, such as coverage, depth, and duration, by converting temporally and seasonally flooded areas to more permanently flooded wetland types to help resources of concern at the time, which were primarily migratory waterfowl during migration.



Rachel Laubhan/FWS

Prairie cordgrass is an important component of meadows on Quivira Refuge providing relatively taller conditions for wildlife.

- Unit 7 was a low sump area of about 15 acres fed from the LSM.
- Drainage from unit 11 went northeast through a natural channel.
- Units 14a and 14b occurred along an old creek channel, and dominant plants were alkali sacaton and saltgrass.
- Unit 16 was a natural sump dominated by alkali sacaton and saltgrass flats.
- Unit 21 was a natural low area in an old creek channel.
- Units 22 and 23 were natural ponds and depended on surface runoff for water, and both had a good history of waterfowl use, including dabbling and diving ducks.
- Unit 24, or Darrynane Lake, was an existing 16-acre impoundment on Rattlesnake Creek, part of an old hunting club property that had a washed concrete spillway.
- Unit 25 was a natural, low saltgrass–sacaton area between sand knolls.
- Unit 26 contained about 90 acres of good farmland.
- Unit 28 was surrounded by tallgrass to the south and east.
- Unit 34 was in a low area in a tallgrass pasture.
- The plan for Unit 44 was to have it drain into scattered sump areas on the flats to the north.
- Units 47 and 55 were saltgrass flats that characteristically flooded in spring and were used by 50,000 ducks in 3–4 inches of water.
- Units 48 had 75 surface acres and unit 49 had 100 surface acres.
- Unit 50 was an old hunting club property.
- Unit 57 was a natural lake called McCandless or East Lake.
- Unit 60 had a history of heavy duck use in late winter, indicating that it had some deep water and remained ice free longer than other wetland habitats.
- Unit 62 was covered by a dense stand of prairie cord grass.
- Dead Horse Slough was an existing slough at the time.
- The BSM was unit 72, and it was planned to be the storage unit for habitat area in the northwestern part of the refuge that was attractive to diving ducks like scaup, redhead, and canvasback.

Current Conditions

Since presettlement times and refuge establishment in 1955, more environmental changes have occurred on refuge lands (Heitmeyer et al. 2012). In 1954, a reconnaissance map of the area was completed that described cover types, associated dominant plants, and miscellaneous notes of vegetation conditions for the purpose of assessing property values before acquisition of lands by the Federal Government. Our refuge staff recently recreated the hand-drawn map of 1954 in a geographic information system (GIS) (figure 9) and recoded cover types to use as a general baseline cover map to facilitate its comparison with a recent vegetation map of refuge lands made in 2011 (figure 10). While important shifts in plant communities mapped in 1954 and 2008 are evident (table 5), results should be viewed with caution partly because of differences in the purposes for which the two maps were developed; methodologies, such as observer bias, minimum mapping unit, equipment, and technology; and environmental conditions occurring at specific points in time, such as certain days, months, years during relatively wet and dry periods.

Some of the more notable differences include: (1) an increase in the occurrence of nonnative and invasive species in both grassland and wetland communities; (2) an increase in the coverage of shrubs and trees, especially in uplands and riparian zones; (3) the establishment and spread of Phragmites and cattail in wetlands; (4) the extensive development of artificial infrastructure; (5) an increase in the area of surface water; and (6) indications of a decline in shortgrass species. However, the 1954 appraisal and other refuge reports described much of the refuge land area as being overgrazed at the time of establishment, and this grazing regime likely favored shortgrass over tallgrass species, as reported by Aldous (1935) in central Kansas.

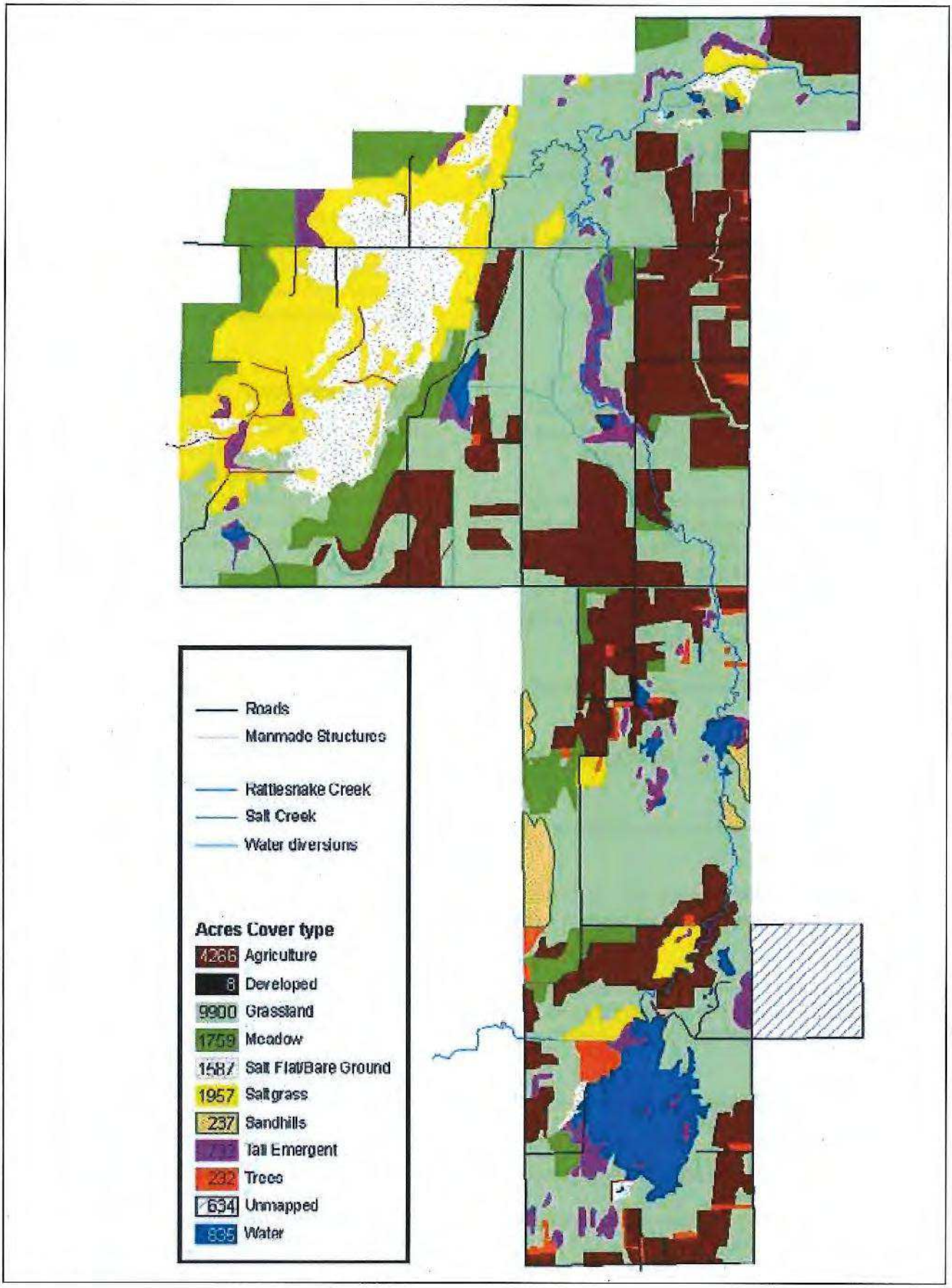


Figure 9. Vegetation cover types in 1954, Quivira National Wildlife Refuge, Kansas.

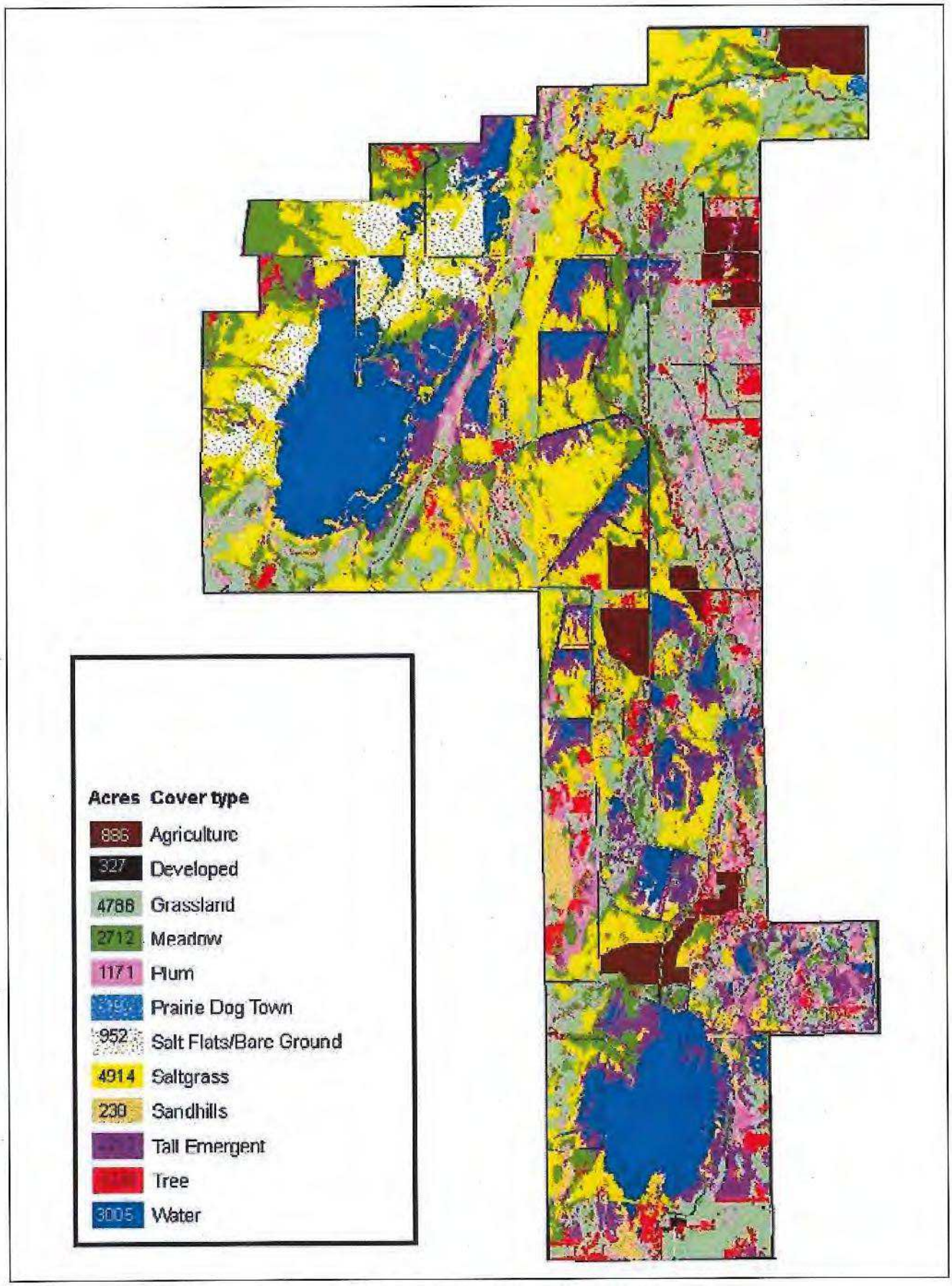


Figure 10. Vegetation cover types in 2008 (NVCS), Quivira National Wildlife Refuge, Kansas.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 54 of 144

Table 5. Comparison of vegetation cover types between 1954 and 2011 on Quivira National Wildlife Refuge, Kansas.

Cover type	*Map**	*Descriptions (dominant plant species)*
Grassland	1954	big and little bluestem, switchgrass, Indiangrass, sand lovegrass, buffalograss, blue grama, sideoats grama, three-awn, sand dropseed, wild barley, wild rye, bluestem wheatgrass, panic grass, saltgrass (G1 and G2 symbols on original map)
	2011	big and little bluestem, switchgrass, Indiangrass, and less of other prairie grasses and forbs (sometimes lesser amounts of meadow species present)
Sandhills	1954	Sandhills with carrying capacity of >5 acres of cow and calf for 6 months because of low vegetation density. Based on our soil survey geographic database soil map, this is most of the Tivin fine sand with 10—30% slope sites on Quivira Refuge. (G3 symbol on original map is comprised of the Sandhills and Saltgrass cover types)
	2011	unmapped areas, polygons with >50% Tivin fine sand with 10–30% slopes (figure 7)
Saltgrass	1954	Saltgrass (G3 symbol on original map includes Sandhills and Saltgrass cover types)
	2011	Saltgrass
Salt flat, bare ground	1954	bare soil, mostly with alkaline salts (white) on surface (Af symbol on original map)
	2011	bare ground areas, some with alkali and sparse cover of saltgrass
Meadow	1954	little bluestem, Indiangrass, three-square, sedges, rushes (H symbol on original map, "wild hay")
	2011	Medium-short emergent plants, primarily prairie cordgrass, three-square, sedges, rushes (not tall bulrushes, sometimes lowland prairie grasses mixed in this cover type)
Tall emergent	1954	three square bulrush, hardstem bulrush, nutgrass [*Scirpus paludosus*], sedges, rushes (M symbol on original map; for Marsh, fresh; in swales and depressions and next to wetland areas)
	2011	cattail, Phragmites, tall bulrushes (mostly softstem bulrush)
Water	1954	surface water (W symbol on original map)
	2011	surface water
Trees	1954	mostly shelterbelt strips or groves near buildings and cultivated fields. One site with saltcedar on the delta where Rattlesnake Creek enters the LSM. Several groves of open, mixed oaks scattered in the "grazing type" (B, T symbols on original map)
	2011	black locust, tamarisk, cottonwood, Russian olive, Siberian elm, and some tall shrubs that were not plum
Plum	1954	not included in map description
	2011	sand plum with little coverage (<5%) of American plum and other shrubs
Agriculture	1954	farmed areas and few small sites that were primarily forbs (weeds)
	2011	farmed areas
Prairie dog towns	1954	not included in map description
	2011	active prairie dog towns

*The 1954 map was adapted to improve visual clarity. The current map used 2008 aerial photos that were ground truthed in 2010 and 2011 and was completed in 2011. Of note, descriptions of certain cover types are similar but not exactly the same for the 1954 and current maps. For instance, current "tall emergent" plant types are taller than what occurred in the past.

A recent inventory of refuge vegetation was completed in 2011, and approximately 22,262 acres of refuge lands were mapped to plant association classes. The inventory excluded a small tract of refuge land that occurs a few miles west of the main refuge boundary, but includes at least parts of boundary road areas, which accounts for the seeming discrepancy in refuge acreage. Protocol largely followed National Vegetation Classification System (NVCS) standards (Federal Geographic Data Committee 2008) and other guidance. The minimum mapping unit of the aerial photos was 0.5 acre, but ground truthing only included plum stands 0.2 acre or greater. Ground truthing used 2008 aerial photographs and was conducted in 2010, which was relatively wet, and 2011, which was relatively dry. Thus, it is presumed that certain plant species were more conspicuous under wetter conditions and other species were more conspicuous under dry conditions. A plant key was used to classify different combinations

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 55 of 144

of 20 herbaceous, 5 shrub, and 15 tree-dominant plant species into suitable categories, which resulted in the identification of 43 vegetation associations (table 6) (Farr and Laubhan 2011).

Based on this inventory and on estimates from summed GIS acreage data, Quivira Refuge is comprised of the following association types: 48.6 percent (10,819 acres) herbaceous wetland zones, 13.5 percent (3,005 acres) open water, 22.0 percent (4,898 acres) grassland, 6.6 percent (1,469 acres) shrubland, and 3.9 percent (868 acres) riparian area and upland woodland categories combined. It is important to understand that this coverage estimation is scale dependent. For instance, shrub associations were only classified as such if stands were equal to, or greater than, 0.2 acre and shrub coverage was equal to, or greater than, 50 percent. This minimum mapping unit was chosen because it was reasonable for both mapping and for our management planning and implementation. Therefore, smaller shrub stands may exist that are mapped as grassland. Similarly, existing ephemeral or seasonal wetlands measuring less than 0.2 acre were classified as different herbaceous and woodland associations of which they were a part. The most abundant plants for each association type were: saltgrass, cattail, and three-square in wetlands; little bluestem, switchgrass, and Indiangrass in grasslands; plum and saltcedar—also considered a small tree—in shrubland; and locust, Russian olive, and cottonwood in forest or woodland.

Table 6. National Vegetation Classification System (NVCS) associations, Quivira National Wildlife Refuge, Kansas.

Vegetation associations	*Acres*	*Hectares*
Boxelder woodland	0.3	0.1
Agriculture vegetation	885.9	358.5
Tree-of-heaven forest	7.8	3.1
Big bluestem–helianthus herbaceous vegetation	551.2	223.1
Big bluestem–western Great Plains herbaceous vegetation	426.4	172.6
Sand bluestem herbaceous vegetation	62.5	25.3
Bare ground	18.9	7.6
Black-tailed prairie dog town grassland complex	18.9	7.6
Cheatgrass seminatural herbaceous vegetation	82.1	33.2
Northern catalpa forest	11.9	4.8
Hackberry woodland	0.6	0.3
Roughleaf dogwood shrubland	22.7	9.2
Inland saltgrass herbaceous vegetation	4926.1	1993.5
Russian olive woodland	29.2	11.8
Spikerush fascicularis herbaceous vegetation	329.3	133.3
Green ash forest	3.1	1.3
Kentucky coffeetree forest	16.2	6.6
Eastern redcedar seminatural forest	85.4	34.5
Osage orange woodland	5.6	2.3
Mullberry woodland	8	3.3
Switchgrass vegetation	431.8	174.8
Switchgrass–Indiangrass vegetation	1245	503.8
Common reed western North American temperate seminatural herbaceous vegetation	72.5	29.3
Plains cottonwood–black willow forest	389.5	157.6
Plum shrubland	1231.1	498.2
Fragrant sumac shrubland	28.1	11.4
Riverine sand flats–bar sparse vegetation	936.3	378.9
Black locust or honeylocust forest	253.8	102.7
Sandbar willow or mesic graminoids shrubland	57.1	23.1
Soapberry woodland	1.6	0.6

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 56 of 144

Table 6. National Vegetation Classification System (NVCS) associations, Quivira National Wildlife Refuge, Kansas.

Vegetation associations	*Acres*	*Hectares*
Little bluestem–sideoats grama western Great Plains herbaceous vegetation	2058.8	833.2
Common threesquare herbaceous vegetation	1107.6	448.2
Softstem bulrush semipermanently flooded herbaceous vegetation	167.9	68
Softstem bulrush–cattail herbaceous vegetation	366.9	148.5
Prairie cordgrass –spikerush and sedge herbaceous vegetation	1293.6	523.5
Saltcedar seminatural temporarily flooded shrubland	126.4	51.2
Cattail Great Plains herbaceous vegetation	1615	653.6
American elm woodland	1.9	0.8
Siberian elm woodland	50.6	20.5
Para grass herbaceous vegetation	2.8	1.1

The Boiling Springs has an artesian well and an associated freshwater habitat of small streams and pools that form a few acres. In the area of the artesian well, water cress is abundant as well as a source population of State-threatened Arkansas darters. All of our alternatives in this CCP and EA suggest the need to further evaluate potential future management to support the Arkansas darters. Besides mapped vegetation associations, other important factors to consider include the current existence of a pipe where water from the spring flows to the surface and increasing woody vegetation. The pump remains from an oil well that has been removed, and it is unknown if the removal of the pipe would result in more springs or if habitat suitability would increase for the Arkansas darter. Increasing woody vegetation in the area may also create changes in water quality or habitat use. A beaver downed one large tree in 2011, creating a dam in the area where Arkansas darters live. Casual observations suggest that larger pools in the area would encourage use by predator fish, such as the green sunfish, and that would likely adversely affect Arkansas darter populations.

Wildlife Communities

This sections includes details on the various wildlife communities found on Quivira Refuge

Status and Trends of Wildlife Communities

While national wildlife refuges are managed for wildlife first, a particular refuge cannot be managed for all associated wildlife every year. Habitat conditions constantly change over time generally favoring a broad diversity of wildlife species. Thus, planning that evaluates trade-offs in management effects on wildlife at various spatial and temporal scales may better sustain native communities.

As part of this process, various regional and national conservation plans and species of concern lists are considered collectively within the context of the refuge bird list and other relevant local conservation factors such as: (1) the refuge purposes and relevant policies and mandates; (2) a species native or nonnative status; (3) species population trends; (4) species range distribution in relation to refuge location; (5) species current and potential occurrence on refuge lands; (6) species tolerance of grassland fragmentation, urbanization, and agricultural activities; and (7) the availability and condition of habitat outside refuge boundaries. A detailed analysis of species tolerance of grassland fragmentation is presented in appendix H. Collectively, these considerations helped us to develop a list of priority management species we call focal species (table 3).

Presettlement Conditions

Consideration of changes in wildlife since presettlement is important for understanding the full range of native habitat conditions and for evaluating current management potential. For instance, knowledge of native species life needs and behavior may be used to describe what the environment used to look like and how it functioned. Many native herbivores and predators that were an inherent part of the historical natural system no longer occur on refuge lands or in the region, and, consequently, their absence likely has altered fundamental ecosystem processes. For example, grazing or browsing by bison, pronghorn, elk, and prairie dogs in central Kansas used to variably influence many indigenous prairie plants and wildlife

that have unique adaptations, and now their roles or functions are only partially replaced by domestic cattle, sheep, or goats.

Similarly, the use of prescribed fire and artificial manipulation of hydrology do not completely mimic the historical frequency, intensity and magnitude of historical fires and water movement on the landscape. Thus, complete restoration of historical processes and associated native plant and wildlife community will not be possible regardless of the alternative we select in this CCP and EA, however, the extent to which restoration will occur differs among the alternatives. In managing for wildlife, strategies may be used for various purposes, including compensating for one, or more, of the many long-term, or permanent, imbalances that have been created in the landscape.

Conditions of wildlife communities since refuge establishment have not been summarized, but have been recorded in the refuge master plan, annual narratives, and other files and documents. Of particular relevance to our alternatives, the deer count on the refuge at the time of establishment was less than 20, and turkey were not present. Also, the master plan showed our intention to manage habitat to encourage use by greater prairie-chickens, noting their former occurrence on refuge lands and their absence in the early 1950s. Because birds are a primary focus of the Refuge System and changes in communities have been many and complex, it is worth referring those interested in more details to a discussion by Johnsgard (2009) of the changes in bird communities and range distributions over the past three decades.

Current Conditions

The refuge is recognized nationally and internationally for its importance in wildlife conservation. Quivira Refuge is a Ramsar Wetland of International Importance, a Western Hemisphere Shorebird Reserve Network site, and a Globally Important Bird Area. The most current inventory of Quivira Refuge wildlife is provided in appendix G, but some highlights are described below.

Birds

More than 300 species of birds are thought to use Quivira Refuge. Some main attractions for visitors to the refuge are spring and fall bird migrations that include hundreds of thousands of geese and ducks, more than 30 species of shorebirds, many sandhill cranes, and the occurrence of rare species, such as the whooping crane, interior least tern, and snowy plover. Quivira Refuge wetlands provide migration and wintering habitat used by large populations of Canada geese, greater white-fronted geese, and, increasingly in recent years, snow geese. From 2009 to 2010, more than 11,000 ducks, 300,000 Canada geese, 402,500 white-fronted geese, and 425,000 snow geese were estimated to visit the refuge on independent, bimonthly survey dates. More than half of the fall surveys in 2009–2010 and 2008–2009 showed use by more than 20,000 geese, and three of the fourteen 2009–2010 surveys each reported more than 30,000 sandhill cranes. From 2002 to 2006, an annual average of more than 30,000 shorebirds were counted on Quivira Refuge during biweekly migration surveys (Hands 2008). In 2010, biweekly data counted 55,491 shorebirds on the refuge during the migration periods surveyed. With Cheyenne Bottoms Wildlife Management Area only about 30 miles away from the refuge and with high local variation in weather patterns, many birds rely on both areas to acquire necessary life resources. It has been suggested that these areas, combined, often hold more than 90 percent of the world's population of such species as stilt sandpipers and white-rumped sandpipers.

While many rare birds may be observed at Quivira Refuge, some receive much more attention than others. Whooping cranes are usually observed in small family groups during migration on Quivira Refuge. In recent years, the highest recorded season total for whooping cranes observed using areas on and near the refuge is 91 in the spring and 112 in the fall. Thus, the relative importance of the refuge to whooping cranes during migration is substantial, considering that the population in recent years has ranged from approximately 250 to possibly 300 during the winter of 2011–2012. Whooping cranes may stay on the refuge for up to 5 to 6 weeks in the fall, but spring migration stays are typically shorter and last from several days to weeks. Bald eagles are also a common wintering attraction, with a high of 204 eagles reported on the Quivira Refuge during the Christmas Bird Count in 2010. Only recently has one bald eagle pair been reported nesting on the refuge,



FWS

Harris' sparrow, reported on Quivira Refuge, has been identified as a priority species by the Great Plains Landscape Conservation Cooperative.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 58 of 144

and they successfully fledged two young annually during 2010 and 2011. Quivira Refuge is one of the few sites in Kansas with nesting black-necked stilt, interior least tern, snowy plover, and various rail species. Production of interior least tern on Quivira Refuge fluctuates, but colonies of equal to, or greater than, 10 nesting pairs are common, and young raised to flight stage has been as high as 36 to 40 individuals. More information on threatened and endangered species and other species of concern may be found in the appendixes.

Quivira Refuge is primarily a migration refuge, but, as shown above, many birds use habitat for nesting as well. Of the birds reported nesting on Quivira Refuge, 23 species are considered Birds of Management Concern (FWS 2008a). Of these, 13 species are Birds of Conservation Concern in Region 6, and 11 species are Birds of Conservation Concern in Bird Conservation Region 19, Central Mixed-grass Prairie (FWS, Mountain–Prairie Region 2008a). For a comparison, the total number of birds listed as Birds of Conservation Concern for Region 6 and Bird Conservation Region 19 include 43 and 16 breeding species, respectively. Based on available published information on how climate affects bird breeding in the region, most nesting activities begin in April and extend to August. But, bird use and timing of different breeding events vary within, and among, community types. Because management of wooded habitat is a current topic of interest in considering alternatives, it is important to note that many nesting bird species associated with wooded habitat on the refuge are generalists that have not exhibited population declines and may occur in more than one habitat type or have benefited from the expansion of urban and residential areas or constructed habitats like bridges, nest boxes, and farmland.

The presence of upland grassland passerines on Quivira Refuge is often overshadowed by the more easily identifiable and popular wetland-associated birds. However, many of these species are adversely affected by increasing woody vegetation, and refuge management has traditionally struggled with successfully reducing trees and shrubs to levels more characteristic of natural prairie. Some of the more common native passerines that characteristically breed on the refuge include: upland sandpiper, both eastern and western meadowlark, bobolink, dickcissel, grasshopper sparrow, field sparrow, lark sparrow, and brown-headed cowbird.

Many of the species associated with woodlands on refuge lands have benefited from human modifications to the landscape (table 7).

Table 7. Observed woodland bird use at Quivira National Wildlife Refuge, Kansas.

Bird species	*Woodland units*												
	1	2	3	4	5	6	7	8	9	10	11	12	Total
wood duck		X											1
wild turkey		X							X				2
great blue heron					X								1
green heron		X											1
yellow-crowned night-heron									X				1
Mississippi kite									X				1
bald eagle											X		1
Cooper's hawk									X				1
red-tailed hawk											X	X	2
American kestrel					X								1
mourning dove												X	1
yellow-billed cuckoo	X	X		X					X			X	5
eastern screech owl	X	X					X		X				4
great horned owl		X		X	X		X						4
barred owl	X				X				X				3
chuck-will's widow									X				1
chimney swift					X								1
red-headed woodpecker												X	1
red-bellied woodpecker	X	X			X			X	X				5
downy woodpecker	X	X		X	X		X	X	X				7

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 59 of 144



Rachel Lanbhan/USFWS

Egrets and Ibis

Table 7. Observed woodland bird use at Quivira National Wildlife Refuge, Kansas.

Bird species	*Woodland units*												
	1	2	3	4	5	6	7	8	9	10	11	12	Total
hairy woodpecker	X	X			X			X	X				5
northern flicker		X					X	X	X				4
eastern wood-pewee	X							X	X			X	4
great crested flycatcher	X	X	X	X	X	X	X	X	X	X			10
western kingbird												X	1
eastern kingbird												X	1
Bell's vireo											X		1
warbling vireo	X	X			X	X		X		X	X	X	8
red-eyed vireo	X	X							X				3
blue jay		X							X			X	3
American crow									X				1
black-capped chickadee	X	X							X				3
white-breasted nuthatch	X	X			X				X				4
Carolina wren	X				X				X				3
house wren	X	X	X			X	X	X	X	X		X	9
blue-gray gnatcatcher	X	X			X	X	X	X	X				7
eastern bluebird	X	X		X		X		X	X				6
American robin		X	X						X	X		X	5
gray catbird	X												1
northern mockingbird						X							1
brown thrasher	X		X						X	X		X	5
yellow warbler	X	X		X				X			X	X	6
field sparrow				X					X				2
Northern cardinal	X	X		X	X		X	X	X	X	X	X	10
indigo bunting	X	X		X	X				X				5
common grackle												X	1
orchard oriole				X				X				X	3
Baltimore oriole		X		X				X	X	X	X	X	7
American goldfinch						X		X				X	3
Total species	21	24	4	11	15	7	8	15	29	7	7	18	49

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 60 of 144

Mammals

There are many information gaps about mammal populations and habitat use on the refuge. However, casual observations, limited refuge studies, and available literature were used to develop a refuge species list—which may be found in appendix G—and to gain knowledge of refuge habitat–mammalian community relationships. For example, while small mammals are widely known as an important prey base for many birds characteristic of the prairie, certain species have unique associations with open, sandy environments, such as the plains pocket gopher, eastern mole, plains pocket mouse, and Ord's kangaroo rat.

Prairie dogs are well-known associates of Great Plains grasslands, especially in shortgrass and mixed-grass prairie, and there are two prairie dog towns on Quivira Refuge (figure 11). The expansion of prairie dog towns on the refuge is limited by the high ground water table. Roads, canals, and other artificial infrastructure factors likely influence ground water conditions in certain areas of the refuge, thereby restricting the prairie dog colonies to an area that is likely smaller than what occurred historically.

There are various species associated with habitat in and around wetlands, such as beaver and muskrat. The least and short-tailed shrew are often found in mesic, or lowland, prairie here. With increasing coverage of woody vegetation, it is likely that the mammal community has shifted from what historically occurred in this area. The nine-banded armadillo is one obvious addition since refuge establishment, though the population seems to be low. The various potential effects to the sand prairie system resulting from mammalian community shifts are largely unknown, but it is presumed that supporting species characteristic of this unique environment would also promote important functions, such as soil disturbance, plant dispersal, burrow production as habitat for various wildlife, and food web interactions.

In the early to mid-1800s, deer in Kansas generally occurred along wooded parts of streams and in large, timbered areas in the eastern part of the State (Sexson et al. 1985a). Deer were considered extirpated in Kansas in 1904, and were still largely absent in 1933. By refuge establishment in the mid-1950s, it was estimated that there were easily less than 20 deer in the area of the refuge. In other words, it was an extremely rare event, and exciting, to see a deer on refuge lands in the mid-1950s. Since refuge establishment, legal harvest of deer has not been permitted on the refuge. In 1960, it was noted that, "An occasional white-tailed deer was seen on the refuge area, deer observations were becoming more frequent, and that the manager saw three deer between January and April." (from refuge narrative on file at the refuge). By 1971, deer sightings were described as common, and about 100 deer were estimated to be using the refuge area during the summer months, with a buck-to-doe ratio of 1:3. By 1980, deer were described as being "frequently seen throughout the refuge" (from refuge narratives on file at the refuge). Results of a statewide, 1984–1985, landowner deer survey showed deer populations were increasing throughout Kansas (Sexson et al. 1985b). Results of spotlight surveys conducted on Quivira Refuge between 1989 and 2005 found continued, substantial increases in the deer population (Althoff et al. 2006). While hunting was occurring on private lands next to the refuge, the numbers of deer counted during the prerifle season were not greater when compared to numbers counted during rifle season and after. No data were collected that could be used to definitively explain the results. Researchers noted evident browse lines in wooded areas and concurrent declines in the percentage of does with twins, which is commonly linked to poor herd health. Recent and ongoing distance sampling documents extremely high deer densities in areas of the refuge—19 groups per square kilometer, or 41 individual deer per 0.39 square mile (1 square kilometer), (Blecha et al. 2011). However, preliminary results of a September 2011 assessment found sampled deer—5 bucks and 5 does from ages 1.5 to 7.5 years—were healthy.

Although deer numbers on the refuge at the time of establishment were less than 20, relatively intense studies of white-tailed deer have occurred on the refuge in recent years because of their increasing population. Among many findings, some, in particular, are worth noting for planning purposes: (1) surveys show high, localized densities of both groups—19 groups per square kilometer—and individuals—41 deer per 0.39 square mile (1 square kilometer), (2) doe survival rates are relatively high compared to bucks because of poaching and hunting; (3) deer prefer existing woodland canopy and canopy edge; (4) use of private land is substantially higher during fall and winter; (5) male deer use private land more than females during winter and summer; and (6) during winter, male deer are in closer proximity with other males, in comparison to female-to-male or female-to-female associations, (Blecha et al. 2011).

Observations and preliminary data from a deer health assessment conducted on Quivira Refuge in 2011 suggest the population is now healthy. However, woodland canopy edge and food plots and fields where deer congregate could be key habitats for potential future chronic wasting disease transmission (Blecha et al. 2011). Method of spread is unknown. Frequent contact between younger males suggests that management actions targeting that age class might cause reductions in contact rates and lessen the chance of disease transmission. Because



Barry Jones/FWS

Tiger Salamander

deer within the Quivira Refuge population extensively use private lands, researchers believe that management of deer would be most successful if conducted on both private and refuge lands.

Reptiles and Amphibians

Reptiles and amphibians, or herptile species, recently documented as occurring on Quivira Refuge include three toads, four frogs, one salamander, six turtles, two lizards, and 13 snakes; see appendix G. Other herptile species have reported distributions in the area, but have not been documented on Quivira Refuge. Of significance to us, many herptile species may spend their entire lives on refuge lands. Thus, our refuge management actions could substantially alter metapopulation dynamics —or the spatially separate populations—of these species.

Furthermore, changes in herptile communities may effectively show how our management affects them, depending on the objectives. For instance, amphibians are often used in research and monitoring programs as sensitive indicators of water quality. At the same time, observing herptiles is not always easy, because many species spend considerable time underground, or have active periods that vary seasonally or that occur at night.

Like many birds and mammals, several herptiles have associations with open prairie, loose sandy soils, and wet environments that are characteristic of Quivira Refuge, such as Great Plains and Woodhouse's toads, yellow mud and spiny softshell turtles, lesser earless and prairie lizards, Graham's crayfish snake, western plains garter, and eastern and western hognose snakes. The six-lined racerunner and ornate box turtle are particularly abundant in sand or open prairie, and the latter is commonly observed on the refuge. The western massasauga is only abundant in a few locations in Kansas, one, of which, is the refuge.

Fish

Management of fish communities on the refuge is largely constrained by the species that enter it via Rattlesnake Creek. Those who frequently fish the LSM report that carp and channel catfish are common. A published survey of Rattlesnake Creek fish that included areas on, and near, the refuge found that the upper parts of the stream with low chloride concentrations supported communities dominated by red shiners or common carp; and lower, more saline, parts of the stream supported communities dominated by plains killifish (Eberle et al. 1996). Fathead minnows and sand shiners were other common species found in samples.

Arkansas darters were documented in the area of the Boiling Springs. The presence of a healthy source population of Arkansas darters at the Boiling Springs area was confirmed through observations of many fish of different ages by local experts in 2011. Casual sampling of Quivira Refuge creek and spring habitat by local experts in 2011 also found river carpsucker, mosquito fish, black bullhead, green sunfish, bluegill, and one goldfish.

Other

There are 10 species of crayfish reported to occur in Kansas (Ghedotti 1998). The northern crayfish is distributed throughout Kansas and is the most commonly observed species in streams (Ghedotti 1998). A baseline survey of crayfish species is unknown for Quivira Refuge, but crayfish and their burrows are a common occurrence. Various birds, fish, reptiles, amphibians, and mammals, eat crayfish, and many of them also compete with crayfish for food. Crayfish have been reported as a potential food item of whooping cranes (Armbruster 1990) and various waterbirds (Huner 2000). Reptiles and amphibians use crayfish burrows as shelter (Collins et al. 2010).

Other wildlife, such as butterflies, are listed in appendix G. Past refuge inventories of other wildlife are incomplete or nonexistent, and efforts to expand inventories have occurred in recent years. However, much remains to be learned of these species and associations on Quivira Refuge.

Federally and State-Listed Species

Quivira Refuge habitats support Federal and State threatened and endangered species, Federal candidate species, and State Species in Need of Conservation, including those species with designated critical habitat on the refuge and those that most commonly depend on refuge resources (table 8).

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 62 of 144

Table 8. Threatened and endangered species and species of concern, Stafford County, Kansas.

Species	*Federal status*	*State status*
Whooping crane*	endangered (CH)	endangered (CH)
Interior least tern*	endangered	endangered (CH)
Eskimo curlew	endangered	endangered
Piping plover	threatened	threatened (CH)
Arkansas darter *	Federal candidate species	threatened (CH)
Lesser prairie-chicken	Federal candidate species	
Sprague's pipit	Federal candidate species	
Western snowy plover *		threatened (CH)
Eastern spotted skunk		threatened
Plains minnow		threatened

* Those species that most commonly depend on refuge resources

CH indicates species with designated critical habitat on Quivira Refuge lands.

State Species in Need of Conservation that occur in Stafford County include: black rail, black tern, bobolink, Chihuahuan raven, eastern and western hognose snake, ferruginous hawk, glossy snake, golden eagle, long-billed curlew, mountain plover, short-eared owl, southern bog lemming, and whip-poorwill. In general, habitat conditions on Quivira Refuge should be suitable for most of these species, though several are not known to regularly use the area.

The KDWPT (2011) periodically updates descriptions and State distributions of species that are State listed or are of management concern. Information on status and occurrence of these species on the refuge are available in appendix G. Additional information is available on listed species and associated information for Stafford County (FWS 2012c, KDWPT 2011).

3.3 Management Tools

We use prescribed treatments to manage habitat primarily to promote the long-term sustainability of native wildlife and their associated ecosystems.

Native prairie vegetation and wildlife of the Great Plains evolved with periodic ecological disturbances from herbivory in the form of grazing, fire, flooding, drought, wind, ice, and other natural forces. In other words, long-term ecosystem sustainability is dependent on periodic disturbance. Landscapes, increasingly, have not incurred their characteristic, historical disturbances largely because land uses have been altered and concerns of human safety have arisen as human populations have grown. For example, wildfires generally do not grow large and burn across millions of acres of prairie, huge herds of bison do not migrate across the plains, and streamflow peaks and lows are relatively less dynamic.

A primary purpose of management uses on refuges is to conduct strategies that produce effects similar to historical disturbances to support, or restore, ecosystems. Quivira Refuge uses various management strategies to accomplish goals and objectives that promote a diverse plant community dominated by native vegetation that supports many different migratory and resident wildlife species. Management uses carried out in recent years include combinations of rest; water management; prescribed grazing and fire; mechanical treatments such as mowing, haying, farming, or tree cutting; and chemical use for control of exotic or invasive species (FWS 1994).

But, human-caused landscape changes and our management affect how uses are carried out. For example, some disturbance types are used more frequently than what occurred historically to control invasive plants or nonnative plants that have different tolerance thresholds than native species. Flooding is highly controlled on the refuge to regularly provide required resources for waterbirds and other wildlife, and wetlands have been created and altered. Brief overviews of primary refuge management uses are provided below.

Rest

For planning purposes, rest is a product of management decisions related to disturbance frequencies. In this case, we use this term to refer to the time when we choose not to graze, flood, drain, burn, or otherwise directly affect an area using an active form of management. It is important to recognize rest as a management use because community responses to prairie stressors, such as grazing, burning, and climate, are inherently variable in space and over time (Helzer 2010). Thus, management actions may produce changes in communities that last years, even during "rest," while natural forces also continue to occur. As referenced throughout the document, allowing many years of rest from disturbance in Great Plains grasslands runs contrary to natural ecosystem processes and may lead to adverse habitat conditions, such as the invasion by woody species and

an excessive accumulation of standing dead plant material that inhibits new plant growth.

Water Management

Water management on Quivira Refuge has been used to provide food and different types of habitat for waterbirds and other wetland-dependent wildlife throughout the year. Even before the refuge's establishment, water was impounded by various duck clubs to promote the area's use by waterfowl. Development of refuge infrastructure has occurred over decades, generally following the original refuge master plan.

Water management involves an extensive system of impoundments and dikes, canals, and associated control structures (figure 5). Maintaining water control infrastructure is essential for us to manage the refuge efficiently, and system operations, such as manipulating water levels, can be time-consuming and planning intensive.

Prescribed Fire

Historical prairie fires of the central Great Plains have been described as occurring about once every 3–4 years in tallgrass areas and once every 5–8 years in mixed-grass prairie, and they ranged in size from less than 0.25 acre to millions of acres (Helzer 2010). Fire characteristics and its resulting effects are dependent on fuel, weather, and topographic conditions at the time and place of ignition, and, historically, there were few natural fuel breaks in the open prairie and no suppressions by humans. Fire influences environmental conditions, such as light, moisture, and nutrients, that affect plant competition and wildlife use and promotes biodiversity and health, such as through increased nutrient cycling, the reduction in the amount of residual and woody vegetation, and by decreasing the potential effects of certain insects and of certain diseases caused by moisture and nutrient stress.

Over the past century, aggressive wildland fire suppression and the lack of prescribed fire implementation in the prairie have resulted in unnaturally altered habitats. Fire exclusion and the substantial increase of agricultural land uses are two major factors that are undoubtedly responsible for the declining abundance of some wildlife species.

Prescribed fire is now used in all major habitat types on the refuge to achieve fire program objectives involving both hazardous fuel reduction and habitat management. Prescriptions require specific procedures that set priorities for human safety, and, therefore, particular environmental and fire-behavior parameters regulate when burning may, or may not, occur to accomplish habitat objectives. In recent years, prescribed fire has been conducted on about a third of the refuge each year. There are 15 predefined fire treatment units, several, of which, may be further subdivided into 2–4 smaller units, using natural and constructed features to decide boundaries, such as water units and roads. For individual prescribed burns, boundaries may also be adjusted based on changing conditions, such as moisture, vegetation, and adjacent treated areas, to meet our refuge management objectives and to maximize safety and efficiency considerations associated with the prescription.

Because most of the available fuel within the refuge is grass, fires consume the fuel and go out quickly. Overall, fuel load varies by soil type and disturbance history, often ranging from 2,500 to at least 8,000 pounds per acre. Grass and forb responses vary because of the time of year, intensity, and duration of the fire, but they most often reestablish in place of woody vegetation. Other fuel types are present on the refuge, but they are seldom contiguous enough to be the primary carrier of fire. Between mid-October and mid-May, fuel in the form of dead grass and marsh vegetation is present in amounts that are greater than 2 tons per acre, or 4,000 pounds per acre. While fire generally results in little wildlife mortality, a large wildfire during drought conditions or occurring late in the growing season could reduce cover and forage availability for wildlife to the point that would increase mortality, especially if cover and forage are limited in the larger landscape, a situation that seldom occurs. All wildfires occurring on the refuge are now suppressed.

Grazing

Prescribed grazing on Quivira Refuge, usually involving cattle, consists of the clipping and removal of plant parts and soil disturbance caused by associated hoof action. As with other treatments, the main parts of grazing are timing and intensity. Its effects vary by timing in relation to climate influences on plants, the frequency and duration that plants are exposed to grazing, the number and type of livestock involved, environmental conditions, management history of the site, and infrastructure such as fence configuration and the distribution of water sources.

Specific plans are developed for each grazed area of the refuge, but they may change annually, or more frequently, depending on conditions. Traditionally, grazing occurs on the refuge between April and Sep-

tember or October, but it may occur earlier to control cattail growth or cheatgrass. Maintenance grazing periods typically last 5–7 consecutive days. More intensive, restoration grazing may occur onsite, such as when controlling large, dense stands of cattail.

Mechanical Treatments

A variety of mechanical treatments are used on Quivira Refuge.

Haying, Mowing, Tree cutting

These management uses are used to remove the buildup of residual vegetation in grasslands and wetlands or to manage the coverage of invasive woody vegetation. As with other mechanical activities, guidance and policy is appropriately followed to help avoid disturbing breeding birds. Timing and other considerations are made to encourage our desired plant species and habitat conditions and to discourage undesirable plant species.

Farming, such as Plowing, Disking, Planting, and Harvesting, and Restoration Activities

Many acres on the refuge were farmed before its establishment. Afterward, farming on poorer soils was retired, and those acres were replanted with native seed. In the 1960s, during the time of refuge development, there were about 2,500 acres under cultivation on the refuge to primarily provide supplemental grains and browse foods for migrating waterfowl. For decades, cropland management consisted of cooperative farmers conducting a winter wheat–milo–fallow crop rotation using strips 50–1,000 feet wide. Traditionally, a quarter-to-one-third of the total crop shares have been either sold or left in the field as the refuge crop shares. Even in the 1980s, it was estimated that refuge grain fields provided less than 10 percent of foods needed to support waterfowl use and that surrounding lands were a much greater source of grain and browse foods for wildlife.

There are 885.24 acres of refuge lands dryland farmed through cooperative agreements with local farmers. Acreage of farmed land on the refuge has been gradually decreasing, partly because of the low productivity of crops. Also, since establishment, there has been a shift in the understanding and need of refuge crops to supplement wildlife food resources. As refuge lands are retired from farming, management starts activities, such as the treatment of noxious weeds and the seeding of desired plants, to encourage the restoration of native vegetation. Genetically modified crops have never been used on the refuge, but current policy allows for the future use of such crops to reestablish native plants.

Disking of Wetlands

Disking is sometimes used in dry wetlands to stimulate the germination and growth of desired plants during subsequent flooding, or to manage undesirable conditions, such as cattail growth.

Chemical Treatments

The application of chemicals is used to effectively manage undesirable plants, such as exotic, noxious weeds. Use of chemicals on the refuge follows required guidance and policy with an approved integrated pest management plan and with annual pesticide use proposals that provide specific guidance on the use of herbicides.

3.4 Human History and Cultural Resources

This section describes what is known about the human history and cultural resources of the refuge.

Prehistoric Resources

Available archaeological studies used certain methods to date artifacts that suggest native people first occupied the south-central Kansas region 10,000 to 12,000 years before the present (Buller 1976). These people had a highly mobile lifestyle that depended largely on big game hunting. About 9,000 years before the present, regional patterns of human use began to change in response to regional climate fluctuations and increasing populations of people. Archaeological evidence suggests that these changes included more localized, less mobile, population centers and a greater diversity of tools.

Prehistoric Occupation

Certain dating methods suggest that by about 3,000 years before the present, larger campsites that

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 65 of 144

received repeated use occurred along floodplains of the Arkansas River and, presumably, Rattlesnake Creek. Inhabitants of the area collected wild plants, hunted large and small animals, and created chipped and ground tools. Human populations in south-central Kansas continued to increase and, by about 2,000 years before the present, small villages were established, and there is evidence that early agriculture was present along some waterways.

Protohistoric and Historic Native Americans

When the Spanish explorer Don Francisco Vasquez de Coronado reached the region in 1541, several Native American groups were present in central Kansas, including the Pawnee, Wichita, Plains Apache, Kansa, Kiowa, and Osage (Grajeda 1976, Wedel 1942). Throughout recorded early history, native people were attracted to the Quivira Refuge region because of the presence of salt, camp sites on higher elevation sandhills and uplands, and abundant wildlife. Although many tribes moved in and out of the region, the influx of European settlers was prevalent by the mid-1800s and, by the late 1870s, most tribes had been relocated to Oklahoma.

Historic Euro-Americans

The Spanish word "Quivira" is a form of the Native American name "Kirikuru," which is what local people called themselves when Coronado visited the region in search of the fabled Seven Cities of Cibola. After following the course of what is now the Arkansas River into the central Great Plains, the Coronado expedition spent several months encamped with the native peoples in a semipermanent village. The precise location of this village is not known, but it is believed to be northeast of the present-day Quivira Refuge. Thereafter, only a few trappers and



Library of Congress

A member of the Wichita Tribe posing for famed photographer Edward S. Curtis sometime around 1927.

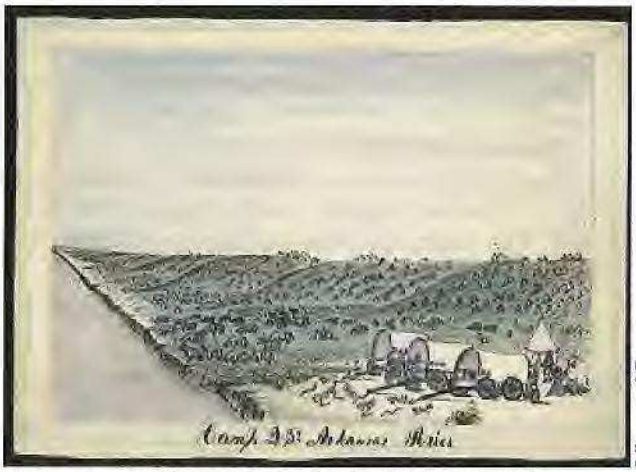
Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 66 of 144

explorers visited the area until the mid-1800s (Dolin 2010).

The first European definitively known to visit the Great Bend region of Kansas after Coronado was the French explorer Etienne de Bourgmont in 1724. Western explorers and fur trapping expeditions traveled through the Great Bend region in the mid- and late 1800s, and the Santa Fe Trail was established within 12 miles of the current refuge boundary (Cutler 1883, Blackmar 2002).

From May through July 1843, Captain Nathan Boone led an expedition of Army dragoons from Fort Gibson, Oklahoma. The route looped through south-central Kansas, and mentioned several prominent landmarks, including Salt Creek, a large salt lake, and the Arkansas River. Boone's journal provides a decent glimpse of the landscape from that period, including descriptions of the area both near, and within, present-day Quivira Refuge, including the following excerpts:

- June 10th: "after travelling 5 miles S.W. came to the Arkansas river at a point where for miles up and down, not a tree was growing." The crossing is believed to be near present-day Alden.
- June 11th: "Their first 4 miles were through Sand hills or drifting sand and in one place, a lake near a mile long of salt water." This is thought to be the BSM.
- June 11th: "Near 200 elk seen within 10 miles of camp and plenty of buffalo S.W. within 5 miles beyond a range of sand hills." The location of this camp is estimated to be directly north of present-day Quivira Refuge along the Arkansas River.
- June 22nd: "Started at 7 A.M. and marched 15 miles S. 3o W. and en-camped on open prairie on the head of the Creek, supposed to be the creek [a branch of present-day Rattlesnake Creek] on which we encamped on the 4th of June. No timber in sight since we left the river. Saw some buffalo, and passed some of the largest buffalo roads bearing to the E.S.E. probably to the salt in that region."



Library of Congress

A drawing by Daniel A. Jenks depicts his party's encampment on the Arkansas River in 1859 near present-day Great Bend, Kansas.

Santa Fe Railroad explored and documented a wide swath across Kansas, describing every other section of land along their route. Detail can often be found in the journals, field notes, and maps from both surveys. Below are excerpts from the Railroad Survey:

- April, 1872; section 33, T21S, R11W [For all but the S.E. 1/4, this is the BSM.] "embraces an area of some five Sec and has the appearance of a shallow lakebed—the top soil all being gone makes it about a foot lower than the adjacent land—Its surface to the subsoil is a light or whitish color and seems to be impregnated with alkali."
- Section 17, T22S, R11W [Entire section, 2 miles west of what is now the Migrants Mile area] "All pure sand without any vegetation. All hills and hollows. Constantly drifting. Worthless." It is important to note that, for the survey, land was being evaluated for farming, grazing, or other uses.
- E 1/2, section 13, T22S, R11W [Just southeast of present-day Migrants Mile]. "Dog village over most of both quarters."
- E 1/2, section 1, T23, R11W [East half of the section on which the present-day headquarters is located] "Surface mostly covered with drifting sand. In some small basins, good grass is found."

History

The General Land Survey was conducted in this region in 1871. The following year, surveyors for the

The first European settlement in Stafford County occurred in the 1860s, and, by 1876, a few people located near the BSM on Quivira Refuge (Cutler 1883, Ogle and Company 1904, Steele 1953). A company was organized for the purpose of manufactur-

ing salt, which was soon found to be unprofitable, and the homesteaders began using the marshes and adjacent grasslands for pasture, hayland, and cattle production (Sheridan 1956). The artesian wells, seeps, and springs near the BSM were relished by people in the area and believed to have health benefits. Early settler accounts from the region commonly speak of the abundance and desirability of wild haylands next to the BSM basin (Hay 1890). By the early 1900s, some upland areas at Quivira Refuge had been converted to small grain agriculture and some native prairies were modified with the introduction of nonnative species.

Besides agriculture expansion in the Quivira Refuge area, the saltmarshes were used for commercial and recreational waterfowl hunting after the turn of the 20th century. Private hunting clubs, including the Hutchinson Gun and Hunting Club, Stafford Gun Club, Ellinwood Club, Park Smith Club and the McGuire Club either owned or leased much of the marsh lands, and, in the late 1920s or early 1930s, they dug a permanent ditch to connect, and divert, water from Rattlesnake Creek to the LSM. Other wetland areas along Rattlesnake Creek were also partly impounded by hunting clubs with small dikes and ditches, such as the 16-acre Darrynane Lake (Unit 24) impoundment.

By the 1930s, many upland areas on, and next to, Quivira Refuge had been converted to cropland and pasture. By 1954, about 4,266 acres of what is now Quivira Refuge were in agricultural production (figure 9).



Library of Congress

George Spangerberger's Privy



Library of Congress

This barn is on George Spangerberger's farmstead located in South Hutchison, Kansas.

3.5 Special Management Areas

We established the Santana Research Natural Area on Quivira Refuge in 1967 to preserve 347 acres of native bluestem prairie—classified as K–74, Bluestem Prairie—which includes 15 acres of a century-old cottonwood timber claim. Research natural areas are intended to represent the full array of North American ecosystems with their biological communities, habitats, natural phenomena, and geological and hydrological formations. As with designated Wilderness Areas, natural processes are allowed to predominate without human intervention.

Under certain circumstances, deliberate manipulation may be used to support the unique features for which a research natural area was established. This is the case with Santana Research Natural Area, as the 1984 management plan for the area described a current and future need to control woody vegetation, specifically listing cottonwood, black willow, Russian olive, sand plum, dogwood, and skunkbush as potential invading species. Our activities to support the habitat and biological communities here include prescribed fire, grazing, mowing, and cutting woody plants to prevent their spread.

Activities such as hiking, birdwatching, hunting, fishing, wildlife observation, and photography are permissible, but not mandated, in research natural areas. These special areas also may be closed to all public use if such use is found to be incompatible with primary refuge purposes. The Santana Research Natural Area on Quivira Refuge is open to the public but is not within the hunting area, and no fishing opportunities are available. Because our intent is to not alter or disrupt the characteristic bluestem grasslands found here, no trails or facilities have been, or will be, established in the area.

3.6 Visitor Services

Visitors can enjoy a variety of wildlife-dependent activities, such as hunting, fishing, wildlife observation, photography, environmental education, and interpretation. Most who come use the 14-mile auto tour route. Brochures containing area maps, public use regulations, bird species, and general information are available. Our refuge office is open Monday–Friday, 7:30 a.m.–4:00 p.m. The auto tour route and the rest of the refuge are open from 1 and one-half hours before dawn to 1 and one-half hours after dusk, except during hunting season when hunters are allowed a reasonable amount of time to access hunting areas before dawn and to leave after dusk.

No fees or registration are required for visiting the refuge. There are many access roads, and several county and township roads pass through the refuge. Therefore, attempts to estimate visitation present a challenge for our refuge staff. Visitors are asked to sign the guest register at the headquarters visitor center, but registration is not mandatory. Nonhunting use is estimated each year based on the guest register, head counts of education and interpretation groups, and estimates of visitors on the tour route during various seasons. Current annual visitation is estimated to be 65,000.

Visitors also make use of educational and interpretive activities in the classrooms and auditorium at the GPNC's large visitor center building as well as on the adjacent grounds.

Traditional tribal uses are also allowed on the refuge with a special use permit.

Hunting

Currently, about 8,062 of the refuge's 22,135 acres are within the hunting area. Hunting is permitted for ducks, geese, quail, pheasant, squirrel, rabbit, snipe, and rail. Hunting is not allowed for deer, turkey, or cranes. Hunting season runs from September 1 to February 28, with specific seasons within this period coinciding with State seasons. An accessible hunting blind is available by reservation in Unit 30.

Hunting rules, such as licensing needs and daily possession limits, follow applicable Federal and State regulations. Refuge-specific regulations include:

- Persons possessing, transporting, or carrying firearms on national wildlife refuge lands must comply with all provisions of State and local law. Persons may only use, or discharge, firearms in accordance with refuge regulations—50 CFR 27.42 and specific refuge regulations in 50 CFR Part 32. Discharge of a firearm is prohibited for any reason other than for the taking of game animals in legal hunting areas.

- Hunting is not permitted outside of the public hunting areas or from across roads, trails, or parking areas.

- Vehicle travel and parking is restricted to roads, pullouts, and parking areas.

- Steel shot, bismuth, or other nontoxic shot is required in all gauges when hunting any game on the refuge. The possession of lead shot in the field is prohibited.

- Trapping and baiting are prohibited.
- Retrieving game from areas closed to hunting is prohibited.
- The use of dogs for hunting and retrieving is encouraged. Dogs and other pets must be under their owners' control. From March 1 through August 31, all dogs and other pets must be leashed.
- Portable devices or temporary blinds of natural vegetation are permitted, though we encourage preventing the spread of nonnative invasive vegetation. Permanent blinds or pits may not be constructed. All equipment and blinds must be removed daily.

Many lands next to, or near, the refuge boundary are leased for private hunting. Thus, hunting activities are quite prevalent in the area.

Hunting on the refuge will expand and change as a result of this CCP, see chapter 4 for details.

Fishing

Fishing is allowed on all refuge waters in accordance with State fishing regulations, however, access is generally restricted to the LSM, the Kids' Fishing Pond, and a few points on Rattlesnake Creek. Accessible fishing piers are located at the north end of the LSM and at the Kids' Fishing Pond. The Kids' Fishing Pond is open for kids up to 14 years, although adults may fish there if they are accompanying a youth. Only one fish may be taken per person per day.

Fish species listed in the State fishing regulations may be taken. All other wildlife species, including turtles, frogs, and snakes are protected and may not be disturbed or removed from the refuge. Fishing with trotlines and setlines is prohibited. The use of seines for taking bait is not permitted. Fishing from water control structures and bridges, and the use of live bait is prohibited.

Fishing is also allowed at Chisholm Creek Park near the GPNC, managed and maintained by the City of Wichita.

Wildlife Observation and Photography

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.

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.

The 40-plus miles of public roads within, or alongside, refuge boundaries include a 14-mile tour road that features a 4-mile Wildlife Drive through the BSM. There is an accessible observation tower, equipped with a spotting scope and seating, at the LSM, and a similar scope and seating are located at a viewpoint along the Wildlife Drive. Photo blinds, available on a first-come, first-served basis, are located at the LSM and on the Migrants Mile Trail. Horseback riding and bicycling on established roads, not hiking trails, are also allowed along with dogs that are under their owner's control and that are leashed during the nesting season of April 1 to August 15.

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.

Environmental Education

Whereas general school field trips formed most school visits in the past, educational programs have been increasingly focused on topics that help schools and other educational organizations by matching State curriculum-based standards. Several curricula have been developed and used for topics such as bird migration, prairie studies, animal communication, and shorebirds. New curricula are continually under development to offer a variety of subjects to a wider spectrum of grade levels.

Programs are presented either at the refuge or at schools. For onsite visits, Quivira opened a remodeled and modernized environmental education classroom in 2010 to better accommodate and focus on children's education. The facility, designed to hold a class of up to 45 persons, has built-in audiovisual equipment and a large variety of classroom supplies. It serves as the refuge's primary indoor class space, but also as a center for outdoor education activities associated with the nearby Migrants Mile Trail. As an alternate, or added, educational space, the headquarters' conference room, is occasionally used. Virtual geocaching is also allowed to enhance environmental education on the refuge.



© Mitch Werner

The Butterfly Blossoms Pathway native prairie wildflower interpretive trail at Quivira Refuge was made possible through a partnership with The Friends of Quivira.

The emphasis at the GPNC is on providing an opportunity for people of all ages to learn about the natural resources of the Great Plains, to develop an appreciation of the beauty and value of this region, and to become stewards of the natural resources. Environmental education, a learning process that increases knowledge and awareness about the environment and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action, is one tool used with school groups to achieve our stated goals. On average, the GPNC's staff conducts nearly 1,800 presentations and programs to school groups; community organizations, such as civic, church, and Scouting groups; organized recreation groups from places like city recreation centers and day camps for latchkey children; and casual visitors. Staff provides educational programs both on, and off, site; and programs are conducted year round. With a variety of wildlife available for their use under permit, staff is able to use live animals to help make connections with their audiences.

Interpretation

We lack a current refuge visitor services plan and a primary interpretive theme to provide guidance for our refuge management and staff. However, interpretation has been a vital part of Quivira Refuge's operations for many years. Primary themes have included birds and bird migration, refuge management, fire management, and endangered species. The primary method to present interpretive information to the public is via displays and signs, programs and workshops, brochures, and by Web and other social media. Interpretive displays are available at the headquarters. Topics in permanent displays include bird migration, saltmarshes, Quivira Refuge area history, endangered species, and refuge habitats. Other displays, either temporary or permanent, are added to augment knowledge about our refuge management, flora, and fauna. Displays are also present along the refuge tour road. Nine information kiosks are situated along the route, with maps and information about refuge habitats and hunting. The tour road also features eight different wayside exhibits featuring refuge wildlife and management activities. In addition, the Migrants Mile Trail, Quivira Refuge's premier hiking trail, has many interpretive signs along its length featuring wildlife and wildlife habitat.

Our refuge staff presents interpretive programs and workshops whenever possible, either by request or by scheduling through area schools or community organizations; see the outreach section in this chapter for more details. These are topic-oriented talks, slide shows, or guided walks and auto tours.

Both our refuge-general brochure and our bird checklist were revised and reprinted in 2011. Brochures about other topics, such as whooping cranes, common wildlife, and grasses have also been devel-

oped and printed. Our headquarters also has a rack featuring brochures of other nearby sites of interest, as well as other Service topics.

Quivira Refuge's Web site, in the content management system as of 2012, has long been popular as a source of information. Quivira Refuge was one of the first sites in the content management system. The current Web site has become diverse and detailed, offering interpretive information about subjects such as birds, mammals, reptiles and amphibians, and refuge habitats. Special features include separate pages dedicated to providing a variety of information about the endangered whooping crane, climate influences on refuge plants, and changes in the refuge environment throughout the year. Especially popular are the listings of recent bird observations and road conditions. During the most recently recorded period, March 2010 through February 2011, Quivira Refuge's Web site had 38,185 total visitors and 983,667 total visitor hits. Also during this period, there was an average of 107 visitors to the Web site per day.

In 2011, Quivira Refuge also began using Facebook and Flickr to showcase refuge wildlife, wildlife management, and current happenings; see the outreach section in this chapter for more detail.

Other Uses

Quivira has more than 2 miles of supported hiking trails, including the mile-long Migrants Mile Trail, which is a popular destination. Other activities that have been found to be compatible with the priorities of the refuge include bicycling and horseback riding only on established roads and, depending on the time of the year, bringing dogs on leashes. A national and well-publicized bicycling route passes through the center of the refuge on NE. 140th Street.

Activities that are prohibited on the refuge because of conflicts with wildlife include camping, boating, picnicking, canoeing, fires, the use of all-terrain vehicles, and the collecting of plant, animal, mineral, or any other natural materials.

See appendix B for more details.

Special Events

Annual events, such as Kids' Fishing Day in June, Monarch Mania in September, and Refuge Week Celebration in October, are held by refuge staff with the support of The Friends of Quivira. The Friends of Quivira and Friends of the Great Plains Nature Center are reciprocal partners and, as such, support each other's special events as needed and as time permits.

Public Outreach

Our mission—that of the Refuge System and Quivira Refuge—is an important focus topic for the refuge's environmental and interpretive programs and is also a priority for all outreach activities. It is a goal for all programs to include at least basic information on these missions. Programs that focus on refuge management are regularly given to area communities through civic organizations, churches, public libraries, and schools. Other than these programs, the primary outlets for outreach include the Kansas State Fair, refuge special events, and the Web and other social, or online, media.

Quivira Refuge is the lead partner in the operation of our booth at the annual Kansas State Fair in nearby Hutchinson, Kansas. The primary purpose of the booth is to teach others about our mission, to showcase Kansas refuges, and to educate about various wildlife-oriented topics and programs, our Ecological Services Division, Partners for Fish and Wildlife (Partners), and other operations. Our staff from Quivira Refuge and other offices in the State are on hand to help and educate fair visitors during the 10-day event.

Several special events are held annually, all in partnership with the Friends of Quivira. Some, such as Kids' Fishing Day in June and Monarch Mania in September, each have their own recurring annual themes, such as fish for the fishing day and butterflies for the monarch day, and often involve a combination of activities, education, and, in some cases, refreshments for the participants. Others, such as the Great Migration Rally in May and the Refuge Week Celebration in October, feature topics and activities that vary each year.

Quivira Refuge's Web site, updated several times a week, is also an important outlet for public information about the refuge's mission and objectives. Regular features include new happenings around the refuge, such as improvements, construction, and management; road conditions; schedules for special events; and bird observations. The Web site also has hunting and fishing regulations and bird count tallies. Refuge staff also regularly reports similar information on its official Facebook site, which is updated several times a week. Unusual bird observations, whooping crane sightings, and road conditions are also posted on the Kansas Listserv, used by many birders statewide.

3.7 Partnerships

Quivira Refuge and the GPNC collaborate with educational, regulatory, and research institutions that support refuge goals and objectives. Our refuge has formal and informal partnerships with Fort Hays State University, Sterling College, Kansas State University, Emporia State University, Friends University, Wichita State University, and others to work on research and educational projects. These working relationships involve, among other things, offering summer classes for educators to obtain continuing education credits, offering board memberships for the GPNC, and offering students working opportunities through AmeriCorps or internships.

The refuge is part of the Rattlesnake Creek Partnership, which seeks to resolve water rights issues in Groundwater Management District 5. The refuge partners with the KDWPT on a variety of wildlife-related projects, including avian influenza surveillance, chronic wasting disease and deer health programs, fish stocking, breeding shorebird surveys, and educational and interpretive programs. Quivira Refuge is a member of the Wetlands and Wildlife National Scenic Byway's planning committee, and Quivira staff regularly attends planning meetings about the Byway and the local Byway communities.

Partnerships with Ducks Unlimited over the years have resulted in many habitat improvement projects on the refuge, and these will continue.

Quivira Refuge staff partners with the Friends of Quivira to plan and present educational programs and annual events. The Friends of Quivira operate a nonprofit bookstore in the refuge visitor center.



Barry Jones/FWS

School kids from the local community learn about issues affecting the wildlife in their area at the Stafford County, Kansas, Conservation Day.

The GPNC operates under a memorandum of agreement with the City of Wichita and the KDWPT. Together, they have partnerships with many corporate sponsors like The Coleman Company, Koch, and Spirit AeroSystems and with educational institutions like Wichita State University and Friends University. This partnership also often works informally with other universities and colleges to provide work experience for interns when available.

The GPNC is supported by the Friends of the Great Plains Nature Center, who operate a bookstore in the nature center, support educational programming at the nature center, and provide pay for six employees, including a full-time naturalist who presents environmental education programs in schools and locations throughout the Wichita metropolitan area. The Friends of the Great Plains Nature Center naturalist helps in educational programming for both the GPNC and Quivira Refuge.

The refuge and the GPNC are always open to establishing new partnerships where possible that help wildlife and habitat conservation. The refuge is looking to establish a partnership to control invasive species in the Rattlesnake Creek watershed, such as saltcedar, and a partnership with neighbors to prevent the continued encroachment of invasive woody species, such as eastern red cedar and Russian olive.

With the addition of a Partners biologist to the staff at Quivira Refuge and a new focus area that is comprised of Quivira Refuge and Cheyenne Bottoms, new partnerships should continue to be developed.

3.8 Socioeconomic Environment

Quivira Refuge is open for the compatible, wildlife-dependent uses of hunting, fishing, wildlife observation, and photography. These recreational opportunities attract visitors and bring dollars to the community. Associated visitor activity, such as spending on food, gasoline, and overnight lodging in the area, provides local businesses with extra income and increases the local tax base. Our refuge management decisions about public uses, the expansion of services, and habitat improvement may either increase or decrease visitation to the refuge and affect visitor spending in the local economy.

As part of the development of this CCP, we hired a contractor to prepare a socioeconomic study for the Quivira Refuge (USGS 2012c). This study provides the basis for the sections that follow, including population and employment, public use of the refuge, and baseline economic activity.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 73 of 144

For the purposes of an economic impact analysis, a region (and its economy) is typically defined as all counties within a 30–60 mile radius of the impact area. Only spending that takes place within this regional area is included as stimulating changes in economic activity. The size of the region influences both the amount of spending captured and the multiplier effects. Quivira Refuge is located in south-central Kansas. Most of the economic activity related to the refuge is located within the five-county area of Stafford, Rice, Reno, Barton and Pratt Counties, therefore, these counties compose the local economic region for this analysis. The Refuge is also a partner in the establishment and daily operations of the GPNC located 90 miles from the refuge. While the GPNC lies outside the local economic region, connections with refuge activities will be discussed.

Collectively, the 5-county area has a population of approximately 116,000 people and covers a total area of 4,431 square miles (U.S. Census Bureau 2010). Within the five-county area, the cities of Ellinwood, Great Bend, Hutchinson, Larned, Lyons, Pratt, Stafford, Sterling and St. John are economically significant to the refuge and, as such, are additional areas of focus for the regional economic setting.

Population, Ethnicity, and Education

Table 9 lists population estimates and trends for the 5-county area and table 10 lists population estimates for the nine communities near the refuge. In 2010, the counties accounted for approximately 4 percent of the State's population (U.S. Census Bureau 2010). While Kansas has experienced an increase in the number of residents since 2000, 4 of the counties have experienced a decline in residents, with only Pratt showing a slight, 0.1-percent increase (U. S. Census Bureau 2010a). Ellinwood, Larned, Sterling and St. John have experienced declining populations, with St. John showing the greatest decline, losing more than 20 percent of its population since 2000.

Though Kansas is expected to grow in population, population decline is expected to continue in all five of the counties surrounding the refuge (The University of Kansas Institute for Policy and Social Research 2012). Barton and Stafford are expected to show the greatest decline, losing more than 20 percent of their populations by 2040, while Pratt is expected to show the least decline, with an expected loss of 9 percent. The overall decline in population may be due to an aging population as well as to migration to more urban areas. This trend can be observed across many of the rural counties in Kansas (Wichita State University 2011).

Table 9. State and county population estimates in the area around Quivira National Wildlife Refuge, Kansas.

	Residents (2010)[1]	*Persons per square mile (2010)*[1]	*Percent population change (2000–2010)*[2]
Kansas	2,853,118	34.9	6.8
Barton	27,674	30.9	–1.9
Pratt	9,656	13.1	0.1
Reno	64,511	51.4	–0.4
Rice	10,083	13.9	–6.3
Stafford	4,437	5.6	–7.4

Source: [1]U. S. Census Bureau 2012b. [2]U. S. Census Bureau 2010a.

Table 10. Community population estimates in the area around Quivira National Wildlife Refuge, Kansas.

	Residents (2010)[1]	*Persons per square mile (2010)*[1]	*Percent population change (2000–2010)*[2]
Ellinwood	2,131	1,966	–1.5
Great Bend	15,995	1,505	4.2
Hutchinson	42,080	1,994	3.2
Larned	4,054	1,745	–4.3
Lyons	3,739	1,736	0.2
Pratt	6,835	922	4.0
Stafford	1,159	1,233	7.8
Sterling	2,328	1,640	–11.9
St. John	1,036	575	–20.7

Source: [1]U. S. Census Bureau 2012b. [2]U. S. Census Bureau 2010a.

While the percentage of the State population with at least a bachelor's degree is higher than the national average (29.3 percent compared to 27.9 percent), each county within the 5-county area has lower than both the State and national averages (ranging from a low of 18.8 percent in Reno to a high of 22.7 percent in Pratt). Each of the nine communities surrounding the refuge also fall below State and national averages, with Stafford and Lyons having the lowest (13.2 percent) (U. S. Census Bureau 2010a).

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 74 of 144

In 2010, more than 87 percent of the population of Kansas self-identified as white, not of Hispanic or Latino origin (U. S. Census Bureau 2010a). This percent is lower than reported for each of the counties within the 5-county area (ranging from a low of 90.6 percent in Barton County to a high of 96 percent in Pratt County). Relative to the other counties in the 5-county area, Barton County had the largest percentage of the population who identified as Hispanic or Latino (13.3 percent) (U. S. Census Bureau 2012b) while Reno County had the highest percentage of the population who identified as African-American (4.1 percent) (U. S. Census Bureau 2012b).

Regional Economic Setting

Table 11 shows the median household income, poverty, and unemployment rates for the 5-county area, while table 12 lists the same for communities near the refuge. The five counties and nine communities have median household incomes below both State and national levels. Of the counties, Barton had the highest median household income at $43,763 per year, while Stafford had the lowest at $39,375. Of the communities, Great Bend had the highest median household income at $42,293 per year, while Stafford had the lowest at $33,182 (U. S. Census Bureau 2010a).

In 2010, 12.4 percent of the Kansas population was living below the poverty line, compared to 13.8 percent nationally. Poverty rates within the 5-county area are similar to State and national averages, with Pratt having the lowest rate (10 percent) and Stafford having the highest (14 percent). The communities near the refuge show substantial variability, from 6.7 percent in Larned to nearly 20 percent in St. John (U. S. Census Bureau 2010a).

Table 13 shows the percent employment by sector within the 5-county area. The combined 5-county area had a total employment of more than 73,000 individuals in 2011 (Bureau of Economic Analysis 2012). Farm employment accounted for nearly 6 percent of the workforce. The highest percentage of total

Table 11. State income, unemployment, and poverty statistics and county statistics in the area around Quivira National Wildlife Refuge, Kansas.

	Median household income (2010)	*Percentage of individuals below poverty (2010)*	*Percentage unemployed (2010)*	*Change in percent unemployed (2000–2010)*
Kansas	$49,424	12.4	4.1	1.3
Barton	$43,763	12.2	3.6	0.1
Pratt	$43,583	10.0	2.2	–0.8
Reno	$41,431	13.1	3.0	0.1
Rice	$43,164	13.7	4.2	0.6
Stafford	$39,375	14.0	2.7	0.6

Source: U. S. Census Bureau 2010a.

Table 12. Community income, unemployment and poverty statistics in the area around Quivira National Wildlife Refuge, Kansas.

	Median household income (2010)	*Percentage of individuals below poverty (2010)*	*Percentage unemployed (2010)*	*Change in percent unemployed (2000–2010)*
Ellinwood	$39,444	7.7	3.0	0.9
Great Bend	$42,293	13.7	3.9	1.3
Hutchinson	$38,880	15.7	3.2	–0.3
Larned	$37,235	6.7	2.8	0.8
Lyons	$41,552	15.7	3.7	1.5
Pratt	$39,142	11.1	2.0	0.1
Stafford	$33,182	15.2	2.5	0.5
Sterling	$36,192	14.4	6.3	–2.1
St. John	$37,589	19.0	3.4	2.2

Source: U. S. Census Bureau 2010a.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 75 of 144

Table 13. Employment by sector in the area around Quivira National Wildlife Refuge, Kansas.

Industry	*2011*	*Percent of total*
Total employment	73,106	100
Wage and salary employment	54,353	74.3
Proprietors employment	18,753	25.7
Farm proprietors employment	3,365	4.6
Nonfarm proprietors employment	15,388	21.0
Farm employment	4,330	5.9
Private (nonfarm) employment	57,278	78.3
Forestry, fishing, and related activities	637	0.9
Mining	5,907	8.1
Utilities	124	0.2
Construction	3,362	4.6
Manufacturing	4,934	6.7
Wholesale trade	2,300	3.1
Retail trade	7,351	10.1
Transportation and warehousing	561	0.8
Information	828	1.1
Finance and insurance	3,354	4.6
Real estate and rental and leasing	1,628	2.2
Professional, scientific, and technical services	2,146	2.9
Management of companies and enterprises	671	0.9
Administrative and waste management services	2,731	3.7
Educational services	412	0.6
Health care and social assistance	8,406	11.5
Arts, entertainment, and recreation	867	1.2
Accommodation and food services	4,317	5.9
Other services, except public administration	3,483	4.8
Government and government enterprises	11,498	15.7
Federal, civilian	397	0.5
Military	502	0.7
State and local	10,599	14.5

Source: Bureau of Economic Analysis 2012.

employment was found in the government and government enterprise sector (15.7 percent of nonfarm employment). This sector includes both local and nonlocal government agencies. The second and third highest percentages of total employment were in health care and social assistance (11.5 percent) and retail trade (10.1 percent). Forestry, fishing, and related activities accounted for less than 1 percent of the total employment by sector.

Agricultural Sector

Kansas is a highly productive region in the United States for both crops and livestock. In 2011, Kansas had an agricultural output of more than $17 billion, with crop output contributing more than $6 billion, animal output contributing nearly $9 billion, and services and forestry contributing more than $2 billion. The top five commodities produced in the State were cattle and calves, corn, wheat, soybeans, and sorghum grain (Economic Research Service 2012).

As of the 2007 Census of Agriculture, the 5-county area was home to more than 4,000 farms, with more than 2.7 million acres in agricultural production. This accounted for more than 6.26 percent of the total land in production in the State (U. S. Department of Agriculture 2007). In 2007 within the 5-county area, Reno had the greatest number of farms and acreage in production (1,749 farms, and 780,893 acres). Pratt had the fewest number of farms (538) and Rice had the smallest acreage in production (428,422) (U.S. Department of Agriculture 2007).

Recreation and Tourism

Angling, hunting, and wildlife viewing are popular recreational activities across Kansas and within the five-county area. According to the recent 2011 National Survey of Fishing, Hunting and Wildlife-Associated Recreation, approximately 1.2 million residents and nonresidents took part in wildlife-associated activities in Kansas (FWS 2012a). Of all participants, 46 percent identified as sportsmen and women, engaging in either hunting or fishing, and 69 percent reported engaging in wildlife-watching activities. For the purpose of the National Survey, wildlife watching is broken down into away-from-home activities taking place at least 1 mile from home and around-the-home activities taking place within 1 mile from home. All visitors to the refuge that engage in wildlife watching are considered away-from-home participants. The number of hunting days by both residents and nonresidents totaled 5.2 million, with Kansas residents accounting for 78 percent of hunting days. The number of fishing days by residents and nonresidents totaled 4.1 million, with Kansas residents accounting for 98 percent of fishing days. In 2011, residents and nonresidents spent a

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 76 of 144

total of 1 million days watching wildlife away from home, with residents accounting for 77 percent of wildlife watching days. The in-state spending associated with these activities totaled $820 thousand in 2011, with $293 thousand spent on trip-related expenditures, $197 thousand spent on equipment, and $330 thousand spent for other items (FWS 2012a).

The Wetlands & Wildlife National Scenic Byway connects Cheyenne Bottoms Wildlife Area in Barton County to Quivira Refuge. Along this 77-mile stretch of road, visitors have the opportunity to view more than 300 bird species and visit the remains of the Santa Fe Trail, historic sites, museums, and natural sites. The byway also connects several cities. Claflin, Ellinwood, Great Bend, Hoisington, Hudson, St. John, and Stafford are all considered Byway Communities (Kansas Scenic Byways Program).

From 2009–2010, a visitor survey was conducted by Fort Hays State University's Kansas Wetlands Education Center. The survey found that day trips were the most popular trip length for visitors to the Wetlands & Wildlife National Scenic Byway, with trips 1–3 days in length being the second most popular. In general, day visitors spent under $100 within the local area, while visitors staying 1–3 days generally spent $100–$200. Most visitors to the area were Kansas residents. According to Barton County Counselor and Administrator, Richard Boeckman (personal interview, date unknown), several byway communities are collaborating to improve marketing and increase tourism in the area. He says the byway, refuge, and Cheyenne Bottoms are all considered important assets to the local economy.

Public Use of the Refuge

The USGS headed a National Wildlife Refuge Visitor Survey (USGS 2012a) at Quivira Refuge and several other refuges to tell us more about visitor use. Data in this report, outlined in the following sections, came from survey forms completed by visitors to Quivira Refuge during the selected sampling periods of fall 2010 and spring 2011.

According to the USGS (2012a), about half of visitors, or 47 percent, had only been to Quivira Refuge once in the 12-month survey period, while the other half, or 53 percent, had been there multiple times. These repeat visitors went to the refuge an average of 7 times during the 12-month period. Fifty nine percent of visitors used the refuge during only one season, 28 percent used it during multiple seasons, and 13 percent used it year round.

Most visitors, 64 percent, first learned about the refuge from friends or relatives, 21 percent from printed information, and 18 percent from highway signs. Key information sources used by visitors to find their way to the refuge included highway signs, by 54 percent; earlier knowledge, by 46 percent; and a road atlas or highway map, by 44 percent.

Twenty-five percent of visitors live in the local area, which is within 50 miles of the refuge, whereas 75 percent are nonlocal visitors (USGS 2012a). For 79 percent of local visitors and for 59 percent of nonlocal visitors, Quivira Refuge was the primary purpose, or sole destination, of their trip. Local visitors reported that they traveled an average of 32 miles to get to the refuge, while nonlocal visitors traveled an average of 319 miles. About 60 percent of visitors travelling to Quivira Refuge were from Kansas.

Nearly all, or 99 percent of, visitors to Quivira Refuge said that they were citizens or permanent residents of the United States (USGS 2012a). Visitors were 62 percent male, with an average age of 57 years, and 38 percent female, with an average age of 59 years. On average, visitors reported they had 16 years of formal education, college or technical school. The median level of income was $50,000–$74,999.

Visitors reported that they spent an average of 5 hours at Quivira Refuge during 1 day there (USGS 2012a). However, the most frequently reported length of visit during 1 day was 8 hours, as reported by 31 percent of respondents. The key modes of transportation used by visitors to travel around the refuge were private vehicle, by 93 percent of respondents, and walking or hiking, by 11 percent. More than half of visitors, or 69 percent, said that they were part of a group on their visit to the refuge, often travelling with family and friends.

According to the USGS, visitors took part in a variety of refuge activities during the survey period (USGS 2012a). The top activities reported were birdwatching, by 77 percent of respondents; wildlife observation, by 70 percent; auto tour route or driving, by 53 percent; and photography, by 51 percent. The primary reasons mentioned for their most recent visit included birdwatching, by 52 percent of respondents; hunting, by 18 percent; photography, by 10 percent; and wildlife observation, by 9 percent. The visitor center was used by 70 percent of visitors, mostly to ask information of staff or volunteers, by 91 percent of this group; or to view the exhibits, by 82 percent; or to use the facilities, by 75 percent.

Visitor Levels

Of those who visited Quivira Refuge and took part in the USGS's National Wildlife Refuge Visitor Survey, overall satisfaction with the services, facilities, and recreational opportunities we provided were rated as follows (Sexton et al. 2012):

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 77 of 144



© Mitch Werner

Painted turtles are easily viewed at Quivira Refuge.

- Ninety-two percent were satisfied with the recreational activities and opportunities.
- Ninety-one percent were satisfied with the information and education provided about the refuge and its resources.
- Ninety-three percent were satisfied with the services provided by employees or volunteers.
- Ninety-three percent were satisfied with the refuge's job of conserving fish, wildlife and their habitats.

Satisfaction levels were divided into quadrants. All Quivira Refuge services and facilities fell into the Keep Up the Good Work quadrant (Sexton et al. 2012). Refuge recreational opportunities fell into Keep Up the Good Work except for volunteer, kayak and canoe, bicycling, fishing, and hunting, which fell into the Look Closer quadrant. The average importance of fishing, hunting, bicycling, and volunteer opportunities in Look Closer may be higher among visitors who engaged in these activities during the past 12 months. However, there were either not enough people in the sample to evaluate such responses or it is unknown how many in the sample took part in an activity. Boating is not allowed on the refuge, which may explain the low importance rating for kayaking and canoeing. All transportation-related features fell into Keep Up the Good Work.

Economic Contributions of the Refuge

Quivira Refuge affects the local economy through the visitor spending it generates and the employment it supports. Combining the effects of our employment and visitor spending, the total economic activity generated in the 5-county study area is approximately $1.015 million in added value.

U.S. Fish and Wildlife Service Employment

Refuge management activities directly related to refuge operations generate an estimated 20 jobs and $667,500 in labor income. It is estimated that salary spending by Quivira Refuge staff generates secondary effects of 5 jobs, $168,600 in labor income, and $301,700 in value added to the local economy.

Visitor Spending

A region, and its economy, is typically defined as all counties within 50 miles of a travel destination (Stynes 1998). Visitors that live within the local, 50-mile area of a refuge typically have different spending patterns than those who travel from longer distances. Approximately 25 percent of visitors to Quivira Refuge said that they live within the local area. Nonlocal visitors, or 75 percent, stayed in the local area, on average, for 2 days. Table 14 shows local and nonlocal visitor expenditures reported on a per-person-per-day basis. Nonlocal visitors spent an average of $55 per person per day, and local visitors spent an average of $45.

3.9 Operations

This section describes funding, staff and facilities at Quivira Refuge.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 78 of 144

Table 14. Total visitor expenditures, expressed in dollars per person per day, for Quivira National Wildlife Refuge, Kansas.

Visitors	*Sample size*	*Median*	*Mean*	*Standard deviation*	*Minimum*	*Maximum*
Nonlocal	100	$42	$55	$57	$0	$313
Local	30	$29	$45	$55	$0	$250

Funding and Staff

Refuge staff is comprised of 11 permanent full-time employees, 1 permanent part-time employee, 3 temporary employees, and 2 regional employees that are not paid through the refuge (table 15). The current staff level remains well below the minimum prescribed in the June 2008 Final Report—Staffing Model for Field Stations (FWS 2008b), which recommends that eight more staff, including three maintenance workers, one biologist, two biological technicians, one refuge law enforcement officer, and one GPNC visitor services specialist be added.

Table 15. Base staff budgeted in fiscal year 2012 and other staff stationed at Quivira National Wildlife Refuge, Kansas.

Staff group	*Position*
Current staff	
management	General Schedule–13 refuge manager General Schedule–12 deputy refuge manager and collateral duty law enforcement officer (vacant) General Schedule–9 wildlife refuge specialist and collateral duty law enforcement officer General Schedule–11 zone fire management officer General Schedule–7 supervisory range technician (vacant)
biology	General Schedule–11 wildlife biologist
public use	General Schedule–12 park ranger—visitor services manager at the GPNC General Schedule–9 park ranger for visitor services
administration	General Schedule–9 administrative officer General Schedule–5 office assistant, 0.5 full-time equivalent
maintenance	Two Wage Grade Schedule–8 maintenance workers
maintenance, temporary or term	Two Wage Grade Schedule–6 tractor operators, career seasonal, 6 months General Schedule–5 range technician for invasive species control, term position
Current staff stationed at, but not paid by, Quivira Refuge	
biology	Zone biologist Partners biologist

Facilities

Facilities are used to support habitat and wildlife management programs and wildlife-dependent public uses for 65,000 annual visitors. The refuge has two full-time maintenance workers and two part-time tractor operators to support buildings, water conveyance structures, fences, and roads.

Facilities have been regularly updated over the years. The refuge headquarters was built in 1964 and a visitor center with a conference room was added in 1992. In 2011, these facilities were remodeled, and space was developed for seven more offices. The shop was built in 1979 and has been kept in good condition. Two residences were built in 1964 to provide housing for refuge employees at the headquarters and shop area and have been kept in good condition.

Half of the original block building office built in 1958 houses an environmental education classroom. The other half of the building is a bunkhouse that can house six seasonal employees or volunteers. The building is in poor condition and would be difficult to remodel or improve because of its construction.

We received a three-bedroom trailer as unused excess from the Federal Emergency Management Agency in 2009 and placed it at the environmental education classroom site. It is in good condition. There are two cold storage buildings, one eight-bay building was built in 1991 and a four-bay equipment storage building was built in 2005. Two full-hookup trailer pads are also available at the environmental education classroom site for use by volunteers. A new, concrete, accessible, aboveground tornado shelter was placed there in 2010.

We own 7 acres of land at the GPNC and a 23,000-square foot visitor center and office building that was built in 1995 and is in good condition. We will also own a garage and storage building on the site pending official transfer. Remaining land there is owned by the city of Wichita, including parking lots, Chisholm Creek Park, and associated trails.

Quivira Refuge's public use facilities are shown in figure 11. More than 45 miles of public roads exist either within, or next to, the refuge's boundaries. Of these, 16.8 miles are refuge owned. The refuge maintains 55 public parking lots, ranging from being graveled to grass surfaced.

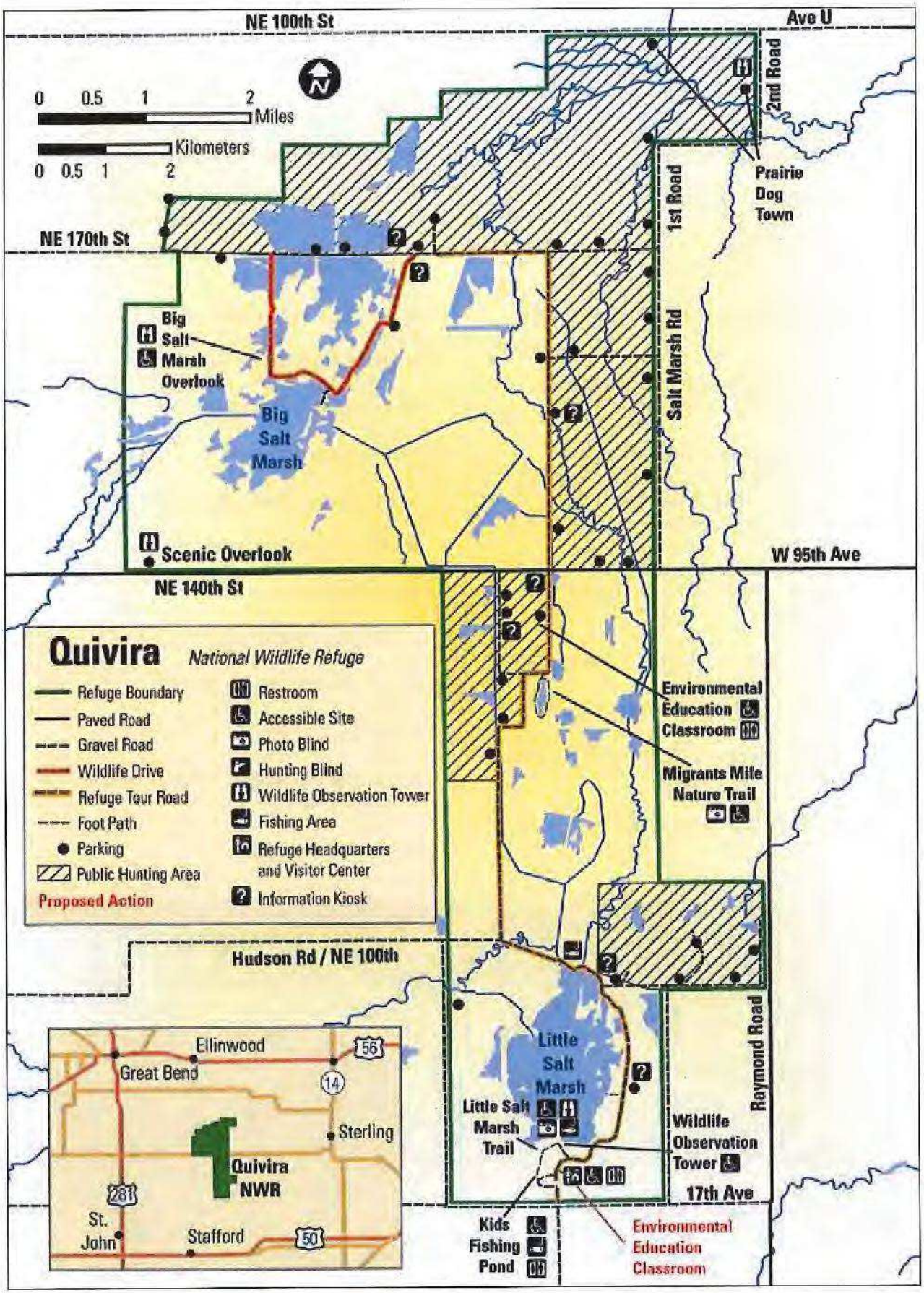


Figure 11. Public use facilities at Quivira National Wildlife Refuge, Kansas.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 80 of 144

Refuge facilities include:

- headquarters office and visitor center building, 6,720 square feet
- maintenance shop, fire cache, and vehicle storage building, 9,200 square feet
- two 176-square foot grain bins
- eight-bay cold storage building, 6,750 square feet
- four-bay equipment storage building, 3,600 square feet
- environmental education classroom and bunkhouse, 1,900 square feet
- two 2002-square foot, three-bedroom houses for staff, with one stall, attached garage and one 400-square foot stall, detached garage for each
- oil storage building with 3 associated 1000-gallon, aboveground fuel tanks, 180 square feet
- pesticide storage building, 140 square feet
- fencing storage shed, 576 square feet
- two metal, 192-square foot pump houses for the domestic water supply
- pole shed building, 2,160 square feet
- storage building, 192 square feet
- asphalt hiking trail, 0.65 mile; earthen hiking trail, 0.57 mile; and photo blind at Migrants Mile
- earthen hiking trail at the LSM, 0.63 mile
- accessible wooden observation tower on the LSM, 6,536 square feet
- BSM overlook
- two vault toilet restrooms
- one photo blind at the LSM
- one accessible hunting blind
- nine information kiosks
- self-guided gravel auto tour route, 14 miles
- eight wayside interpretive exhibits
- two fishing piers
- fifty-five parking lots
- refuge roads, 16.8 miles
- canals, 25 miles
- one hundred and three water control structures
- nine entrance signs



FWS

The Kid's Fishing Pond has one of two fishing piers on the refuge.

Chapter 4—Management Direction



© Bob Gress

Wilson's Phalaropes

This chapter describes how we intend to carry out the proposed action through the formulation of objectives and strategies that are designed to help us achieve our goals for Quivira Refuge.

4.1 Management Focus

As stated in the Improvement Act, the primary mission of our Refuge System is wildlife conservation. Multiple policies and guidance documents have been developed to accomplish this mission, including the policy on Biological Integrity, Diversity, and Environmental Health and the 2011 Conserving the Future document developed in collaboration with our stakeholders and the public. The Biological Integrity, Diversity, and Environmental Health policy provides directives for supporting and restoring the biological integrity, diversity and health of the Refuge System, whereas Conserving the Future articulates the desired roles for refuges and provides recommendations for the next decade and beyond (FWS 2011) and states, "At the root of these challenges [that the Refuge System must address] is the increasing consumption of natural resources, which has caused loss, degradation and fragmentation of habitat around the world. Habitat loss is largely responsible for the current extinction event, in which the Earth may lose half of its species in the next 100 years."

Our focus and planning approach for Quivira Refuge is consistent with the visions and principles promoted in the Improvement Act; the policy on Biological Integrity, Diversity, and Environmental Health; and the Conserving the Future document, including conserving native communities and species of concern and developing "quantifiable conservation

objectives" that "integrate the conservation needs of the larger landscape (including the communities they support)."

4.2 Overview of Goals and Objectives

The vision, proposed alternative, and goals for Quivira Refuge collectively focus objectives and associated management strategies on achieving sustainable, diverse, native communities that will conserve native species of concern at landscape and local scales. Achieving this vision represents the greatest contribution we at the refuge can make in addressing current and future threats to natural resources in the central Great Plains. Threats include increasing habitat fragmentation and decreasing landscape connectivity, adverse effects on water quantity and quality, and cumulative risks associated with changing climate and energy production. To alleviate these and to meet the purposes of the refuge requires us to consider multiple perspectives, including Refuge System policies and guidance, the current understanding of native community ecology, increasing human demands on natural resources, continued landscape change, and our need to collaborate with the public and our partners, on projects that span beyond refuge boundaries.

4.3 Landscape Conservation Goal

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

Quivira Refuge's contribution toward conserving natural resources in the central Great Plains must be considered within the context of the greater, surrounding landscape. Substantial loss and degradation of native environments have occurred there, which limits the amount, distribution, and quality of habitat available for native wildlife. Identifying primary needs of wildlife that are of conservation concern is essential for making decisions about the desired future condition of refuge lands, because we may have the potential to fulfill those needs. In addition, incorporating information on ecosystem function at the watershed scale is necessary because past and ongoing modifications near the refuge significantly affect our current, and future, capability to sustain the functions required to provide quality wildlife habitat. The watershed is the most appropriate scale at which to consider these factors because all flow of energy and materials in its environment are contained within its boundaries. This means that land use practices, such as conservation actions, at one site within a watershed can influence other sites within that same watershed.

In the case of Quivira Refuge, the Rattlesnake Creek watershed (subbasin) forms our most appropriate scale at which to consider landscape conservation planning. Refuge lands are at the lowest elevation of the subbasin, and the end of its primary surface water source, Rattlesnake Creek, is northeast of the BSM where it joins with Salt Creek on the refuge (figure 12). The subbasin mostly overlies the Great Bend Prairie Aquifer, which is a subregion of the High Plains Aquifer (Basin Management Team 2011). Although the area of the subbasin is 1,232 square miles, the area that actually contributes runoff to the refuge is only about 519 square miles and contributes drainage for USGS Zenith gaging station #07142575, which is located within a few miles of the creek's entrance into the refuge (USGS 2012d). The long-term average annual precipitation since 1948 is 24.33 inches, but it varies from about 15 to more than 27 inches. The average annual free-surface evaporation is about 64 inches (Sophocleous et al. 1997), with rates being highest during the summer months (Latta, 1950).

The dominant land use in this watershed is agriculture, and crop irrigation occurs largely by pumping ground water from the aquifer, which can affect ground water levels on, and near, the refuge. In addition, there is a direct connection between ground water levels and Rattlesnake Creek flows. The quantity of ground water pumped is inversely related to the amount and timing of precipitation, but most pumping occurs from May through October when surface water from Rattlesnake Creek is needed for managing refuge habitats to support annual wildlife needs.

Water rights in Groundwater Management District Number 5, which encompasses the subbasin, are overappropriated, with 1,377 water rights authorizing the use of 266,726 AFY. Ground water use often exceeds recharge (Basin Management Team 2011). The 10-year rolling average of ground water use for the stream–corridor part of the subbasin has been around 30,000 AFY for the years 2009–2011, and basin-wide estimates that include the refuge and the larger mineral intrusion area exceeded 55,000 AFY (Basin Management Team 2012). Since 1974, streamflow at USGS Zenith gaging station #07142575 has averaged 44.36 cfs, and average streamflow for the

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 83 of 144

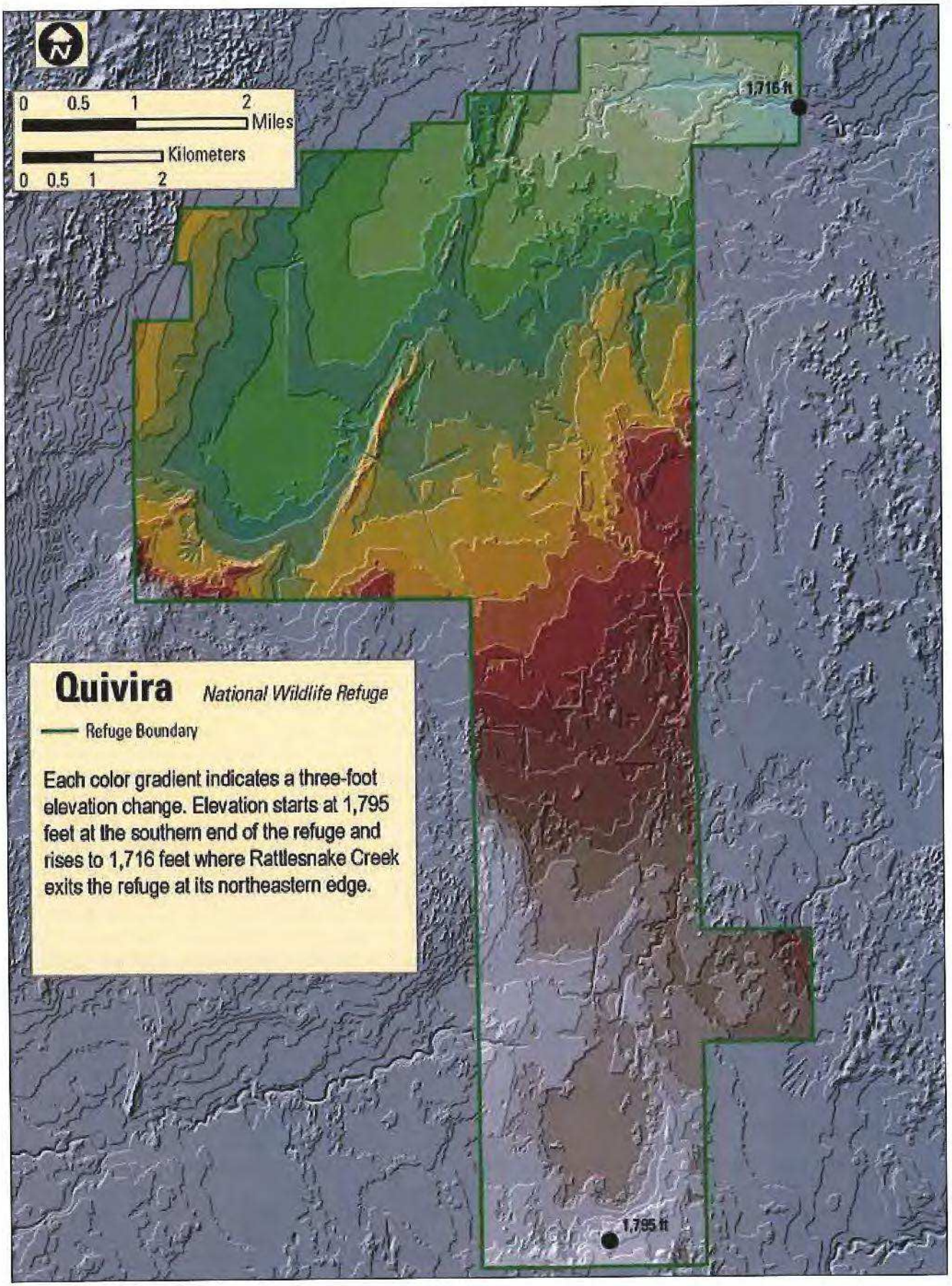


Figure 12. Elevation at Quivira National Wildlife Refuge, Kansas.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 84 of 144

years 2000–2009 was 37.36 cfs (Basin Management Team 2011). These flows are below historical reports. A streamflow of 100 cfs was estimated in the area of the refuge at the time of establishment in the 1950s, and that was during a dry period (Heitmeyer et al. 2012). Declines in the ground water table lead to reduced streamflows that are often insufficient to meet surface water demands. Water levels have continued to decline throughout most of the subbasin between 2001 and 2012 (Basin Management Team 2012). Total water use for the subbasin reported for years 1989 through 2009 averaged 175,656 AFY, ranging from 119,204 AFY in 1997 to 216,347 AFY in 2002 (Basin Management Team 2011).

The refuge has a senior water right [Permit # 7571] allowing use of Rattlesnake Creek water quantities of 14,632 AFY and flows of 300 cfs. Since 1984, the minimum desirable streamflow criteria for USGS Zenith gaging station #07142575 have been: 15 cfs for the months of December through June, 5 cfs in July, 3 cfs from August through October, and 10 cfs in November. There are periods of record where the minimum desirable streamflow was not met, but water use was not administered because it was difficult to figure out individual diversion effects on streamflow (Basin Management Team 2012).

Information on current environmental conditions at the subbasin scale was evaluated to identify factors that could limit the value of the refuge and adjacent lands for wildlife. In addition, land use practices occurring in the watershed were considered that have altered, or could alter, important processes, like hydrology, and that constrain our, and the public's, ability to provide quality habitat in the entire subbasin. We used this evaluation to develop landscape objectives that address priority needs in the subbasin and to make decisions on which habitat types to provide on refuge lands. Relative to the rest of the subbasin, land use activities closer to the refuge have created an area that has more grassland and wetland habitat (figure 13). This offers potential benefits to native communities and species of concern.

Landscape Conservation Objective 1: Land Ownership and Collaboration

Throughout the life of the plan, collaborate with other programs and with natural resource agencies to promote land protection, restoration, and management in the Rattlesnake Creek watershed, emphasizing lands within 10 miles of the refuge boundary.

Strategies

- Continue to include Partners staff in our regular refuge staff meetings.
- Collaborate with Partners, NRCS, KDWPT, and other agencies to develop private lands programs that promote the sustainability of water resources, the control of invasive species, and the restoration of native plant communities in the Rattlesnake Creek watershed.
- Collaborate with educational institutions, as well as with other agencies and organizations, to craft pertinent research and monitoring programs to identify best management practices that can be incorporated into private lands programs.
- Collaborate with agencies responsible for regulating water use in the Rattlesnake Creek watershed to help identify and improve water use efficiencies.

Rationale

We considered expanding the refuge boundary and acquiring more fee-title lands to enhance landscape conservation. However, it would be difficult for us to obtain large tracts of land adjoining the refuge in fee title, and any acquired lands would require extensive restoration and maintenance. Agriculture and energy developments within the watershed have significantly altered surface and ground water dynamics, which has not only resulted in the loss and fragmentation of wetland and grassland habitats near the refuge, but has altered hydrologic functions that influence refuge wetlands and grasslands (Heitmeyer et al. 2012). Therefore, we decided that it would be better to collaborate with our partners to develop and conduct programs that address natural resource issues on private lands near the refuge.

Many agencies and organizations have programs that are available to landowners in the subbasin, including Partners, KDWPT, PLJV, NRCS, and the Rattlesnake Creek Partnership, among others. Such programs may provide better conservation in the Rattlesnake Creek watershed because current, and emerging, environmental threats, such as water deficiencies and invasive species, are pervasive and difficult, if not impossible, to address by only acquiring and restoring small tracts of land. Furthermore, new techniques, such as decision support systems and models, are being developed by several entities, like the landscape conservation cooperative, the Western

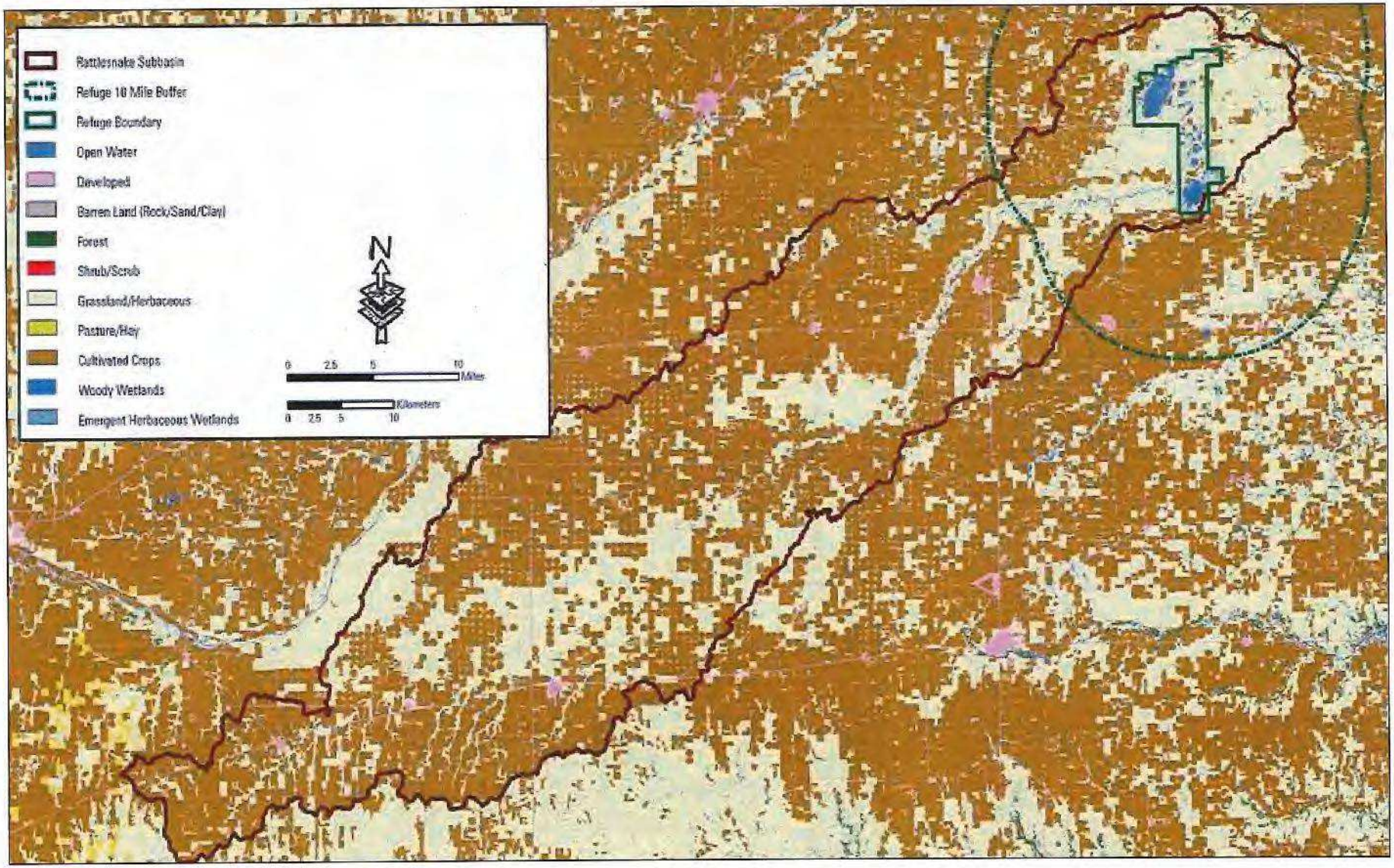


Figure 13. Land use and habitat outside the boundaries of Quivira National Wildlife Refuge, Kansas.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 86 of 144

Governors Association, and KDWPT, which help target lands where implementation of program practices would generate the greatest benefits. Private lands programs are also cost effective because they are flexible and can be strategically deployed to address specific issues. They not only improve habitat for wildlife on lands around the refuge, but they help us to reduce the sources of invasive species, to protect senior water rights, and to do more on refuge lands.

This objective should complement, rather than override, the objectives of the Rattlesnake Creek Subbasin management plan, which identifies multiple, ranked areas for water conservation throughout the watershed. Many activities that occur more than 10 miles from the refuge influence our water resources. We support water conservation-related activities throughout the subbasin that contribute to the improvement and sustainability of water resources.

Landscape Conservation Objective 2: Habitat Fragmentation

- Reduce fragmentation of refuge grassland habitats within the next 15 years by strategically removing, at most, 850 acres of trees or tall shrubs, as shown in appendix H, to benefit grassland-dependent wildlife, particularly species that exhibit area sensitivity during essential life cycle events.

- Initiate the restoration of about 866 acres of remaining refuge agricultural lands (figure 6) during the next 15 years to suitable, native plant communities, based on ecological site descriptions, to help native grassland species, including those that are area sensitive during certain life cycle events.

Strategies

- Remove specific tree species as follows (other strategies may be used if they are likely to increase success in achieving objectives):

  - Eastern red cedar—cut, pile, and burn; prescribed fire to prevent invasion; mowing.

  - Black locust, honey locust, elm, Russian olive, cottonwood, or trees that resprout—cut and spray herbicides, or spray herbicides and cut, particularly black locust.

  - Cottonwood and eastern red cedar—cut and pile cedar under cottonwood, follow with burning.

  - Saltcedar—burn and apply herbicide to regrowth because cutting is difficult.

  - Plum and sumac—conduct a combination of three treatments within two growing seasons to include burning or mowing as low as possible.

  - Large cottonwood—chainsaw and follow up with herbicide.

- Restore agricultural lands, including areas that are removed from production but not seeded to natives, and treed areas.

  - Prepare a largely weed-free, smooth seedbed. Options include using herbicides or planting Glyphosate-ready crops or other agricultural crops, with the last year being a grain crop. As stated earlier, policy allows for the use of genetically modified crops, and that remains an option. However, the refuge has never permitted this use to date and does not plan to do so in the near future. It is a more commonly used strategy in the northern plains largely because of differences in agricultural trends.

  - Use high-diversity seeding, at least 15–20 species of forbs and grasses, that is suitable for the soil type and for other environmental conditions.

  - Collect seed from the refuge or buy local ecotypes.

  - Seed during normal-to-wet periods and avoid seeding during drought periods.

  - Broadcast seed over snow, if possible.

  - Buy a native grass harvester, such as a stripper, and harvest local seed.

Rationale

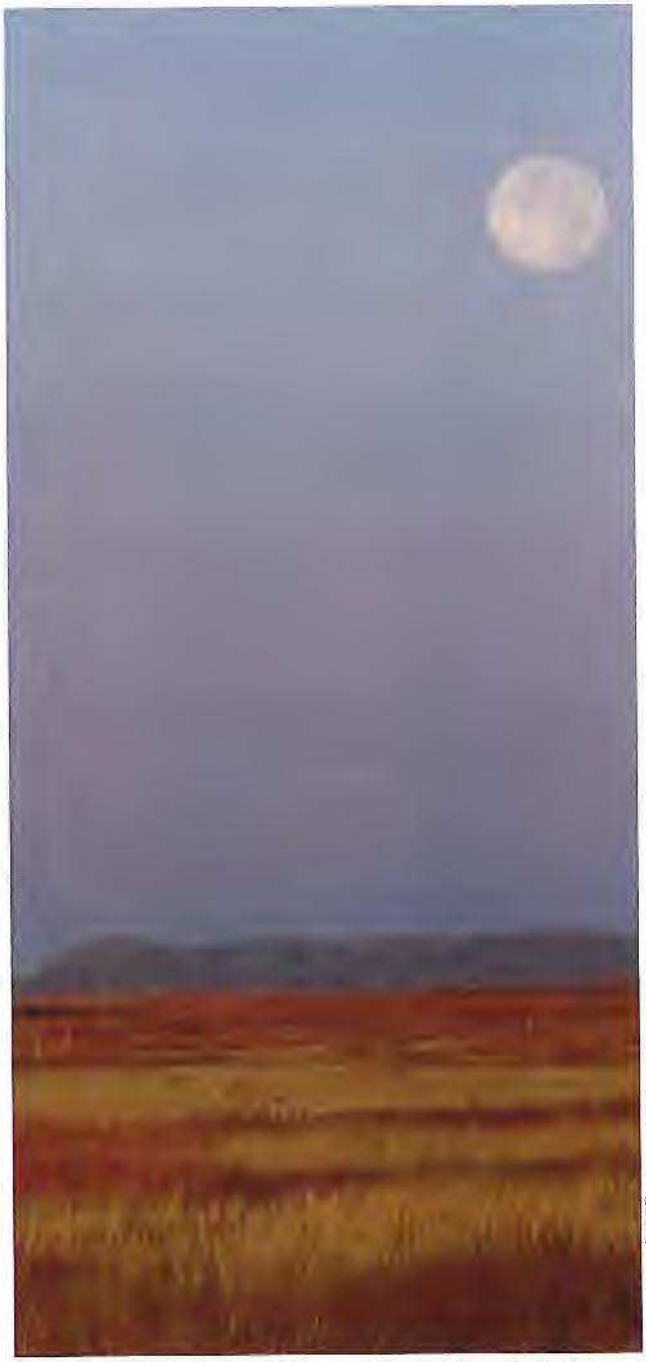
We studied refuge lands and the current surrounding landscape to identify the desired future vegetation types needed to sustain native habitats

and associated focal species. A review of existing spatial data showed that land use beyond the refuge boundary is dominated by crop and livestock production. Our planning team found that the remaining grassland tracts near the refuge are often isolated from each other and surrounded by croplands and by woody vegetation in areas that are not conducive to farming, like sandhills, and in shelterbelts that are used between fields and in areas that are managed for game, especially white-tailed deer. In addition, managing for livestock often creates areas with short-stature grasses and few forbs that do not provide adequate structure for native wildlife at certain times during the year. For example, fields of hay and other crops may be used by species for breeding or other activities early in the growing season, but harvesting, or plowing between plantings, often occurs before primary nesting activities are complete. Given these considerations, our planning team found that native prairie habitats were underrepresented in the landscape surrounding the refuge to sustain habitat for wildlife on the refuge.

Woody encroachment into habitat that was open before, resulting in the eventual replacement of grassland, has been reported as one of the greatest threats to this ecosystem (Knapp et al. 2008). Woody encroachment into grasslands around the world not only threatens ecosystem integrity but, more specifically, threatens the presence, abundance, nesting success, and local composition of grassland-obligate birds (Bakker 2003, Chapman et al. 2004). Based on our observation, this trend appears to hold true for the remaining tracts of sand prairie in, at least, the northern section of the Rattlesnake Creek watershed and on lands surrounding the refuge. Therefore, reducing woody vegetation would help refuge lands to provide unique and essential grassland habitat conditions.

Landscape Conservation Objective 3: Environmental Health and Climate Change

- Promote ecological resilience by restoring and maintaining native communities based on the following principles:
  - Continue to collect climate information and to conduct baseline inventories of refuge water use and wetland water chemistry during the next 15 years to document changes in abiotic factors to assess changes in environmental conditions that will help us develop our approach.
  - Conduct inventories of refuge habitats, including composition and structure of vegetation, at periodic intervals not to exceed 5 years, to document vegetation conditions that can be used to assess changes because of our actions and because of natural variation.



Barry Jones/FWS

A twilight view from Old Township Road on Quivira Refuge.

- Conduct informal surveillance of select wildlife species, such as waterfowl, shorebirds, and deer, during the next 15 years to detect disease outbreaks and monitor wildlife health.

Strategies

- Continue collecting climate information from established weather stations on refuge lands.
- Collaborate with our Region 6 Water Resources Division staff and with our partners to design and carry out:
  - monitoring programs on Rattlesnake Creek flow parameters at designated points of diversion on the refuge;
  - inventories of water chemistry on refuge lands.
- Develop educational programs to help the public understand the threat of environmental contaminants.
- Collaborate with our partners to collect relevant abiotic data and to periodically assess changes in environmental conditions that will help us adjust our activities.
- Reclaim mineral rights on refuge lands, as legally allowed, when existing oil wells are not used or abandoned.
- Continue to collaborate with our partners like KDWPT and academic organizations to conduct surveillance that increases the detection, prevention, and knowledge of disease outbreaks, including avian influenza and chronic wasting disease, and adjust refuge hunting programs if necessary.

Rationale

Land use practices in the Rattlesnake Creek watershed have not only resulted in the loss and fragmentation of native habitats, but they have also modified how remaining native habitats function. Agricultural and energy practices, as well as our past refuge management activities, have resulted in the introduction of nonnative plants and animals; an increased presence of chemicals, like fertilizers and pesticides; and altered disturbance regimes, such as the frequency, timing, and magnitude of fire, herbivory, and hydrology, that influence processes like nutrient cycling and sedimentation. The effects of these would likely be exacerbated by climate change, which is predicted to include higher temperatures and less frequent, but more intense, precipitation events at the refuge. Collectively, these factors can have significant effects on our ability to restore and support native plant communities and associated wildlife species.

Addressing these challenges will require us to develop flexible strategies that promote native species diversity, which has been reported to increase the resiliency of systems to climate change (Peterson et al. 1998). To accomplish this objective, we must use information about the current status of key abiotic factors that influence plant community composition and, ultimately, wildlife community composition in our management plans. We chose climate, water quality, and water quantity measures as primary abiotic factors to monitor because they influence the vegetation composition and structure of refuge habitats and are among the first to change in response to altered environmental conditions, regardless of what caused the change. For example, refuge lands are located at the lowest elevation in this agriculture-dominated watershed, thus, the amount, timing, and quality of water entering the refuge is not only influenced by climate patterns but also by agricultural practices, like irrigation and pesticide use, and by energy practices, like drilling and the storing of resources onsite.

4.4 Native Ecological Community Conservation Goal

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.

We are required to provide the plant communities necessary for wildlife to complete their annual life cycle needs, like breeding and migration. Thus, we chose habitat-based objectives that provide the resources necessary to support a native wildlife community over objectives based on individual wildlife species because (1) the long-term, sustainable productivity of habitats is essential for wildlife regardless of the landscape scale we consider; (2) most of the management activities conducted by our refuge staff indirectly influences wildlife composition and popula-

tion by altering vegetation composition and structure; (3) decisions about our management activities must be made within the context of current habitat conditions relative to the life requisites of multiple species; and (4) assessing habitat composition and structure to gauge our progress in achieving the vision and goals of Quivira Refuge is more reliable and informative than assessing wildlife populations because their migrations can include great fluctuations in things like turnover rates and lengths of stay that would affect our study of them.

We need to integrate multiple factors, including landscape form and function, regional and local environmental stressors, and the public's various perspectives, to make decisions about habitat types and management strategies. We used information from peer-reviewed outlets and refuge reports as the foundation on which to develop objectives that are supported by the best available science, that contain sufficient specificity to guide future management, and that could be studied to assess our progress and help us make decisions using an adaptive management framework (Adamcik et al. 2004). Before we held planning meetings, our refuge staff compiled and synthesized pertinent data—with the relevant literature referenced and cited throughout this document—to help guide our discussions and to make sure that our decisions were consistent with the facts. We also developed charts and tables to help us interpret data, and many of these are in this CCP.

Sometimes objectives can be misinterpreted when taken out of context. For example, seeing habitat-based objectives as static targets to achieve annually on the same tract of land is inconsistent with the more flexible reality of plant community ecology, and attempts to manage for static targets tend to alter important processes, like hydrology, that eventually lead to lower productivity. To resolve this potential problem, our refuge staff will apply the following to the set of biological objectives created to support this goal:

- We will consider these objectives collectively as representing a continuum of spatial and structural conditions that are characteristic of that habitat type in the central Great Plains.

- We will use these objectives as a reference to provide the full range of conditions necessary to support the wildlife community that is native to the refuge and the surrounding area.

- We will optimize the area and distribution (structure) of various habitat conditions characterized by the objectives to help focal species within the constraints imposed by using management that ensures sustained productivity (processes, function) of the habitat.

The following describes the initial steps we took to collect and organize information in a manner that would be useful for developing habitat-based objectives, including assumptions and rationales used to make decisions during our planning meetings.

Delineation of Current Habitat Types

Our staff at Quivira Refuge completed a spatially explicit plant community inventory in 2011. Based on 2008 aerial photography, communities were mapped to the alliance, or dominants, and finer associations, or subdominants, as defined by the NVCS using e-cognition software. The minimum mapping unit was 0.5 acre, but was adjusted to 0.2 acre during ground truthing of woody vegetation. More than 95 percent of the e-cognition polygons were ground truthed for accuracy and modified if necessary (figure 10 and table 7). A total of 43 associations, ranging in area from 0.3 to 4,926 acres, were mapped.

In addition, Quivira Refuge took part in a pilot project to map invasive species during 2011 (Edvarchuk and Ransom 2012). Approximately 10,160 acres, or 46 percent, of refuge lands were inventoried for 17 priority invasive species using standardized protocols that provided 90 percent confidence in detecting infestations greater than 100 square feet. A total of 3,573 individual infestations totaling 133 acres were mapped. These detailed maps were used to produce more map products using a GIS, as needed, to inform our planning activities. For example, plant associations provide valuable information for developing our strategies for specific areas, whereas broader community categories are more suitable when evaluating area needs of grassland-nesting birds.

Defining a Focal Wildlife Community

The refuge staff, with input from the core planning team, developed a list of focal species that we will use to help guide our development of habitat-based objectives. By providing the habitat types and conditions necessary to support focal species, we will also provide life requisites for other species and plants on the refuge and surrounding landscape. The concept of using select wildlife species to subdivide community resources along a continuum has been used to guide planning and management of both wetlands (Short 1989) and grasslands (VerCauteren and Gillihan 2004), as well as to describe habitat use patterns (Skinner 1975).

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 90 of 144

We chose migratory birds and threatened and endangered species known to use the refuge to serve as a starting point for developing the larger focal wildlife community because these species are a primary responsibility of the Refuge System and are central to the purpose of Quivira Refuge. The current refuge bird list contains more than 340 species and represents sightings recorded since refuge establishment. The list not only has native or endemic species characteristic of the region, but also species whose occurrences are considered rare or accidental and those that were introduced to the area following substantial habitat changes (Johnsgard 1978). The current list of threatened and endangered bird species known to occur on the refuge has species that are listed by both Federal and State governments. While refuge bird lists are not based on standardized surveys, this list is the best available information we have for some species occurrences on the refuge.

We further refined the refuge bird list to create a suite of focal species to help us quantify the range of structural and successional habitat conditions that we will need to provide for them. This approach helps us to prevent underestimating the wildlife values of the site, and it has been advocated by others. For example, breeding bird species documented in the Great Plains is approximately 320 (Johnsgard 2009), but developing suitable grassland restoration objectives for a local area may focus on as few as 32 bird species (Samson and Knopf 1994).

The following criteria were used to identify the focal community:

- Include species that conform to the purpose of the refuge, including those listed as endangered, threatened, or of concern by various laws or conservation plans. We consulted various plans, including our species of conservation and management concern for the Mountain–Prairie Region, the U.S. Shorebird Conservation Plan, the North American Waterfowl Management Plan, and the Central Mixed-grass Prairie Bird Conservation Region, which is part of the North American Bird Conservation Initiative.

- Include species that rely on unique or important refuge wetland habitats. Habitat uniqueness and importance on the refuge has been noted through its designation as a wetland of international importance by the Ramsar Convention and as a site of regional importance for shorebirds by the Western Hemisphere Shorebird Reserve Network.

- Include species that have comparatively greater dependence on, or association with, unique characteristics of refuge habitats, such as native sand prairie. The incorporation of species that use these habitats provides a more representative description of native upland communities and promotes diversity at spatial scales beyond refuge boundaries.

- Include species with core distributions that include refuge lands and have habitat needs that are not typically provided for on private lands in the vicinity. For example, species that require larger blocks of key habitat were given priority consideration relative to species that are considered habitat generalists or that have adapted to human modifications like urban encroachment and agriculture.

- Include species that are indicators of ecosystem health, such as having an abundance of prey species, or changing salinity conditions.

We identified 127 focal bird species that have recently occurred on the refuge and are representative of native habitat types and species of concern (table 16). We chose many focal species, in part, because of the importance of refuge habitats to a diversity of wetland-dependent species during migration. We do not expect to benefit all focal species every year because many factors outside the boundaries and control of the refuge influence species occurrences and densities. For example, climate conditions are a primary driver of waterfowl, shorebird, and whooping crane migration chronology and residence times. Furthermore, we will not be able to conduct monitoring programs for all focal species. Instead, life cycle needs of these species will be used to guide our development of habitat-based objectives, which subsequently will be used to develop annual management planning and implementation activities and monitoring programs.

Species other than birds, such as the Arkansas darter and regal fritillary, are important parts of native communities, and they may be added to the focal species list in the future because resources and landscape conditions will continue to change and more information of species–habitat relationships will become available.

Life Requisites of Focal Species

For each focal species, the life cycle events occurring on Quivira Refuge, such as breeding or migration, were noted and a literature search was conducted to locate quantitative information that

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 91 of 144

Table 16. Focal species by life event and habitat at Quivira National Wildlife Refuge, Kansas.

	Species common name	*Recent seasonal abundance*[1]				*Management priority by habitat association and life event*[2]		
		March to May	June to August	September to November	December to February	Migration	Breeding	Wintering
	Ducks, geese, and swans							
1	Greater white-fronted goose	c	r	c	c	WWW		WWW
2	Snow goose	c	r	c	c	WWW		WWW
3	Ross's goose	u		u	u	WW		WW
4	Cackling goose	c	r	c	c	WWW		WWW
5	Canada goose*	c	c	c	c	WWW	WWW GGG	WWW
6	Trumpeter swan	o		o	o	W		W
7	Tundra swan	o		o	o	W		W
8	Wood duck*	c	c	c	o	WWW		
9	Gadwall*	c	u	c	o	WWW	WW GG	
10	American wigeon*	c	u	c	o	WWW		
11	Mallard*	c	c	c	c	WWW	WWW GGG	WWW
12	Blue-winged teal*	c	c	c		WWW	WWW GGG	
13	Cinnamon teal	u	r	o	r	W		
14	Northern shoveler*	c	u	c	u	WWW	WW GG	WW
15	Northern pintail*	c	u	c	c	WWW	WW GG	WWW
16	Green-winged teal*	c	o	c	u	WWW		
17	Canvasback*	c	o	c	u	WWW		WW
18	Redhead*	c	o	c	u	WWW		WW
19	Ring-necked duck	c	o	c	u	WWW		WW
20	Greater scaup	o		o	o	W		W
21	Lesser scaup*	c	o	c	u	WWW		WW
22	Bufflehead	u		c	c	WWW		WWW
23	Common goldeneye	c		c	c	WWW		WWW
24	Hooded merganser*	u	r	u	u	WW		WW
25	Common merganser	u		r	c	WW		WWW
26	Red-breasted merganser	r		o	r	W		W
27	Ruddy duck*	c	u	c	u	WWW		WW
	Grouse and quail							
28	Greater prairie-chicken*	r	r	r	r	G		
29	Lesser prairie-chicken	Refuge was part of historical range, but is not now. May use in future, especially considering climate change adaptation.						
30	Northern bobwhite*	u	u	u	u	GG SS		
	Loons and grebes							
31	Pied-billed grebe*	c	c	c	o	WWW	WWW	
32	Horned grebe	u		u	o	WW		
33	Eared grebe*	c	o	c	r	WWW		
	Pelicans and miscellaneous							
34	American white pelican	c	c	c	o	WWW		

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 92 of 144

Table 16. Focal species by life event and habitat at Quivira National Wildlife Refuge, Kansas.

	Species common name	Recent seasonal abundance[1]				Management priority by habitat association and life event[2]		
		March to May	June to August	September to November	December to February	Migration	Breeding	Wintering
	Herons, egrets, and ibis							
35	American bittern*	u	u	u	o	WW	WW	
36	Least bittern*	o	u	o		W	WW	
37	Great blue heron*	c	c	c	u	WWW		
38	Great egret*	c	c	c		WWW	WWW (foraging)	
39	Snowy egret*	c	c	c		WWW	WWW (foraging)	
40	Little blue heron*	u	u	o		WW		
41	Green heron*	u	u	o		WW		
42	Black-crowned night-heron*	c	c	c	r	WWW	WWW	
43	Yellow-crowned night-heron*	u	u	o		W		
44	White-faced ibis*	c	c	c	r	WWW	WWW (foraging)	
	Birds of prey							
45	Mississippi kite*	u	u	o		TT	TT	
46	Bald eagle*	u	u	u	c	WW TT	TT	WWW TTT
47	Northern harrier*	c	o	c	c	WWW GGG	W G	WWW GGG
48	Swainson's hawk*	c	c	o		GGG TTT	SSS TTT	
49	Ferruginous hawk	o		r	o	G		G
50	Rough-legged hawk	u		r	u	WW GG		WW GGG
51	Prairie falcon	r	r	o	o			W
	Rails and cranes							
52	Black rail*	u	u	r		WW	WW	
53	King rail*	u	u	r	r	WW	WW	
54	Virginia rail*	c	c	u	o	WWW	WWW	
55	Sora*	c	u	c		WWW	WW	
56	Sandhill crane	c		c	o	WWW		W
57	Whooping crane	o		o	r	W		
	Shorebirds							
58	Black-bellied plover	u	u	u	r	WW		
59	American golden-plover	u	o	u		WW		
60	Western snowy plover*	c	c	c		WWW	WWW	
61	Semipalmated plover	c	u	c		WWW		
62	Piping plover	u	o	o		W		
63	Killdeer*	c	c	c	o	WWW	WWW	
64	Black-necked stilt*	c	c	u		WWW	WWW	
65	American avocet*	c	c	c		WWW	WWW	
66	Spotted sandpiper*	c	u	c		WWW		

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 93 of 144

Table 16. Focal species by life event and habitat at Quivira National Wildlife Refuge, Kansas.

	Species common name	*Recent seasonal abundance*[1]				*Management priority by habitat association and life event*[2]		
		March to May	June to August	September to November	December to February	Migration	Breeding	Wintering
67	Solitary sandpiper	u	u	o		WW		
68	Greater yellowlegs	c	c	c	o	WWW		
69	Willet	u	u	u		WW		
70	Lesser yellowlegs	c	c	c	r	WWW		
71	Upland sandpiper*	c	o	o		WWW	WW GG	
72	Whimbrel	o	o	o		W		
73	Long-billed curlew	o	o	o		W		
74	Hudsonian godwit	u	r	u		WW		
75	Marbled godwit	u	u	u		WW		
76	Ruddy turnstone	o	o	o		W		
77	Sanderling	o	o	o		W		
78	Semipalmated sandpiper	c	c	c		WWW		
79	Western sandpiper	c	c	c		WWW		
80	Least sandpiper	c	c	c		WWW		
81	White-rumped sandpiper	c	c	u		WWW		
82	Baird's sandpiper	c	c	c		WWW		
83	Pectoral sandpiper	u	u	u		WW		
84	Dunlin	u	o	u	r	WW		
85	Stilt sandpiper	c	c	c		WWW		
86	Buff-breasted sandpiper	o	r	u		WW		
87	Short-billed dowitcher	u	u	o		WW		
88	Long-billed dowitcher	c	c	c		WWW		
89	Wilson's snipe	u	r	u	o	WW		
90	Wilson's phalarope*	c	c	c		WWW	WWW GGG	
91	Red-necked phalarope	o	r	o		W		
	Gulls and terns							
92	Franklin's gull	c	u	c	r	WWW		
93	Interior least tern*	u	u	o		WW		
94	Black tern*	c	c	u		WWW		
95	Forster's tern*	c	c	o		WWW		
	Pigeons and doves							
96	Yellow-billed cuckoo*	o	u	r		SS		
	Owls							
97	Short-eared owl*	r		r	o			G
	Woodpeckers							
98	Red-headed woodpecker*	c	c	c		TTT		
	Flycatchers							
99	Western kingbird*	c	c	u		SSS TTT		
100	Eastern kingbird*	c	c	u		TTT		
101	Scissor-tailed flycatcher*	o	o	o		S		

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 94 of 144

Table 16. Focal species by life event and habitat at Quivira National Wildlife Refuge, Kansas.

	Species common name	Recent seasonal abundance[1]				Management priority by habitat association and life event[2]		
		March to May	June to August	September to November	December to February	Migration	Breeding	Wintering
	Shrikes and vireos							
102	Loggerhead shrike*	u	u	u	u		SS TT	
103	Bell's vireo*	u	u	o			SS	
	Larks							
104	Horned lark*	o	o	o	o	G	G	
	Thrushes, pipits, waxwings, and miscellaneous							
105	Sprague's pipit	r		r		G		
	Longspurs							
106	Lapland longspur	r		o	u			GG
107	Chestnut-collared longspur	r			r	G		
	Wood warblers							
108	Yellow warbler*	u	u	o		SS (riparian area)	SS TT	
109	Common yellowthroat*	c	c	u	o	GGG	WWW GGG	
	Sparrows and towhees							
110	Cassin's sparrow	r					G S	
111	Field sparrow*	c	u	c	u	GGG	GG	GG
112	Vesper sparrow	c	r	c		GGG		
113	Lark sparrow*	c	u	o		GGG	GG	
114	Savannah sparrow	c		c	o	GGG		
115	Grasshopper sparrow*	u	u	u		GG	GG	
116	Le Conte's sparrow	o		o	r	W G		
117	Harris's sparrow	c	r	c	c	GGG		SSS
	Grosbeaks and buntings							
118	Blue grosbeak*	u	u	r			SS	
119	Dickcissel*	c	c	r			GGG	
	Blackbirds and allies							
120	Bobolink*	u	u				GG	
121	Red-winged blackbird*	c	c	c	c	WWW	WWW	
122	Eastern meadowlark*	c	c	c	c		GGG	GGG
123	Western meadowlark*	u	o	u	c		G	GGG
124	Yellow-headed blackbird*	c	c	u	r	WWW	WWW	
125	Orchard oriole*	c	c	o			TTT	
126	Baltimore oriole*	c	c	o			TTT	
	Finches							
127	American goldfinch*	c	c	c	c	GGG	GGG	GGG

* Reported nesting on the refuge.

[1] Abundance is indicated as follows: c = common (certain to be seen in suitable habitat), u = uncommon (present, but not certain to be seen), o = occasional (seen a few times during season), r = rare (seen every 2–5 years).

[2] Habitat association is indicated as follows: G= grass or meadow, W= wetland–riparian area–flooded, S= shrubs, T= isolated trees–small groves. Within a cell, the number of times a letter is repeated is proportional to abundance. For example, WWW= common and W= occasional or rare in wetland habitat during the indicated life event.

characterized suitable habitat conditions for as many focal species as possible. Sources of information largely included dissertations, scientific periodicals, published books and refuge files held onsite. The specific information we sought included:

- chronology of use, including dates of spring migration, breeding, fall migration, and wintering activities on the refuge
- spatial needs for breeding, including minimum area, perimeter-to-area ratios, area of 50-percent occupancy, and distance from other required, or hostile, habitat types or conditions, such as nesting within a minimum distance to water or from a woodland edge
- vegetation composition at breeding sites, including the percent of grass, forb, and shrub
- vegetation structure at nest sites of breeding species, including litter depth, visual obstruction, and plant height
- characteristics of waterbird foraging habitats, including preferred foraging depths, diet, and vegetation cover

Information on each of these factors was not available for all species. This is not a problem, however, because information on individual species was grouped into functional guilds, such as species that forage in water less than 2 inches, to identify important parameters that influence habitat suitability. We further organized this information into categories that were based on our capability. For example, foraging depths of waterbirds were grouped in minimal increments of greater or equal to 2 inches because our staff experience suggests that the existing water infrastructure, such as structure type and canals, would facilitate management at this level of specificity. We do not denote distinct community types for individual species, but we provide a broader perspective of multiple species benefits provided by a habitat type in different successional conditions (figure 14).

While our approach maximizes the use of existing information, there are limitations. First, most quantitative information on the habitat needs of many species is based on certain points during the breeding season and reflects conditions near nest sites or breeding territories during the growing season. By comparison, there is relatively little quantitative information on the habitat needs during the nonbreeding period, except for dietary information and waterbird foraging depths. Therefore, the quantitative information compiled to develop objectives is limited because, as focal species table 16 shows, Quivira Refuge is an important migration stopover for wetland-dependent migratory birds, and it also provides some wintering habitat. In cases where we lacked detailed information, our planning team used less common descriptive measures and anecdotal information provided by experts to categorize the habitat needs of some focal species.

Second, most information on habitat needs of species was obtained from research not conducted on the refuge. As such, the results of this research may not apply directly to the refuge because of differences in landscape context, like the land use practices surrounding the refuge; abiotic qualities, like soils and climate; and other factors. Our planning team reduced this concern by considering only information from sand prairie or sandhill ecosystems. However, information on many species were still absent, thus, information from other ecotypes was also included. In these cases, the habitat measures, like visual obstruction and plant height, were included only if they could be met in refuge habitats. We made this determination by comparing the metrics reported in the literature to the ecological site potential of the appropriate habitat on the refuge.

Given these limitations, we decided that using habitat-based objectives for a given native plant community to represent a continuum of conditions along a successional gradient for long-term sustainability is an appropriate interpretation of the data. From our perspective, this more aptly represents the dynamic nature of systems and ends any attempt to maintain static habitat conditions within, and among, years or to manage exclusively for a few, select species or species groups. At the same time, it provides sufficient guidance to make sure that different seral stages required by wildlife are provided on refuge lands, with the understanding that refuge-specific information is limited and that the applicability of data collected on other sites may not apply directly to the refuge. It also embraces the value of using quantitative information, which:

- decreases the confusion associated with qualitative terms such as "tall" and "dense" and provides a unifying perspective of what management is attempting to achieve;
- enables our staff to establish thresholds that clarify when a decision must be made about treatment and the type of treatment to apply;
- provides a baseline on which to develop a monitoring plan that will provide refuge-

SYMBOL	OBJECTIVE(S)	EXAMPLES OF USE BY SPECIES
a.	Grassland b3	breeding grasshopper sparrow and western meadowlark
b.	Grassland b4	breeding dickcissel, blue-winged teal, eastern meadowlark
c.	Wetland a2, c2	foraging waterfowl and marsh birds
d.	Wetland b2	breeding and foraging bitterns and rails
e.	Grassland b1	nesting American avocet, least tern, and snowy plover
f.	Wetland a1, b1, c1	foraging shorebirds and roosting cranes
g.	Wetland a3, c3, d1	wintering waterfowl and foraging eagles
h.	Wetland b2	breeding and foraging bitterns and rails
i.	Grassland b2	breeding lark and field sparrow, and upland sandpiper
j.	Grassland a1, b5, b6, c1	breeding Bell's vireo, wintering Harris's sparrow (in shrub)
k.	Woodland	Baltimore oriole, bald eagle, and yellow warblers
l.	Grassland a1, b5, b6, c1	migrating vesper and field sparrows, breeding blue grosbeak
m.	Wetland e (springs)	Arkansas darters and source of *fresh* water for various wildlife

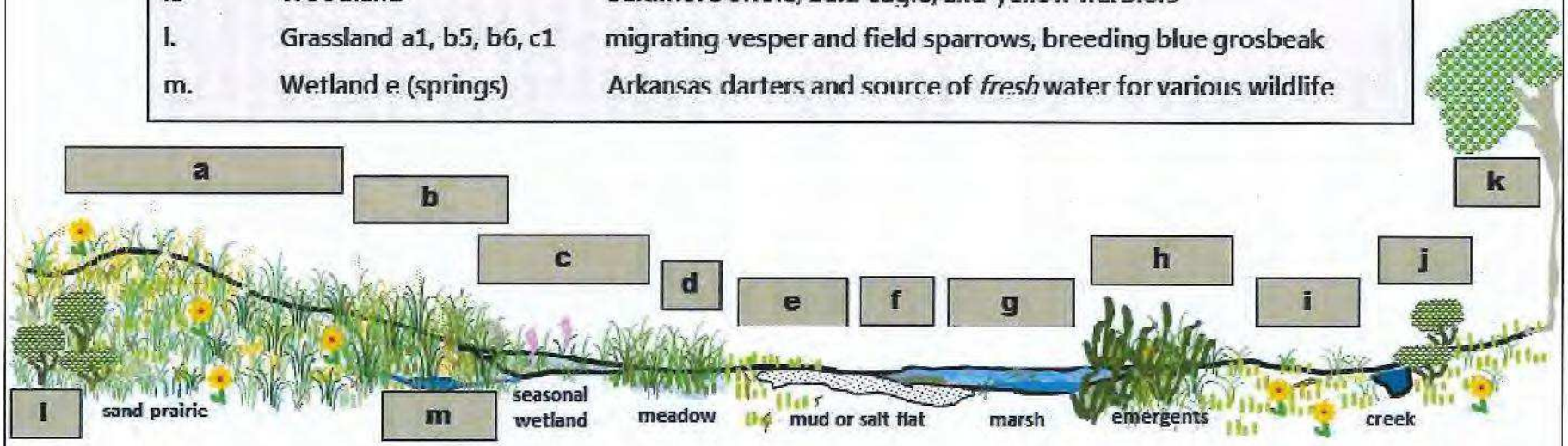


Figure 14. Native ecological community conservation objectives for Quivira National Wildlife Refuge, Kansas, illustrated in a community profile schematic.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 97 of 144

specific information useful for understanding treatment effects and species–habitat relationships, which ultimately can be used to refine management treatments.

Native Ecological Community Conservation Objective 1: Wetlands

Maintaining the integrity and persistence of all wetland types is important. Of principal importance is restoring and maintaining the suitable hydrological cycles characteristic of each wetland type to the extent possible, as described in the objective below, because hydrology is the single greatest driver of wetland functions, including nutrient cycling and sediment dynamics, as well as plant community dynamics (Mitsch and Gosselink 2003, Euliss et al. 2004, Laubhan et al. 2012).

Criteria

A. Apply from mid-February through May—spring migration:

1. Reliably provide at least 70 percent of the 2,931 estimated potential acres of early successional habitat—defined as bare mudflat or salt flat with less than 25 percent cover vegetation—flooded to depths less than 6 inches to provide foraging habitat for shorebirds and waterfowl, as well as roosting habitat for cranes (table 17); tolerate 5 percent or less in exotic or invasive plant species.

2. Reliably provide at least 70 percent of the 1,581 estimated potential acres of early mid-successional habitat—defined as greater than 75 percent cover of annuals—moist soil—or wet meadow—sedges and rushes—flooded to depths less than 15 inches for foraging waterfowl (table 17); tolerate 1 percent or less in exotic or invasive plant species and 25 percent or less in perennial robust emergent vegetation, such as cattail.

3. Reliably provide at least 70 percent of the 2,160 estimated potential acres of mid- to late-successional habitat, defined as less than 25 percent cover of emergent vegetation and greater than 20 percent aquatic vegetation, flooded to depths of 6–30 inches to provide foraging and roosting habitat for American white pelican and waterfowl (table 17); tolerate 5 percent or less in exotic or invasive plant species.

B. Apply from May through July—breeding season:

1. Reliably provide at least 70 percent of the 1,740 estimated potential acres of early successional habitat, defined as bare mudflat and salt flats with less than 25 percent cover of all vegetation, next to moist or shallowly— equal to, or less than, 1 inch—flooded areas to provide breeding habitat for western snowy plovers, interior least



FWS

An example of a wetland with interspersed tall, dense cover on Quivira Refuge.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 98 of 144

terns, and resident focal species (table 17); tolerate 5 percent or less in exotic or invasive plant species.

2. about 400–500 acres, with a minimum block size of 50 acres, of mid- to late-successional habitat, defined as 30–60 percent interspersed, flooded emergent cover with a visual obstruction of 4–20 inches and a height greater than 20 inches to provide breeding and foraging habitat for pied-billed grebe, sora, Wilson's phalarope, black-crowned night-heron, and American bittern in most years (table 17); tolerate 5 percent or less in exotic or invasive species.

C. Apply from late July to November—fall migration:

1. Reliably provide at least 70 percent of the 576 estimated potential acres of early successional habitat, defined as bare mudflat or salt flat with less than 25 percent cover vegetation, flooded to depths less than 6 inches to provide foraging habitat for shorebirds and waterfowl, as well as roosting habitat for cranes (table 17); tolerate 1 percent or less in exotic or invasive species.

2. Reliably provide at least 70 percent of the 1,073 estimated potential acres of early mid-successional habitat, defined as greater than 75 percent cover of annuals—moist soil—or wet meadow—sedges or rushes—flooded to depths less than 15 inches for foraging waterfowl (table 17); tolerate 1 percent or less in exotic or invasive plant species and 25 percent or less in perennial robust emergent vegetation, such as cattail.

3. Reliably provide at least 70 percent of the 903 estimated potential acres of mid- to late-successional habitat, defined as less than 25 percent cover of emergent vegetation and greater than 20 percent aquatic vegetation, flooded to depths of 6–30 inches to provide foraging and roosting habitat for American white pelican and waterfowl (table 17); tolerate 5 percent or less in exotic or invasive plant species.

D. From November through February—winter—reliably provide at least 70 percent of the 5,086 estimated potential acres, with a minimum block size of 50 acres, of mid- to late-successional habitat, defined as less than 25 percent vegetation cover and greater than 20 percent aquatic vegetation, flooded to depths of 6–30 inches to provide foraging and roosting habitat for geese, diving ducks, swans, American white pelican, whooping and sandhill cranes, and bald eagles—foraging only (table 17); tolerate 5 percent or less in exotic or invasive plant species.



Rachel Laubhan/FWS

Damselflies on a wetland with submerged aquatic vegetation.

E. Support the current integrity of freshwater springs on the refuge, including quantity, as possible, and waterflow direction; native vegetation composition; and Arkansas darter protection.

For each part of this objective, the greatest potential area is based on current water control structure elevations; available information, like spatial analysis using a GIS, aerial imagery, light detection and ranging and vegetation data, and our staff experience and knowledge of management potential; and on management philosophy described herein. Even if environmental and management conditions are ideal, the greatest potential is not intended to be met in any given year because of the need to vary prescriptions to mimic natural wetland processes to sustain long-term wetland structure and function. This means that, for a given created wetland, we will not maintain static hydroperiods within, and among, years.

Wetlands Strategies

- Store Rattlesnake Creek water in the LSM, in accordance with existing water rights, to:
  - provide a source of water that can be used to manage vegetation and to provide flooded habitat in created wetlands;
  - inundate mudflats and annual vegetation that will provide foraging habitat for waterbirds.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 99 of 144

Table 17. Estimated greatest potential distribution of wetland habitat conditions (acres by unit and objective) for the proposed alternative for Quivira National Wildlife Refuge, Kansas.

		Mid-February through May spring migration			*May through July summer breeding*		*August–November fall migration*			*November–February winter*
		A1	A2	A3	B1	B2	C1	C2	C3	D
Wetland	*Acres*	Acres bare flats <25% vegetation, flood <6 inches	Acres >75% annual or meadow, flood <15 inches	Acres <25% emerging >20% submerged aquatic vegetation, flood 6–30 inches	Acres of bare flats <25% cover	Acres of 30–60% tall emerging, flood <10 inches	Acres of bare flats <25% vegetation, flood <6 inches,	Acres >75% annual or meadow, flood <15 inches	Acres <25% emerging >20% submerged aquatic vegetation, flood 6–30 inches,	Acres <25% emerging, flood 6–30 inches
Little Salt Marsh	931	181.2	0	662.9	3.8	87.3	181.1	0	662.9	931
Unit 7 (created)	62	15.8	40.5	5.6	15.8	0	15.8	40.5	5.6	62
Unit 10a (created)	19	12.9	12.9	6.3	0	6.3	0	12.9	0	19
Unit 10b (created)	14	0	0	10.3	0	0	3.9	0	10.3	14
Unit 10c (created)	7	6	6.1	0.8	6.1	0	0	6.1	0.8	7
Unit 11 (created)	30	11.9	12	16.3	0	0	0	12	6.3	30
Unit 12b (created)	12	8.8	8.8	2.9	0	11.5	0	8.8	2.9	12
Unit 14a (created)	100	15.5	73.9	0	27.3	0	15.6	73.9	0	100
Unit 14b (created)	45	43.1	43.1	1.7	0	1.7	0	43.1	1.7	45
Unit 16 (created)	14	0	5.8	8.5	0	14.2	0	5.8	8.5	14
Unit 20a (created)	69	60.3	60.4	8.5	0	8.5	0	60.4	8.5	69
Unit 20b (created)	66	0	62.2	3.7	0	3.7	0	62.2	3.7	0
Unit 21 (created)	11	3.9	0	5.9	3.8	1.5	3.8	0	5.9	11
Unit 22 (created)	12	0	0	12.1	0	12.1	0	0	12.1	12
Unit 23 (created)	14	0	0	14.1	0	14.1	0	0	14.1	14
Unit 24 (created)	54	0	0	54.1	0	54.1	0	0	54.1	54
Unit 25 (created)	54	0.6	53.4	0	0	0	0	53.4	0	54
Unit 26 (created)	69	69.1	69.1	0	0	0	0	69.1	0	69
Unit 28 (created)	61	60.8	60.9	0	0	0	0	60.9	0	61

Table 17. Estimated greatest potential distribution of wetland habitat conditions (acres by unit and objective) for the proposed alternative for Quivira National Wildlife Refuge, Kansas.

		Mid-February through May spring migration			*May through July summer breeding*		*August–November fall migration*			*November–February winter*
		A1	A2	A3	B1	B2	C1	C2	C3	D
Wetland	*Acres*	Acres bare flats <25% vegetation, flood <6 inches	Acres >75% annual or meadow, flood <15 inches	Acres <25% emerging >20% submerged aquatic vegetation, flood 6–30 inches	Acres of bare flats <25% cover	Acres of 30–60% tall emerging, flood <10 inches	Acres of bare flats <25% vegetation, flood <6 inches,	Acres >75% annual or meadow, flood <15 inches	Acres <25% emerging >20% submerged aquatic vegetation, flood 6–30 inches,	Acres <25% emerging, flood 6–30 inches
Unit 29 (created)	27	23.7	23.7	3.6	0	0	0	23.7	3.6	27
Unit 30 (created)	42	41.6	41.6	0	0	0	0	41.6	0	42
Unit 37 (created)	50	0	0	49.8	0	49.8	0	0	49.8	50
Unit 40 (created)	36	36.7	36.4	0	0	0	0	36.4	0	36
Unit 48 (created)	55	54.4	54.4	0.8	0	0	0	54.4	0.8	55
Unit 49 (created)	85	83.9	83.9	1.3	83.9	0	83.9	83.9	1.3	85
Unit 50 (created)	91	90.5	90.6	0	0	0	0	90.6	0	91
Unit 57 (created)	89	0	43.4	34.0	11.5	43.4	11.5	0	34	89
Unit 58 (created)	116	67.5	0	48.9	0	48.9	0	0	0	116
Unit 61 (created)	121	121.2	104.2	0	121.2	0	17.2	104.2	0	121
Unit 62 (created)	38	35.7	35.8	1.7	0	0	1.7	35.8	1.7	38
Unit 63 (created)	103	93	93	0	10	0	10.0	93	0	103
Unit 80 N. Lake	393	393.2	0	72.1	393.2	0	0	0	0	393
Marsh Road Meadow	494	267.6	226.2	226.2	267.6	0	0	0	0	0
Wildlife Drive (BSM)	801	723.2	0	107.3	697.1	0	25.1	0	0	801
Big Salt Marsh	1209	408.8	0	800.6	98.3	0	206.4	0	0	1209
Salt Springs	252	0	238.3	0	0	14.7	0	0	14.6	252
Total	5646	2930.9	1580.6	2160	1739.6	371.8	576	1072.7	903.2	5086

NOTE: Table does not include wetlands managed as part of the grassland habitat type.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 101 of 144



FWS

Northern shoveler in a wetland with midheight, sparse vegetation.

- Transport water from the LSM to:
  - create mudflats and shallow water habitats, <16 inches, for foraging and roosting waterbirds;
  - expose bare mudflat and salt flat habitat for nesting shorebirds;
  - promote the germination and growth of vegetation in created wetlands.
- Support infrastructure and replace water control structures as necessary. Develop structures for A2 and A3.
- Use a combination of treatments, such as prescribed fire, chemical, grazing, and mechanical, to reduce and control invasive species and hazardous fuel.
- Refine the measures used in objectives as new information becomes available, such as through monitoring programs or research.
- When appropriate, use wildfires to help achieve land and resource management objectives.
- Refine strategies as new or better information become available to improve success in accomplishing objectives.
- Disk wetland soil surface when necessary and appropriate to benefit or encourage germination and growth of desirable vegetation.

Wetlands Rationale

Located within the migration corridor of the central flyway, Quivira Refuge is an important stopover for a diversity of waterbirds. Thus, we consider providing migratory habitat to be most important; and a primary role of refuge wetlands is to provide plant foods rich in carbohydrates, like seeds, tubers, and browse, and animal foods high in protein, like invertebrates. During spring, these foods provide the energy necessary for birds to reach their breeding grounds and, for some species, accumulate reserves necessary for egg production. In the fall, these foods provide energy for birds traveling to wintering grounds and protein for feather molt. Diets vary among species, with shorebirds consuming predominantly invertebrates, waterfowl consuming a combination of plant foods and invertebrates, cranes consuming predominantly plant foods, and American white pelican consuming fish.

While providing migration habitat is our primary concern, refuge wetlands also support limited breeding habitat for several bird species and, in some years, provide early winter habitat, primarily for large-bodied waterbirds that forage in wetlands. Therefore, we want to provide suitable habitat for completing these life cycle events even though the area of habitat needed is much less than for migration habitat. Primary nesting species include the federally listed interior least tern, the State-threatened western snowy plover, pied-billed grebe, sora, Wilson's phalarope, American bittern, and black-crowned night-heron.

Early winter habitat offers abundant, energy-rich foods and, for some waterfowl species, thermal cover in stands of tall emergent vegetation such as cattail and bulrush. As with the breeding season, the foods and cover required by these species are typically produced when we manage refuge wetlands for migration habitat. Therefore, the primary consideration for winter habitat is to make suitable sites available by flooding at suitable times and depths. In addition, wildlife values of a given wetland change within, and among, years, and attempts to manage for static conditions often leads to lower primary productivity that reduces wildlife benefits. Given these considerations, objectives were developed by considering refuge wetlands collectively rather than by developing objectives for each wetland unit.

The refuge also has a unique habitat in the freshwater springs, which supports a population of the State-threatened Arkansas darter. We want to maintain the integrity of these springs for them. Because little is known of the historical condition of this area, necessitating further study, the life history needs of the Arkansas darter will be used to guide our management efforts while we conduct more research.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 102 of 144

Little Salt Marsh

Historically, hydrology of the marsh was determined by a combination of ground water levels and overbank flooding of Rattlesnake Creek. Water levels in the marsh fluctuated greatly and in some years no surface water was present. Similarly, water chemistry ranged from brackish to fresh depending on the amount of surface water inputs. However, before refuge establishment, Rattlesnake Creek was diverted directly into the marsh. Consequently, complete drying of marsh substrates is rare as some water enters the marsh annually and water chemistry likely has changed.

The ability to restore the hydrology of the LSM and reactivate the historic Rattlesnake Creek channel is not considered feasible because refuge water rights may be forfeited. In addition, extensive ground water depletion in the watershed, coupled with reduced flows in Rattlesnake Creek, has severely reduced the quantity and timing of water reaching the refuge that affects management capability. For example, in years of below average precipitation and extensive agricultural demands, insufficient water quantities are delivered to the refuge to exercise all habitat management options (Heitmeyer et al. 2012). Consequently, continuing to use the LSM as a storage reservoir is the best way for providing quality wildlife habitat on the refuge.

Although the hydrology of the LSM has been altered, management can still manipulate water levels within the marsh to promote important processes (for example, nutrient cycling) and simultaneously optimize habitat for a diversity of waterbirds. Partial drawdowns can be conducted to oxidize soils and facilitate plant decomposition on the marsh perimeter, which provide nutrients for invertebrates and create suitable conditions for plant germination and growth on islands and along the marsh perimeter (Fredrickson and Taylor 1982, Laubhan et al. 2012). In addition, partial drawdowns also create bare flats suitable for nesting shorebirds and concentrate prey for shorebirds (invertebrates), as well as bald eagles and American white pelicans (fish). Conversely, addition of water during storage phases of the cycle results in flooding of newly established vegetation and creates a range of water depths suitable for roosting and foraging by many waterbirds throughout the year, including shorebirds and cranes.

Big Salt Marsh

The historical hydrology of the BSM has been altered by activities both on, and off, the refuge. Development of the water transport infrastructure on the refuge has included canals that facilitate the movement of water from Rattlesnake Creek to the BSM, whereas ground water depletion in the watershed has likely reduced the quantity and timing of ground water discharge to the BSM. In combination, we presume that increased use of Rattlesnake Creek water and smaller amounts of ground water dis-



Rachel Laubhan/FWS

Big Salt Marsh

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 103 of 144

charge has resulted in lower salinities, which is supported by the increased occurrence of cattail and other species that germinate under low saline conditions. In addition, the increased input of Rattlesnake Creek water has altered the timing of flooding and reduced the frequency and extent of drying. Collectively, these changes have stimulated a change in vegetation community composition, including an increase in cattail and an accompanying decline in salt-tolerant emergent species such as alkali bulrush and alkali sacaton. We also presume that these changes have altered the composition of the invertebrate community.

Although vegetation communities with different salinity tolerances provide food and cover to focal wildlife species, emergent vegetation better adapted to less saline conditions can be managed in other areas of the refuge to provide food resources and robust structural cover, as in created wetlands and wet meadows. By contrast, the ability to provide an interspersion of barren salt flats with large expanses of saltgrass and scattered areas of salt-tolerant emergent plant species is unique to the BSM area because saline conditions limit the amount of vegetation cover on mud and alkali flats, which provides open areas near water that are suitable for nesting interior least terns and snowy plover, foraging and roosting habitat for cranes, and foraging habitat for migratory shorebirds. In addition, the deeper parts of the marsh provide flooded open water that provides foraging and roosting habitat for American white pelicans and diving ducks throughout the year.

Given these considerations, mimicking historical conditions to the extent possible and relying on ground water discharge as the primary hydrologic input represents our best way for managing the BSM. Dynamic fluctuations in water quantity and quality will occur within, and among, years. In most years, surface water will be allowed to evaporate in late summer and ground water discharge will slowly begin to provide surface water in late October, with the marsh becoming full by January. Areas that are typically shallow when the marsh is fully flooded will have water during the spring, and then slowly begin drying in late spring through the summer. Use of Rattlesnake Creek water will be diverted to keep water chemistry, as in salinity, within the range of conditions necessary to sustain native plant communities or to avoid infrastructure damage during substantial flooding events.

Big Salt Marsh Strategies

- Support or improve appropriate salinity gradients through water management, including limiting relatively fresher water from Rattlesnake Creek.
- Support or improve water control structures and associated infrastructure.
- Use a combination of treatments, such as prescribed fire, chemical, grazing, and mechanical, to promote native plant communities and reduce invasive species and hazardous fuel.
- Evaluate, then change or install water control structures to improve surface waterflows.
- Evaluate, then change or remove roads, such as ditches and roads on the west side, Y road, Road to Mandalay, and Tern Pad Road, that significantly alter surface waterflows.
- Evaluate the south end and, when oil wells become inactive, remove oil well roads and restore those areas.
- Replace the Unit 80 structure with a larger structure to better export water from the BSM to Salt Creek and to improve water management capability to better prevent flooding of least tern and snowy plover nests.
- When appropriate, use wildfires to help achieve land and resource management objectives.

Created Wetlands

The primary purpose of managing created wetland units is to produce plant and animal foods for migratory birds during spring and fall migration that supplement foods provided in other wetland types, see objectives A2 and C2 above. Plant food production in these units usually exceeds the production in other wetland types on the refuge because the time and rate of drawdowns can be manipulated to stimulate the germination and growth of desirable annual vegetation, like barnyard grass and sprangletop, that produces abundant seed and structure for invertebrate production after reflooding in the fall and winter. Similarly, making these foods available to a greater diversity of birds is possible because we can control the time and depth of flooding (Fredrickson and Taylor 1982, Laubhan and Fredrickson 1997, Laubhan et al. 2012, Laubhan and Roelle 2001). Created wetland units that we manage to mimic seasonally flooded wetlands to produce foods also provide

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 104 of 144

many other benefits. For example, drawdowns to stimulate plant germination often can be timed to create mudflats, oxidize soils, and increase invertebrate availability during spring shorebird and crane migration. Following plant germination, units can be shallowly flooded to improve plant growth and seed production, and provide summer foraging habitat for breeding species.

Some created wetlands on Quivira Refuge can also be managed as temporary or semipermanent wetlands to supplement migration or breeding habitat and thermal cover for certain species.

Created Wetlands Strategies

- Manage hydroperiods for desired conditions. Gather and apply information on the germination and growth needs of plants and on the utilization criteria, such as chronology, foraging depths, and nesting needs, of the species that use these wetlands.
- Keep water transfer infrastructure and associated water control structures 95-percent free of emergent vegetation.
- Evaluate water control structure conditions and replace or change them as necessary. One such structure is on Dead Horse Slough.
- Use a combination of treatments, such as prescribed fire, chemical, grazing, and mechanical, to reduce and control invasive species and hazardous fuel.
- Inventory these units to refine the measures used in objectives. Correlate water level gauge readings with unit elevation gradients to help predict habitat potentials.
- When appropriate, use wildfires to help achieve land and resource management objectives.

Freshwater Springs

The freshwater springs are a source of permanent water that is unique to the refuge. The site has been modified by the installation of a pipe and the creation of more small pools to trap spring flows and by the installation of a pipe that created an artesian well. These pools support aquatic vegetation, and surrounding lands support a mixture of native and nonnative vegetation and scattered trees. Monitoring programs of wildlife use here have not been conducted, but the value of this habitat for waterbirds is likely limited because of the small size and depth of these pools and the presence of trees. However, the area does support an isolated population of Arkansas darter.



FWS

Created Wetland

Freshwater Springs Strategies

- Within 5 years, begin collaboration with experts and review current information to evaluate potential habitat improvements that support Arkansas darters, including the possible removal of existing infrastructure north of the springs.
- Within the life of the CCP, develop a more detailed management plan specific to the freshwater springs area that incorporates the current knowledge of experts and current information.

Temporary and Seasonal Prairie Wetlands

There are many temporary and seasonal wetland basins interspersed throughout the upland community on the refuge. The exact locations of all basins are not known, but most are less than 0.5 acre. Local precipitation and ground water fluctuations determine their hydrology, and no water management capabilities exist for them. Consequently, plant communities there are dynamic and range from perennial sedges and rushes and annual emergent vegetation to obligate upland species. When flooded, we presume that these basins provide temporary foraging habitat for waterbirds, like waterfowl and ibis, and supplement foods in other wetland types. Other uses for these wetlands may also occur.

We manage these basins as part of their surrounding upland communities and typically use prescribed fire and grazing to alter vegetation



Rachel Laubhan/FWS

Seasonal Prairie Wetland

community composition and structure. However, we will not intentionally drain or ditch these wetlands, and we will control their nonnative vegetation.

Temporary and Seasonal Prairie Wetlands Strategies

- Determine and map the location of these basins.
- Protect the integrity of basin morphology, such as their shape, structure and pattern.
- Avoid mechanical disturbances that will drain these basins.
- Time prescribed fires and grazing to avoid their peak periods of use by wildlife.
- Control nonnative vegetation and hazardous fuel.
- When appropriate, use wildfires to help achieve land and resource management objectives.

Native Ecological Community Conservation Objective 2: Grasslands

The grasslands objective was written based on the considerations of different species–habitat relationships of focal species, known characteristics of the soil–plant associations on the refuge, the need for periodic management treatments, and limitations of management. Individually, objectives capture perceived differences in bird habitat types within the grassland community that also seem realistic for management implementation. It represents the potential range of natural environmental conditions of the grassland community needed to promote the long-term sustainability of the system. Quantifiable measures of vegetation composition, height, density, litter depth, and other factors are commonly reported attributes of breeding grassland bird habitat descriptions and were used to develop the objective (appendix H).

Available quantitative information of grassland bird cover and structural needs during the nonbreeding season is comparably less than that during breeding. Knowledge of birds outside of the breeding

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 106 of 144

season traditionally relates to diet, energetics, foraging behavior, and, more recently, large-scale movements between breeding and wintering grounds. Descriptions that quantify structure and composition of habitat preferred by nonbreeding grassland passerines are lacking. Yet, management of grassland determines the extent, distribution, and within stand attributes of different habitat conditions within the community. Limited information of nonbreeding bird habitat was used to determine shrub attributes in grassland and is discussed in more detail below. Otherwise, until more information becomes available, management presumes that accomplishment of the grasslands objective relevant to the breeding season will concurrently satisfy habitat needs during the nonbreeding season. For example, by managing for a range of successional stages during the breeding and growing season as defined in the objective below, then a similar range of conditions will be provided during the nonbreeding season. As well, the distribution of the different successional stages would be expected to shift, dependent on methods of dispersal and growth in relation to current plant composition (Ratajczak et al. 2011), the ecological site potential, environmental conditions under relatively wet and dry conditions, and disturbance history.

Some woody vegetation is acceptable within native grasslands, thus the planning team had to evaluate relevant available information to identify optimal habitat conditions and suitable management actions such as mowing or burning. Again, species–habitat relationship information, such as percent shrub cover and proximity to other habitat types, facilitated this process.

Criteria

A. From January through March—nonbreeding—provide a range from 5–30 percent of tall, about 3–10 feet, native shrub interspersed within larger grassland blocks to support both focal grassland and shrub–grassland specialists.

B. Apply from April through August—breeding:

1. Provide at least 500 acres of estimated habitat that is predominantly native—short, bare to sparse—to help associated focal species, such as breeding killdeer, American avocet, interior least tern, western snowy plover, upland sandpiper, and ground-foraging passerines; composition less than 5 percent grass or fine-stemmed emergent, less than 5 percent forb, and no shrub; mean greatest height less than 6 inches; visual obstruction, or height density, less than 4 inches; no litter depth; no overlap with similar habitat made available under wetland objective B1 above.

2. Provide at least 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; composition 40–50 percent grass or fine-stemmed emergent, 10–20 percent forb, and 10–20 percent shrub; mean greatest height of 6–20 inches; visual obstruction, or height density, less than 4 inches; litter depth of 0.2–1.2 inches.

3. Provide at least 70 percent of the estimated 2,053 acres of predominantly native—mid–tall, medium—grassland habitat to support associated focal species, such as breeding western meadowlark, grasshopper sparrow, bobolink, dickcissel, northern harrier, and blue-winged teal; composition 40–50 percent grass or fine-stemmed emergent, 10–20 percent forb, and less than 15 percent shrub; mean greatest height greater than 6 inches; visual obstruction, or height density, of 4–12 inches; litter depth greater than 0.8 inch.

4. Provide at least 70 percent of the estimated 2,756 acres of predominantly native—tall, medium-dense—grassland habitat to support associated focal species, such as breeding western meadowlark, grasshopper sparrow, bobolink, dickcissel, northern harrier, and blue-winged teal; composition 40–50 percent grass or fine-stemmed emergent, 10–20 percent forb, and less than 15 percent shrub; mean greatest height greater than 20 inches; visual obstruction, or height density, of 4–12 inches and greater than 12 inches; litter depth greater than 0.2 inch; acres outside of those with at least 50 percent plum or shrub coverage—1,278.58 acres—which mostly occur in subirrigated soil types where tallgrasses characteristically dominate.

5. Provide more than 10 sparse stands of shrub—mostly plum—interspersed within larger grassland blocks and riparian corridors to support associated focal species, such as lark and field sparrows; shrub height about 3–10 feet; stand size about

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 107 of 144

0.40–0.90 acre each; and within-stand shrub coverage of 7–11 percent.

6. Provide more than 10 dense stands of shrub—mostly plum—habitat interspersed within larger grassland blocks and riparian corridors to support shrub-dependent focal species, such as Bell's vireo; shrub height about 3–10 feet; stand size about 0.75–1.5 acre each; and within-stand shrub coverage of 25–35 percent.

C. From September through December—nonbreeding—provide the same as criterion A.

There are about 9,512 acres of native, grass-dominated vegetation associations outside of what is defined as wetland, based on GIS calculations of recent coverage (table 18). The acreage estimates used in the grassland criteria B.1–4 do not include other association types in the larger grassland landscape: about 82 acres of nonnative, invasive cheatgrass; 1,279 acres of plum or shrub-dominated (equal to, or greater than, 50 percent) habitat; about 870 acres of recently or currently farmed lands; 1,008 acres of trees; and 3,483 acres of herbaceous or emergent wetland association types, such as prairie cordgrass–three square (2,054), cattail–rush (1,096), water (176), spikerush (135), and Phragmites (23). Still, these other association types interspersed throughout the larger grassland blocks are managed as part of grassland.

While the restoration of farmed lands, nonnative habitats, and many woody-dominated habitats to native grassland association types will be started over the next 15 years, the duration of this restoration phase is unknown and may take many years, depending on various factors such as climate. Because of this uncertainty, these other association types are not included in the acreages used in the grassland criteria B.1–4.



FWS

Killdeer in short, sparse upland habitat.



FWS

Little bluestem in intermediate grassland.



FWS

Switchgrass in tall, dense grassland.

Strategies

- Use a wide range of disturbance types, levels, and frequencies to support or improve habitat, including prescribed grazing or fire, flooding and drying, and chemical and mechanical methods.

- Use a combination of treatments such as prescribed fire, chemicals, grazing, and mechanical methods to reduce and control invasive species and hazardous fuel.

- Promote the restoration and conservation of native understories and the reduction or elimination of cheatgrass-dominated understories when applying treatments for shrub-related objectives.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 108 of 144

Table 18. Dominant nonwetland habitat types at Quivira National Wildlife Refuge, Kansas.

Habitat type	*Dominant vegetation*	*Estimated acres*
Native tallgrass	Switchgrass	1,720
	Big bluestem	974
	Sand bluestem	62
	Total	2,756
Native midgrass	Little bluestem	2,053
Native shortgrass	Saltgrass	4,362
	Prairie dog town	19
	Buffalograss	1
	Total:	4,381
Natural bare–sparse	Sand flats	322
Shrub	Plum, sumac, dogwood	1,279
Nonnative upland grass	Cheatgrass	82
Agricultural (farmed)	Agricultural (farmed)	885
Trees	Cottonwood	355
	Locust	253
	Saltcedar	125
	Other	105
	Red cedar	85
	Willow	57
	Russian olive	28
	Total:	1,008
Wetland	Prairie cordgrass–three square	2,054
	Cattail–rush	1,096
	Water	176
	Spikerush	135
	Phragmites	23
	Total:	3,483
Other	Roads	316
	Bare ground (like oil pads)	12
	Buildings, structures	6
	Total:	327
Grand total outside wetland		16,581

- Evaluate the feasibility of managing sites when planning annual prescriptions. For example, some semipermanent shrub sites have long-term coverage of some shrub habitat where management can be difficult to impossible and other sites occur between drainages that can impede equipment access.
- Conduct a monitoring program early on to meet our objectives for shrubs because we have limited knowledge and information on plum habitat.
- When appropriate, use wildfires to help achieve land and resource management objectives.

Rationale

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 (Sauer et al. 2008). In general, these declines are attributed to habitat loss and degradation caused by many factors, including land use changes, the spread of invasive species, habitat fragmentation, urbanization, and the management of water quantity and quality. The relative importance of each of these factors depends on the resources and scales considered. Quivira Refuge lands have the potential to contribute to grassland bird conservation, especially when considering that public lands compose less than 3 percent of Kansas and Quivira Refuge comprises a smaller percentage of those lands that are specifically managed for natural resource conservation.

Some woody vegetation is acceptable within native grasslands. Nonbreeding (fall, winter, spring) specialists of grassland and shrub–grassland in Texas, many of which also occur on Quivira Refuge, had their highest combined densities reported in shrub–grassland habitat with less than 30 percent interspersed woody vegetation generally less than 3.28 yards tall by 24.71 acres (3 meters tall by 10 hectares) compared to habitat with less than 10 percent woody interspersion or less than 50 percent woody interspersion (Igl and Ballard 1999). When evaluated separately, grassland specialists had their highest densities in the same habitat as when combined, but shrub–grassland specialists had their highest densities in woodland dominated by trees more than 3.28 yards tall and secondarily in brushland dominated by woody plants less than 3.28 yards tall and comprising more than 30 percent woody canopy coverage. If Quivira trends are similar to what was reported, then management will be supporting less optimal habitat for grassland–shrub



Barry Jones/FWS

View from sandhills.

specialists to support both grassland and shrub–grassland specialists during the nonbreeding season. The same intent influenced the decision to provide at least 10 dense and sparse stands each—or between 5–30 percent interspersed total shrub coverage—during the breeding season. Also considered was the knowledge that much additional shrub coverage occurs in the landscape that is not defined as shrub habitat for refuge mapping and planning purposes because stands are less than 0.2 acre in size or have more than 50 percent shrub coverage (not a dominant plant type within stand).

There are about 9,512 acres of native grass-dominated vegetation associations outside of what is defined as "wetland" based on GIS calculations of recent coverage. Grassland communities are dynamic and cannot be held in static conditions, as illustrated in State transition diagrams of soil–vegetation associations and ecological site descriptions (Natural Resource Conservation Service 2010). For example, factors contributing to grassland dynamics include variation in climate effects, such as from changes in precipitation, temperature, and wind; landscape features, such as differences in soil, aspect, and slope position; plant–wildlife interactions, such as plant adaptations to herbivory and soil disturbance; and the timing of environmental changes or disturbances in relation to plant and wildlife life stages (Anderson 2006, Helzer 2010). Thus, it is unrealistic to set an objective that attempts to maintain static conditions over time. Development of this objective considered these factors, the recent spatial location of various vegetation associations, and the understanding that areas of the refuge will be "rested" (no planned burning or grazing) each year. This explains the desirability to attain a minimum of 70 percent of the estimated potential acres of the associated grassland conditions described in the grassland criteria B. 1–4. While this proportion is somewhat arbitrary, it promotes the sustainability of ecosystem processes and the need for periodic disturbance as well as management's ability to mimic natural stressors, such as when using fire and herbivory.

Native Ecological Community Conservation Objective 3: Woodlands

At least 125 acres of woodlands largely located on the refuge perimeter and within 55 yards of the refuge's main roads will remain (figure 15) during the next 15 years, see appendix H.

Strategies

- Based on current conditions, maintain woodlands in areas identified in appendix H.
- Keep select trees or small groves that are located in areas along roads or next to other nondesirable habitat on and off the refuge where removal would not provide substantial benefits to native wildlife, such as obligate grassland birds, and where their presence may benefit species of concern, such as Loggerhead shrike or bald eagle. Ultimately, this will be the refuge manager's decision based on available information.
- Conduct no substantial active management, such as regular stand thinning and fire suppression in most cases, specifically to benefit

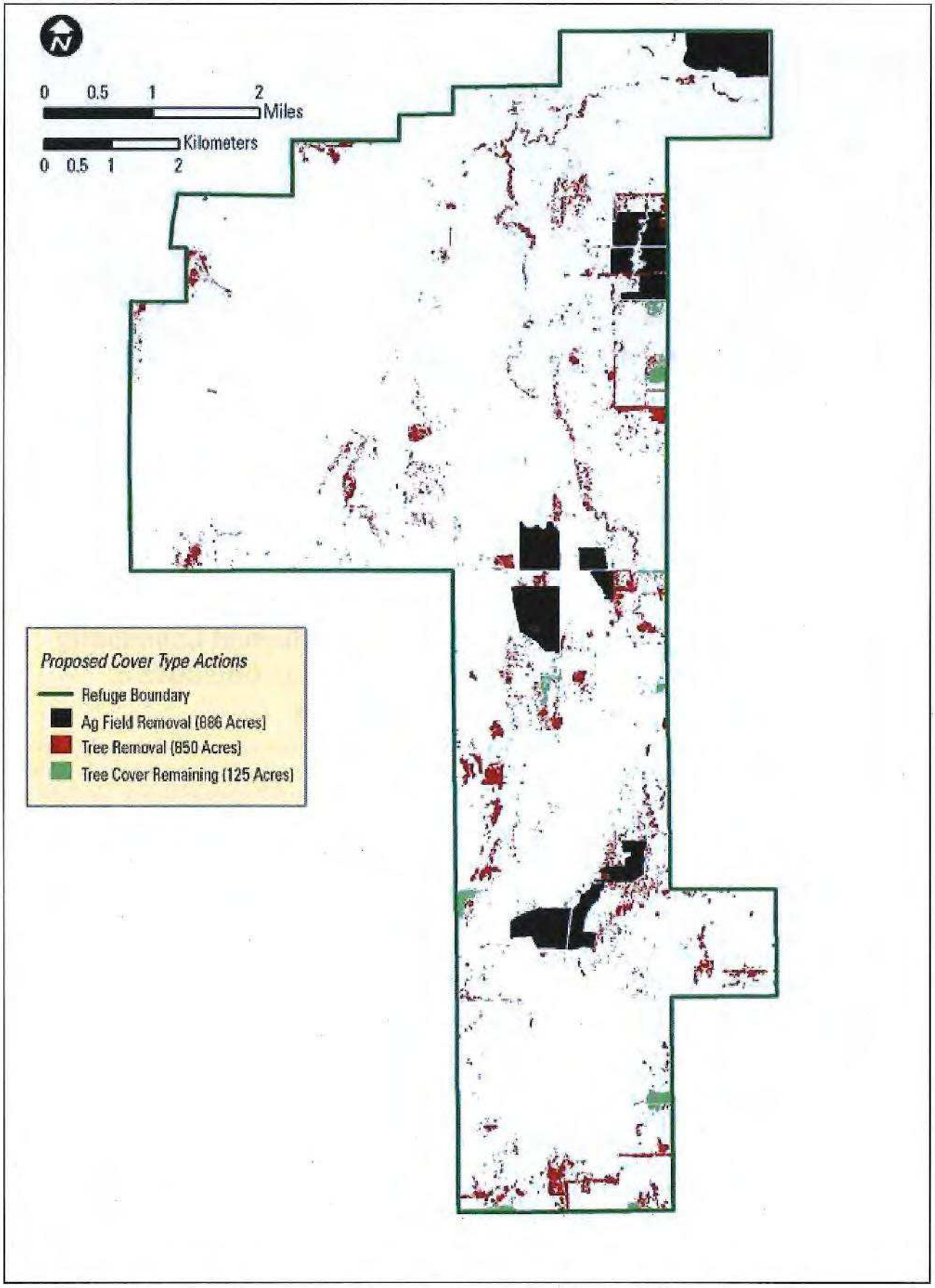


Figure 15. Cropland and tree coverage planning at Quivira National Wildlife Refuge, Kansas.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 111 of 144

species largely associated with nonnative woodlands. Prioritize time and money resources for other species–habitat communities over woodland, especially shelterbelts and nonnative types.

- Manage woodlands to reduce seed or propagation sources or to maintain fence lines and other infrastructure, such as removing red cedar growth under canopy trees or Russian olive in the Artesian Grove.
- Do not allow encroachment of woodland into surrounding habitat.
- Allow limited native trees to remain onsite where they might have occurred naturally, such as up to a few willow or cottonwood trees near a spring.

Rationale

Historically, nonwetland habitats comprising the refuge were dominated by native prairie interspersed with inclusions of shrubs (Heitmeyer et al. 2012). However, changes in land use practices in the watershed, coupled with our past management direction, led to the encroachment of shrubs and native and nonnative trees. By 2008, thousands of acres of woody vegetation existed on refuge lands (figure 16). Years ago, our refuge staff decided that restoring native prairie communities represented the best use of refuge lands, given the extensive loss and fragmentation of this habitat in the watershed and the accompanying population declines of some species, particularly of grassland obligates that rely on it.

However, removing all trees during the next 15 years may not be warranted given the location of woodlands surrounding the refuge and other hostile habitat on and off refuge lands. And it may not be feasible given our limited staff and budgets.

Migratory birds that require woodlands to complete essential life history events, like nesting, historically were not common on the refuge. Thus, they generally were not selected as focal species during the planning process. However, isolated trees and small groves would benefit focal species, such as loggerhead shrike and Swainson's hawk. Because woodland areas are attractive to wildlife enthusiasts, primarily bird watchers and photographers, a list of birds recorded using the woodlands not now planned for removal in the next 15 years was compiled from refuge files and recent observations to assess potential loss in birdwatching opportunities on the refuge (table 11). This list—which is presumed to be incomplete given that formal surveys have not been conducted—includes 49 species, indicating that birdwatchers will still have opportunities to view woodland-associated birds on refuge lands in easily accessible areas. It seems that bird species richness will be maintained.

4.5 Visitor Services Goal

Visitors enjoy quality wildlife-dependent recreation opportunities.

As part of the Service's guiding principles, legitimate and appropriate wildlife-dependent uses of refuges include compatible activities involving hunting, fishing, wildlife observation, photography, interpretation and education.



FWS

Shrubland



FWS

Woodland

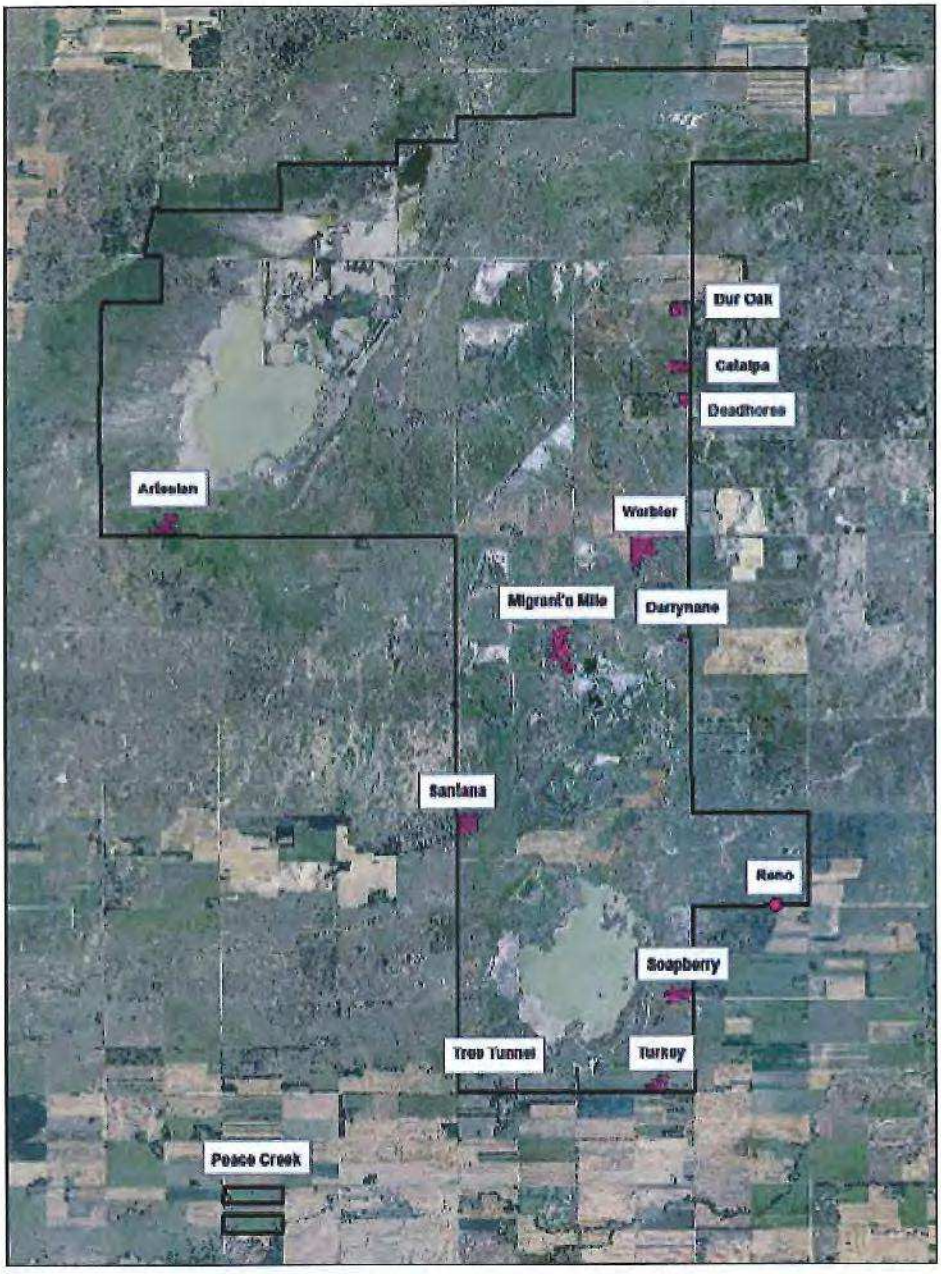


Figure 16. Location of woodland groves at Quivira National Wildlife Refuge, Kansas, in 2012.

Hunting Objective 1

Throughout the life of the plan, continue to allow compatible waterfowl, upland bird, and small game hunting opportunities within traditional boundaries (figures 11) that adequately protect whooping cranes and promote employee and public safety.

Strategies

- Write a detailed hunt plan during the life of the CCP. Refuge-specific regulations may apply to any hunt program on the refuge.
  - Consider an extended light goose season during the spring conservation order.
  - Update the CFR to be consistent with the approved hunt plan.
- Close the refuge to waterfowl and upland bird hunting as necessary to protect whooping cranes. The refuge manager has the authority to decide when to open and close the refuge to hunting.
- Continue to provide and improve access to hunting information through kiosks, signs, interpretive displays, handout literature, and by other means, such as through social media and the refuge's Web site.
- Do not allow the hunting of certain species that are not common or are closely associated with potential impacts to species of concern, such as rail, woodcock, snipe, sandhill crane, and prairie-chicken. Because the occurrence of many of these species is limited, hunting opportunities will not be significantly reduced and educational opportunities related to the conservation of these species and associated communities could be promoted.
- Continue to allow hunting of Northern bobwhite, pheasant, and dove within traditional hunt boundaries (on less than 40 percent of the refuge). Of note, bobwhite occurrence on the refuge regularly includes areas both inside and outside of hunt boundaries. Allow the hunting of small game according to refuge-specific regulations.
- Close the refuge to the public between dusk and dawn, except for special events or activities that require a refuge permit or for unique circumstances permitted by the refuge manager.
- Allow only nontoxic shot on the refuge.
- Provide adequate law enforcement that supports staff and public safety and the protection of natural resources.

Rationale

The perspectives and opinions on public use-related issues vary widely. Therefore, an objective approach was applied to discuss and evaluate public-use activities within the context of Service laws, policies, and guidance. Many of the concerns related to hunting activities involved decisions beyond the scope of this CCP. Therefore, a more detailed stepdown management plan is needed that considers: (1) reducing risks to threatened, endangered and protected species; (2) the safety of refuge staff and the public; (3) the logistics or the ability to implement actions that ensure compliance with laws and regulations; (4) potential conflicts among use activities; and (5) the requirement of refuge-specific regulations and permits, such as limits to hunting intensity, season, method, and area within approved boundaries and opportunities for youth or the military.

Among the major factors that are considered in decisionmaking, besides the balancing of multiple use activities and compatibility with wildlife, are observations of whooping crane behavior and habitat use that is unique or specific to the area of the refuge. Both consumptive and nonconsumptive users share concern for the protection of whooping cranes. Also, many hunters indicated a preference for the opportunity to hunt the North Lake area for a limited number of days, which is often due to refuge closures because whooping cranes are present, over hunting in alternative areas over more hunt days when there has traditionally been no to little observed use of the refuge by whooping cranes. As part of planning, we will continue to consider tradeoffs like these and other management decisions.

Hunting Objective 2

Throughout the life of the plan, broaden and increase safe and compatible hunting opportunities on the refuge, such as for deer, turkey, and furbearers, that will require refuge-specific permits (figure 17).

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 114 of 144

Strategies

- Use refuge-specific regulations to restrict aspects of trapping activities, such as the number, location, and types of traps used, and require the approval of a special use permit by the refuge manager.
- Consult with the State of Kansas and experts, when writing a more-detailed hunt plan, on factors important in decisionmaking, such as limits based on deer health and population targets or thresholds.
- Understand that the hunting of deer, turkey, and furbearers will not necessarily need to occur throughout the entire approved area, nor during every season or year.

Rationale

Before and during the planning of this CCP, the public requested consideration of opportunities for deer and turkey hunting. Deer population trends have increased substantially since refuge establishment, from less than 20 in the entire local population to a density of 41 individual deer per 0.39 square mile (1 square kilometer) based on recent distance sampling reported by Blecha et al. (2011). There are concerns about the combination of high-density populations and the rate of spread of Chronic Wasting Disease, which was reported in Stafford County in 2013.

Some think hunting could help address deer-related issues, while others feel that deer hunting would negatively impact deer viewing opportunities. While opinions on deer hunting on the refuge vary, there seems to be general agreement that unique hunt opportunities, such as for youth, are acceptable. All hunting possibilities—including exceptions to hunting closures when whooping cranes are present such as for the limited use of archery in hunting deer—will be explored in the development of a more-detailed hunt plan. Safety, compatibility with wildlife, logistics, and the potential tradeoffs of multiple use activities will be considered in the development of policy and guidance.

The wild turkey population varies annually on the refuge, but has generally increased since the establishment of the refuge. While turkey hunting will be allowed, refuge-specific regulations will limit opportunities. Compatibility with wildlife and potential conflicts with nonconsumptive uses, especially in the spring, will be considered.

Furbearer hunting will require refuge-specific regulations. Approval of a special use permit will be required to control aspects of hunting or trapping, and the desired reduction of furbearer impacts to refuge infrastructure and management implementation will be considered.

Fishing Objective 1

Throughout the life of the plan, allow fishing in refuge waters with minimal disturbance to other wildlife and the natural aquatic ecosystem.

Strategies

- Allow fishing, in accordance with State and Federal regulations, year round on all waters on the refuge.
- Provide and maintain accessible fishing docks for visitors with disabilities.
- Do not allow boats on any waters.
- Do not stock Refuge waters (except Kids' Fishing Pond, see objective 2), but instead manage wetlands and lakes for migratory birds, allow these to fluctuate through natural hydrologic cycles.
- Do not allow bait collecting and live fish bait, except night crawlers, on any waters.
- Provide educational materials and interpretive exhibits about native fish, the threat of introducing or spreading nonnative plants or wildlife and other things that could hurt the environment, like diseases harmful to humans or wildlife populations.
- Plan and conduct unique fishing events for kids to encourage and support a new generation of anglers.
- Do not allow frogging.

Rationale

Fishing is a tool to help the public connect with nature and to promote existing and future programs. Fishing and its promotion provides a type of compatible public use that is encouraged by initiatives such as the Department of the Interior's "Youth and the Great Outdoors" and the U.S. Fish and Wildlife Service's "Let's Go Outside." Boats and bait collecting

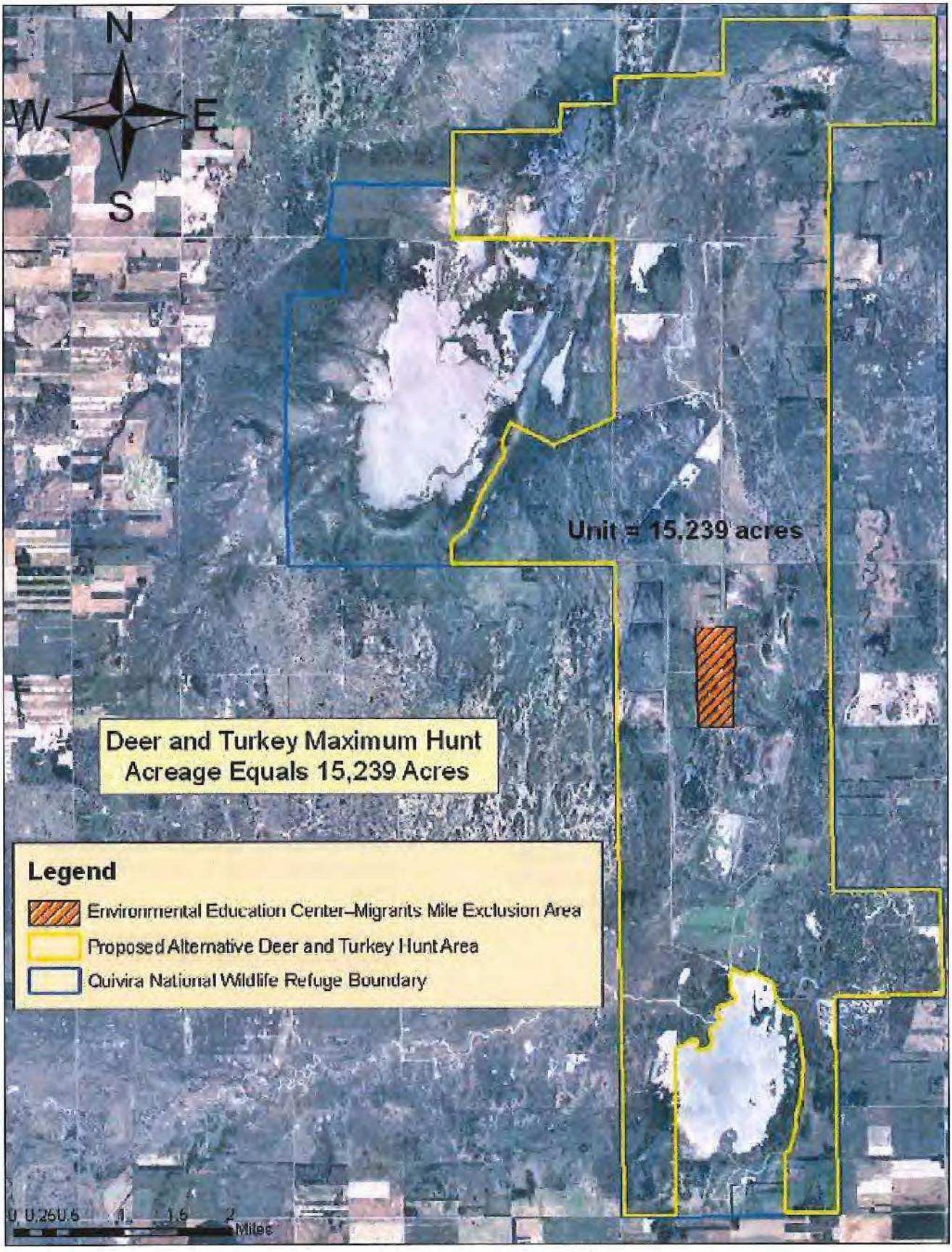


Figure 17. Proposed deer and turkey hunt area, Quivira National Wildlife Refuge, Kansas.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 116 of 144

are not allowed because they increase the risk of exotic and invasive species introduction and spread.

Frogging will be prohibited on the refuge because, at various life phases (eggs, tadpoles, adult), frogs are an important diet item for many wildlife species. Also, frogging commonly occurs at night when the refuge is closed to the public. Therefore, frogging opportunities would be very limited. Because bait collecting is not allowed on the refuge, we would need regulations to control the frog species and sizes collected, among other considerations, and these would be difficult to enforce, especially when law enforcement on the refuge is limited.

Fishing Objective 2

Enhance fishing and fishing education opportunities for youth by maintaining the Kids' Fishing Pond and annually stocking it with sport fish species.

Strategies

- Allow fishing, in accordance with State and Federal regulations, for kids 14 and under (and adults accompanying such children). Adults will not be permitted to fish without children.
- Maintain the existing accessible fishing dock.
- Produce and install an interpretive panel about aquatic ecology with children-supplied artwork and text.
- Produce and support an interpretive media that is coproduced, written, and continually revised by, and for, children to enhance their knowledge of fishing and fish resources.

Rationale

Similar to Objective 1, but in addition, maintaining a population of sport fish at the Kids' Fishing Pond by stocking provides a location where fish populations are continually stable. It also provides a type of compatible public use that follows initiatives described in objective 1.

Wildlife Observation and Photography Objective 1

Throughout the life of the plan, increase awareness and access to wildlife observation and photography opportunities on the refuge and the Great Plains Nature Center.

Strategies

- Maintain and improve the 14-mile wildlife auto tour route, trails, other public roads, observation towers, spotting scopes, and photography blinds.
- Keep and improve diverse and dynamic interpretive displays, social media, and handout literature that continually enhance and increase visitors' awareness of and interest in exploring the refuge.
- Loan equipment, like binoculars, scopes, and backpacks, through the Birding Initiative and through Connecting People With Nature.
- Continue to provide opportunities at the GPNC for wildlife observation and photography during operating hours and from sunrise to sunset every day via City of Wichita Chisholm Creek Park.
- Keep refuge open daily during daylight hours.
- Allow and encourage use throughout the entire refuge except in seasonally closed areas.
- Promote awareness of opportunities through the Wetlands and Wildlife National Scenic Byway.
- Collaborate with Friends groups and others to install a tower camera at the bald eagle and BSM areas to provide more observation opportunities of remote wildlife.
- Allow horseback riding and bicycling on established roads, not on hiking trails.
- Allow the walking of pets according to refuge regulations. Pets must be leashed and under their owners' control at all times,

unless for purposes approved by the refuge manager.

Wildlife Observation and Photography Objective 2

Over the next 10 years, promote and expand public use of woodland groves by birdwatchers, and photographers.

Strategies

- Develop information in brochures, panels and social media that promote wildlife observation and photography in designated woodland areas around the refuge.
- Enhance access to at least some woodland groves while considering management constraints and other priorities.
- Promote awareness of opportunity through the Wetlands and Wildlife National Scenic Byway.
- Encourage minimal use of the Artesian Grove through interpretive panels explaining the special nature of the site.
- See that activities comply with refuge regulations and Service policy.

Rationale for Wildlife Observation and Photography Objectives 1 and 2

Use information provided to promote connections that nurture the appreciation and stewardship of natural resources. Promoting conservation partnerships with support groups (such as Friends groups and scenic byway) would increase awareness of observation and photography opportunities, and general respect for wildlife resources. Better access to refuge areas would make it easier for people to observe and photograph wildlife.

Environmental Education and Interpretation Objective 1

Within 10 years, refuge staff will design and conduct 5–10 programs to enhance the advocacy and improve awareness of our mission and management; fish and wildlife resources; our refuge management activities; and the refuge's natural, cultural, and historic resources.

Strategies

- Develop an environmental education and interpretation plan.
- Refuge staff will continue to coordinate with Friends of Quivira to create special events and educational programs.
- Provide environmental education programs at the refuge that teach curriculum-based programs for all school grade levels to help meet State educational standards.
- Encourage the use of the refuge by educational organizations as an "outdoor classroom."
- Continue to promote national initiatives, such as Connecting People with Nature, America's Great Outdoors, and Let's Go Outside!
- Continue to engage visitors to the refuge through loan programs for binoculars and other educational products.
- Continue to provide interpretive programs at the refuge on a variety of refuge management and wildlife-oriented subjects, both by request and as scheduled activities, and increase programs as staff and time allow.
- Interpret the cultural history of the refuge area, including tribal uses and early settlement.
- Continue relevant and effective annual school events, such as those about the conservation of whooping cranes.
- Continue networking and communicating with area educators as to availability of environmental education programs and opportunities both on and off the refuge.
- Allow virtual geocaching.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 118 of 144



FWS

Visitors participate in the Monarch Mania event held at Quivira Refuge.

Environmental Education and Interpretation Objective 2

Within 5 years, refuge staff will increase interpretive media by 25 percent, thus reaching more public both onsite and offsite.

Strategies

- Educate and inform individuals, schools, and other organizations through accessible programs, exhibits, signs, pamphlets, the Internet, and social media.
- Continually evaluate interpretive media like brochures, signs, and displays for relevancy, effectiveness, and timeliness.
- Use social media to increase contact and exposure to the refuge.

Environmental Education and Interpretation Objective 3

Interagency staff at the GPNC will conduct an average of 1,700 onsite and offsite programs every year focusing on "at risk" youth and other underserved audiences.

Strategies

- Evaluate needs and increase Service staff, as applicable, to support programming efforts.
- Increase communication and networking efforts with Unified School District 259 (Wichita) and area school administrators to advertise and market GPNC programs (such as school field trips and in-classroom presentations)
- Coordinate educational programs with area educators to make sure that State Core standards are being met through programming efforts.
- Increase the distribution of educational kits and discovery boxes to educators.
- Continue to promote national initiatives, such as Connecting People with Nature, America's Great Outdoors, and Let's Go Outside!
- Educate and inform individuals, schools, and other organizations through accessible programs, exhibits, signs, pamphlets, the Internet, and social media.
- Continue to support the GPNC through its partnership with the City of Wichita Department of Park and Recreation and the KDWPT.
- Use funding opportunities from the Urban Presence Initiative to support educational programming at the GPNC.

Environmental Education and Interpretation Objective 4

Within 5 years Refuge and GPNC staff will create a definition of environmental education and increase the level of professionalism of environmental education programs presented.

Strategies

Partner agency staff will attend capacity building training and environmental education workshops.

Environmental Education and Interpretation Objective 5

Increase outreach and marketing efforts to increase participation by teachers and students in the Junior Federal Duck Stamp program by 10 percent within 5 years.

Strategies:

- Hire a consultant to evaluate our program and suggest improvements to increase participation.
- Display artwork 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.
- Create educational and marketing products, such as calendars and guides, that will engage potential participants, including parents, teachers and students.
- Educate and inform individuals, schools, and other organizations through accessible programs, exhibits, signs, pamphlets, the Internet, and social media.

Environmental Education and Interpretation Objective 6

Throughout the life of the plan maintain 2 miles of foot trails and increase interpretative signs on trails by 50 percent within 10 years.

Strategies

- Evaluate Birdhouse Boulevard trail and interpretive components for potential improvements and updates.
- Evaluate the Headquarters and Little Salt Marsh trails for interpretive signage needs and install signage as outlined.
- Evaluate signage needs on the Migrants Mile Trail and replace and install as outlined.
- Evaluate trail surfaces, boardwalks, directional signs, and bridges and improve as needed.
- Develop and provide printed media such as trail maps and guides.
- Consider incorporating a fitness program on refuge and GPNC trails through HealthyKansas.org

Rationale for Environmental Education and Interpretation Objectives 1–6

It is important for all ages of the public to have an understanding of the refuge and GPNC missions, goals, and responsibilities. Both facilities are in the "backyard" of several local communities, providing a sense of pride can be nurtured and perpetuated by increased understanding through education and interpretation. In addition, all the local communities benefit economically from their proximity to the facilities and their popularity as destinations. As community members come to know more about the refuge and the GPNC, they will be better able to educate both other residents and visitors.

Other Uses Objective

Throughout the life of the plan, provide appropriate and compatible opportunities for wildlife-dependent and non–wildlife-dependent recreation that support the six priority public uses or contribute to the appreciation of the refuge. These opportunities will not be allowed to disturb wildlife and will not be allowed when areas are closed for safety reasons.

Strategies

- Allow dog training by individuals, not commercial vendors, as described in appendix B.
- Allow commercial photography with a special use permit.
- Allow commercial tours for birding only with a special use permit.
- Allow firewood cutting in limited designated areas with a special use permit.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 120 of 144

- Do not allow the collection of berries, fruit, roots, and mushrooms.
- Do not allow the collection of shed antlers and wildflowers.
- Do not allow commercial guiding for hunting.
- Do not allow boating or camping.
- Do not allow unauthorized vehicle use on roads and trails.
- Do not allow off-road vehicle use.
- Do not allow the collection of reptiles and amphibians or crayfish.
- Review requests for other non–wildlife-dependent for compatibility and appropriateness on a case-by-case basis.

Rationale

The Improvement Act states that other uses can occur within the Refuge System, but they must support, or not conflict with, a priority public use. Furthermore, a use may not keep a national wildlife refuge from accomplishing its purposes or the mission of the Refuge System.

The refuge supports various forms of nature-based outdoor recreation that, while not strictly wildlife dependent, may support or facilitate wildlife-dependent recreation. These include activities such as equestrian use, bicycling, or hiking, which are compatible with the purposes of the refuge and contribute to the appreciation and enjoyment of it. These opportunities have been found to be appropriate at certain times of the year, and compatible with the goals and objectives set by the refuge. The opportunities will not be allowed to disturb wildlife during certain times of the year, and will not be allowed when areas are closed for safety reasons.

4.6 Public Outreach Goal

Visitors of all abilities understand, appreciate, and support the Service mission, as well as the refuge's unique habitats and importance to migratory birds and other wildlife and plant species.

Following are objectives for a variety of public outreach activities.

Public Outreach Objective 1

Within 5 years, refuge and GPNC staff will design and conduct outreach programs to present to 10–20 civic and environmental organizations annually in local communities within a 50-mile radius of each respective site.

Strategies

- Develop speaker-led multimedia programs that emphasize refuge or GPNC features, facilities, management goals, and natural, cultural, and historic resources. Actively seek new civic organizations, clubs, educational groups, and other entities to which we can present programs.
- Work with Friends of Quivira and Friends of the Great Plains Nature Center to promote public awareness of the refuge and its mission and provide opportunities for the public to learn more about the resources of the Great Plains.
- Emphasize the importance of Quivira and the GPNC to area communities because of the strong draw the sites have to visitors from outside the area. Present information about what makes each site special, such as unique features to the sites, great bird-watching opportunities, and rare species occurrences.
- Work with the Friends of the Great Plains Nature Center to develop information about how Quivira Refuge and the GPNC function as "green" operations in the environment. Provide educational material about geothermal, solar, and other features at these sites through media such as displays, literature, and the Web.
- Install a tower camera at the bald eagle and BSM areas to provide more observation opportunities of remote wildlife to heighten understanding and awareness of refuge resources, encourage refuge visitation, and increase positive personal experiences with natural resources.



FWS

The blue goose, representing the Refuge System, rides in the Octoberfest Parade held in Stafford, Kansas.

Public Outreach Objective 2

By working in partnership with respective Friends groups, foster appreciation and increase knowledge of the refuge and GPNC by holding at least 10 special events annually and through the Friends' newsletters and Web sites.

- Present theme-oriented special events throughout the year that emphasize either subjects, such as butterflies or birds, or activities, such as fishing.
- Make sure that all special events are used to emphasize the purpose, mission, and wildlife of the refuge and the GPNC.
- Contribute regular articles to Friends newsletters and Web sites about refuge and GPNC news, management actions, and other pertinent subjects.
- Recruit, train, and use volunteers from local communities to help us meet our management and public use goals at Quivira Refuge and the GPNC. Strive to help GPNC volunteers contribute at least 2,800 hours of service to the nature center. The Friends of the GPNC volunteer coordinator will work to increase and enhance the GPNC volunteer corps.

Public Outreach Objective 3

Within 5 years, contribute to knowledge and appreciation of the refuge, GPNC, and the Service through a minimum of 65,000 public visits to the respective sites; 8,000 visits to offsite stations such as the Kansas State Fair, and 40,000 visits to online media.

- Increase and continually freshen Quivira Refuge Web content by offering fresh, informative, and pertinent content about refuge operations, bird and wildlife sightings, hunting, events, and more. The GPNC staff and webmaster continue to update existing pages and add more pages as needed for new events, projects, and programs.
- Oversee the development, maintenance, and staff of our information booth at the annual Kansas State Fair for both Quivira Refuge and the GPNC and continue to update and change its theme. Make sure that information about our various operations, missions, and activities is regularly available, but also offer fun and educational, hands-on exhibits for the entire family.
- Develop static, portable displays about refuge and GPNC wildlife, facilities, and management that can be used at fairs, conventions, and other events that last a day or more.
- Install traffic counters at strategic locations to count visitor use.
- Work with partners to survey visitor use.

Rationale for Public Outreach Objectives 1–3

Following the 2011 "Conserving the Future" visioning workshop, implementation teams were cre-

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 122 of 144

ated to address a variety of issues, such as urban wildlife refuges, community partnerships, communication, interpretive and environmental education, volunteers, hunting, fishing, and outdoor recreation. These implementation teams were tasked with developing plans that outline goals, objectives, and strategies to meet issues identified at the visioning workshop. Once these plans are complete, Quivira Refuge staff will review and incorporate their recommendations to enhance public outreach as they apply to refuge and GPNC operations and visitor services opportunities. The plans will also form the basis for various stepdown plans, such as for Visitor Services, that will be created following the completion of this document.

Public outreach furthers the mission of the refuge and the Refuge System for the protection of public trust resources by garnering support for wildlife and their wild places. Using the principle that appreciation begins and is nurtured through understanding, outreach builds and enhances a sense of stewardship in the public, which in turn allows the public to feel better connected to the natural world through the refuge and the GPNC.

4.7 Cultural Resources Goal

The cultural resources and cultural history of the refuge are identified, valued, and preserved and connect staff, visitors, and the community to the area's past.

Following is the objective for cultural resources on Quivira Refuge.

Cultural Resources Objective

Protect and preserve cultural resources on the refuge through coordination with the Region 6 cultural resources branch, which helps our refuge staff in meeting the requirements of Section 106 of the National Historic Preservation Act and other cultural resources-related legislation.

Strategies

- Inform the Region 6 cultural resources staff of refuge projects early in project planning by using the Cultural Resources Review Form.
- Develop exhibits and signs to enhance educational opportunities.
- Encourage collaboration with interested tribes in developing relevant materials and correct interpretation.

Rationale

The refuge was once an important Native American gathering site for hunting and salt gathering. Different cultural values are acknowledged, respected, and celebrated by the Refuge System (FWS 2011). Cultural services are one of many ecosystem services, or benefits, that one can get from nature (FWS 2011).

4.8 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 Great Plains Nature Center.

Following are objectives for a variety of visitor and employee safety and resource protection activities.

Visitor and Employee Safety Objective

Ensure visitor safety and the safety of our employees at Quivira Refuge and the GPNC. Strive to keep the refuge 100-percent visitor accident free and keep employee accidents and injuries, as reportable to the Office of Workers Compensation Program, below the regional average of 6.2 hours of lost time a year over the life of the plan.

Strategies

- Educate and inform visitors of their responsibilities when visiting national wildlife refuges and the ways they might mitigate potential dangers and hazards.

- Use directional and informative signs, visitor information kiosks, updated Web pages, and posted warnings to help reduce preventable accidents and mishaps.
- Close roads deemed unsafe for travel because of weather conditions or poor visibility, and post closings on our Web page promptly to alert visitors about our conditions before travelling, if possible.
- Maintain up-to-date station safety plans that provide emergency contacts, procedures, and training for all employees.
- Conduct an annual safety inspection of all facilities.
- Provide emergency shelters, accessible facilities, and suitable trails and roads.
- Review and follow infectious disease plans and policies and update as necessary every year.
- Law enforcement officers help with protecting visitors and report serious incidents to the proper authorities, per our guidance found in regulation 054 FW 1.
- Keep a collateral duty safety officer at Quivira Refuge.
- Provide employees with suitable personal protective equipment.
- Make sure that all required safety and operator training is completed before engaging in risky tasks or work situations. Make sure that other training, such as cardiopulmonary resuscitation, or CPR, and first aid, is available to employees as needed or requested.
- Make sure that employees review job hazard analyses before engaging in at-risk tasks.
- Practice sound risk management, "the state in which risks are acceptable."

Rationale

Visiting a national wildlife refuge can be inherently dangerous. Snake bites, stinging and biting insects and their associated diseases, extreme hot and cold temperatures, wind, lightning, tornados, standing or turbulent water, uneven terrain, and steep edges can potentially turn a pleasant day out into a life-altering experience. Our role is to help identify these dangers, inform about them, and mitigate these dangers to the greatest extent possible.

Reducing the potential for accidents and injuries is cost efficient, provides better job satisfaction for employees, and is the right way to conduct business. We require written job hazard analyses before undertaking all at-risk tasks, such as operating an all-terrain vehicle or pounding fence posts. A library of job hazard analyses is available on the Region 6 safety office Web site and at refuge headquarters.

Resource Protection Objective

Protect wildlife and other natural and cultural resources from damage, theft, or illegal taking to preserve resources for visitors to the refuge and to prevent their unnatural decline.

Strategies

- Enforce hunting, fishing, and all other regulations in accordance with the CFR, State laws, and refuge regulations to protect designated critical habitat and wildlife.
- Close areas to protect wildlife from human disturbance when necessary.
- Enforce regulations and apply refuge closure strategies, as determined by the refuge manager, to protect whooping cranes and other resources of concern.
- Use law enforcement and education to protect cultural resources in accordance with Federal, State, and tribal laws, policies and guidelines.
- Keep at least two dual-function law enforcement officers or one dual-function and one full-time permanent law enforcement officer.
- Provide ample and easy access to refuge regulations through various media such as printed leaflets, Web site and social media, and six information kiosks located throughout the refuge.

Rationale

To adequately staff refuges with sufficient officers to protect wildlife and habitat and to make refuges safe places for staff and visitors is a top priority for the Refuge System. Conserving the Future (FWS 2011), Recommendation 16, charges us to: Conduct a new, independent analysis of refuge law enforcement to measure progress and to identify needed improvements.

4.9 Administration Goal

Provide and support facilities, strategically acquire and allocate staff, increase volunteer opportunities and partnerships, and effectively develop and use money to support the long-term integrity of infrastructure, habitats, and wildlife resources at the refuge and the Great Plains Nature Center.

Following are objectives for a variety of administration activities.

Strategies

- Continue to correctly document budget and staff needs through memos and reports.
- Continue to hire one to five seasonal biological aids and technicians and continue to hire range technicians, as money allows, each year.
- Provide office space at Quivira Refuge for a regional refuge zone biologist, a Partners private lands biologist, and for other program staff as needed.
- Use the Youth Conservation Corps program to help accomplish refuge goals and objectives.
- Raise money through grants and initiatives, such as AmeriCorps and Youth in the Great Outdoors, to supplement our staff and projects.
- Keep permanent fire staff to include a fire management office, and refill a supervisory range technician.

Funding and Staff Objective 1

Strive to keep funding level for 11 permanent full-time and 1 permanent part-time staff positions; provide regional or zone office space as needed; and continue to seek money for vacant, seasonal, temporary, and youth positions.

Funding and Staff Objective 2

Plan to recruit and fill new positions that are identified in this CCP as being needed for accomplishing the goals and objectives to protect habitat, infrastructure, and wildlife resources at Quivira Refuge and the GPNC throughout the life of the plan.



FWS

The Great Plains Nature Center

Strategies

- Identify needed positions and projects in the Refuge Operations Needs System database and update as requested. The top refuge priority identified in the database is one full-time maintenance worker.
- Coordinate with our regional law enforcement coordinator.
- Continue to correctly document budget and staff needs through memos and reports.
- Evaluate and add a new position at the GPNC to meet needs
- Refine and increase participation in our refuge volunteer program.

Rationale

Conserving the Future (FWS 2011) states, "We must engage and prepare a diverse group of qualified and enthusiastic professionals that want to make the Service and the Refuge System their life's work. We must be adaptive and flexible to recruit a workforce that reflects society...to ensure a workforce of the best and brightest minds...we must look for ways to transfer knowledge from senior staff. As part of this succession, we will value diversity of people and skills to create a culture of inclusivity."

Conserving the Future (FWS 2011), Recommendation 22, charges us to: within the next 10 years, make our workforce match the diversity in the civilian labor workforce and recruit and keep a workforce that reflects the ethnic, age, socioeconomic and cultural backgrounds, and language diversity of contemporary America.

Facilities Objective 1

Within 5 years at the refuge and GPNC, review and update our refuge deferred maintenance projects list and document deficiencies, and submit a ranked project list for potential money every year.

Strategies

- Support and enhance the water delivery infrastructure necessary to achieve our wetland goals and objectives for the refuge.
- Maintain the roads and parking lots required to support public use opportunities consistent with our goals and objectives.
- Maintain the fencing, wells, and other infrastructure necessary to operate a grazing program that helps us achieve our goals and objectives for the refuge.
- Maintain existing buildings, including an office, visitor center, maintenance shop, three storage buildings, one pole barn, two residences, and two comfort stations.
- Review displays, interactive, portable, and static, about area flora, fauna, ecology, and history at our visitor centers and update as resources allow.
- Maintain and enhance the existing 2 miles of trails and accompanying structures, like bridges, boardwalks, interpretive signs, and kiosks, to provide quality visitor use experiences.
- Explore creating more trails on the refuge to provide more opportunities for compatible wildlife-dependent recreation.
- Maintain infrastructure at the GPNC, including Koch Habitat Hall, Coleman Auditorium, offices, classrooms, and a storage garage, to support our multiagency partnership with the City of Wichita Park and Recreation Department and KDWPT.

Rationale

Visitor services infrastructure for both the refuge and GPNC need routine annual and long-term maintenance to keep them in good-to-excellent condition. Because of our salty environment at the refuge, our water control facilities and equipment deteriorate faster than those at refuges that protect freshwater marshes. Much of the refuge is also comprised of the sandy, Sand Prairie ecotype soils, which necessitates more constant maintenance to keep water control structures from washing out. Some old water control structures need to be replaced. Boundary fences and signs are in constant need of replacement because of severe weather events, environmental degradation and occasional vandalism.

The maintenance shop requires an addition and updating. The bunkhouse and environmental education classroom were created out of the old, original 1957 block office building, which was abandoned because of poor domestic water quality. So, there is a

need to again abandon this building and move operations to the current headquarters site to consolidate facilities and operations at one location with good quality water. An improved environmental education program could ensue near the headquarters with access to accessible trails, the observation tower, the visitor center, the Kid's Fishing Pond and to quality wetlands and grasslands for interpretation.

Energy conservation modifications have recently been made at several facilities, but more improvements are needed.

Facilities Objective 2

At the GPNC, within 5 years, identify changes and additions to the facility that will improve our cooperative partnership and agency's performances while enhancing the visitors' experience.

Strategies

- Work with partner staffs and develop a plan to expand the building, thus adding office space, classrooms, and a large public meeting space that has the possibility to accommodate traveling exhibits.
- Encourage Friends of the GPNC to investigate strategies to pay for building a new addition to the facility and for improved and enhanced programming efforts.
- Continue to work with corporate sponsors to provide up-to-date and state-of-the-art exhibits in the Koch Habitat Hall.

Rationale

Current exhibits are reaching the end of their expected lifespan and should be replaced and updated. The building will be insufficient for anticipated future needs.

Facilities Objective 3

Within 15 years, design and develop a new environmental education site near the headquarters area.

Strategies

- Include a capital improvement project in the Service asset and maintenance management system.
- Develop a conceptual site plan and engineering design.
- Demolish and rehabilitate old environmental education site.
- Construct new environmental education site.

Rationale

Same as objective 2 and rationale for environmental education and interpretation objective 1. Centralized buildings improve visitor service, reduce staff travel, and improve water quality.

Facilities Objective 4

Within 15 years design and construct another cold storage building and fire cache on the refuge.

Strategies

- Include a capital improvement project in the Service asset and maintenance management system.
- Develop a conceptual site plan and engineering design.
- Potentially demolish and rehabilitate old site.
- Construct new cold storage building and fire cache.

Rationale

Additional storage space is needed to better protect vehicles and to support other refuge objectives.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 127 of 144



FWS

Migrants Mile Trail

4.10 Stepdown Management Plans

This CCP is a broad umbrella plan that provides general concepts and specific wildlife, habitat, visitor services, and partnership objectives over the next 15 years. The purpose of stepdown management plans is to provide detail for our managers and employees so they may more effectively carry out the specific actions and strategies authorized by this CCP. Table 19 lists the stepdown plans needed, their status, and their next revision dates.

4.11 Monitoring and Evaluation

We believe that the uncertainty surrounding habitat management can be dealt with most efficiently within the paradigm of adaptive resource manage-

Table 19. Stepdown management plans for Quivira National Wildlife Refuge, Kansas.

Plan	*Completed plan, year approved*	*New or revised plan, completion year*
Habitat management plan (annual)	2012	2013 revise annually
Habitat management plan	—	2017
Inventory and monitoring plan	—	2014
Integrated pest management plan	2012	2017
Fire management plan	2009	2014 validate annually
Visitor services plan	1986	2017
Law enforcement plan	2012	2017
Station safety plan	2012	2017
Water management plan (annual)	2012	2013 revise annually
Hunting plan	—	2016
Trapping plan	—	2016
GPNC operations plan	2012	2013 revise annually
Santana Research Natural Area plan	1984	revise as appropriate

ment (see figure 18) (Holling 1978, Kendall 2001, Lancia et al. 1996, Walters and Holling 1990). This approach provides a framework within which we can make objective decisions and reduce the uncertainty surrounding those decisions. The key components of an adaptive resource management plan follow:

- clearly defined management goals and objectives
- a set of management actions with associated uncertainty as to their outcome
- predictions of various alternative responses to management strategies
- monitoring or assessing select natural resource conditions of interest, largely directed by objectives
- communicating and using new information to direct future decisionmaking

The adaptive management framework facilitates an iterative process, whereby our understanding of the effectiveness of strategies and the response and conditions of natural resources on the refuge is improved over time. Reducing the uncertainty of habitat management via adaptive resource management helps in the continual development of long-term habitat management plans.

4.12 Plan Amendment and Revision

This CCP will be reviewed annually to decide if it needs revision. A revision will occur when significant information becomes available, such as a change in ecological conditions. The final CCP will be augmented by detailed stepdown management plans to address the completion of specific strategies in support of the CCP goals and objectives. Revisions to the CCP and the stepdown management plans will be subject to public review and NEPA compliance. At a minimum, this plan will be evaluated every 5 years and revised after 15 years.

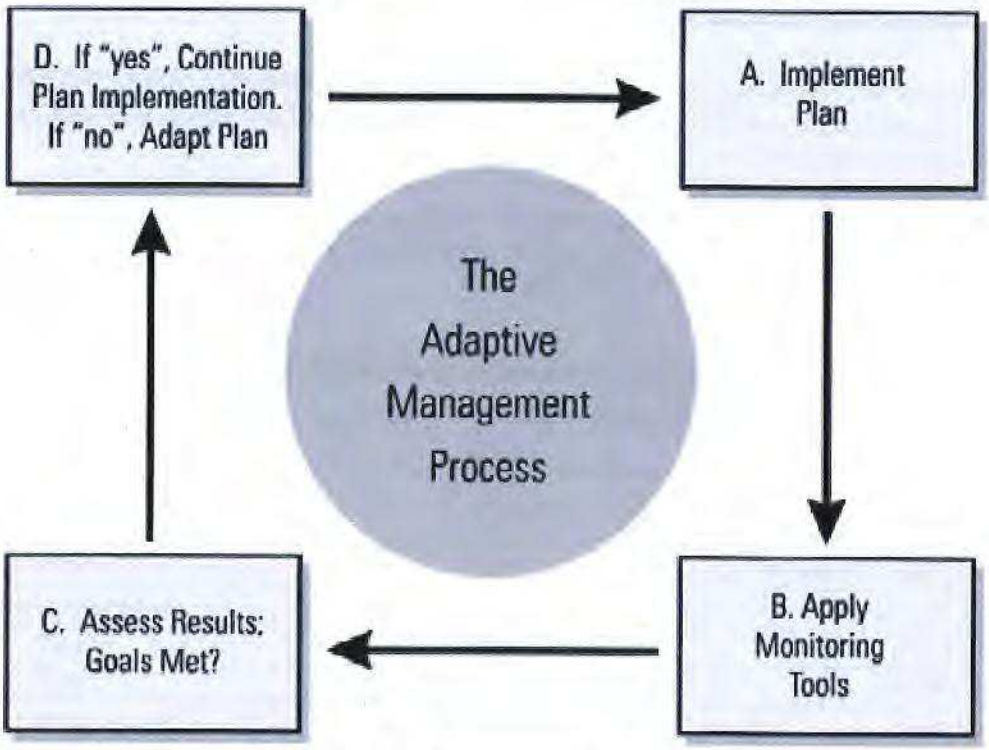


Figure 18. The adaptive resource management process.

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 understory 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; firefighting; 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

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 130 of 144

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

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 131 of 144

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.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 132 of 144

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 seashore 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

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 134 of 144

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.

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.; Leistritz, 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.; Krementz, 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].

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 136 of 144

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

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 137 of 144

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/vncs.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].

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 138 of 144

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. Macroscope: 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 Juniperus 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 John 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.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 140 of 144

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].

Ratajczak, 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-

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 141 of 144

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.; Montei, 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.; Ramireddygari, 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.

Case 2:21-cv-02025-HLT-JPO Document 1-3 Filed 01/15/21 Page 142 of 144

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 moethodology. [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 tallgrass 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 strategraphic 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.

1320 Research Park Drive
Manhattan, Kansas 66502
(785) 564-6700

Kansas
Department of Agriculture
agriculture.ks.gov

900 SW Jackson, Room 456
Topeka, Kansas 66612
(785) 296-3556

Jackie McClaskey, Secretary

Governor Sam Brownback

December 8, 2016

Dear GMD No. 5 Board Members,

On Thursday, December 1, we received the U.S. Fish & Wildlife Service's response to GMD #5's Stakeholder Proposal of September 8. As you know, the Service declined the Basin's offer principally on the grounds that it is insufficient in quantity and that placing augmentation infrastructure on the refuge as described in the offer poses "significant legal obstacles." It appears from its response that the Service intends to file a request to secure water, which we anticipate receiving soon. Nevertheless, the Service goes on to state that, "We look forward to continuing to work with GMD #5 as we seek a resolution to the matter that is fully protective of the interests of the United States."

Our final report does not specifically identify a remedy for the impairment. We intentionally did not do this work in favor of fostering constructive and effective dialogue in the basin and between the basin stakeholders and the Service. We continue to hold that locally developed solutions are best. For this reason, we request the basin stakeholders develop a revised settlement offer by February 15, 2017. We very much hope that the extra time, and the Service's stated willingness to continue to work with GMD #5, will allow the basin stakeholders to work with the Service to find a path forward to a negotiated settlement.

Should an agreement not be reached, we will be obligated to develop an administrative remedy for implementation in 2018 and beyond.

Since it is late in the year and many producers have already made cropping decisions and purchases for the coming year, we will not administer the basin's impairing water rights during the 2017 irrigation season.

Please let me know if we can be of any assistance to you in this matter. We look forward to discussing this further with the Board at your next meeting on Dec. 15.

Sincerely,

David W. Barfield, P.E.
Chief Engineer
Kansas Department of Agriculture,
Division of Water Resources

Pc:
Sec. Jackie McClaskey, Kansas Department of Agriculture
Will Meeks, U.S. Fish and Wildlife Service, Mountain-Prairie Region
Mike Oldham, Quivira National Wildlife Refuge
Lynn Preheim, Stinson Leonard Street LLP
WaterPACK, Richard & Jane Wenstrom
Jeff Lanterman, Kansas Department of Agriculture, Stafford Field Office

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Mountain-Prairie Region

IN REPLY REFER TO:
BA WTR
KS WR
Mail Stop 60189

MAILING ADDRESS:
P.O. Box 25486, DFC
Denver, Colorado 80225-0486

STREET LOCATION:
134 Union Boulevard
Lakewood, Colorado 80228-1807

David Barfield, P.E., Chief Engineer
Kansas Department of Agriculture
Division of Water Resources
1320 Research Park Drive
Manhattan, Kansas 66502

JAN 17 2017

Dear Mr. Barfield:

Enclosed is the U.S. Fish and Wildlife Service (Service) request to secure water regarding water right No. 7571 from injury due to junior groundwater wells. The Service appreciates the help received during our January 03, 2016 phone conversation ensuring the form was filled out accurately. Please let us know if any further changes need to be made.

As we indicated in our December 01, 2016 letter, submission of this form will not preclude us from working further with Big Bend Groundwater Management District No. 5 to obtain a mutual solution. We must, however, have the solution be enforceable from your office and feel that submitting this request will ensure that enforceability occurs in 2018.

Please contact me at 303-236-4491 if you any questions or would like to discuss further. Thank you for your assistance in this matter.

Sincerely,

Brian S. Caruso, Ph.D., P.E.
Chief, Division of Water Resources

EXHIBIT 4

REQUEST TO SECURE WATER

To: Chief Engineer
Division of Water Resources
Kansas Department of Agriculture
(or his or her authorized agent)

January 01, 2018
(Date)

1. I am presenting the following information as the basis for action on my request to secure water:

   That pursuant to K.S.A. 82a-701 et. seq., a water right, identified as follows, has been established:

   a. Vested Right
   File No. _____ _____ County _____ Source

   _____ Quantity _____ Rate

   b. Appropriation Right
   File No. **7571** Priority Date **August 15, 1957**

   Status **Certified**

   Rattlesnake Creek Source | **14,632** Quantity | **300 cfs** Rate

2. That the authorized place of use for the water right is: **Quivira National Wildlife Refuge**

3. A. That the appurtenant to the water right described in paragraphs 1 and 2 is owned by:

   U.S. Dept. of the Interior - U.S. Fish and Wildlife Service Name | **P.O. Box 25486, Denver Federal Center, Mailstop 60189, Denver, CO 80225** Address

   _____ Name | _____ Address

   B. That the land described in paragraph 2 is owned by:
   (If different than owner of water right)

   same as above Name | _____ Address

   _____ Name | _____ Address

4. That the undersigned, (if not the owner) has an interest in the above-described land and water right as follows:

   Agent
   (tenant, lessee, buyer, contract or other)

5. That during this calendar year **0** acre-feet of water has been used under this right.

6. That the undersigned has need for **14,632** acre-feet of water at a rate of see attached g.p.m. for **Recreational** purposes at locations described as follows:

   Fish and Wildlife Habitat, Forage

   No. of Acres: **22,135** Kind of Crop: **N/A**

7. That I am prepared to, and will, in the exercise of my water right described above, apply to beneficial use all water available to me at a rate of See attached g.p.m. or less, commencing at 12 o'clock A.M. on January 1, 2018.

8. That I have been informed that water is available from the source of supply in the amount of:

Date	Estimated Flow	Location
1974 - 2013	Variable	Rattlesnake Creek, Zenith Gage

9. That I have been informed that water is, or was, being diverted from the source of supply as follows:

Date	Water Right	Name	Estimated Rate of Diversion
1995 - 2007	Multiple	Junior Appropriators	30,000 - 60,000 AF per year depletions to Rattlesnake Creek

10. That I have advised the persons listed below of my need for water and my intention to exercise my water right:

Name of Person	Date	Agreeable – Yes Or No
Big Bend GMD No. 5	12/01/2016	No

I request in accordance with the provisions of K.S.A. 82a-706b, that the Chief Engineer or his or her authorized agent open, close, adjust or regulate the headgates, valves, or other controlling works of any ditch, canal, conduit, pipe, well, or structure as may be necessary to secure water to which I am entitled:

Brian S. Caruso, agent
Signature

State of ~~Kansas~~ Colorado)
) SS
County of Jefferson)

Brian S. Caruso by me being duly sworn, declare that the information is true and correct to the best of his or her knowledge and belief.

Brian S. Caruso, agent
Affiant's Signature

Subscribed and sworn to before me this 17th day of January, 2017

CAROLINE M. CORDOVA
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20044034704
MY COMMISSION EXPIRES 09/28/2020

Caroline M Cordova
Notary Public
135 Quitman Street
Denver CO 80219

My Commission Expires September 28, 2020

Seasonal Rattlesnake Creek Water Need Estimates for Quivira National Wildlife Refuge, Prepared May 2015

Background

At the request of Kansas Department of Agriculture, Division of Water Resources (DWR), the U.S. Fish and Wildlife Service (Service) has provided information to increase understanding of *seasonal* water needs to accomplish management objectives of the Quivira National Wildlife Refuge (Refuge). The Refuge's current annual Water Right 7571 on Rattlesnake Creek is 14,632 ac-ft. There is no single estimate that accurately predicts seasonal surface water needs of the Refuge because various factors influence water needs within and among years, such as short- and long-term weather patterns, the timing of wildlife events (e.g., migration), and changing habitat conditions.

Approach

Scenario 1 – There was interest by DWR to evaluate the potential of using past water use records to quantify estimates of seasonal water needs to accomplish refuge management objectives. To accomplish this task, Refuge staff compiled 48 years of monthly water-use records and grouped months into seasons based on the life cycle events of waterbirds (timing of migration, relative abundances) and the lag time required to transfer water to wetlands through the ditch infrastructure (Table 1). For example, flooding a wetland to the appropriate depth can require days to weeks depending on location from the diversion, volume of water available, and existing soil moisture conditions (e.g., dry, saturated).

Table 1. Significant annual events largely considered in determining seasonal water needs to accomplish management objectives of Quivira National Wildlife Refuge.

Jan-Feb	Mar-Apr	May-Jun	Jul-Sep	Oct-Nov	Dec
MANAGEMENT TO SUPPORT WILDLIFE FOOD & COVER REQUIREMENTS					
Use water where needed to provide/maintain semipermanent wetland habitat.					
	Shallowly flood select units to saturate dry soils that will be used to produce wildlife foods.				
	Dewater select wetlands for suitable germination and growth of desired plants used for wildlife food and cover. Drawdown dates are based on scientific information.				
		Irrigate select wetland units to support survival, growth, and seed production of germinated wildlife food plants.	After seeds mature, gradually increase water levels in wetlands to coincide with the food and cover needs of target species.		
CHRONOLOGY OF SPECIES ANNUAL EVENTS OR WHEN LIFE REQUIREMENTS NEED TO BE AVAILABLE FOR SPECIES USE					
Waterfowl and bald eagle wintering habitat is provided when open water is available (generally where flooded deep and/or where flow prevents ice formation).	Peak spring waterfowl migration (habitat flooded <15 inches).	Main spring shorebird migration (habitat flooded <6 inches and mudflat).		Main fall shorebird migration (habitat flooded <6 inches and mudflat).	Peak fall waterfowl migration (habitat flooded <15 inches).
	Endangered whooping crane spring migration (shoreline & habitat flooded <1 ft).	Breeding-related activities occur for several waterbirds that require flooded habitat for food and/or cover resources, such as for the state-threatened snowy plover, the endangered interior least tern, and for state species in need of conservation (e.g., black rail, black tern).		Endangered whooping crane fall migration (shoreline and habitat flooded <1 ft).	

After reviewing the water use records, Refuge staff made the determination to exclude years (n=28) when total annual water use did not exceed 7,000 ac-ft to prevent extreme bias in estimating seasonal water use due to

limited water availability and/or inappropriate timing of available water. For example, during low water years Refuge staff often receive and use water at less than optimal times (e.g., winter) to help increase the odds that at least some wetland habitat is flooded at critical times (e.g., spring waterbird migration). In this case, the average amount of water used during the winter season would be biased high. Conversely, it is common during low water years to not have sufficient water to maintain wetland vegetation, which results in low food production and sparse cover required by wildlife. In this case, the use of water during summer would be biased extremely low. The use of 7,000 ac-ft as a cutoff point was based on approximating 50% of the Refuge water right and, as such, is somewhat arbitrary.

For the 20 years of when total annual water use exceeded 7,000 ac-ft, water use for each year was partitioned into the appropriate seasons and the median, minimum, and maximum seasonal values across all years were calculated (Table 2).

Table 2. Seasonal median, minimum, and maximum water use (ac-ft) values, calculated using 20 years of data where annual use exceeded 7,000 ac-ft. Totals of the median and maximum seasonal water use values are respectively lower and higher than the current annual water right (14,632 ac-ft).

	Jan -Feb	Mar-Apr	May-Jun	Jul-Sep	Oct-Nov	Dec	Total
Median	986	1,115	1,062	2,117	1,781	684	7,746
Minimum	0	89	126	463	151	101	
Maximum	3,557	3,111	2,601	4,374	6,205	2,003	21,851

This Scenario 1 estimate is biased due to the following:

- Historic *use* does not accurately reflect water *needs* during any given year or season.
- Historic water use in a given season may not accurately reflect the volume of water that would have been used if water had been available during that season or, perhaps, previous to that season.
- The use of records that exceeded 7,000 ac-ft was arbitrary and only represents nearly half of the Refuge water right. As such, these estimates likely are biased low.

Scenario 2 **–**

Scenario 2 is based on achieving minimum requirements of CCP objectives following a drought year and water use was not constrained by the current water right (Table 3, Scenario 2). Unlike Scenario 1, seasons in Scenario 2 were defined by CCP habitat-based objectives, as approved in 2013. Data used to develop this scenario included area estimates and area-capacity curves developed by the Service for individual wetlands, published long-term precipitation and pan evaporation data (including the use of a coefficient to account for shallow wetlands), soil infiltration rates calculated based on information in NRCS soil survey data (SSURGO), LiDAR data to estimate volume of ditches, and aerial imagery to estimate surface area of water in the Big and Little Salt Marshes at the beginning of the scenario.

Table 3. Comparison of Rattlesnake Creek surface water use Scenarios 1 and 2 for Quivira NWR.

Scenario	Seasonal Water Use Estimates (Acre-Feet)												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1	986		1,115		1,062		2,117			1,781		684	7,746
2	3,144		7,427		2,895		4,053				5,881		23,400

This Scenario 2 estimate is biased due to the following:

- Water loss due to plant transpiration was not included in water use estimates (which would increase water needs to meet objectives).
- Water loss due to soil infiltration in some wetlands was underestimated because values for the available water capacity of 2,300 acres of wetland soils were not available (which would increase water needs to meet objectives).

- Water loss due to horizontal seepage in ditches during initial flooding was not estimated (which would increase water needs to meet objectives).
- Estimate based on a "normal precipitation" year following a drought year (all units dry); thus, a large volume of water (3,144 acre-feet) is needed to initially flood the Little Salt Marsh before water can be diverted elsewhere on the Refuge. This volume would be lower in years not preceded by drought.
- Estimate based on initially flooding only units and infrastructure on the south end of the Refuge. If north portion of Refuge were flooded early in the year, water use estimates would increase.
- Seasons are based on habitat objectives and do not always reflect the water management activities/schedules (e.g., time required for water to travel from diversion to wetland of interest).

Results

The seasonal estimates in Table 4 were developed after considering Scenarios 1 and 2 described in the approach above.

Table 4. Seasonal Rattlesnake Creek surface water need estimates for Quivira NWR, given the current water right.

Seasonal Water Use (Acre-Feet)						
Jan-Feb	Mar-Apr	May-Jun	Jul-Sep	Oct-Nov	Dec	Total
1,500	3,500	2,000	3,500	3,632	500	14,632

Although Scenarios 1 and 2 were developed based on quantitative information; these estimates were constrained by limitations that precluded either scenario from being used to directly estimate seasonal water needs. In general, the estimate based on past water use is known to be flawed because the Refuge either did not receive its full annual right of 14,632 ac-ft and/or the seasonal availability of water was not available or lacking, which resulted in the use of water during suboptimal times that often limited or impeded the accomplishment of management objectives. In contrast, the Scenario 2 estimate, based on water needs following drought, exceeded the Refuge water right even though important factors (e.g., water infiltration in ditches, plant transpiration) that would have increased water needs were not included in the estimate. Therefore, the Service used information from both Scenario 1 and Scenario 2 to adjust water use so total annual use matches the current water right of 14,632 ac-ft (Table 4).

Audubon of Kansas

STATE OFFICE
Ron Klataske, Executive Director
210 Southwind Place, Manhattan, KS 66503
TEL: (785) 537-4385 EMAIL: aok@audubonofkansas.org
Websites: www.audubonofkansas.org;
www.niobrarasanctuary.org
Lana Arrowsmith, On-site Niobrara Coordinator

BOARD OF TRUSTEES

Margy Stewart
Chair, McDowell Creek, Geary Co.

Dick Seaton
Vice Chair/Treasurer, Manhattan

Joyce Wolf
Secretary, Lawrence

Lisa Stickler
Past Chair, Bucyrus

John W. Head
Exec. Committee, Lawrence

Cathy Lucas
Exec. Committee, Sublette

Dan Baffa
Salina

Phillip L. Baker
Topeka

Bernita Berntsen
Berryton

Rex Buchanan
Lawrence

Mike Corn
Hays

Michael Donnelly
Manhattan

Tom Ewert
Wichita

Matt Gearheart
Lenexa

David Gnirk
Herrick, SD

Royce Guhr
Independence

Gary Haden
Manhattan

Larry T. Hower
Salina

Lucia Johnson
Lenexa

Bruce Kennedy
Lincoln, NE

Robert T. McElroy
Past Chair, Topeka

Carol Morgan
Topeka

Grant Newbold
Minden, NE

Mary Powell
Topeka

Randy Rathbun
Past Chair, Wichita

John Schukman
Leavenworth

Elizabeth Schultz
Lawrence

Richard G. Tucker
Parsons

Don Wissman
Manhattan

Ron Wolf
Lawrence

John Zempel
Topeka

September 6, 2017

BY E-MAIL (PDF) AND U.S. MAIL

Mr. David W. Barfield, P.E.
Chief Engineer, Division of Water Resources
Kansas Department of Agriculture
1320 Research Park Drive
Manhattan, Kansas 66502
david.barfield@ks.gov

WATER RESOURCES
RECEIVED
SEP 08 2017
KS DEPT OF AGRICULTURE

Re: Quivira National Wildlife Refuge Impairment Negotiations

Dear Mr. Barfield:

On May 13, 2016, Audubon of Kansas (AOK) submitted a comment letter to the Division of Water Resources (DWR) emphasizing the importance of the Quivira National Wildlife Refuge (Refuge). (For ease of reference, we have attached that letter to this one.) Writing on behalf of AOK and our members, we appreciate both your recognition of the Refuge's importance and the seriousness with which you are assessing the many challenges involved in protecting the Refuge's senior surface water right.

However, AOK has become concerned that DWR, Big Bend Groundwater Management District No. 5 (GMD5), and the U.S. Fish & Wildlife Service (Service) are not addressing multiple and fundamental legal issues that demand attention for the adequate protection of the Refuge's water right—a right that secures the lifeblood upon which the Refuge depends. Based upon the materials which DWR has posted on its Quivira website as of August 17, 2017, these negotiations appear to have remained limited to technical questions concerning the parties' preferred solutions, including augmentation. Unfortunately, these negotiations appear to be neglecting federal law: law that prohibits any reduction of the Refuge's water right, law that prohibits augmentation and other encumbrances upon Refuge property, and law that requires environmental and administrative review. Likewise, the correspondence among the interested parties appears to neglect both federal and state law requirements that impose non-discretionary duties of natural resources managers at both the federal and state levels to protect the Refuge and its water right.

Because AOK has become concerned by this apparent inattention to the binding law, we have prepared this letter. Part I of this letter summarizes the legal issues involved. Part II distills this binding law into a series of required elements for the successful resolution of the Refuge's impairment. Part III proposes several solutions to that impairment. The letter closes with a request: in light of the severity of the Refuge's impairment, but also in

SCANNED

light of local irrigators' need to plan for the 2018 irrigation season, AOK hereby requests a full response from DWR by **October 1, 2017,** informing AOK and the public of DWR's positions on these relevant legal issues and its intended solutions. AOK understands that DWR, the Service, and the relevant irrigation interests may be avoiding discussion of the law that governs this situation, perhaps out of an abundance of caution if litigation is to commence; but AOK believes that the public interest requires such an open, forthright, and candid discussion.

I. Legal protections to which the Refuge is entitled under federal and state law.

As a federal wildlife refuge holding a senior surface water right under Kansas law, the Refuge is entitled to substantial protections under both federal and state law. This section summarizes the eleven most prominent of these protections.

At the outset, we want to stress that the Refuge is entitled to special protections under federal law: it cannot be treated in the same way as a state-law appropriation right holder that does not enjoy these federal protections.

a. Protections under federal law.

i. The Refuge is entitled to full ecological and hydrological sustainability pursuant to the National Wildlife Refuge System Improvement Act.

Pursuant to the National Wildlife Refuge System Improvement Act (NWRSIA) (1997), the Refuge is entitled to full ecological sustainability. NWRSIA requires that the Secretary of the Interior, in managing wildlife refuges, "ensure that the biological integrity, diversity, and environmental health of the [National Wildlife Refuge] System are maintained for the benefit of present and future generations of Americans . . . ." 16 U.S.C. § 668dd(a)(4)(B). In stark contrast to other federal public lands statutes such as those governing the national forests, this requirement is not subject to cost-benefit analysis or other multiple-use compromises. The biological integrity of the Refuge—a wetland of international importance for migratory birds—depends primarily on the long-term hydrological integrity of its water supply. Unfortunately, that hydrological integrity has become damaged by excessive groundwater pumping by junior irrigators in the Rattlesnake Creek Basin (Basin), which explains the Service's decision to bring its impairment complaint. But the mandate in NWRSIA is clear: any resolution of this impairment situation that compromises the hydrological integrity of the Refuge's water right compromises and harms the biological integrity of the Refuge, and thus violates the act. Given this federal mandate, a resolution of the Refuge's impairment situation that includes augmentation plans would be unacceptable. From a water-quantity standpoint, such plans do little more than replace depleted surface flows with more groundwater pumping, which in turn depletes the groundwater baseflows upon which the alluvial system depends. From a water-quality standpoint, augmentation plans would not duplicate the mixture of salt and fresh water upon which the habitat of the Refuge depends.

ii. The Migratory Bird Treaty Act prohibits the parties from reaching a settlement that harms the Refuge's bird life.

WATER RESOURCES
RECEIVED
SEP 08 2017
SCANNED
KS DEPT OF AGRICULTURE

The Migratory Bird Treaty Act (MBTA) prohibits the "take" of any migratory bird—that is, any action that kills or harms such a bird—"by any means or in any manner . . . ." 16 U.S.C. § 703. The Refuge harbors hundreds of migratory bird species listed at 50 C.F.R. § 10.13. There is no exemption in the MBTA for farmers, state officers, or federal agencies. Thus, a negotiated resolution of the Refuge's impairment situation that results in the "take" of any migratory bird dependent upon the Refuge will make the Service, DWR and other parties to such an agreement potential violators of the MBTA. The taking of a migratory bird is not justifiable under the MBTA: there is no right to harm or to kill federally protected wildlife in defense of property. *Christy v. Hodel,* 857 F.2d 1324, 1329-1330 (9th Cir. 1988), *cert. denied,* 480 U.S. 114 (1989). Such violations would subject the parties to the criminal penalty provisions of the MBTA. 16 U.S.C. § 707(a).

iii. The Endangered Species Act requires the full protection of Refuge habitat, including the protection of the Refuge's water right at its full quantities.

The Endangered Species Act (ESA), 16 U.S.C. §§ 1531-1543, is the most powerful federal statute governing any decisions made regarding the protection of the Refuge's water right. It protects listed species, whether threatened or endangered, according to a series of procedural and substantive protections, most notably by prohibiting actions which place listed species "in jeopardy" or which result in the "take" of any endangered species. (As you are aware from AOK's 2016 letter, the Refuge harbors numerous species listed as either threatened or endangered.) Under the "no jeopardy" provision in Section 7 of the ESA, state and federal agencies must not adversely modify critical habitat that is essential for the listed species' recovery. Section 9 of the ESA, which prohibits the taking of any endangered species, applies to both public and private lands. "Take" is defined in the ESA to include "harm," 16 U.S.C. § 1539, and "harm" includes significant habitat modification on both public and private lands. Thus, regulatory actions that threaten the Refuge's water right—including the approval of existing or increased levels of groundwater pumping, or the distortion of the Refuge's hydrological balance between surface and groundwater—would be construed by a federal court as a violation of the "take" prohibition under Section 9 of the ESA. Any such violation would likely result in a permanent injunction against the regulatory actions that caused jeopardy and the taking of endangered species, as well as the imposition of criminal and civil penalties.

iv. Pursuant to the requirements of federal law, the Refuge may require more water supplies than those granted under its state law appropriation water right.

The sustainability mandate of NWRSIA, together with the standards set forth under the MBTA and the ESA, raise the issue of whether the Refuge has sufficient water supplies to meet these federal requirements. Given the long history of impairment of the Refuge's state-law appropriation water right, the priority and authorized quantities of that right may be insufficient to meet the Refuge's purposes. Addressing this problem may well require the Refuge to obtain additional water rights, whether under federal law, state law, or both. Under the doctrine of federal reserved water rights, the Refuge may be entitled to federal water rights sufficient to meet the purposes of the Refuge—since reserved water rights can be implied from the purposes of NWRSIA, the MBTA, and the ESA. *Winters v. United States,* 207 U.S. 564 (1908); *Potlatch*

WATER RESOURCES
RECEIVED
SEP 08 2017
KS DEPT OF AGRICULTURE
SCANNED

Corp. v. United States, 12 P.3d 1256 (2000). Alternatively, the Service may need to acquire additional water rights under state law—rights of sufficient priority and quantity to protect the Refuge—to fulfill the sustainability requirements under NRWSIA and the standards of the MBTA and the ESA. Whether through the recognition of federal reserved rights or the purchase of senior state-law appropriation rights, the Refuge may need to obtain additional water rights. Failure to do so likely violates federal law.

v. Federal law prohibits the disposition of any federal property, including the diminution of the Refuge's water right or the burdening of Refuge land with easements.

The Service owns the Refuge's state-law water rights, which are statutorily defined as real property rights under the Kansas Water Appropriation Act (KWAA). K.S.A. § 82a-701(g). Federal law clearly prohibits the disposition of federal property—the Refuge's water right—and disposition includes the diminution of that water right. Thus, neither the Service nor DWR can dispose of or diminish the Refuge's water right by negotiation; neither can they place a burden (such as an easement for augmentation purposes) on Refuge land that diminishes the value of the Refuge's property. Only Congress, and not an executive branch agency such as Interior or the Service, can authorize the disposition of federal property. This rule dates back at least to *Gibson v. Chouteau,* 80 U.S. 92, 99 (1871), and is regularly cited in modern environmental litigation. The parties should keep this rule in mind: any such disposition or diminution would require Congressional approval, which would be unlikely in this case given the statutory authorities described above.

vi. Changes in refuge operations trigger procedural protections for the Refuge under federal administrative law.

Both the National Environmental Policy Act (NEPA) and the Administrative Procedure Act (APA) require the Service to conduct administrative review of any proposed resolution of the Refuge's impairment. A change in Refuge operations, including a change in the operational dynamics of the Refuge's water right, constitutes "major federal action" that would trigger NEPA review. *Middle Rio Grande Conservancy District v. Norton,* 794 F.3d 1220 (10th Cir. 2002). Moreover, an agreement between the Service and DWR would qualify as an "agency action" subject to review under the APA. *Industrial Safety Equipment Association v. Environmental Protection Agency,* 656 F.Supp. 852, 855 (D.D.C. 1987), *aff'd,* 837 F.2d 1115 (D.C.Cir. 1988). Finally, such an agreement between federal and state entities cannot delegate federal regulatory authority over the Refuge to the State of Kansas—even though DWR has jurisdiction over its water right. *United States Telecom Association v. Federal Communications Commission,* 359 F.3d 554, 566 (D.C.Cir. 2004), *cert. denied,* 543 U.S. 925 (2004). The parties should keep these procedural requirements in mind as they conduct negotiations to protect the Refuge and its water rights.

b. Protections under State Law.

WATER RESOURCES
RECEIVED
SEP 08 2017
KS DEPT OF AGRICULTURE
SCANNED

i. Because DWR's impairment investigations have determined that groundwater pumping is impairing the Refuge's water right, the Refuge and AOK are entitled to an injunction prohibiting that pumping.

As you are well aware, the KWAA provides multiple protections for senior water rights owners. The most powerful of these protections is that of injunctive relief prohibiting junior water rights holders from impairing the Refuge's water rights. K.S.A. §§ 82a-716a, 82a-717. Such a right was recently and comprehensively affirmed in *Garetson v. American Warrior,* 51 Kan.App.2d 370 (2015). (Notably, the court's clear defense of senior rights against compromise in *Garetson* aligns well with the federal statutory mandate for uncompromised sustainability in NWRSIA.) While both K.S.A. §§ 82a-716a and 82a-717 were amended in 2017, these amendments would not apply to the Refuge's impairment situation for two reasons. First, the Refuge, unlike the plaintiffs in *Garetson,* have maintained their pursuit of the administrative remedy for impairment set forth in the KWAA, by engaging the provisions of K.A.R. § 5-4-1. Second, because this investigation began before the 2017 amendments to the KWAA, these statutory amendments, which are prospective in their application, do not apply to this situation.

If the Service decides to seek injunctive relief through the courts, it would likely obtain injunctive relief similar to that ordered in *Garetson.* Moreover, given the Kansas Supreme Court's subordination of the KWAA to the Kansas Judicial Review Act (KJRA) in *Cochran v. Dep't of Agriculture,* 291 Kan. 898 (2011), it is likely that AOK would have standing to bring an action for injunctive relief on behalf of the Refuge pursuant to state law.

ii. The augmentation option provided for in K.S.A. § 82a-706b(a)(2) is not permissible because it must yield to contrary federal law.

The parties to the impairment negotiations have repeatedly discussed stream augmentation as a possible full or partial remedy for the depletion of the surface waters of the Basin, surface waters upon which the Refuge depends. (*See, e.g.,* E-mail from Mike Oldham, FWS, to Orrin Feril, manager of GMD5, December 13, 2016). The Kansas Legislature enacted K.S.A. § 82a-706b(a)(2) in 2015 to specifically allow for augmentation in the Basin, perhaps with a mind to resolving the impairment of the Refuge's water right. Regardless of its intent, the provision has no force in this situation: it must yield to the federal statutory mandates described above in Section I.a, pursuant to the Supremacy Clause in the U.S. Constitution. U.S. Const., art. VI, cl. 2. Because K.S.A. § 82a-706b(a)(2) cannot apply to this situation, the minimum desirable streamflows for the Basin set forth in K.S.A. § 82a-703c must be met from streamflow levels without the aid of augmentation.

iii. The chief engineer cannot suspend his duty to protect senior water rights, and the Secretary of Agriculture cannot suspend it for him.

AOK is troubled by the express decision made by the Kansas Department of Agriculture (KDA) not to administer junior water rights in the Basin during 2017—even though KDA acknowledges that junior groundwater rights are impairing the Refuge's senior water right. (Letter from Secretary McClaskey to GMD5, December 8, 2016, at 1). While KDA may have made this decision in the hope of advancing negotiations, the decision violates the KWAA.

WATER RESOURCES
RECEIVED
SEP 08 2017
KS DEPT OF AGRICULTURE
SCANNED

Under the KWAA, the chief engineer has the statutory and non-discretionary duty to administer junior water rights that are impairing a senior right. K.S.A. § 82a-706. Nothing in the KWAA abridges the property rights of senior water rights holders. *Id.,* § 82a-721a. Thus, were the Refuge to request administration of junior groundwater rights in 2017—a request which seems both reasonable and necessary, given DWR's impairment reports—then the chief engineer would be required to administer those junior rights to remove the impairment of the Refuge's water right. While the chief engineer is afforded considerable deference in determining how to resolve the impairment, he cannot avoid resolving it. And while the Secretary of Agriculture can review certain decisions made by the chief engineer, she cannot foreclose the clear statutory protections afforded to senior water rights holders. Pursuant to both the federal law of standing and Kansas law, the Service, AOK, or any other similarly situated third party could bring a mandamus action to ensure that DWR fulfills its duties in 2017 and 2018.

iv. DWR's impairment findings may place a duty upon the chief engineer to initiate proceedings for an Intensive Groundwater Use Control Area (IGUCA), pursuant to the Groundwater Management District Act, K.S.A. § 82a-1020 *et seq.* (GMD Act).

DWR's investigation of the impairment of the Refuge's senior surface water right has produced two impairment reports. Together, these reports found decisively that groundwater pumping in the Basin is impairing the Refuge's water right. These findings have been made pursuant to the KWAA; but because they align with the findings necessary to initiate proceedings for the establishment of an IGUCA pursuant to the GMD Act, K.S.A. § 82a-1036, they may require the chief engineer to initiate IGUCA proceedings. As DWR's impairment reports make clear, groundwater levels in the Basin are declining and have declined excessively, K.S.A. § 82a-1036(a); the rate of withdrawal of groundwater within the Basin equals or exceeds the rate of recharge, *id.,* § 82a-1036(b); and unreasonable deterioration of the quality of water is occurring in the Basin—deterioration in the form of distorting the balance of saline and fresh water upon which the Refuge depends, *id,* § 82a-1036(d). The Refuge has not, apparently, requested the initiation of IGUCA proceedings; neither GMD5 nor irrigators within GMD5 have done so either, which is their right pursuant to K.S.A. § 82a-1036. Nor has GMD5 requested the initiation of proceedings for a Local Enhanced Management Area (LEMA) pursuant to K.S.A. § 82a-1041. Given the authoritativeness of DWR's impairment findings, it is clear that the chief engineer must take action consistent with those findings. If he declines to initiate IGUCA proceedings, then he may risk neglecting his duties under both the KWAA and the GMD Act to follow the statutory dictates of the KWAA. K.S.A. §§ 82a-706, 82a-716, 82a-717, 82a-721a, 82a-1020, 82a-1039. Regulatory inaction constitutes action under state and federal administrative law.

v. The chief engineer may be prohibited from reducing the original quantification of the Refuge's state-law water right.

DWR should keep in mind that the Refuge may be entitled to a larger annual authorized quantity for its water right than the quantity that appears in its water rights certificate. In *Clawson v. DWR,* 49 Kan.App.2d 789 (2013), the Kansas Court of Appeals effectively negated the statutory and regulatory provisions by which the annual authorized quantities of an Approval

WATER RESOURCES
RECEIVED
SEP 08 2017
KS DEPT OF AGRICULTURE
SCANNED

of Application may be reduced during the perfection period. Pursuant to *Clawson,* a court could well find that the perfected quantification of the Refuge's 1957 water right (14,632 acre-feet per year, at a maximum rate of 300 cubic feet per second) must give way to the amounts described in the Refuge's approval of application—an original amount of 22,000 acre-feet annually, as GMD5 has noted. (Second Stakeholder Proposal in Connection with USFWS Impairment Complaint, February 15, 2017, at 2). DWR should take this matter under consideration as it evaluates the various proposals provided so far by the Service and GMD5.

II. The required elements for the adequate protection of the Refuge's impaired water right.

Given the federal and state laws described in Section I, DWR must proceed according to their requirements. Because the Refuge is a federal wildlife refuge afforded specific protections under federal law, any negotiated resolution that violates that law will likely be enjoined and reversed. To comply with these statutory requirements, the adequate protection of the Refuge requires the protection of the sustainability of the hydrological system of the Basin upon which the Refuge depends. The KWAA similarly requires the full protections afforded to senior surface water rights holders. Together, that protection requires the following elements:

a. The Refuge's state-law water right must be protected at its full authorized quantity and rate of diversion. There can be no compromises to this right, which is owned by the Service.

b. To meet the sustainability mandate of NWRSIA and the standards set forth in the MBTA and the ESA, the Refuge's state-law water right must be protected as a surface water right, drawing its full authorized quantity and rate of diversion from the Basin, without short-term hydrological compromises such as stream augmentation produced by further groundwater pumping. Such pumping only serves to accelerate the depletion of the Basin's water supplies as a hydrological whole, and to distort the saltwater/freshwater mixture that is critical to Refuge habitat.

c. DWR's first duty is to protect the Refuge's senior water right. However, given the long history of impairment of that right, the Service and DWR must together consider whether the Refuge requires additional water rights—whether under the doctrine of federal reserved water rights, or through the purchase, lease, or other transfer of state-law appropriation rights. In either case, these additional rights must be of sufficient priority and quantity to meet the requirements of the Refuge. If the Refuge's water right is insufficient to protect the Refuge from chronic impairment, then the Service must obtain additional water rights.

d. The failure to protect the Refuge's water supplies has caused considerable harm to the Refuge for decades. That harm continues and accumulates, as the water and habitat conditions at the Refuge deteriorate further. Thus, a successful resolution of the Refuge's impairment situation requires an adequate restoration plan to compensate the Refuge for the harms it has already suffered. As conditions

WATER RESOURCES
RECEIVED
SEP 08 2017
KS DEPT OF AGRICULTURE
SCANNED

continue to deteriorate, more water supplies than those secured under the Refuge's water right will likely be needed to effect that restoration. Failure to restore will incur liability according to the statutes described in Section I.a.

e. Pursuant to *Clawson,* DWR and the Service must evaluate whether the Refuge is entitled to an authorized quantity and rate of diversion that are greater than the quantity and rate described in its water rights certificate. The decision in *Clawson* likely requires protection of the Refuge's water right at its originally approved, unperfected quantity of 22,000 acre-feet per year.

III. Acceptable Resolutions of the Refuge's Impairment Complaint.

AOK sees three potential pathways that would resolve the Refuge's impairment complaint in accordance with federal and state law. While the parties may have been discussing these (and potentially other) pathways, AOK wants to make clear that the Refuge, as a federal wildlife refuge governed by federal law, cannot be treated in the same way as a state-law appropriation right holder that does not enjoy the federal protections set forth in Section I.a. This point cannot be emphasized too strongly.

a. Administration of Junior Water Rights pursuant to the KWAA.

First, as set forth above in Section I.b., the chief engineer has the duty to protect senior surface rights pursuant to both the KWAA and the GMD Act. In the event that neither GMD5, nor a petition by its irrigators, nor the chief engineer initiates proceedings to form an IGUCA, or in the event that GMD5 does not initiate proceedings to form a LEMA, then the only remaining option is priority administration of water rights in the Basin. If priority administration is the only available resolution, then neither the chief engineer nor the Secretary of Agriculture has the legal ability to refuse to administer water rights. KDA should retract its illegal promise not to administer water rights in 2017, and should make so such promise hereafter.

b. *Initiation of Proceedings to form an IGUCA in the Basin.*

DWR has employed the IGUCA mechanism in groundwater-dependent surface water systems throughout Kansas—in particular, the Walnut Creek IGUCA, which has restored some degree of hydrological balance and sustainability to protect the groundwater-dependent ecosystem of the Cheyenne Bottoms. There is no reason why a similar resolution would not work in the Basin, provided it complies with federal law. The Refuge cannot have its senior surface water right diminished in any way as part of these proceedings. While the GMD Act contemplates the possibility of an IGUCA order that does not strictly follow priority administration, K.S.A. § 82a-1038, the Refuge cannot, for the reasons set forth above in Section I.a., suffer any qualitative or quantitative reduction in its senior surface water right.

c. Initiation of Proceedings to form a LEMA in the Basin.

Because neither of the above options may be amenable to DWR, GMD5, or irrigators within GMD5, DWR should encourage GMD5 to develop a local management plan pursuant to

WATER RESOURCES
RECEIVED
SEP 08 2017
KS DEPT OF AGRICULTURE
SCANNED

K.S.A. § 82a-1041 and initiate proceedings for the formation of a LEMA within the Basin. Given the greater flexibility afforded to groundwater irrigators under the LEMA statute, this may be the preferred option. Again, however, such a local management plan must abide by the same federal law that protects the Refuge from any qualitative or quantitative diminution of its senior surface water right.

In light of the clear legal mandates set forth in Section I, AOK is very disappointed by the LEMA proposals that GMD5 has recently submitted to DWR. (GMD5 Proposal to remedy impairment to QNWR, August 11, 2017; Second Stakeholder Proposal in Connection with USFWS Impairment Complaint, February 15, 2017). These proposals are facially defective under both federal and state law. A temporary LEMA, by definition, fails to meet the statutory requirements for permanent sustainability under NWRSIA, the MBTA, and the ESA, as well as the state law requirements under both the KWAA and the GMD Act. As set forth above, augmentation is not a legal option in the Basin because it runs afoul of the Supremacy Clause and thus must defer to federal statutes mandating sustainability and hydrological and biological integrity. The removal of "end-guns" on irrigation systems will provide only a miniscule reduction in the pumping that is impairing the Refuge. However, AOK is heartened by GMD5's willingness to transfer water rights from within GMD5 to the Refuge, whether through the transfer of water rights from the Central Kansas Water Bank Association or through the purchase of junior water rights. Finally, the Refuge likely requires additional water rights for the restoration of its habitat and the dependable sustainability of the Refuge as a whole over the long term.

Across these three pathways, DWR must keep in mind that it has both the duty to address both the immediate impairment of the Refuge and the duty to resolve the long-term causes of that impairment—excessive groundwater pumping by junior water rights holders over the past several decades at least. Regarding the pathway of water rights administration, injunctive relief for the overuse of water extends to retrospective relief. *Texas v. New Mexico,* 482 U.S. 124, 129 (1987). The IGUCA and LEMA pathways similarly require regulatory actions that resolve long-term impairment by restoring the sustainability of whatever water supplies are necessary for the permanent protection of the Refuge.

AOK requests from DWR a full written response to the legal issues set forth in this letter, and its position on what DWR sees as acceptable resolutions, no later than **October 1, 2017.**

In closing, AOK would like to extend its appreciation to DWR, the Service, and GMD5 for its attention to this important matter.

Sincerely,

Mr. Ron Klataske
Executive Director
Audubon of Kansas

Ms. Margy Stewart
Chair, Board of Trustees
Audubon of Kansas

WATER RESOURCES
RECEIVED
SEP 08 2017
KS DEPT OF AGRICULTURE
SCANNED

Attachment:
Letter from AOK to DWR, May 13, 2016

cc:
Mr. Will Meeks
Assistant Regional Director
United States Department of the Interior, Fish & Wildlife Service
Region 6, Mountain-Prairie Region
P.O. Box 25486
Denver Federal Center
Denver, CO 80225-0486

Mr. Brian Caruso
Chief, Division of Water Resources
Regional Hydrologist
United States Department of the Interior, Fish & Wildlife Service
Region 6, Mountain-Prairie Region
P.O. Box 25486
Denver Federal Center
Denver, CO 80225-0486

United States Department of the Interior
Office of the Solicitor
Rocky Mountain Region
755 Parfet St.
Lakewood, CO 80215

Mr. Mike Oldham
Project Leader and Refuge Manager
Quivira National Wildlife Refuge
U.S. Fish & Wildlife Service
1434 NE 80th St.
Stafford, KS 67578

Mr. Orin Feril, Manager,
Big Bend Groundwater Management District No. 5
125 South Main St.
Stafford, KS 67578

WATER RESOURCES
RECEIVED
SEP 08 2017
KS DEPT OF AGRICULTURE
SCANNED

David W. Barfield. PE.
Chief Engineer
Division of Water Resources
Kansas Department of Agriculture
1320 Research Par Drive
Manhattan, KS 66502

May 13, 2016

Dear Mr. Barfield:

The purpose of this letter is to comment on the "Claim of Water Right Impairment, In the Matter of Water Right File No. 7,571, Owned and operated by U.S. Fish and Wildlife Service."

Audubon of Kansas, Inc. urges the Kansas Department of Agriculture (KDA) Division of Water Resources (DWR) to implement all necessary measures, regulations and water rights to fully restore water flows in Rattlesnake Creek to provide the U.S. Fish and Wildlife Service (Service) with flows sufficient to provide for the senior water right for the Quivira National Wildlife Refuge (Refuge). As acknowledged in the Initial Report of the Chief Engineer, Prepared pursuant to K.A.R. 5-4-1 Concerning a Claim of Water Right Impairment, In the Matter of Water Right File No. 7,571, Owned and operated by U.S. Fish and Wildlife Service published December 2, 2015, the Service's water right is senior in priority to approximately 95 percent of the water rights in the Rattlesnake Creek Basin.

The report finds the Refuge's water supply "has been regularly and substantially impacted by junior groundwater pumping." According to the report, over the 34 years reviewed, shortages of greater than 3,000 acre-feet occurred in 18 years. Impairment of the Refuge's water right has become increasingly frequent and severe as hundreds of irrigation wells with junior water rights have been approved by the DWR, resulting in the cumulative lowering of groundwater levels and instream flows in the Rattlesnake Creek Basin.

Audubon of Kansas urges that the water right for the Quivira National Wildlife Refuge be fully protected and provided for prior to depleting consumption by junior water rights users.

Audubon of Kansas does not support the suggestion that the severe impairment of the Refuge water right (due to over-pumping of groundwater in the Rattlesnake Creek Basin) can be satisfactorily solved by pumping groundwater into the Refuge. In addition to the astronomical cost of installation and ongoing operations/maintenance, this approach would ignore the fact that depleting the groundwater and stream flows will further diminish ground water levels and adversely impact and/or destroy the stream, wetlands, wet meadows and other ecological values associated with the Refuge and other areas within the Rattlesnake Creek Basin.

WATER RESOURCES
RECEIVED
SEP 08 2017
KS DEPT OF AGRICULTURE
SCANNED

The Quivira National Wildlife Refuge was established in 1955 to protect migratory waterfowl. Its 7,000 acres of wetlands attract hundreds of thousands of ducks and geese of thirty different species, shorebirds, wading birds (including tens of thousands of Sandhill Cranes, and Whooping Cranes) and water birds annually. Its location in the middle of the Central Flyway places it in the primary pathway for many species of migrating birds. Over 340 species of birds have been recorded at Quivira. It's 22,135 acres feature a unique combination of rare inland salt marsh and sand prairie.

In terms of protection of, and management for, species of concern, several official levels of Threatened and Endangered status are recognized within the United States and within the State of Kansas. An Endangered species is one that is in danger of becoming extinct; a Threatened species is one whose population levels are low enough where the species could become Endangered. A Federal Candidate species is one that is under review for listing as a Threatened or Endangered species. In several cases, Quivira has been designated as Critical Habitat for certain species, either at the national or state level (or both).

Whooping Cranes are an endangered species that consistently utilize Quivira as an important migratory habitat. The tallest North American bird, and one of the rarest, they once numbered as few as 16. Whooping Cranes occur regularly at Quivira each fall and spring. Fall migration use typically occurs from late October through late November, while spring migration occurs from late March through early April. Whooping Cranes utilize Quivira's shallow wetlands and lake borders for feeding and overnight roosting.

Inland populations of Least Terns are typically found along large river systems. Interior Least Terns have been declining and are classified as Endangered nationally and in the state of Kansas. Quivira hosts a nesting population of these birds, in both the Big and Little Salt Marsh areas. Least Terns occur at the Refuge during the spring, summer and early fall.

The Western Snowy Plover is classified as Threatened in Kansas. This small, whitish shorebird occurs at Quivira from spring through early fall, and nests regularly on sand flats, primarily in the Big Salt Marsh area. Their populations have suffered declines similar to those of the Interior Least Tern, with whom they share habitat.

Many other "Species of Greatest Conservation Concern" depend on habitat at Quivira. The Piping Plover, a small shorebird similar to the Snowy Plover, occurs at Quivira occasionally during migration. The State of Kansas recognizes Species in Need of Conservation (SINC) throughout the state. Species with that status that occur at Quivira include: Black Rail, Black Tern, Eastern Hognose Snake, Western Hognose Snake, Ferruginous Hawk, Golden Eagle, Long-billed Curlew, Short-eared Owl, and Southern Bog Lemming.

WATER RESOURCES
RECEIVED
SEP 08 2017
KS DEPT OF AGRICULTURE
SCANNED

Tens of thousands of shorebirds—shorebirds of thirty different species --rely on the wetlands and water-associated habitats of the Quivira National Wildlife Refuge. Shorebirds are a large and diverse group of birds that typically feed on shorelines, mudflats, and in shallow water. The group includes, but is not limited to, plovers, sandpipers, phalaropes, yellowlegs, and snipe. Although located in the center of the Great Plains, Quivira is uniquely situated in the center of the Central Flyway, one of the busiest of North America's four migration pathways. An oasis in the prairie, Quivira attracts migrating shorebirds by the tens of thousands in aggregate both spring and fall.

Beginning as early as February, Greater and Lesser Yellowlegs, along with a few other sandpipers, begin appearing on their northward journey. Numbers of species and birds increase until a peak in mid-May, when shorebirds can be found just about anywhere there is water at Quivira. There is a short lull of just a few weeks during June, after which the "fall" southward migration begins for many species by early July. This period of shorebird occurrence typically peaks in late August and September.

Shorebirds do not just occur as migrants at Quivira. Several species use Quivira's wetlands to nest. These are extant breeding populations, where the next nearest breeding populations may be hundreds of miles from Quivira. Nesting species include Wilson's Phalarope, Snowy Plover, American Avocet, and Black-necked Stilt.

Inland Salt Marshes are rare in the United States. The presence of Inland Salt Marshes contributes to the uniqueness of Quivira. Quivira's wetlands are unique due to the high concentration of salt in many areas. Subterranean salt deposits are near enough to the surface in the Quivira area to affect the groundwater that percolates to the surface. Salinity (or salt) levels in the water varies depending on rainfall, runoff from rainfall, and the depth of the water.

Many areas have a high enough salinity to support salt-tolerant plant species such as inland salt grass (*Distichlis spicata*), alkali sacaton (*Sporobolus airoides*), and seepweed (*Suaeda caceoliformis*).

Once dotted with active sand dunes, Quivira is also home to a unique prairie community called Sand Prairie. In the pre-settlement era of Kansas, prairie covered most of the state. During this time, much of the area south of the "great bend" of the Arkansas River consisted of plains with scattered active sand dunes. Once inactive, these dunes were covered with prairie grasses and forbs. This Sand Prairie is a unique and uncommon ecosystem in North America.

The Quivira National Wildlife Refuge is among thirty **"Wetlands of International Importance,"** as designated under an international treaty signed in 1971. The Ramsar convention on wetlands, signed by 160 countries, provides the framework

WATER RESOURCE
RECEIVED
SEP 08 2017
KS DEPT OF AGRICULTUI
SCANNED

for national action and international cooperation for the conservation and wise use of wetlands and their resources.

Quivira was also designated in 1994 as part of the **Western Hemisphere Shorebird Reserve Network.** The designation is based on the fact that Quivira supports more than 500,000 shorebirds annually. Shorebirds are among nature's most ambitious, long-distance migrants. But their numbers are dropping quickly with some species projected to go extinct within our lifetime. Protecting these birds is an important international conservation priority that requires proactive and coordinated efforts within each of the countries these birds fly through during their vast, nearly pole-to-pole migrations.

Quivira was also designated as a **Globally Important Bird Area** by the American Bird Conservancy in 2001.

It is critical that the State of Kansas recognizes that the Quivira National Wildlife Refuge is critically important for migratory birds from a state, national, international and global perspective. Restoring the Service's water rights and making flows available to the Refuge is a legal and ecologically essential responsibility of the Kansas Department of Agriculture, Division of Water Resources.

Sincerely,

Ron Klataske

Ron Klataske
Executive Director
Audubon of Kansas

WATER RESOURCES
RECEIVED
SEP 08 2017
KS DEPT OF AGRICULTUR
SCANNED

1320 Research Park Drive
Manhattan, Kansas 66502
(785) 564-6700

Kansas
Department of Agriculture
agriculture.ks.gov

900 SW Jackson, Room 456
Topeka, Kansas 66612
(785) 296-3556

Jackie McClaskey, Secretary

Governor Sam Brownback

September 29, 2017

BY E-MAIL (PDF) AND U.S. MAIL

Mr. Ron Klataske
Executive Director
Audubon of Kansas
210 Southwind Place
Manhattan, KS 66503
Ron_klataske@audubonofkansas.org

Ms. Margy Stewart
Chair, Board of Trustees
Audubon of Kansas
210 Southwind Place
Manhattan, KS 66503
aok@audubonofkansas.org

Dear Mr. Klataske and Ms. Stewart,

Thank you for your interest in the Quivira National Wildlife Refuge (Refuge) impairment investigation and remedy development as expressed in your letter dated September 6, 2017.

We are actively working with Groundwater Management District No. 5 (GMD 5) and basin stakeholders to develop a long-term solution to remedy the impairment.

GMD 5 is working on a project to augment flows into the refuge and is developing a local enhanced management plan (LEMA) to reduce groundwater pumping. The GMD is actively working to develop more details on both components and each will be carefully evaluated by KDA-DWR to ensure they address the existing impairment. The goal is to provide the Refuge with water of sufficient quantity and quality to satisfy their water right.

While we appreciate the concerns expressed in your letter, we believe it is premature to determine that either the process or the product of this process is insufficient.

As more details become available, we will make them available on our web site and via other public processes as appropriate. We encourage you to remain informed and engaged in these processes.

David W. Barfield

David W. Barfield, P.E.
Chief Engineer
Division of Water Resources
Kansas Department of Agriculture

Cc:

Mr. Will Meeks
Assistant Regional Director
United States Department of the Interior, Fish & Wildlife Service
Region 6, Mountain-Prairie Region
P.O. Box 25486
Denver Federal Center
Denver, CO 80225-0486

Mr. Brian Caruso
Chief, Division of Water Resources
Regional Hydrologist
United States Department of the Interior, Fish & Wildlife Service
Region 6, Mountain-Prairie Region
P.O. Box 25486
Denver Federal Center
Denver, CO 80225-0486

United States Department of the Interior
Office of the Solicitor
Rocky Mountain Region
755 Parfet St.
Lakewood, CO 80215

Mr. Mike Oldham
Project Leader and Refuge Manager
Quivira National Wildlife Refuge
U.S. Fish & Wildlife Service
1434 NE 80th St.
Stafford, KS 67578

Mr. Orin Feril
Manager
Big Bend Groundwater Management District No. 5
125 South Main St.
Stafford, KS 67578

Jackie McClaskey
Secretary of Agriculture
Kansas Department of Agriculture
1320 Research Park Drive
Manhattan, KS 66502-5000

Jeff Lanterman
Water Commissioner
Kansas Department of Agriculture, Division of Water
Division of Water Resources - Stafford Field Office
300 S. Main Street
Stafford, KS 67578-1521

1320 Research Park Drive
Manhattan, Kansas 66502
(785) 564-6700

Kansas
Department of Agriculture
agriculture.ks.gov

900 SW Jackson, Room 456
Topeka, Kansas 66612
(785) 296-3556

Jackie McClaskey, Secretary

Governor Sam Brownback

MEMORANDUM

December 13, 2017

To: Orrin Feril, GMD 5 Manager
GMD 5 Board of Directors

From: David Barfield and Jackie McClaskey, Kansas Department of Agriculture

Please consider this letter a follow-up to the short phone conversation between Orrin and members of our KDA team last week about the status of the GMD's efforts to develop a LEMA to address the impairment of Quivira National Wildlife Refuge, and about the need to have a public meeting soon to update and engage basin stakeholders. As we discussed, there is a high level of concern and misunderstanding in the basin regarding what is going to happen, and tensions seem especially heightened as we approach the end of the calendar year.

In addition, this letter will provide an update to our December 8, 2016, letter regarding steps needed to develop a remedy to the Quivira impairment. Since that time, significant progress has been made, but as we all know, work remains. Since December 2016, the following key events have occurred:

- In February 2017, GMD 5 provided a second offer to resolve the impairment.
- GMD 5 then asked KDA to define what elements it believed necessary to resolve the impairment beyond augmentation.
- KDA provided that information at our meeting on July 6, 2017.
- On August 11, 2017, GMD 5 provided a framework for a proposed LEMA to remedy the impairment.
- At that time and since, KDA has provided expectations for necessary LEMA plan elements as well as appropriate technical support to assist GMD 5 in developing specifics for the proposed LEMA.
- The GMD 5 Board and a subcommittee of GMD 5 have worked with staff and consultants to develop additional LEMA components.

We are pleased to hear that the work of the subcommittee is progressing and the development of a LEMA plan is near completion. We look forward to receiving the initial plan soon. In light of the progress made and our desire to provide every opportunity for a locally developed solution, **KDA will not impose strict administration of water rights on January 1, 2018, nor do we have any intent to do so in the immediate future**. KDA believes more time to develop and implement a locally-developed solution — a LEMA that comes from your board — remains the best path forward.

It is critical that formal action to address the impairment begin in 2018. Since the Chief Engineer has a statutory duty to secure water to senior water rights, it is imperative that any LEMA plan submitted include the essential

elements needed to resolve the impairment. The basis of this plan should include at least: 1) 2018-2022 as the initial period for evaluating its success in achieving the needed water use reductions; 2) actual steps toward reduction of water use beginning in 2018 (for example, implementation of the GMD Board's concept to require the removal of end guns); and 3) a detailed plan for augmentation implementation (if included in your proposal).

Further, as we have often stated, a proposal that includes augmentation is expected to also include water use reductions so that a sustainable solution can be achieved. While we believe you can develop a LEMA with a flexible management plan to accomplish the needed pumping reductions over the initial period, such a LEMA will be required to define the reduction goal, achieve real pumping reductions, provide a means of evaluating if the goal is achieved, and include a plan for defined corrective controls to be implemented in the subsequent period if the goal is not achieved in the initial period. We have provided a number of examples of acceptable options that may be included in a LEMA plan, but they are not the only options. The fundamentals of an acceptable plan — that depletions need to be significantly reduced to make augmentation viable — remain firm. How the basin wants to get there is for your board to decide. KDA does have a legal obligation to secure water to senior users and, therefore, remains committed to providing you and your board with technical, policy, and outreach assistance to help you make your LEMA work — not only to address the impairment, but also to have as little economic impact on district water users as possible. If a local solution to address impairment is not proposed early in 2018, other actions will need to be considered.

It is time that GMD 5 and KDA jointly host a public meeting to provide stakeholders an update on the work that has been done and engage them in the LEMA process by presenting and taking feedback on the initial LEMA plan. This public forum needs to be held no later than early February. Brittney Houck, KDA executive assistant, will be reaching out to you to get a date set on the calendar.

Thank you for your commitment to working with us to find a solution.

Dennis L. Gillen
Jack Scott McInteer
Randall K. Rathbun
Charles C. Steincamp

DEPEW & GILLEN RATHBUN & McINTEER, LC

Kimberly A. Vining
Joseph A. Schremmer
Benjamin K. Carmichael
Paul F. Good, Of Counsel

Spencer L. Depew (1933-2005)
Nicholas S. Daily (1949-2006)

RECEIVED
AUG 20 2018
LEGAL SECTION
KS DEPT. OF AGRICULTURE

August 17, 2018

BY E-MAIL AND U.S. MAIL

Ms. Noreen Walsh
Regional Director, Mountain-Prairie Region
U. S. Fish and Wildlife Service
134 Union Blvd.
Lakewood, Colorado 80228
Noreen_Walsh@fws.gov

Mr. David W. Barfield, P.E.
Chief Engineer, Division of Water Resources
Kansas Department of Agriculture
1320 Research Park Drive
Manhattan, Kansas 66502
david.barfield@ks.gov

Re: Quivira National Wildlife Refuge, Water Right File No. 7,571

Dear Ms. Walsh and Mr. Barfield:

The undersigned is counsel for Audubon of Kansas ("AOK"). On September 6, 2017, AOK wrote the Division of Water Resources ("DWR") a detailed letter setting forth the applicable law concerning the impairment of Water Right File No. 7,571, which is owned by the United States Fish and Wildlife Service ("Service") on behalf of Quivira National Wildlife Refuge ("Refuge"). The Service and the Department of Interior's Office of the Solicitor were copied on that letter. In that letter, AOK asked DWR to respond fully to that letter, and to provide a plan to protect the Refuge's water right in accordance with the law. The response of DWR was completely inadequate; the Service did not respond at all. The Service's inaction has violated federal law, while DWR's conduct has ignored the dictates of both federal and state law. Please allow me to summarize the abdication of your respective legal duties.

Starting in 1986, the Service made known to DWR that the Refuge's water right was suffering severe water shortages as a consequence of junior groundwater pumping in the Rattlesnake Creek Basin. Efforts by the Service and other stakeholders to effect voluntary reductions in junior groundwater rights failed.

After three decades of such ineffectiveness, the Service finally filed an impairment complaint with DWR on April 8, 2013, pursuant to K.A.R. § 5-4-1.

In response to that complaint, Mr. Barfield issued a final report on July 15, 2016, finding the Refuge's water right to be impaired. "Final Report of the Chief Engineer Prepared pursuant to K.A.R. 5-4-1 Concerning a Claim of Water Right Impairment in the Matter of Water Right File No. 7,571 Owned and operated by U.S. Fish and Wildlife Service, July 15, 2016." ("Final Report of Impairment"). That was more than two years ago.

Since the issuance of the Final Report of Impairment, the Service has not filed a request to secure water pursuant to K.A.R. § 5-4-1, which is the expected response from a senior water right holder whose right the chief engineer has found to be impaired. The Service has allowed its water usage to be diminished for two years since then as a consequence—in violation of multiple provisions of federal law.

On December 8, 2016, Secretary McClaskey of the Kansas Department of Agriculture ("KDA") made the express decision not to administer junior water rights in the Rattlesnake Creek Basin during 2017. As detailed in AOK's earlier letter, there is no legal basis for this decision under the Kansas Water Appropriation Act ("KWAA"), K.S.A. § 82a-701 *et seq.*, or any other law. Mr. Barfield abdicated his duties as chief engineer and condoned the secretary's usurpation of the chief engineer's statutory duty to protect water rights according to priority of appropriation.

That abdication continued. On September 29, 2017, writing on KDA stationery, Mr. Barfield deferred much of the Refuge's impairment matter to Big Bend Groundwater Management District No. 5 (GMD5), a body composed of groundwater irrigation interests that has no regulatory authority over water rights. GMD5 has been preparing various iterations of a Local Enhanced Management Area ("LEMA") management plan pursuant to K.S.A. § 82a-1041, a management option that is voluntary and does not follow the doctrine of prior appropriation. The chief engineer's response to AOK's letter concluded that DWR "believe[s] it is premature to determine that either the process or the product of this [LEMA] process is insufficient."

Subsequent events belie Mr. Barfield's conclusion. On December 13, 2017, DWR and KDA repeated the Secretary's promise of December 8, 2016 not to administer water rights to protect the Refuge during 2018—a second flagrant violation of the KWAA, which confers upon the chief engineer the non-discretionary duty to protect water rights according to the doctrine of priority of appropriation. K.S.A. § 82a-706.

On February 15, 2018, GMD5 submitted a draft "Request for Rattlesnake LEMA" to DWR. Like GMD5's earlier proposal of September 8, 2016, this management plan contains no date certain, no fixed reductions, no firm commitments, and numerous technical and legal speculations.

Mr. Barfield responded to this plan with a power point presentation of February 16, 2018. In this presentation, he proposed a start date of 2020 for a GMD5 LEMA at the earliest. Further, DWR's goal for such a LEMA is little more than to reduce the rate of increase of groundwater depletions. Based on DWR's own evaluation of the situation, it appears that DWR will be satisfied with (a) waiting two more years to remedy the impairment of the Refuge, and only then (b) taking steps that do not reverse these depletions. If these are DWR's standards, then the chief engineer and KDA have committed DWR to condone the permanent impairment of a senior surface water right, in patent violation of federal and state law.

On March 13, 2018, Governor Colyer issued Executive Order 18-11, a Drought Declaration for all of Kansas. Stafford County, where most of the Refuge is located, is under a Drought Emergency according to that declaration. That declaration, which remains in effect, has had no apparent effect on the Service's or DWR's response to the Refuge's ongoing impairment.

Despite the clear mandates of federal and state law, despite the issuance of the Final Impairment Report, and despite the Governor's drought emergency declaration for Stafford County, both the Service and DWR have abdicated their clear legal duties to protect the Refuge and its lifeblood—its senior water right. These duties, as set forth in AOK's previous letter, are clearly mandated. Indeed, as DWR states on its own website, at http://agriculture.ks.gov/ divisions-programs/dwr/water-appropriation/impairment-complaints:

> A founding principle of Kansas water law is first in time, first in right. That means water rights are assigned a priority date to establish who has first right to water. This allows the Division of Water Resources to protect a sometimes scarce water resource for those who established their rights first from those who came along later.
>
> In times of plenty, there may be enough water to satisfy all water rights. However, in times of water scarcity, those who have earlier, or more senior, water rights are entitled to satisfy those rights before those who have rights junior to them.

Based upon this recitation of the record, the following facts are undeniable.

1. Federal wildlife and environmental law require Interior and DWR to protect the Refuge and the species which depend upon it.

2. The KWAA requires the chief engineer to protect senior water rights according to the doctrine of priority of appropriation.

3. The Final Report of Impairment found that the Refuge's senior 1957 surface water right is being impaired by junior groundwater irrigators in the Rattlesnake Creek Basin.

4. The Final Report of Impairment concedes that "none of the pumping shutoff scenarios produce an effective baseflow response for two to three years." Final Report of Impairment, p. 47.

5. Over two years since the Final Report of Impairment was issued, the Service has failed to request the protection of its water right.

6. Junior groundwater pumping that the chief engineer has found to be impairing the Refuge's water right has continued, undiminished, since the issuance of the Final Report of Impairment.

7. KDA and DWR have repeatedly committed to avoid protecting the Refuge's senior water right by administering junior water rights, in patent violation of the KWAA.

8. In so committing to avoid the law, KDA and DWR have deferred to GMD5, an entity with no regulatory authority under the KWAA, in the politic hope that GMD5 will author a LEMA that resolves the impairment of the Refuge's water right, starting in 2020 at the earliest.

9. Despite his own findings quoted above in Paragraph 4, the chief engineer has defined that satisfactory resolution as one that waits until 2020 to begin, and does nothing more than reduce the rate of groundwater depletion beneath and surrounding the Refuge.

These facts support one equally undeniable conclusion: the Service and DWR have deliberately abdicated their respective duties under state and federal law to protect the Refuge and its senior water right.

It is well past time to protect that right by obeying the law. On behalf of AOK, I demand that Interior, the Service, and DWR perform the following duties:

1. That the Service file, within thirty days of receipt of this letter, a Request to Secure Water for years 2018 and 2019 in response to DWR's impairment finding, pursuant to K.A.R. § 5-4-1(d). The Service's request must require the protection of its water right at its full approved quantities, taking into account its 2018 water usage so far. The form required by this regulation is enclosed with this letter. In the event the Service decides not to file a Request, I demand that it provide a full explanation, with authority, for its decision.

2. That, in the event that the Service fails to file such a request, that DWR respond to AOK's Request to Secure Water, which is also enclosed with this letter. AOK has standing to file this request pursuant to the citizen standing provisions of federal wildlife and environmental law and pursuant to *Cochran v. Dep't of Agriculture,* 291 Kan. 898 (2011), which subordinates the standing requirements of the KWAA to the Kansas Judicial Review Act. (Because AOK lacks water usage information for the water right, some of these sections are blank.) In the event that DWR decides not to act upon this request, I demand that it provide a full explanation, with authority for its decision, within thirty days' receipt of this letter.

3. That, in light of Mr. Barfield's own findings in the Final Report of Impairment, that DWR issue an order by October 1, 2018, setting forth the priority administration for 2019 of all junior water rights in the Rattlesnake Creek Basin that are impairing the Refuge's senior water right, to protect that right at its full approved annual quantity of 22,200 acre-feet at a diversion rate of 300 cubic feet per second.

This time AOK expects a satisfactory response from the Service and DWR. If either agency fails to follow the law and protect the Refuge's water right—a right owned in trust for the American people—then I will pursue legal remedies on behalf of AOK to remedy that failure. Those remedies will include an injunction forbidding the diversion of water by any junior water rights in the Rattlesnake Creek Basin for 2019, in accordance with the rights of priority of appropriation. Finally, I am certain that you recall that the federal environmental statutes upon which we rely provide for an award of attorneys' fees to the prevailing party.

I look forward to your timely responses.

Very truly yours,

Randall K. Rathbun
of Depew Gillen Rathbun & McInteer LC

RKR:kgm
enclosures:
Request to Secure Water Pursuant to K.A.R. § 5-4-1 (blank)
Request to Secure Water Pursuant to K.A.R. § 5-4-1, filed on behalf of the Refuge by AOK

cc:
Mr. Ron Klataske, Executive Director, Audubon of Kansas
Ms. Margy Stewart, Chair, Board of Trustees, Audubon of Kansas

Mr. Mike Oldham
Project Leader and Refuge Manager
Quivira National Wildlife Refuge
U.S. Fish & Wildlife Service
1434 NE 80th St.
Stafford, Kansas 67578

United States Department of the Interior
Office of the Solicitor
Rocky Mountain Region
755 Parfet St.
Lakewood, Colorado 80215

Attorney General Derek Schmidt
Office of the Kansas Attorney General
109 SW 10th Ave., Second Floor
Topeka, Kansas 66612

Ms. Jackie McClaskey, Secretary
Kansas Department of Agriculture
1320 Research Park Drive
Manhattan, Kansas 66502

Mr. Kenneth Titus, Chief Legal Counsel
Kansas Department of Agriculture
1320 Research Park Drive
Manhattan, Kansas 66502

Mr. Orin Feril, Manager
Big Bend Groundwater Management District No. 5
125 South Main St.
Stafford, Kansas 67578

REQUEST TO SECURE WATER

To: Chief Engineer
Division of Water Resources
Kansas Department of Agriculture
(or his or her authorized agent)

_____
(Date)

1. I am presenting the following information as the basis for action on my request to secure water:

   That pursuant to K.S.A. 82a-701 et. seq., a water right, identified as follows, has been established:

   a. Vested Right
   File No. _____ _____ County _____ Source

   _____ Quantity _____ Rate

   b. Appropriation Right
   File No. _____ Priority Date _____

   Status _____

   _____ Source _____ Quantity _____ Rate

2. That the authorized place of use for the water right is: _____

   _____

3. A. That the appurtenant to the water right described in paragraphs 1 and 2 is owned by:

   _____ Name _____ Address

   _____ Name _____ Address

   B. That the land described in paragraph 2 is owned by:
   (If different than owner of water right)

   _____ Name _____ Address

   _____ Name _____ Address

4. That the undersigned, (if not the owner) has an interest in the above-described land and water right as follows:

   _____
   (tenant, lessee, buyer, contract or other)

5. That during this calendar year _____ acre-feet of water has been used under this right.

6. That the undersigned has need for _____ acre-feet of water at a rate of _____ g.p.m. for _____ purposes at locations described as follows:

   _____

   No. of Acres: _____ Kind of Crop: _____

7. That I am prepared to, and will, in the exercise of my water right described above, apply to beneficial use all water available to me at a rate of _____ g.p.m. or less, commencing at _____ o'clock A.M./P.M. on _____, 20_____.

8. That I have been informed that water is available from the source of supply in the amount of:

Date	Estimated Flow	Location

9. That I have been informed that water is, or was, being diverted from the source of supply as follows:

Date	Water Right	Name	Estimated Rate of Diversion

10. That I have advised the persons listed below of my need for water and my intention to exercise my water right:

Name of Person	Date	Agreeable – Yes Or No

I request in accordance with the provisions of K.S.A. 82a-706b, that the Chief Engineer or his or her authorized agent open, close, adjust or regulate the headgates, valves, or other controlling works of any ditch, canal, conduit, pipe, well, or structure as may be necessary to secure water to which I am entitled:

_____
Signature

State of Kansas)
) SS
County of _____)

_____ by me being duly sworn, declare that the information is true and correct to the best of his or her knowledge and belief.

_____
Affiant's Signature

Subscribed and sworn to before me this _____ day of _____, 20_____

_____
Notary Public

My Commission Expires _____.

REQUEST TO SECURE WATER

To: Chief Engineer
Division of Water Resources
Kansas Department of Agriculture
(or his or her authorized agent)

August 17, 2018
(Date)

1. I am presenting the following information as the basis for action on my request to secure water:

   That pursuant to K.S.A. 82a-701 et. seq., a water right, identified as follows, has been established:

   a. Vested Right
   File No. _____ _____ (County) _____ (Source)

   _____ (Quantity) _____ (Rate)

   b. Appropriation Right
   File No. 7,571 Priority Date August 15, 1957

   Status Impaired

   Rattlesnake Creek (Source) | 22,000 acre-feet (Quantity) | 300 cfs (Rate)

2. That the authorized place of use for the water right is: Quivira National Wildlife Refuge

3. A. That the appurtenant to the water right described in paragraphs 1 and 2 is owned by:

   U.S. Fish & Wildlife Service (Name) | 1434 BE 80th St., Stafford, KS 67578 (Address)

   _____ (Name) _____ (Address)

   B. That the land described in paragraph 2 is owned by:
   (If different than owner of water right)

   _____ (Name) _____ (Address)

   _____ (Name) _____ (Address)

4. That the undersigned, (if not the owner) has an interest in the above-described land and water right as follows:
   Audubon of Kansas, pursuant to 16 U.S.C. 1538(g).
   (tenant, lessee, buyer, contract or other)

5. That during this calendar year _____ acre-feet of water has been used under this right.

6. That the undersigned has need for _____ acre-feet of water at a rate of _____ g.p.m. for _____ purposes at locations described as follows:

   No. of Acres: _____ Kind of Crop: _____

7. That I am prepared to, and will, in the exercise of my water right described above, apply to beneficial use all water available to me at a rate of _____ g.p.m. or less, commencing at _____ o'clock A.M./P.M. on _____, 20_____.

8. That I have been informed that water is available from the source of supply in the amount of:

Date	Estimated Flow	Location
See Final Report of Impairment, issued by DWR July 15, 2016		

9. That I have been informed that water is, or was, being diverted from the source of supply as follows:

Date	Water Right	Name	Estimated Rate of Diversion

10. That I have advised the persons listed below of my need for water and my intention to exercise my water right:

Name of Person	Date	Agreeable – Yes Or No
David W. Barfield, P. E.	August 17, 2018	
Noreen Walsh	August 17, 2019	

I request in accordance with the provisions of K.S.A. 82a-706b, that the Chief Engineer or his or her authorized agent open, close, adjust or regulate the headgates, valves, or other controlling works of any ditch, canal, conduit, pipe, well, or structure as may be necessary to secure water to which I am entitled:

_____
Signature

State of Kansas)
) SS
County of Sedgwick)

_____ by me being duly sworn, declare that the information is true and correct to the best of his or her knowledge and belief.

_____
Affiant's Signature

Subscribed and sworn to before me this 17th day of August, 20 18

_____
Notary Public

My Commission Expires 8-6-22.

KARIN GLENN-MILLER
NOTARY PUBLIC
STATE OF KANSAS
My Appt. Exp. 8-6-22

STATE OF KANSAS

DEPARTMENT OF AGRICULTURE
1320 RESEARCH PARK DRIVE
MANHATTAN, KS 66502
PHONE: (785) 564-6700
FAX: (785) 564-6777

900 SW JACKSON, ROOM 456
TOPEKA, KS 66612
PHONE: (785) 296-3556
www.agriculture.ks.gov

GOVERNOR JEFF COLYER, M.D.
JACKIE MCCLASKEY, SECRETARY OF AGRICULTURE

August 27, 2018

Also sent via email to randy@depewgillen.com

Randall K. Rathbun
Depew Gillen Rathbun & McInteer LC
8301 E. 21st Street North, Suite 450
Wichita, Kansas 67206

Re: Quivira National Wildlife Refuge – Water Right File No. 7,571

Mr. Rathbun:

In response to your letter dated August 17, 2018, attached is the Request to Secure Water filed with our office by the United States Fish and Wildlife Service, dated January 17, 2017. We have attempted to maintain a digital copy of all relevant documents regarding this issue on our website for public access, however, we initially failed to post the Request to Secure Water and have since remedied this oversight.

As noted in your letter, Big Bend Groundwater Management District No. 5 ("GMD5") continues their work to develop a local enhanced management area ("LEMA)" to address the impairment within parameters that we have established. Those requirements are clear that if augmentation is not provided, much more significant pumping reductions will be required. Once ordered, a LEMA's corrective controls are not voluntary and are enforceable under state law.

A Request to Secure Water is filed pursuant to K.A.R. 5-4-1, which in section (e)(2) states:

> If the area of complaint is located within the boundaries of a GMD and if the final report determines that the impairment is substantially due to direct interference, the chief engineer shall allow the GMD board to recommend how to regulate the impairing water rights to satisfy the impaired right.

The GMD5 Board of Directors recommend that they move forward with a local enhanced management area, and they are working diligently towards the formation of such a district. Although GMD5 has not yet finalized a plan, we believe an appropriate and enforceable solution can be crafted and that our actions to date are within our regulatory authority.

Sincerely,

Kenneth B. Titus
Chief Legal Counsel
kenneth.titus@ks.gov

Encl: Request to Secure Water

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Mountain-Prairie Region

IN REPLY REFER TO:
BA WTR
KS WR
Mail Stop 60189

MAILING ADDRESS:
P.O. Box 25486, DFC
Denver, Colorado 80225-0486

STREET LOCATION:
134 Union Boulevard
Lakewood, Colorado 80228-1807

David Barfield, P.E., Chief Engineer
Kansas Department of Agriculture
Division of Water Resources
1320 Research Park Drive
Manhattan, Kansas 66502

JAN 17 2017

Dear Mr. Barfield:

Enclosed is the U.S. Fish and Wildlife Service (Service) request to secure water regarding water right No. 7571 from injury due to junior groundwater wells. The Service appreciates the help received during our January 03, 2016 phone conversation ensuring the form was filled out accurately. Please let us know if any further changes need to be made.

As we indicated in our December 01, 2016 letter, submission of this form will not preclude us from working further with Big Bend Groundwater Management District No. 5 to obtain a mutual solution. We must, however, have the solution be enforceable from your office and feel that submitting this request will ensure that enforceability occurs in 2018.

Please contact me at 303-236-4491 if you any questions or would like to discuss further. Thank you for your assistance in this matter.

Sincerely,

Brian S. Caruso, Ph.D., P.E.
Chief, Division of Water Resources

REQUEST TO SECURE WATER

To: Chief Engineer
Division of Water Resources
Kansas Department of Agriculture
(or his or her authorized agent)

January 01, 2018
(Date)

1. I am presenting the following information as the basis for action on my request to secure water:

   That pursuant to K.S.A. 82a-701 et. seq., a water right, identified as follows, has been established:

   a. Vested Right
   File No. _____ _____ County _____ Source

   _____ Quantity _____ Rate

   b. Appropriation Right
   File No. 7571 Priority Date August 15, 1957

   Status Certified

   Rattlesnake Creek (Source) | 14,632 (Quantity) | 300 cfs (Rate)

2. That the authorized place of use for the water right is: Quivira National Wildlife Refuge

3. A. That the appurtenant to the water right described in paragraphs 1 and 2 is owned by:

   U.S. Dept. of the Interior - U.S. Fish and Wildlife Service (Name) | P.O. Box 25486, Denver Federal Center, Mailstop 60189, Denver, CO 80225 (Address)

   _____ (Name) _____ (Address)

   B. That the land described in paragraph 2 is owned by:
   (If different than owner of water right)

   same as above (Name) _____ (Address)

   _____ (Name) _____ (Address)

4. That the undersigned, (if not the owner) has an interest in the above-described land and water right as follows:

   Agent
   (tenant, lessee, buyer, contract or other)

5. That during this calendar year 0 acre-feet of water has been used under this right.

6. That the undersigned has need for 14,632 acre-feet of water at a rate of see attached g.p.m. for Recreational purposes at locations described as follows:

   Fish and Wildlife Habitat, Forage

   No. of Acres: 22,135 Kind of Crop: N/A

7. That I am prepared to, and will, in the exercise of my water right described above, apply to beneficial use all water available to me at a rate of See attached g.p.m. or less, commencing at 12 o'clock A.M. on January 1, 2018.

8. That I have been informed that water is available from the source of supply in the amount of:

Date	Estimated Flow	Location
1974 - 2013	Variable	Rattlesnake Creek, Zenith Gage

9. That I have been informed that water is, or was, being diverted from the source of supply as follows:

Date	Water Right	Name	Estimated Rate of Diversion
1995 - 2007	Multiple	Junior Appropriators	30,000 - 60,000 AF per year depletions to Rattlesnake Creek

10. That I have advised the persons listed below of my need for water and my intention to exercise my water right:

Name of Person	Date	Agreeable – Yes Or No
Big Bend GMD No. 5	12/01/2016	No

I request in accordance with the provisions of K.S.A. 82a-706b, that the Chief Engineer or his or her authorized agent open, close, adjust or regulate the headgates, valves, or other controlling works of any ditch, canal, conduit, pipe, well, or structure as may be necessary to secure water to which I am entitled:

Brian S. Caruso, agent
Signature

State of ~~Kansas~~ Colorado)
) SS
County of Jefferson)

Brian S. Caruso by me being duly sworn, declare that the information is true and correct to the best of his or her knowledge and belief.

Brian S. Caruso, agent
Affiant's Signature

Subscribed and sworn to before me this 17th day of January, 2017

CAROLINE M. CORDOVA
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20044034704
MY COMMISSION EXPIRES 09/28/2020

My Commission Expires September 28, 2020

Caroline M Cordova
Notary Public
135 Quitman Street
Denver CO 80219

Seasonal Rattlesnake Creek Water Need Estimates for Quivira National Wildlife Refuge, Prepared May 2015

Background

At the request of Kansas Department of Agriculture, Division of Water Resources (DWR), the U.S. Fish and Wildlife Service (Service) has provided information to increase understanding of *seasonal* water needs to accomplish management objectives of the Quivira National Wildlife Refuge (Refuge). The Refuge's current annual Water Right 7571 on Rattlesnake Creek is 14,632 ac-ft. There is no single estimate that accurately predicts seasonal surface water needs of the Refuge because various factors influence water needs within and among years, such as short- and long-term weather patterns, the timing of wildlife events (e.g., migration), and changing habitat conditions.

Approach

Scenario 1 – There was interest by DWR to evaluate the potential of using past water use records to quantify estimates of seasonal water needs to accomplish refuge management objectives. To accomplish this task, Refuge staff compiled 48 years of monthly water-use records and grouped months into seasons based on the life cycle events of waterbirds (timing of migration, relative abundances) and the lag time required to transfer water to wetlands through the ditch infrastructure (Table 1). For example, flooding a wetland to the appropriate depth can require days to weeks depending on location from the diversion, volume of water available, and existing soil moisture conditions (e.g., dry, saturated).

Table 1. Significant annual events largely considered in determining seasonal water needs to accomplish management objectives of Quivira National Wildlife Refuge.

Jan-Feb	Mar-Apr	May-Jun	Jul-Sep	Oct-Nov	Dec
MANAGEMENT TO SUPPORT WILDLIFE FOOD & COVER REQUIREMENTS					
Use water where needed to provide/maintain semipermanent wetland habitat.					
	Shallowly flood select units to saturate dry soils that will be used to produce wildlife foods.				
	Dewater select wetlands for suitable germination and growth of desired plants used for wildlife food and cover. Drawdown dates are based on scientific information.				
		Irrigate select wetland units to support survival, growth, and seed production of germinated wildlife food plants.	After seeds mature, gradually increase water levels in wetlands to coincide with the food and cover needs of target species.		
CHRONOLOGY OF SPECIES ANNUAL EVENTS OR WHEN LIFE REQUIREMENTS NEED TO BE AVAILABLE FOR SPECIES USE					
Waterfowl and bald eagle wintering habitat is provided when open water is available (generally where flooded deep and/or where flow prevents ice formation).	Peak spring waterfowl migration (habitat flooded <15 inches).	Main spring shorebird migration (habitat flooded <6 inches and mudflat).	Main fall shorebird migration (habitat flooded <6 inches and mudflat).	Peak fall waterfowl migration (habitat flooded <15 inches).	
	Endangered whooping crane spring migration (shoreline & habitat flooded <1 ft).	Breeding-related activities occur for several waterbirds that require flooded habitat for food and/or cover resources, such as for the state-threatened snowy plover, the endangered interior least tern, and for state species in need of conservation (e.g., black rail, black tern).		Endangered whooping crane fall migration (shoreline and habitat flooded <1 ft).	

After reviewing the water use records, Refuge staff made the determination to exclude years (n=28) when total annual water use did not exceed 7,000 ac-ft to prevent extreme bias in estimating seasonal water use due to

limited water availability and/or inappropriate timing of available water. For example, during low water years Refuge staff often receive and use water at less than optimal times (e.g., winter) to help increase the odds that at least some wetland habitat is flooded at critical times (e.g., spring waterbird migration). In this case, the average amount of water used during the winter season would be biased high. Conversely, it is common during low water years to not have sufficient water to maintain wetland vegetation, which results in low food production and sparse cover required by wildlife. In this case, the use of water during summer would be biased extremely low. The use of 7,000 ac-ft as a cutoff point was based on approximating 50% of the Refuge water right and, as such, is somewhat arbitrary.

For the 20 years of when total annual water use exceeded 7,000 ac-ft, water use for each year was partitioned into the appropriate seasons and the median, minimum, and maximum seasonal values across all years were calculated (Table 2).

Table 2. Seasonal median, minimum, and maximum water use (ac-ft) values, calculated using 20 years of data where annual use exceeded 7,000 ac-ft. Totals of the median and maximum seasonal water use values are respectively lower and higher than the current annual water right (14,632 ac-ft).

	Jan -Feb	Mar-Apr	May-Jun	Jul-Sep	Oct-Nov	Dec	Total
Median	986	1,115	1,062	2,117	1,781	684	7,746
Minimum	0	89	126	463	151	101	
Maximum	3,557	3,111	2,601	4,374	6,205	2,003	21,851

This Scenario 1 estimate is biased due to the following:

- Historic *use* does not accurately reflect water *needs* during any given year or season.
- Historic water use in a given season may not accurately reflect the volume of water that would have been used if water had been available during that season or, perhaps, previous to that season.
- The use of records that exceeded 7,000 ac-ft was arbitrary and only represents nearly half of the Refuge water right. As such, these estimates likely are biased low.

Scenario 2 –

Scenario 2 is based on achieving minimum requirements of CCP objectives following a drought year and water use was not constrained by the current water right (Table 3, Scenario 2). Unlike Scenario 1, seasons in Scenario 2 were defined by CCP habitat-based objectives, as approved in 2013. Data used to develop this scenario included area estimates and area-capacity curves developed by the Service for individual wetlands, published long-term precipitation and pan evaporation data (including the use of a coefficient to account for shallow wetlands), soil infiltration rates calculated based on information in NRCS soil survey data (SSURGO), LiDAR data to estimate volume of ditches, and aerial imagery to estimate surface area of water in the Big and Little Salt Marshes at the beginning of the scenario.

Table 3. Comparison of Rattlesnake Creek surface water use Scenarios 1 and 2 for Quivira NWR.

Scenario	Seasonal Water Use Estimates (Acre-Feet)												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1	986		1,115		1,062		2,117			1,781		684	7,746
2	3,144		7,427		2,895		4,053				5,881		23,400

This Scenario 2 estimate is biased due to the following:

- Water loss due to plant transpiration was not included in water use estimates (which would increase water needs to meet objectives).
- Water loss due to soil infiltration in some wetlands was underestimated because values for the available water capacity of 2,300 acres of wetland soils were not available (which would increase water needs to meet objectives).

- Water loss due to horizontal seepage in ditches during initial flooding was not estimated (which would increase water needs to meet objectives).
- Estimate based on a "normal precipitation" year following a drought year (all units dry); thus, a large volume of water (3,144 acre-feet) is needed to initially flood the Little Salt Marsh before water can be diverted elsewhere on the Refuge. This volume would be lower in years not preceded by drought.
- Estimate based on initially flooding only units and infrastructure on the south end of the Refuge. If north portion of Refuge were flooded early in the year, water use estimates would increase.
- Seasons are based on habitat objectives and do not always reflect the water management activities/schedules (e.g., time required for water to travel from diversion to wetland of interest).

Results

The seasonal estimates in Table 4 were developed after considering Scenarios 1 and 2 described in the approach above.

Table 4. Seasonal Rattlesnake Creek surface water need estimates for Quivira NWR, given the current water right.

Seasonal Water Use (Acre-Feet)						
Jan-Feb	Mar-Apr	May-Jun	Jul-Sep	Oct-Nov	Dec	Total
1,500	3,500	2,000	3,500	3,632	500	14,632

Although Scenarios 1 and 2 were developed based on quantitative information; these estimates were constrained by limitations that precluded either scenario from being used to directly estimate seasonal water needs. In general, the estimate based on past water use is known to be flawed because the Refuge either did not receive its full annual right of 14,632 ac-ft and/or the seasonal availability of water was not available or lacking, which resulted in the use of water during suboptimal times that often limited or impeded the accomplishment of management objectives. In contrast, the Scenario 2 estimate, based on water needs following drought, exceeded the Refuge water right even though important factors (e.g., water infiltration in ditches, plant transpiration) that would have increased water needs were not included in the estimate. Therefore, the Service used information from both Scenario 1 and Scenario 2 to adjust water use so total annual use matches the current water right of 14,632 ac-ft (Table 4).

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Mountain-Prairie Region

IN REPLY REFER TO:
NWRS WTR
KS WR
Mail Stop 69016

MAILING ADDRESS:
P.O. Box 25486, DFC
Denver, Colorado 80225-0486

STREET LOCATION:
134 Union Boulevard
Lakewood, Colorado 80228-1807

David Barfield, P.E., Chief Engineer
Kansas Department of Agriculture
Division of Water Resources
1320 Research Park Drive
Manhattan, Kansas 66502

December 13, 2018
submitted via email to:
David.Barfield@ks.gov

Dear Mr. Barfield:

Enclosed is the U.S. Fish and Wildlife Service (Service) 2019 request to secure water regarding water right No. 7571 from injury due to junior groundwater wells. The Service appreciates being informed of any developments regarding the Local Enhanced Management Area (LEMA) that is being drafted to remedy impairment.

Please contact me at 303-236-4491 if you any questions or would like to discuss further. Thank you for your assistance in this matter.

Sincerely,

Brian S. Caruso, Ph.D., P.E.
Chief, Division of Water Resources

REQUEST TO SECURE WATER

To: Chief Engineer
Division of Water Resources
Kansas Department of Agriculture
(or his or her authorized agent)

January 01, 2019
(Date)

1. I am presenting the following information as the basis for action on my request to secure water:

   That pursuant to K.S.A. 82a-701 et. seq., a water right, identified as follows, has been established:

   a. Vested Right
   File No. _____ _____ (County) _____ (Source)

   _____ (Quantity) _____ (Rate)

   b. Appropriation Right
   File No. **7571** Priority Date **August 15, 1957**

   Status **Certified**

Rattlesnake Creek	**14,632**	**300 cfs**
Source	Quantity	Rate

2. That the authorized place of use for the water right is: **Quivira National Wildlife Refuge**

3. A. That the appurtenant to the water right described in paragraphs 1 and 2 is owned by:

U.S. Dept. of the Interior - U.S. Fish and Wildlife Service	**P.O. Box 25486, Denver Federal Center, Mailstop 60189, Denver, CO 80225**
Name	Address
Name	Address

   B. That the land described in paragraph 2 is owned by:
   (If different than owner of water right)

same as above	
Name	Address
Name	Address

4. That the undersigned, (if not the owner) has an interest in the above-described land and water right as follows:

   Agent
   (tenant, lessee, buyer, contract or other)

5. That during this calendar year **0** acre-feet of water has been used under this right.

6. That the undersigned has need for **14,632** acre-feet of water at a rate of ^ (see attached) g.p.m. for **Recreational** purposes at locations described as follows:

   Fish and Wildlife Habitat, Forage

   No. of Acres: **22,135** Kind of Crop: **N/A**

7. That I am prepared to, and will, in the exercise of my water right described above, apply to beneficial use all water available to me at a rate of see attached g.p.m. or less, commencing at **12** o'clock A.M. on **January 1** 20**19**.

8. That I have been informed that water is available from the source of supply in the amount of:

Date	Estimated Flow	Location
1974 - 2013	**Variable**	**Rattlesnake Creek, Zenith Gage**

9. That I have been informed that water is, or was, being diverted from the source of supply as follows:

Date	Water Right	Name	Estimated Rate of Diversion
1995 - 2007	**Multiple**	**Junior Appropriators**	**30,000 - 60,000 AF per year depletions to Rattlesnake Creek**

10. That I have advised the persons listed below of my need for water and my intention to exercise my water right:

Name of Person	Date	Agreeable – Yes Or No
Big Bend GMD No. 5	**12/01/2016**	**No**

I request in accordance with the provisions of K.S.A. 82a-706b, that the Chief Engineer or his or her authorized agent open, close, adjust or regulate the headgates, valves, or other controlling works of any ditch, canal, conduit, pipe, well, or structure as may be necessary to secure water to which I am entitled:

Signature

State of ~~Kansas~~ Colorado)
) SS
County of Jefferson)

Brian S. Caruso by me being duly sworn, declare that the information is true and correct to the best of his or her knowledge and belief.

Affiant's Signature

Subscribed and sworn to before me this 13th day of December, 20 18

CAROLINE M. CORDOVA
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20044034704
MY COMMISSION EXPIRES 09/28/2020

Caroline M Cordova
Notary Public

My Commission Expires Sept. 28, 2020

135 Quitman Street
Denver CO 80219

Seasonal Rattlesnake Creek Water Need Estimates for Quivira National Wildlife Refuge, Prepared May 2015

Background

At the request of Kansas Department of Agriculture, Division of Water Resources (DWR), the U.S. Fish and Wildlife Service (Service) has provided information to increase understanding of *seasonal* water needs to accomplish management objectives of the Quivira National Wildlife Refuge (Refuge). The Refuge's current annual Water Right 7571 on Rattlesnake Creek is 14,632 ac-ft. There is no single estimate that accurately predicts seasonal surface water needs of the Refuge because various factors influence water needs within and among years, such as short- and long-term weather patterns, the timing of wildlife events (e.g., migration), and changing habitat conditions.

Approach

Scenario 1 – There was interest by DWR to evaluate the potential of using past water use records to quantify estimates of seasonal water needs to accomplish refuge management objectives. To accomplish this task, Refuge staff compiled 48 years of monthly water-use records and grouped months into seasons based on the life cycle events of waterbirds (timing of migration, relative abundances) and the lag time required to transfer water to wetlands through the ditch infrastructure (Table 1). For example, flooding a wetland to the appropriate depth can require days to weeks depending on location from the diversion, volume of water available, and existing soil moisture conditions (e.g., dry, saturated).

Table 1. Significant annual events largely considered in determining seasonal water needs to accomplish management objectives of Quivira National Wildlife Refuge.

Jan-Feb	Mar-Apr	May-Jun	Jul-Sep	Oct-Nov	Dec
MANAGEMENT TO SUPPORT WILDLIFE FOOD & COVER REQUIREMENTS					
Use water where needed to provide/maintain semipermanent wetland habitat.					
	Shallowly flood select units to saturate dry soils that will be used to produce wildlife foods.				
	Dewater select wetlands for suitable germination and growth of desired plants used for wildlife food and cover. Drawdown dates are based on scientific information.				
		Irrigate select wetland units to support survival, growth, and seed production of germinated wildlife food plants.	After seeds mature, gradually increase water levels in wetlands to coincide with the food and cover needs of target species.		
CHRONOLOGY OF SPECIES ANNUAL EVENTS OR WHEN LIFE REQUIREMENTS NEED TO BE AVAILABLE FOR SPECIES USE					
Waterfowl and bald eagle wintering habitat is provided when open water is available (generally where flooded deep and/or where flow prevents ice formation).	Peak spring waterfowl migration (habitat flooded <15 inches).	Main spring shorebird migration (habitat flooded <6 inches and mudflat).		Main fall shorebird migration (habitat flooded <6 inches and mudflat).	Peak fall waterfowl migration (habitat flooded <15 inches).
	Endangered whooping crane spring migration (shoreline & habitat flooded <1 ft).	Breeding-related activities occur for several waterbirds that require flooded habitat for food and/or cover resources, such as for the state-threatened snowy plover, the endangered interior least tern, and for state species in need of conservation (e.g., black rail, black tern).		Endangered whooping crane fall migration (shoreline and habitat flooded <1 ft).	

After reviewing the water use records, Refuge staff made the determination to exclude years (n=28) when total annual water use did not exceed 7,000 ac-ft to prevent extreme bias in estimating seasonal water use due to

limited water availability and/or inappropriate timing of available water. For example, during low water years Refuge staff often receive and use water at less than optimal times (e.g., winter) to help increase the odds that at least some wetland habitat is flooded at critical times (e.g., spring waterbird migration). In this case, the average amount of water used during the winter season would be biased high. Conversely, it is common during low water years to not have sufficient water to maintain wetland vegetation, which results in low food production and sparse cover required by wildlife. In this case, the use of water during summer would be biased extremely low. The use of 7,000 ac-ft as a cutoff point was based on approximating 50% of the Refuge water right and, as such, is somewhat arbitrary.

For the 20 years of when total annual water use exceeded 7,000 ac-ft, water use for each year was partitioned into the appropriate seasons and the median, minimum, and maximum seasonal values across all years were calculated (Table 2).

Table 2. Seasonal median, minimum, and maximum water use (ac-ft) values, calculated using 20 years of data where annual use exceeded 7,000 ac-ft. Totals of the median and maximum seasonal water use values are respectively lower and higher than the current annual water right (14,632 ac-ft).

	Jan -Feb	Mar-Apr	May-Jun	Jul-Sep	Oct-Nov	Dec	Total
Median	986	1,115	1,062	2,117	1,781	684	7,746
Minimum	0	89	126	463	151	101	
Maximum	3,557	3,111	2,601	4,374	6,205	2,003	21,851

This Scenario 1 estimate is biased due to the following:

- Historic *use* does not accurately reflect water *needs* during any given year or season.
- Historic water use in a given season may not accurately reflect the volume of water that would have been used if water had been available during that season or, perhaps, previous to that season.
- The use of records that exceeded 7,000 ac-ft was arbitrary and only represents nearly half of the Refuge water right. As such, these estimates likely are biased low.

Scenario 2 **–**

Scenario 2 is based on achieving minimum requirements of CCP objectives following a drought year and water use was not constrained by the current water right (Table 3, Scenario 2). Unlike Scenario 1, seasons in Scenario 2 were defined by CCP habitat-based objectives, as approved in 2013. Data used to develop this scenario included area estimates and area-capacity curves developed by the Service for individual wetlands, published long-term precipitation and pan evaporation data (including the use of a coefficient to account for shallow wetlands), soil infiltration rates calculated based on information in NRCS soil survey data (SSURGO), LiDAR data to estimate volume of ditches, and aerial imagery to estimate surface area of water in the Big and Little Salt Marshes at the beginning of the scenario.

Table 3. Comparison of Rattlesnake Creek surface water use Scenarios 1 and 2 for Quivira NWR.

Scenario	Seasonal Water Use Estimates (Acre-Feet)												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1	986		1,115		1,062		2,117			1,781		684	7,746
2	3,144		7,427		2,895		4,053				5,881		23,400

This Scenario 2 estimate is biased due to the following:

- Water loss due to plant transpiration was not included in water use estimates (which would increase water needs to meet objectives).
- Water loss due to soil infiltration in some wetlands was underestimated because values for the available water capacity of 2,300 acres of wetland soils were not available (which would increase water needs to meet objectives).

- Water loss due to horizontal seepage in ditches during initial flooding was not estimated (which would increase water needs to meet objectives).
- Estimate based on a "normal precipitation" year following a drought year (all units dry); thus, a large volume of water (3,144 acre-feet) is needed to initially flood the Little Salt Marsh before water can be diverted elsewhere on the Refuge. This volume would be lower in years not preceded by drought.
- Estimate based on initially flooding only units and infrastructure on the south end of the Refuge. If north portion of Refuge were flooded early in the year, water use estimates would increase.
- Seasons are based on habitat objectives and do not always reflect the water management activities/schedules (e.g., time required for water to travel from diversion to wetland of interest).

Results

The seasonal estimates in Table 4 were developed after considering Scenarios 1 and 2 described in the approach above.

Table 4. Seasonal Rattlesnake Creek surface water need estimates for Quivira NWR, given the current water right.

Seasonal Water Use (Acre-Feet)						
Jan-Feb	Mar-Apr	May-Jun	Jul-Sep	Oct-Nov	Dec	Total
1,500	3,500	2,000	3,500	3,632	500	14,632

Although Scenarios 1 and 2 were developed based on quantitative information; these estimates were constrained by limitations that precluded either scenario from being used to directly estimate seasonal water needs. In general, the estimate based on past water use is known to be flawed because the Refuge either did not receive its full annual right of 14,632 ac-ft and/or the seasonal availability of water was not available or lacking, which resulted in the use of water during suboptimal times that often limited or impeded the accomplishment of management objectives. In contrast, the Scenario 2 estimate, based on water needs following drought, exceeded the Refuge water right even though important factors (e.g., water infiltration in ditches, plant transpiration) that would have increased water needs were not included in the estimate. Therefore, the Service used information from both Scenario 1 and Scenario 2 to adjust water use so total annual use matches the current water right of 14,632 ac-ft (Table 4).

Dennis L. Gillen
Jack Scott McInteer
Randall K. Rathbun
Charles C. Steincamp
Kimberly A. Vining

DEPEW & GILLEN RATHBUN & McINTEER, LC

Spencer L. Depew (1933-2005)
Nicholas S. Daily (1949-2006)

Benjamin K. Carmichael
Paul F. Good, Of Counsel
Kurt A. Harper, Of Counsel
William E. Dakan, Of Counsel

August 16, 2019

BY EMAIL AND U.S. MAIL

Mr. David W. Barfield, Chief Engineer
Kansas Department of Agriculture, Division of Water Resources
David.Barfield@ks.gov
1320 Research Park Drive
Manhattan, Kansas 66506

Mr. Mike Beam, Secretary of Agriculture
AgSecretary@ks.gov
1320 Research Park Drive
Manhattan, Kansas 66506

Re: In the Matter of the U.S. Fish and Wildlife Service's Impairment Complaint filed on behalf of the Quivira National Wildlife Refuge, File No. 7,571.

Dear Mr. Barfield and Secretary Beam,

As you both know, Audubon of Kansas ("AOK") has been following the developments and proceedings related to the impairment of the Quivira National Wildlife Refuge ("Refuge") with great interest. We appreciate the time and effort that the Department of Agriculture ("KDA") and the Division of Water Resources ("DWR") have devoted to responding to our written statements submitted to KDA and DWR about the impairment of the Refuge's water rights, and to meeting with AOK at your offices in Manhattan earlier this year. AOK has had similarly fruitful meetings and conversations with WaterPack, a consortium of irrigators within GMD5.

And so we read with interest Mr. Barfield's letter of July 30, 2019, to the Big Bend Groundwater Management District No. 5 ("GMD5"), in which DWR formally rejected the Local Enhanced Management Plan that GMD5 proposed earlier this year. As you know, our extensive earlier written comments submitted to KDA-DWR have repeatedly articulated our position regarding what would constitute an acceptable plan, under the federal and state laws that govern the Refuge and its senior surface water right. Based on KDA-DWR's responses to AOK's written and in-person statements, we believe KDA-DWR has taken those statements under consideration, as has GMD5.

On August 14, 2019, GMD5 filed a Petition for Review and a Petition for Stay in response to your July 30, 2019 letter. AOK learned of the letter from DWR on or about August 8, 2019, when, to the best of AOK's knowledge, it was posted on the DWR website and circulated. This

delay effectively prohibited AOK from intervening and filing a Petition for Administrative Review within the 15-day window allowed pursuant to K.S.A. § 77-527. While this lapse in time does not affect AOK's ability to challenge KDA-DWR's final agency action or actions related to the Refuge in the future, it is nonetheless concerning.

The purpose of this letter is thus twofold.

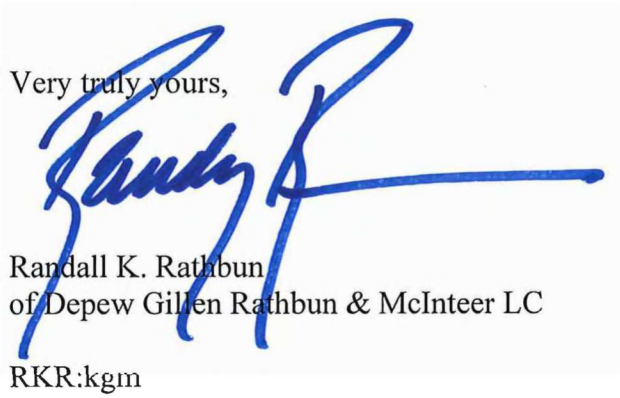
First, AOK requests from KDA-DWR an acknowledgment that AOK qualifies as a party to the proceedings related to the above-captioned matter, pursuant to the Kansas Judicial Review Act ("KJRA"), specifically K.S.A. § 77-611(b). That subsection confers statutory standing to obtain judicial review of final or non-final agency action to "a person who was a party to the agency proceedings that led to the agency action . . . ." *Id.* Kansas courts have consistently construed the term "party to the agency proceedings," as that term is used in that subsection, as "a person to whom the agency action is specifically directed" or "a person named as a party to any agency proceeding or allowed to intervene *or participate as a party in the proceeding.*" *Cochran v. State, Dept. of Agr., Div, of Water Resources,* 291 Kan. 898, 905 (2011) (citing K.S.A. § 77-602(f)(2) and *Board of Sumner County Comm'rs v. Bremby,* 286 Kan. 745, 752 (2008) (emphasis supplied by the court)). The court in *Bremby* found that the Kansas legislature intended the term "proceeding" as it is used in the KJRA to "be read broadly to refer to *the process* by which an agency carries out its statutory duties," and further, that an interested person's "'submission of written comments during a public notice and comment period and all persons' comments made during a public hearing held by an agency both qualify as participation within the meaning of the KJRA's standing requirements.'" *Id.,* (quoting *Bremby,* 286 Kan. at 758, 761). That KDA-DWR receives input from such a party and considers that input are sufficient; there is no requirement of a public notice and comment process for such party to obtain standing under the KJRA. *Id.,* at 906. Similarly, where a party lacks administrative remedies to exhaust prior to judicial review, there is no additional requirement of exhaustion. *Id.,* at 908 (construing K.S.A. § 77-612 and citing numerous authorities).

Like the plaintiffs in *Cochran,* AOK has provided input to KDA-DWR during its consideration of agency action, and KDA-DWR has considered that input during the proceedings related to the impairment of the Refuge's water rights. At this stage, AOK lacks the administrative remedies available to GMD5, which proposed the Local Enhanced Management Plan. Because the KJRA is the statutory scheme for judicial review under the Kansas Water Appropriation Act, the KJRA confers standing upon AOK to seek judicial review of KDA-DWR's determinations pursuant to the KJRA. *Id.,* at 907. This is clearly settled law. (AOK also enjoys traditional common-law standing under federal and state law, according to the court's discussion in *Cochran, see id.,* at 909-910.)

Second, because AOK does enjoy statutory standing under the KJRA, AOK hereby requests that it be notified of KDA-DWR orders and decisions at the same time, and through the same process, as it timely notifies GMD5, the U.S. Fish and Wildlife Service, and other parties to this proceeding. This notification will be especially important given your intent to issue administrative orders relating to the Refuge on September 1, 2019. You may notify AOK electronically and by mail through this office.

In closing, AOK commends your intent to protect the Refuge's senior surface water rights. Please contact this office if you have any questions regarding this letter. We look forward to your response—and your recognition.

Very truly yours,



Randall K. Rathbun
of Depew Gillen Rathbun & McInteer LC

RKR:kgm

NEWS RELEASES

Sen. Moran Discusses Quivira National Wildlife Refuge Water Rights with FWS Nominee Aurelia Skipwith (/public/index.cfm/news-releases?ID=A3009528-1D7F-488B-87C2-D9B02455E970)

"I am pleased that Ms. Skipwith committed to working with local stakeholders to find a voluntary solution to satisfy the Quivira water impairment. . ."

Oct 21 2019

WASHINGTON – U.S. Senator Jerry Moran (R-Kan.) met with Aurelia Skipwith, the nominee to be the Director of the U.S. Fish and Wildlife Service (FWS) and the current Deputy Assistant Secretary for Fish, Wildlife and Parks at the Department of the Interior. During the meeting, Sen. Moran raised concerns regarding the water rights dispute surrounding the Quivira National Wildlife Refuge (NWR).

"In my meeting with Ms. Skipwith, I explained the need for farmers and ranchers to be able to utilize groundwater in the basin and the importance of agriculture to the regional economy," **said Sen. Moran.** "I am pleased that Ms. Skipwith committed to working with local stakeholders to find a voluntary solution to satisfy the Quivira water impairment before requesting that the Kansas Department of Agriculture (KDA) move forward with an administrative order to regulate junior water rights. This solution should include augmentation of Rattlesnake Creek, voluntary water conservation efforts and maximizing use of the water the refuge currently receives. I look forward to continue working with Ms. Skipwith to pursue commonsense solutions to this issue that will impact Kansas producers and the regional economy."

While water rights are generally handled at the state and local government level, the impairment claim directly involved a federal agency, the FWS. The FWS holds a senior surface water right near the bottom of Rattlesnake Creek for its Quivira NWR. After an investigation, KDA's Division of Water Resources (DWR) concluded in 2016 that Quivira NWR's water supply has been impacted by upstream junior groundwater pumping.

On July 30, 2019, KDA rejected the latest Local Enhanced Management Area proposal put forth by the Groundwater Management District #5 intended to resolve the impairment. Subsequently, KDA has communicated with junior water rights holders – primarily farmers and ranchers – in the Quivira NWR stating their intentions to move forward with regulations limiting irrigation and other water usage. These regulations will only be implemented if FWS – the senior water rights holder – makes a formal request for action to settle the impairment.

# # #

Quivira National Wildlife Refuge Impairment Complaint

News
On the morning of 10/25/2019, KDA-DWR received the following official position of the U.S. Fish and Wildlife Service related to the Quivira impairment: "*The U.S. Fish and Wildlife Service will not make a request for water to the State of Kansas for Quivira National Wildlife Refuge in Fiscal Year 2020. Throughout the year, the Service will continue to work to find local, voluntary, collaborative and non-regulatory solutions, including augmentation, to address the water needs of the community and the wildlife conservation purposes of the refuge before determining if more formal measures are necessary to ensure the refuge's water rights are secured. We look forward to working with the Kansas Department of Agriculture, the Kansas congressional delegation, and all water users to develop concrete milestones and lasting solutions.*"

On 10/21/2019, two public meetings were held in St. John related to the proposed administrative orders by the Chief Engineer (which are now NOT moving forward). Below are links to the slides presented and to archives of the livestream videos of each session. **For more, including a summary of the current status of the matter, see this *KDA-DWR-Update*.**

On 10/18/2019, KDA was informed that the United States Department of the Interior, which oversees the U.S. Fish and Wildlife Service, is interested in working with the local leadership of the Rattlesnake Creek region to renew efforts to find a locally-driven solution to the impairment at the Quivira National Wildlife Refuge operated by the Service, before requested DWR to protect their water right.

Slides from Public Meeting in St. John, Oct. 21, 2019
Livestream of KDA-DWR Public Meetings in St. John, Oct. 21:
- Oct. 21 3:00-5:00 meeting
- Oct. 21 7:00-9:00 meeting

Sample Letter: Notice of Planned Administration, 2020-22

List of Sections: Follow the links below to navigate to the corresponding sections.

Planned Administration, 2020-22
Administrative Review of Chief Engineer's LEMA Decision
Development of Impairment Remedy
GMD 5 Proposed Rattlesnake/Quivira LEMA
Development of Impairment Investigation Report
Statutory Provision and Impairment Procedures
Impairment Investigation Progress and Plan

MEMORANDUM OF AGREEMENT

I. Resolutions

WHEREAS, the U.S. Fish and Wildlife Service ("the Service") and the Big Bend Groundwater Management District #5 ("the District") (collectively known as "the Parties") have met regularly to find a local, voluntary, collaborative solution to resolve the Service's water impairment complaint related to Water Right File No. 7,571 ("the Complaint") for the Quivira National Wildlife Refuge ("the Refuge").

WHEREAS, the Parties agree that after examining relevant data and hydrologic modeling, the development and implementation of an augmentation wellfield, as described herein, will be the primary mechanism in addressing the Service's Complaint. The Parties also agree that the development of the water rights purchase program, water rights movement program, and a program to incentivize the removal of end guns within the District as described herein, may be pursued by the District to adjust the amount of water augmented for the Refuge by the wellfield.

WHEREAS, it is the intent of the Parties to initiate evaluation of the proposal to develop an augmentation wellfield under the National Environmental Policy Act (NEPA), including a later agreement following this Agreement to include additional details of the projects described herein to address the Service's impairment complaint related to the Refuge ("Subsequent Agreement").

WHEREAS, the Parties agree that this Agreement serves as the basis for the Subsequent Agreement that will specify all terms and obligations related to the planning, design and implementation of an augmentation wellfield and the development of the water rights purchase and movement programs described herein. The Parties desire to put the proper assurances in place to allow the planning, design and implementation of an augmentation wellfield and the development of water rights purchase and movement programs until the Subsequent Agreement is executed.

WHEREAS, based on information received from the Service and Kansas Department of Health and Environment, the Parties believe that the groundwater in this area is within the water quality range acceptable to the Refuge. Pending further analysis through NEPA, the Parties preliminarily agree this area has a quantity of water that can be appropriated in a sustainable manner.

WHEREAS, the Parties have worked cooperatively in reaching the terms of this Agreement, with the District sharing with the Service all its available data, studies, reports and calculations collected to address the issues in the Service's Complaint.

WHEREAS, this Agreement is entered into pursuant to the Fish and Wildlife Act of 1956, 16 U.S.C. § 742a, et seq.; the Fish and Wildlife Coordination Act, 16 U.S.C. 661 et seq., the Migratory Bird Conservation Act, 16 U.S.C. § 715d et seq., and the National Wildlife Refuge System Administration Act, 16 U.S.C. 668dd et seq.

WHEREAS, the execution of this Agreement shall not constitute, nor is it in any way an admission by any Party of any liability, and shall not be used in any other action against any Party as proof of liability.

II. Definitions

"Short-Term Projects" means projects developed that will be implemented and operated under contracts, or through other appropriate means within the first 5 years of this Agreement.

"Long-Term Projects" means projects developed that will be implemented and operated under contracts or through other appropriate means beyond 5 years of this Agreement.

"Management Committee" means the committee to provide input for the successful implementation of this Agreement and the Subsequent Agreement. The committee is anticipated to include lead representatives from the District, Service, as well as ad hoc representatives from the Kansas Department of Agriculture-Division of Water Resources, Kansas Department of Health and Environment, and Water Protection Association for Central Kansas (WaterPACK).

"Technical Committee" means the committee formed to advise and make recommendations to the Management Committee to implement the projects for purposes of this Agreement. This committee will be chosen by the Management Committee and will be composed of members with expertise in groundwater and surface water project development and management.

"Technical Operations Plan" means the plan to be developed by the Parties to outline processes and procedures to implement and operate projects under this Agreement and to be incorporated into the Subsequent Agreement.

III. Stipulations

In consideration of the mutual covenants contained herein and other good and valuable consideration, the adequacy of which is acknowledged, the Parties hereby stipulate as follows:

1. Short Term Projects

a. Rattlesnake Augmentation Wellfield

The District shall design and construct an augmentation wellfield to supplement the streamflow in the Rattlesnake Creek with groundwater pumped from the regional aquifer. Water will be delivered directly to the Rattlesnake Creek channel immediately upstream of the Refuge. Streamflow augmentation will be implemented from the wellfield designed with a delivery capacity of 15 cubic feet per second ("cfs") under normal conditions to the Rattlesnake Creek stream channel. The District agrees to provide an additional 3 cfs to the Rattlesnake Creek at critical, agreed upon, times each year. The Technical Committee will make recommendations to the Parties regarding whether the additional 3 cfs will be needed each year.

b. Work Plan

Within twelve (12) months of the Effective Date of this Agreement, the District shall submit a work plan for the augmentation wellfield to supplement the streamflow in the Rattlesnake Creek. Such work plan which will contain an implementation schedule, including dates for at least the following milestones:

i. Project Design

ii. Engineering Plans and Specifications

iii. Wellfield construction beginning and completion dates

c. Delivery Schedule

The District will work with the Refuge Manager, in coordination with the Technical Committee, to develop a delivery schedule that maximizes the efficiency of delivery to meet augmentation obligations at the Refuge. In months when streamflow in Rattlesnake Creek is sufficient to meet or exceed the requirements for water at the Refuge, as determined by the Technical Committee, the District will have no obligation to deliver streamflow during those months. Accounting for the water delivery will be conducted using newly established telemetry enabled water flowmeters at the delivery point of the stream channel. The Service will install the appropriate type of staff gauge at Little Salt Marsh ("LSM") to enhance delivery coordination and maintain transparency in monitoring water elevations.

Operational use and scheduling for the streamflow augmented water will be further described in more detail in a technical operations plan, which will be developed by the Parties and incorporated into the Subsequent Agreement.

d. Costs

The District agrees to pay for the cost to develop, construct, operate, and maintain the augmentation wellfield, all pipelines or canals, and points of discharge necessary to ensure water from the wellfield is delivered to the Rattlesnake Creek channel or any other point agreed upon with the Service south of the Refuge.

2. Long-Term Projects

The District will use reasonable efforts to develop a water right purchase program to promote the retirement of water rights from sensitive areas in the Rattlesnake Creek region. The goal of this program is to retire 2,500 acre-feet ("AF") from areas close to the stream based on the response map published by KDA–DWR on November February 14, 2018 (the "response map").

The District will also use reasonable efforts to promote the movement of water under K.A.R. 5-25-22 and other programs, such as the Central Kansas Water Bank Association, from sensitive areas in the Rattlesnake Creek region to less-sensitive areas of the District.

If the water right purchase program is unable to retire 2,500 acre-feet ("AF") from areas close to the stream based on the response map, the District will use reasonable efforts to incentivize end gun removal from center pivot systems within the region. As of January 2015, the District determined that there were 1,032 center pivots with operational end guns.

3. Water Storage Measures

Water management at the Refuge utilizes the LSM in a manner that provides water to all reaches of the Refuge while maintaining adequate water levels for habitat in and around LSM. Once the augmentation wellfield is operational, the Service agrees to store up to an additional 383 AF of water in LSM annually to provide quality water bird habitat following

monthly/seasonal species-habitat requirements as outlined in the Comprehensive Conservation Plan ("CCP").

4. Monitoring

The Parties intend to develop a monitoring program to ensure the on-going operations of the augmentation wellfield as intended under this Agreement. Such monitoring program will detail the Parties' monitoring roles and will be incorporated into the Subsequent Agreement. The program will address:

a. Monitoring water quality and augmentation operations in accordance with water quality requirements of the Kansas Department of Health and Environment, and

b. Monitoring water quantity and permitting requirements of the Kansas Department of Agriculture – Division of Water Resources.

c. Monitoring of water storage and release operations at LSM.

5. Request to Secure Water

The Service agrees not to submit a request to secure water pursuant to K.S.A. 82a-706b and K.A.R. 5-4-1 to address its impairment in 2020 and 2021.

6. Assistance in Developing an Augmentation Project

The Parties agree to provide administrative and regulatory assistance and support within their authority to assist in the development and implementation of projects under this Agreement.

7. Modification

The Parties recognize that there are circumstances that are outside the direct control of the District (e.g. ability to obtain water rights, acquisition necessary easements, etc.) and that a modification of this Agreement may be necessary. The Parties also recognize that, after the augmentation wellfield is implemented and operational, additional assessment of hydrologic conditions may necessitate amendments to the long term projects identified in Paragraph 2. The terms of this Agreement, including any timeframe herein, may be modified by written consent of both Parties. No modification of this Agreement shall be valid unless the change is made in writing and is approved by authorized representatives of the Parties, evidenced by the signature of each respective representative.

8. Timeline

The District and Service will use reasonable efforts to meet the following milestones to implement the terms of this Agreement. Parties will notify each other as soon as practicable if any timeframe in this section will not be met and shall modify the timeframe(s) to include the new date(s) pursuant to Paragraph 7.

i. District applies for Watershed Act grant August 2020

ii.	Funding potentially awarded	November 2020
iii.	Environmental Assessment and Feasibility Study completed	May 2021
iv.	Decision anticipated	August 2021

9. Term and Termination

This Agreement shall remain in effect until replaced by a subsequent agreement or terminated by either Party. Either Party may terminate this Agreement only upon 90 days' notice in writing. In addition to such notice, the Party wishing to terminate shall afford the non-terminating Party a reasonable opportunity to confer before such termination takes effect. Any pending notice to terminate this Agreement will be rescinded by the Party who served the notice once the issues have been resolved.

10. Limitation

Nothing in this MOA shall be construed as obligating the United States, the District or any other public agency, their officers, agents or employees to expend any funds in excess of appropriations authorized by law.

11. Third-Party Challenges or Appeals

Nothing in this MOA may be the basis of any third-party challenges or appeals. Nothing in this MOA creates any rights or causes of action in persons not parties to this MOA.

12. Notices

All official notices shall be sent to the Parties' designated contacts as listed below:

U.S. Fish and Wildlife Service
Quivira National Wildlife Refuge
Refuge Manager
1434 NE 80th Street
Stafford, KS 67578

U.S. Fish and Wildlife Service
Chief, Division of Water Resources
134 Union Boulevard
Lakewood, CO 80228-1807

Manager
GMD5
125 S. Main St.
Stafford, KS 67578

Lynn Preheim
Stinson LLP
1625 N. Waterfront Pkwy
Suite 300
Wichita, KS 67206

13. No Third-Party Beneficiary

No Party to this Agreement intends for this Agreement to confer any benefit upon any person or entity not a signatory to this Agreement, whether as a third-party beneficiary or otherwise.

14. Headings

The headings of clauses contained herein are used for convenience and ease of reference. They shall not limit the scope or intent of the clause.

15. Effective Date

This Agreement shall become effective upon the execution by the Parties hereto.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement on the day and year first written above.

Darrell N. Wood Date: 7-25-20
Darrell Wood
President, Board of Directors
Big Bend Groundwater Management District 5

Walter M. Oldham Date: 7/25/20
Mike Oldham
Refuge Manager
U.S. Fish and Wildlife Service

News Release

U.S. Fish and Wildlife Service Identifies Solutions for Water at Quivira National Wildlife Refuge in 2021

For Immediate Release

December 23, 2020

Like 0 Tweet **Share** 3

DENVER – Working collaboratively with our partner, the Big Bend Groundwater Management District #5 (District), and the local community, the U.S. Fish and Wildlife Service (Service) identified voluntary solutions to remedy water impairment at Quivira National Wildlife Refuge – located in south-central Kansas. Through this effort, the Service does not intend to submit a request to secure water for Quivira National Wildlife Refuge. Cooperation and collaboration with local communities are a priority for the Trump Administration.



Waterfowl at Quivira National Wildlife Refuge. Photo by Dan Severson, USFWS.

"The Trump Administration has prioritized working families and communities, as well as conservation of species and their habitats. The U.S. Fish and Wildlife Service is committed to working alongside our Quivira National Wildlife Refuge neighbors to try to find a commonsense solution that is equitable to us all in utilizing and conserving such a vital resource as water," **said Service Director Aurelia Skipwith.** "Through partnership and leveraging new technologies, we are excited to use the best available science to inform a balanced approach to water distribution."

For more than six decades, the congressionally designated refuge has protected more than 22,000 acres of unique and rare inland salt marsh and sand prairie habitats that are vital to more than 300 species of birds, some threatened and endangered, in the Central Flyway. The Big and Little Salt marshes attract thousands of migratory waterfowl, shorebirds and wetland birds, providing them with food, water, shelter and a place to rest.

In 2016, the Kansas Chief Engineer found the refuge's senior state water rights along Rattlesnake Creek were being significantly infringed upon by junior water right holders. In July 2020, the Service and District entered an MOA establishing a framework to develop short- and long-term water conservation actions. This MOA was instrumental in highlighting the collaborative efforts and partnership support for the U.S Department of Agriculture Natural Resources Conservation Service (NRCS) grant to the District. The NRCS grant will allow for the development of an augmentation workplan that supplements water distributed from groundwater wells, conduct water quality and quantity feasibility testing, and complete an environmental assessment under the National Environmental Policy Act. The activities that will be carried out as a result of this grant will benefit the family farmers, ranchers and agricultural communities that fall within the District area of responsibility.

U.S. Senator Jerry Moran's coordinated water management discussions led to the signing of a Memorandum of Agreement (MOA) between the Service and the district this summer in Saint John, Kansas, and the sustainable path forward on this longstanding water management challenge.



"The U.S. Fish and Wildlife Service's decision to not request to secure water in 2021 for Quivira National Wildlife Refuge demonstrates their continued commitment to work towards fulfilling the water needs of both the refuge and local producers," **said U.S. Senator Moran (KS)**. "Through a grant secured earlier this month for watershed planning at Rattlesnake Creek and the partnership of Director Skipwith, we are on track to establish long-term solutions that will support the refuge, Kansas producers and the regional economy."

Although the Service does not intend to send a request to secure water for the coming year, both parties will continue to work toward meeting milestones from the agreement to develop both short- and long-term water conservation actions. The partners strive to maintain healthy wildlife populations while supporting the economic viability of farming and ranching operations in America's heartland.

The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. For more information on our work and the people who make it happen in the West, visit ***our website****, or connect with us through any of these social media channels:* ***Facebook****,* ***Twitter****,* ***Flickr****,* ***YouTube****, and* ***Instagram****.*

– FWS –

U.S. Fish and Wildlife Service
Office of External Affairs
Mountain-Prairie Region
134 Union Blvd
Lakewood, CO 80228
303-236-7905
303-236-3815 FAX
www.fws.gov/mountain-prairie/

Contacts

Joe Szuszwalak



(303) 236-4336
joseph_szuszwalak@fws.gov

Tweets by @USFWSMtnPrairie





EMAIL UPDATES

To sign up for updates or to access your subscriber preferences, please enter your contact information below.

E-mail Address

Submit

govDELIVERY



U.S. Fish and Wildlife Service Home Page
Department of the Interior
USA.gov
About the U.S. Fish and Wildlife Service
Accessibility
Privacy
Notices
Disclaimer
FOIA

The mission of the U.S. Fish and Wildlife Service is working with Others to conserve, protect, and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American People.

Last modified: December 23, 2020

All Images Credit to and Courtesy of the U.S. Fish and Wildlife Service Unless Specified Otherwise.

